Leuze

Original operating instructions

BCL 258i

Bar code reader

The Sensor People

We reserve the right to make technical changes
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1 About this document

Used symbols and signal words

Tab. 1.1: Warning symbols and signal words

	Symbol indicating dangers to persons
	Symbol indicating possible property damage
NOTE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injuries Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for serious injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.
DANGER	Signal word for life-threatening danger Indicates dangers with which serious or fatal injury is imminent if the measures for danger avoidance are not followed.

Tab. 1.2: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbol for action steps Text passages with this symbol instruct you to perform actions.
	Symbol for action results Text passages with this symbol describe the result of the preceding action.

Terms and abbreviations

Tab. 1.3: Terms and abbreviations

AutoConfig	Function for easily configuring a code type or number of digits
AutoReflAct	Function for activation without additional sensors (Automatic Reflector Activation)
BCL	Bar code reader
CIP	Application protocol within Ethernet/IP (Common Industrial Protocol)
CRT	Code reconstruction technology
DHCP	Process for automatically assigning the IP address (Dynamic Host Configuration Protocol)
DLR	Process for networking devices in a ring topology (Device Level Ring)
EDS	Standardized electronic data sheet (Electronic Data Sheet)
EMC	Electromagnetic compatibility
EN	European standard
FE	Functional earth
ICMP	Process for exchanging information and error messages (Internet Control Message Protocol)
IGMP	Process for organizing multicast groups (Internet Group Management Protocol)
IP address	Network address, which is based on the Internet Protocol (IP)
MAC address	Media Access Control Address; hardware address of a device in the network
ODVA	User organization (Open DeviceNet Vendor Association)
PELV	Protective Extra-Low Voltage; protective extra-low voltage with reliable disconnection
PLC	Programmable Logic Controller
SWI1	Digital switching input (Switching Input)
SWO2	Digital switching output (Switching Output)
TCP/IP	Transmission Control Protocol/Internet Protocol; Internet protocol family
UL	Underwriters Laboratories

2 Safety

The bar code readers of the BCL 200i 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 200i series are conceived as stationary, high-speed scanners with integrated decoders for all current bar codes used for automatic object detection.

Areas of application

The bar code readers of the BCL 200i 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

CAUTION

Observe 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.

- Only operate the device in accordance with its intended use.
- Leuze electronic GmbH + Co. KG is not liable for damages caused by improper use.
- Read these operating instructions before commissioning the device. Knowledge of the operating instructions is an element of proper use.

NOTICE

Comply with conditions and regulations!

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

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
- in circuits which are relevant to safety
- for medical purposes

NOTICE

Do not modify or otherwise interfere with the device!

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

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 operating instructions for 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 (German Social Accident Insurance) provision 3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Disclaimer

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

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

2.5 Laser safety notices

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

⚠ CAUTION	
	**Laser radiation** Opening the device can lead to dangerous exposure to radiation.

3 Fast commissioning

Below you will find a short description for the initial commissioning of the BCL 258i. Detailed explanations for all listed points can be found throughout these operating instructions.

3.1 Mounting

The bar code reader can be mounted in the following ways:

- Mounting with four M4x5 screws on the rear side of the housing.
- Mounting with mounting devices on the fastening groove on one side of the housing.

3.2 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 bar code reader in relation to the bar code module width.
- The resulting minimum and maximum reading distance from the respective reading field with the respective module width (see chapter 13.2 "Reading fields").
- alignment of the bar code reader for avoiding reflections.
- Distance between bar code reader and host system with respect to the interface.
- The correct time for data output. The bar code reader 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 should be highly visible.
- For configuring and commissioning with the webConfig tool, the HOST interface should be easily accessible.

For further information, see see chapter 5 "Mounting" and see chapter 6 "Electrical connection".

The best read results are obtained if the following prerequisites are fulfilled:

- The reading distance lies in the middle area of the reading field.
- There is no direct sunlight and protect against ambient light effects.
- The bar code labels are of good print quality and have good contrast ratios.
- You are not using high-glossy labels.
- The bar code is moved past with an angle of inclination of ±10° … 15° to vertical.

	NOTICE
	**Avoid direct reflection of the laser beam!** The beam on the bar code reader is emitted at 105° to the housing base. An angle of incidence of 15° of the laser to the label has already been integrated in the deflecting mirror so that the bar code reader can be installed parallel to the bar code (rear housing wall).

3.3 Electrical connection

The bar code reader is equipped with two connection cables, each with an M12 connector.

- PWR/SWIO: M12 connection for supply voltage and switching input/output, 5-pin, A-coded, cable length 0.9 m (unshielded)
- HOST: M12 connection for Ethernet, 4-pin, D-coded, cable length 0.7 m (shielded)

1 PWR/SWIO

2 HOST

1 PWR/SWIO, M12 connector, 5-pin, A-coded
2 HOST, M12 socket, 4-pin, D-coded

Fig. 3.1: Electrical connections

	NOTICE
	The shielding is connected using the M12 connector of the Ethernet cable.

Details on the connectors see chapter 6 "Electrical connection".

3.4 Preparatory settings

↳ Connect the +18 … 30 V DC supply voltage (typically +24 V DC).

⇨ The bar code reader starts up.

3.4.1 Start up BCL 258i on EtherNet/IP

Commissioning on the EtherNet/IP is performed according to the following scheme:

1. Address assignment
   automatically via DHCP, BootP or manually using the webConfig tool
2. Configuration of the participant depending on the version of the control software
   either with the help of the Generic Ethernet Module or installation of the EDS file
3. Transferring the data to the control
4. Adapting the device parameters via the webConfig tool
5. Use explicit messaging services

	NOTICE
	On delivery, the automatic address assignment via DHCP server is defined as the standard setting of the sensor and the IP address is set to 0.0.0.0.

3.4.2 Manually setting the IP address

Set the IP manually if your system does not include a DHCP server or if the IP addresses of the devices are to be set permanently.

- Have the network administrator specify the data for IP address, net mask and gateway address of the BCL 258i.
- Set the IP address manually via the BootP/DHCP server tool and deactivate the DHCP operation in the BCL 258i.
  - ⇨ The BCL 258i automatically adopts the settings. A restart is not required.

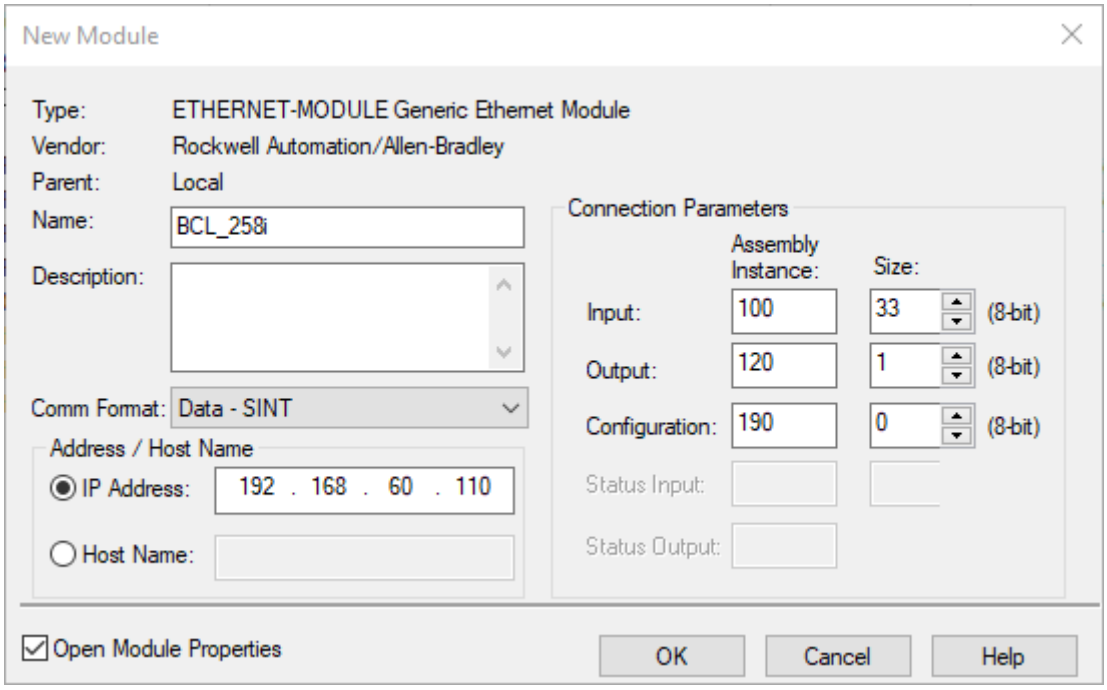


Fig. 3.2: Manual configuration of the IP address

Alternatively, you can set the IP address manually via the webConfig tool. Proceed as follows:

- Have the network administrator specify the data for IP address, net mask and gateway address of the BCL 258i.
- Connect the BCL 258i to your computer via the Ethernet cable.
- Set these values on the BCL 258i.

In the webConfig tool:

Configuration > Communication > Ethernet interface

NOTICE	
	If the IP address is set via the webConfig tool, then it becomes active after transfer to the device. A restart is not required.

3.4.3 Configuration

Configuration with the generic Ethernet module

In the configuration tool, e.g., Studio 5000, a so-called Generic Ethernet Module is created under the Communication path for the sensor.

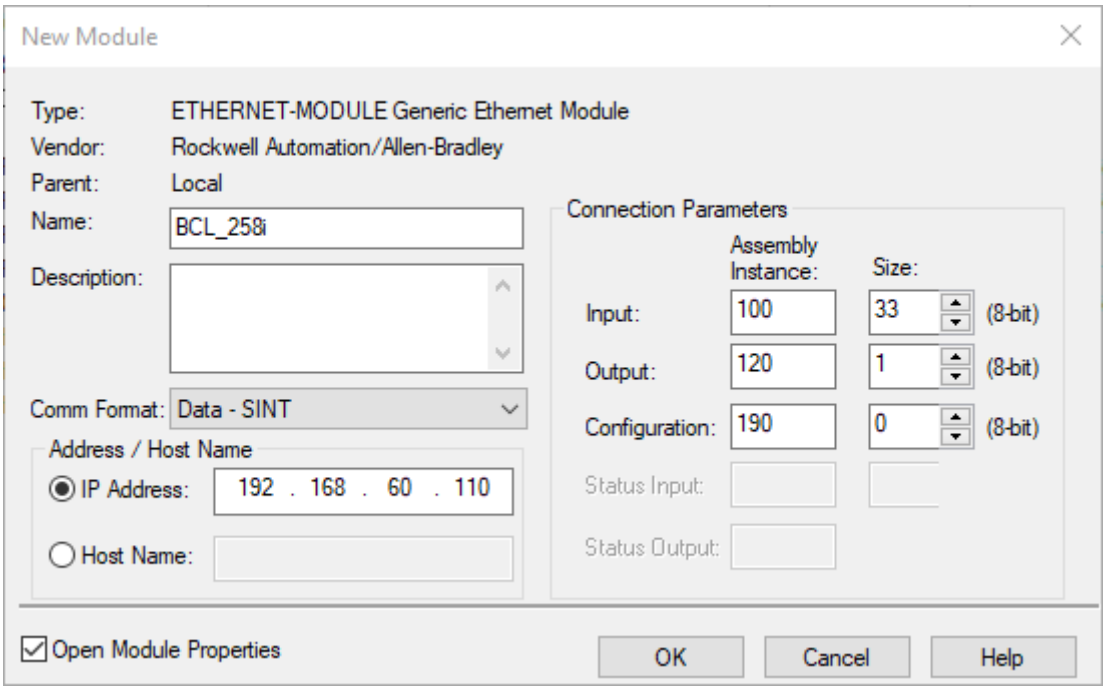


Fig. 3.3: Generic Ethernet module

The input mask for the generic module describes the following parameters to be set:

- the name of the participant (can be selected freely; e.g. BCL 258i)
- the format of I/O data (data - SINT = 8 bits)
- the IP address of the participant
- the address and length of the input assembly (instance 100, instance 101 or instance 102; min 1 byte - up to max. 266 bytes for the default input assembly of the read results).
- the address and length of the output assembly (instance 120, instance 121 or instance 122; min 1 byte - up to max. 263 bytes for the default output assembly)
- the address and length of the configuration assembly (instance 190; 3 bytes)

For the exact description of the assemblies for input/output and configuration, see chapter 8 "Starting up the device - Configuration".

Configuration of the participant using the EDS file

The following steps are necessary for commissioning with a Rockwell control:

- Load the EDS file for the device via EDS wizard into the PLC database.
  You can find the EDS file at: **www.leuze.com**.
- Select the device from the device list.
- Open the input dialog for setting the address and additional parameters by double-clicking on the device symbol and make the desired entries.
- Transfer the values to the control via download.

3.4.4 Transfer data to the control (RSLogix 5000 specific)

- Activate the online mode.
- Select the Ethernet communication port.
- Select the processor onto which the project is to be transferred.
- Set the control to PROG.
- Start the download.
- Set the control to RUN.

3.5 Further settings

Carry out further settings, such as the control of the decoding and processing of the read data and the configuration of the connected switching inputs and outputs.

Decoding and processing the read data

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

In the webConfig tool:

Configuration > Decoder

Control of the decoding

Configure the connected switching input according to your requirements.

↳ Configure the switching behavior.

In the webConfig tool:

Configuration > Device > Switching inputs/outputs

Control of the switching output

Configure the connected switching output according to your requirements.

↳ Configure the switching behavior.

In the webConfig tool:

Configuration > Device > Switching inputs/outputs

3.6 Starting the device

↳ Connect the +18 … 30 V DC supply voltage (typically +24 V DC).

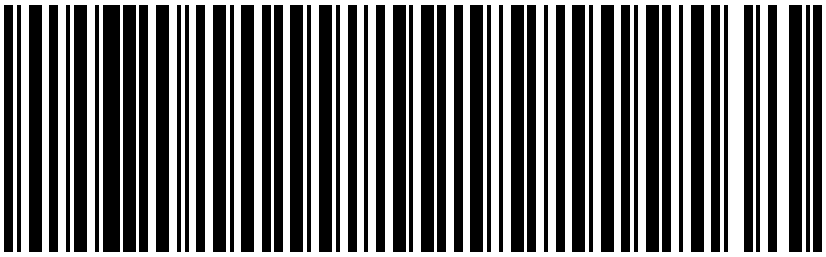
⇨ The BCL 258i starts up, the PWR, NET and LINK LEDs indicate the operating state.

Tab. 3.1: Display of operating state

LED	Color	State	Description
PWR	Green	Flashing	Device ok, initialization
		Continuous light	Power On, device OK
		Briefly off - on	Good read, reading successful
	Green - red	Green off – briefly red – green on	No Read, reading not successful
	Yellow	Continuous light	Service mode
	Red	Flashing	Warning
		Continuous light	Error, device error
NET	Green	Flashing	Initialization
		Continuous light	Network mode ok
	Red	Flashing	Communication error
		Continuous light	Network error
LINK	Green	Continuous light	Ethernet connected (LINK)
	Yellow	Flashing	Data communication (ACT)

During the initialization phase (power on), the laser is switched on for approx. 2 seconds. A configuration code can be read in during this time.

NOTICE
Setting the IP address to the Leuze default address By reading in the configuration code during the initialization phase, the IP address and the subnet mask are set to the Leuze default. IP address: 192.168.60.101 Subnet mask: 255.255.255.0



Operating the bar code reader

After connecting a supply voltage of +18 … 30 V DC to the switching input, a read process is activated. In the standard setting, all common code types for decoding are released. Only the 2/5 Interleaved code type is limited to 10 digits of code content.

If a code is moved through the reading field, the code content is decoded and forwarded to the superior system (PLC/PC) via Ethernet.

3.7 Bar code reading

↳ Test the device with the following bar code in format 2/5 Interleaved. The bar code module here is 0.5.

The PWR LED goes off briefly and then turns green again. Simultaneously, the read information is forwarded to the superior system (PLC/PC) via the Ethernet.

↳ Check the incoming data of the bar code information.

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

4 Device description

4.1 Device overview

Bar code readers of the BCL 200i 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 200i series are available in various models as line/raster scanners with deflecting mirror.

The interfaces integrated in the various device models offer an optimum connection to the superior host system:

- Ethernet TCP/IP UDP
- EtherNet/IP
- PROFINET IO

4.2 Performance characteristics

- Integrated fieldbus connectivity, Plug-and-Play fieldbus coupling and easy networking
- Numerous interface variants facilitate connection to the superior systems
  - Ethernet
- Integrated code reconstruction technology (CRT) enables the identification of soiled or damaged bar codes
- Maximum depth of field and reading distances from 40 mm to 255 mm
- Large optical opening angle and, thus, large reading field width
- High scanning rate with 1000 scans/s for fast reading tasks
- Adjustment of all device parameters with a web browser
- Easy alignment and diagnostics functions
- 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
- Heavy-duty housing of degree of protection IP 65

	NOTICE
	Information on technical data and characteristics: see chapter 13 "Technical data"

Integrated fieldbus connectivity

The integrated fieldbus connectivity contained in the bar code readers of the BCL 200i 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.

CRT decoder

For decoding bar codes, the bar code readers of the BCL 200i series make available the proven CRT decoder with code reconstruction technology.

The proven code reconstruction technology (CRT) enables bar code readers of the BCL 200i 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 angle of rotation).

