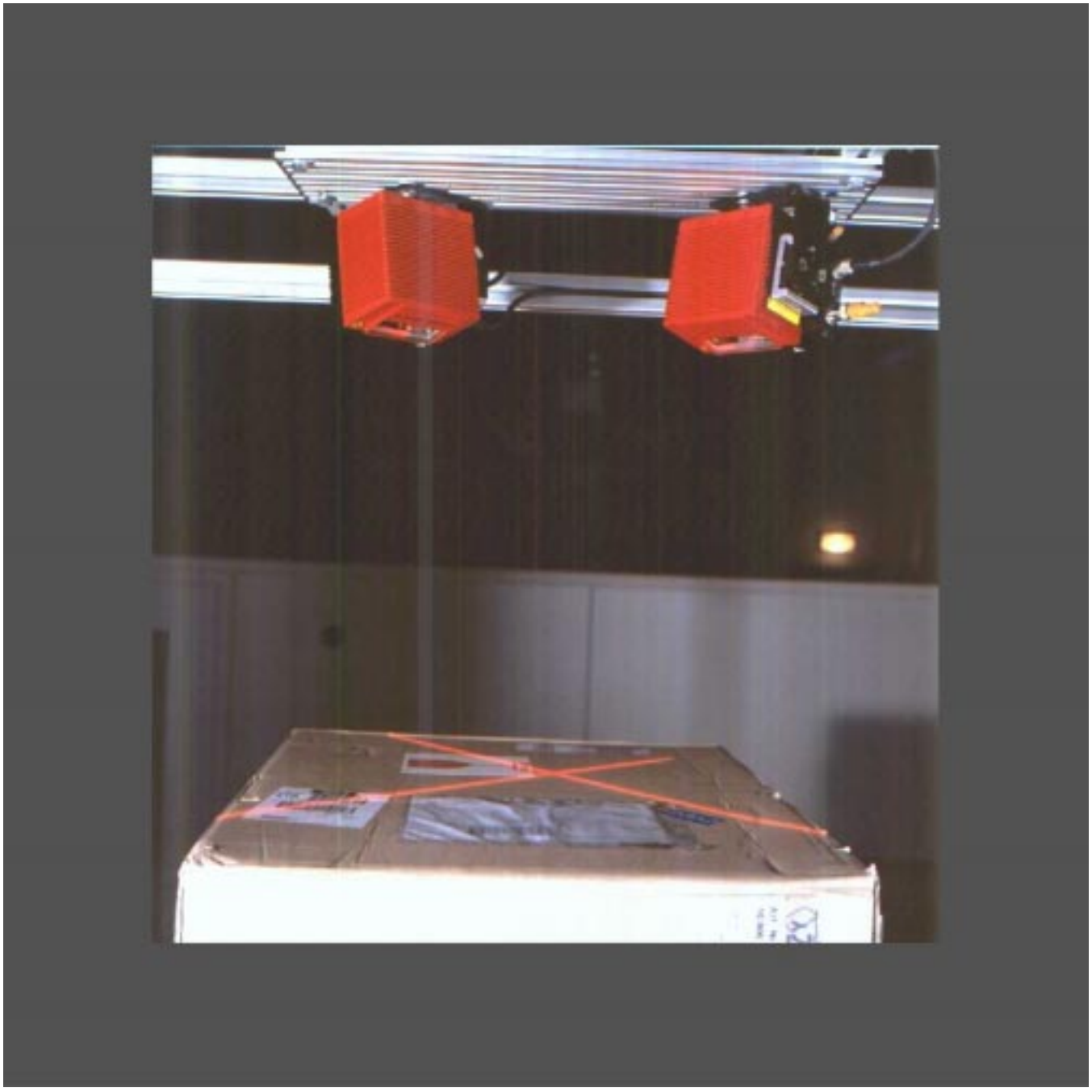

Modular Scanner Portal
MSP Systems

Software version

Software/ tool	Function	Version
MCU/TPC	Firmware	V 1.0 onwards
MSP Config	User interface	V 2.7 J645 onwards
MSP Config Help	Online help (HTML)	V 1.1 onwards

Contents

Abbreviations

BCL **B**ar **C**ode **L**eser
MCU **M**odular **C**onnection **U**nit
TPC **T**racking **P**ortal **C**ontroller
MSP **M**odular **S**canner **P**ortal

Tables

Figures

1 Notes on this document

1.1 Purpose

This document provides information on operating the MCU Modular Connection Unit with the TPC Tracking Portal Controller in an MSP Modular Scanner Portal. In the MSP, the bar code scanners are connected to the MCU/ TPC as appropriate.

This document describes

- The basic principles of an OMNIDIRECTIONAL reading operation
- Mounting and electrical installation
- Startup
- Operation and configuration
- Maintenance
- Exchanging the device

In the remainder of the document, the devices will be referred to as "MCU" or "TPC".

1.2 Target audience

This document targets people who work in the following areas:

1.21 Mounting, installing, maintaining, and replacing the device

Suitably trained personnel, such as electricians or service technicians.
Only qualified electricians should connect the MCU 400 to the voltage supply or connect the relay.

1.22 Startup, operation, and configuration

Suitably trained personnel, such as technicians or engineers.

1.3 Information content

This document contains all information that is required to mount, install, and start up the **MSP with the MCU/TPC** and the bar code scanners using **the default settings**. Step-by-step instructions are provided.
Details on the bar code scanners are not explained here. This information can be found in the relevant operating instructions. (e.g. BCL 90 Operating Instructions, English edition)

Further information on the bar code scanners and on bar code technology can be obtained from Leuze electronic division.

1.4 Symbols used

Some of the information in this document is specially marked for quick reference:

WARNING!

A warning protects against physical injury to personnel or extensive damage to the MCU/TPC and the bar code scanners.

➢ Always read warnings carefully and follow them at all times

Note	Indicates special features of the device
Explanation	Provides technical background knowledge
Recommendation	Provides help on setting up/operating the device
TIP	Explains optional settings in the Windows-based "MSP Config" program
Scan frequency	Refers to an option field in the "MSP Config" program

2 Safety information

2.1 Authorized personnel

In order to ensure that the MCU/TPC functions correctly and safely in the MSP, it must be mounted and operated by sufficiently qualified personnel. The following qualifications are required to start up the device.

2.1.1 Mounting and maintenance

- Practical training in electrical engineering
- Knowledge of the current guidelines for safety at the workplace

2.1.2 Electrical installation and replacement

- Practical training in electrical engineering
- Knowledge of the current safety standards for electrical engineering
- Knowledge of operating a conveyor belt

2.1.3 Startup, operation, and configuration

- Knowledge of the mechanical and electrical parameters, and characteristics of the conveyor belt
- Knowledge of the software and hardware environment of the conveyor belt
- Knowledge of operating the conveyor belt
- Basic knowledge of Windows 95™/98™ or Windows NT™
- Basic knowledge of an HTML browser (e.g. Netscape Navigator™)
- Basic knowledge of data transfer
- Basic knowledge of bar code technology

2.2 Intended use

- The MCU Modular Connection Unit and the TPC Tracking Portal Controller are used in an MSP Modular Scanner Portal in conjunction with the required number of bar code scanners, in order to detect bar codes in different directions and on different sides of an object.
- A total of 24 scanners for reading bar codes on up to 6 planes can be connected to the MSP using the MCU/TPC. The bar code scanners are connected to the TPC via CAN Bus/CanOpen. Preformed connection cables are available for connecting the bar code scanners to the MCU/TPC. Incremental encoders and the required trigger signals can also be connected to the MCU/TPC. Other optional inputs are also available.
- RS 232/RS 422/485 interfaces are provided for connecting the host. In addition, various bus interfaces can be integrated directly in the MCU.
- The MCU uses housing with enclosure rating IP 65 with PG conduit threads and mounting brackets. This housing contains the TPC, a power supply unit, a service socket with a fuse and a mains switch.
- The TPC can also be used as a stand-alone device (without MCU) and is also suitable for installation in industrial control cubicles. The enclosure rating is IP 20.

Any warranty claims vis-à-vis LEUZE electronic will be rendered invalid if the device is used for any other purpose or if it is modified in any way, even during installation.

2.3 General safety instructions and protection measures

- Please read the general safety instructions carefully and observe them at all times when working with the MCU/TPC and the bar code scanners. This also applies to the warnings accompanying the instructions contained in the individual chapters of this document.
- The voltage supply for operating the TPC (24 V +20%/ –10% direct voltage) must be protected by electrical separation.

Shock hazard!

The MCU is connected to an operating voltage of 230 or 115V AC.

- When working with electrical installations, always observe the current security regulations.

2.3.1 Bar code scanners

When connecting the bar code scanner and applying the operating voltage, remember that the laser beam is in operation:

Laser warning!

The bar code scanner (standard device) operates with a red-light laser. Staring at the laser beam for a long time can damage your eyesight.

- Never look directly at the laser beam (compare to sunlight).
- Never point the laser beam at other persons.
- Observe the laser protection specifications pursuant to DIN EN 60825-1.

