

Original operating instructions

## BCL 304*i* Bar code readers



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## 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/i 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/i 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/i 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

|  <b>CAUTION!</b> |  |
|---|--|
|                  | <p><b>Observe intended use!</b></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> |

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


|  <b>ATTENTION!</b> |  |
|---|--|
|                    | <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 <sup>1)</sup>
- for medical purposes

| <b>NOTE</b>   |  |
|---|--|
|  | <p><b>Do not modify or otherwise interfere with the device!</b></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> |

<sup>1)</sup> 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 <b>laser class 1</b> 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!            |  |



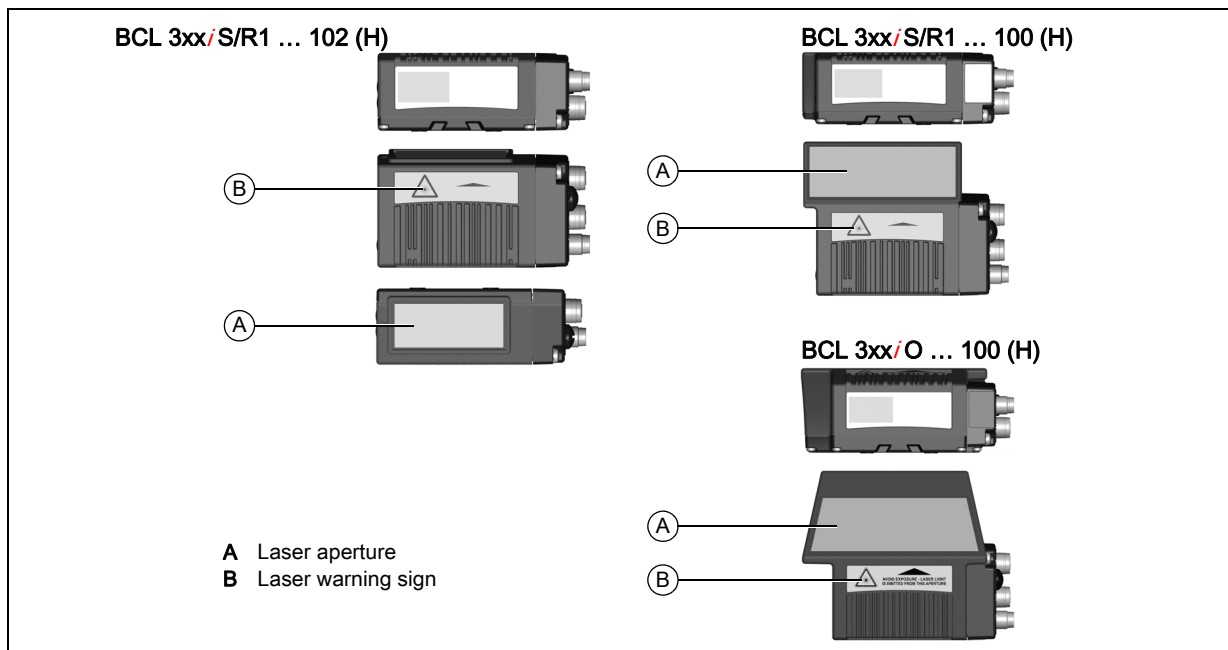


Figure 2.1: Laser apertures, laser warning signs

### 3 Fast commissioning / operating principle

Below you will find a short description for the initial commissioning of the BCL 304/. Detailed explanations for all listed points can be found throughout this technical description.

#### 3.1 Mounting the BCL 304/

The BCL 304/ 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 304/ 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 304/ and the host system depending on which interface is used.
- The correct time for data output. The BCL 304/ 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 exits the BCL 304/ as follows for the respective devices:  |
|   | <ul style="list-style-type: none"> <li>- line scanner <b>parallel</b> to the <b>housing base</b></li> <li>- deflecting mirror <b>105 degrees</b> to the <b>housing base</b></li> <li>- oscillating mirror <b>perpendicular</b> to the <b>housing base</b>.</li> </ul> <p>The red areas in Figure 6.2 are the housing base. The best read results are obtained when:</p> <ul style="list-style-type: none"> <li>• The BCL 304/ is mounted in such a way that the scanning beam is incident on the bar code at an angle of inclination greater than <math>\pm 10^\circ \dots 15^\circ</math> to vertical.</li> <li>• The reading distance lies in the middle area of the reading field.</li> <li>• The bar code labels are of good print quality and have good contrast ratios.</li> <li>• You do not use high-gloss labels.</li> <li>• There is no direct sunlight.</li> </ul> |

#### 3.3 BCL 304/ electrical connection

For the electrical connection of the BCL 304/, 2 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.

## MS 304 connector hood with 2 integrated M12 connectors

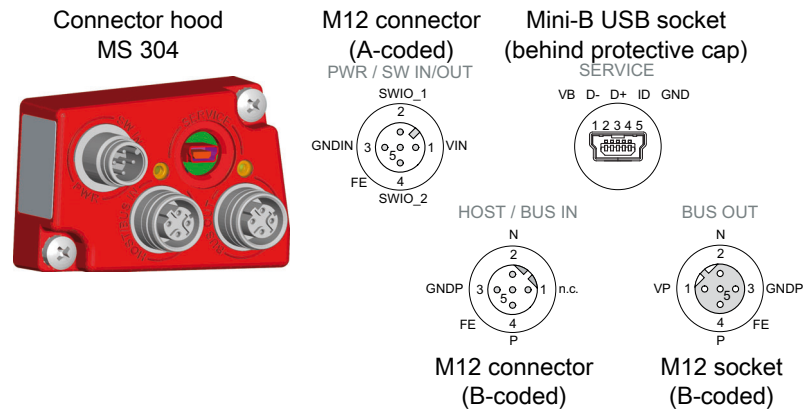





Figure 3.1: BCL 304/i - MS 304 connection hood with M12 connectors

| NOTE  |   |
|---|---|
|    | The shielding connection is done via the M12 connector housing.   |
| NOTE  |   |
|   | PROFIBUS address 126 is set by default in the MS 304.<br>The integrated parameter memory for the simple replacement of the BCL 304/i is located in the MS 304.  |
| NOTE  |   |
|  | The PROFIBUS is looped through the MS 304, i.e. the bus is not interrupted when the BCL 304/i is removed from the MS 304.<br>The bus is terminated at BUS OUT via an external mounted terminating resistor (see chapter 12.4 "Accessory – Terminating resistor"). |

## MK 304 terminal hood with spring-cage terminals

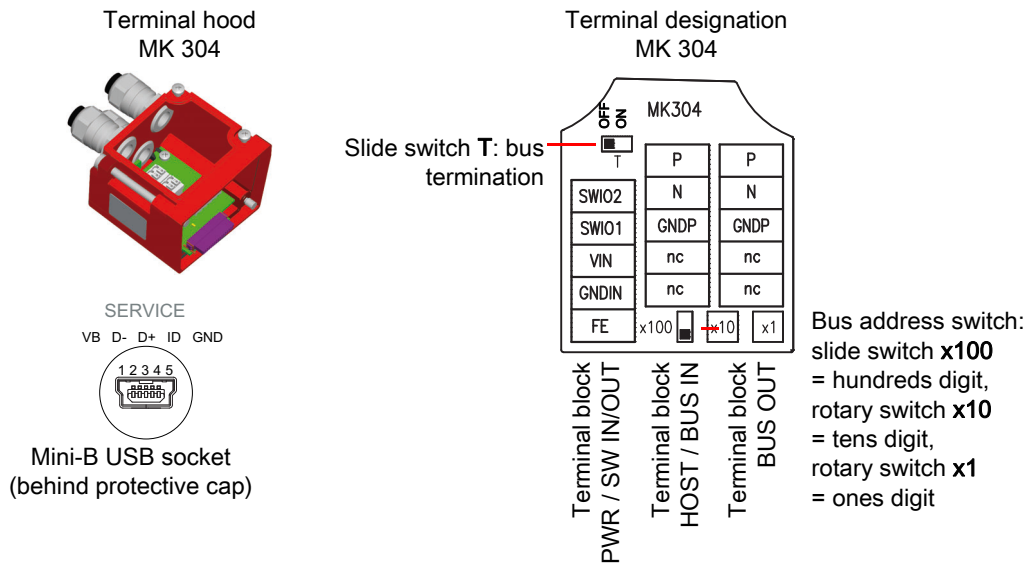


Figure 3.2: BCL 304/- MK 304 terminal hood with spring-cage terminals

## NOTE



PROFIBUS address 126 is set by default in the MK 304. The integrated parameter memory for the simple replacement of the BCL 304/- is located in the MK 304.

## NOTE



The PROFIBUS is looped through the MK 304, i.e. the bus is not interrupted when the BCL 304/- is removed from the MK 304. The PROFIBUS is terminated via slide switch T in the MK 304. 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.

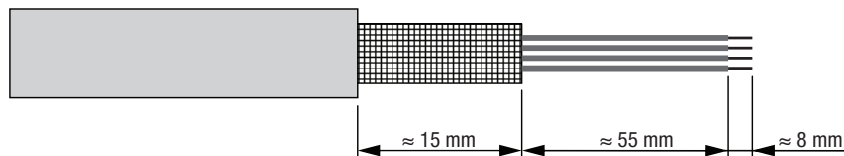


Figure 3.3: Cable fabrication for MK 304 terminal hood

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.

## 3.4 Starting the device

- Set the PROFIBUS address of the BCL304i in your PROFIBUS network via the address switch (one slide and two rotary switches) provided for this purpose in the MS 304 or MK 304.
- Install the GSD file associated with the BCL 304/- in the PROFIBUS manager of your control.
- Activate the desired modules (at least module 10 and one of the modules 21 ... 27).
- Store the slave address for the BCL 304/- in the PROFIBUS manager. Ensure that the address is the same as the address configured in the device.
- Connect the +18 ... 30VDC supply voltage (typ. +24VDC).

The BCL 304/- starts up, the **PWR** and **NET** LEDs display the operating state. If there is a display, the bar code reading window appears in it.

**PWR LED****Green, flashing****Device ok, initialization phase****Green, continuous light****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****Device error / parameter enable****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 304i SM 102 D
- Reading Result

If Reading Result is displayed, the device is ready.

**Operation of BCL 304/i**

After voltage (18 ... 30VDC) has been connected to the switching input, a read process is activated. In the standard setting, the **2/5 interleaved** code type is enabled. The decoding result module (21-27) must be configured and the BCL 304/i must be connected to the PROFIBUS.

If a code is lead through the reading field, the code content is decoded and sent to the PLC via PROFIBUS.

### 3.5 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 304 *i* 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) via PROFIBUS.

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.

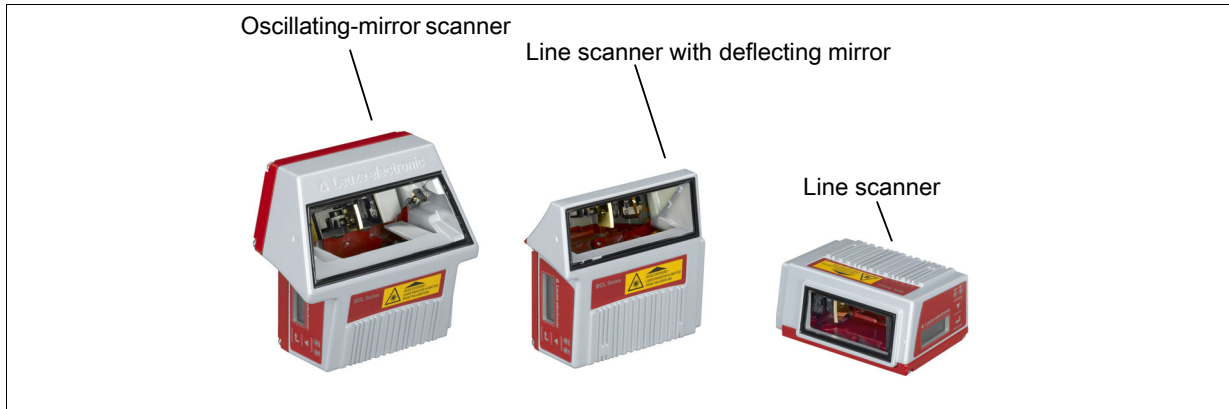


Figure 4.1: Line scanner, line scanner with deflecting mirror and oscillating-mirror scanner

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 = *i* -> 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
- 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).

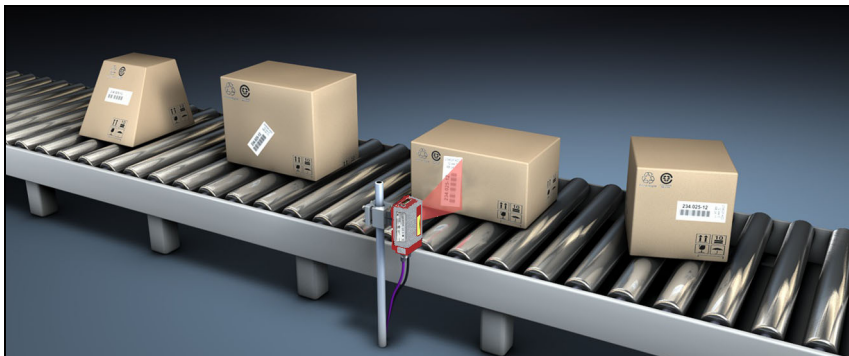


Figure 4.2: Possible bar code orientation

With the BCL 304**/**, configuration is generally performed with the aid of the GSD file.

The BCL 304**/**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 304**/**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 or via the PROFIBUS. An alternative option for activation is the **autoRefIAct** function.

Through the read operation, the BCL 304**/**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 304**/**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 304/ 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 304/ Bar code reader

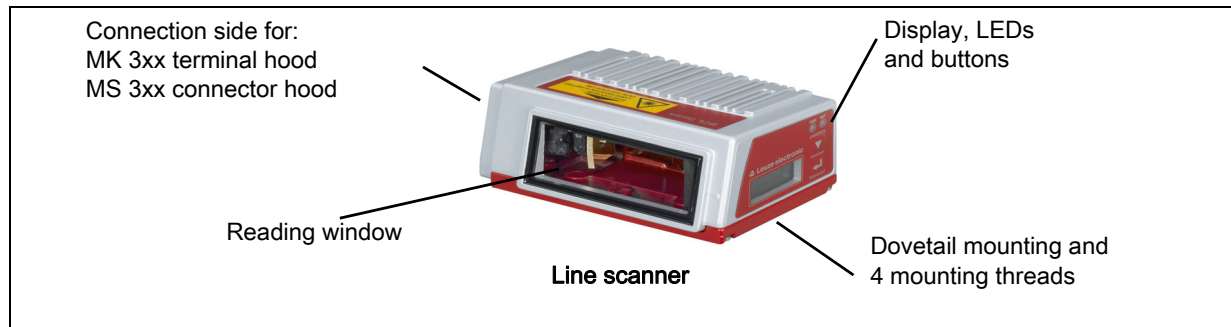


Figure 4.3: BCL 304/ device construction - line scanner

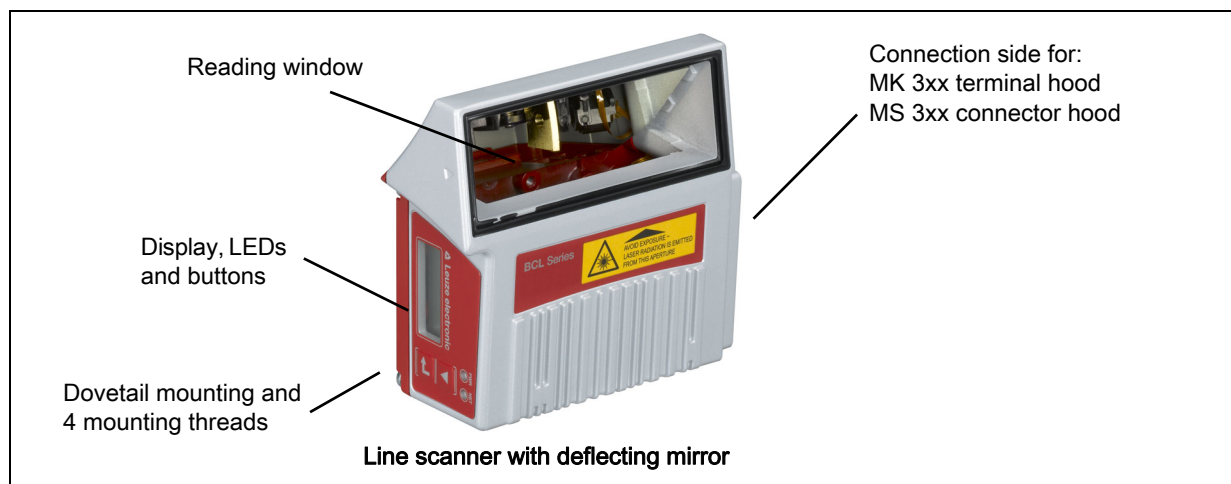


Figure 4.4: Device construction BCL 304/- Line scanner with deflecting mirror

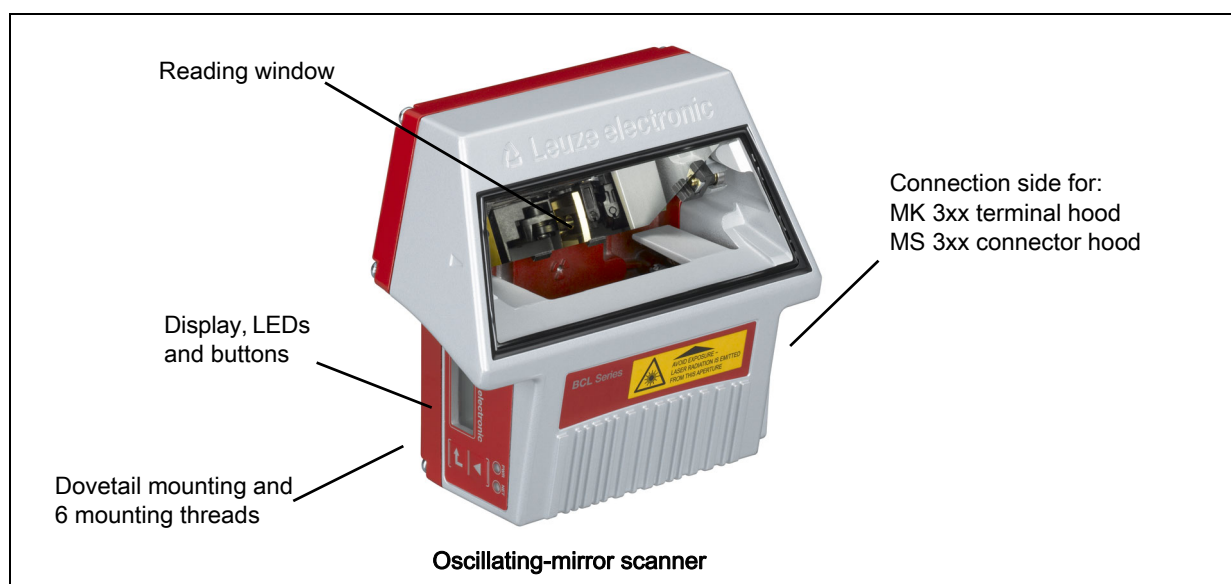


Figure 4.5: BCL 304/ device construction - oscillating-mirror scanner

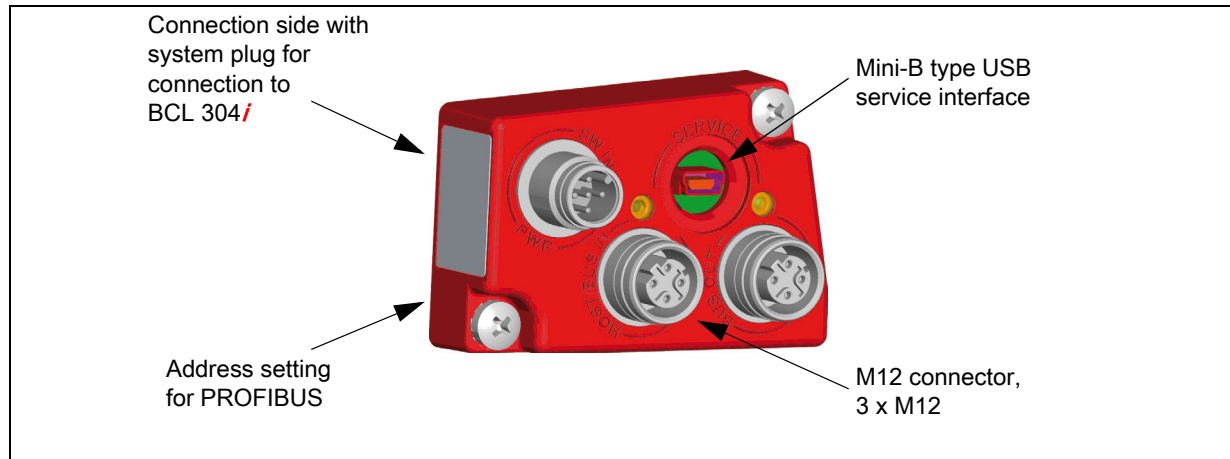
**MS 304 connector hood**

Figure 4.6: Device construction - MS 304 connector hood

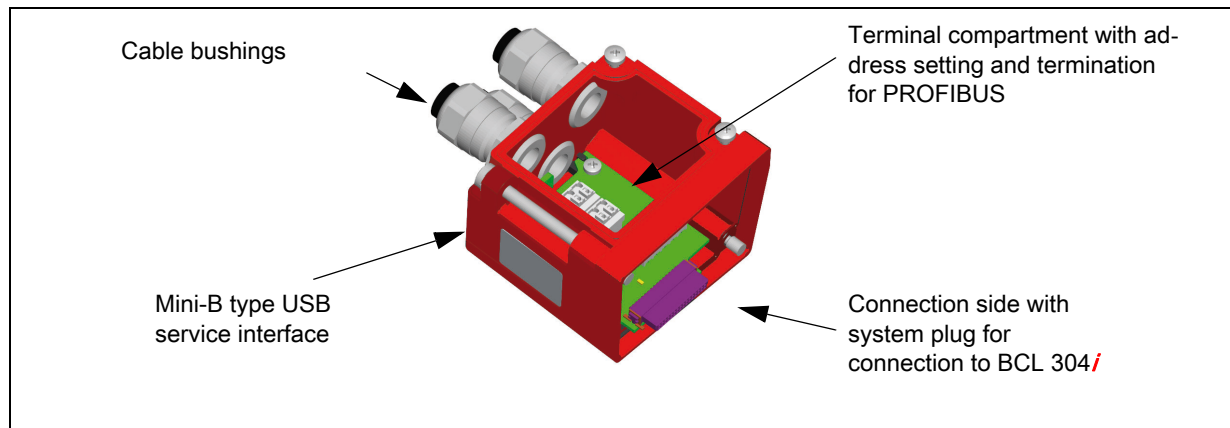
**MK 304 terminal hood**

Figure 4.7: Device construction MK 304 hood with integrated connectors

**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 4.8: 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 304*i* 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.

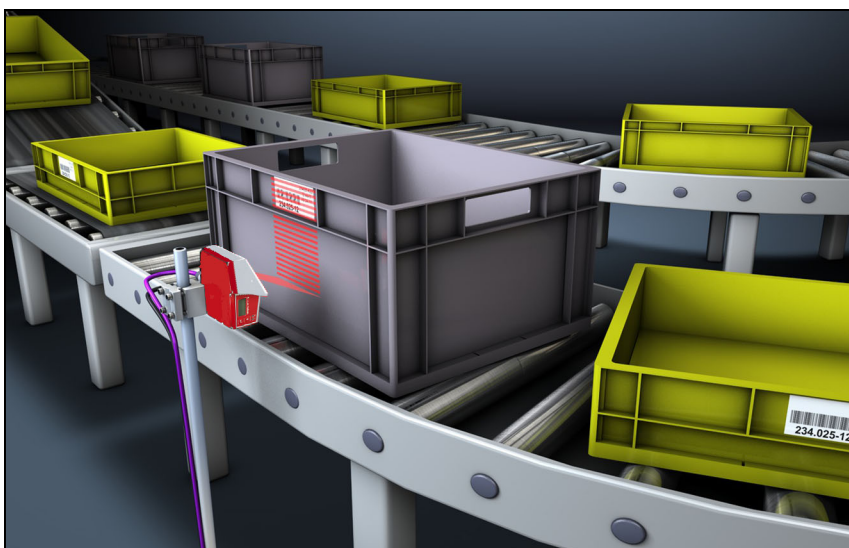


Figure 4.9: Deflection principle for the line scanner with oscillating mirror add-on

#### 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

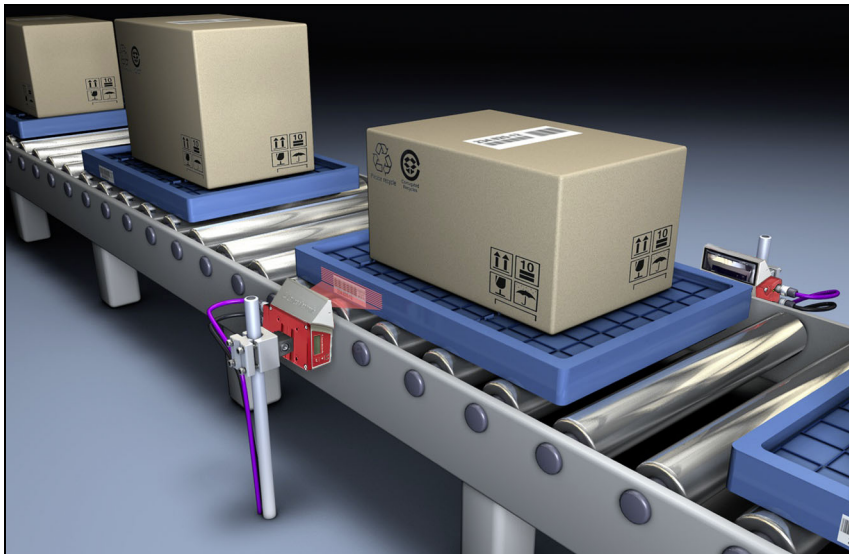


Figure 4.10: Deflection principle for the raster scanner

##### 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 Fieldbus systems

Various product variants of the BCL 300/series are available for connecting to different fieldbus systems such as PROFIBUS DP, PROFINET, Ethernet, EtherNet/IP and EtherCAT.

### 4.5.1 PROFIBUS DP

The BCL 304/ is designed as a PROFIBUS device (PROFIBUS DP-V1 acc. to IEC 61158) with a baud rate of max. 12MBd. The functionality of the device is defined via parameter sets which are clustered in modules. These modules are contained in a GSD file.

The BCL 304/ bar code readers can be operated as network devices on the PROFIBUS. The BCL 304/ features multiple M 12 connectors / sockets for the electrical connection of the supply voltage, the interface and the switching inputs and outputs.

The BCL 304*/* supports:

- PROFIBUS-DP slave functionality.
- Modular structure of the IO data
- Automatic baud rate detection up to 12 Mbit/s
- SYNC/FREEZE
- FailSafe Mode
- Device-specific diagnostic data
- I&M
- No change of the slave address via the PROFIBUS

For further details, see Chapter 10!

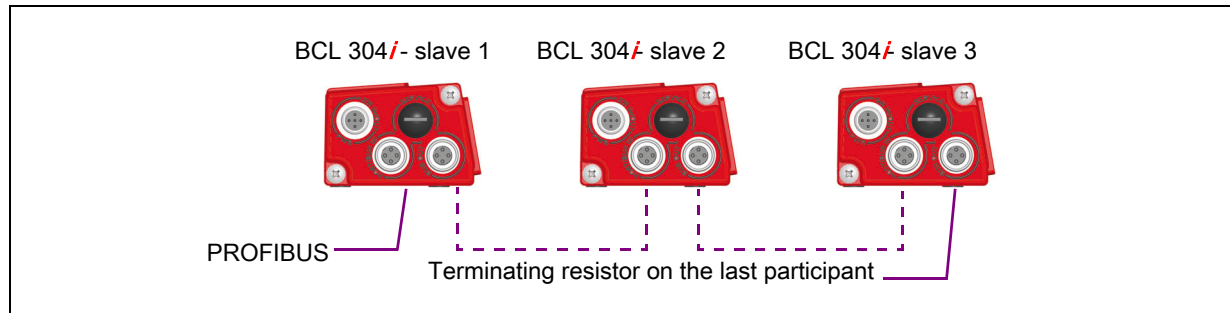


Figure 4.11: PROFIBUS DP

## 4.6 Heating


For low-temperature applications to min. -35°C (e.g. in cold storage), the bar code readers of the BCL 304*/* series can optionally be permanently fitted with a built-in heating and these bar code readers purchased as separate device models.

## 4.7 External parameter memory in the MS 304 / MK 304

The parameter memory available in the MS 304 or MK 304 simplifies and speeds up the process of exchanging a BCL 304*/* on-site by providing a copy of the current parameter set of the BCL 304*/* – the control can immediately access the exchanged BCL 304*/*.

## 4.8 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.



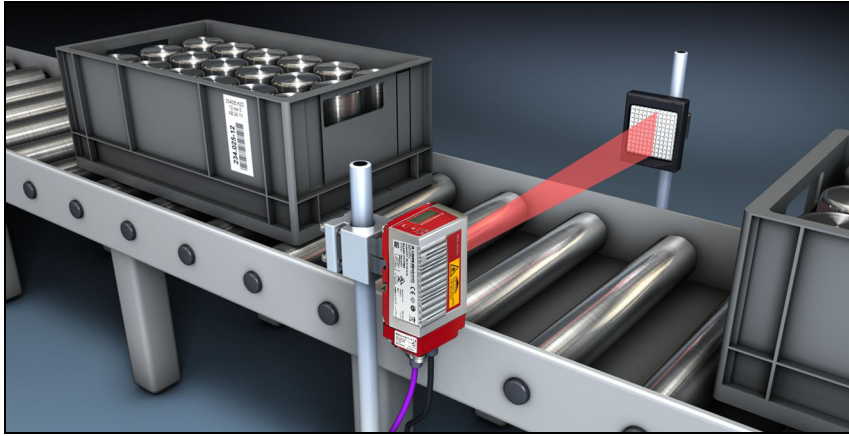


Figure 4.12: Reflector arrangement for autoReflAct

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

#### 4.9 Reference codes

The BCL 304/i offers the possibility of storing one or two reference codes.

It is possible to store the reference codes via the webConfig tool or via PROFIBUS.

The BCL 304/i can compare read bar codes with one and/or both reference codes and execute user-configurable functions depending on the comparison result.

#### 4.10 autoConfig

With the autoConfig function, the BCL 304/i 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 304/i.

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 304/<br>PROFIBUS DP   |
|---------------------------------------|---|
| Design                                | Line scanner without heating  |
| <b>Optical data</b>                   |   |
| Light source                          | Laser diode $\lambda = 655\text{nm}$ (red light)  |
| Wavelength                            | 655nm (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. $60^\circ$   |
| Optics models / resolution            | High Density (N): 0.127 ... 0.20 mm<br>Medium Density (M): 0.20 ... 0.5 mm<br>Low Density (F): 0.30 ... 0.5 mm<br>Ultra Low Density (L): 0.35 ... 0.8 mm<br>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   |
| <b>Bar code data</b>                  |   |
| Code types                            | 2/5 Interleaved, Code 39, Code 128, EAN 128, EAN / UPC, Codabar, Code 93, GS1Data Bar, EAN Addendum   |
| Bar code contrast (PCS)               | $\geq 60\%$   |
| Ambient light tolerance               | 2000 lx (on the bar code)   |
| Number of bar codes per scan          | 3   |
| <b>Electrical data</b>                |   |
| Interface type                        | 1x RS 485<br>on 2x M12 (B)  |
| Protocols                             | PROFIBUS DP   |
| Baud rate                             | 9.6Kbaud ... 12Mbaud  |
| Data formats                          | Slave DPV1  |
| Service interface                     | USB 2.0 Mini-B type socket  |
| Switching input / switching output    | 2 switching inputs/outputs, freely programmable functions<br>- Switching input: 18 ... 30 V DC depending on supply voltage, I max. = 8 mA<br>- Switching output: 18 ... 30VDC depending on supply voltage, I max. = 60mA (short-circuit proof)<br>Switching inputs/outputs protected against polarity reversal! |
| Operating voltage                     | 18 ... 30VDC (Class 2, protection class III)  |
| Power consumption                     | Max. 3W   |
| <b>Operating and display elements</b> |   |
| Display                               | Monochromatic graphical display, 128 x 32 pixel, with background lighting   |
| Keyboard                              | 2 keys  |
| LEDs                                  | 2 LEDs for power (PWR) and bus state (BUS), two-colored (red/green)   |
| <b>Mechanical data</b>                |   |
| Degree of protection                  | IP 65 <sup>1)</sup>   |
| 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: Technical data of the BCL 304/line/raster scanners without heating

| Type                          | BCL 304/<br>PROFIBUS DP  |
|-------------------------------|--|
| Design                        | Line scanner without heating   |
| <b>Environmental data</b>     |  |
| 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 compatibility | EN 55022;<br>IEC 61000-6-2 (contains IEC 61000-4-2, -3, -4, -5 and -6) <sup>2)</sup> |

Table 5.1: Technical data of the BCL 304/*i*/line/raster scanners without heating

- 1) Only with the MS 304 or MK 304 connection hood and screwed-on M12 connectors or cable bushings 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.