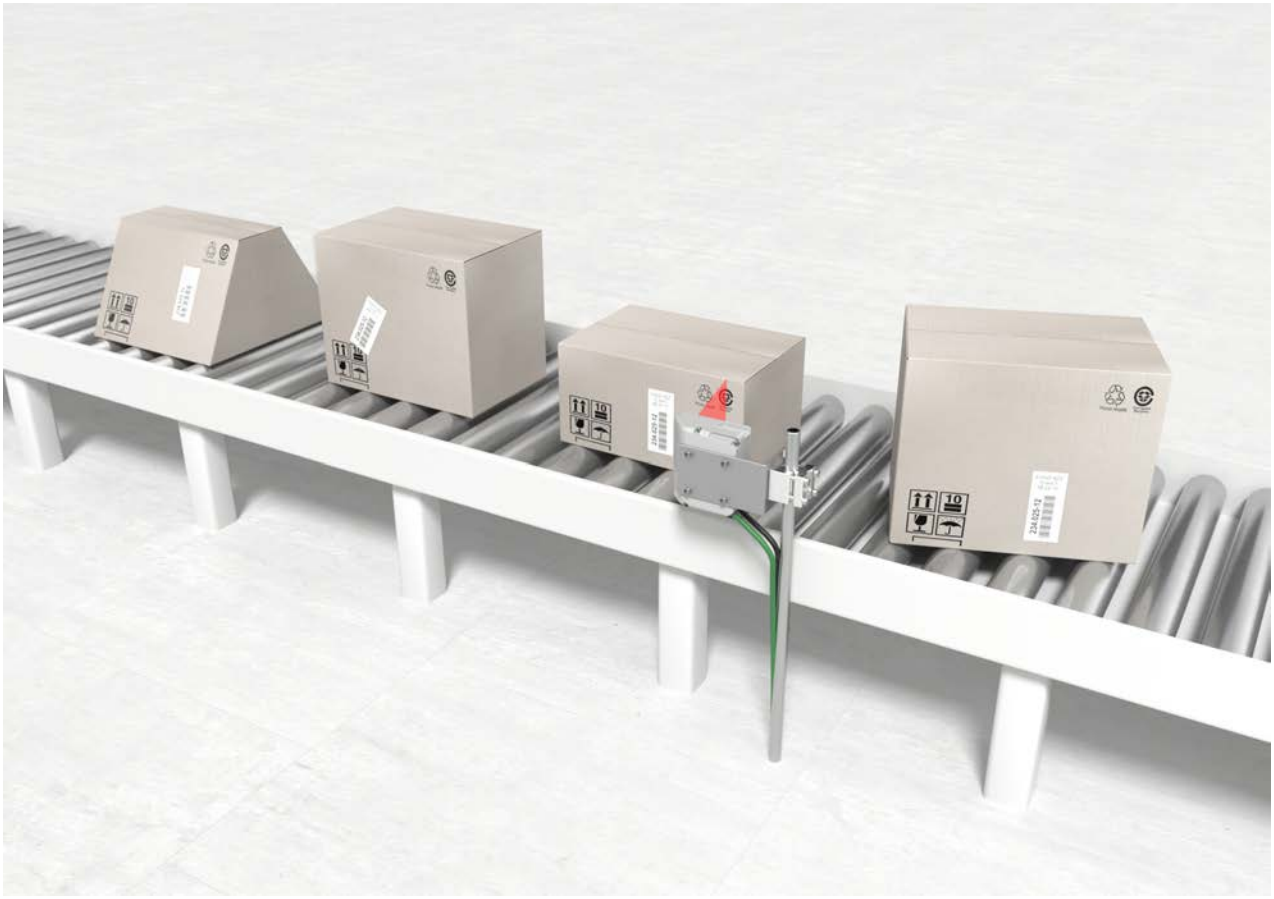


Fig. 4.1: Possible bar code orientation

Configuration

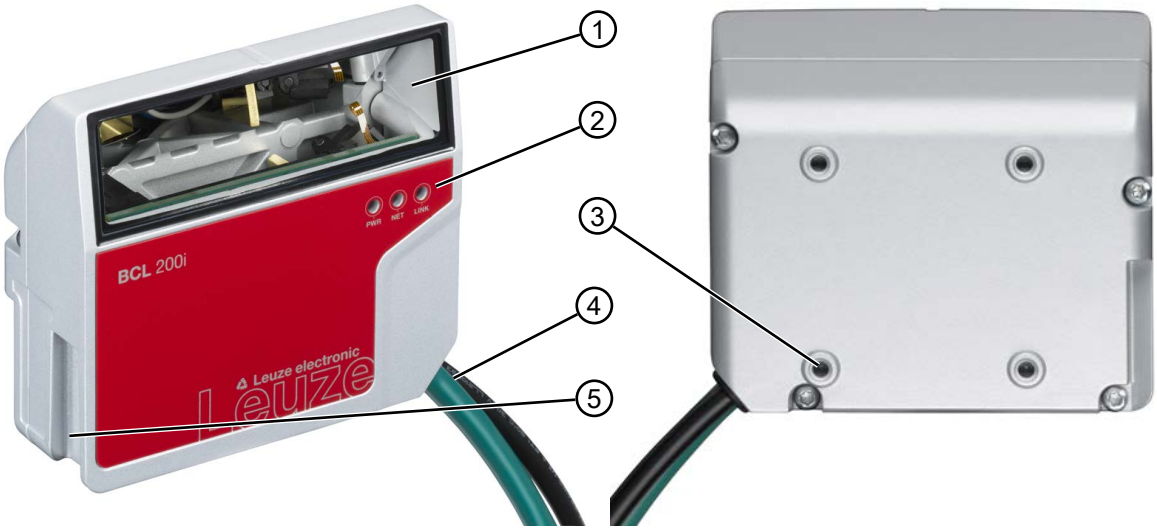
The BCL 258i can be operated and configured using the integrated webConfig tool via the Ethernet interface; alternatively, the bar code readers can be adjusted using configuration commands via the host interface.

The bar code reader 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 bar code reader 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 Ethernet. An alternative option for activation is the autoReflAct function.

Through the read operation, the bar code reader 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.

4.3 Device construction



1 Reading window
2 Indicator LEDs
3 4 mounting threads on the rear of the device
4 Connection cable
5 Dovetail mounting

Fig. 4.2: Device construction BCL 200i – Line scanner with deflecting mirror

4.4 Display elements

Located on the front side of the housing are three multicolor indicator LEDs: PWR, NET, LINK.

Fig. 4.3: LED indicators

PWR LED

Tab. 4.1: PWR indicators

Color	State	Description
---	OFF	Device off No supply voltage
Green	Flashing	Device ok • Initialization phase • Bar code reading not possible • Supply voltage applied • Self test running
	Continuous light	Device ok • Bar code reading possible • Self test successfully finished • Device monitoring active
	Briefly off - on	Good Read • Bar code reading successful
	Green briefly off – briefly red – green on	No read • Bar code reading not successful
Orange	Continuous light	Service mode • Bar code reading possible • No data on the host interface
Red	Flashing	Device ok, warning set • Bar code reading possible • Temporary operating fault
	Continuous light	Device error/parameter enable • Bar code reading not possible

NET LED

Tab. 4.2: NET indicators

Color	State	Description
---	OFF	No supply voltage • No communication possible • Ethernet protocols not released
Green	Flashing	Initialization of the device Establishing communication
	Continuous light	Operation ok • Network mode ok • Connection and communication to Host established
Red	Flashing	Communication error • Temporary connection error • If DHCP is active, no address could be obtained
	Continuous light	Network error • No connection established • No communication possible

LINK LED

Tab. 4.3: LINK indicators

Color	State	Description
Green	Continuous light	Ethernet connected (LINK)
Yellow	Flashing	Data communication (ACT)

4.5 Reading techniques

4.5.1 Line scanner (single line)

The scan line scans the label. Due to the optical 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

- With the bars of the bar code arranged lengthwise with respect to 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)

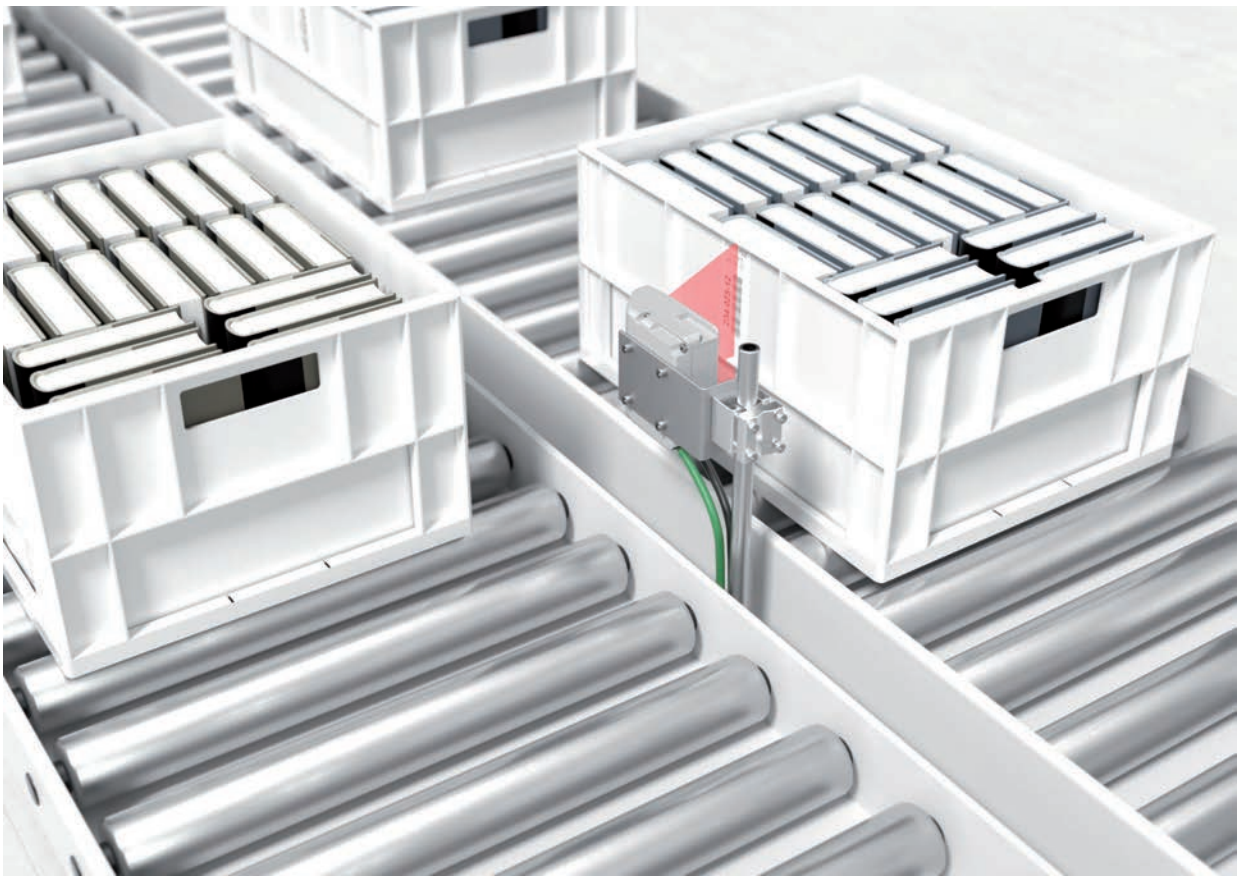


Fig. 4.4: Deflection principle for the line scanner

4.5.2 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

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

	NOTICE
	There may not be two or more bar codes in the raster detection range simultaneously.

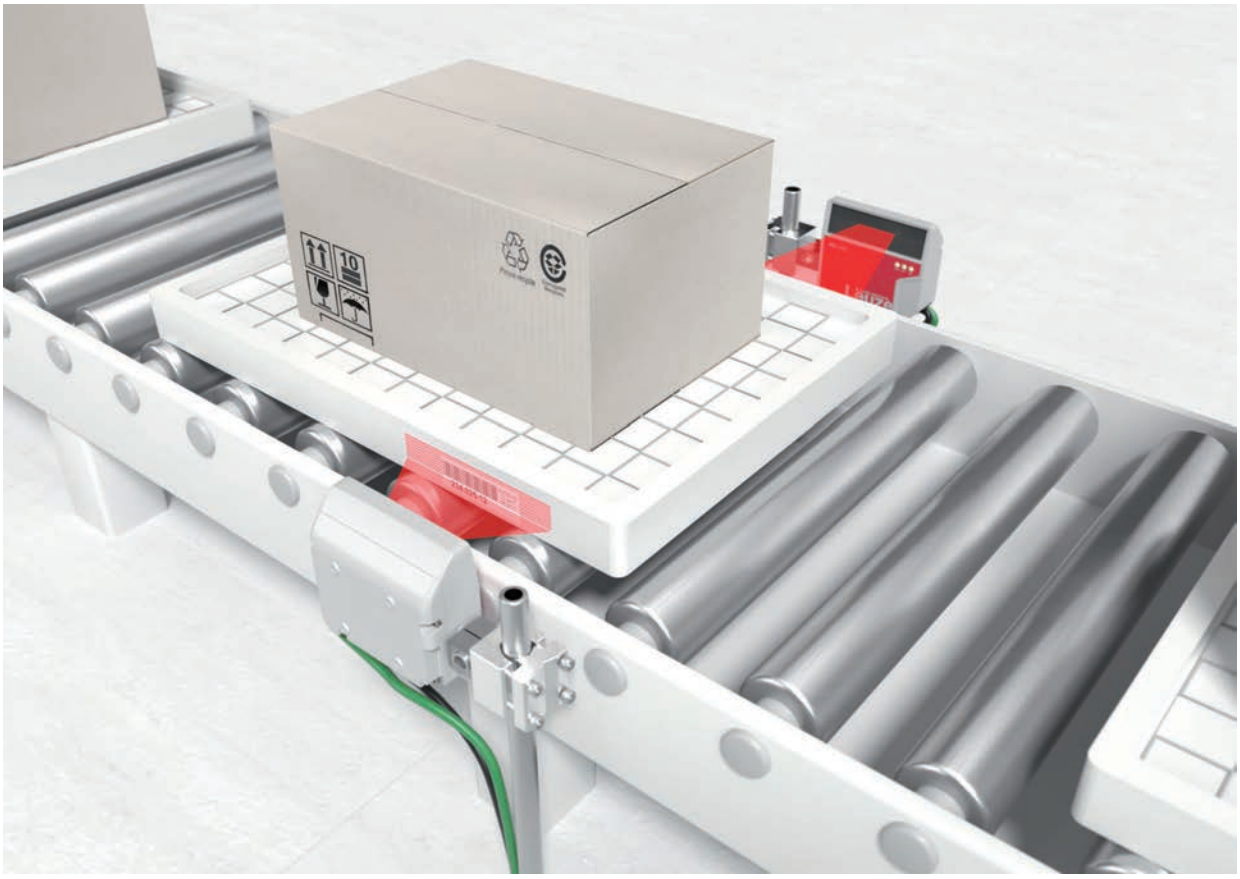


Fig. 4.5: Deflection principle for the raster scanner

4.6 Fieldbus systems

Various product variants of the BCL 200i series are available for connecting to different fieldbus systems such as PROFINET, Ethernet, and EtherNet/IP.

4.6.1 EtherNet/IP

The BCL 258i is designed as an EtherNet/IP device (acc. to IEEE 802.3) with a standard baud rate of 10/100 Mbit. EtherNet/IP makes use of the Common Industrial Protocol (CIP) as an application layer for the user. The functionality of the device is defined via parameter sets which are clustered in objects, classes and instances. These are contained in an EDS file which, depending on the version of the control software, can be used to configure and integrate the BCL 258i into the system. On delivery, each BCL 208i comes with a unique MAC-ID; this ID cannot be changed.

The BCL 258i automatically supports the transmission rates of 10 Mbit/s (10Base T) and 100 Mbit/s (100Base TX), as well as auto-negotiation and auto-crossover.

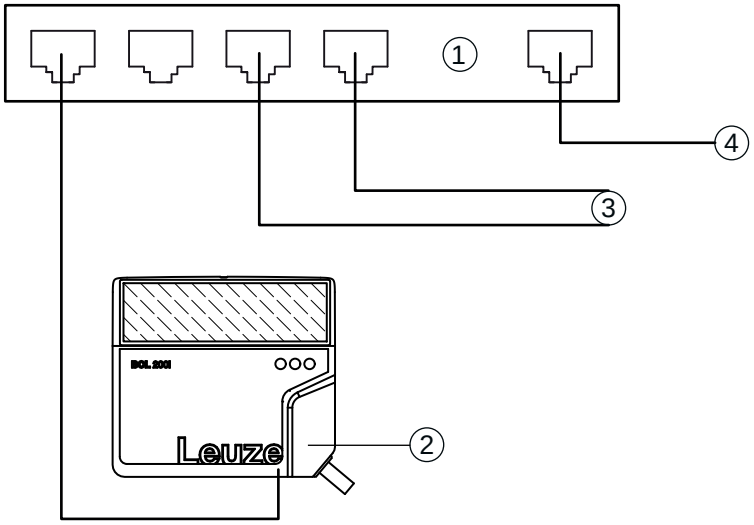
The BCL 258i supports the following protocols and services for communication:

- EtherNet/IP
- DHCP
- HTTP
- ARP
- PING
- Telnet
- BootP
- ICMP
- IGMP

NOTICE
The BCL 258i communicates via the Common Industrial Protocol (CIP). CIP Safety, CIP Sync and CIP Motion are not supported by the BCL 258i. Further information on commissioning: see chapter 7 "Starting up the device – Leuze webConfig tool"

4.6.2 Ethernet – star topology

The BCL 258i can be operated as a single device (stand-alone) with an individual IP address in a star topology. The IP address can either be set manually and permanently via BootP/webConfig tool or assigned dynamically via a DHCP server.



1 Ethernet switch
2 Bar code reader of the BCL 200i series
3 Other network participants
4 Host interface - PC/control

Fig. 4.6: Ethernet in a star topology

NOTICE
The BCL 258i does not support the DLR (Device Level Ring) ring structure determined by the ODVA.

4.7 autoReflAct

autoReflAct stands for **auto**matic **Refl**ector **Act**ivation 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.

NOTICE
Suitable reflectors are available, see chapter 14.5 "Accessories – Reflectors and reflective tapes".

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.

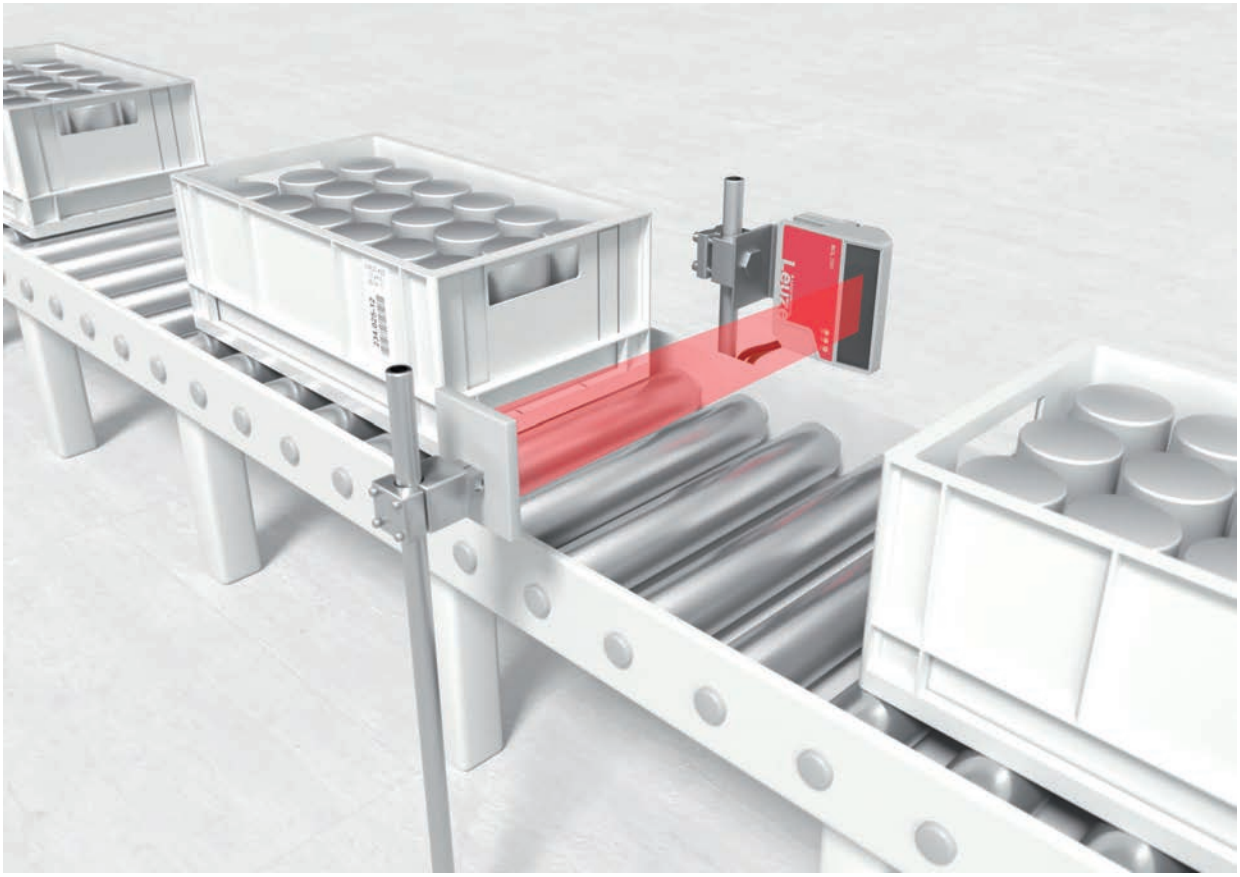


Fig. 4.7: Reflector arrangement for autoReflAct

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

4.8 Reference codes

The bar code reader offers the possibility of storing one or two reference codes.