Laser class of the bar code scanners (according to EN 60825-1):

Device type	Laser class	Max. output power at the reading window
BCL 90	2	2.8 mW; Pulse duration 111 µs (Germany)

Table 2-1: Laser classes of the different bar code scanners

For further information, see the *"Laser protection"* section in the Operating Instructions of the bar code scanners.

2.4 Quick stop and quick restart

2.4.1 Switching off the MCU

- Switch off the operating voltage at the mains switch.
- If the TPC is installed without the MCU, the operating voltage for the TPC must be disconnected.

This will result in the loss of (at the most):

- The application-specific parameter block if it was only stored **temporarily** in the MCU/TPC or in the BCLs
- The last reading result
- Daily operating hours counter of the individual BCLs and the TPC (operating hours counter, number of reading intervals, number of good reads, maximum time of the reading interval, minimum time of the reading interval, average identification quality)

2.4.2 Switching on the MCU again

- Switch on the operating voltage at the mains switch.
- If the TPC is installed without an MCU, switch on the operating voltage for the TPC again.
  The MCU and the connected bar code scanners resume operation with the parameter set that was last stored permanently and reset the daily operating data.

2.5 Environmental information

The MCU/TPC is designed to minimize the impact on the environment. It neither contains nor emits any substances that are harmful to the environment.

2.5.1 Power consumption

The power consumption of the device is low and mainly depends on the number of bar code scanners that are operated in the MSP. The typical power consumption of an MCU with one BCL 90 bar code scanner is 30 W and, with 8 BCL 90 bar code scanners, 130 W.

2.5.2 Disposal after removal from service

Unusable or irreparable devices should be disposed of in an environmentally-friendly manner in line with the applicable national waste disposal regulations. The MCU/TPC can be separated into reusable secondary raw materials (housing) and problem waste (boards as electronic scrap).
See Section 9.3 Disposal.

At present, Leuze electronic does not accept any devices that can no longer be used or repaired.

3 Product description

3.1 Design

3.1.1 Scope of delivery

The MCU Modular Connection Unit is supplied with:

- An information sheet (notes on device, yellow)

Depending on the **number of devices ordered,** one or more of the following:

- These MCU/TPC Operating Instructions in English or German
- A set of DOS-formatted diskettes (3.5 inch) with the "MSP Config" program for Windows™.

Chapter *12 LEUZE Accessories* provides an overview of mounting accessories, connection modules, cables, and connector covers.

3.1.2 Variants

The MCU Modular Connection Unit is currently available in the following variants:

Order no	Type	Description
500 35 526	MCU 400 - 0000	MCU Omni Tracking System with RS 232/ RS 422/485 host interface
*	MCU 400 - 1000	MCU Omni Tracking System with bus interface module for Profibus DP
*	MCU 400 - 2000	MCU Omni Tracking System with bus interface module for Interbus – S
*	MCU 400 - 3000	MCU Omni Tracking System with bus interface module for Device Net
*	MCU 400 - x100	MCU Omni Tracking System with display
* Available on request		

Table 3-1: MCU variants

The TPC Tracking Portal Controller is currently available with the following variants:

Order no	Type	Description
500 35 527	TPC 400 - 0000	TPC Omni Tracking Controller without display
*	TPC 400 - 1000	TPC Omni Tracking Controller with display
* Available on request		

Table 3-2: TPC variants

3.1.3 System requirements

1. Requirements for mounting and starting up the **MCU** with TPC:

- An operating voltage of 230 V AC (115 V AC) –15%/ +10% with protective grounding. The power consumption depends on the number of bar code scanners connected. The typical power consumption with one BCL 90 bar code scanner is 30 W. The typical power consumption with 8 BCL 90 bar code scanners is 130 W.

Risk of irreparable damage to the power supply unit

The power supply is equipped with a switch that is set to an operating voltage of 230 V AC at the factory. If set to 115V AC but operated at 230 V AC, the power supply unit may be damaged irreparably.

➢ Never operate the MCU at 230 V AC if the power supply unit is set to 115 V AC.

---

2. Requirements for mounting and starting up the **TPC**:

- An operating voltage of 24V DC –10%/ +20% according to IEC 742.
  The power consumption depends on the number of bar code scanners connected. The typical power consumption with one BCL 90 bar code scanner is 20 W. The typical power consumption with 8 BCL 90 bar code scanners is 120 W. The operating voltage supplied must be protected by electrical separation.

3. Requirements for mounting and starting up the MCU with TPC, or the TPC:

- A suitable sensor, e.g. a reflection photoelectric switch, to signal the presence of an object with a bar code, if an external reading pulse is supplied via the "Trigger 1“,"Trigger 2“, or "Trigger 3“ terminal
- An external incremental encoder for connecting to the "INC 1" or "INC 2" terminal for internal object assignment. The incremental signal should be resolved every 10 ... 15 mm. A minimum of 4 clock pulses should be transmitted, however, in the smallest possible gap between the objects.
- A connection to the required host interface (RS 232, RS 422/485) for the MCU 400-0000 or the TPC 400-0000; or a connection to the required bus interface module (MCU 400-1000/ -2000/ -3000).

4. Requirements for accessing the terminal interface of the TPC:

- A PC with the Windows-based "MSP Config“ program, version 2.7 or higher (can be run on Windows 95™/98 ™ or Windows NT™) and a serial port (port "COM x“)
- An RS 232 data connection cable with two 9-pole D Sub sockets.
  Pin 2 (RxD) and pin 3 (TxD) are crossed in each case.

3.1.4 Design

Fig. 3-1: MCU (outside view)

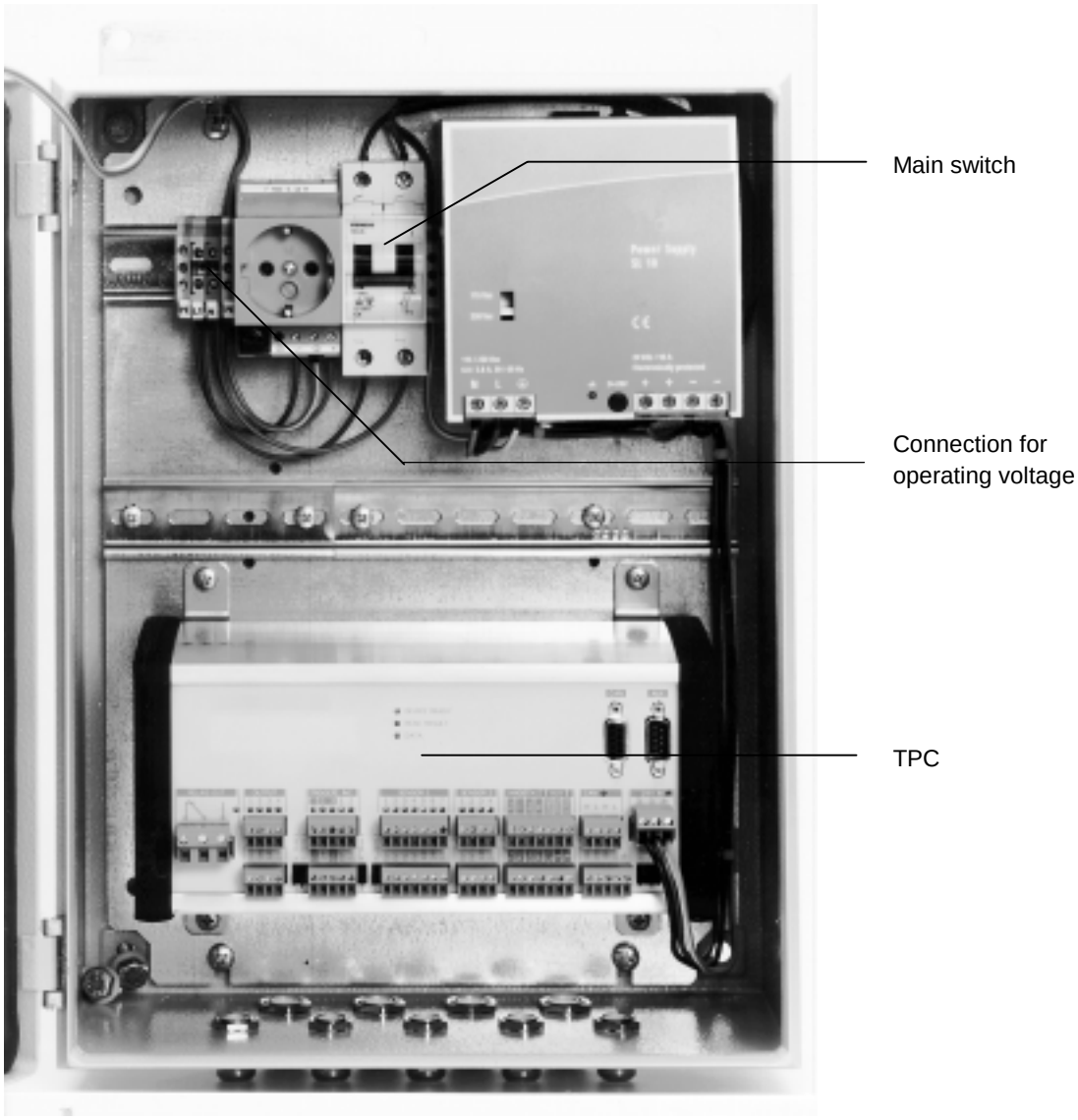

Fig. 3-2: MCU (inside view)

