SSI

Barcode positioning system BE 901 SSI (D) (H)

_Safety instructions
_Function description
_Mounting and installation
_Commissioning, Configuration
_Diagnostics and troubleshooting
_Technical data
_Ordering information and accessories

User Manual

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Italic or **bold** font styles displays text, which is visible on the display or screen and software menu selections.

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- General update - Preferred heights for barcode tape removed	05/30/2017	01
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Chapter 12 Table 12.6: Product Reliability added	03/12/2024	03

1 About this document

1.1 Used symbols and signal words

Table 1.1: Warning symbols and signal words

⚠ WARNING	Signal word for serious injury Indicates hazards that could result in serious or fatal injury if you do not follow the measures for danger avoidance.
⚠ CAUTION	Signal word for light injuries Indicates dangers that can cause slight injuries if the measures for danger avoidance are not followed.
NOTICE	Signal word for property damage Indicates dangers that can cause damage to property if you do not follow the measures for avoiding danger.
	Symbol for dangers from harmful laser radiation

Table 1.2: Other symbols

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

Table 1.3: Terms and abbreviations

BCB	Barcode tape
BE 901	Barcode positioning system - Series 901
CFR	Code of Federal Regulations
DAP	Device Access Point
DCP	Discovery and Configuration Protocol
EMC	Electromagnetic compatibility
EN	European standard
FE	Functional earth
GSD	General Station Description
GSDML	Generic Station Description Markup Language
GUI	Graphical User Interface
IO or I/O	Input/Output
I&M	Information & Maintenance
IP	Internet Protocol
LED	Light Emitting Diode
MAC	Media Access Control
MVS	Type of control barcode
MV0	Type of control barcode
NEC	National Electric Code
OSI	Open Systems Interconnection model
PELV	Protective Extra-Low Voltage
RT	Real Time
SNMP	Simple Network Management Protocol
PLC	Programmable Logic Control
SSI	Synchronous-Serial-Interface
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
USB	Universal Serial Bus
UL	Underwriters Laboratories
UV	Ultraviolet
XML	Extensible Markup Language

2 Safety

This sensor was developed, manufactured and tested in line with the applicable safety standards. It corresponds to the state of the art.

2.1 Intended use

The device is an optical measuring system which uses visible red laser light to determine its position relative to a permanently mounted barcode tape.
All accuracy details for the BE 901 SSI measurement system refer to the position relative to the permanently mounted barcode tape.

⚠ CAUTION

Only use approved barcode tapes!

The barcode tapes approved and offered by TR-Electronic GmbH are an essential part of the measuring system. Barcode tapes from external sources are not allowed and the intended use is not given for this case.

Areas of application:

The BE 901 SSI is designed for positioning in the following areas of application:

- Telpher line
- Travel and lifting axes of high-bay storage devices
- Repositioning units
- Gantry crane bridges and their trolleys
- Elevators

⚠ CAUTION

Observe intended use!

The protection of operating personnel and the device is not guaranteed if the device is not used in accordance with its intended use.

- *Only operate the device in accordance with its intended use.*
- *TR-Electronic GmbH is not liable for damages resulting from improper use.*
- *Please read this operating manual before using the device. Knowledge of the operating instructions is part of the intended use.*

NOTICE

Comply with conditions and regulations!

- *Observe the locally applicable statutory provisions and the regulations of the employers' liability insurance associations.*

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
- for medicinal purposes
- as own safety component in accordance with the machinery directive*

Use as a security-related component within a security function is possible with a corresponding conception of the combination of component parts by the machinery manufacturer.

NOTICE

No intervention or changes to the device!

- *Do not make any interventions or changes to the device. Interventions and changes to the device are not permitted.*
- *The use of a barcode tape not approved by TR-Electronic GmbH is to be equated with an intervention or a change to the device / measuring system.*
- *The device must not be opened. It does not contain any parts to be adjusted or maintained by the user.*
- *A repair may only be carried out by TR-Electronic GmbH.*

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 original operating instructions of the device.
- They have been instructed by the responsible person on the mounting and operation of the device.

Certified electricians:

Electrical work must be carried out by a certified electrician.
Due to their technical training, knowledge and experience as well as their familiarity with relevant standards and regulations, certified electricians are able to perform work on electrical systems and independently detect possible dangers.

In Germany, certified electricians must fulfill the requirements of accident-prevention regulations BGV A3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Exemption of liability

TR-Electronic GmbH 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 warning notices

NOTICE

LASER RADIATION - LASER CLASS 1

The device meets the requirements of IEC/EN 60825-1:2014 for a Class 1 laser product and the requirements of U.S. 21 CFR 1040.10 with the deviations as per Laser Notice No. 56 dated May 8, 2019.

- *Observe the applicable legal and local laser safety regulations.*
- *Access and modifications to the device are not permitted. The device contains no parts that need to be adjusted or maintained by the user. Repairs may only be carried out by TR-Electronic GmbH.*

⚠ CAUTION

Do not open the device!

- *Opening the device can lead to radiation exposure.*

3 Device description

3.1 Device overview

3.1.1 General information

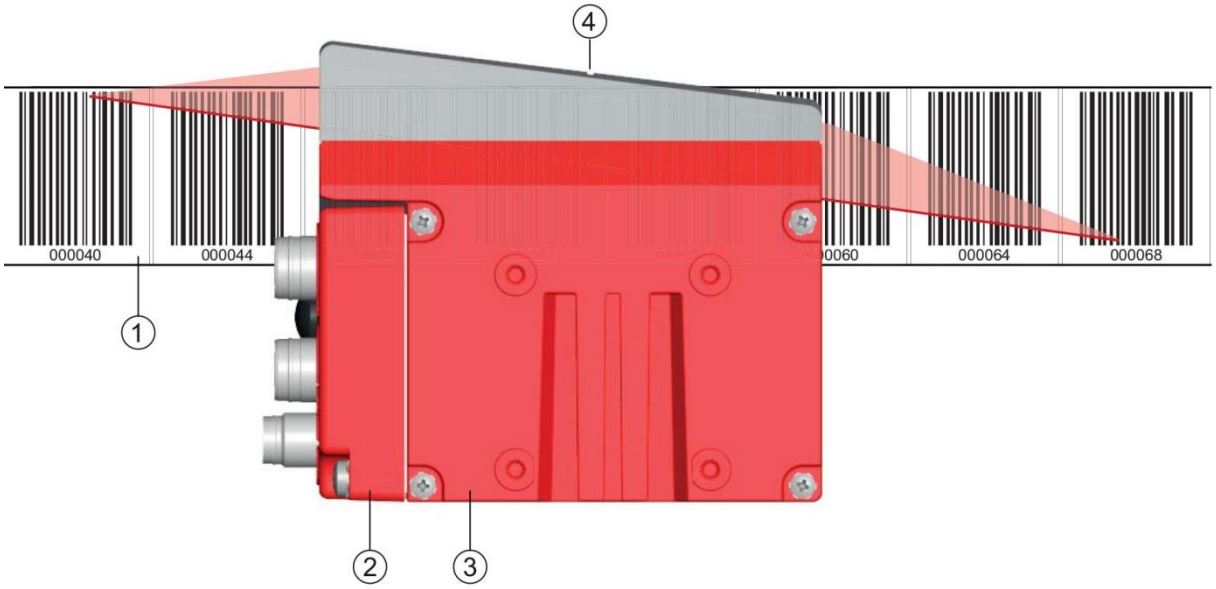
The BE 901 SSI barcode positioning system uses visible red laser light to determine its position and its speed value relative to a barcode tape that is affixed along the travel path. This takes place in the following steps:

- Read a code on the barcode tape (see Figure 3.1)
- Determine the position of the read code in the scanning beam
- Calculate the position to within less than a millimeter using the code information and the code position relative to the device's center.

The position and speed values are then output to the controller via the host interface.
The BE 901 SSI consists of device housing and interface connection hood for the connection to the control. The BE 901 SSI can optionally be delivered with display and optics heating.

The following connection hoods are available for the connection of the SSI interface:

- BE 901 MS SSI connection hood with M12 connectors
- BE 901 MK SSI connection hood with spring-cage terminals



1: Barcode tape
2: Connection hood
3: Device housing
4: Middle of the scanning beam (device middle, output position value)

Figure 3.1: Device construction, device arrangement and beam exit

3.1.2 Performance characteristics

The most important performance characteristics of the barcode positioning system:

- Positioning with submillimeter accuracy from 0 to 10,000 m
- For the control at high traverse rates of up to 10 m/s
- Simultaneous position and speed measurement
- Working range: 50 to 170 mm; enables flexible mounting positions
- Interfaces: PROFINET fieldbus, PROFIBUS fieldbus, SSI
- Binary inputs and outputs for control and process monitoring
- Configuration via webConfig tool or fieldbus
- Diagnostics via webConfig tool or optional display
- Optional model with display
- Optional model with heating for use to -35 °C

3.1.3 Accessories

Special accessories are available for the barcode positioning system. The accessories are optimally matched to the BE 901 SSI:

- Highly flexible, scratch-, smudge- and UV-resistant barcode tape
- Mounting devices for precise mounting with one screw
- Modular connection technology via connection hoods with M12 connectors or spring-cage terminals

3.1.4 Device model with heating

The barcode positioning system is optionally available as a model with integrated heating. In this case, heating is permanently installed ex works.

NOTICE

No self-installation of the heating!

↳ *Self-installation of the heating on-site by the user is not possible.*

The heating consists of two parts:

- Front cover heater
- Housing heater

Features of the integrated heating:

- Extends the application range of the BE 901 SSI to -35 °C
- Supply voltage 18 … 30 VDC
- BE 901 SSI enabling through an internal temperature switch (startup delay of about 30 min for 24 VDC and minimum ambient temperature of -35 °C)
- Required conductor cross-section for the power supply: At least 0.75 mm^2

NOTICE

Do not use ready-made cables!

↳ *It is not possible to use ready-made cables. The current consumption of the BE 901 SSI is too high for the ready-made cables.*

Function:

When the supply voltage is applied to the BE 901 SSI, a temperature switch initially only supplies the heating with current (front cover heater and housing heater). During the heating phase (around 30 min), when the inside temperature rises above 15 °C, the temperature switch connects the BE 901 SSI to the supply voltage. This is followed by the self-test and the changeover to read operation. The PWR LED lights up, showing overall readiness for operation.
When the inside temperature reaches approx. 18 °C, another temperature switch turns the housing heater off and, if necessary, back on again (if the inside temperature drops below 15 °C). This does not interrupt the read operation.
The front cover heater remains activated until an inside temperature of 25 °C is reached. At temperatures above this, the front cover heater switches off and, with a switching hysteresis of 3 °C, back on again at an inside temperature below 22 °C.

3.2 Connection technology

For the electrical connection of the BE 901 SSI, the following connection variants are available:

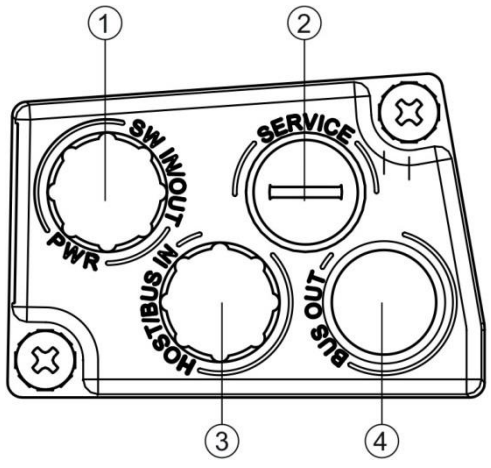
- BE 901 MS SSI connection hood with M12 connectors
- BE 901 MK SSI connection hood with spring-cage terminals

The voltage supply (18 … 30 VDC) is connected acc. to the connection type selected. Two freely programmable switching inputs/switching outputs for individual adaptation to the respective application are also available here.

3.2.1 BE 901 MS SSI connection hood with M12 connectors

The BE 901 MS SSI connection hood features two M12 connector plugs and a Mini-B type USB socket as a service interface for configuration and diagnostics of the BE 901 SSI.

The configuration switches and the integrated parameter memory for the simple replacement of the BE 901 SSI are located in the BE 901 MS SSI.



1: PWR / SW IN/OUT: M12 plug (A-coded)
2: SERVICE: Mini-B USB socket (behind protective cap)
3: HOST / BUS IN: M12 plug (B-coded), SSI
4: BUS OUT: not equipped

Figure 3.2: BE 901 MS SSI connection hood, connections

NOTICE

Shielding connection

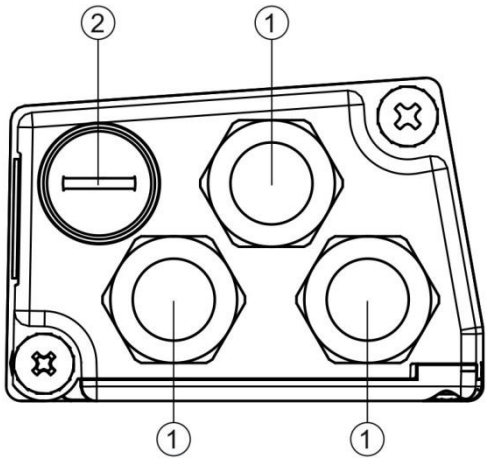
↳ *The shielding connection is done via the M12 connector housing.*

3.2.2 BE 901 MK SSI connection hood with spring-cage terminals

The BE 901 MK SSI connection hood makes it possible to connect the BE 901 SSI directly and without additional connectors.

- The BE 901 MK SSI features three cable bushings in which the shielding connection for the interface cable is also located.
- A Mini-B type USB socket is used for service purposes and for configuration and diagnostic of the BE 901 SSI.

The configuration switches and the integrated parameter memory for the simple replacement of the BE 901 SSI are located in the BE 901 MK SSI.



1: 3x cable bushing, M16 x 1.5
2: SERVICE: Mini-B USB socket (behind protective cap)

Figure 3.3: BE 901 MK SSI connection hood, connections

Cable fabrication and shielding connection:

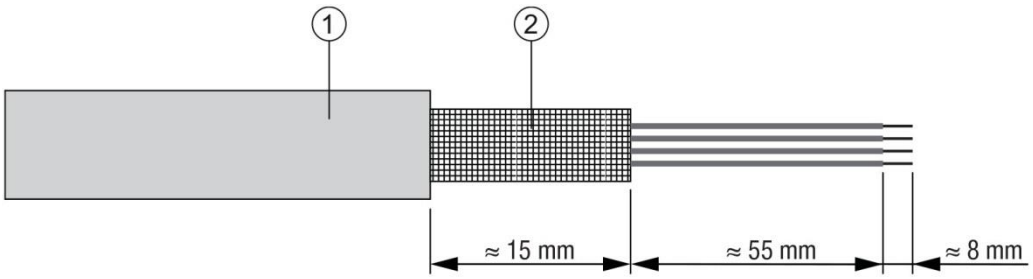
- Remove approx. 78 mm of the connection cable sheathing.
  15 mm of sheath of the shielded line must be freely accessible.
- Lead the individual wires into the terminals according to the diagram.

NOTICE

Do not use wire-end sleeves!

- *When fabricating cables, we recommend against using wire-end sleeves.*

The shield is automatically contacted when the cable is lead into the metal screw fitting and fastened when the cord grip is closed.



1: Diameter of contact area, cable: 6 … 9.5 mm
2: Diameter of contact area, shield: 5 … 9.5 mm

Figure 3.4: Cable fabrication for connection hoods with spring-cage terminals

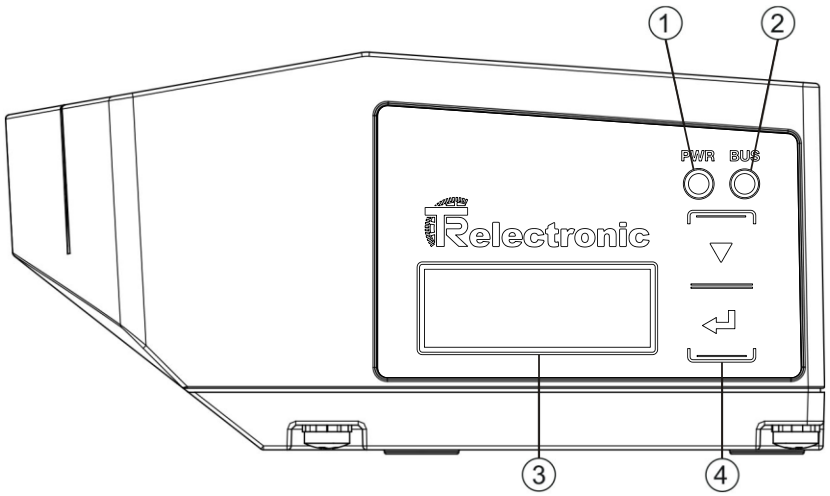
3.3 Display elements

The BE 901 SSI is available optionally with display, two control buttons and LEDs or with only two LEDs as indicators on the device housing.

3.3.1 LED indicators

The device housing features the following multicolor LED indicators as primary display element:

- PWR
- BUS



1: LED PWR
2: LED BUS
3: Display
4: Control buttons

Figure 3.5: Indicators on the device housing

Table 3.1: Meaning of the LED indicators on the device housing

LED	Color, state	Description
LED 1 PWR	Off	Device is switched off - No supply voltage
	Green, flashing	Device is being initialized - Supply voltage connected - Initialization running - No measurement value output
	Green, continuous light	Device in operation - Initialization finished - Measurement value output
	Red, flashing	Warning set - No measurement (e.g. no barcode tape)
	Orange, continuous light	Service active - No data on the host interface - Configuration via USB service interface
LED 2 BUS	Off	No supply voltage
	Green, flashing	Initialization of the host interface - No communication
	Green, continuous light	Host interface active - Communication possible
	Red, flashing	Communication error detected

3.3.2 Display indicators

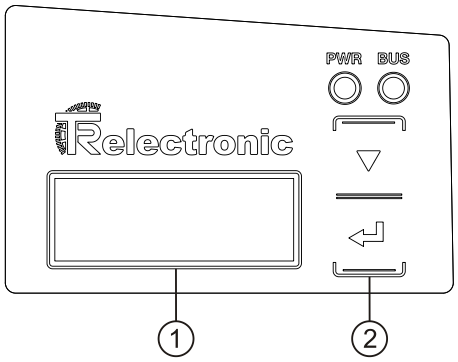
The optional display of the BE 901 SSI is only used as a display element. The display has the following features:

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

Two control buttons can be used to control which values appear in the display.
The background lighting is activated by pressing any control button and is automatically deactivated after ten minutes have passed.

The display shows the content on two lines:

- The upper display line shows the selected function as an English term.
- The lower display line shows the data of the selected function.



1: Display
2: Control buttons

Figure 3.6: Display on the device housing

Display functions:

The following functions can be displayed and activated in the display:

- Position value
  - *Position Value*
  - Position value in mm, displayed with "." as decimal separator character (e.g., + *34598.7 mm*)
- Reading quality
  - *Quality*
  - *0 … 100 %*
- Device status
  - *BE901 Info*
  - *System OK / Warning / Error*
- I/O status
  (Status of the inputs/outputs)
  - *I/O status*
  - *IO1 In: 0 / IO2 Out: 0*
  - In/Out depending on configuration, 0/1 for state of the I/O
- Version information
  Software and hardware version of the device
  - *Version*
  - *SW: V1.3.0 HW:1*

NOTICE

Laser activation by selecting Quality!

↳ *If position measurement is stopped, the laser is activated by selecting Quality.*

The display is controlled via the control buttons:

- ↵ – **Enter:** activate or deactivate the display shift function
- ▼ – **Down:** scroll through functions (downwards)

Example: Representation of the I/O status on the display

1. Press button ↵: display flashes
2. Press button ▼: Display changes from position value (*Position Value*) to reading quality (*Quality*)
3. Press button ▼: Display changes from reading quality (*Quality*) to device status (*BE901 Info*)
4. Press button ▼: Display changes from device status (*BE901 Info*) to I/O status
5. Press button ↵: I/O status displayed, display stops flashing

Display during device startup:

During device startup, a startup display first appears which is briefly followed by the display with the version information.
The standard display after starting up the BE 901 SSI is Position Value.

3.4 Barcode tape

3.4.1 General information

The barcode tape (BCB) is available in different variants:

- Barcode tape BCB G40 with 40 mm grid
  Code128 with character set C, increasing in increments of 4 (e.g., 000004, 000008, …)
- Barcode tape BCB G30 with 30 mm grid
  Code128 with character set C, increasing in increments of 3 (e.g. 000003, 000006, …)

A barcode tape consists of a sequence of individual position labels in one of the two grids. Defined cut marks are provided for cutting the BCB.

The barcode tape is delivered on a roll. A roll contains up to 300 m of BCB, with the wrapping direction from the outside to the inside (smallest number on the outside). If more than 300 m of BCB is ordered, the total length is divided into rolls of 300 m.

Barcode standard tapes in fixed length gradations as well as special tapes with individual tape start value, tape end value, individual length and height can be ordered from TR-Electronic GmbH (see chapter 13.5 "Barcode tapes").

NOTICE

Only one BCB type per system!

↳ *Use either only BCB G30 with 30 mm grid or only BCB G40 with 40 mm grid in a system.*

If different grids are used in a system, the BE 901 SSI cannot ensure accurate positioning.

NOTICE

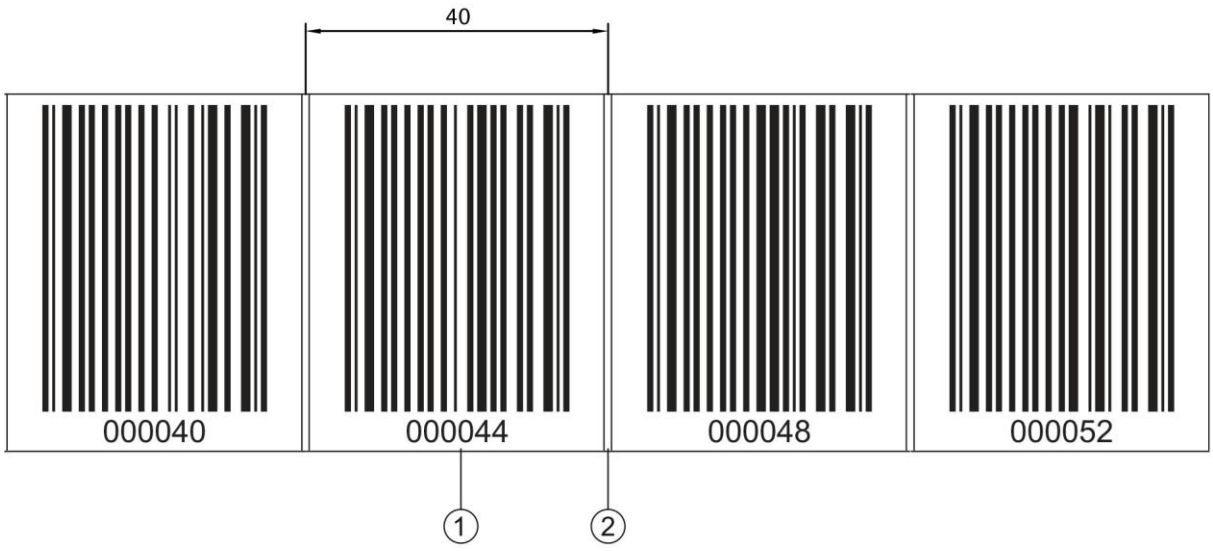
Configure the BE 901 SSI for the used BCB type!