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

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

4.9 autoConfig

With the autoConfig function, the bar code reader 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 bar code reader.

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

5 Mounting

5.1 Transport and storage

NOTICE

- 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.

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
  - Package insert

The name plate on the bottom of the device provides information as to what BCL type your device is, see chapter 13 "Technical data".

- Save the original packaging for later storage or shipping.
- If you have questions, please contact your supplier or Leuze customer service, see chapter 12 "Service and support".
- Observe the applicable local regulations when disposing of the packaging materials.

5.2 Mounting

The bar code reader can be mounted in the following ways:

- Mounting with four M4x5 screws on the rear side of the housing.
- Mounting with mounting devices on the fastening groove on one side of the housing.

NOTICE

- 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 notes in see chapter 5.3 "Selecting a mounting location".
- Please refer to see chapter 13.2 "Reading fields" for the permissible minimum and maximum distances between the bar code reader and the labels to be read.

5.2.1 Mounting with M4 fastening screws

- Mount the device on the system with M4 fastening screws (not included in delivery contents).
  - ⇨ Max. tightening torque of the fastening screws: 2.5 Nm
  - ⇨ Location and thread depth of the mounting thread: see chapter 13.3 "Dimensioned drawings"

5.2.2 Mounting with BT 56 or BT 56-1 mounting device

Mounting with the mounting device is intended for rod mounting.

Order guide: see chapter 14.4 "Accessories – mounting systems"

- Mount the mounting device on the rod with the clamp profile (system-side).
- Mount the device on the mounting device using the fastening grooves.
  - ⇨ Max. tightening torque of the fastening screws: 1.4 Nm

5.2.3 Mounting with BT 300-1 mounting device

Mounting with the mounting device is intended for rod mounting (10 – 16 mm).

Order guide: see chapter 14.4 "Accessories – mounting systems"

- Mount the mounting device on the rod with the clamp profile (system-side).
- Mount the device on the mounting device (included with delivery) using the fastening screws.
  - ⇨ Max. tightening torque of the fastening screws: 2.5 Nm

5.2.4 Mounting with the BT 300 W mounting bracket

Mounting with the BT 300 W mounting bracket is intended for wall mounting.

Order guide: see chapter 14.4 "Accessories – mounting systems"

- Mount the mounting bracket on the system side with M4 fastening screws (not included in delivery contents).
- Mount the device to the mounting bracket (included in delivery) with M4 fastening screws.
  - ⇨ Max. tightening torque of the fastening screws: 2.5 Nm

5.3 Selecting a mounting location

NOTICE

The size of the bar code module influences the maximum reading distance and the width of the reading field.

- When selecting a mounting location and/or the bar code label, take into account the different reading characteristics of the bar code reader with various bar code modules.

NOTICE

Observe when choosing the mounting location!

- Maintain the permissible environmental conditions (humidity, temperature).
- Avoid possible soiling of the reading window due to liquids, abrasion by boxes, or packaging material residues.
- Ensure that there is the lowest possible chance of damage to the bar code reader by mechanical collision or jammed parts.
- Avoid possible ambient light influence (no direct sunlight).

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

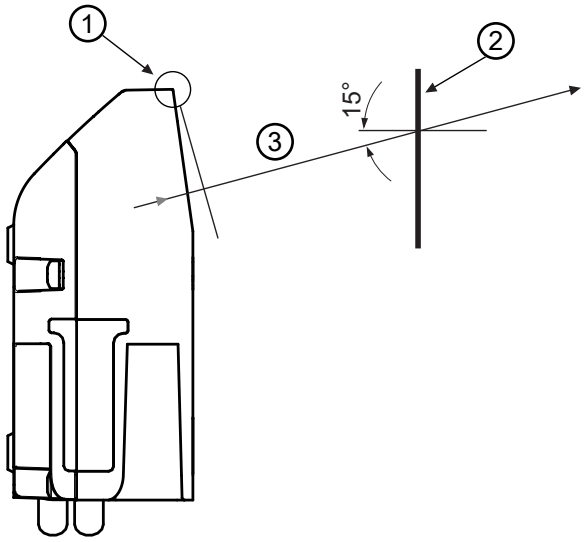
- Size, orientation, and position tolerance of the bar codes on the objects to be scanned.
- The reading field of the bar code reader in relation to the bar code module width.
- The resulting minimum and maximum reading distance from the respective reading field with the respective module width (see chapter 13.2 "Reading fields").
- alignment of the bar code reader for avoiding reflections.
- Distance between bar code reader and host system with respect to the interface.
- The correct time for data output. The bar code reader 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 should be highly visible.
- For configuring and commissioning with the webConfig tool, the HOST interface should be easily accessible.

The best read results are obtained if the following prerequisites are fulfilled:

- The reading distance lies in the middle area of the reading field.
- There is no direct sunlight and protect against ambient light effects.
- The bar code labels are of good print quality and have good contrast ratios.
- You are not using high-glossy labels.
- The bar code is moved past with an angle of inclination of ±10° … 15° to vertical.

	NOTICE
	Avoid direct reflection of the laser beam! The beam on the bar code reader is emitted at 105° to the housing base. An angle of incidence of 15° of the laser to the label has already been integrated in the deflecting mirror so that the bar code reader can be installed parallel to the bar code (rear housing wall).

↳ Mount the bar code reader with deflecting mirror parallel to the bar code.

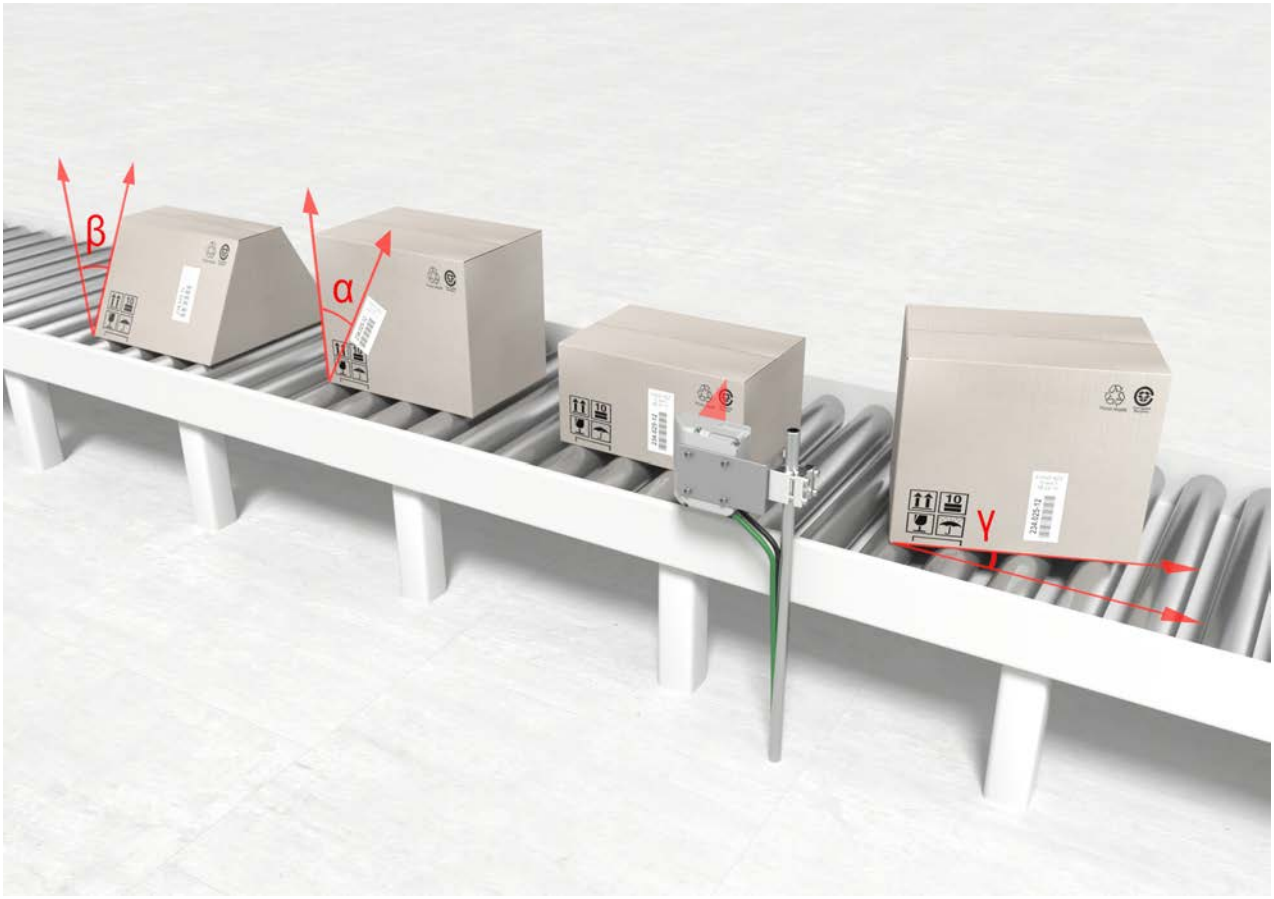


1 Zero position
2 Bar code
3 Distance acc. to reading field curves

Fig. 5.1: Total reflection – line scanner

Reading angle between bar code reader and bar code

The optimum alignment of the bar code reader 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.



α	Azimuth angle (tilt)
β	Angle of inclination (Pitch)
γ	Angle of rotation (skew)

Fig. 5.2: Reading angle for the line scanner

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

5.4 Cleaning

- Clean the glass window of the bar code reader 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 bar code reader.

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

6 Electrical connection

CAUTION

Safety notices!

- The bar code reader is completely sealed and must not be opened.
- Do not try to open the device under any circumstances, as this avoids both degree of protection IP65 and the warranty.
- Before connecting the device, be sure that the supply voltage agrees with the value printed on the name plate.
- Connection of the device and maintenance work while under voltage must only be carried out by a qualified electrician.
- Ensure that the functional earth (FE) is connected correctly. Unimpaired operation is only guaranteed when the functional earth is connected properly.
- If faults cannot be rectified, take the device out of operation and protect it from accidentally being started.

CAUTION

UL applications!

For UL applications, the supply is only permitted according to UL 62368-1 ES1/PS2 or SELV/LPS according to UL 60950-1.

NOTICE

Protective Extra Low Voltage (PELV)!

The device is designed in accordance with protection class III for supply with PELV (Protective Extra-Low Voltage).

NOTICE

Degree of protection IP65

Degree of protection IP65 is achieved only if the connectors are screwed into place and caps installed.

The bar code reader is equipped with two connection cables, each with an M12 connector.

- PWR/SWIO: M12 connection for supply voltage and switching input/output, 5-pin, A-coded, cable length 0.9 m (unshielded)
- HOST: M12 connection for Ethernet, 4-pin, D-coded, cable length 0.7 m (shielded)

1 PWR/SWIO, M12 connector, 5-pin, A-coded
2 HOST, M12 socket, 4-pin, D-coded

Fig. 6.1: Electrical connections

6.1 PWR/SWIO (supply voltage, switching input and switching output)

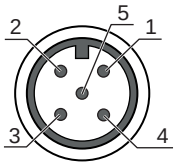


Fig. 6.2: M12 connector, 5-pin, A-coded

Tab. 6.1: PWR/SWIO pin assignment

Pin	Designation	Assignment
1	VIN	Positive supply voltage +18 … +30 V DC
2	SWI1	Configurable switching input 1
3	GNDIN	Negative supply voltage 0 V DC
4	SWO2	Configurable switching output 2
5	FE	Functional earth

Supply voltage

CAUTION

UL applications!

For UL applications, the supply is only permitted according to UL 62368-1 ES1/PS2 or SELV/ LPS according to UL 60950-1.

NOTICE

Protective Extra Low Voltage (PELV)!

The device is designed in accordance with protection class III for supply with PELV (Protective Extra-Low Voltage).

NOTICE

Connections of 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 / switching output

The bar code readers of the BCL 200i series are equipped with

- 1 fixed, programmable, opto-decoupled switching input SWI1
- 1 fixed, programmable, opto-decoupled switching output SWO2

The switching input can be used to activate various internal functions of the bar code reader (decoding, autoConfig, …). The switching output can be used to signal the state of the bar code reader and to implement external functions independent of the superior control.

The switching input/output is configured as follows by default:

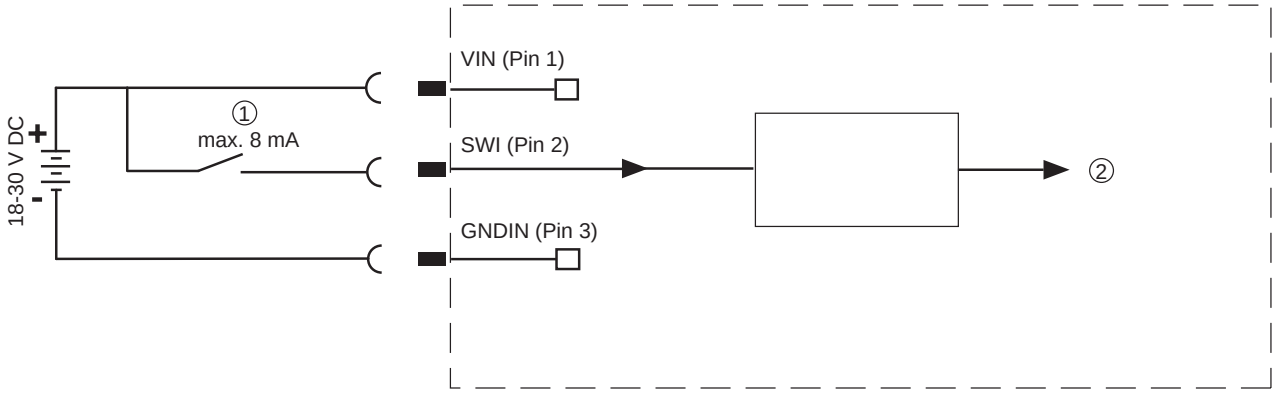
- SWI1: Switching input reading gate start/stop (default)
- SWO2: GOOD READ switching output (default)

NOTICE

You can configure the respective function with the help of the webConfig tool.

The external wiring as switching input and switching output is described in the following. The respective function assignment to the switching inputs/outputs can be found in see chapter 8 "Starting up the device - Configuration".

Function as switching input



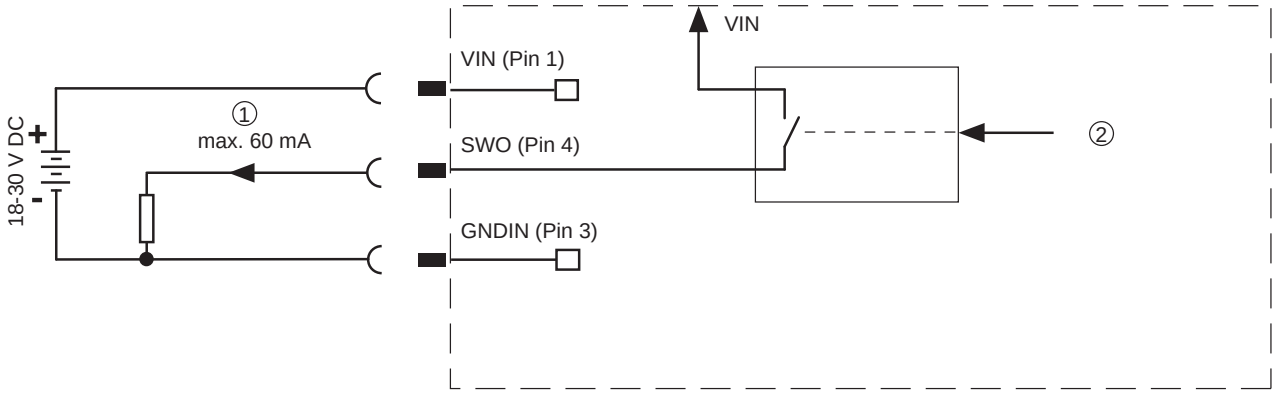
1 Switching input
2 Switching input to controller

Fig. 6.3: Connection diagram for switching input SWI1

NOTICE

The maximum input current must not exceed 8 mA.

Function as switching output



1 Switching output
2 Switching output from controller

Fig. 6.4: Connection diagram for switching output SWO2

NOTICE

Each configured switching output is short-circuit proof! Do not load the respective switching output of the bar code reader with more than 60 mA at +18 … +30 V DC in normal operation.

6.2 HOST (Ethernet, cable assignments)

The BCL 258i makes the EtherNet/IP interface available as host interface.