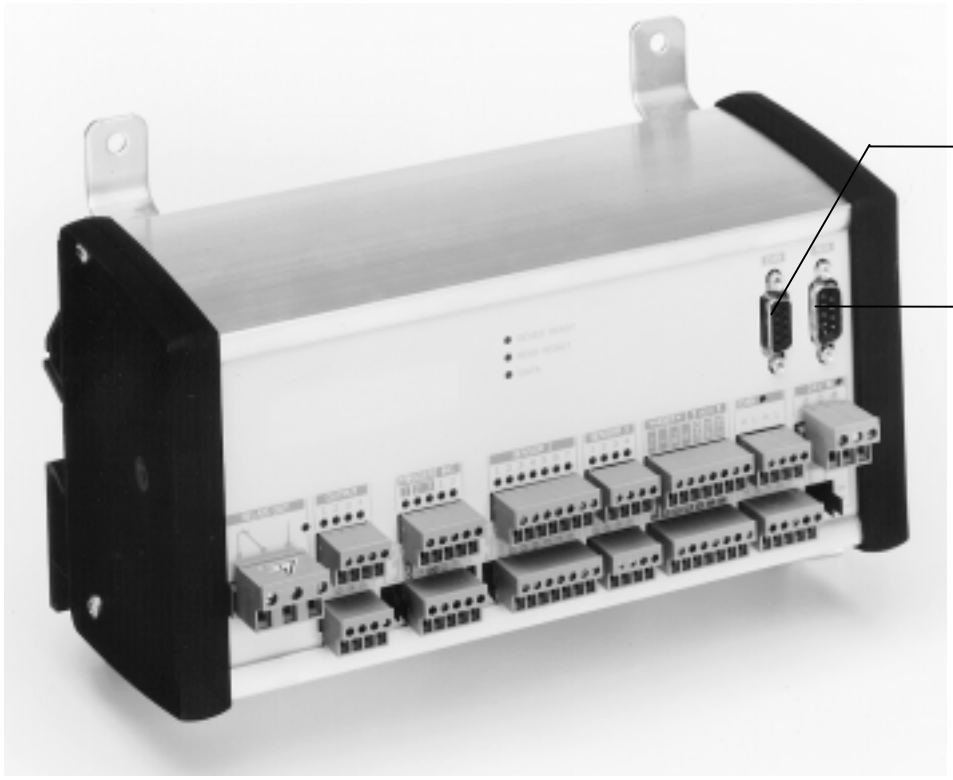

Fig. 3-3: TPC (front view)

3.2 Operating principle

The MCU Modular Connection Unit combines the information supplied by the individual bar code scanners on the code content, code position, code distance, and (in the case of line scanners with oscillating mirror) code angle, assignment of the bar code to the object etc., and transfers this bar code information for each object to the host, together with any required additional information.
The MCU also powers the bar code scanners and photoelectric switches required in the MSP .

The MCU and TPC communicate using the CAN Bus/ CAN Open protocol. The MCU/TPC provides each bar code scanner with the beginning and the end of an object, which is assigned a fixed number.
The current travel increment is continuously communicated to each bar code scanner. If the bar code scanner detects a bar code, it assigns it to the current object and travel increment and sends this information immediately to the MCU/TPC. The MCU/TPC then combines the results from the individual bar code scanners and sends these to the host at a defined output point.

The individual bar code scanners are also monitored by the TPC for possible system errors. In this way, the MCU/TPC can notify the host, and therefore the plant operator, if maintenance is required.

3.3 Indicators and control elements

The MCU/TPC operates with a total of 26 LEDs. The device is operated (operating mode selection) and parameterized using the Windows-based "MSP Config" PC software or alternatively using command strings. See Section 8.3 *Setting parameters with MSP Config*.

3.3.1 Functions of the LEDs

The LED indicators are located on the front of the TPC and have the following functions:

Indicator	**Color**	**Function**
Device ready	*green*	Indicates that the MCU/TPC is ready in **reading mode**: lights up after the device has been switched on if the automatic self-test was performed successfully. Extinguishes when a different operating mode/function is selected.
Read result	*yellow*	In **reading mode**: Lights up after a successful read (good read) Lights up if the match code comparison is activated and the bar code read matches the specified match code(s) Always lights up until the start of the next reading pulse
Data	*yellow*	Blinks while the MCU/TPC is transmitting data to the host on the serial interface in reading mode
Output (4x)	*yellow*	Lights up when active
Output relay (1x)	*yellow*	Lights up when active
Input trigger (3x)	*green/ red*[*)]	Lights up when active, trigger 1: internal or external ground, Trigger 2 and 3: internal or external ground
Input INC (2x)	*green/ red*[*)]	Lights up when active, internal or external ground
Input Sensor 1 (7x)	*green/ red*[*)]	Lights up when active, internal or external ground
Input Sensor 2 (4x)	*green/ red*[*)]	Lights up when active, internal or external ground
Input 24V (1x)	*green*	Lights up when active
Input CAN (1x)	*green*	Blinks while data is being exchanged between the MCU/TPC and the bar code scanners on the CAN Bus.
*) red if interchanged		

Table 3-3: Functions of the LEDs

3.4 Maximum cable lengths

Due to voltage losses on the cables connecting the bar code scanners, the overall cable length is limited in accordance with the number of scanners connected on each branch line. A maximum of 2 branch lines are allowed for each MCU/TPC. The maximum cable lengths are based on the cables provided by Leuze electronic. See the following tables.

3.4.1 Maximum cable lengths for an MCU

The power supply unit in the MCU is set to 26 V at the factory. The cable lengths are as follows:

Number of scanners per branch line	Maximum cable length
2	70 m
3	50 m
4	36 m
5	28 m
6	24 m
7	20 m
8	18 m
9	16 m
10	14 m
11	13 m
12	12 m

Table 3-4: Max. cable length for MCU

3.4.2 Maximum cable lengths for an TPC

If the TPC is used as a stand-alone device (without MCU), the maximum cable length depends on the supply voltage. The values in the following table are based on typical supply voltages of 24 V DC and 21.6 V DC (24 V DC minus 10%). Maximum cable lengths for other voltages are available on request.

Number of scanners per branch line	**Maximum cable length for DC 24 V**	**Maximum cable length for DC 21.6 V (DC 24 V minus 10%)**
2	50 m	34 m
3	36 m	22 m
4	28 m	16 m
5	22 m	13 m
6	18 m	11 m
7	15 m	-
8	13 m	-
9	12 m	-
10	11 m	-
11	10 m	-
12	-	-

Table 3-5: Max. cable length for TPC

3.4.3 Maximum transmission rates

The transmission rate on the data transmission cables between the MCU/TPC and bar code scanners depends on the cable lengths:

Cable length	**transmission rate**
Up to 40m	1 Mbit/s
> 40m	500 kbit/s

Table 3-6: Max. transmission rate

4 Installation

4.1 Installation sequence

- Mount the frame above the reading location (if not already installed)
- Mount the BCLs
- Align and adjust the BCLs with the objects and range in which bar codes can appear
- Mount the sensor for generating the reading pulse (if a reading interval signal is not already provided)
- Install MCU/ TPC

4.2 Preparations for installation

4.2.1 Required accessories

- Hinged bracket or basic mounting bracket with the enclosed screws
- 2 screws for fixing each bar code scanner to the frame (if already provided)

4.2.2 Required components to be mounted

- MCU/ TPC
- Bar code scanners
- Reflection photoelectric switch for external reading interval control
- Connector covers with EEPROM
- Connecting cables
- Terminating resistor
- Hinged bracket or mounting bracket
- Frame (if not already provided)

4.2.3 Required tools

- Tool
- Measuring tape (max. required length 3000 mm)
- Protractor

4.2.4 Procedure for mounting the bar code scanners

The procedure for mounting bar code scanners is described in detail in Chapter 4 *Installation* in the Operating Instructions of the bar code scanner in question.

4.3 Mounting the MSP

4.3.1 Mounting the MCU/ TPC

1 Install the frame and the bar code scanners.

2 Install the MCU/ TPC. The MCU/TPC is attached near the BCLs. See Section 3.4 *Maximum cable lengths*. The MCU/ TPC must be mounted in such a way that the open device can be accessed at any time.

Mounting holes are provided on the MCU/TPC or TPC (stand-alone) for securing the devices.
See 11.2 *Dimensional drawings MCU/ TPC*.

4.3.2 Mounting the external reading pulse sensor

See Chapter 4 *Installation* in the Operating Instructions of the bar code scanner in question.

4.3.3 Mounting sensors for detecting the object distance

The BCL 90 bar code scanner, which is mainly used in the MSP, is equipped with an autofocus function for detecting the object distance automatically. For this reason, sensors for detecting the object distance are usually unnecessary.
If you want to use sensors for detecting the object, nevertheless, proceed as described in Chapter 4 *Installation* for the bar code scanner in question.