- *The used BCB type must be set in the BE901 configuration with the Tape selection parameter; see chapter 9.3.4 "CONFIGURATION function".*
- *On delivery, the BE 901 SSI is set for BCB G40 with a 40 mm grid.*

  If the BCB G30 with a 30 mm grid is used, the Tape selection must be adjusted in the BE901 configuration.
- *If the used BCB type does not correspond to the Tape selection configured in the BE 901 SSI, exact position determination cannot be performed by the BE 901 SSI.*

*Standard barcode tapes are available in different length gradations in the heights **47 mm** and **25 mm**.*

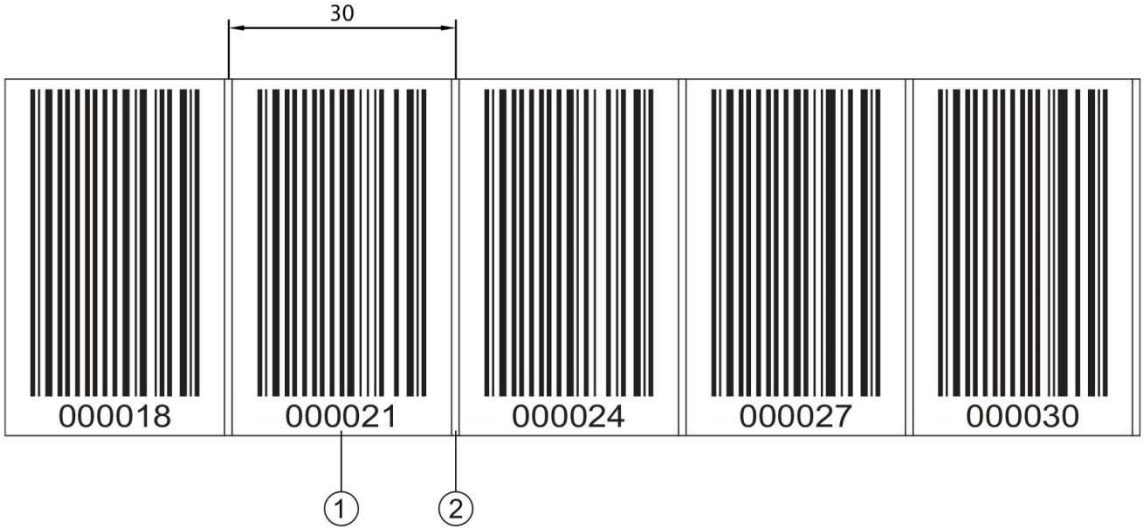
Barcode tape BCB G40 with 40 mm grid:



1: Position label with position value
2: Cut mark

Figure 3.7: Barcode tape BCB G40 with 40 mm grid

Barcode tape BCB G30 with 30 mm grid



1: Position label with position value
2: Cut mark

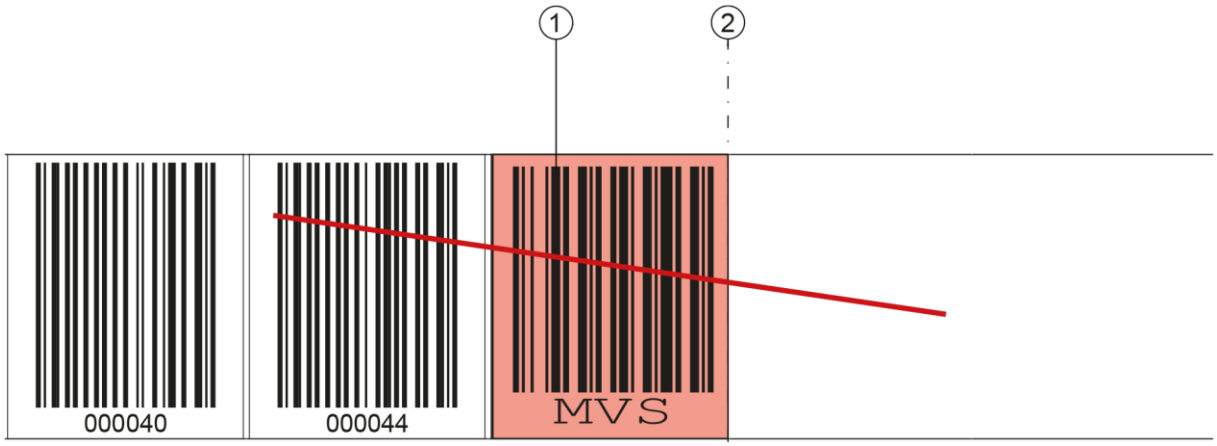
Figure 3.8: Barcode tape BCB G30 with 30 mm grid

3.4.2 Control barcodes

With the help of control barcodes that are affixed on top of the barcode tape at appropriate positions, functions in the BE 901 SSI can be activated or deactivated, e.g., for changing various position values at switches. Code type Code128 with character set B is used for the control barcode.

MVS label

The *MVS* label is a control bar code for the direction-independent switching of the position values from one bar code tape to another in the middle of the control bar code label.
If, upon reaching the changeover position in the middle of the *MVS* label, the BE 901 SSI does not detect the new BE 901 SSI section in the scanning beam, the position value of the first BCB section is still output after the middle of the *MVS* label for half of the label width.

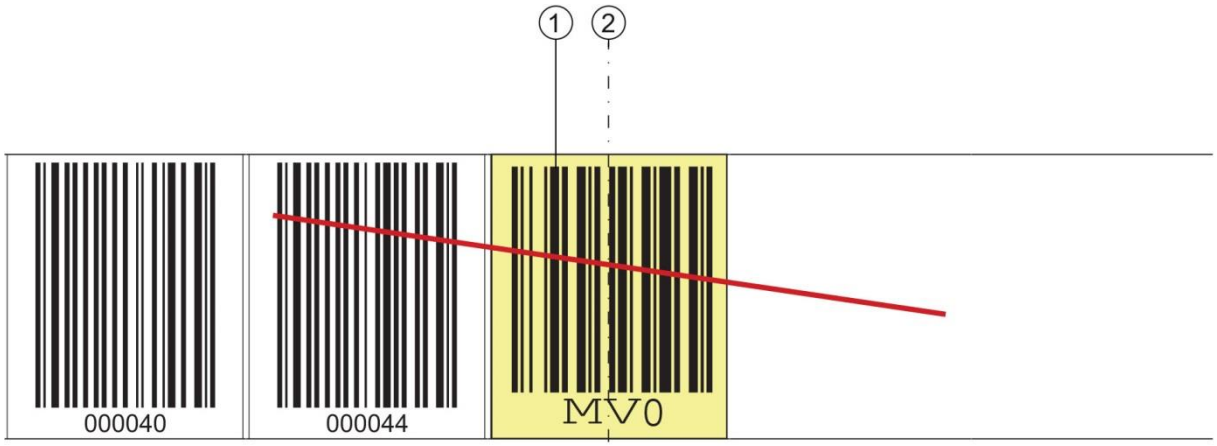


1: Control barcode
2: Deactivation of the position detection at the end of the control barcode

Figure 3.9: Arrangement of the MVS control barcode

MV0 label

The *MV0* label is a control bar code for the direction-independent switching of the position values from one bar code tape to another in the middle of the control bar code label.
If, upon reaching the changeover position in the middle of the *MV0* label, the BE 901 SSI does not detect the new BE 901 SSI section in the scanning beam, no position is output from the middle of the *MV0* label.



1: Control barcode
2: Deactivation of the position detection from the middle of the control barcode

Figure 3.10: Arrangement of the MV0 control barcode

Arrangement of the control barcodes:

The control barcode is arranged to replace a position barcode or to connect two barcode tapes with different value ranges.

The control barcode *MVS* or *MV0* need not be immediately followed by a position label. For an uninterrupted determination of measured values, there may be a gap between the control barcode and the following position label of less than or equal to a label width (40 mm).

NOTICE

Distance between two control barcodes!

↳ *Make certain that there is only one control barcode (or marker label) in the scanning beam at a time.*

The minimum distance between two control barcodes is determined by the distance between the BE 901 SSI and barcode tape and the resulting length of the scanning beam.

The control barcodes are simply affixed over the existing barcode tape.

A control barcode should cover an entire position barcode and must have the correct grid dimension (see Figure 3.11):

- 30 mm with BCB G30 barcode tapes
- 40 mm with BCB G40 barcode tapes

Keep the gap between the BCBs that are switched between as small as possible.

1: Control barcode perfectly affixed on the barcode tape
2: Control barcode at small gap between two barcode tapes

Figure 3.11: Correct positioning of the control barcode

NOTICE

Gaps in barcode tape!

- *Avoid polished and high-gloss surfaces.*
- *Keep the gaps between the two barcode tapes and the control barcode as small as possible.*

Measurement value switching between two barcode tapes with different value ranges:

The *MVS* or *MV0* control barcode is used to switch between two barcode tapes.

NOTICE

1 m difference of the barcode position values for correct measured value switching!

↳ *If the BCB value ranges are different, make sure that the position value has a value distance of at least 1 m between the leading position barcode (before the control barcode) and the following position barcode (after the control barcode).*

If the minimum distance between the barcode values is not maintained, the position determination may be disturbed.

➢ *Example (BCB in 40 mm grid): If the last position barcode on the BCB is 75120 before the control barcode, the subsequent position barcode on the BCB after the control barcode must be at least 75220.*

- The end of the preceding barcode tape and the start of the subsequent barcode tape can end and begin, respectively, with completely different position barcodes.
- BCB changeover by means of a control barcode always occurs at the same position, i.e., it serves to change from the preceding tape to the subsequent tape and vice versa.
- If the center of the BE 901 SSI reaches the transition point of the control barcode, the device switches to the second BCB, provided the next position label is in the BE 901 SSI's scanning beam (see Figure 3.12). The output position value is thereby always uniquely assigned to one BCB.

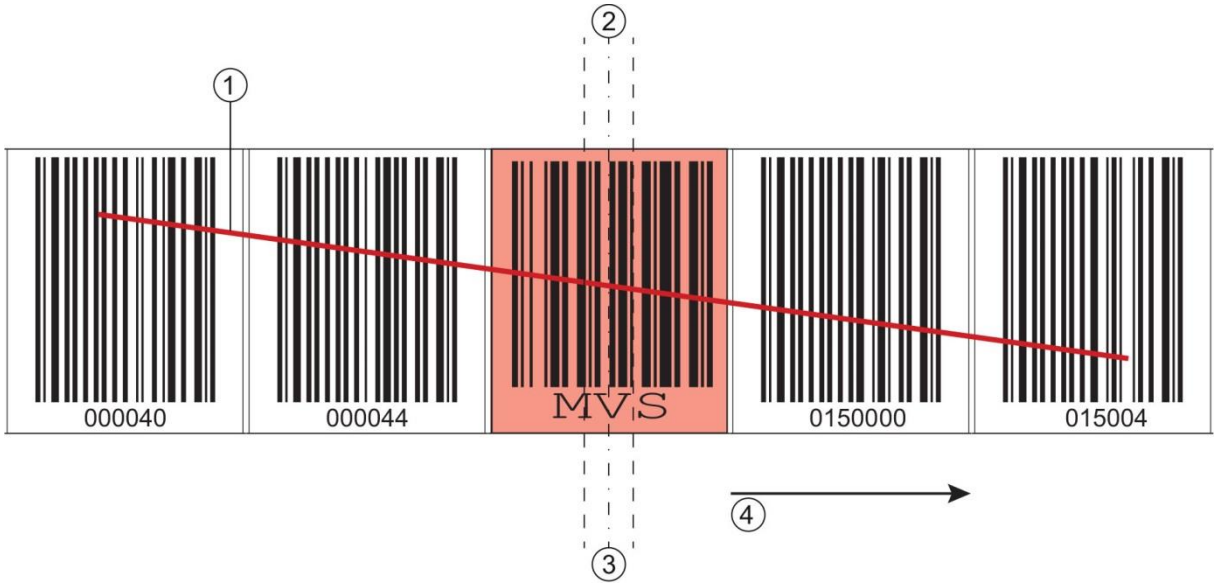
  This means that the output position value is always clearly assigned to a BCB.

If the BE 901 SSI does not detect the new BCB section upon reaching the changeover position, the position value output is dependent on the used control barcode.

MVS control barcode: The position value of the first BCB is output beyond the middle of the MVS label for half of the label width.

MV0 control barcode: No position values are output after the middle of the MV0 label.

- When the control label is passed, the new BCB value is output relative to the middle of the device or label.



1: Scanning beam
2: Middle of the control barcode
3: Middle of the BE 901 SSI
4: Direction of movement

Figure 3.12: Changeover position with MVS control barcode for BCB changeover

3.4.3 Marker labels

Marker labels, which are affixed at the appropriate locations on top of the barcode tape, can be used to trigger various functions in the superior control. The BE 901 SSI detects the defined marker labels in the scanning beam, decodes them, and makes them available to the control.

NOTICE

Distance between two marker labels!

↳ *Make certain that there is only one marker label (or control barcode) in the scanning beam at a time.*

The minimum distance between two marker labels is determined by the distance between the BE 901 SSI and barcode tape and the resulting length of the scanning beam.

Definition of the marker label:

The following combinations of letters and numbers may be used as marker labels:

- AA1
- BB1
- CC1
- DD1
- EE1
- FF1
- GG1

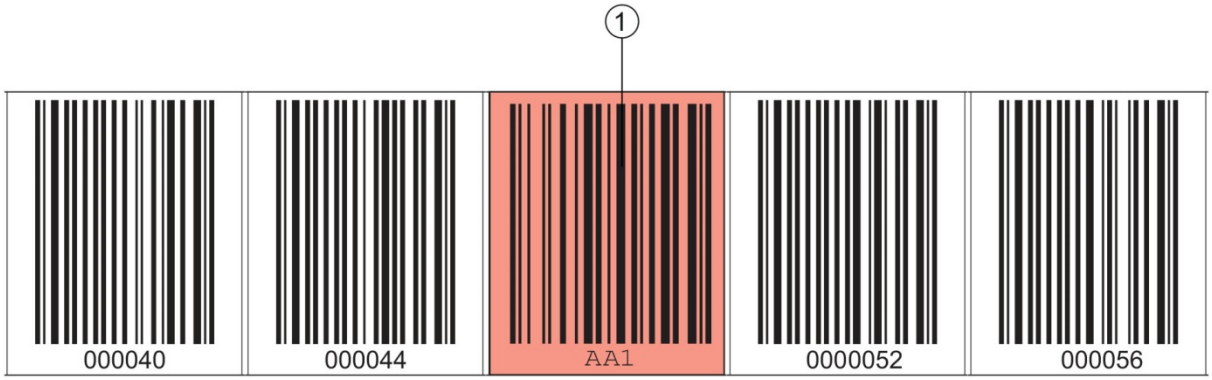
Marker labels are designed as follows:

- Color red
- height 47 mm
- with grid dimension 40 mm (BCB G40)
- with grid dimension 30 mm (BCB G30)
- Code 128 B

Marker labels are single labels and are delivered in a packaging unit of 10 pieces.

Arrangement when using the marker label with positioning:

The marker label must be attached to the barcode tape aligned with the grid of the actual coding. A position code should be visible before and after the marker label.



1: Marker label

Figure 3.13: System arrangement of marker labels

Arrangement when using the marker label without positioning:

The marker label must be positioned within the BE 901 SSI's detection range.

3.4.4 Twin tapes

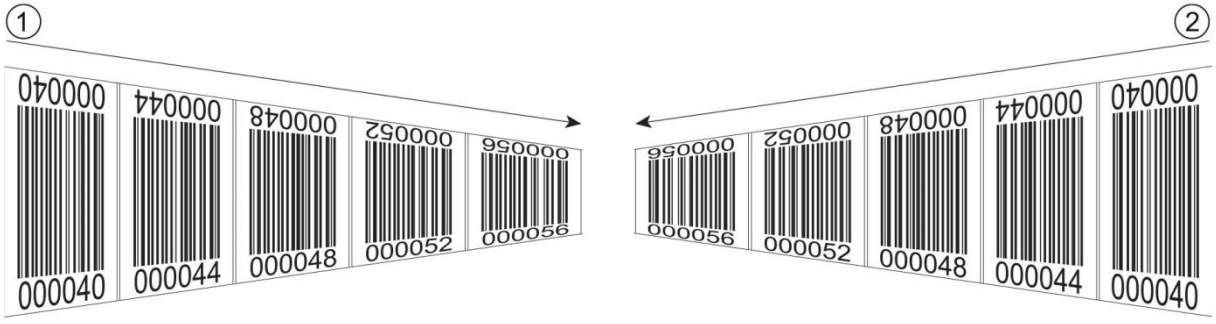
Twin tapes are jointly manufactured barcode tapes with the same value range.

NOTICE

A twin tape always consists of two barcode tapes!

↳ *When ordering a twin tape, two barcode tapes are always included with an order.*

Twin tapes are used if positioning with two barcode tapes is necessary, e.g., with crane systems or elevators.
Because they are manufactured jointly, both tapes have the same length tolerance. As a result, differences in length and code position are minimal. By having the same code position on both tapes, improved synchronization can be achieved during positioning compared to barcode tapes that are manufactured separately.



1: Twin barcode tape 1
2: Twin barcode tape 2

Figure 3.14: Twin tape with double numbering

Twin tapes are always delivered in pairs on two rolls.
If twin tapes are replaced, both tapes are to be replaced.

4 Functions

This chapter describes the functions of the BE 901 SSI and the parameters for adaptation to the respective application conditions and requirements.

Main functions:

- Position measurement
- Speed measurement

The following parameters are relevant for the timing of the position and speed measurement:

- Measurement value preparation
  Configurable response time
- Measurement error tolerance
  Configurable time-based error suppression

4.1 Position measurement

The output value of the position measurement is calculated from the measurement and the settings for resolution, preset, offset, etc.
The most important individual parameters for the position measurement are:

Parameter	Description	Range/Values
Position resolution	The parameter specifies the resolution of the position value. It acts only on the host interface. The resolution has no effect on the set parameter values such as offset or preset.	0.01 mm 0.1 mm 1 mm 10 mm or free resolution
Measurement unit	The parameter specifies the measurement unit of the measured position and speed. The selection of the measurement unit affects all parameters with measurement units.	Metric (mm) or Inch (1/100 in)
Offset	The offset is used to correct the position value by a fixed amount. If the offset is activated, the offset is added to the position value. This yields a new output value: Output value = position value + offset	1 mm or inch/100
Preset	Like the offset, the preset is used to correct the position value. With preset, a preset value is specified. The value is accepted during a corresponding event (switching input or fieldbus). If the preset is activated, this has priority over the offset.	1 mm or inch/100

4.2 Speed measurement

The current speed is ascertained and output on the basis of the respective position values. The most important individual parameters for the speed measurement are:

Parameter	Description	Range/Values
Speed resolution	The parameter defines the resolution of the speed value. It affects only the fieldbus output.	1 mm/s 10 mm/s 100 mm/s or free resolution
Averaging	The parameter specifies the averaging time of the calculated speed values in steps.	Steps: 2, 4, 8, 16, 32 ms

4.3 Timing

The BE 901 SSI operates with a scanning rate of 1000 scans per second. A measurement value is ascertained every 1 ms.
The following parameters are relevant for the timing of the position and speed measurement:

Parameter	Description	Range/Values
Integration depth	The integration depth affects the measurement of position and speed. The *integration depth* parameter specifies the number of sequential measurements that the BE 901 SSI uses for position determination. The integration results in smoothing of the output measurement value. With the BE 901 SSI, an *integration depth* of 8 yields an integration time of 8 ms.	Factory setting: 8
Update rate	The update rate (50 µs to 2 ms) of the measurement values at the SSI interface can be configured via the webConfig tool; see chapter 9.3.4 "*CONFIGURATION* function".	Factory setting: 2 ms
Error delay time	Errors that occur are suppressed for the configured time. If no valid position or speed value can be ascertained in the configured *error delay time*, the last valid value is always output. If the error persists after the *error delay time* elapses, the value of the *Position / Speed value in case of error* parameter is then output (standard).	Factory setting: 50 ms

4.4 TR webConfig tool

The webConfig configuration tool offers a graphical user interface for the display of process data, configuration and diagnostics of the BE 901 SSI via a PC; see chapter 9 "Commissioning – webConfig tool".

4.5 Evaluation of the reading quality

Output of the reading quality

The BE 901 SSI can diagnose the reading quality in the arrangement of the BE 901 SSI to the barcode tape.

- *The reading quality is displayed in % values.*
- *Despite optimum operating conditions, the reading quality may be slightly below 100%. This does not constitute a defect of the BE 901 SSI or the barcode tape.*

The factory preset warning threshold at a read quality < 60%, as well as a shutdown threshold at a read quality < 30%, corresponds to the experience of TR-Electronic GmbH in a typical application.

For applications that result in a deliberate interruption of the barcode tape (switches, expansion joints, vertical slopes/gradients), the preset thresholds can be adapted to the respective application.

The reading quality depends on several factors:

- Operation of the BE 901 SSI at the specified depth of field
- Number of barcodes in the transmission beam
- Number of barcodes in reading range
- contamination of the barcodes
- Travel speed of the BE 901 SSI (number of barcode symbols within the time window)
- Incidence of ambient light on the barcode and on the optics (glass exit window) of the BE 901 SSI

In particular, the reading quality is influenced in the following cases:

- Switches, expansion joints and other transition points where the barcode tape is not glued without interruption
- Vertical travel if at least three barcode symbols are not completely within the reading range of the sensor at any time.
- Vertical travel when the barcode tape has been cut at the marked cutting edges to adapt to the curve.

If the reading quality is influenced by the factors listed above, the reading quality may drop to 0%.

↳ *This does not mean that the BE 901 SSI is defective, but that the read quality characteristics are reduced to 0% in the respective arrangement.*

↳ *If a position value is output at a read quality of 0%, it is correct and valid.*

The parameters for the evaluation of the reading quality are set via the webConfig tool: **CONFIGURATION > DATA PROCESSING > Read Quality**; see chapter 9.3.4 "*CONFIGURATION* function".

The read quality values are indicated via the optional display (Quality), the serial communication protocol and via the webConfig tool; see chapter 9.3.3 “ALIGNMENT function”.

The evaluation of the reading quality provides the following information, for example:

- The reading quality is constantly poor: contamination of the optics of the BE 901 SSI
- The reading quality is always poor at certain position values: contamination of the BCB

4.6 Distance measurement to the barcode tape

Within the reading field, the BE 901 SSI can output the current distance from the read head to the BCB. The distance from the position label closest to the reference point is output.

The distance measurement value is output via the *ALIGNMENT* function (*Quality* menu) in the webConfig tool. This function is only available in the *Service* operating mode (see chapter 9.3.3).

5 Applications

Wherever systems are moved automatically, it is necessary to uniquely determine their respective positions. In addition to mechanical measuring sensors, optical methods are particularly well suited for position determination as they can be used to determine position without mechanical wear and slippage.
Compared to common optical measurement techniques, the barcode positioning system (BE 901 SSI) is able to measure a position with absolute sub-millimeter accuracy, i.e. independent of reference points. As a result, it is able to provide a unique position value at any time. With the highly flexible and hard-wearing Bar Code Tape (BCB), the system can even be used without problem in systems with curves or guide tolerances. And this at lengths of up to 10,000 meters.

The product family of TR-Electronic GmbH barcode positioning systems convinces with a variety of advantages:

- The laser simultaneously scans three barcodes and, as a result, is able to determine the position with sub-millimeter accuracy. The wide reading field makes accurate position determination possible even in the event of minor damage to the tape.
- With the systems' flexible depth of field, it is also possible to bridge over mechanical deviations.
- Due to the large reading distance combined with the great depth of field, a large opening angle and a very compact construction, the device is ideally suited for the conveyor and storage technology market.
- The BE 901 SSI devices are capable of simultaneously measuring position and speed and are thus also suitable for control tasks in your automation applications.
- Using a mounting device, the BE 901 SSI can be mounted with millimeter accuracy with just one screw. If mounted using a mounting device, a new device is automatically aligned correctly should it be necessary to exchange a device.
- Due to the unique coding of the position value on the barcode tape, the system can continue to operate without any problems even after a short-term voltage drop without having to resort to a reference point, for example.
- The barcode tape is very robust, highly flexible and, thanks to the self-adhesive back, can be easily integrated into your overall mechanical system. It can be fit optimally to both vertical as well as horizontal curved paths and thereby reliably facilitates trouble-free and reproducible measurement at any point in your system with sub-millimeter accuracy.