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



The BCL 304/*i*/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 304/<br>PROFIBUS DP   |
|------------------------|---|
| Design                 | Oscillating-mirror scanner without heating  |
| <b>Optical data</b>    |   |
| 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<br>(adjustable, max. frequency is dependent on set swivel angle)      |
| Max. swivel angle      | ±20° (adjustable)   |
| Reading field height   | See reading field curves  |
| <b>Electrical data</b> |   |
| Power consumption      | Max. 4.2W   |
| <b>Mechanical data</b> |   |
| Weight                 | 580 g (without connection hood)   |
| Dimensions (H x W x D) | 58 x 125 x 110 mm (without connection hood)                                       |

Table 5.2: Technical data of the BCL 304/*i*/oscillating-mirror scanners with 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 304/<br>PROFIBUS DP  |
|------------------------|--|
| Design                 | Line scanner with deflecting mirror without heating                      |
| <b>Optical data</b>    |  |
| Beam exit              | Lateral zero position at an angle of 105°                                |
| Beam deflection        | Via rotating polygon wheel (horizontal) and deflecting mirror (vertical) |
| <b>Electrical data</b> |  |
| Power consumption      | Max. 3W  |
| <b>Mechanical data</b> |  |
| Weight                 | 350 g (without connection hood)  |
| Dimensions (H x W x D) | 44 x 103 x 96 mm (without connection hood)                               |

Table 5.3: Technical data of the BCL 304/ deflecting mirror scanners without heating

## 5.2 Heating models of the bar code readers

The BCL 304/ 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 304/ to -35 °C
- Supply voltage 24VDC ±20%
- Enabling the BCL 304/ 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 mm<sup>2</sup>; 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 304/, 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 304/ 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 304/ with heating directly to a cold air stream. To achieve an optimal heating effect, the BCL 304/ 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 mm<sup>2</sup>.

|  <b>ATTENTION!</b> |  |
|---|--|
|                    | The voltage supply must not be looped through from one device to the next. |

**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 304/<br>PROFIBUS DP  |
|------------------------------|--|
| Design                       | Line scanner with heater   |
| <b>Electrical data</b>       |  |
| 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 0.75mm <sup>2</sup> for the supply voltage supply line.<br>Wiring through of the voltage supply to multiple heating devices is <b>not</b> permissible.<br>Standard, M12 ready-made cable <b>not</b> usable<br>(insufficient cable cross-section) |
| <b>Environmental data</b>    |  |
| Operating temperature range  | -35 °C ... +40 °C  |
| Storage temperature range    | -20 °C ... +70 °C  |

Table 5.4: Technical data of the BCL 304/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 304/<br>PROFIBUS DP  |
|------------------------------|--|
| Design                       | Oscillating-mirror scanner with heating  |
| <b>Optical data</b>          |  |
| Useful opening angle         | Max. 60°   |
| Max. swivel angle            | ±20° (adjustable)  |
| <b>Electrical data</b>       |  |
| 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 0.75mm <sup>2</sup> for the supply voltage supply line.<br>Wiring through of the voltage supply to multiple heating devices is <b>not</b> permissible.<br>Standard, M12 ready-made cable <b>not</b> usable<br>(insufficient cable cross-section) |

Table 5.5: Specifications of the BCL 304/oscillating-mirror scanners with heating

| Type                        | BCL 304/<br>PROFIBUS DP                 |
|-----------------------------|---|
| Design                      | Oscillating-mirror scanner with heating |
| <b>Environmental data</b>   |   |
| Operating temperature range | -35 °C ... +40 °C                       |
| Storage temperature range   | -20 °C ... +70 °C                       |

Table 5.5: Specifications of the BCL 304/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 304/<br>PROFIBUS DP  |
|------------------------------|--|
| Design                       | Deflecting mirror scanner with heating   |
| <b>Optical data</b>          |  |
| Useful opening angle         | Max. 60°   |
| Max. adjustment range        | ±10°(adjustable via display or software)   |
| <b>Electrical data</b>       |  |
| 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.<br>Wiring through of the voltage supply to multiple heating devices is <b>not</b> permissible.<br>Standard, M12 ready-made cable <b>not</b> usable<br>(insufficient cable cross-section) |
| <b>Environmental data</b>    |  |
| Operating temperature range  | -35 °C ... +40 °C  |
| Storage temperature range    | -20 °C ... +70 °C  |

Table 5.6: Technical data of the BCL 304/deflecting mirror scanners with heating

## 5.3 Dimensioned drawings

### 5.3.1 Dimensioned drawing of complete overview of the BCL 304/with MS 3xx / MK 3xx

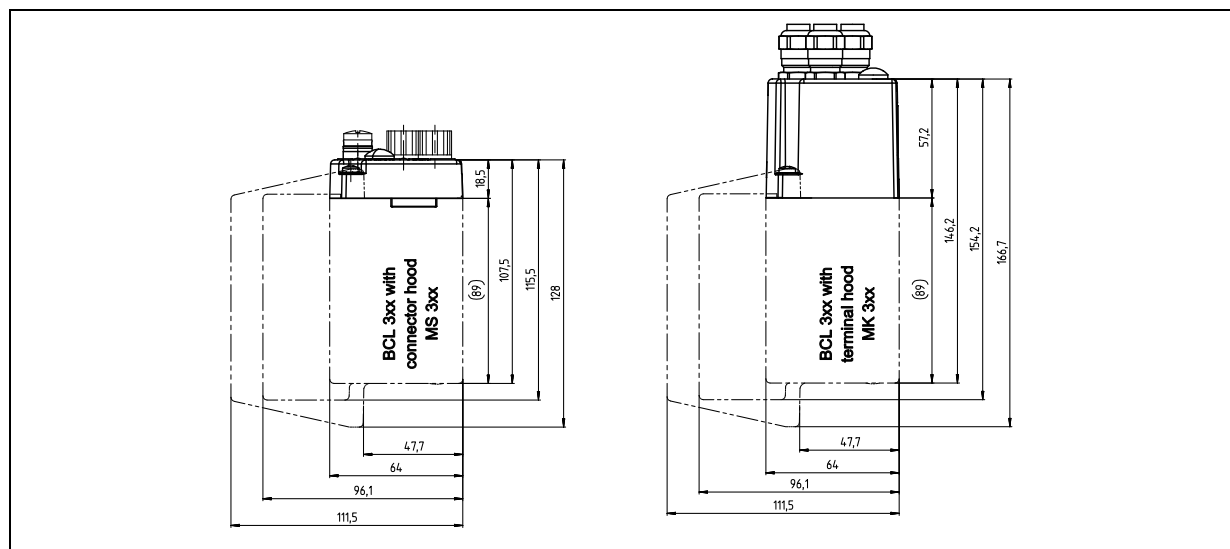


Figure 5.1: Dimensioned drawing of complete overview of the BCL 304/with MS 3xx / MK 3xx

### 5.3.2 Dimensioned drawing of line scanner with / without heating

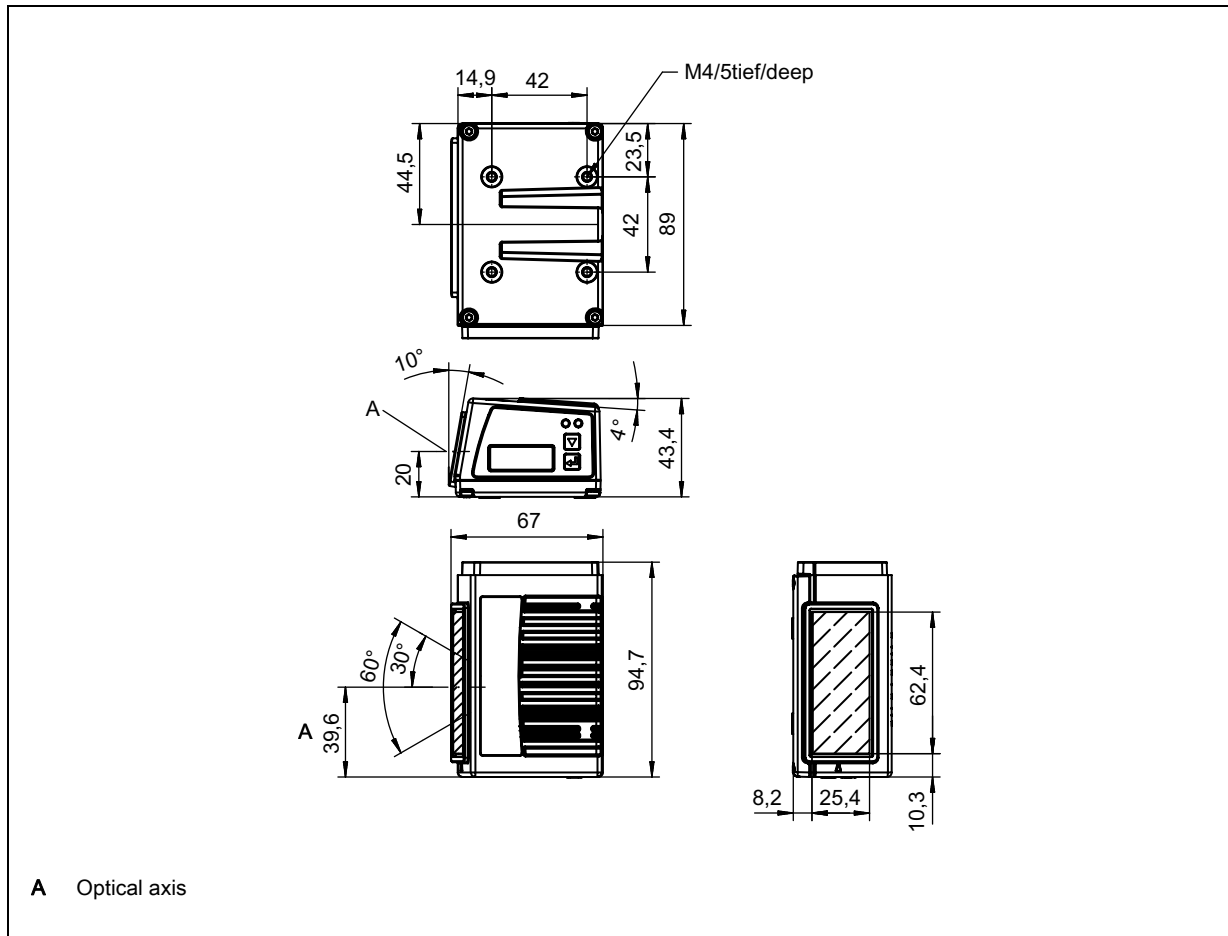


Figure 5.2: Dimensioned drawing of BCL 304/S...102 line scanner

### 5.3.3 Dimensioned drawing of deflecting mirror scanner with / without heating

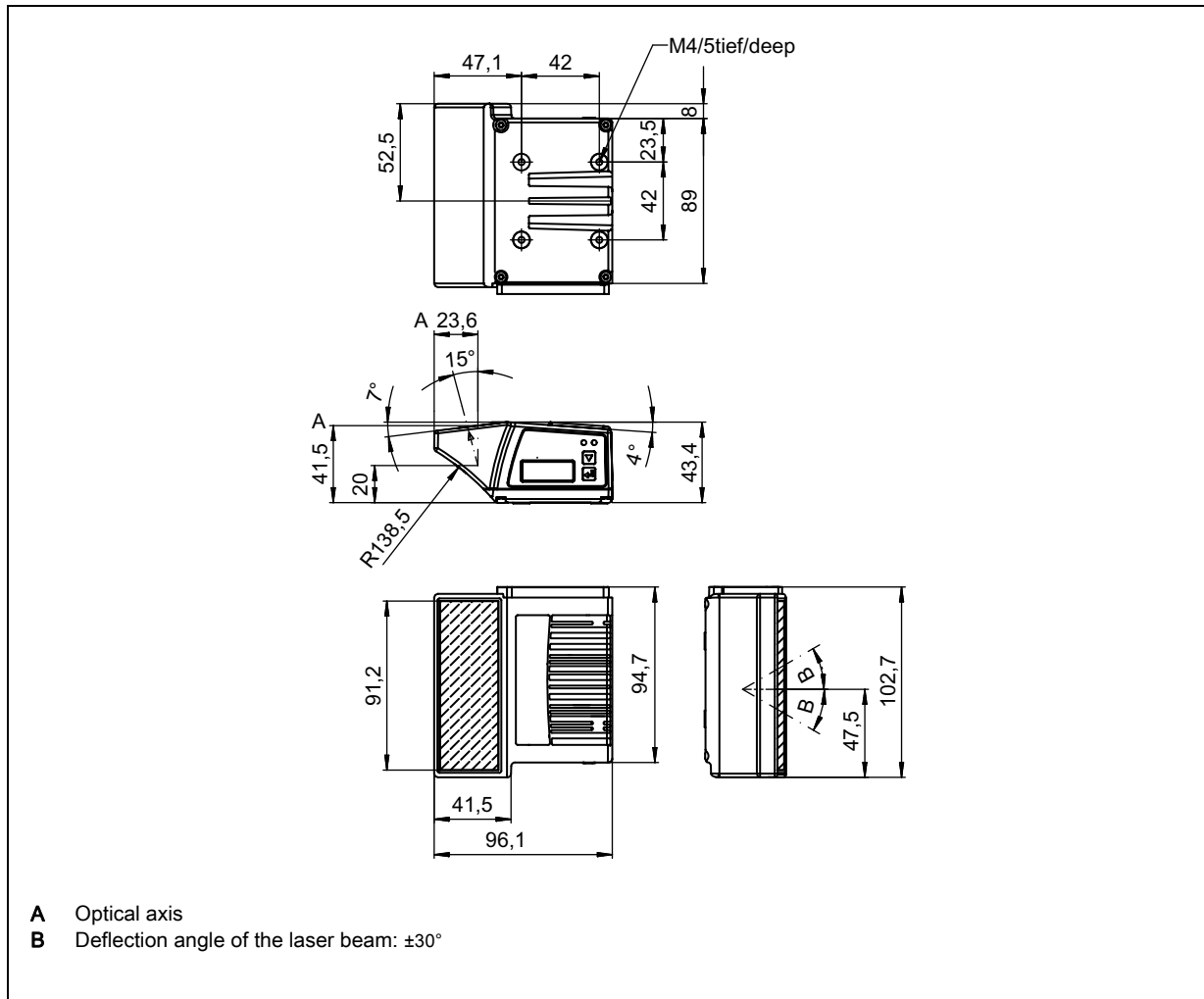


Figure 5.3: Dimensioned drawing of BCL 304/S...100 with deflecting mirror

### 5.3.4 Dimensioned drawing of oscillating-mirror scanner with / without heating

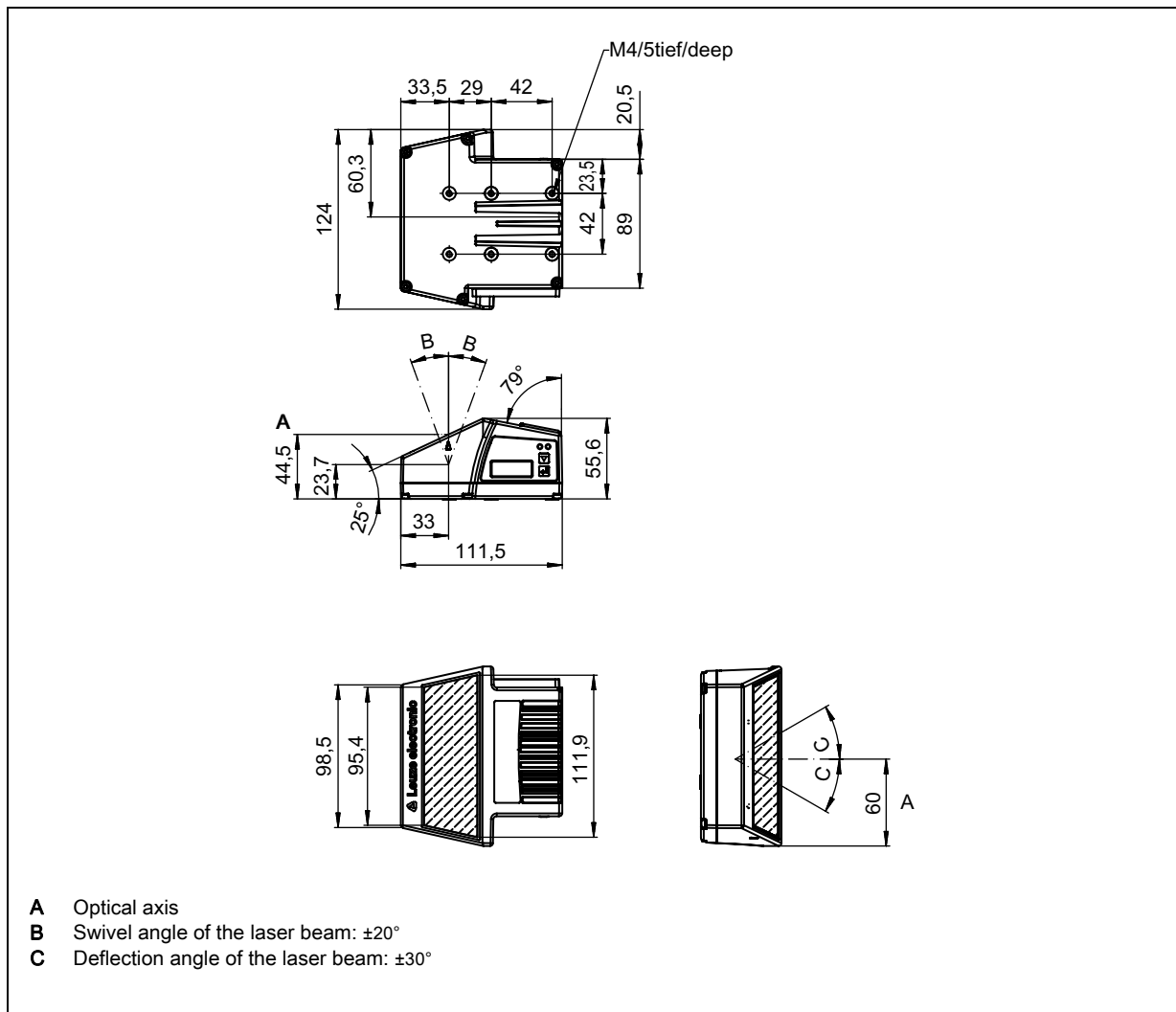


Figure 5.4: Dimensioned drawing of BCL 304/O...100 oscillating-mirror scanner

### 5.3.5 Dimensioned drawings of MS 3xx / MK 3xx connection hoods

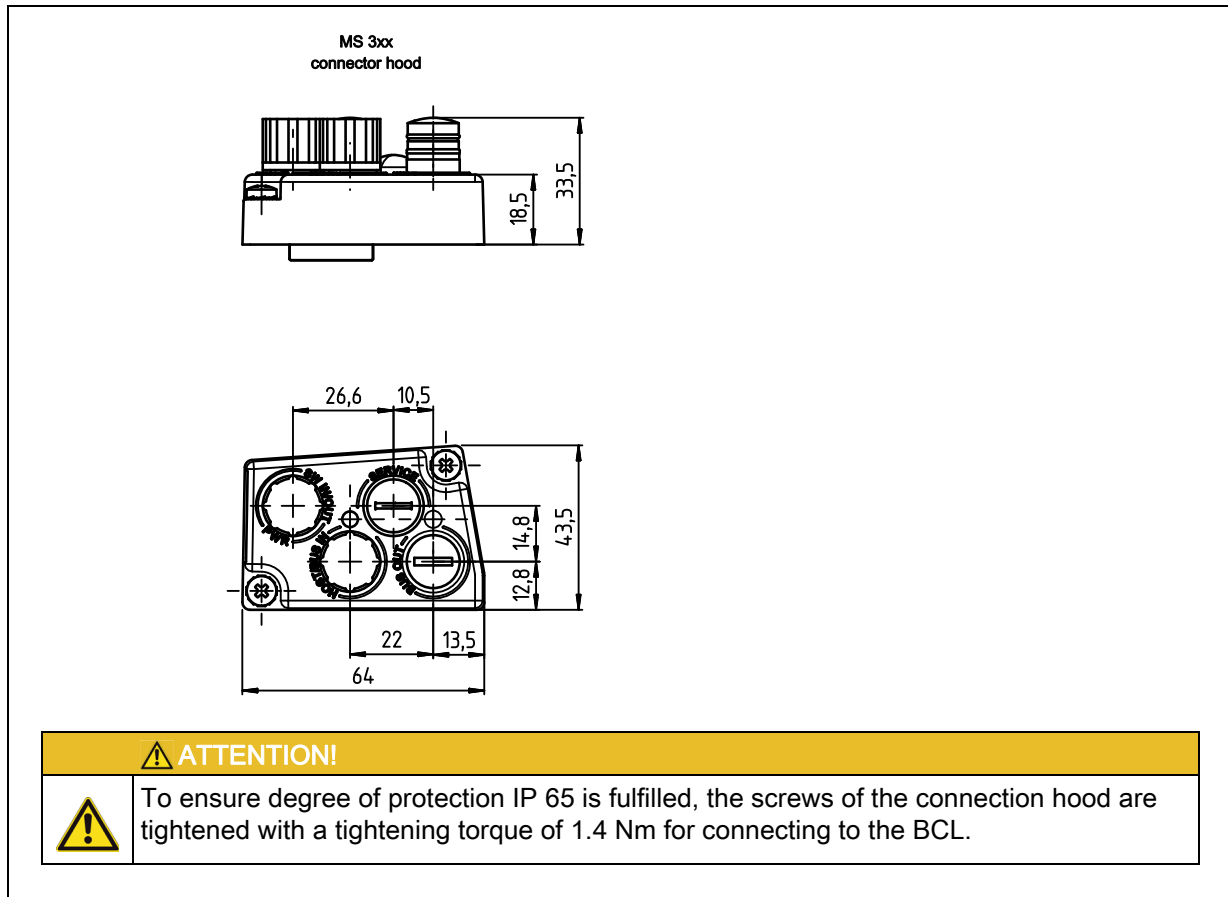


Figure 5.5: Dimensioned drawing of MS 3xx connector hood

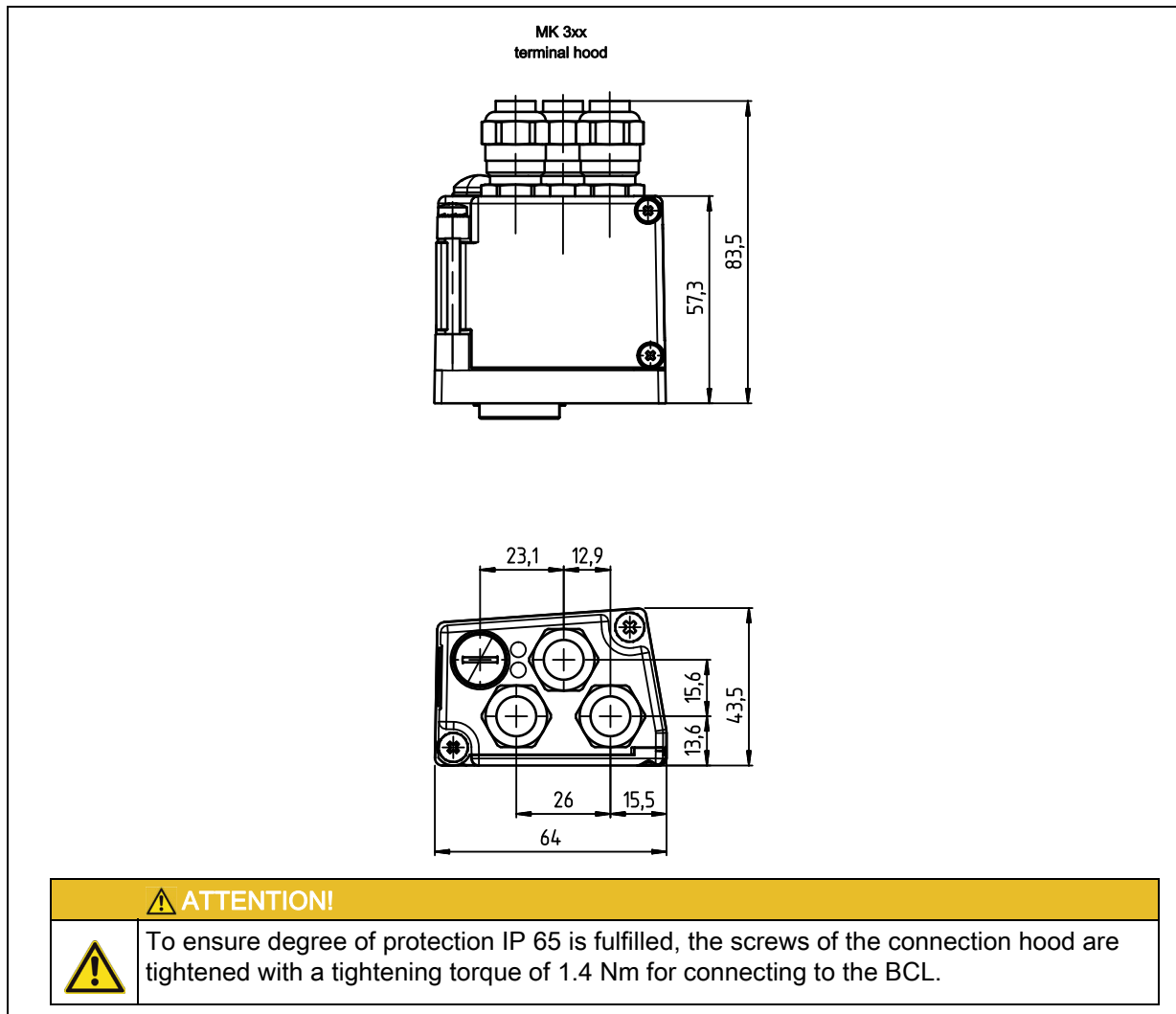


Figure 5.6: Dimensioned drawing of MK 3xx terminal hood

## 5.4 Reading field curves / optical data

### 5.4.1 Bar code characteristics

| NOTE |  |
|------|--|
|      | <p>Please note that the size of the bar code module influences the maximum reading distance and the width of the reading field. Therefore, when selecting a mounting location and/or the bar code label, take into account the different reading characteristics of the scanner with various bar code modules.</p> |

|  |  |
|--|--|
|  | <p>M = Module: The narrowest line or space of a bar code in mm</p> <p>Z<sub>B</sub> = Wide character: Wide bars and gaps are a multiple (ratio) of the module.<br/>Module x Ratio = Z<sub>B</sub> (Normal Ratio 1 : 2.5)</p> <p>B<sub>Z</sub> = Quiet zone: The quiet zone should be at least 10 times the module, but not less than 2.5mm.</p> <p>L = Code length: The length of the bar code in mm including the start and stop characters. The quiet zone is included depending on the code definition.</p> <p>S<sub>L</sub> = Bar length: height of the elements in mm</p> |
|--|--|

Figure 5.7: The most important characteristics of a bar code

The range in which the bar code can be read by the BCL 304/ (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<br>cover [mm]<br>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 304*i* in Figure 5.8.

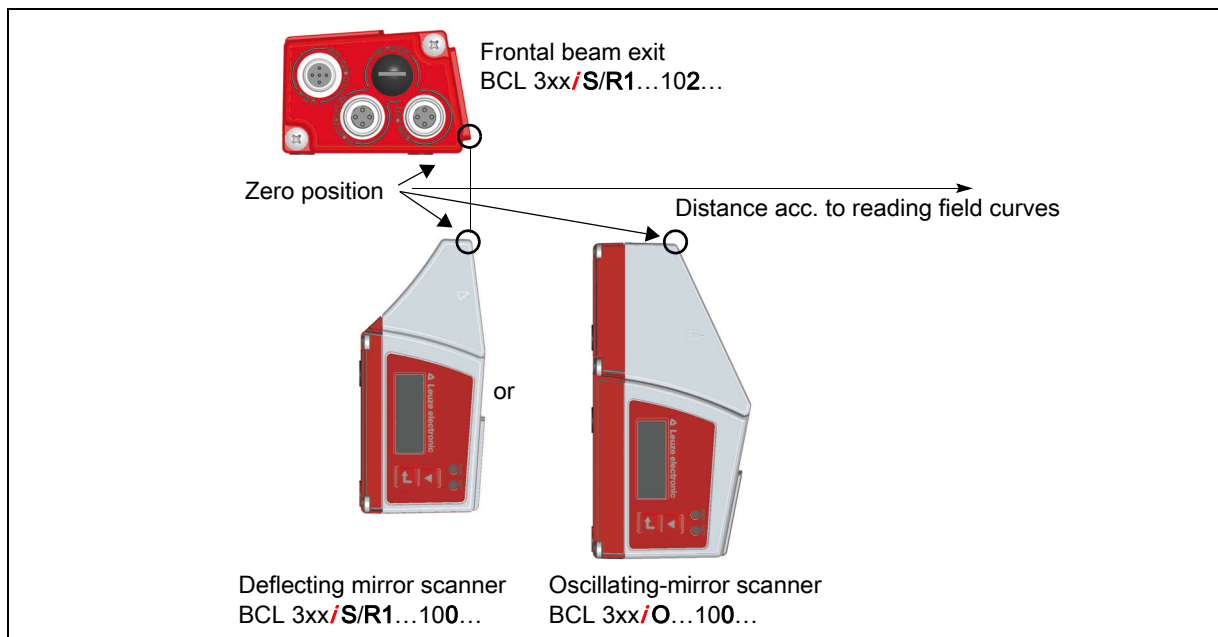


Figure 5.8: Zero position of the reading distance

### 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 304/S/R1 N 102 (H)

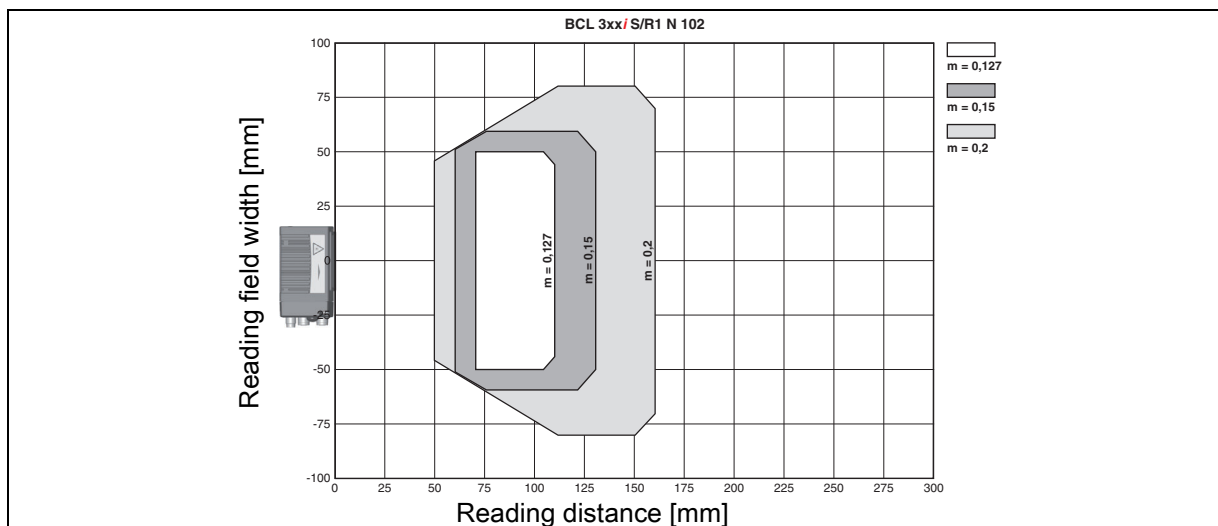


Figure 5.9: "High Density" reading field curve for line scanner without deflecting mirror

### 5.5.2 High Density (N) - optics: BCL 304/S/R1 N 100 (H)

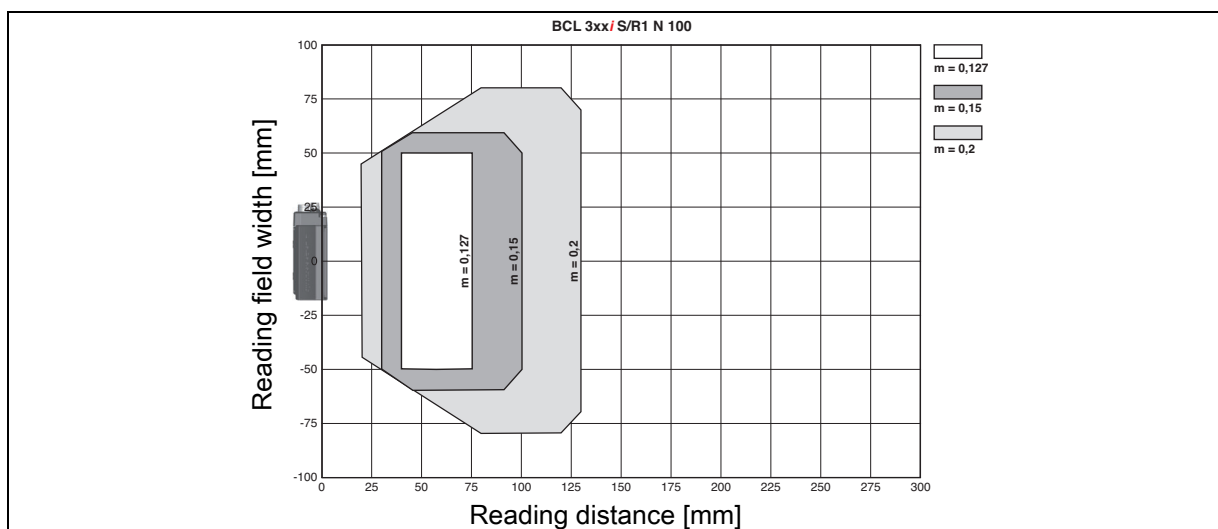


Figure 5.10: "High Density" reading field curve for line scanner with deflecting mirror

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

### 5.5.3 Medium Density (M) - optics: BCL 304/S/R1 M 102 (H)

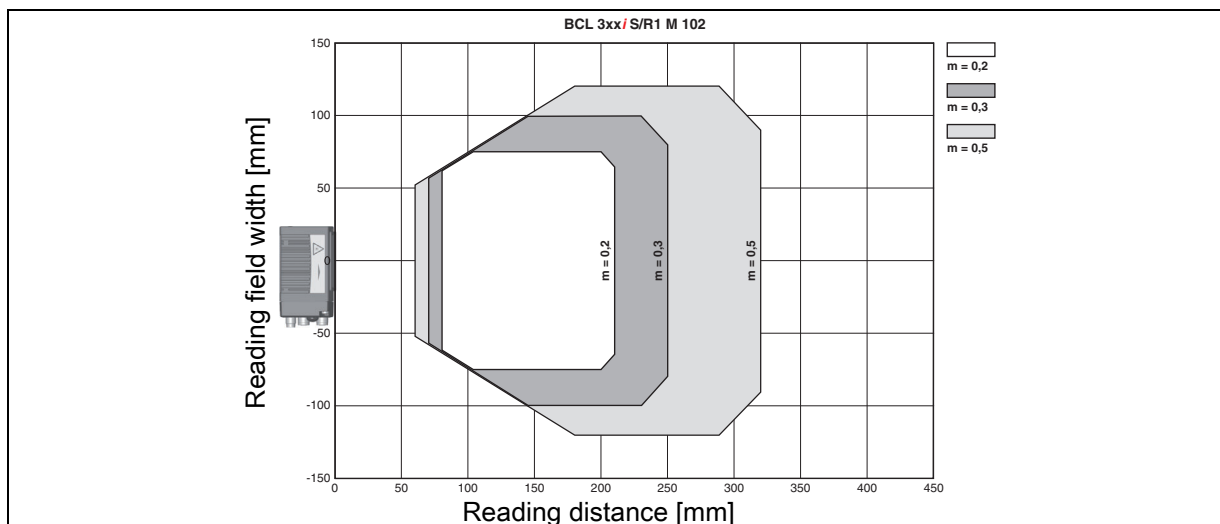


Figure 5.11: "Medium Density" reading field curve for line scanner without deflecting mirror

### 5.5.4 Medium Density (M) - optics: BCL 304/S/R1 M 100 (H)

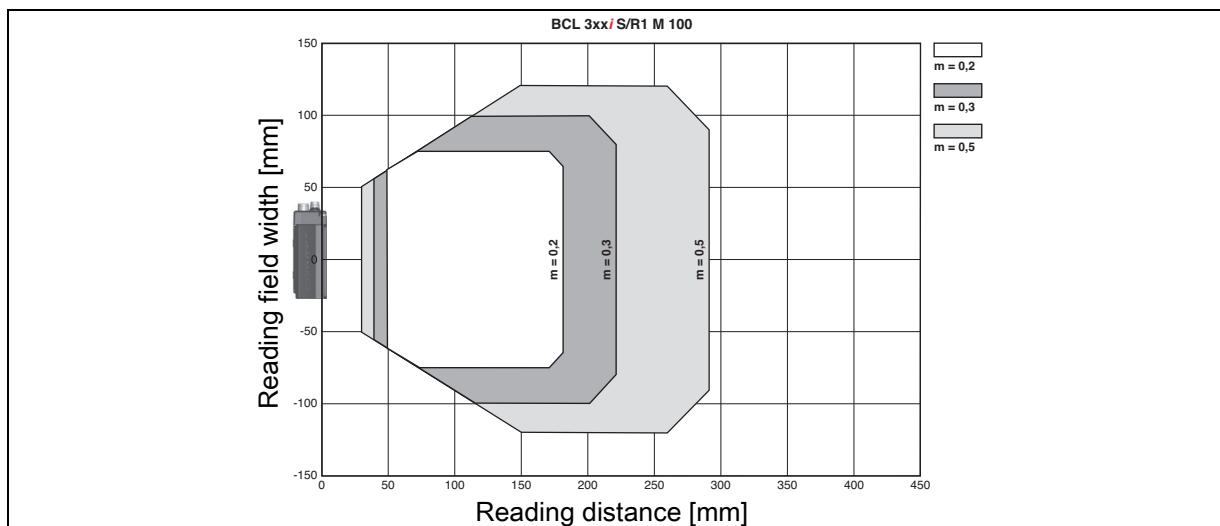


Figure 5.12: "Medium Density" reading field curve for line scanner with deflecting mirror

