Leuze electronic

the sensor people

SMART SENSOR BUSINESS

BPS 8

Bar code positioning system

en 02-2016/10 50105556
We reserve the right to make technical changes

Original operating instructions

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1 General information

1.1 Explanation of symbols

The symbols used in this technical description are explained below.

Attention!

This symbol precedes text messages which must strictly be observed. Failure to observe the provided instructions could lead to personal injury or damage to equipment.

Attention Laser!

This symbol warns of possible danger through hazardous laser radiation.

Note!

This symbol indicates text passages containing important information.

1.2 Declaration of Conformity

The bar code positioning system BPS 8 and the optional modular connection unit MA 8 have been developed and manufactured in accordance with the applicable European standards and directives.

Note!

A copy of all declarations of conformity available for the product can be found in the appendix of this handbook (see chapter 13.1 "EC Declaration of Conformity" on Page 93).

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

2 Safety

The bar code positioning systems of the BPS 8 series and the MA 8-01 modular connection unit have been developed, produced and tested subject to the applicable safety standards. They correspond to the state of the art.

2.1 Intended use

The bar code positioning system of the BPS 8 series is an optical measuring system which uses visible red laser light to determine the position of the BPS relative to a permanently mounted bar code tape.

The optional connector and interface unit MA 8-01 is intended for the easy connection of bar code positioning systems of type BPS 8.

Areas of application

The BPS 8 bar code positioning systems are designed for the following areas of application:

- Crane bridges and trolleys
- Side-tracking skates
- Telpher lines
- Elevators

CAUTION

Observe intended use!

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

NOTE

Comply with conditions and regulations!

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

Attention

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

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
- as stand-alone safety component in accordance with the machinery directive [1]
- for medical purposes

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

2.3 Competent persons

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

Prerequisites for competent persons:

- They have a suitable technical education.
- They are familiar with the rules and regulations for occupational safety and safety at work.
- They are familiar with the technical description 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

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.

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

2.5 Laser safety notices

ATTENTION, LASER RADIATION – LASER CLASS 2

Never look directly into the beam!

The device satisfies the requirements of IEC 60825-1:2007 (EN 60825-1:2007) safety regulations for a product of **laser class 2** as well as the U.S. 21 CFR 1040.10 regulations with deviations corresponding to "Laser Notice No. 50" from June 24, 2007.

- Never look directly into the laser beam or in the direction of reflected laser beams!
  If you look into the beam path over a longer time period, there is a risk of injury to the retina.
- Do not point the laser beam of the device at persons!
- Interrupt the laser beam using a non-transparent, non-reflective object if the laser beam is accidentally directed towards a person.
- When mounting and aligning the device, avoid reflections of the laser beam off reflective surfaces!
- CAUTION! The use of operating or adjusting devices other than those specified here or carrying out of differing procedures may lead to dangerous exposure to radiation.
- Observe the applicable statutory and local laser protection regulations.
- The device must not be tampered with and must not be changed in any way.
  There are no user-serviceable parts inside the device.
  Repairs must only be performed by Leuze electronic GmbH + Co. KG.

NOTE

Affix laser information and warning signs!

Laser warning and laser information signs are affixed to the device (see Figure 2.1):

In addition, self-adhesive laser warning and information signs (stick-on labels) are supplied in several languages (see Figure 2.2).

- Affix the laser information sheet to the device in the language appropriate for the place of use.
  When using the device in the U.S.A., use the stick-on label with the "Complies with 21 CFR 1040.10" notice.
- Affix the laser information and warning signs near the device if no signs are attached to the device (e.g., because the device is too small) or if the attached laser information and warning signs are concealed due to the installation position.
  Affix the laser information and warning signs so that they are legible without exposing the reader to the laser radiation of the device or other optical radiation.

A Laser aperture
B Laser warning sign
C Laser information sign with laser parameters

Figure 2.1:Laser apertures, laser warning signs

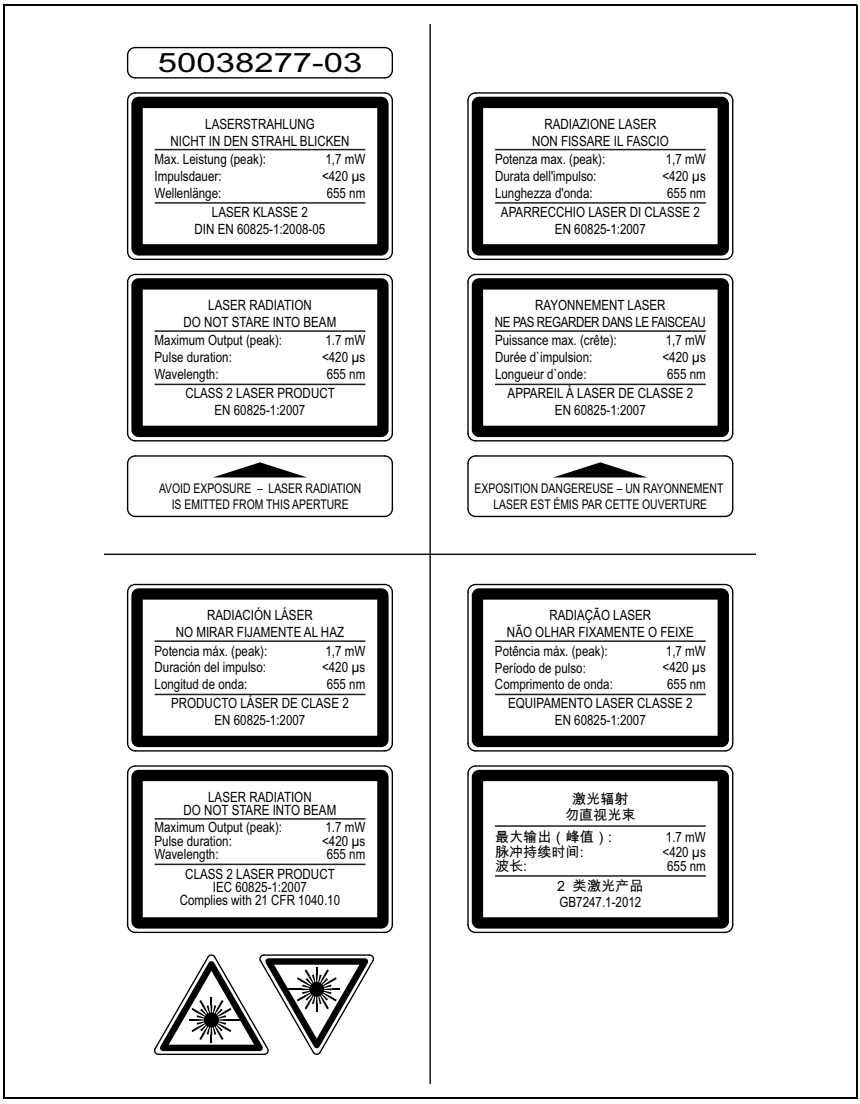


Figure 2.2:Laser warning and information signs – supplied stick-on labels

3 Fast commissioning steps at a glance

Note!

*Below you will find a **short description for the initial commissioning** of the bar code positioning system BPS 8. Detailed explanations of all listed points can be found throughout the handbook.*

Description of the BPS 8 functions

The BPS 8 uses visible red laser light to determine its position relative to the bar code tape. This essentially takes place in three steps:

1. Reading a code on the bar code tape
2. Determining the position of the read code in the scanning area of the scanning beam
3. Calculating the position to within a millimeter using the code information and the code position relative to the device's center.

The position value is then output via the interface.

① Mechanical design

Mounting the bar code tape

The bar code tape is to be affixed without tension to a dust- and grease-free mounting surface.

→ Chapter 6.3 **on Page 30**

Mounting the BPS 8 device

There are 2 different types of mounting arrangements for the BPS 8:

1. Directly, using the 2 through holes in the housing.
2. Using a mounting device (BT 8-01) on the through holes.

Note!

The installation dimensions listed in Figure 3.1 and Figure 3.2 must absolutely be adhered to. Optically, it must be ensured that the scanner has an unobstructed view of the bar code tape at all times. ➔ Chapter 7.2 **on Page 41**

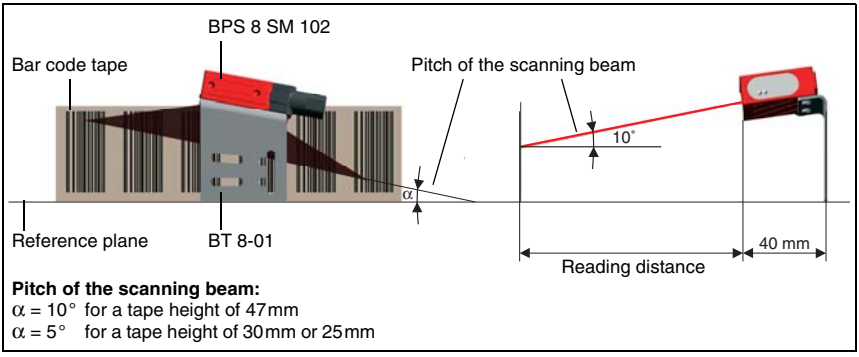
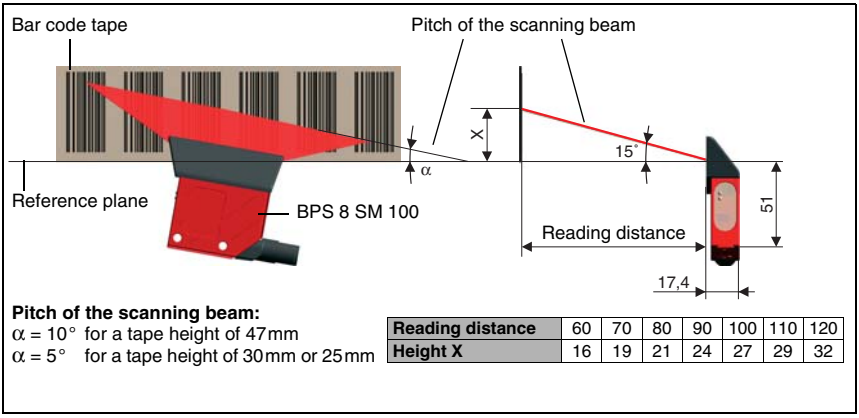


Figure 3.1:Beam exit and device arrangement of the BPS 8 SM 102

Note!

During mounting, the angle of inclination α must be taken into account in the vertical axis:
10° for a tape height of 47mm,
5° for a tape height of 30mm or 25 mm,
the working range of the reading field curve must also be taken into account.



Reading distance	60	70	80	90	100	110	120
Height X	16	19	21	24	27	29	32

Figure 3.2:Beam exit and device arrangement of the BPS 8 SM 100

Note!

During mounting, the angle of inclination α must be taken into account in the vertical axis:
10° for a tape height of 47mm,
5° for a tape height of 30mm or 25 mm,
the working range of the reading field curve must also be taken into account.

➔ Chapter 7.1 **on Page 38**

Attention!

For the position calculation, the scanning beam of the BPS 8 must be incident on the bar code tape without interruption. Ensure that the scanning beam is always incident on the bar code tape when the system is moving.

Connecting the voltage supply and interface

② *Connecting the voltage supply/RS 232 directly to the BPS 8*

The voltage supply and the RS 232 interface is connected via the M12 connection **PWR IN on the BPS 8**.

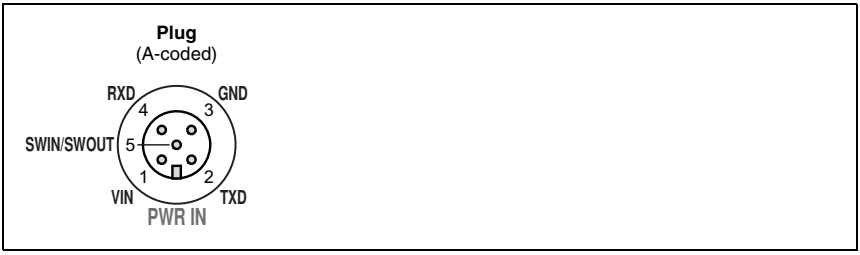


Figure 3.3:BPS 8 - assignment M12 connector PWR IN

③ *Connecting the voltage supply/RS 485 to the MA 8-01*

The BPS 8 is connected to the MA 8-01 via the interconnection cable KB 008-1000AA. The voltage supply and the RS 485 interface are connected to the MA 8-01 via the M12 connection **PWR IN HOST/RS485**.

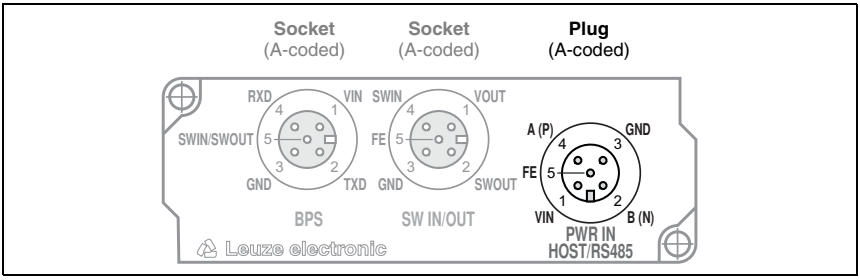


Figure 3.4:BPS 8 - Connection of voltage supply and RS 485 at the MA 8-01

④ *Connecting the switching input / switching output to the MA 8-01*

The switching input and the switching output are connected via the M12 connection **SW IN/OUT** to the MA 8-01.

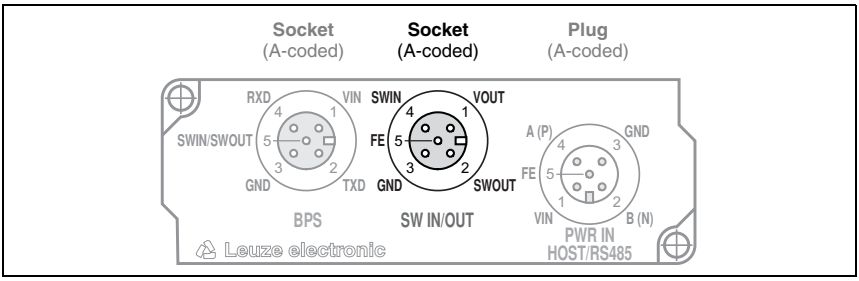


Figure 3.5:BPS 8 - Connection of switching input/output to the MA 8-01

⑤ *Connecting the BPS 8 to the MA 8-01*

The BPS 8 is connected to the MA 8-01 via the interconnection cable KB 008-1000AA. The connection to the MA 8-01 is made via the M12 connector **BPS**.

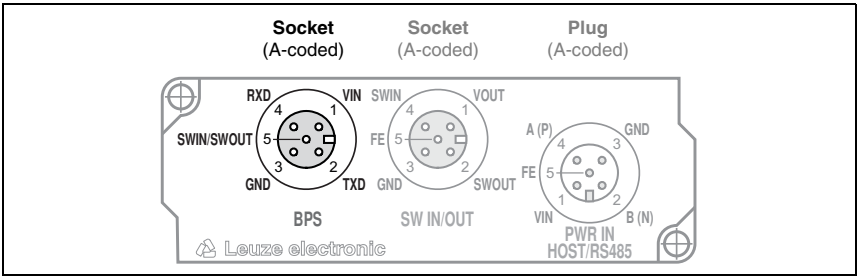


Figure 3.6:BPS 8 - Connection to the MA 8-01

4 Technical data of BPS 8

4.1 General specifications BPS 8

Optical data	
Light source	Laser diode
Beam deflection	Via rotating polygon wheel
Reading distance	See reading field (Figure 4.11 and Figure 4.12 on Page 24)
Optical window	Glass with scratch-resistant indium coating
Laser class	2 acc. to IEC 60825-1:2007
Wavelength	655 nm
Max. output power (peak)	1.7 mW
Impulse duration	< 420 µs
Measurement data	
Reproducible accuracy	±1 (2) mm
Response time	26.6 ms (configurable)
Output time	3.3 ms
Basis for contouring error calculation	13.3 ms
Working range	BPS 8 SM 102: 80 … 140 mm BPS 8 SM 100: 60 … 120 mm
Max. traverse rate	4 m/s
Electrical data	
Interface type	RS 232, RS 485 in combination with MA 8-01
Service interface	RS 232 directly at the BPS 8, RS 485 via MA 8-01, with default data format, 9600 Bd, 8 data bits, no parity, 1 stop bit
Switching input / switching output	1 switching input, 1 switching output, each is programmable, only in combination with MA 8-01
Green LED	Device ready (power on)
Operating voltage [1)]	BPS 8: 4.9 … 5.4 VDC With MA 8-01: 10 … 30 VDC
Power consumption	BPS 8: 1.5 W With MA 8-01: max. 2 W
Mechanical data	
Degree of protection	IP 67
Weight	70 g
Dimensions (H x W x D)	48 x 40.3 x 15 mm
Housing	Diecast zinc

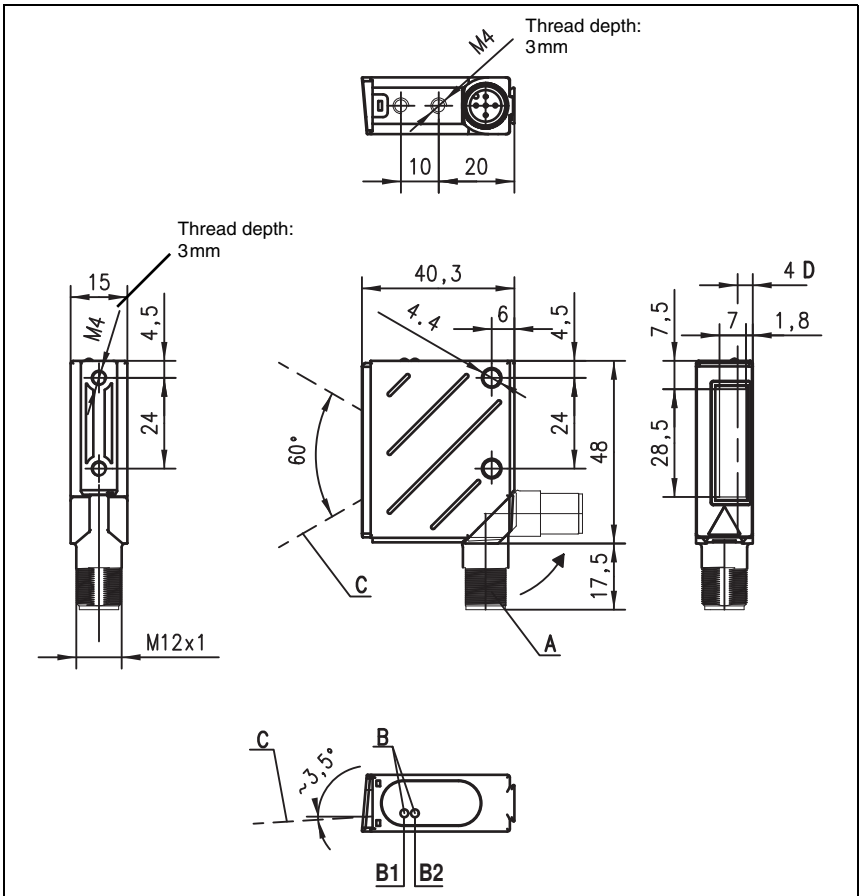
Environmental data	
Operating temperature range	0 °C … -40 °C
Storage temperature range	-20 °C … -60 °C
Air humidity	Max. 90% rel. humidity, non-condensing
Vibration	IEC 60068-2-6, test Fc
Shock	IEC 60068-2-27, test Ea
Continuous shock	IEC 60068-2-29, test Eb
Electromagnetic compatibility	EN 55022, EN 55024, EN 61000-4-2, -3, -4 and -6, EN 61000-6-2 and -3
Conformity	CE, CDRH
Certifications [1) 2)]	UL 60950-1, CSA C22.2 No.60950-1
Bar code tape	
Max. length (measurement length)	10,000 m [3)]
Ambient temperature	-40 °C … -120 °C
Mech. properties	Scratch and wipe resistant, UV resistant, moisture resistant, partly chemical resistant

1) For UL applications: use is permitted exclusively in Class 2 circuits according to NEC
2) These sensors shall be used with UL Listed Cable assemblies rated 30V, 0.5A min, in the field installation, or equivalent (categories: CYJV/CYJV7 or PVVA/PVVA7)
3) Depends on the transmission protocol and on the configured resolution.