4.4 Disassembling the MSP

1. Switch off the operating voltage.
2. Disconnect all cables
3. Remove the BCLs and MCU/ TPC from the mounting device
4. Remove the frame if necessary

For information on environmentally-friendly disposal, please refer to Section 9.3 *Disposal*.

5 Electrical installation

5.1 Installation sequence

- Connect the bar code scanners to the MCU/ TPC
- Connect the data and function interfaces of the MCU/ TPC
- Connect the PC to the MCU/ TPC
- Connect the MCU or TPC to the operating voltage

5.2 Electrical connections and cables

The power supply for the **MCU** is connected via the screw terminals (top left in the MCU, see *Fig. 3-2 on page 3-4*). Terminal specifications:

Connection cable	Cross section
Rigid	0.2 ... 4 mm^2
Flexible	0.2 ... 4 mm^2

Table 5-1: Power supply connection cable for MCU

PVC cables are suitable for all connections. Neither heat protection nor halogen-free cables are required. The load carrying capacity of each terminal is 30 A.

The **TPC** can also be used separately (without an MCU). In this case, a functional extra-low voltage of 24 V DC +20%/–10% % to IEC 742 is required. This is wired directly on the terminal strip on the front panel. Specification of the connection terminal:

Connection cable	Cross section
Rigid	0.2 ... 2.5 mm^2
Flexible	0.2 ... 2.5 mm^2

Table 5-2: Power supply connection cable for TPC

Furthermore, the following connections can be made using the terminals on the front panel:

- RS 232 or RS 422/485 interface (connection to the host)
- CAN Bus/CAN OPEN connection for communication with the bar code scanners
- Power supply for the bar code scanners
- Four switching outputs
- A relay switching output
- Three trigger inputs for external reading pulse triggers
- Two travel increment inputs for external incremental encoders
- Seven sensor inputs (“Sensor 1-1 ... 1-7”) that can be freely defined (e.g. for height photoelectric switches)
- Four sensor inputs (“Sensor 2-1 ... 2-4”) that can be freely defined (e.g. for height photoelectric switches)
- An "AUX" connection (9-pin D Sub HD connector) for test/diagnosis and parameter purposes
- A "CAN" connection (9-pin D Sub HD socket) for test and diagnosis purposes

- All connections, with the exception of the relay switching output must be wired with copper leads with a minimum wire cross-section of 0.09 mm^2!
- Connections for the relay switching output at least 1 mm^2.

5.3 Connector pin assignment

5.3.1 "CAN" terminal

Pin	Signal	Function
1		
2	CAN L	CAN Bus (IN/OUT)
3	GND	Ground
4		
5		
6		
7	CAN H	CAN Bus (IN/OUT)
8		
9		

Table 5-3: Pin assignment of the 9-pole D Sub socket "CAN"

5.3.2 "AUX" terminal

Pin	Signal	Function
1	T+ (RS 422/485)	Host SST (RS 422/485)
2	RxD_T	Terminal SST (RS 232)
3	TxT_T	Terminal SST (RS 232)
4	R+ (RS 422/485)	Host SST (RS 422/485)
5	GND	Ground
6	T- (RS 422/485), TxD (RS 232)	Host SST (RS 422/485)
7	RTS_T	Terminal SST (RS 232)
8	CTS_T	Terminal SST (RS 232)
9	R- (RS 422/485), RxD (RS 232)	Host SST (RS 422/485)

Tab. 5-4: Pin assignment of the 9-pole D Sub "AUX" plug

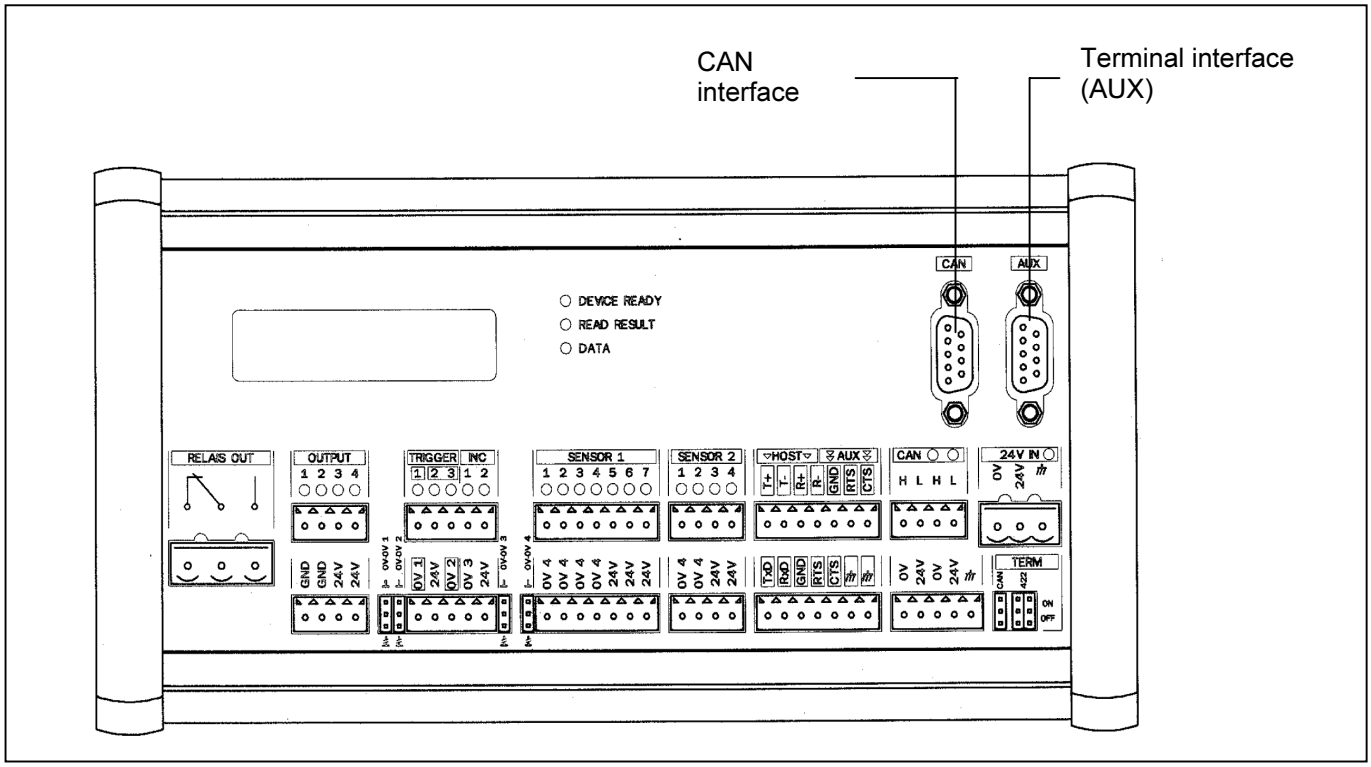

Fig. 5-1: TPC - front view

In addition to the 9-pin connectors of the terminal interface, the individual connections for the host and terminal interface (AUX) are available in two connector strips. *See Fig. 5-1*.

5.4 Preparations for electrical installation

5.4.1 Requirements of the host interface

The host interface of the MCU/TPC can be operated as an RS 422/485 or RS 232 interface. Table 5-3 shows the recommended maximum cable length, in accordance with the data transmission rate.

Interface type	Transmission rate	Distance to host
RS 232	Up to 19 200 bits/s	max. 10m
	38 400 bits/s	max. 3m
RS 422/485[1)]	max. 38 400 bits/s	max. 1200 m
1) with appropriate line termination		

Table 5-5: Maximum cable length between the MCU and host

Alternatively, bus connection modules can be used, see Chapter 3 *Product description*.

5.4.2 Supply voltage

The MCU with TPC requires an operating voltage of 230 V AC (115 V AC) –15%/+10% with protective grounding. In stand-alone operation (without the MCU), the TPC requires an operating voltage of 24 V DC –10%/+20% to IEC 742. For connecting the power supply to the MCU, see *Fig. 3-2*. For connecting the power supply to the TPC in stand-alone operation at the 24 V IN connector strip, see *Fig. 5-1*.