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

### 5.5.5 Medium Density (M) - optics: BCL 304/i/O M 100 (H)

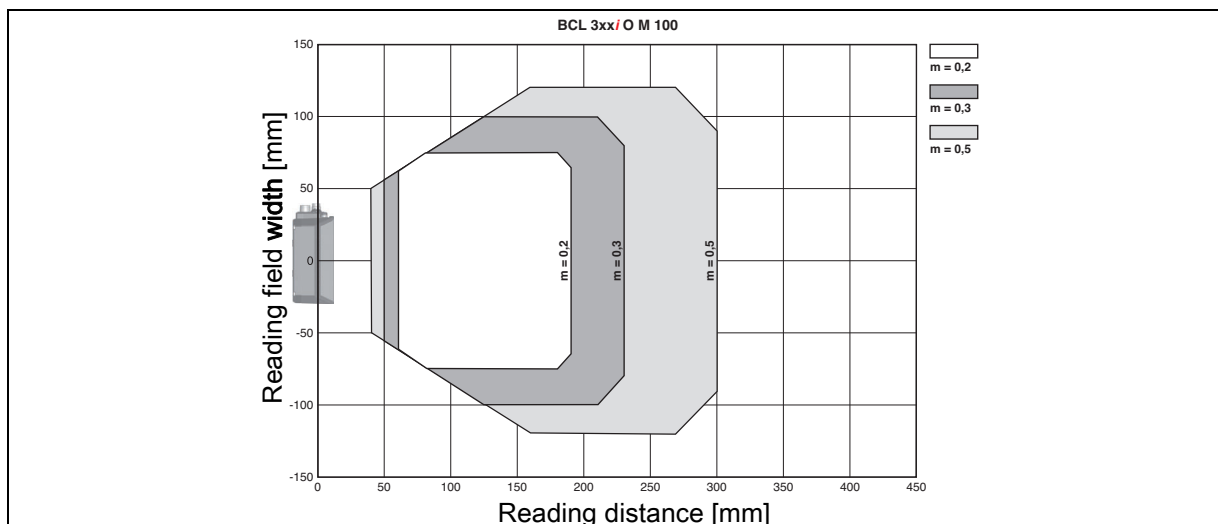


Figure 5.13: "Medium Density" reading field curve for oscillating-mirror scanners

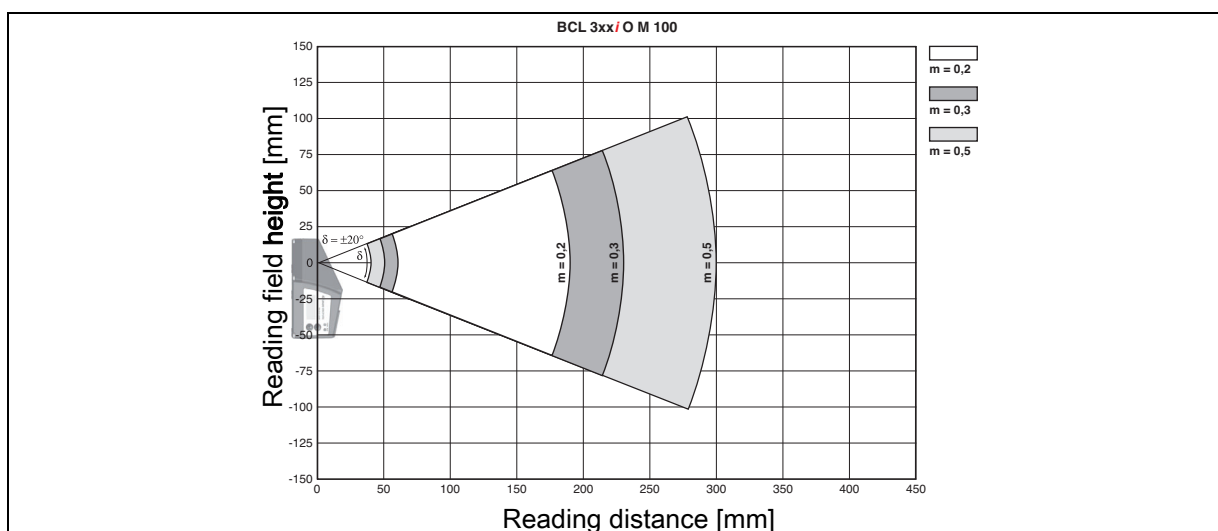


Figure 5.14: Lateral "Medium Density" reading field curve for oscillating-mirror scanners

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

### 5.5.6 Low Density (F) - optics: BCL 304/i/S/R1 F 102 (H)

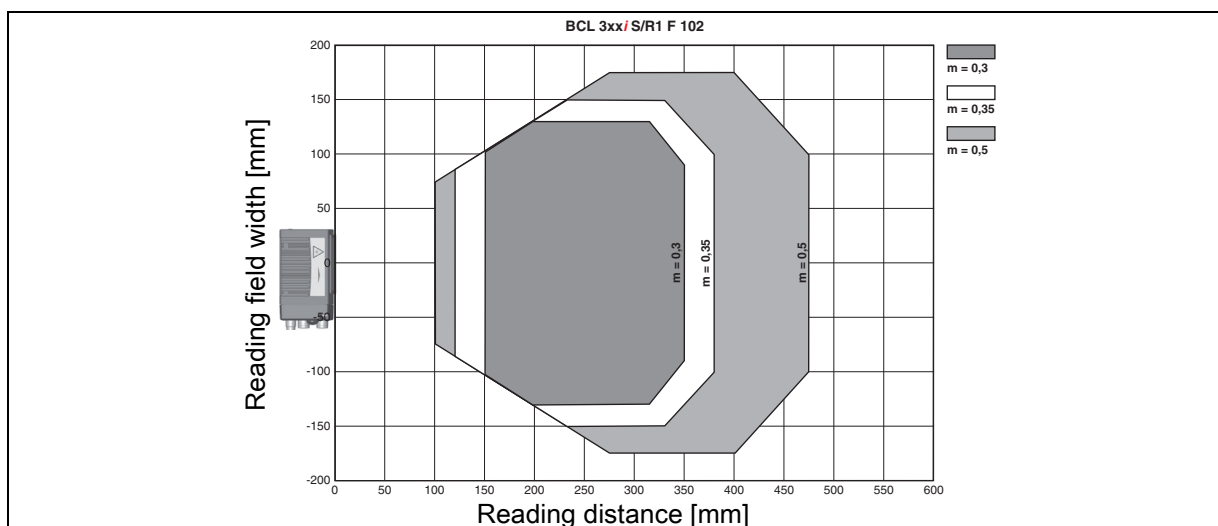


Figure 5.15: "Low Density" reading field curve for line scanner without deflecting mirror

### 5.5.7 Low Density (F) - optics: BCL 304/i/S/R1 F 100 (H)

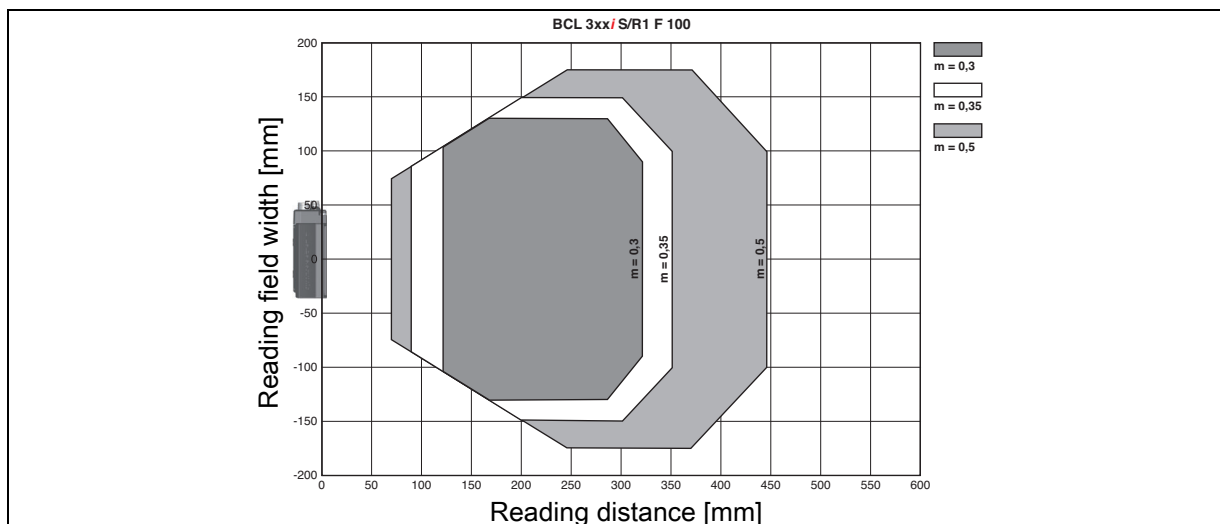


Figure 5.16: "Low Density" reading field curve for line scanner with deflecting mirror

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

### 5.5.8 Low Density (F) - optics: BCL 304/i/O F 100 (H)

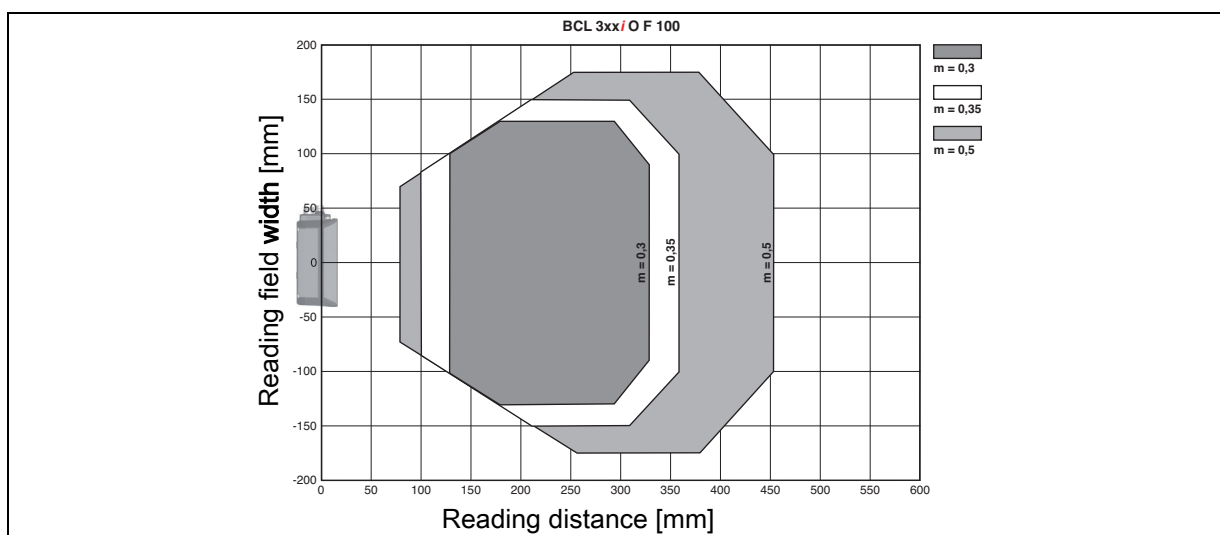


Figure 5.17: "Low Density" reading field curve for oscillating-mirror scanners

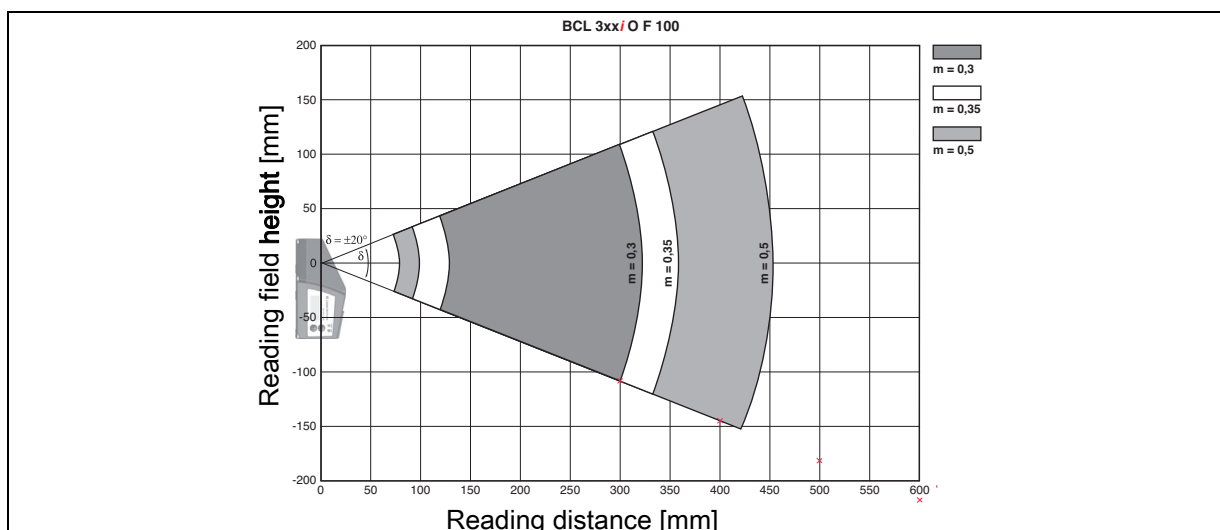


Figure 5.18: Lateral "Low Density" reading field curve for oscillating-mirror scanners

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

### 5.5.9 Ultra Low Density (L) - optics: BCL 304/S L 102 (H)

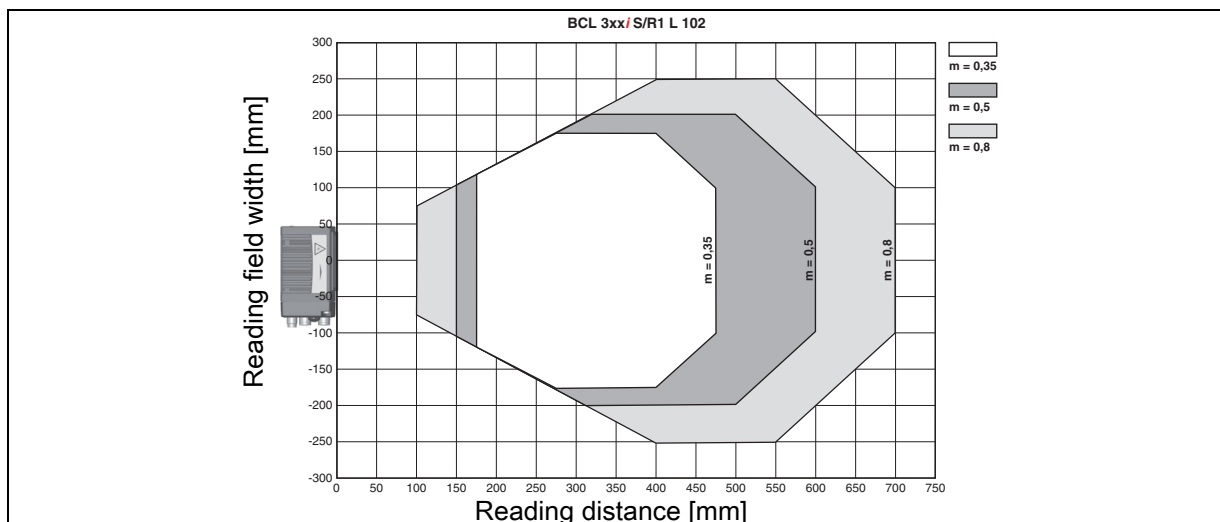


Figure 5.19: "Ultra Low Density" reading field curve for line scanner without deflecting mirror

### 5.5.10 Ultra Low Density (L) - optics: BCL 304/S L 100 (H)

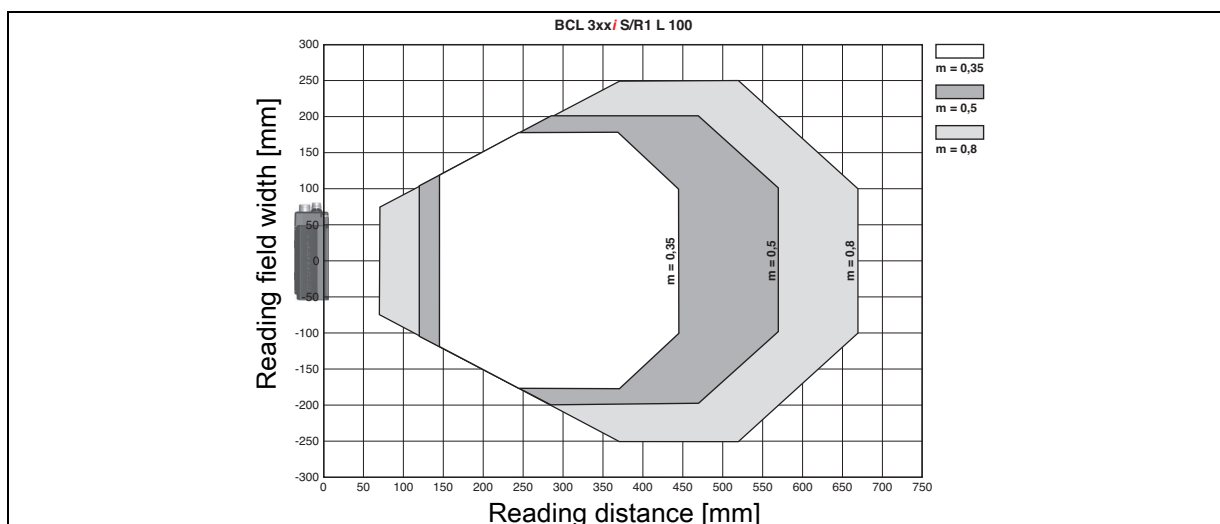


Figure 5.20: "Ultra Low Density" reading field curve for line scanner with deflecting mirror

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

### 5.5.11 Ultra Low Density (L) - optics: BCL 304/i O L 100 (H)

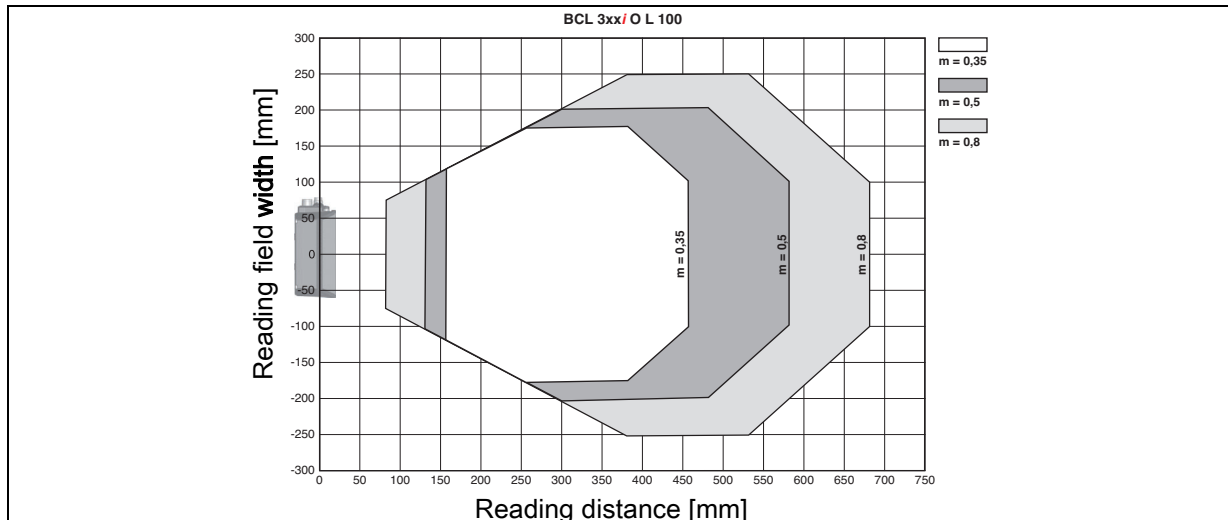


Figure 5.21: "Ultra Low Density" reading field curve for oscillating-mirror scanners

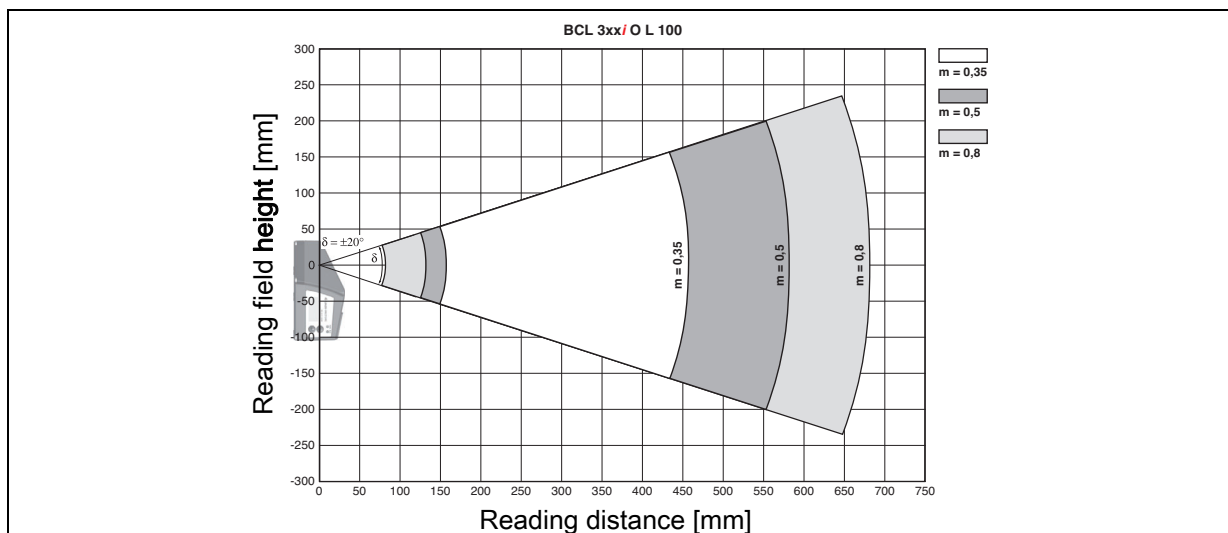


Figure 5.22: Lateral "Ultra Low Density" reading field curve for oscillating-mirror scanners

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



### 5.5.12 Ink Jet (J) - optics: BCL 304/R1 J 100

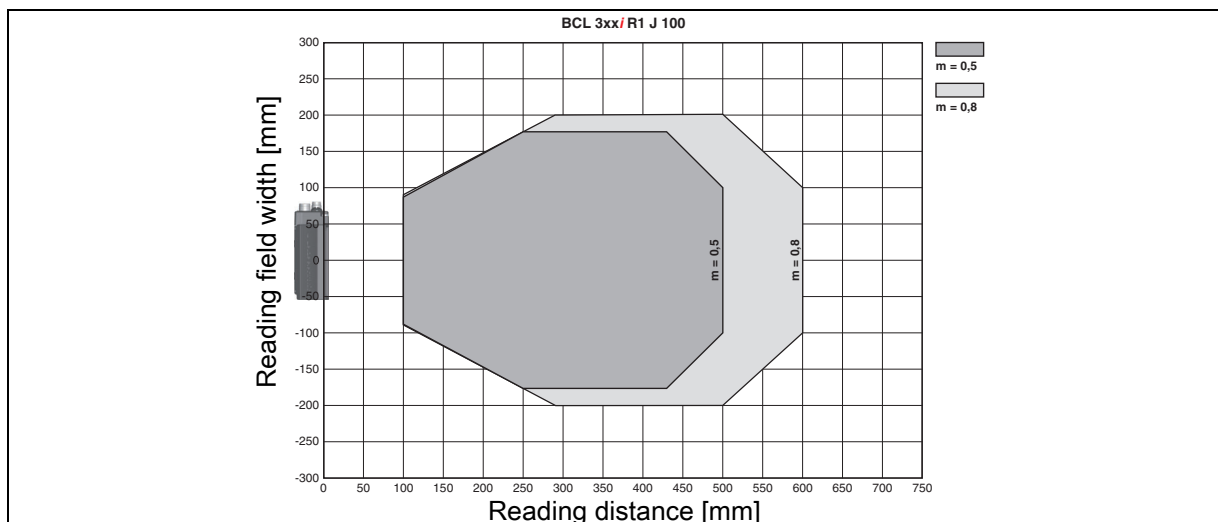


Figure 5.23: "Ink Jet" reading field curve for line scanner with deflecting mirror

#### 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 304/series

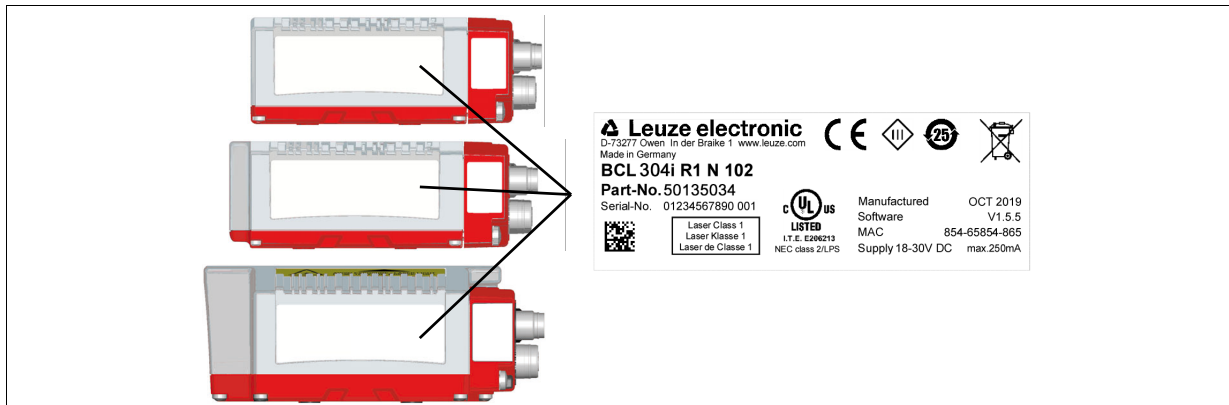



Figure 6.1: Device name plate BCL 304/

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

| NOTE  |  |
|---|--|
|  | <p>All BCL 304/ 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 304/

The BCL 304/ 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 304/ 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

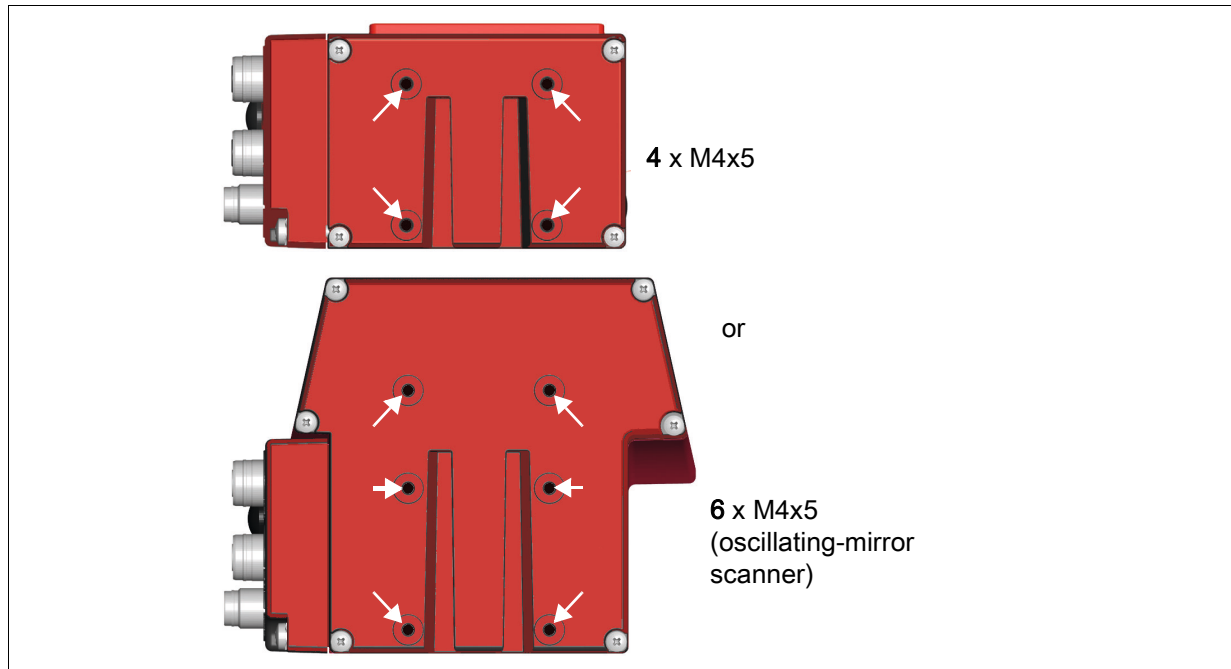


Figure 6.2: Fastening options using M4x5 threaded holes

### 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 304 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 128.

#### Mounting devices BT 56 and BT 56-1

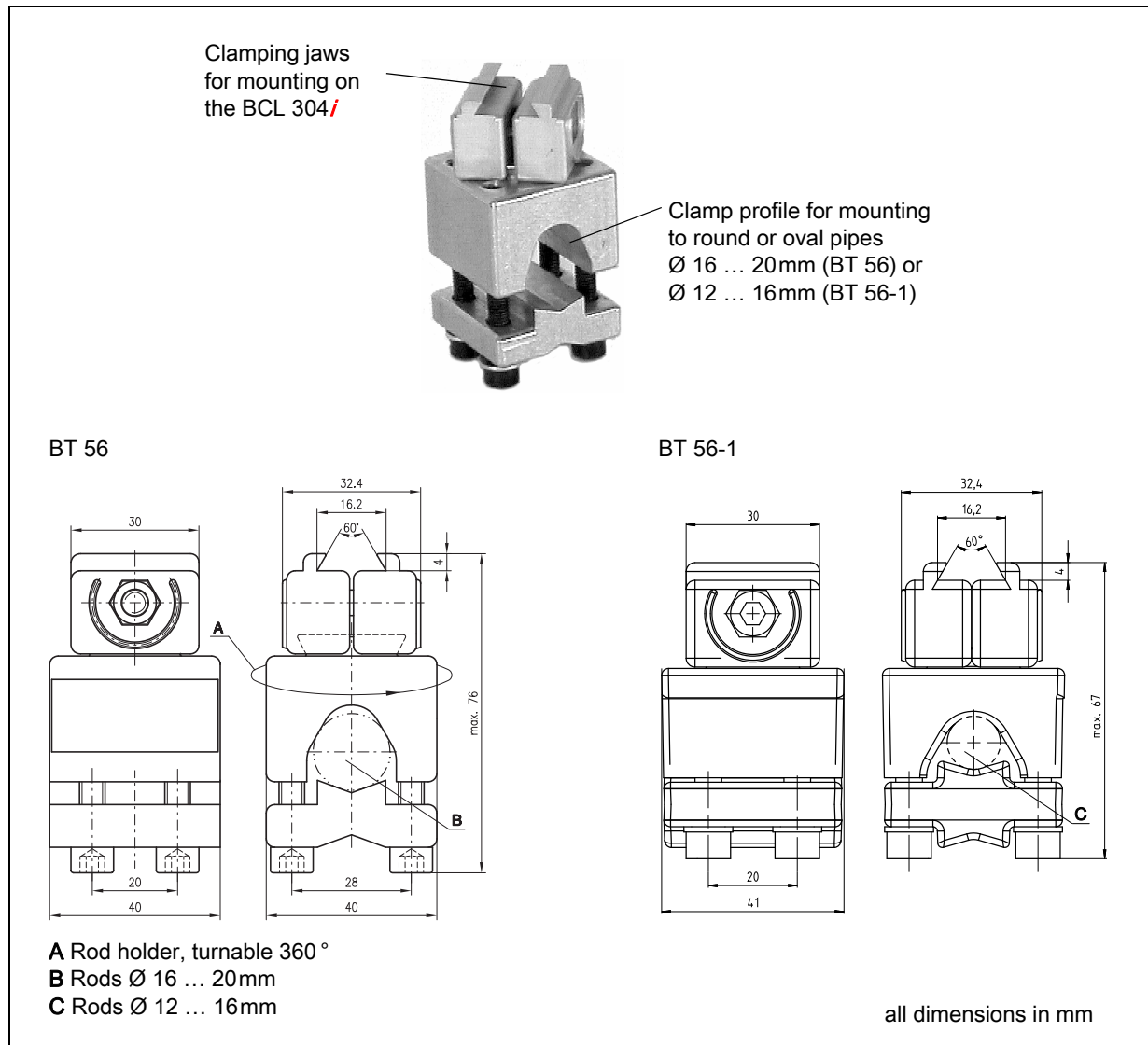


Figure 6.3: Mounting devices BT 56 and BT 56-1

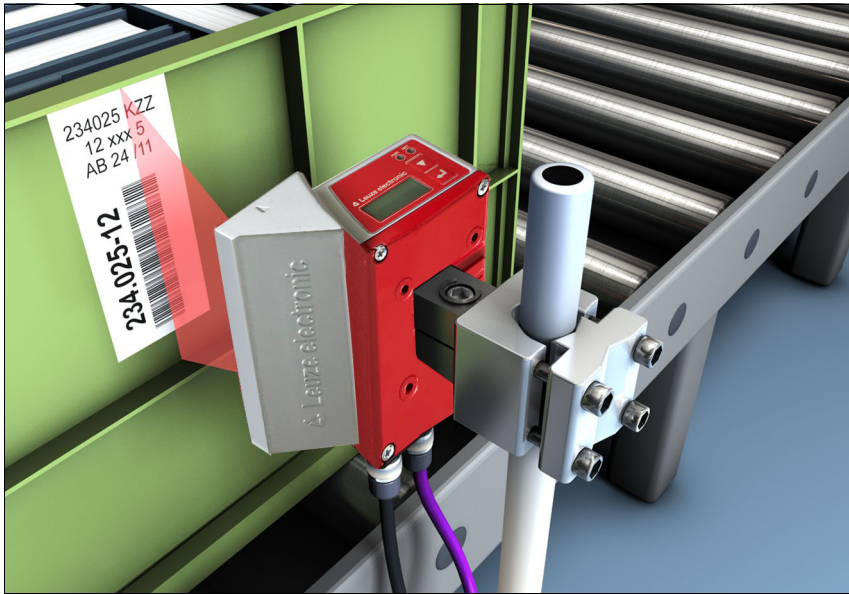


Figure 6.4: Mounting example of BCL 304/i with BT 56

### 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 128.

#### BT 59 mounting device

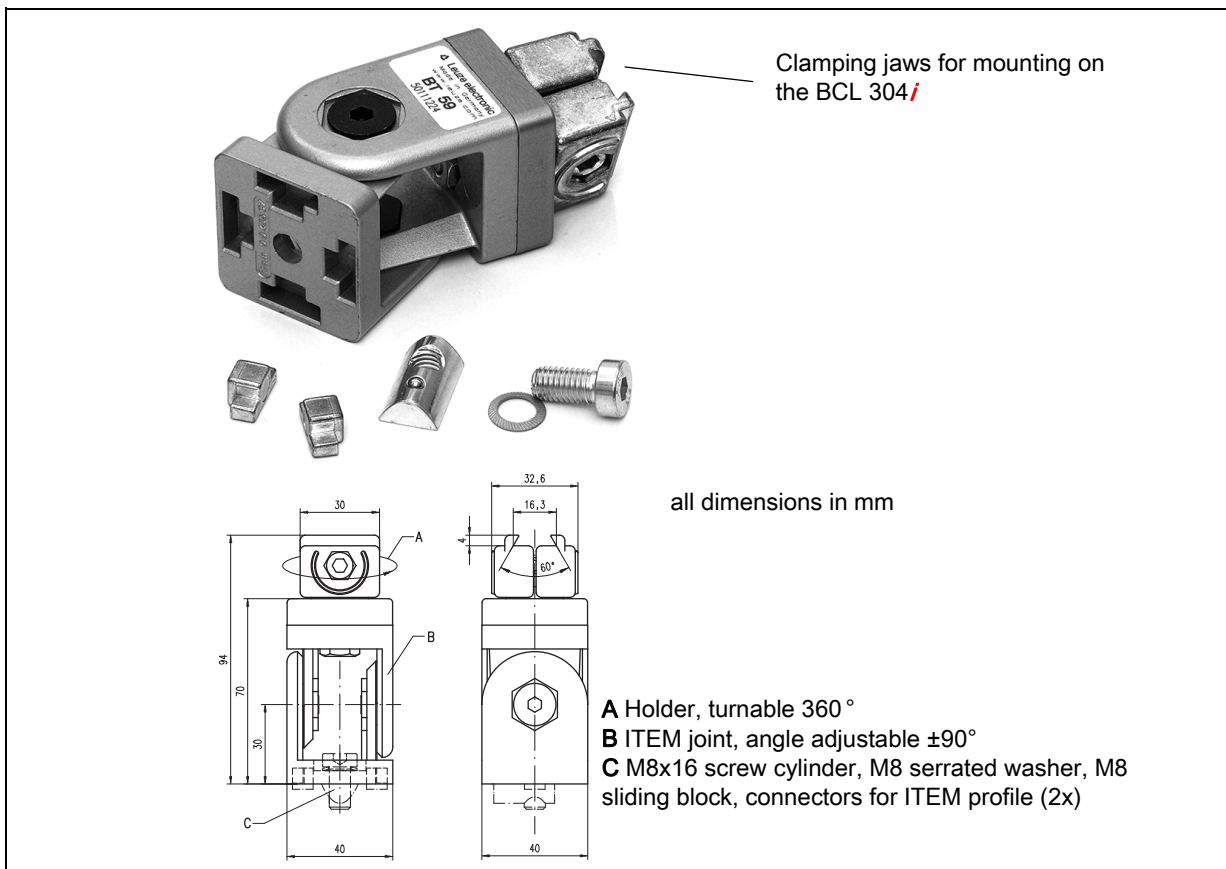


Figure 6.5: BT 59 mounting device

#### 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 304/i 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 128.

