

# Barcode reader BCL 31/32 with integrated decoder

## Technical Description





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# 1 General Information

## 1.1 Explanation of Symbols

The symbols used in this operating manual are explained below.

**Attention!**

*Pay attention to passages marked with this symbol. Failure to heed this information can lead to injuries to personnel or damage to the equipment.*

**Attention Laser!**

*This symbol warns of possible danger through hazardous laser radiation.*

**Notice!**

*This symbol indicates text passages containing important information.*

## 1.2 Declaration of Conformity

The bar code reader BCL 31/32 and the optional connector units MA 2/MA 2.2/MA 4/MA 4D/MA 22 DC have been developed and manufactured under observation of the applicable European standards and directives.

**Notice!**

*The corresponding declaration of conformity can be requested from the manufacturer.*

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



## 2 Safety Notices

### 2.1 Safety Standards

The bar code readers BCL 31/32 and the optional connector units MA 2/MA 2.2/MA 4/MA 4D/MA 22 DC have been developed, produced and tested subject to the applicable safety standards. They correspond to the state of the art.

### 2.2 Intended Use

**Attention!**

*The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not corresponding to its intended use.*

Bar code readers of the type BCL 31/32 are conceived as stationary, high-speed scanners with integrated decoders for all current bar codes used for automatic object recognition.

The optional connector and interface units MA 2/MA 2.2/MA 4/MA 4D/MA 22 DC are intended for the easy connection of bar code readers of type BCL 31/32.

In particular, unauthorised uses include:

- rooms with explosive atmospheres
- operation for medical purposes

**Areas of application**

The bar code readers BCL 31/32 with optional connector unit MA 2/MA 2.2/MA 4/MA 4D/MA 22 DC are conceived particularly for the following fields of application:

- labelling and packaging machines
- automatic analysers
- space-critical bar code reading tasks
- storage and conveying engineering, in particular for object identification on fast-moving conveyor belts
- pharmaceutical industry

### 2.3 Working Safely



#### **Attention Laser Radiation!**

*The BCL 31/32 are laser devices of the Laser Protection Class 2.*

*Do not look directly into the laser beam. Observe the applicable legal and local regulations for the operation of laser units.*



#### **Attention!**

*Access to or changes on the device, except where expressly described in this operating manual, is not authorised.*

#### **Safety regulations**

Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.

#### **Qualified personnel**

Mounting, commissioning and maintenance of the device must only be carried out by qualified personnel.

Electrical work must be carried out by a certified electrician.



### 3 Description

#### ***BCL 31/32 device construction***

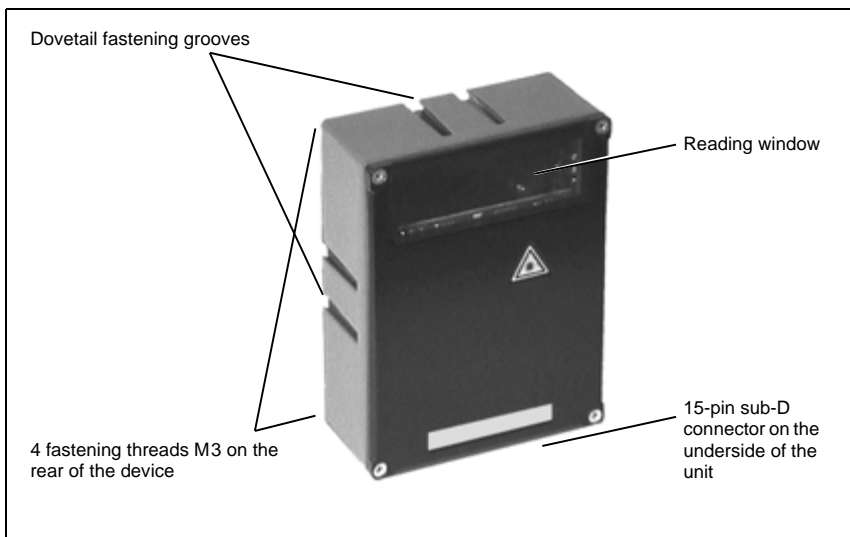


Figure 3.1: BCL 31/32 device construction

#### 3.1 The Bar Code Readers BCL 31/32

The bar code readers BCL 31/32 are high-speed scanners with integrated decoder for all bar codes currently in use, e.g. 2/5 Interleaved, EAN etc.

The many possible configurations of the device allow its adaptation to a multitude of reading tasks. Due to the small dimensions of the unit and the short minimum reading distance, the BCL 31/32 may also be used in highly constrained spaces.

Information on technical data and characteristics can be found in Chapter 4.

#### 3.2 Standalone operation

The bar code reader BCL 31/32 is operated as a "stand-alone" device. The BCL features a 15-pin sub-D connector for the electrical connection of the supply voltage, the interface, and the switching inputs.

##### ***With connection units***

The connection units simplify the electrical installation of the bar code readers in standalone operation.

In addition, they permit the networking of several bar code readers; they can store operating parameters (MA 4 / MA 4D), and can show parameters and operating data on a display (MA 4D).

A listing of the available connection units and associated short descriptions may be found in Chapter 5. Separate data sheets are available that contain further details about the connection units.

### **3.3 Networking**

#### **3.3.1 multiNet plus**

Up to 30 scanners can be networked together using the connector units MA 2, MA 4 or MA 4D and a bus master MA 30/31. To achieve this, each BCL 31 is assigned a separate hardware address in the respective connection unit. The devices are networked by connecting the individual RS 485 interfaces in parallel.

In the Leuze multiNet plus, the individual network devices sequentially transfer their data to the network master MA 30/31 when requested. In addition, each network device that is declared as slave receives a device address. It is set via a coding switch in the respective connection unit. When exchanging a scanner, the device address remains stored in the MA 2. The connection units MA 4 and MA 4D also store the operating parameters of the scanner.

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

##### ***Two-wire RS 485***

The Leuze MultiNet plus is optimised for fast transmission of scanner data to a primary host computer. The multiNet plus consists physically of a two-wire RS 485 interface through which the multiNet plus software protocol is controlled. This makes wiring the network easy and inexpensive as slaves are connected to one another in parallel.

##### ***Interface modules***

Shielded, twisted pair conductors should be used for the multiNet. This allows a total network length of up to 1200 m. Connection of the network to the primary computer is made via the host interface of the MA 30/31 which can be equipped with 4 different physical interface modules. Modules are available for RS 422, RS 232, TTY and RS 485.

### Networking via multiNet plus

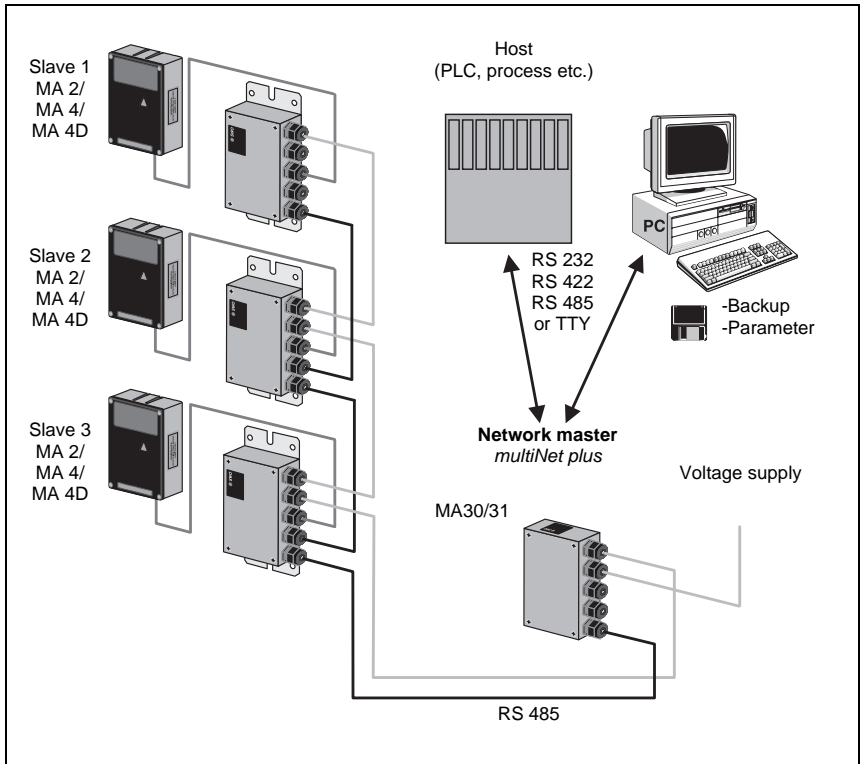


Figure 3.2: Networking possibilities using the multiNet plus (BCL 31)

### 3.3.2 Daisy Chain

The connection unit MA 22 DC permits the networking of up to 4 bar code readers BCL 32 without an additional network master. The MA 22 DC features two host interfaces, one of which can be used to cascade a further connection unit MA 22 DC. This permits the networking of in total eight BCL 32 without an additional master.

For details regarding the networking with MA 22 DC, please refer to the description of the MA 22 DC.