5.5 Electrical installation

5.5.1 Connecting the bar code scanners

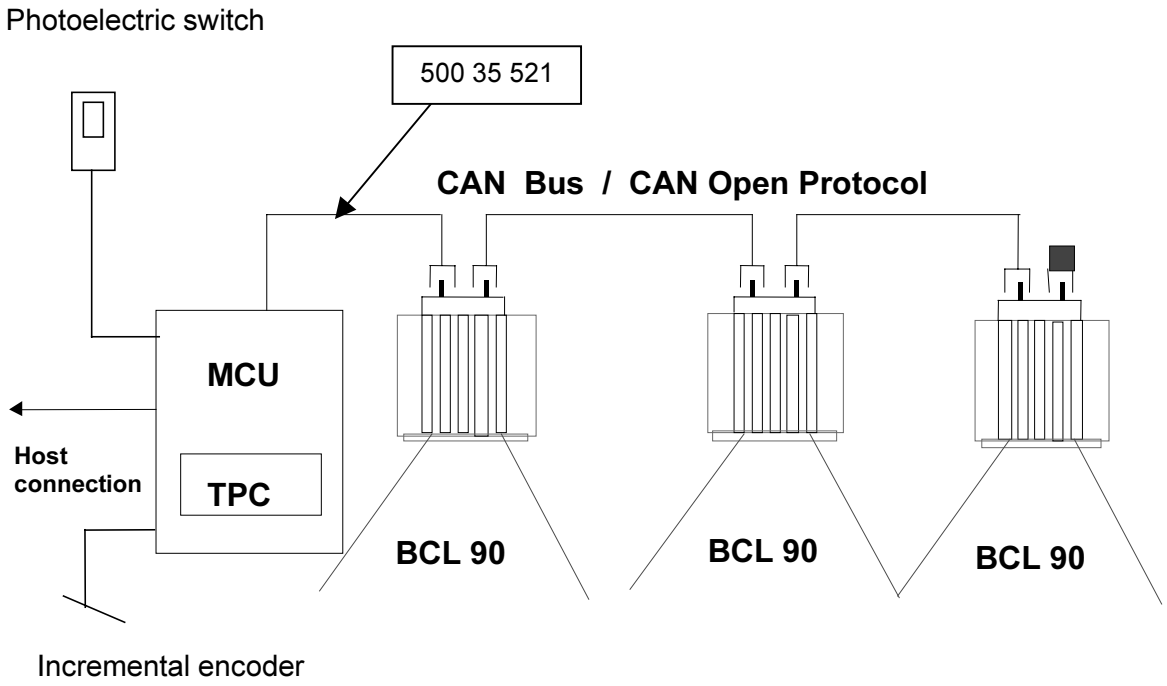

Fig. 5-2: Wiring diagram

Cable no. 500 35 521 is available for connecting the first bar code scanner to the MCU/ TPC. A socket is provided for connection to the bar code scanner; open cable heads are available for the connection to the TPC.

Recommendation:
the supply cable should be shortened as much as possible, in order to prevent unnecessary transmission losses.

Pin	Signal	Color	Connection TPC 400
1	Shield		Shield*)
2	+24 V	Red	+24 V
3	GND	Black	0V
4	CAN_H	White	H
5	CAN_L	Blue	L
*) with the MCU, apply the shield directly over the conduit thread (housing entry).			

Table 5-6: Pin assignment of the connection cables

For connecting the cables, *see Fig. 5-3*.

Danger of irreparable damage to the TPC

When operating the TPC as a stand-alone device:

- The power supply for the bar code readers may only be supplied at the 24V and 0V terminals in the CAN field. The correct currents are only available at these terminals.

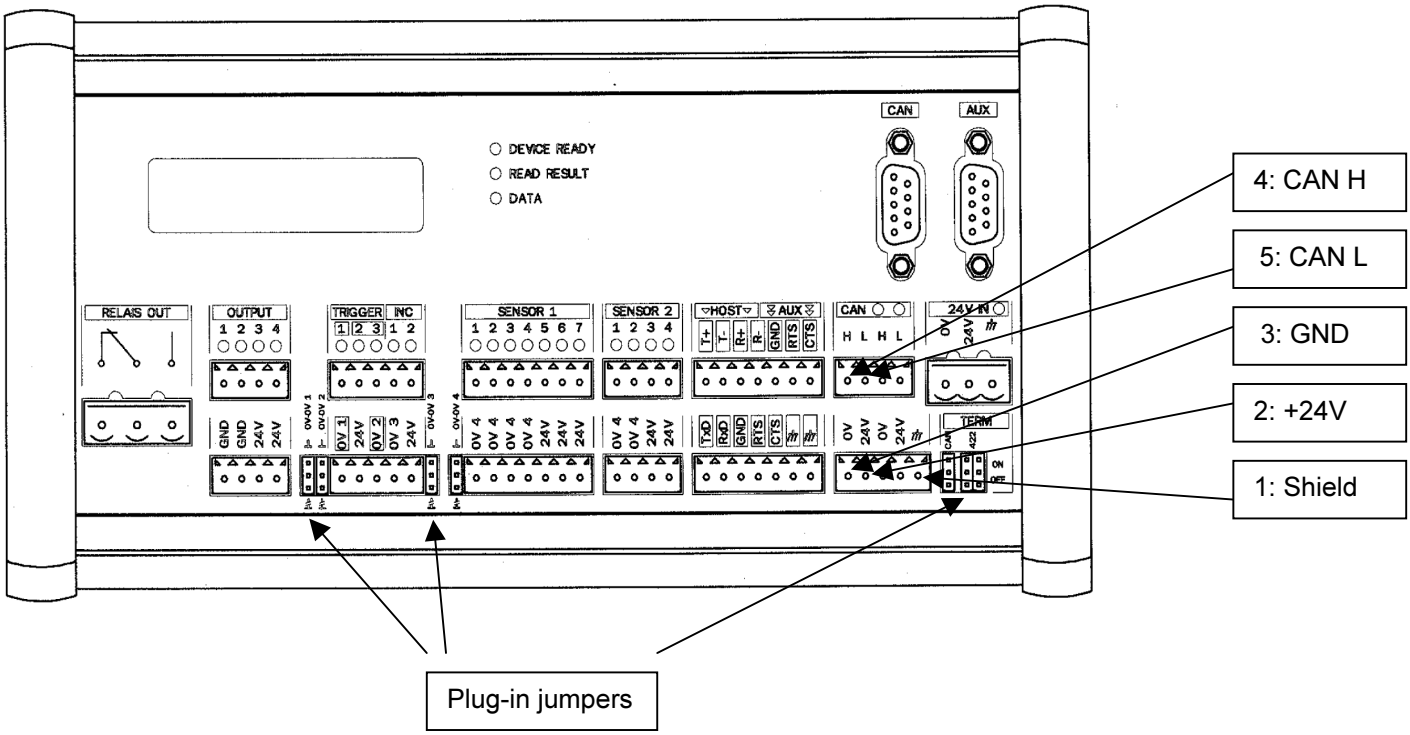

Fig. 5-3: TPC - front view

The cables for connecting the individual bar code scanners are available in 3 different lengths:

No.	Length	Article
500 35 521	5 m	Supply cable (1x open end/ 1x socket)
500 35 522	10 m	Supply cable (1x open end/ 1x socket)
500 35 528	0.7 m	Cable (1x connector/ 1x socket)
500 35 529	3 m	Cable (1x connector/ 1x socket)
500 35 530	5 m	Cable (1x connector/ 1x socket)
500 35 523	10 m	Return cable (1x connector/ 1x open end)

Table 5-7: Length of cables

The connector cover with EEPROM parameter memory should be attached between the connection cables and the bar code scanner. The operating principle of the connector cover is described in detail in the BCL 90 Operating Instructions. The basic design is shown in *Fig. 5-4*.
The last bar code scanner is provided with a terminating resistor. This is also pluggable.
A maximum of 2 branch lines per MCU/ TPC are possible.

Fig. 5-4: Bar code scanner BCL 90 with connector cover and connection cables

5.5.1 Connecting the incremental encoder

An incremental encoder is to assign the bar codes to the various objects and must be connected directly to the TPC. The terminal INC 1 is provided for this purpose.
The plug-in jumper "0V – OV 3" is used to connect the frame potential of the incremental encoders with the frame potential of the TPC (top position of the plug-in jumper), if the latter is to be powered via the TPC. The terminal strip below the INC 1 terminal is used to connect the power supply.
Otherwise, the external potential should be assigned to the incremental encoder (bottom position of the plug-in jumper).
A dual-channel incremental encoder can also be connected if necessary. The TPC then evaluates the two phase-shifted signals.

Switching behavior:	Provision of an incremental signal at a distance of 10 ... 15 mm per increment. Between 4 and 5 increments should be always available for the smallest object gap. See *Fig. 5-5*.
Characteristics:	Opto-decoupled, non-interchangeable
Electrical values:	Low: $-10V \le V_i \le +10V$; $-3mA \le I_i \le +3mA$ High: $-30V \le V_i \le -15V$; $-10mA \le I_i \le -5mA$ High: $+30V \le V_i \le +15V$; $+10mA \le I_i \le +5mA$

Table 5-8: Characteristic data of the "incremental encoder" input

5.5.2 Connecting the reading pulse sensor

The TRIGGER 1 terminal is provided for connecting the reading pulse sensor.
The plug-in jumper "0V – OV 1" is used to connect the ground potential of the reading pulse sensor with the ground potential of the TPC (top position of the plug-in jumper), if the latter is to be powered via the TPC. The terminal strip below the TRIGGER terminal is used to connect the power supply.
Otherwise, the external potential should be assigned to the reading pulse sensor (bottom position of the plug-in jumper).
A 2nd and 3rd reading pulse sensor (TRIGGER 2 or 3) can also be connected, with power supply and assigned ground potential (plug-in jumper "0V – 0V2").

