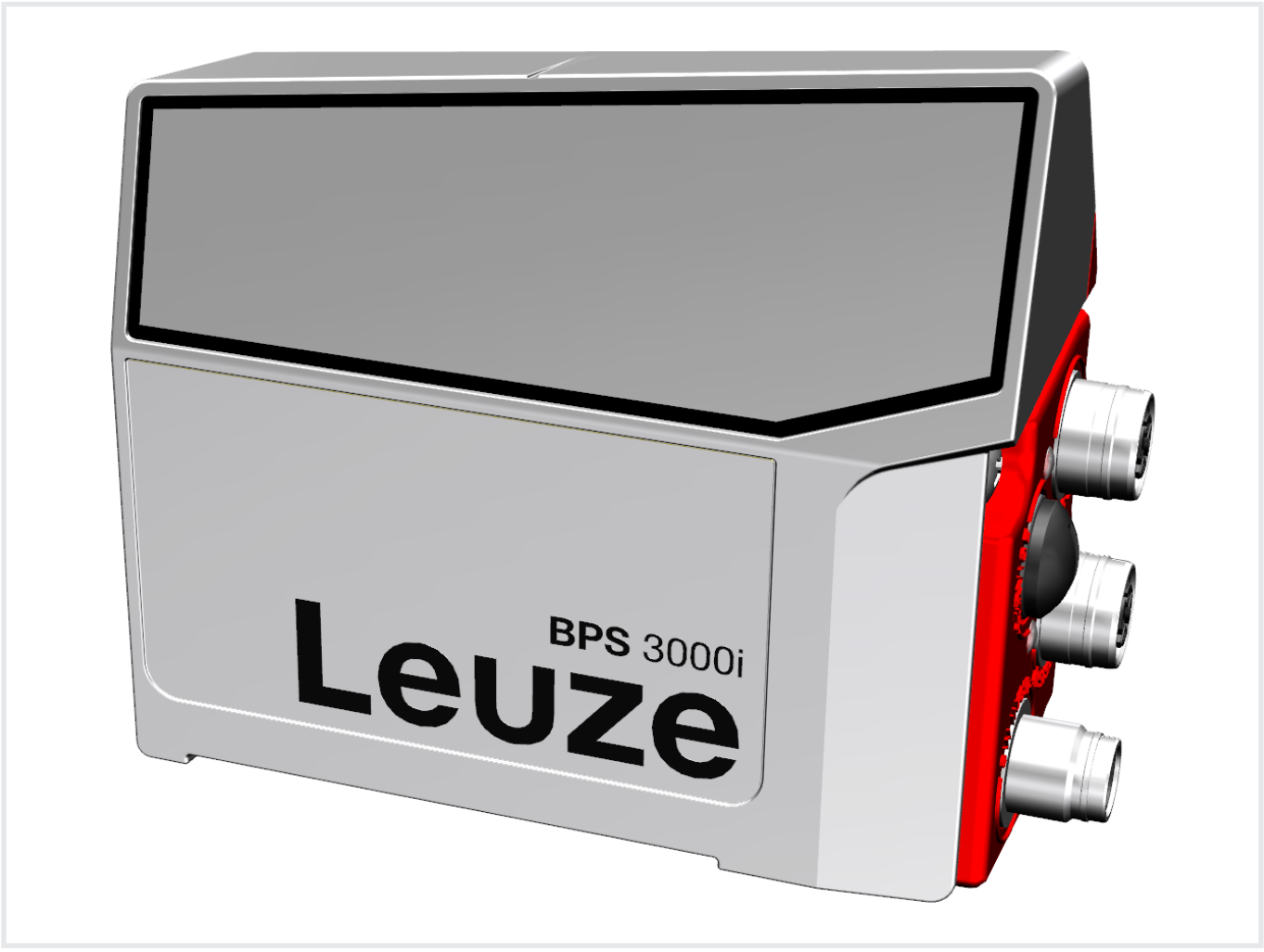
Leuze

Original operating instructions

BPS 3007i

Bar code positioning system



The Sensor People

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

1.1 Used symbols and signal words

Tab. 1.1: Warning symbols and signal words

	Symbol indicating dangers to persons
	Symbol indicating dangers from harmful laser radiation
	Symbol indicating possible property damage
NOTE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injuries Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for serious injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.

Tab. 1.2: Other symbols

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

Tab. 1.3: Terms and abbreviations

BCB	Bar code tape
BPS	Bar code positioning system
EMC	Electromagnetic compatibility
EN	European standard
FE	Functional earth
IO or I/O	Input/Output
LED	Light Emitting Diode
NEC	National Electric Code
PELV	Protective Extra-Low Voltage
SSI	Synchronous Serial Interface (Digital Synchronous Serial Interface)
USB	Universal Serial Bus
UV	Ultraviolet

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 of laser class 1 to determine its position relative to a permanently mounted bar code tape.

All accuracy details for the BPS 3000i measurement system refer to the position relative to the permanently mounted bar code tape.

CAUTION

Use only approved bar code tapes!

The bar code tapes approved by Leuze and listed on the Leuze website as accessories are an essential part of the measurement system.

Bar code tapes not approved by Leuze are not allowed.
The use of such bar code tapes is contrary to the intended use.

Areas of application

The BPS is designed for positioning in the following areas of application:

- Electrical monorail system
- Travel and lifting axes of stacker cranes
- Repositioning units
- Gantry crane bridges and their trolleys
- Elevators

CAUTION

Observe intended use!

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

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

NOTICE

Comply with conditions and regulations!

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

2.2 Foreseeable misuse

Any use other than that defined under "Intended use" or which goes beyond that use is considered improper use.

In particular, use of the device is not permitted in the following cases:

- in rooms with explosive atmospheres
- for medical purposes
- as own safety component in accordance with the machinery directive

NOTICE

Use as safety-related component within the safety function is possible, if the component combination is designed correspondingly by the machine manufacturer.

NOTICE
Do not modify or otherwise interfere with the device! ↳ Do not carry out modifications or otherwise interfere with the device. The device must not be tampered with and must not be changed in any way. ↳ The use of a bar code tape not approved by Leuze is equivalent to an intervention in or change to the device/measurement system. ↳ The device must not be opened. There are no user-serviceable parts inside. ↳ Repairs must only be performed by Leuze electronic GmbH + Co. KG.

2.3 Competent persons

Connection, mounting, commissioning and adjustment of the device must only be carried out by competent persons.

Prerequisites for competent persons:

- They have a suitable technical education.
- They are familiar with the rules and regulations for occupational safety and safety at work.
- They are familiar with the operating instructions for the device.
- They have been instructed by the responsible person on the mounting and operation of the device.

Certified electricians

Electrical work must be carried out by a certified electrician.

Due to their technical training, knowledge and experience as well as their familiarity with relevant standards and regulations, certified electricians are able to perform work on electrical systems and independently detect possible dangers.

In Germany, certified electricians must fulfill the requirements of accident-prevention regulations DGUV (German Social Accident Insurance) provision 3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Disclaimer

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

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

2.5 Laser warning notices

⚠ ATTENTION
LASER RADIATION – CLASS 1 LASER PRODUCT The device satisfies the requirements of IEC 60825-1:2014 / EN 60825-1:2014+A11:2021 safety regulations for a product of **laser class 1** as well as the U.S. 21 CFR 1040.10 regulations with deviations corresponding to Laser Notice No. 56 from May 8, 2019. ↳ Observe the applicable statutory and local laser protection regulations. ↳ The device must not be tampered with and must not be changed in any way. There are no user-serviceable parts inside the device. **CAUTION!** Opening the device can lead to dangerous exposure to radiation! Repairs must only be performed by Leuze electronic GmbH + Co. KG.

3 Device description

3.1 Device overview

3.1.1 General information

The BPS 3000i bar code positioning system uses visible red laser light to determine its position and its speed value relative to a bar code tape that is affixed along the travel path. This takes place in the following steps:

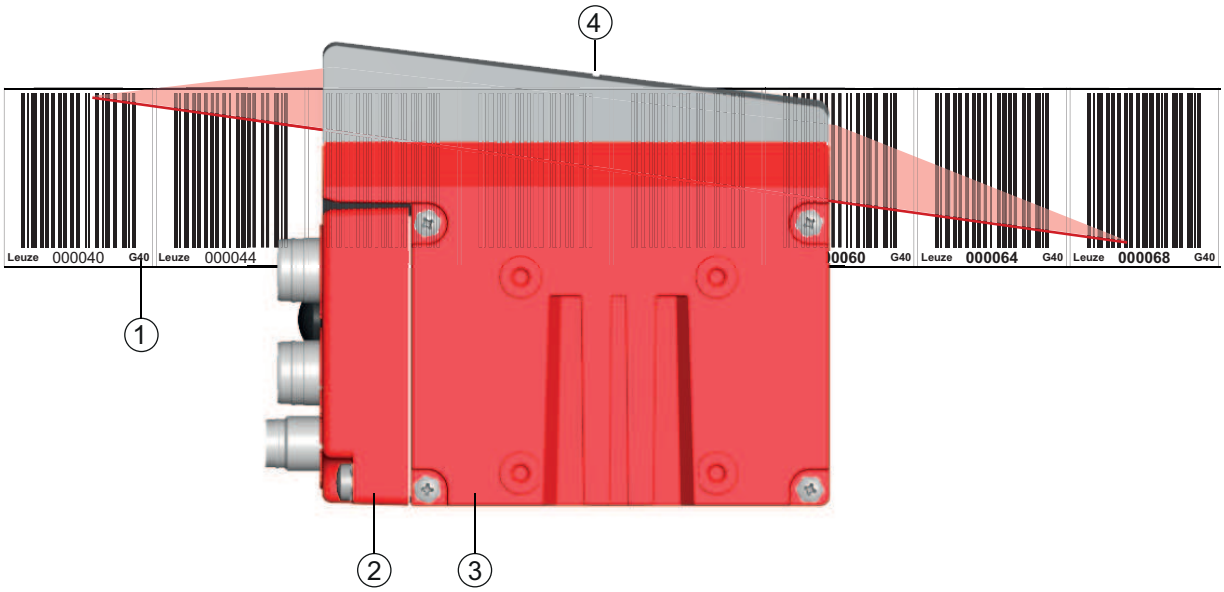
- Read a code on the bar code tape (see following figure)
- Determine the position of the read code in the scanning beam
- Calculate the position to within less than a millimeter using the code information and the code position relative to the device's center.

The position and speed values are then output to the controller via the host interface.

The BPS consists of device housing and interface connection hood for the connection to the control. The connection hood must be ordered separately.

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

- MS 3007 connection hood with M12 connectors
- MK 3007 connection hood with spring-cage terminals



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

Fig. 3.1: Device construction, device arrangement and beam exit

3.1.2 Performance characteristics

The most important performance characteristics of the bar code 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
- Working range: 50 to 170 mm; enables flexible mounting positions
- Interface: SSI

3.1.3 Accessories

Special accessories are available for the bar code positioning system. The accessories are optimally matched to the BPS:

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

3.2 Connection technology

For the electrical connection of the BPS, the following connection variants are available:

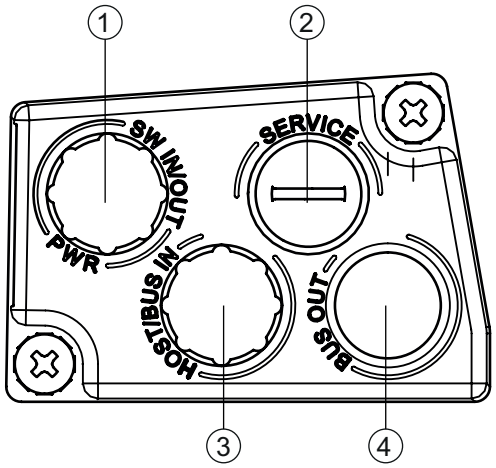
- MS 3007 connection hood with M12 connectors
- MK 3007 connection hood with spring-cage terminals

The voltage supply (18 … 30 VDC) is connected acc. to the connection type selected.

