OMNI Bar Code Scanner BCL 90 CAX

Technical Description

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1 Device Description

1.1 The Function of the Device

The BCL detects bar codes using a folded scan line (producing a cross) and decodes them. The BCL transmits the data via the serial host interface to a host/PC for further processing. Figure 1.1 gives on overview of the BCL's functions

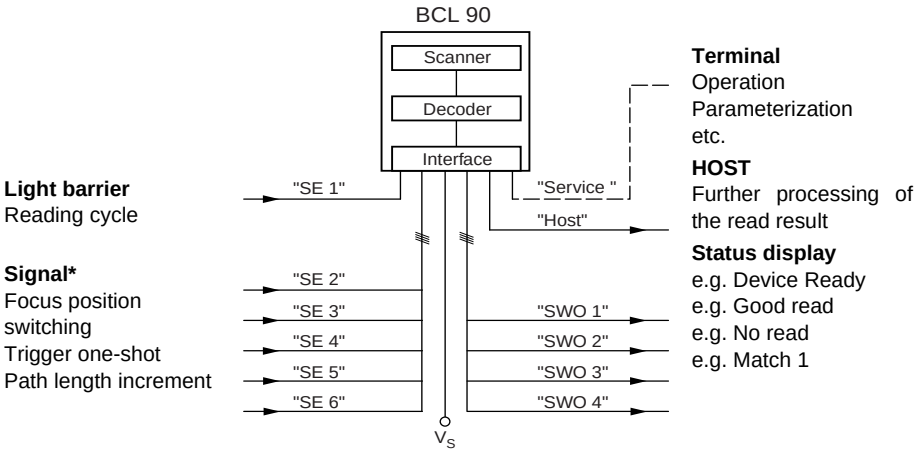


Figure 1.1: Block diagram: functions of the BCL

The BCL offers two decoders:

- the CRT decoder for decoding bar codes with small code heights, of bar codes with damaged or dirty print and for reading extremely tilted bar codes (azimuth angle)
- the tried-and-tested standard decoder of the BCL series

The BCL derives from the read processes useful diagnosis data which can be transferred to the host, and also contains operation data that can be called up. The read quality can be checked in the operating mode percentage evaluation.

The BCL needs a suitable trigger to start a read process as soon as an object is in the reading field. A time window ("scan gate time") for the read process is then opened in the BCL. In the basic setting, triggering takes place through an external reading cycle sensor. Alternatively, free-oscillating operation or a command via the host interface can also serve as triggers.

Four LED status indicators provide optical information on the current operation status.

In the case of external triggering by a sensor, the switching input "SE 1" tells the BCL when to start the read process. As an alternative to the auto-focus function, the five switching inputs "SE 2 … SE 6" switch the focus position in response to events (event-driven). The inputs "SE 5" and "SE 6" can also be assigned special functions. The four switching outputs

"SWO 1 … SWO 4" can be assigned various output functions for result status and actuate external devices, e.g. a PLC.

The BCL is operated and configured on the user interface of the PC software BCL-Config through the terminal interface (auxiliary interface) or using command strings through the host interface/service interface.
System, warning and error messages provide assistance in set-up/troubleshooting during commissioning and read operation.

1.2 Scope of Delivery

The following items are included in the **BCL device package**:

- an information sheet (device information) with electrical connection diagram and quick-start
- an extra set of laser warning signs (self-adhesive) of Class 2 in German/American English and French/American English

depending on the **number of devices ordered** one **set of technical documentation** in one or several copies, comprised of:

- the BCL 90 operating manual (in German or English)
- one set of DOS-formatted diskettes (3.5 inch) with the PC software BCL-Config for Windows.

Chapter 3, on page 19 gives an overview of available accessories for the device, electrical connections and mounting as well as connection modules and cables.

1.3 Device Models

The BCL 90 CAX is available in the following versions:

Model	Order number	Scan technology	Heater
BCL 90 CAX M 100	500 36 660	Compact OMNI bar code scanner	no
BCL 90 CAX M 100 H	500 36 661	Compact OMNI bar code scanner	yes

Table 1.1: BCL versions

1.4 System Requirements

BCL without heater

The following are required for commissioning and operating the BCL:

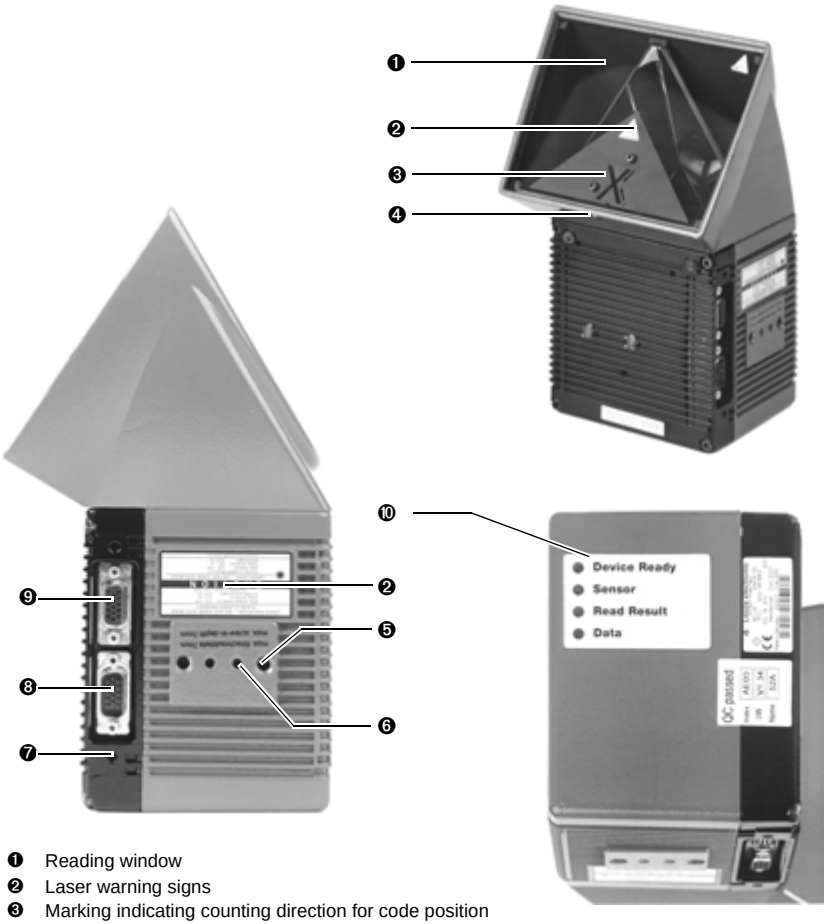
1. A modular connector unit MA 90 for power supply and wiring-up of data and function interfaces.
   - or -
   Alternatively, an external power supply unit with an output voltage of DC +18 … +30 V acc. to IEC 742 (functional low voltage) and at least **20 W** output power.
   Connecting cable No. 500 35 321 (3 m) with 15-pin D-Sub-HD plug and open cable end for connecting the BCL to the external power supply unit.
2. The operating voltage/output power is as follows:
   - MA 90: DC +18 … +30 V (acc. to IEC 742), at least 20 W
3. Appropriate connecting cables KB 090-...
4. With external read clocking via switching input "SE 1": suitable reading cycle sensor to signal object with bar code, e.g. retro-reflective photoelectric sensor.
5. With tracking (assignment of bar code to objects with small object distances): suitable incremental encoder
6. With detection of object distance via switching inputs "SE 2 … SE 6": suitable sensors for multi-step focus position switching, e.g. retro-reflective photoelectric sensors.
7. PC with Windows®9x/ME or WindowsNT®/2000 and serial interface ("COM x" port).
8. RS-232 data transmission cable with two 9-pin D-Sub sockets for connecting PC to service interface of BCL in MA 90.
   Pin 2 (RxD) and Pin 3 (TxD) are crossed.