Typical applications for the BE 901 SSI include:

- High-bay storage device (see chapter 5.1)
- Telpher line (see chapter 5.2)
- Gantry cranes (see chapter 5.3)

5.1 High-bay storage device

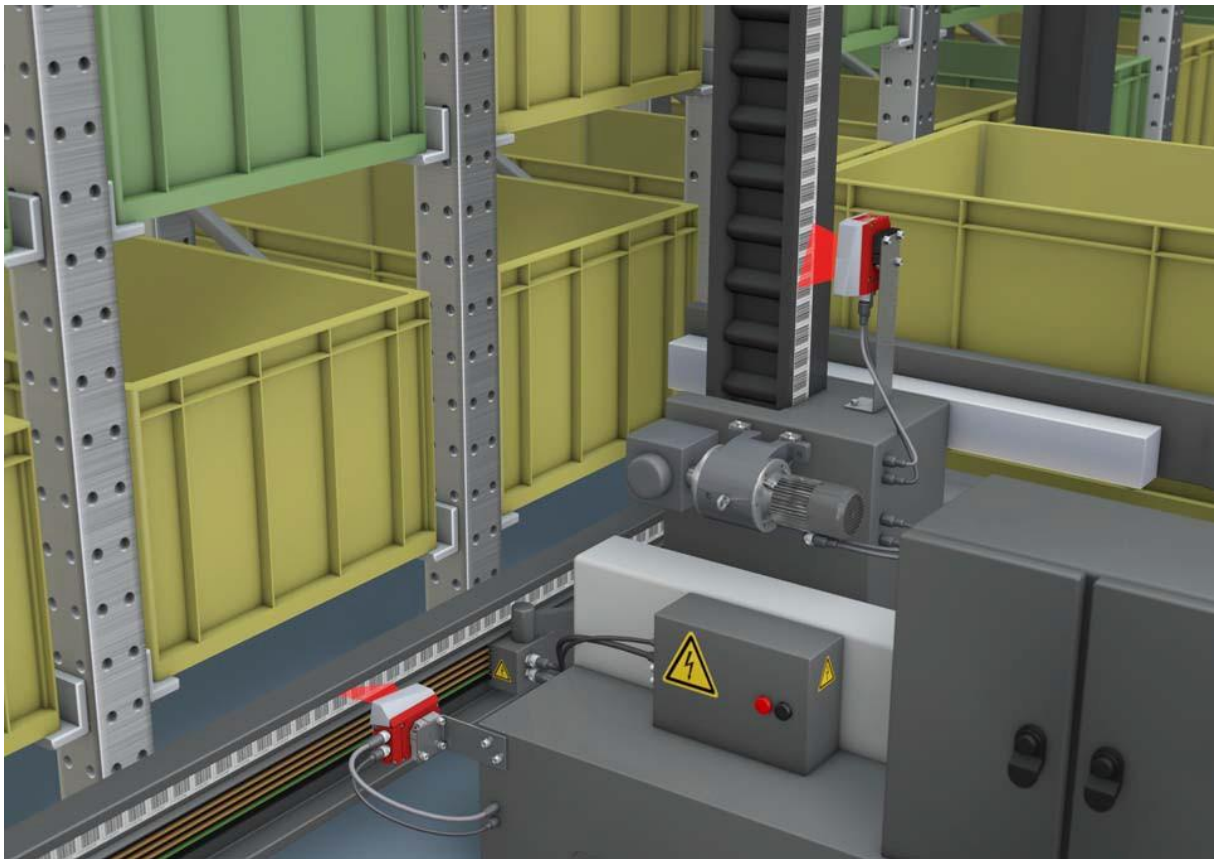


Figure 5.1: High-bay storage device

- Simultaneous position and speed measurement for regulation tasks
- Precise positioning with a reproducibility of ± 0.15 mm
- Control at high traverse rates of up to 10 m/s

5.2 Telpher line

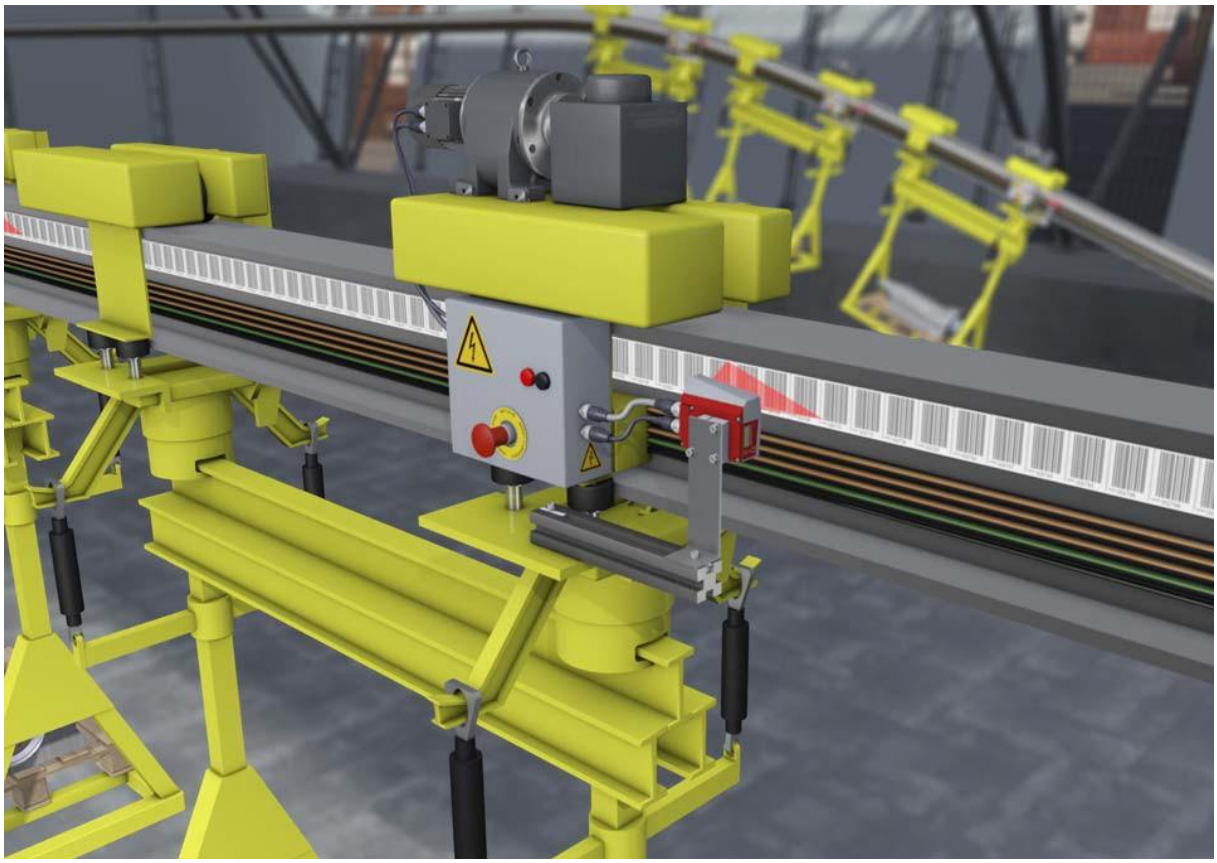


Figure 5.2: Telpher line

- Positioning from 0 to 10,000 meters
- The working range from 50 - 170 mm allows for flexible mounting positions and reliable position detection at varying distances
- Control codes for changing to different position values at switches

5.3 Gantry cranes

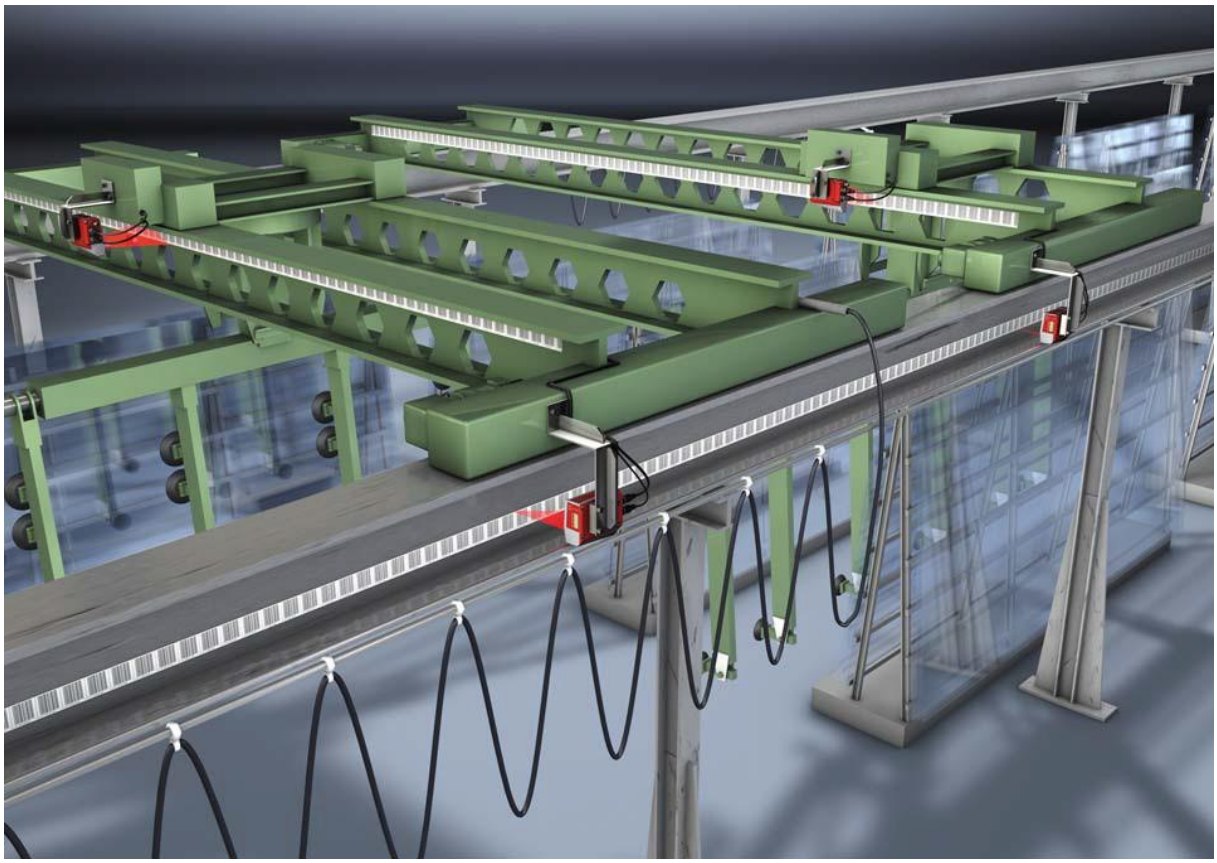


Figure 5.3: Gantry cranes

- Scratch- and smudge-proof, UV-resistant barcode tapes
- Synchronous positioning with twin tapes on both rails
- Mounting device for fast, precise mounting with one screw

6 Mounting and installation

6.1 Mounting barcode tape

6.1.1 Installation and application remarks

NOTICE

BCB mounting

- *When processing BCBs, observe the specified processing temperatures.*

  When processing BCBs in cold storage facilities, the BCB must be affixed before cooling the storage facility.

  However, if it should be necessary to affix the BCB at temperatures outside of the specified processing temperature, assure that the bonding surface as well as the BCB is at the processing temperature.
- *Avoid dirt deposits on the BCB.*

  If possible, affix the BCB vertically.

  If possible, affix the BCB below an overhead covering.

  The BCB must never be continuously cleaned by on-board cleaning devices such as brushes or sponges. Permanent on-board cleaning devices polish the BCB and give it a glossy finish. The reading quality deteriorates as a result.
- *After affixing the BCBs, make certain that there are no polished, high-gloss surfaces in the scanning beam (e.g., glossy metal at gaps between the individual BCBs), as the measurement quality of the BE 901 SSI may be impaired.*

  Affix the BCBs to a diffusely reflective support, e.g., a painted surface.
- *Avoid sources of extraneous light and reflections on the BCB.*

  Ensure that neither strong sources of extraneous light nor reflections of the support on which the BCB is affixed occur in the vicinity of the BE 901 SSI scanning beam.
- *Affix the BCB over expansion joints up to a width of several millimeters.*

  The BCB must not be interrupted at this location.
- *Cover protruding screw heads with the BCB.*
- *Ensure that the BCB is affixed without tension.*

  The BCB is a plastic tape that can be stretched by strong mechanical tension. Excessive mechanical stretching results in lengthening of the tape and distortion of the position values.

NOTICE

BCB application

- *Make certain that the BCB is located in the scanning beam of the BE 901 SSI over the entire traversing path. The BE 901 SSI can determine the position on BCBs with arbitrary orientation.*
- *Barcode tapes with different value ranges may not directly follow one another.*

  For different value ranges, a gap of at least 1 m between the position value of the last position barcode of the leading BCB and the position value of the first position barcode of the trailing BCB must be maintained (see chapter 3.4.2 “Control barcodes”).
- *For MVS/MV0 control barcodes (see chapter 3.4.2), the minimum distance of 1 m between the last position barcode before the control barcode and the first position barcode after the control barcode must be maintained.*
- *For barcode tapes with different value ranges, both BCBs must correspond to the BCB type configured in the BE 901 SSI (see chapter 3.4.1).*
- *Avoid position barcode labels with the value 00000.*

  Measurements to the left of the center of a 00000 label produce negative position values that may not be displayed correctly.

6.1.2 Cutting barcode tapes

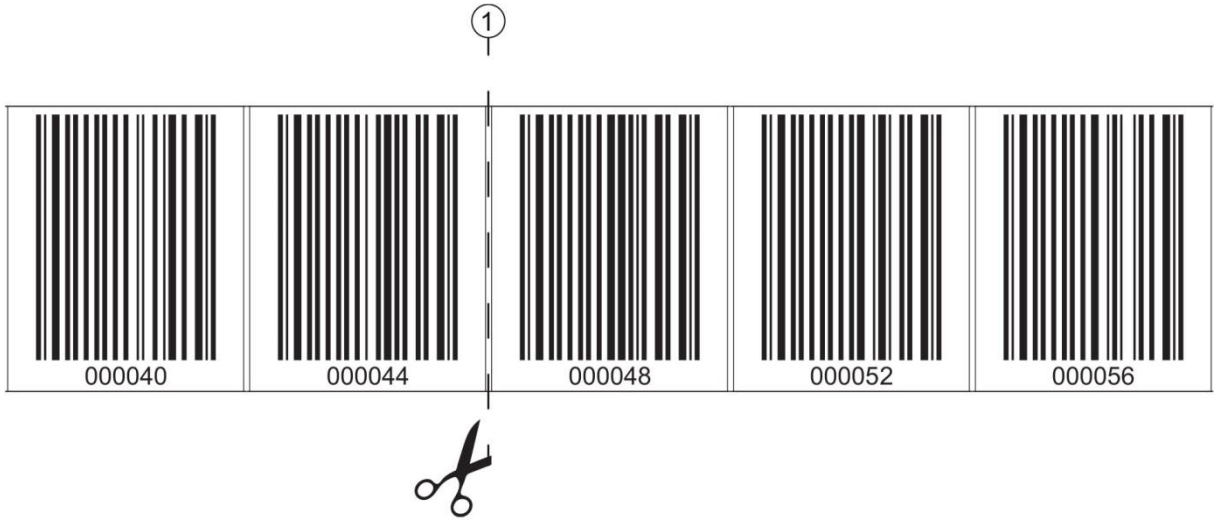
NOTICE

Avoid cutting BCB!

- *If possible, avoid cutting barcode tapes.*

  Optimum position value determination by the BE 901 SSI is achieved with continuously affixed BCB.
- *If there are mechanical gaps, first affix the BCB continuously. Then cut the BCB.*

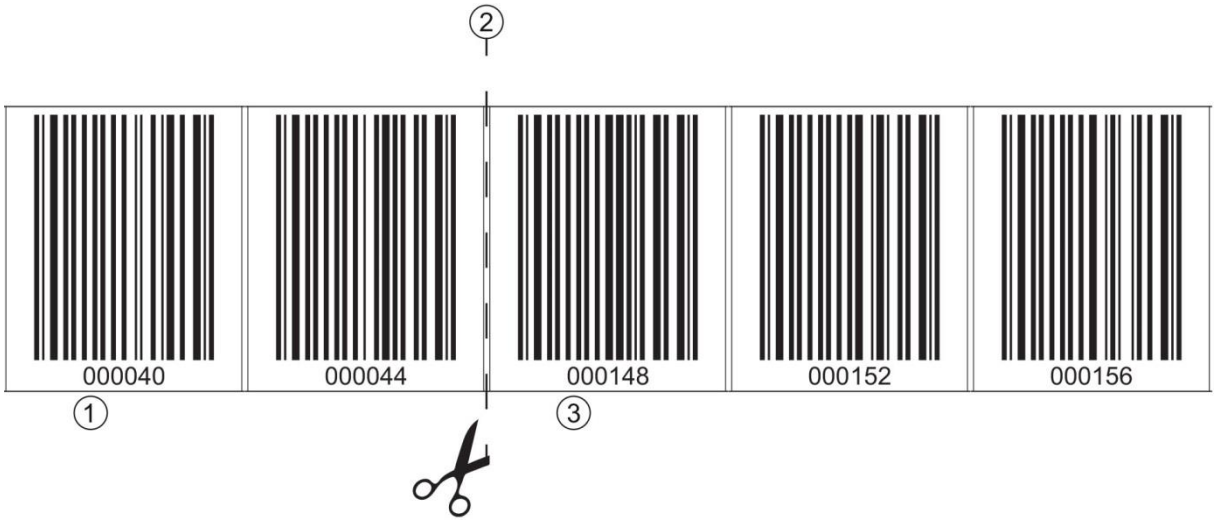
The BCB is cut at the indicated cut marks.



1: Cut mark

Figure 6.1: Cut mark on the barcode tape

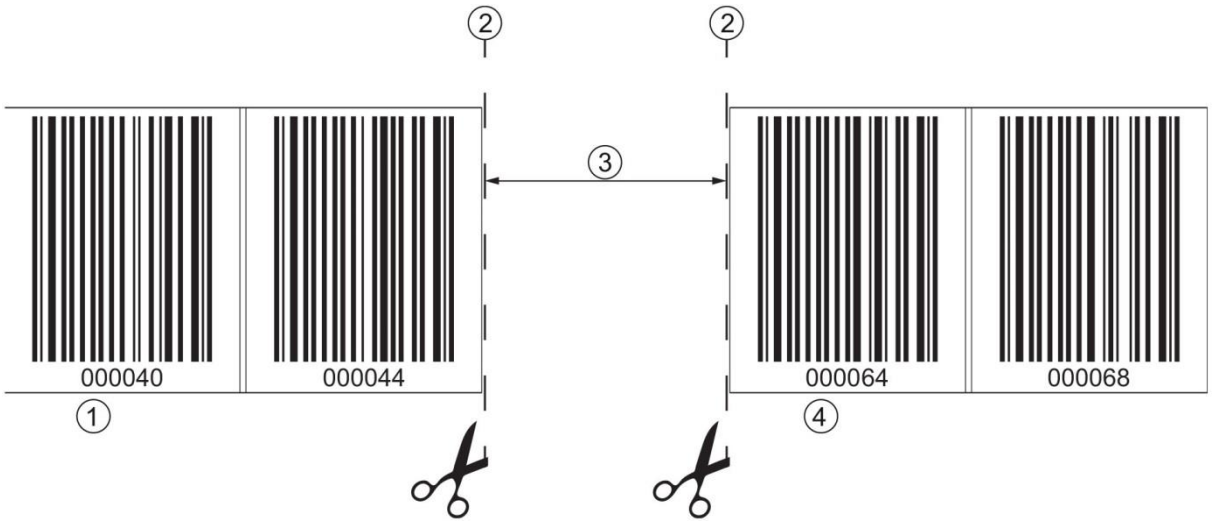
If another BCB is to be affixed directly after the preceding BCB, the subsequent barcode value must differ from the preceding BCB by at least 1 m; see Figure 6.2.



1: Preceding barcode tape
2: Cut mark
3: Subsequent barcode tape, value range + 1 m

Figure 6.2: Cut barcode tape

If there is a gap without tape after the preceding BCB, it must be at least 300 mm wide before the subsequent BCB is affixed, see Figure 6.3. The first barcode value of the subsequent BCB must differ by at least 20 (200 mm) from the last barcode value of the preceding BCB.



1: Preceding barcode tape
2: Cut mark
3: Gap, at least 300 mm
4: Following barcode tape

Figure 6.3: Gap in cut barcode tape to avoid double positions

NOTICE

No glossy gaps in the cut barcode tape!

↳ *Ensure that there are matt, bright surfaces behind the gaps in the BCB.*

Polished, reflective, and high-gloss surfaces in the scanning beam may impair the measurement quality of the BE 901 SSI

6.1.3 Mounting of the BCB

Mount the BCB as follows:

↳ Check the surface.

It must be flat, free of grease and dust, and be dry.

↳ Define a reference edge (e.g., metal edge of the busbar).

↳ Remove the backing and affix the BCB along the reference edge tension free.

↳ Secure the bar code tape to the mounting surface by pressing down with the palm of your hand.

When affixing, make certain that the BCB is free of folds and creases and that no air pockets form.

NOTICE

When mounting, do not pull on the BCB!

The BCB is a plastic tape that can be stretched by strong mechanical tension.

The stretching results in lengthening of the tape and distortion of the position values on the BCB.

While the BE 901 SSI can still perform the position calculation in the event of distortions, the absolute measurement accuracy is no longer ensured in this case. If the values are taught using a teach-in process, stretching of the BCB is irrelevant.

If a barcode tape was damaged, e.g., by falling parts, you can download a repair kit for the BCB (see chapter 11.2.2 "BCB repair with repair kit").

↳ *Use the barcode tape created with the repair kit only temporarily as an emergency solution.*

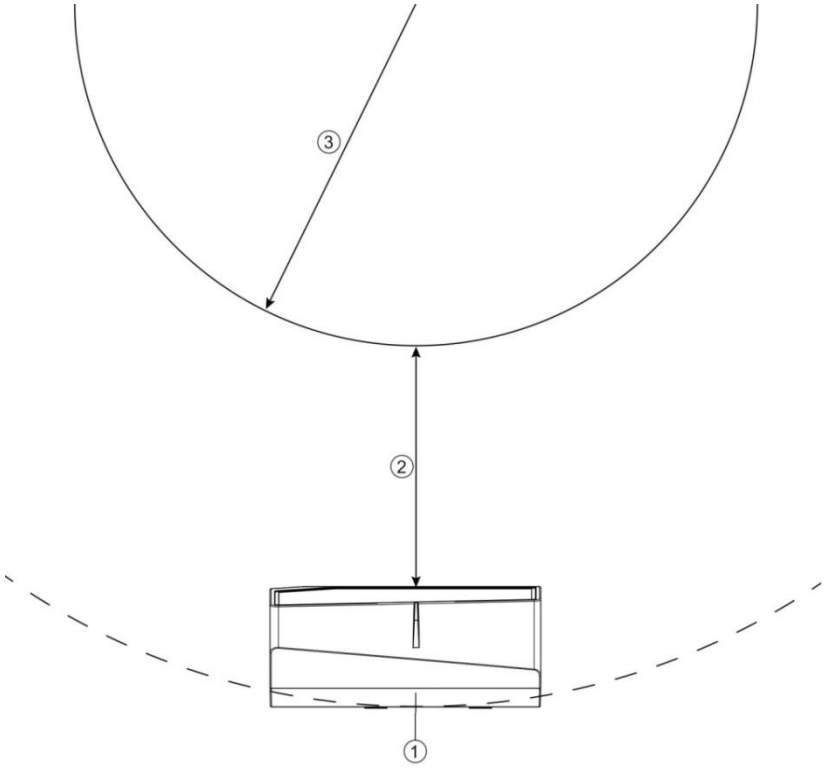
BCB mounting in horizontal curves:

NOTICE

Limited absolute measurement accuracy and reproducibility!

BCB mounting in curves impairs the absolute accuracy of the BE 901 SSI, since optical distortions mean that the distance between two barcodes is no longer exactly 40 mm or 30 mm.

↳ For horizontal curves, maintain a minimum bending radius of 300 mm (see Figure 6.4).



1: BE 901 SSI
2: Reading distance
3: Radius barcode tape, R_{min} = 300 mm

Figure 6.4: Mounting the barcode tape for use in horizontal curves

BCB mounting in vertical curves:

NOTICE

Limited absolute measurement accuracy and reproducibility!

- *BCB mounting in curves decreases the absolute measurement accuracy of the BE 901 SSI, since the distance between two barcodes is no longer exactly 40 mm or 30 mm.*
- *In areas where the BCB is fanned out around curves, limitations of the reproducibility must be expected.*

- Only partially cut the BCB at the cut mark.
- Affix the BCB along the curve like a fan (see Figure 6.5).
- Ensure that the BCB is affixed without mechanical tension.

NOTICE

No glossy gaps in the barcode tape!

