SSI

BE-90 SSI

User Manual

Barcode positioning system BE-90 with SSI interface

- **Safety instructions**
- **Technical data**
- **Installation**
- **Commissioning**
- **Configuration / Parameterization**
- **Maintenance**

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Table of Contents

Revision index

Revision	Date	Index
First release	05/02/2002	00
Correction of the operating range	01/28/2003	01
- Additional information about the laser radiation in chap. "Working Safely" - New SSI format as of V 01.06 in chap. "Technical Data" - Additional information's about the connection of the protective conductor PE	11/13/2003	02
- Note: No use into environments with direct sunlight exposure	11/14/2006	03
- New chapter added "5 Barcode tape"	05/06/2009	04
- Operating range modified - Mounting drawing for fastener added	03/09/2011	05

1 General Information

1.1 Explanation of Symbols

The symbols used in this operating manual are explained below.

⚠️ ***Attention***
Play attention to passages marked with this symbol. Failure to heed this information can lead to injuries to personnel or damage to the equipment.

⚠️ ***Attention Laser***
This symbol warns of possible danger through hazardous laser radiation.

i ***Notice***
This symbol indicates text passages containing important information.

2 Safety Notices

2.1 Safety Standards

The barcode positioning system BE-90 and the optional connection units have been developed, produced and tested subject to the applicable safety standards. They correspond to the state of the art.

2.2 Intended Use

⚠ *Attention!*
The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not corresponding to its intended use.

Barcode positioning systems of the type BE-90 are optical measuring systems which use visible red laser light to determine the position of the BE-90 relative to a permanently mounted barcode band.

Typically, the BE-90 is mounted on a (rail-)guided vehicle whose position is to be exactly determined.

The position is determined to within a millimeter using the information of the fixed barcode band and made available to the primary system at a suitable interface.

The optional connector and interface units are intended for the easy connection of barcode positioning systems of type BE-90

In particular, unauthorized uses include:

- rooms with explosive atmospheres
- operation for medical purposes
- into environments with direct sunlight exposure or with suitable protection device only

Areas of application

The barcode positioning system BE-90 with optional connection unit has been designed particularly for the following fields of application:

- High-bay storage devices and lifting gear
- Crane systems
- Side-tracking skates
- Transfer machines
- Telpher lines

2.3 Working Safely

Attention Laser Radiation!
The barcode positioning system BE-90 operates with a red light laser of class 2 acc. to EN 60825-1 (2001/11). It also complies with the U.S. 21 CFR 1040 regulations for a class II product. If you look into the beam path over a longer time period, the retina of your eye may be damaged!

Never look directly into the beam path!

Do not point the laser beam of the BE-90 at persons!

When mounting and aligning the BE-90, take care to avoid reflections of the laser beam off reflective surfaces!

The use of operating and adjusting devices other than those specified in this technical description, carrying out of differing procedures, or improper use of the barcode positioning system may lead to dangerous exposure to radiation!

The use of optical instruments or devices in combination with the device increases the danger of eye damage!

Adhere to the applicable legal and local regulations regarding protection from laser beams acc. to EN 60825-1 in its latest version.

The BE-90 uses a laser diode with low power in the visible red light range with an emitted wavelength of about 650nm. The output power of the laser beam at the reading window is at most 1.8 mW acc. to EN 60825-1 (2001/11).

The reading window is the only opening through which the laser radiation can escape from the device. The housing of the BE-90 is sealed and has no parts that need to be adjusted or maintained by the user. The device must not be tampered with and must not be changed in any way!

i *Notice!*
It is important that you attach the sticky labels supplied to the device (notice signs and laser emission symbol)! If the signs would be covered due to the installation situation of the BE-90, attach them close to the BE-90 such that reading the notices cannot lead to looking into the laser beam!
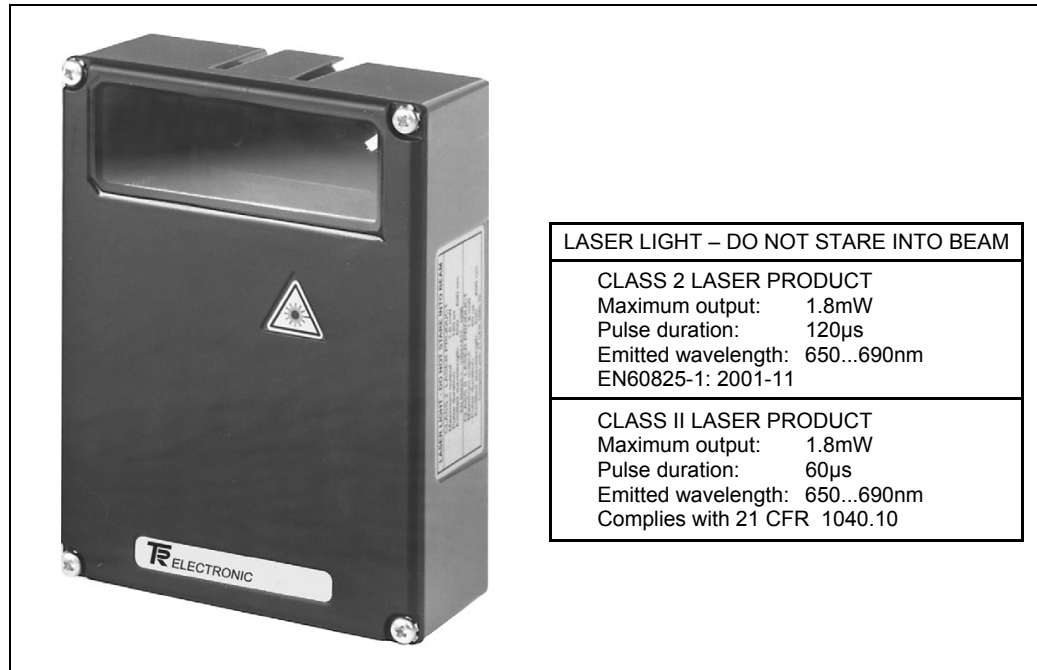
Figure 2-1: Example for the attachment of the sticky label with warning notices

Attention!
Access to or changes on the device, except where expressly described in this operating manual, is not authorized.

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

Qualified personnel
Mounting, commissioning and maintenance of the device must only be carried out by qualified personnel.
Electrical work must be carried out by a certified electrician.

3 Description

Information on technical data and characteristics can be found in chapter 4.

3.1 BE-90 device construction
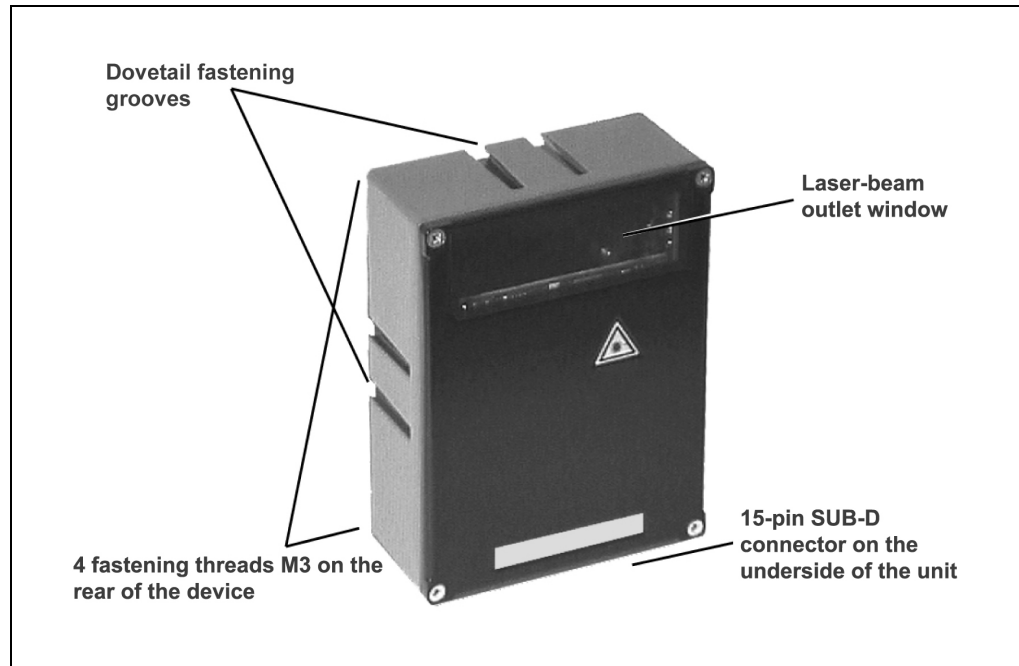
Figure 3-1: BE-90 device construction

3.2 Application

Anywhere systems are moved automatically, it is necessary to correctly determine their positions. This is achieved using various measurement techniques. In addition to mechanical measurement sensors, optical methods are particularly well suited for determining positions as they operate without mechanical wear and slippage.

Unlike other optical measurement methods, the barcode positioning system is not restricted to linear movements. It can also be used flexibly in curved systems. Anywhere the longwearing barcode band can be attached, it is possible to use the BE-90 to determine the position to within a millimeter.

Guide tolerances of the system play no roll as the permitted separation between band and BE-90 allows for large deviations in distance.

3.3 Function

The BE-90 uses visible red laser light to determine its position relative to the barcode band. This essentially takes place in three steps:

1. Reading a code on the barcode band

2. Determining the position of the read code in the scanning area of the laser beam

3. Calculating of the position to within a millimeter using the code information and the code position

The position value is then passed on via the standardized SSI interface (synchronous serial interface) to the drive system of the vehicle for which the position is to be determined.

3.4 Advantages

- Easy installation and commissioning

- Teach-function for the "zero point", i.e. it is not necessary to exactly affix the barcode band.