BCL with heater

The following are required for commissioning and operating the BCL:

1. A modular connector unit MA 90 for power supply and wiring-up of data and function interfaces.
   - or -
   Alternatively, an external power supply unit with an output voltage of DC 24 V +20%/ -10% acc. to IEC 742 (functional low voltage) and at least 100 W output power.
   Connecting cable No. 500 35 321 (3 m) with 15-pin D-Sub-HD plug and open cable end for connecting the BCL to the external power supply unit.
2. The operating voltage/output power is as follows:
   - MA 90: DC 24 V + 20% / – 10% (acc. to IEC 742), at least 100 W
3. From point 4 onwards: identical to BCL without heater

1.5 View of the Device



❶ Reading window
❷ Laser warning signs
❸ Marking indicating counting direction for code position
❹ Scanner reference point
❺ Fastening thread M 6, 7 mm deep, for mounting
❻ Locating hole, Ø 3,6 mm, 6 mm deep
❼ Fastening thread M 4, 10 mm deep, for plug cover
❽ "Host/Term" port, D-Sub-HD plug, 15-pin
❾ "I/O" port, D-Sub-HD socket, 15-pin
❿ LED function indicators

Figure 1.2: Design features of BCL 90 CAX …

2 Technical Data

2.1 Technical Data

2.1.1 Data Sheet for BCL 90 CAX M 100

Model	**BCL 90 CAX M 100** (Medium Density)
Type	**Compact OMNI bar code scanner without heater**
Reading window	Frontal
Laser diode (wavelength)	Red light (λ= 650 nm)
Service life of the laser diode	MTBF 20,000 h
Laser class of the device	Class 2 (acc. to DIN EN 60825-1), safety disconnection of the laser diode after 10 min [1)]
Focus control	Autofocus, alternatively event-driven focus position switching
Number of distance configurations	max. 8
Focus adjustment time	≤ 20 ms (typical)
Focus trigger	Switching inputs "SE 2… SE 6" / data interface / timer
Scanning/decoding frequency	600 … 1200 Hz
Resolution	0.3 … 1.0 mm
Reading fields	See reading field diagram from page 13 onwards
Bar code print contrast (PCS)	≥ 60%
External light tolerance	2000 lx (on bar code)
Number of bar codes per scan	1 … 12 (standard decoder), 1 … 5 (CRT decoder)
Number of bar codes per scan gate time [2)]	1 … 50 (auto-discriminating)
Types of bar code (CRT decoder)	Code 39, Code 128, Code 93, Codabar, EAN, EAN 128, UPC, 2/5 Interleaved
Bar code length	max. 50 characters (max. 600 characters for all bar codes per scan gate time taken together)
Print ratio	2:1 … 3:1
Number of multiple readings	1 … 99
Optical indicators	4 LED function indicators

Model	**BCL 90 CAX M 100** (Medium Density)
Read clocking	Switching input "SE 1"/ free-oscillating / serial interface / MSP/ TCP
Data interface "Host"	RS 232 or RS 422/485, adjustable data output format
Data transmission rate	300 … 57 600 bits/ s
Protocols	Leuze standard, Leuze network multiNet plus and 3964(R)
Physical configurations	Stand alone, network (bus)
Data interface "Service"	RS 232, 9600 baud, 8 data bits, no parity, 1 stop bit, predefined output format
Function switching inputs	6 ("SE 1 … SE 6") - Opto-decoupled, U_{emax}= +30 V, polarity-proof, can be connected to p-n-p outputs - "SE 1" (reading cycle): internal delay time max. 30 ms, reduced max 2 … 6 ms - "SE 2 … SE 6": focus position switching, SE 6: function selectable, int. delay time max. 30 ms
Function switching outputs	4 ("SWO 1" … "SWO 4") - p-n-p, short-circuit proof, adjustable pulse duration (static, resolution 10 … 990 ms or 100 … 9900 ms) - Function of the result status indication selectable
Electrical connections	1 x 15-pin D-Sub-HD device plug, 1 x 15-pin D-Sub-HD device socket
Operating voltage/ power consumption	DC 18 … 30 V / typically 9 W, max. 16 W
Housing	Aluminium die-cast, no silicone used in the exterior materials
Type of protection/ safety class	IP 65 [3] (acc. to DIN 40 050) / class 3 (acc. to VDE 0106/ IEC 1010-1)
EMC / vibration / shock testing	Acc. to EN 50081-1, 50082-2 / acc. to IEC 68-2-6 Test FC / acc. to IEC 68-2-27 Test EA
Weight	approx. 2 kg
Operating ambient/ storage temperature	0 … +40°C/ –20 … +70°C
Max. relative air humidity	90%, non-condensing