- *Ensure that there are matt, bright surfaces behind the gaps in the BCB.*

  Polished, reflective, and high-gloss surfaces in the scanning beam may impair the measurement quality of the BE 901 SSI

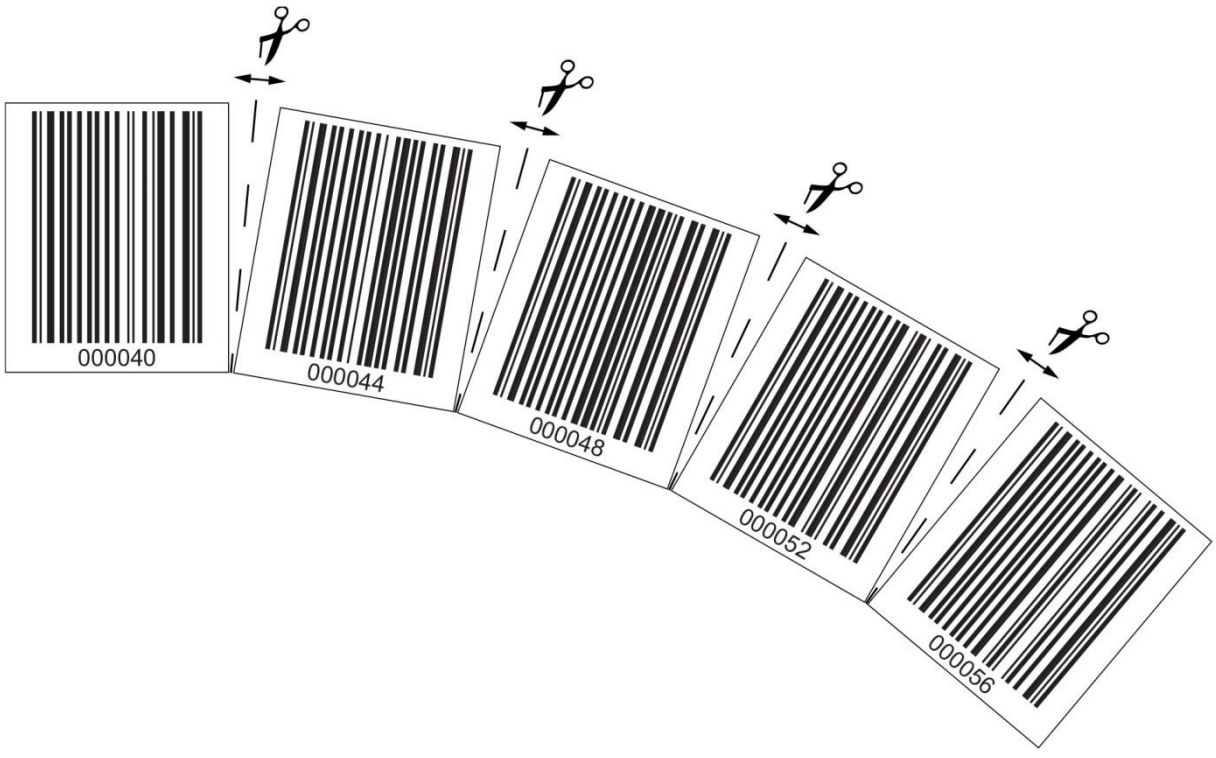
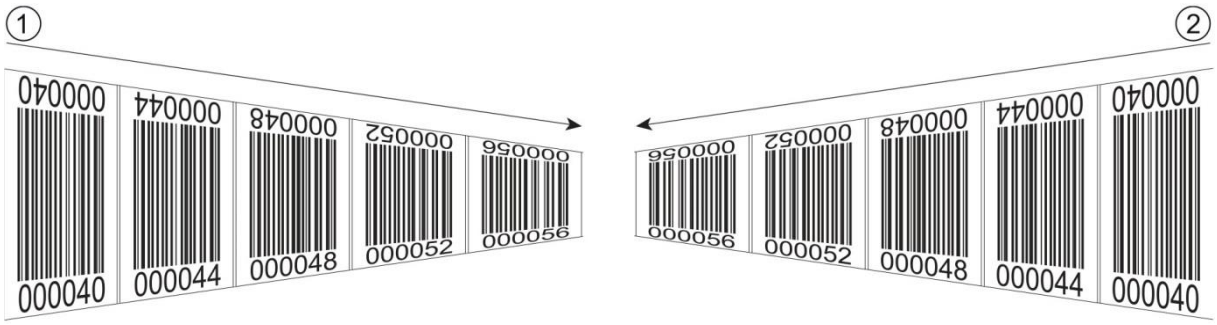


Figure 6.5: Preparing the barcode tape for use in vertical curves

Mounting twin tapes:

If two barcode tapes with the same value range are used for positioning, e.g., for crane systems or elevators, the use of twin tapes is recommended (see chapter 3.4.4 "Twin tapes").

Twin tapes are provided with duplicate numbering. As a result, it is not necessary to affix the BCBs “upside down” in order to have the same values at the same position (see Figure 6.6).



1: Twin barcode tape 1
2: Twin barcode tape 2

Figure 6.6: Mounting twin tapes

NOTICE

A twin tape always consists of two barcode tapes

- *When ordering twin tapes, two barcode tapes are always delivered with one order.*
- *The two TWIN barcode tapes have exactly the same length tolerances to each other.*
- *Make sure that the BCB is attached without tension.*

  The BCB is a plastic tape that can be stretched by strong mechanical tension. Excessive mechanical stretching will lengthen the tape and distort the position values.

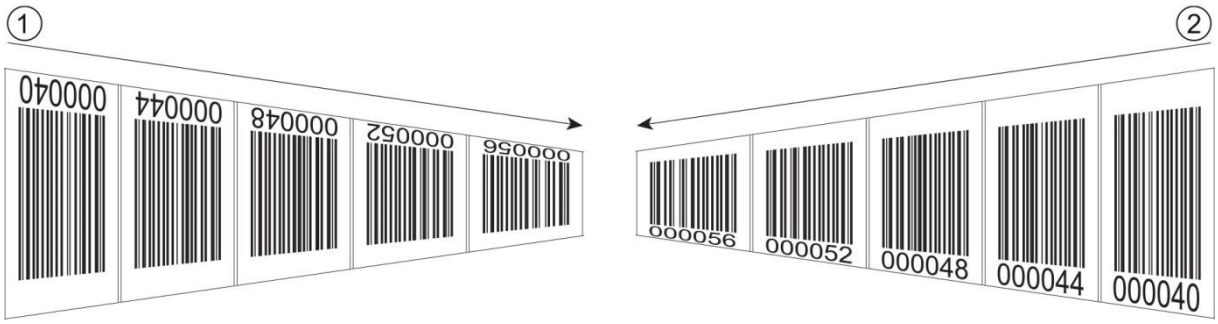
Mounting two barcode tapes with the same value range:

For crane systems or elevators, two barcode tapes with the same value range are used for positioning.

If two barcode tapes with the same value range and the same length tolerances are required, the use of twin tapes is recommended (see 3.4.4 "Twin tapes").

If a twin tape is not used: To have the same values at the same position, one barcode tape must be affixed with numbers upside down while the other is affixed normally (see Figure 6.7).

If no TWIN barcode tapes are used, the two barcode tapes can deviate +/- 1 mm per meter from each other.



1: BCB affixed upside down
2: BCB affixed normally

Figure 6.7: Affixing two barcode tapes with the same value range

6.2 Mounting barcode positioning system

The BE 901 SSI can be mounted in the following ways:

- Mounting using a mounting device on the fastening grooves
  - BE 901 FA-001 (BE901 Befestigung): Wall mounting
  - BE 90 FA-001: Mounting on a rod
- Mounting using a mounting device on the M4 mounting threads on the rear of the device
  - BE 901 FA-002 (BE901 Befestigungswinkel): Mounting on a mounting bracket
  - BE 901 FA-003 (BE901 Befestigung kompl.): Mounting on a rod
- Mounting using four M4 mounting threads on the rear of the device

If the BE 901 FA-001 mounting device is used to mount the device, the new device is automatically aligned correctly should it be necessary to exchange a device.

6.2.1 Mounting instructions

NOTICE

Select the mounting location.

- *Make certain that the required environmental conditions (humidity, temperature) are maintained.*
- *Make certain that the distance between BE 901 SSI and barcode tape is sufficiently large. The scanning beam of the BE 901 SSI should cover three or more barcodes. The distance between BE 901 SSI and barcode tape must be in the working range of the reading field curve.*
- *Make certain that the exit window does not become soiled, e.g., by leaking liquids, abrasion from cardboard packaging or residues from packaging material.*
- *Mounting the BE 901 SSI outdoors or with BE 901 SSI with integrated heating:*

  Mount the BE 901 SSI in a way which provides maximum thermal isolation, e.g., using rubber bonded metal.

  Mount the BE 901 SSI so that it is protected from airflow, e.g., in a protective housing.
- *Mounting the BE 901 SSI in a protective housing:*

  When installing the BE 901 SSI in a protective housing, ensure that the scanning beam can exit the protective housing without obstruction.
- *Make certain that the scanning range determined from the scanning curve is adhered to at all locations where a position determination is to be made.*
- *Ensure that the scanning beam is always incident on the BCB when the system is moving. For the position calculation, the scanning beam of the BE 901 SSI must be incident on the BCB without interruption.*

  For the best functionality, the BE 901 SSI must be guided parallel to the BCB. It is not permitted to move outside of the approved working range of the BE 901 SSI (50 … 170 mm) while the system is in motion.
- *Make certain that there is only one control barcode (or marker label) in the scanning beam at a time. The minimum distance between two control barcodes is determined by the distance between the BE 901 SSI and barcode tape and the resulting length of the scanning beam.*

NOTICE

For parallel mounting, maintain the minimum distance!

- *Maintain the minimum distance of 300 mm if you mount two BE 901 SSI next to or above one another.*

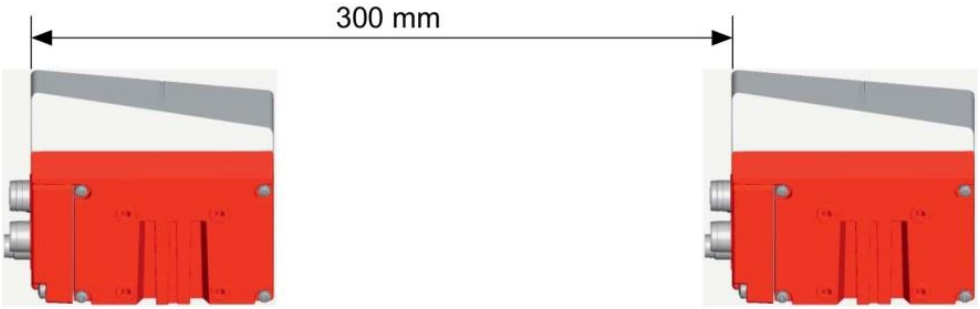


Figure 6.8: Minimum distance for parallel mounting

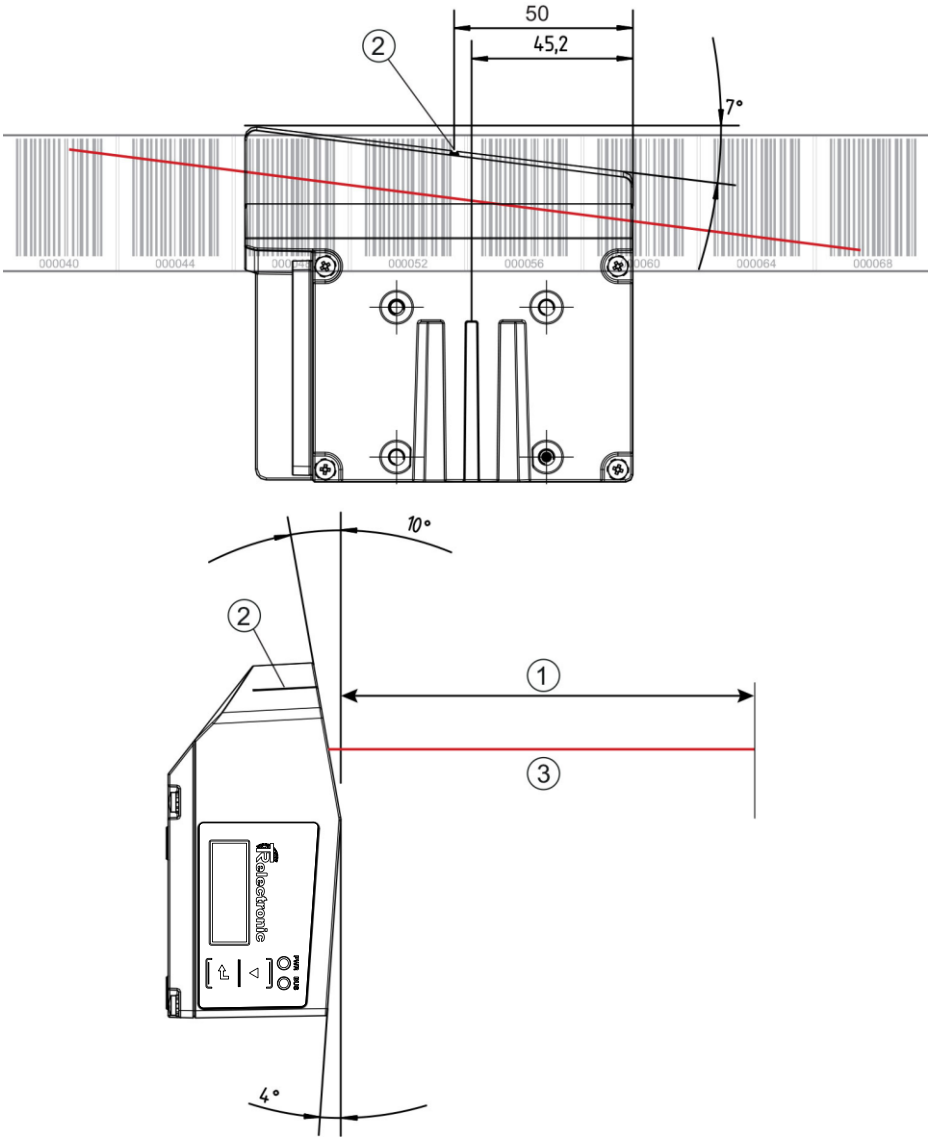
NOTICE

Install the connection hood before mounting the BE 901 SSI!

- *Screw the BE 901 MS SSI or BE 901 MK SSI connection hood to the device housing with two M4 screws.*
- *Tighten the screws on the connection hood with a tightening torque of 1.4 Nm.*

6.2.2 Orientation of the BE 901 SSI to the barcode tape

The beam of the BE 901 SSI must be oriented at an incline of 7° to the barcode tape (see Figure 6.9). When positioning, make certain that the angle of radiation to the rear side of the housing is 90 ° and the reading distance to the barcode tape is maintained.

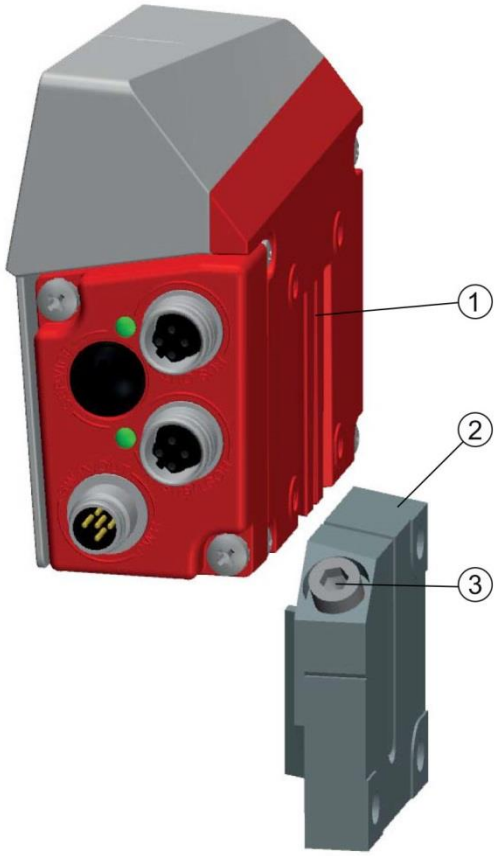


1: Reading distance
2: Reference point for the barcode position
3: Scanning beam

Figure 6.9: Beam exit

6.2.3 Mounting with the BE 901 FA-001 mounting device

Mounting the BE 901 SSI with a BE 901 FA-001 mounting device is intended for wall mounting. For ordering information see chapter 13.4; for dimensioned drawing see Figure 12.7.



1: Clamp profile
2: Clamping jaws
3: Screw terminal

Figure 6.10: Mounting the BE 901 SSI with the BE 901 FA-001 mounting device

- Mount the BE 901 FA-001 on the system side with M6 fastening screws (not included in delivery contents).
- Mount the BE 901 SSI with the dovetail fastening grooves on the clamping jaws of the BE 901 FA-001 with limit stop at end.
- Secure the BE 901 SSI with the M6 screw terminal.

  Maximum tightening torque for the M6 screw terminal: 8 Nm

6.2.4 Mounting with BE 90 FA-001 mounting device

Mounting of the BE 901 SSI with a BE 90 FA-001 mounting device is intended for rod mounting. For ordering information see chapter 13.4; for dimensioned drawing see Figure 12.9.

- Mount the BE 90 FA-001 on the rod with the clamp profile (system-side).
- Mount the BE 901 SSI with its fastening grooves on the clamping jaws of the BE 90 FA-001 with limit stop at end.
- Secure the BE 901 SSI with the M6 screw terminal.

  Maximum tightening torque for the M6 screw terminal: 8 Nm

6.2.5 Mounting with the BE 901 FA-002 mounting bracket

Mounting of the BE 901 SSI with a BE 901 FA-002 mounting bracket is intended for wall mounting. For ordering information see chapter 13.4; for dimensioned drawing see Figure 12.8.

- Mount the BE 901 FA-002 mounting bracket on the system side with M6 fastening screws (included in delivery contents).
- Mount the BE 901 SSI on the mounting bracket with M4 fastening screws (included in delivery contents).

  Maximum tightening torque of the M4 fastening screws: 2 Nm

6.2.6 Mounting with BE 901 FA-003 mounting device

Mounting of the BE 901 SSI with a BE 901 FA-003 mounting device is intended for rod mounting. For ordering information see chapter 13.4; for dimensioned drawing see Figure 12.10.

- Mount the BE 901 FA-003 mounting device with the clamp profile on the rod (system-side).
- Mount the BE 901 SSI on the mounting bracket of the BE 901 FA-003 with M4 fastening screws (included in delivery contents).

  Maximum tightening torque of the M4 fastening screws: 2 Nm

6.2.7 Mounting with M4 fastening screws

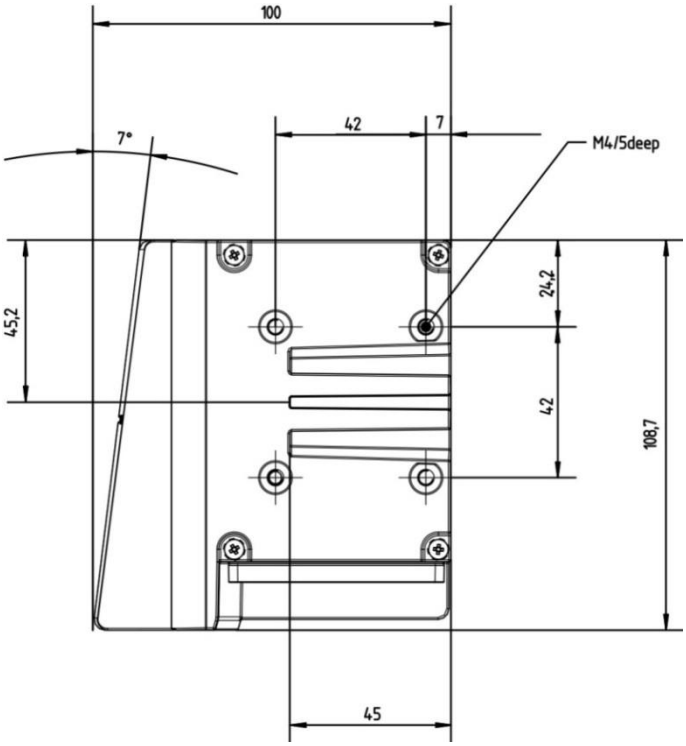


Figure 6.11: Dimensioned drawing of rear of BE 901 SSI

- Mount the BE 901 SSI on the system with M4 fastening screws (not included in delivery contents).

  Maximum tightening torque of the fastening screws: 2 Nm

7 Electrical connection

⚠ CAUTION

- *Before connecting the device, be sure that the supply voltage agrees with the value printed on the name plate.*
- *Only allow competent persons to perform the electrical connection.*
- *Ensure that the functional earth (FE) is connected correctly.*

  Fault-free operation is only guaranteed if the functional earth is connected properly.
- *If faults cannot be rectified, take the device out of operation. Protect the device from accidentally being started.*

⚠ CAUTION

UL applications!

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

NOTICE

Protective Extra Low Voltage (PELV)

- *The BE 901 SSI is designed in accordance with pro tection class III for supply with PELV (protective extra-low voltage).*

NOTICE

Connection hood and degree of protection IP 65

- *Before connecting, mount the connection hood on the BE 901 SSI device housing.*
- *To ensure degree of protection IP 65 is fulfilled, the screws of the connection hood are tightened with a tightening torque of 1.4 Nm for connecting to the BE 901 SSI.*
- *Degree of protection IP 65 is not fulfilled until connectors or cable bushings are screwed on and caps are installed.*

7.1 External parameter memory in the connection hood

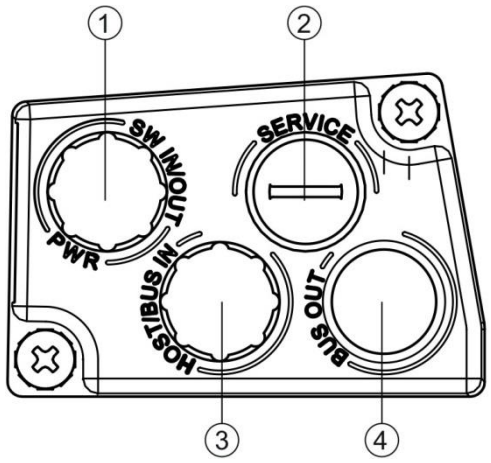
To enable simple exchange of the BE 901 SSI, the integrated parameter memory of the BE 901 MS SSI and BE 901 MK SSI connection hoods store a copy of the current parameter set.

Also located in the BE 901 MS SSI and BE 901 MK SSI are switches S1 and S2.

- Slide switch S1 is used to toggle the encoding of the output measurement value between Gray and binary.
- Rotary switch S2 is used to set the resolution of the position value (in mm) or a speed monitoring function.

7.2 BE 901 MS SSI connection hood with connectors

The BE 901 MS SSI connection hood features three M12 connector plugs and a Mini-B type USB socket as a service interface.
The integrated parameter memory for the simple replacement of the BE 901 SSI is located in the BE 901 MS SSI.



1: PWR / SW IN/OUT: M12 plug (A-coded)
2: SERVICE: Mini-B USB socket (behind protective cap)
3: HOST / BUS IN: M12 plug (B-coded), SSI
4: BUS OUT: not equipped

Figure 7.1: BE 901 MS SSI connection hood, connections

NOTICE

Shielding connection and functional earth connection!

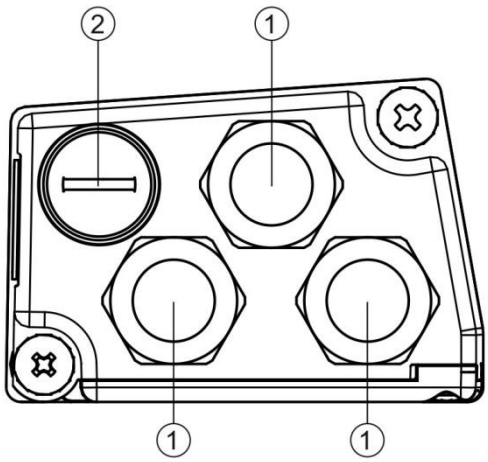
- *The shielding connection is done via the M12 connector housing.*
- *Ensure that the functional earth (FE) is connected correctly. Unimpaired operation is only guaranteed when the functional earth is connected properly.*

  All electrical disturbances (EMC couplings) are discharged via the functional earth connection.

- Connect connection PWR / SW IN/OUT to the supply voltage or the switching inputs/outputs connection cable.
- Connect connection SSI (HOST / BUS IN) to your SSI interface.

7.3 BE 901 MK SSI connection hood with spring-cage terminals

With the BE 901 MK SSI connection hood, the BE 901 SSI is connected directly and with no additional plug. The BE 901 MK SSI features cable bushings in which the shielding connection for the interface cable is also located. The integrated parameter memory for the simple replacement of the BE 901 SSI is located in the BE 901 MK SSI. A Mini-B type USB socket is used for service purposes.



1: 3x cable bushing, M16 x 1.5
2: SERVICE: Mini-B USB socket (behind protective cap)

Figure 7.2: BE 901 MK SSI connection hood, connections

NOTICE

Cable fabrication!

↳ *It is recommended not to use wire-end sleeves.*

NOTICE

Functional earth connection!

↳ *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.*

↳ Connect connection PWR / SW IN/OUT to the supply voltage or the switching inputs/outputs.
↳ Connect connection SSI (HOST / BUS IN) to your SSI interface.

7.4 Pin assignment

7.4.1 PWR / SW IN/OUT (Power and switching input/output)

5-pin, M12 plug (A-coded) or terminal block for connecting to PWR / SW IN/OUT.

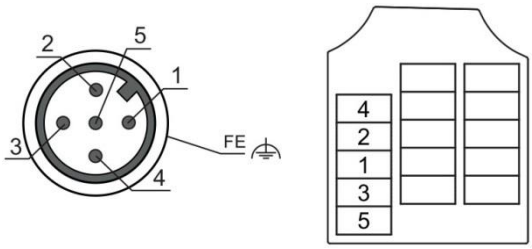


Figure 7.3: PWR / SW IN/OUT connection

Table 7.1: PWR / SW IN/OUT pin assignment

Pin/terminal	Designation	Assignment
1	VIN	+18 … +30 VDC supply voltage
2	SWIO1	Sw. input/output 1 (configurable)
3	GNDIN	Negative supply voltage (0 VDC)
4	SWIO2	Sw. input/output 2 (configurable)
5	FE	Functional earth
Thread (M12 plug) Cable gland	Functional earth	Connection cable shield. The shield of the connection cable is on the thread of the M12 plug or on the screw fitting of the cable bushing. The thread or the screw fitting is part of the metallic housing. The housing is at the potential of the functional earth via pin 5.