- Data output via SSI interface; BE-90 can be connected instead of a conventional rotation encoder.

- The function of the BE-90 makes it possible to attach the barcode band only at those locations where it is necessary that the positions be known exactly.

- Positioning of non-linear movements as well

- No referencing necessary following voltage drop

- Thanks to the large scanning depth, it is possible to compensate for mechanical tolerances.

- It is possible to exactly determine positions from distances of 10000 metres.

3.5 Standalone operation

The barcode positioning system BE-90 is operated as a single "stand alone" device. The BE-90 features a 15-pin SUB-D connector for the electrical connection of the supply voltage, the interface and the switching inputs.

With connection units
The connection units simplify the electrical installation of the barcode positioning system in stand-alone operation.

Moreover, they store the operating parameters so that the configuration data are retained even if the BE-90 is replaced and can show parameters and operating data on a display.

A listing of the available connection units and associated short descriptions can be found in chapter 6.
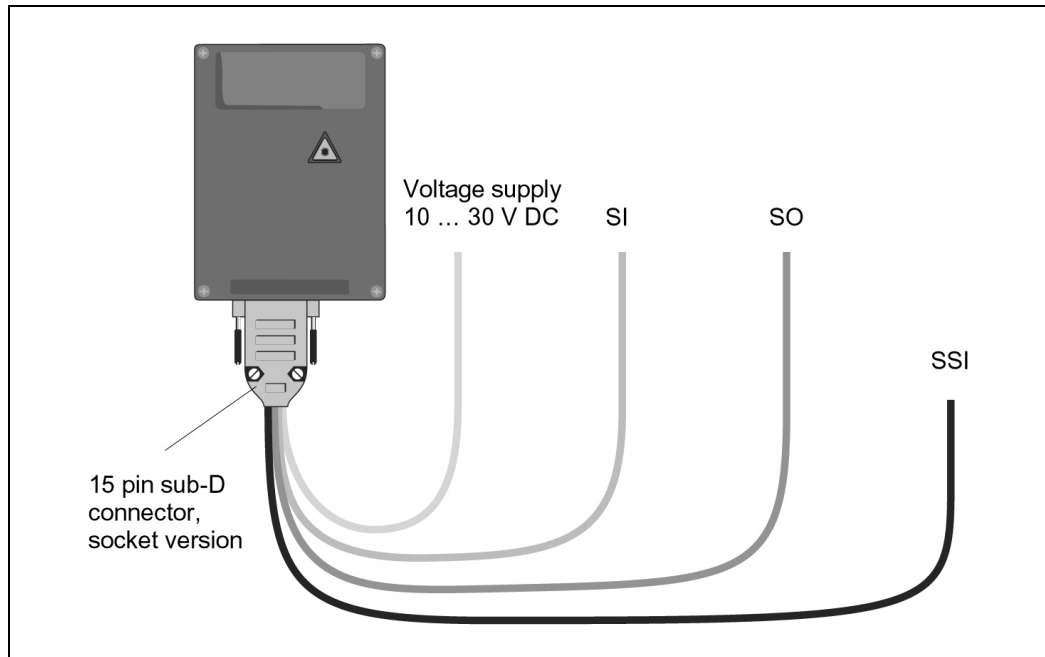
Without connection unit

Figure 3-2: Connection BE-90 "Stand alone"

With connection unit
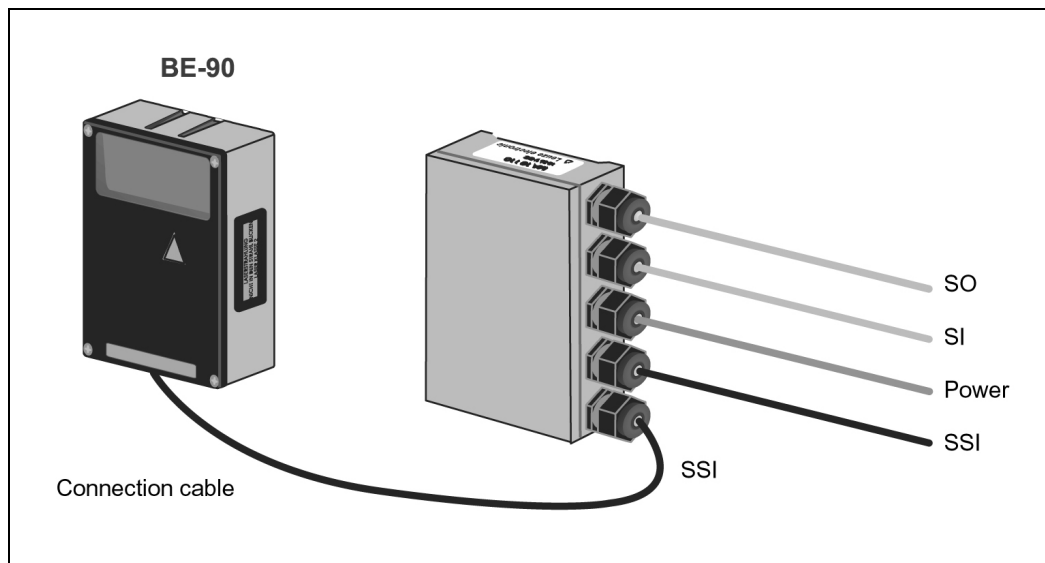
Figure 3-3: BE-90 connection with connection unit

4 Technical Data

4.1 General Specifications BE-90

Optical Data

Light source	Laser diode 650 nm
Scanning rate	1000 scans/sec.

Measurement data

Reproducible accuracy	±1 (2) mm
Integration time	16 (8) ms
Measurement value output	500 values/sec.
Scanning depth	90 … 170 mm

Electrical Data

Interface type	SSI (RS422)
(standard setting)	electrically isolated
	bits 0 … 24: data bits with position value
	bit 25: error bit
	resolution: 1mm
	800 kHz max. clock frequency
	output of positive and negative position values Gray coded
Service Interface	RS232 with fixed data format,
	9600 baud, 8 data bits, no parity, 1 stop bit
Ports	1 switching output, 1 switching input
LED green	device ready (Power On)
Operating voltage	10 ... 30 V
Power consumption	3.2 W

Mechanical Data

Protection class	IP 65
Weight	400 g
Dimensions (W x H x D)	120 x 90 x 43 mm
Housing	diecast aluminum

Environmental data

Operation without optics heating	0°C ... +40°C
Operation with optics heating	-30°C ... +40°C
Storage	-20°C ... +60°C
Air humidity	max. 90% rel. humidity, non-condensing
Vibration	IEC 68.2.6
	IEC 68.2.27 (shock)
	IEC 801
Electromagnetic compatibility	acc. to IEC 60947-5-2

Table 4-1: General Specifications BE-90

4.2 Barcode band

Max. length (measurement length)	10 000 m
Ambient temperature	-40°C ... +120°C
Mechanically characteristics	Resistantly against scratch and wipe, UV-light, humidity, chemicals and solvents (restricted).

Further details see page 16, and the following pages.

4.3 LED-indicators

An internal LED indicates in the reading window whether or not the supply voltage is present.

4.4 Dimensioned and Connection Drawings

BE-90
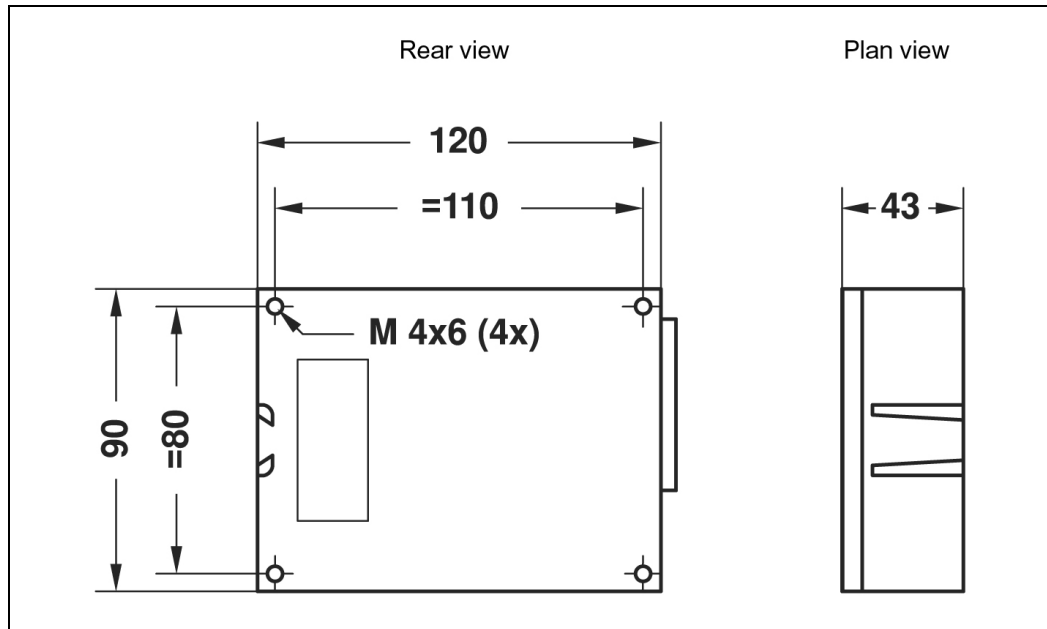
Figure 4-1: Dimensioned drawing BE-90