## 4 Technical Data

### 4.1 General Specifications BCL 31/32

#### Optical Data

|                       |  |
|-----------------------|--|
| Light source          | Laser diode 650nm  |
| Scanning rate         | BCL with M optics: 1000scans/s<br>BCL with F optics: 800scans/s  |
| Resolution            | BCL 3x xM 100: m = 0.2mm ... 0.5mm<br>BCL 3x xF 100: m = 0.3mm ... 0.8mm   |
| Beam deflection       | by means of rotating polygon mirror wheel  |
| Reading distance      | see reading curve  |
| Reading field opening | see reading curve  |
| Laser safety class    | 2  |
| Code types            | 2/5 Interleaved, Code 39, Code 128, EAN 128, EAN/UPC, EAN Addendum, Codabar, Pharma Code, Code 93  |
| Software features     | selectable output format, autoConfig, autoControl, autoRe-flAct, reference code comparison, multiple read, real time decoding, adjustment mode, diagnosis, reading gate control, control of switching inputs and switching outputs, etc. |

#### Electrical data

|                   |  |
|-------------------|--|
| Interface type    | BCL 31: RS 485<br>BCL 32: RS 232   |
| Service interface | RS232 with fixed data format, 9600Bd, 8 data bits, no parity, 1 stop bit                         |
| Baud rate         | 110 ... 115400Bd   |
| Data formats      | data bits: 7, 8, 9<br>parity: None, Even, Odd<br>stop bits: 1, 2                                 |
| Protocols         | with/without frame protocol<br>ACK/NAK, 3964 (R) RK 512, RTS/CTS<br>X ON / X OFF, multiNet plus  |
| Ports             | BCL 31: 1 switching output, 1 switching input<br>BCL 32: 2 switching outputs, 2 switching inputs |
| LED green         | device ready (Power On)  |
| Operating voltage | 10 ... 30V   |
| Power consumption | 3.2 W  |

#### Mechanical data

|                        |                   |
|------------------------|-------------------|
| Protection class       | IP 65             |
| Weight                 | 400 g             |
| Dimensions (W x H x D) | 120 x 90 x 43mm   |
| Housing                | diecast aluminium |

**Environmental data**

|                                      |  |
|--------------------------------------|--|
| Ambient temp.<br>(operation/storage) | 0°C ... +40°C/-20°C ... +60°C                |
| Air humidity                         | max. 90% rel. humidity, non-condensing       |
| Vibration                            | IEC 68.2.6<br>IEC 68.2.27 (shock)<br>IEC 801 |
| Electromagnetic compatibility        | acc. to IEC 60947-5-2                        |

**Additional Functions**

|             |  |
|-------------|--|
| autoReflAct | automatic reading activation via reflector |
|-------------|--|

Table 4.1: General specifications

## 4.2 LED indicators

An internal LED indicates in the reading window whether or not the supply voltage is present.

## 4.3 Dimensioned and Connection Drawings

**BCL 31/32**

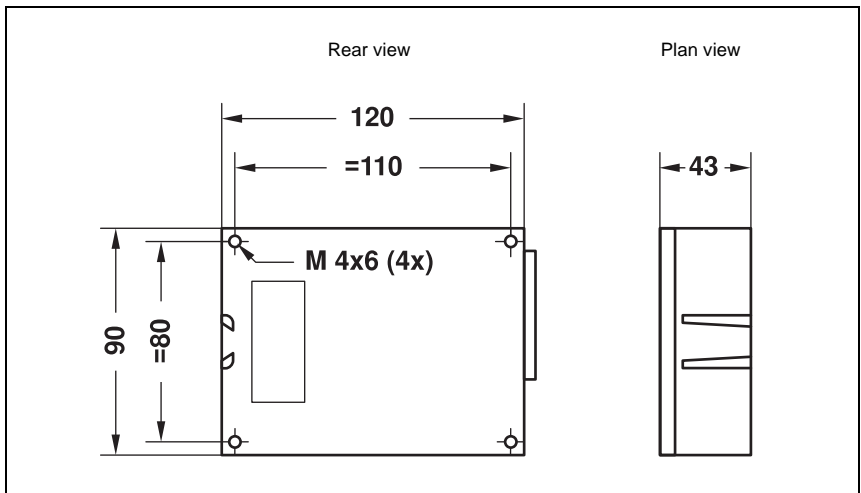


Figure 4.1: Dimensioned drawing BCL 31/32

4.4    **Optical Data**



**Notice!**

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.

For different reading tasks, the BCL 31/32 is available in various versions, both as a raster scanner and as a single line scanner. Please refer to the following table or the respective scanning curves for ratings.

4.4.1    **Type overview**

| Model           | Range       | Module/<br>resolution<br>(mm) | Scanning<br>rate<br>(scan/s) | Scanner type | Part No.  |
|-----------------|-------------|-------------------------------|------------------------------|--------------|-----------|
| BCL 31 S M 100  | up to 220mm | 0.2 ... 0.5                   | 1000                         | Single line  | 500 36276 |
| BCL 31 R1 M 100 |             |                               |                              | Raster       | 500 36275 |
| BCL 32 S M 100  |             |                               |                              | Single line  | 500 36272 |
| BCL 32 R1 M 100 |             |                               |                              | Raster       | 500 36271 |
| BCL 31 S F 100  | up to 450mm | 0.3 ... 0.8                   | 800                          | Single line  | 500 36278 |
| BCL 31 R1 F 100 |             |                               |                              | Raster       | 500 36273 |
| BCL 32 S F 100  |             |                               |                              | Single line  | 500 36274 |
| BCL 32 R1 F 100 |             |                               |                              | Raster       | 500 36277 |

Table 4.2:    Type overview



**Notice!**

BCL 31: interface RS 485  
BCL 32: interface RS 232

4.4.2    **Optics variants and reading fields**

The BCL 31/32 is available with two different optics. The optics differ in range and resolution (see Chapter 4.4.1).

- Optic M: for small to medium modules
- Optic F: for small to medium modules

The following graphic displays the scanning curves of the various BCL models.



**Notice!**

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

**Scanning curves BCL 31/32 with optic M**

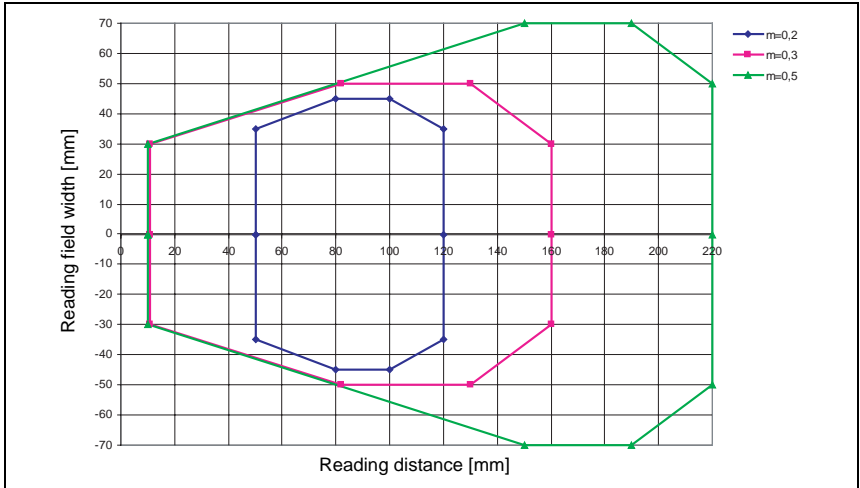


Figure 4.2: Reading field, optics model M (medium density, normal range)

**Scanning curves BCL 31/32 with optic F**

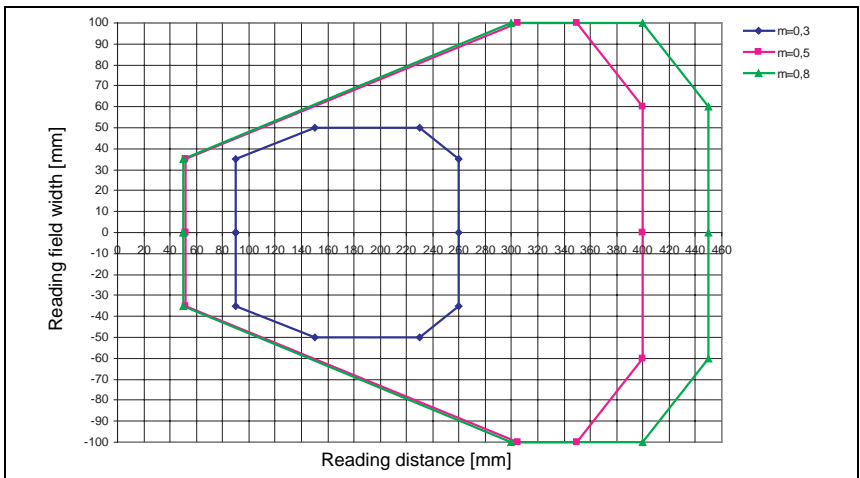


Figure 4.3: Reading field, optics model F (low density, long range)