##### BT 300 - 1, BT 300 W mounting devices

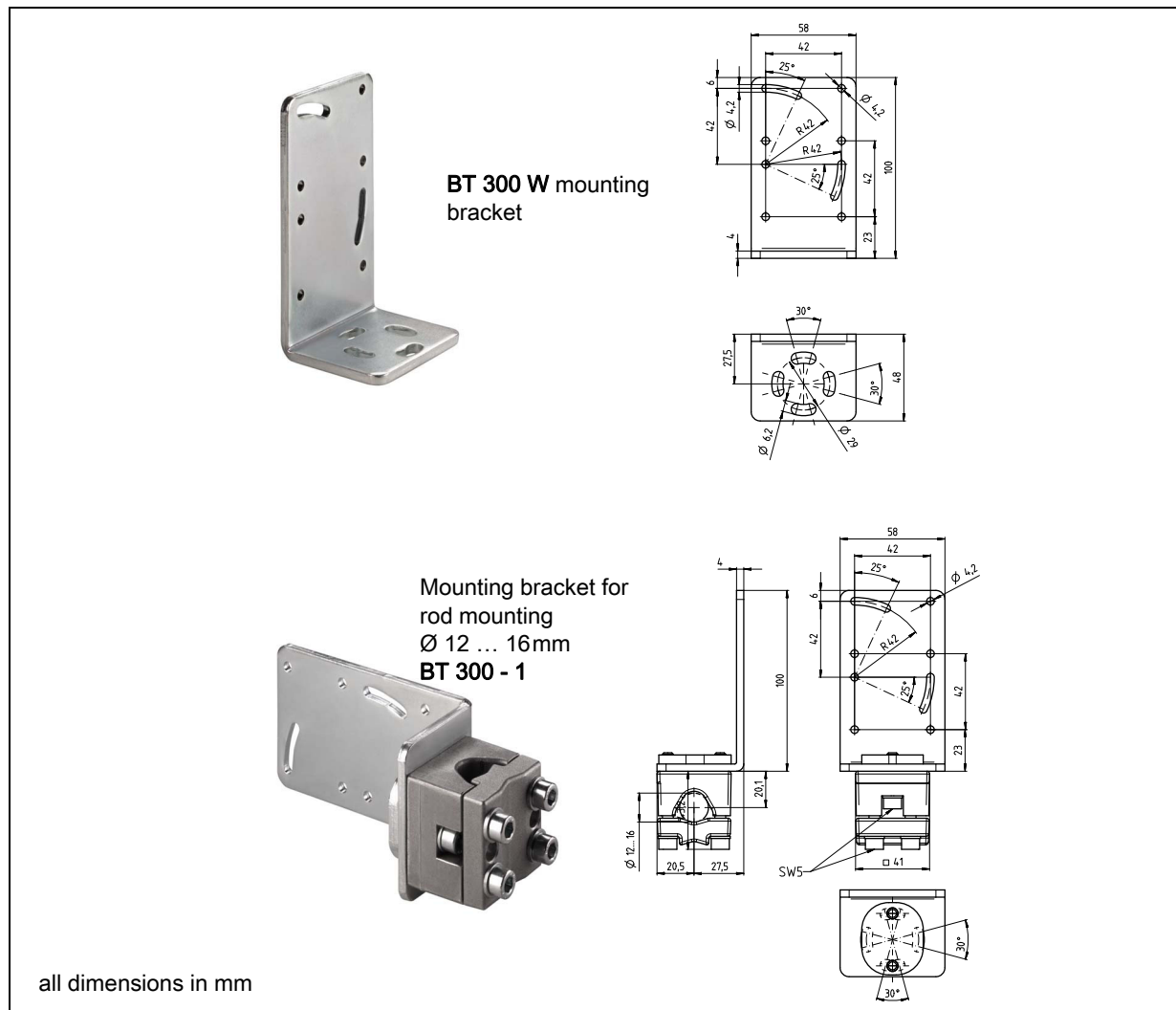


Figure 6.6: BT 300 - 1, BT 300 W mounting devices

#### 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 304/i 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 304/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 304/i and the host system depending on which interface is used.
- The correct time for data output. The BCL 304/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 304/i exits:</p> <ul style="list-style-type: none"> <li>• <b>Parallel</b> to the <b>housing base</b> in the case of the line scanner</li> <li>• <b>At 105 degrees</b> from the <b>housing base</b> in the case of the deflecting mirror</li> <li>• <b>Perpendicular</b> to the <b>housing base</b> in the case of the oscillating mirror</li> </ul> <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"> <li>• The BCL 304/i is mounted in such a way that the scanning beam is incident on the bar code at an angle of inclination greater than <math>\pm 10^\circ \dots 15^\circ</math> to vertical.</li> <li>• The reading distance lies in the middle area of the reading field.</li> <li>• The bar code labels are of good print quality and have good contrast ratios.</li> <li>• You do not use high-gloss labels.</li> <li>• There is no direct sunlight.</li> </ul> |

### 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  $90^\circ$ . The light directly reflected by the bar code may overload the bar code reader and thereby cause non-readings!

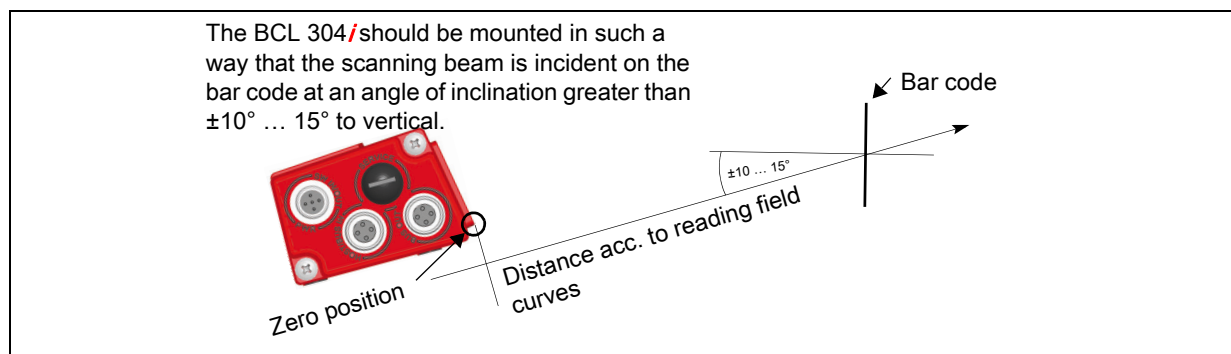


Figure 6.7: Total reflection – line scanner

### 6.3.3 Avoiding total reflection – deflecting mirror scanner

For the BCL 304/i with **deflecting mirror**, the laser beam exits at an angle of  $105^\circ$  to the rear housing wall. An angle of incidence of  $15^\circ$  of the laser to the label has already been integrated in the deflecting mirror so that the BCL 304/i can be installed parallel to the bar code (rear housing wall).

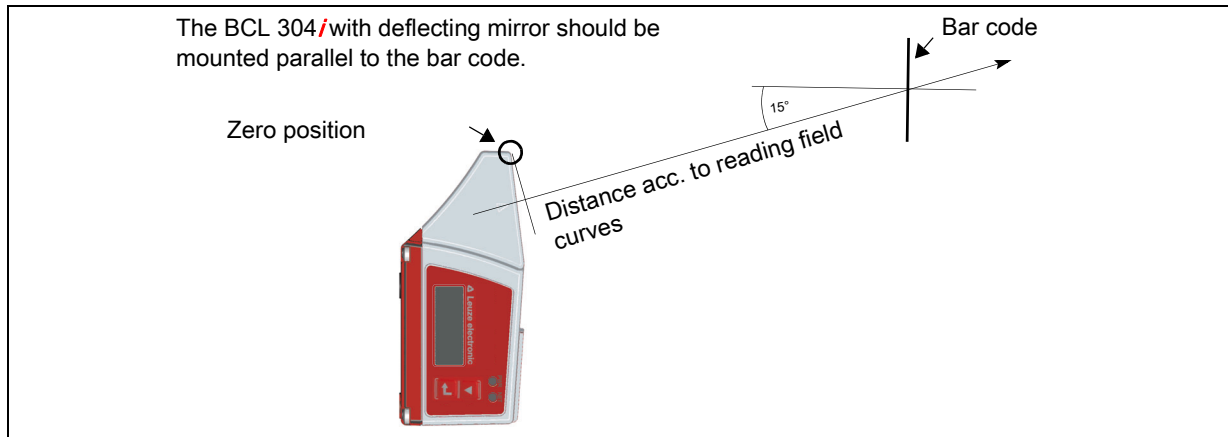


Figure 6.8: Total reflection – line scanner

### 6.3.4 Avoiding total reflection – oscillating-mirror scanner

For the BCL 304/i with **oscillating mirror**, the laser beam exits at an angle of  $90^\circ$  to vertical.

For the BCL 304/i 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 304/i with oscillating mirror must be inclined upward or downward  $20^\circ \dots 30^\circ$ !

#### NOTE



Mount the BCL 304/i with oscillating mirror in such a way that the exit window of the bar code reader is parallel to the object. This will result in an angle of inclination of approx.  $25^\circ$ .

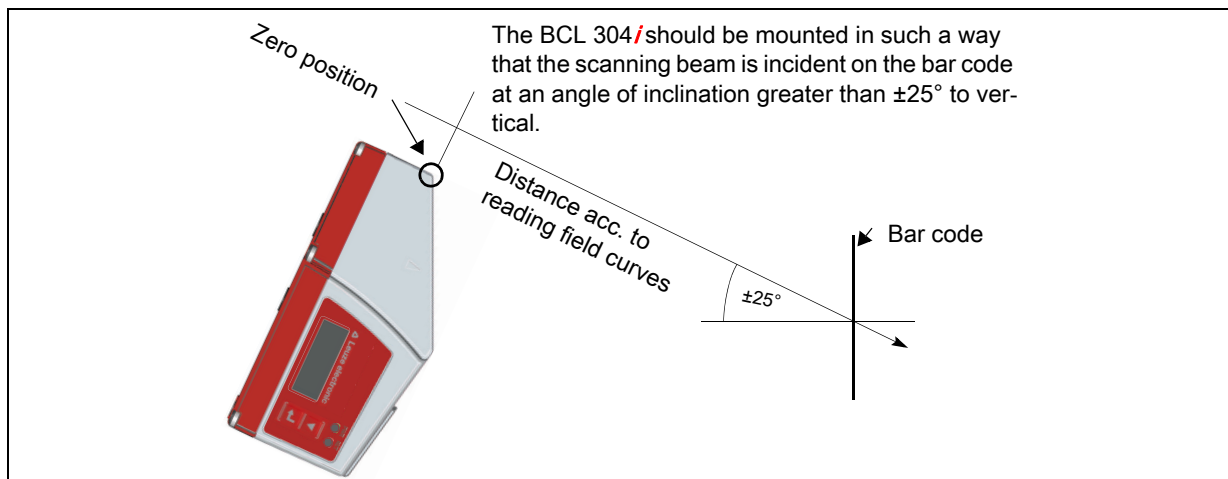


Figure 6.9: Total reflection – BCL 304/i with oscillating-mirror scanner

### 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 304/i 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 304/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 304/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 304/i and bar code

The optimum alignment of the BCL 304/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).

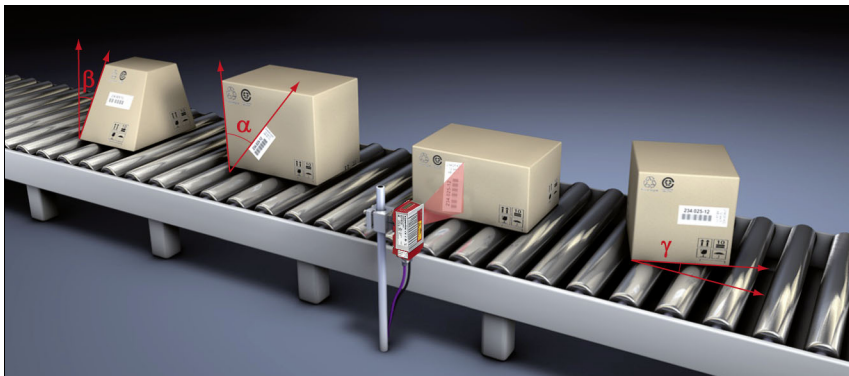


Figure 6.10: Reading angle for the line scanner

- $\alpha$  Azimuth angle (tilt)  
 $\beta$  Inclination angle (pitch)  
 $\gamma$  Angle of rotation (skew)

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

## 6.4 Cleaning

↳ Clean the glass window of the BCL 304/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 304/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 interchangeable connection hoods.

The additional Mini-B type USB interface is used for service purposes.

| NOTE  |  |
|---|--|
|  | On delivery, the products are provided with a plastic protective cap on the side of the system plug or the system socket.<br>Additional connection accessories can be found in Chapter 12. |

| ⚠ ATTENTION!  |   |
|---|---|
|  | The BCL 304/ 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

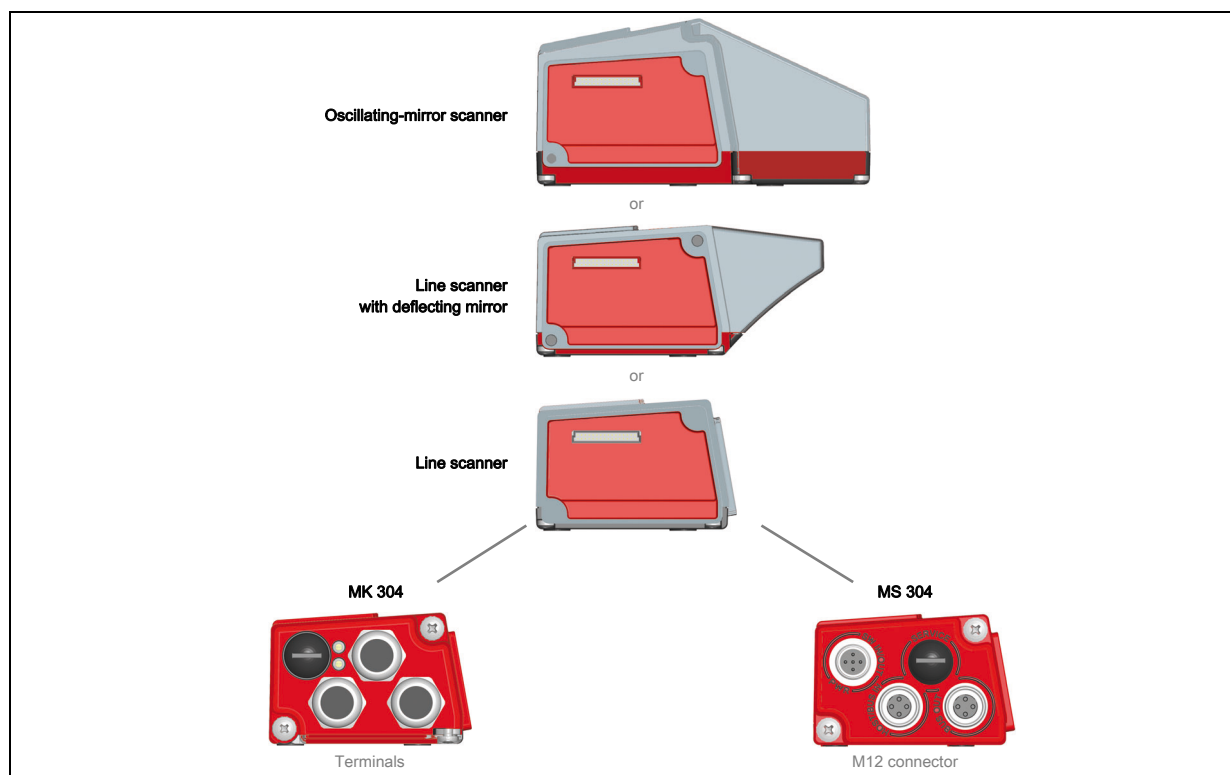



Figure 7.1: Location of the electrical connections

### 7.1 Safety notices for the electrical connection

| ⚠ ATTENTION!  |  |
|---|--|
|  | <p>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 304/ contains no parts that need to be adjusted or maintained by the user.</p> <p>Before connecting the device, be sure that the supply voltage agrees with the value printed on the name plate.</p> <p>Connection of the device and cleaning must only be carried out by a qualified electrician.</p> <p>Ensure that the functional earth (FE) is connected correctly. Unimpaired operation is only guaranteed when the functional earth is connected properly.</p> <p>If faults cannot be cleared, the device should be switched off and protected against accidental use.</p> |

**⚠ 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 304/i electrical connection

For the electrical connection of the BCL 304/i, 2 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 7.3.1.

### 7.2.1 MS 304 connector hood with 3 integrated M12 connectors

The MS 304 hood with integrated connectors features three M12 connector plugs and a Mini-B type USB socket as a service interface. When the device is exchanged, the PROFIBUS address does not have to be re-set; it stays set in the MS 304. The PROFIBUS is not interrupted when the device is exchanged. BUS IN and BUS OUT are connected in the MS 304 and safeguard the operation of the PROFIBUS even in the case of device replacement.

The address switches located in the MS 304 are used to set the PROFIBUS address of the BCL 304/i. If the BCL 304/i is the last participant on the PROFIBUS cable, the BUS OUT socket on the MS 304 must be fitted with a terminator plug (accessories).

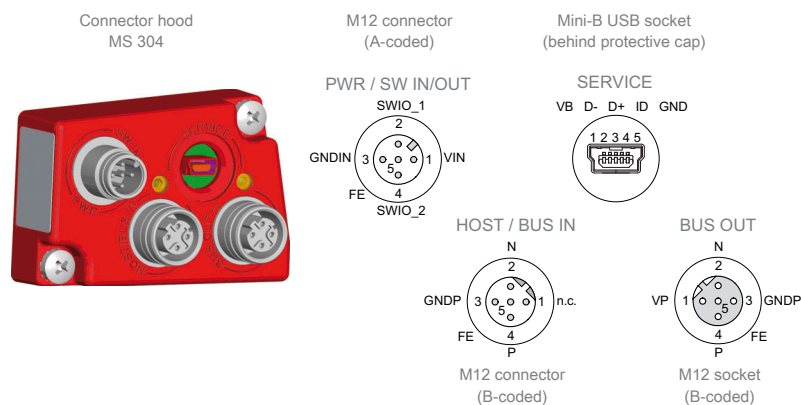






Figure 7.2: BCL 304/i - MS 304 connection hood with M12 connectors

| NOTE  |   |
|---|---|
|  | The shielding connection is done via the M12 connector housing.   |
| NOTE  |   |
|  | PROFIBUS address 126 is set by default in the MS 304.<br>The integrated parameter memory for the simple replacement of the BCL 304/i is located in the MS 304.  |
| NOTE  |   |
|  | The PROFIBUS is looped through the MS 304, i.e. the bus is not interrupted when the BCL 304/i is removed from the MS 304.<br>The bus is terminated at BUS OUT via an external mounted terminating resistor (see chapter 12.4 "Accessory – Terminating resistor"). |
| NOTE  |   |
|  | Dimensioned drawing on see chapter 5.3.5 "Dimensioned drawings of MS 3xx / MK 3xx connection hoods" on Page 33.   |

### 7.2.2 MK 304 terminal hood with spring-cage terminals

The MK 304 terminal hood makes it possible to connect the BCL 304/i directly and without additional connectors. The MK 304 features three cable lead-throughs in which the shielding connection for the interface cable is also located. When the device is exchanged, the PROFIBUS address does not have to be re-set; it stays set in the MS 304. The PROFIBUS is not interrupted when the device is exchanged. A Mini-B type USB socket is used for service purposes. One slide switch and two rotary switches are inte-

grated in the MK 304 for setting the PROFIBUS address. The slide switch for termination of the PROFIBUS is also located in the interior of the MK 304.

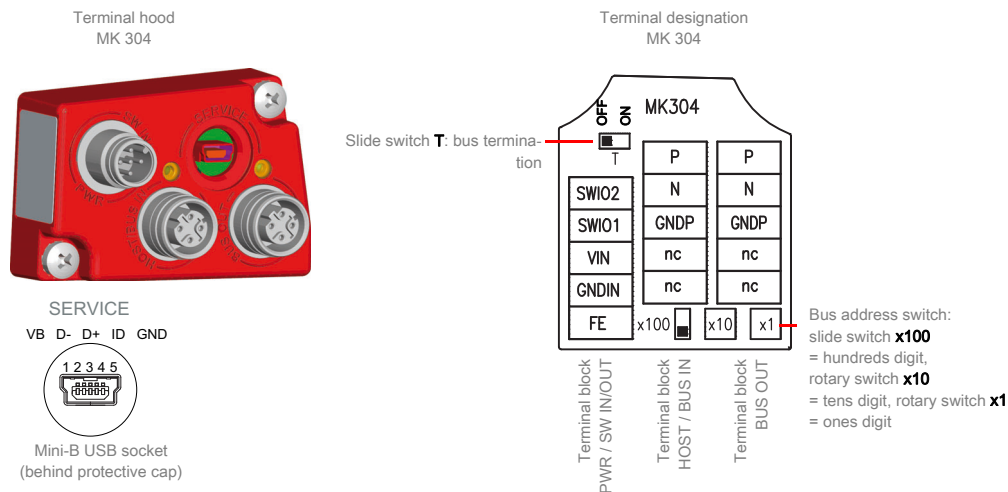




Figure 7.3: BCL 304/- MK 304 terminal hood with spring-cage terminals

| NOTE  |   |
|---|---|
|   | PROFIBUS address 126 is set by default in the MK 304.<br>The integrated parameter memory for the simple replacement of the BCL 304/- is located in the MK 304.  |
| NOTE  |   |
|  | The PROFIBUS is looped through the MK 304, i.e. the bus is not interrupted when the BCL 304/- is removed from the MK 304. The PROFIBUS is terminated via slide switch T in the MK 304. 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.

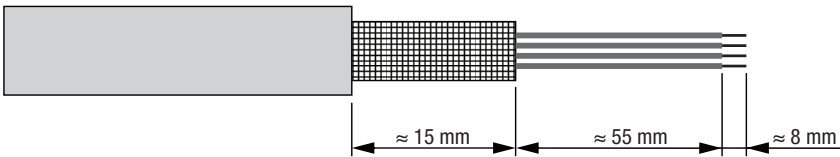



Figure 7.4: Cable fabrication for MK 304 terminal hood

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 5.4 "Reading field curves / optical data" on Page 34. |

### 7.3 Detailed description of the connections

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

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

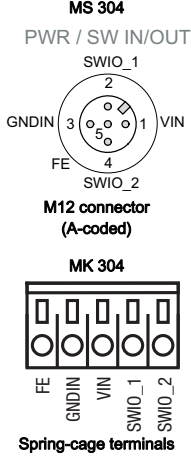

| PWR / SW IN/OUT   |              |                    |  |
|---|--------------|--------------------|--|
|  | Pin<br>(M12) | Name<br>(terminal) | Comment                                |
|   | 1            | VIN                | Positive supply voltage +18 ... +30VDC |
|   | 2            | SWIO_1             | Configurable switching input/output 1  |
|   | 3            | GNDIN              | Negative supply voltage 0VDC           |
|   | 4            | SWIO_2             | Configurable switching input/output 2  |
|   | 5            | FE                 | Functional earth                       |
|   | Thread       | FE                 | Functional earth (housing)             |

Table 7.1: PWR / SW IN/OUT pin assignment

#### 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 304*/*(decoding, autoConfig, ...). The switching outputs can be used to signal the state of the BCL 304*/*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

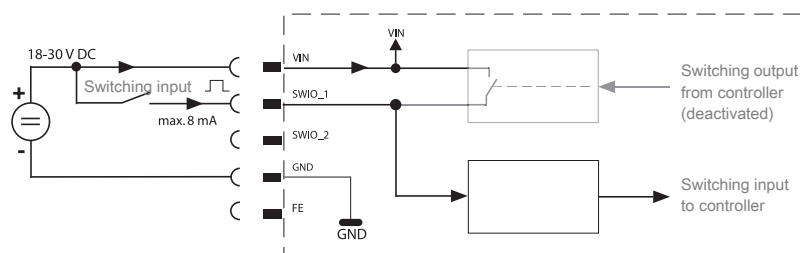


Figure 7.5: Switching input connection diagram SWIO\_1 and SWIO\_2

👉 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

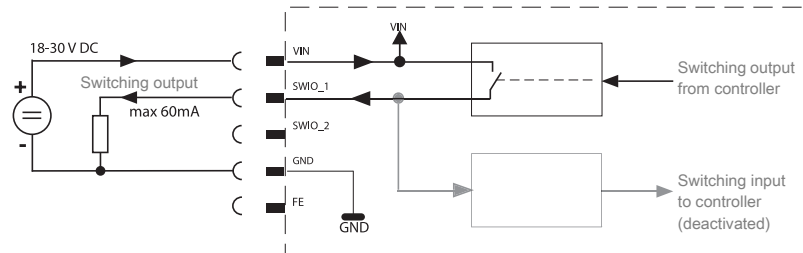


Figure 7.6: Switching output connection diagram SWIO\_1 / SWIO\_2

#### ⚠ ATTENTION!



Each configured switching output is short-circuit proof! Do not load the respective switching output of the BCL 304/i with more than 60mA at +18 ... +30VDC in normal operation!

#### NOTE



Both switching inputs/outputs SWIO\_1 and SWIO\_2 are configured by default in such a way that:

- Switching input SWIO\_1 activates the reading gate.
- Switching output SWIO\_2 switches by default on "No Read".

### 7.3.2 SERVICE – USB interface (Mini-B type)

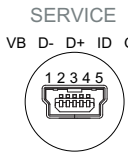

| SERVICE – USB interface (Mini-B type)   |                  |      |               |
|---|------------------|------|---------------|
|   | Pin (USB Mini-B) | Name | Comment       |
|  | 1                | VB   | Sense input   |
|   | 2                | D-   | Data -        |
|   | 3                | 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 12 "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. |

### 7.3.3 HOST / BUS IN for BCL 304/

The BCL 304/ makes available an interface of type **DP IN - incoming PROFIBUS** as **HOST / BUS IN** connection.

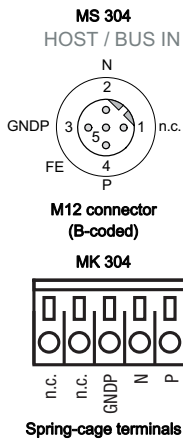
| HOST / BUS IN PROFIBUS DP incoming (5-pin connector, B-coded)                       |               |                      |                                  |
|---|---------------|----------------------|----------------------------------|
|   | Pin (M12)     | Name (terminal)      | Comment                          |
|  | 1             | n.c.                 | Not connected                    |
|   | 2             | N                    | Receive/transmit data A-line (N) |
|   | 3             | GNDP                 | PROFIBUS reference ground        |
|   | 4             | P                    | Receive/transmit data B-line (P) |
|   | 5             | FE                   | Functional earth / shield        |
|   | FE via thread | FE via screw fitting | Functional earth (housing)       |

Table 7.3: Pin assignment HOST / BUS IN for BCL 304/



### 7.3.4 BUS OUT for the BCL 304/i

To set up the PROFIBUS with additional participants, the BCL 304/i makes available another interface of type DP OUT - outgoing PROFIBUS DP.

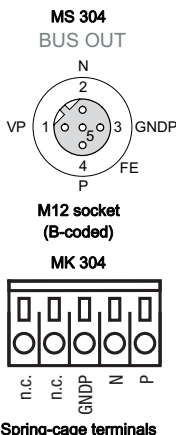

| BUS OUT PROFIBUS DP outgoing (5-pin connector, B-coded)                           |               |                      |                                  |
|---|---------------|----------------------|----------------------------------|
|  | Pin (M12)     | Name (terminal)      | Comment                          |
|   | 1             | VP                   | +5 V DC for bus termination      |
|   | 2             | N                    | Receive/transmit data A-line (N) |
|   | 3             | GNDP                 | PROFIBUS reference ground        |
|   | 4             | P                    | Receive/transmit data B-line (P) |
|   | 5             | FE                   | Functional earth / shield        |
|   | FE via thread | FE via screw fitting | Functional earth (housing)       |

Table 7.4: Pin assignment BUS OUT for BCL 304/i

| NOTE  |   |
|---|---|
|  | Ensure adequate shielding. The entire interconnection cable must be shielded and earthed. For connecting DP IN and DP OUT, we recommend the ready-made PROFIBUS cables. |

### 7.3.5 Terminating the PROFIBUS

The last physical PROFIBUS participant must be terminated with a terminating resistor (see "Accessory – Terminating resistor" on page 130) on the BUS OUT socket or via the activation of the termination using a slide switch in the MK 304.

## 7.4 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 |
| PROFIBUS                | PROFIBUS DP | Acc. to PNO specifications | Acc. to PNO specifications                                |
| BCL – power supply unit |             | 30m                        | Not necessary   |
| Switching input         |             | 10 m                       | Not necessary   |
| Switching output        |             | 10 m                       | Not necessary   |

Table 7.5: Cable lengths and shielding

## 8 Display elements and display

The BCL 304/i is available optionally with display, 2 control buttons and LEDs or with only 2 LEDs as display elements.

### 8.1 BCL 304/i LED indicators



Figure 8.1: BCL 304/i - 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 the BCL 304*/*, establishing communication

NET



**Green, continuous light**

**Operation ok**

- Bus ok, BCL 304*/* active on bus ("data exchange")

NET



**Flashes red**

**Communication error**

Bus error

- Parameterization failed  
("parameter failure")  
- DP error  
- no data exchange

NET



**Red continuous light**

**Network error**

## 8.2 BCL 304/-display



Figure 8.2: BCL 304/- Display

### NOTE



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

The optional display of the BCL 304/- 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 304/- on the PROFIBUS
- 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"><li>• German</li><li>• English</li><li>• French</li><li>• Italian</li><li>• Spanish</li><li>• Chinese</li></ul> |

### 9.1 Connecting the SERVICE USB interface

The connection to the SERVICE USB interface of the BCL 304*i* is established via the PC-side USB interface using a standard USB cable with 1 type A connector and a Mini-B type connector.

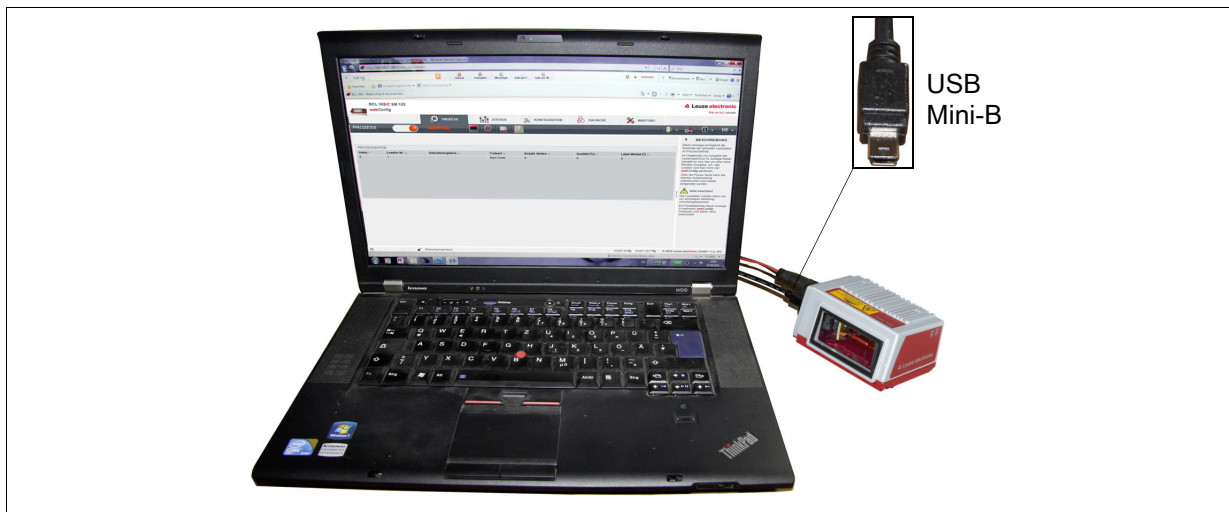


Figure 9.1: Connecting the SERVICE USB interface

## 9.2 Installing the required software

### 9.2.1 System requirements

|                               |  |
|-------------------------------|--|
| Operating system:             | Windows 2000<br>Windows XP (Home Edition, Professional)<br>Windows Vista<br>Windows 7<br>Windows 8/8.1<br>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 304*/i*. In this case, you can also start the webConfig tool of the BCL 304*/i* by double-clicking on the BCL 5xx*i* icon.

In order for the BCL 304*/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 304*/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](http://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 304*/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 304*/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.

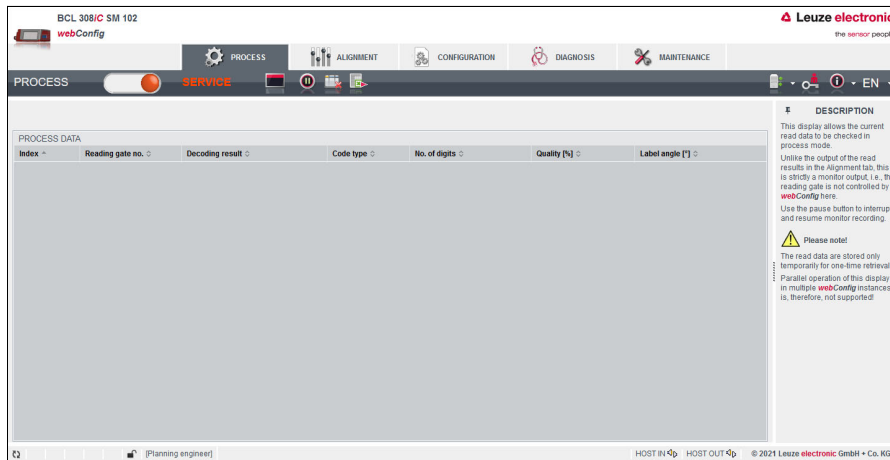



Figure 9.2: The start page of the webConfig tool

| NOTE  |  |
|---|--|
|  | <p>The webConfig tool is completely contained in the firmware of the BCL 304/. 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 304/.
- **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 304/ are clustered in modules in the Configuration menu.