1) In reading mode with clocking types "Switching input Sensor" and "Serial interface"

2) Scan gate time: time window of code evaluation generated internally through the reading cycle

3) Including plug cover or plug cover with parameter memory

Table 2.1: Technical specifications of BCL 90 CAX M 100

2.1.2 Data Sheet for BCL 90 CAX M 100 H

Technical data identical to BCL 90 CAX M 100, except for the following differences:

Model	**BCL 90 CAX M 100 H**
Type	**Compact OMNI bar code scanner with heater**
Switch-on behaviour/ temperature variation	See Technical Description BCL 90
Switch-on delay	35 … 40 min (with DC 24 V and min. ambient temperature of -30°C)
Operating voltage	DC 24 V +20% / –0%
Power consumption	Typically 75 W, max. 90 W
Required core cross-section	At least 0.75 mm² (for operating voltage supply)
Weight	approx. 2 kg
Operating ambient/ storage temperature	–30 … +35 °C / –20 … +70 °C

Table 2.2: Technical specifications of BCL 90 CAX M 100 H

2.2 Dimensioned Drawing of BCL 90 CAX …

BCL 90 CAX M 100
BCL 90 CAX M 100 H

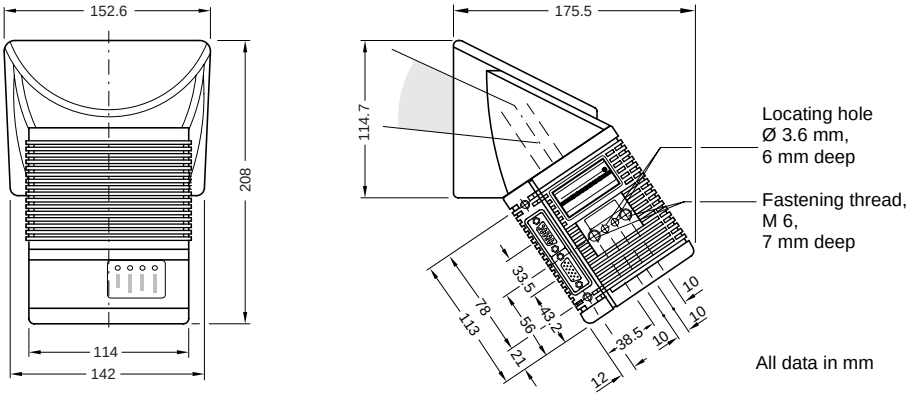


Figure 2.1: Dimensions of BCL 90 CAX …

2.3 Optical Data (Specification Diagrams)

2.3.1 Reading Conditions for All Diagrams

Test code	Code 128
Print contrast	> 90%
Tilt	± 45°
External light	< 2000 lx
Good Read rate	> 75%

Table 2.3: Reading conditions for specification diagrams

Note!

Min. and max. read distances are measured radially from the BCL!

2.3.2 Overview of Diagrams

Model	Diagrams	Page
BCL 90 CAX M 100/M 100 H:	Reading field height in relation to read distance and resolution	page 13
	Characteristics for scanning frequency in relation to read distance and resolution	page 14