5      **Accessories / Order Designation**

5.1    **Accessories**



**Notice!**

*Products from Leuze electronic GmbH + Co. can be ordered from any of the sales and service offices listed on the back page of this operating manual.*

| Symbol       | Order No. | Short Description   |
|--------------|-----------|---|
| MA 2         | 500 31256 | Coupling unit MA 2 for BCL 31;<br>standard, multiNet Slave with host interface RS 485   |
| MA 2.2       | 500 31538 | Coupling unit MA 2.2 for BCL 32;<br>standard, multiNet Slave with host interface RS 232 |
| MA 22 DC     | 500 31496 | Daisy chain connection unit for four BCL 32   |
| MA 4         | 500 31537 | Connection unit for BCL 31/32 with parameter memory                                     |
| MA 4D        | 500 31536 | Connection unit for BCL 31/32 with parameter memory<br>and display                      |
| BT 56        | 500 27375 | Mounting bracket with dovetail for rod  |
| KB 031-3000  | 500 35355 | Connection cable between BCL and MA,<br>length: 3m                                      |
| KB 040-3000  | 500 26658 | Connection cable between BCL and MA in L version,<br>length: 3m                         |
| KB 040-6000  | 500 29381 | Connection cable between BCL and MA in L version,<br>length: 6m                         |
| KB 040-10000 | 500 29382 | Connection cable between BCL and MA in L version,<br>length: 10m                        |
| BCLConfig    | 500 60298 | Programming software  |

Table 5.1:    Accessories / Order Designation

5.1.1    **Connection units**



**Notice!**

*The connection units are described here in brief only. For further information regarding the connection units please refer to the relevant data sheets.*



### **Connector unit MA 2/MA 2.2**

The connection units MA 2/MA 2.2 are used to simplify the electrical installation of the BCL 31/32. They have the following advantages compared to the installation of the BCL 31/32 as a standalone device:

- Terminals for switching inputs and outputs, including supply voltage
- Terminals for feed-through of the RS 485 connection (MA 2)
- 9-pin sub D plug for service interface
- Operating mode switch: service operation/standard operation
- Rotary switch for address setting

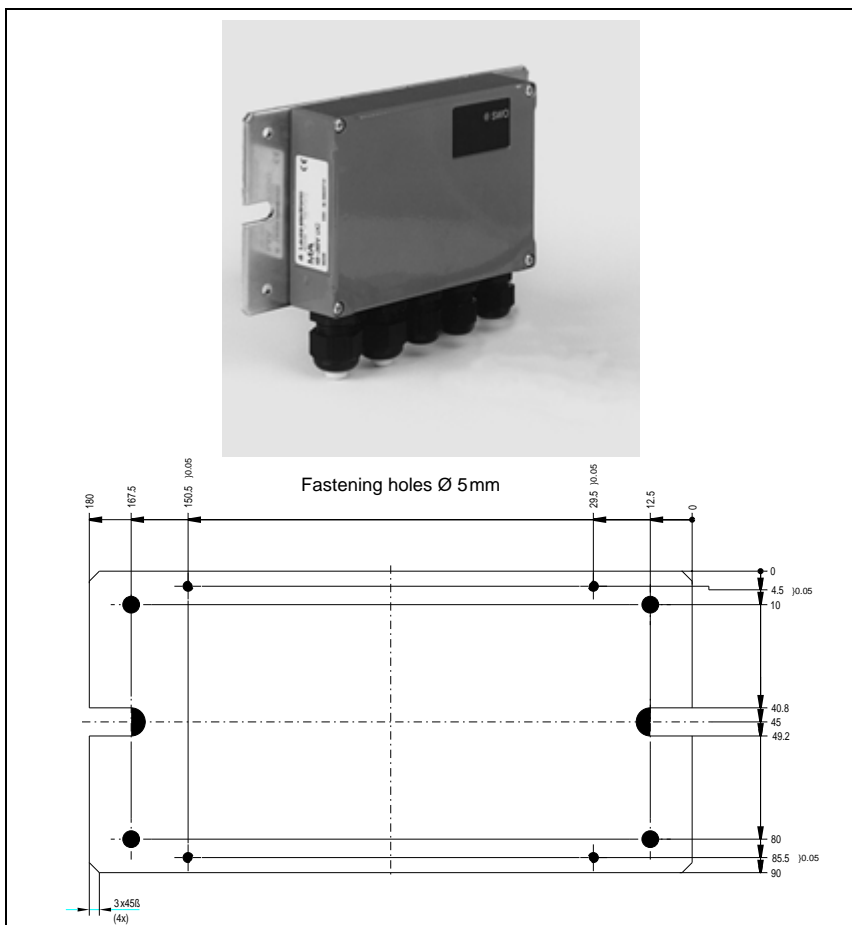


Figure 5.1: connector unit MA 2/MA 2.2

### Connector unit MA 4/MA 4D

Apart from the advantages of the connection units MA 2/MA 2.2, the connection units MA 4/MA 4D have the following additional characteristics:

- Parameter memory for the BCL - the BCL can be exchanged without the need for reconfiguration
- Display (MA 4D only)

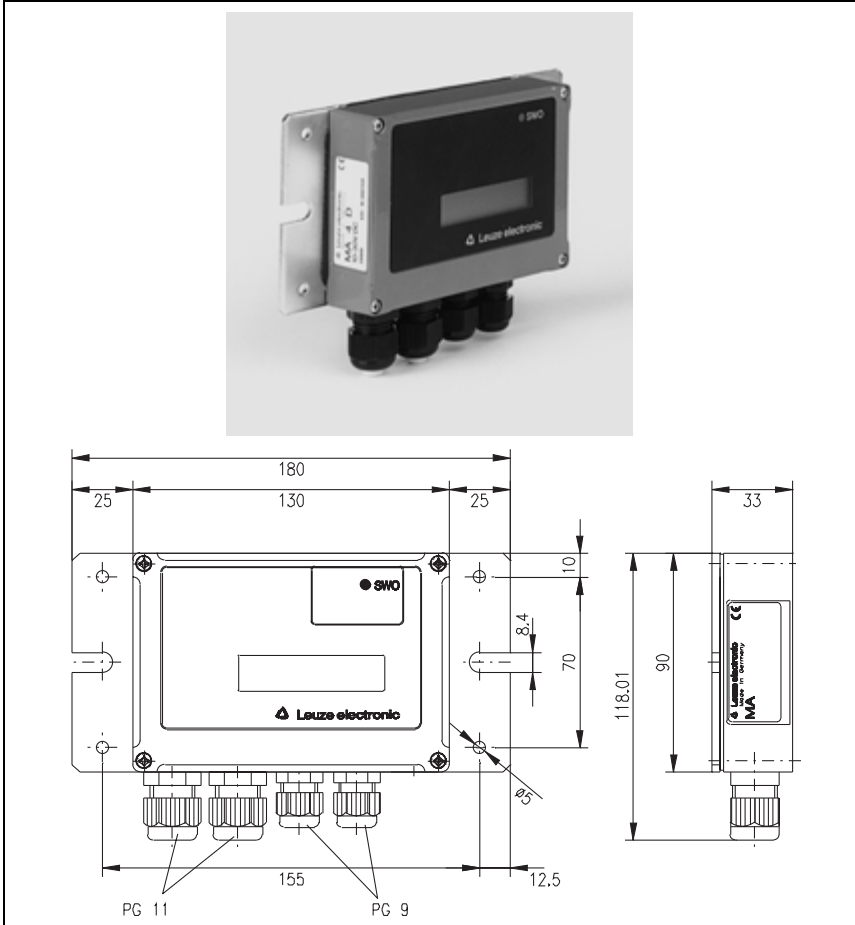


Figure 5.2: Connection unit MA 4/MA 4D / drawing to scale

### 5.1.2 Fastening Accessories

The mounting unit BT 56 is available for mounting the BCL 31/32. It is designed for rod installation.

#### *Mounting device BT 56*

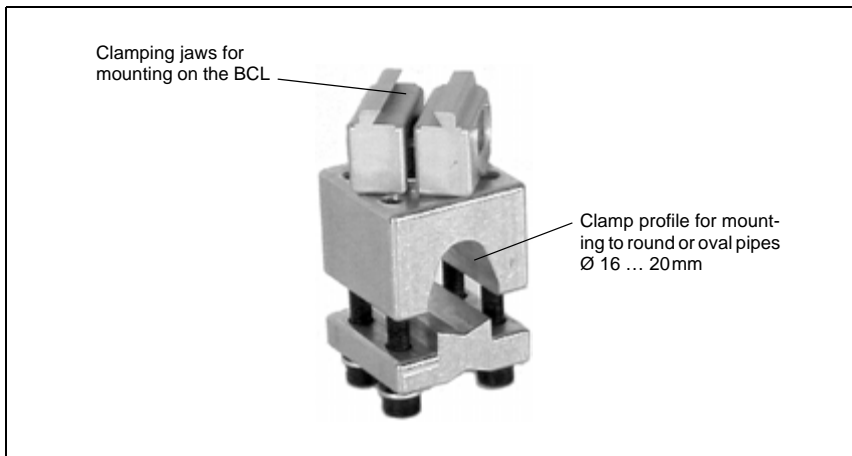


Figure 5.3: Mounting device BT 56

### 5.1.3 Connection cable

Specific connection cables in various lengths are available for the connection between BCL and connection unit, depending on the model of the connection unit (standard version or L version). These connection cables may be used for the connection units MA 2/MA 2.2 as well as for MA 4/MA 4D.

## 6 Installation

### 6.1 Storage, Transportation



#### **Attention!**

*When transporting, package the device so that it is protected against collision and humidity. Optimal protection is achieved when using the original packaging. Heed the required environmental conditions specified in the technical data.*

#### **Unpacking**

✎ *Check the packaging 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
- accessories
- operating manual

The name plates provide information as to what BCL-type your device is. For specific information, please refer to Chapter 4.4.1.