Scanning curve BE-90
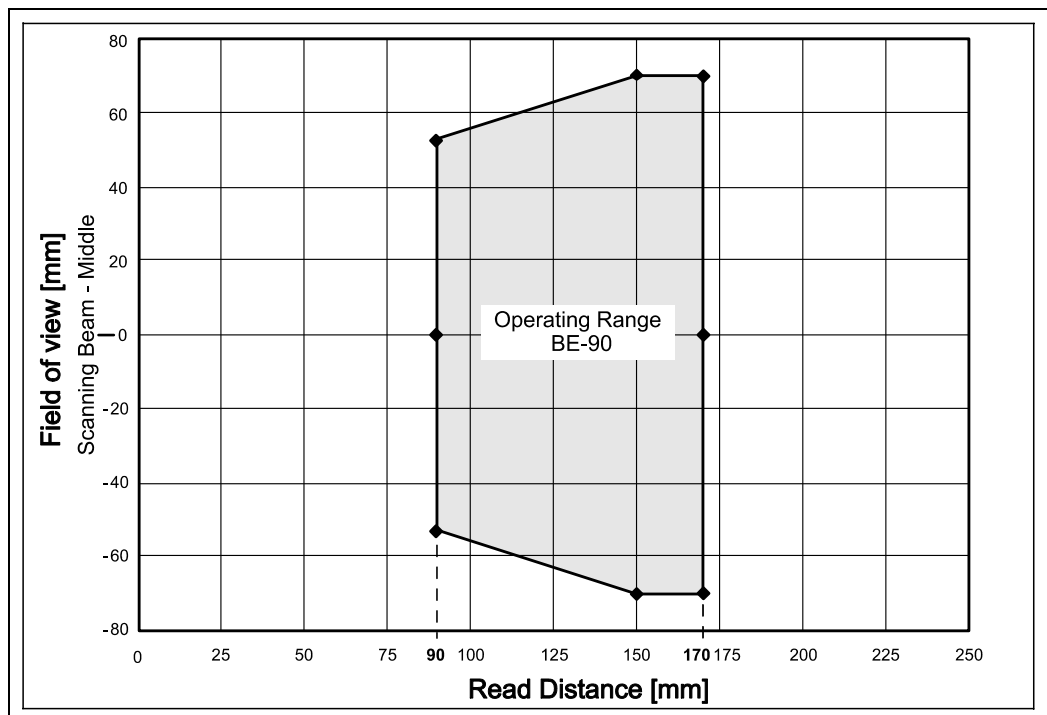
Figure 4-2: Scanning curve BE-90

5 Barcode tape

5.1 General information

The barcode tape is delivered on a roll. A roll contains up to 200m of barcode tape, with the wrapping direction from the outside to the inside (smallest number on the outside). If a barcode tape is ordered which is considerably longer than 200m, the total length is divided into rolls of 200m each.

Figure 5-1: Roll with barcode tape

Features:

   • Robust and durable polyester adhesive tape
   • High dimensional stability
   • Max. length 10.000 m
   • Self-adhesive, high adhesive strength

5.2 Specifications of the barcode tape

Dimensions

Standard height	47 mm (other heights on request)
Length	0 … 5 m, 0 … 10 m, 0 … 20 m, …, 0 … 150 m, 0 … 200 m, special lengths and special codings for lengths from150 m

Construction

Manufacturing process	Filmsetting	
Surface protection	Polyester, matt	
Base material	Polyester film, affixed without silicone (0.08mm)	
Adhesive	Acrylate adhesive	
Adhesive thickness	0.1 mm	
Adhesive strength (average values)	on aluminium:	25 N/25 mm
	on steel:	25 N/25 mm
	on polycarbonate:	22 N/25 mm
	on polypropylene:	20 N/25 mm

Environmental data

Recom. processing temperature	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 BE-90 after the barcode tape is affixed
Thermal expansion	due to the high elasticity of the barcode tape, thermal expansion of the base material on which the barcode tape is affixed is not known to have an effect
Tearing resistance	150N
Elongation at tear	min. 80 %, tested in accordance with DIN 50014, DIN 51220
Weathering resistance	UV-light, humidity, salt spray (150h/5%)
Chemical resistance (tested at 23 °C for 24 h)	transformer oil, diesel oil, white spirit, heptane, ethylene glycol (1:1)
Behaviour in fire	self-extinguishing after 15 s, does not drip
Mounting surface	grease-free, dry, clean, smooth

Table 5-1: Specifications of the barcode tape

5.3 Mounting the barcode tape

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

i *Notice!*

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

The recommended interruption points on the barcode tape are at the provided cut marks.
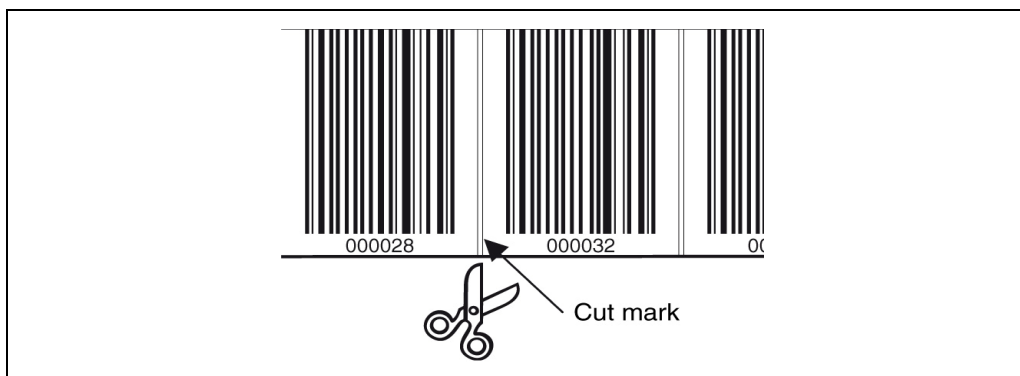
Figure 5-2: Cut mark on the barcode tape

i *Notice!*

Cutting the barcode tape 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 BE-90. The gap must not be greater than the distance from one cut mark to the next (max. one label).
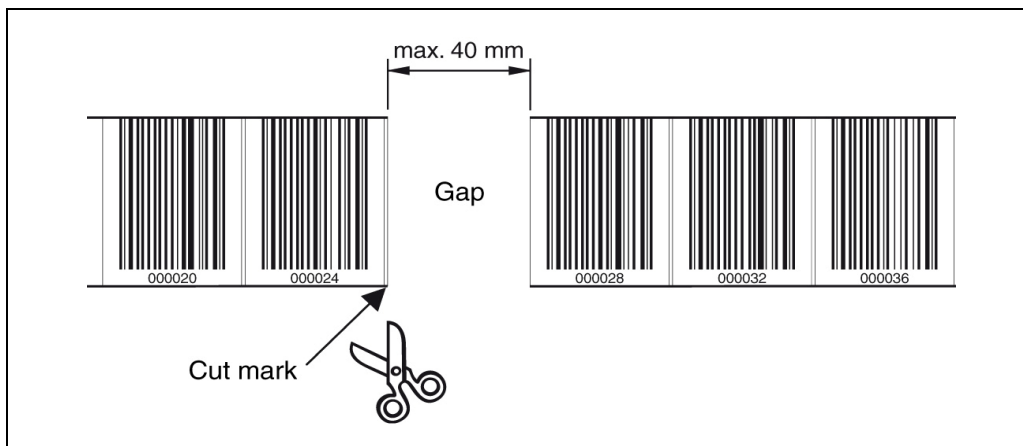

Figure 5-3: Gap in the cut barcode tape

Procedure:

- Examine the mounting 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 barcode tape along the reference edge tension free. Secure the barcode tape to the mounting surface by pressing down with the palm of your hand. When affixing, make certain that the barcode tape is free of folds and creases and that no air pockets form.

- Never pull the barcode tape. 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 BE-90 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 millimetres can simply be covered with the barcode tape. The tape must not be interrupted at this location.

- 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 completely scan any label, the BE-90 returns the value 0. As soon as the BE-90 can again scan a complete label, it calculates the next position value.

- The maximum gap between two barcode positions without affecting the measurement value is 40 mm.

⚠️ *Attention!*

Barcode tapes with different value ranges may not directly follow one another. If the value ranges are different, the gap between the two barcode tapes must be greater than the detection range of the scanning beam or control barcodes must be used.

i *Notice!*

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

i *Notice!*

When working with barcode tape in curves, the barcode tape should only be partially cut at the cut mark and affixed along the curve like a fan; it must also be ensured that the barcode tape is affixed without tension (see **Figure 5-4**).
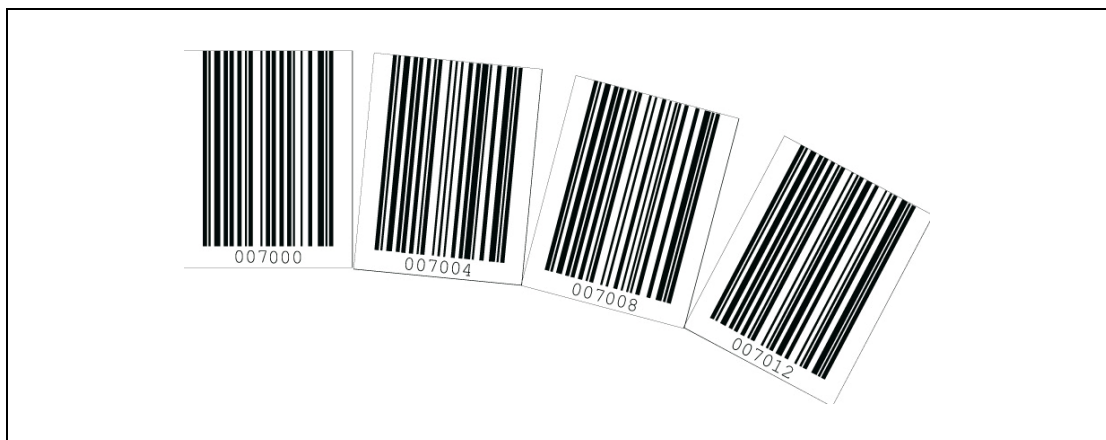
Figure 5-4: Partial cutting of the barcode tape in curves

TR - E - BA - GB - 0024 - 05 03/09/2011

6 Accessories / Order Designation

i

Notice!
Products manufactured by TR-Electronic GmbH can be ordered from any of the distributor and service addresses listed on the last page.