Switching behavior:	Start reading interval when input is live (default: active high, de-bouncing: standard). For connection diagram, *see Fig. 5-5.*
Characteristics:	Opto-decoupled, non-interchangeable
Electrical values:	Low: $-10V \le V_i \le +10V$; $-3mA \le I_i \le +3mA$ High: $-30V \le V_i \le -15V$; $-10mA \le I_i \le -5mA$ High: $+30V \le V_i \le +15V$; $+10mA \le I_i \le +5mA$

Table 5-9: Characteristic data of the "TRIGGER 1, 2, and 3" inputs

5.5.3 Connecting sensors

Additional sensors can be connected if necessary. The SENSOR 1 (1-1 ...1-7) and SENSOR 2 (2-1 ... 2-4) terminal strips are provided for this purpose. A plug-in jumper (0V – 0V4) is also available for SENSOR 1.
At present, the switching function is not defined and can be configured by the customer.

Switching function:	Undefined. *See Fig. 5-5.*
Characteristics:	Opto-decoupled, non-interchangeable
Electrical values:	Low: $-10V \le V_i \le +10V$; $-3mA \le I_i \le +3mA$ High: $-30V \le V_i \le -15V$; $-10mA \le I_i \le -5mA$ High: $+30V \le V_i \le +15V$; $+10mA \le I_i \le +5mA$

Table 5-10: Characteristic data of the "SENSOR" inputs

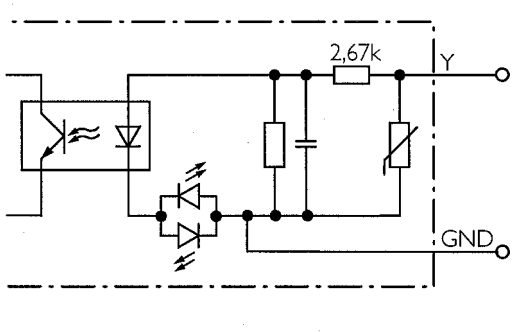

Fig. 5-5: Input circuits

The GND shown in *Fig. 5-5* is the external GND. To connect this to the internal GND, change the jumper setting.

5.5.4 Connecting the outputs

The 4 switching outputs and the relay output can be assigned various result functions, independent of one another. If the associated event occurs during the read operation, the corresponding output becomes live at the end of the reading pulse for the selected pulse duration.

Switching outputs:

The 4 outputs have the same characteristic data.

Switching behavior:	Switches with respect to the supply voltage V_S and ground
Characteristics:	Short-circuit-proof, temperature-protected, not electrically isolated from V_s
Function assignment (defaults)	Output 1: "Device ready" (static), output 2: "Good read", output 3: "No read", Output 4: "Data pulse", pulse duration 100ms
Electrical values:	$0V \le V_o \le V_s$ Guaranteed: $V_o \ge V_s - 2.5V$ for $I_o \le 100mA$ $I_o \le 100mA$

Table 5-11: Characteristic data of the 4 switching outputs

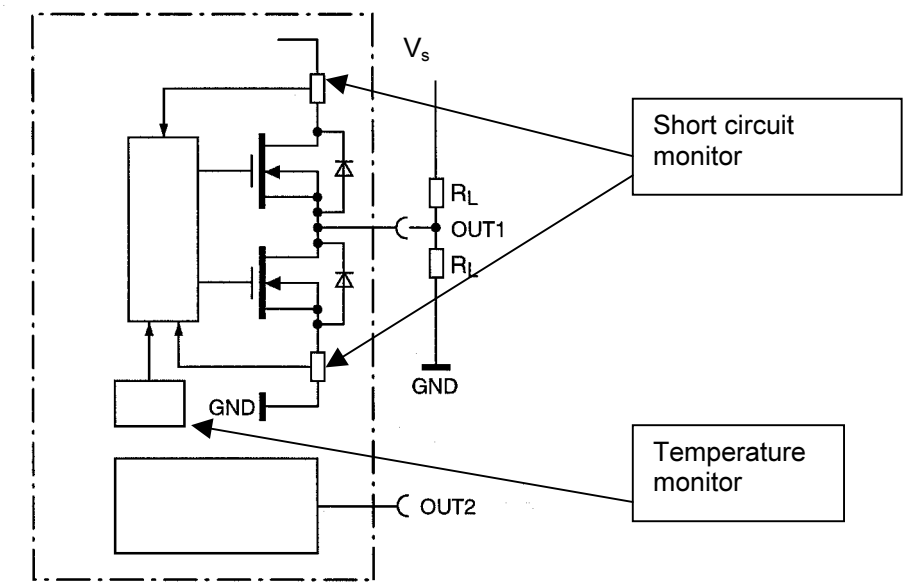

Fig. 5-6: Circuit diagram of the 4 switching outputs (Here: output 1 in detail)

Relay output:

Characteristics:	Not short-circuit-proof, not temperature-protected, electrically isolated, floating
Function setting (defaults)	Relay output: "Device ready" (static)
Electrical values:	Alternating voltage/direct voltage $0V \le V_{SWITCH} \le 250V$ according to VDE 0110 group C Max. current 1.5 A for 24 V DC Max. current 0.2 A for 250 V DC Max. current 1.5 A for 250 V AC

Table 5-12: Characteristic data of the relay output

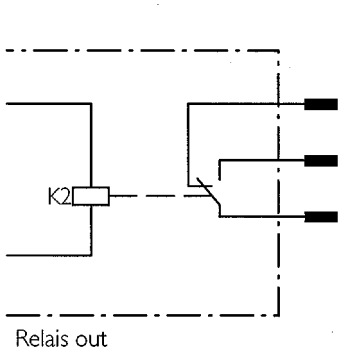

Fig.: 5-7: Circuit diagram of the relay output

Note:

Even high-quality relays suffer from wear and tear on the contacts. For this reason, we recommend the relay output be used only for functions that require many switching cycles (e.g. good read).
Typical service life of a relay at maximum load (220 V AC/ 8 A): 100 000 switching cycles
Typical mechanical service life (without load): 30 000 000 switching cycles

5.5.5 Wiring the host interface

Important:
If the host interface is wired incorrectly, electronic components in the TPC may be damaged.

- Wire the host interface correctly
- Check the wiring carefully before switching on the TPC

---

1. Connect the host interface of the TPC to the host using shielded cables, in accordance with EMC guidelines
2. Note the maximum cable lengths, as defined in Section 5.4.1 *Requirements of the host interface*
3. Apply the shield to one side **(recommendation)**
   When using the MCU, apply the shield directly over the conduit thread (housing entry).

In the default setting, the BCL communicates via the **RS 422/485** interface version with the following values:

Parameter	**Value**
Data transmission rate	9600 bits/ s
Data bit	8
Parity	None
Stop bit	1
Log	LEUZE (start characters: STX, stop characters: ETX, handshake: none, timeout: 50 ms)

Table 5-13: Defaults of the communication parameters of the host interface

Terminating the RS 422 interface:

The plug-in jumpers (*see Fig. 5-3*) are used to terminate the host interface:

- To activate the RS 422 version, set both plug-in jumpers to OFF.
- To activate the RS 485 version, set both plug-in jumpers to ON.

Activating the RS-232 version:

The RS 232 interface is activated on the "Host interface" tab of the MSP Config program.
Only the terminal description for the RS 422 version is displayed under host on the terminal strip. The following assignment must be made to connect the RS 232 interface:

RS 232	**RS 422**
TxD	T-
RxD	R-

Table 5-14: Assignment of the RS 232 signals on the RS 422 interface

Downloading to the TPC:

1. In the toolbar, click the "Page to bar code scanner" button.
   MSP Config downloads the parameter set to the TPC.
   The "Download Parameters" dialog box with the storage options appears.
2. Click the desired storage options.
   The dialog box closes automatically.
   The TPC now operates the host interface in the RS 232 version.

5.5.6 Wiring the terminal interface

The terminal interface is the auxiliary interface with which the user operates and configures the TPC with the "MSP Config" PC software. Unlike the host interface, it has a fixed data format and data transmission rate.

The PC must be connected either to the connector strip of the auxiliary interface directly (*see Fig. 5-1*) or to the terminal interface (*see Fig. 5-1*, 9-pin D Sub connector) via the RS 232 connection cable.

The communication parameters for the PC port should be set as follows:

Parameter	**Value**
Data transmission rate	9600 bits/ s
Data bit	8
Parity	None
Stop bit	1

Table 5-15: Communication parameters for the terminal interface

In the default setting, the terminal interface outputs the reading result in "Reading diagnosis" mode. The operating mode can be changed on the "Auxiliary interface" tab in the MSP Config program. Other available operating modes are described in *Section 7.3*.

5.5.7 Wiring the CAN interface

The procedure for connecting the cable to CAN-H and CAN-L is described in Section 5.5.1 *Connecting the bar code scanners*. The CAN interface must also be terminated.

Terminating the CAN interface:

- The plug-in jumper (*see Fig. 5-3*) is used to terminate the CAN interface.
- To operate the MCU/ TPC with one branch line (*see Fig. 5-2*), set the plug-in jumper to ON.
- To operate the MCU/ TPC with two branch lines, set the plug-in jumper to OFF.

The 9-pin D Sub connector of the CAN interface (*Fig. 5-1*) is used to monitor the CAN bus and is only required for internal analyses at Leuze electronic.