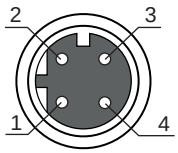


Fig. 6.5: M12 socket, 4-pin, D-coded

Tab. 6.2: HOST pin assignment

Pin	Designation	Assignment
1	TDO+	Transmit Data +
2	RDO+	Receive Data +
3	TDO-	Transmit Data -
4	RDO-	Receive Data -
Thread	FE	Functional earth (housing)

Ethernet cable assignments

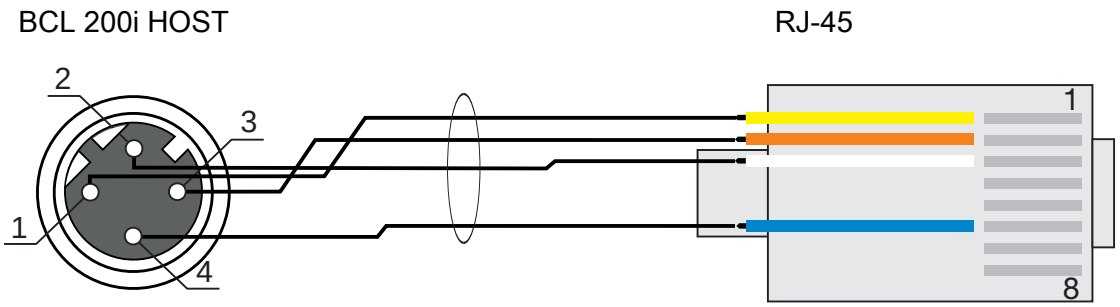
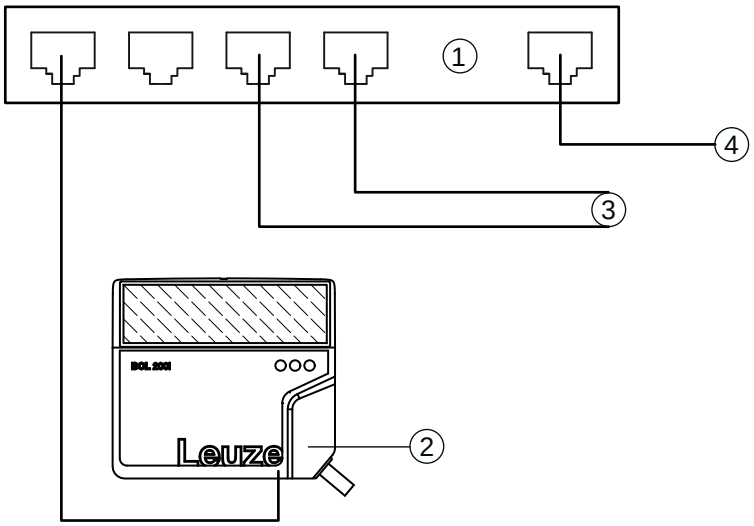


Fig. 6.6: HOST to RJ-45 cable assignments

6.3 Ethernet – star topologies

The BCL 258i can be operated as a single device (stand-alone) with an individual IP address in a star topology. The IP address can either be set manually and permanently via BootP/webConfig tool or assigned dynamically via a DHCP server.



1 Ethernet switch
2 Bar code reader of the BCL 200i series
3 Other network participants
4 Host interface - PC/control

Fig. 6.7: Ethernet in a star topology

Ethernet wiring

A Cat. 5 Ethernet cable should be used for wiring.

NOTICE	
	The BCL 258i does not support the DLR (Device Level Ring) ring structure determined by the ODVA.

6.4 Cable lengths and shielding

↳ Observe the maximum cable lengths and shielding:

Tab. 6.3: Cable lengths and shielding

Connection	Interface	Max. cable length	Shielding
BCL – host	Ethernet	100 m	Required
BCL – power supply unit		30 m	Not necessary
Switching input		10 m	Not necessary
Switching output		10 m	Not necessary

7 Starting up the device – Leuze webConfig tool

With the webConfig tool, an operating-system independent, web-technology based, graphical user interface is available for configuring bar code readers of the BCL 200i series.

The webConfig tool can be run on any Internet-ready PC. The webConfig tool uses HTTP as communication protocol and the client-side restriction to standard technologies (HTML, JavaScript and AJAX) that are supported by modern browsers.

NOTICE

The webConfig tool is offered in the following languages: German, English, French, Italian and Spanish

7.1 System requirements

To use the webConfig tool, you need a PC or laptop with the following specifications:

Tab. 7.1: System requirements for the webConfig tool

Monitor	Min. resolution: 1280 x 800 pixels or higher
Internet browser	Recommended is a current version of: • Mozilla Firefox • Google Chrome • Microsoft Edge

NOTICE

↳ Regularly update the operating system and the Internet browser.

↳ Install the current Windows Service Packs.

NOTICE

Other Internet browsers are possible but have not been tested with the current device firmware.

7.2 Start webConfig tool

↳ Start the webConfig tool via your PC's Internet browser with IP address **192.168.60.101** or with the IP address set by you.

⇨ **192.168.60.101** is the standard Leuze IP address for communication with bar code readers of the BCL 200i series.

The following start page appears on your PC:

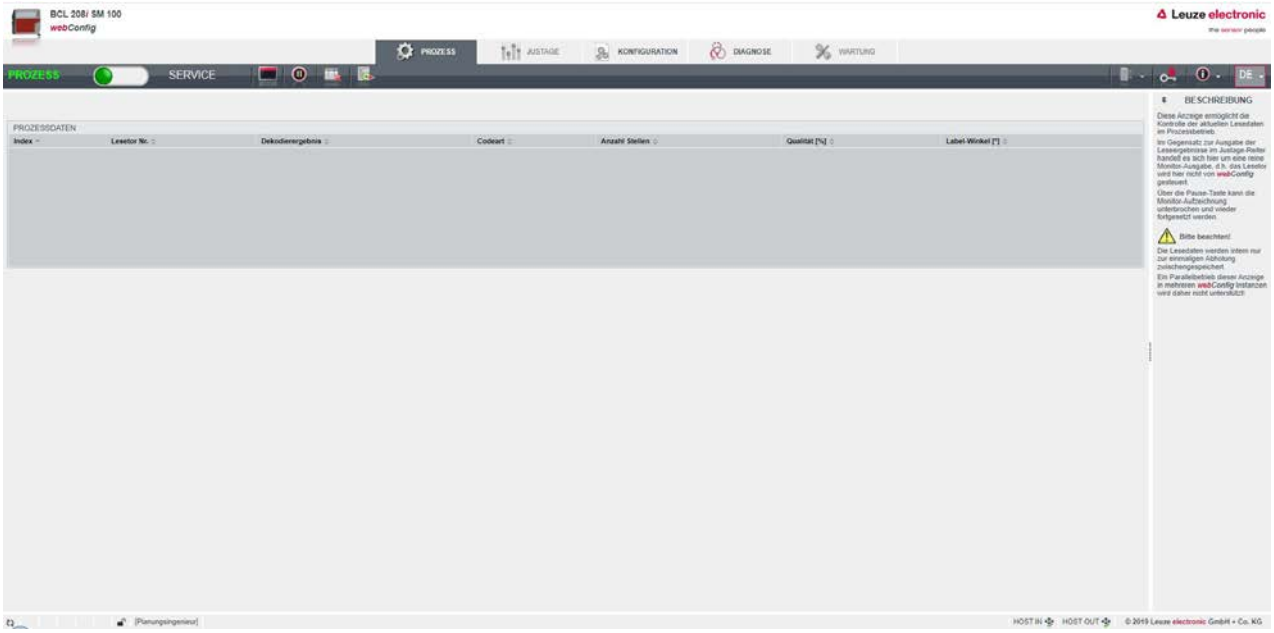


Fig. 7.1: webConfig tool – start page

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

	NOTICE
	The webConfig tool is completely contained in the firmware of the device. The pages and functions of the webConfig tool may appear and be displayed differently depending on the firmware version.

7.3 Short description of the webConfig tool

The webConfig tool has five main menus:

- PROCESS
  - Information on the current result
- ALIGNMENT
  - Alignment of the bar code reader
  - Manually starting of read processes. 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
  - Configuring decoding
  - Configuring data formatting and data output
  - Configuring the switching inputs/outputs
  - Configuring communication parameters and interfaces
- DIAGNOSIS
  - Event logging of warnings and errors
- MAINTENANCE
  - Update firmware

7.3.1 CONFIGURATION menu

The adjustable parameters of the bar code reader are clustered in modules in the CONFIGURATION menu.

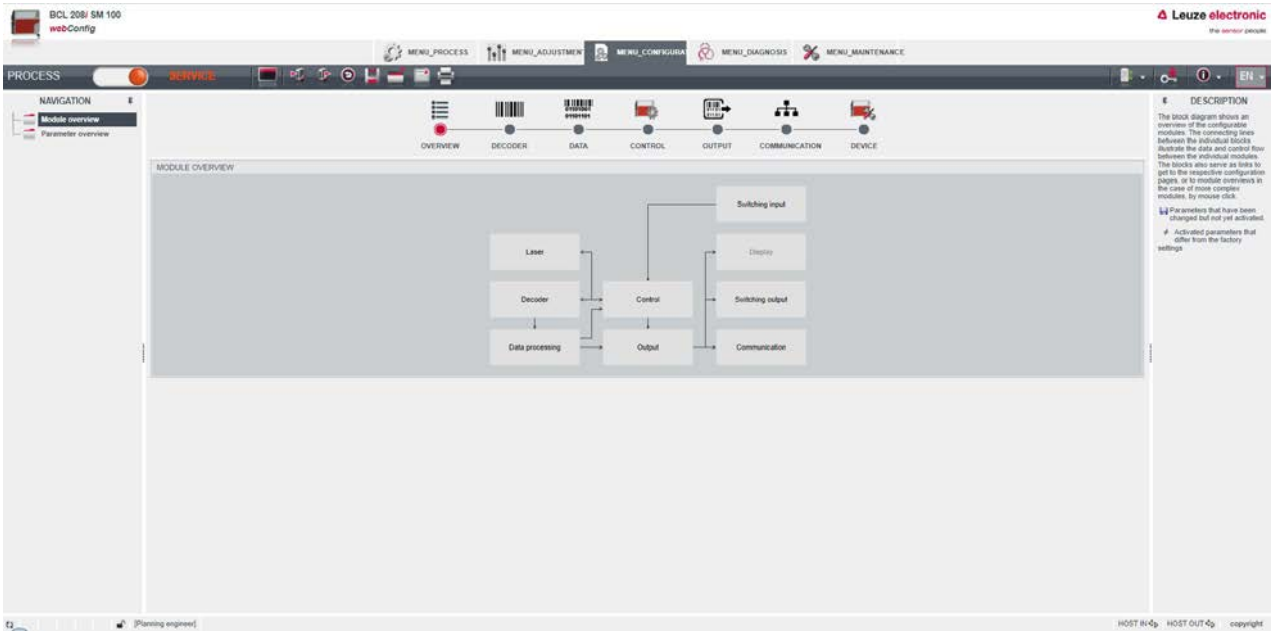


Fig. 7.2: webConfig tool – CONFIGURATION menu

Overview of the configurable modules

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

	NOTICE
	A description containing notes and explanations for all called-up functions can be found at the right-hand edge of the screen. The language that is used can be selected in the webConfig tool via the language selection list.

The webConfig tool is available for all bar code readers of the BCL 200i series.

8 Starting up the device - Configuration

ATTENTION

LASER

↳ Observe the safety notices in see chapter 2.5 "Laser safety notices".

You can execute the basic configuration steps

- via the webConfig tool or
- via the Rockwell control.

Configuration with the webConfig tool

The most convenient way to configure the BCL 258i is via the webConfig tool.

↳ Set up an Ethernet connection between the BCL 258i and a PC/notebook.

NOTICE

Notes on the use of the webConfig tool can be found in see chapter 7 "Starting up the device – Leuze webConfig tool".

8.1 Starting the device

NOTICE

Before commissioning, familiarize yourself with the operation and configuration of the BCL 258i.

Before connecting the supply voltage, recheck all connections and ensure that they have been properly made, see chapter 6 "Electrical connection".

↳ Connect the +18 … 30 V DC supply voltage (typically +24 V DC).

⇨ The BCL 258i starts up, the PWR, NET and LINK LEDs indicate the operating state.

NOTICE

The BCL 258i can decode the following code types in the standard setting:

- Code 128 (number of digits 4 … 63)
- 2/5 Interleaved (number of digits 10)
- Code 39 (number of digits 4 … 30)
- EAN 8 / 13 (number of digits 8 and 13)
- UPC (number of digits 8)
- Codabar (number of digits 4 … 63)
- Code 93 (number of digits 4 … 63)
- Code GS1 Data Bar OMNIDIRECTIONAL
- Code GS1 Data Bar LIMITED
- Code GS1 Data Bar EXPANDED

Deviations from these settings must be set via the webConfig tool, see chapter 7.3.1 "CONFIGURATION menu"

First, you must now set the communication parameters of the BCL 258i.

8.2 Set communication parameters

With the communication parameters, you determine how data is exchanged between BCL 258i and host system. The communication parameters are independent of the topology in which the BCL 258i is operated, see chapter 6.3 "Ethernet – star topologies".

On delivery, the automatic address assignment via DHCP server is defined as the standard setting of the BCL 258i.

8.3 Configuration for a Rockwell control without EDS support

Integrating the hardware into the PLC using the Generic Ethernet Module

In the configuration tool, e.g., Studio 5000, a so-called Generic Ethernet Module is created under the Communication path for the sensor.

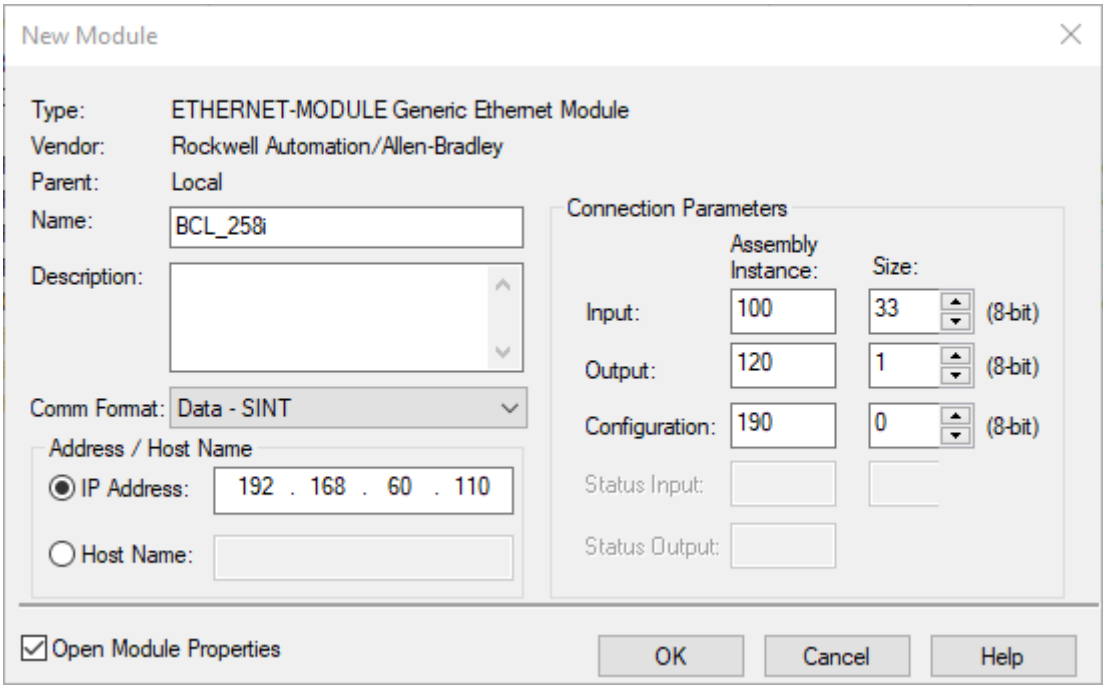


Fig. 8.1: Generic Ethernet Module dialog

↳ Set the following parameters in the input mask:

Tab. 8.1: Adjustment parameters for the Generic Ethernet module

Parameter	Description	Value/value range
Name	Name of the participant	Freely selectable; e.g., BCL 258i
Comm Format	Format of the I/O data	Data - SINT = 8 bits
IP Address	IP address of the participant	e.g., 192.168.60.110
Connection parameters		
Input Assembly Instance	Address of the input assembly	• Instance 100 • Instance 101 • Instance 102
Input Size	Length of the input assembly	Min 1 byte - up to max. 266 bytes for the default input assembly of the read results
Output Assembly Instance	Address of the output assembly	• Instance 120 • Instance 121 • Instance 122
Output Size	Length of the output assembly	Min 1 byte - up to max. 263 bytes for the default output assembly
Configuration Assembly Instance	Address of the configuration assembly	Instance 190
Configuration Size	Length of the configuration assembly	4 bytes

8.4 Configuration for a Rockwell control with EDS support

The following steps are necessary for commissioning with a Rockwell control:

- Install the EDS file via the EDS wizard.
- Create the EtherNet/IP participants in the PLC software, e.g., Studio 5000.
- Set the parameters of the sensor via the configuration assembly or the webConfig tool.

Integrating the hardware in the PLC and installing the EDS file

To integrate the sensor and to establish a connection between the PLC and the sensor, proceed as follows:

- Download the EDS file from the Leuze website **www.leuze.com** under the corresponding product on the *Downloads* tab.
- Load the EDS file for the device via EDS wizard into the PLC database.
- Select the device from the device list.
- Open the input dialog for setting the address and additional parameters by double-clicking on the device symbol and make the desired entries.
- Click on the [Change] button to define the combination of input and output assemblies.

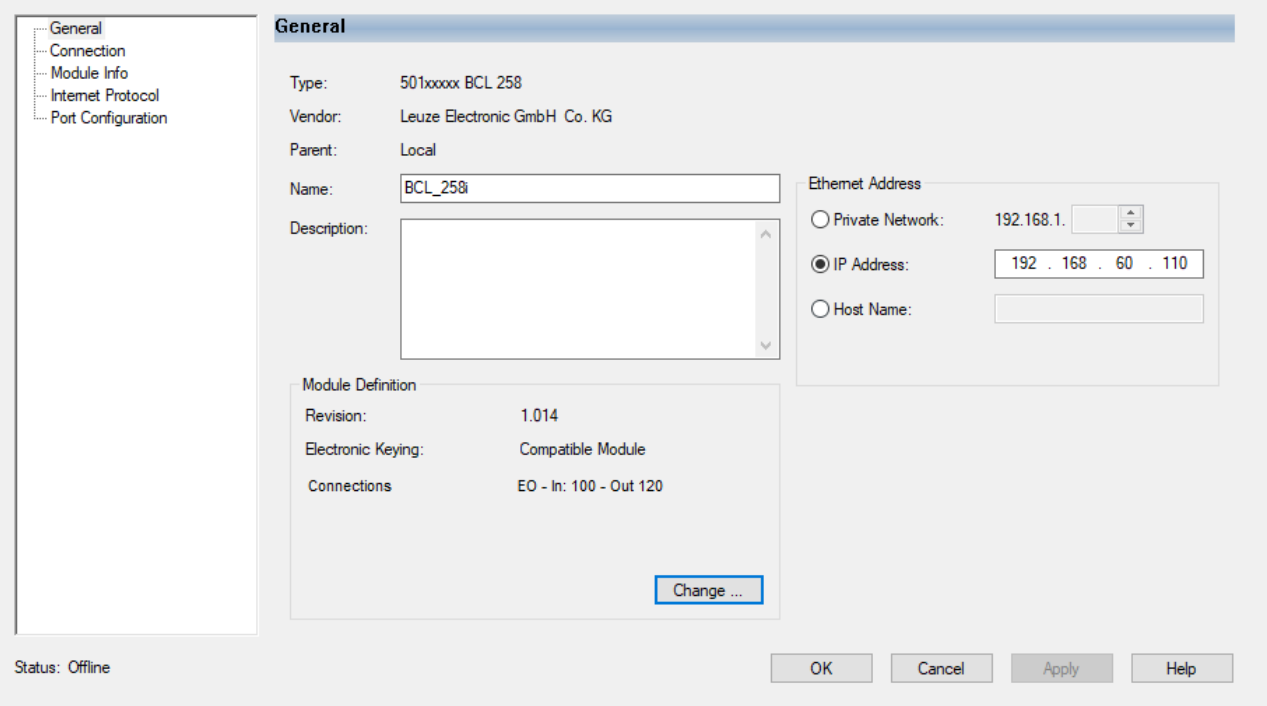


Fig. 8.2: New Module dialog

- Transfer the values to the control via download.