#### **Name plates, BCL-models**

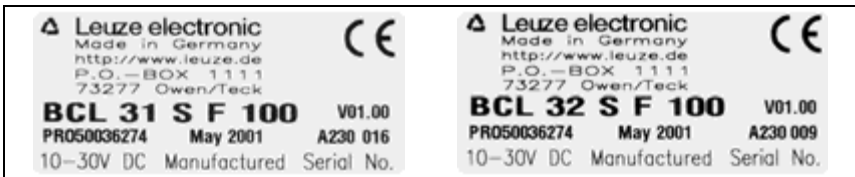


Figure 6.1: Device type plates BCL 31/32

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

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

✎ *Observe the local regulations regarding disposal and packaging.*

#### **Cleaning**

✎ *Clean the glass window of the BCL 31/32 with a soft cloth before mounting. Remove all packaging remains, e.g. carton fibres or Styrofoam balls.*



#### **Attention!**

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

## 6.2 Mounting

### ***Accessories***

The mounting system BT 56 is available for installation. It may be ordered separately from Leuze electronic. For order numbers, see table 5.1 "Accessories / Order Designation" on page 14.

### ***Mounting the BCL 31/32***

There are two basic types of mounting arrangements for the BCL 31/32:

- using the dovetail groove and the corresponding mounting accessories (see figure 6.2)
- using the fastening threads on the back- and underside of the devices (Chapter 4.3)

### ***Mounting example BCL 31/32***

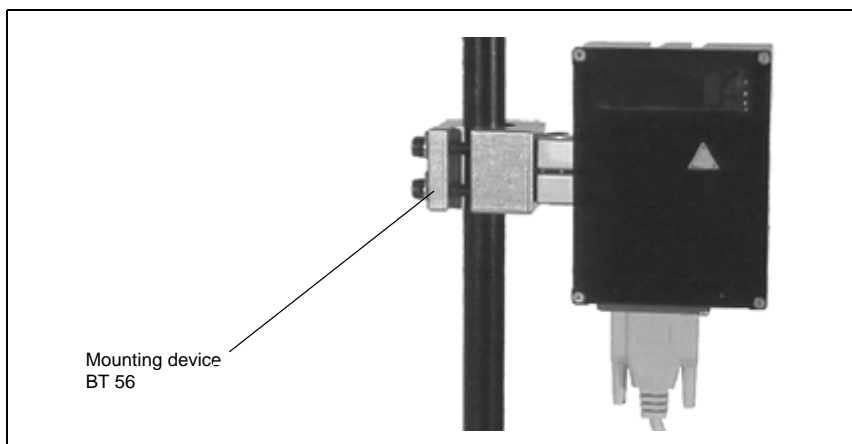


Figure 6.2: Mounting example BCL 31/32

### ***Mounting MA***

You can mount all connection units individually through the holes located on the mounting plate (see Figure 5.1 and Figure 5.2).

Subsequently, connect the BCL 31 with the connection unit via the respective cable (see Chapter 5.1.3).

## 6.2.1 Device Arrangement

### **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 31/32 in relation to the bar-code module width
- the resulting minimum and maximum reading distance from the respective reading field

For specific information, please refer to Chapter 4.4.



#### **Notice!**

*The best reading results are obtained when*

- the bar code is moved in a plane that is parallel to the reading window,
- the reading distance lies in the middle area of the reading field.
- you do not use high-gloss labels.



#### **Notice!**

*On the BCL 31/32, the beam is not emitted perpendicular to the cover of the housing, but with an angle of 10 ° towards the top. This angle is intended in order to avoid a total reflection of the laser in the case of glossy labels. For highly reflective surfaces, this angle may be widened by tilting the BCL.*

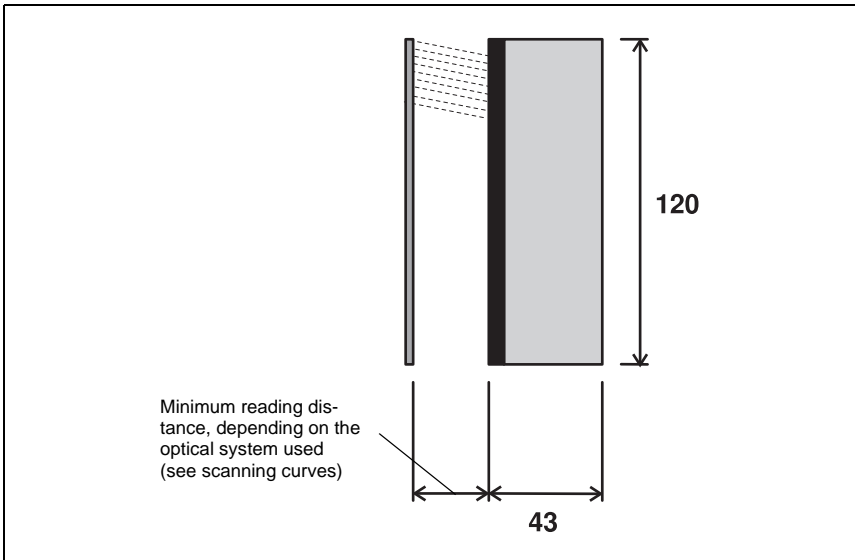


Figure 6.3: Device type plates BCL 31/32

### ***Mounting location***

↳ When selecting a mounting location, pay attention to

- maintaining the required environmental conditions (humidity, temperature),
- possible soiling of the reading window due to liquids, abrasion by boxes, or packaging material residues,
- lowest possible chance of damage to the scanner by mechanical collision or jammed parts.

### ***Application example***

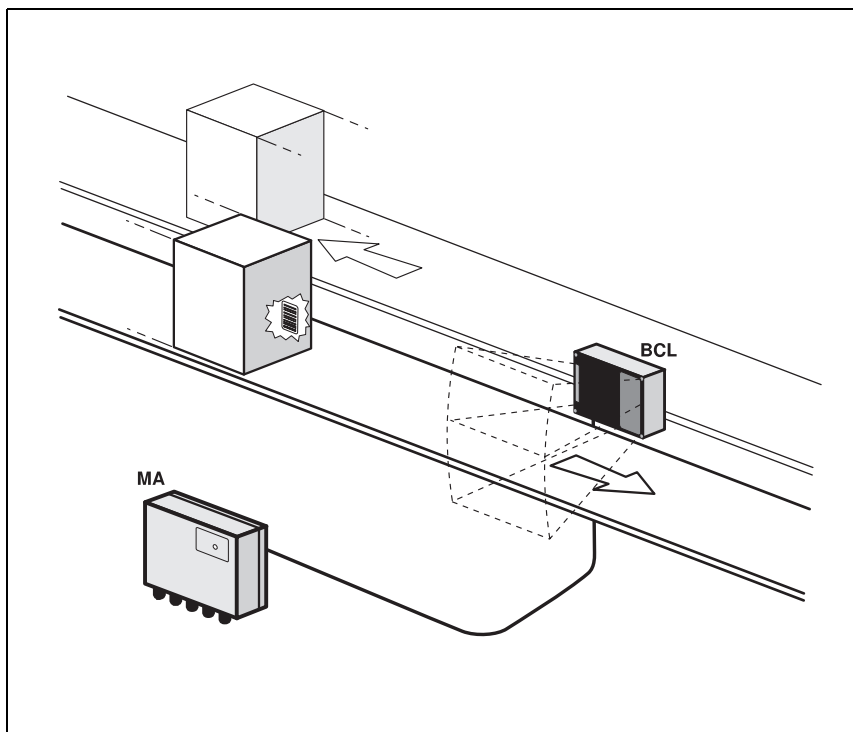


Figure 6.4: Application example "conveyor chain"

**6.3 Connection**



**Attention!**  
*Never open the device yourself, as this may compromise protection class IP 65.*

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

*Connection of the device and maintenance work while under voltage must only be carried out by a qualified electrician.*

*The power supply unit for the generation of the supply voltage for the BCL 31/32 and the respective connection units must have a secure electrical insulation through double insulation and safety transformers according to DIN VDE 0551 (IEC 742).*

*Be sure that the earthing conductor is connected correctly. Error-free operation is only guaranteed when the device is properly earthed.*

*If faults cannot be corrected, the device should be removed from operation and protected against possible use.*