6 Setup

6.1 Quick start with the factory defaults

Unlike the individual bar code scanner, the MSP does not support the Quick Start procedure, as the position of each individual bar code scanner must be parameterized exactly. See Chapter 8 *Parameterization*. The parameters should be defined using the MSP Config program.

6.2 Defaults

Table 6-1 shows an overview of the factory defaults for the TPC, e.g. when it is switched on for the first time. The tried-and-tested default parameters enable the TPC to be used in a wide range of applications with only minor changes.
The default values are stored permanently in the TPC, the BCL in question, and in the MSP Config program and can be activated at any time.

Parameter	**Default**
Active code types	Code 39, Code 128, 2/5 Interleaved
Code length	Free (2/5 Interleaved: interval, 4 ... 50 characters)
Multiple reads	3
Min./max. number of codes	1
MCU trigger mode	Active, if TRIG 1 high, end of reading pulse by reading pulse source
Distribution of focus position info	Once per reading pulse
Increment input	INC 1
Switching outputs	Output 1: "Device ready"; Output 2: "Good read"; Output 3: "No read"; Output 4: "Data pulse", Relay output: "Device ready"
Host interface	RS 422/ 485
Protocol	NAK; start character: STX, stop character: ETX
Transmission rate	9600 bits/ s
Data format	8 data bits, no parity, 1 stop bit
Output format	Header: blank, separator: blank, terminator: blank; error string: NOREAD + separator
Output assortment	Code position
Output point	Reading result: end of reading interval, separator: after code
Test string	Inactive
Terminal interface	Reading diagnosis

Table 6-1: Default parameter values of the TPC

To display and print out the entire default settings, proceed as follows in the MSP Config program:

1. Saves any changes you made to the current parameter set in a new configuration file "Name.scl" using the menu option "File/Save As".
2. Click the defaults icon ("red factory building") in the toolbar.
   The default settings are loaded and displayed on the tabs.
3. Click the printer icon.
   The Print dialog box appears.
4. Edit and confirm the dialog box.
   MSP Config prints out the default settings.

7 Operation

7.1 Overview

The MCU/ TPC and the BCL 90 bar code scanners connected in the MSP feature the following operating modes/functions:

Standard operating mode:

- Reading mode

Startup:

- Percentage evaluation[1)]
- Adjustment mode and visualization of the CP limits[2)]
- Background teach-in[2)]

Parameterization:

- Parameter mode (configuration)

Monitoring/troubleshooting:

- View and edit operating data
- Reading diagnosis
- Monitor host interface
- Auxiliary input
- Self-test
- Standard MCU statistics (single read)
- Extended MCU statistics (single read)
- Summarized MCU statistics (single read)
- Standard MCU statistics (single read) with overall statistics after 100 reading pulses
- Summarized MCU statistics after 100 reading pulses
- I/O monitor in the increment pulse
- Monitor scanner - reading results

1) These functions are only available for BCL 90 bar code scanners and not for the MCU/TPC itself.

2) These functions are only available for BCL 90 bar code scanners and not for the MCU/TPC itself. These can be found in the MSP Config program in the menu "Tools" under "Device Functions".

To call up these functions, choose the "Parameters in the MCU network" option from the TPC 400 device selection and enter the ID of the bar code scanner.

7.2 Preparations for operation

1. Connect the PC to the terminal interface (auxiliary interface) on the MCU/ TPC.
2. Switch on the operating voltage for the MCU/ TPC and connected bar code scanners.
3. Start Windows and MSP Config on your PC.
4. Click the "Terminal" icon in the toolbar.
   The Terminal Emulator window appears. The BCL is now in Reading mode.

7.3 Operating modes/functions

7.3.1 Reading mode (standard operating mode)

The MCU/TPC switches to this mode automatically after it has been started and the self-test has been completed successfully. In the default setting, the MCU/TPC works with the "TRIGGER 1" switching input (set to "high") as a trigger source for generating the reading pulse. The MCU/TPC outputs the reading result at the end of the reading field on both the host and terminal interface.
Travel information is required to assign the bar code to the object in question. This must be supplied via an external incremental encoder. In the default setting, "INC 1" with a length of 10 mm is active.
If the incremental encoder does not output any signals to the MCU/TPC, e.g. because the conveyor belt is switched off, the end of the reading field is not reached and no reading result is output.
A PC is only required to access the reading result directly.

Displaying the reading result:

1. Connect the incremental encoder and trigger source to the MSP
2. Switch on the the conveyor belt.
3. Place an object with a sample bar code in front of the MSP (position object on the conveyor belt and let it pass through the MSP).
4. Once the object is no longer recognized by the trigger source and the parameterized end of the reading field has been reached, the MCU/TPC outputs the reading result in the Terminal Emulator.
   The terminal interface is then in "Reading diagnosis" mode (default).

Reading result on the terminal interface:

The reading result on the terminal interface comprises the data contents of the bar code(s) and the reading diagnosis data. The function of the reading diagnosis data is explained in the BCL 90 Operating Instructions, in Chapter 7 *Operation*.

Reading result on the host interface:

In the default setting, the MCU/TPC sends only the data contents of the bar code(s) as a simple data string on the host interface, without reading diagnosis data. The header, separator, and terminator are empty (blank).
You can define the structure of the data output string on the host interface from the "Data string" tab in the MSP Config program. The header, separator, and terminator can comprise up to 10 elements, consisting of constants and/or reading diagnosis data.

1. Click "Header" in the drop-down list.
   The "Edit parameters: TFH" dialog box appears.
2. Choose the desired constants or placeholders for reading diagnosis data.
   The selected elements appear in the line at the top of the dialog box.
3. Confirm the dialog box with "OK".
4. Repeat this procedure for the separator and terminator.

Download to the MCU/ TPC:

1. Click the "page to bar code scanner" icon in the toolbar
   MSP Config downloads the parameter set to the MCU/ TPC.
   The "Download Parameters" dialog box appears with the storage options.
2. Click the desired storage option.
   The dialog box closes automatically.

The MCU/ TPC now works with the new settings.

Defining an alternative reading pulse in the Terminal Emulator:

For test purposes, the MCU/TPC can also be triggered directly from the Terminal Emulator window without an external reading pulse sensor. This option can also be used if the conveyor belt controller provides a PLC signal for the reading interval.

1. Close the Terminal Emulator.
2. Choose the "Device Configuration" tab.
3. Click the "Edit Reading Trigger" button.
   The "Edit Reading Trigger" dialog box appears.
4. Choose the "Serial Interface" option field.
5. Confirm the dialog box with "OK".

This function requires the incremental signal. The MCU/ TPC outputs the reading result in the main window of the Terminal Emulator.

Download to the MCU/ TPC:

1. Click the "page to bar code scanner" icon in the toolbar
   MSP Config downloads the parameter set to the MCU/ TPC.
   The "Download Parameters" dialog box appears with the storage options.
2. Click the desired storage option.
   The dialog box closes automatically.

The MCU/ TPC now works with the new settings.

Triggering the SW trigger:

1. Click the "Terminal" icon.
   The Terminal Emulator screen appears. The MCU/ TPC is in Reading mode.
2. Click the "Start SW Trigger" button.
3. Place the bar code in front of any bar code scanner.
4. Click the "Stop SW Trigger" button.

This function requires the incremental signal. The MCU/ TPC outputs the reading result in the main window of the Terminal Emulator.

As a prerequisite, the MCU/ TPC must be able to assign the read bar code uniquely to one object, i.e. the bar code is located on the object detected by the trigger source of the reading pulse generator.

7.3.2 Percentage evaluation

This operating mode is available for each individual bar code scanner in the MSP and is only accessible via the **terminal interface**. It can be used to assess the reading quality for bar codes that are placed statically in the reading field of the MSP or of individual bar code scanners in the MSP (conveyor belt stationary). The BCL evaluates the good read rate statistically for 100 scans in free-running mode and outputs the reading results every 2 seconds. These results can be displayed using the MSP Config program.

1. Click the "Terminal" icon.
   The Terminal Emulator window appears. The MCU/ TPC is in Reading mode.
2. Click the "Percentage Evaluation" option.
   The MCU/ TPC is in Percentage Evaluation mode.
3. Place bar code statically in front of any bar code scanner and monitor the Terminal Emulator.
   The MCU/ TPC outputs every result. Depending on the reading quality, the "Read result" LED either lights up or blinks. See also Section 3.3.1 *Functions of the LEDs*. The output format of the read result is identical to that in Reading mode.

7.3.3 Setting parameters (configuration)

The parameterization process adapts the MCU/ TPC and the connected bar code scanners manually to the application-specific conditions. The most efficient method is the online method using the tabs and download function of the MSP Config program. In this mode, the MCU/ TPC does not output any reading results. The procedure is described in Chapter 8 *Parameterization*.

Setting parameters with the Terminal Emulator:

The Terminal Emulator can also be used to parameterize the MCU/ TPC and connected bar code scanners directly by entering command strings. This enables special devices to be adjusted and new MCU/TPC parameters to be configured that do not exist in the current version of MSP Config.
The changes made here are not registered in the program until they have been uploaded from the MCU/ TPC to the PC (provided that they are recognized as parameters) and should be treated with care. The command language accesses the command interpreter of the device directly.
The *Command language of the BCL bar code scanners* reference manual provides a complete description of the command language.