Table 4.1: General specifications

4.2 Dimensioned drawings

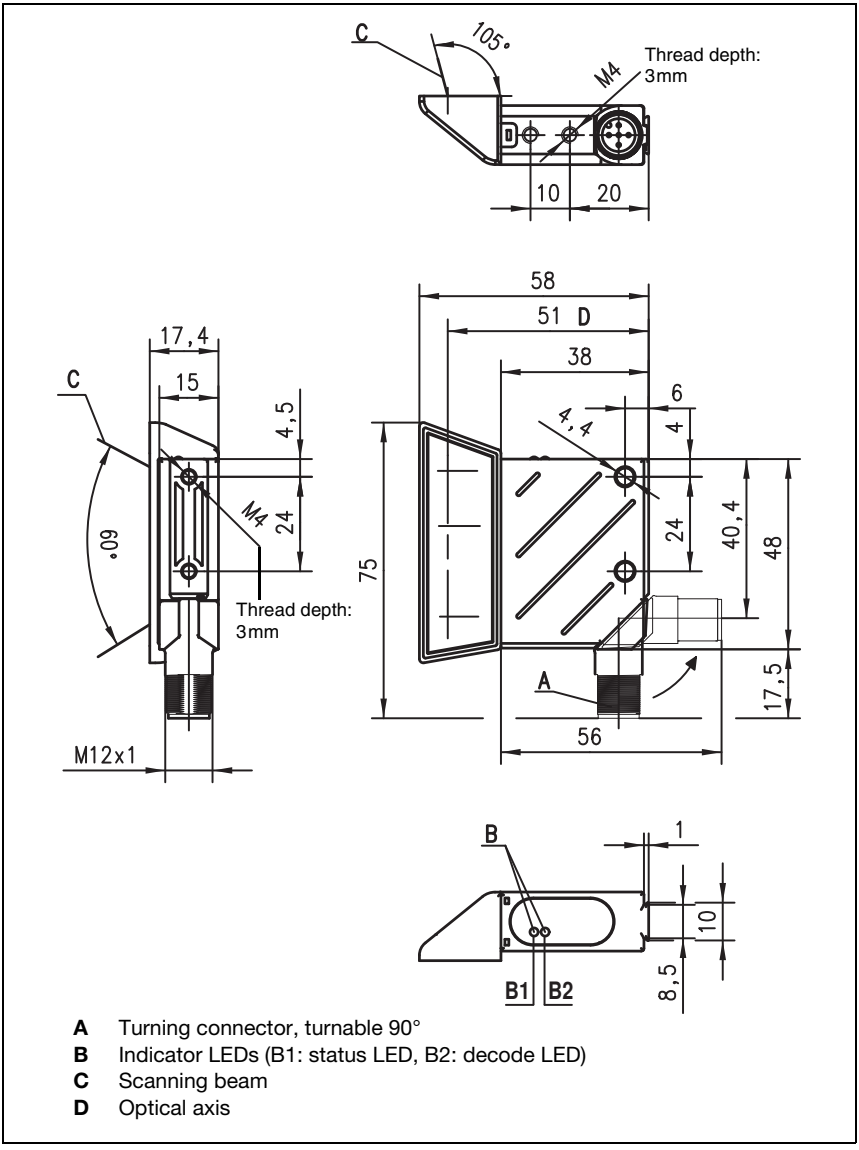
BPS 8 SM 102-01 bar code positioning system with front beam exit



A Turning connector, turnable 90°
B Indicator LEDs (B1: status LED, B2: decode LED)
C Scanning beam
D Optical axis

Figure 4.1:BPS 8 SM 102-01 dimensioned drawing

BPS 8 SM 100-01 bar code positioning system with lateral beam exit



A Turning connector, turnable 90°
B Indicator LEDs (B1: status LED, B2: decode LED)
C Scanning beam
D Optical axis

Figure 4.2:BPS 8 SM 100-01 dimensioned drawing

4.3 Electrical connection

The BPS 8 is connected to the MA 8-01 via the M12 cable KB 008-… . For the locations of the individual device connections, please refer to the device detail shown in Figure 4.3.

The corresponding mating connectors and ready-made cables are available as accessories for all connections. For additional information, refer to Chapter 11 starting on Page 90.

Attention!

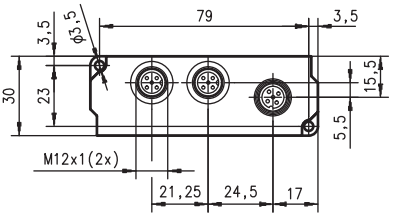
Connection of the device and cleaning must only be carried out by a qualified electrician.

If faults cannot be cleared, the device should be switched off and protected against accidental use.

Before connecting the device, be sure that the supply voltage agrees with the value printed on the respective name plate of the BPS 8 or the MA 8-01.

The power supply unit for the generation of the supply voltage for the BPS 8 and the respective connection units must have a secure electrical insulation through double insulation and safety transformers according to EN 60742 (corresponds to IEC 60742).

Ensure the device is correctly earthed. Unimpaired operation is only guaranteed when the functional earth is connected properly.



all dimensions in mm

PWR IN HOST/RS485 = Voltage supply/RS 485 host interface
SW IN/OUT = Switching input/output
BPS = Connection to BPS 8

Note!

The SW IN/OUT connection is sealed with a thread plug upon delivery.

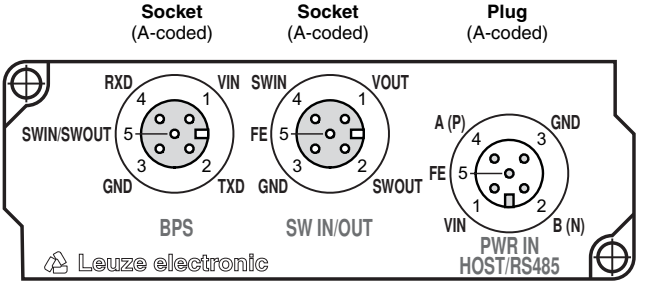


Figure 4.3:Pin assignment - MA 8-01

Attention!

Degree of protection IP 67 is achieved only if the connectors and caps are screwed into place!

4.3.1 BPS 8 - PWR IN - Voltage supply, RS 232, Switching input/output

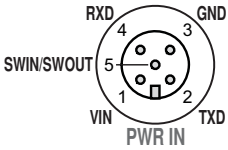
PWR IN (5-pin plug, A-coded)			
 **M12 plug (A-coded)**	**Pin**	**Name**	**Comment**
	1	VIN	Positive supply voltage: +4.9 … +5.4 VDC
	2	TXD	RS 232 transmission line
	3	GND	Supply voltage: 0 VDC
	4	RXD	RS 232 receiving line
	5	SWIN/ SWOUT	Configurable switching input/output
	Thread	FE	Functional earth (housing)

Figure 4.4:BPS 8 - Pin assignment PWR IN

Note!

*The switching input/switching output are programmed via the parameters in the configuration software **BPS Configuration Tool** in the tabs Switching input and Switching output. For more information see also Chapter 8.1.6.20 and Chapter 8.1.6.22, Page 63 et seq.*

Attention!

Degree of protection IP 67 is achieved only if the connectors and caps are screwed into place!

4.3.2 MA 8-01 - PWR IN HOST/RS485 - Voltage supply and RS 485

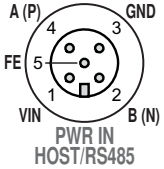
PWR IN HOST/RS485 (5-pin plug, A-coded)			
 **M12 plug (A-coded)**	**Pin**	**Name**	**Comment**
	1	**VIN**	Positive supply voltage: +10 … +30 VDC
	2	**B (N)**	RS 485 receive/transmit data B-line (N)
	3	**GND**	Supply voltage: 0 VDC
	4	**A (P)**	Receive/transmit data A-line (P)
	5	**FE**	Functional earth
	Thread	**FE**	Functional earth (housing)

Figure 4.5:MA 8-01 - Pin assignment PWR IN HOST/RS485

Attention!

Degree of protection IP 67 is achieved only if the connectors and caps are screwed into place!

4.3.3 MA 8-01 - SW IN/OUT - switching input and switching output

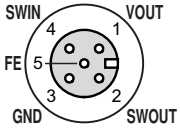
SW IN/OUT (5-pin socket, A-coded)			
 SW IN/OUT **M12 socket (A-coded)**	**Pin**	**Name**	**Comment**
	1	**VOUT**	Voltage supply for sensor system (VOUT identical to VIN at PWR IN)
	2	**SWOUT**	Switching output
	3	**GND**	GND for the sensor system
	4	**SWIN**	Switching input
	5	**FE**	Functional earth
	Thread	**FE**	Functional earth (housing)

Figure 4.6:MA 8-01 - Pin assignment SW IN/OUT

Attention!

Degree of protection IP 67 is achieved only if the connectors and caps are screwed into place!

Note!

*The switching input/switching output are programmed via the parameters in the configuration software **BPS Configuration Tool** in the tabs Switching input and Switching output. For more information see also Chapter 8.1.6.20 and Chapter 8.1.6.22, Page 63 et seq.*

Attention!

If you use a sensor with a standard M 12 connector, please note the following:

*Use **only sensors** on which the **switching output does not lie on pin 2** or **sensor cables on which pin 2 is not assigned**. Otherwise, the switching output is not protected against feedback on the switching input. If the inverted sensor output lies on pin 2, for example, erroneous behavior of the switching output will result.*

Connecting the switching input / switching output

The MA 8-01 is provided with a switching input and a switching output. The connection of switching input / switching output is carried out in accordance with Figure 4.7.

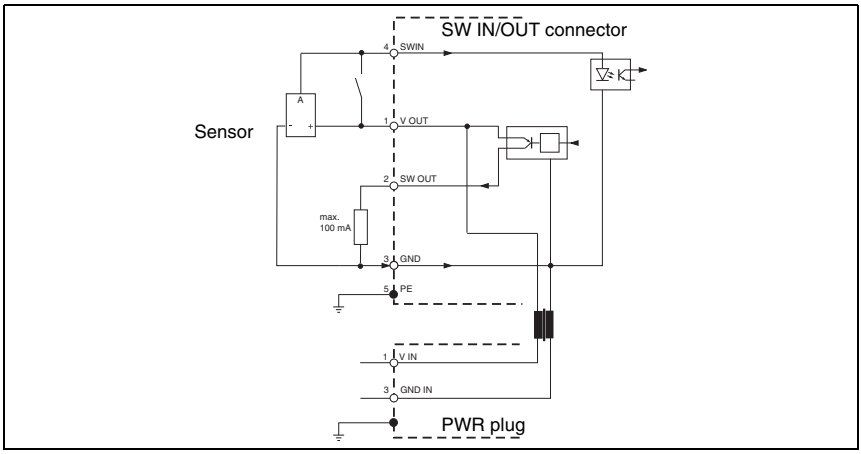


Figure 4.7:Connecting the switching input / switching output of the MA 8-01

4.3.4 MA 8-01 - BPS - Connecting the BPS 8 to the MA 8-01

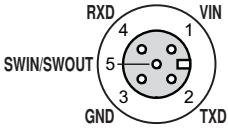
BPS (5-pin socket, A-coded)			
 **M12 socket (A-coded)**	**Pin**	**Name**	**Comment**
	1	VIN	Supply voltage for BPS 8 +4.9 … +5.4 VDC
	2	TXD	RS 232 transmission line
	3	GND	Supply voltage: 0 VDC
	4	RXD	RS 232 receiving line
	5	SWIN/ SWOUT	Programmable switching input/output of the BPS 8
	Thread	FE	Functional earth (housing)

Figure 4.8:MA 8-01 - Pin assignment BPS

Attention!

Degree of protection IP 67 is achieved only if the connectors and caps are screwed into place!

The BPS 8 is connected to the MA 8-01 via the interconnection cable KB 008-1000/2000/3000 (AA/AR). The voltage supply is connected via the **PWR IN HOST/RS485** socket.

Attention!

It is absolutely necessary to connect the functional earth, since all electrical interference (EMC coupling) is discharged via the functional earth connection.

The voltage for the MA 8-01 is supplied via the interconnection cable KB 008-10000/5000/3000 (A/R).

Contact assignment of KB 008-10000/5000/3000 (A/R)

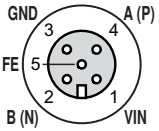
PWR connection cable (5-pin socket, A-coded)			
 **M12 socket (A-coded)**	**Pin**	**Name**	**Core color**
	1	VIN	**Brown**
	2	B (N)	**White**
	3	GND	**Blue**
	4	A (P)	**Black**
	5	FE	**Gray**
	Thread	FE	**Shield**

Figure 4.9:Contact assignment KB 008-10000/5000/3000 (A/R)

4.3.5 Connecting the RS 485 interface

The RS 485 interface is connected to pins 2 and 4 of the M12 plug **PWR IN HOST/RS485** at the MA 8-01.

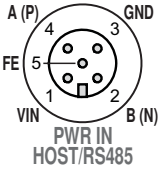
PWR IN HOST/RS485 (5-pin plug, A-coded)			
 **M12 plug (A-coded)**	**Pin**	**Name**	**Comment**
	1	**VIN**	Positive supply voltage: +10 … +30 V DC
	2	**B (N)**	RS 485 receive/transmit data B-line (N)
	3	**GND**	Supply voltage: 0 V DC
	4	**A (P)**	Receive/transmit data A-line (P)
	5	**FE**	Functional earth
	Thread	**FE**	Functional earth (housing)

Figure 4.10:MA 8-01 - Pin assignment PWR IN HOST/RS485

Note!

The entire interconnection cable must be shielded and earthed.

Attention!

It is absolutely necessary to connect the functional earth, since all electrical interference (EMC coupling) is discharged via the functional earth connection.

Connecting the functional earth FE

- **BPS 8 without cable**:
  connect **FE** to the BPS 8 housing and the cable shield!
- **BPS 8 with cable** KB 008-10000/5000/3000 (A/R):
  connect **FE** to the shield!
- **BPS 8 with cable** KB 008-3000/2000/1000 (AA/AR) **and MA 8-01**:
  connect **FE** to voltage supply shield to MA 8-01 or connect the functional earth to pin 5 of the **PWR IN** connector!

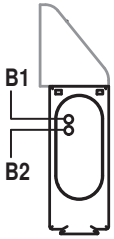
Cable lengths and shielding

The following maximum cable lengths and shielding types must be observed:

Connection	Interface	Max. cable length	Shielding
BPS 8 - Service	RS 232	10 m	Absolutely required, sheath of a shielded line
BPS 8/MA 8-01 - Host	RS 485	25 m	Absolutely required, shielded
Switching input		10 m	Not necessary
Switching output		10 m	Not necessary

4.4 Description of the LED states

Two 3-color-LEDs at the top of the BPS 8 case show the device and reading status (see dimensioned drawings Page 15 et seq.).

	LED	State	Meaning
	**Status LED (B1)**	Off	No supply voltage
		Green, flashing	Initialization of the device
		Green, continuous light	Operational readiness
		Red, flashing	Warning
		Red, continuous light	Error, no function possible
		Orange, flashing	Service operation active
	Decode LED (B2)	Off	Positioning deactivated
		Green, continuous light	Positioning running (position value valid)
		Red, continuous light	Positioning running (position value invalid)
		Orange, continuous light	Positioning running (marker label detected)

4.5 Reading field curves

BPS 8 SM 102 with front beam exit

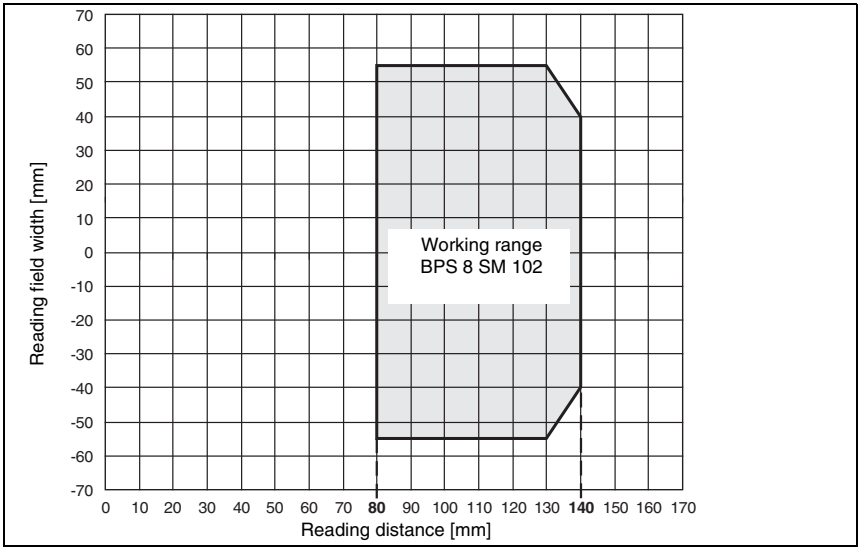


Figure 4.11:Reading field curve BPS 8 SM 102 with front beam exit

BPS 8 SM 100 with lateral beam exit

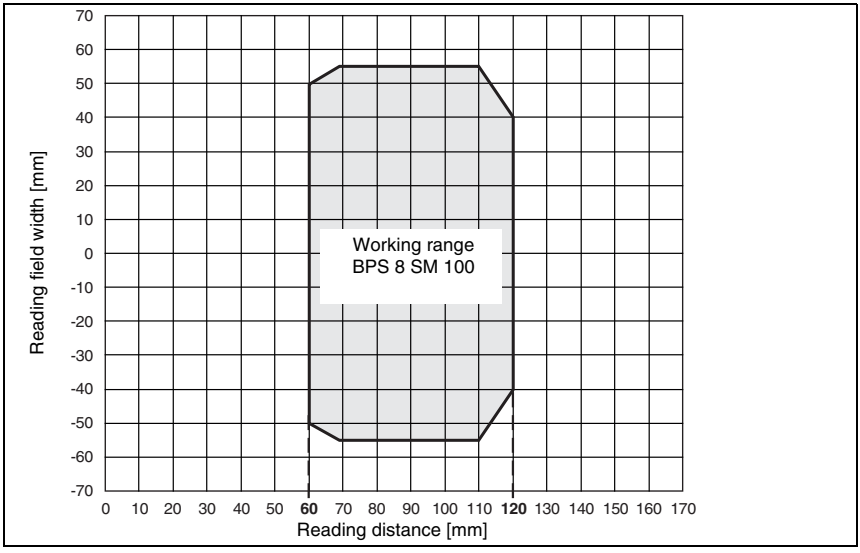


Figure 4.12:Reading field curve BPS 8 SM 100 with lateral beam exit

5 Connection unit

5.1 MA 8-01 modular connection unit

Using the RS 485 interface in a BPS 8 system always requires a MA 8-01 connection unit. The connection unit is not only used to connect to the supply voltage and the RS 485 interface, it also permits a switching input and switching output to be connected via a standard sensor connector, and connection to the BPS 8 system via ready-made cables.

5.1.1 General information

The modular connection unit is an indispensable accessory when connecting a BPS 8 to an RS 485 interface. The RS 485 interface, the switching input and the switching output are all connected to the MA 8-01. It also supplies voltage to the BPS 8.