**6.3.1 Connecting the BCL 31 (RS485)**

**BCL 31 Sub D pin assignments**

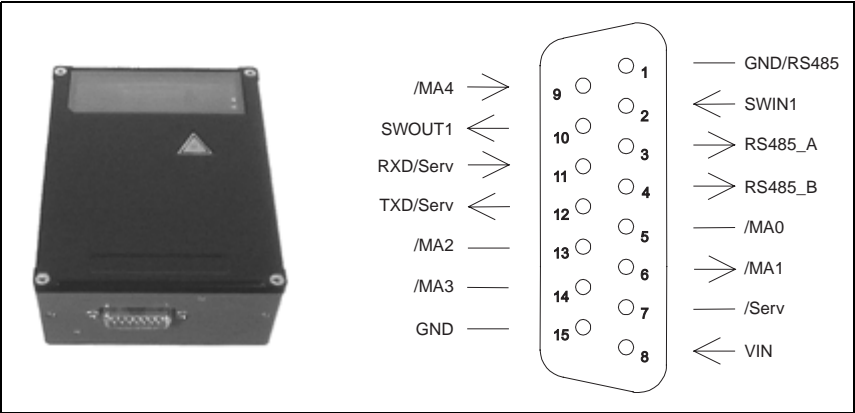


Figure 6.5: BCL 31 Sub D pin assignments



### ***Wiring description***

|               |           |   |
|---------------|-----------|---|
| <b>Pin 1</b>  | GND/RS485 | Reference ground RS 485                                 |
| <b>Pin 2</b>  | SWIN1     | Switching input 1 (+12 ... 30VDC)                       |
| <b>Pin 3</b>  | RS485_A   | Signal line A RS485                                     |
| <b>Pin 4</b>  | RS485_B   | Signal line B RS485                                     |
| <b>Pin 5</b>  | /MA0      | Address selection bit0                                  |
| <b>Pin 6</b>  | /MA1      | Address selection bit1                                  |
| <b>Pin 7</b>  | /Serv     | Bridge to pin 15: service operation via RS232 interface |
| <b>Pin 8</b>  | VIN       | supply voltage +10 ... 30VDC                            |
| <b>Pin 9</b>  | /MA4      | Address selection bit4                                  |
| <b>Pin 10</b> | SWOUT1    | Switching output 1 (max. 100mA)                         |
| <b>Pin 11</b> | RXD/Serv  | RXD signal, service interface RS 232                    |
| <b>Pin 12</b> | TXD/Serv  | TXD signal, service interface RS 232                    |
| <b>Pin 13</b> | /MA2      | Address selection bit2                                  |
| <b>Pin 14</b> | /MA3      | Address selection bit3                                  |
| <b>Pin 15</b> | GND       | Supply voltage 0VDC                                     |

Table 6.1: Connection description BCL 31

### ***Address setting***

When integrating the BCL 31 into a network, you have to set its address and create connections between the individual BCLs.



#### ***Notice!***

*The setting of the address takes place most conveniently together with a connection unit. In the connection units, there are rotary coding switches for address setting.*

Here it is described how you may set the address without a connection unit:

As an example, a BCL 31 with the address 5 is to be included into the multiNet plus with an MA 31 110 as the master.

Please connect through the following connection from slave to slave: VIN, GND, RS485\_A, RS485\_B, RS485 GND (shield).

To set the address (address 5), you connect the pins /MA0 and /MA2 with a jumper lead to the GND of the voltage supply. The address 0 is set if all /MAx pins are open.

The following table shows the possible settings:

| Address         | /MA0 | /MA1 | /MA2 | /MA3 | /MA4 |
|-----------------|------|------|------|------|------|
| 1               | GND  | open | open | open | open |
| 2               | open | GND  | open | open | open |
| 3               | GND  | GND  | open | open | open |
| 4               | open | open | GND  | open | open |
| 5               | GND  | open | GND  | open | open |
| ...             | ...  | ...  | ...  | ...  | ...  |
| 30              | GND  | GND  | GND  | GND  | open |
| Parameter Reset | GND  | GND  | GND  | GND  | GND  |

Table 6.2: Address setting BCL 31

As the table shows, you may set the addresses 1 to 30. Address 31 is used for the parameter reset. The address is always adopted according to the connection of the /MA inputs when the BCL is switched on, and remains saved while it remains switched on. A parameter reset loads the parameter set with the default settings into the BCL. With regard to the meaning of a parameter reset please refer also to "Parameter sets" on page 29.

**6.3.2 Connecting the BCL 32 (RS232)**

***BCL 32 Sub D pin assignments***

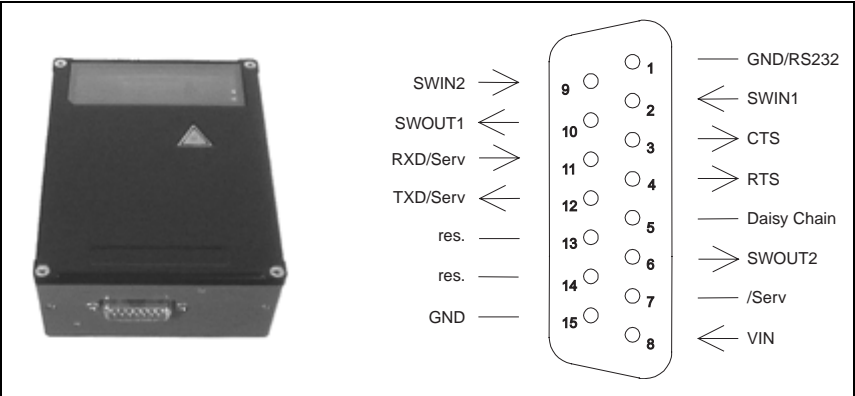


Figure 6.6: BCL 32 Sub D pin assignments

***Wiring description***

|               |             |   |
|---------------|-------------|---|
| <b>Pin 1</b>  | Res.        | Reserved                                  |
| <b>Pin 2</b>  | SWIN1       | Switching input 1 (+12 ... 30VDC)         |
| <b>Pin 3</b>  | CTS         | CTS signal, host interface RS 232         |
| <b>Pin 4</b>  | RTS         | RTS signal, host interface RS232          |
| <b>Pin 5</b>  | Daisy Chain | Bridge with pin 15: Daisy chain is active |
| <b>Pin 6</b>  | SWOUT2      | Switching output 2 (max. 100mA)           |
| <b>Pin 7</b>  | /Serv       | Bridge with pin 15: service operation     |
| <b>Pin 8</b>  | VIN         | supply voltage +10 ... 30VDC              |
| <b>Pin 9</b>  | SWIN2       | Switching input 2 (+12 ... 30VDC)         |
| <b>Pin 10</b> | SWOUT1      | Switching output 1 (max. 100mA)           |
| <b>Pin 11</b> | RXD/Serv    | RXD signal, service interface RS 232      |
| <b>Pin 12</b> | TXD/Serv    | TXD signal, service interface RS 232      |
| <b>Pin 13</b> | Res.        | Reserved                                  |
| <b>Pin 14</b> | Res.        | Reserved                                  |
| <b>Pin 15</b> | GND         | Supply voltage 0VDC                       |

Table 6.3: Wiring description BCL 32

### 6.3.3 Connection of switching inputs and outputs

The BCL 31 has one switching input and one switching output — the BCL 32 has two switching inputs and two switching outputs each. The connection of the switching inputs and outputs is carried out according to Figure 6.7:

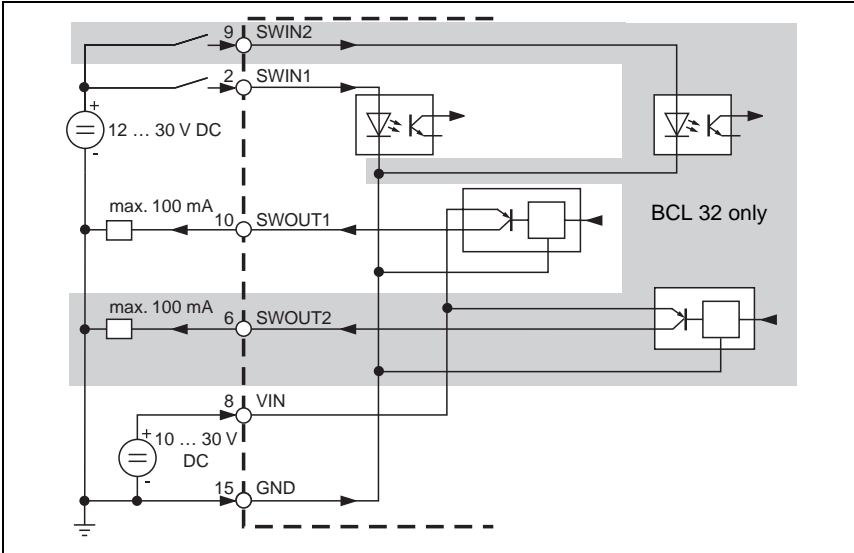


Figure 6.7: Connection diagram switching inputs and outputs BCL 31/32

#### Switching inputs

In the standard setting, you can trigger a reading action via the switching input connections SWIN1/SWIN2 by applying a voltage of 12 ... 30VDC between SWIN1 (pin 2) or SWIN2 (pin 9) and GND (pin 15).

#### Switching outputs

The switching output connections between SWOUT1 (pin 10) or SWOUT2 (pin 6) and GND (pin 15) are normally open. In the standard setting, SWOUT1 is closed in case of a reading error, SWOUT2 in the case of a detected code.

You can configure the switching inputs and outputs according to your needs, using the BCL Config program supplied.



#### Notice!

*You can configure the switching inputs and outputs according to your needs, using the program BCL Config supplied.*

### 6.3.4 Wire Lengths and Shielding

The following maximum lengths for wires and the type of shielding to be used must be observed:

| Connecting                   | Interface | Max. wire length | Shielding  |
|------------------------------|-----------|------------------|--|
| <b>BCL 31/32 - Service</b>   | RS 232    | 10 m             | absolutely required, shield meshing                  |
| <b>BCL 31/MA 2 - Host</b>    | RS 485    | 1200m            | absolutely required, flexible leads as twisted pairs |
| <b>Switching inputs 1+2</b>  |           | 10 m             | not necessary  |
| <b>Switching outputs 1+2</b> |           | 10 m             | not necessary  |

Table 6.4: Wire Lengths and Shielding

## 6.4 Disassembling, Packing, Disposing

### ***Repacking***

For later reuse, the device is to be packed so that it is protected against shocks and dampness. Optimal protection is achieved when using the original packaging.