2.3.3 Reading performance data for compact OMNI bar code scanner

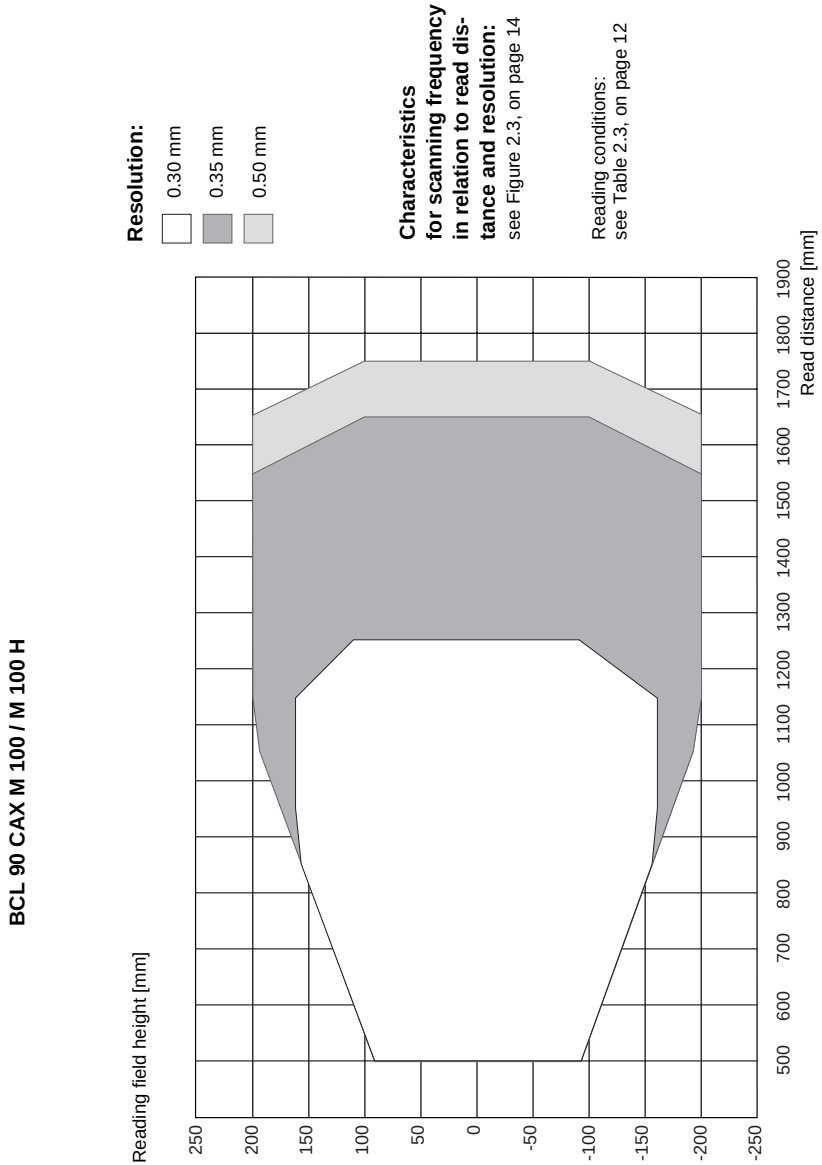


Figure 2.2: Reading field height in relation to read distance and resolution

BCL 90 CAX M 100 / M 100 H

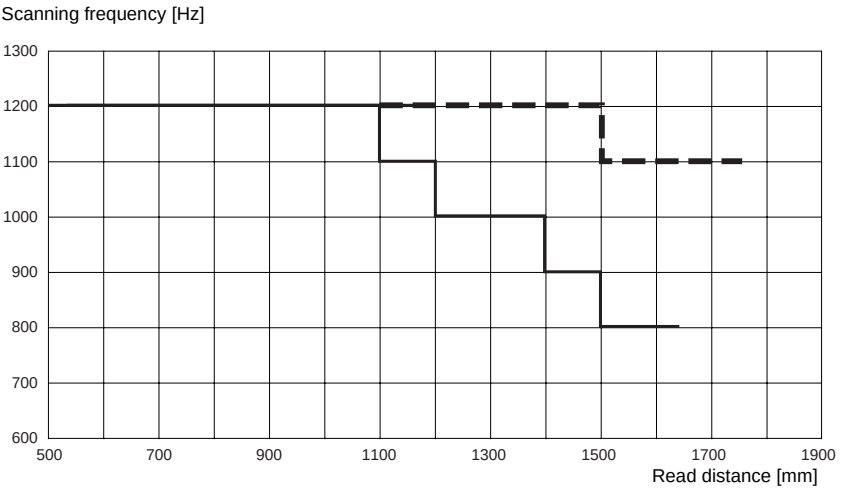


Figure 2.3: Characteristics for scanning frequency in relation to read distance and resolution

2.3.4 Reading Field and System Dimensions of BCL 90 CAX M 100 / M 100 H

Belt width 300 mm

Module 0.30 mm

Specification 1 Specification 2	*Bar width* *Belt width*	*0,30* *300*	*Min. scanning distance* *896*

Specification 3	*Specified Depth Of Field (spec.DOF)*	*100*	*200*	*300*	*316*

System dimensions	*Position of photoel. sensor L2*	X_{L2}	425	450	475	479
	Coordinates of scanner reference point 1) (relative to L1)	X_P	536	561	586	590
		Y_P	150	150	150	150
		Z_P	996	1096	1196	1212

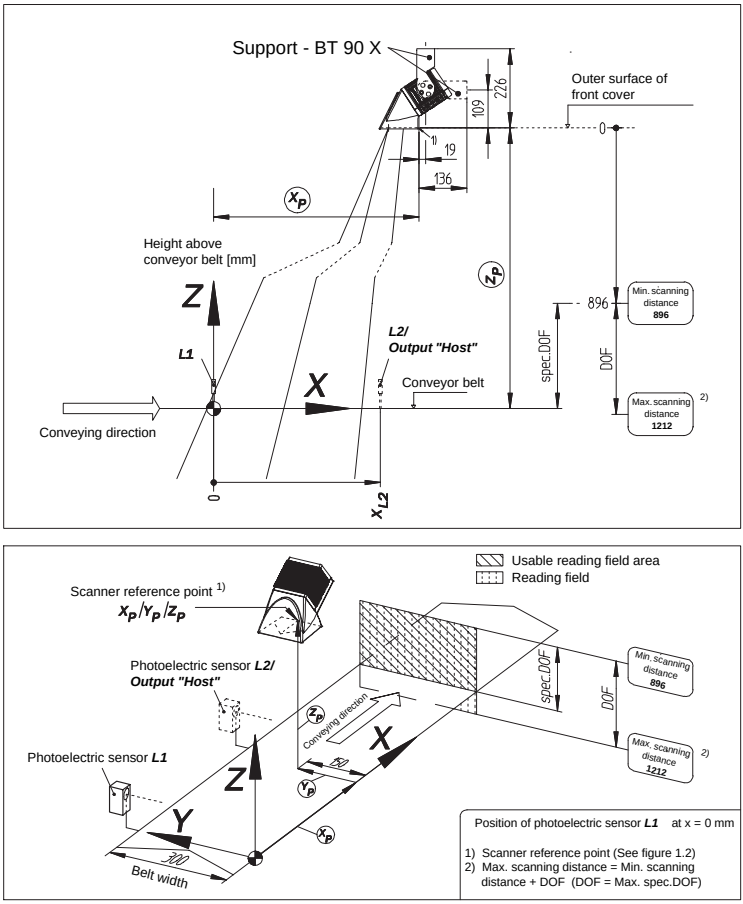


Figure 2.4: Required mounting position of BCL 90 CAX… above conveyor section (resolution 0.30 mm, belt width 300 mm)

Belt width 400 mm

Module 0.35 mm

Specification 1 Specification 2	*Bar width* *Belt width*	*0,35* *400*	*Min. scanning distance*	*1200*		
Specification 3	*Specified Depth Of Field (spec.DOF)*	*100*	*200*	*300*	*400*	
System dimensions	*Position of photoel. sensor L2*	X_{L2}	525	550	575	600
	Coordinates of scanner reference point 1) (relative to L1)	X_P	661	686	711	736
		Y_P	200	200	200	200
		Z_P	1300	1400	1500	1600