3.2.1 MS 3007 connection hood with M12 connectors

The MS 3007 connection hood features two M12 connector plugs and a Mini-B type USB socket.

	NOTICE
	The configuration switches and the integrated parameter memory for the simple replacement of the BPS are located in the MS 3007.



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

Fig. 3.2: MS 3007 connection hood, connections

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

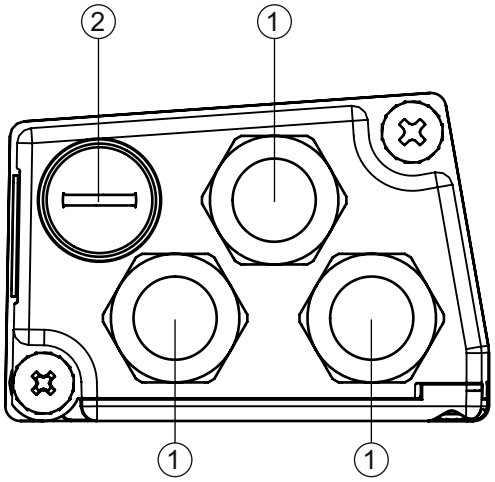
3.2.2 MK 3007 connection hood with spring-cage terminals

The MK 3007 connection hood makes it possible to connect the BPS directly and without additional connectors.

- The MK 3007 features cable bushings in which the shielding connection for the interface cable is also located, and
- a Mini-B type USB socket.

NOTICE

The configuration switches and the integrated parameter memory for simple replacement of the BPS are located in the MK 3007.



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

Fig. 3.3: Connection hood MK 3007, 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.

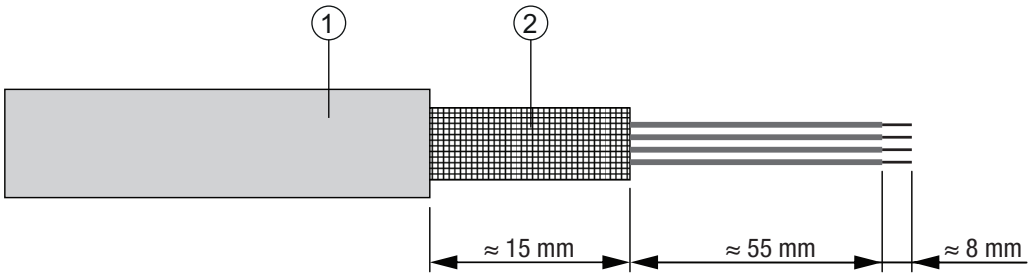
NOTICE

Do not use wire-end sleeves!

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

NOTICE

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

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

3.3 Display elements

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

- PWR
- NET

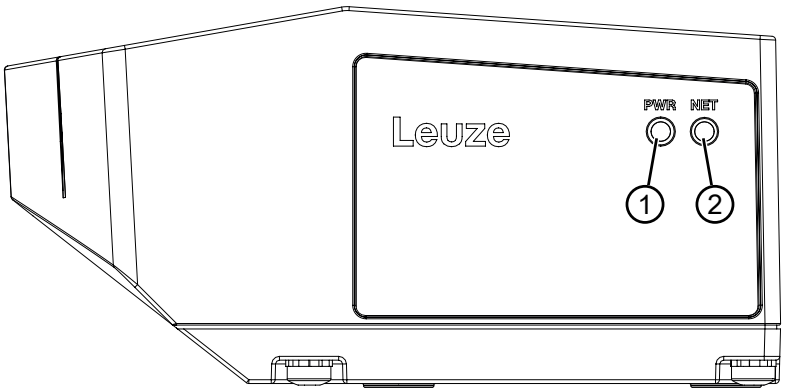


Fig. 3.5: Indicators on the device housing

1 PWR LED
2 NET LED

Tab. 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 bar code tape)
	Orange, continuous light	Service active • No data on the host interface
LED 2 NET	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

3.4 Bar code tape

3.4.1 General information

A bar code tape with 40 mm grid is required for operation of a BPS 3000i bar code positioning system.

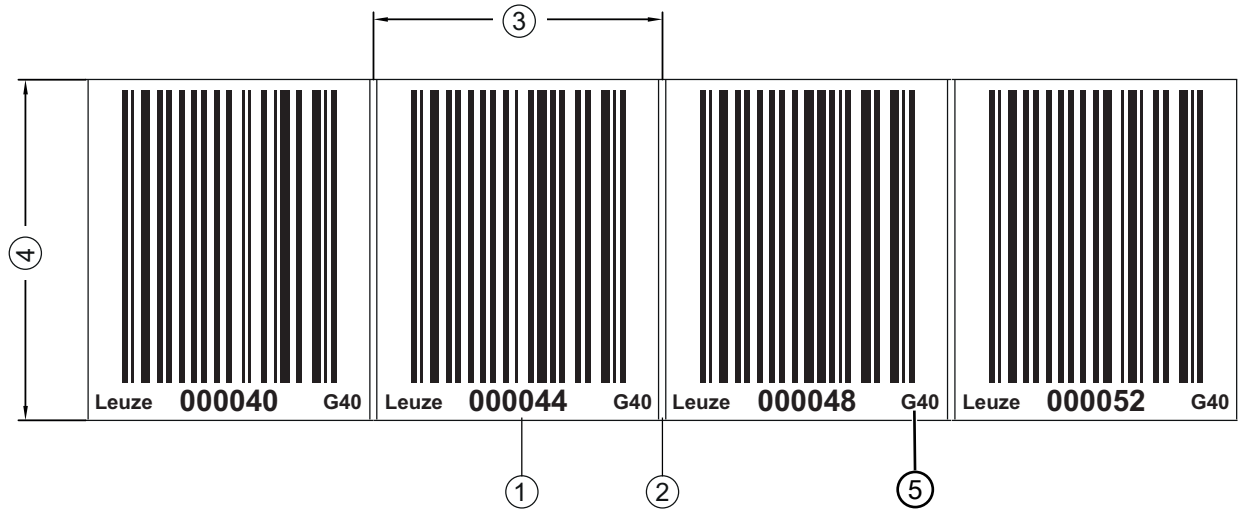
A bar code tape consists of a sequence of individual position labels. Defined cut marks are provided between the individual bar codes for cutting the BCB.

The BCB 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 max. 300 m.

Standard bar code tapes in fixed length increments as well as special bar code tapes with custom tape start value, tape end value, custom length and height can be found on the Leuze website in the accessories for the BPS 3000i devices.

An entry wizard is available for special bar code tapes on the Leuze website under devices BPS 3000i - *Accessories* tab. The entry wizard provides support when entering the individual pieces of tape data and creates a query or order form with the correct part number and type designation.

Bar code tape … G40 … with 40 mm grid



1 Position label with position value
2 Cut mark
3 Grid dimension = 40 mm
4 Height
Standard heights: 47 mm and 25 mm
5 G40 = designation in plain-text for 40 mm grid

Fig. 3.5: Bar code tape … G40 … with 40 mm grid

	NOTICE
	Standard … G40 … bar code tapes are available in various length increments in the following heights: 47 mm and 25 mm. Special BCB G40 … bar code tapes are available in mm height increments between 20 and 140 mm. An entry wizard is available for special bar code tapes on the Leuze website under devices BPS 3000i - *Accessories* tab. The entry wizard provides support when entering the individual pieces of tape data and creates a query or order form with the correct part number and type designation.

3.4.2 Twin tapes

Designation: BCB G40 … TWIN

Twin tapes are jointly manufactured bar code tapes with the same value range.

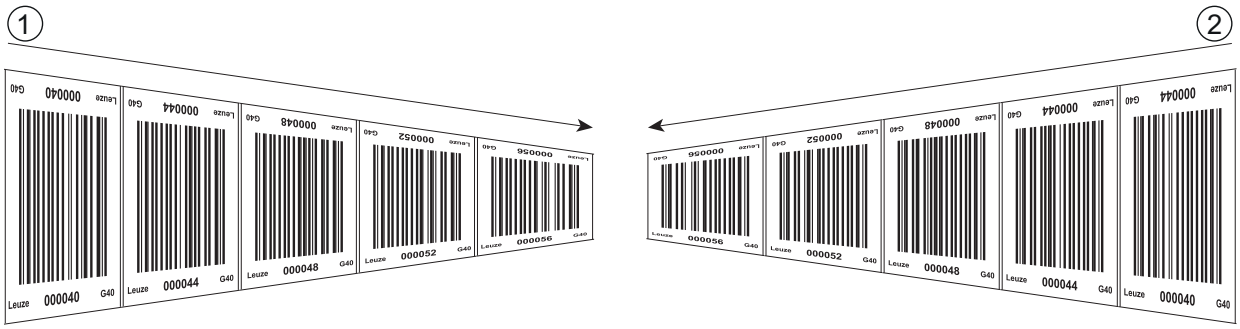
NOTICE

A twin tape always consists of two bar code tapes!

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

Twin tapes are used if positioning with two bar code 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 bar code tapes that are manufactured separately.



1 Twin bar code tape 1
2 Twin bar code tape 2

Fig. 3.6: Twin bar code tape with double numbering

NOTICE

Twin tapes are always delivered in pairs on two rolls.
If twin tapes are replaced, both tapes are to be replaced.
An entry wizard for twin tapes with custom tape start value, tape end value, custom length and height is available on the Leuze website under devices BPS 3000i - *Accessories* tab. The entry wizard provides support when entering the individual pieces of tape data and creates a query or order form with the correct part number and type designation.

4 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 Leuze Bar code Positioning System (BPS) 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 bar code positioning system convinces with a variety of advantages:

- The laser simultaneously scans multiple bar codes and, as a result, is able to determine the position with sub-millimeter precision. 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.
- Using a mounting device, the BPS 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 (easy-mount).
- The unique encoding of the position value on the bar code tape allows the system to be put back into operation without problem even after a brief voltage drop without, e.g., needing to utilize a reference point.
- The Leuze bar code 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 BPS include:

- Stacker crane (see chapter 4.1 "High-bay storage device")
- Electrical monorail system (see chapter 4.2 "Electrical monorail system")
- Gantry cranes (see chapter 4.3 "Gantry cranes")