6.1 Read head, RH (stand-alone unit)

Explanation of the order designation

The order designation is structured according to the following scheme:

40803-**1**ABCD

The letters A - D represent the following device variants:

- A interface   1 = SSI (synchronous-serial)
                            2 = PROFIBUS, RS485

- B extension   always 0

- C extension   always 0

- D option (H)   0 = without option
                            1 = -30 - +40°C

Available device variants:

BE-90 RH SSI 40803-11000   Read Head SSI without option
BE-90 RH SSI + H 40803-11001   Read Head SSI with option -30 - +40°C

BE-90 RH PB 40803-12000   Read Head Profibus without option
BE-90 RH PB + H 40803-12001   Read Head Profibus with option -30 - +40°C

RH   = Read Head
SSI   = Synchronous-Serial-Interface
PB   = Profibus
H   = Heating

Please indicate these designations at the order.

6.2 Connection-Unit, CU

Explanation of the
order designation

The order designation is structured according to the following scheme:

40803-**2**ABCD

The letters A - D represent the following device variants:

- A interface   1 = SSI interface box, programmable with
                          parameter memory

- B extension   always 0

- C extension   always 0

- D option   0 = without display
                      1 = extension

Available device variants:

BE-90 CU SSI 40803-21000   Connection-Unit SSI without display

CU   = Connecting Unit
SSI   = Synchronous-Serial-Interface

Please indicate these designations at the order.

i *Notice!*

The connection unit is described here in brief only. For further information regarding the connection unit please refer to the relevant data sheets

The connection unit is used to simplify the electrical installation of the BE-90. It has the following advantages compared to the installation of the BE-90 as a standalone device:

- Terminals for switching inputs and outputs, including supply voltage

- 9-pin sub-D plug for service interface

- Operating mode switch: service operation/standard operation

- Code types – changeover switches binary/Gray

- Rotary switch for setting the resolution

- Parameter memory for the BE-90 – the positioning system can be exchanged without the need for reconfiguration.

- Display (SSI variant only)

Printed in the Federal Republic of Germany
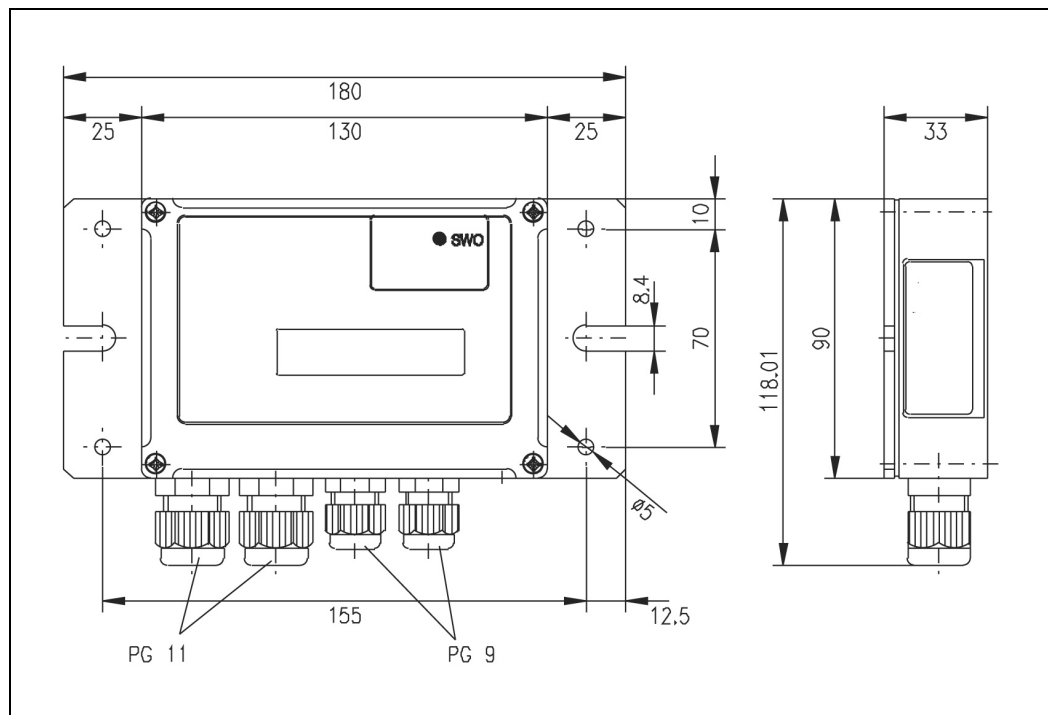
Figure 6-1: Connection unit BE-90 / dimensioned drawing

6.3 Software, SW

Explanation of the order designation

The order designation is structured according to the following scheme:

40803-**3**ABCD

The letters A - D represent the following software variants:

- A   interface   1 = SSI (Synchronous-Serial)
                                        2 = PROFIBUS, RS485

- BCD   software-no.   until now "000" for both variants

Available software variants:

BE-90 SW SSI 40803-31000   SSI software variant

BE-90 SW PB 40803-32000   Profibus software variant, device master files (GSD)

SW   = Software
SSI   = Synchronous-Serial-Interface
PB   = Profibus

Please indicate these designations at the order.

6.4 Cable Set, CA

For the connection between BE-90 and SSI-Connection-Unit a special connection-cable is available.

Explanation of the order designation

The order designation is structured according to the following scheme:

40803-**4**ABCD

The letters A - D represent the following cable variants:

- A extension   always 0

- B extension   always 0

- C extension   always 0

- D cable set variant   1 = cable set, 15 pin Sub-D, without connector
                                2 = cable set, 15 pin Sub-D, with 12 pin Contact-Connector

Available cable variants:

BE-90 CA-3M 40803-40001   Cable set for Read-Head and SSI-Connection-Unit with 3 m length
BE-90 CA-3M 12P 40803-40002   Cable set for Read-Head and SSI-Connection-Unit with 3 m length, 12 pin Contact

Pin assignment, *c*able set BE-90 CA-3M 12P 40803-40002

Function	15 pin SUB-D (female)	Color	12 pin Contact Connector
GND	1	red/blue	7
SWIN 1	2	white	9
SSI-Data +	3	pink	3
SSI-Data -	4	gray	4
NC	5	black	NC
SSI-clock +	6	white/green	2
/Serv	7	gray/pink	8
US = 10 - 30 V	8	red	11
SSI-clock -	9	brown	1
SWOUT 1	10	white/yellow	10
RXD	11	yellow	5
TXD	12	green	6
NC	13	violet	NC
NC	14	brown/green	NC
GND 0V	15	blue	12

6.5 Fastening Accessories, FA

The mounting unit is available for mounting the **BE-90**. It is designed for rod installation.

Explanation of the order designation

The order designation is structured according to the following scheme:

40803-**5**ABCD

The letters A - D represent the following mounting variants:

- A extension   always 0

- B extension   always 0

- C extension   always 0

- D mounting element   1 = Mounting element BE-90 / Connection-Unit

Available mounting variants:

BE-90 FA-001 40803-50001   Mounting element (dove tail for round pipes) between BE-90 and connection-unit

FA   = Fastener

Please indicate these designations at the order.
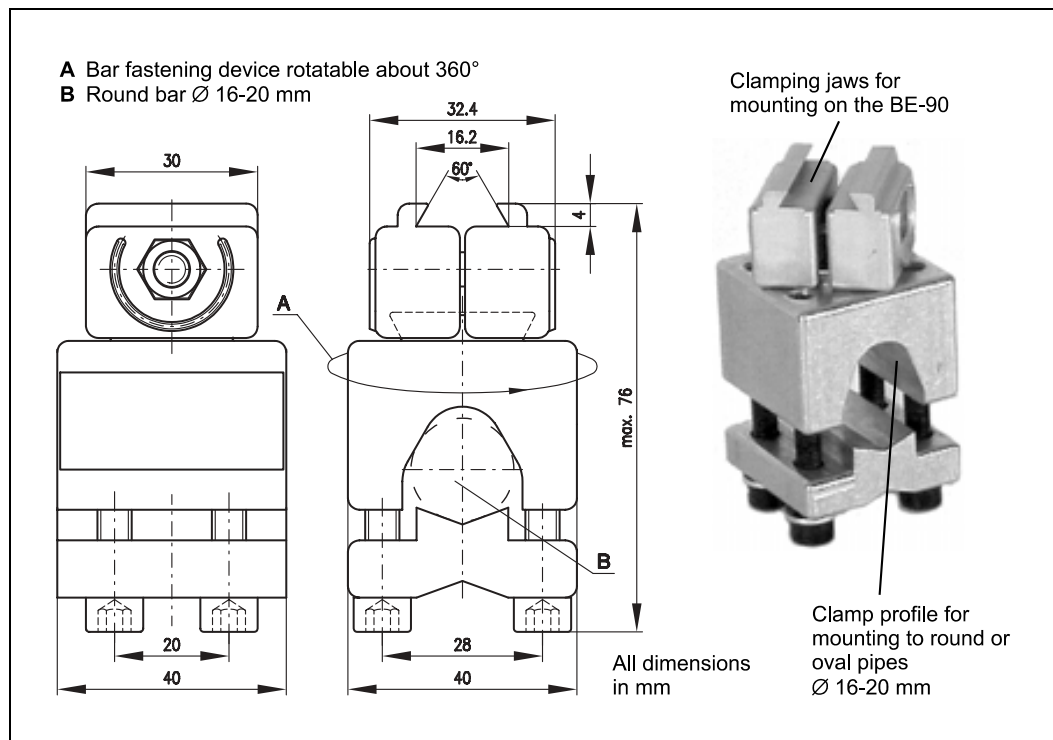
A Bar fastening device rotatable about 360°
B Round bar ⌀ 16-20 mm