MA 8-01

The MA 8-01 offers the following interfaces:

- M12 connection for RS 485 interface **HOST/RS485**
- M12 connection for voltage supply **PWR IN**
- M12 connection for switching input and switching output **SW IN/OUT**
- M12 connection for BPS 8 **BPS**

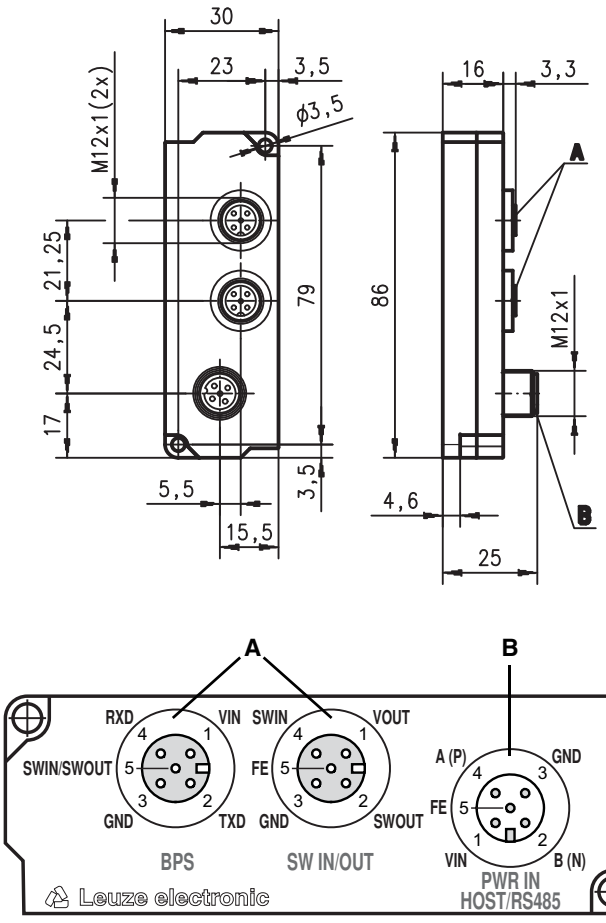
5.1.2 Technical data of the connection unit

Mechanical data	
Degree of protection	IP 67[1)]
Weight	70g
Dimensions (H x W x D)	86 x 30 x 25 mm
Housing	Plastic
Connection type	M12 connectors
Environmental data	
Operating temperature range	0°C … +50°C
Storage temperature range	-30 °C … -80 °C
Air humidity	Max. 90% rel. humidity, non-condensing
Standards applied	IEC 801
Electromagnetic compatibility	EN 55022, EN 61000-4-2, -3, -4 and -6, EN 61326-1, CISPR 22, class B, ITE FCC Part 15, Class B, ITE

1) With M12 connectors/caps screwed into place

5.1.3 Dimensioned drawings

MA 8-01



A M12 socket, 5-pin, A-coded
B M12 plug, 5-pin, A-coded

Figure 5.1:Dimensioned drawing and position/designation of the MA 8-01 connectors

5.1.4 Electrical connection

Electrical data

Interface type	RS 485
Service interface	**No MA 8-01 connected**: RS 232 with default data format, 9600 Bd, 8 data bits, no parity, 1 stop bit **With MA 8-01 connected**: RS 485 replaces RS 232
Switching input/output	1 switching input, 1 switching output, each is programmable Switching input: 10 … 30 V DC Switching output: I_{max} = 100 mA output voltage = operating voltage
Operating voltage	10 … 30 V DC
Power consumption	Max. 0.5 W

5.1.5 Termination of the RS 485 interface

A permanently installed termination network is present in the MA 8-01. The network terminates the outgoing RS 485 data interface, as shown in Figure 5.2, and cannot be switched off.

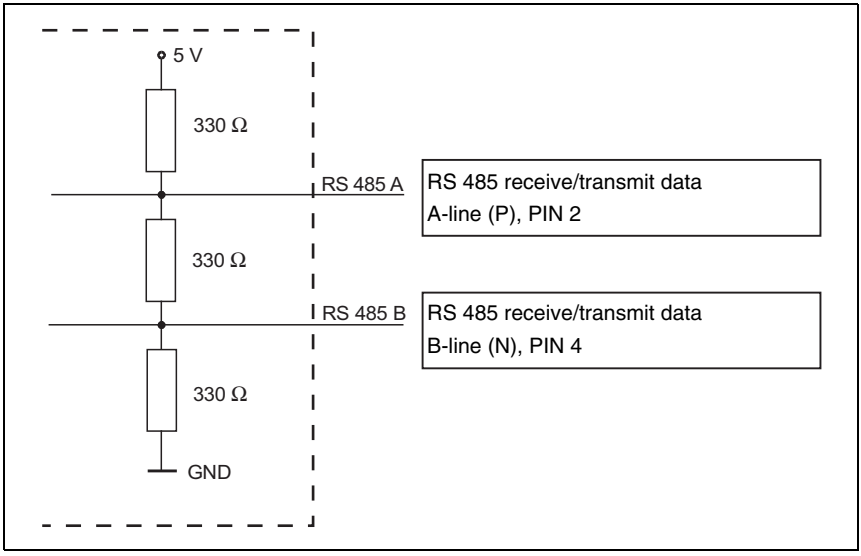


Figure 5.2:Termination of the RS 485 interface in the MA 8-01

6 Bar code tape

6.1 General information

The bar code tape (BCB) is delivered on a roll. A roll contains up to 200m of BCB, with the wrapping direction from the outside to the inside (smallest number on the outside). If a BCB is ordered which is considerably longer than 200m, the total length is divided into rolls of 200m each (see chapter 11.6 "Type overview: Bar code tape" on Page 91).

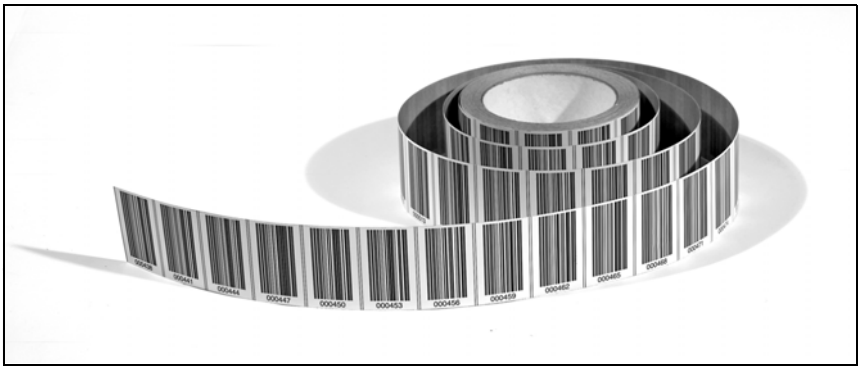


Figure 6.1:Roll with bar code tape

Features:

- Robust and durable polyester adhesive tape
- High dimensional stability
- Max. length 10,000m
- Self-adhesive, high adhesive strength

Note!

Unlike the BPS 3x systems, the BPS 8 is optimized for a ***BCB with position labels in a 30mm grid****.*

6.2 Technical data of the bar code tape

Dimensions		
Standard height	47 mm, or 30 mm and 25 mm	
Length	0 … 5 m, 0 … 10 m, 0 … 20 m, …, 0 … 150 m, 0 … 200 m, special lengths and special codings for lengths from 150 m, for details see order guide in Chapter 11.6, Page 91	
Structure		
Manufacturing process	Filmsetting	
Surface protection	Polyester, matt	
Base material	Polyester film, affixed without silicone	
Adhesive	Acrylate adhesive	
Strength of adhesive	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
Environmental data		
Processing temperature received	0 °C … -45 °C	
Temperature resistance	-40 °C … -120 °C	
Dimensional stability	No shrinkage, tested according to DIN 30646	
Curing	Final curing after 72 h, the position can be detected immediately by the BPS 8 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 fog (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	

Table 6.1: Technical data of the bar code tape

6.3 Mounting the bar code tape

To prevent deposits of dirt from forming, it is recommended that the BCB be affixed vertically, possibly below a roof-like cover. If the application does not permit this, permanent cleaning of the BCB by on-board cleaning devices such as brushes or sponges is not permitted in any case. Permanent on-board cleaning devices polish the BCB and give it a glossy finish. The reading quality deteriorates as a result.

Note!

When mounting the BCB, it must be ensured that neither strong sources of ambient light nor reflections of the base on which the BCB is affixed occur in the area of the scanning beam.

The recommended interruption points on the BCB are at the provided cut marks.

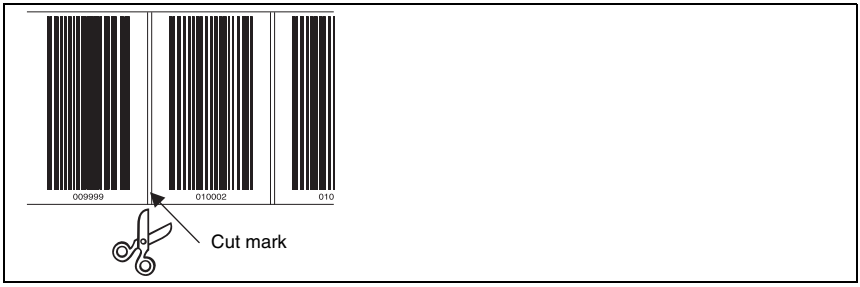


Figure 6.2:Cut mark on the bar code tape

Note!

Cutting the BCB and affixing the tape so that a gap forms which is so large that a label can no longer be reliably detected in the scanning beam results in double positions during the position calculation of the BPS. The gap must not be greater than the distance from one cut mark to the next (max. one label).

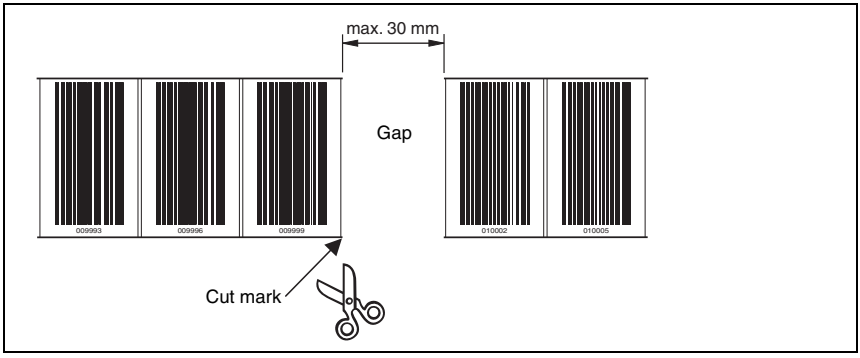


Figure 6.3:Gap in the cut bar code tape

Procedure:

- Check the surface. It must be flat, without warping, free of grease and dust, and 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.
- Never pull the BCB. Because this is a plastic tape, forceful pulling may stretch it. This results in a distortion of the measurement units on the tape. While the BPS 8 can still perform the position calculation, the accuracy in this case is no longer ensured. If the values are taught using a teach-in process, distortions are irrelevant.
- Expansion joints with widths up to several millimeters can simply be covered with the bar code tape. The tape must not be interrupted at this spot.
- Protruding screw heads can simply be taped over. Cut out the bar code which covers the screw head at the cut marks.
- If the application dictates the necessity of a gap, the tape is to be affixed over this gap and the affected cut marks cut out. If the gap is small enough that the scanning beam can detect the label to the left or to the right of the gap, measurement values are delivered without interruption. If the scanning beam cannot scan a label completely, the BPS 8 outputs a "tape error" message. As soon as the BPS 8 can scan a complete label again, it calculates the next position value.
- The maximum gap between two bar code positions without affecting the measurement value is 30 mm.

Note!

*If the bar code tape was damaged, e.g. by falling parts, a repair kit for the BCB 8 with a raster of 30 mm can be downloaded from the Internet (**www.leuze.com**).*

Attention!

Bar code tapes with different value ranges may not directly follow one another. If the value ranges are different, the gap between the two BCBs must be greater than the detection range of the scanning beam or control bar codes must be used (for further information, see also Chapter 6.4 on Page 33).

Note!

When working with the BCB in cold warehouses, it should be ensured that the BCB be affixed before the warehouse is cooled. However, if it should be necessary to work with the BCB at temperatures outside of the specified processing temperature, please make sure that the bonding surface as well as the BCB are at processing temperature.

Note!

When working with BCB in curves, the BCB should only be partially cut at the cut mark and affixed along the curve like a fan; it must also be ensured that the BCB is affixed without tension (see Figure 6.4).

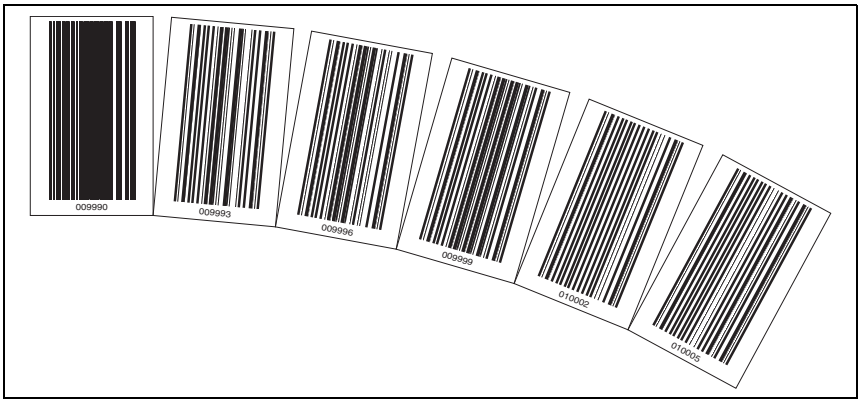


Figure 6.4:Partial cutting of the bar code tape in curves

6.4 Control bar codes

With the aid of control bar codes, which are simply affixed over the bar code tape at the necessary locations, functions can be activated and deactivated in the BPS 8.

Structure of the control bar codes

The control bar codes utilize code type **Code128** with character set **B**; the position bar codes, on the other hand, utilize **Code128** with character set **C**. **Code128** with character set **B** enables the display of all letters and numbers in the ASCII character set.

System arrangement

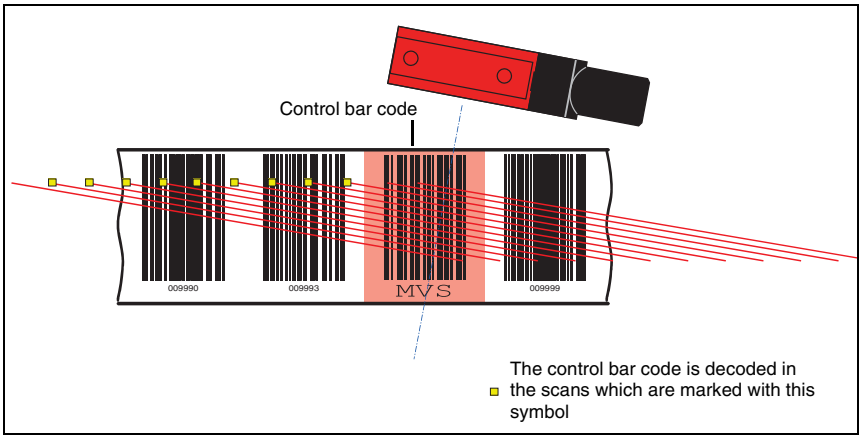


Figure 6.5:System arrangement of control bar codes

The control bar code is affixed either within one or between two bar code tapes in such a way that one position bar code is replaced or two bar code tapes are seamlessly connected to one another.

Attention!

It must be ensured that only one control bar code is located in the scanning beam at any one time. Thus, the minimum distance between two control bar codes is determined by the distance between the BPS and bar code tape and the resulting length of the scanning beam.

For error-free function, when using control bar codes it must absolutely be ensured that the distance between the BPS and bar code tape is selected large enough. The scanning beam of the BPS should cover three or more bar codes; this is ensured at a distance which lies in the working range of the reading field curve.

The control bar codes are simply affixed over the existing tape. When affixing the control bar codes, make certain to cover entire bar codes to ensure that a bar code spacing of 3cm is maintained.

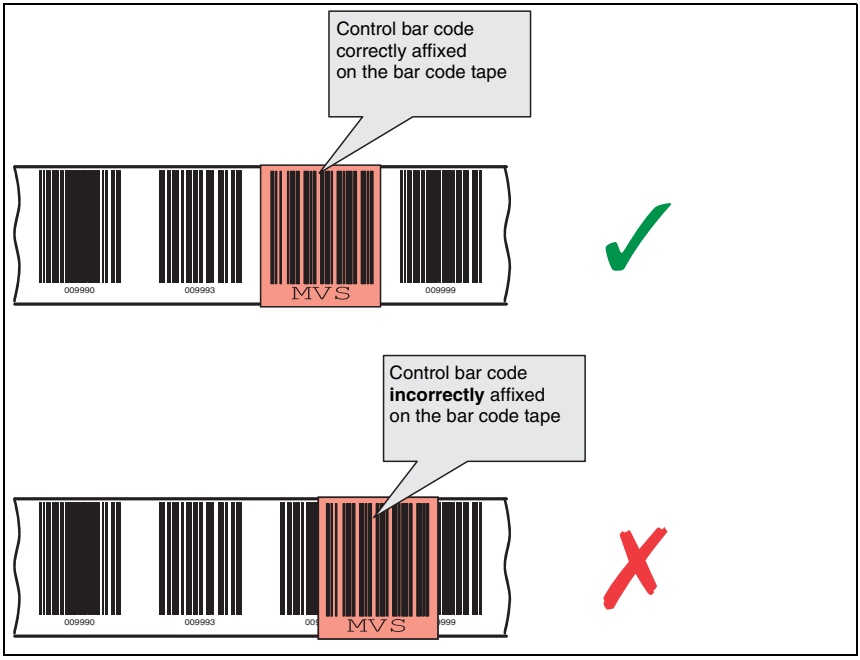


Figure 6.6:Correct positioning of the control bar code

6.4.1 Controllable functions

Measurement value switching between 2 bar code tapes with different value ranges

The "**MVS**" control bar code is used to switch between two bar code tapes. The end of one tape and the start of the next can end and begin, respectively, with completely different position bar codes. If the center of the BPS 8 reaches the transition point of the control bar code, the device switches to the second tape, provided the next position label is in its scanning beam. As a result, the output position can always be uniquely associated with one tape.

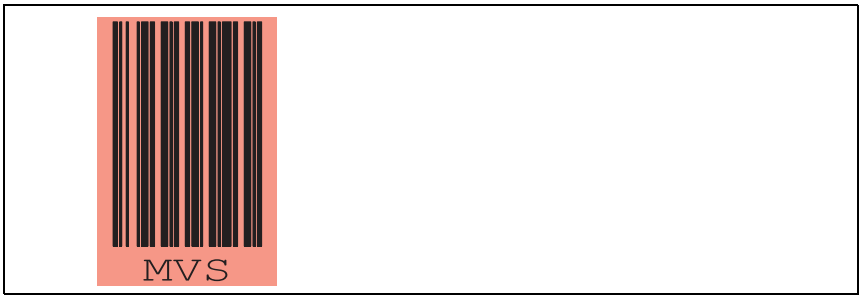


Figure 6.7:"MVS" control bar code for switching between tapes

Use of the "MVS" control bar code for switching between tapes is not dependent on direction. This means that it functions for switching from tape 1 to tape 2 and vice versa.

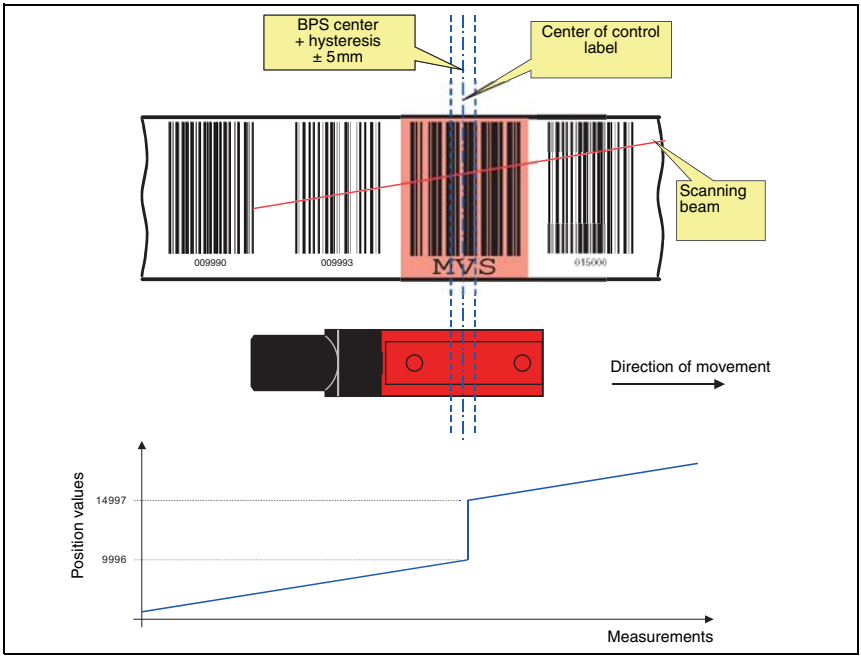


Figure 6.8:Switching position with the "MVS" control bar code

If the "MVS" label is passed over, the new tape value is always output relative to the center of the device or label (see Figure 6.8). In this situation, the hysteresis of ±5mm is irrelevant.

However, if the direction is changed after stopping within the hysteresis on the label "MVS", a switch to the previous tape value is made, using the specified hysteresis.

Note!