4.1 High-bay storage device

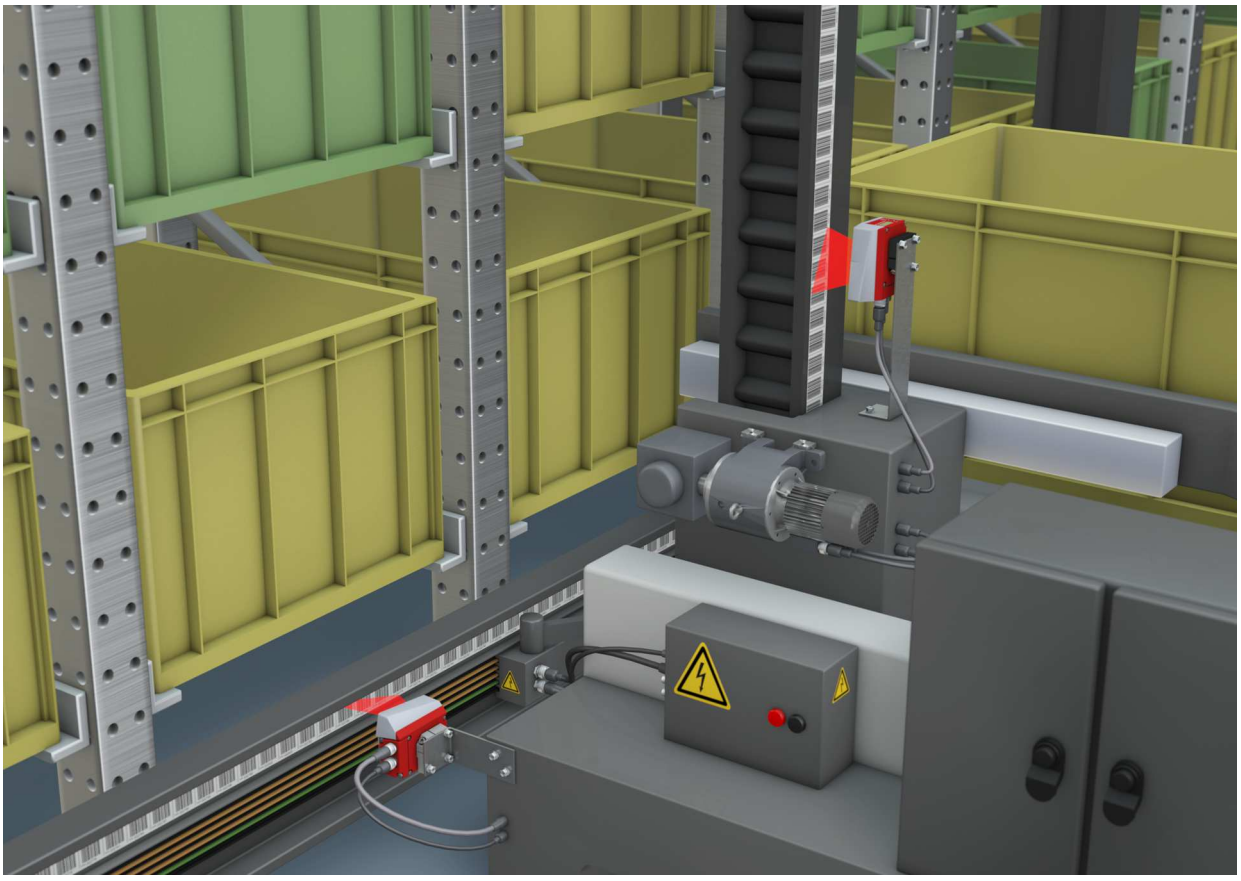


Fig. 4.1: Stacker crane

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

4.2 Electrical monorail system

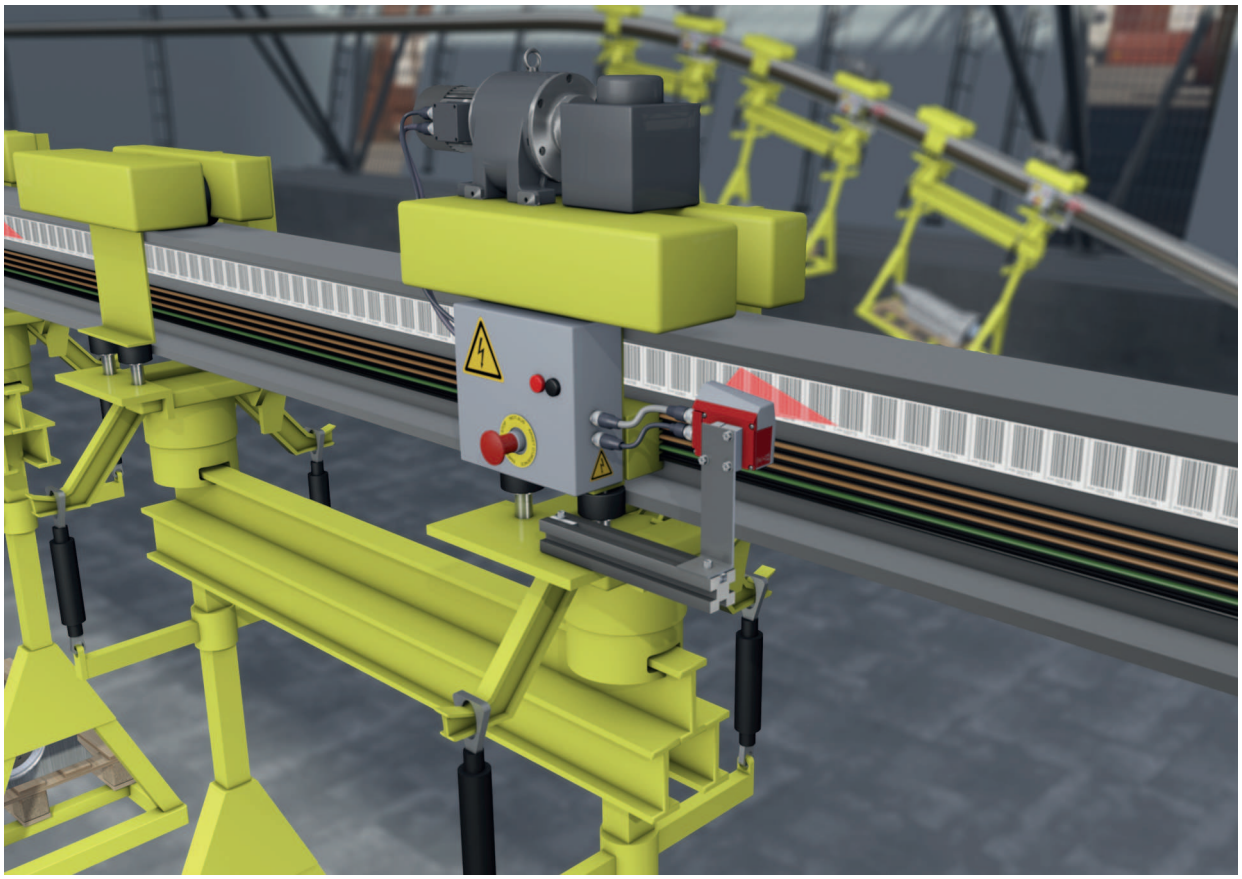


Fig. 4.2: Electrical monorail system

- Positioning from 0 to 10,000 meters
- The working range from 50 - 170 mm allows for mounting positions and reliable position detection at varying distances

4.3 Gantry cranes

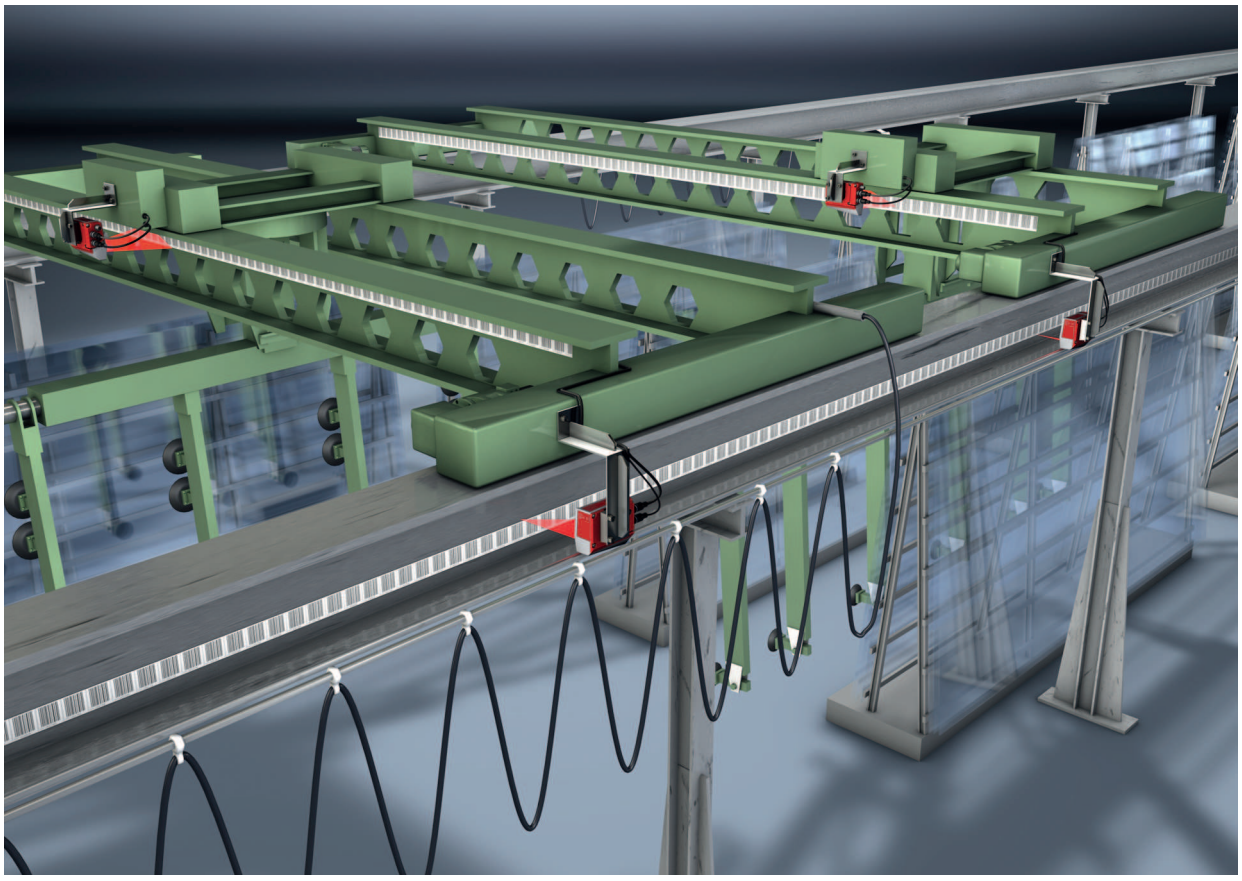


Fig. 4.3: Gantry cranes

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

5 Mounting

5.1 Mounting bar code tape

5.1.1 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 are 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 BPS 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 BPS 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 BPS over the entire traversing path. The BPS can determine the position on BCBs with arbitrary orientation.
- Bar code tapes with different value ranges may not directly follow one another.
  In the case of different value ranges, a difference of at least 1 m must be maintained between the position value of the last position bar code of the preceding BCB and the position value of the first position bar code of the subsequent BCB.
- Avoid position bar code 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.

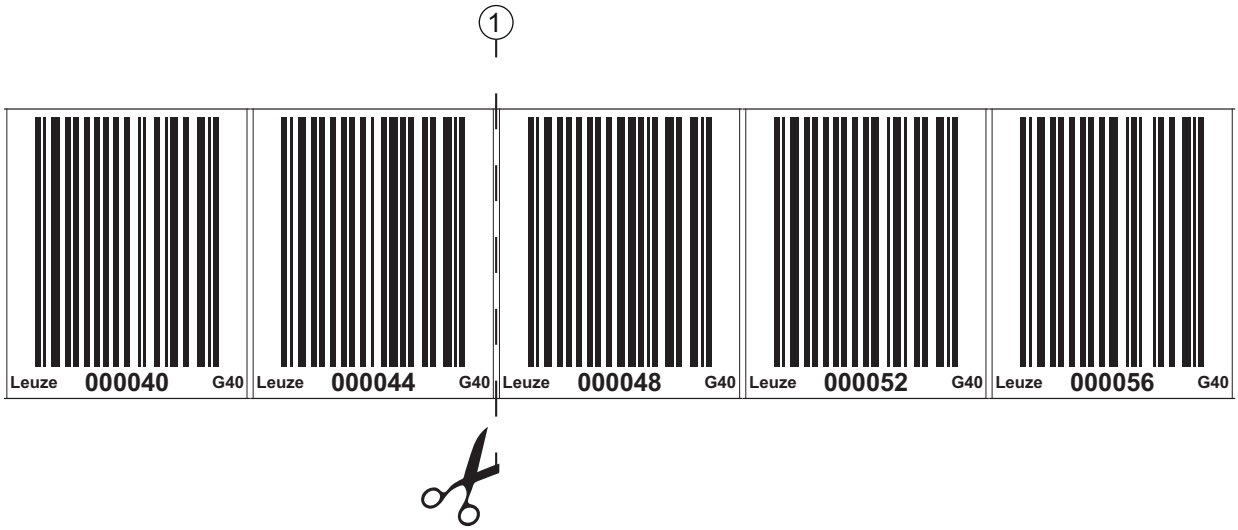
5.1.2 Cutting bar code tapes

NOTICE

Avoid cutting BCB!

- If possible, avoid cutting bar code tapes.
  Optimum position value determination by the BPS is achieved with continuously affixed BCB.
- If there are mechanical gaps, first affix the BCB continuously. Then cut the BCB.