### ***Notice!***

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

## 7 Commissioning

### 7.1 Measures to be performed prior to the first commissioning

- ✚ *Before commissioning, familiarise yourself with the operation and configuration of the device(s)!*
- ✚ *Before switching on, recheck all connections and ensure that they have been properly made.*

#### **Setting the device address**

The device addresses are set via address bits. For setting instructions refer to Chapter 6.3.1. If the BCL is connected to a connection unit, the device address can also be set conveniently via a rotary coding switch in the connection unit.

✚ *Set the device address to*

- **0**, if the BCL 31/32 will not be operated in a network,
- **1...30**, if several BCL 31 are operated in a network. Each multiNet plus network device must have a different device address assigned to it.
- **31**, if you want to carry out a parameter reset. The parameters set with the default settings will then be loaded into the BCL when it is switched off and on.



#### **Attention!**

*A parameter reset overwrites all customer-specific settings. Make sure that you only set the address 31 if you want to work with the default settings and if you have saved your customer-specific settings e.g., using the "BCLConfig" program.*



#### **Notice!**

*From the hardware address (device address > 0), the BCL 31 detects that networking is required. With the BCL 31/32, it is possible to perform a reset using the software and the online commands. In addition, it is possible to perform a reset by switching off the supply voltage. The parameters are not lost as a result of the reset. For information on the reset commands, see Chapter 9. The LED remains dark during a reset; the green LED illuminates when the device is ready for operation.*

### 7.2 Function Test

#### **"Power On" test**

After connecting the operating voltage, the BCL 31/32 carry out an automatic "Power On" function test. Subsequently, the green LED lights up in the optics window of the BCL 31/32.

#### **Interface**

Proper function of the interface can be tested easiest in service operation using the service interface with the "BCLConfig" programming software and a notebook computer. For order numbers, see table 5.1 on page 14.

### ***Online commands***

Using the 'Online' commands, the important device functions can be checked, e.g. proper functioning of the laser.

### ***Problems***

Should problems occur during device commissioning, refer first to Chapter 8.2. Should a problem persist after checking all electrical connections and settings on the devices and host, please contact a Leuze service office near you (see the back page of this operating manual).

## **7.3 Setting the Parameters**

You have now commissioned the BCL. Usually, you will have to configure it before you can use it. Using the parameter options made available by the BCL, you may configure the BCL to suit your individual area of application. For instructions regarding the various setting options refer to Chapter 9 or to the online help of the BCLConfig program.

In order to operate the BCL, it is typically sufficient to set code type and code length in accordance with the bar codes that are to be read. However, depending on the application, you will additionally activate the autoReflAct function and configure the switching inputs and outputs according to your requirements.

The setting of code type and code length is usually accomplished by using the program BCLConfig, see "Installing the "BCLConfig"-software" on page 33.

To understand what is happening during the parameter setting, the following Chapter 7.3.1 briefly explains the various parameter sets.

The setting of the parameter sets then takes place in the operating mode "service", which is described in Chapter 7.3.2.

### **7.3.1 Parameter sets**

In the BCL 31/32, three different parameter sets are administered:

- parameter set with the default settings in the ROM
- current parameter set in the EEPROM
- working copy of the current parameter set in the RAM

Before a parameter set is loaded into the memory of the BCL 31/32 processor, the validity of the parameter set is verified using checksums.

#### ***Factory default parameter set***

This parameter set contains the default settings made ex works for all BCL 31/32 parameters. It is permanently stored in the ROM of the BCL 31/32. The parameter set with the default settings is loaded into the memory of the BCL 31/32

- the first time the device is commissioned after delivery,
- following the command "Factory Default" in the parameterisation program,
- if the checksums of the current parameter set are invalid.

***Current parameter set***

In this parameter set, the current settings for all device parameters are stored. When the BCL 31/32 is in operation, the parameter set is stored in the EEPROM of the BCL 31/32. The current set can be stored:

- by copying a valid parameter set from the host computer
- by means of an off-line setup with the PC setup program BCLConfig

The current parameter set is loaded into the memory of the BCL 31/32

- each time the supply voltage is connected
- following a software reset

The current parameter set is overwritten by the parameter set with the default settings:

- by a parameter reset, see page 28

### **7.3.2 Service Operating Mode**

Setting the required parameters is carried out easiest in the "service" operating mode. The operating mode "service" makes the following defined operating parameters available on a separately wired RS232 interface, independent from the BCL's configuration for standard operation:

- transfer rate 9600 baud
- no parity
- 8 data bits
- 1 stop bit
- prefix: STX
- postfix: CR, LF

***Service interface active***

The service interface is activated via a bridge between the pins 7 and 15 on the 15-pin sub-D connector. If the BCL 31/32 is operated with a connection unit, the service interface is activated through a switch in the connection unit.

***Connection***

You can connect a PC or terminal to the BCL 31/32 via the serial interface and configure the BCL 31/32 through this connection. For this, you need a crossed RS 232 connection cable (null modem cable) that provides the connections RxD, TxD and GND. A hardware handshake via RTC, CTS is not supported at the service interface.

If the BCL is connected to a connection unit, you can use the 9-pin sub-D service connector in the connection unit. For the respective connection specifications please refer to the data sheet of the connection unit.



***Service Operating Mode***

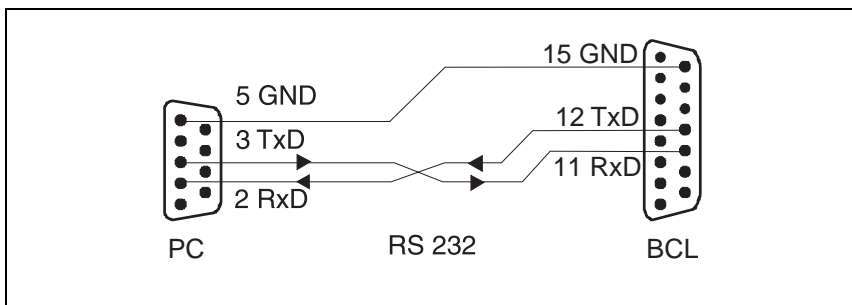


Figure 7.1: Connecting the service interface to a PC or terminal

## 8 Operation

### 8.1 Display Elements

On the BCL 31/32 there is an LED. It signals that the BCL is ready for operation.

### 8.2 Error Handling

Error, warning and status messages of the BCL 31/32 are transmitted via the host interface only.

#### ***Types of errors***

Errors are divided up into the following types:

- Warnings
- Serious errors

#### ***Warnings***

Warnings indicate temporary operating faults which do not effect the proper functioning of the device.

#### ***Serious errors***

Serious errors impair the proper functioning of the device. The device must be re-initialised.

#### ***Troubleshooting***

Isolated warnings can be ignored, since the BCL 31/32 will continue to function properly.

Following a serious error, you should re-initialise the BCL. It will then usually again function properly. If a hardware problem is present, the BCL 31/32 will not re-initialise.

Warnings and errors which occur frequently can be corrected easiest using the BCLConfig software.

If you cannot correct faults and errors with the software, please contact a Leuze electronic sales office or service facility. For addresses, please refer to the back page of this operating manual.

## 9 Communicating with the Device

Device parameters can be set using the automatic configuration "autoConfig", via commands at the serial interface or using the easy-to-use "BCLConfig 3.0" control software.

### 9.1 Installing the "BCLConfig"-software

- ↳ Insert the installation diskette into your disk drive.
- ↳ Call up the installation file (e.g. Setup.exe).