⚠ CAUTION

UL applications!

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

Switching input/output:

The BE 901 SSI is equipped with two, freely programmable, optically decoupled switching inputs/outputs, SWIO1 and SWIO2.

- The switching inputs can be used to activate various internal functions of the BE 901 SSI (e.g., Measurement Stop/Start, Teach Preset and Reset Preset).
- The switching outputs can be used to signal the state of the BE 901 SSI and to implement external functions independent of the superior control (e.g. position value/speed value invalid, position and speed limit value exceeded, device error).
- The control can use switching inputs/outputs as digital I/O's.

  If no internal BE 901 SSI function is connected to the switching inputs/outputs, the ports can be addressed as two inputs, two outputs or as one input and one output of a digital I/O component.

*The function as an input or output is set via the webConfig configuration tool (**CONFIGURATION > DEVICE > Switching inputs/outputs**, see chapter 9.3.4).*

NOTICE

Maximum input current

↳ *The input current of the respective switching input is maximum 8 mA.*

NOTICE

Maximum loading of the switching outputs

↳ *Do not load the respective switching output of the BE 901 SSI with more than 60 mA at + 18 … 30 VDC in normal operation.*

↳ *Each configured switching output is short-circuit proof.*

The two switching inputs/outputs, SWIO1 and SWIO2, are configured as follows by default:

Switching output SWIO1: Position value invalid

Switching input SWIO2: Teach Preset

NOTICE

SWIO1 and SWIO2 as switching output

↳ *At the outputs of the BE 901 SSI (SWIO1 and SWIO2), no switching outputs may be connected from external sensors/devices.*

The switching output of the BE 901 SSI may otherwise malfunction.

7.4.2 SSI (HOST / BUS IN)

5-pin, M12 plug (B-coded) or terminal block for connecting to an SSI interface.

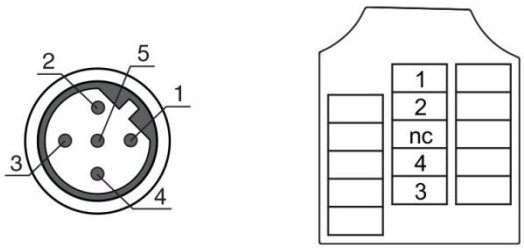


Figure 7.4: SSI connection

Table 7.2: SSI (HOST / BUS IN) pin assignment

Pin/terminal	Designation	Assignment
1	DATA+	+ Data line SSI (Output electrically isolated)
2	DATA-	- Data line SSI (Output electrically isolated)
3	CLK+	+ Clock line SSI (Input electrically isolated)
4	CLK-	- Clock line SSI (Input electrically isolated)
5	FE	Functional earth
Thread (M12 plug) Cable gland	Functional earth (housing)	Connection cable shield. The shield of the connection cable is on the thread of the M12 plug or on the screw fitting of the cable bushing. The thread or the screw fitting is part of the metallic housing. The housing is at the potential of the functional earth via pin 5.

NOTICE

Data cables for the SSI interface!

↳ *Use only shielded and twisted-pair cables as data line for the SSI interface.*

- Twisting: pin 1 with 2, pin 3 with 4

- The shield must be connected at both ends.

7.4.3 Service USB

NOTICE

Connection to PC!

- *The service USB interface of the BE 901 SSI can be connected to the USB interface on the PC with a standard USB cable (plug combination - Mini-B type / Type A).*
- *If possible, use the ready-made cables from TR-Electronic GmbH (see chapter 13.3 “Other accessories”).*

5-pin, Mini-B plug for connecting to the service USB.

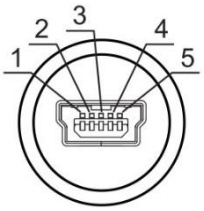


Figure 7.5: Service USB connection

Table 7.3: BUS OUT pin assignment

Pin/terminal	Designation	Assignment
1	VB	Sense input
2	D-	Data -
3	D+	Data +
4	ID	Not connected
5	GND	Ground

NOTICE

Self-configured cables!

- *The entire USB connection cable must be shielded according to the USB specifications.*
- *The maximum cable length of 3 m must not be exceeded.*

7.5 Cable lengths and shielding

Observe the maximum cable lengths and the shielding types:

Connection	Interface	Max. cable length	Shielding
Service	USB	3 m	Shielding absolutely necessary acc. to USB specifications
Power supply unit		30 m	Not necessary

Cable length according to the data rate:

NOTICE

Data cables for the SSI interface!

- *Use only shielded and twisted-pair cables as data line for the SSI interface.*
  - *Twisting: pin 1 with 2, pin 3 with 4*
  - *The shield must be connected at both ends.*
- *Do not lay the data line parallel to power cables.*

The maximum possible cable length of the SSI connection is dependent on the used cable and the data rate.

Table 7.4: SSI cable lengths according to the data rate

Data rate [kbit/s]	80	100	200	300	400	500	600	800
Maximum cable length [m]	500	400	200	100	50	25	18	15

8 Commissioning – Basic configuration

The parameters of the SSI interface as well as the switching inputs/outputs can be configured via the webConfig tool (see chapter 9) or via connection hood BE 901 MS SSI or BE 901 MK SSI.

8.1 Configuring the SSI interface

8.1.1 Principal functionality of the SSI interface

Data communication of the SSI interface is based on differential transmission as is used for RS 422 interfaces. The position value is transmitted in sync with a cycle (CLOCK) specified by the control, starting with the most significant bit (MSB); see Figure 8.1.

- In the quiescent state, both the clock line as well as the data line are at HIGH level.

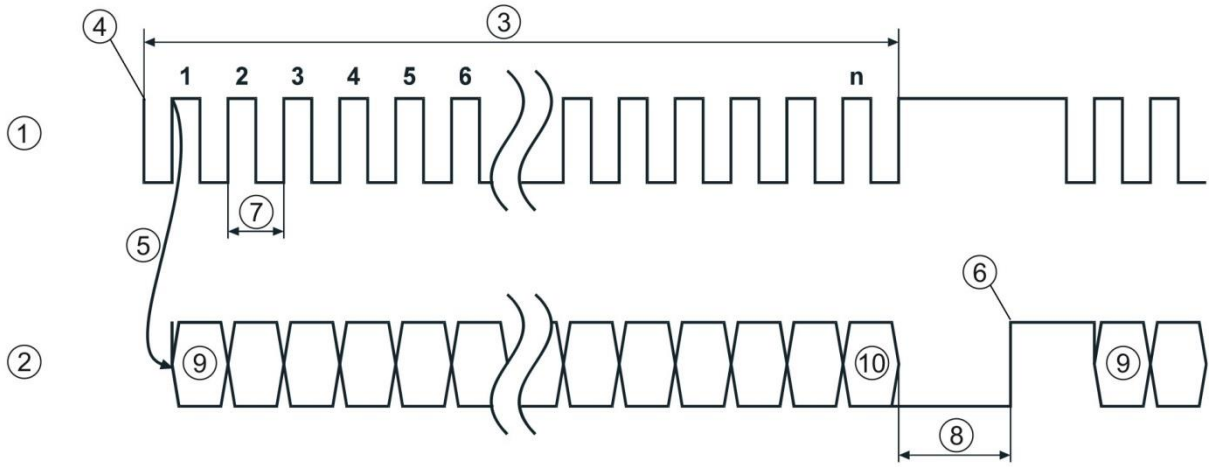
  On the first HIGH-LOW edge (1), the data of the internal register are stored.

  This ensures that the data are not changed during serial transfer of the value.
- With the subsequent change of the clock signal from LOW to HIGH level (2), transfer of the position value begins with the most significant bit (MSB).
  - With each subsequent change of the clock signal from LOW to HIGH level, the next least-significant bit is transmitted on the data line.
  - After the least significant bit (LSB) has been output, the clock signal switches from LOW to HIGH for one last time and the data line switches to LOW level (end of transmission).
- A monoflop retriggered by the clock signal determines how long before the SSI interface can be called for the next transmission. This yields the minimum pause time between two successive clock cycles (t_m)

  If time t_m has elapsed, the data line is reset to bias level (HIGH) (3). This signals the fully completed data exchange and renewed transmission-ready state.
  - t_m = 20 µs with master clock frequency 80 kHz - 800 kHz
  - t_m = 30 µs with master clock frequency 50 kHz - 79 kHz
- The update rate (50 µs to 2 ms) of the measurement values at the SSI interface can be configured via the webConfig tool. Factory setting: 2 ms.

  The update rate describes how quickly the data are replaced on the SSI interface by current data.

  The measurement value is updated independent of the clock frequency.



1: CLOCK
2: DATA
3: Clock sequence
4: First HIGH-LOW edge
5: Change LOW level to HIGH level
6: Bias level (HIGH)
7: T_{SSI} ($1/f_{SSI}$)
8: T_m = 20 µs or 30 µs
9: MSB
10: LSB (0)

Figure 8.1: SSI data transmission sequence diagram

If the off-cycle of data transmission is interrupted for longer than t_m = 20 µs or t_m = 30 µs, a completely new transmission cycle starts on the next cycle.

If a new transmission cycle is started before time t_m elapses, the previous value is output again.

NOTICE

Factory setting: only positive position and speed values with SSI!

↳ *In the factory setting, the SSI interface can only represent positive position and speed values.*

If negative output values are ascertained due to the orientation of the BE 901 SSI to the BCB or the counting direction, the value 0 is output at the SSI interface!

In the event of a number overflow, all data bits are set to 1.

Factory settings of the SSI interface parameters:

- Data encoding of the measurement values: *Gray*
- Sign: *binary representation*
- Transmission mode: 24 measurement bits + 1 error bit
- Resolution position value: 1 mm
- Error bit: measurement error, LSB, *1* = active
- Value of the error bit:
  The error bit is not included in the Gray encoding of the measurement value.
  The error bit is *1* = active
- Update rate: 2 ms
- SSI master clock frequency: 80 kHz - 800 kHz

8.1.2 Setting the configuration of the SSI interface

↳ Set the parameters of the SSI interface via the webConfig tool or via connection hood BE 901 MS SSI or BE 901 MK SSI.

8.2 Configuring the switching inputs/outputs

↳ Set the configuration of the switching inputs/outputs via the webConfig tool or via connection hood BE 901 MS SSI or BE 901 MK SSI.

- Setting via the webConfig tool:
  CONFIGURATION > DEVICE; see chapter 9.3.4 "*CONFIGURATION* function"
- Setting via connection hood BE 901 MS SSI / BE 901 MK SSI:
  see chapter 8.6 "Configuration via the switches of the connection hood"

8.3 Configuring the resolution for the position value

↳ Set the parameters for the resolution during position measurement via the webConfig tool or via connection hood BE 901 MS SSI or BE 901 MK SSI.

- Setting via the webConfig tool:
  CONFIGURATION > OUTPUT; see chapter 9.3.4 "*CONFIGURATION* function"
- Setting via connection hood BE 901 MS SSI / BE 901 MK SSI:
  see chapter 8.6 "Configuration via the switches of the connection hood"

8.4 Configuring speed monitoring with switching output

↳ Set the parameters for speed monitoring via the webConfig tool or via connection hood BE 901 MS SSI or BE 901 MK SSI.

Setting via the webConfig tool:

- Switching output function:
  CONFIGURATION > DEVICE > Switching inputs/outputs;
  see chapter 9.3.4 "*CONFIGURATION* function"
- Speed limit values:
  CONFIGURATION > DATA PROCESSING > Speed > Monitoring;
  see chapter 9.3.4 "*CONFIGURATION* function"
- Setting via connection hood BE 901 MS SSI / BE 901 MK SSI:
  see chapter 8.6 "Configuration via the switches of the connection hood"

8.5 Setting tape selection via the webConfig tool

↳ In the webConfig tool (**CONFIGURATION > MEASUREMENT DATA > Bar code tape**), set the Tape selection parameter according to the used barcode tape grid; see chapter 9.3.4 "*CONFIGURATION* function".

- 30 mm grid (BCB G30)
- 40 mm grid (BCB G40)

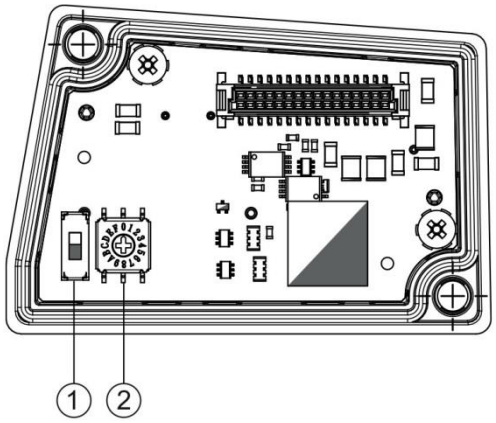
8.6 Configuration via the switches of the connection hood

The following settings can be configured via the operational controls of connection hoods BE 901 MS SSI and BE 901 MK SSI:

- Resolution of the position value
- Data encoding of the measurement values: Gray or binary
- Speed monitoring via switching output (SWIO1)

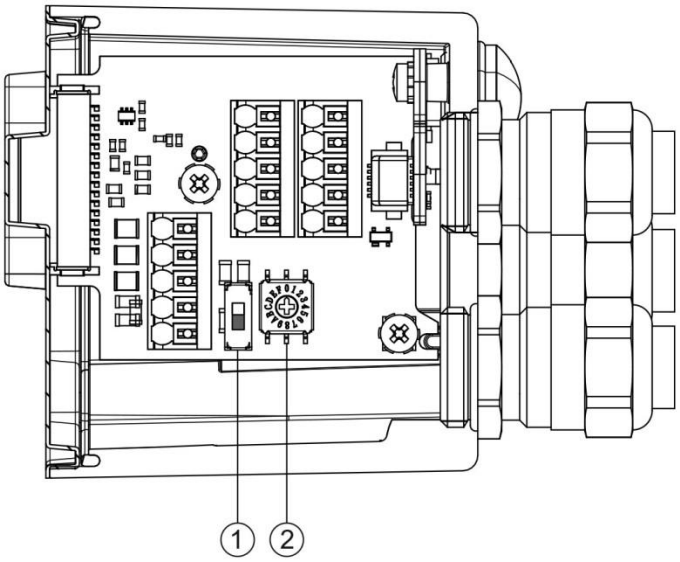
The settings made via the operational controls of the connection hood can alternatively be configured via the webConfig tool; see chapter 9.3.4. To do this, rotary switch S2 must be set to switch position 0.

If rotary switch S2 is set to switch position 0, slide switch S1 is not evaluated.



1: Slide switch S1
Factory setting: Gray encoding
2: Hexadecimal rotary switch S2
Factory setting: *0,*
i.e., configuration via the webConfig tool

Figure 8.2: Operational controls of connection hood BE 901 MS SSI



1: Slide switch S1
Factory setting: Gray encoding
2: Hexadecimal rotary switch S2
Factory setting: switch position *0,*
i.e., configuration via
webConfig tool

Figure 8.3: Operational controls of connection hood BE 901 MK SSI

Slide switch S1:

Change the measurement value encoding

- S1 up: Gray encoding
- S1 down: binary encoding

Rotary switch S2:

NOTICE

Hexadecimal rotary switch S2 for setting the resolution and speed monitoring!

↳ *Set the resolution of the position measurement and speed monitoring via rotary switch S2.*

Table 8.1: SSI cable lengths according to the data rate

Switch position	Position resolution [mm]	Maximum speed [m/s]	Level of the switching output	Speed monitoring
0	Configuration via webConfig tool			
1	0.01	webConfig	webConfig	webConfig
2	0.1	webConfig	webConfig	webConfig
3	1	webConfig	webConfig	webConfig
4	10	webConfig	webConfig	webConfig
5	webConfig	webConfig	webConfig	webConfig
6	webConfig	webConfig	webConfig	webConfig
7	webConfig	0,7	• HIGH Current speed below maximum speed • LOW Current speed above maximum speed	activated
8	webConfig	2		activated
9	webConfig	3		activated
A	webConfig	4		activated
F	Factory setting of the configuration parameters **Notice:** Switch S1 must be set to switch position Gray encoding.			
webConfig: The parameter value set via the webConfig tool is used.				

All parameters that are not influenced by the position of the switch are configured via the webConfig tool; see chapter 9.

In rotary switch positions 7, 8, 9 or A, the webConfig tool can be used, e.g., to change the resolution of the position measurement or invert the mode of the switching inputs/outputs.

NOTICE

Rotary switch S2 on 0 if configuring with the webConfig tool!

↳ *To configure the BE 901 SSI with the webConfig tool, rotary switch S2 on connection hood BE 901 MS SSI and BE 901 MK SSI must be set to switch position 0.*

8.7 Setting configuration parameters to factory settings

Proceed as follows:

- Set slide switch S1 to switch position Gray encoding.
- Set rotary switch S2 to switch position F.
- Restart the BE 901 SSI.

The current parameter set of the BE 901 SSI is overwritten with the parameter set containing the factory settings.

8.8 Key factory settings of the

Table 8.2: Factory settings on delivery of the BE 901 SSI

Parameter	Factory settings	Description
Measurement value encoding	Gray	Data encoding of the measurement values
Tape selection	BCB with 40 mm grid	Changeover between BCB with 30 mm grid and BCB with 40 mm grid
Position measurement	Integration depth: 8	Number of successive measurements that the BE 901 SSI uses for position determination.
	Resolution: 1 mm	Resolution of the position value in mm
Master clock frequency	80 kHz - 800 kHz	Request frequency of the control (master)
Update rate	2 ms	Update rate of the measurement values on the SSI interface
SSI interface		
Transmission mode	24 measurement bits + 1 error bit	
Position resolution	1 mm	Resolution of the position value in mm
Error bit	Measurement error LSB 1 = active	Value of the error bit: • The error bit is not included in the Gray encoding of the measurement value. • The error bit is 1 = active
Sw. inputs/outputs		
IO1	HIGH Function: Position value invalid	Switching output - level controlled If a valid position value cannot be ascertained, the output is set
IO2	HIGH Function: Preset teach	Switching input - edge-triggered Transition 0 → 1: Read in preset value

9 Commissioning – webConfig tool

The webConfig tool provides a graphical user interface based on web technology for the configuration of the BE 901 SSI.
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.

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

9.1 Installing software

In order for the BE 901 SSI to be automatically detected by the connected PC, the USB driver must be installed once on your PC. Administrator rights are required for driver installation.

If a USB driver for the webConfig tool is already installed on your computer, the USB driver does not need to be installed again.

9.1.1 System requirements

Regularly update the operating system and the Internet browser.
Install the current Windows Service Packs.

Table 9.1: webConfig system requirements

Operating system	Windows 10 Windows 8, 8.1 Windows 7
Computer	PC, Laptop or Tablet with USB interface version 1.1 or higher
Graphics card	Min. 1280 x 800 pixels
Required disk space for USB driver	10 MB
Internet browser	A current version of: - Mozilla Firefox - Google Chrome - Microsoft Edge Other Internet browsers are possible, but not tested with the current device firmware.

9.1.2 Install USB driver

- Start your PC with administrator privileges and log on.
- Download the setup program from the Internet:
  www.tr-electronic.com/f/zip/TR-E-SW-MUL-0001
- Start the setup program and follow the instructions.

*Alternatively you can install the USB driver **LEO_RNDIS.inf** manually.*
Contact your network administrator if the installation failed.

9.2 Start webConfig tool

Prerequisite: The USB driver for the webConfig tool is installed on the PC.

- Connect the operating voltage to the BE 901 SSI.
- Connect the SERVICE USB interface of the BE 901 SSI to the PC.

  The connection to the SERVICE USB interface of the BE 901 SSI is established via the PC-side USB interface.

  Use a standard USB cable with one Type A plug and one Mini-B type plug.
- Start the webConfig tool using your PC's Internet browser with IP address

  192.168.61.100
- ➢ The webConfig start page appears on your PC.

The webConfig tool is completely contained in the firmware of the BE 901 SSI.
The pages and functions of the webConfig tool may appear and be displayed differently depending on the firmware version.

Clearing browser history:

The cache of the Internet browser is to be cleared if different device types or devices with different firmware were connected to the webConfig tool.

- Delete cookies and temporary Internet and website data from the browser cache before starting the webConfig tool.

Note limit of Firefox sessions for version 30.0 and higher:

If the limited number of Firefox sessions is exceeded, it may no longer be possible to address the BE 901 SSI via the webConfig tool.

- Do **not** use the refresh functions of the Internet browser: [Shift] [F5] or [Shift] + mouse click

9.3 Short description of the webConfig tool

9.3.1 Overview

Operating modes

For configurations with the webConfig tool, you can switch between the following operating modes:

- ***Process***
  The BE 901 SSI is connected to the control.
  - The process communication to the control is activated.
  - The switching inputs/outputs are activated.
  - Configuration and diagnostic functions available, cannot be changed.
  - *PROCESS* function available.
  - Alignment and maintenance function not available.

- ***Service***
  The process communication to the control is interrupted.
  - The switching inputs/outputs are deactivated.
  - The configuration can be changed.
  - *PROCESS* function not available.
  - Alignment, configuration, diagnostic and maintenance functions available.

Operating mode ***Process***
The webConfig tool has the following main menus or functions in the operating mode *Process*:

- ***PROCESS***
  Check and save the current read data in process mode (see chapter 9.3.2).
  - Tabular display of the following values:
    Scan number, position, speed, reading quality, distance from BCB and info on the control label

- ***CONFIGURATION*** (see chapter 9.3.4)
  Information on the current BE901 configuration – no change to the configuration:
  - Selection of the used barcode tape (30 mm grid or 40 mm grid)
  - Display of the tape value correction (deviation of the BCB from scaling)
  - Display of the device components (switching inputs/outputs, display)
  - Data processing (position / speed detection or monitoring, data preparation)
  - Display of the warning threshold and the error threshold for the reading quality
  - Display of the interface parameters

Operating mode ***Service***
The webConfig tool has the following main menus or functions in the operating mode *Service*:

- ***ALIGNMENT*** (see chapter 9.3.3)
  - Display of the following values:
    Scan number, position, speed, quality, distance, number of labels in the scanning beam
  - Graphical displays of the following values:
    Position, speed, quality

- ***CONFIGURATION*** (see chapter 9.3.4)
  - Configuration of device components (switching inputs/outputs, display)
  - Selection of the used barcode tape
  - Configuration of the data processing (position / speed detection or monitoring, data preparation)
  - Configuration of the warning threshold and the error threshold for the reading quality
  - Configuration of the interface parameters

- ***DIAGNOSIS*** (see chapter 9.3.5)
  - Event logging of warnings and errors.

- ***MAINTENANCE*** (see chapter 9.3.6)
  - Firmware update
  - User management
  - Backup/Restore

9.3.2 *PROCESS* function

The *PROCESS* function serves to control the current measurement data in the *Process* operating mode.
The measurement results are output in tabular form – strictly as monitor output.
The **Pause/Start** icon can be used to interrupt and resume monitor recording.

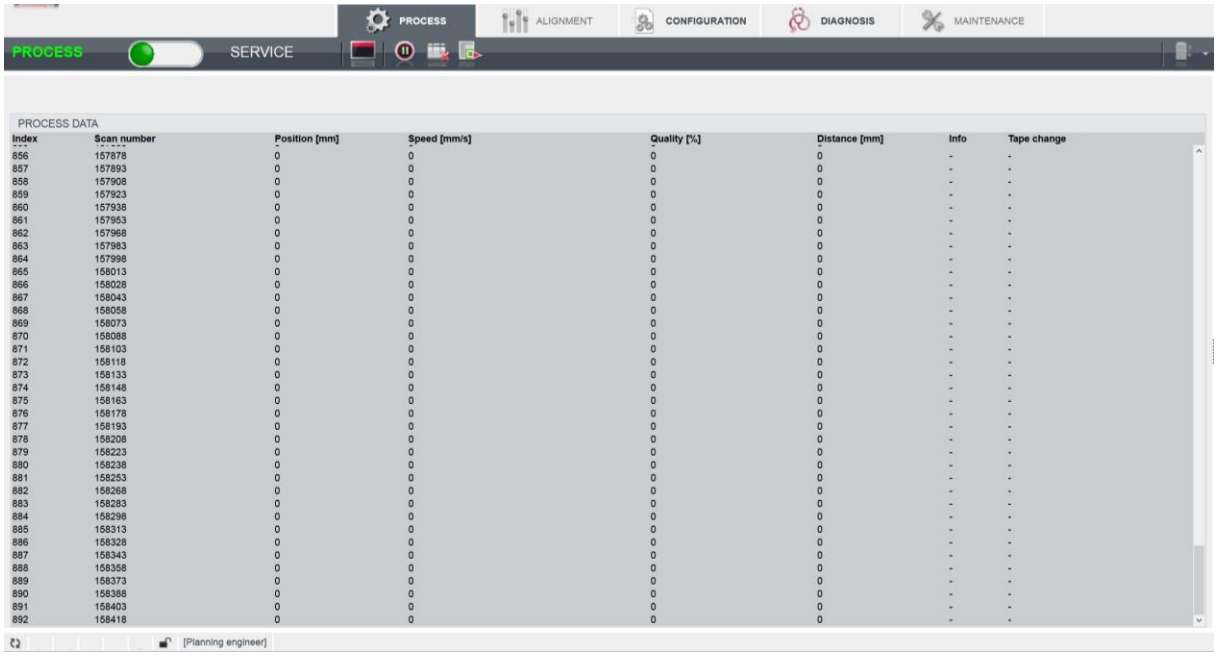


Figure 9.1: *PROCESS* webConfig function

9.3.3 *ALIGNMENT* function

NOTICE

ALIGNMENT function only in the Service operating mode!