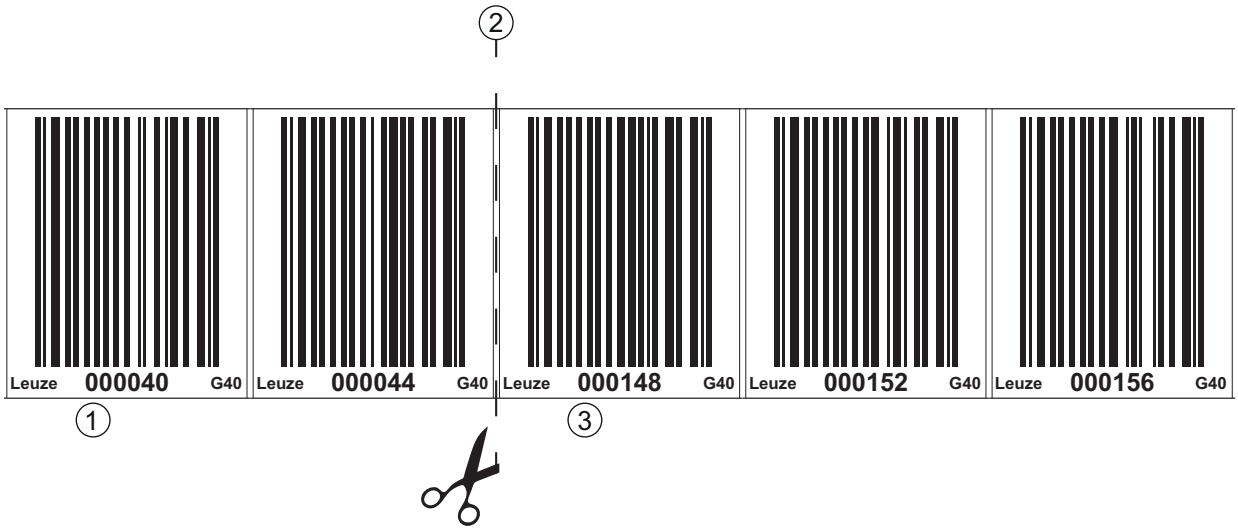
The BCB is cut at the indicated cut marks:



1 Cut mark

Fig. 5.1: Cut mark on the bar code tape

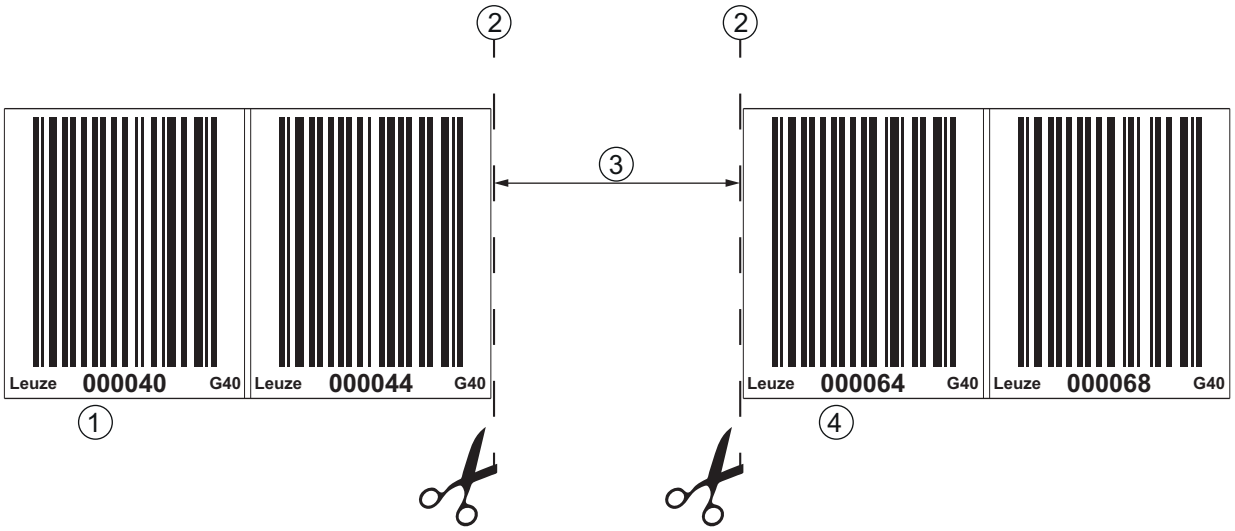
If another BCB is to be affixed directly after the preceding BCB, the subsequent bar code value must differ from the preceding BCB by at least 1 m:



1 Preceding bar code tape
2 Cut mark
3 Subsequent bar code tape, value range + 1 m

Fig. 5.2: Cut bar code 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. The first bar code value of the subsequent BCB must differ by at least 20 (200 mm) from the last bar code value of the preceding BCB.



1 Preceding bar code tape
2 Cut mark
3 Gap, at least 300 mm
4 Subsequent bar code tape

Fig. 5.3: Gap in cut bar code tape to avoid double positions

NOTICE

No glossy gaps in the cut bar code tape!

- Ensure that there are matt, bright surfaces behind the gaps in the BCB.
  Reflective and high-gloss surfaces in the scanning beam may impair the measurement quality of the BPS.

5.1.3 Mounting 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 BPS 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.

NOTICE

If a bar code tape was damaged, e.g., by falling parts, you can download a repair kit for the BCB from the Internet (see chapter 9.2.2 "BCB repair with repair kit").

- Use the bar code tape created with the repair kit only temporarily as an emergency solution.

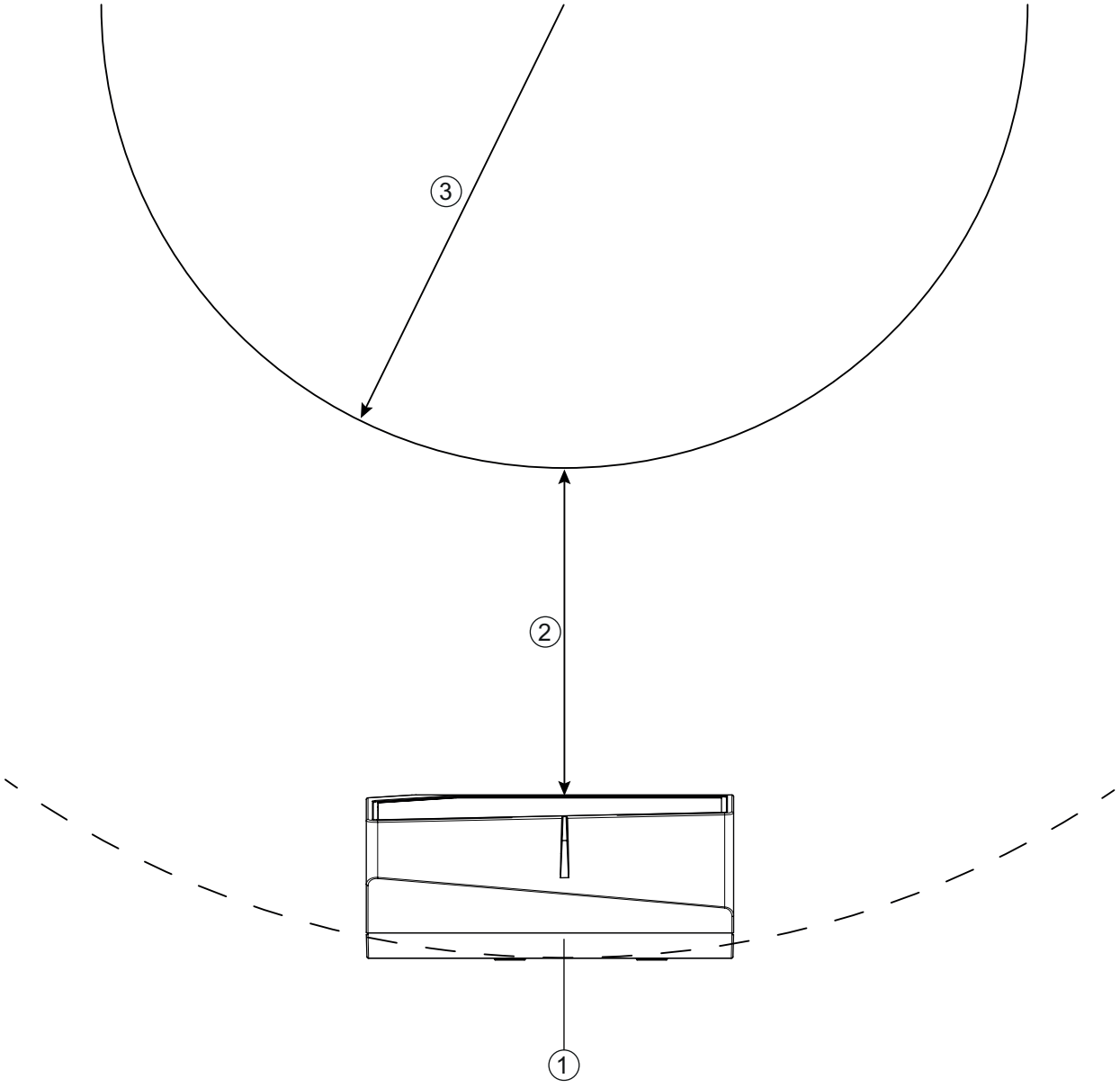
BCB mounting in horizontal curves

NOTICE

Limited absolute measurement accuracy and reproducibility!

BCB mounting in curves reduces the absolute accuracy of the BPS, since the distance between two bar codes is no longer exactly 40 mm due to optical distortions.

- For horizontal curves, maintain a minimum bending radius of 300 mm.



1 BPS
2 Reading distance
3 Radius of the bar code tape, R_{min} = 300 mm

Fig. 5.4: Mounting the bar code 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 BPS, since the distance between two bar codes is no longer exactly 40 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.
- Ensure that the BCB is affixed without mechanical tension.

NOTICE

No glossy gaps in the bar code tape!

- Ensure that there are matt, bright surfaces behind the fanning in the BCB curves. Reflective and high-gloss surfaces in the scanning beam may impair the measurement quality of the BPS.