8.5 EDS file

The EDS file contains all identification and communication parameters of the device, as well as the available objects. The PLC software, e.g., Studio 5000 from Rockwell, offers EDS support for EtherNet/IP.

The sensor is uniquely classified via a class 1 identity object (component of the BCL258i.eds file) for the EtherNet/IP sensor.

The identity object contains, among other things, a manufacturer-specific Vendor ID, as well as an ID that describes the principle function of the participant. If accepting the objects without change, all parameters are set to default values. The default settings are listed in the descriptions of the EDS object classes in the Default column.

NOTICE
The EDS object classes are described with their primary attributes in the following tables. Access permissions: **Get**: only read access is allowed. **Set**: read access and the setting of the attribute are allowed.

8.6 EDS object classes

8.6.1 Class 1 – Identity object

Object Class 1 = 0x01

Services:

- Get Attribute Single 0x0E
- Reset type 0x05

Path			Designation	Size in bit	Data type	Default (dec)	Min (dec)	Max (dec)	Access
Cl.	Inst.	Attr.							
1	1	1	Vendor ID	16	UINT	524	-	-	Get
		2	Device type	16	UINT	43	-	-	Get
		3	Product Code	16	UINT	21	-	-	Get
		4	Revision (Major, Minor)	16	Struct {USINT major, USINT minor}	Major=1, Minor=1	Major=1, Minor=1	Major=127, Minor=999	Get
		5	Status	16	WORD	See CIP specification (5-2.2.1.5 status)			Get
		6	Serial number	32	UDINT	Manufacturer specific			Get
		7	Product Name	(max. 32) x 8	SHORT_STRING	"BCL 258i"			Get

In the network configuration (e.g., Studio 5000, Generic Module), it is possible to specify when entering the individual participants which attributes of the scanner are to be monitored from the identity object.

Vendor ID

The Vendor ID assigned by ODVA for Leuze electronic GmbH + Co. KG is 524D.

Device type

The BCL 258i is defined as a generic device (keyable) by Leuze. According to ODVA, the BCL 258i is assigned number 43D = 0x2B.

Product Code

The product code is an ID assigned by Leuze that has no further impact on other objects.

Revision

Version number of the identity object.

Status

The device status is displayed in the status byte, the first part of the telegram.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Ext. device state				Reserved	Configured	Reserved	Owned
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved							

Serial number

For use in EtherNet/IP, the serial number receives a serial number converted according to CIP. CIP describes a special format for the serial number. After conversion to a CIP code, the serial number is, as before, unique, but no longer corresponds to the serial number on the name plate.

Product Name

This attribute contains a short designation of the product. Devices with the same product code may have different product names.

8.6.2 Class 4 – Assembly

The following assemblies are supported by the profile. A distinction is made between input and output assembly. The input assembly groups the data from the sensor for the control. The data from the control is transmitted to the sensor via the output assembly.

Input assembly

The input assembly is the cyclical data from the sensor to the control.

The following three input assemblies are supported.

Input assembly instance 100

Instance 100, attribute 3

Input assembly, length: min. 1 byte … max. 260 bytes

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100	0	Device status							
	1	Number of results							
	2	Reserved		Waiting for acknowledgment	New result (toggle bit)	Buffer overflow	Further results in the buffer	User data or command	Status activation
	3	Result data length (low byte)							
	4	Result data length (high byte)							
	5	Data Byte 0							
	6	Data Byte 1							
	…	Data Byte …							
	259	Data Byte 254							

The number of data starting at byte 5 is defined in the control while configuring the sensor. This makes it possible to use the assembly with any length.

NOTICE
Formula for calculating *the* assembly length: **Length of the assembly = 5 + length of the result/bar code** For results/bar codes with length 10, the assembly must be configured with a length of 5 + 10 = 15.

NOTICE

An example for using the assembly: see chapter 8.6.8 "Example configuration"

Input assembly instance 101

Instance 101, attribute 3

Input assembly, length: min. 1 byte … max. 264 bytes

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
101	0	Device status							
	1	Reserved	Error code			Reserved		Data rejection (toggle bit)	Data acceptance (toggle bit)
	2	Fragment number							
	3	Remaining fragments							
	4	Fragment size							
	5	Number of results							
	6	Reserved		Waiting for acknowledgment	New result (toggle bit)	Buffer overflow	Further results in the buffer	User data or command	Status activation
	7	Result data length (low byte)							
	8	Result data length (high byte)							
	9	Data Byte 0							
	10	Data Byte 1							
	…	Data Byte …							
	263	Data Byte 254							

The number of data starting at byte 9 is defined in the control while configuring the sensor. This makes it possible to use the assembly with any length.

NOTICE

Formula for calculating *the* assembly length:

Length of the assembly = 9 + length of the result/bar code

For results/bar codes with length 10, the assembly must be configured with a length of 9 + 10 = 19.

Input assembly instance 102

Instance 102, attribute 3

Input assembly, length: min. 1 byte … max. 265 bytes

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
102	0	Device status							
	1	Reserved	Switching output, comparison state 2 (toggle bit)	Switching output, comparison state 2	Status input/output I/O 2	Reserved	Switching output, comparison state 1 (toggle bit)	Switching output, comparison state 1	Status input/output I/O 1
	2	Reserved	Error code			Reserved		Data rejection (toggle bit)	Data acceptance (toggle bit)
	3	Fragment number							
	4	Remaining fragments							
	5	Fragment size							
	6	Number of results							
	7	Reserved		Waiting for acknowledgment	New result	Buffer overflow	Further results in the buffer	User data or command	Status activation
	8	Result data length (low byte)							
	9	Result data length (high byte)							
	10	Data Byte 0							
	11	Data Byte 1							
	…	Data Byte …							
	264	Data Byte 254							

The number of data starting at byte 10 is defined in the control while configuring the sensor. This makes it possible to use the assembly with any length.

NOTICE

Formula for calculating *the* assembly length:

Length of the assembly = 10 + length of the result/bar code

For results/bar codes with length 10, the assembly must be configured with a length of 10 + 10 = 20.

Output assembly

The output assembly is the cyclical data from the control to the sensor. The following output assemblies are supported.

Output assembly instance 120

Instance 120, attribute 3

Output assembly, length: min. 1 byte … max. 263 bytes

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
120	0	Reserved			Standby	Error acknowledge	Data reset	Data acknowledgment	Activation signal
	1	Reserved				Reset Event Counter 2	Activation switching output 2 *)	Reset Event Counter 1	Activation switching output 1 *)
	2	Fragment number							
	3	Remaining fragments							
	4	Fragment size							
	5	Reserved						New entry (toggle bit)	New data
	6	Entry data length (low byte)							
	7	Entry data length (high byte)							
	8	Data Byte 0							
	9	Data Byte 1							
	…	Data Byte …							
	262	Data Byte 254							

*) To be able to use the *Activation switching output* function, the output function must be set to External event in the webConfig tool.

The number of data starting at byte 8 is defined in the control while configuring the sensor. This makes it possible to use the assembly with any length.

It is also possible to specify the length of the assembly with one byte and only use the control bits. With a length of 2 bytes, the I/O monitoring control bits can be used in addition to the control bits.

NOTICE

Formula for calculating the assembly length:

Length of the assembly = 8 + length of the entry data

For entry data with length 10, the assembly must be configured with a length of 8 + 10 = 18.

NOTICE

An example for using the assembly: see chapter 8.6.8 "Example configuration"

Output assembly instance 121

Instance 121, attribute 3

Output assembly, length: min. 1 byte … max. 262 bytes

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
121	0	Reserved			Standby	Error acknowledge	Data reset	Data acknowledgment	Activation signal
	1	Fragment number							
	2	Remaining fragments							
	3	Fragment size							
	4	Reserved						New entry (toggle bit)	New data
	5	Entry data length (low byte)							
	6	Entry data length (high byte)							
	7	Data Byte 0							
	8	Data Byte 1							
	…	Data Byte …							
	261	Data Byte 254							

The number of data starting at byte 7 is defined in the control while configuring the sensor. This makes it possible to use the assembly with any length.

It is also possible to specify the length of the assembly with one byte and only use the control bits.

NOTICE

Formula for calculating the assembly length:

Length of the assembly = 7 + length of the entry data

For entry data with length 10, the assembly must be configured with a length of 7 + 10 = 17.

Output assembly instance 122

Instance 122, attribute 3

Output assembly, length: min. 1 byte … max. 261 bytes

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
122	0	Fragment number							
	1	Remaining fragments							
	2	Fragment size							
	3	Reserved						New entry (toggle bit)	New data
	4	Entry data length (low byte)							
	5	Entry data length (high byte)							
	6	Data Byte 0							
	7	Data Byte 1							
	…	Data Byte …							
	260	Data Byte 254							

The number of data starting at byte 6 is defined in the control while configuring the sensor. This makes it possible to use the assembly with any length.

NOTICE

Formula for calculating the assembly length:

Length of the assembly = 6 + length of the entry data

For entry data with length 10, the assembly must be configured with a length of 6 + 10 = 16.

Configuration assembly

The configuration assembly is the data from the control to the sensor which is transferred as the configuration during the establishment of communication. The following configuration assembly is supported.

Configuration assembly instance 190

Instance 190, attribute 3

Configuration assembly, length: 4 bytes

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
190	0	Reserved							Mode 0 = Without ACK 1 = With ACK
	1	Reserved							Activate result fragmentation 0 = Fragmentation inactive 1 = Fragmentation active
	2	Reserved							Activate input fragmentation 0 = Fragmentation inactive 1 = Fragmentation active
	3	Reserved							

Byte	Cross reference address	Function	Bit assignment (default)								Default (hex)
			7	6	5	4	3	2	1	0	
0	106 / 1 / 1	Mode	-	-	-	-	-	-	-	0	00
1	107 / 1 / 9	Activate result fragmentation	-	-	-	-	-	-	-	0	00
2	108 / 1 / 8	Activate input fragmentation	-	-	-	-	-	-	-	0	00
3	-	Reserved	-	-	-	-	-	-	-	-	00

NOTICE

In the configuration assembly, all parameters have the value 0. Changing the individual default values is possible at any time. The participant is defined in off-line mode; the data must subsequently be transferred to the control.

8.6.3 Class 103 – I/O status and control

This class is for handling switching input and switching output signals.

Object class 103 = 0x67

Services:

- Get Attribute Single 0x0E
- Set Attribute Single 0x10

Path			Designation	Size in bits	Data type	Default (dec)	Min (dec)	Max (dec)	Access
Cl.	Inst.	Attr.							
103	1	1-4	Reserved						
SWI 1		5	Status (input/output)	8	U8	0	0	1	Get
		6	Output activation	8	U8	0	0	1	Set
		7	Reset Event Counter	8	U8	0	0	1	Set
		8	Switching output comparison state (event counter)	8	U8	0	0	1	Get
		9	Switching output comparison state toggle bit (event counter)	8	U8	0	0	1	Get
103	2	1-4	Reserved						
SWO 2		5	Status (input/output)	8	U8	0	0	1	Get
		6	Output activation	8	U8	0	0	1	Set
		7	Reset Event Counter	8	U8	0	0	1	Set
		8	Switching output comparison state (event counter)	8	U8	0	0	1	Get
		9	Switching output comparison state toggle bit (event counter)	8	U8	0	0	1	Get

NOTICE

Toggle bits are control and monitoring control flags which are not level-sensitive, but rather triggered by edges.

Attributes 1-4

Attributes 1-4 are not supported in this profile.

Status (input/output)

Signal state of the switching input or switching output.

Output activation

Sets the state of the switching output:

0: Switching output 0, low, inactive

1: Switching output 1, high, active

Reset Event Counter

Resets the event counter of the activation function back to zero:

0 > 1: Perform reset

1 > 0: No function

Switching output comparison state (event counter)

Indicates whether the event counter has exceeded the set comparative value. The bit is reset to the initial value by resetting the event counter.

0: Not exceeded

1: Exceeded

Switching output 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. The bit is reset to the initial value by resetting the event counter.

0 > 1: Event counter exceeded

1 > 0: Event counter exceeded again

8.6.4 Class 106 – Activation

This class defines the control signals for activating the sensor as well as the signals for the control of the result output. It is possible to select between standard data output 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 result, the input data is reset (filled with zeros).

Object class 106 = 0x6A

Services:

- Get Attribute Single 0x0E
- Set Attribute Single 0x10

Path			Designation	Size in bit	Data type	Default (dec)	Min (dec)	Max (dec)	Access
Cl.	Inst.	Attr.							
106	1	1	Mode *)	8	U8	0	0	1	Set
		2	Number of results	8	U8	0	0	255	Get
		3	Activation signal	8	U8	0	0	1	Set
		4	Data acknowledgment	8	U8	0	0	1	Set
		5	Data reset	8	U8	0	0	1	Set

*) The *Mode* attribute is a parameter. The value of the parameter can be set via the configuration assembly.

Mode

The parameter defines the mode in which the communication is operated:

0: Without ACK

1: With ACK

Number of results

This value specifies how many messages are ready to be picked up in the sensor.

Activation signal

Signal for activating the sensor. This action starts image acquisition with the sensor. This attribute is edge-triggered, not level-controlled.

0 > 1: Activation (e.g., open reading gate)

1 > 0: Deactivation (e.g., close reading gate)

Data acknowledgment

This control bit signals that the transmitted data have been processed by the master. Only relevant with handshake mode (with ACK), see Mode.

0 > 1: Data has been processed by the master

1 > 0: Data has been processed by the master

Data reset

Deletes results that may have been stored and resets the input data.

0 > 1: Data reset

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

1. Deletion of results that may still be stored
2. Resetting of the attributes of Class 107 – Result data

8.6.5 Class 107 – Result data

NOTICE

The result is the data from the sensor to the control.

This class defines the transfer of the result data. The result data comes from the Formatter currently selected. This can be selected and configured in the webConfig tool. This class also defines the output of fragmented results. To occupy few I/O data, the results may be split into several fragments with this class. The fragments can then be transmitted one after another with a handshake.

Object class 107 = 0x6B

Services:

- Get Attribute Single 0x0E
- Set Attribute Single 0x10

Path			Designation	Size in bit	Data type	Default (dec)	Min (dec)	Max (dec)	Access
Cl.	Inst.	Attr.							
107	1	1	Activation status	8	U8	0	0	1	Get
		2	User data or command	8	U8	0	0	1	Get
		3	Further results in the buffer	8	U8	0	0	1	Get
		4	Buffer overflow	8	U8	0	0	1	Get
		5	New results (toggle bit)	8	U8	0	0	1	Get
		6	Waiting for acknowledgment	8	U8	0	0	1	Get
		7	Result data length	16	U16	0	0	65535	Get
		8	Data	2040	U8 [255]	0	0	255	Get
		9	Activate result fragmentation *)	8	U8	0	0	1	Set
		10	Fragment number	8	U8	0	0	255	Get
		11	Remaining fragments	8	U8	0	0	255	Get
		12	Fragment size	8	U8	32	0	255	Get

*) The *Activate result fragmentation* attribute is a parameter. The value of the parameter can be set via the configuration assembly.

Activation status

Displays the current activation status:

0: Deactivated

1: Activated

User data or command

Distinction between result from the Formatter and answer from the command interpreter. Makes the distinction easy for the user:

0: User data

1: Response from command interpreter

Further results in the buffer

This signal indicates whether further results are in the buffer:

0: No

1: Yes

Buffer overflow

This signal indicates that all result buffers are occupied and that the sensor rejects data:

0: No

1: Yes

New result (toggle bit)

The toggle bit indicates whether a new result is present:

0 > 1: New result

1 > 0: New result

Waiting for acknowledgment

This signal represents the internal state of the control:

0: Base state

1: Control waiting for acknowledgment from the master

Result data length

Data length of the actual result information. If the result information fits in the selected assembly length, this value reflects the length of the transmitted data. A value larger than the assembly length indicates a loss of information caused by an assembly length which has been selected too small.

Data

Result information with a length of max. 255 bytes.

Activate result fragmentation

This attribute specifies whether the messages from the sensor to the control should be transferred in fragments:

0: Fragmentation inactive

1: Fragmentation active

Fragment number

Current fragment number

Remaining fragments

Number of fragments which still have to be read for a complete result.

Fragment size

The fragment size corresponds to the projected fragment length, except for the last fragment.

8.6.6 Class 108 – Entry data

NOTICE

The entry data are the data from the control to the sensor.

This class defines the transfer of entry data to a command interpreter in the sensor. This class also defines the transfer of fragmented entry data. To occupy few I/O data, the entry data may be split into several fragments with this class. The fragments can then be transmitted one after another with a handshake.

Object class 108 = 0x6C

Services:

- Get Attribute Single 0x0E
- Set Attribute Single 0x10

Path			Designation	Size in bit	Data type	Default (dec)	Min (dec)	Max (dec)	Access
Cl.	Inst.	Attr.							
108	1	1	Data acceptance (toggle bit)	8	U8	0	0	1	Get
		2	Data rejection (toggle bit)	8	U8	0	0	1	Get
		3	Error code	8	U8	0	0	8	Get
		4	Reserved						
		5	New entry (toggle bit)	8	U8	0	0	1	Set
		6	Entry data length	16	U16	0	0	65535	Set
		7	Data	2040	U8 [255]	0	0	255	Set
		8	Activate input fragmentation *)	8	U8	0	0	1	Set
		9	Fragment number	8	U8	0	0	255	Set
		10	Remaining fragments	8	U8	0	0	255	Set
		11	Fragment size	8	U8	0	0	255	Set

*) The *Activate input fragmentation* attribute is a parameter. The value of the parameter can be set via the configuration assembly.

Data acceptance (toggle bit)

The signal shows that the sensor has accepted the data or the data fragment (see also Toggle bit data rejection):

0 > 1: Data has been accepted

1 > 0: Data has been accepted

Data rejection (toggle bit)

The sensor has rejected the acceptance of the data or the data fragment (see also Toggle bit data acceptance).

0 > 1: Data has been rejected

1 > 0: Data has been rejected

Error code

Cause of error if a message is rejected:

0: No error

1: Receive buffer overflow, e.g., if the data length to be transferred is greater than the data buffer of the command interpreter.

2: Sequence error, i.e. an error was detected with the fragment number transferred from the control, the number of remaining fragments or the fragment size.

	NOTICE
	The following sequence diagram shows with examples how the *Data acceptance*, *Data rejection* and *Error code* attributes are connected.