↳ *The BE 901 SSI can only be aligned using the ALIGNMENT function in the Service operating mode.*

The *ALIGNMENT* function serves to simplify mounting and alignment of the BE 901 SSI. The laser is to be activated via the **Start** icon so that the function can monitor and directly display the measurement values for position and speed and determine the optimum installation location.

In addition, reading quality (in %), working distance and the number of labels in the scanning beam can be displayed. Using this information, it is possible to assess how well the BE 901 SSI is aligned with the BCB.

During output of the read results, the BE 901 SSI is controlled by the webConfig tool.

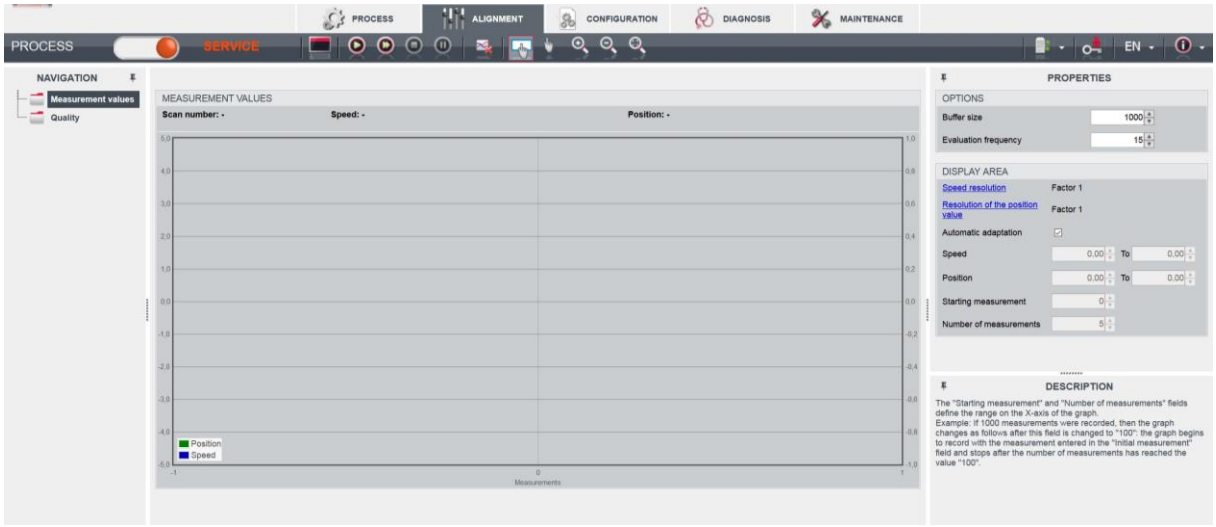


Figure 9.2: *ALIGNMENT* webConfig function

9.3.4 *CONFIGURATION* function

NOTICE

Rotary switch S2 of BE 901 MS SSI or BE 901 MK SSI to 0 if configuring with the webConfig tool!

↳ *To configure with the webConfig tool, set rotary switch S2 on connection hood BE 901 MS SSI or BE 901 MK SSI to switch position 0; see chapter 8.1.*

NOTICE

Configuration changes only in the Service operating mode!

↳ *Changes made using the CONFIGURATION function can only be performed in the Service operating mode.*

Overview of the webConfig configuration functions:

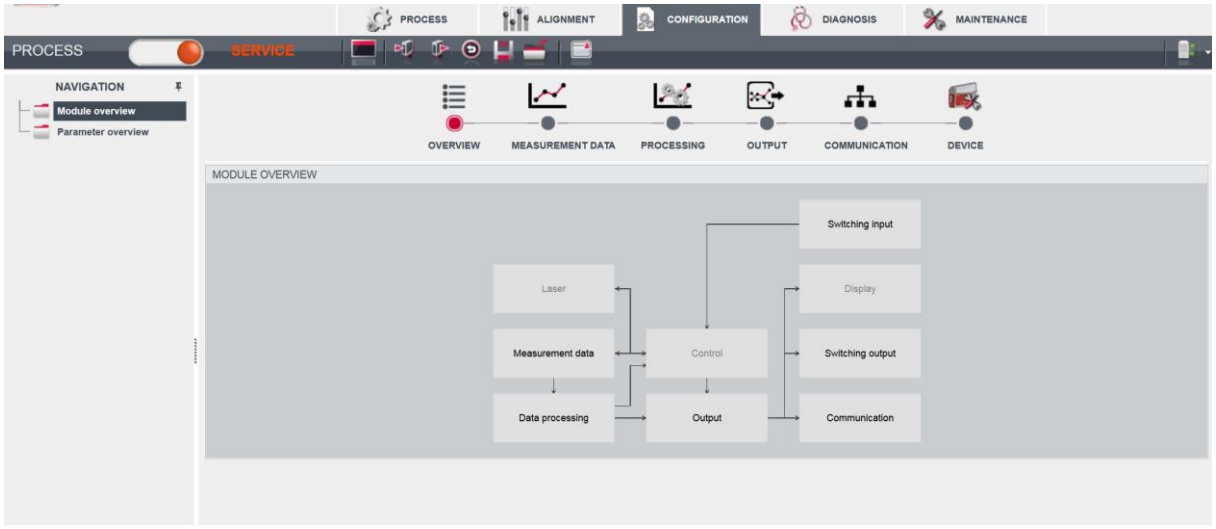


Figure 9.3: *CONFIGURATION* webConfig function

Configuration of the SSI interface

(*OUTPUT* tab)

The SSI parameters and the formatting of the SSI host interface are configured via the *OUTPUT* > *HOST formatting* function.

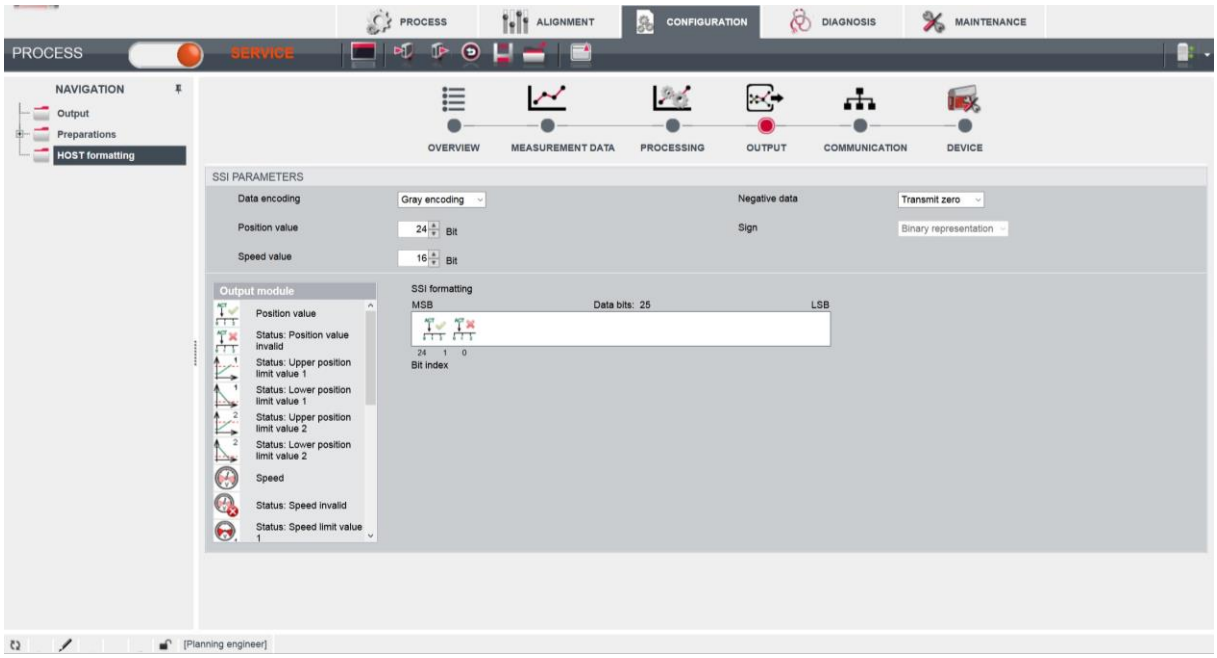


Figure 9.4: webConfig function *OUTPUT > HOST formatting*

SSI parameters:

- Data encoding
  Toggling the measurement value encoding: Gray or binary
  For devices with connection hood BE 901 MS SSI or BE 901 MK SSI, the measurement value encoding set here is overwritten on device startup with the measurement value encoding set via slide switch S1; see chapter 8.6.
- Position value
  Number of data bits - position value
- Speed value
  Number of data bits - speed value
- Sign
  If changed to sign with magnitude, the BE 901 SSI can also transmit negative position and speed values.

Formatting data output on the SSI interface

To format the data output, the symbols of the configured output modules are arranged in the desired order in the *SSI formatting* area.

- Select the required output module in the *Output modules* area.
  Click the symbol for the output module with the left mouse button and keep the mouse button pressed down.
- Drag the symbol for the output module into the white field in the *SSI formatting* area and release the mouse button (“drag and drop”).
- Use “drag and drop” to drag the symbols for all required output modules into the SSI formatting area.
- Arrange the symbols for the output modules in the *SSI formatting* area with the left mouse button in the sequence required for the data output.
- Save the SSI formatting in the device.
  Click the  . symbol.

NOTICE

Set data bits in the SSI master!

- *Set the configured number of data bits in the SSI master.*

The webConfig tool can be used to output the following data modules via the SSI interface:

- Position value
  Current position of the BE 901 SSI.
- Status: Position value invalid
  Signals that no valid position value can be ascertained.
- Status: Upper/lower position limit value 1/2
  Signals a value above/below the position limit.
- Speed
  Current speed of the BE 901 SSI
- Status: Speed invalid
  Signals that no valid speed can be ascertained.
- Status: speed limit value 1-4
  Signals that speed limit value 1-4 has been exceeded or has not been met.
- Direction of movement
  Signals the direction of movement of the BE 901 SSI.
- Tape direction
  Signals the orientation of the BE 901 SSI to the BCB (0° or 180°).
- Status IO1, IO2
  The status of the switching input/output is output.

Configuration of the switching inputs/outputs:
(*DEVICE* tab)

- I/O mode: switching input or switching output *
- Output function
- Function input
- Timing functions
  - Signal delay
  - Pulse duration
  - Switch-on/switch-off delay
  - Debounce time
  - Inversion yes/no

Configuring switching outputs

- Select the function symbol for activation of the switching output in the Functions area.
- Use the left mouse button to drag the function symbol into the Activation window.
- Configure the timing; see "Timing functions of the switching inputs/outputs".
- Save the configuration of the switching outputs in the device.

  Click the . symbol.

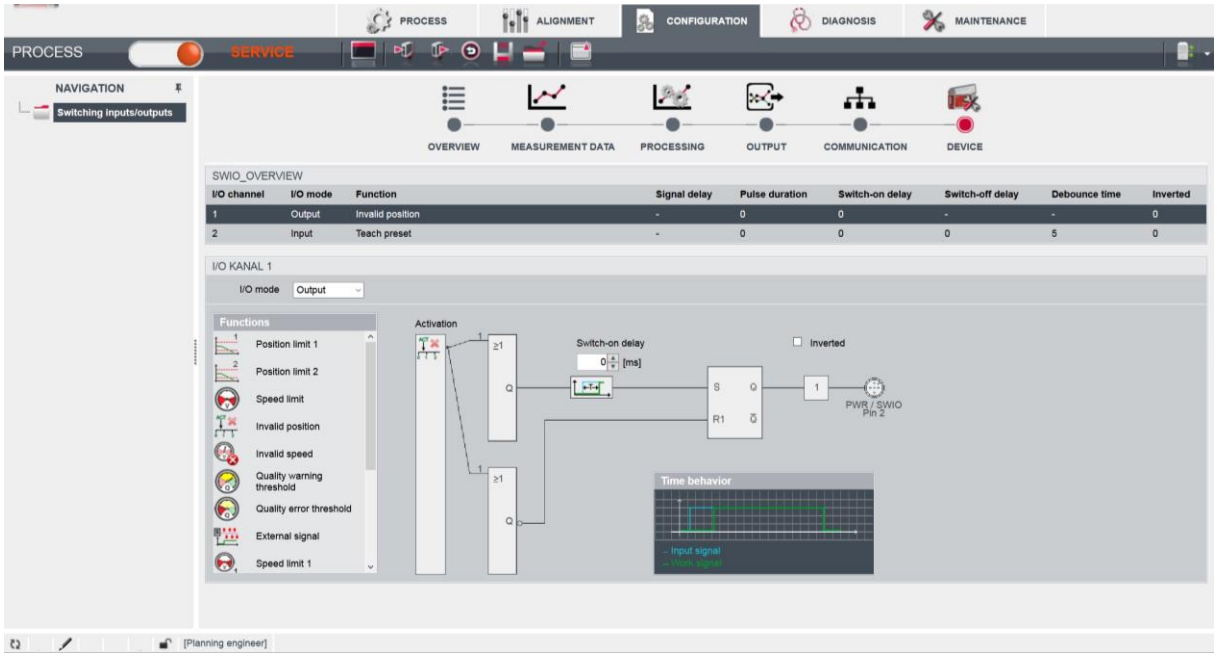


Figure 9.5: Configuration of the switching outputs

Possible signals via the switching outputs:

- Position limit 1/2
  Signals a value above/below the position limit.
- Invalid position
  Signals that no valid position can be ascertained.
- Speed limit
  Signals a value above/below the speed limit.
- Speed limit value 1-4
  Signals that speed limit value 1-4 has been exceeded or has not been met.
- Invalid speed
  Signals that no valid speed can be ascertained.
- Quality warning threshold
  Signals that the reading quality is less than the warning threshold.
- Quality error threshold
  Signals that the reading quality is less than the error threshold.
- Device error
  Signals a device error.

Configuring switching inputs

↳ Select the function of the switching input from the Function list:

- No function
- Start/stop measurement
- Teach preset
- Reset preset

↳ Configure the timing; see "Timing functions of the switching inputs/outputs".

↳ Save the configuration of the switching inputs in the device.

Click the . symbol.

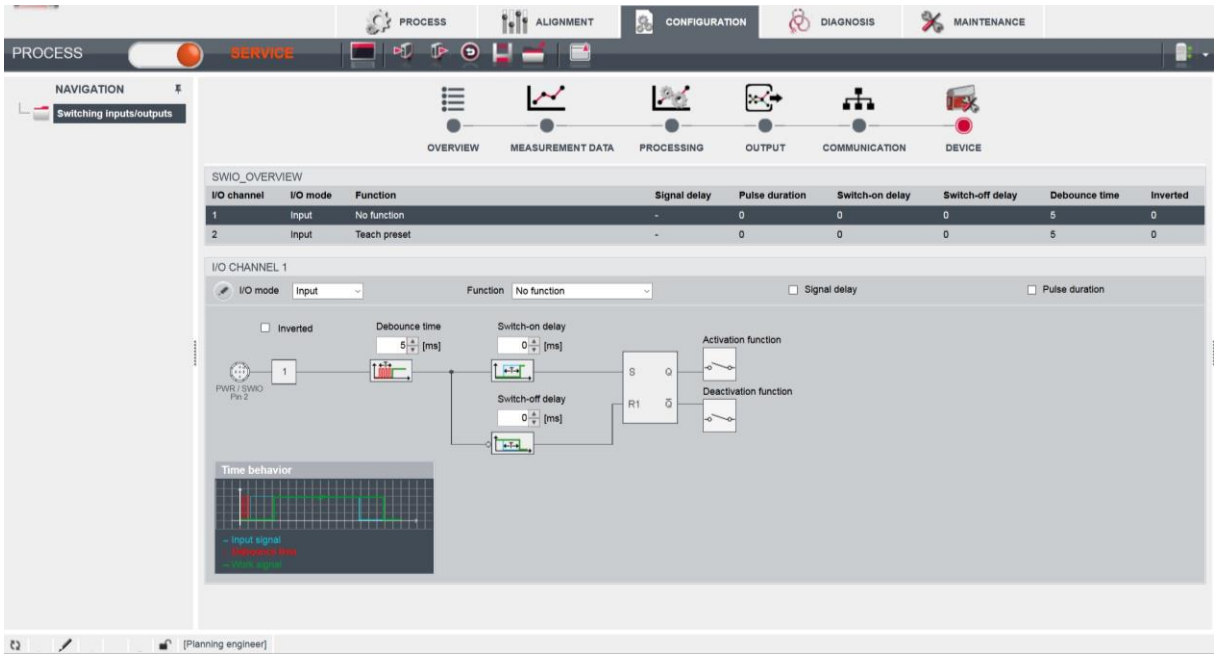


Figure 9.6: Configuration of the switching inputs

Timing functions of the switching inputs/outputs:

The timing functions (e.g., startup delay) can **only** be configured with the webConfig tool.

- Startup delay
  With this setting, the output pulse is delayed by the specified time (in ms).
- Switch-on time
  Defines the switch-on time period for the switching input. Any activated switch-off function then no longer has any function.
  If the output is deactivated via the switch-off signal before the startup delay lapses, only a brief pulse appears at the output following the startup delay.
- Debounce time
  Parameter for setting the software debounce time for the switching input. The definition of a debounce time extends the signal transition time accordingly.
  If this parameter has the value 0, no debouncing takes place. Otherwise, the set value corresponds to the time (in ms) that the input signal must be present and stable.
- Switch-off delay
  This parameter specifies the duration of the switch-off delay (in ms).

Configuration of the resolution for position and speed measurement on the SSI interface
(OUTPUT tab, Preparation > SSI)

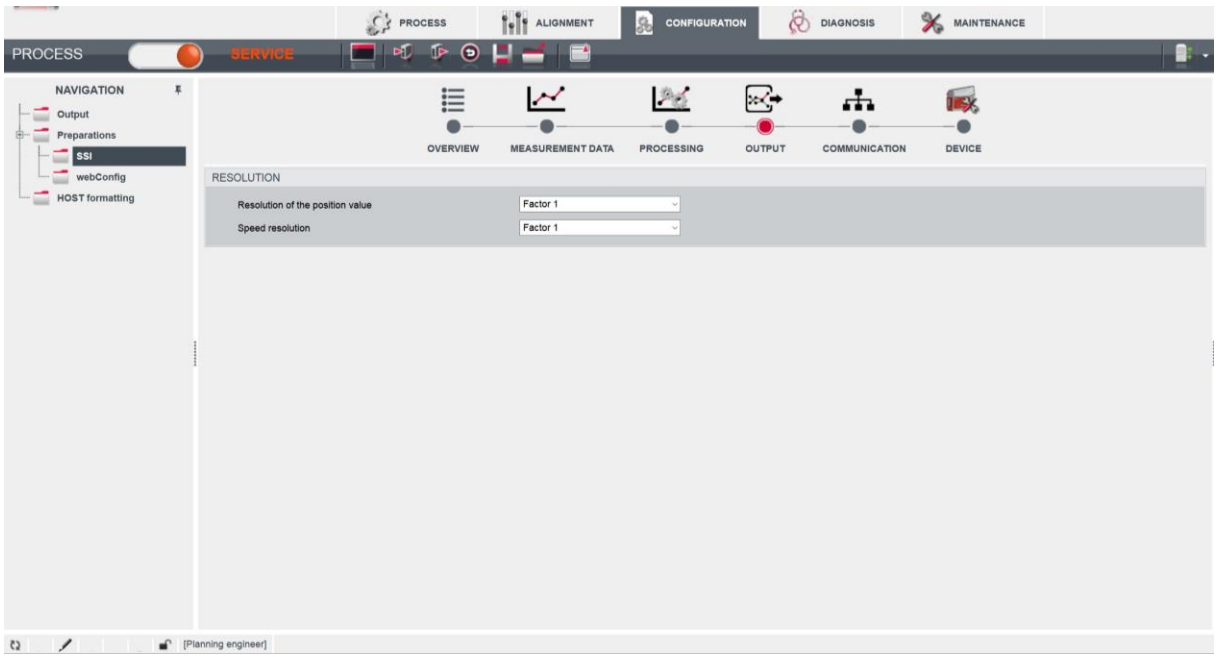


Figure 9.7: webConfig function *OUTPUT > Preparation > SSI*

- Position resolution
  Resolution for the position value
- Speed resolution
  Resolution for the speed value

Configuration of the barcode tape selection and tape value correction
(*MEASUREMENT DATA* tab, *Barcode tape*)

- Barcode tape with 30 mm grid (BCB G30) or 40 mm grid (BCB G40)
- Tape value correction
  With this parameter, the deviation of the BCB from the correct millimeter scaling that arises from the production process can be corrected.

Configuration of position detection
(*DATA PROCESSING* tab, *Position >Detection*)

- Integration depth
  Number of successive measurements that the BE 901 SSI uses for position determination.
- Scaling free resolution
  Free scaling of the output of the position values.
- Preset
  A preset position value (preset value) is activated at an appropriate position.
- Offset
  Output value = measurement value + offset
  If a preset is active, this has priority over the offset.
- Error handling procedures
  Parameters for the position value in case of failure.

Configuration of position monitoring
(*DATA PROCESSING* tab, *Position* > *Monitoring*)

- Position limit value ½
  Signals that the position value is outside of the configured limit value range.

Configuration of speed detection
(*DATA PROCESSING* tab, *Speed* > *Detection*)

- Speed measurement averaging
  Measurement value preparation averages all speed values calculated during the selected period (averaging) to yield a speed output value.
- Scaling free resolution
  Free scaling of the output of the speed values.
- Error handling procedures
  Parameters for the speed value in case of failure.

Configuration of speed monitoring
(*DATA PROCESSING* tab, *Measurement data* > *Speed* > *Monitoring*)

- Speed limit value 1-4
  Signals that the speed is outside of the configured limit value range.

Configuration of the measurement value display
(*DATA PROCESSING* tab, *General preparation*)

- Unit
  Unit of measurement: metric or inch
- Count direction
  Count direction for position calculation or sign for speed calculation.
- Output mode sign
  Output mode of the sign. Affects position value and speed output.

Configuration of monitoring of the reading quality
(*DATA PROCESSING* tab, *Reading quality*)

- Warning threshold for reading quality in %**
- Error threshold for reading quality in % **

Configuration of the communication data
(*COMMUNICATION* tab)

- Configuration of the SERVICE USB interface
- Selection of the master clock frequency according to the request frequency of the control (master):
  - 80 kHz - 800 kHz
  - 50 kHz - 79 kHz
- Update rate of the measurement values on the SSI interface. The measurement value is updated independent of the clock frequency.
  - 2 ms
  - 1 ms
  - 200 µs
  - 50 µs

9.3.5 *DIAGNOSTICS* function

The *DIAGNOSTICS* function is available in the Process and Service operating modes.
The device event log is displayed with the *DIAGNOSTICS* function.

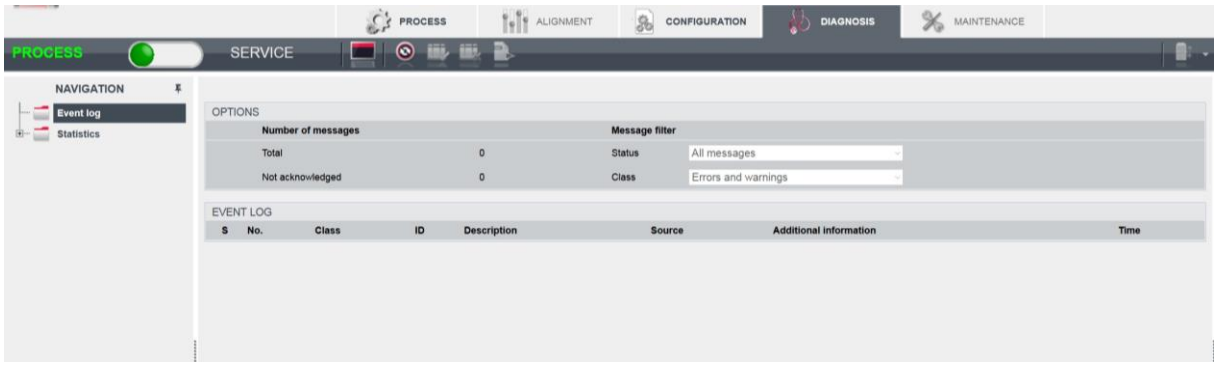


Figure 9.8: *DIAGNOSTICS* webConfig function

9.3.6 *MAINTENANCE* function

The *MAINTENANCE* function is only available in the Service operating mode.