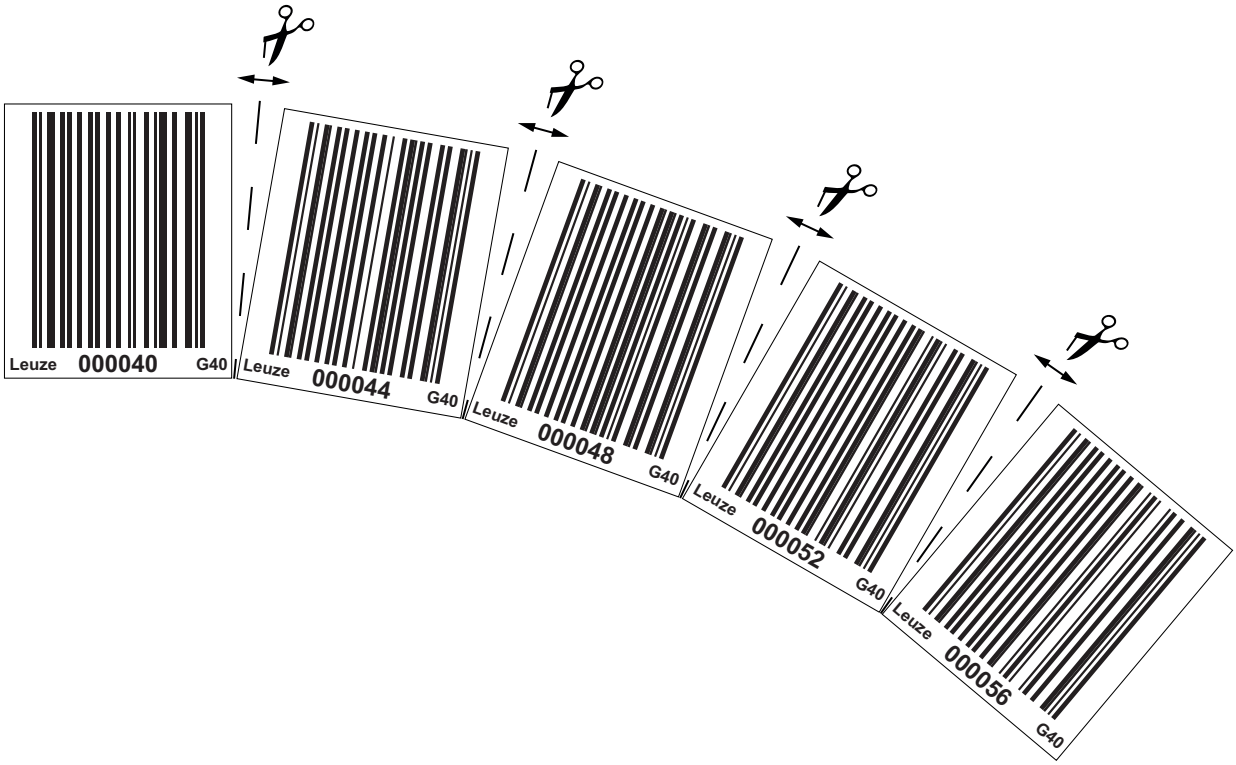
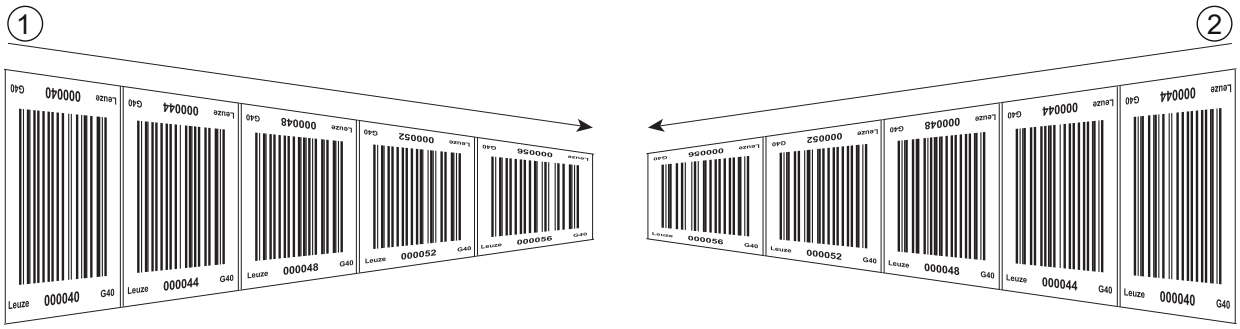


Fig. 5.5: Preparing the bar code tape for use in vertical curves

Mounting twin tapes

If two bar code 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 3.4.2 "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.



1 Twin bar code tape 1
2 Twin bar code tape 2

Fig. 5.6: Mounting twin bar code tapes

NOTICE

A twin tape always consists of two bar code tapes.

- When ordering twin tapes, two bar code tapes are always included with an order.
- The two twin bar code tapes have the exact same length tolerances relative to each other.
- 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.

Mounting two bar code tapes with the same value range

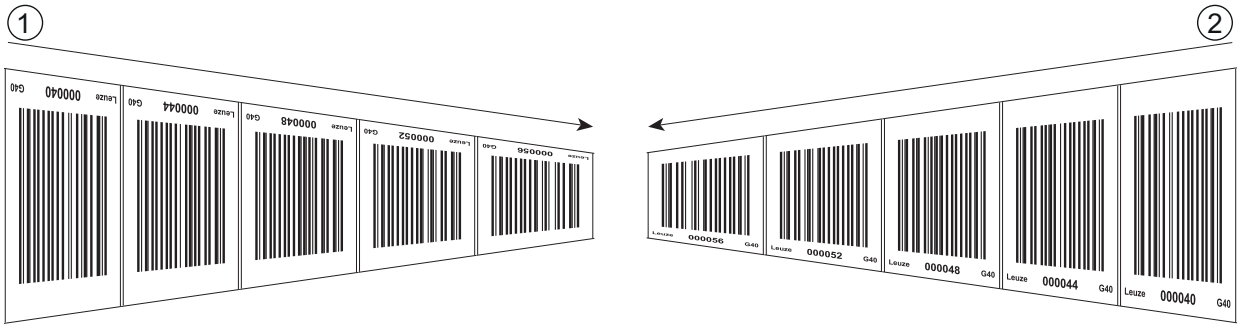
For crane systems or elevators, two bar code tapes with the same value range are used for positioning.

NOTICE

If two bar code tapes with the same value range and the same length tolerances are needed, the use of twin tapes is recommended (see chapter 3.4.2 "Twin tapes").

If a twin tape is not used: To have the same values at the same position, one bar code tape must be affixed with numbers upside down while the other is affixed normally.

If twin bar code tapes are not used, the two bar code tapes may deviate +/- 1 mm per meter relative to one another.



1 BCB affixed upside down
2 BCB affixed normally

Fig. 5.7: Affixing two bar code tapes with the same value range

5.2 Mounting the bar code positioning system

The BPS can be mounted in the following ways:

- Mounting using a mounting device on the fastening grooves
  - BTU 0300M-W: Wall mounting
- Mounting using a mounting bracket on the M4 threads on the rear side of the device
  - BT 300 W: Mounting on a mounting bracket
- Direct mounting using four M4 mounting threads on the rear side of the device

NOTICE

If the BTU 0300M-W mounting device is used to mount the device, the new device is automatically aligned correctly should it be necessary to exchange a device.

5.2.1 Mounting instructions

NOTICE

Select the mounting location.

- Make certain that the required environmental conditions (humidity, temperature) are maintained.
- Make certain that the distance between BPS and bar code tape is sufficiently large.
  The scanning beam of the BPS should cover three or more bar codes.
  The distance between BPS and bar code 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 BPS in a protective housing:
  When installing the BPS in a protective housing, ensure that the scanning beam can exit the protective housing without obstruction.
- Make certain that the working 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 BPS must be incident on the BCB without interruption.
  For the best functionality, the BPS must be guided parallel to the BCB. It is not permitted to move outside of the approved working range of the BPS (50 … 170 mm) while the system is in motion.

NOTICE

For parallel mounting, maintain the minimum distance!

- Maintain the minimum distance of 300 mm if you mount two BPS next to or above one another.

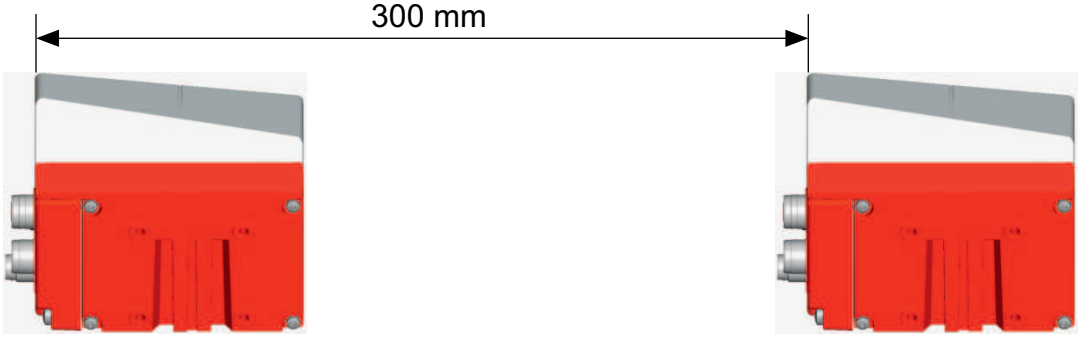


Fig. 5.8: Minimum distance for parallel mounting

NOTICE

Install the connection hood before mounting the BPS!

- Screw the MS 3007 or MK 3007 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.

5.2.2 Orientation of the BPS to the bar code tape

The beam of the BPS must be oriented at an incline of 7° to the bar code tape (see following figure). When positioning, make certain that the angle of radiation to the rear side of the housing is 90 ° and the reading distance to the bar code tape is maintained.

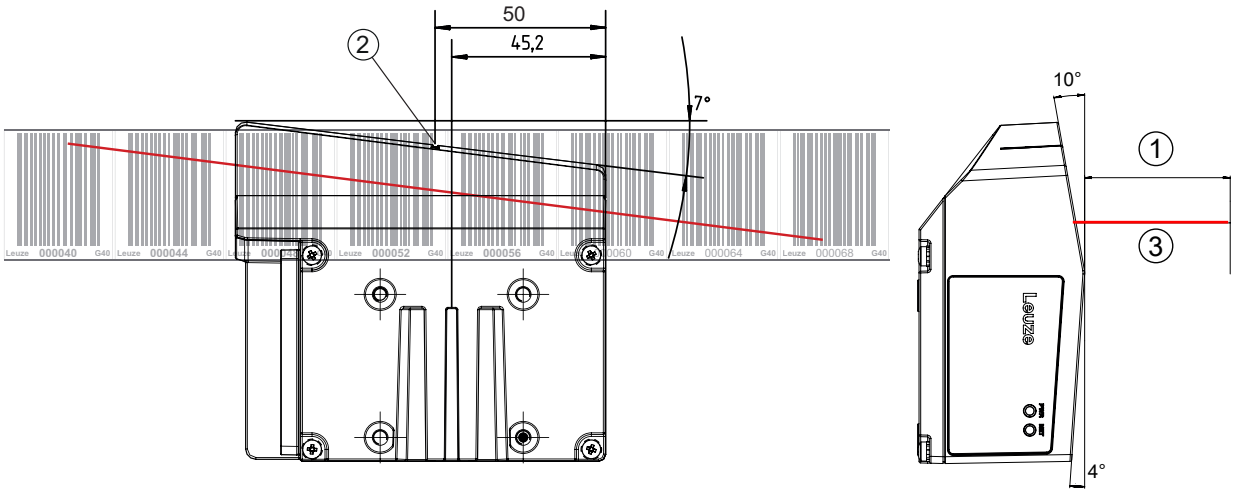


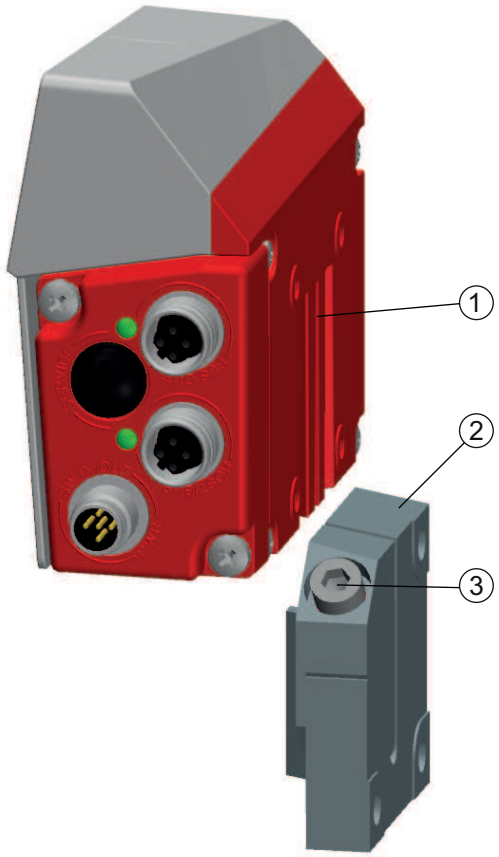
Fig. 5.19: Beam exit

1 Reading distance
2 Reference point for the bar code position
3 Scanning beam

5.2.3 Mounting with the BTU 0300M-W mounting device

Mounting the BPS with a BTU 0300M-W mounting device is intended for wall mounting.

For ordering information see chapter 12 "Order guide and accessories"; for dimensioned drawing see chapter 11.4 "Dimensioned drawings: Accessories".