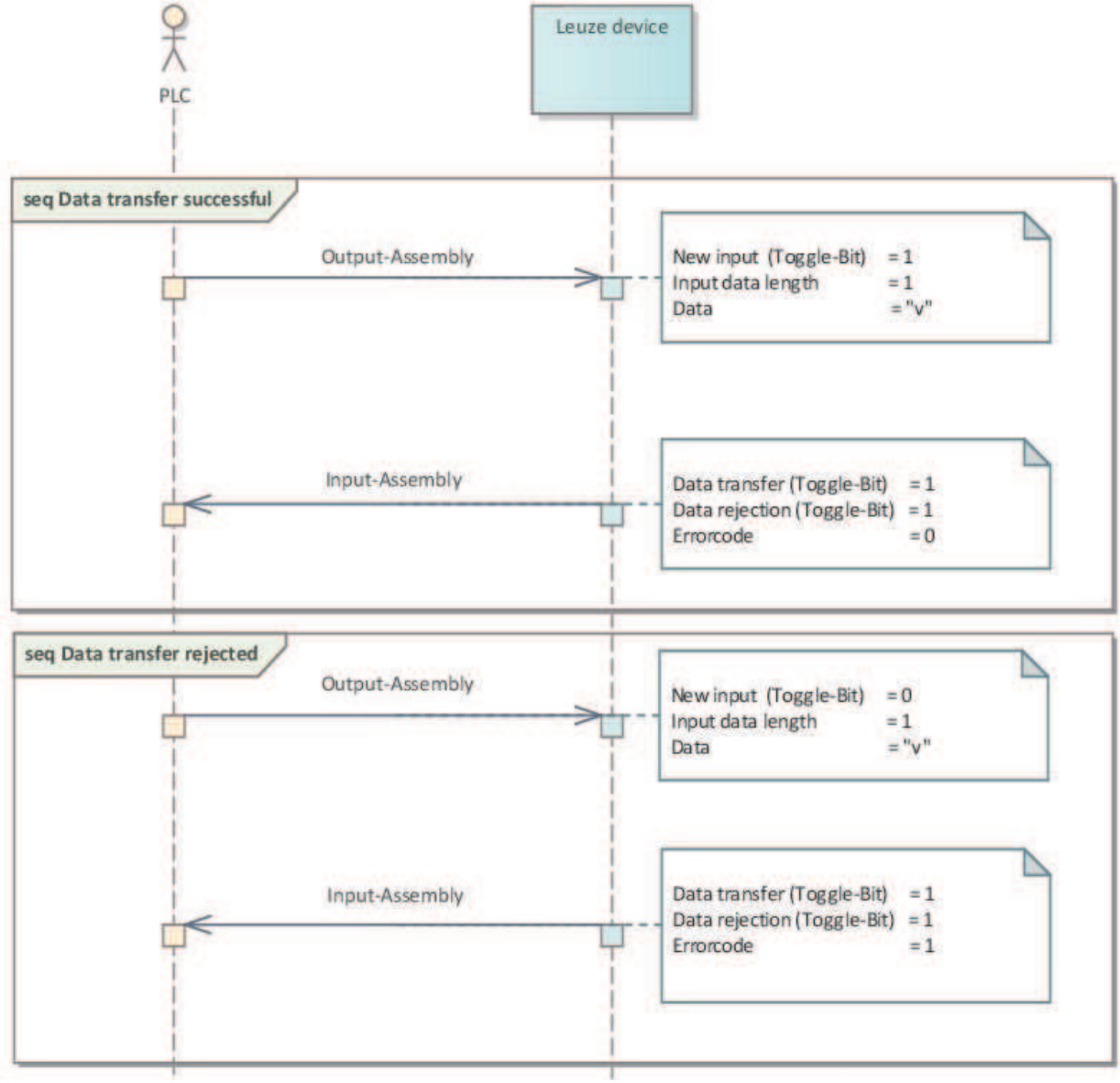


Fig. 8.3: Summary of the attributes *data acceptance*, *data rejection* and *error code*

New entry (toggle bit)

The toggle bit shows whether new entry data is present:

0 > 1: New result

1 > 0: New result

Entry data length

Data length of the actual information.

Data

Information with a length of max. 255 bytes.

Activate input fragmentation

This attribute specifies whether the messages from the control to the sensor should be transferred in fragments.

0: Fragmentation inactive

1: Fragmentation active

Fragment number

Current fragment number

Remaining fragments

Number of fragments which still have to be transmitted for a complete entry.

Fragment size

The fragment size should always be identical, except for the last fragment to be transferred. A fragment size of 0 means that the fragmentation is not used.

8.6.7 Class 109 – Device status and device control

This class contains the display of the device status as well as control bits for deleting an error or putting the sensor into standby mode.

Object class 109 = 0x6D

Services:

- Get Attribute Single 0x0E
- Set Attribute Single 0x10

Path			Designation	Size in bit	Data type	Default (dec)	Min (dec)	Max (dec)	Access
Cl.	Inst.	Attr.							
109	1	1	Device status	8	U8	15	0	129	Get
		2	Error acknowledge	8	U8	0	0	1	Set
		3	Standby	8	U8	0	0	1	Set

Device status

This byte represents the device status:

10: Standby

15: Device is ready

128: Error

129: Warning

Error acknowledge

This control bit confirms and deletes errors or warnings that may be present in the system. It acts like a toggle bit.

0 > 1: Error Acknowledge

1 > 0: Error Acknowledge

Standby

Activates the standby function:

0: Standby off

1: Standby on

NOTICE
The standby function results in - no data going to the outside via the interfaces. - the IOs not being operated. - it not being possible to trigger a trigger. - the device displaying 'not ready'.

8.6.8 Example configuration

Using two examples, we will show how the previously described profile can be used to solve different scenarios.

Example	In	Out	Config
1 – Activation and result	33 bytes	1 byte	0 byte
2 – Activation and result and I/Os	20 bytes	2 bytes	0 byte

Example 1 – Activation and result

The following screenshot shows the configuration of the device in the Studio 5000 control software.

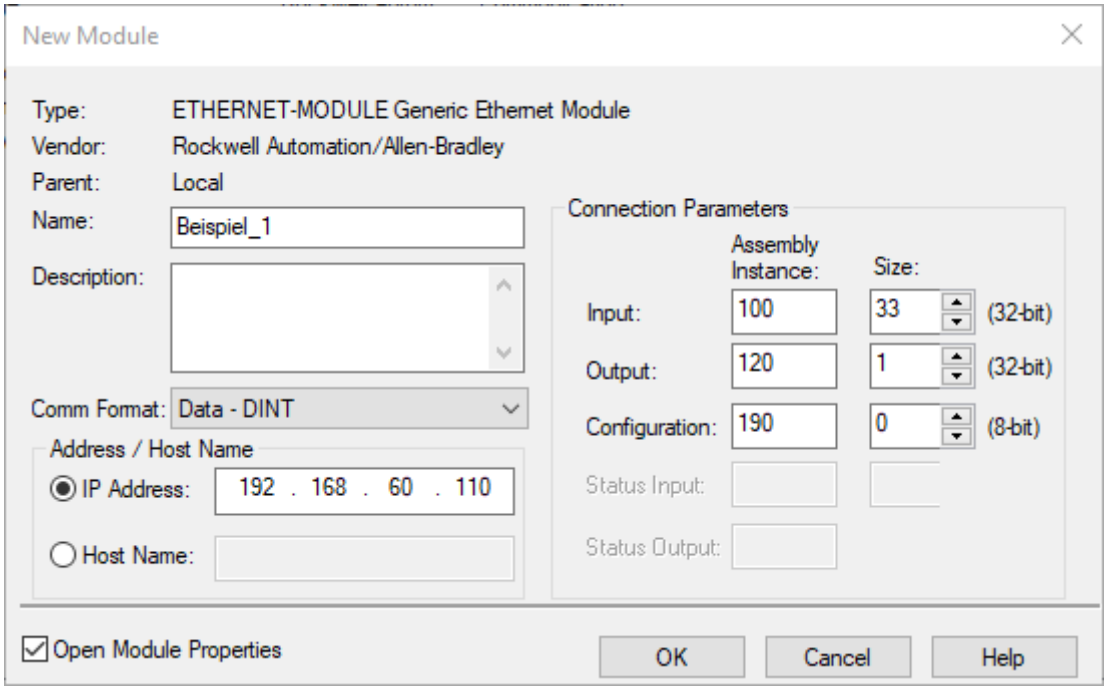


Fig. 8.4: Configuration of example 1 – module definition with generic module

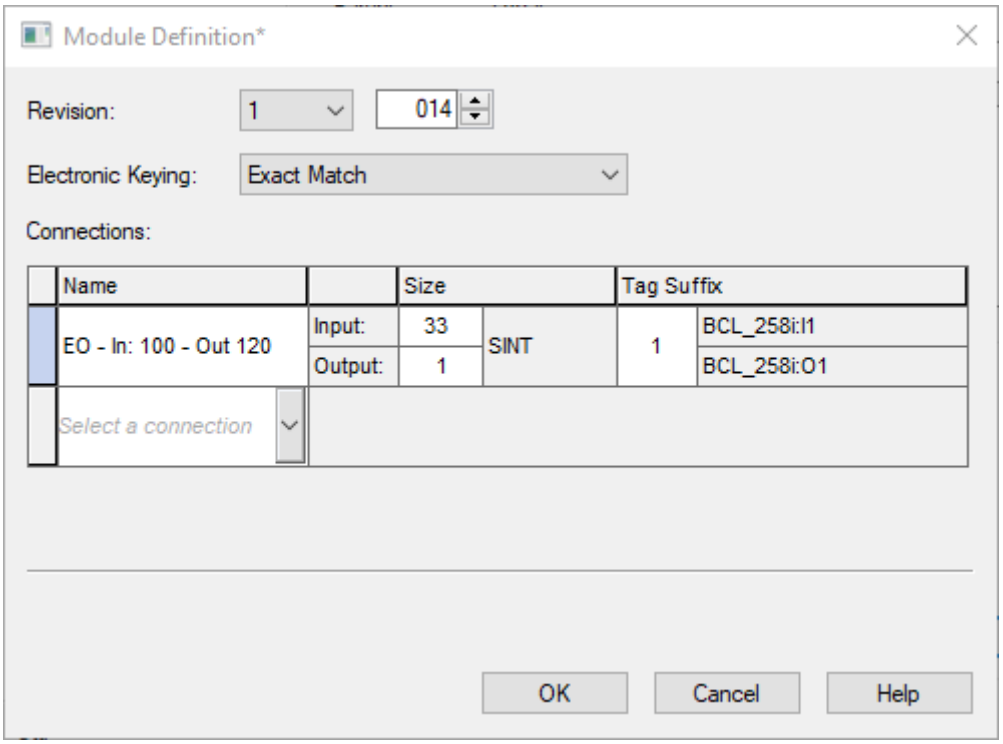


Fig. 8.5: Configuration of example 1 – module definition with the EDS file

Tab. 8.2: Structure of input assembly 100

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100	0	Device status							
	1	Number of results							
	2	Reserved		Waiting for acknowl-edgment	New result (toggle bit)	Buffer overflow	Further results in the buffer	User data or com-mand	Status acti-vation
	3	Result data length (low byte)							
	4	Result data length (high byte)							
	5	Data Byte 0							
	6	Data Byte 1							
	…	Data Byte …							
	32	Data Byte 27							

Tab. 8.3: Structure of output assembly 120

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
120	0	Reserved			Standby	Error ac-knowledge	Data reset	Data ac-knowledg-ment	Activation signal

Structure of configuration assembly 190

Since the configuration is not used, the length of the configuration assembly is specified as 0. The device then operates with the default values. In this case, the acknowledge mode is not used.

Below, examples of what data exchange looks like during two subsequent activations are shown.

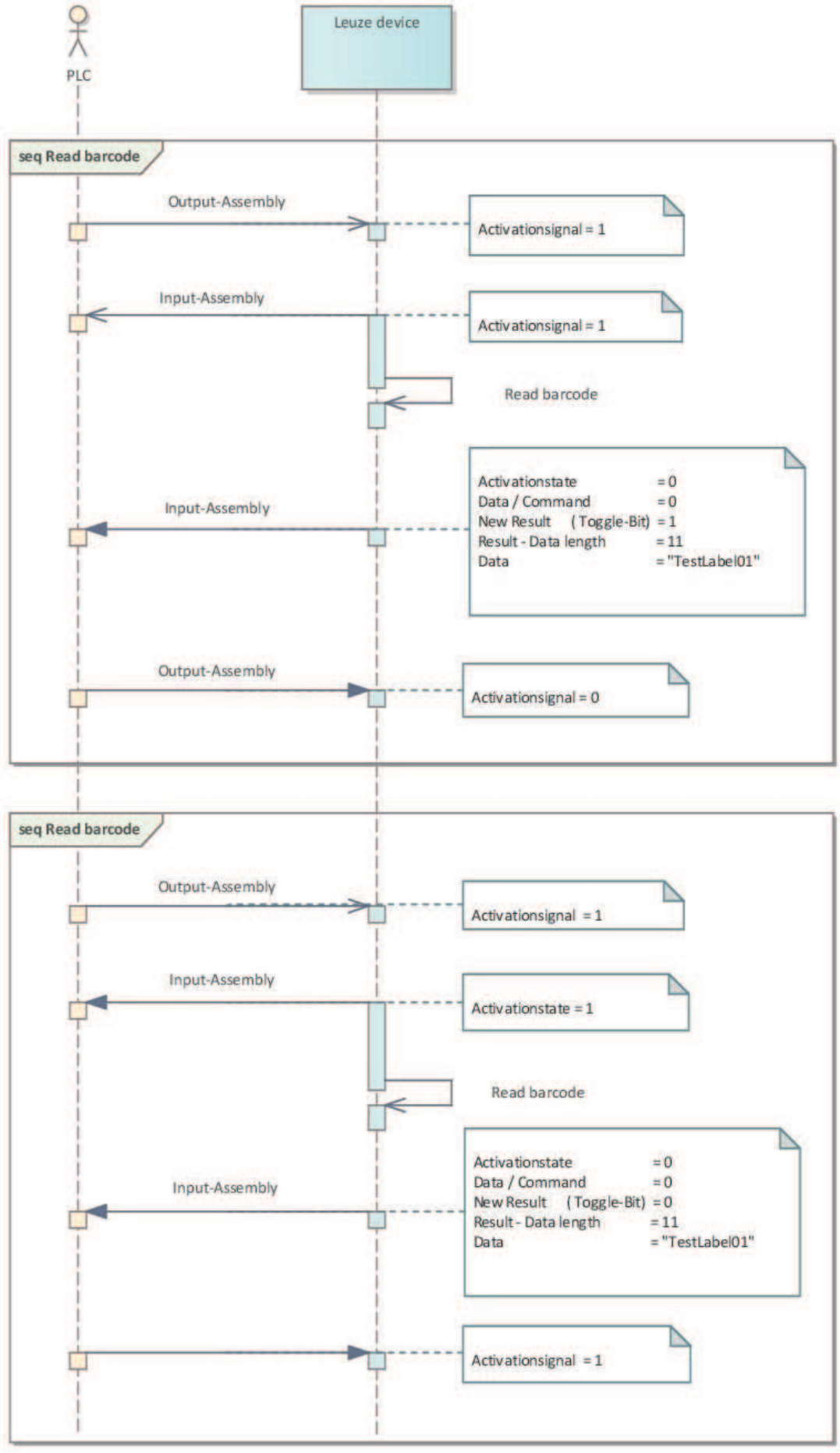


Fig. 8.6: Sequence diagram: data exchange when reading a bar code

Example 2 – Activation and result and I/Os

The following screenshot shows the configuration of the device in the Studio 5000 control software.

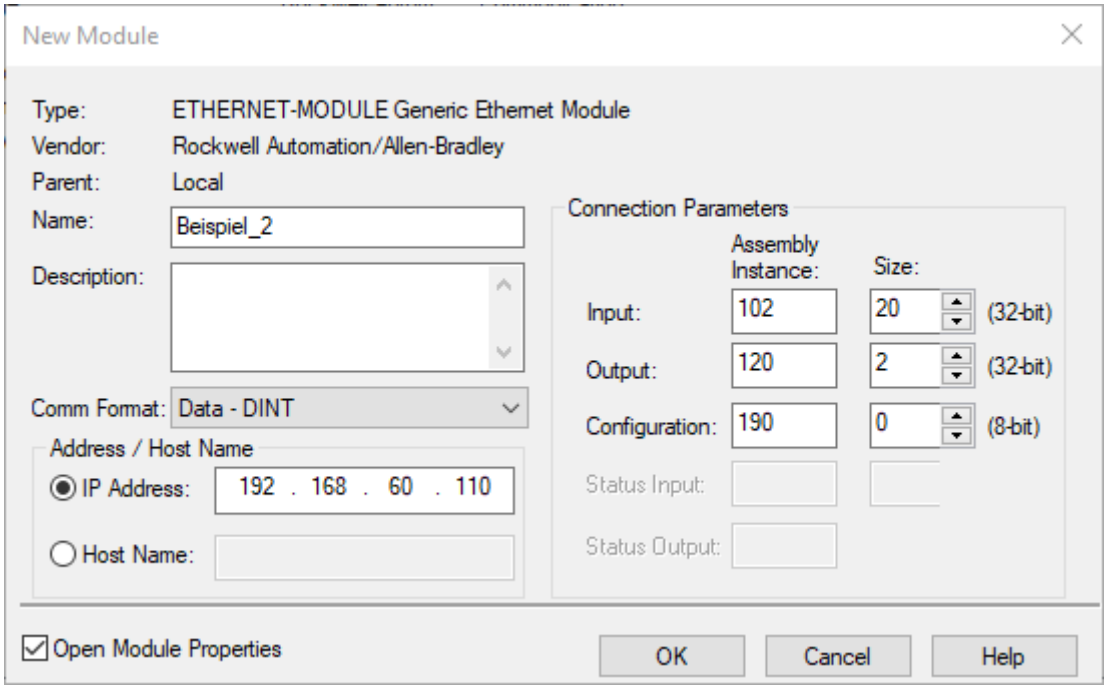


Fig. 8.7: Configuration of example 2 – module definition with generic module

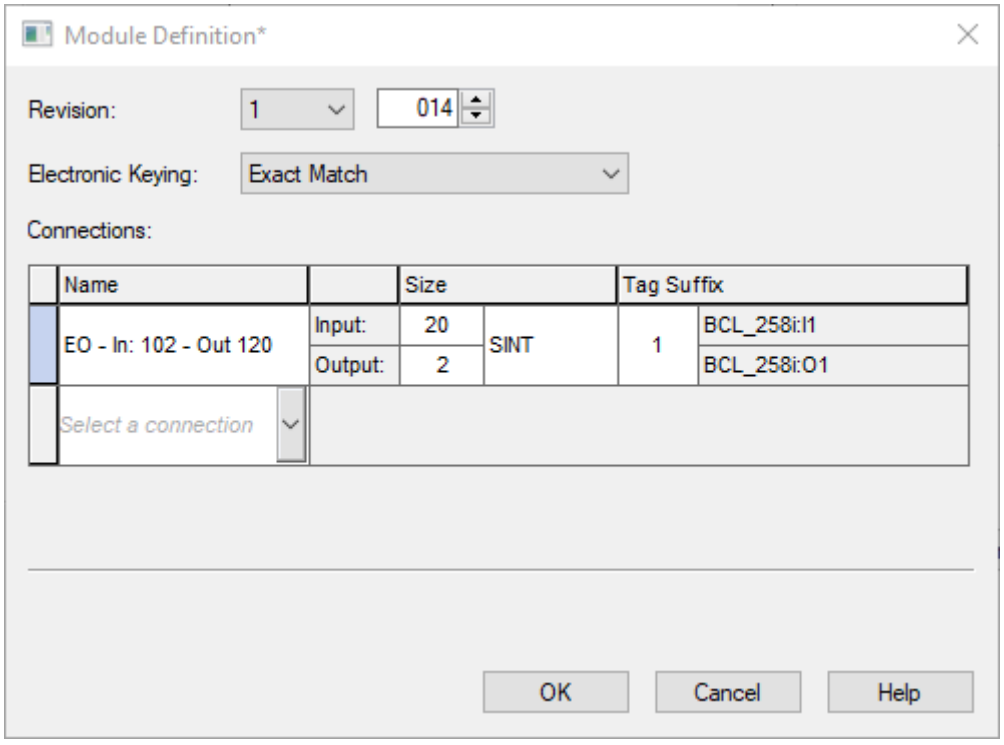


Fig. 8.8: Configuration of example 2 – module definition with the EDS file

Tab. 8.4: Structure of input assembly 102

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
102	0	Device status							
	1	Reserved	Switching output, comparison state 2 (toggle bit)	Switching output, comparison state 2	Status input/output I/O 2	Reserved	Switching output, comparison state 1 (toggle bit)	Switching output, comparison state 1	Status input/output I/O 1
	2	Reserved	Error code			Reserved		Data rejection (toggle bit)	Data acceptance (toggle bit)
	3	Fragment number							
	4	Remaining fragments							
	5	Fragment size							
	6	Number of results							
	7	Reserved		Waiting for acknowledgment	New result	Buffer overflow	Further results in the buffer	User data or command	Status activation
	8	Result data length (low byte)							
	9	Result data length (high byte)							
	10	Data Byte 0							
	11	Data Byte 1							
	…	Data Byte …							
	19	Data Byte 9							