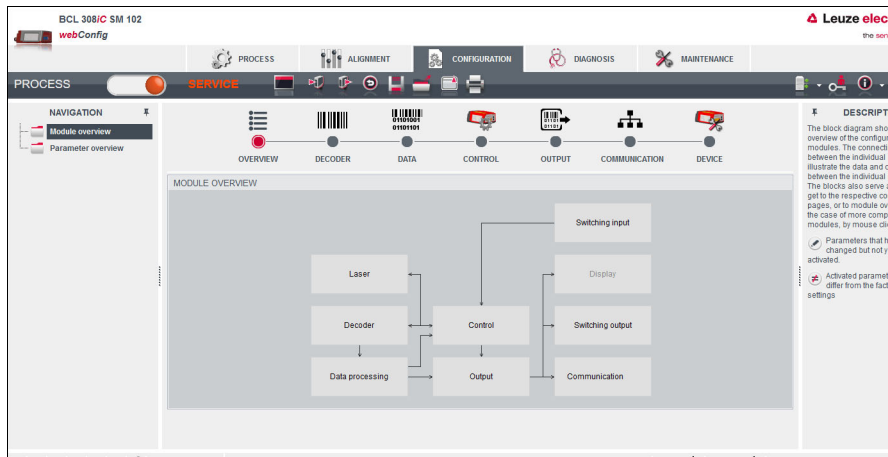


Figure 9.3: Module overview in the webConfig tool

#### NOTE



The webConfig tool is completely contained in the firmware of the BCL 304/. 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.

The webConfig tool is available for all bar code readers of the BCL 300/ series. Because configuration of the BCL 304/ PROFIBUS device is performed via the PROFIBUS, the module overview shown in the webConfig tool is, in this case, used only for displaying and checking the configured parameters.


#### NOTE



If parameters are set via webConfig which are simultaneously activated via the GSD file modules, the settings made via the PLC (GSD) always prevail.

The current configuration of your BCL 304/i is loaded upon startup of the webConfig tool. If you change the configuration via the PROFIBUS while the webConfig tool is running, you can use the  "Load parameter from device" button after making the changes to update the display in the webConfig tool. This button appears in the upper left in the center window area in all submenus of the Configuration main menu.

## 10 Commissioning and configuration

| ⚠ ATTENTION LASER!  |  |
|---|--|
|  | Observe the safety notices in Chapter 2! |

### 10.1 General information on the PROFIBUS implementation of the BCL 304/i

#### 10.1.1 Communication profile

The **communication profile** defines how participants serially transmit their data via the transmission medium. The BCL 304/i supports the communication profile for automation systems and Decentral Periphery -> **PROFIBUS DP**.

##### DP communication profile

The **PROFIBUS DP** communication profile is designed for efficient data exchange on the field level. Data exchange with the decentral devices occurs primarily cyclically. The necessary communication functions are defined in the **DP** basic functions. The **DP** optionally offers acyclic communication services as well. These are used for configuring, operating, observing and alarm handling.

In order to be able to perform data exchange, services are defined which **PROFIBUS DP** differentiates between on the basis of the data access points transmitted in the telegram header.

The BCL 304/i profile is based on the PROFIBUS profile for identification systems.


#### 10.1.2 Bus-access protocol

The PROFIBUS communication profiles (DP, FMS) use a uniform bus-access process. It is implemented by layer 2 of the OSI model. The bus-access control (MAC) defines the process for specifying the point in time at which a network device can transmit data. It must ensure that no more than one participant has permission to transmit at any given time. The PROFIBUS bus-access process includes the token-passing process and the master-slave process.

| Process               | Description  | BCL 304/i |
|-----------------------|--|-----------|
| Token-passing process | With this process, the bus-access permission is distributed by means of a token. The participant obtains permission to transmit with the token. The token wanders between the master devices in the ring in a permanently defined time frame. This type of bus-access process is used for communication between the masters. | No        |
| Master-slave process  | Various slave devices are assigned to a master. The master can address the slaves which are assigned to it and fetch messages from them. The master always has the initiative.   | Yes       |

Table 10.1: PROFIBUS bus-access processes

Both processes can be mixed in order to create a multi-master system. The BCL 304/i functions both in a mono-master system as well as in a multi-master system.


| NOTE  |  |
|---|--|
|  | In 2007, the PROFIBUS DP was extended by the DPV2 specification. The specification will then also permit SLAVE-SLAVE communication. The BCL 304/i does not support this type of communication. |

### 10.1.3 Device types

With the PROFIBUS DP, there are two types of master and one type of slave:

| Device type           | Description  | BCL 304/ |
|-----------------------|--|----------|
| Class 1 master (DPM1) | Class 1 masters are defined for the user-data communication. (e.g., PLC, PC)   |          |
| Class 2 master (DPM2) | Class 2 masters are defined for commissioning purposes. Additional services facilitate easier configuration as well as device diagnosis. |          |
| Slave                 | The slave is a peripheral device which makes available input data for the control and receives output data from the control.             | X        |

Table 10.2: PROFIBUS DP master and slave types

| NOTE  |  |
|---|--|
|  | The device is defined as a slave in the device master file (GSD file) of the BCL 304/. |

### 10.1.4 Extended DP functions

The PROFIBUS standard has been expanded (DPV1) and, in addition to the cyclic services, also offers acyclic services. These services operate in parallel with the cyclic user-data communication. Masters and slaves can use additional READ and WRITE functions as well as ALARM functions. This is intended especially for operation with an engineering tool (DP-master class 2, DPM2) in order to change parameters and read out status information during normal operation.

The acyclic services operate with lower priority. The functions are different for the various master classes.

| Function    | Slave SAP | Description              | BCL 304/          |
|-------------|-----------|--------------------------|-------------------|
| MSAC1_Read  | SAP51     | Read datablock at slave  | Yes <sup>1)</sup> |
| MSAC1_Write | SAP51     | Write datablock at slave | Yes <sup>2)</sup> |


Table 10.3: Services for DPV1 class 1 and slaves

1) For I&M functionality

2) For I&M functionality

| Function             | Slave SAP | Description   | BCL 304/ |
|----------------------|-----------|---|----------|
| MSAC2_Read           | 51        | Read datablock at slave   | No       |
| MSAC2_Write          | 51        | Write datablock at slave  | No       |
| MSAC2_Initiate       | 49        | Establish connection between DPM2 and slave                     | No       |
| MSAC2_Abort          | 0 ... 48  | Establish connection between DPM2 and slave                     | No       |
| MSAC1_Data_Transport | 0 ... 48  | Write data to slave and read data from slave in a service cycle | No       |

Table 10.4: Services for DPV1 class 2 and slaves

| NOTE  |  |
|---|--|
|  | All expanded services are <b>not</b> implemented for the first BCL 304/PROFIBUS profile. |

### 10.1.5 Automatic baud rate detection

The PROFIBUS implementation of the BCL 304/ features automatic baud rate detection. The BCL 304/ uses this function and offers no possibility for manual or permanent adjustment. The following baud rates are supported:

| Baud rate kbit/s | 9.6 | 19.2 | 45.45 | 93.75 | 187.5 | 500 | 1500 | 3000 | 6000 | 12000 |
|------------------|-----|------|-------|-------|-------|-----|------|------|------|-------|
|------------------|-----|------|-------|-------|-------|-----|------|------|------|-------|

Automatic baud rate detection is indicated in the device master file of the BCL 304: **Auto\_Baud\_supp = 1**

## 10.2 Measures to be performed prior to the initial commissioning

- ✚ Before commissioning, familiarize yourself with the operation and configuration of the BCL 304.
- ✚ Before connecting the supply voltage, recheck all connections and ensure that they have been properly made.

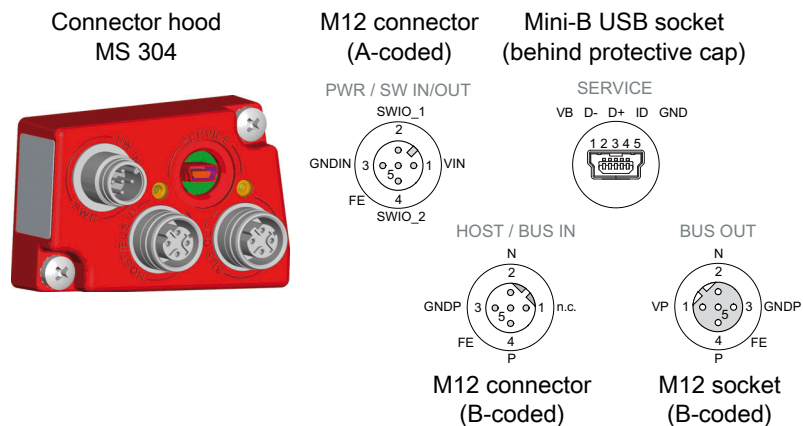


Figure 10.1: BCL 304/- MS 304 connection hood with M12 connectors

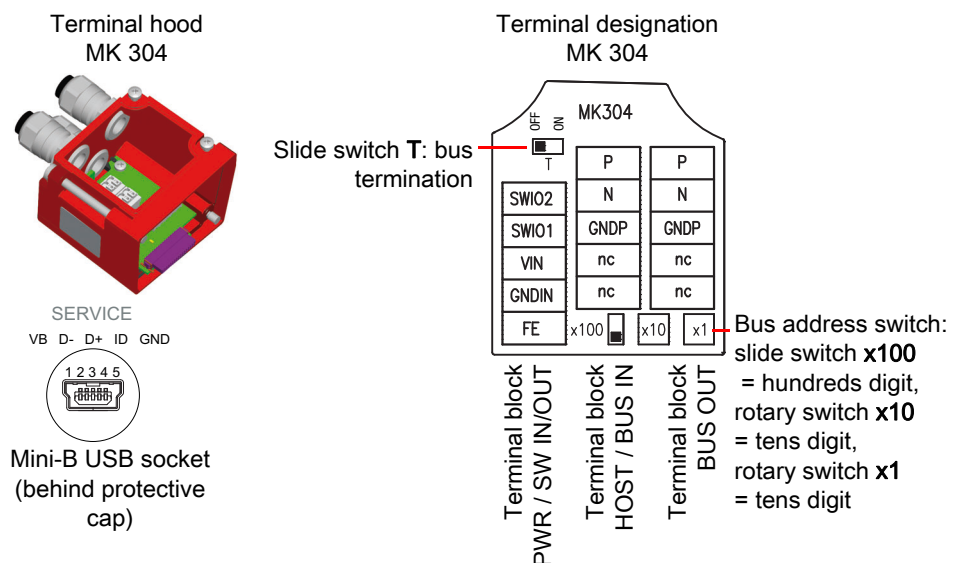


Figure 10.2: BCL 304/- MK 304 terminal hood with spring-cage terminals

- ✚ Check the applied voltage. It must be in the range between +18V ... 30 V DC.

### 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.

### 10.3 Setting the PROFIBUS address

In the MS 304 and MK 304, the PROFIBUS address can be set using two rotary switches and a slide switch.

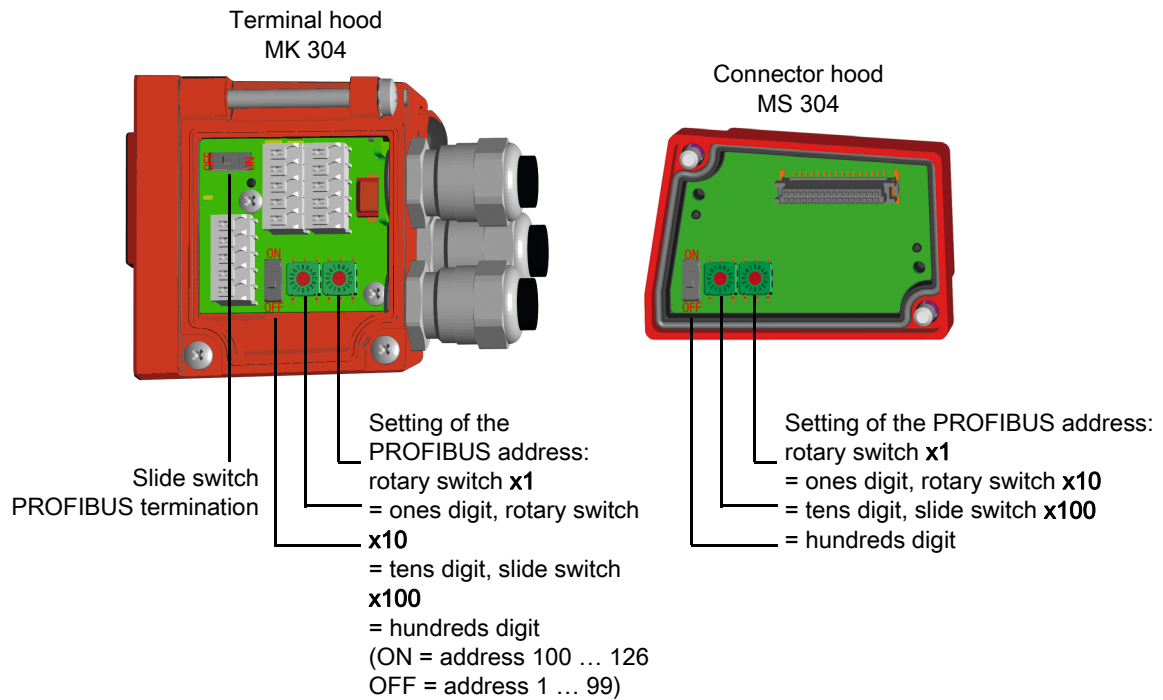


Figure 10.3: BCL 304/- Setting the PROFIBUS address

The set address must be greater than or equal to 1 and less than or equal to 126. On delivery, the address is set to 126. Address 126 may not be used for data communication. It may only be used temporarily for commissioning.

The address must be set individually in the connection hood of every BCL 304/- type of bar code reader.

#### NOTE




The BCL 304/- does not support automatic address assignment via the PROFIBUS!

## 10.4 Commissioning via the PROFIBUS

### 10.4.1 General information

The BCL 304/i is designed as a PROFIBUS slave device. The functionality of the device is defined via parameter sets which are clustered in modules. The modules are included in a GSD file, which is supplied as an integral part of the device. By using a user-specific configuration tool, such as, e.g., Simatic Manager for the programmable logic control by Siemens, the required modules are integrated into a project during commissioning and its settings and parameters are adjusted accordingly. These modules are provided by the GSD file.

| NOTE  |  |
|---|--|
|  | All input and output modules described in this documentation are described from the viewpoint of the control:                            |
|   | <ul style="list-style-type: none"> <li>• Input data arrives at the control</li> <li>• Output data is sent out by the control.</li> </ul> |

### 10.4.2 Preparing the control for consistent data transmission

During programming the control system must be prepared for consistent data transmission. This varies from control to control. The following possibilities are available for the Siemens control systems.

#### S7

The specific function blocks **SFC 14** for input data and **SFC 15** for output data must be integrated in the program. These are standard function blocks and are used to facilitate consistent data transmission.

### 10.4.3 General information on the GSD file

You can find the GSD file at


**[www.leuze.com](http://www.leuze.com) -> Download -> Identification -> Stationary bar code readers.**

All data in modules required for operating the BCL 304/i is described in this file. These are input and output data and device parameters for the functioning of the BCL 304/i and the definition of the control and status bits.

If parameters are changed, e.g., in the project tool, these changes are stored on the PLC side in the project, not in the GSD file. The GSD file is a certified and integral part of the device and must not be changed manually. The file is not changed by the system either.


The functionality of the BCL 304/i is defined via GSD parameter sets. The parameters and their functions are structured in the GSD file using modules. A user-specific configuration tool is used during PLC program creation to integrate the required modules and configure them appropriately for their respective use. During operation of the BCL 304/i on the PROFIBUS all parameters are set to default values. If these parameters are not changed by the user, the device functions with the default settings delivered by Leuze electronic.

For the default settings of the BCL 304/i, please refer to the following module descriptions.

| NOTE  |  |
|---|--|
|  | Please note that the set data is overwritten by the PLC!   |
|   | Some controls make available a so-called "universal module". This module must not be activated for the BCL 304/i |

From the perspective of the device, a distinction is made between PROFIBUS parameters and internal parameters. PROFIBUS parameters are all parameters that can be changed via the PROFIBUS and are described in the following modules. Internal parameters, on the other hand, can only be changed via a service interface and retain their value even following a PROFIBUS configuration.

During the configuration phase, the BCL receives a parameter telegram from the master. Before this is evaluated and the respective parameter values are set, all PROFIBUS parameters are reset to default values. This ensures that the parameters of modules that are not selected are set to the default values.

| NOTE  |  |
|---|--|
|  | This does not affect modules 1-4 for the code table extension. By default, all but the first code table entry are locked. If "no code" is selected here, all subsequent code tables are deactivated (see chapter 10.6.1 "Modules 1-4 – Code table extensions 1 to 4"). |
|   |  |

#### 10.4.4 Permanently defined parameters/device parameters

On the PROFIBUS, parameters may be stored in modules or may be defined permanently in a PROFIBUS participant.

Depending on the configuration tool, the permanently defined parameters are called "common" parameters or device-specific parameters.

These parameters must always be present. They are defined outside of the modules and are permanently anchored in the telegram header.

##### Simatic S7 control

In SIMATIC Manager, the permanently defined parameters are set via object properties of the device. The module parameters are set via the module list of the selected device. By selecting the project properties of a module, the respective parameters may be set if required.

The following list contains the parameters that are permanently defined in the BCL 304*/* but are configurable. These parameters always exist and are available independent of the modules.

| Parameter             | Description  | Addr.       | Data type | Value range  | Default | Unit |
|-----------------------|--|-------------|-----------|--|---------|------|
| Profile number        | Number of the activated profile. For BCL 304 <i>/</i> constant with value 0.   | 0           | Byte      | 0 ... 255  | 0       | -    |
| Code type 1           | Released code type; no code means that all subsequent code tables are also deactivated.<br><br>The valid number of digits also depends on the code type. | 1.0 ... 1.5 | BitArea   | 0: No code<br>1: 2/5 Interleaved<br>2: Code39<br>2: Code32<br>6: UPC, UPCE<br>7: EAN8, EAN13<br>8: Code128<br>10: EAN Addendum<br>11: Codabar<br>12: Code93<br>13: GS1 Data Bar OMNIDIRECTIONAL<br>14: GS1 Data Bar LIMITED<br>15: GS1 Data Bar EXPANDED | 1       | -    |
| Number-of-digits mode | Specifies how the subsequent numbers of digits are to be interpreted.  | 2.6         | Bit       | 0: Enumeration<br>1: Range   | 0       | -    |
| Number of digits 1    | Decodable number of digits; in the case of a range, this number defines the lower limit. <sup>1)</sup>   | 2.0 ... 2.5 | UNSIGNED8 | 0 ... 63   | 10      | -    |
| Number of digits 2    | Decodable number of digits; in the case of a range, this number defines the upper limit.   | 3           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 3    | Decodable number of digits in the <b>enumeration</b> mode.   | 4           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 4    | Decodable number of digits in the <b>enumeration</b> mode.   | 5           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 5    | Decodable number of digits in the <b>enumeration</b> mode.   | 6           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Reading reliability   | Min. reading reliability to be achieved in order to output a read code.  | 7           | UNSIGNED8 | 1 ... 100  | 4       | -    |
| Check digit method    | Used check digit procedure.  | 8.0 ... 8.6 | BitArea   | 0: Standard check digit evaluation<br>1: No check digit verification<br>2: MOD10 Weight 3<br>3: MOD10 Weight 2<br>4: MOD10 Weight 4_9<br>5: MOD11 Cont<br>6: MOD43<br>7: MOD16   | 0       | -    |
| Check digit output    | Turns the check digit output on or off.  | 8.7         | Bit       | Check digit output<br>0: Standard<br>1: Not standard   | 0       | -    |

Table 10.5: "Common" parameters



| Parameter               | Description  | Addr.         | Data type | Value range  | Default | Unit |
|-------------------------|--|---------------|-----------|--|---------|------|
| Code type 2             | See code type 1  | 9.0 ... 9.5   | BitArea   | See code type 1  | 0       | -    |
| Number of digits mode 2 | Specifies how the subsequent numbers of digits are to be interpreted.                    | 10.6          | Bit       | 0: Enumeration<br>1: Range   | 0       | -    |
| Number of digits 2.1    | Decodable number of digits; in the case of a range, this number defines the lower limit. | 10.0 ... 10.5 | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 2.2    | Decodable number of digits; in the case of a range, this number defines the upper limit. | 11            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 2.3    | Decodable number of digits in the <b>enumeration</b> mode.                               | 12            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 2.4    | Decodable number of digits in the <b>enumeration</b> mode.                               | 13            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 2.5    | Decodable number of digits in the <b>enumeration</b> mode.                               | 14            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Reading reliability 2   | Min. reading reliability to be achieved in order to output a read code.                  | 15            | UNSIGNED8 | 1 ... 100  | 4       | -    |
| Check digit method 2    | Used check digit procedure.  | 16.0... 16.6  | BitArea   | 0: Standard check digit evaluation<br>1: No check digit verification<br>2: MOD10 Weight 3<br>3: MOD10 Weight 2<br>4: MOD10 Weight 4_9<br>5: MOD11 Cont<br>6: MOD43<br>7: MOD16 | 0       | -    |
| Check digit output 2    | Turns the check digit output on or off   | 16.7          | Bit       | Check digit output<br>0: Standard<br>1: Not standard   | 0       | -    |
| Code type 3             | See code type 1  | 17.0 ... 17.5 | BitArea   | See code type 1  | 0       | -    |
| Number of digits mode 3 | Specifies how the subsequent numbers of digits are to be interpreted.                    | 18.6          | Bit       | 0: Enumeration<br>1: Range   | 0       | -    |
| Number of digits 3.1    | Decodable number of digits; in the case of a range, this number defines the lower limit. | 18.0 ... 18.5 | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 3.2    | Decodable number of digits; in the case of a range, this number defines the upper limit. | 19            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 3.3    | Decodable number of digits in the <b>enumeration</b> mode.                               | 20            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 3.4    | Decodable number of digits in the <b>enumeration</b> mode.                               | 21            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 3.5    | Decodable number of digits in the <b>enumeration</b> mode.                               | 22            | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Reading reliability 3   | Min. reading reliability to be achieved in order to output a read code.                  | 23            | UNSIGNED8 | 1 ... 100  | 4       | -    |
| Check digit method 3    | Used check digit procedure.  | 24.0... 24.6  | BitArea   | 0: Standard check digit evaluation<br>1: No check digit verification<br>2: MOD10 Weight 3<br>3: MOD10 Weight 2<br>4: MOD10 Weight 4_9<br>5: MOD11 Cont<br>6: MOD43<br>7: MOD16 | 0       | -    |
| Check digit output 3    | Turns the check digit output on or off   | 24.7          | Bit       | Check digit output<br>0: Standard<br>1: Not standard   | 0       | -    |

Table 10.5: "Common" parameters

| Parameter               | Description  | Addr.            | Data type | Value range  | Default | Unit |
|-------------------------|--|------------------|-----------|--|---------|------|
| Code type 4             | See code type 1  | 25.0 ...<br>25.5 | BitArea   | See code type 1  | 0       | -    |
| Number-of-digits mode 4 | Specifies how the subsequent numbers of digits are to be interpreted.                    | 26.6             | Bit       | 0: Enumeration<br>1: Range   | 0       | -    |
| Number of digits 4.1    | Decodable number of digits; in the case of a range, this number defines the lower limit. | 26.0 ...<br>26.5 | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 4.2    | Decodable number of digits; in the case of a range, this number defines the upper limit. | 27               | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 4.3    | Decodable number of digits in the <b>enumeration</b> mode.                               | 28               | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 4.4    | Decodable number of digits in the <b>enumeration</b> mode.                               | 29               | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 4.5    | Decodable number of digits in the <b>enumeration</b> mode.                               | 30               | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Reading reliability 4   | Min. reading reliability to be achieved in order to output a read code.                  | 31               | UNSIGNED8 | 1 ... 100  | 4       | -    |
| Check digit method 4    | Used check digit procedure.  | 32.0...<br>32.6  | BitArea   | 0: Standard check digit evaluation<br>1: No check digit verification<br>2: MOD10 Weight 3<br>3: MOD10 Weight 2<br>4: MOD10 Weight 4_9<br>5: MOD11 Cont<br>6: MOD43<br>7: MOD16 | 0       | -    |
| Check digit output 4    | Turns the check digit output on or off   | 32.7             | Bit       | Check digit output<br>0: Standard<br>1: Not standard   | 0       | -    |

Table 10.5: "Common" parameters

- 1) Specifying a 0 for the number of digits means that this entry is ignored for the device.

Parameter length: 33 bytes

#### Input data

None

#### Output data

None

#### Note on number of digits:

If 0 is specified in a field for the number of digits, the corresponding parameter is ignored by the device firmware.

#### Example:

For a code table entry x, the two code lengths 10 and 12 are to be enabled. For this purpose, the following number of digit entries are necessary:

Number of digits mode x = 0 (enumeration)

Number of digits x.1 = 10

Number of digits x.2 = 12

Number of digits x.3 = 0

Number of digits x.4 = 0

Number of digits x.5 = 0

## 10.5 Overview of the project modules

In the current version, a total of 52 modules are available for use. A **Device Module** (see "Permanently defined parameters/device parameters" on page 74) is used for basic configuration of the BCL 304*i* and is permanently integrated into the project. Further modules may be included into the project according to requirements and application.

The modules fall into the following categories:

- Parameter module for the configuration of the BCL 304*i*.
- Status or control modules that influence the input/output data.
- Modules that may include both parameters and control or status information.


A PROFIBUS module defines the existence and meaning of the input and output data. In addition, it defines the necessary parameters. The arrangement of the data within a module is defined.

The composition of the input/output data is defined via the module list.

The BCL 304*i* interprets the incoming output data and triggers the appropriate reactions in the BCL 304*i*. The interpreter for processing the data is adapted to the module structure during initialization.

The same applies for the input data. Using the module list and the defined module properties, the input data string is formatted and referenced to the internal data.

During cyclic operation, the input data is then passed on to the master.

| NOTE  |   |
|---|---|
|  | <p>The modules can be grouped together in any order in the engineering tool. The BCL 304<i>i</i> offers 52 different modules. Each of these modules may only be selected once; otherwise, the BCL 304<i>i</i> ignores the configuration.</p> <p>The BCL 304<i>i</i> checks its max. permissible number of modules. In addition, it checks the max. permissible total length (244 bytes each) of the input and output data over all selected modules. The specific limits of the individual modules of the BCL 304<i>i</i> are declared in the GSD file.</p> |

The following module overview shows the characteristics of the individual modules:


| Module                           | Description   | Module identifier | Parameters <sup>1)</sup> | Output data | Input data |
|----------------------------------|---|-------------------|--------------------------|-------------|------------|
| <b>Decoder</b>                   |   |                   |                          |             |            |
| Code table extension 1           | Extension of the existing code table  | 1                 | 8                        | 0           | 0          |
| Code table extension 2           | Extension of the existing code table  | 2                 | 8                        | 0           | 0          |
| Code table extension 3           | Extension of the existing code table  | 3                 | 8                        | 0           | 0          |
| Code table extension 4           | Extension of the existing code table  | 4                 | 8                        | 0           | 0          |
| Code type properties             | The module permits changing the muted zones as well as the line-gap ratios    | 5                 | 6                        | 0           | 0          |
| Code reconstruction technology   | Support of code reconstruction technology                                     | 7                 | 3                        | 0           | 0          |
| <b>Control</b>                   |   |                   |                          |             |            |
| Activations                      | Control bits for activation of the standard reading operation                 | 10                | 1                        | 0           | 1          |
| Reading gate control             | Extended control of the reading gate  | 11                | 6                        | 0           | 0          |
| Multi-label                      | Output of several bar codes per reading gate                                  | 12                | 2                        | 1           | 0          |
| Fragmented read result           | Transmission of the read results in the fragmented mode                       | 13                | 1                        | 2           | 0          |
| Interlinked read result          | Interlinking of the individual read results within one reading gate           | 14                | 1                        | 0           | 0          |
| <b>Result format</b>             |   |                   |                          |             |            |
| Decoder state                    | Status display – decoding   | 20                | 0                        | 1           | 0          |
| Decoding result 1                | Bar code information 4 bytes max.   | 21                | 0                        | 6           | 0          |
| Decoding result 2                | Bar code information 8 bytes max.   | 22                | 0                        | 10          | 0          |
| Decoding result 3                | Bar code information 12 bytes max.  | 23                | 0                        | 14          | 0          |
| Decoding result 4                | Bar code information 16 bytes max.  | 24                | 0                        | 18          | 0          |
| Decoding result 5                | Bar code information 20 bytes max.  | 25                | 0                        | 22          | 0          |
| Decoding result 6                | Bar code information 24 bytes max.  | 26                | 0                        | 26          | 0          |
| Decoding result 7                | Bar code information 28 bytes max.  | 27                | 0                        | 30          | 0          |
| Data formatting                  | Specification for formatting the data output                                  | 30                | 23                       | 0           | 0          |
| Reading gate number              | Number of the reading gate since system start-up                              | 31                | 0                        | 2           | 0          |
| Number of scans per reading gate | Number of scans per reading gate  | 32                | 0                        | 2           | 0          |
| Code position                    | Relative position of the bar code label in the scanning beam                  | 33                | 0                        | 2           | 0          |
| Reading reliability              | Calculated reading reliability for the transmitted bar code                   | 34                | 0                        | 2           | 0          |
| Scans per bar code               | Number of scans between the first and the last time of detecting the bar code | 35                | 0                        | 2           | 0          |
| Scans with information           | Number of scans with processed information                                    | 36                | 0                        | 2           | 0          |
| Decoding quality                 | Quality of the read result  | 37                | 0                        | 1           | 0          |
| Code direction                   | Orientation of the bar code   | 38                | 0                        | 1           | 0          |
| Number of digits                 | Number of digits in the bar code  | 39                | 0                        | 1           | 0          |
| Code type                        | Bar code type   | 40                | 0                        | 1           | 0          |

Table 10.6: Module overview

| Module  | Description   | Module identifier | Parameters 1) | Output data | Input data |
|---|---|-------------------|---------------|-------------|------------|
| Code position in the swivel range             | Code position in the swivel range of an oscillating mirror device   | 41                | 0             | 2           | 0          |
| <b>Data Processing</b>                        |   |                   |               |             |            |
| Characteristics filter                        | Configuration of the characteristics filter   | 50                | TBD           | TBD         | TBD        |
| Data filtering                                | Configuration of the data filtering   | 51                | 60            | 0           | 0          |
| Segmentation acc. to the EAN process          | Activation and configuration of the segmentation acc. to the EAN process  | 52                | 27            | 0           | 0          |
| Segmentation via fixed positions              | Activation and configuration of the segmentation via fixed positions  | 53                | 37            | 0           | 0          |
| Segmentation acc. to identifier and separator | Activation and configuration of the segmentation acc. to identifier and separator                                   | 54                | 29            | 0           | 0          |
| String handling parameter                     | Definition of placeholder characters for bar code segmentation, filtering, completion and reference code processing | 55                | 3             | 0           | 0          |
| <b>Device-Functions</b>                       |   |                   |               |             |            |
| Device status                                 | Display of the device status as well as control bits for reset and standby  | 60                | 0             | 1           | 1          |
| Laser control                                 | Switch-on and switch-off positions of the laser   | 61                | 4             | 0           | 0          |
| Alignment                                     | Alignment mode  | 63                | 0             | 1           | 1          |
| Oscillating mirror                            | Configuration of the oscillating mirror   | 64                | 6             | 0           | 0          |
| <b>Switching inputs/outputs SWIO</b>          |   |                   |               |             |            |
| Switching input/output SWIO1                  | Parameter settings SWIO1  | 70                | 23            | 0           | 0          |
| Switching input/output SWIO2                  | Parameter settings SWIO2  | 71                | 23            | 0           | 0          |
| SWIO status and control                       | Handling of switching input and switching output signals  | 74                | 0             | 2           | 2          |
| <b>Data output</b>                            |   |                   |               |             |            |
| Sorting                                       | Sorting support   | 80                | 3             | 0           | 0          |
| Reference code comparator 1                   | Definition of the operation mode of reference code comparator 1   | 81                | 8             | 0           | 0          |
| Reference code comparator 2                   | Definition of the operation mode of reference code comparator 2   | 82                | 8             | 0           | 0          |
| Reference code comparison pattern 1           | Definition of the 1st comparison pattern  | 83                | 31            | 0           | 0          |
| Reference code comparison pattern 2           | Definition of the 2nd comparison pattern  | 84                | 31            | 0           | 0          |
| <b>Special functions</b>                      |   |                   |               |             |            |
| Status and control                            | Grouping of multiple status and control bits  | 90                | 0             | 1           | 0          |
| AutoRefIAct                                   | Automatic reflector activation  | 91                | 2             | 0           | 0          |
| AutoControl                                   | Automatic monitoring of the reading properties  | 92                | 3             | 1           | 0          |

Table 10.6: Module overview

1) The number of parameter bytes does not include the constant module number, which is always transmitted in addition.

| NOTE  |   |
|---|---|
|  | For the standard case, at least module 10 (activation) and one of modules 21 ... 27 (decoding result 1 ... 7) should be integrated. |

## 10.6 Decoder modules

### 10.6.1 Modules 1-4 – Code table extensions 1 to 4

#### Description

The modules extend the code type tables of the device parameters and permit the additional definition of further 4 code types together with the respective number of digits.

#### Parameters

| Parameter                        | Description  | Rel. addr.  | Data type | Value range  | Default | Unit |
|----------------------------------|--|-------------|-----------|--|---------|------|
| Code type                        | Released code type; no code means that all subsequent code tables are also deactivated.<br><br>The valid number of digits also depends on the code type.   | 0.0 ... 0.5 | BitArea   | 0: No code<br>1: 2/5 Interleaved<br>2: Code39<br>3: Code32<br>6: UPC, UPCE<br>7: EAN8, EAN13<br>8: Code128<br>10: EAN Addendum<br>11: Codabar<br>12: Code93<br>13: GS1 Data Bar OMNIDIRECTIONAL<br>14: GS1 Data Bar LIMITED<br>15: GS1 Data Bar EXPANDED | 0       | -    |
| Number of digits mode            | Interpretation of the number of digits.  | 1.6         | Bit       | 0: Enumeration<br>1: Range   | 0       | -    |
| Number of digits 1 <sup>1)</sup> | Decodable number of digits; in the case of a range, this number defines the lower limit.   | 1.0 ... 1.5 | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 2               | Decodable number of digits; in the case of a range, this number defines the upper limit.   | 2           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 3               | Decodable number of digits in the enumeration mode.  | 3           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 4               | Decodable number of digits in the enumeration mode.  | 4           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Number of digits 5               | Decodable number of digits in the enumeration mode.  | 5           | UNSIGNED8 | 0 ... 63   | 0       | -    |
| Reading reliability              | Min. reading reliability to be achieved in order to output a read code.  | 6           | UNSIGNED8 | 1 ... 100  | 4       | -    |
| Check digit method               | Used check digit procedure.  | 7.0 ... 7.6 | BitArea   | 0: Standard check digit evaluation<br>1: No check digit verification<br>2: MOD10 Weight 3<br>3: MOD10 Weight 2<br>4: MOD10 Weight 4_9<br>5: MOD11 Cont<br>6: MOD43<br>7: MOD16   | 0       | -    |
| Check digit output               | Turns the check digit output on or off. Standard means that the check digit is transmitted according to the applicable standard for the selected code type.<br>If <b>no check digit transmission is intended</b> for the selected code type, then " <b>Standard</b> " means that the check digit is <b>not</b> transmitted and " <b>Not Standard</b> " means that the check digit is transmitted anyway. | 7.7         | Bit       | Check digit output<br>0: Standard<br>1: Not standard   | 0       | -    |

Table 10.7: Parameters for modules 1-4

1) Cf. in Section 10.4.4 Permanently defined parameters/device parameters the notice on number of digits.