1 Clamp profile
2 Clamping jaws
3 Screw terminal

Fig. 5.9: Mounting the BPS with the BTU 0300M-W mounting device

- Mount the BTU 0300M-W on the system side with M6 fastening screws (not included in delivery contents).
- Mount the BPS with the dovetail fastening grooves on the clamping jaws of the BTU 0300M-W with limit stop at end.
- Secure the BPS with the M6 screw terminal.
  Maximum tightening torque for the M6 screw terminal: 8 Nm

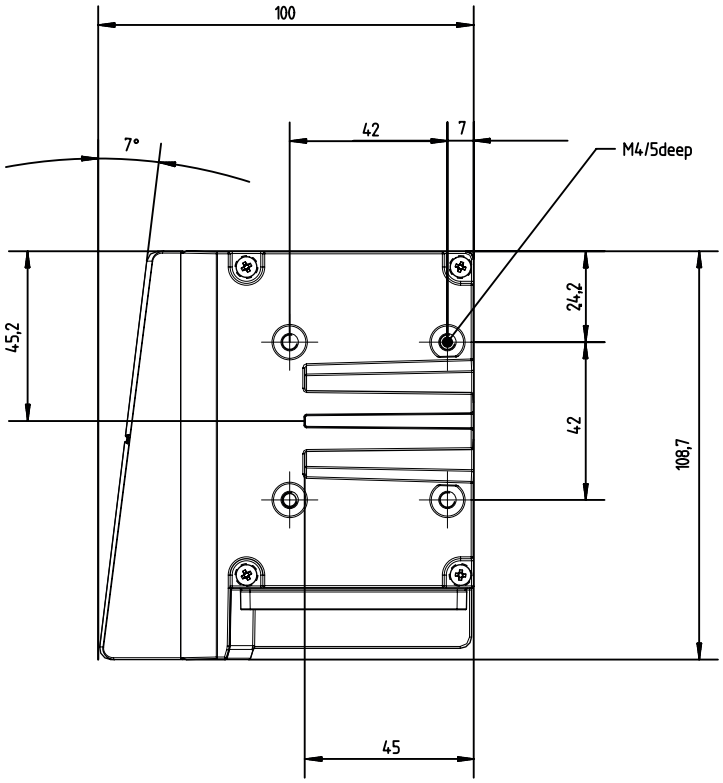
5.2.4 Mounting with the BT 300 W mounting bracket

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

For ordering information see chapter 12 "Order guide and accessories"; for dimensioned drawing see chapter 11.4 "Dimensioned drawings: Accessories".

- Mount the BT 300 W mounting bracket on the system side with M6 fastening screws (included in delivery contents).
- Mount the BPS on the mounting bracket with M4 fastening screws (included in delivery contents).
  Maximum tightening torque of the M4 fastening screws: 2 Nm

5.2.5 Mounting with M4 fastening screws



all dimensions in mm

Fig. 5.10: Dimensioned drawing of rear of BPS

- Mount the BPS on the system with M4 fastening screws (not included in delivery contents).
  Maximum tightening torque of the fastening screws: 2 Nm

6 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.

NOTICE

Protective Extra Low Voltage (PELV)!

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

NOTICE

Connection hood and degree of protection IP 65

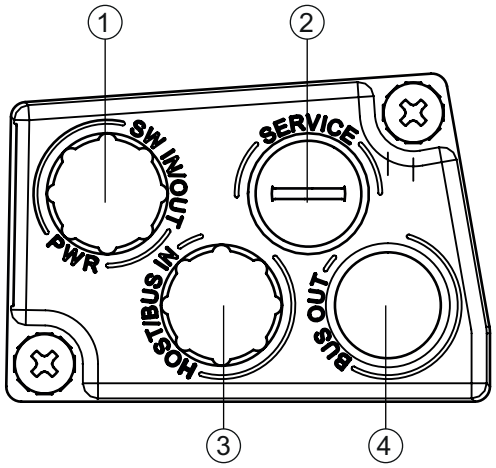
- Before connecting, mount the connection hood on the device housing.
- To ensure degree of protection IP 65 is fulfilled, the screws of the connection hood are tightened with a tightening torque of 1.4 Nm for connecting to the BPS.
- Degree of protection IP 65 is not fulfilled until connectors or cable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

NOTICE

For all connections (connection cable, interconnection cable, etc.), use only the cables listed in the accessories (see chapter 12 "Order guide and accessories").

6.1 MS 3007 connection hood with connectors

The MS 3007 connection hood features two M12 connector plugs and a Mini-B type USB socket.



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

Fig. 6.1: MS 3007 connection hood, connections

NOTICE

Shielding connection and functional earth connection!

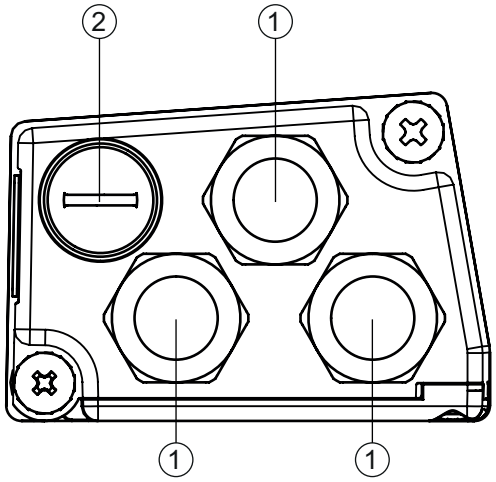
- The shielding connection is done via the M12 connector housing.
- Ensure that the functional earth (FE) is connected correctly.
  Unimpaired operation is only guaranteed when the functional earth is connected properly.
  All electrical disturbances (EMC couplings) are discharged via the functional earth connection.

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

6.2 MK 3007 connection hood with spring-cage terminals

With the MK 3007 connection hood, the BPS is connected directly and with no additional plug.

- The MK 3007 features cable bushings in which the shielding connection for the interface cable is also located, and
- a Mini-B type USB socket.



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

Fig. 6.2: Connection hood MK 3007, connections

NOTICE

Cable fabrication!

- We recommend against using 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.

6.3 Pin assignment

6.3.1 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.

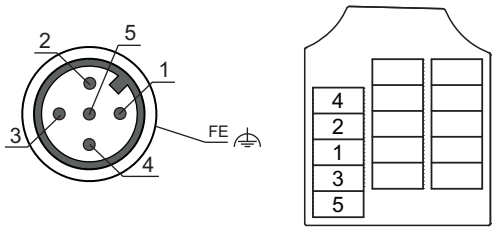


Fig. 6.3: PWR / SW IN/OUT connection

Tab. 6.1: PWR / SW IN/OUT pin assignment

Pin/terminal	Designation	Assignment
1	VIN	+18 … +30 VDC supply voltage
2	SWIO1	Switching output: Invalid position value
3	GNDIN	Negative supply voltage (0 VDC)
4	SWIO2	Switching input: NC
5	FE	Functional earth
Thread (M12 connector) 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.

Connection cables: see chapter 12 "Order guide and accessories"

Switching output

NOTICE
Switching output SWIO1 At the output of the BPS (SWIO1), no switching outputs may be connected from external sensors/devices. The switching output of the BPS may otherwise malfunction.

6.3.2 SSI (HOST / BUS IN)

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

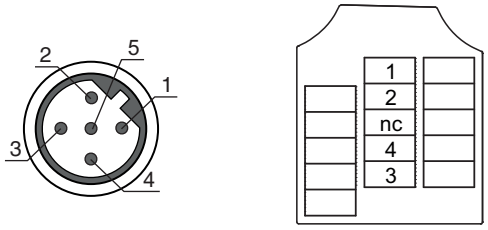


Fig. 6.4: SSI connection

Tab. 6.2: 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 connector) 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

Use preassembled cables!

- If possible, use the preassembled cables from Leuze (see chapter 12.3 "Cables accessories").

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.

6.4 Cable lengths and shielding

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.

Tab. 6.3: 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

7 Starting up the device – Basic configuration

7.1 Configuring the SSI interface

7.1.1 Principal functionality of the SSI interface

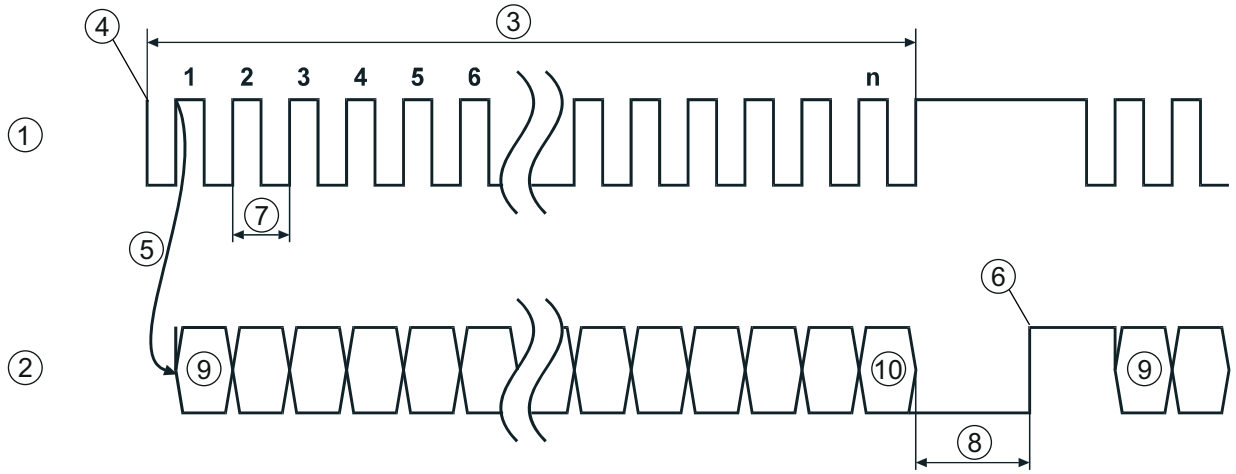
Data communication of the SSI interface is based on differential transmission as is used for RS 422 interfaces. The position value is transmitted in sync with a cycle (CLOCK) specified by the control, starting with the most significant bit (MSB).

- In the idle 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 - 600 kHz



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)

Fig. 7.1: SSI data transmission sequence diagram

NOTICE	
	If the off-cycle of data transmission is interrupted for longer than t_m = 20 µs, the next cycle will begin with a completely new transmission 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!

↳ The SSI interface can only represent positive position and speed values.
If negative output values are ascertained due to the orientation of the BPS 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 value invalid, 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 - 600 kHz

7.2 Configuration via the switches of the connection hood

Rotary switch S2

NOTICE

Hexadecimal rotary switch S2 for setting the resolution

↳ Set the resolution of the position measurement via rotary switch S2.

Tab. 7.1: Configuration via rotary switch S2

Switch position	Position resolution [mm]
0	Default
1	0.01
2	0.1
3	1
4	10
5	Default
6	Default
7	Default
8	Default
9	Default
A	Default
F	Default

8 Diagnosis and troubleshooting

8.1 What to do in case of failure?

After switching on the BPS, display elements (see chapter 3.3 "Display elements") 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 and the error messages and rectify the error.

NOTICE

Contact Leuze subsidiary/customer service.

- If you are unable to rectify a fault, contact the Leuze branch responsible for you or call the Leuze customer service (see chapter 10 "Service and support").

8.2 Operating indicators of the LEDs

You can ascertain general causes of errors via the PWR and NET status LEDs (see chapter 3.3 "Display elements").

Tab. 8.1: PWR LED displays – causes and measures

Error	Possible cause	Measures
Off	No supply voltage connected to the device Hardware error	Check supply voltage Contact Leuze customer service (see chapter 10 "Service and support")
Green, flashing	Device is being initialized	
Red, flashing	No valid measurement value	No bar code in the scanning beam

8.3 Checklist for causes of errors

Tab. 8.2: LED indicators - interface errors – causes and measures

Error	Possible cause	Measures
NET LED "off"	No supply voltage connected to the device	Check supply voltage
	Hardware error	Contact Leuze customer service (see chapter 10 "Service and support")
NET 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

Tab. 8.3: Position measurement errors – causes and measures

Error	Possible cause	Measures
Measurement value or reading quality is continuously instable	Soiling of the BPS optics	Clean the optics of the BPS
Measurement value or reading quality is poor • at certain position values • always at the same position values	Soiling of the bar code tape	Clean the bar code tape Replace the bar code tape
No measurement value can be determined	No code in scanning beam Code not in the working range of the BPS	Align the scanning beam with the bar code tape Align the BPS with the bar code tape (working range 50 mm … 170 mm)
Faulty measurement value	Wrong bar code tape BCB grid different from BPS configuration	Use Leuze bar code tape …G40…

9 Care, maintenance and disposal

9.1 Cleaning

If there is dust on the device:

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

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

9.2 Servicing

The device does not normally require any maintenance by the operator.