Clamping jaws for mounting on the BE-90

Clamp profile for mounting to round or oval pipes ⌀ 16-20 mm

All dimensions in mm

Figure 6-2: Mounting element BE-90

6.6 Special Barcode band, BC

Explanation of the order designation

The order designation is structured according to the following scheme:

40803-**6**ABCD

The letters A - D represent the following barcode band length

- ABCD   barcode band length   Total length in 10 m steps
  The length begins with the first meter
  Example: 40803-60002 = 20 m (0 - 20 m)

Available barcode band lengths:

BE-90 BC 020   40803-60000   Barcode band, 0 - 5 m length

BE-90 BC 010   40803-60001   Barcode band, 0 - 10 m length

BE-90 BC 020   40803-60002   Barcode band, 0 - 20 m length

BE-90 BC 030   40803-60003   Barcode band, 0 - 30 m length

BE-90 BC 040   40803-60004   Barcode band, 0 - 40 m length

BE-90 BC 050   40803-60005   Barcode band, 0 - 50 m length

BE-90 BC 060   40803-60006   Barcode band, 0 - 60 m length

BE-90 BC 070   40803-60007   Barcode band, 0 - 70 m length

BE-90 BC 080   40803-60008   Barcode band, 0 - 80 m length

BE-90 BC 090   40803-60009   Barcode band, 0 - 90 m length

BE-90 BC 100   40803-60010   Barcode band, 0 - 100 m length

BE-90 BC 200   40803-60020   Barcode band, 0 - 200 m length

BC   = Barcode band

Please indicate these designations at the order.

6.6.1 Special barcode band (replacement)

Must, by a damage caused, only a certain part of a barcode band to be replaced, the damaged bar code piece can be reordered. The article number BE-90 BC SA 40803-70001 must be indicated with specification of the start- and end-value of the damaged barcode band.

7 Installation

7.1 Storage, Transportation

⚠️ ***Attention***

When transporting, package the device so that it is protected against collision and humidity. Optimal protection is achieved when using the original packaging. Heed the required environmental conditions specified in the technical data.

Unpacking

- *Check the packaging for any damage. If damage is found, notify the post office or shipping agent as the supplier.*
- *Check the delivery contents using your order and the delivery papers:*
    - delivered quantity
    - device type and model as indicated on the nameplate
    - accessories
    - operating manual
- *Save the original packaging for later storage or shipping.*

If you have any questions concerning your shipment, please contact your supplier or your local TR-Electronic sales office.

- *Observe the local regulations regarding disposal and packaging.*

Cleaning

- *Clean the glass window of the BE-90 with a soft cloth before mounting. Remove all packaging remains, e.g. carton fibers or Styrofoam balls.*

⚠️ ***Attention!***

Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device and the barcode band.

7.2 Mounting

Accessories

For mounting a mounting system is available. It may be ordered separately from TR-Electronic. For order numbers, see page 25.

Mounting the BE-90

There are two basic types of mounting arrangements for the BE-90:

- using the dovetail groove and the corresponding mounting accessories (see Figure 6-2, page 25)
- using the fastening threads on the back- and underside of the devices (see Figure 4-1: Dimensioned drawing BE-90)
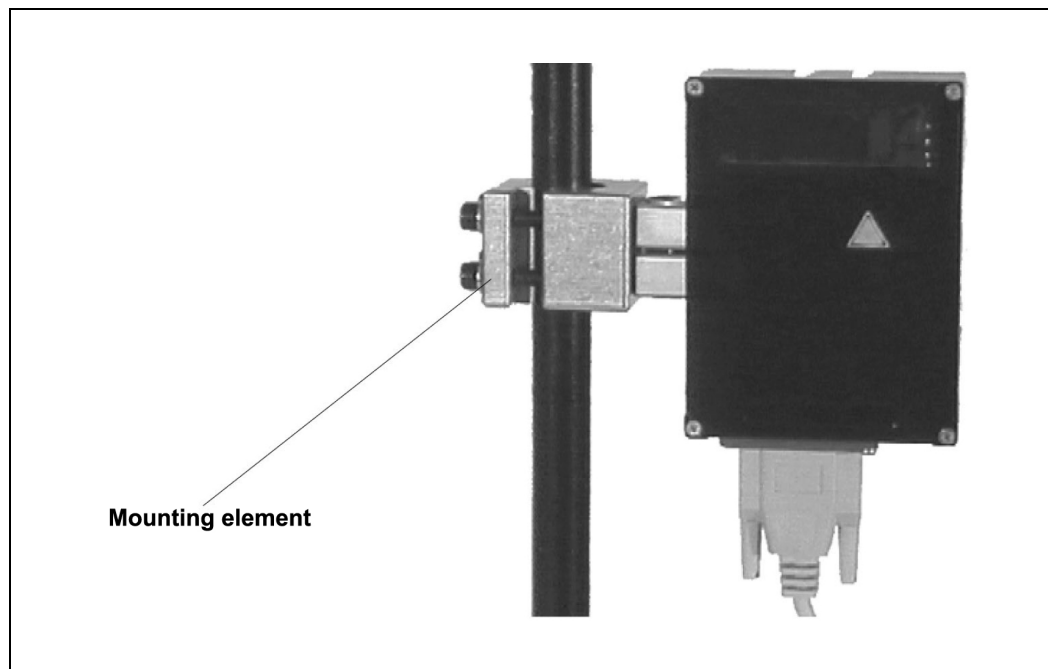
Mounting example BE-90

Figure 7-1: Mounting example BE-90

Mounting

You can mount all connection units individually through the holes located on the mounting plate (see Figure 6-1, page 23).

Subsequently, connect the BE-90 with the connection unit via the respective cable (see chapter 6.4, page 24).

7.2.1 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 locations at which a position determination is to be made.
- The BE-90 should be mounted inclined 10° from vertical towards the barcode band to ensure that the read results are reliably obtained even if the barcode band is soiled.

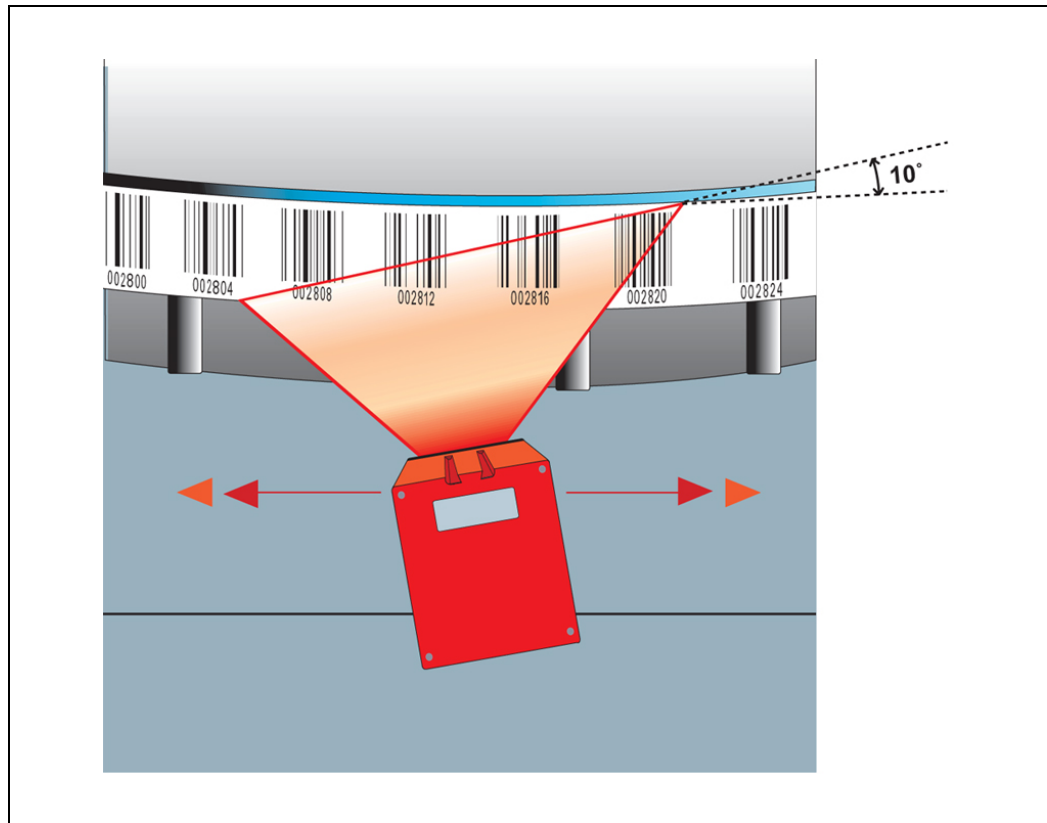**Figure 7-2: Device arrangement to the code band**

i *Notice*

The best functionality is obtained when:
- the BE-90 is guided parallel to the band
- the permitted working range is not exited