When affixing the BCB in a system in which the end of one BCB meets the start of another BCB (position value X with position value 0), ensure that position labels 0 - 9 are not used. This means that position label 12 must be the first label used on the continuing bar code tape. If this correction is not carried out, negative values may be calculated.

Note!

If only the "MVS" label is read within the scanning beam, the scanning beam must not be interrupted during the read operation until the scanner can again read a complete position label.

If only the "MVS" label is located in the scanning beam, the voltage on the BPS 8 must not be switched off. Otherwise the BPS 8 will return a position value of zero when the voltage is switched back on.

Moreover, the scanner must not be configured while in this position. Otherwise, a value of zero is output as long as no position label is present in the scanning beam due to the fact that the scanning beam is switched off during configuration.

6.5 Repair kit

Note!

*If the bar code tape was damaged, e.g. by falling parts, a repair kit for the BCB 8 with a raster of 30 mm can be downloaded from the Internet (**www.leuze.com**).*

In these files you will find all code information for a tape with the length of 500 m within the range of 0 … 9999.96 m. 0.9 m of bar code tape is provided on each A4 sheet. The 0.9 meters are divided into 5 lines of 18 cm each, with 6 code information segments of 3 cm each.

Procedure when replacing the defective area:

1. Determine the coding of the defective area.
2. Print out the area determined to be defective
3. Affix the printed area over the defective location

Important note for printing:

1. Select only those pages that are required.
2. Change the printer settings so that the code is not distorted.
   Suggestion for printer settings, see Figure 6.9.
3. Verify the printing result by measuring the distance between two codes (see Figure 6.10).
4. Cut the code strips and concatenate them. It is important that the code content always increases or decreases in blocks of 30 mm.

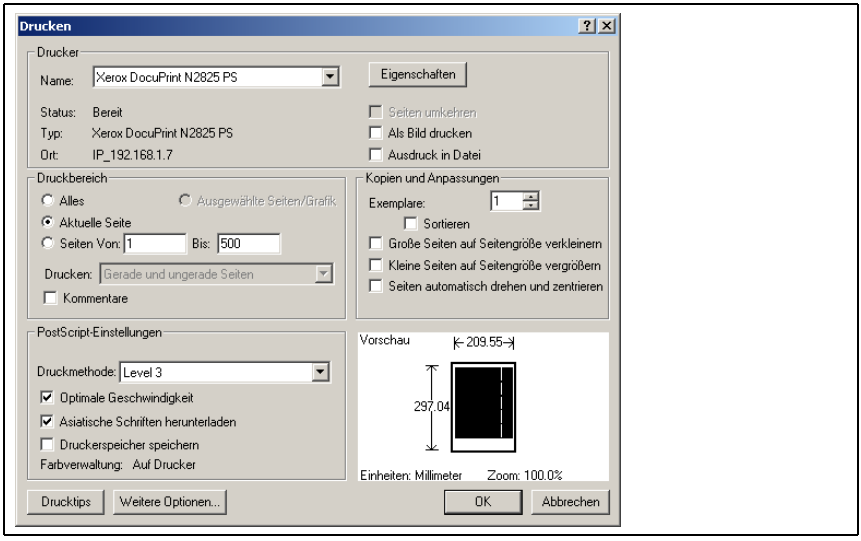


Figure 6.9:Printer settings for BCB repair kit

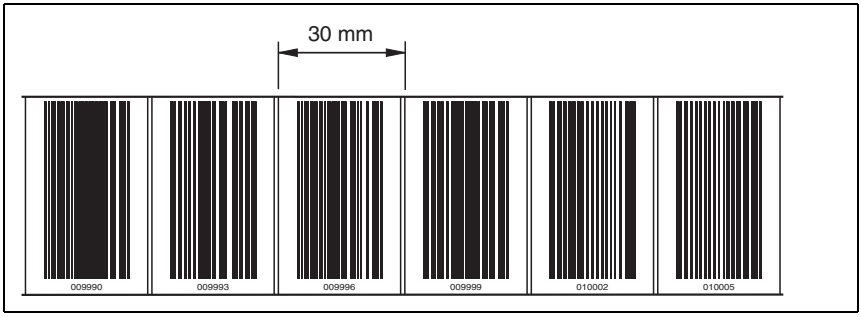


Figure 6.10:Checking the print results of the BCB repair kit

7 Mounting

7.1 Mounting the BPS 8

There are 2 different types of mounting arrangements for the BPS 8:

1. Directly, using the 2 through holes in the housing.
2. Using a mounting device (BT 8-01) on the through holes.

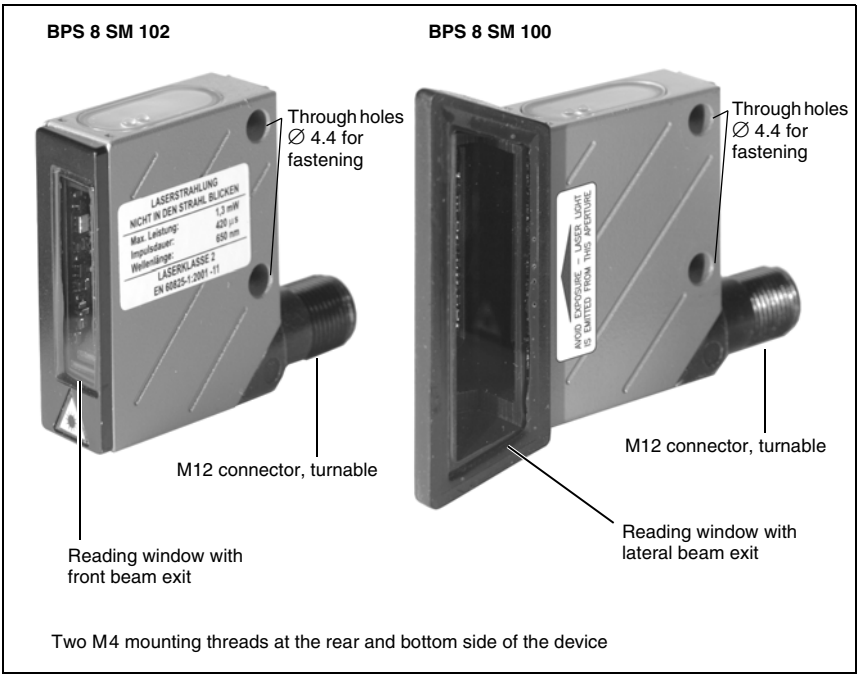
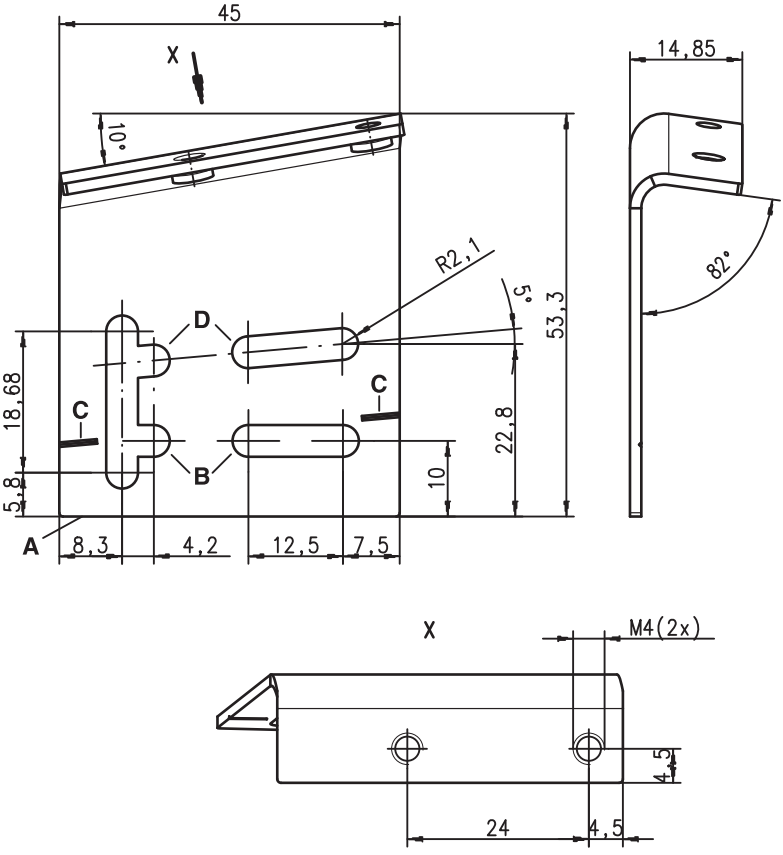


Figure 7.1:BPS 8 mounting options

BT 8-01 mounting device

The BT 8-01 mounting device is available for mounting the BPS 8 using the 2 through holes. It is intended for attachment via two M4 screws. For order guide, please refer to Chapter 11.5 on Page 91.



A Reference plane for a bar code tape height of 47mm
B Fastening holes for a bar code tape height of 47mm
C Reference plane for a bar code tape height of 30mm and 25mm
D Fastening holes for a bar code tape height of 30mm and 25mm

Figure 7.2:BT 8-01 mounting device

BPS 8 system components

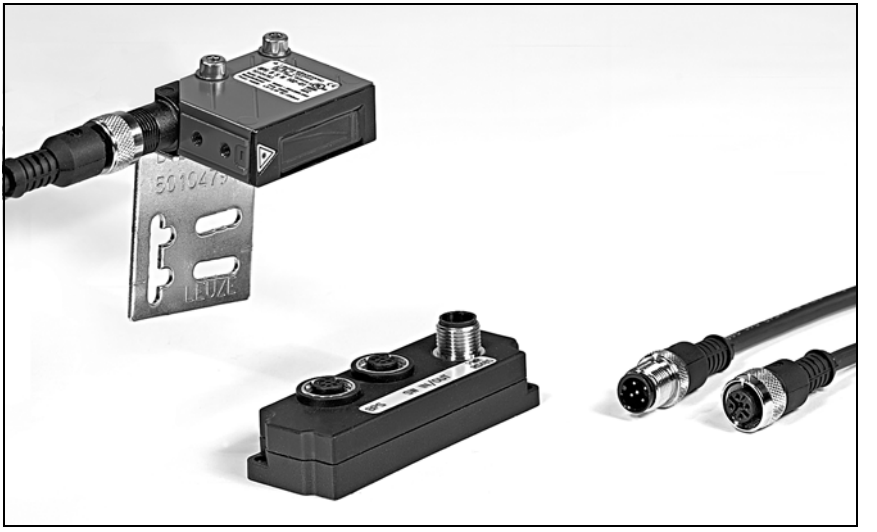


Figure 7.3:BPS 8 system components

Note!

During mounting, the following angles of inclination must be taken into account in the vertical axis:
10° for a tape height of 47mm,
5° for a tape height of 30mm or 25 mm,
the working range of the reading field curve must also be taken into account.

Attention!

For the position calculation, the scanning beam of the BPS 8 must be incident on the bar code tape without interruption. Ensure that the scanning beam is always incident on the bar code tape when the system is moving.

7.2 Device arrangement

Selecting a mounting location

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

- The scanning range determined from the scanning curve must be adhered to at all areas at which a position determination is to be made
- The BPS should be mounted at an angle of 10° (depending on the tape height, see note on Page 40) in the horizontal axis relative to the bar code tape to ensure continued reliable positioning results even in the event of soiling of the bar code tape.
- On the BPS 8, the beam is not emitted perpendicular to the cover of the housing, but with an angle of about 3.5° towards the bottom. To achieve a total pitch of 10°, the mounting bracket MA 8-01 has an angle of about 6.5°. This angle is intended to prevent total reflection on the bar code tape. With the angles integrated into the BT 8-01, the BPS 8 can be mounted in parallel to the bar code tape in the reading distance required.

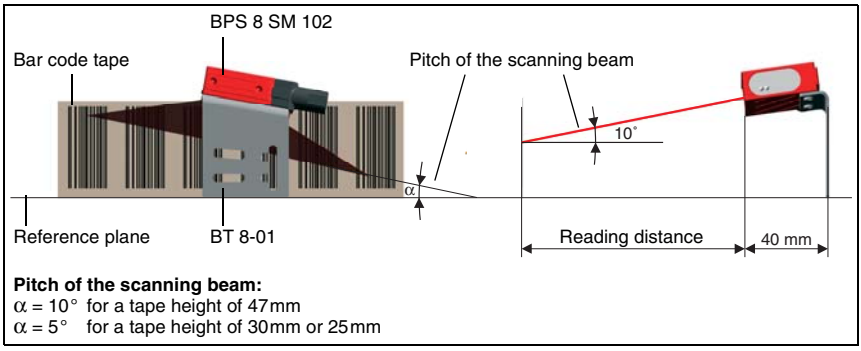
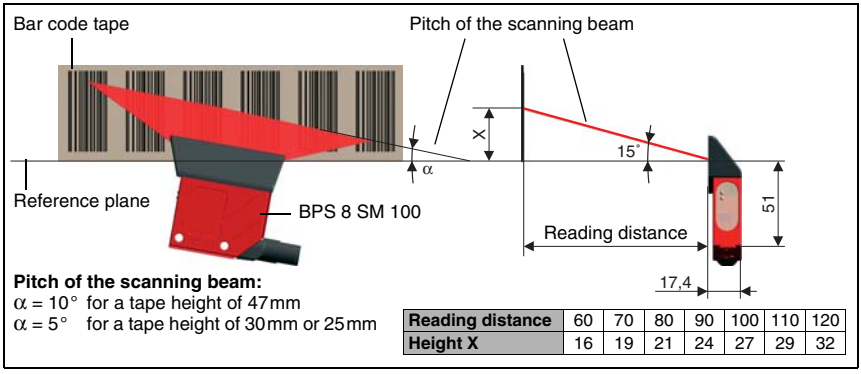


Figure 7.4:Beam exit and device arrangement of the BPS 8 SM 102



Reading distance	60	70	80	90	100	110	120
Height X	16	19	21	24	27	29	32

Figure 7.5:Beam exit and device arrangement of the BPS 8 SM 100

Note!

The BPS 8 has to be mounted in such a way that

- the BPS is guided parallel to the tape.
- the permitted working range is not exited.

Mounting location

When choosing the mounting location, observe the following:

- maintaining the required environmental conditions (non-condensing, temperature),
- possible soiling of the reading window due to liquids, abrasion by boxes, or packaging material residues.

Mounting outdoors

When mounting outdoors, also observe the following points:

- mount in such a way that the device is protected from relative wind; mount additional shields if necessary.
- when using outdoors, we recommend mounting in an additional protective housing.

Note!

When installing the BPS 8 in a protective housing, it must be ensured that the scanning beam can exit the protective housing without obstruction.

7.3 Mounting the bar code tape

The BPS 8 and bar code tape combination is mounted in such a way that the scanning beam is uninterrupted and is incident on the bar code tape as described in Figure 7.4 on Page 41.

Note!

For further information on mounting the bar code tape, please refer to Chapter 6.3 on Page 30.

8 Device parameters and interfaces

8.1 RS 232/RS 485 interface

8.1.1 General information

The BPS 8 system is supplied with an RS 232 interface. Using the MA 8-01 permits this to be replaced by an RS 485 interface. All settings regarding the protocols and device parameters may be configured according to customer specifications using the **BPS Configuration Tool** software.

Note!

*The BPS Configuration Tool can be downloaded from the Leuze Homepage at **www.leuze.com**.*

8.1.2 Electrical connection

Connecting the voltage supply/RS 232 directly to the BPS 8

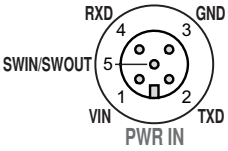
PWR IN (5-pin plug, A-coded)			
 **M12 plug (A-coded)**	**Pin**	**Name**	**Comment**
	1	VIN	Positive supply voltage: +4.9 … +5.4 VDC
	2	TXD	RS 232 transmission line
	3	GND	Supply voltage: 0 VDC
	4	RXD	RS 232 receiving line
	5	SWIN/ SWOUT	Configurable switching input/output
	Thread	FE	Functional earth (housing)

Figure 8.1:BPS 8 - Pin assignment PWR IN

Attention!

Degree of protection IP 67 is achieved only if the connectors and caps are screwed into place!

Connecting the voltage supply/RS 485 to the MA 8-01

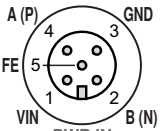
PWR IN HOST/RS485 (5-pin plug, A-coded)			
 **M12 plug (A-coded)**	**Pin**	**Name**	**Comment**
	1	**VIN**	Positive supply voltage: +10 … +30 VDC
	2	**B (N)**	RS 485 receive/transmit data B-line (N)
	3	**GND**	Supply voltage: 0 VDC
	4	**A (P)**	Receive/transmit data A-line (P)
	5	**FE**	Functional earth
	Thread	**FE**	Functional earth (housing)

Figure 8.2:MA 8-01 - Pin assignment PWR IN HOST/RS485

Attention!

Degree of protection IP 67 is achieved only if the connectors and caps are screwed into place!

Note!

For connection of the voltage supply and interface, we recommend our ready-made cables. For further information on this topic, refer to Chapter 11.3 on Page 90.

Attention!

Before connecting the device, be sure that the supply voltage agrees with the indicated value.

Connection of the device and cleaning must only be carried out by a qualified electrician.

The power supply unit for the generation of the supply voltage for the BPS 8 and the respective connection unit must have a secure electrical insulation through double insulation and safety transformers according to EN 60742 (corresponds to IEC 60742).

Ensure the device is correctly earthed. Unimpaired operation is only guaranteed when the functional earth is connected properly.

If faults cannot be cleared, the device should be switched off and protected against accidental use.

To then further isolate the error, proceed as described in Chapter 10 on Page 88.

8.1.3 BPS Configuration Tool software

8.1.3.3 Installation of the BPS Configuration Tool software

- Insert the installation CD in your drive
  (also available as download on the Internet under www.leuze.com).
- Call up the installation file (e.g. Setup.exe)

↳ Select the language for your installation.

The following window appears:

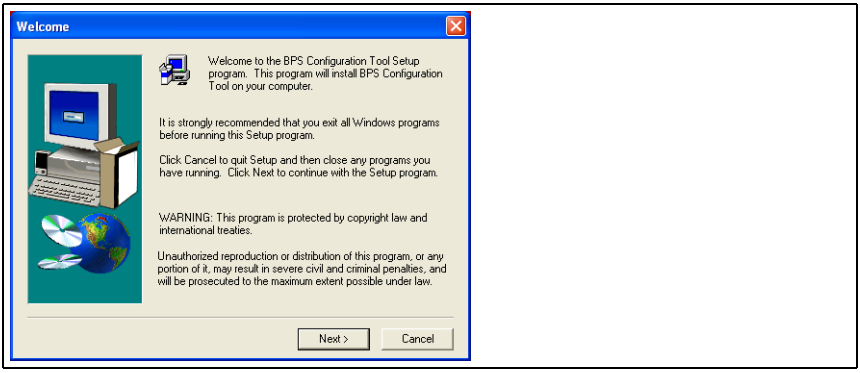


Figure 8.4:Installation window

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

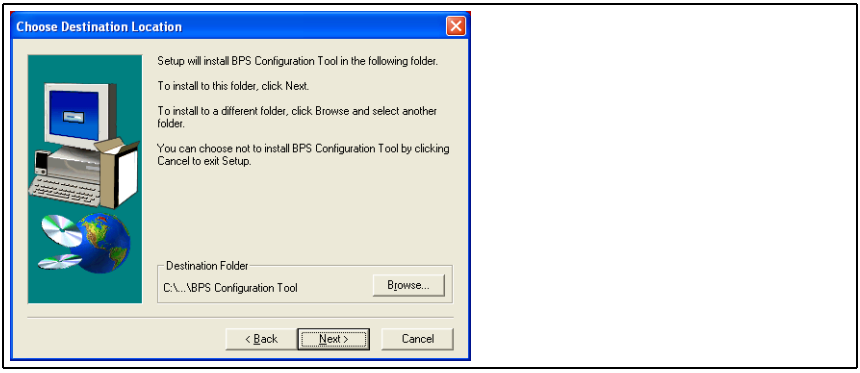


Figure 8.5:Installation directory

↳ Confirm your entry with Next, then follow the installation routine.
For further details please refer to online help of the "BPS Configuration Tool" software.

↳ After the successful installation, double-click on the **BPS Configuration Tool** icon to activate the configuration program.