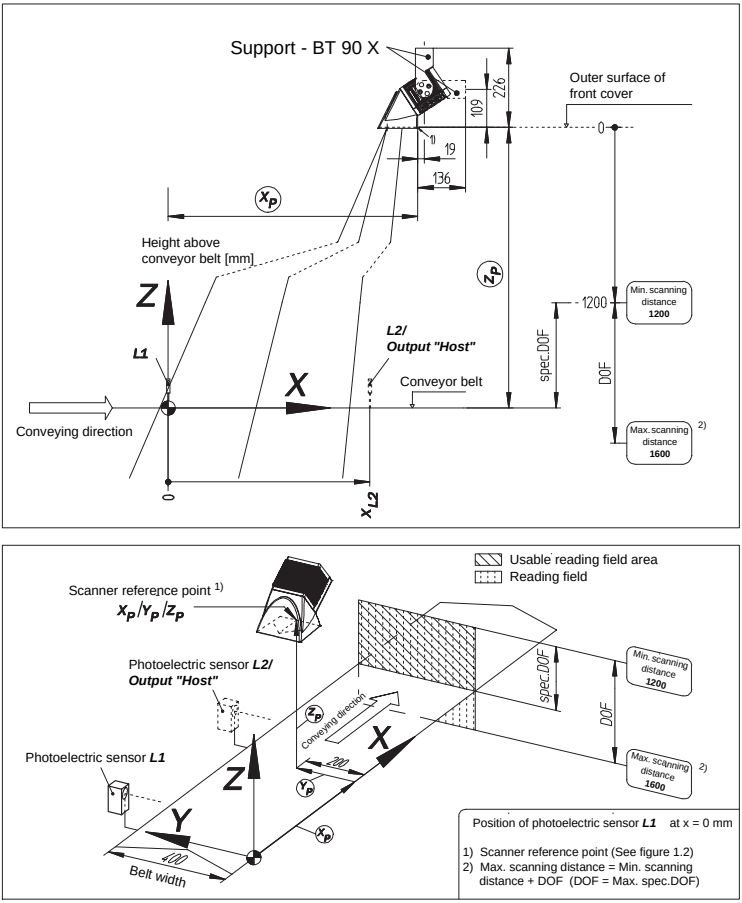


Figure 2.5: Required mounting position of BCL 90 CAX... above conveyor section (resolution 0.35 mm, belt width 400 mm)

Belt width 400 mm

Module 0.50 mm

Specification 1 Specification 2	*Bar width* *Belt width*	0,50 400	*Min. scanning distance*	1200			
Specification 3	*Specified Depth Of Field (spec.DOF)*		100	200	300	400	500
System dimensions	*Position of photoel. sensor L2*	X_{L2}	525	550	575	600	625
	Coordinates of scanner reference point 1) (relative to L1)	X_P	661	686	711	736	761
		Y_P	200	200	200	200	200
		Z_P	1300	1400	1500	1600	1700

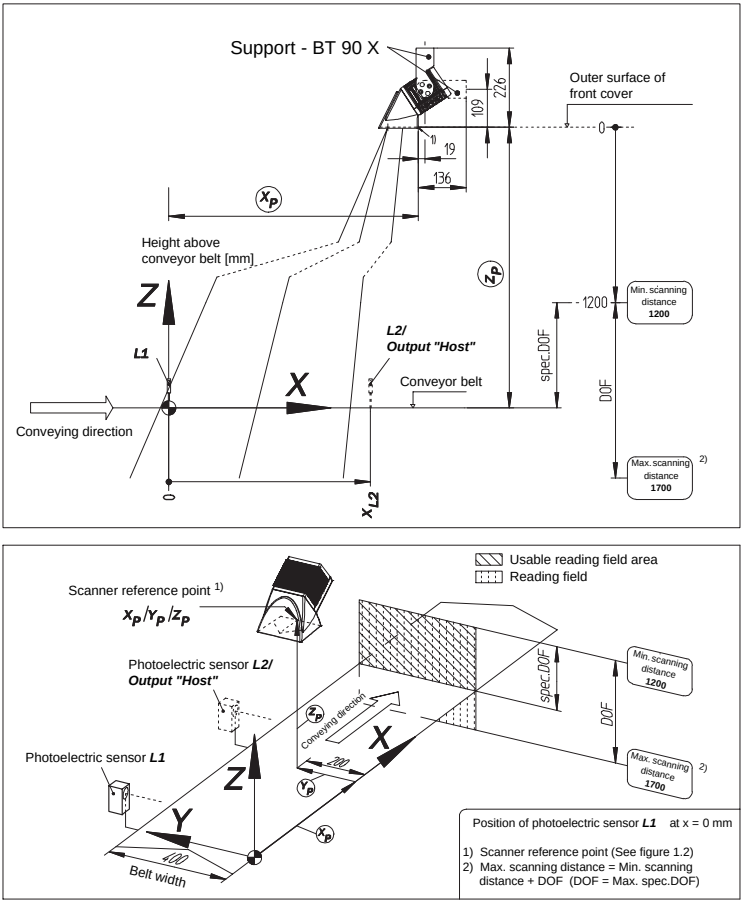


Figure 2.6: Required mounting position of BCL 90 CAX… above conveyor section (resolution 0.50 mm, belt width 400 mm)

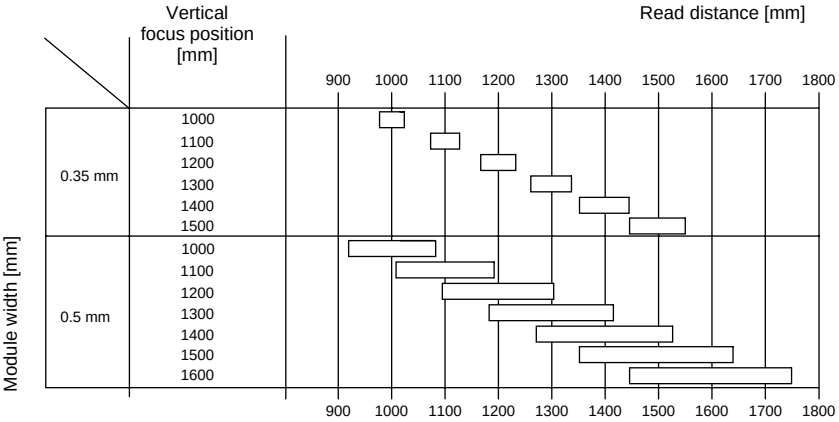


Figure 2.7: Depth of field in relation to module width and focus position with belt width of 400 mm

3 Accessories (Order Codes)

3.1 Cables, External Parameter Memories and Plug Covers

Note!