i *Notice*

On the BE-90, the beam is not emitted perpendicular to the cover of the housing, but with an angle of 10° towards the top. This angle is intended to prevent total reflection on the barcode band.
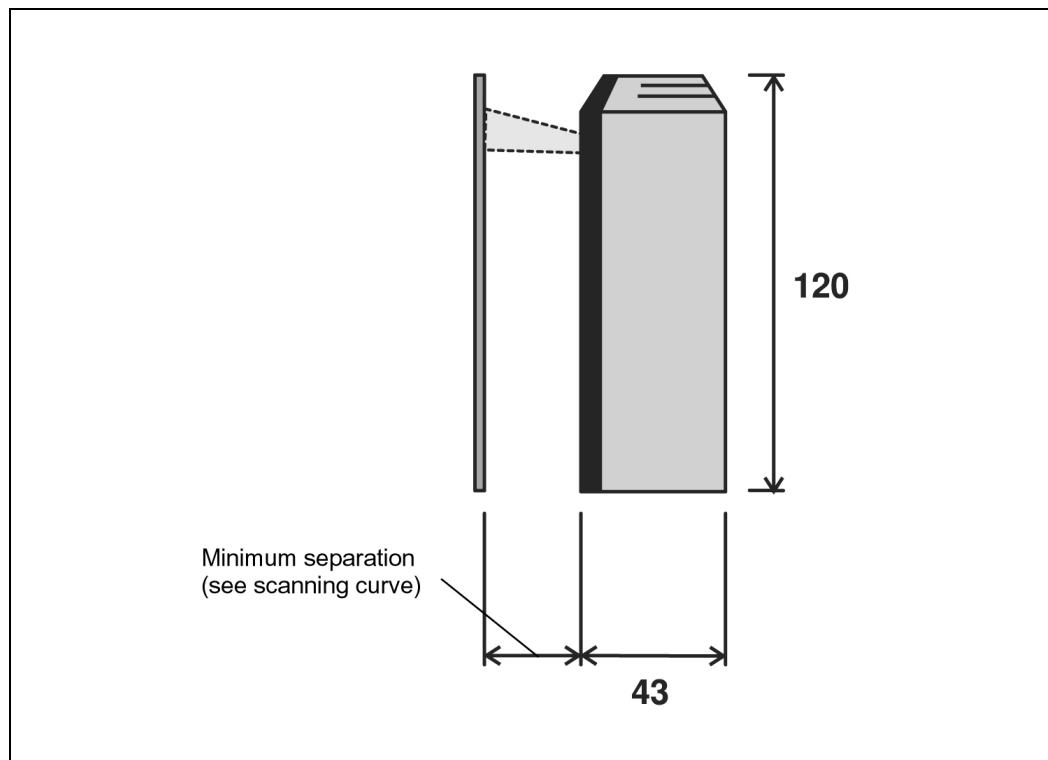
Figure 7-3: Beam outlet on the BE-90

Mounting location

- *When selecting a mounting location, pay attention to*

    - maintaining the required environmental conditions (humidity, temperature).

    - possible soiling of the reading window due to liquids, abrasion by boxes, or packaging material residues.

    - lowest possible change of damage to the scanner by mechanical collision or jammed parts.
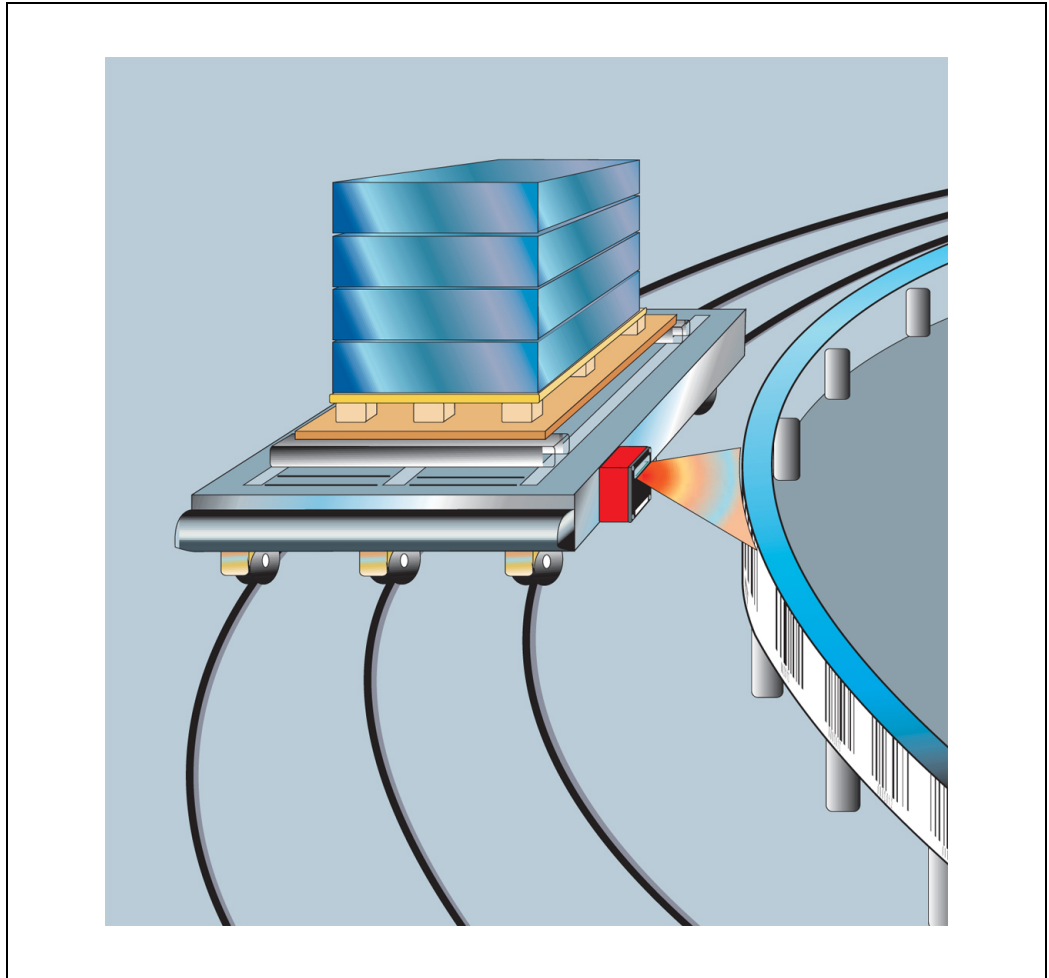
Application example

Figure 7-4: Application example

7.3 Connection

⚠️ **Attention!**
Never open the device yourself, as this may compromise protection class IP 65.

Before connecting the device, be sure that the supply voltage agrees with the value printed on the nameplate.

Connecting the device and maintenance work while under voltage must only be carried out by a qualified electrician.

The power supply unit for the generation of the supply voltage for the BE-90 and the respective connection units must have a secure electrical insulation via double insulation and safety transformers according to DIN VDE 0551 (IEC 742).

BE sure that the earthing conductor is connected correctly. Error-free operation is only guaranteed when the device is properly earthed.

If faults cannot be corrected, the device should be removed from operation and protected against possible use.

7.3.1 Connecting BE-90 (SSI)

BE-90 sub-D pin assignments
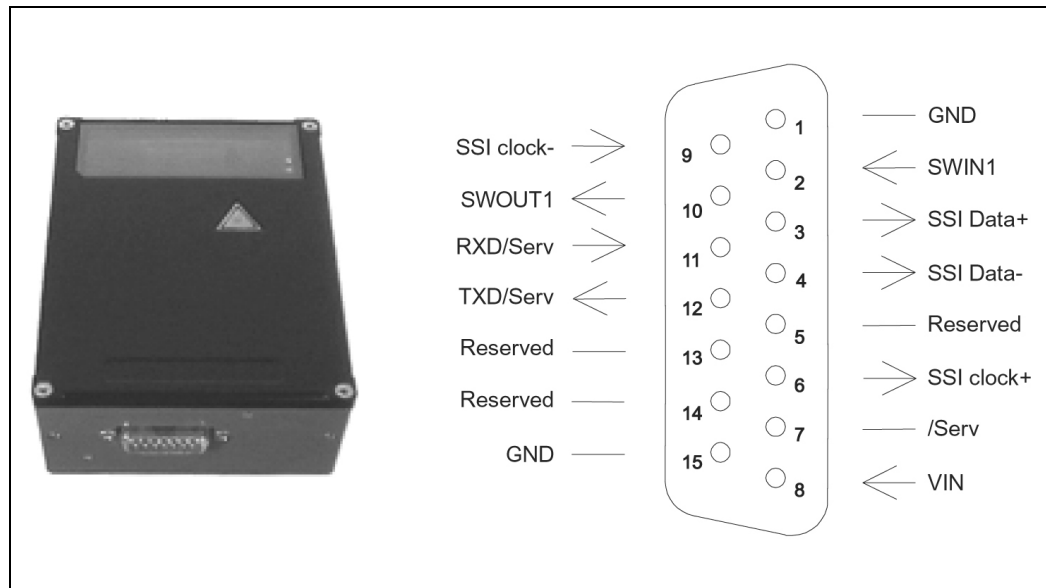
Figure 7-5: BE-90 sub-D pin assignments

Wiring description

Pin 1	GND	Ground reference RS 422 / SSI
Pin 2	SWIN1	Switching input 1 (+12 ... 30 VDC)
Pin 3	SSI-data+	SSI data line
Pin 4	SSI-data-	SSI data line
Pin 5	Reserved	
Pin 6	SSI-clock+	SSI clock line
Pin 7	/Serv	Bridge to pin 15: service operation via RS232 interface
Pin 8	VIN	Supply voltage +10 ... 30VDC
Pin 9	SSI-clock-	SSI clock line
Pin 10	SWOUT1	Switching output 1 (max. 100 mA)
Pin 11	RXD/Serv	RXD signal, service interface RS 232
Pin 12	TXD/Serv	TXD Signal, service interface RS 232
Pin 13	Reserved	
Pin 14	Reserved	
Pin 15	GND	Supply voltage 0VDC