Tab. 8.5: Structure of output assembly 120

Inst.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
120	0	Reserved			Standby	Error acknowledge	Data reset	Data acknowledgment	Activation signal
	1	Reserved				Reset Event Counter 2	Activation switching output 2 *)	Reset Event Counter 1	Activation switching output 1 *)

*) To be able to use the *Activation switching output* function, the output function must be set to External event in the webConfig tool.

Structure of configuration assembly 190

Since the configuration is not used, the length of the configuration assembly is specified as 0. The device then operates with the default values. In this case, the acknowledge mode is not used.

Below, examples of what data exchange looks like during two subsequent activations are shown.

Switching output 1 reflects the activation signal. Switching output 2 displays whether the result is valid (status input/output I/O 2 = 1] or whether a NoRead has taken place (status input/output I/O 2 = 0).

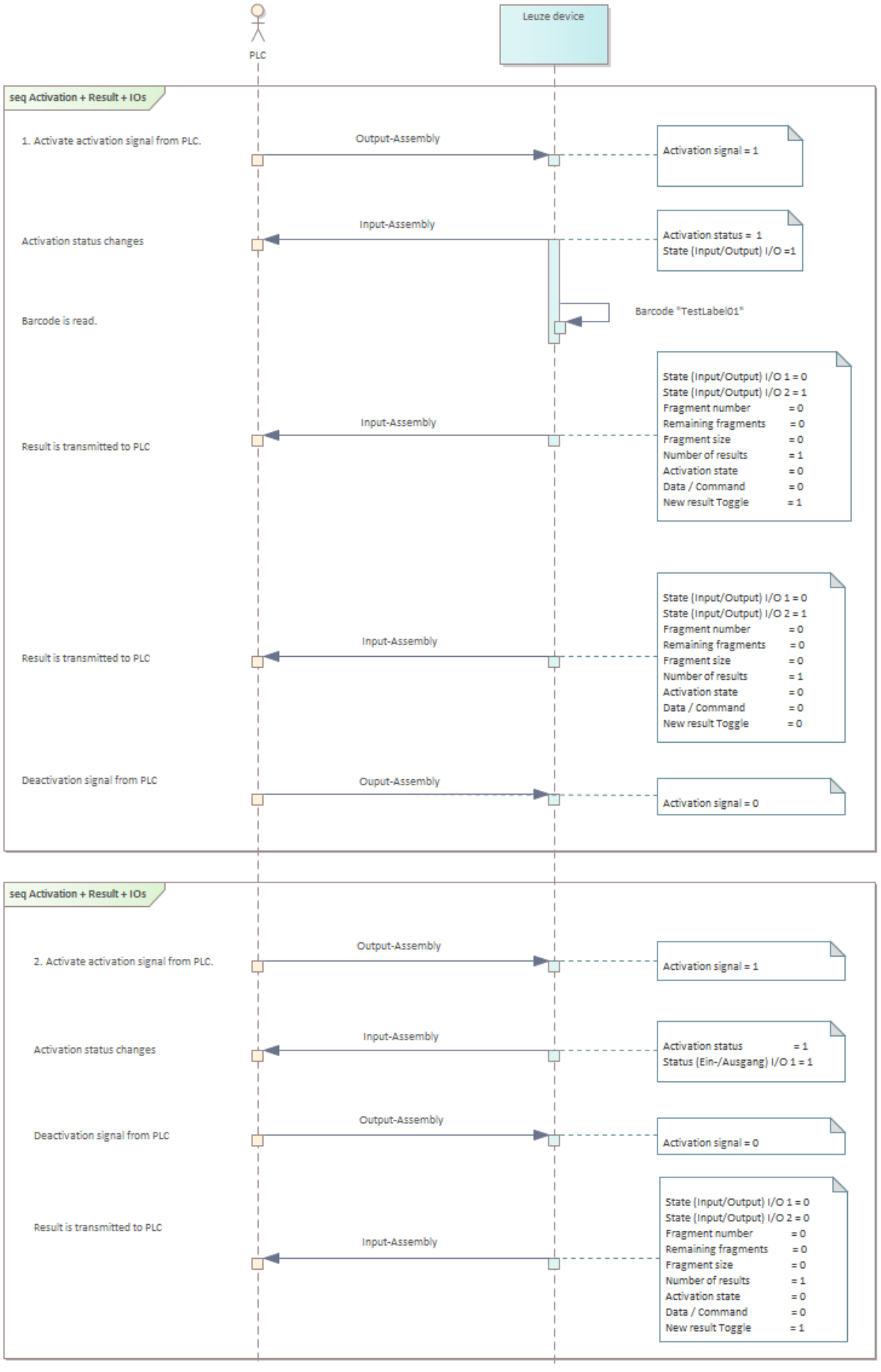


Fig. 8.9: Sequence diagram: data exchange for activation, result and I/Os

9 Online commands

9.1 Overview of commands and parameters

Online commands can be used to send commands directly to the device for control and configuration. For this purpose, the bar code reader must be connected to a host or service computer via the interface. The described commands are sent via the host interface.

Online commands offer the following options for controlling and configuring the bar code reader:

- Control/decode the reading gate
- Read/write/copy parameters
- Carry out an automatic configuration
- Teach-in/set reference codes
- Call up error messages
- Query statistical device information
- Perform a software RESET and re-initialize the bar code reader

Syntax

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

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

Example:

Command '**CA**':	autoConfig function
Parameter '**+**':	Activation
Transmitted is:	'**CA+**'

Notation

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

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

9.2 General online commands

Software version number

Command	**'V'**
Description	Requests device version information
Parameter	None
Acknowledgment	Example: **'BCL 258i SM 110 V1.14.0 2021-07-19'** The first line contains the device type of the bar code reader, followed by the device version number and version date. The data which is actually displayed may vary from the values given here.

NOTICE

You can use this command to check whether the communication between PC and bar code reader is functional.

↳ If you do not receive an acknowledgment, please check the interface connections or the protocol.

Software reset

Command	'H'
Description	Carries out a software reset. The device is restarted and reinitialized, leaving it in the same state as when the supply voltage is switched on.
Parameter	None
Acknowledgment	'S' (start signal)

Code recognition

Command	'CC'		
Description	Detects an unknown bar code and outputs number of digits, code type, and code information to the interface, without storing the bar code in the parameter memory.		
Parameter	None		
Acknowledgment	'xx yyyy zzzzzz'		
	xx	Code type of the read code	
		'01'	2/5 Interleaved
		'02'	Code 39
		'03'	Code 32
		'06'	UPC (A, E)
		'07'	EAN
		'08'	Code 128, EAN 128
		'10'	EAN Addendum
		'11'	Codabar
		'12'	Code 93
		'13'	GS1 DataBar OMNIDIRECTIONAL
		'14'	GS1 DataBar LIMITED
		'15'	GS1 DataBar EXPANDED
	yy	Number of digits of the read code	
	zzzzzz	Contents of the decoded label. A ↑ appears if the label was not correctly read.	

autoConfig

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

Alignment mode

Command	'JP'	
Description	Activates or deactivates the alignment mode for simple mounting alignment of the device. After activating the function with **JP+**, the bar code reader constantly outputs status information on the serial interface. With this online command, the bar code reader is set to terminate the decoding after 100 successfully decoded labels and output the status information. Subsequently, the read process is reactivated automatically. In addition to the output of the status information, the laser beam is used to display the reading quality. Depending on how many read results could be extracted, the duration of the laser's "OFF" time increases. If the reading quality is high, the laser beam flashes in brief, regular intervals. The worse the decoder decodes, the longer the pauses become during which the laser is switched off. The flashing intervals become more and more irregular because the laser may, in total, be active for longer to extract more labels. The duration of the pauses has been stepped in such a way that they can be distinguished by the eye.	
Parameter	'+'	activates the alignment mode
	'-'	deactivates the alignment mode
Acknowledgment	'yyy zzzzzz'	
	yyy	Read quality in %. A high process availability is ensured at read qualities > 75 %.
	zzzzzz	Bar code information

Manual definition of the reference code

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

Command	'RS'
Example	Entry = 'RS130678654331' Code 1 (1), RAM only (3), UPC (06), code information

Reference code teach-in

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

NOTICE
With this function, only code types are recognized that are identified using the *autoConfig* function or which were set in the set-up. ↳ After each reading via an 'RTy' command, explicitly switch off the function again since failure to do so will interfere with other commands as well as prevent execution of a new 'RTx' command.

Reading a reference code

Command	'RR'		
Description	The command reads out the reference code defined in the bar code reader. If no parameters are specified, all defined codes are output.		
Parameter	<reference code number>		
	'1' … '2'	Value range of reference code 1 to 2	
Acknowledgment	Output in the following format: '**RCyvxxzzzzzz**' If no reference codes are defined, nothing is entered for **zzzzzz**. **y**, **v**, **x** and **z** are placeholders (variables) for the actual input.		
	y	Defined reference code no.	
		'1'	(Code 1)
		'2'	(Code 2)
	v	Storage location for reference code	
		'0'	RAM+EEPROM
		'3'	RAM only
	xx	Defined code type (see command 'CA')	
	z	Defined code information (1 … 63 characters)	

9.3 Online commands for system control

Activate sensor input

Command	'+'
Description	The command activates configured decoding. This command is used to activate the reading gate. It remains active until it is deactivated by one of the following criteria: • Deactivation by a manual command • Deactivation by a switching input • Deactivation upon reaching the specified read quality (equal scans) • Deactivation by timeout • Deactivation upon reaching a preset number of scans without information
Parameter	None
Acknowledgment	None

Deactivate sensor input

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

9.4 Online commands for configuration of switching inputs/outputs

Activate switching output

Command	'OA'		
Description	Switching output SWO2 can be activated with this command. The logic state is output, i.e., an inverted logic is taken into account (e.g., inverted logic and a state of High corresponds to a voltage of 0 V at the switching output).		
Parameter	'OA<a>' <a> Selected switching output 2, unit (dimensionless)		
Acknowledgment	None		

Query the state of the switching output

Command	'OA'		
Description	The states of the switching output set by means of commands can be queried with this command. The logic state is output, i.e., an inverted logic is taken into account (e.g., inverted logic and a state of High corresponds to a voltage of 0 V at the switching output).		
Parameter	'OA?'		
Acknowledgment	'OA S1=<a>;S2=<a>'		
	<a>	State of the switching output	
		'0'	Low
		'1'	High
		'I'	Configuration as switching input
		'P'	Passive configuration

Set the state of the switching output

Command	'OA'		
Description	The state of switching output SWO2 can be set with this command. The logic state is output, i.e., an inverted logic is taken into account (e.g., inverted logic and a state of High corresponds to a voltage of 0 V at the switching output). You may also use only a selection of the existing switching inputs/outputs as long as these are listed in ascending order.		
Parameter	'OA [S1=<a>][;S2=<a>]'		
	<a>	State of the switching output	
		'0'	Low
		'1'	High
Acknowledgment	'OA=<aa>'		
	<aa>	Status acknowledgment, unit (dimensionless)	
		'00'	Ok
		'01'	Syntax error
		'02'	Parameter error
		'03'	Other error

Deactivate switching output

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

9.5 Online commands for the parameter set operations

Copying parameter set

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

Request parameter data set of the bar code reader

Command	'PR'		
Description	The parameters of the bar code reader are grouped together in a parameter set and permanently stored in memory. There is one parameter set in permanent memory and one operating parameter set in volatile memory; in addition, there is a default parameter set (factory parameter set) for initialization. This command can be used to edit the first two parameter sets (in permanent and volatile memory). A check sum can be used for reliable parameter transfer.		
Parameter	'PR<BCC type><PS type><Address><Data length>[<BCC>]'		
	<BCC type>	Check-digit function during transmission, unit [dimensionless]	
		'0'	Not used
		'3'	BCC mode 3
	<PS type>	Memory from which the values are to be read, unit [dimensionless]	
		'0'	Parameter values stored in the flash memory
		'1'	Reserved
		'2'	Default values
		'3'	Operating values in RAM
	<Address>'aaaa'	Relative address of the data within the data set, four-digit, unit [dimensionless]	
	<Data length>'bbbb'	Length of the parameter data to be transferred, four-digit, unit [length in bytes]	
	<BCC>	Check sum calculated as specified under BCC type	
Acknowledgment positive	PT<BCC-Type><PS-Type><Status><Start><Parameter Value Address><Parameter Value Address+1>…[;<Address><Parameter Value Address>][<BCC>]		
	<BCC type>	Check-digit function during transmission, unit [dimensionless]	
		'0'	Not used
		'3'	BCC mode 3
	<PS type>	Memory from which the values are to be read, unit [dimensionless]	
		'0'	Parameter values stored in flash memory
		'2'	Default values
		'3'	Operating values in RAM
	<Status>	Mode of parameter processing, unit [dimensionless]	
		'0'	No further parameters
		'1'	Additional parameters follow
	<Start>'aaaa'	Relative address of the data within the data set, four-digit, unit [dimensionless]	
	<P.value A.>	Parameter value of the parameter stored at this address; the parameter set data 'bb' is converted from HEX format to a 2-byte ASCII-format for transfer.	
	<BCC>	Check sum calculated as specified under BCC type,	

Command	'PR'		
Acknowledgment negative	'PS=<aa>'		
	Parameter reply:		
	<aa>	Status acknowledgment, unit [dimensionless]	
		'01'	Syntax error
		'02'	Impermissible command length
		'03'	Impermissible value for checksum type
		'04'	Invalid check sum received
		'05'	Impermissible number of data requested
		'06'	Requested data does not (any longer) fit in the transmission buffer
		'07'	Impermissible address value
		'08'	Read access after end of data set
		'09'	Impermissible QPF data set type

Determining parameter data set difference to default parameters

Command	'PD'		
Description	This command outputs the difference between the default parameter set and the operating parameter set or the difference between the default parameter set and the permanent parameter set. Comment: The reply supplied by this command can e.g. be directly used for programming a device with factory settings, whereby this device receives the same configuration as the device on which the PD-sequence was executed.		
Parameter	'PD<P.set1><P.set2>'		
	<P.set1>	Parameter data set that is to be copied, unit [dimensionless]	
		'0'	Parameter data set in permanent memory
		'2'	Default or factory parameter set
	<P.set2>	Parameter set into which the data is to be copied, unit [dimensionless]	
		'0'	Parameter data set in permanent memory
		'3'	Operating parameter data set in volatile memory
	Permissible combinations here include:		
		'20'	Output of the parameter differences between the default and the permanently saved parameter set
		'23'	Output of the parameter differences between the default parameter set and the operating parameter set saved in volatile memory
		'03'	Output of the parameter differences between the permanent parameter set and the operating parameter set saved in volatile memory

Command	'PD'		
Acknowledgment positive	PT<BCC><PS-Type><Status><Address><Parameter Value Address><Parameter Value Address+1>… [;<Address><Parameter Value Address>]		
	<BCC>	Check-digit function during transmission, unit [dimensionless]	
		'0'	No check digits
		'3'	BCC mode 3
	<PS type>	Memory from which the values are to be read, unit [dimensionless]	
		'0'	Values stored in flash memory
		'3'	Operating values stored in RAM
	<Status>	Mode of parameter processing, unit [dimensionless]	
		'0'	No further parameters
		'1'	Additional parameters follow
	<Address>'aaaa'	Relative address of the data within the data set, four-digit, unit [dimensionless]	
	<P.value>	Parameter value of the parameter stored at this address. The 'bb' parameter set data is converted for transmission from HEX format to a 2-byte-ASCII format.	
Acknowledgment negative	'PS=<aa>'		
	Parameter reply:		
	<aa>	Status acknowledgment, unit [dimensionless]	
		'0'	No difference
		'1'	Syntax error
		'2'	Impermissible command length
		'6'	Impermissible combination, parameter set 1 and parameter set 2
		'8'	Invalid parameter set

Writing parameter set

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

10 Care, maintenance and disposal

Cleaning

↳ Clean the device with a soft cloth; use a cleaning agent (commercially available glass cleaner) if necessary.

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

Maintenance

Usually, the bar code reader does not require any maintenance by the operator.

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

↳ For repairs, contact your responsible Leuze subsidiary or Leuze customer service (see chapter 12 "Service and support").

Disposing

↳ For disposal observe the applicable national regulations regarding electronic components.