8.1.3.6 Brief manual for the BPS Configuration Tool

General information

The **BPS Configuration Tool** program was developed as a convenient user-friendly tool to operate all common Leuze BPS systems.

To install the tool, double click on the **Setup.exe** file and follow the instructions. After the program has been successfully installed and started, the left side shows the default project **Leuze electronic**. In this project, every possible device has already been created.

This project is read-only but can be edited arbitrarily and saved under a different name using the **Project -> Save as** menu.

Creating a new project

- Select **Project -> New…** or click on the symbol in the top left corner.
- Assign a file name. Up to 256 characters are possible.
  The **.PCT** extension must remain the same.
- Assign a project name (= title) to the project. Up to 256 characters are possible.
- Enter a description if required.
- After confirmation with **OK**, the new project name is shown in the top left corner.

Create individual devices

- Left click on project name (= title)
- **Device -> New -> Individual device** or click on the top left icon .
- Assign a device name
- Select device type (only BPS can be selected).
- Select BPS type
- Select BPS version = software version of the device
- After clicking **OK**, the new device is shown in the project.

Follow this procedure to create all devices required.

Note!

When creating an individual device, the Leuze standard parameter set is always created together with the selected device according to the software version selected. The interface data from the PC to the device are also created together with the Leuze standard settings.

These are:	***9600 / 8 / 1 / None***
Framing protocol:	***<STX><data><CR><LF>***
Address:	***none***

Copying and pasting devices

It is possible to copy and paste individual devices. To do this, the device to be copied must be selected. By clicking on the right mouse button, the **Copy** and **Paste** functions become available. Only the device settings are copied, not the deposited interface data of the PC.

Renaming devices

It is possible to rename individual devices. This requires the respective device to be selected. Right click on the mouse button, select **Device properties…** and enter the desired description under **Name**.

Graphical configuration

If a device is selected via the left mouse button, the window of the graphical configuration opens automatically. The graphical interface visualizes the device settings and these can be loaded or transferred using the symbols and .

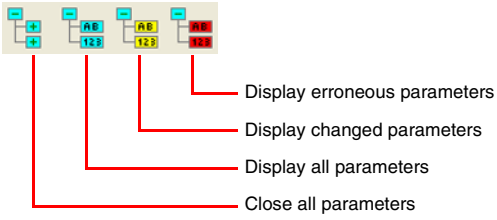
For further help on device-specific parameters, the technical description for the selected device may be opened. To view the technical description of the device, click on the symbol.

All parameters that were changed, i.e. that deviate from the Leuze factory settings, have a yellow background or frame color or are marked with the symbol for better orientation.

To reset all parameters of the selected device back to the Leuze factory settings, click on the symbol. This only resets the values in the PC and not the settings in the BPS.

Tree structure configuration

The second option for working off-line is the tree structure. The tree structure contains all settings of the graphical structure plus additional parameters.



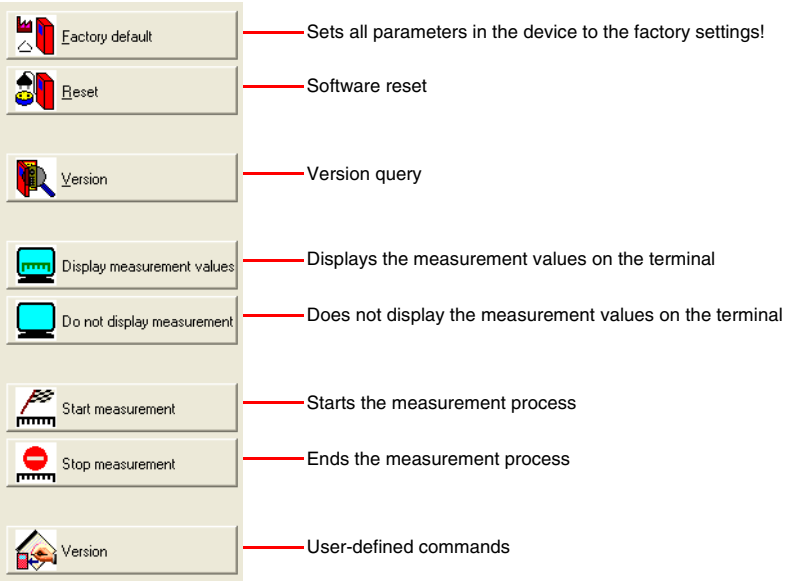
Terminal

The third option of communicating with the device is the terminal. This is only possible online.

If no device is selected, only the terminal is available. Its interface settings are available under **Options -> Communication…**. They can also be selected by clicking on the communication parameters displayed in the lower status bar.

Standard commands

The right third of the terminal window shows the following symbols for direct online commands:



Note!

Please note that the device settings are not always displayed with their current values if one changes between online and offline programming. This means that if a parameter is edited using an online command, the change is only displayed in the graphical menu (and thus stored in the project) once the edited parameters have been uploaded from the device!

Terminal options

From the menu, select **Terminal -> Options…** or click on the symbol (terminal must be selected). From the **Send** and **Receive** tabs choose between the 3 data formats **ASCII**, **Hexadecimal** and **Decimal**. Standard: **ASCII**

Note!

*If your computer has the **Terminal** font installed, please select this font for the display.*

In the **Terminal** tab you also have the option to output the **Line number**, the **Date** and the **Time**.

Terminal content

Use the , , and symbols to save, open or print the data in the terminal window.

Use to clear the content of the terminal window.

In **Version V01.12** and higher of the **BPS Configuration Tool**, the terminal content is logged automatically in the file **terminal.txt**. This file is stored in the main directory of the BPS Configuration Tool. It may be edited with any text editor.

Attention!

If another device is selected, the file content is deleted and the recording starts again.

User-defined commands

By using the symbol, you can create your own commands or sequences or load previously stored commands. In the window that appears, the following labels mean:

Command name: description of the symbol's command.

Command: actual command sequence.

Click the **Accept** button and the new commands appear in the right third of the terminal window below the permanently defined symbols.

Send file

This feature has been implemented to permit several consecutive sequences to be transmitted to the device. This requires the sequences to be created as a text file first. The text file can then be retrieved under **Terminal -> Send file**.

Boot

For the scanner families BPS 8 and BPS 3x, the firmware may be changed directly with the BPS Configuration Tool. This requires the respective firmware boot file, however. To obtain the file, please get in touch with your respective contact person.

Graphical measurement value monitoring

This view allows the current position of the BPS system to be graphically displayed.

Setting the device-specific interface values

This sets the connection (interface) **from the PC to the device** and not the interface of the device. For service interface operation, the settings here do not need to be edited.

If the connected device is **not** operated via the service protocol:

- Use the left mouse button to select the device to be edited.
- Right click and select **Communication**. In the **Communication properties** window that opens, carry out the respective changes.

If the settings were changed, the Leuze standard parameters can be reselected by clicking on the ♻ button.

MA 8-01 connection unit

The MA 8-01 connection unit is not relevant for the configuration and is thus not supported in the BPS Configuration Tool.

8.1.3.7 Setting the parameters

You now have commissioned the BPS 8 and are ready to configure it. Using the parameter options made available by the BPS 8, you can configure the BPS 8 to suit your individual area of application. For instructions regarding the various setting options, refer to the online help or to Chapter 8.1.6, Page 54.

The various parameter sets are explained briefly in Chapter 8.1.5, to understand what is happening during parameter setting. The setting of the parameters then takes place in the **service** operating mode, which is described in the following chapter.

8.1.4 Service operating mode

Setting the required parameters is carried out in the **Service** operating mode. The operating mode **Service** provides the following defined operating parameters on the external RS232 interface, no matter how the BPS 8 is configured for standard operation:

- Transmission rate: 9600 baud
- No parity
- 8 data bits
- 1 stop bit
- Prefix: STX
- Postfix: CR, LF

8.1.4.8 Activate service interface

The service interface may be activated as follows:

- Via a "**v**" command during power-up (initialization phase).
- Via the defined bar code label "**Service**" (see accompanying package insert) in front of the reading window during power-up (initialization phase).

Figure 8.9:Bar code label "Service"

8.1.4.10 Connecting the service interface

You can connect a PC or a terminal to the BPS 8 via the serial interface and configure the BPS 8 through this connection. For this, you need a crossed RS 232 interconnection cable (null modem cable) that provides the connections RxD, TxD and GND. A hardware handshake via RTS, CTS is not supported at the service interface.

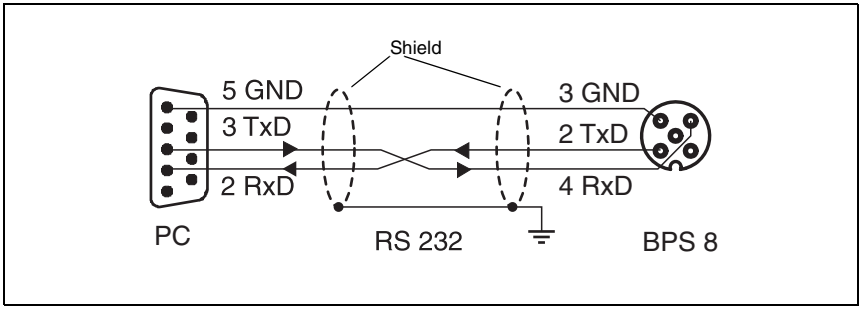


Figure 8.11:Connecting the RS 232 service interface to a PC or terminal

8.1.4.12 Overview of commands and parameters

Online commands can be used to send commands directly to the BPS 8 for control and configuration.

For this, the BPS 8 has to be connected to a host or service computer via the serial interface. The commands described can be sent either via the host or the service interface.

General online commands

Command	Description
M+	Activation of the measurement.
M-	Deactivation of the measurement.
MMS	Controls the data output via the service interface. A single measurement value is output (Single Shot mode).
MMTyyyy	Controls the data output via the service interface. Measurement values are output cyclically; time must be subsequently specified: yyyy = Time specification in ms. Example: MMT0500. Measurement values are output via the service interface in a time interval of 500 ms.
MM-	Deactivation of the MMTyyy function. If the cyclical output via the service interface is no longer required, the function must be deactivated using the command MM-.
PC20	Resets all parameters in the BPS 8 to Leuze default values.
V	Version query, or puts the device into service mode. This requires a "V" to be transmitted during the initialization phase of the BPS 8.

8.1.5 Overview of the parameter structure

Using the **BPS Configuration Tool** program, parameters can be changed via the service interface. These parameters are separated into individual tabs in the **Graphical configuration** menu.

The following tabs are available:

Tab name	Folder contents
Control Page 55	• Measurement start mode
	• Measurement stop mode
	• Maximum polling interval
Position detection Page 56	• Resolution for the position value
	• Integration time
	• Preset value added to tape value
	• Counting direction for position calculation
	• Scaling factor
	• Offset value
	• Maximum permitted measurement length
	• Minimum permitted measurement length
	• Position tolerance time
	• Error output delay
Communication Page 61	• Baud rate
	• Data mode
	• Protocol
	• Address
Switching input Page 63	• Inversion
	• Mode
	• Debounce time
	• Start-up delay
	• Pulse duration
	• Switch-off delay
	• Function
Switching output Page 65	• Activation
	• Deactivation
	• Pulse duration

8.1.6 Detailed description of the tabs

Note!

In the following detailed descriptions of the tabs you will find in the last column of the tables ***cross references (CR) to parameters and input/output data of other tabs*** *which are directly related to the described parameter.* ***These cross references must be observed during configuration****.*

Within the tabs, the ***parameters*** *are labeled alphanumerically from* a *...* z *.*

Example:

The parameter a **Preset value static** [mm] is activated only if the preset teaching is carried out via switching input h.

8.1.6.13 Control

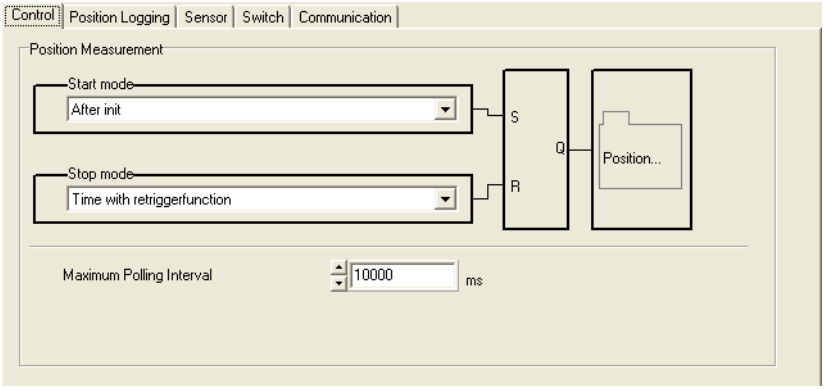


Figure 8.14:Control tab

Description:

The control manages the timing of the position calculation by starting and stopping the decoding. Control is performed depending on certain events such as the switching input or time functions. Using parameters, the events which influence the states are determined.

Parameters

Parameter	Description	Value range	Default	Unit	CR
a **Start mode**	The start mode determines by which event the position measurement is started.	1: After initialization **2: Via command or switching input**	**2**	–	Switching input h
b **Stop mode**	The stop mode determines after which event the position measurement is stopped.	2: Time (Polling Interval) **3: Time with re-triggering function (polling interval) via command or switching input** 4: Via command or switching input (the switching input must be programmed for this purpose)	**3**	–	Switching input h
c **Maximum polling interval**	Time period after which the scanning beam is switched off if no polling takes place.	0 … 65,535	**10,000**	ms	

8.1.6.15 Position detection

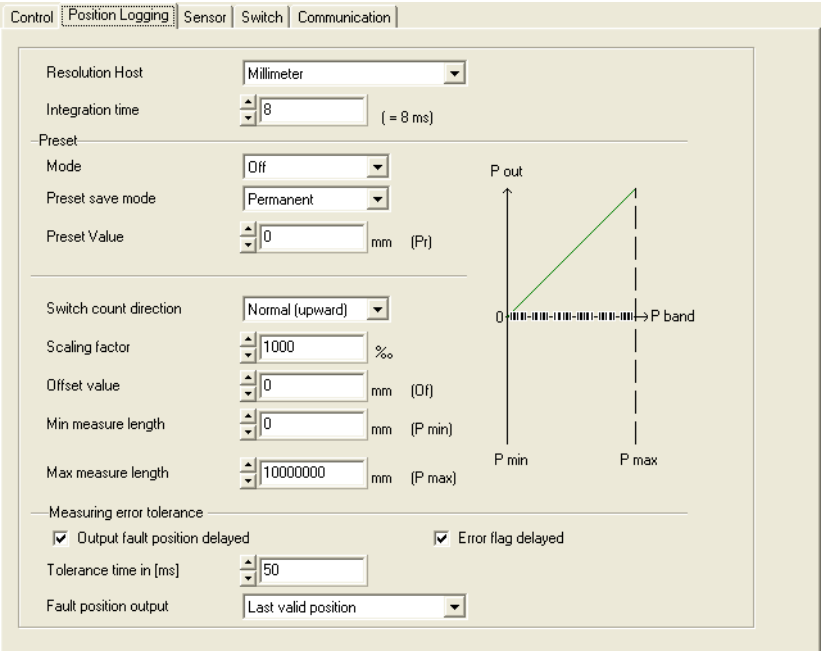


Figure 8.16:Position detection tab

Description:

The position detection controls all settings that affect the position values.

Parameters

Parameter	Description	Value range	Default	Unit	CR
a **Resolution in [mm]**	The parameter specifies the resolution for the position value. The resolution has no effect on - Static preset - Offset.	1: 0.01 2: 0.1 **3: 1** 4: 10 5: 100 6: 1,000	**3**	mm	–

With the **Resolution** parameter, the resolution for the position values is defined. This parameter also performs a rounding correction (the position value is divided by the defined value range).

Note!

The resolution only determines the mathematical decimal value and has no effect on the measurement accuracy.

Parameter	Description	Value range	Default	Unit	CR
b **Integration time**	Number of consecutive scans which are to be used for position determination.	4 … 32	**8**	Integration steps	–

The integration depth parameter is used to specify the number of raw position data which is used for integration in order to determine the position value.

Integration depth	Integration time [ms]
4	13.2
5	16.5
6	19.8
7	23.1
8 (default)	26.4
9	29.7
10	33.0
:	:
29	95.7
30	99.0
31	102.3
32	105.6

In order to obtain more exact measurement data while in the static state or for very slow travel speeds, the integration depth can be increased here. If, however, a high integration depth is used for high speeds, the contouring error is increased. With respect to contouring errors and exact measurement data, very good results have been obtained using 8 integration steps. Using 8 integration steps, the integration time is 26.4 ms.

Parameter	Description	Value range	Default	Unit	CR
c **Preset mode**	Switches the preset function on or off	**1: Off** 2: On	**1**	–	–
d **Memory mode**	Store data temporarily or permanently.	**1: Permanently** 2: Temporarily	**1**	–	–
e **Preset value in [mm]**	New position value after teach event.	0 … 10,000,000	**0**	mm	Switching input h

With this parameter, a preset value can be defined which the BPS 8 outputs following a teach event. A switching input function is defined as a teach event. After reading in the preset, the current position value is replaced by the preset value and the position value is now calculated and output on the basis of the preset. The preset remains stored in the BPS 8 and remains active even following a new start. In order for the BPS 8 to again output the position value without the preset, the Preset mode must be switched off again.

Note!

To activate this function, the preset mode must be switched on.

*The **preset value is always entered in units of mm**, independent of the resolution setting. The scaling factor has no effect on the static preset value.*

Parameter	Description	Value range	Default	Unit	CR
f **Counting direction**	Counting direction for position calculation.	**0: Normal** 1: Inverted	**0**	–	–

Note!

The BPS 8 is set as follows by default:

*The position value is output with **normal** counting direction. With the **inverted** counting direction, 10,000,000mm minus the position value is output. The **Preset value** and **Offset value** parameters can be used to influence this behavior.*

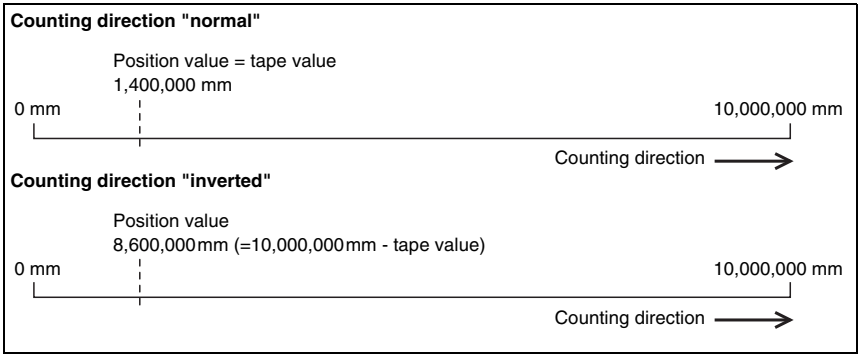


Figure 8.17:Counting direction for position calculation

Parameter	Description	Value range	Default	Unit	CR
g **Scaling factor in [‰]**	Scaling factor used to convert the position values.	0 … 65,535	**1,000**	‰	–

The scaling function is used to convert the tape values to any unit of measurement. To do this, the tape value is multiplied by the scaling factor.

Note!

This parameter affects the Offset value. The Preset value parameter is not influenced by the scaling.

Parameter	Description	Value range	Default	Unit	CR
h **Offset value in [mm]**	Offset value added to tape value.	-10,000,000 … 10,000,000	**0**	mm	–

This function adds an offset value to the tape value.

Note!

If the Preset parameter is activated and, as a result, a new value assigned to the tape value, the Offset function no longer affects the position value. The offset is not reactivated until the preset function is canceled. The offset value is entered in mm. When entering the offset value, the scaling factor parameter must be taken into account.

Parameter	Description	Value range	Default	Unit	CR
i **Min. measurement length in [mm]**	Minimum permitted measurement length.	0 … 2,147,483,647	**0**	mm	Switching output d, e
j **Max. measurement length in [mm]**	Maximum permitted measurement length.	0 … 2,147,483,647	**10,000,000**	mm	Switching output d, e

With this parameter, a working limit on the bar code tape can be defined. The BPS 8 outputs position values within these minimum and maximum limits. Outside of this limit, a position value of zero is output.

Note!

The switching output can be used to indicate that the measured value is outside of the measurement range. To enable this function, the "outside measurement range" or "inside measurement range" parameter must be activated.