Table 7-1: Connection description BE-90

7.3.2 Connection SSI interface

Connection unit
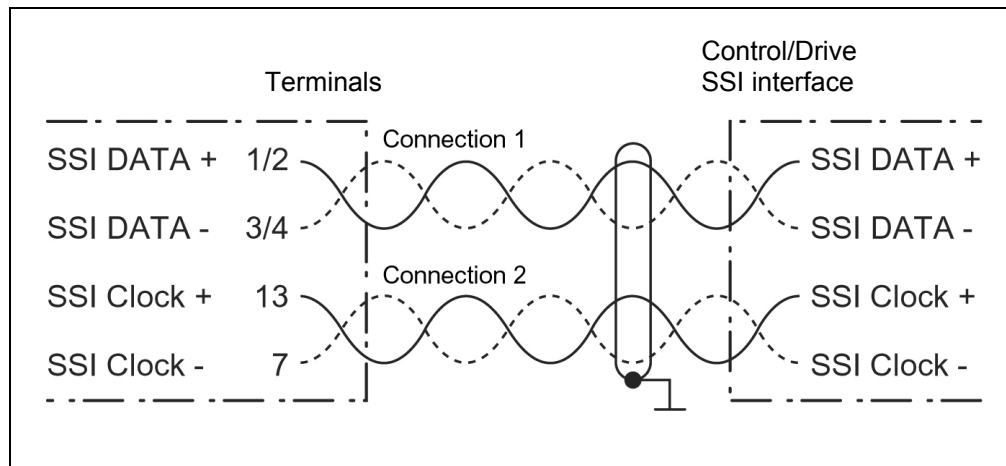
Figure 7-6: Connection unit

Connection BE-90 direct
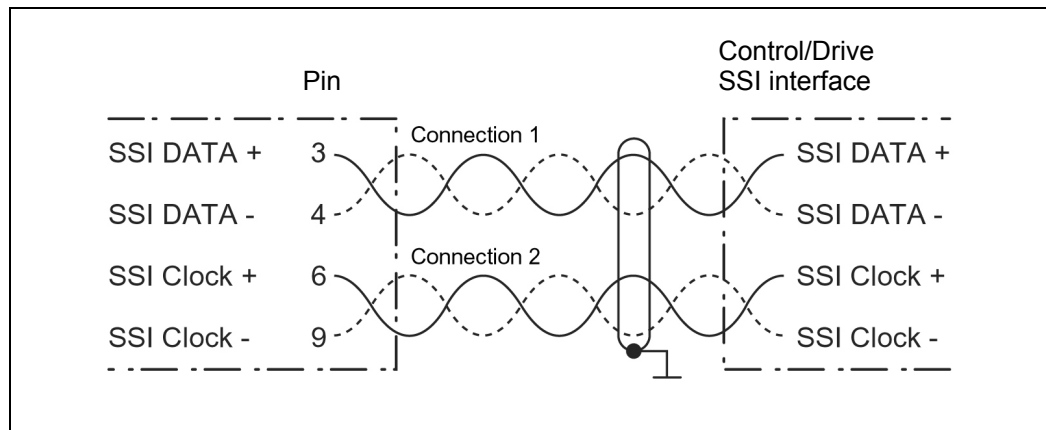
Figure 7-7: Connection BE-90 direct

i *Notice!*
Ensure adequate shielding. Connections 1 and 2 must be twisted pairs and the total connection line must be shielded and grounded at one end.

⚠ *Attention!*
It is absolutely necessary to connect the protective conductor, since all electrical inter-ference (EM pick-up) is discharged via the protective conductor connection.

Connection of the protective conductor PE

BE-90 without cable:
Connect PE to the housing of the BE-90 or to the housing of the 15-pin SUB-D con-nector!

BE-90 with cable:
Connect PE to the wire with bl/wh color coding or connect it to the shield!

BE-90 with cable and connection-unit:
Connect PE to PIN 21 or PIN 22!

7.3.3 Connection of switching input and output

The BE-90 is provided with a switching input and a switching output. The connection of the switching input and output is made according to Figure 7-8:
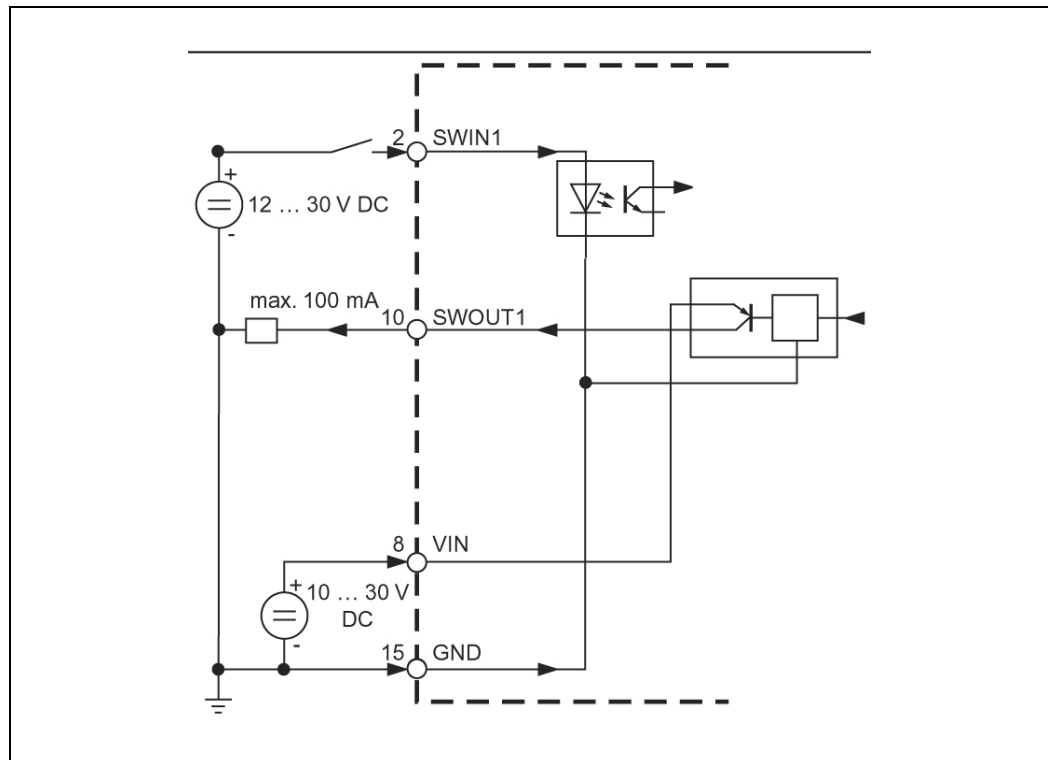
Figure 7-8: Connection diagram switching inputs and outputs BE-90

Switching input

In the standard setting you can use the switching input connection SWIN1 to reset output of the position measurement data to zero by applying a voltage of 12...30VDC between SWIN1 (pin 2) and GND (pin 15)

Switching output

The switching output connection between SWOUT1 (pin 10) and GND (pin 15) is normally open. In the standard setting, SWOUT1 is closed in the event of a positioning error.

You can configure the switching inputs and outputs according to your needs, using the supplied BE-90 configuration program.

7.3.4 Wire Lengths and Shielding

The following maximum lengths for wires and the type of shielding to be used must be observed:

Connecting	Interface	Max. wire length	Shielding
BE-90 - Service	RS 232	10 m	absolutely required, shield meshing
BE-90/connection unit	SSI	1200 m	absolutely required, flexible leads as twisted pairs and shielded
Switching input		10 m	not necessary
Switching output		10 m	not necessary

Table 7-2: Wire Lengths and Shielding

7.4 Disassembling, Packing, Disposing

Repacking
For later re-use, the device is to be packed so that it is protected against shocks and dampness. Optimal protection is achieved when using the original packaging.

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

8 Commissioning

8.1 Measures to be performed prior to the initial commissioning

- Before commissioning, familiarize yourself with the operation and configuration of the device(s)!

- Before switching on, recheck all connections and ensure that they have been properly made.

8.2 Function Test

"Power-On"-test
After connecting the operating voltage, the BE-90 performs an automatic "Power On" function test. Subsequently, the green LED lights up in the optics window of the BE-90.

Interface
Proper function of the interface can be tested easiest in service operation using the service interface with the parameter-software and a notebook computer. For order numbers, see table 6.3, on page 23.

Online commands
Using the 'Online' commands, important device functions can be checked, e.g. proper functioning of the laser.

Problems
Should a problem persist after checking all electrical connections and setting on the devices and host, please contact a TR-Electronic service-office near you (see the last page of this operating manual).

8.3 Setting the Parameters

You have now commissioned the BE-90. Usually, you will have to configure it before you can use it. Using the parameter options made available by the BE-90, you can configure the positioning system to suit your individual area of application. For instructions regarding the various setting options refer to chapter 10 or to the online help of the configuration program.

The setting is usually accomplished by using the configuration-program, see "Installing the configuration software" 10.1, page 40.

To understand what is happening during the parameter setting, the following chapter 8.3.1 briefly explains the various parameter sets.

The setting of the parameter sets then takes place in the operating mode "service", which is described in chapter 8.3.2 .

8.3.1 Parameter sets

In the BE-90 three different parameter sets are administered:

- parameter set with the default settings in the ROM
- current parameter set in the EEPROM
- working copy of the current parameter set in the RAM

Before a parameter set is loaded into the memory of the BE-90 processor, the validity of the parameter set is verified using checksums.

Factory default parameter set
This parameter set contains the default settings made ex works for all BE-90 parameters. It is permanently stored in the ROM of the BE-90. The parameter set with the default settings is loaded into the memory of the BE-90,

- the first time the device is commissioned after delivery
- following the command "Factory Default" in the parameterization program
- if the checksums of the current parameter set are invalid.