Information on cables, external parameter memories and plug covers can be found in the Technical Description BCL 90 (Chapter 5.1).

a) BCL without heater

Temperature range of the connection materials:

When stationary: –30 … +70 °C; when in motion: 0 … +70 °C

b) BCL with heater

Temperature range of the connection materials:

When stationary: –50 … +70 °C; when in motion: –40 … +70 °C

3.2 Mounting Accessories

Type / order number	Description	Figure
BT 90 S / 500 35 514	Quick-action clamping device, with complete fastening materials	Figure 3.1
BT 90 X/ 500 37 598	Mounting bracket, with 2 screws M 6 x 10 mm, self-locking	Figure 3.2

Table 3.1: Available accessories: mounting accessories

3.3 Dimensions

View of the quick-action clamping device BT 90 S

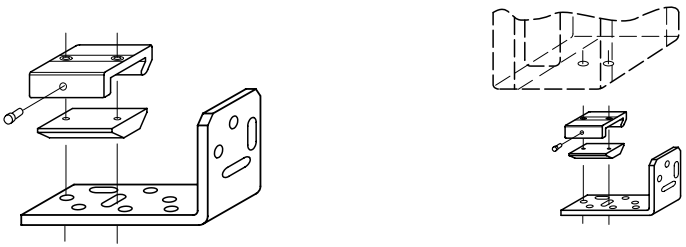
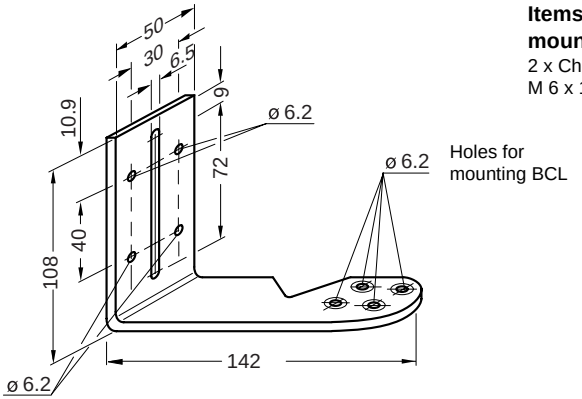


Figure 3.1: View of the quick-action clamping device with bracket support

Mounting bracket BT90 X



Items included for mounting BCL:
2 x Cheese-head screws
M 6 x 10 mm, self-locking

Figure 3.2: Dimensions of mounting bracket BT 90 X

4 Mounting

4.1 Overview of Mounting Steps

- if needed, exchange the language version of the laser warning sign
- select mounting site for the BCL
- adjust the position of the BCL to the bar code
- mount BCL
- modular connector unit MA 90
- connect the BCL to MA 90
- adjust the BCL
- mount the reading cycle sensor for external reading cycle triggering
- optional for event-driven focus position switching:
  mount the sensors for external detection of the object distance

4.2 Preparations Before Mounting

4.2.1 Have Ready the Components to be Mounted

- Bar code scanner BCL

4.2.2 Have Accessories Ready

- Leuze mounting support for BCL:
  as per order, mounting bracket BT 90 X (order No. 500 37 598) or quick-action clamping device BT 90 S (order No. 500 35 514) with mounting material for BCL

- or -

alternatively, in case the user provides the mounting support:

- sturdy mounting device enabling the BCL to change its orientation on the x-axis and y-axis. The BCL weighs approx. 2 kg
- two M6 screws for the BCL. Screw length depends on the wall thickness of the mounting support used. Screw depth in **BCL, max. 7 mm** below housing surface
- modular connector unit MA 90 (not included in the scope of delivery of the BCL)
- reading cycle sensor, e.g. retro-reflective photo electric sensor/light switch (not included in the scope of delivery of the BCL)
- optional for event-driven focus position switching: sensors for the detection of the read distance, e.g. retro-reflective photo electric sensor/light switch (not included in the scope of delivery of the BCL)

4.2.3 Have Auxiliary Material Ready

- two M6 screws to fasten the Leuze mounting support to the mounting base. Screw length depends on the wall thickness of the mounting base
- one set of laser warning signs (as required)
- tools
- measuring tape (up to 3000 mm)
- L-blade

4.2.4 Exchanging the Laser Warning Sign

If necessary, stick a laser warning sign in the appropriate language version over the warning sign (GB-English / US-English) already attached to the BCL (Figure 4.1).

The included set of laser warning signs consists of:

- a German/American warning sign
- a French/American English warning sign

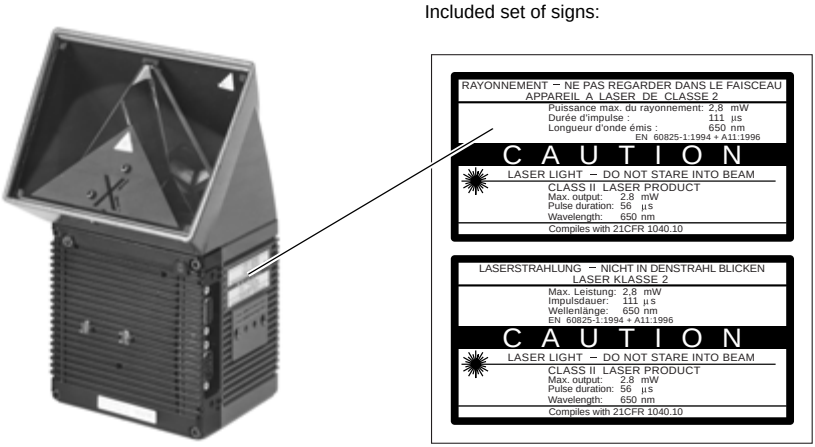


Figure 4.1: Exchanging the laser warning sign

4.2.5 Selecting the Mounting Site

In selecting the mounting site, the distance between the BCL and host as well as the distance between the BCL and the bar code have to be taken into consideration.

Distance between the BCL and host

If it is not connected to the Leuze network or a bus connection, the BCL can be mounted at a distance of max. 1200 m from the host. The actual distance, however, depends on the selected physical type of the host interface and the adjusted data transmission rate.

Distance between the BCL and MA 90

The MA 90 should not be mounted further than 10 m away from the BCL because the PC accesses the terminal interface of the BCL through the software BCL-Config via the module (RS 232 type).

4.2.6 Mounting Accessories

The BCL is attached by way of two fastening threads (M6) located above the electrical connections. Figure 4.2 shows the location of the threads.
The dimensions of the BCL housing are given in Figure 2.1.