11 Diagnostics and troubleshooting

11.1 Error signaling via LED

Tab. 11.1: Meaning of the LED indicators

Error	Possible error cause	Measures
PWR LED		
Off	• No supply voltage connected to the device • Hardware error	• Check supply voltage • Contact Leuze customer service (Service and support)
Red, continuous light	Error: no function possible	Contact Leuze customer service (Service and support)
Red, flashing	Warning	Query diagnostic data and carry out the resulting measures
Orange, continuous light	Device in Service mode	Reset Service mode with webConfig tool
NET LED		
Off	• No supply voltage connected to the device • No IP address assigned • Hardware error	• Check supply voltage • IP address assigned • Contact Leuze customer service (Service and support)
Red, continuous light	Double IP address	Check network configuration
Red, flashing	Communication error	Check interface

11.2 Interface error

Tab. 11.2: Interface error

Error	Possible error cause	Measures
No communication via the Ethernet interface	• Incorrect wiring • Different protocol settings • Protocol not released	• Check wiring • Check protocol settings • Activate TCP/ IP or UDP

Sporadic errors at the EtherNet/IP	• Incorrect wiring
	• Effects due to EMC
	• Overall network expansion exceeded
		• Check wiring
		  • In particular, check wire shielding
		  • Check the cable used
		• Check shielding (shield covering in place up to the clamping point)
		• Check grounding concept and connection to functional earth (FE)
		• Avoid EMC coupling caused by power cables laid parallel to device lines.
		• Check max. network expansion as a function of the max. cable lengths

12 Service and support

Service hotline

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

Repair service and returns

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

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

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

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

What to do should servicing be required?

	NOTICE
	**Please use this chapter as a master copy should servicing be required!** ↳ Enter the contact information and fax this form together with your service order to the fax number given below.

Customer data (please complete)

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

Leuze Service fax number:

+49 7021 573 - 199

13 Technical data

13.1 General specifications

Optics

Light source / Wavelength	Laser / 655 nm (visible red light)
Laser class	1 (acc. to IEC/EN 60825-1:2014 and 21 CFR 1040.10 with Laser Notice No. 56)
Max. output power (peak)	≤ 1.8 mW
Impulse duration	≤ 150 µs
Beam exit	Lateral zero position at an angle of 90°
Beam deflection	Via rotating polygon wheel (horizontal) and deflecting mirror (vertical)
Useful opening angle	Max. 60°
Adjustment range	Max. ±10°, adjustable via software
Scanning rate	1000 scans/s
Optics / resolution	M optics: 0.2 … 0.5 mm
Reading distance / reading field width	See reading fields

Code specifications

Code types	2/5 Interleaved Code 39 Code 128 EAN 128 EAN/UPC EAN Addendum Codabar Code 93 GS1 DataBar
Bar code contrast (PCS)	≥ 60 %
Ambient light tolerance	2000 lx (on the bar code)
Number of bar codes per scan	3

Interfaces

Interface type	1x Ethernet on M12 (D)
Protocols	EtherNet/IP communication DCP TCP/IP (client/server) / UDP
Baud rate	10/100 MBaud
Switching input / switching output	• 1 switching input: 18 … 30 V DC depending on supply voltage, configurable I max. = 8 mA • 1 switching output: 18 … 30 V DC depending on supply voltage, configurable output current I max. = 60 mA (short-circuit proof) The switching inputs/outputs are protected against polarity reversal.

Electrical equipment

Supply voltage	18 … 30 V DC (PELV, Class 2)
Power consumption	≤ 4 W
VDE protection class	III

CAUTION

UL applications!

For UL applications, the supply is only permitted according to UL 62368-1 ES1/PS2 or SELV/LPS according to UL 60950-1.

NOTICE

Protective Extra Low Voltage (PELV)!

The device is designed in accordance with protection class III for supply with PELV (Protective Extra-Low Voltage).

Display elements

LEDs	3 LEDs for power (PWR), bus state (NET) and link state (LINK)

Mechanical data

Degree of protection	IP65
Connection type	Connected cable, 0.9 m, M12 connector, 5-pin Connected cable, 0.7 m, M12 connector, 4-pin
Weight	400 g incl. cable
Dimensions (H x W x D)	38 x 92 x 83 mm (without cable)
Housing	Diecast aluminum

Environmental data

Ambient temperature Operation Storage	 0 C … +40 °C -20 °C … +70 °C
Relative humidity	Max. 90 % (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 61000-6-3:2007-01 + A1:2011-03/AC:2012-08 EN 61000-6-2:2005-08 + AC:2005-09

Conformity, approvals

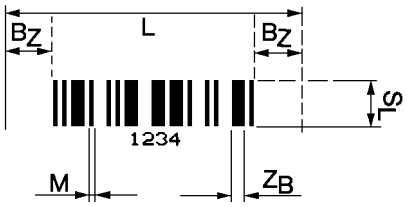
Conformity	CE

13.2 Reading fields

13.2.1 Bar code characteristics

NOTICE

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.



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.

S_L Bar length: height of the elements in mm

M Module: The narrowest line or space of a bar code in mm

Z_B Wide character: Wide bars and gaps are a multiple (ratio) of the module.

Z_B = Module x Ratio (Normal Ratio 1 : 2.5)

B_Z Quiet zone: The quiet zone should be at least 10 times the module, but not less than 2.5 mm.

Fig. 13.1: The most important characteristics of a bar code

The range in which the bar code can be read by the bar code reader, 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.

NOTICE

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.

13.2.2 Raster scanner

A raster variant is also available in the BCL 200i series. The BCL 200i as a raster scanner projects 8 scan lines which vary depending on the reading distance from the raster aperture.

Tab. 13.1: Raster line cover dependent on the distance

Distance [mm] starting at the zero position	50	100	200	250
Raster-line cover [mm] of all raster lines	12	17	27	33

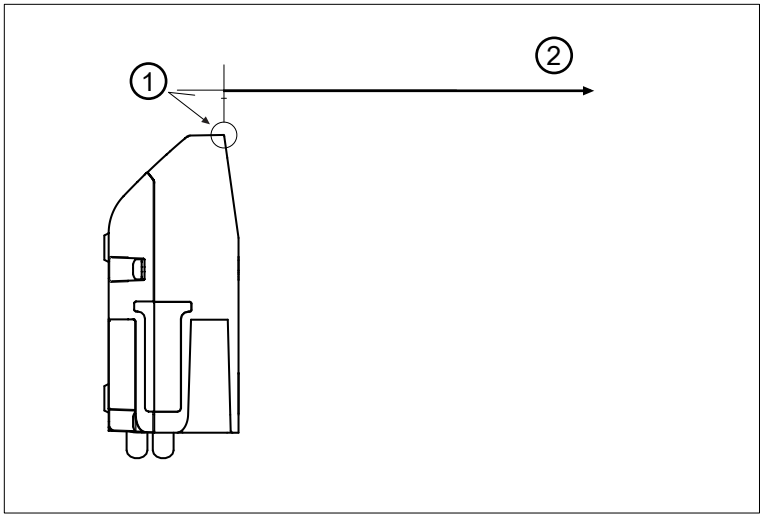
NOTICE

There may not be two or more bar codes in the raster detection range simultaneously.

13.2.3 Reading field curves

NOTICE

Please note that the actual 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 origin of the read distance always refers to the front edge of the housing of the beam exit.



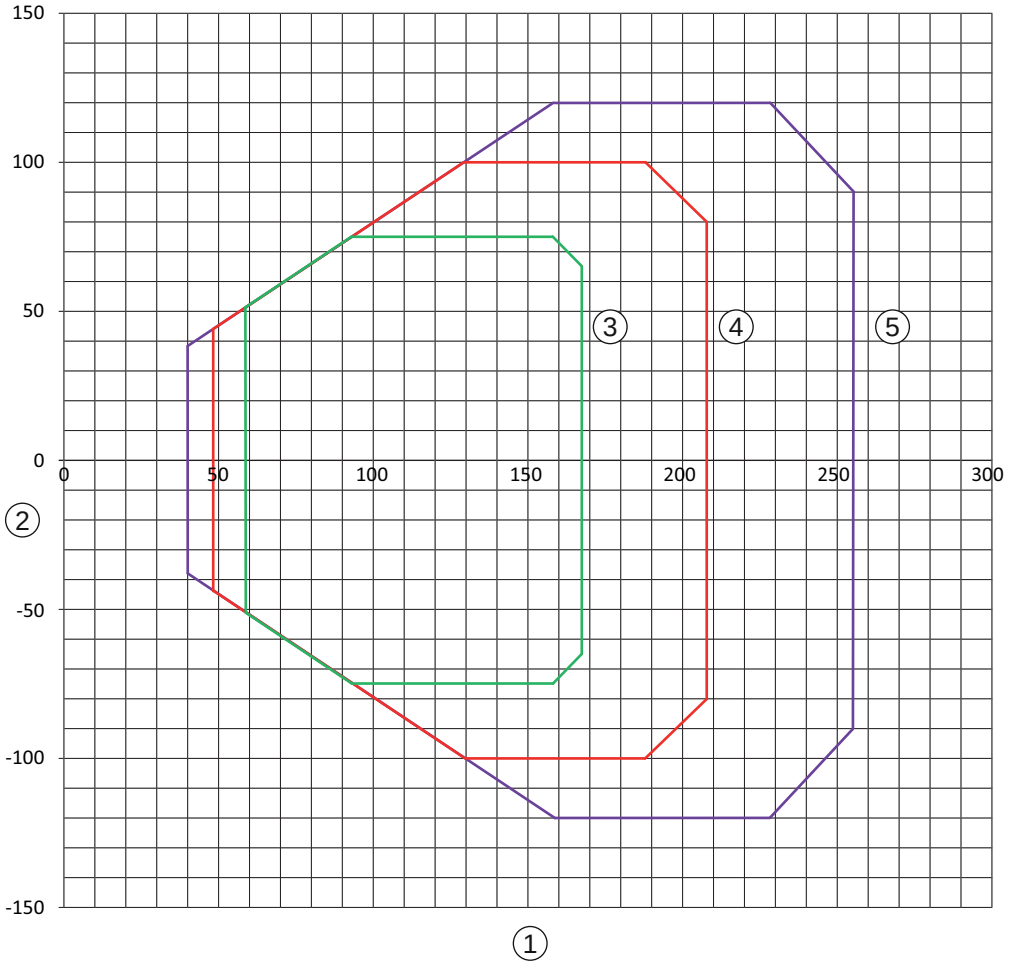
1 Zero position
2 Distance acc. to reading field curves

Fig. 13.2: Zero position of the reading distance

Tab. 13.2: Reading conditions for the reading field curves

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

Reading field curve BCL 258i S/R1 M 100, optics: Medium Density

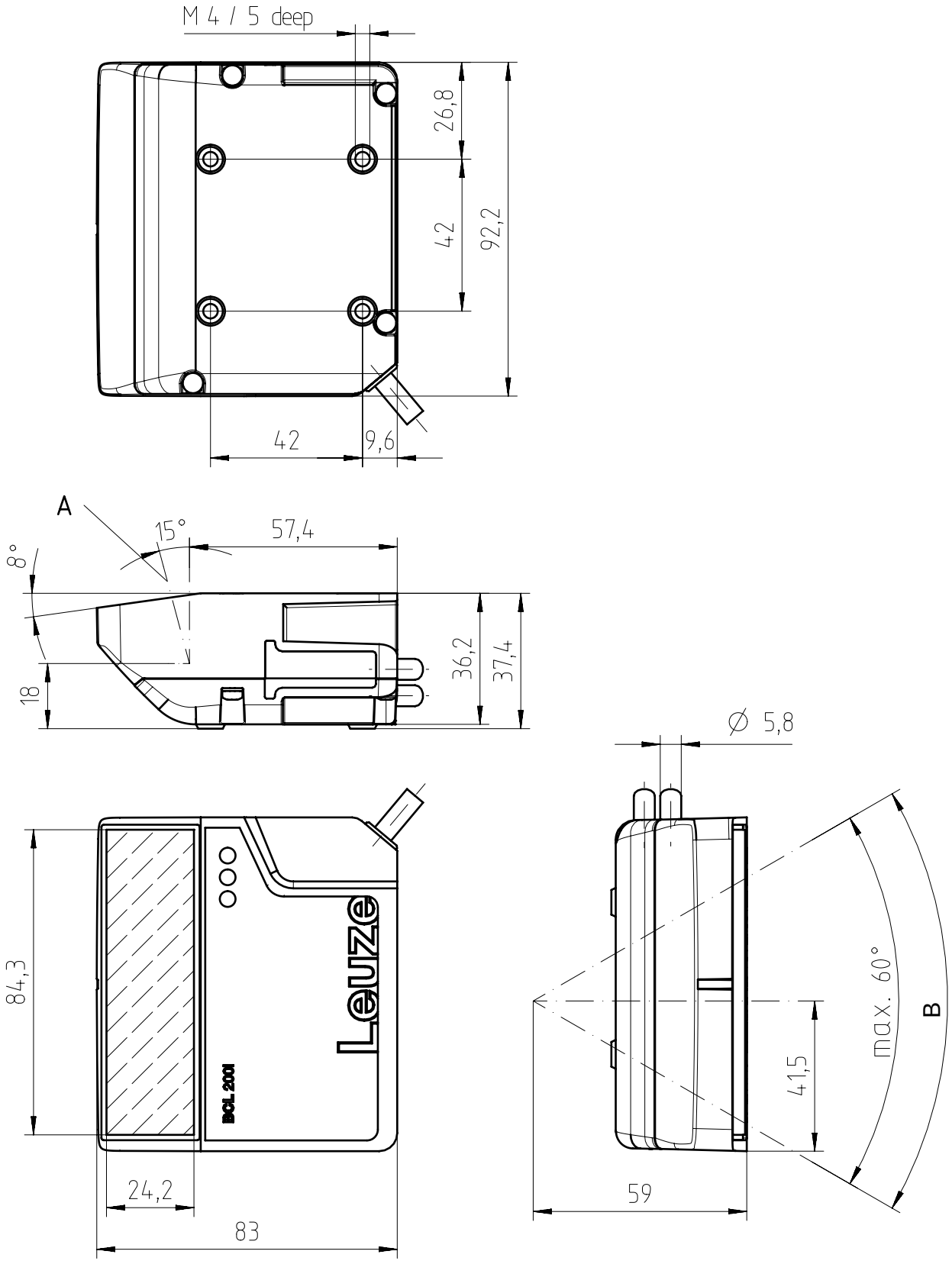


1	Reading distance [mm]	3	m = 0.2
2	Reading field width [mm]	4	m = 0.3
		5	m = 0.5

Fig. 13.3: "Medium Density" reading field curve for line scanner with deflecting mirror

The reading field curves apply for the reading conditions stated above.

13.3 Dimensioned drawings



all dimensions in mm

A Optical axis

B Deflection angle of the laser beam: ± 30°

Fig. 13.4: Dimensioned drawing of BCL 200i

14 Order guide and accessories

14.1 Part number code

BCL 2xxiC S M 110 Fxxx

BCL	Operating principle: bar code reader
2	Series: BCL 200i
xx	Interface: 08: Ethernet 48: PROFINET 58: EtherNet/IP
iC	I: Integrated fieldbus technology C: IoT / Industry 4.0 connectivity
S	Scanning principle: S: Line scanner R1: Raster scanner
M	Optics: M: Medium distance (medium density)
11**0**	110: Lateral beam exit
Fxxx	Cloud connectivity for IoT / Industry 4.0 with 3-digit code

NOTICE

A list with all available device types can be found on the Leuze website **www.leuze.com**.

14.2 Type overview

Tab. 14.1: Type overview with EtherNet/IP interface

Type designation	Description	Part no.
BCL 258i SM 110	Single line scanner with M optics	50143213
BCL 258i R1M 110	Raster scanner with M optics	50143214

14.3 Accessories – connection technology

Tab. 14.2: Connector for the BCL 200i bar code reader

Type designation	Description	Part no.
KD 095-5A	M12 axial socket for voltage supply, shielded, user-configurable	50020501
D-ET1	RJ45 connector, user-configurable	50108991
S-M12A-ET	M12 connector, axial, D-coded, user-configurable	50112155
KDS ET-M12 / RJ45 W–4P	Adapter of M12, D-coded, to RJ45 socket	50109832

Tab. 14.3: Connection cables for the BCL 200i bar code reader

Type designation	Description	Part no.
M12 socket (5-pin, A-coded), axial connector, open cable end, unshielded		
KD U-M12-5A-V1-020	PWR connection cable, length 2 m	50132077
KD U-M12-5A-V1-050	PWR connection cable, length 5 m	50132079
KD U-M12-5A-V1-100	PWR connection cable, length 10 m	50132080
KD U-M12-5A-V1-300	PWR connection cable, length 30 m	50132432

Tab. 14.4: Interconnection cables for the BCL 200i bar code reader

Type designation	Description	Part no.
M12 connector (4-pin, D-coded), axial connector to RJ-45 connector, shielded, UL		
KSS ET-M12-4A-RJ45-A-P7-020	Ethernet interconnection cable to RJ45, length 2 m	50135080
KSS ET-M12-4A-RJ45-A-P7-050	Ethernet interconnection cable to RJ45, length 5 m	50135081
KSS ET-M12-4A-RJ45-A-P7-100	Ethernet interconnection cable to RJ45, length 10 m	50135082
KSS ET-M12-4A-RJ45-A-P7-150	Ethernet interconnection cable to RJ45, length 15 m	50135083
KSS ET-M12-4A-RJ45-A-P7-300	Ethernet interconnection cable to RJ45, length 30 m	50135084

14.4 Accessories – mounting systems

Tab. 14.5: Mounting devices for the BCL 200i bar code reader

Type designation	Description	Part no.
BT 56	Mounting device for rod	50027375
BT 56 - 1	Mounting device for rod	50121435
BT 59	Mounting bracket for groove mounting	50111224
BT 300 W	Mounting bracket	50121433
BT 300 - 1	Mounting device for rod	50121434

14.5 Accessories – Reflectors and reflective tapes

Tab. 14.6: Reflector for AutoReflAct

Type designation	Description	Part no.
REF 4-A-100x100	Reflective tape as reflector for AutoReflAct operation	50106119

15 EC Declaration of Conformity

The bar code readers of the BCL 200i series have been developed and manufactured in accordance with the applicable European standards and directives.

16 Appendix

16.1 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
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

ASCII	Dec.	Hex.	Oct.	Designation	Meaning
&	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
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

ASCII	Dec.	Hex.	Oct.	Designation	Meaning
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
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

ASCII	Dec.	Hex.	Oct.	Designation	Meaning
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

16.2 Bar code sample

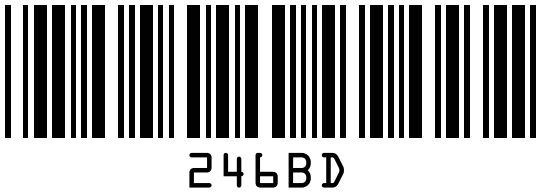
Module 0.3

Fig. 16.1: Bar code sample labels (module 0.3)

Module 0.5

Modul 0,5

Modul 0,5



Modul 0,5

Modul 0,5

Modul 0,5

SC 4

SC 6

SC 2

Fig. 16.2: Bar code sample labels (module 0.5)