Current parameter set

In this parameter set, the current settings for all device parameters are stored. When the BE-90 is in operation, the parameter set is stored in the EEPROM of the BE-90. The current set can be stored:

• by copying a valid parameter set from the host computer
• by means of an off-line set-up with the PC set-up program

The current parameter set is loaded into the memory of the BE-90:

- each time the supply voltage is connected
- following a software reset

The current parameter set is overwritten by the parameter set with the default settings:

- by a parameter reset, see Table 10-1, page 42.

8.3.2 Service Operating Mode

Setting the required parameters is carried out easiest in the 'Service' operating mode. The Service operating mode makes the following defined operating parameters available on a separately wired RS232 interface, independent from the positioning system configuration for standard operation:

• transfer rate 9600 baud
• no parity
• 8 data bits
• 1 stop bit
• prefix: STX
• postfix: CR, LF

Service interface active

The service interface is activated via a bridge between the pins 7 and 15 on the 15-pin sub-D connector. If the BE-90 is operated with a connection unit, the service interface is activated trough a switch in the connection unit.

Connection

You can connect a PC or terminal to the BE-90 via the serial interface and configure the BE-90 via this connection. For this, you need a crossed RS232 connection cable (null modem cable) that provides the connections RxD, TxD and GND. A hardware hand-shake via RTC, CTS is not supported at the service interface.

If the positioning system is connected to a connection unit, you can use the 9-pin sub-D service connector in the connection unit. For the respective connection specifications please refer to the data sheet of the connection unit.

Service Operating Mode
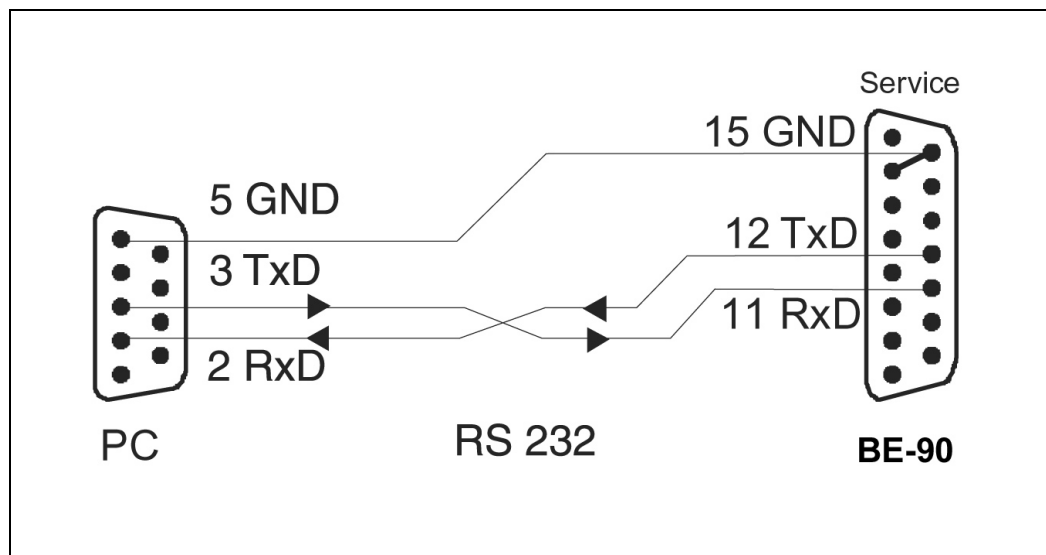
Figure 8-1: Connecting the service interface to a PC or terminal

9 Operation

9.1 Display Elements

On the BE-90 there is an LED. It signals that the positioning system is ready for operation.

10 Communicating with the Device

Device parameters can be set via commands or using the easy-to-use configuration software.

10.1 Installing the configuration software

- *Place the installation CD in your CD drive*

- *Call up the installation file (e.g. Set-up.exe)*

The following window appears:

Installation window

Figure 10-1: Installation window

- *Confirm the following license agreement and select the installation path in the following window:*

Installation directory

Figure 10-2: Installation directory

- *Confirm your entry with Continue, then follow the installation routine.*

For further information, please see the online help for the configuration software.

10.2 Overview of Commands and Parameters

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

For this, the BE-90 has to be connected to a host or service computer via the serial interface. The commands can be sent either via the host or the service interface.
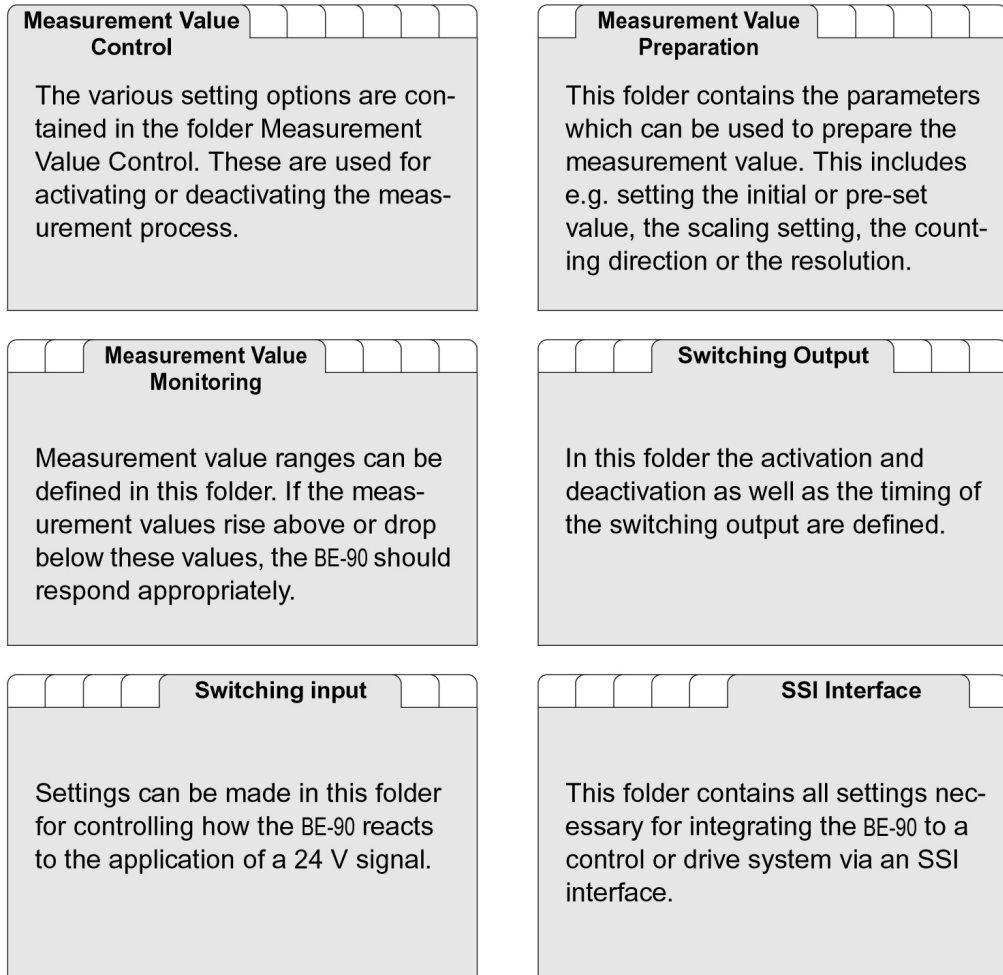
10.2.1 General 'Online' Commands

Command	Description
M+	Activating the measurement
M-	Deactivating the measurement
MI	Reversing the count direction With the standard setting, the calculation is performed back from the max. measurement length (10000 m)
MNxyyyyyyy	Set pre-set value x = T = value is stored temporarily (the value is erased after switching on and off) x = D = value is stored permanently in the EPROM y = specification of the pre-set value in mm Example: MND0001000 Current position is set permanently to 1000 mm.
MNR	Deactivates the pre-set value. The unformatted measurement value is output.
MMxyyyy	Controls the data output via the service interface x = S = a measurement value is output (Single Shot Mode); subsequent specification of the time not necessary x = T =measurement values are output cyclically; time must be subsequently specified y = time specification in ms Example: MMT0500 Measurement values are output via the service interface in a time interval of 500ms
MM-	Deactivating the function MMTyyyy If the cyclical output via the service interface is no longer required, the function must be deactivated using the command MM.
PC20	Resetting all parameters in the BE-90 to TR-Electronic default values. Version query

Table 10-1: General 'Online' Commands

10.2.2 General parameter structure

Using the configuration program, parameters can be changed via the service interface. These parameters are divided into individual folders.

The following folders are available:

Measurement Value Control

The various setting options are contained in the folder Measurement Value Control. These are used for activating or deactivating the measurement process.

Measurement Value Preparation

This folder contains the parameters which can be used to prepare the measurement value. This includes e.g. setting the initial or pre-set value, the scaling setting, the counting direction or the resolution.

Measurement Value Monitoring

Measurement value ranges can be defined in this folder. If the measurement values rise above or drop below these values, the BE-90 should respond appropriately.

Switching Output

In this folder the activation and deactivation as well as the timing of the switching output are defined.

Switching input

Settings can be made in this folder for controlling how the BE-90 reacts to the application of a 24 V signal.

SSI Interface

This folder contains all settings necessary for integrating the BE-90 to a control or drive system via an SSI interface.

11 Maintenance

11.1 General Maintenance Information

Usually, the barcode positioning system BE-90 does not require any maintenance by the operator.

Cleaning
Should it become soiled, clean the glass window of the BE-90 with a soft cloth.

i ***Notice!***
Do not the aggressive cleaning agents such as thinner or acetone for cleaning the device.

11.2 Repairs, Servicing

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

- Contact your TR-Electronic distributor or service organization should repairs be required. For addresses, please refer to the last page of this operating manual.