The following window appears:

#### **Installation window**

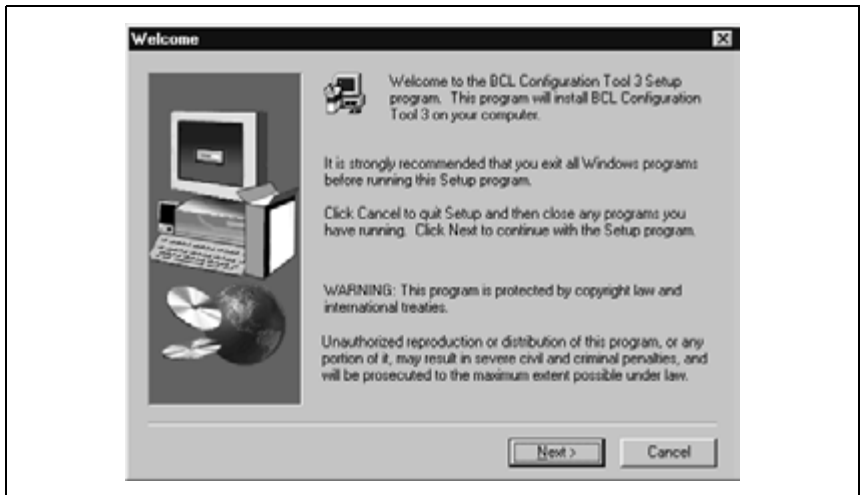


Figure 9.1: Installation window

- ↳ Confirm the following licence agreement and select the installation path in the following window:

### *Installation directory*

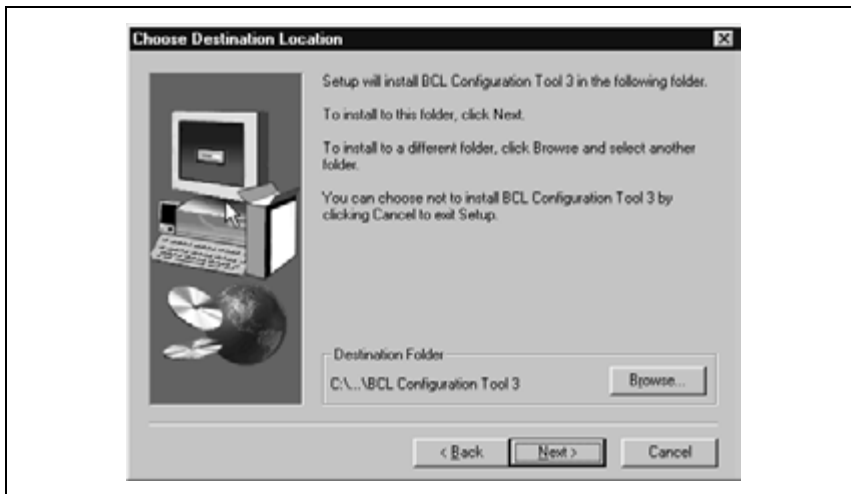


Figure 9.2: Installation directory

↪ *Confirm your entry with Continue, then follow the installation routine.*

For further information, please see the online help for the "BCLConfig" software.

## 9.2 Overview of Commands and Parameters

Online commands can be used to send commands directly to the device for control and configuration.

For this, the BCL 31/ 32 has to be connected to a host or service computer via the serial interface. The commands can be sent either via the host or the service interface.

For information on the transmission protocol, please see Chapter 7.3.2.

With the commands, you can

### **Online commands**

- Control/decode reading gate.
- Read/write/copy parameters.
- Carry out an automatic configuration.
- Teach/set reference code.
- Call up error messages.
- Call up statistical device information.
- Carry out a software reset in order to re-initialise the device.

### **Syntax**

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

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

Example:

Command '**CA**': autoConfig function

Parameter '**+**': Activation

Transmitted is: '**CA+**'

### **Notation**

Commands, command parameters and returned data are enclosed between single quotation marks ' '.

Most "online" commands are acknowledged by the BCL 31/32 and any requested data returned. For commands that are not acknowledged, command execution can be observed or monitored directly on the device.

9.2.1 General 'Online' Commands

*Software version number*

| Command         | 'V'   |
|-----------------|---|
| Description     | Requests device version information   |
| Parameter       | no  |
| Acknowledgement | <b>'BCL 3x V 01.00 08.01.1999'</b><br>The device type appears in the first line followed by the devices version number and date. The data which are actually displayed may vary from the values given here. |



**Notice!**

*This command allows you to check whether a host or service computer is correctly connected and configured. If you do not receive an acknowledgement, please check interface connections, protocol and service switches.*

*Software reset*

| Command         | 'H'  |
|-----------------|--|
| Description     | Carries out a software reset. The device is restarted and reinitialised, leaving it in the same state as when the supply voltage is switched on. |
| Parameter       | no   |
| Acknowledgement | <b>'S'</b> (start signal)  |

***autoConfig***

| Command         | 'CA'  |
|-----------------|---|
| Description     | Activates or deactivates the 'autoConfig' function. Certain label reading parameters are programmed automatically in the setup by the labels which are read while the 'autoConfig' function is active.  |
| Parameter       | '+' activates 'autoConfig'<br>/ rejects the last code read<br>- deactivates 'autoConfig' and stores the decoded data in the current parameter set.  |
| Acknowledgement | <b>'CSx'</b><br><b>x:</b> Status<br>'0' valid 'CA' command<br>'1' invalid command<br>'2' autoConfig could not be activated<br>'3' autoConfig could not be deactivated<br>'4' Result could not be deleted  |
| Description     | <b>'xx yy zzzzzz'</b><br><b>xx:</b> Code type of the read code<br>'01' 2/5 Interleaved<br>'02' Code 39<br>'06' UPC (A, E)<br>'07' EAN<br>'08' Code 128, EAN 128<br>'10' EAN/UPC<br>'11' Codabar<br><b>yy</b> Number of digits of the code detected<br><b>zzzzzz</b> Contents of the decoded label. The ↑ appears if the label was not correctly read. |

**Manual definition of the reference code**

| Command         | RS  |
|-----------------|---|
| Description     | This command can be used to define a new reference code in the BCL 2x by means of direct entry via the serial interface. The data are saved in the parameter set according to their input under reference code 1 through 9 and stored in the working buffer for direct further processing.  |
| Parameter       | <b>'RSyvxzzzzzzzz'</b><br><b>y, v, x</b> and <b>z</b> are placeholders (variables) for the actual input.<br><b>y:</b> def. reference code No<br><b>'1'</b> (Code 1)<br><b>'2'</b> (Code 2) ...<br><b>'9'</b> (Code 9)<br><b>v</b> Storage location for the reference code:<br><b>'0'</b> RAM+EEPROM<br><b>'3'</b> only RAM<br><b>xx</b> def. Code type (see Command 'CA')<br><b>z</b> def. Code information (1 ... 63 characters) |
| Acknowledgement | <b>'RSx'</b><br><b>x:</b> Status<br><b>'0'</b> valid 'Rx' command<br><b>'1'</b> invalid command<br><b>'2'</b> insufficient memory for reference code<br><b>'3'</b> reference code has not been saved<br><b>'4'</b> reference code invalid   |
| Example         | Input = 'RS130678654331' (Code 1 (1), RAM only (3), UPC (06), code information  |



**Teach-In**

| Command         | 'RT'  |
|-----------------|---|
| Description     | This command enables a reference code to be defined quickly by reading an example label.  |
| Parameter       | <b>'RTy'</b><br>Function<br>'1' defines reference code 1<br>'2' defines reference code 2 ...<br>'9' defines reference code 9<br>'+' activates the definition of reference code 1 up to the value of<br>Parameter no_of_labels<br>- Exit the Teach-In process  |
| Acknowledgement | The BCL first responds with the command <b>'RS'</b> and corresponding status (see Command RS). After a barcode has been read, it sends the result in the following format:<br><b>'RCyvxzzzzz'</b><br><b>y</b> , <b>v</b> , <b>x</b> and <b>z</b> are placeholders (variables) for the actual input.<br><b>y</b> : def. reference code No<br>'1' (Code 1) ...<br>'9' (Code 9)<br><b>v</b> : Storage location for reference code<br>'0' RAM+EEPROM<br>'3' only RAM<br><b>xx</b> def. Code type (see Command 'CA')<br><b>z</b> def. Code information (1 ... 63 characters) |



**Notice!**

*With this function, only code types are recognised that are identified using the autoConfig-function or which were set in the setup.*

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

*Reading a reference code*

| Command         | 'RR'  |
|-----------------|---|
| Description     | The command reads out the reference code defined in the BCL. If no parameters are specified, all defined codes are output.  |
| Parameter       | <Reference code number><br>'1' '9' value range of reference codes 1 to 9  |
| Acknowledgement | If no reference codes are defined, the BCL responds with the <b>'RS'</b> command and corresponding status (see Command RS).For valid codes, the output corresponds to the following format:<br><b>RCyvxzzzzzz</b><br><b>y</b> , <b>v</b> , <b>x</b> and <b>z</b> are placeholders (variables) for the actual input.<br><b>y</b> : def. reference code No<br><b>'1'</b> (Code 1) ...<br><b>'9'</b> (Code 9)<br><b>v</b> : Storage location for reference code<br><b>'0'</b> RAM+EEPROM<br><b>'3'</b> only RAM<br><b>xx</b> def. Code type (see Command 'CA')<br><b>z</b> def. Code information (1 ... 63 characters) |

9.2.2 'Online' Commands for System Control

*Activate sensor input 1*

| Command         | '+'                             |
|-----------------|---------------------------------|
| Description     | The command activates decoding. |
| Parameter       | no                              |
| Acknowledgement | no                              |

*Deactivate sensor input 1*

| Command         | '-'                               |
|-----------------|-----------------------------------|
| Description     | The command deactivates decoding. |
| Parameter       | no                                |
| Acknowledgement | no                                |

***Activate sensor input 2***

|                 |   |
|-----------------|---|
| <b>Command</b>  | <b>''</b>   |
| Description     | The command activates the definition of reference code 1. |
| Parameter       | no  |
| Acknowledgement | no  |

***Deactivate sensor input 2***

|                 |   |
|-----------------|---|
| <b>Command</b>  | <b>''</b>   |
| Description     | The command deactivates the definition of reference code 1. |
| Parameter       | no  |
| Acknowledgement | no  |

***Activate switching output***

|                 |   |
|-----------------|---|
| <b>Command</b>  | <b>'OA'</b>   |
| Description     | The command activates a selected switching output.  |
| Parameter       | 'OA $x$ ': Activate switching output<br>$x$ : Switching output No<br>'1' (Output 1)<br>'2' (Output 2) |
| Acknowledgement | no  |