Parameter	Description	Value range	Default	Unit	CR
k **Tolerance time in [ms]**	Specifies the time for the display of the last position value following an error.	0 … 65,535	**50**	ms	–
l **Delayed output of position error**	Delays the output of an error by the configured tolerance time.	0: No, error delay deactivated **1: Yes, error delay activated**	**1**	–	–
m **Delayed output of error status**	Delays the output of an error in the status byte of the binary protocol by the configured tolerance time.	0: No, error delay deactivated **1: Yes, error delay activated**	**1**	–	–

The measurement error tolerance function is used to configure a time which results in an extended output of the last position value in the event of an error. If the position value changes momentarily to zero, e.g. due to a brief interruption of the scanning beam, soiling of the bar code tape or other short-term disturbances, the BPS 8 transmits the last valid position value.

If the error disappears within the configured time, the control notices nothing. The availability of the system is thereby ensured. No new values are delivered by the BPS 8, however, for a period of time extending up to the configured tolerance time. With the **Delay error output** parameter, an integration error (corresponds to a missing position value) can be signaled immediately or after the tolerance time has elapsed. If the error persists after the tolerance time has elapsed, a position value of zero is output.

Parameter	Description	Value range	Default	Unit	CR
n **Position value in the case of failure**	In the case of failure, retain the last position value or output zero.	0: Zero **1: Last valid position value**	**1**	–	–

8.1.6.18 Communication

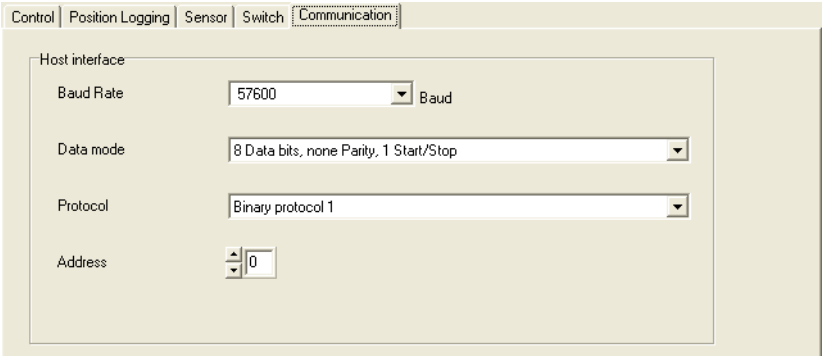


Figure 8.19:Communication tab

Parameters

Parameter	Description	Value range	Default	Unit	CR
a **Baud rate**	Setting the baud rate.	4: 1200 5: 2400 6: 4800 7: 9600 8: 19200 9: 38400 **10: 57600** 11: 62500 12: 115200 13: 187500	**10**	Baud	–
b **Data mode**	Setting of the data mode.	1: 7 data bits, no parity, 2 stop bits 2: 7 data bits, even parity, 1 stop bit 3: 7 data bits, even parity, 2 stop bits 4: 7 data bits, odd parity, 1 stop bit 5: 7 data bits, odd parity, 2 stop bits **6: 8 data bits, no parity, 1 stop bit** 7: 8 data bits, no parity, 2 stop bits 8: 8 data bits, even parity, 1 stop bit 9: 8 data bits, even parity, 2 stop bits 10: 8 data bits, odd parity, 1 stop bit 11: 8 data bits, odd parity, 2 stop bits 12: 8 data bits, no parity, 1 stop bit + WakeUp bit 13: 9 data bits, no parity, 1 stop bit	**6**	–	–
c **Protocol**	Setting the protocol type.	**0: Binary protocol 1** 1: Binary protocol 2 2: Binary protocol 3	**0**	–	–
d **Address**	Sets the participant address for the RS 485 network.	**0: Address 0** 1: Address 1 2: Address 2 3: Address 3	**0**	–	–

Note!

*The 3 different binary protocols are described in a separate chapter (**see chapter 9 "Protocol types for position value output"**).*

Note!

The settings in the communication area apply to the RS 232 interface of the BPS 8 and to the settings of the RS 485 interface of the MA 8-01. ***The conversion from RS 232 to RS 485 in the MA 8-01 is implemented entirely in hardware****. The communication settings for the RS 232 interface also apply to the RS 485 for this reason.*

8.1.6.20 Switching input

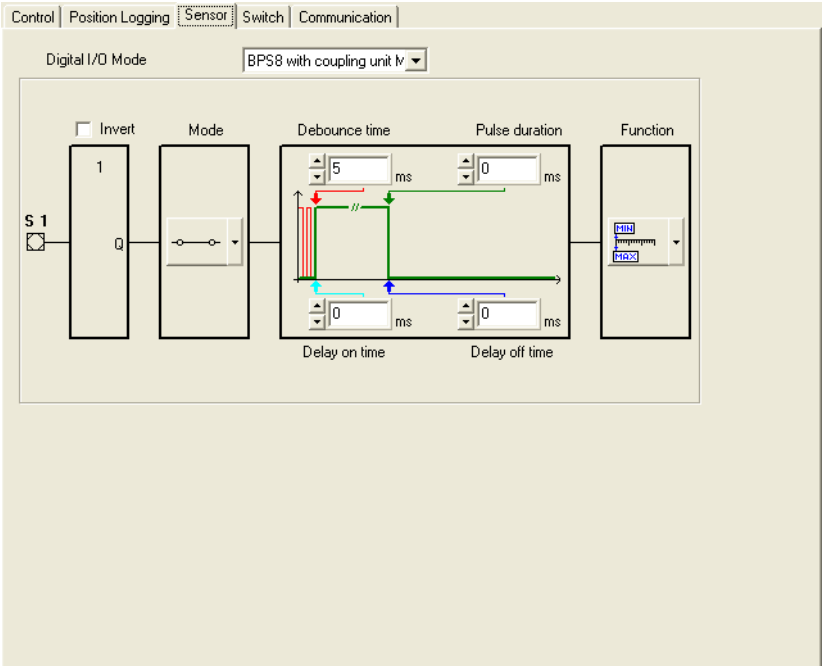


Figure 8.21:Switching input tab

Description:

Within this tab, the mode of operation of the digital switching input is defined.

Parameters

Parameter	Description	Value range	Default	Unit	CR
a **Digital I/O mode**	Defines whether the switching input and output are activated via the MA 8-01 or whether only the switching input or only the switching output is activated.	0: Not released **1: BPS 8 with MA 8-01 (switching input + switching output)** 2: Switching input 3: Switching output	**1**	–	–
b **Inversion**	The parameter defines the logic of the applied signal. In case of an inversion, an external HIGH level is interpreted as an internal LOW level.	**0: No (active high)** 1: Yes (active low)	**0**	–	–
c **Mode**	This parameter controls the release of the switching input.	0: Off **1: On**	**1**	–	–
d **Debounce time in [ms]**	This parameter defines a debounce time which is implemented via software.	0 … 255	**5**	ms	–
e **Start-up delay in [ms]**	The parameter influences the timing during switch-on.	0 … 65535	**0**	ms	–
f **Pulse duration in [ms]**	The parameter defines a minimum time period before the signal is reset.	0 … 65535	**0**	ms	–
g **Switch-off delay in [ms]**	The parameter defines a time delay for the signal during switch-off.	0 … 65535	**0**	ms	–
h **Function**	The parameter specifies the function which is to be activated or deactivated by a status change at the switching input.	0: No function	**2**	–	–
		1: Teach preset			Position detection e
		2: Start/stop position measurement			Control a
		3: Stop position measurement			Control b

Note!

*The switching input function **Pos. measurement start/stop** in the **Function** parameter means:*

- *High level at the switching input starts the position measurement.*
- *Low level at the switching input stops the position measurement.*

8.1.6.22 Switching output

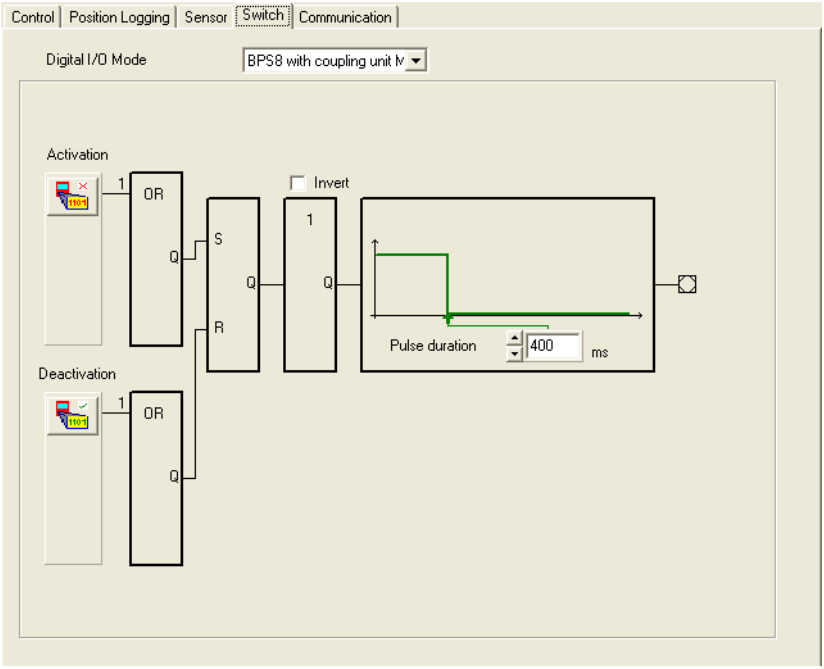


Figure 8.23:Switching output tab

Description:

Within this tab, the mode of operation of the digital switching output is defined.

Parameters

Parameter	Description	Value range	Default	Unit	CR
a **Digital I/O mode**	Defines whether the switching input and output are activated via the MA 8-01 or whether only the switching input or only the switching output is activated.	0: Not released **1: BPS 8 with MA 8-01 (switching input + switching output)** 2: Switching input 3: Switching output	**1**	–	–
b **Bias level / inverted**	The parameter defines the bias level of the switching output.	**0: LOW (0V)** 1: HIGH (+Ub)	**0**	–	–
c **Pulse duration in [ms]**	The parameter defines the switch-on time period for the switching output. If the value is 0, the signal is static.	0 ... 1300	**400**	ms	–
d **Switch-on function [EF]**	The parameter specifies the events which set the switching output: - outside measurement range - within measurement range - erroneous measurement - successful measurement	Each 0: Not active 1: Active	**0** **0** **1** **0**	–	Position detection i, j Position detection i, j Position detection Position detection
e **Switch-off function [AF]**	The parameter specifies the events which reset the switching output: - outside measurement range - within measurement range - erroneous measurement - successful measurement	Each 0: Not active 1: Active	– **0** **0** **0** **1**	–	– Position detection i, j Position detection i, j Position detection Position detection

Note!

The events of the switch-on function and switch-off function are both linked to one another with a logical OR.

9 Protocol types for position value output

Note!

This chapter describes the three binary protocols for communication between host and BPS 8 that can be selected via the communication parameters (see Chapter 8.1.6.18).

9.1 Binary protocol type 1

Note!

*With the **BPS Configuration Tool**, the user can individually adapt the binary protocol 1 to the specific requirements of the application. The binary protocols 2 and 3, on the other hand, have a fixed structure and cannot be modified.*

9.1.1 Data format

- Baud rate: 57.600 kBaud
- Data bits: 8
- Start bit: 1
- Stop bits: 1
- Parity: none

Note!

*Using the **BPS Configuration Tool**, the data format may be configured arbitrarily. The default values are the values shown above.*

9.1.2 Telegram structure

9.1.2.1 Query to the BPS 8 (query telegram)

With the help of the **BPS Configuration Tool**, all bits may be configured individually with the following values:

Designation	Type	Description	Function	Value
Request marker information	1 bit	The marker information is requested.	**M**	1
		The marker information is not requested.		**0**
Request diagnostic information	1 bit	Diagnostic data is requested.	**D**	1
		Diagnostic data is not requested.		**0**
Activate SLEEP mode	1 bit	Laser and polygon wheel motor are switched off and the BPS 8 enters into SLEEP mode [1].	**SLEEP**	1
		Laser and polygon wheel motor are switched on.		**0**
XOR combination	8 bit	Exclusive-OR combination	**XOR**	
Address	2 … x bit	With this bit, the address of the relevant BPS 8 system is transmitted along with the query.	A0 … Ax	
Bit to zero	1 bit	Bit is permanently set to zero.	0	0
Bit to one	1 bit	Bit is permanently set to one.	1	1
Request single measurement	1 bit	Request single measurement (laser on, measurement, laser off).	SINGLE	1
		Single measurement is not requested.		0

Designation	Type	Description	Function	Value
Request position information	1 bit	Position data is requested.	**POS**	1
		Position data is not requested.		**0**
Acknowledge diagnostics	1 bit	Diagnostic data are to be acknowledged.	DQ	1
		Diagnostic data are not to be acknowledged.		0
Check digit	8 bit	Permits a check digit with configurable mode to be stored.	CS	
Prefix	8 bit	Permits a prefix to be selected.	PREFIX	
Postfix	8 bit	Permits a postfix to be selected.	POSTFIX	
Data length	2 … 8 bits	Permits the following full data length of the information to be transmitted alongside in the protocol.	DL	

1) To further increase the life expectancy of the device, it can be put into a SLEEP state. In SLEEP state, the motor and laser are switched off. Diagnosis of the read system cannot be performed.
When reactivating the device, the system takes approx. 5 s to boot.

Note!

*The BPS 8 replies to an **Individual measurement** or **Request position information** query with a position response.*

Note!

*A0 … Ax are the address bits. If several BPS 8's operate in one network, an address configuration is required. This can only be done via the **BPS Configuration Tool**.*

By default, the control byte is structured as follows:

Bit no.	7	6	5	4	3	2	1	0
Designation	0	0	0	0	POS	SLEEP	M	D
Combination	XOR	XOR	XOR	XOR	XOR	XOR	XOR	XOR

Priority of the bits:

- Priority 1: Diagnostic data
- Priority 2: Marker information
- Priority 3: SLEEP
- Priority 4: Position values

Note!

It is advisable to set only one control bit for each control byte as the BPS can only answer one query at a time. If several control bits are set, the function with the highest priority is executed.

Bit **POS**: If this bit is set to 1, the position data is output.

Bit **SLEEP**: If this bit is set to 1, the SLEEP mode is activated.

Bit **M**: If this bit is set to 1, the marker information is output.

Bit **D**: If this bit is set to 1, the diagnostic data is sent in response. An indicated error is reset once all diagnostic data has been polled. This is indicated by the status LED changing from red to green.

9.1.2.2 BPS 8 response (response telegram)

With the help of the **BPS Configuration Tool**, all bits may be configured individually with the following values:

Designation	Type	Description	Function	Value
Error	1 bit	An internal error has occurred.	**ERR**	1
		No error exists.		0
Tape error	1 bit	If no bar code tape is located in the scanning beam, this is signaled with a tape error.	**OUT**	1
		Bar code tape is located in the scanning beam.		0
Marker in memory	1 bit	Marker information is located in the memory.	**MM**	1
		No marker information is located in the memory.		0
Diagnostics exist	1 bit	Diagnostic data is present in the memory.	**D**	1
		No diagnostic data exists.		0
SLEEP mode	1 bit	Device is in SLEEP mode [1].	**SLEEP**	1
		Device is in positioning mode.		0
Data	16 … 32 bits	The data is transmitted here depending on the query in the control byte; it is either positioning data, diagnostic data, marker information or a SLEEP response.	**DATA**	
XOR combination	8 bit	Exclusive-OR combination.	**XOR**	
Data resend	16 … 32 bits	Depending on the query in the control byte, the data can be retransmitted. This can be the position data, diagnostic data or marker information.	RDATA	
Measurement range exceeded	1 bit	The configured measurement range of 10,000,000 mm has been exceeded.	MVE	1
		The configured measurement range of 10,000,000 mm has not been exceeded.		0
Below measurement range	1 bit	The configured measurement range of 0 mm has not been reached.	MVFB	1
		The configured measurement range of 0 mm has been exceeded.		0
Range error	1 bit	Outside the configured measurement range.	RANGE	1
		Inside the configured measurement range.		0
Mark detected	1 bit	A marker label has been detected in the scanning beam.	M	1
		No marker label has been detected in the scanning beam.		0
Address	2 … x bit	The BPS 8 system supplies the configured address.	A0 … Ax	
Number of labels in the last scan	3 bit	Number of position labels in the last scan.	SCAN-INFO	
Bit to zero	1 bit	Bit is permanently set to zero.	0	0
Bit to one	1 bit	Bit is permanently set to one.	1	1
Sign of position value	1 bit	Calculated position values are negative.	POSH	1
		Calculated position values are positive.		0
Status of the switching input	1 bit	Switching input is activated.	SI	1
		Switching input is deactivated.		0
Status of the switching output	1 bit	Switching output is activated.	SO	1
		Switching output is deactivated.		0
Check digit	8 bit	Permits a check digit with configurable mode to be stored.	CS	
Prefix	8 bit	Permits a prefix to be selected.	PREFIX	
Postfix	8 bit	Permits a postfix to be selected.	POSTFIX	
Data length	2 … 8 bits	Permits the following full data length of the information to be transmitted alongside in the protocol.	DL	

1) To further increase the life expectancy of the device, it can be put into a SLEEP state. In SLEEP state, the motor and laser are switched off. Diagnosis of the read system cannot be performed.
When reactivating the device, the system takes approx. 5s to boot.

By default, the response from the BPS 8 is structured as follows:

Byte no.	Designation	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte	0	0	0	SLEEP	MM	D	OUT	ERR
1	Data byte 1	P31	P30	P29	P28	P27	P26	P25	P24
2	Data byte 2	P23	P22	P21	P20	P19	P18	P17	P16
3	Data byte 3	P15	P14	P13	P12	P11	P10	P09	P08
4	Data byte 4	P07	P06	P05	P04	P03	P02	P01	P00
5	XOR combination	Exclusive OR combination of bytes 0 to 5							

Note!

*The **P00** data bit corresponds to the **LSB**, the **P31** data bit corresponds to the **MSB**.*

Response to marker information

If information consisting of one of the capital letters A / B / C / D / Z and two digits is read, the **MM** bit for the recognition of the marker information is set in the status byte. The **M** control bit can now be used to retrieve the marker information. If the marker information is not requested, the position continues to be output.

The marker information is output as an ASCII hex value in three bytes.

Marker detection:

If there is marker information within the detection range, it is indicated in the status byte.

Bit labeled **MM** in the status byte:

0 = no marker in memory.

1 = marker in memory.

Requesting marker information:

If the respective bit in the control byte is set, the marker label is output as an ASCII hex value on the interface, instead of the position.

Bit labeled **M** in the control byte:

0 = do not send marker information.

1 = send marker information.

Definition of the marker labels:

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

First character:	A / B / C / D / Z
Second character:	Digit between 0 … 9
Third character:	Digit between 0 … 9

Marker label structure:

The marker label uses code type **Code128 with character set B** as opposed to Code128 with character set C for the position bar codes. Code128 with character set B enables the display of all letters and numbers in the ASCII character set.

Using the marker label with positioning (bar code tape):

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

Figure 9.3:System arrangement of marker labels

Using the marker label without positioning (bar code tape):

The marker label must be positioned within the BPS 8's detection range.

Positioning the marker label:

At any one time, no more than one marker label must be visible in the BPS 8's detection range.