**Parameter length**

8 bytes

**Input data**

None

**Output data**

None

**10.6.2 Module 5 – Code type features (symbology)****Description**

The module defines extended features for various code types.

**Parameters**

| Parameter                     | Description  | Addr.          | Data type | Value range   | Default | Unit |
|-------------------------------|--|----------------|-----------|---|---------|------|
| Maximum width deviation       | Max. permitted width deviation of a character in percent of the directly adjacent character. | 0              | UNSIGNED8 | 0 ... 100   | 15      | %    |
| Code 39 max. element ratio    | Permissible ratio between maximum and minimum element of Code 39.                            | 1              | UNSIGNED8 | 0 ... 255   | 8       | -    |
| Code 39 character gap         | Permissible ratio for the gap between two characters for Code 39.                            | 2              | UNSIGNED8 | 0 ... 255   | 3       | -    |
| Codabar max. element ratio    | Permissible ratio between maximum and minimum element of the Codabar code.                   | 3              | UNSIGNED8 | 0 ... 255   | 8       | -    |
| Codabar character gap         | Permissible ratio for the gap between two characters for the Codabar code.                   | 4              | UNSIGNED8 | 0 ... 255   | 3       | -    |
| Codabar Monarch Mode          | The decoding of a Monarch bar code as Codabar bar code can be switched on or off.            | 5.0            | Bit       | 0: Off<br>1: On   | 0       | -    |
| Codabar start/stop character  | Switches the transmission of a start and stop character for the Codabar code on and off.     | 5.1            | Bit       | 0: Off<br>1: On   | 0       | -    |
| UPC-E extension               | Switches the extension of a UPC-E code to a UPC-A result on and off.                         | 5.4            | Bit       | 0: Off<br>1: On   | 0       | -    |
| Code 128: activate EAN header | Switches the output of the EAN header on and off.  | 5.5            | Bit       | 0: Off<br>1: On   | 1       | -    |
| Code 39 conversion            | Defines the conversion method used for Code 39.  | 5.6 ...<br>5.7 | BitArea   | 0: Standard (usual conversion method)<br>1: Standard ASCII (combination of standard method and ASCII method)<br>2: ASCII (This conversion method uses the entire ASCII character set) | 0       | -    |

Table 10.8: Parameters for module 5

**Parameter length**

6 byte

**Input data**

None

**Output data**

None

### 10.6.3 Module 7 – Code reconstruction technology

#### Description

Module for supporting the code reconstruction technology.

#### Parameters

| Parameter                      | Description   | Addr.   | Data type  | Value range                       | Default | Unit |
|--------------------------------|---|---------|------------|-----------------------------------|---------|------|
| Maximum width ratio            | The maximum width ratio is used to determine the light zones. The light zones identify the beginning or end of patterns.        | 0       | UNSIGNED8  | 0 ... 255                         | 13      | -    |
| Minimum number of elements     | A pattern must have at least this minimum number of duo-elements, i.e. no patterns which have fewer duo-elements.               | 1 ... 2 | UNSIGNED16 | 2 ... 400                         | 6       | -    |
| Code fragment mode             | This parameter can be used to switch CRT mode on and off.   | 3.0     | Bit        | 0: Switched off<br>1: Switched on | 1       | -    |
| Processing end at end of label | If this parameter is set, a decoded bar code is only completely decoded after the scanning beam has exited the entire bar code. | 3.2     | Bit        | 0: Switched off<br>1: Switched on | 0       | -    |

Table 10.9: Parameters for module 7

#### Parameter length

4 byte

#### Input data

None

#### Output data

None

#### Processing end at end of label:

If this parameter is set, a decoded bar code is only completely decoded after the scanning beam has exited the entire bar code. This mode is useful if the quality of the bar code is to be assessed, since more scans are now available for the quality evaluation of the bar code.

This parameter should be set if the AutoControl function is activated (see chapter 10.15.3 "Module 92 – AutoControl"). If the parameter is not set, the bar code is immediately decoded and processed further as soon as all necessary bar code elements are available.

## 10.7 Control modules

### 10.7.1 Module 10 – Activations

#### Description

The module defines the control signals for the reading operation of the bar code reader. It is possible to select between standard reading operation and handshake operation.

In handshake operation, the control must acknowledge the data reception via the ACK bit before the new data is written into the input area.

After acknowledging the last decoding result, the input data is reset (filled with zeros).

#### Parameters

| Parameter | Description  | Addr. | Data type | Value range   | Default | Unit |
|-----------|--|-------|-----------|---|---------|------|
| Mode      | The parameter defines the mode in which the activation module is operated. | 0     | UNSIGNED8 | 0: Without ACK <sup>1)</sup><br>1: With ACK <sup>2)</sup> | 0       | -    |

Table 10.10: Parameters for module 10

- 1) corresponds to BCL34 module 18
- 2) corresponds to BCL34 module 19

#### Parameter length

1 byte

#### Input data

None


#### Output data

| Output data        | Description   | Addr. | Data type | Value range  | Initial value | Unit |
|--------------------|---|-------|-----------|--|---------------|------|
| Reading gate       | Signal for activating the reading gate  | 0.0   | Bit       | 1 -> 0: Reading gate off<br>0 -> 1: Reading gate active  | 0             | -    |
|                    | Free  | 0.1   | Bit       |  | 0             | -    |
|                    | Free  | 0.2   | Bit       |  | 0             | -    |
|                    | Free  | 0.3   | Bit       |  | 0             | -    |
| Data acknowledged- | This control bit signals that the transmitted data have been processed by the master. Only relevant in handshake mode (with ACK). | 0.4   | Bit       | 0 -> 1: Data has been processed by the master<br>1 -> 0: Data has been processed by the master | 0             | -    |
| Data reset         | Deletes decoding results that may have been stored and resets the input data of all modules.                                      | 0.5   | Bit       | 0 -> 1: Data reset   | 0             | -    |
|                    | Free  | 0.6   | Bit       |  |               |      |
|                    | Free  | 0.7   | Bit       |  |               |      |

Table 10.11: Output data for module 10

#### Output data length

1 byte consistent

| NOTE  |  |
|---|--|
|  | <p>If several bar codes are decoded in sequence without the acknowledge mode having been activated, the input data of the result modules are overwritten with the respective most recently read decoding result.</p> <p>If a data loss in the control is to be avoided in such a case, mode 1 (with Ack) should be activated. If multiple decoding results occur within one reading gate, it is possible - dependent on the cycle time - that only the last decoding result is visible on the bus. In this case, the acknowledge mode MUST be used. There is otherwise a risk of data loss.</p> <p>Multiple, individual decoding results may occur within one reading gate if the Module 12 – Multi-label (see Chapter 10.7.3) or one of the identifier modules (see chapter 10.10 "Identifier" beginning on Page 98) is used.</p> |



**Data reset behavior:**

If the data reset control bit is activated, the following actions are carried out:

1. Deletion of decoding results that may still be stored.
2. Reset of module 13 - fragmented read result (see Chapter 10.7.4), i.e., even a partially transmitted read result is deleted.
3. Deletion of the input data areas of all modules. Exception: The input data of module 60 - device status (see Chapter 10.11.1) is not deleted. For the status byte of decoding result modules 20 ... 27 (see Chapter 10.8.2), the two toggle bytes and the reading gate status remain unchanged.

**10.7.2 Module 11 – Reading gate control****Description**

With the module, the reading gate control of the bar code reader can be adapted to the application. With different parameters from the bar code reader, a time-controlled reading gate may be created. In addition, it defines the internal criteria for the reading gate end and the completeness inspection.

**Parameters**

| Parameter                               | Description   | Addr. | Data type  | Value range  | Default | Unit |
|---|---|-------|------------|--|---------|------|
| Automatic reading gate repeat           | The parameter defines the automatic repeat of reading gates.  | 0     | Byte       | 0: No<br>1: Yes  | 0       | -    |
| Reading gate end mode/completeness mode | This parameter can be used to configure the completeness inspection.  | 1     | Byte       | 0: <b>Independent of decoding</b> , i.e., the reading gate is not terminated prematurely.<br>1: <b>Dependent on decoding</b> , i.e., the reading gate is terminated if the configured number of bar codes to be decoded has been reached. <sup>1)</sup><br>2: <b>DigitRef table-dependent</b> , i.e., the reading gate is terminated if each bar code stored in the code type table has been decoded. <sup>2)</sup><br>3: <b>Ident list dependent</b> , i.e., the reading gate is terminated if each identifier stored in a list could be segmented via a respective bar code segmentation. <sup>3)</sup><br>4: <b>Reference code comparison</b> , i.e., the reading gate is terminated if a positive reference code comparison has taken place. <sup>4)</sup> | 1       | -    |
| Restart delay                           | The parameter specifies a time after which a reading gate is restarted. The BCL 304 <i>/</i> generates its own periodic reading gate. The configured time is active only if the automatic reading gate repeat is switched on. | 2     | UNSIGNED16 | 0 ... 65535  | 0       | ms   |
| Max. reading gate time when scanning    | The parameter switches off the reading gate after the set time has elapsed, thus limiting the reading gate to the set period.   | 4     | UNSIGNED16 | 1 ... 65535<br>0: Reading gate deactivation is switched off.   | 0       | ms   |

Table 10.12: Parameters for module 11

1) See "Module 12 – Multi-label" on page 85.

2) Corresponds to the settings carried out via the device module (Chapter 10.4.4) or Modules 1-4 – Code table extensions 1 to 4.

- 3) See "Identifier" on page 98, modules 52-54 "Identifier filter string"
- 4) See Module 83 – Reference code comparison pattern 1 and Module 84 – Reference code comparison pattern 2

**Parameter length**

6 byte

**Input data**

None

**Output data**

None

### 10.7.3 Module 12 – Multi-label

#### Description

The module permits the definition of multiple bar codes with a different number of digits and/or code types in the reading gate and provides the necessary input data.

#### Parameters

| Parameter                   | Description  | Addr. | Data type | Value range | Default | Unit |
|-----------------------------|--|-------|-----------|-------------|---------|------|
| Minimum number of bar codes | Minimum number of different bar codes scanned for per reading gate.  | 0     | UNSIGNED8 | 0 ... 64    | 1       | -    |
| Maximum number of bar codes | Maximum number of different bar codes scanned for per reading gate. Only if this number of bar codes has been reached, the reading gate is terminated prematurely. <sup>1)</sup> | 1     | UNSIGNED8 | 0 ... 64    | 1       | -    |

Table 10.13: Parameters for module 12

1) Compare with "Module 11 – Reading gate control" on page 83, parameter "reading gate termination mode"

#### Parameter length

2 bytes

#### Input data

| Input data                 | Description   | Addr. | Data type | Value range | Initial value | Unit |
|----------------------------|---|-------|-----------|-------------|---------------|------|
| Number of decoding results | Number of decoding results which have not been fetched. | 0     | UNSIGNED8 | 0 ... 255   | 0             | -    |

Table 10.14: Input data for module 12

#### Input data length

1 byte


#### Output data

None

This module is used to set the maximum and minimum number of bar codes which are to be decoded within a reading gate.

If parameter "minimum number of bar codes" = 0, it is not taken into account at the decoder control. If it is not equal to 0, this means that the bar code reader expects a number of labels within the set range.

If the number of decoded bar codes is within the set limits, no additional "No Reads" are output.

| NOTE  |   |
|---|---|
|  | When using this module, the ACK mode should be activated (see Module 10 – Activations, "Mode" parameter). Otherwise there is a risk of losing decoding results if the control is not fast enough. |

### 10.7.4 Module 13 – Fragmented read result

#### Description

The module defines the transfer of fragmented reading results. To occupy few I/O data, the read results may be split into several fragments with this module. The fragments can then be transmitted one after another with a handshake.

#### Parameters

| Parameter       | Description  | Addr. | Data type | Value range | Default | Unit |
|-----------------|--|-------|-----------|-------------|---------|------|
| Fragment length | The parameter defines the maximum length of the bar code information per fragment. | 0     | UNSIGNED8 | 1 ... 28    | 0       | -    |

Table 10.15: Parameters for module 13

**Parameter length**

1 byte

**Input data**

| Input data          | Description  | Addr.       | Data type | Value range | Initial value | Unit |
|---------------------|--|-------------|-----------|-------------|---------------|------|
| Fragment number     | Current fragment number  | 0.0 ... 0.3 | Bitarea   | 0 ... 15    | 0             | -    |
| Remaining fragments | Number of fragments which still have to be read for a complete result.                               | 0.4 ... 0.7 | Bitarea   | 0 ... 15    | 0             | -    |
| Fragment size       | Fragment length, always corresponds to the configured fragment length, except for the last fragment. | 1           | UNSIGNED8 | 0 ... 28    | 0             | -    |

Table 10.16: Input data for module 13

**Input data length**

2 byte consistent

**Output data**

None

**10.7.5 Module 14 – Interlinked read result****Description**

This module is used to switch to a mode in which all decoding results within one reading gate are combined into a single read result.

**Parameters**

| Parameter           | Description  | Addr. | Data type | Value range                           | Default | Unit |
|---------------------|--|-------|-----------|---------------------------------------|---------|------|
| Separator character | This parameter is used to define a delimiter that is inserted between two individual decoding results. | 0     | UNSIGNED8 | 1 ... 255<br>0: No delimiter is used. | 1       | -    |

Table 10.17: Parameters for module 13

**Parameter length**

1 byte

**Input data**

None

**Output data**


None

**NOTE**

An interlinked read result also requires Module 12 – Multi-label. In this mode, the additional information transmitted in modules 31ff relates to the last decoding result in the chain.

## 10.8 Result format

In the following, various modules for the output of decoding results are listed. They have the same structure but different output lengths. The PROFIBUS module concept does not cater for modules of variable data length.

| NOTE  |  |
|---|--|
|  | Modules 20 ... 27 are, thus, to be regarded as alternatives and should not be used in parallel. Modules 30 ... 40, on the other hand, can be combined freely with the decoding result modules. |

### 10.8.1 Module 20 – Decoder state

#### Description

The module indicates the state of the decoding and of the automatic decoder configuration.

#### Parameter

None

#### Input data

| Input data                    | Description   | Addr. | Data type | Value range   | Initial value | Unit |
|-------------------------------|---|-------|-----------|---|---------------|------|
| Reading gate state            | The signal indicates the current state of the reading gate <sup>1)</sup> .          | 0.0   | Bit       | 0: Off<br>1: On   | 0             | -    |
| New result                    | The signal indicates whether a new decoding has occurred.                           | 0.1   | Bit       | 0: No<br>1: Yes   | 0             | -    |
| Result state                  | The signal indicates whether the bar code has been read successfully.               | 0.2   | Bit       | 0: Successful reading<br>1: NOREAD  | 0             | -    |
| Further results in the buffer | The signal indicates whether further results are in the buffer.                     | 0.3   | Bit       | 0: No<br>1: Yes   | 0             | -    |
| Buffer overflow               | The signal indicates that result buffers are occupied and the decoder rejects data. | 0.4   | Bit       | 0: No<br>1: Yes   | 0             | -    |
| New decoding                  | Toggle bit indicates whether decoding has occurred.                                 | 0.5   | Bit       | 0 -> 1: New result<br>1 -> 0: New result  | 0             | -    |
| Result state                  | Toggle bit indicates that the bar code has not been read.                           | 0.6   | Bit       | 0->1: NOREAD<br>1->0: NOREAD  | 0             | -    |
| Waiting for acknowledgment    | This signal represents the internal state of the control.                           | 0.7   | Bit       | 0: Base state<br>1: Control waiting for acknowledgment from the PROFIBUS master | 0             | -    |

Table 10.18: Input data for module 20

1) **Attention:** This does not necessarily correspond to the state at the time the bar code is scanned

#### Input data length

1 byte

#### Output data

None

#### Comments

The following bits are constantly updated, i.e. they are updated immediately after the respective event occurs:

#### Reading gate state

- Further results in the buffer
- Buffer overflow
- Waiting for acknowledgment

All other flags refer to the currently output decoding result.

If the input data is reset to the init. value (cf. "Module 30 – Data formatting" on page 90), the following bits are reset:

- New result
- Result state

All others remain unchanged.

#### Data reset behavior:

Upon data reset (see Module 10 – Activations), the input data is deleted, except for the reading gate status and the two toggle bits.

### 10.8.2 Modules 21-27 – Decoding result

#### Description

The module defines the transfer of the actually decoded reading results. The data is transmitted consistently over the entire range.

#### Parameter

None

#### Input data

| Module No. | Input data                    | Description   | Addr. | Data type     | Value range   | Initial value | Unit |
|------------|-------------------------------|---|-------|---------------|---|---------------|------|
| 21 ... 27  | Reading gate state            | The signal indicates the current state of the reading gate. <sup>1)</sup>       | 0.0   | Bit           | 0: Off<br>1: On   | 0             | -    |
| 21 ... 27  | New result                    | Signal indicates whether a new decoding result is present.                      | 0.1   | Bit           | 0: No<br>1: Yes   | 0             | -    |
| 21 ... 27  | Result state                  | Signal indicates whether the bar code has been read successfully.               | 0.2   | Bit           | 0: Successful reading<br>1: NOREAD  | 0             | -    |
| 21 ... 27  | Further results in the buffer | Signal indicates whether further results are in the buffer.                     | 0.3   | Bit           | 0: No<br>1: Yes   | 0             | -    |
| 21 ... 27  | Buffer overflow               | Signal indicates that result buffers are occupied and the decoder rejects data. | 0.4   | Bit           | 0: No<br>1: Yes   | 0             | -    |
| 21 ... 27  | New result                    | Toggle bit indicates that a new decoding result is present.                     | 0.5   | Bit           | 0 -> 1: New result<br>1 -> 0: New result  | 0             | -    |
| 21 ... 27  | Result state                  | Toggle bit indicates that the bar code has not been read.                       | 0.6   | Bit           | 0->1: NOREAD<br>1->0: NOREAD  | 0             | -    |
| 21 ... 27  | Waiting for acknowledgment    | This signal represents the internal state of the control.                       | 0.7   | Bit           | 0: Base state<br>1: Control waiting for acknowledgment from the PROFIBUS master | 0             | -    |
| 21 ... 27  | Bar code data length          | Data length of the actual bar code information. <sup>2)</sup>                   | 1     | UNSIGNED8     | 0-48  | 0             | -    |
| 21         | Data                          | Bar code information with a length of consistently 4 bytes.                     | 2..   | 4x UNSIGNED8  | 0-FFh   | 0             | -    |
| 22         | Data                          | Bar code information with a length of consistently 8 bytes.                     | 2..   | 8x UNSIGNED8  | 0-FFh   | 0             | -    |
| 23         | Data                          | Bar code information with a length of consistently 12 bytes.                    | 2..   | 12x UNSIGNED8 | 0-FFh   | 0             | -    |
| 24         | Data                          | Bar code information with a length of consistently 16 bytes.                    | 2..   | 16x UNSIGNED8 | 0-FFh   | 0             | -    |
| 25         | Data                          | Bar code information with a length of consistently 20 bytes.                    | 2..   | 20x UNSIGNED8 | 0-FFh   | 0             | -    |
| 26         | Data                          | Bar code information with a length of consistently 24 bytes.                    | 2..   | 24x UNSIGNED8 | 0-FFh   | 0             | -    |
| 27         | Data                          | Bar code information with a length of consistently 28 bytes.                    | 2..   | 28x UNSIGNED8 | 0-FFh   | 0             | -    |

Table 10.19: Input data for modules 21 ... 27

1) Attention: This does not necessarily correspond to the state at the time the bar code is scanned

2) If the bar code information (bar code and, possibly, other items such as the check sum) fits in the selected module width, this value reflects the length of the transmitted data. A value larger than the module width indicates a loss of information caused by a module width which has been selected too small.

#### Input data

2 bytes consistently + 4..28 bytes of bar code information depending on the module


#### Output data

None

**Comments**

The remarks for module 20 – decoder state, apply in an analogous manner.

In addition, all bytes beginning with address 1 are reset to the initial value.

| NOTE  |   |
|---|---|
|  | <p>Shortening decoding results that are too long: If the bar code information (bar code possibly including supplementary information such as the check sum) does not fit in the selected module width, the decoding results are shortened. This shortening is either from the left or the right depending on the setting in Module 30 – Data formatting.</p> <p>Shortening is indicated by the passed bar code data length.</p> |

### 10.8.3 Module 30 – Data formatting

#### Description

The module defines the output string for the case that the BCL 304/i could not read a bar code. In addition, the initialization of the data fields and the definition of unused data ranges may be set.

#### Parameters

| Parameter                             | Description   | Addr.            | Data type                                  | Value range  | Default  | Unit |
|---------------------------------------|---|------------------|--|--|----------|------|
| Text in the case of misreading        | The parameter defines the output characters if no bar code could be read.         | 0                | STRING<br>20 characters<br>Null terminated | 1 ... 20 bytes of ASCII characters   | 63 („?“) | -    |
| Decoding result at reading gate start | The parameter defines the state of the data at the start of the reading gate.     | 20.5             | Bit  | 0: Input data remain on the old value<br>1: Input data is reset to the initial value | 0        | -    |
| Data alignment                        | The parameter defines the alignment of the data in the result field <sup>1)</sup> | 21.0             | Bit  | 0: Left-justified<br>1: Right-justified  | 0        | -    |
| Fill mode                             | The parameter defines the fill mode for the not assigned data ranges              | 21.4<br>... 21.7 | Bitarea                                    | 0: No fill up<br>3: Fill up to the transmission length                               | 3        | -    |
| Fill character                        | The parameter defines the character which is used for filling up the data ranges. | 22               | UNSIGNED8                                  | 0 ... FFh  | 0        | -    |

Table 10.20: Parameters for module 30

1) and thus also controls possible shortening of a decoding result that is too large.

#### Parameter length

23 byte

#### Input data

None

#### Output data

None

#### Comment

The "decoding result at reading gate start" parameter is only taken into account if the "Without ACK" mode is set (cf. "Module 10 – Activations" on page 82).



### 10.8.4 Module 31 – Reading gate number

**Description**

The module defines input data for the communication of the number of reading gates since system start.

**Parameter**

None

**Input data**

| Input data          | Description   | Addr.   | Data type  | Value range | Initial value | Unit |
|---------------------|---|---------|------------|-------------|---------------|------|
| Reading gate number | The BCL 304/i transmits the current reading gate number. The reading gate number is initialized with the system start and is then incremented continuously. At 65535, an overflow occurs and the counter starts again from 0. | 0 ... 1 | UNSIGNED16 | 0 ... 65535 | 0             | -    |

Table 10.21: Input data for module 31

**Input data length**

2 byte consistent

**Output data**

None

### 10.8.5 Module 32 – Reading gate time

**Description**

This module returns the time between opening and closing of the last reading gate.

**Parameter**

None

**Input data**

| Input data                           | Description                                      | Addr.   | Data type  | Value range   | Initial value | Unit |
|--------------------------------------|--|---------|------------|---|---------------|------|
| Opening duration of the reading gate | Opening duration of the last reading gate in ms. | 0 ... 1 | UNSIGNED16 | 0 ... 65535<br>If the range is exceeded, the value remains at 65535 | 0             | ms   |

Table 10.22: Input data for module 32

**Input data length**

2 byte consistent

**Output data**

None

### 10.8.6 Module 33 – Code position

**Description**

The module defines input data for the communication of the relative bar code position in the laser beam.

**Parameter**

None

**Input data**

| Input data    | Description  | Addr.   | Data type | Value range | Initial value | Unit        |
|---------------|--|---------|-----------|-------------|---------------|-------------|
| Code position | Relative position of the bar code in the scanner beam. The position is normalized to the zero position (middle position). Specified in 1/10 degrees. | 0 ... 1 | SIGNED16  | ±450        | 0             | 1/10 degree |

Table 10.23: Input data for module 33

**Input data length**

2 byte consistent

**Output data**

None

**10.8.7 Module 34 – Reading reliability (equal scans)****Description**

The module defines the input data for the communication of the calculated reading reliability. The value refers to the currently output bar code.

**Parameter**

None

**Input data**

| Input data                        | Description  | Addr.   | Data type  | Value range | Initial value | Unit |
|-----------------------------------|--|---------|------------|-------------|---------------|------|
| Reading reliability (equal scans) | Calculated reading reliability for the transmitted bar code. | 0 ... 1 | UNSIGNED16 | 0 ... 65535 | 0             | -    |

Table 10.24: Input data for module 34

**Input data length**

2 byte consistent

**Output data**

None

**10.8.8 Module 35 – Bar code length****Description**

The module defines input data for the communication of the length of the currently output bar code.

**Parameter**

None

**Input data**

| Input data      | Description  | Addr.   | Data type  | Value range | Initial value | Unit        |
|-----------------|--|---------|------------|-------------|---------------|-------------|
| Bar code length | Length/duration of the currently output bar code, beginning with the code position specified in module 35 in 1/10 degrees. | 0 ... 1 | UNSIGNED16 | 1 ... 900   | 1             | 1/10 degree |

Table 10.25: Input data for module 35

**Input data length**

2 byte consistent

**Output data**

None

**10.8.9 Module 36 – Scans with information****Description**

The module defines input data for the communication of the calculated number of scans which provided information contributing to the result of the bar code.

**Parameter**

None

**Input data**

| Input data                          | Description | Addr.   | Data type  | Value range | Initial value | Unit |
|-------------------------------------|-------------|---------|------------|-------------|---------------|------|
| Scans with information per bar code | See above   | 0 ... 1 | UNSIGNED16 | 0 ... 65535 | 0             | -    |

Table 10.26: Input data for module 36

**Input data length**

2 byte consistent

**Output data**

None

**10.8.10 Module 37 – Decoding quality****Description**

The module defines input data for the communication of the calculated decoding quality of the currently transmitted bar code.

**Parameter**

None

**Input data**

| Input data       | Description                                  | Addr. | Data type | Value range | Initial value | Unit |
|------------------|--|-------|-----------|-------------|---------------|------|
| Decoding quality | Decoding quality of the transmitted bar code | 0     | UNSIGNED8 | 0 ... 100   | 0             | 1%   |

Table 10.27: Input data for module 37

**Input data length**

1 byte consistent

**Output data**

None

**10.8.11 Module 38 – Code direction****Description**

The module defines input data for the communication of the detected code direction of the currently transmitted bar code.

**Parameter**

None

**Input data**

| Input data     | Description                                | Addr. | Data type | Value range                            | Initial value | Unit |
|----------------|--|-------|-----------|--|---------------|------|
| Code direction | Code direction of the transmitted bar code | 0     | UNSIGNED8 | 0: Normal<br>1: Inverted<br>2: Unknown | 0             | -    |

Table 10.28: Input data for module 38

**Input data length**

1 byte

**Output data**

None

**Comment:**

A decoding result of type "No Read" has as code direction the value 2 = unknown!

**10.8.12 Module 39 – Number of digits****Description**

The module defines input data for the communication of the number of digits of the currently transmitted bar code.

**Parameter**

None

**Input data**

| Input data       | Description                                  | Addr. | Data type | Value range | Initial value | Unit |
|------------------|--|-------|-----------|-------------|---------------|------|
| Number of digits | Number of digits of the transmitted bar code | 0     | UNSIGNED8 | 0 ... 48    | 0             | -    |

Table 10.29: Input data for module 39

**Input data length**

1 byte

**Output data**

None

**10.8.13 Module 40 – Code type****Description**

The module defines input data for the communication of the code type of the currently transmitted bar code.

**Parameter**

None

**Input data**

| Input data | Description                           | Addr. | Data type | Value range   | Initial value | Unit |
|------------|---------------------------------------|-------|-----------|---|---------------|------|
| Code type  | Code type of the transmitted bar code | 0     | UNSIGNED8 | 0: No code<br>1: 2/5 Interleaved<br>2: Code39<br>6: UPC, UPCE<br>7: EAN8, EAN13<br>8: Code128, EAN128<br>10: EAN Addendum<br>11: Codabar<br>12: Code93<br>13: RSS-14<br>14: RSS Limited<br>15: RSS Expanded | 0             | -    |

Table 10.30: Input data for module 40

**Input data length**

1 byte

**Output data**

None

**10.8.14 Module 41 – Code position in the swivel range****Description**

The module defines input data for the communication of the relative bar code position in the swivel range of an oscillating mirror device.

**Parameter**

None

**Input data**

| Input data                   | Description  | Addr.   | Data type | Value range   | Initial value | Unit  |
|------------------------------|--|---------|-----------|---------------|---------------|-------|
| Position in the swivel range | Relative position of the bar code in the swivel range. The position is normalized to the zero position (middle position). Specified in 1/10 degrees. | 0 ... 1 | SIGNED16  | -200 ... +200 | 0             | 1/10° |

Table 10.31: Input data for module 41

**Input data length**

2 bytes

**Output data**

None

**NOTE**

The module is then only active if an oscillating-mirror scanner is used.

## 10.9 Data Processing

### 10.9.1 Module 50 – Characteristics filter

#### Description

Configuration of the characteristics filter.

This filter can be used to set how bar codes with identical content are handled and what criteria are to be taken into account in determining the likeness.

#### Parameters

| Parameter  | Description   | Addr.   | Data type  | Value range  | Default | Unit        |
|--|---|---------|------------|--|---------|-------------|
| Handling of identical bar code information         | Determines how bar codes with the same content are to be managed  | 0       | UNSIGNED8  | 0: All bar codes are stored and output.<br>1: Only non-identical bar code contents are output.<br>2: Two identical bar codes arranged in T-shape are treated as a single bar code. | 1       | -           |
| Comparison parameter - code type                   | If this criterion has been activated, the bar code type is used to determine whether the bar codes are identical.   | 1.0     | Bit        | 0: Deactivated<br>1: Activated   | 1       | -           |
| Comparison parameter bar code content              | If this criterion has been activated, the bar code content is used to determine whether the bar codes are identical.  | 1.1     | Bit        | 0: Deactivated<br>1: Activated   | 1       | -           |
| Comparison parameter bar code direction            | If this criterion has been activated, the bar code direction is used to determine whether the bar codes are identical.  | 1.2     | Bit        | 0: Deactivated<br>1: Activated   | 1       | -           |
| Comparison parameter scan position                 | If this parameter is not equal to 0, the bar code position in the scanning beam is used to determine whether identical bar codes have already been decoded. In this case, a +/- bandwidth in degrees must be specified, within which the same bar code is permitted to be in the scanning beam.                                   | 2 ... 3 | UNSIGNED16 | 0 ... 450  | 0       | 1/10 degree |
| Comparison parameter - oscillating mirror position | If this parameter is not equal to 0, the bar code position in the swivel range of the oscillating mirror is used to determine whether identical bar codes have already been decoded. A +/- bandwidth in degrees must then be specified, within which the same bar code is permitted to be in the oscillating mirror swivel range. | 4 ... 5 | UNSIGNED16 | 0 ... 200  | 0       | 1/10 degree |
| Comparison parameter scanning time info            | If this parameter is not equal to 0, the decoding time (time at which the bar code was decoded) is used to determine whether identical bar codes have already been detected. Here, a difference time specified in milliseconds ensures that identical bar codes may only occur within this time.                                  | 6 ... 7 | UNSIGNED16 | 0 ... 65535  | 0       | ms          |

Table 10.32: Parameters for module 50

#### Parameter length

8 byte

#### Input data

None

**Output data**

None

All comparison criteria are AND linked; this means all active comparisons must be fulfilled before the just-decoded bar code can be identified as already decoded and then deleted.

**10.9.2 Module 51 – Data filtering****Description**

Configuration of the data filter.

**Parameters**

| Parameter                | Description         | Addr. | Data type                                  | Value range                        | Default | Unit |
|--------------------------|---------------------|-------|--|------------------------------------|---------|------|
| Bar code filter string 1 | Filter expression 1 | 0     | STRING<br>30 characters<br>null terminated | 1 ... 30 bytes of ASCII characters | \00     | -    |
| Bar code filter string 2 | Filter expression 2 | 30    | STRING<br>30 characters<br>null terminated | 1 ... 30 bytes of ASCII characters | \00     | -    |

Table 10.33: Parameters for module 51

**Parameter length**

60 bytes

**Input data**

None

**Output data**

None

**Filter string**

The filter string is used to define passthrough filters for bar codes.


Any number of '?' is permitted as placeholders for an arbitrary character at exactly this position. Also permitted are '\*' as placeholders for a character sequence of arbitrary length, and an 'x' if the character at the respective position is to be deleted.

## 10.10 Identifier

The following modules can be used to specify the segmentation process to be used when extracting identifiers from the bar code data.

When a module is configured, the associated segmentation process is activated. If none of the modules is configured, no segmentation takes place.

Therefore, the modules can only be used one at a time and not simultaneously.

| NOTE  |  |
|---|--|
|  | When using one of the following modules, multiple results may occur within a reading gate. If there are multiple results, acknowledge mode must be used (cf. "Module 10 – Activations" on page 82, "Mode" parameter and the additional notices); data may otherwise be lost! |

### 10.10.1 Module 52 – Segmentation according to the EAN process

#### Description

The module activates the segmentation according to the EAN process. The parameters specify the identifiers to be searched for and the output mode.

#### Parameters

| Parameter                | Description   | Addr. | Data type                                 | Value range   | Default | Unit |
|--------------------------|---|-------|---|---|---------|------|
| <b>Identifier list</b>   |   |       |   |   |         |      |
| Identifier 1             | The identifier string is used for the identifier list and the filtering according to the segmentation.  | 0     | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | **      | -    |
| Identifier 2             | See identifier 1.   | 5     | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 3             | See identifier 1.   | 10    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 4             | See identifier 1.   | 15    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 5             | See identifier 1.   | 20    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| <b>Identifier output</b> |   |       |   |   |         |      |
| Output with identifier   | If this switch is not set, the output of the identifiers is suppressed. Only the data values that belong to the identifiers are displayed in this case. | 25.0  | Bit                                       | 0: Output of the identifiers is suppressed.<br>1: Identifiers are output. | 1       | -    |
| Output delimiter         | This delimiter, if not equal to 0, is inserted between the identifier and the associated data value in the output.                                      | 26    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |

Table 10.34: Parameters for module 52

#### Parameter length

27 byte

#### Input data

None

#### Output data

None

#### Identifier string n (n = 1 ... 5)

The identifier string defines both the identifier list for the segmentation and the passthrough filter for the subsequent filtering.

The string may contain wildcards. Any number of '?' is permitted as placeholders for an arbitrary character at exactly that defined position.

Also permitted are '\*' as placeholders for a character sequence of arbitrary length, and an 'x' if the character at the respective position is to be deleted. There are a total of 5 identifier strings.



An identifier with less than 5 characters must be null terminated. However, if the identifier string consists of exactly 5 characters, it does not have to be terminated.

### 10.10.2 Module 53 – Segmentation via fixed positions

#### Description

The module activates the segmentation via fixed positions. The parameters specify the identifiers to be searched for, the output mode, and the positions.