Functionalities:

- User management
- Devices Backup/Restore
- Firmware update
- System clock
- Setting of the user interface

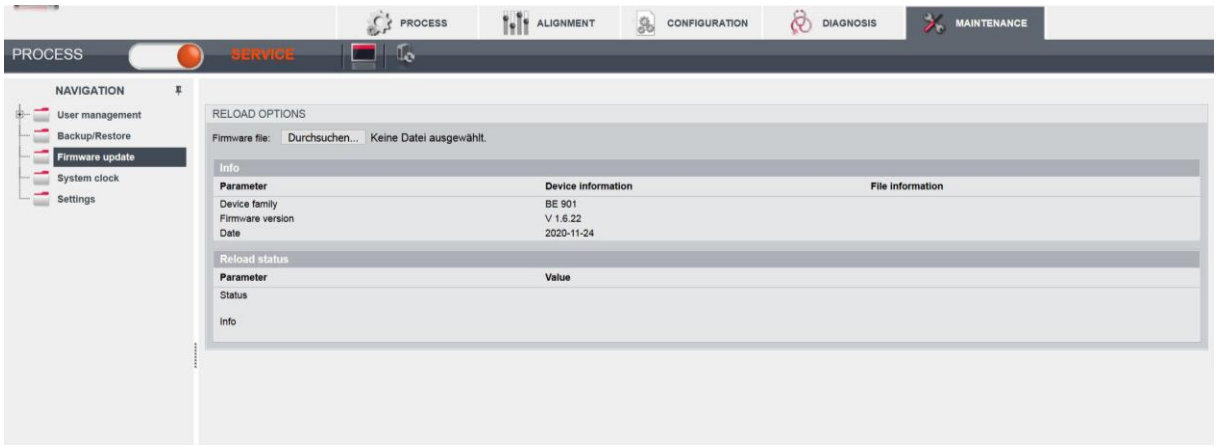


Figure 9.9: *MAINTENANCE* webConfig function

9.4 The role concept of the webConfig users

This web based graphical operator control program is structured in a way that a logical sequence of operations ensues that follows the required actions and their corresponding roles. This means that any actions that belong to a certain work step or a certain role are situated in close proximity (preferably on the same user interface screen).

9.4.1 Roles

The webConfig using concept provides the following roles for the customer:

- "Observer" Display of general information
- "Operator" Operate the sensor
- "Maintenance" Operate and maintain the sensor
- "Planning Engineer" Additional authority, e.g. manage projects

These roles serve the end consumer for facility operation. It admits another 3 additional roles which serves TR-Electronic GmbH for the user support, for the device set up and for test purposes. The permissions of the respective roles shall be considered ascending. An “Observer” has the least permissions, a “Planning Engineer” the most.

Allocating of roles as “Planning Engineer”

To keep all access rights on the measuring system, a role of "Planning engineer" must be created in before the installation of further roles. As a "Planning engineer" subordinate roles can be managed.

The following definitions show what constitutes the individual roles and where they are distinguished.

9.4.1.1 The role “Observer”

The "Observer" takes a purely passive role. The Observer can see only the general device data, which are offered on the initial page and does none need password for the logon, since it does not have any further authorities. An Observer also can be described as a “Guest”.

The "observer" plays a strictly passive role. The observer can only see the general device data on the "Process" tab and does not require a password to login, since he has no other permissions. An observer can also be referred to as a "guest".

Allowed actions:

- View general/public data:
  - Start page
  - Type plate
  - Hardware and software version numbers
  - Installation descriptions
  - Technical specification
- Login

An "observer" cannot change any device parameters and cannot switch the device to another operating state ("Process" or "Service" mode).

9.4.1.2 The role “Operator”

The "operator" is strictly an operator of the sensor who accompanies and observes production operation ("Process" mode). He is also an observer. He can read the parameters for production operation but cannot change them.

Allowed actions:

- *Allowed actions of the role "Observer"*
- Perform adjustment actions in the "Setup" tab without changing the devices’ parameter settings
- Switch the operating state ("Process" mode, "Service" mode)
- Restart the device (“Reset”)
- View selected device parameters
- View selected production parameters
- Observe the current production progress (current result, production statistics, error messages)
- Call diagnosis functions of a basically reading type:
  - Read event protocol
  - Confirm event protocol
  - Read statistical information
  - Read firmware information

9.4.1.3 The role “Maintenance”

A "maintenance" employee is an operator who can influence production operation within defined limits (set threshold values) and call up diagnostic functions.
The "maintenance" employee can perform all tasks of the "operator" role, as well as the following additional tasks:

Allowed actions:

- *Allowed actions of the role "Operator"*
- Additional switching of the operating state ("Standby" mode, "Host In"/"Host Out" switches)
- Carry out teach functions for device parameterization
- Change selected device parameters
- Change I/O parameters (Digital I/O and communication parameters)
- Reset of process related statistic data
- Clear the event protocol

9.4.1.4 The role “Planning Engineer”

A “planning engineer” (or “specialist”/supervisor”) manages the conduct of production beyond the role of maintenance by creating profiles/projects, managing check programs and changing their sequence. He can change I/O parameters, update the firmware and manage users (roles).

Allowed actions:

- *Allowed actions of the role "Maintenance"*
- Reset the device to factory settings
- Create/delete check programs (control flow oriented sensor)
- Edit the program sequence (create, delete or change tools, control flow oriented sensor)
- Manage user date (create, delete or change users)
- Define startup role (observer, operator, maintenance or planning engineer)
- Reset selected statistical data (customer)
- Update firmware (customer)

10 Diagnostics and troubleshooting

10.1 What to do in case of failure?

After switching on the BE 901 SSI, display elements (see chapter 3.3) assist in checking the proper function and troubleshooting.
In case of error, you can determine the error from the LED displays. With the error message you can determine the cause of the error and initiate measures to rectify it.

- Switch off the system and leave it switched off.
- Analyze the cause of the error using the operation indicators, the error messages and the diagnostic tools (also with the help of the webConfig tool, *DIAGNOSTICS* tab) and rectify the error.

NOTICE

Contact TR-Electronic GmbH.

- *If you are unable to rectify a fault, contact the TR-Electronic GmbH.*

10.1.1 Diagnostics with webConfig tool

System events are displayed in the webConfig tool via the *DIAGNOSTICS* tab. Noteworthy system events are recorded in the event log. Depending on their importance, the events are classified as info, warning, error and critical error.

The statistics counters detect the number of all recorded as well as non-acknowledged messages. With the message filters, the events can be filtered according to their status and their class.

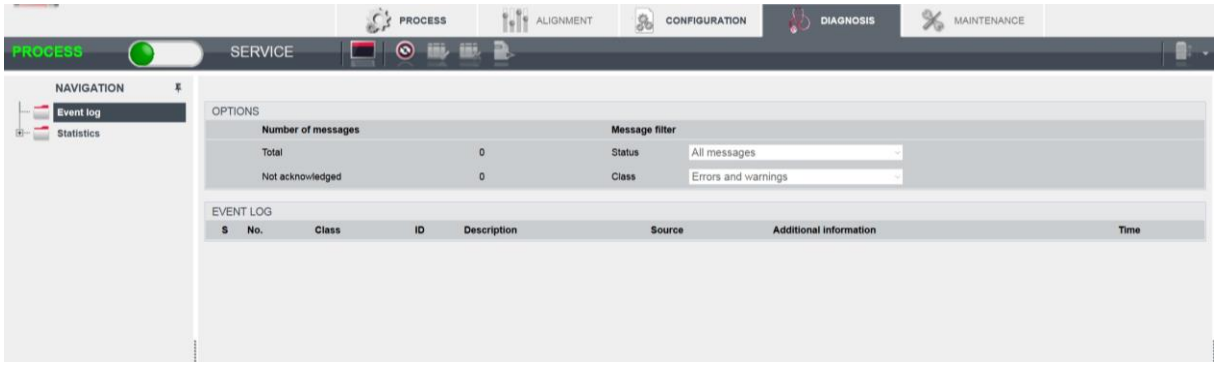


Figure 10.1: *DIAGNOSTICS* webConfig function

10.2 Operating indicators of the LEDs

You can ascertain general causes of errors via the PWR and BUS status LEDs (see Table 10.4).

Table 10.1: PWR LED displays – causes and measures

Errors	Possible cause	Measures
Off	- No supply voltage connected to the device - Hardware error	- Check supply voltage - Contact TR-Electronic GmbH
Green, flashing	- Device is being initialised	
Red, flashing	- No barcode in the scanning beam - No valid measurement value	- Query BCB diagnostic data and carry out the resulting (see chapter 10.4 “Checklist for causes of errors”, Table 10.5: Position measurement errors – causes and measures)
Orange, continuous light	- Device in *Service* mode	- Reset the device to *Process* mode using the webConfig tool

10.3 Error messages on the display

Via the optional display of the BE 901 SSI, the device outputs the following possible error status information while it has the “*BE901 Info”* device status:

- *System OK*: BE 901 SSI operating error-free.
- *Warning*: Warning message. Query the device status in the webConfig tool.
- *Error*: Device function is not ensured.

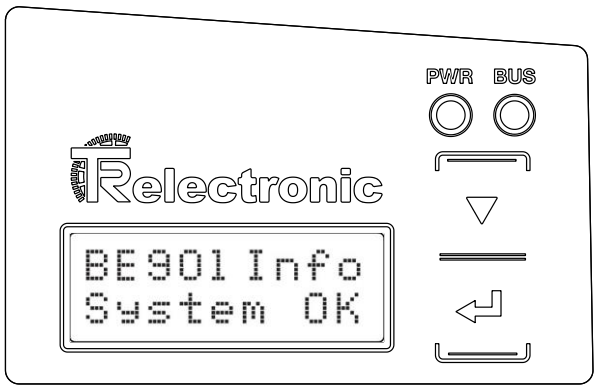


Figure 10.2: Example: Device status/error status information on the display

10.4 Checklist for causes of errors

Table 10.2: Service interface errors – causes and measures

Errors	Possible cause	Measures
webConfig does not start	- Incorrectly connected interconnection cable - Connected BE 901 SSI is not recognized - No communication via USB service interface - Old webConfig configuration in the browser cache	- Check interconnection cable - Install USB driver - Clear browser history

Table 10.3: Process interface errors – causes and measures

Errors	Possible cause	Measures
Sporadic network errors	- Check wiring for proper contacting	Check wiring: - Check wire shielding - Check wires used
	- EMC coupling	- Observe contact quality of screwed or soldered contacts in the wiring - Avoid EMC coupling caused by power cables laid parallel to device lines - Separate laying of power and data communications cables
	- Maximum cable length exceeded	- Check cable lengths according to the data rate

Table 10.4: LED indicators - interface errors – causes and measures

Errors	Possible cause	Measures
BUS LED “Off”	- No supply voltage connected to the device	- Check supply voltage
	- Hardware error	- Contact TR-Electronic GmbH
BUS LED “red flashing”	- Incorrect wiring	- Check wiring
	- Communication error	- Check SSI parameters - Carry out a reset on the control
	- Different protocol settings	- Check protocol settings

Table 10.5: Position measurement errors – causes and measures

Errors	Possible cause	Measures
Measurement value or reading quality is continuously instable	- Soiling of the BE 901 SSI optics	- Clean the optics of the BE 901 SSI
Measurement value or reading quality is poor - at certain position values - always at the same position values	- Soiling of the barcode tape	- Clean the barcode tape - Replace the barcode tape
No measurement value can be determined	- No code in scanning beam - Code not in the working range of the BE 901 SSI	- Align the scanning beam with the barcode tape - Align the BE 901 SSI with the barcode tape (working range 50 mm … 170 mm)
Faulty measurement value	- Wrong barcode tape - BCB grid different from BE901 configuration - Preset or offset active - Wrong unit of measurement or resolution configured	- Change BE901 configuration to the barcode tape that is being used

11 Care, maintenance and disposal

11.1 Cleaning

If there is dust on the BE 901 SSI device:

- Clean the BE 901 SSI 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 BE 901 SSI device.*

11.2 Servicing

The BE 901 SSI does not normally require any maintenance by the operator. Repairs to the device must only be carried out by the manufacturer.

- For repairs, contact TR-Electronic GmbH.

11.2.1 Firmware update

A firmware update can only be performed by TR-Electronic GmbH.

- For firmware updates, contact TR-Electronic GmbH.

11.2.2 BCB repair with repair kit

If the barcode tape has been damaged, e.g. by falling parts, you can download a repair kit for the BCB.

NOTICE

Do not use the BCB repair kit on a permanent basis!

- *Use the barcode tape created with the repair kit only temporarily as an emergency solution.*

  The optical and mechanical properties of the self-printed barcode tape do not correspond to those of the original barcode tape.

  Self-printed barcode tape should not remain in the system on a permanent basis.
- *Original repair tapes can be ordered on request from TR-Electronic GmbH.*

Repair kit download:

BCB G30: **www.tr-electronic.com/f/zip/TR-E-TI-MUL-0109**
0.9 m of barcode tape is provided on each A4 sheet.
Five lines of 18 cm with six code-information segments of 30 mm each
Tape lengths: 0 ... 9999.99 m in different files per 500 m

BCB G40: **www.tr-electronic.com/f/zip/TR-E-TI-MUL-0110**
1 m of barcode tape is provided on each A4 sheet.
Five lines of 20 cm with five code-information sections of 40 mm each
Tape lengths: 0 ... 9999.99 m in different files per 500 m

Replacing a section of defective barcode tape:

- Determine the coding of the defective area.
- Print out the coding for the given area.
- Affix the printed code over the defective section of barcode tape.

NOTICE

Printing coding

- *Select only those pages that are actually required.*
- *Change the printer settings so that the barcode is not distorted.*
- *Check the print results and measure the distance between two barcodes:*
  - *BCB G40: 40 mm (see Figure 11.1)*
  - *BCB G30: 30 mm (see Figure 11.2)*
- *Cut the code strips and arrange them next to one another. The code content must always increase or decrease in increments of 30 mm or 40 mm.*

  Check that the printed values increase by 3 or 4.

Figure 11.1: Checking the print results of the BCB G40 repair kit (40 mm grid)

Figure 11.2: Checking the print results of the BCB G30 repair kit (30 mm grid)

11.3 Disposing

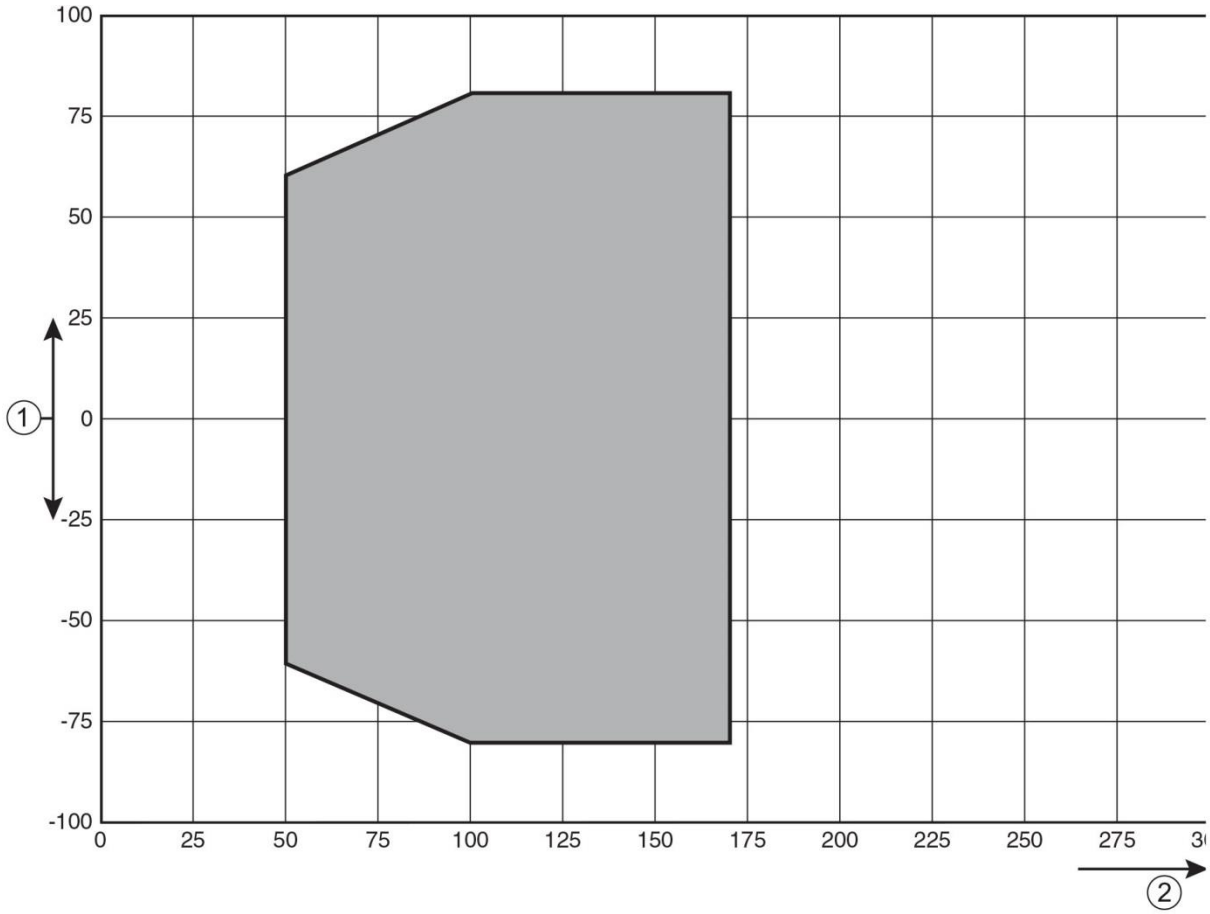
- For disposal observe the applicable national regulations regarding electronic components.

12 Technical data

12.1 General specifications

Table 12.1: Optics

Light source	Laser diode
Wavelength	655 nm
Pulse duration	< 150 µs
Max. output power	1.8 mW
Life expectancy laser diode	100,000 h (typ. at +25 °C)
Beam deflection	Via rotating polygon wheel
Exit window	Glass
Laser class	1 according to IEC/EN 60825-1:2014
Working range	50 mm … 170 mm At a reading distance of 50 mm, the reading field width is 120 mm. At a reading distance beyond 100 mm, the reading field width is 160 mm (see Figure 12.1: BE 901 SSI reading field curve).



1: Reading field width [mm]
2: Reading distance [mm]

Figure 12.1: BE 901 SSI reading field curve

Table 12.2: Measurement data

Reproducibility (1 sigma)	± 0.05 mm
Output time	0.05 ms … 2 ms (configurable), default: 2 ms
Response time	8 ms factory setting (adjustable)
Basis for contouring error calculation	4 ms
Measurement range	0 … 10,000,000 mm
Resolution	0.1 mm factory setting (adjustable)
Max. traverse rate	10 m/s

Table 12.3: Operating and display elements

Display	Monochromatic graphical display, 128 x 32 pixels, With background lighting
Keyboard	Two buttons
LEDs	Two LEDs for power (PWR) and bus state (BUS), two-colored (red/green)

Table 12.4: Mechanical data

Housing	Diecast aluminum
Connection technology	- BE 901 SSI with BE 901 MS SSI: M12 connectors - BE 901 SSI with BE 901 MK SSI: Terminal blocks with spring cage terminals (5-pin)
Degree of protection	IP 65
Weight	Approx. 580 g (without connection hood)
Dimensions (without connection hood)	(H x W x D) 108.7 mm x 100.0 mm x 48.3 mm
Dimensions (with BE 901 MS SSI connection hood)	(H x W x D) 108.7 mm x 100.0 mm x 48.3 mm
Dimensions (with BE 901 MK SSI connection hood)	(H x W x D) 147.4 mm x 100.0 mm x 48.3 mm
Dimensions of BE 901 MS SSI connection hood	(H x W x D) 64.0 mm x 43.5 mm x 33.5 mm
Dimensions of BE 901 MK SSI connection hood	(H x W x D) 64.0 mm x 43.5 mm x 83.5 mm

Table 12.5: Environmental data

Air humidity	Max. 90% rel. humidity, non-condensing
Vibration	IEC 60068-2-6, test Fc
Shock / Continuous shock	IEC 60068-2-27, test Ea
Electromagnetic compatibility	IEC 61000-6-3 IEC 61000-6-2 (contains IEC 61000-4-2, -3, -4, -5, -6)

Table 12.6: Product Reliability

MTTF	83 years *
$MTTF_d$	166 years *

* at 25 °C ambient temperature

Table 12.7: Certifications, conformity

Conformity	CE, CDRH
Certifications	UL 60950-1, CSA C 22.2 No. 60950-1

⚠ CAUTION

UL applications!

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

12.1.1 BE 901 SSI without heating

⚠ CAUTION

UL applications!

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

Table 12.8: Electrical equipment

Interface type	SSI SSI clock rate (CLOCK): 50 kHz … 800 kHz
Service USB interface	Mini-B type USB 2.0 socket
Switching input / Switching output	2 switching inputs/ outputs Switching input: 18 … 30 VDC, depending on supply voltage, I max. = 8 mA Switching output: 18 … 30 VDC, depending on supply voltage, I max. = 60 mA (short-circuit proof) Switching inputs/outputs protected against polarity reversal!
PWR LED green	Device ready (Power On)
Operating voltage U_B	18 … 30 VDC (Class 2, safety class III)
Power consumption	max. 3.7 W

Table 12.9: Ambient temperature

Ambient temperature (operation)	-5 °C … +50 °C
Ambient temperature (storage)	-35 °C … +70 °C

12.1.2 BE 901 SSI with heating

⚠ CAUTION

UL applications!

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

Table 12.10: Electrical equipment

Operating voltage UB	18 … 30 VDC
Power consumption	max. 17.7 W
Structure of the heating	Housing heating and separate heating of the optics glass
Warmup time	Minimum 30 min at +24 VDC and an ambient temperature of -35 °C
Minimum conductor cross section	Conductor cross section of at least 0.75 mm² for the supply voltage supply line. **Notice:** Wiring through of the voltage supply to multiple heating devices is not permissible. Standard, M12 ready-made cable not usable (insufficient conductor cross section).