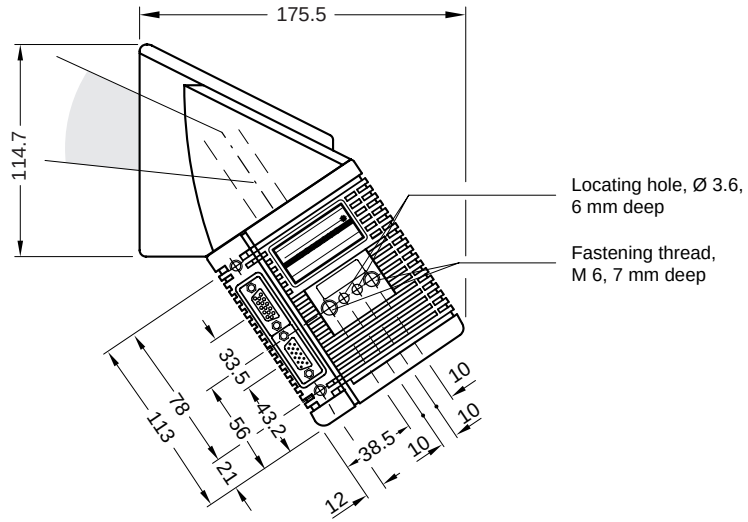


Figure 4.2: Position of mounting threads on BCL

The BCL can be mounted using the following Leuze mounting supports:

- Mounting bracket BT 90 X, single, order No. 500 37 598
- Quick-action clamping device BT 90 S, order No. 500 35 514

The mounting supports are designed in such a way that allows diverse mounting variations and the orientation of the BCL on two levels. Figure 4.3 shows two examples for mounting the device.

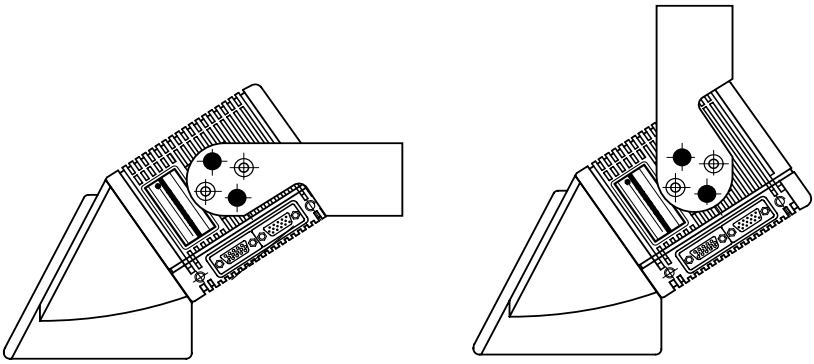


Figure 4.3: Mounting options for BCL 90 CAX … with mounting bracket BT 90 X

The dimensions of the mounting supports are given in Section 3.3, on page 20.

4.2.7 Distance Between BCL and Bar Code

Principle Orientation of the Scan Line to the Bar Code

The BCL is used for reading omni-directional bar codes on the sides or on the top of objects. Figure 4.4 shows the basic arrangement of the BCL.

Read Distance to Bar Code

The distance between the reading window of the BCL and the bar code may not exceed the technical limits specified for the device. The height of the reading field in relation to the read distance is given for various resolutions (module widths) in Chapter 2.3.3 "Reading performance data for compact OMNI bar code scanner".

Figure 4.4 defines the read distance **a** from the reading window.

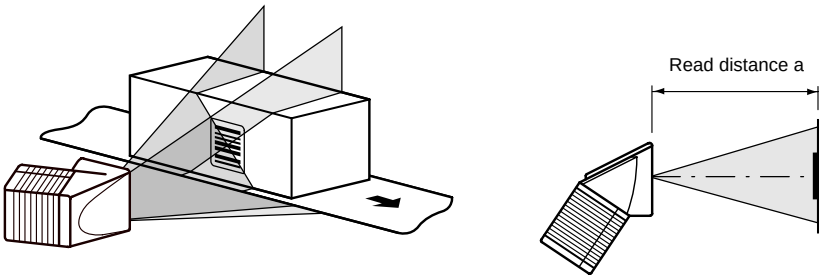


Figure 4.4: Orientation of scanning method to bar code and conveyor belt

Owing to the X principle used for beam deflection, the reading field height (length of the scan line) depends on the read distance.

Angular alignment of BCL

All read angles that are possible between the scan line and bar code must be taken account (Figure 4.5 and Table 4.1).

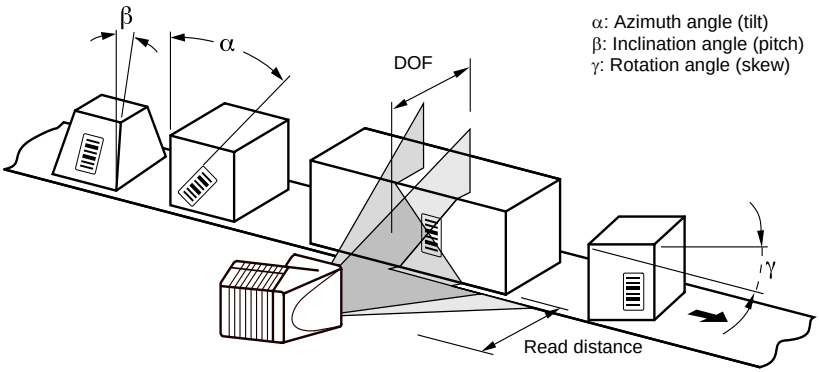


Figure 4.5: Read angles occurring between scan line and bar code

Angle	Limit value
Azimuth α (tilt)	Omni-directional
Inclination β (pitch)	Max. 45°
Rotation γ (skew)	Max. 45°

Table 4.1: Permissible read angles between scan line and bar code

4.2.8 Counting Direction for Code Position CP

The BCL can scan and decode several bar codes in every reading operation.
In this process, it determines for each bar code its read diagnosis data relating to its location:

- the position (CP value) of the bar code middle within the scan line

Figure 4.6 shows the counting direction for the code position. The cross in the reading window below the yellow laser warning sign indicates the counting direction for the code position.

Determination of the code position makes it possible to separate identical bar codes (code type, code length and data content all identical) and to assign the location of the bar code data in the reading result to its position on the object.