#### Parameters

| Parameter                            | Description  | Addr. | Data type                                 | Value range   | Default | Unit |
|--------------------------------------|--|-------|---|---|---------|------|
| <b>Identifier list</b>               |  |       |   |   |         |      |
| Identifier 1                         | The identifier string is used for the identifier list and the filtering according to the segmentation.   | 0     | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | ***     | -    |
| Identifier 2                         | See identifier 1.  | 5     | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 3                         | See identifier 1.  | 10    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 4                         | See identifier 1.  | 15    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 5                         | See identifier 1.  | 20    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| <b>Identifier output</b>             |  |       |   |   |         |      |
| Output with identifier               | If this switch is not set, the output of the identifiers is suppressed. Only the data values that belong to the identifiers are displayed in this case.  | 25.0  | Bit                                       | 0: Output of the identifiers is suppressed.<br>1: Identifiers are output. | 1       | -    |
| Output delimiter                     | This delimiter, if not equal to 0, is inserted between the identifier and the associated data value in the output.   | 26    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |
| <b>Fixed positions</b>               |  |       |   |   |         |      |
| Start position of the 1st identifier | Specifies the position of the first character of the first identifier in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated.  | 27    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |
| Start position of the 1st data value | Specifies the position of the first character of the first data value in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated.  | 28    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |
| Start position of the 2nd identifier | Specifies the position of the first character of the second identifier in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated. | 29    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |
| Start position of the 2nd data value | Specifies the position of the first character of the second data value in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated. | 30    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |
| Start position of the 3rd identifier | Specifies the position of the first character of the third identifier in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated.  | 31    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |

Table 10.35: Parameters for module 53

| Parameter                            | Description  | Addr. | Data type | Value range | Default | Unit |
|--------------------------------------|--|-------|-----------|-------------|---------|------|
| Start position of the 3rd data value | Specifies the position of the first character of the third data value in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated.  | 32    | UNSIGNED8 | 0 ... 127   | 0       | -    |
| Start position of the 4th identifier | Specifies the position of the first character of the fourth identifier in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated. | 33    | UNSIGNED8 | 0 ... 127   | 0       | -    |
| Start position of the 4th data value | Specifies the position of the first character of the fourth data value in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated. | 34    | UNSIGNED8 | 0 ... 127   | 0       | -    |
| Start position of the 5th identifier | Specifies the position of the first character of the fifth identifier in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated.  | 35    | UNSIGNED8 | 0 ... 127   | 0       | -    |
| Start position of the 5th data value | Specifies the position of the first character of the fifth data value in the data string of the bar code. The first character in the bar code has position 1. If the parameter is = 0, it is deactivated.  | 36    | UNSIGNED8 | 0 ... 127   | 0       | -    |

Table 10.35: Parameters for module 53

**Parameter length**

37 bytes

**Input data**

None

**Output data**

None

**Identifier string n (n = 1 ... 5)**

The identifier string defines both the identifier list for the segmentation and the passthrough filter for the subsequent filtering.

The string may contain wildcards. Any number of '?' is permitted as placeholders for an arbitrary character at exactly that defined position.

Also permitted are '\*' as placeholders for a character sequence of arbitrary length, and an 'x' if the character at the respective position is to be deleted. There are a total of 5 identifier strings.

An identifier with less than 5 characters must be null terminated. However, if the identifier string consists of exactly 5 characters, it does not have to be terminated.

## 10.10.3 Module 54 – Segmentation according to identifier and separator

**Description**

This module activates the segmentation according to identifier and separator. The parameters specify the identifiers to be searched for, the output mode, and the parameters for the identifier/separator algorithm.

**Parameters**

| Parameter  | Description   | Addr. | Data type                                 | Value range   | Default | Unit |
|--|---|-------|---|---|---------|------|
| <b>Identifier list</b>                               |   |       |   |   |         |      |
| Identifier 1   | The identifier string is used for the identifier list and the filtering according to the segmentation.  | 0     | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | ***     | -    |
| Identifier 2   | See identifier 1.   | 5     | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 3   | See identifier 1.   | 10    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 4   | See identifier 1.   | 15    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| Identifier 5   | See identifier 1.   | 20    | STRING<br>5 characters<br>null terminated | 1 ... 5 bytes of ASCII characters   | \0      | -    |
| <b>Identifier output</b>                             |   |       |   |   |         |      |
| Output with identifier                               | If this switch is not set, the output of the identifiers is suppressed. Only the data values that belong to the identifiers are displayed in this case.   | 25.0  | Bit                                       | 0: Output of the identifiers is suppressed.<br>1: Identifiers are output. | 1       | -    |
| Output delimiter                                     | This delimiter, if not equal to 0, is inserted between the identifier and the associated data value in the output.  | 26    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |
| <b>Segmentation acc. to identifier and separator</b> |   |       |   |   |         |      |
| Identifier length                                    | Fixed length of all identifiers in the segmentation process. After this length, the text of the identifier ends and the associated data value starts. The end of the data value is determined by the separator. | 27    | UNSIGNED8                                 | 0 ... 255   | 0       | -    |
| Delimiter in the identifier/separator algorithm      | The separator terminates the data value that follows its identifier directly after the identifier length. After the separator, the next identifier starts.  | 28    | UNSIGNED8                                 | 0 ... 127   | 0       | -    |

Table 10.36: Parameters for module 54

**Parameter length**

29 byte

**Input data**

None

**Output data**

None

**Identifier string n (n = 1 ... 5)**

The identifier string defines both the identifier list for the segmentation and the passthrough filter for the subsequent filtering.

The string may contain wildcards. Any number of '?' is permitted as placeholders for an arbitrary character at exactly that defined position.

Also permitted are '\*' as placeholders for a character sequence of arbitrary length, and an 'x' if the character at the respective position is to be deleted. There are a total of 5 identifier strings.

An identifier with less than 5 characters must be null terminated. However, if the identifier string consists of exactly 5 characters, it does not have to be terminated.

## 10.10.4 Module 55 – String handling parameters

**Description**

This module is used to configure placeholder characters for the bar code segmentation, filtering, termination, and reference code processing.

**Parameters**

| Parameter            | Description  | Addr. | Data type | Value range | Default | Unit |
|----------------------|--|-------|-----------|-------------|---------|------|
| Wildcard character   | This parameter is similar to the "don't care character" parameter. The difference between this and the "don't care character" is that all subsequent characters, and not only one character at a certain position, are disregarded until a character pattern is found in the string that follows the wildcard character pattern. This character has the same behavior as the wildcard character for the DIR command in the command line interpreter under Windows. | 0     | UNSIGNED8 | 32 ... 127  | '*'     | -    |
| Don't care character | Placeholder character. Characters at the position of the placeholder character are not taken into account in a comparison. This permits certain areas to be masked.  | 1     | UNSIGNED8 | 32 ... 127  | '?'     | -    |
| Delete character     | Delete character for bar code and identifier filtering (characters at the position of the delete character are deleted in a comparison. This permits certain areas to be deleted).   | 2     | UNSIGNED8 | 32 ... 127  | 'x'     | -    |

Table 10.37: Parameters for module 55

**Parameter length**

3 byte

**Input data**

None

**Output data**

None

## 10.11 Device functions

### 10.11.1 Module 60 – Device status

#### Description

The module contains the display of the device status as well as control bits for triggering a reset or putting the device into standby mode.

#### Parameter

None

#### Input data

| Input data    | Description                            | Addr. | Data type | Value range  | Initial value | Unit |
|---------------|--|-------|-----------|--|---------------|------|
| Device status | This byte represents the device status | 0     | UNSIGNED8 | 1: Initialization<br>10: Standby<br>11: Service<br>12: Diagnosis<br>13: Parameter enabled<br>15: Device is ready<br>0x80: Error<br>0x81: Warning | 0             | -    |

Table 10.38: Input data for module 60

#### Input data length

1 byte

#### Output data


| Output data  | Description  | Addr. | Data type | Value range                     | Initial value | Unit |
|--------------|--|-------|-----------|---------------------------------|---------------|------|
| System reset | The control bit triggers a system reset <sup>1)</sup> if the level changes from 0 to 1 | 0.6   | Bit       | 0: Run<br>0 -> 1: Reset         | 0             | -    |
| Standby      | Activates the standby function   | 0.7   | Bit       | 0: Standby off<br>1: Standby on | 0             | -    |

Table 10.39: Output data for module 60

- 1) Analogous to command H, activation of this bit triggers a restart of all electronics, incl. a restart of the PROFIBUS stack.

#### Output data length

1 byte

| NOTE  |  |
|---|--|
|  | When resetting the data (see Module 10 – Activations), the input data of this module is not deleted. |

## 10.11.2 Module 61 – Laser control

**Description**

The module defines the switch-on and switch-off position of the laser.

**Parameters**

| Parameter            | Description   | Addr.   | Data type  | Value range   | Default | Unit  |
|----------------------|---|---------|------------|---------------|---------|-------|
| Laser start position | This parameter defines the switch-on position of the laser in 1/10° increments within the visible range of the laser. The center of the reading field corresponds to the 0° position. | 0 ... 1 | UNSIGNED16 | -450 ... +450 | -450    | 1/10° |
| Laser stop position  | This parameter defines the switch-off position of the laser in 1/10° increments within the visible range of the laser.  | 2 ... 3 | UNSIGNED16 | -450 ... +450 | +450    | 1/10° |

Table 10.40: Parameters for module 61

**Parameter length**

4 byte

**Input data**

None

**Output data**

None

## 10.11.3 Module 63 – Alignment

**Description**

The module defines input and output data for the alignment mode of the BCL 304/i. The alignment mode is used for easy alignment of the BCL 304/i with the bar code. Using the transmitted decoding quality as a percentage, the optimum alignment can be easily selected. This module should not be used in connection with module 81 (AutoReflAct) as this may cause malfunctions.

**Parameter**

None

**Input data**

| Input data       | Description   | Addr. | Data type | Value range | Initial value | Unit       |
|------------------|---|-------|-----------|-------------|---------------|------------|
| Decoding quality | Transmits the current decoding quality of the bar code located in the scanning beam | 0     | Byte      | 0 ... 100   | 0             | Percentage |

Table 10.41: Input data for module 63

**Input data length:**

1 byte

**Output data**

| Output data    | Description  | Addr. | Data type | Value range               | Initial value | Unit |
|----------------|--|-------|-----------|---------------------------|---------------|------|
| Alignment mode | Signal activates and deactivates the alignment mode for optimum alignment of the BCL 304/i with the bar code | 0.0   | Bit       | 0 -> 1: On<br>1 -> 0: Off | 0             | -    |

Table 10.42: Output data for module 63

**Output data length:**

1 byte

## 10.11.4 Module 64 – Oscillating mirror

**Description**

Module for supporting the oscillating mirror.

**Parameters**

| Parameter             | Description   | Addr.   | Data type | Value range  | Default | Unit  |
|-----------------------|---|---------|-----------|--|---------|-------|
| Oscillation mode      | This parameter defines the mode in which the oscillating mirror operates.         | 0       | UNSIGNED8 | 0: Single oscillation<br>1: Double oscillation<br>2: Continuous oscillation<br>3: Continuous oscillation, oscillating mirror moves to the start position at the end of the reading gate. | 2       | -     |
| Start position        | Start position (opening angle) relative to the zero position of the swivel range. | 1 ... 2 | SIGNED16  | -200 ... +200  | 200     | 1/10° |
| Stop position         | Stop position (opening angle) relative to the zero position of the swivel range.  | 3 ... 4 | SIGNED16  | -200 ... +200  | -200    | 1/10° |
| Oscillation frequency | Common value for forward and backward motion                                      | 5       | UNSIGNED8 | 15 ... 116   | 48      | °/s   |

Table 10.43: Parameters for module 64

**Parameter length**

6 byte

**Input data**

None

**Output data**

None

**NOTE**

The module is then only active if an oscillating-mirror scanner is used.

## 10.12 Switching inputs/outputs SWIO 1 and SWIO 2

These modules define the mode of operation of the 2 digital switching inputs and outputs (I/Os). They are separated into individual modules for configuring the individual I/Os and a shared module for signaling the status and controlling

### 10.12.1 Parameters for operating as an output

#### Switch-on delay

With this setting, the output pulse can be delayed by the specified time (in ms).

#### Switch-on time

Defines the switch-on time period for the switching input. Any activated switch-off function then no longer has any function.

A value of 0 causes the output to be set statically; this means that the selected input function(s) activate the output, and the selected switch-off function(s) deactivate it again.

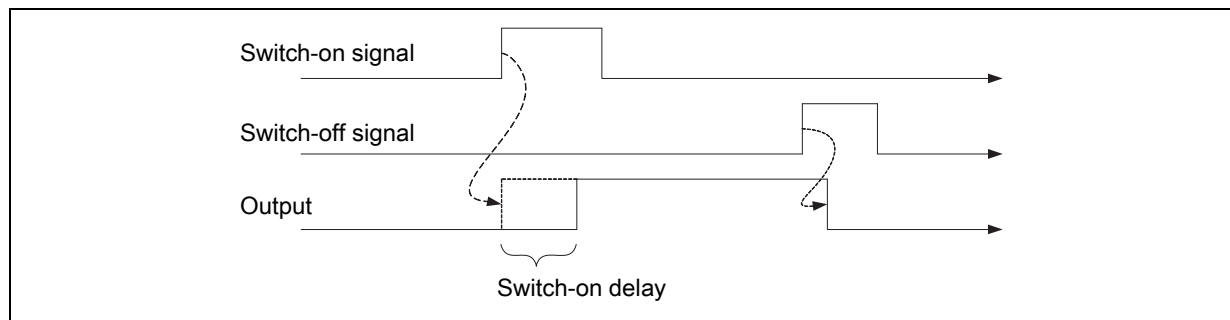


Figure 10.4: Example 1: Switch-on delay > 0 and switch-on time = 0

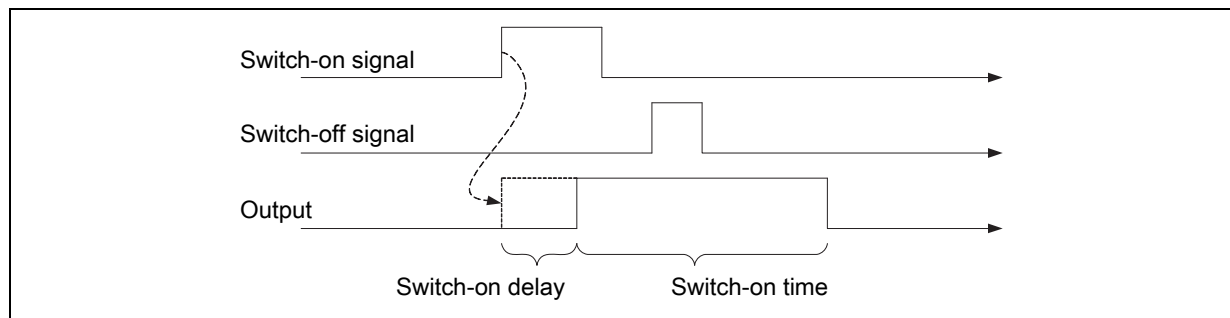


Figure 10.5: Example 2: Switch-on delay > 0 and switch-on time > 0

In example 2, the activation duration of the output is only dependent on the selected switch-on time; the switch-off signal has no effect.

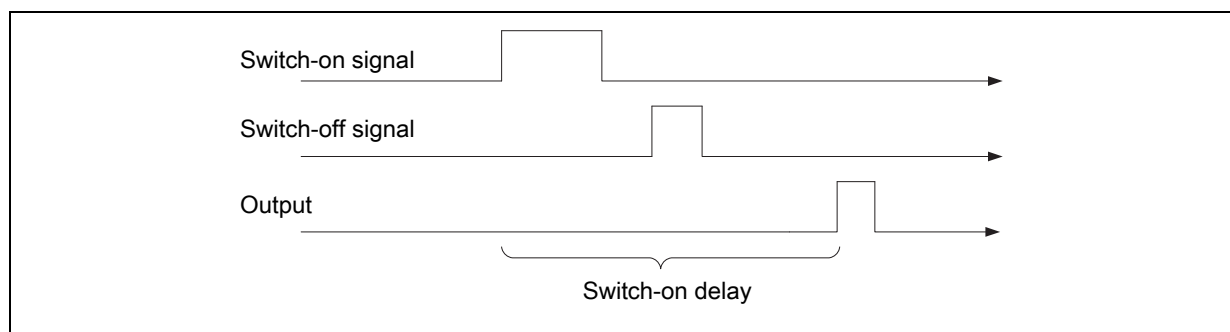


Figure 10.6: Example 3: Switch-on delay > 0 Switch-off signal prior to lapsing of the switch-on delay

If the output is again deactivated via the switch-off signal before the start-up delay lapses, only a brief pulse appears at the output following the switch-on delay.

#### Comparison functionality

If, for example, the switching output is to be activated after four invalid read results, the **comparative value** is set to **4** and the **switch-on function** is configured to "invalid read result".



The **comparison mode** parameter can be used to define whether the switching output is activated only once in the case that the event counter and comparative value fulfill the "**parity**" condition, or if it is activated multiple times, on each successive event after the "**parity**" condition is met.

The event counter can always be reset with the I/O data in the **I/O status and control** module; furthermore, the **reset mode** parameter enables automatic resetting upon reaching the **comparative value**. Automatic resetting upon reaching the **comparative value** always results in the switching output being switched once independent of the **comparison mode** parameter.

The standard switch-off function at **reading gate start** is rather unsuited for this module since it causes the event counter to be reset on each reading gate start. Suitable as switch-off function for this example is the **valid read result** function; otherwise, all switch-off functions are deactivated.

### 10.12.2 Parameters for operating as an input

#### Debounce time

Parameter for setting the software debounce time for the switching input. The definition of a debounce time extends the signal transition time accordingly.

If the value of this parameter = 0, no debouncing takes place; otherwise, the configured value represents the duration in milliseconds for which the input signal must be present and stable.

#### Switch-on delay td\_on

If the value of this parameter = 0, no switch-on delay occurs for the activation of the input function; otherwise, the configured value represents the time in milliseconds by which the input signal is delayed.

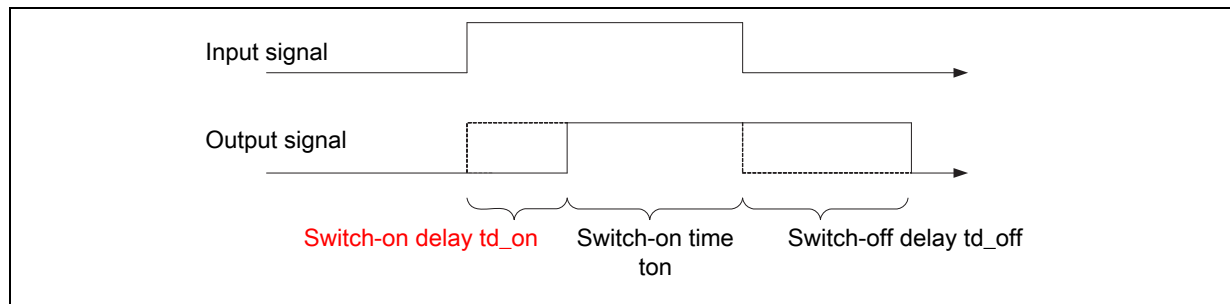


Figure 10.7: Switch-on delay in input mode

#### Switch-on time ton

This parameter specifies the min. activation duration for the selected input function in ms.

The actual activation duration is calculated from the switch-on time as well as the switch-off delay.

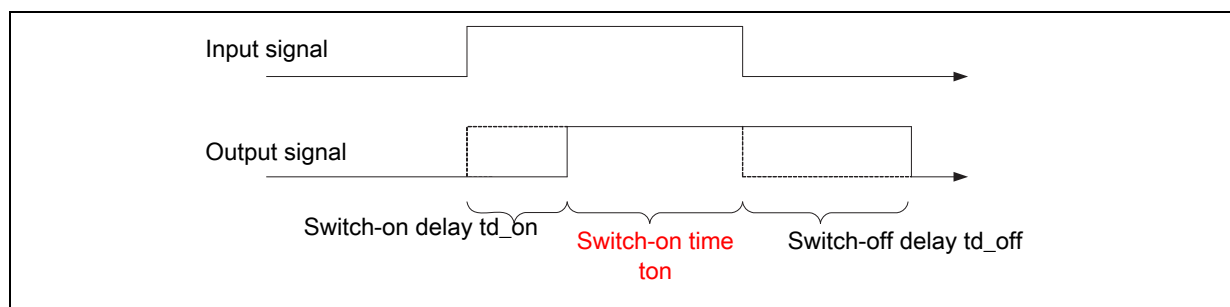


Figure 10.8: Switch-on time in input mode

#### Switch-off delay td\_off

This parameter specifies the duration of the switch-off delay in ms.

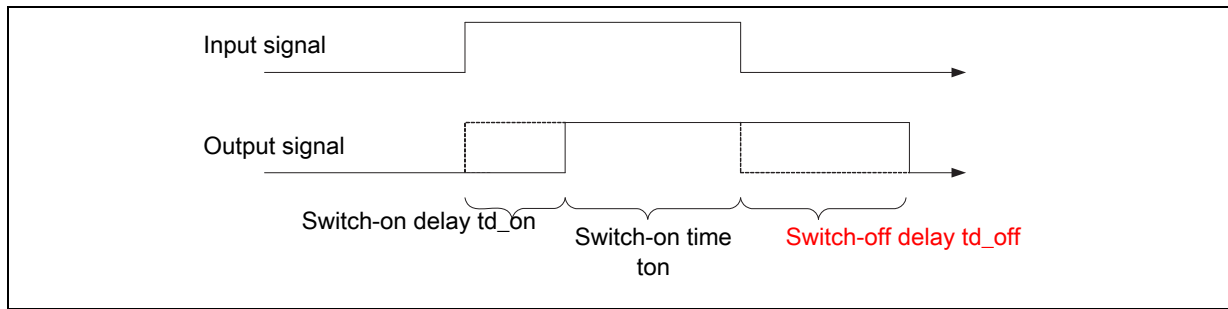


Figure 10.9: Switch-off delay in input mode

### 10.12.3 Switch-on and switch-off functions for operation as an output

The following options are available for switch-on and switch-off functions in the "output" operating mode:

| Name                                 | Value | Comment  |
|--------------------------------------|-------|--|
| No function                          | 0     | No functionality   |
| Reading gate start                   | 1     |  |
| Reading gate end                     | 2     |  |
| Positive reference code comparison 1 | 3     |  |
| Negative reference code comparison 1 | 4     |  |
| Valid read result                    | 5     |  |
| Invalid read result                  | 6     |  |
| Device ready                         | 7     | The device is in a ready state.  |
| Device not ready                     | 8     | The device is not yet ready (motor and laser are being activated).   |
| Data transmission active             | 9     |  |
| Data transmission not active         | 10    |  |
| AutoControl good quality             | 13    |  |
| AutoControl bad quality              | 14    |  |
| Reflector detected                   | 15    |  |
| Reflector not detected               | 16    |  |
| External event, pos. edge            | 17    | In the PROFIBUS case, the external event is generated with the aid of module 74 – "I/O status and control", See "Module 74 – SWIO status and control" on page 111. |
| External event, neg. edge            | 18    | See above  |
| Device active                        | 19    | Decoding is currently being performed.   |
| Device in standby mode               | 20    | Motor and laser inactive.  |
| No device error                      | 21    | No error detected.   |
| Device error                         | 22    | Device is in an error state.   |
| Positive reference code comparison 2 | 23    |  |
| Negative reference code comparison 2 | 24    |  |

Table 10.44: Switch-on/switch-off functions

### 10.12.4 Input functions for operation as an input

| Name                              | Value | Comment          |
|-----------------------------------|-------|------------------|
| No function                       | 0     | No functionality |
| Reading gate activation           | 1     |                  |
| Reading gate deactivation only    | 2     |                  |
| Reading gate activation only      | 3     |                  |
| Reference bar code teach-in       | 4     |                  |
| Start/Stop Autoconfiguration Mode | 5     |                  |

Table 10.45: Input functions

## 10.12.5 Module 70 – Switching input/output SWIO1

## Parameter

| Parameter   | Description   | Addr.          | Data type  | Value range  | Default | Unit |
|---|---|----------------|------------|--|---------|------|
| Function  | This parameter defines whether I/O functions as an input or as an output.   | 0.0            | Bit        | 0: Input<br>1: Output  | 0       | -    |
| <b>Mode of operation for configuration as an output</b> |   |                |            |  |         |      |
| Bias level  | The parameter defines the DC bias level of the switching output and, thus, simultaneously whether the output is low-active (0) or high-active (1).  | 0.1            | Bit        | 0: LOW (0 V)<br>1: HIGH (+Ub)  | 0       | -    |
| Reserved  | Free  | 0.2 ...<br>0.7 |            |  |         |      |
| Switch-on delay   | With this parameter, the output pulse may be delayed by a set time period.  | 1              | UNSIGNED16 | 0 ... 65535  | 0       | ms   |
| Switch-on time  | The parameter defines the switch-on time period for the switching output. If the value is 0, the signal is static.  | 3              | UNSIGNED16 | 0 ... 1300   | 400     | ms   |
| Switch-on function 1                                    | This parameter specifies an event which can set the switching output.   | 5              | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108                     | 0       | -    |
| Switch-on function 2                                    | This parameter specifies an event which can set the switching output. Switch-on function 1 and switch-on function 2 are OR linked.  | 6              | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108                     | 0       | -    |
| Switch-off function 1                                   | This parameter specifies an event which can reset the switching output.   | 7              | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108                     | 0       | -    |
| Switch-off function 2                                   | This parameter specifies an event which can reset the switching output. Switch-off function 1 and switch-off function 2 are OR linked.  | 8              | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108                     | 0       | -    |
| Comparative value (Event Counter)                       | If the number of activation events of the selected switch-on function reaches this comparative value, the switching output is activated. A deactivation event of the selected switch-off function resets the counter. | 9              | UNSIGNED16 | 0..65535   | 0       | -    |
| Comparison mode (Event Counter)                         | Specifies whether the switching output switches only on parity (once) or also in the event of greater or equal to (multiple times) after the comparative value is reached.  | 11             | UNSIGNED8  | 0: SWOUT switches once<br>1: SWOUT switches several times            | 0       | -    |
| Reset mode (Event Counter)                              | Specifies whether the counter (Event Counter) is reset only by the reset bit and the selected switch-off function, or if the counter should be automatically reset after the comparative value is reached.            | 12             | UNSIGNED8  | 0: Reset bit and switch-off function<br>1: Comparative value reached | 0       | -    |
| <b>Mode of operation for configuration as an input</b>  |   |                |            |  |         |      |
| Inversion   | The parameter defines the logic of the incident signal. In case of an inversion, an external HIGH level is interpreted internally as a LOW level.   | 13.1           | Bit        | 0: Normal<br>1: Inverted   | 0       | -    |
| Reserved  | Free  | 13.2 ... 13.7  |            |  |         |      |
| Debounce time   | The parameter defines a debounce time which is implemented in software.   | 14             | UNSIGNED16 | 0 ... 1000   | 5       | ms   |
| Switch-on delay   | The parameter influences the time behavior during switch-on.  | 16             | UNSIGNED16 | 0 ... 65535  | 0       | ms   |

Table 10.46: Parameters for module 70 – Input/Output 1

| Parameter              | Description  | Addr. | Data type  | Value range                       | Default | Unit |
|------------------------|--|-------|------------|-----------------------------------|---------|------|
| Minimum switch-on time | The parameter defines a minimum time period before the signal is reset.  | 18    | UNSIGNED16 | 0 ... 65535                       | 0       | ms   |
| Switch-off delay       | The parameter defines a time delay for the signal during switch-off.   | 20    | UNSIGNED16 | 0 ... 65535                       | 0       | ms   |
| Input function         | The parameter specifies the function which is to be activated or deactivated by a status change in the signal. | 22    | UNSIGNED8  | Cf. "Input functions" on page 108 | 1       | -    |

Table 10.46: Parameters for module 70 – Input/Output 1

**Parameter length**

23 byte

**Input data**

None

**Output data**

None

**Comment**

The DC bias level also defines whether the output is low-active (0) or high-active (1).

Switching on an I/O configured as an output means switching to the active state; switching off, on the other hand, results in switching to the inactive or idle state.

**10.12.6 Module 71 – Switching input/output SWIO2****Parameter**

| Parameter   | Description  | Addr.       | Data type  | Value range                                      | Default | Unit |
|---|--|-------------|------------|--|---------|------|
| Function  | This parameter defines whether I/O 2 functions as an input or as an output.  | 0.0         | Bit        | 0: Input<br>1: Output                            | 1       | -    |
| <b>Mode of operation for configuration as an output</b> |  |             |            |  |         |      |
| Bias level  | The parameter defines the DC bias level of the switching output and, thus, simultaneously whether the output is low-active (0) or high-active (1). | 0.1         | Bit        | 0: LOW (0 V)<br>1: HIGH (+Ub)                    | 0       | -    |
| Reserved  | Free   | 0.2 ... 0.7 |            |  |         |      |
| Switch-on delay   | With this parameter, the output pulse may be delayed by a set time period.   | 1           | UNSIGNED16 | 0 ... 65535                                      | 0       | ms   |
| Switch-on time  | The parameter defines the switch-on time period for the switching output. If the value is 0, the signal is static.                                 | 3           | UNSIGNED16 | 0 ... 1300                                       | 400     | ms   |
| Switch-on function 1                                    | This parameter specifies an event which can set the switching output.  | 5           | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108 | 5       | -    |
| Switch-on function 2                                    | This parameter specifies an event which can set the switching output. Switch-on function 1 and switch-on function 2 are OR linked.                 | 6           | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108 | 0       | -    |
| Switch-off function 1                                   | This parameter specifies an event which can reset the switching output.  | 7           | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108 | 1       | -    |
| Switch-off function 2                                   | This parameter specifies an event which can reset the switching output. Switch-off function 1 and switch-off function 2 are OR linked.             | 8           | UNSIGNED8  | Cf. "Switch-on/switch-off functions" on page 108 | 0       | -    |

Table 10.47: Parameters for module 71 – Input/Output 2

| Parameter  | Description   | Addr.            | Data type  | Value range  | Default | Unit |
|--|---|------------------|------------|--|---------|------|
| Comparative value (Event Counter)                      | If the number of activation events of the selected switch-on function reaches this comparative value, the switching output is activated. A deactivation event of the selected switch-off function resets the counter. | 9                | UNSIGNED16 | 0..65535   | 0       | -    |
| Comparison mode (Event Counter)                        | Specifies whether the switching output switches only on parity (once) or also in the event of greater or equal to (multiple times) after the comparative value is reached.  | 11               | UNSIGNED8  | 0: SWOUT switches once<br>1: SWOUT switches several times            | 0       | -    |
| Reset mode (Event Counter)                             | Specifies whether the counter (Event Counter) is reset only by the reset bit and the selected switch-off function, or if the counter should be automatically reset after the comparative value is reached.            | 12               | UNSIGNED8  | 0: Reset bit and switch-off function<br>1: Comparative value reached | 0       | -    |
| <b>Mode of operation for configuration as an input</b> |   |                  |            |  |         |      |
| Inversion  | The parameter defines the logic of the incident signal. In case of an inversion, an external HIGH level is interpreted internally as a LOW level.   | 13.1             | Bit        | 0: Normal<br>1: Inverted   | 0       | -    |
| Reserved   | Free  | 13.2<br>... 13.7 |            |  |         |      |
| Debounce time  | The parameter defines a debounce time which is implemented in software.   | 14               | UNSIGNED16 | 0 ... 1000   | 5       | ms   |
| Switch-on delay  | The parameter influences the time behavior during switch-on.  | 16               | UNSIGNED16 | 0 ... 65535  | 0       | ms   |
| Minimum switch-on time                                 | The parameter defines a minimum time period before the signal is reset.   | 18               | UNSIGNED16 | 0 ... 65535  | 0       | ms   |
| Switch-off delay                                       | The parameter defines a time delay for the signal during switch-off.  | 20               | UNSIGNED16 | 0 ... 65535  | 0       | ms   |
| Input function   | The parameter specifies the function which is to be activated or deactivated by a status change in the signal.  | 22               | UNSIGNED8  | Cf. "Input functions" on page 108                                    | 0       | -    |

Table 10.47: Parameters for module 71 – Input/Output 2

**Parameter length**

23 byte

**Input data**

None

**Output data**

None

**Comment**

The DC bias level also defines whether the output is low-active (0) or high-active (1).

Switching on an I/O configured as an output means switching to the active state; switching off, on the other hand, results in switching to the inactive or idle state.

**10.12.7 Module 74 – SWIO status and control****Description**

Module for handling switching input and switching output signals.

**Parameter**

None

## Input data

| Input data   | Description  | Addr. | Data type | Value range  | Initial value | Unit |
|--|--|-------|-----------|--|---------------|------|
| State 1  | Signal state of switching input or output 1  | 0.0   | Bit       | 0.1  | 0             | -    |
| State 2  | Signal state of switching input or output 2  | 0.1   | Bit       | 0.1  | 0             | -    |
| Comparison state switching output 1 (Event Counter)            | Indicates whether the event counter has exceeded the set comparative value.<br>The bit is reset to the init. value by resetting the event counter.   | 1.0   | Bit       | 0: Not exceeded<br>1: Exceeded                                       | 0             | -    |
| Switching output 1 Comparison state toggle bit (Event Counter) | If "SWOUT switches several times" was configured as comparison mode, this bit is toggled each time the event counter is exceeded.<br>The bit is reset to the init. value by resetting the event counter. | 1.1   | Bit       | 0 → 1: Event counter exceeded<br>1 → 0: Event counter exceeded again | 0             | -    |
| Comparison state switching output 2 (Event Counter)            | Indicates whether the event counter has exceeded the set comparative value.<br>The bit is reset to the init. value by resetting the event counter.   | 1.2   | Bit       | 0: Not exceeded<br>1: Exceeded                                       | 0             | -    |
| Switching output 2 Comparison state toggle bit (Event Counter) | If "SWOUT switches several times" was configured as comparison mode, this bit is toggled each time the event counter is exceeded.<br>The bit is reset to the init. value by resetting the event counter. | 1.3   | Bit       | 0 → 1: Event counter exceeded<br>1 → 0: Event counter exceeded again | 0             | -    |

Table 10.48: Input data for module 74 Input/output status and control

## Input data length:

2 bytes

## Output data

| Output data                            | Description   | Addr. | Data type | Value range                                    | Initial value | Unit |
|--|---|-------|-----------|--|---------------|------|
| Switching output 1                     | Sets the state of switching output 1  | 0.0   | Bit       | 0: Switching output 0<br>1: Switching output 1 | 0             | -    |
| Switching output 2                     | Sets the state of switching output 2  | 0.1   | Bit       | 0: Switching output 0<br>1: Switching output 1 | 0             | -    |
| Reset Event Counter Switching output 1 | Sets the event counter of the activation function [AF] for switching output 1 back to zero. | 0.4   | Bit       | 0 → 1: Perform reset<br>1 → 0: No function     | 0             | -    |
| Reset Event Counter Switching output 2 | Sets the event counter of the activation function [AF] for switching output 2 back to zero. | 0.5   | Bit       | 0 → 1: Perform reset<br>1 → 0: No function     | 0             | -    |
|  | Reserved  | 1     | Byte      |  |               |      |

Table 10.49: Output data for module 74 Input/output status and control

## Output data length:

2 bytes

## 10.13 Data output

### 10.13.1 Module 80 – Sorting

#### Description

Module to support the sorting of the output data.

#### Parameters

| Parameter        | Description   | Addr.          | Data type | Value range   | Default | Unit |
|------------------|---|----------------|-----------|---|---------|------|
| Sort criterion 1 | Specifies the criterion according to which sorting takes place. | 0.0 ...<br>0.6 | BitArea   | 0: No sorting<br>1: Sorting according to scan number<br>2: Sorting according to position in the scanning beam<br>3: Sorting according to the oscillating mirror position<br>4: Sorting according to the decoding quality<br>5: Sorting according to the bar code length<br>6: Sorting according to the code type number<br>7: Sorting according to the decoding direction<br>8: Sorting according to the bar code content<br>9: Sorting according to time<br>10: Sorting according to scanning duration<br>11: Sorting according to the code list (in which the enabled bar codes are listed)<br>12: Sorting according to the identifier list | 0       | -    |
| Sort direction 1 | Specifies the sorting direction.                                | 0.7            | Bit       | 0: In ascending order<br>1: In descending order   | 0       | -    |
| Sort criterion 2 | Specifies the criterion according to which sorting takes place. | 1.0 ...<br>1.6 | BitArea   | See sorting criterion 1   | 0       | -    |
| Sort direction 2 | Specifies the sorting direction.                                | 1.7            | Bit       | See sorting direction 1   | 0       | -    |
| Sort criterion 3 | Specifies the criterion according to which sorting takes place. | 2.0 ...<br>2.6 | BitArea   | See sorting criterion 1   | 0       | -    |
| Sort direction 3 | Specifies the sorting direction.                                | 2.7            | Bit       | See sorting direction 1   | 0       | -    |

Table 10.50: Parameters for module 80

#### Parameter length

3 byte

#### Input data

None

#### Output data

None

## 10.14 Reference code comparison

The following modules can be used to support reference code comparison.