Function sequence if a marker is inside the detection area:

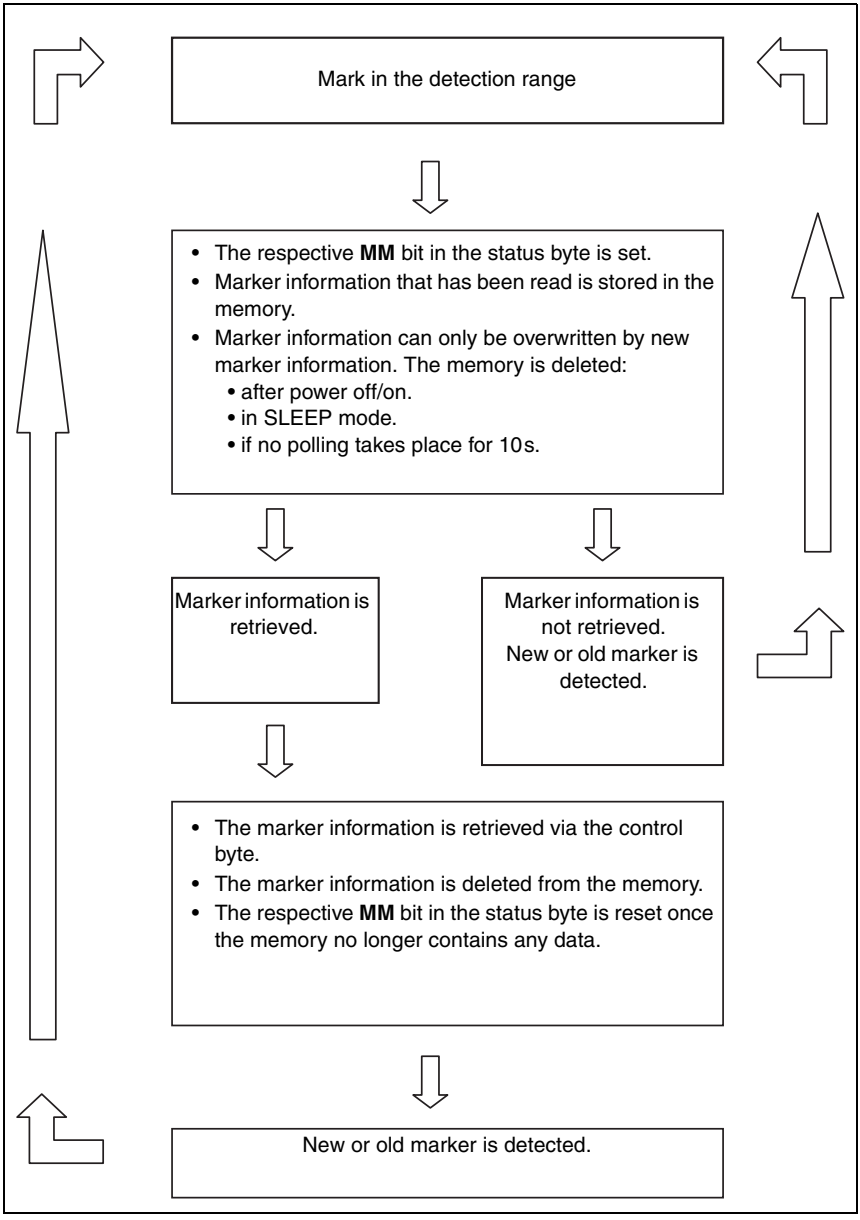


Figure 9.4:Function sequence for marker inside the detection area

This process toggles the data as long as the **MM** bit is set to 1, i.e., as long as the memory contains marker information. The marker information does not depend on the BPS' speed or on the control's clock rate.

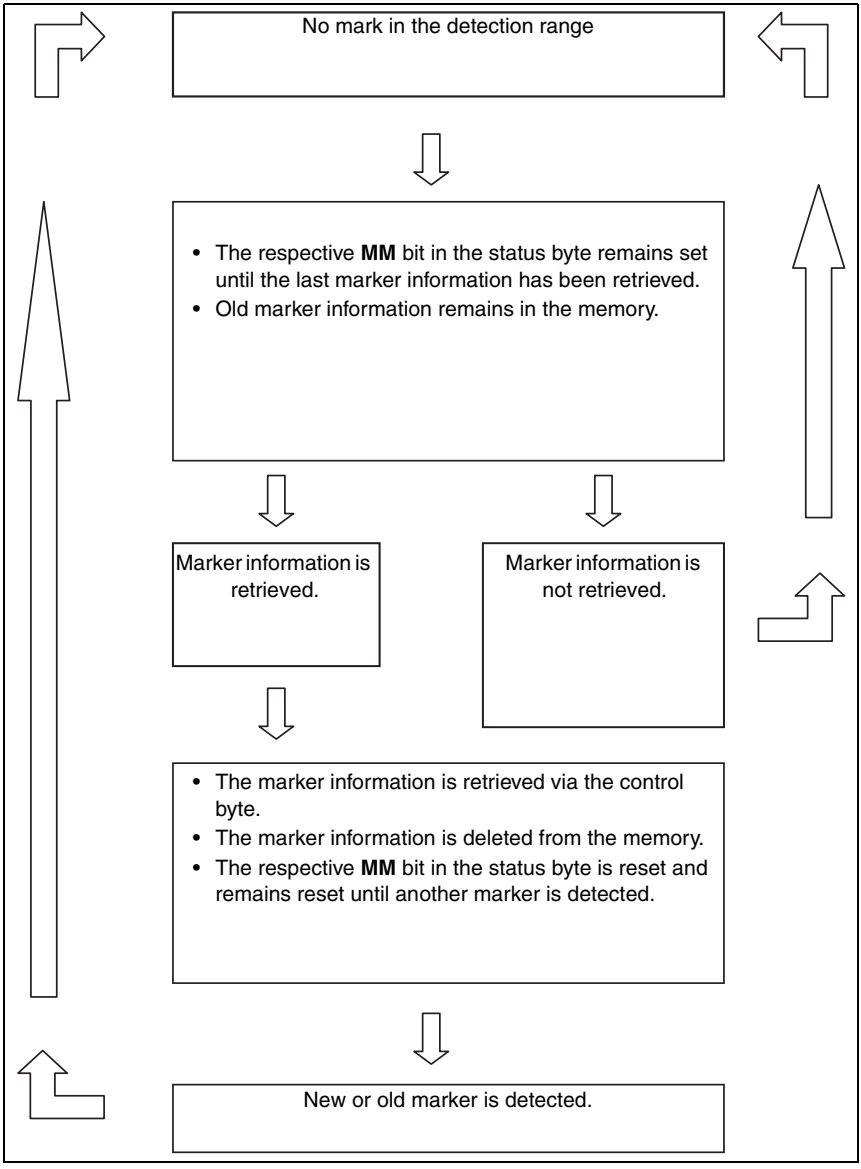


Figure 9.5:Function sequence for no marker inside the detection area

Output of marker information

Example marker information: **A01**

Data byte 2 = **A** = 41 hex = 01000001 bin

Data byte 3 = **0** = 30 hex = 00110000 bin

Data byte 4 = **1** = 31 hex = 00110001 bin

Byte no.	Designation	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte	0	0	0	SLEEP	MM	D	OUT	ERR
1	Data byte 1	0	0	0	0	0	0	0	0
2	Data byte 2	0	1	0	0	0	0	0	1
3	Data byte 3	0	0	1	1	0	0	0	0
4	Data byte 4	0	0	1	1	0	0	0	1
5	XOR combination	Exclusive OR combination of bytes 0 to 5							

Note!

If there is no marker in the marker memory of the BPS 8 and a marker query is received, ***E00*** *is transmitted as 3 ASCII characters.*

Response to diagnostic query

If the diagnostic bit **D** in the status byte is set to 1, diagnostic data is present and may be retrieved.

By setting the respective **D** bit in the control byte (= bit 0), the diagnostic data is retrieved. The diagnostic bit **D** remains set to 1 as long as data is present. Only after the memory for diagnostic data is empty, the bit changes to 0 and the red status LED returns to normal mode.

Just as the marker information, the diagnostic data is transmitted as 3 ASCII characters.

Diagnostic information available:

The diagnostic data have the following format:

Byte 1 = **E** defines the diagnostic data.

Byte 2 = **x** number describing the error.

Byte 3 = **x** number describing the error.

Possible diagnostic data:

100 = software version number of the BPS 8, here in example 1.00

E01 = interface problem

E02 = motor problem

E03 = laser problem

E04 = internal problem

E05 = position value outside of measurement range

SOS = BPS 8 in SLEEP mode (system operation standby/SLEEP)

Note!

*If bit 4 **SLEEP** in the control byte is set to 1 and bit 2 **D** in the status byte has the value 1, the BPS 8 is in SLEEP mode (laser and polygon wheel motor off). If bit 2 **SLEEP** in the control byte is set to 0, the BPS 8 returns to positioning mode after a boot time of approx. 5s. If polling takes place while the BPS 8 boots and there is no valid position data yet, the error message **tape error** (bit **OUT**) is generated.*

Output of diagnostic data

Example for diagnostic data: **E05**

Data byte 2 = **E** = 45 hex = 01000101 bin

Data byte 3 = **0** = 30 hex = 00110000 bin

Data byte 4 = **5** = 35 hex = 00110101 bin

Byte no.	Designation	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte	0	0	0	SLEEP	MM	D	OUT	ERR
1	Data byte 1	0	0	0	0	0	0	0	0
2	Data byte 2	0	1	0	0	0	1	0	1
3	Data byte 3	0	0	1	1	0	0	0	0
4	Data byte 4	0	0	1	1	0	1	0	1
5	XOR combination	Exclusive OR combination of bytes 0 to 5							

Note!

*If there is a diagnostic query during SLEEP mode, **SOS** (System Operation Standby/ SLEEP) is transmitted in data bytes 2 to 4.*

9.2 Binary protocol type 2

Note!

*With the **BPS Configuration Tool**, the user can individually adapt the binary protocol 1 to the specific requirements of the application. The binary protocols 2 and 3, on the other hand, have a fixed structure and cannot be modified.*

9.2.1 Data format

- Baud rate: 62.500 kBaud
- Data bits: 9
- Start bit: 1
- Stop bits: 1
- Parity: none

9.2.2 Telegram structure

9.2.2.6 Query to the BPS 8 (control byte)

Bit no.	8	7	6	5	4	3	2	1	0
Designation	Fixed 1	Fixed 0	Fixed 1	Fixed 1	SLEEP	S-Bit 1	S-Bit 0	A1	A0

Bit	Function	Value	Explanation
0	A0	0	All read heads are occupied with address 0. The address can only be changed via the BPS Configuration Tool.
1	A1	0	
2	S-Bit 0	0	Position data is sent.
		1	The marker information is sent.
3	S-Bit 1	0	Position data is sent.
		1	Diagnostic data is sent.
4	SLEEP	0	Polygon wheel motor is switched on.
		1	Polygon wheel motor is switched off (SLEEP mode [1]).
5	Fixed 1	1	No function, permanently set to 1.
6	Fixed 1	1	No function, permanently set to 1.
7	Fixed 0	0	No function, permanently set to 0.
8	Fixed 1	1	No function, permanently set to 1.

1) To further increase the life expectancy of the device, it can be put into a SLEEP state. In SLEEP state, the motor and laser are switched off. Diagnosis of the read system cannot be performed.
When reactivating the device, the system takes approx. 5s to boot.

Priority of the bits

- Priority 1: Diagnostic data
- Priority 2: Marker information
- Priority 3: SLEEP
- Priority 3: Position values

Note!

It is advisable to set only one control bit for each control byte as the BPS can only answer one query at a time. If several control bits are set, the function with the highest priority is executed.

Note!

***A0** and **A1** are the address bits. If several BPS 8's operate in one network, an address configuration is required.*

Bit **S-Bit 0**: If this bit is set to 1, the marker information is output.

Bit **S-Bit 1**: If this bit is set to 1, the diagnostic data is sent in response. Any indicated error is reset. This may be recognized by the status LED changing from red to green.

Bit **SLEEP**: This bit is used to activate the SLEEP mode.

9.2.2.7 Response of the BPS 8

Data content:

Byte no.	Designation	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte	NU	D	M	A1	A0	QT1	QT0	OUT	ERR
1	Data byte 1	0	P23	P22	P21	P20	P19	P18	P17	P16
2	Data byte 2	0	P15	P14	P13	P12	P11	P10	P09	P08
3	Data byte 3	0	P07	P06	P05	P04	P03	P02	P01	P00
4	XOR combination	Exclusive OR combination of bytes 0 to 3								
5	Repetition of data byte 1	0	P23	P22	P21	P20	P19	P18	P17	P16
6	Repetition of data byte 2	0	P15	P14	P13	P12	P11	P10	P09	P08
7	Repetition of data byte 3	0	P07	P06	P05	P04	P03	P02	P01	P00

Description of the status byte

Byte	Bit	Function	Value	Explanation
0	0	ERR	0	No errors occurred during the calculation of the position value.
			1	During the calculation of the position value, (int.) errors occurred.
	1	OUT	0	Scanning beam is positioned on the bar code tape.
			1	Scanning beam is positioned outside of the bar code tape.
	2	QTO		Reading quality.
	3	QT1		Reading quality.
	4	A0		Address.
	5	A1		Address.
	6	M	0	No marker information exists.
			1	Marker information exists.
	7	D	0	No diagnostic data exists.
			1	Diagnostic data exist.
	8	NU	0	No meaning - bit is permanently set to 0.
1 … 3	0 … 8	POS	--	Position value, binary encoded.
4	0 … 8	XOR	--	Block check digit, exclusive-OR combination of byte 0 to byte 3.
5 … 7	0 … 8	WPOS	--	Repetition of position value, binary encoded.

Note!

At a resolution of 1mm and with 24 position bits, a maximum position of up to 16,777,215mm can be transmitted.

Note!

*The **P00** data bit corresponds to the **LSB**, the **P23** data bit corresponds to the **MSB**.*

Response to marker information

If information consisting of one of the capital letters A / B / C / D / Z and two digits is read, the **M** bit for the recognition of the marker information is set in the status byte. The **S-Bit 0** control bit can now be used to retrieve the marker information. If the marker information is not requested, the position continues to be output.

The marker information is output as an ASCII hex value in three bytes.

Marker detection:

If there is marker information in the marker memory, it is indicated in the status byte.

Bit 6 labeled **M** in the status byte:

0 = no marker in marker memory. Data have been polled and retrieved.

1 = marker in marker memory.

Requesting marker information:

If the respective bit in the control byte is set, the marker label is output as an ASCII hex value on the interface, instead of the position.

Bit 2 labeled **S-Bit 0** in the control byte:

0 = do not send marker information.

1 = send marker information.

Definition of the marker labels:

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

First character:	A / B / C / D / Z
Second character:	Digit between 0 … 9
Third character:	Digit between 0 … 9

Marker label structure:

The marker label uses code type **Code128 with character set B** as opposed to Code128 with character set C for the position bar codes. Code128 with character set B enables the display of all letters and numbers in the ASCII character set.

Using the marker label with positioning (bar code tape):

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

Figure 9.8:System arrangement of marker labels

Using the marker label without positioning (bar code tape):

The marker label must be positioned within the BPS 8's detection range.

Positioning the marker label:

At any one time, no more than one marker label must be visible in the BPS 8's detection range.

Function sequence if a marker is inside the detection area:

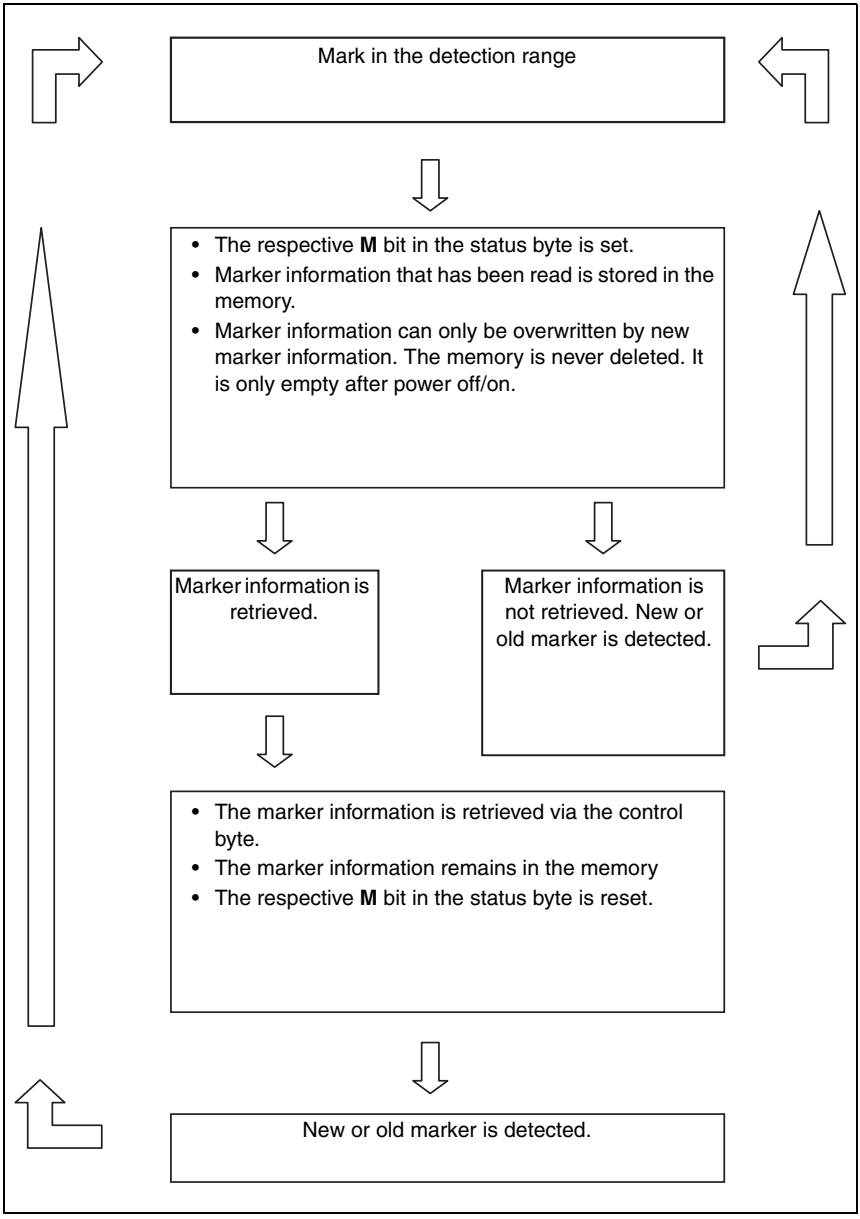


Figure 9.9:Function sequence for marker inside the detection area

This process toggles the **M** bit in the status byte as long as there is a marker in the detection range. The marker information does not depend on the BPS' speed or on the control's clock rate.

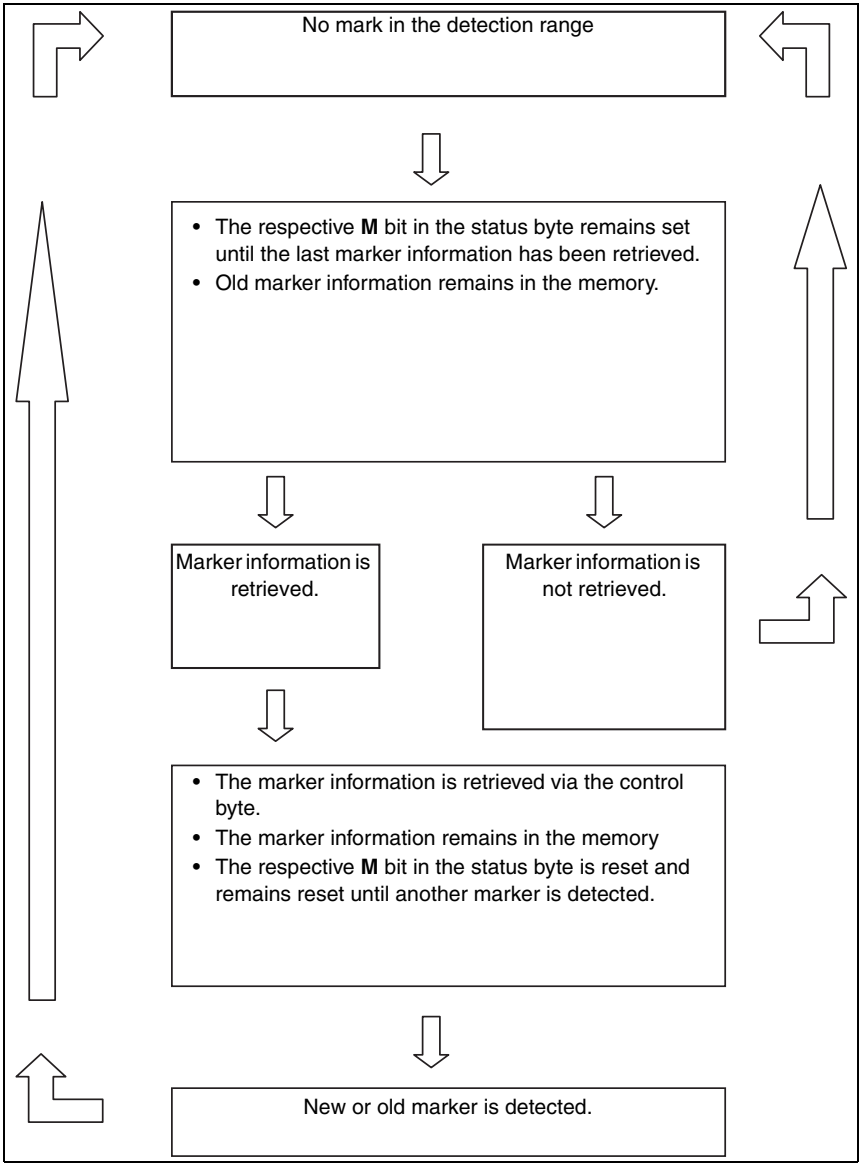


Figure 9.10:Function sequence for no marker inside the detection area

Output of marker information

Example marker information: **A01**

Data byte 1 = **A** = 41 hex = 001000001 bin

Data byte 2 = **0** = 30 hex = 000110000 bin

Data byte 3 = **1** = 31 hex = 000110001 bin

Byte no.	Designation	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte 1	NU	D	M	A1	A0	QT1	QT0	OUT	ERR
1	Data byte 1	0	0	1	0	0	0	0	0	1
2	Data byte 2	0	0	0	1	1	0	0	0	0
3	Data byte 3	0	0	0	1	1	0	0	0	1
4	XOR combination	Exclusive OR combination of bytes 0 to 3								
5	Repetition of data byte 1	0	0	1	0	0	0	0	0	1
6	Repetition of data byte 2	0	0	0	1	1	0	0	0	0
7	Repetition of data byte 3	0	0	0	1	1	0	0	0	1

Response to diagnostic query

If the diagnostic bit **D** in the status byte is set to 1, diagnostic data is present and may be retrieved.