***Deactivate switching output***

|                 |   |
|-----------------|---|
| <b>Command</b>  | <b>'OD'</b>   |
| Description     | The command deactivates a selected switching output.  |
| Parameter       | 'OD $x$ ': Deactivate switching output<br>$x$ : Switching output No<br>'1' (Output 1)<br>'2' (Output 2) |
| Acknowledgement | no  |

### 9.2.3 'Online' Commands for System Checking

#### *Diagnosis laser*

| Command         | 'DL'  |
|-----------------|---|
| Description     | The command controls or tests the laser diode.  |
| Parameter       | '+' switches on the laser diode<br>'-' switches off the laser diode<br>'C' outputs the laser current                      |
| Acknowledgement | No acknowledgment occurs for parameters '+' and '-'.<br>For parameter 'C':<br>'DLCxxx'<br>xxx is the laser current in mA. |

#### *Diagnosis motor*

| Command         | 'DM'   |
|-----------------|--|
| Description     | The command requests the operational data of the motor. In addition, the motor can be switched on and off  |
| Parameter       | 'S' Request rotary frequency of the motor. (message from host)<br>'Cxxxxx' Transmission of the motor RPM as a decimal number with 5 digits. (Message to host)                                    |
| Acknowledgement | 'Sxxxxx'   |
| Description     | xxxxx is the current rotary frequency of the motor in revolutions per minute.<br>In case of malfunction, the BCL responds with the command 'DS' and the corresponding status (see Command 'DS'). |

#### *Status message for diagnosis commands*

| Command     | 'DS'   |
|-------------|--|
| Description | The command serves as an acknowledgement message to the host. The command contains as a two-digit decimal number an acknowledgement status which provides information about the processing of the requested diagnosis function.  |
| Parameter   | '0' valid processing<br>'1' invalid diagnostic message<br>'2' message too long<br>'3' invalid message parameter of the laser diagnosis command<br>'4' invalid length of the laser diagnosis message<br>'5' invalid message parameter of the motor diagnosis command<br>'6' invalid length of the motor diagnosis message |

### 9.2.4 'Online' command for querying error messages

#### *Query memory error messages*

| Command         | 'ER'   |
|-----------------|--|
| Description     | The command queries the buffer memory of the error messages.   |
| Parameter       | no   |
| Acknowledgement | 1st line: <b>New: cc</b><br>2nd through 11th lines:<br>'- <b>00.000</b> ' if no error has occurred<br>' <b>F tt.fff</b> ' if a fatal error has occurred<br>' <b>E tt.fff</b> ' if an error has occurred<br>' <b>C tt.fff</b> ' if a critical warning has occurred<br>' <b>W tt.fff</b> ' if a warning has occurred |
| Description     | <b>cc:</b> number of (new) errors in the error buffer<br><b>tt:</b> task/ function number<br><b>fff:</b> error number<br>Upon output, the counter for the number of errors in the error buffer is deleted, but not the buffer itself!  |



#### **Notice!**

*If an error occurs, note the error number and contact your local Leuze service organisation. The addresses can be found on the back page of this operating manual.*

9.2.5 'Online' Commands for Parameter Set Operations

**Definitions**

- **<BCC type>** type of the checksum calculation  
'0': no checksum  
'3': XOR checksum (mode 3)
- **<PS type>** type of the parameter set  
'0': current parameter set (data stored in the EEPROM non-volatile)  
'1': reserved  
'2': standard parameter set (not changeable)  
'3': operating values (data in the RAM, will be lost after reset)
- **<Status>** mode of the parameter processing  
'0': does not perform a reset following the write operation; no other parameters follow.  
'1': does not perform a reset following the write operation; other parameters follow.  
'2': subsequently performs a reset, no other parameters follow.
- **<Start address>** Relative address of the parameter within the parameter set  
valid values from '000' to '893'
- **<Para0L> <Para0H>... <Para122L> <Para122H>:**  
Parameter-set data of the message. The sequence of the data is arranged identically to the BCL, i.e. when a word is transmitted, first the low byte is sent then the high byte. The parameter-set data are converted for transmission from HEX format to a 2-byte-ASCII format. In the conversion two ASCII characters - representing the lower and higher nipples - are created for each HEX value.  
Example:

| Decimal | HEX    | Transmission                      |
|---------|--------|-----------------------------------|
| 4660    | 0x1234 | '1' '2' '3' '4' = 31h 32h 33h 34h |

- Para0H = 31h, Para0L = 32h, Para1H = 33h, Para1L = 34h  
Taking into consideration the maximum message length and the remaining command parameters, a maximum of 123 bytes of parameter data (246 bytes of message data) can be transmitted at one time.  
valid values: '0' ... '9', 'A' ... 'F'
- **<Acknowledgement>:**  
Acknowledgement of the transmitted message  
'0' valid transmission  
'1' invalid message  
'2' invalid length of message  
'3' invalid block check type  
'4' invalid block check checksum  
'5' invalid data length  
'6' invalid message data  
'7' invalid start address  
'8' invalid parameter set  
'9' invalid parameter type

***Copy parameter set***

| Command         | 'PC'   |
|-----------------|--|
| Description     | The command copies complete parameter sets.  |
| Parameter       | <b>'03'</b> copy parameters from the EEPROM into the RAM and initialise all associated functions<br><b>'20'</b> copy standard parameters from the FLASH into the EEPROM <b>and</b> RAM and initialise all relevant functions<br><b>'30'</b> copy parameters from the RAM into the EEPROM   |
| Acknowledgement | <b>'PSx'</b><br><b>x:</b> Status<br><b>'0'</b> valid transmission<br><b>'1'</b> invalid message<br><b>'2'</b> invalid message length<br><b>'3'</b> invalid block check type<br><b>'4'</b> invalid block check checksum<br><b>'5'</b> invalid data length<br><b>'6'</b> invalid message data<br><b>'7'</b> invalid start address<br><b>'8'</b> invalid parameter set<br><b>'9'</b> invalid parameter type |

***Request parameter set from the BCL***

| Command         | 'PR'   |
|-----------------|--|
| Description     | The command requests parameter data from the BCL. The parameter <PS-Type> indicates from which parameter set the data are to be transmitted.   |
| Parameter       | <BCC type> <PS type> <Start address> <Data length>   |
| Acknowledgement | <b>'PSx'</b><br><b>x:</b> Status<br><b>'0'</b> valid transmission<br><b>'1'</b> invalid message<br><b>'2'</b> invalid message length<br><b>'3'</b> invalid block check type<br><b>'4'</b> invalid block check checksum<br><b>'5'</b> invalid data length<br><b>'6'</b> invalid message data<br><b>'7'</b> invalid start address<br><b>'8'</b> invalid parameter set<br><b>'9'</b> invalid parameter type |

**Acknowledge parameter message**

| Command     | 'PS'  |
|-------------|---|
| Description | The command acknowledges the received message and delivers an acknowledgement status which indicates whether the message was valid or invalid.  |
| Parameter   | <p><b>'PSx'</b></p> <p><b>x:</b>   Status</p> <p>      '<b>0</b>' valid transmission</p> <p>      '<b>1</b>' invalid message</p> <p>      '<b>2</b>' invalid message length</p> <p>      '<b>3</b>' invalid block check type</p> <p>      '<b>4</b>' invalid block check checksum</p> <p>      '<b>5</b>' invalid data length</p> <p>      '<b>6</b>' invalid message data</p> <p>      '<b>7</b>' invalid start address</p> <p>      '<b>8</b>' invalid parameter set</p> <p>      '<b>9</b>' invalid parameter type</p> |

**Transmit parameters**

| Command         | 'PT'  |
|-----------------|---|
| Description     | The command transmits parameter data from the specified address and stores them in an intermediate buffer. If the status indicates that additional messages follow, they are also stored in the intermediate buffer before being stored under the appropriate parameter-set type in the EEPROM. The transmission can optionally take place with a block-check test of the message data.   |
| Parameter       | <BCC type> <PS type> <Status> <Start address> <Para0L><br><Para0H> [... <Para122L>][<BCC>]  |
| Acknowledgement | <p><b>'PSx'</b></p> <p><b>x:</b>   Status</p> <p>      '<b>0</b>' valid transmission</p> <p>      '<b>1</b>' invalid message</p> <p>      '<b>2</b>' invalid message length</p> <p>      '<b>3</b>' invalid block check type</p> <p>      '<b>4</b>' invalid block check checksum</p> <p>      '<b>5</b>' invalid data length</p> <p>      '<b>6</b>' invalid message data</p> <p>      '<b>7</b>' invalid start address</p> <p>      '<b>8</b>' invalid parameter set</p> <p>      '<b>9</b>' invalid parameter type</p> |



## 10 Maintenance

### 10.1 General Maintenance Information

Usually, the barcode reader BCL 31/32 does not require any maintenance by the operator.

#### ***Cleaning***

Should it become soiled, clean the glass window of the BCL 31/32 with a soft cloth.



#### ***Notice!***

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

### 10.2 Repairs, Servicing

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

↳ *Contact your Leuze distributor or service organisation should repairs be required.  
For addresses, please refer to the back page of this operating manual.*







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