The reference code function compares the currently decoded read results with one or more stored comparison patterns. The function is split into two comparison units which can be configured independently of each other.

## 10.14.1 Module 81 – Reference code comparator 1

**Description**

The module defines the mode of operation of reference code comparator 1.

**Parameters**

| Parameter   | Description   | Addr. | Data type | Value range   | Default | Unit |
|---|---|-------|-----------|---|---------|------|
| Output function after reference bar code comparison | This parameter specifies the associated output linkage after a reference bar code comparison. | 0     | UNSIGNED8 | 0: No function<br>1: Comparison function 1<br>2: Comparison function 2<br>3: Comparison function 1 AND 2<br>4: Comparison function 1 OR 2   | 1       | -    |
| Linking logic for reference code output signal      | This parameter specifies the linking logic for the reference code output signal.              | 1     | UNSIGNED8 | 0: Length and type and ASCII<br>1: Length and (type or ASCII)<br>2: (Length or type) and ASCII<br>3: Length or type or ASCII  | 0       | -    |
| Output for reference code comparison                | This parameter specifies whether a bar code length comparison should be carried out.          | 2     | UNSIGNED8 | 0: Length ignored<br>1: Comparison o.k. if length not identical<br>2: Comparison o.k. if length identical.  | 2       | -    |
| Bar code type comparison                            | This parameter specifies whether a bar code type comparison should be carried out.            | 3     | UNSIGNED8 | 0: Type ignored<br>1: Comparison o.k. if types not identical<br>2: Comparison o.k. if types identical.  | 2       | -    |
| Reference code ASCII comparison                     | This parameter specifies how the ASCII comparison should be carried out.                      | 4     | UNSIGNED8 | 0: No comparison<br>1: Bar code not identical to RC<br>2: Bar code identical to RC<br>3: Bar code greater than RC<br>4: Bar code greater than or equal to RC<br>5: Bar code less than RC<br>6: Bar code less than or equal to RC<br>7: RC1 less than or equal to bar code less than or equal to RC2<br>8: Bar code less than RC1 or bar code greater than RC2 | 2       | -    |

Table 10.51: Parameters for module 81 – Reference code comparison



| Parameter                              | Description   | Addr. | Data type | Value range  | Default | Unit |
|--|---|-------|-----------|--|---------|------|
| Reference code comparison mode         | This parameter determines how and which reference bar codes (RC) are to be used for the bar code comparison.  | 5     | UNSIGNED8 | 0: Only the first RC is used for the comparison.<br>1: Only the second RC is used for the comparison.<br>2: RC 1 and 2 are used for the comparison. Both conditions for RC 1 and 2 must be satisfied for a positive comparison.<br>3: RC 1 and 2 are used for the comparison. One of the two conditions for reference bar codes 1 and 2 must be satisfied. | 0       | -    |
| Bar code comparison mode               | This parameter specifies which decoded bar codes are to be used for the reference bar code comparison.  | 6     | UNSIGNED8 | 0: Only the first bar code is used for the comparison.<br>1: Only the second bar code is used for the comparison.<br>2: All bar codes are used for the comparison. All comparisons must be successful.<br>3: All bar codes are used for the comparison. One comparison must be successful.   | 3       | -    |
| Reference code completeness comparison | If this parameter is set, the basic condition for a positive reference code comparison is that all mandatory bar codes that are to be read within a reading gate were actually read. If this condition is not satisfied, no positive reference code comparison is achieved. | 7.0   | Bit       | 0: Completeness comparison switched off.<br>1: Completeness comparison switched on.  | 0       | -    |

Table 10.51: Parameters for module 81 – Reference code comparison

**Parameter length**

8 byte

**Input data**

None

**Output data**

None

## 10.14.2 Module 82 – Reference code comparator 2

## Description

The module defines the mode of operation of reference code comparator 2.

## Parameters

| Parameter   | Description  | Addr. | Data type | Value range   | Default | Unit |
|---|--|-------|-----------|---|---------|------|
| Output function after reference bar code comparison | This parameter specifies the associated output linkage after a reference bar code comparison.                | 0     | UNSIGNED8 | 0: No function<br>1: Comparison function 1<br>2: Comparison function 2<br>3: Comparison function 1 AND 2<br>4: Comparison function 1 OR 2   | 1       | -    |
| Linking logic for reference code output signal      | This parameter specifies the linking logic for the reference code output signal.                             | 1     | UNSIGNED8 | 0: Length and type and ASCII<br>1: Length and (type or ASCII)<br>2: (Length or type) and ASCII<br>3: Length or type or ASCII  | 0       | -    |
| Output for reference code comparison                | This parameter specifies whether a bar code length comparison should be carried out.                         | 2     | UNSIGNED8 | 0: Length ignored<br>1: Comparison o.k. if length not identical<br>2: Comparison o.k. if length identical.  | 2       | -    |
| Bar code type comparison                            | This parameter specifies whether a bar code type comparison should be carried out.                           | 3     | UNSIGNED8 | 0: Type ignored<br>1: Comparison o.k. if types not identical<br>2: Comparison o.k. if types identical.  | 2       | -    |
| Reference code ASCII comparison                     | This parameter specifies how the ASCII comparison should be carried out.                                     | 4     | UNSIGNED8 | 0: No comparison<br>1: Bar code not identical to RC<br>2: Bar code identical to RC<br>3: Bar code greater than RC<br>4: Bar code greater than or equal to RC<br>5: Bar code less than RC<br>6: Bar code less than or equal to RC<br>7: RC1 less than or equal to bar code less than or equal to RC2<br>8: Bar code less than RC1 or bar code greater than RC2 | 2       | -    |
| Reference code comparison mode                      | This parameter determines how and which reference bar codes (RC) are to be used for the bar code comparison. | 5     | UNSIGNED8 | 0: Only the first RC is used for the comparison.<br>1: Only the second RC is used for the comparison.<br>2: RC 1 and 2 are used for the comparison. Both conditions for RC 1 and 2 must be satisfied for a positive comparison.<br>3: RC 1 and 2 are used for the comparison. One of the two conditions for reference bar codes 1 and 2 must be satisfied.    | 0       | -    |

Table 10.52: Parameters for module 82 – Reference code comparison

| Parameter                              | Description   | Addr. | Data type | Value range  | Default | Unit |
|--|---|-------|-----------|--|---------|------|
| Bar code comparison mode               | This parameter specifies which decoded bar codes are to be used for the reference bar code comparison.  | 6     | UNSIGNED8 | 0: Only the first bar code is used for the comparison.<br>1: Only the second bar code is used for the comparison.<br>2: All bar codes are used for the comparison. All comparisons must be successful.<br>3: All bar codes are used for the comparison. One comparison must be successful. | 3       | -    |
| Reference code completeness comparison | If this parameter is set, the basic condition for a positive reference code comparison is that all mandatory bar codes that are to be read within a reading gate were actually read. If this condition is not satisfied, no positive reference code comparison is achieved. | 7.0   | Bit       | 0: Completeness comparison switched off.<br>1: Completeness comparison switched on.  | 0       | -    |

Table 10.52: Parameters for module 82 – Reference code comparison

**Parameter length**

8 byte

**Input data**

None

**Output data**

None

## 10.14.3 Module 83 – Reference code comparison pattern 1

**Description**

This module can be used to define the 1st comparison pattern

**Parameters**

| Parameter                      | Description  | Addr. | Data type                                  | Value range  | Default | Unit |
|--------------------------------|--|-------|--|--|---------|------|
| Code type comparison pattern 1 | Specifies the type of the reference bar code.  | 0     | UNSIGNED8                                  | 0: No code<br>1: 2/5 Interleaved<br>2: Code39<br>3: Code32<br>6: UPC, UPCE<br>7: EAN8, EAN13<br>8: Code128<br>10: EAN Addendum<br>11: Codabar<br>12: Code93<br>13: RSS-14<br>14: RSS Limited<br>15: RSS Expanded | 0       | -    |
| Comparison pattern 1           | Parameter string describing the content of the reference bar code. Note: You can also use the two placeholder characters that are stored in the "Wildcard character" and "Don't care character" parameters. If the string is empty, no comparison takes place. If the most recently stored character is the wildcard character, the comparison is only carried out up to the character before this wildcard character. In this way it is possible to switch off a comparison according to bar code length. | 1     | STRING<br>30 characters<br>null terminated | 1 ... 30 bytes of ASCII characters   | \00     | -    |

Table 10.53: Parameters for module 83 – Reference code comparison pattern

**Parameter length**

31 byte

**Input data**

None

**Output data**

None

**NOTE**

The defined comparison pattern affects both reference code comparators (Module 81 – Reference code comparator 1 and Module 82 – Reference code comparator 2).

## 10.14.4 Module 84 – Reference code comparison pattern 2

**Description**

This module can be used to define the 2nd comparison pattern

**Parameters**

| Parameter                      | Description  | Addr. | Data type                                  | Value range  | Default | Unit |
|--------------------------------|--|-------|--|--|---------|------|
| Code type comparison pattern 2 | Specifies the type of the reference bar code.  | 0     | UNSIGNED8                                  | 0: No code<br>1: 2/5 Interleaved<br>2: Code39<br>3: Code32<br>6: UPC, UPCE<br>7: EAN8, EAN13<br>8: Code128<br>10: EAN Addendum<br>11: Codabar<br>12: Code93<br>13: RSS-14<br>14: RSS Limited<br>15: RSS Expanded | 0       | -    |
| Comparison pattern 2           | Parameter string describing the content of the reference bar code. Note: You can also use the two placeholder characters that are stored in the "Wildcard character" and "Don't care character" parameters. If the string is empty, no comparison takes place. If the most recently stored character is the wildcard character, the comparison is only carried out up to the character before this wildcard character. In this way it is possible to switch off a comparison according to bar code length. | 1     | STRING<br>30 characters<br>null terminated | 1 ... 30 bytes of ASCII characters   | \00     | -    |

Table 10.54: Parameters for module 84 – Reference code comparison pattern

**Parameter length**

31 byte

**Input data**

None

**Output data**

None

**NOTE**

The defined comparison pattern affects both reference code comparators (Module 81 – Reference code comparator 1 and Module 82 – Reference code comparator 2).

## 10.15 Special functions

### 10.15.1 Module 90 – Status and control

This module supplies various BCL 304/i status information to the PROFIBUS master. Various functions of the BCL 304/i can be controlled via the master's output data.

#### Parameter

None

#### Input data

| Input data                 | Description   | Addr.             | Data type | Value range  | Initial value | Unit |
|----------------------------|---|-------------------|-----------|--|---------------|------|
| Reserved                   | Free  | 0.0               | Bit       |  | 0             | -    |
| AutoRefl state             | Signal state of the AutoRefl module   | 0.1               | Bit       | 0: Reflector is recognized<br>1: Reflector is hidden | 1             | -    |
| Auto Control result        | Indicates whether the result of the AutoControl function was a good or bad reading.   | 0.2               | Bit       | 0: Quality good<br>1: Quality bad                    | 0             | -    |
| Reserved                   | Free  | 0.3               | Bit       |  | 0             | -    |
| RefCode comparison state 1 | The signal indicates whether the decoded bar code corresponds to the reference code with regard to the comparison criteria as defined in the comparison function 1. If it matches, the value 1 is output. | 0.4<br>...<br>0.5 | Bit       | 0: Not equal<br>1: Equal<br>2: Unknown               | 2             | -    |
| RefCode comparison state 2 | The signal indicates whether the decoded bar code corresponds to the reference code with regard to the comparison criteria as defined in the comparison function 2. If it matches, the value 1 is output. | 0.6<br>...<br>0.7 | Bit       | 0: Not equal<br>1: Equal<br>2: Unknown               | 2             | -    |

Table 10.55: Input data for module 90 – Status and control

#### Input data length:

1 byte

#### Output data

None

### 10.15.2 Module 91 – AutoReflAct (automatic reflector activation)

#### Description

The module defines the mode of operation of the diffuse laser sensor for controlling the reading gate.

The AutoReflAct function uses the scanning beam to simulate a photoelectric sensor and thus permits an activation without additional sensory mechanism. This is achieved by directing the scanner with reduced scanning beam towards a reflector mounted behind the conveyor path. 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.

#### Parameters

| Parameter  | Description  | Addr. | Data type | Value range   | Default | Unit |
|------------|--|-------|-----------|---|---------|------|
| Mode       | This parameter activates the function of the diffuse laser sensor.<br><br>If "Autom. reading gate control" is set as the parameter value, the BCL activates the reading gate automatically if the reflector is obscured. | 0     | UNSIGNED8 | 0: <b>Normal</b><br>AutoreflAct switched off.<br>1: <b>Auto</b><br>AutoreflAct activated.<br>Autom. reading gate control.<br>2: <b>Manual</b><br>AutoreflAct activated.<br>No reading gate control, signaling only. | 0       | -    |
| Debouncing | The parameter defines the debounce time in scans for the reflector detection.<br>With a motor speed of 1000, 1 scan corresponds to a debounce time of 1 ms.  | 1     | UNSIGNED8 | 1 ... 16  | 5       | -    |

Table 10.56: Parameters for module 91 – AutoreflAct

#### Parameter length

2 bytes

#### Input data

None

#### Output data

None

### 10.15.3 Module 92 – AutoControl

#### Description

The module defines the mode of operation of the function AutoControl. The function monitors the quality of the decoded bar codes and compares these with a limit value. If the limit is reached, a status is set.

#### Parameters

| Parameter                 | Description   | Addr. | Data type | Value range                    | Default | Unit |
|---------------------------|---|-------|-----------|--------------------------------|---------|------|
| AutoControl enable        | This parameter can be used to activate or deactivate the AutoControl function.  | 0     | UNSIGNED8 | 0: Deactivated<br>1: Activated | 0       | -    |
| Limit for reading quality | The parameter defines a threshold for the reading quality.  | 1     | UNSIGNED8 | 0 ... 100                      | 50      | %    |
| Sensitivity               | With this parameter the sensitivity towards changes in the reading ability can be specified.<br>The higher the value, the less influence a change of reading ability has. | 2     | UNSIGNED8 | 0 ... 255                      | 0       | -    |

Table 10.57: Parameters for module 92 – AutoControl

#### Parameter length

3 byte

**Input data**

| Input data   | Description  | Addr. | Data type | Value range | Initial value | Unit |
|--------------|--|-------|-----------|-------------|---------------|------|
| Scan quality | Represents the current average value of the scan quality (at the time of the last reading gate). | 0     | UNSIGNED8 | 0 ... 100   | 0             | -    |

Table 10.58: Input data for module 92 – AutoControl

**Input data length**

1 byte

**Output data**

None

**Note:**

By means of the AutoControl function, it is possible to detect bar codes of decreasing quality and thus take appropriate measures before the label is no longer legible. With activated AutoControl function, note that the "Processing end at end of label" parameter in the CRT module should be set to allow for a better assessment of the bar code quality (see also "Module 7 – Code reconstruction technology" on page 81).



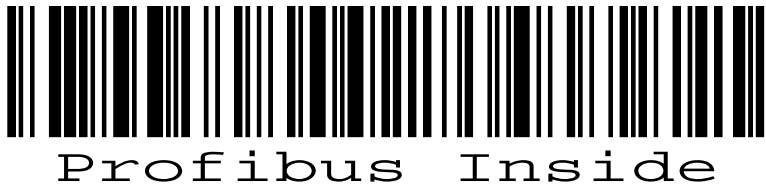
10.16 Example configuration: Indirect activation via the PLC

10.16.1Task

- Reading of a 15-digit code in 128 format
- Indirect activation of the BCL 304/i via the PLC

Code sample

Code 128, 15 digits



10.16.2Procedure

Hardware, connections

The following connections must have been established:

- Voltage supply (PWR)
- PROFIBUS In
- PROFIBUS termination

Required modules

Include the following modules in your project:

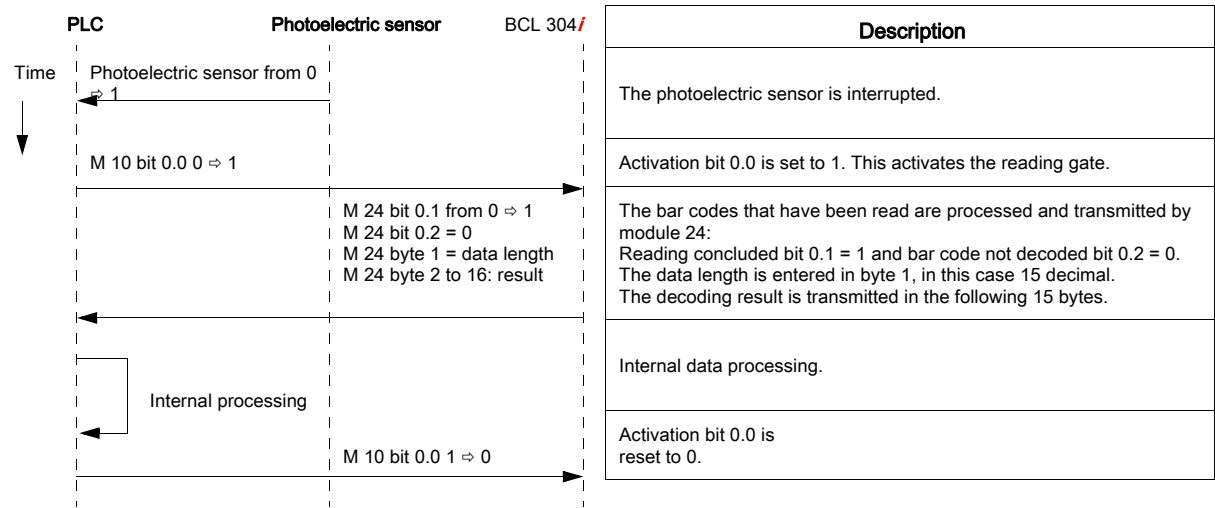
- Module 10 – Activations
- Module 24 – Decoding result 16 bytes

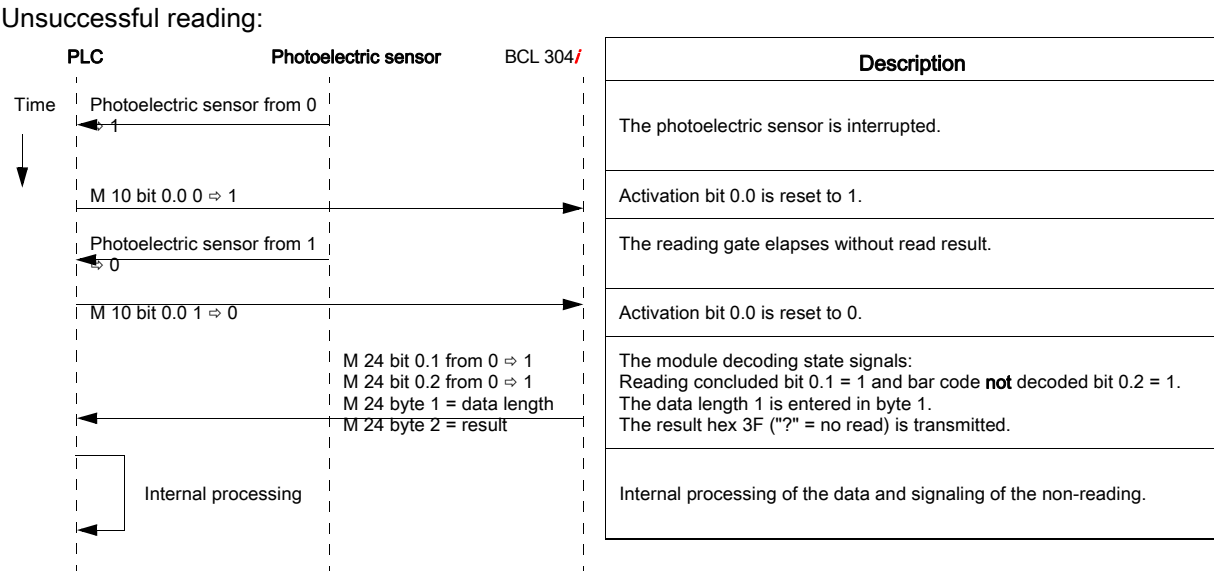
Parameter settings

In the standard parameter set (device parameters), only code 128 with 0 ... 63 digits must be activated.

Flow charts

Successful reading:





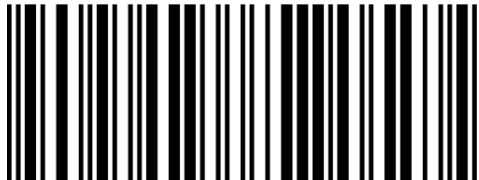
10.17 Example configuration: Direct activation via the switching input

10.17.1Task

- Reading of a 12-digit bar code in 2/5 Interleaved format
- Direct activation of the BCL 304 via a photoelectric sensor

Code sample

Code 2/5 Interleaved 12 digits with check digit



561234765436

10.17.2Procedure

Hardware, connections

The following connections must have been established:

- Voltage supply (PWR)
- PROFIBUS In
- PROFIBUS termination
- Photoelectric sensor at SWIO1

Required modules

Include the following modules in your project:

- Module 23 – Decoding result 12 bytes

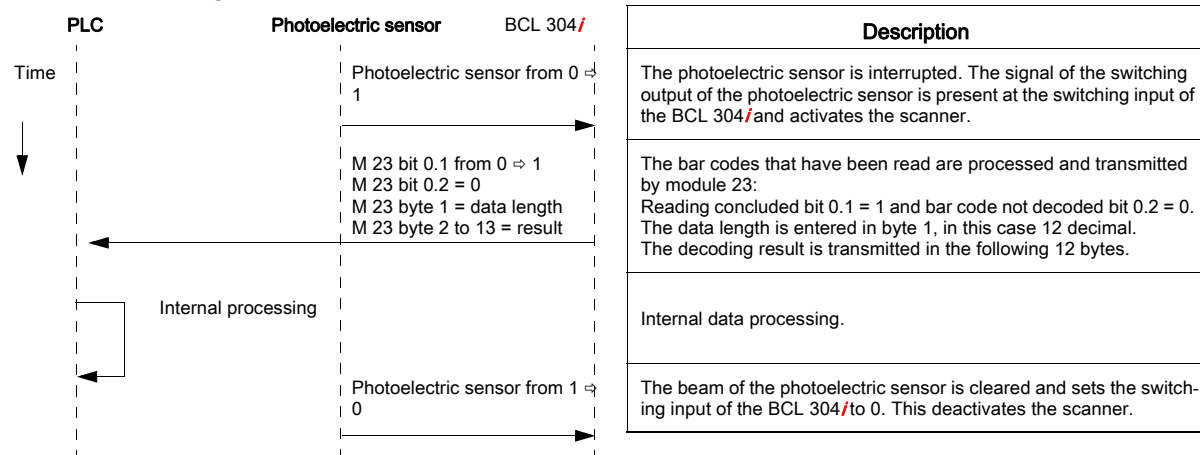
Parameter settings of the "common parameters"

| Byte | Description        | Default value | Change value to:    |
|------|--------------------|---------------|---------------------|
| 1    | Code type 1        | 0             | 01: 2/5 Interleaved |
| 4    | Number of digits 3 | 0             | 12                  |

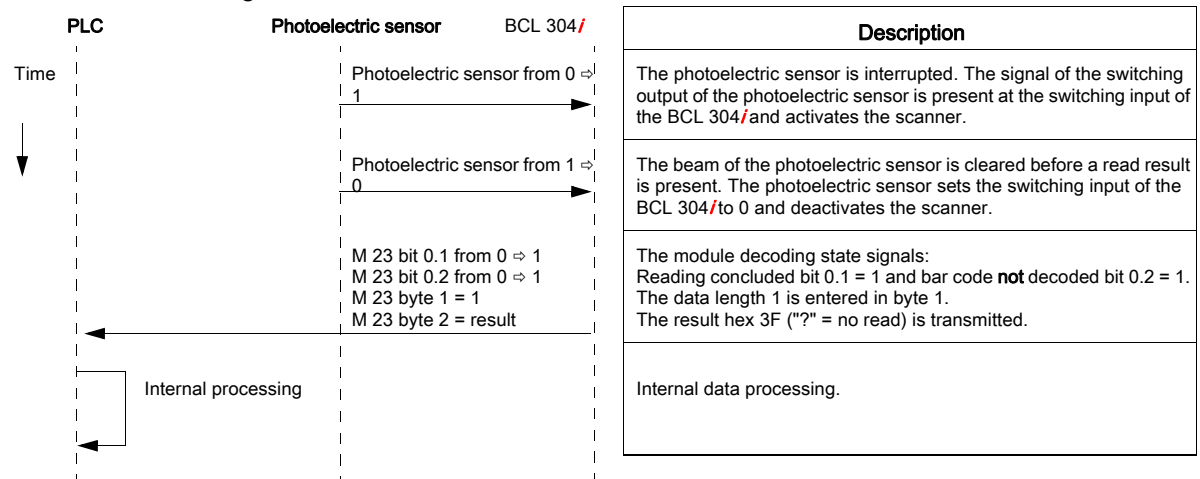
Table 10.59: Device parameters for example configuration 2

Flow charts

Successful reading:



Unsuccessful reading:



## 11 Diagnostics and troubleshooting

### 11.1 General causes of errors

| Error                    | Possible error cause   | Measures  |
|--------------------------|--|---|
| <b>Status LED PWR</b>    |  |   |
| Off                      | <ul style="list-style-type: none"> <li>No supply voltage connected to the device</li> <li>Hardware error</li> </ul>                            | <input type="checkbox"/> Check supply voltage<br><input type="checkbox"/> Send device to customer service   |
| Red, flashing            | <ul style="list-style-type: none"> <li>Warning</li> </ul>  | <input type="checkbox"/> Query diagnostic data and carry out the resulting measures   |
| Red, continuous light    | <ul style="list-style-type: none"> <li>Error: no function possible</li> </ul>  | <input type="checkbox"/> Internal device error, send in device  |
| Orange, continuous light | <ul style="list-style-type: none"> <li>Device in service mode</li> </ul>   | <input type="checkbox"/> Reset service mode with webConfig tool   |
| <b>Status LED NET</b>    |  |   |
| Off                      | <ul style="list-style-type: none"> <li>No supply voltage connected to the device</li> <li>Device not yet recognized by the PROFIBUS</li> </ul> | <input type="checkbox"/> Check supply voltage<br><input type="checkbox"/> Send device to customer service   |
| Red, flashing            | <ul style="list-style-type: none"> <li>Error on the PROFIBUS</li> </ul>  | <input type="checkbox"/> Can be corrected by resetting  |
| Red, continuous light    | <ul style="list-style-type: none"> <li>Error on the PROFIBUS</li> </ul>  | <input type="checkbox"/> Check wiring and termination.<br><input type="checkbox"/> Cannot be corrected by resetting<br><input type="checkbox"/> Send device to customer service |

Table 11.1: General causes of errors

### 11.2 Interface errors

| Error  | Possible error cause   | Measures   |
|--|--|--|
| No communication via USB service interface                                     | <ul style="list-style-type: none"> <li>Incorrect interconnection cable</li> <li>Connected BCL 304/i is not recognized</li> </ul>                                       | <input type="checkbox"/> Check interconnection cable<br><input type="checkbox"/> Install USB driver  |
| No communication via PROFIBUS.<br>Status LED <b>NET</b> , continuous red light | <ul style="list-style-type: none"> <li>Incorrect wiring</li> <li>Wrong termination</li> <li>Incorrect PROFIBUS address set</li> <li>Incorrect configuration</li> </ul> | <input type="checkbox"/> Check wiring<br><input type="checkbox"/> Check termination<br><input type="checkbox"/> Check PROFIBUS address<br><input type="checkbox"/> Check configuration of the device in the configuration tool   |
| Sporadic errors on the PROFIBUS  | <ul style="list-style-type: none"> <li>Incorrect wiring</li> <li>Wrong termination</li> <li>Effects due to EMC</li> <li>Overall network expansion exceeded</li> </ul>  | <input type="checkbox"/> Check wiring<br><input type="checkbox"/> Check termination<br><input type="checkbox"/> Check shielding<br><input type="checkbox"/> Check grounding concept and connection to the functional earth<br><input type="checkbox"/> Avoid EMC coupling caused by power cables laid parallel to device lines<br><input type="checkbox"/> Check max. network expansion as a function of the set baud rate |

Table 11.2: Interface error

## 11.3 Service and support

### Service hotline

You can find the contact information for the hotline in your country on our website [www.leuze.com](http://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](http://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><b>Please use this chapter as a master copy should servicing be required.</b></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

## 12 Type overview and accessories

### 12.1 Part number code

|                                    |     |   |   |   |   |     |   |   |                    |   |
|------------------------------------|-----|---|---|---|---|-----|---|---|--------------------|---|
| BCL                                | 300 | / | 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  |
|                                    |     |   |   |   |   |     |   |   | /                  | Integrated networks (basic netX)  |
|                                    |     |   |   |   |   |     |   |   | C                  | 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 12.1: BCL 304/part number code

## 12.2 BCL 304/type overview

PROFIBUS DP with 1x RS 485 interface at 2x M12 B-coded connectors:

| Type designation                                  | Description                        | Part no. |
|---|------------------------------------|----------|
| <b>Single line scanner with frontal beam exit</b> |                                    |          |
| BCL 304/S N 102                                   | With N optics                      | 50116367 |
| BCL 304/S M 102                                   | With M optics                      | 50116361 |
| BCL 304/S F 102                                   | With F optics                      | 50116349 |
| BCL 304/S L 102                                   | With L optics                      | 50116355 |
| BCL 304/S N 102 D                                 | With N optics and display          | 50116366 |
| BCL 304/S M 102 D                                 | With M optics and display          | 50116360 |
| BCL 304/S F 102 D                                 | With F optics and display          | 50116348 |
| BCL 304/S L 102 D                                 | With L optics and display          | 50116354 |
| BCL 304/S N 102 D H                               | With N optics, display and heating | 50116365 |
| BCL 304/S M 102 D H                               | With M optics, display and heating | 50116359 |
| BCL 304/S F 102 D H                               | With F optics, display and heating | 50116247 |
| BCL 304/S L 102 D H                               | With L optics, display and heating | 50116353 |
| <b>Raster scanner with frontal beam exit</b>      |                                    |          |
| BCL 304/R1 N 102                                  | With N optics                      | 50116343 |
| BCL 304/R1 M 102                                  | With M optics                      | 50116339 |
| BCL 304/R1 F 102                                  | With F optics                      | 50116335 |
| BCL 304/R1 N 102 D                                | With N optics and display          | 50116342 |
| BCL 304/R1 M 102 D                                | With M optics and display          | 50116338 |
| BCL 304/R1 F 102 D                                | With F optics and display          | 50116334 |
| <b>Single line scanner with deflecting mirror</b> |                                    |          |
| BCL 304/S N 100                                   | With N optics                      | 50116364 |
| BCL 304/S M 100                                   | With M optics                      | 50116358 |
| BCL 304/S F 100                                   | With F optics                      | 50116346 |
| BCL 304/S L 100                                   | With L optics                      | 50116352 |
| BCL 304/S N 100 D                                 | With N optics and display          | 50116363 |
| BCL 304/S M 100 D                                 | With M optics and display          | 50116357 |
| BCL 304/S F 100 D                                 | With F optics and display          | 50116345 |
| BCL 304/S L 100 D                                 | With L optics and display          | 50116351 |
| BCL 304/S N 100 D H                               | With N optics, display and heating | 50116362 |
| BCL 304/S M 100 D H                               | With M optics, display and heating | 50116356 |
| BCL 304/S F 100 D H                               | With F optics, display and heating | 50116344 |
| BCL 304/S L 100 D H                               | With L optics, display and heating | 50116350 |
| <b>Raster scanner with deflecting mirror</b>      |                                    |          |
| BCL 304/R1 N 100                                  | With N optics                      | 50116341 |
| BCL 304/R1 M 100                                  | With M optics                      | 50116337 |
| BCL 304/R1 F 100                                  | With F optics                      | 50116333 |
| BCL 304/R1 J 100                                  | With J optics                      | 50123506 |
| BCL 304/R1 N 100 D                                | With N optics and display          | 50116340 |
| BCL 304/R1 M 100 D                                | With M optics and display          | 50116336 |
| BCL 304/R1 F 100 D                                | With F optics and display          | 50116332 |

Table 12.2: BCL 304/type overview

| Type designation                  | Description                        | Part no. |
|-----------------------------------|------------------------------------|----------|
| <b>Oscillating-mirror scanner</b> |                                    |          |
| BCL 304/i O N 100                 | With N optics                      | 50116329 |
| BCL 304/i O M 100                 | With M optics                      | 50116326 |
| BCL 304/i O F 100                 | With F optics                      | 50116320 |
| BCL 304/i O L 100                 | With L optics                      | 50116323 |
| BCL 304/i O N 100 D               | With N optics and display          | 50116330 |
| BCL 304/i O M 100 D               | With M optics and display          | 50116327 |
| BCL 304/i O F 100 D               | With F optics and display          | 50116321 |
| BCL 304/i O L 100 D               | With L optics and display          | 50116324 |
| BCL 304/i O N 100 D H             | With N optics, display and heating | 50116331 |
| BCL 304/i O M 100 D H             | With M optics, display and heating | 50116328 |
| BCL 304/i O F 100 D H             | With F optics, display and heating | 50116322 |
| BCL 304/i O L 100 D H             | With L optics, display and heating | 50116325 |

Table 12.2: BCL 304/i type overview

### 12.3 Accessories – Connection hoods

| Type designation | Description                  | Part no. |
|------------------|------------------------------|----------|
| MS 304           | Connector hood for BCL 304/i | 50116470 |
| MK 304           | Terminal hood for BCL 304/i  | 50116465 |

Table 12.3: Connection hoods for the BCL 304/i

### 12.4 Accessory – Terminating resistor

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

Table 12.4: Terminating resistor for the BCL 304/i

### 12.5 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 12.5: Connectors for the BCL 304/i

### 12.6 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 12.6: Service cable for the BCL 304/i

### 12.7 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 12.7: Mounting devices for the BCL 304/i



## 12.8 Accessory - Reflector for AutoReflAct

| Type designation                        | Description  | Part no. |
|---|--|----------|
| Reflective tape no. 4 /<br>100 x 100 mm | Reflective tape as reflector for AutoReflAct operation | 50106119 |

Table 12.8: Reflector for autoReflAct operation

## 13 Maintenance

### 13.1 General maintenance information

Usually, the BCL 304/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.

### 13.2 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.

### 13.3 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.

## 14 Appendix

### 14.1 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            |

## 14.2 Bar code samples

### 14.2.1 Module 0.3

Code type 01: Interleaved 2 of 5



Code type 02: Code 39



Code type 11: Codabar



Code 128



Code type 08: EAN 128



Code type 06: UPC-A



Code type 07: EAN 8



Code type 10: EAN 13 Add-on



Code type 13: GS1 DataBar  
OMNIDIRECTIONAL

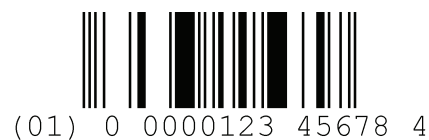


Figure 14.1: Bar code sample labels (module 0.3)

## 14.2.2 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 14.2: Bar code sample labels (module 0.5)