Table 12.11: Ambient temperature

Ambient temperature (operation)	-35 °C … +50 °C
Ambient temperature (storage)	-35 °C … +70 °C

12.2 Barcode tape

Table 12.12: BCB dimensions

	BCB G40	**BCB G30**
Grid	40 mm	30 mm
Standard height	47 mm, 25 mm	47 mm, 25 mm
Length	0 … 5 m, 0 … 10 m, 0 … 20 m, …,0 … 150 m, 0 … 200 m; Special lengths and special coding (see chapter 13.5)	0 … 5 m, 0 … 10 m, 0 … 20 m, …,0 … 150 m; Special lengths and special coding (see chapter 13.5)
Tape tolerance	± 1 mm per meter	± 1 mm per meter

NOTICE

Twin tapes on request

↳ *Twin tapes can be ordered on request (see chapter 13.5 “Barcode tapes”).*

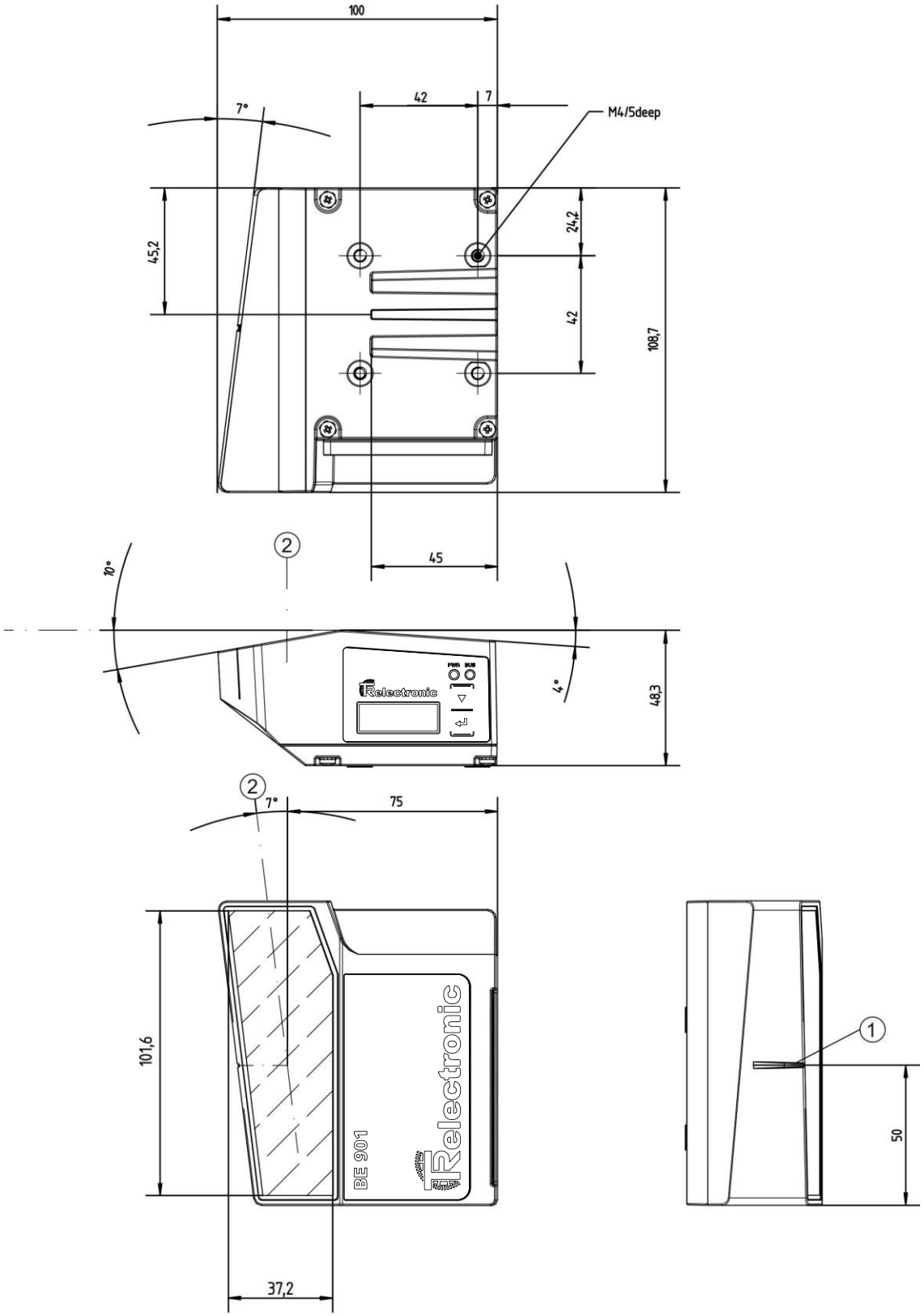
Table 12.13: BCB structure

Manufacturing process	Filmsetting
Surface protection	Polyester, matt
Base material	Polyester film, affixed without silicone
Adhesive	Acrylate adhesive
Adhesive thickness	0.1 mm
Adhesive strength (average values)	On aluminum: 25 N/25 mm On steel: 25 N/25 mm On polycarbonate: 22 N/25 mm On polypropylene: 20 N/25 mm

Table 12.14: BCB structure

Recommended processing temperature	0 °C … +45 °C
Ambient temperature	-40 °C … +120 °C
Dimensional stability	No shrinkage, tested according to DIN 30646
Curing	Final curing after 72 h; the BE 901 SSI can detect the position immediately after the BCB is affixed.
Tear resistance	150 N
Elongation at tear	Min. 80%, tested in accordance with DIN 50014, DIN 51220
Weathering resistance	UV-light, humidity, salt spray (150 h/5 %)
Chemical resistance (checked at 23 °C over 24 h)	Transformer oil, diesel oil, white spirit, heptane, ethylene glycol (1:1)
Behavior in fire	Self-extinguishing after 15 s, does not drip
Surface	Grease-free, dry, clean, smooth
Mechanical properties	Scratch and wipe resistant, UV resistant, moisture resistant, partly chemical resistant

12.3 Dimension drawings



1: Reference point for the barcode position
2: Optical axis

Figure 12.2: Dimension drawing BE 901 SSI without connection hood (all dimensions in mm)

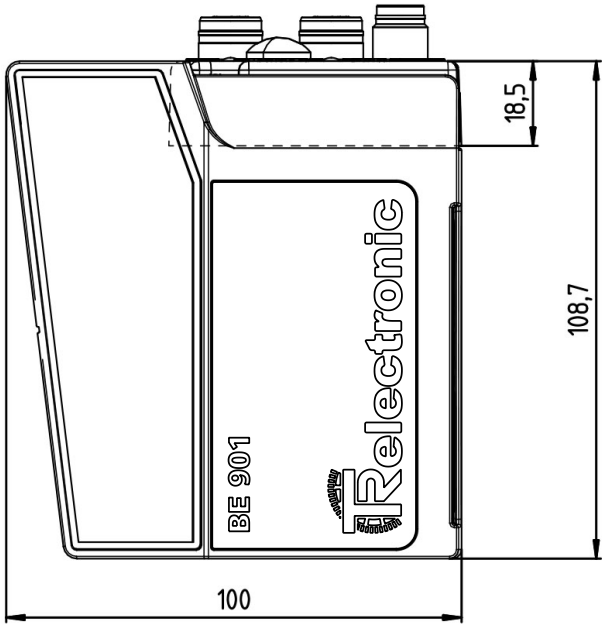


Figure 12.3: Dimension drawing BE 901 SSI with BE 901 MS SSI connection hood (all dimensions in mm)

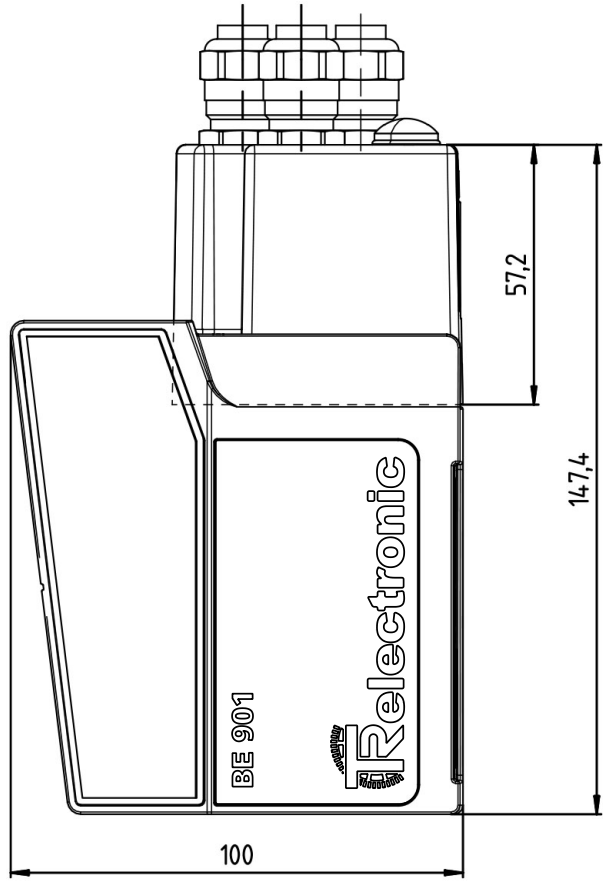


Figure 12.4: Dimension drawing BE 901 SSI with BE 901 MK SSI connection hood (all dimensions in mm)

12.4 : Accessories dimension drawings

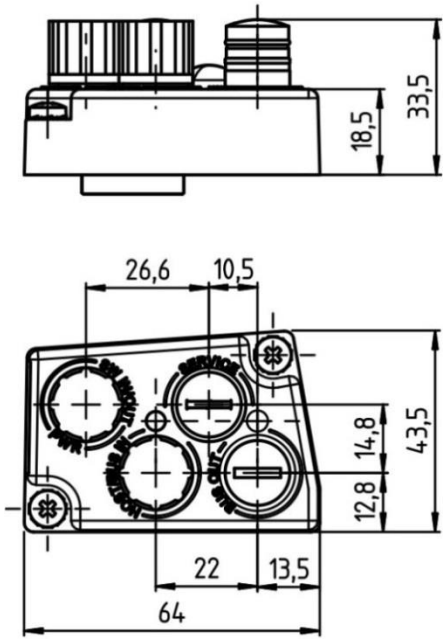


Figure 12.5: Dimension drawing BE 901 MS SSI connection hood (all dimensions in mm)

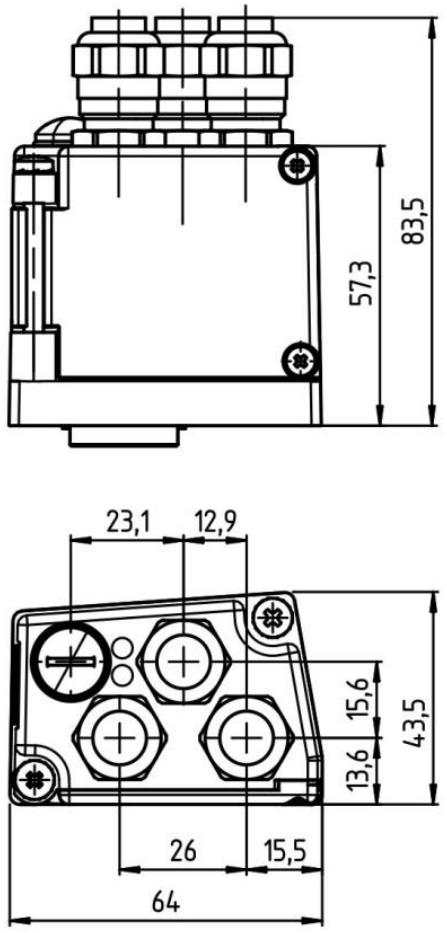


Figure 12.6: Dimension drawing BE 901 MK SSI connection hood (all dimensions in mm)

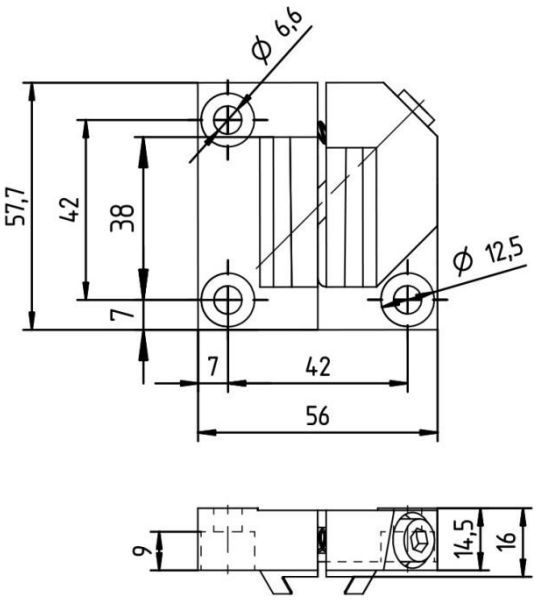


Figure 12.7: Dimension drawing BE 901 FA-001 mounting device (all dimensions in mm)

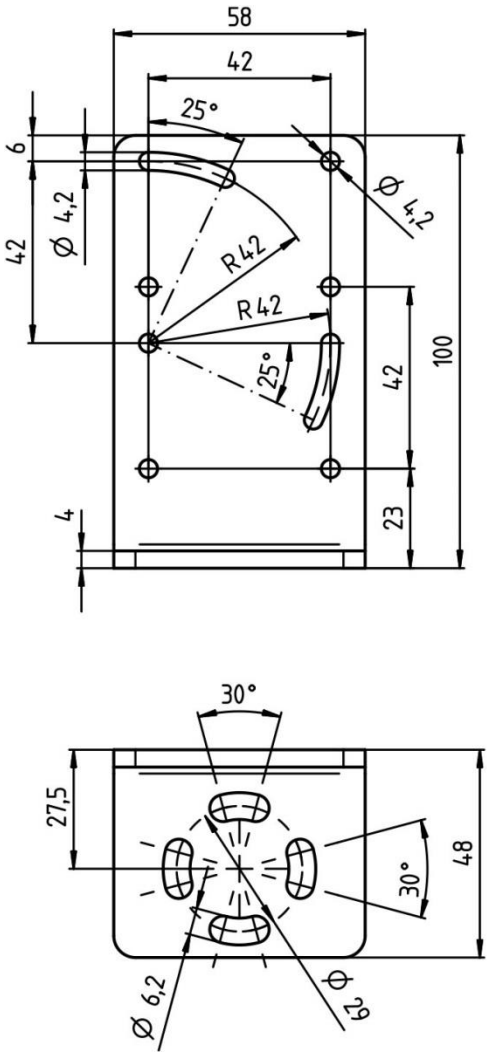
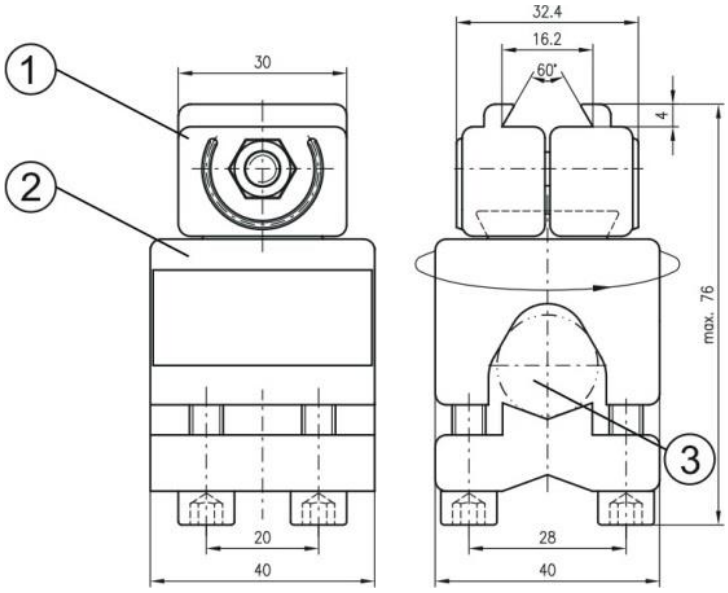


Figure 12.8: Dimension drawing BE 901 FA-002 mounting device (all dimensions in mm)



1: Clamping jaws for mounting on the BE 901 SSI
2: Clamp profile for fastening to round or oval pipes (Ø 16 … 20 mm)
3: Rod holder, turnable 360 °

Figure 12.9: Dimension drawing BE 90 FA-001 mounting device (all dimensions in mm)

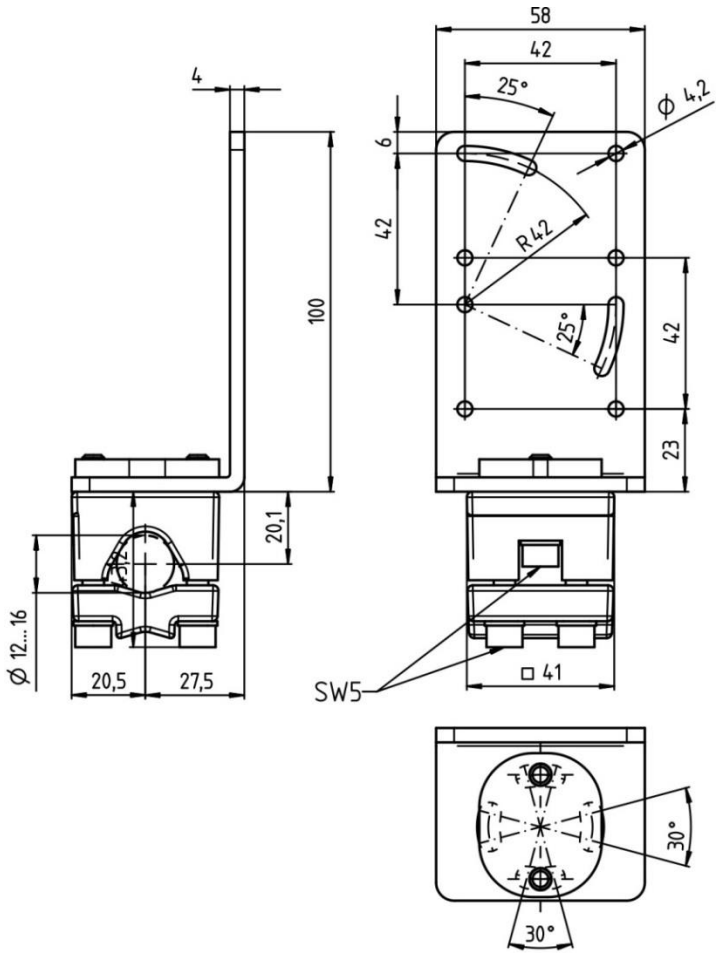


Figure 12.10: Dimension drawing BE 901 FA-003 mounting device (all dimensions in mm)

12.5 Barcode tape dimension drawings

Figure 12.11: Dimension drawing barcode tape BCB G40 with 40 mm grid (all dimensions in mm)

Figure 12.12: Dimension drawing barcode tape BCB G30 with 30 mm grid (all dimensions in mm)

13 Ordering information and accessories

13.1 BE 901 SSI type overview

Table 13.1: BE 901 SSI type overview

Art.-No.	Part designation	Description
40804-11000	BE 901 SSI	BE 901 SSI with SSI interface
40804-11002	BE 901 SSI D	BE 901 SSI with SSI interface and display
40804-11001	BE 901 SSI D H	BE 901 SSI with SSI interface, display and heating

13.2 Connection hoods

Table 13.2: BE 901 SSI connection hoods

Art.-No.	Part designation	Description
40804-21001	BE 901 MS SSI	Connection hood with M12 connectors
40804-21002	BE 901 MK SSI	Connection hood with spring-cage terminals

13.3 Other accessories

Table 13.3: Accessories – BE 901 SSI connectors

Art.-No.	Part designation	Description
40803-40004	BE90-CO-FE-5P	M12 axial socket, 5 pin B-coded, PG9, shielded, for SSI
40803-40006	BE90-CO-PI-5P	M12 axial socket, 5 pin A-coded, PG9, for supply voltage

Table 13.4: Accessory – USB cable

Art.-No.	Part designation	Description
64070120	USB-A to USB-miniB cable	USB service cable, 1 Type A and Mini-B type connector, length 3 m

13.4 Mounting device

Table 13.5: Accessories – Mounting device

Art.-No.	Part designation	Description
40803-50001	BE 90 FA-001	Mounting device for rod
40804-50001	BE 901 FA-001 (BE901 Befestigung)	Mounting device for wall mounting - precise alignment of the BE 901 SSI without adjustment
40804-50002	BE 901 FA-002 (BE901 Befestigungswinkel)	Mounting bracket for wall mounting
40804-50003	BE 901 FA-003 (BE901 Befestigung kompl.)	Mounting bracket for rod

13.5 Barcode tapes

Table 13.6: Accessories – BCB G40-Barcode tapes with 40 mm grid

Art.-No.	Part designation	Description
40803-60000	BCB-005	Barcode tape 5 m length, 47 mm height
40803-60001	BCB-010	Barcode tape 10 m length, 47 mm height
40803-60002	BCB-020	Barcode tape 20 m length, 47 mm height
40803-60003	BCB-030	Barcode tape 30 m length, 47 mm height
40803-60004	BCB-040	Barcode tape 40 m length, 47 mm height
40803-60005	BCB-050	Barcode tape 50 m length, 47 mm height
40803-60006	BCB-060	Barcode tape 60 m length, 47 mm height
40803-60007	BCB-070	Barcode tape 70 m length, 47 mm height
40803-60008	BCB-080	Barcode tape 80 m length, 47 mm height
40803-60009	BCB-090	Barcode tape 90 m length, 47 mm height
40803-60010	BCB-100	Barcode tape 100 m length, 47 mm height
40803-60011	BCB-110	Barcode tape 110 m length, 47 mm height
40803-60012	BCB-120	Barcode tape 120 m length, 47 mm height
40803-60013	BCB-130	Barcode tape 130 m length, 47 mm height
40803-60015	BCB-150	Barcode tape 150 m length, 47 mm height
40803-60018	BCB-180	Barcode tape 180 m length, 47 mm height
40803-60020	BCB-200	Barcode tape 200 m length, 47 mm height
40803-60023	BCB-230	Barcode tape 230 m length, 47 mm height
40803-60025	BCB-250	Barcode tape 250 m length, 47 mm height
40803-60026	BCB-260	Barcode tape 260 m length, 47 mm height
40803-60027	BCB-270	Barcode tape 270 m length, 47 mm height
40803-60028	BCB-280	Barcode tape 280 m length, 47 mm height
40803-69001	MVS label 40 mm 10 pieces	MVS label, 40 mm grid; packaging unit: 10 pieces
40803-69002	MVO label 40 mm 10 pieces	MV0 label, 40 mm grid; packaging unit: 10 pieces
on request	BCB G40 special length 47 mm height	Barcode tape with special length, 47 mm high
on request	BCB G40 special length 25 mm height	Barcode tape with special length, 25 mm high
on request	BCB G40 special length / height	Barcode tape with special length and height
on request	BCB G40 special length / height / winding	Barcode tape with special length, height and wrapping direction

Table 13.7: Accessories – BCB8-Barcode tapes with 30 mm grid

Art.-No.	Part designation	Description
40803-80001	BCB G30-010	Barcode tape, 10 m length, 47 mm high
40803-80005	BCB G30-050	Barcode tape, 50 m length, 47 mm high
on request	MVS Iabel 30 mm 10 pieces	MVS label, 30 mm grid; packaging unit: 10 pieces
on request	MVO Iabel 30 mm 10 pieces	MV0 label, 30 mm grid; packaging unit: 10 pieces
on request	BCB G30 special length 47 mm height	Barcode tape with special length, 47 mm high
on request	BCB G30 special length 25 mm height	Barcode tape with special length, 25 mm high
on request	BCB G30 special length / height	Barcode tape with special length and height

Table 13.8: Accessories – Twin tapes

Art.-No.	Part designation	Description
on request	BCB G40 twin tape special length / height	BCB G40 twin tape, 40 mm grid, with special length and high; delivery contents: Two barcode tapes with the same value range
on request	BCB G30 twin tape special length / height	BCB G30 twin tape, 30 mm grid, with special length and high; delivery contents: Two barcode tapes with the same value range
on request	BCB G40 twin tape special length	BCB G40 twin tape, 40 mm grid, 47 mm high; delivery contents: Two barcode tapes with the same value range
on request	BCB G30 twin tape special length	BCB G30 twin tape, 30 mm grid, 47 mm high; delivery contents: Two barcode tapes with the same value range

14 EC Declaration of Conformity

The barcode positioning systems of the BE 901 SSI series have been developed and manufactured in accordance with the applicable European standards and directives.
The manufacturer of the product, TR-Electronic GmbH in D-78647 Trossingen, possesses a certified quality assurance system in accordance with ISO 9001.

Download EU Declaration of Conformity: **www.tr-electronic.com/f/TR-E-KE-DGB-0026**

15 Appendix

15.1 Barcode sample

15.1.1 BCB G40 barcode tape with 40 mm grid

Figure 15.1: Continuous, 40 mm grid

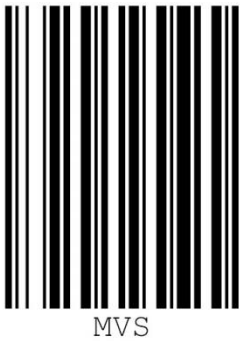


Figure 15.2: Single label MVS, 40 mm grid

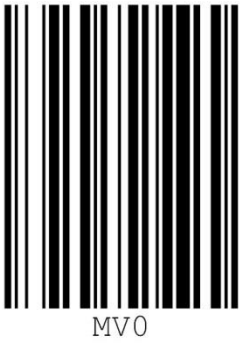


Figure 15.3: Single label MV0, 40 mm grid

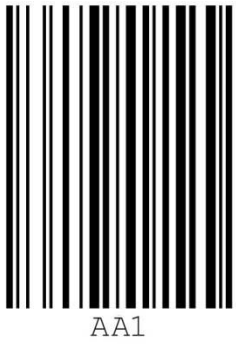


Figure 15.4: Single marker label, 40 mm grid

15.1.2 BCB G30 barcode tape with 30 mm grid

Figure 15.5: Continuous, 30 mm grid

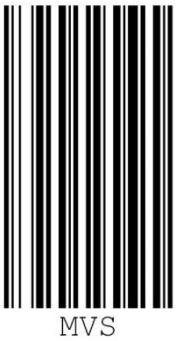


Figure 15.6: Single label MVS, 30 mm grid

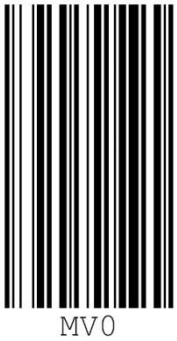


Figure 15.7: Single label MV0, 30 mm grid

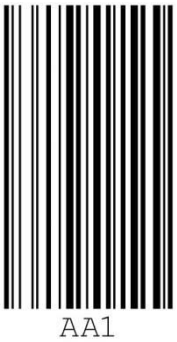


Figure 15.8: Single marker label, 30 mm grid