By setting the respective **S-Bit 1** bit in the control byte (= bit 3), the diagnostic data is retrieved. The diagnostic bit **D** remains set to 1 as long as data is present. Only after the memory for diagnostic data is empty, the bit changes to 0 and the red status LED returns to normal mode.

Just as the marker information, the diagnostic data is transmitted as 3 ASCII characters.

Diagnostic information available:

The diagnostic data have the following format:

Byte 1 = **E** defines the diagnostic data.

Byte 2 = **x** number describing the error.

Byte 3 = **x** number describing the error.

Possible diagnostic data:

100 = software version number of the BPS 8, here in example 1.00

E01 = interface problem

E02 = motor problem

E03 = laser problem

E04 = internal problem

E05 = position value outside of measurement range

SOS = BPS 8 in SLEEP mode (system operation standby/SLEEP)

Note!

*If bit 2 **SLEEP** in the control byte is set to 1 and bit 7 **D** in the status byte has the value 1, the BPS 8 is in SLEEP mode (laser and polygon wheel motor off). If bit 4 **SLEEP** in the control byte is set to 0, the BPS 8 returns to positioning mode after a boot time of approx. 5s. If polling takes place while the BPS 8 boots and there is no valid position data yet, the error message **tape error** (bit **OUT**) is generated.*

Output of diagnostic data

Example for diagnostic data: **E05**

Data byte 1 = **E** = 45 hex = 001000101 bin

Data byte 2 = **0** = 30 hex = 000110000 bin

Data byte 3 = **5** = 35 hex = 000110101 bin

Byte no.	Designation	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte 1	NU	D	M	A1	A0	QT1	QT0	OUT	ERR
1	Data byte 1	0	0	1	0	0	0	1	0	1
2	Data byte 2	0	0	0	1	1	0	0	0	0
3	Data byte 3	0	0	0	1	1	0	1	0	1
4	XOR combination	Exclusive OR combination of bytes 0 to 5								
5	Repetition of data byte 1	0	0	1	0	0	0	1	0	1
6	Repetition of data byte 2	0	0	0	1	1	0	0	0	0
7	Repetition of data byte 3	0	0	0	1	1	0	1	0	1

Note!

*If there is a diagnostic query during SLEEP mode, **SOS** (System Operation Standby/ SLEEP) is transmitted in data bytes 1 to 3.*

9.3 Binary protocol type 3

Note!

*With the **BPS Configuration Tool**, the user can individually adapt the binary protocol 1 to the specific requirements of the application. The binary protocols 2 and 3, on the other hand, have a fixed structure and cannot be modified.*

9.3.1 Data format

- Baud rate: 19.200 kBaud
- Data bits: 8
- Start bit: 1
- Stop bits: 1
- Parity: Even

9.3.2 Telegram structure

9.3.2.11 Query to the BPS 8 (control byte)

Bit no.	7	6	5	4	3	2	1	0
Designation	CMD	F2	F1	F0	0	0	A1	A0

Bit	Function	Value	Explanation
0	A0	0	All read heads are occupied with address 0. The address can only be changed via the BPS Configuration Tool.
1	A1	0	
2	--	0	No function (permanently set to 0)
3	--	0	No function (permanently set to 0)
4	F0	0	Position value request.
		1	Diagnostic data request.
5	F1	0	No function (permanently set to 0)
6	F2	0	Polygon wheel motor is switched on.
		1	Polygon wheel motor is switched off (SLEEP mode [1]).
7	CMD	0	No function.
		1	Byte information is evaluated as a control byte.

1) To further increase the life expectancy of the device, it can be put into a SLEEP state. In SLEEP state, the motor and laser are switched off. Diagnostics of the read system cannot be performed.
When reactivating the device, the system takes approx. 5 s to boot. After this time, it reports with a message "System ready".

Note!

***A0** and **A1** are the address bits. If several BPS 8's operate in one network, an address configuration is required.*

Note!

*If the **F0** bit is set to 1, the diagnostic data are sent in response. Any indicated error is reset. This may be recognized by the status LED changing from red to green.*

Priority of the bits

- Priority 1: Diagnostic data
- Priority 2: Position values
- Priority 3: SLEEP

Note!

It is advisable to set only one control bit for each control byte as the BPS can only answer one query at a time. If several control bits are set, the function with the highest priority is executed.

9.3.2.12 Response from the BPS 8

Data content:

Byte no.	Designation	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte	0	SLEEP	A1	A0	CALC	DB	OUT	ERR
1	Data byte	0	P20	P19	P18	P17	P16	P15	P14
2	Data byte	0	P13	P12	P11	P10	P09	P08	P07
3	Data byte	0	P06	P05	P04	P03	P02	P01	P00
4	XOR combination	Exclusive OR combination of bytes 1 to 4							

Description of the status byte

Byte	Bit	Function	Value	Explanation
0	0	ERR	0	No errors occurred during the calculation of the position value.
			1	Errors occurred during the calculation of the position value.
	1	OUT	0	Scanning beam is positioned on the bar code tape.
			1	Scanning beam is positioned outside of the bar code tape.
	2	DB	0	No diagnostic response.
			1	Diagnostic response.
	3	CALC	0	Telegram-specific.
			1	Telegram-specific.
	4	A0	--	No function.
	5	A1	--	No function.
	6	SLEEP	0	Read head active.
			1	Read head in SLEEP mode
	7	NU	0	No meaning - bit is permanently set to 0.
1 … 3	0 … 6	POS	--	Position value, binary encoded
4	0 … 7	XOR	--	Block check digit, exclusive-OR combination of byte 1 to byte 4.

Note!

At a resolution of 1 mm and with 21 position bits, a maximum position of up to 2,097,151 mm can be transmitted.

Note!

*The **P00** data bit corresponds to the **LSB**, the **P20** data bit corresponds to the **MSB**.*

Note!

*In the response to a position query, the bits **CALC**, **DB** and **SLEEP** are set as follows:*

- ***CALC*** *= 1*
- ***DB*** *= 0*
- ***SLEEP*** *= 0*

Response to diagnostic query

If the diagnostic bit **DB** in the status byte is set to 1, the data in the data bytes correspond to the diagnostic data.

By setting the respective **F0** bit in the control byte (= bit 3), the diagnostic data is retrieved.

The diagnostic data is transmitted as 3 ASCII characters.

Byte no.	Designation	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte	0	SLEEP	A1	A0	CALC	DB	OUT	ERR
1	Data byte	0	P20	P19	P18	P17	P16	P15	P14
2	Data byte	0	P13	P12	P11	P10	P09	P08	P07
3	Data byte	0	P06	P05	P04	P03	P02	P01	P00
4	XOR combination	Exclusive OR combination of bytes 1 to 4							

Note!

*If bit 2 **DB** is set to 1, diagnostic data is present. In the response to a diagnostic query, the bits **CALC**, **DB** and **SLEEP** are set as follows:*

- ***CALC*** *= 1*
- ***DB*** *= 1*
- ***SLEEP*** *= 0*

Diagnostic information available:

The diagnostic data have the following format:

Byte 1 = **E** defines the diagnostic data.

Byte 2 = **x** number describing the error.

Byte 3 = **x** number describing the error.

Possible diagnostic data:

100 = software version number of the BPS 8, here in example 1.00

E01 = interface problem

E02 = motor problem

E03 = laser problem

E04 = internal problem

E05 = position value outside of measurement range

Response to sleep mode

Byte no.	Designation	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte	0	SLEEP	A1	A0	CALC	DB	OUT	ERR
1	Data byte	0	P20	P19	P18	P17	P16	P15	P14
2	Data byte	0	P13	P12	P11	P10	P09	P08	P07
3	Data byte	0	P06	P05	P04	P03	P02	P01	P00
4	XOR combination	Exclusive OR combination of bytes 1 to 4							

Note!

If bit 6 ***SLEEP*** *is set to 1, the BPS is in SLEEP mode. In a diagnostic response during sleep mode, the bits* ***CALC****,* ***DB*** *and* ***SLEEP*** *are set as follows:*

- ***CALC*** *= 0*
- ***DB*** *= 0*
- ***SLEEP*** *= 1*

In SLEEP mode, the data bits ***P00*** *to* ***P20*** *are always 0.*

10 Diagnostics and troubleshooting

10.1 General causes of errors

Error	Possible error causes	Measures
Status LED "off"	• No supply voltage connected to the device.	☐ Check supply voltage.
Status LED "Red, flashing"	• Warning.	☐ Query diagnostic data and carry out the resulting measures.
Status LED "Red, continuous light"	• Error, no function possible.	☐ Internal device error, send in device
Status LED "Orange, flashing"	• Service operation active.	☐ Reset service operation using BPS Configuration Tool.
Decode LED "off"	• Positioning deactivated.	☐ Call up position values. ☐ Deactivate SLEEP mode
Decode LED "Red, continuous light"	• Position value invalid (out of tape).	☐ Check positioning of bar code tape. ☐ Change the angle of the scanning beam by tilting the BPS 8. ☐ Check mounting. ☐ Clean BPS 8 window.
Decode LED "Orange, continuous light"	• Marker label detected.	☐ Retrieve marker label.
Position error	• No bar code tape exists. • Scanner positioned in total reflection. • Scanner not properly mounted.	☐ Check positioning of bar code tape. ☐ Change the angle of the scanning beam by tilting the BPS 8. ☐ Check mounting. ☐ Clean BPS 8 window.

10.2 Error on the interface

Error	Possible error causes	Measures
No communication via RS 232/RS 485	• Incorrect wiring. • Different baud rates. • Different protocol settings.	☐ Check wiring. ☐ Check baud rate. ☐ Check protocol settings.
Sporadic errors on the RS 232/RS 485 interface	• Incorrect wiring. • Effects due to EMC. • Overall network expansion exceeded.	☐ Check wiring, in particular the shield of the wiring. ☐ Check the cable used. ☐ Check shielding (shield covering in place up to the clamping point). ☐ Check grounding concept and connection to the protective conductor. ☐ Check max. network expansion as a function of the max. cable lengths.

Note!

*Please use **the Page 88 and Page 89 as a master copy** should servicing be required. Cross the items in the "Measures" column which you have already examined, fill out the following address field and fax both pages together with your service contract to the fax number listed below.*

***Customer data (please complete) Leuze service fax number:* +49 7021 573-199**

Device type:	
Company:	
Contact person/department:	
Phone (direct dial):	
Fax:	
Street / no.:	
ZIP code / City:	
Country:	

11 Type overview and accessories

11.1 Type overview: BPS 8

Part no.	Type designation	Comment
50104783	BPS 8 S M 102-01	Front beam exit and M12 connector
50104784	BPS 8 S M 100-01	Lateral beam exit and M12 connector

11.2 Accessories – Modular connection unit

Part no.	Type designation	Comment
50104790	MA 8-01	Connection unit for BPS 8 with RS 485 interface, M12 connector

11.3 Accessories - Cable

Part no.	Type designation	Comment
50040763	KB 008-1000 AA	M12 interconnection cable BPS 8 - MA 8 one axial socket, one axial plug, 1m
50040762	KB 008-2000 AA	M12 interconnection cable BPS 8 - MA 8 one axial socket, one axial plug, 2m
50040761	KB 008-3000 A	M12 interconnection cable BPS 8 - MA 8 one axial socket, one axial plug, 3m
50040760	KB 008-1000 AR	M12 m connecting cable BPS 8 - MA 8 one axial socket, one angled plug, 1m
50040759	KB 008-2000 AR	M12 m connecting cable BPS 8 - MA 8 one axial socket, one angled plug, 2m
50040758	KB 008-3000 A	M12 m connecting cable BPS 8 - MA 8 one axial socket, one angled plug, 3m
50102975	KB 008-10000A	M12 connection cable BPS 8 or MA 8-01 (Host) axial socket, one open cable end, 10m
50102973	KB 008-5000A	M12 connection cable BPS 8 or MA 8-01 (Host) axial socket, one open cable end, 5m
50040757	KB 008-3000A	M12 connection cable BPS 8 or MA 8-01 (Host) axial socket, one open cable end, 3m
50102976	KB 008-10000R	M12 connection cable BPS 8 or MA 8-01 (Host) angled socket, one open cable end, 10m
50102974	KB 008-5000R	M12 connection cable BPS 8 or MA 8-01 (Host) angled socket, one open cable end, 5m
50040756	KB 008-3000R	M12 connection cable BPS 8 or MA 8-01 (Host) angled socket, one open cable end, 3m
50102971	KB 008-10000 A-S	M12 connection cable MA 8-01 (SW IN/OUT) axial plug, one open cable end, 10m
50102969	KB 008-5000 A-S	M12 connection cable MA 8-01 (SW IN/OUT) axial plug, one open cable end, 5m
50101941	KB 008-3000 A-S	M12 connection cable MA 8-01 (SW IN/OUT) axial plug, one open cable end, 3m
50102972	KB 008-10000 R-S	M12 connection cable MA 8-01 (SW IN/OUT) angled plug, one open cable end, 10m
50102970	KB 008-5000 R-S	M12 connection cable MA 8-01 (SW IN/OUT) angled plug, one open cable end, 5m
50101942	KB 008-3000 R-S	M12 connection cable MA 8-01 (SW IN/OUT) angled plug, one open cable end, 3m
50020502	KD 095-5	Angled M12 connection socket with screw terminals
50020501	KD 095-5A	Axial M12 connection socket with screw terminals
50040098	KD 01-5-SA	Axial M12 connector for MA 8-01
50101943	KD 01-5-SR	Angled M12 connector for MA 8-01

11.3.1 Contact assignment of PWR IN connection cable

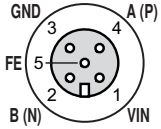
PWR connection cable (5-pin socket, A-coded)			
 **M12 socket (A-coded)**	**Pin**	**Name**	**Core color**
	1	VIN	**Brown**
	2	B (N)	**White**
	3	GND	**Blue**
	4	A (P)	**Black**
	5	FE	**Gray**
	Thread	FE	**Shield**

Figure 11.1:Contact assignment KB 008-10000/5000/3000 (A/R)

11.4 Accessories - Configuration software

Part no.	Type designation	Comment
50060298	BPS Configuration Tool	Configuration software

11.5 Accessories – Mounting device

Part no.	Type designation	Comment
50104791	BT 8-01	Mounting device

11.6 Type overview: Bar code tape

Part no.	Type designation	Comment
50104792	BCB 8 010	Bar code tape, 10m length, 47mm height
50104793	BCB 8 020	Bar code tape, 20m length, 47mm height
50104794	BCB 8 030	Bar code tape, 30m length, 47mm height
50104795	BCB 8 040	Bar code tape, 40m length, 47mm height
50104796	BCB 8 050	Bar code tape, 50m length, 47mm height
50104797	BCB 8 060	Bar code tape, 60m length, 47mm height
50104798	BCB 8 070	Bar code tape, 70m length, 47mm height
50104799	BCB 8 080	Bar code tape, 80m length, 47mm height
50104800	BCB 8 090	Bar code tape, 90m length, 47mm height
50104801	BCB 8 100	Bar code tape, 100m length, 47mm height
50104802	BCB 8 110	Bar code tape, 110m length, 47mm height
50104803	BCB 8 120	Bar code tape, 120m length, 47mm height
50104804	BCB 8 130	Bar code tape, 130m length, 47mm height
50104805	BCB 8 140	Bar code tape, 140m length, 47mm height
50104806	BCB 8 150	Bar code tape, 150m length, 47mm height
50104807	BCB 8 special length 47mm high	Bar code tape with special length, 47mm high
50104808	BCB 8 special length 30mm high	Bar code tape with special length, 30mm high
50104809	BCB 8 special length 25mm high	Bar code tape with special length, 25mm high

12 Maintenance

12.1 General maintenance information

Usually, the BPS 8 does not require any maintenance by the operator.

In the event of dust build-up, clean the optical window with a soft cloth; use a cleaning agent (commercially available glass cleaner) if necessary.

Also check the bar code tape for possible soiling.

Attention!

Do not use solvents and cleaning agents containing acetone. Use of improper cleaning agents can damage the optical window.

12.2 Repairs, servicing

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

- Contact your Leuze distributor or service organization should repairs be required. The addresses can be found on the inside of the cover and on the back.

Note!

When sending devices to Leuze electronic for repair, please provide an accurate description of the error.

12.3 Disassembling, packing, disposing

Repacking

For later reuse, the device is to be packed so that it is protected.

Note!

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

13 Appendix

13.1 EC Declaration of Conformity

Leuze electronic

EG-Konformitätserklärung
EC-Declaration of conformity

Hersteller:
Manufacturer:

Leuze electronic GmbH + Co KG
In der Braike 1
73277 Owen / Teck
Deutschland

erklärt, unter alleiniger Verantwortung, dass die folgenden Produkte:
declares under its sole responsibility, that the following products:

Gerätebeschreibung:
Description of Product: BPS 8 + MA 8

folgende Richtlinien und Normen entsprechen.
are in conformity with the standards an directives:

Zutreffende EG-Richtlinien:
Applied EC-Directive:

89/336/EWG	EMV-Richtlinie / *Guidilines*
73/23/EWG	Niederspannungsrichtlinie / *Low Voltage Directive*

Angewandte harmonisierte Normen:
Applied harmonized standards:

EN 61000-6-2:2001	EMV Fachgrundnormen Störfestigkeit Industrie *Immunity standard for industrial environments*
EN 61000-6-3:2001	EMV-Fachgrundnormen Störaussendung Mischgebiete *Emmission standard for residental commercial and light industrial environments*
EN 55022:1998 + A1:2000 + A2:2003	EMV-Funkstöreigenschaften ITE-Produkte *Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement*
EN 55024:1998 + A1:2001 + A2:2003	EMV-Störfestigkeit, ITE-Produkte *Information technology equipment – Immunity characteristics - Limits and methods of measurement*
EN 61000-4-2:1995 + A1:1998 + A2:2001	Entladung statischer Elektrizität (ESD) *Immunity to electrostatic discharge (ESD)*
EN 61000-4-3:2002 + A1:2002	Hochfrequente elektromagnetischer Felder *Radiated, radio-frequency, electromagnetic field immunity*
EN 61000-4-4:1995 + A1:2001 + A2:2001	Schnelle transiente elektr. Störgrößen *Immunity to electrical fast transient/burst*
EN 61000-4-6:2002	Leitungsgeführte Störgrößen *Immunity to conducted disturbances*
EN 60825-1:1994 + A1:2002 + A2:2001	Sicherheit von Lasereinrichtungen Safety of laser products

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73277 Owen / Teck
Deutschland

Owen, den 23.3.06

Michael Heyne
(Geschäftsführer / managing director)