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

↳ For repairs, contact your responsible Leuze subsidiary or Leuze customer service (see chapter 10 "Service and support").

9.2.1 Firmware update

A firmware update can only be performed by Leuze Service on-site or at the company headquarters.

↳ For firmware updates, contact your responsible Leuze subsidiary or Leuze customer service (see chapter 10 "Service and support").

9.2.2 BCB repair with repair kit

If a bar code tape was damaged, e.g., by falling parts, you can download a repair kit for the BCB from the Leuze website **www.leuze.com**.

NOTICE
Do not use the BCB repair kit on a permanent basis! ↳ Use the bar code tape created with the repair kit only temporarily as an emergency solution. The optical and mechanical properties of the self-printed bar code tape do not correspond to those of the original bar code tape. Self-printed bar code tape should not remain in the system on a permanent basis. ↳ An entry wizard is available for repair tapes on the Leuze website under devices BPS 3000i - Accessories. The entry wizard provides support when entering the individual pieces of tape data and creates a query or order form for the desired repair tape. ↳ Repair tapes are available up to a maximum length of 5 m per repair tape. Repair tapes longer than 5 must be ordered as special tapes in the entry wizard.

NOTICE
In the repair kit files, you will find all position values with 40 mm grid (BCB G40 …).

Layout:

- BCB G40: 1 m of bar code tape is provided on each A4 sheet.
  - Five lines of 20 cm with five code-information sections of 40 mm each
  - Tape lengths: from 0 to 9999.99 m in various files; each 500 m

Replacing a section of defective bar code 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 bar code tape.

NOTICE

Printing coding

- Select only those pages that are actually required.
- Change the printer settings so that the bar code is not distorted.
- Check the print results and measure the distance between two bar codes: BCB G40 …: 40 mm. See graphic below.
- Cut the code strips and arrange them next to one another. The code content must always increase or decrease in increments of 40 mm. Check that the printed values increase by 4 (BCB G40 …).

Fig. 9.1: Checking the print result – BCB G40 …-repair kit (40 mm gird)

9.3 Disposing

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

10 Service and support

Service hotline

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

Repair service and returns

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

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

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

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

What to do should servicing be required?

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

Customer data (please complete)

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

Leuze Service fax number:

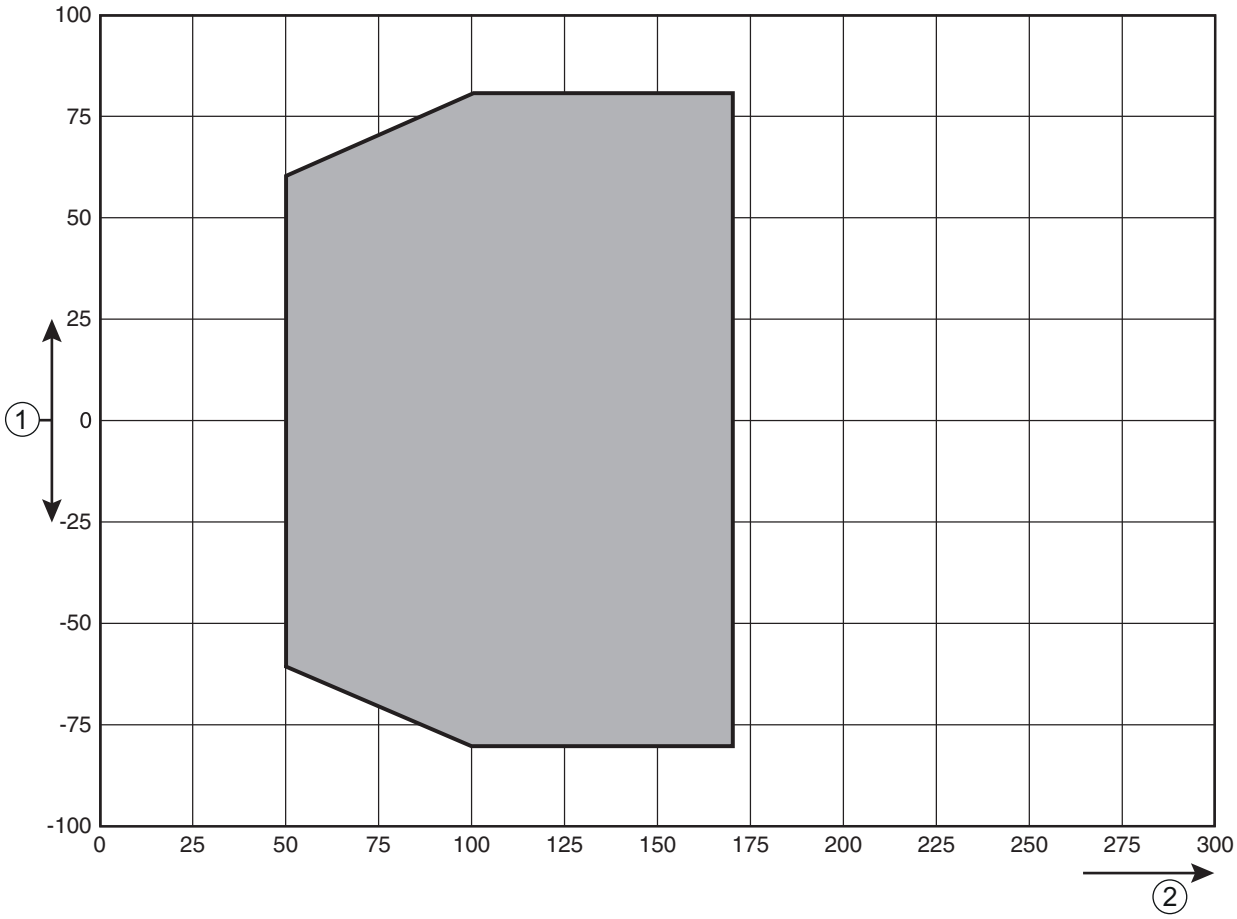
+49 7021 573 - 199

11 Technical data

11.1 General specifications

Tab. 11.1: Optics

Light source	Laser diode
Wavelength	655 nm
Impulse duration	< 150 µs
Max. output power	1.8 mW
Average life expectancy laser diode	100,000 h (typ. at +25 °C)
Beam deflection	Via rotating polygon wheel
Exit window	Glass
Laser class	1 acc. to IEC 60825-1:2014 / EN 60825-1:2014+A11:2021
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 BPS reading field curve).



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

Fig. 11.1: BPS reading field curve

Tab. 11.2: Measurement data

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

Tab. 11.3: Operating and display elements

LEDs	Two LEDs for power (PWR) and bus state (NET), two-colored (red/green)

Tab. 11.4: Mechanical data

Housing	Diecast aluminum
Connection technology	• BPS with MS 3007: M12 connectors • BPS with MK 3007: Terminal blocks with spring-cage terminals (5-pin)
Degree of protection	IP 65
Weight	Approx. 580 g (without connection hood)
Dimensions of the BPS 3007i without connection hood	(H x W x D) 108.7 mm x 100.0 mm x 48.3 mm
Dimensions (with MS 3007 connection hood)	(H x W x D) 108.7 mm x 100.0 mm x 48.3 mm
Dimensions (with MK 3007 connection hood)	(H x W x D) 147.4 mm x 100.0 mm x 48.3 mm
Dimensions of MS 3007 connection hood	(H x W x D) 64.0 mm x 43.5 mm x 33.5 mm
Dimensions of MK 3007 connection hood	(H x W x D) 64.0 mm x 43.5 mm x 83.5 mm

Tab. 11.5: 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)

Tab. 11.6: Certifications, conformity

Conformity	CE

11.1.1 BPS

Tab. 11.7: Electrical equipment

Interface type	SSI SSI clock rate (CLOCK): 50 kHz … 800 kHz
PWR LED green	Device ready (power on)
Operating voltage U_B	18 … 30 VDC (Class 2, protection class III)
Power consumption	Max. 3.7 W

Tab. 11.8: Ambient temperature

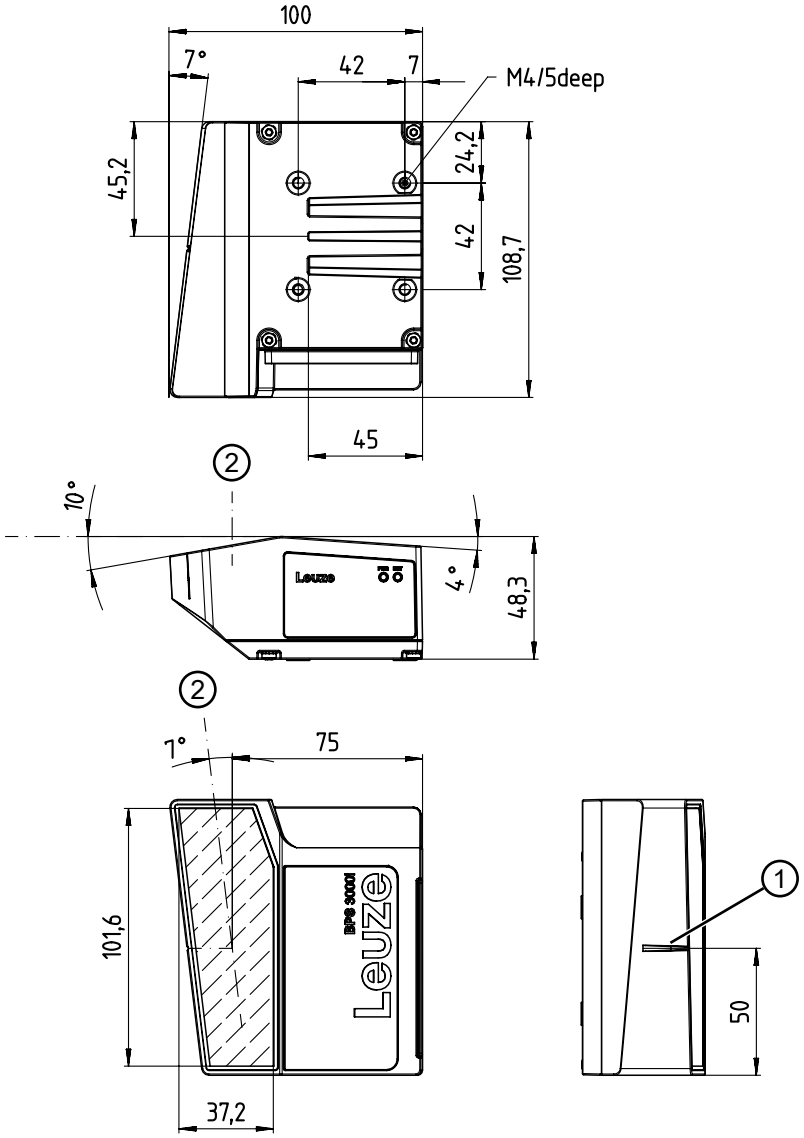
Ambient temperature (operation)	-5 °C … +50 °C
Ambient temperature (storage)	-35 °C … +70 °C

11.2 Bar code tape

Tab. 11.9: Dimensions of bar code tape … G40 …

Grid	40 mm
Standard height	47 mm, 25 mm
Length	0 … 5 m, 0 … 10 m, 0 … 20 m, …, 0 … 150 m, 0 … 200 m; Special lengths and special encodings: see chapter 12 "Order guide and accessories"
Tape tolerance	±1 mm per meter