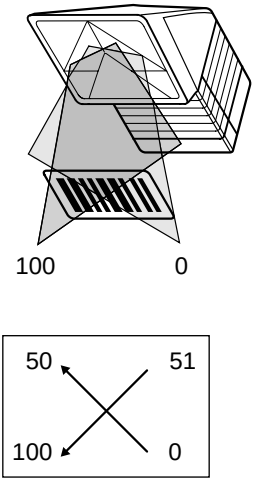


Figure 4.6: Counting direction for code position CP within scan line

5 Operation

5.1 Overview of Commissioning Steps

- Commissioning the BCL with basic factory settings (quick-start).
  In this configuration, the BCL can be operated without connecting it to a PC.
- Configuring (parameterising) the BCL for use with BCL-Config or command strings
  (see Technical Description BCL 90, page 102)

5.2 Basic settings

Table 5.1 lists the basic factory settings of the BCL. The parameters of the basic settings are selected in such a way that the BCL can be used in this configuration directly or only with small adjustments in many applications. A PC is not needed for commissioning with the basic settings

The basic setting values are permanently stored both in the BCL (ROM) and in the database of BCL-Setup. They can be downloaded any time in the operating memory (RAM) of the BCL or displayed in the tabs of BCL-Config.

5.2.1 Basic Settings of Compact OMNI Bar Code Scanner BCL 90 CAX 100 / 100 H

Parameter	Basic setting
Decoder	CRT decoder / standard
Active code types	Code 39, 2/5 Interleaved, code 128
Code length	Unlimited (2/5 Interleaved: interval 4 … 50 characters)
Start/stop conditions	Automatic
Multiple reading	3
Min./ max. number of codes	1
Scanning frequency	800 Hz
Autofocus mode	Smallest distance
- Range	400 … 1800 mm
- Focus position switching trigger	Autofocus, immediate/synchronous switching
Reading cycle source	Start: switching input "SE 1" (active: high); End: switching input "SE 1"
Switching inputs SE 2 … SE 6	(No function for autofocus) Focus position switching
Switching input "SE 1"	Start and stop of the reading cycle (level: active high), debouncing 20 … 30 ms

Parameter	Basic setting
Switching outputs	Not inverted; pulse duration: 400 ms
- Status output function	SWO 1: "Device Ready" (static); SWO 2: "Good Read"; SWO 3: "No Read"; SWO 4: "Match 1"
Arrangement to host	Stand alone
Device number	1
Start option	Download parameter set from the external parameter memory
- Host interface (type)	RS 232
- Protocol	NAK; start character: STX, stop character: CR, LF
- Transmission rate	9600 bits/s
- Data format:	8 data bits, no parity, 1 stop bit
- Output format	Header: empty, separator: ST, terminator: CR LF; error string: only separator
- Output sorting	Acc. to code position
- Output time	Read result: clocking separator: acc. to code
- Test string	Not active
Terminal interface	RS 232, 9600 baud, 8 data bits, no parity, 1 stop bit (values unalterable)
Function	Read diagnosis

Table 5.1: Excerpt: basic parameter settings of BCL 90

6 Maintenance

6.1 Servicing during Operation

In order to maintain its full reading capability, the BCL needs a clean reading window.
We therefore recommend checking regularly whether the reading window is dirty, particularly in rough operating environment (dust, abraded particles, humidity, finger prints).

Damage to the eyes through laser radiation*!*

The BCL operates with a red light laser of Class 2. Staring at the laser beam may cause damage to the retina.

- *Never look at the laser beam directly (same as sunlight).*
- *Turn off device during cleaning*

Avoid looking at the reading window at all times during device operation

Damage to the reading window!

The reading window is made of glass. The reading capacity is reduced through scratches and streaks on the reading window.

- *Use mild detergents without powder additives*
- *Avoid scratching and scrubbing motions on the reading window*

Cleaning the reading window:

- Clean the reading window in regular intervals with a mild detergent without powder additives, e.g. an antistatic window cleaning detergent. Figure 6.1 shows the areas to be cleaned.
  Use a soft, lintfree cleaning cloth.

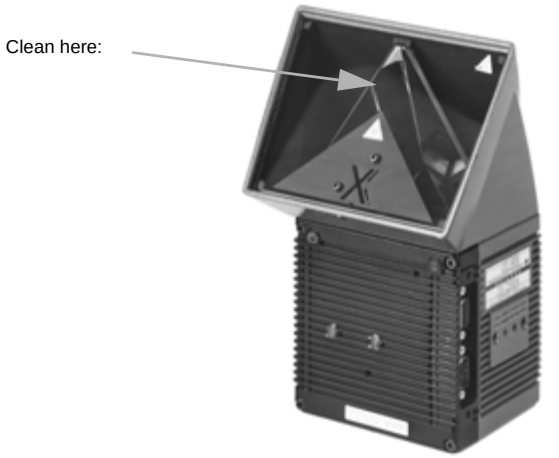


Figure 6.1: Cleaning the reading window

- Also clean the LED indicator at the back of the device as required.

Clean other, optically relevant surfaces:

- Also clean the optical surfaces of sensors (e.g. retro-reflective photo electric sensors) for external reading cycle generation and/or object height detection (Figure 6.2). Fouling may cause erroneous switching.

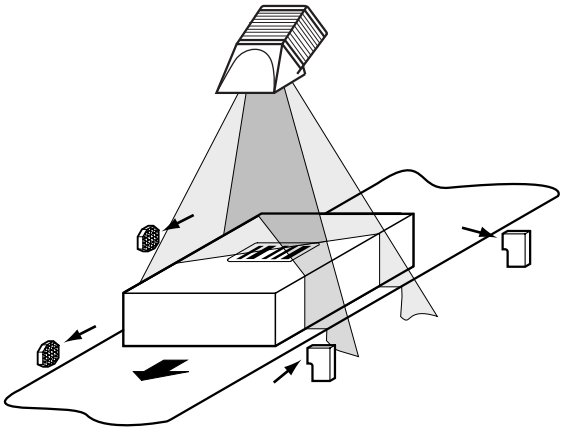


Figure 6.2: Cleaning the external optical sensors
(reading cycle clock generator, object height detection)

6.2 Maintenance

The BCL runs without maintenance. Its self-monitoring functions provide for a long operation free of failures.
The BCL outputs device and functional disorders in the form of messages via the service interfaces. These can be displayed on the PC screen in the extended mode of the terminal emulator of the user interface of BCL-Config.

6.3 Repairs, Servicing

Only the manufacturer may repair the devices

- For repairs please turn to the your Leuze sales or service outlets. You will find the addresses at the back of this description

Leuze electronic GmbH + Co.
Postfach 11 11, D-73277 Owen/Teck
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