11.3 Dimensioned drawings

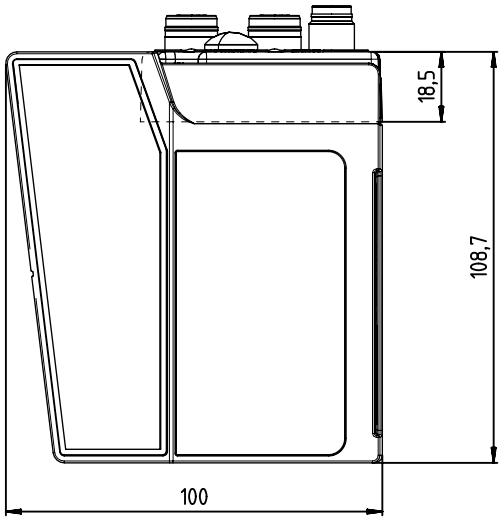


all dimensions in mm

1 Reference point for the bar code position

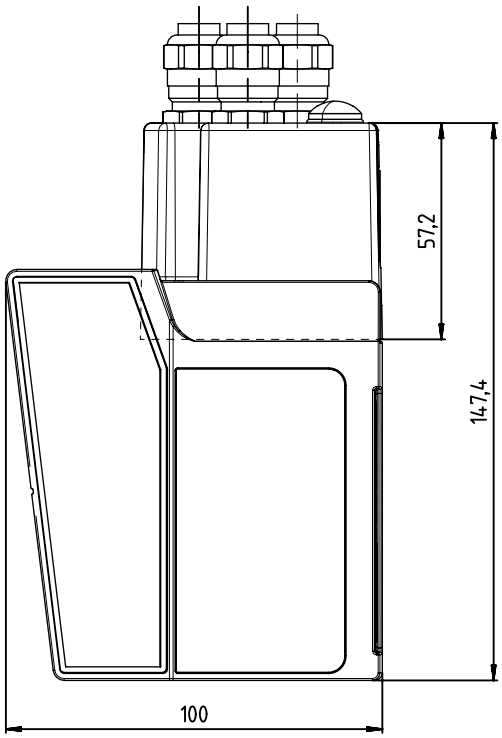
2 Optical axis

Fig. 11.2: Dimensioned drawing BPS without connection hood



all dimensions in mm

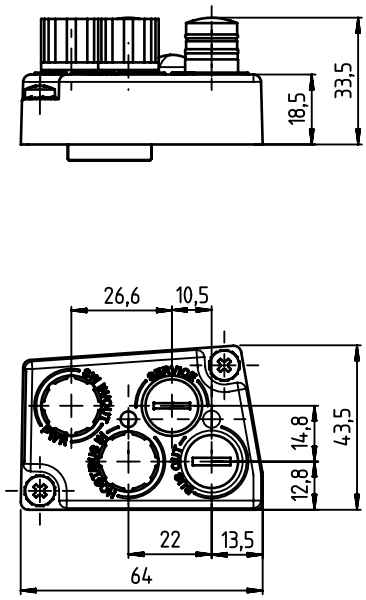
Fig. 11.3: Dimensioned drawing BPS with MS 3007 connection hood



all dimensions in mm

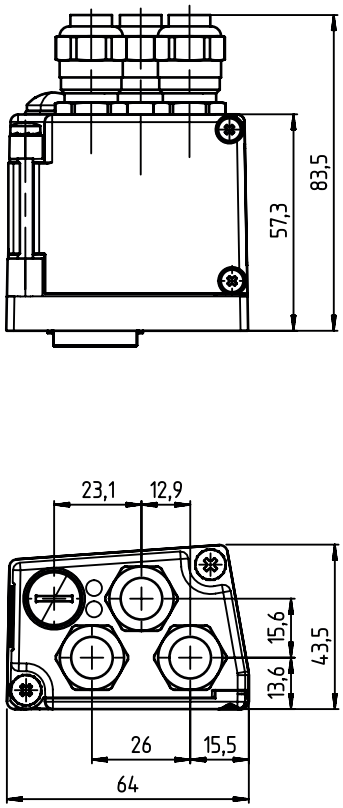
Fig. 11.4: Dimensioned drawing BPS with MK 3007 connection hood

11.4 Dimensioned drawings: Accessories



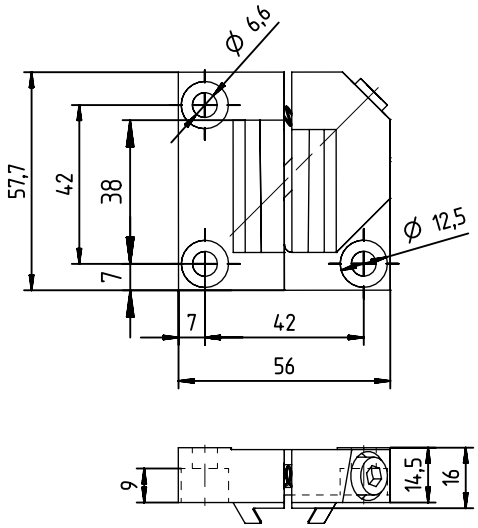
all dimensions in mm

Fig. 11.5: Dimensioned drawing MS 3007 connection hood



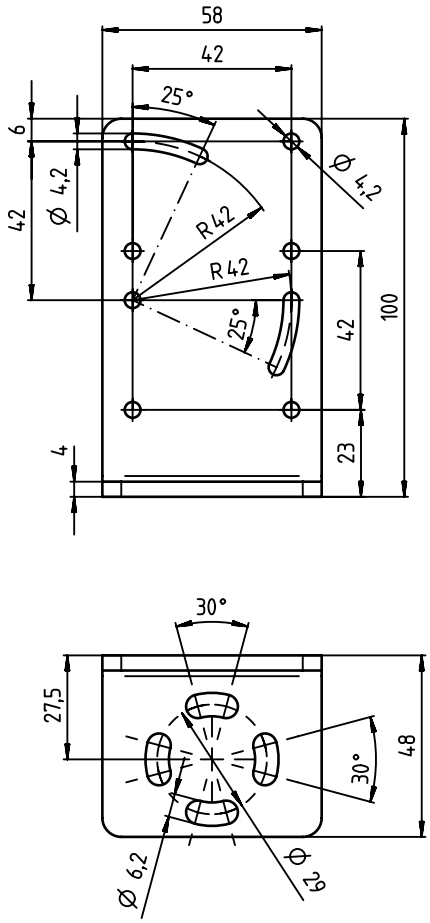
all dimensions in mm

Fig. 11.6: Dimensioned drawing MK 3007 connection hood



all dimensions in mm

Fig. 11.7: Dimensioned drawing BTU 0300M-W mounting device



all dimensions in mm

Fig. 11.8: Dimensioned drawing BT 300-W mounting bracket

11.5 Dimensioned drawing bar code tape

all dimensions in mm

Fig. 11.9: Dimensioned drawing bar code tape … G40 … with 40 mm grid

12 Order guide and accessories

12.1 Type overview

Tab. 12.1: BPS 3007i type overview

Part no.	Part designation	Description
50148805	BPS 3007i SM 100	BPS with SSI interface

12.2 Connection hoods

Tab. 12.2: BPS connection hoods

Part no.	Part designation	Description
50148808	MS 3007	Connection hood with M12 connectors
50148809	MK 3007	Connection hood with spring-cage terminals

12.3 Cables accessories

Tab. 12.3: Accessories – PWR connection cable (voltage supply)

Part no.	Part designation	Description
50132079	KD U-M12-5A-V1-050	PWR connection cable, M12 socket for PWR, axial plug outlet, open cable end, cable length 5 m, not shielded
50132080	KD U-M12-5A-V1-100	PWR connection cable, M12 socket for PWR, axial plug outlet, open cable end, cable length 10 m, not shielded

Tab. 12.4: Accessories – SSI/Interbus connection cable (only for RS 232)

Part no.	Part designation	Description
M12 plug for SSI/Interbus, axial connector, open line end		
50104172	KB SSI/IBS-2000-BA	SSI/Interbus connection cable, length 2 m
50104171	KB SSI/IBS-5000-BA	SSI/Interbus connection cable, length 5 m
50104170	KB SSI/IBS-10000-BA	SSI/Interbus connection cable, length 10 m
50104169	KB SSI/IBS-15000-BA	SSI/Interbus connection cable, length 15 m
50108446	KB SSI/IBS-30000-BA	SSI/Interbus connection cable, length 30 m

12.4 Other accessories

Tab. 12.5: Accessories – BPS connectors

Part no.	Part designation	Description
50020501	KD 095-5A	M12 axial socket for voltage supply, shielded
50038538	KD 02-5-BA	M12 axial socket, B-coded, for SSI, shielded

Tab. 12.6: Mounting device accessories

Part no.	Part designation	Description
50124941	BTU 0300M-W	Mounting device for wall mounting – precise alignment of the BPS without adjustment (easy-mount).
50121433	BT 300 W	Mounting bracket

12.5 Bar code tapes

12.5.1 Standard bar code tapes

Leuze offers a wide selection of standardized bar code tapes.

Tab. 12.7: Data for standard bar code tapes

Feature	Value
Grid dimensions	40 mm (… G40 …)
Height	47 mm 25 mm
Length	5 m 10 m, 20 m … in 10 m increments up to 150 m 200 m
Length graduation	10 m
Tape start value	0

- Standard bar code tapes are printed below the bar code with the corresponding position value.
- The bar code tapes are wound and delivered on a core.

All available standard tapes are listed on the Leuze website under the currently selected BPS device in the *Accessories* tab.

12.5.2 Special bar code tapes

Special tapes are produced according to customer specifications.

Tab. 12.8: Data for special bar code tapes

Feature	Value
Grid dimensions	40 mm (BCB G40 …)
Height	20 mm – 140 mm in millimeter increments
Length	According to customer specifications, maximum 10,000 m
Tape start value	According to customer specifications
Tape end value	According to customer specifications, maximum tape end value at 10,000 m

- Special bar code tapes are printed below the bar code with the corresponding position value.
- Special bar code tapes over 300 m in length are wound and delivered on multiple rolls.

An entry wizard is available for special bar code tapes on the Leuze website under devices BPS 3000i - *Accessories* tab. The entry wizard provides support when entering the individual pieces of tape data and creates a query or order form with the correct part number and type designation.

12.5.3 Twin tapes

Twin tapes are special bar code tapes and are produced according to customer specifications.

Tab. 12.9: Data for Twin tapes

Feature	Value
Grid dimensions	40 mm (BCB G40 …)
Height	20 mm – 140 mm in millimeter increments
Length	According to customer specifications, maximum 10,000 m
Tape start value	According to customer specifications
Tape end value	According to customer specifications, maximum tape end value at 10,000 m

- Two identical tapes are delivered in one package. The tape values as well as the tape tolerances are identical on both tapes. The tapes are printed with the position value in plain text below and above the bar code.
- Twin tapes over 300 m in length are wound and delivered on multiple rolls.

An entry wizard for twin tapes with custom tape start value, tape end value, custom length and height is available on the Leuze website under devices BPS 3000i - *Accessories* tab. The entry wizard provides support when entering the individual pieces of tape data and creates a query or order form with the correct part number and type designation.

12.5.4 Repair tapes

Repair tapes are produced according to customer specifications.

Tab. 12.10: Data for repair tapes

Feature	Value
Grid dimensions	40 mm (BCB G40 …)
Height	47 mm 25 mm
Length	According to customer specifications, maximum 5 m
Tape start value	According to customer specifications
Tape end value	According to customer specifications

- Repair tapes longer than 5 m must be ordered as special tapes.
- Repair tapes are printed below the bar code with the corresponding position value.
- Repair tapes are usually delivered wound on a roll.

An entry wizard is available for repair tapes on the Leuze website under devices BPS 3000i - *Accessories* tab. The entry wizard provides support when entering the individual pieces of tape data and creates a query or order form with the correct part number and type designation.

13 EC Declaration of Conformity

The bar code positioning systems of the BPS 3000i series have been developed and manufactured in accordance with the applicable European standards and directives.

14 Appendix

14.1 Bar code sample

Bar code tape … G40 … with 40 mm grid

Fig. 14.1: Continuous, 40 mm grid