Parameterizing the MCU/ TPC or BCL with command strings:

1. Click the "Terminal" icon in the toolbar.
   The Terminal Emulator window appears. The MCU/ TPC is in Reading mode.
2. Click the "Parameterise" option field.
   MSP Config issues a command that switches the MCU/ TPC to Parameter mode (all commands begin with "3").
3. Enter the desired command in the command line and send it to the MCU/TPC by pressing the Return key.
   The MCU/ TPC responds to a command with the correct syntax by issuing an echo.
   Example:
   The entry "3?HS" instructs the MCU/ TPC to output the communication parameters of the host interface.
4. To return to Reading mode, click the "Reading mode" option.

7.3.4 Viewing and editing operating data

This function allows you to interrogate and reset statistical operating data that the MCU/TPC logs in the form of counters during the reading operation. The MCU/ TPC does **not** output reading results in this mode.

1. Click the "operating data" icon (“jagged line”) in the toolbar.
   The Operating Data dialog box appears. The MCU/ TPC interrupts Reading mode.
2. After reading/resetting the desired counters, confirm the dialog box with "OK".
   The MCU/ TPC resumes Reading mode.

7.3.5 Displaying Adjusting mode and CP limits

These two functions are not directly available in the MCU/ TPC but in the bar code scanners connected to the MSP. A detailed description is provided in Chapter 6 *Operation* of the BCL 90 Operating Instructions.

7.3.6 Background teach-in

This function is not directly available in the MCU/ TPC but in the bar code scanners connected to the MSP.
A detailed description is provided in Chapter 6 *Operation* of the BCL 90 Operating Instructions.

7.3.7 Reading diagnosis

Function of the **terminal interface** (default). In this mode, the MCU/ TPC outputs the data contents of all read bar codes with the associated reading diagnosis data, including the data recorded incorrectly according to the selection criteria (errored). The number of bar codes output, therefore, may be greater than the number of bar codes that are sent in the reading result on the host interface.
In the default setting, the MCU/ TPC does not output any reading diagnosis data on the host interface.

The reading diagnosis can be activated on the "Auxiliary Interface" tab in the MSP Config program as follows:

➢ Choose the "Read Diagnostics" option in the "Auxiliary Interface" list box.

Download to the MCU/ TPC:

1. Click the "page to bar code scanner" icon in the toolbar.
   The MSP Config downloads the parameter set to the MCU/ TPC.
   The "Download Parameters" dialog box appears with the storage options.
2. Click the desired storage option.
   The dialog box closes automatically.

The terminal interface of the MCU/ TPC is now working in "Reading diagnosis" mode.

7.3.8 Monitoring the host interface

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs the data traffic on its host interface via the terminal interface. Repetition requests from the protocol driver and protocol-specific data, such as start and stop characters, are suppressed. Each data string is represented on a separate line.

Identification of the data direction:

O data string ... = MCU/ TPC sending to the host (**O** = Output)
I data string ... = MCU/ TPC receiving from the host (**I** = Input)

The function for monitoring the host interface can be activated on the "Auxiliary Interface" tab in the MSP Config program as follows:

➢ Choose the "Monitor Host Interface" option from the "Auxiliary Interface" drop-down list.

Download to the MCU/ TPC:

1. Click the "page to bar code scanner" icon in the toolbar.
   The MSP Config downloads the parameter set to the MCU/ TPC.
   The "Download Parameters" dialog box appears with the storage options.
2. Click the desired storage option.
   The dialog box closes automatically.

The terminal interface of the MCU/ TPC is now working in "Monitor Host Interface" mode.

Displaying data in the Terminal Emulator (for test purposes):

1. Choose the serial interface as a trigger source for the reading pulse. See Section 7.3.1 *Reading mode*.
2. Click the "Terminal" icon in the toolbar.
   The Terminal Emulator window appears. The BCL is in Reading mode.
3. Click the "Start SW Trigger" button.
4. Place the bar code in front of any bar code scanner.
5. Click the "Stop SW Trigger button.
   The MCU/ TPC outputs the result of the host interface in the main Terminal Emulator window. In the default setting, the result does not contain any reading diagnosis data.

This function requires the incremental signal. The MCU/ TPC outputs the reading result in the main window of the Terminal Emulator.
As a prerequisite, the MCU/ TPC must be able to assign the read bar code uniquely to one object, i.e. the bar code is located on the object detected by the trigger source of the reading pulse generator.

If the data traffic on the host interface is very fast or very high, it may not be displayed correctly. This is due to the slower transmission speed of the terminal interface, with the result that missing information appears as ".....".

7.3.9 Auxiliary input

Function of the **terminal interface**. In this mode, the MCU/ TPC accepts a bar code entered manually on the terminal interface (via keyboard or handheld scanner with decoder). It sends the bar code to the host in a separate data string on the host interface. This function can be used to correct no reads, for example, by transferring missing bar codes subsequently.

7.3.10 Self-test

During the self-test, the MCU/TPC checks whether its hardware components are functioning properly and verifies the number and error status of the connected bar code scanners. A concluding message output on the terminal interface provides information on the test result. Each time it is switched on, the device runs a self-test before it is initialized with the valid parameter set. The test can be called up explicitly at any time. The BCL **does not** output any **reading results** during the test routine.

1. Click the "Terminal" icon in the toolbar.
   The Terminal Emulator window appears. The MCU/ TPC is in Reading mode.
2. Click the "Self-Test" option field.
   The MCU/ TPC terminates Reading mode and starts the test routine. After a few seconds, the MCU/ TPC outputs the test result in the form of a code number.
3. To return to Reading mode, click the "Reading mode" option or close the Terminal Emulator.
   The MCU/ TPC resumes Reading mode.

The code number "15**000"** means that the test has been concluded successfully and no errors were diagnosed. Section 10.2 *Error messages* contains a list of error codes and associated remedies.

7.3.11 Standard MCU statistics (single read)

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs an overview of the information collected for each reading pulse via the terminal interface. The reading interval lengths and durations, as well as velocity are output. Furthermore, the code type, length, and contents, reading rate, and code reliability are output for each code read.

The standard MCU statistics (single read) can be activated on the "Auxiliary Interface" tab in the MSP Config program as follows:

- Choose the "Standard MCU Statistics (single read)" option from the "Auxiliary Interface" drop-down list.

Download to the MCU/ TPC:

1. Click the "page to bar code scanner" icon in the toolbar.
   The MSP Config downloads the parameter set to the MCU/ TPC.
   The "Download Parameters" dialog box appears with the storage options.
2. Click the desired storage option.
   The dialog box closes automatically.

The terminal interface of the MCU/ TPC is now working in the "Standard MCU statistics (single read)" mode.

The procedure for activating the described function for 7.3.11 .. 7.3.17 is always the same and only described in Section 7.3.11.

7.3.12 Extended MCU statistics (single read)

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs an overview of the information collected for each reading pulse via the terminal interface. In addition to Section 7.3.11 *Standard MCU statistics (single read*), the reading results of the various bar code scanners are also transferred in detail here.

7.3.13 Summarized MCU statistics (single read)

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs a summarized overview on the information collected for each reading pulse via the terminal interface. Only the most important items of data are summarized in one line. This compressed form is particularly useful for evaluating the results in detail (e.g. with a spreadsheet program).

7.3.14 Standard MCU statistics (single read) with overall statistics after 100 reading pulses

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs an overview of the information collected for every 100th reading pulse via the terminal interface. No data is output between the cycles, with the exception of error messages. The information output here is the same as that described in Section 7.3.11 *Standard MCU statistics (single read).*

7.3.15 Summarized MCU statistics (single read) with overall statistics after 100 reading pulses

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs a summarized overview of the information collected for every 100th reading pulse via the terminal interface. No data is output between the cycles, with the exception of error messages. Only the most important items of data are summarized in one line. This compressed form is particularly useful for evaluating the results in detail (e.g. with a spreadsheet program).

7.3.16 I/O monitor in the incremental pulse

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs a status line referring to the time and increment on the terminal interface for every status change of an input or output. One position in the status line is available for this purpose for each of the 4 outputs, the relay, and 14 inputs (without increment inputs). Depending on the status of the input or output, the position contains either a "." or a "1".

7.3.17 Monitoring the scanner results

Function of the **terminal interface**. In this mode, the MCU/ TPC outputs all of the reading results determined by the individual bar codes via the terminal interface. It shows which bar code scanners read which code and at which distance. Furthermore, the assigned object and the coordination of the bar code are transferred.
A bar code can be read by a bar code scanner up to 3 times (CRT forwards, CRT backwards, and Standard Decoder).

7.4 Switching off the device

Any changes made to the parameter set of the MCU/ TPC or the BCL with the MSP Config program do not take effect until they have been transferred to the MCU/ TPC or BCL.

Current parameter set unchanged:

1. If **no changes** have been made or if these are to be rejected, choose "File" and "Exit" in the menu bar.
   MSP Config closes.
2. Switch off the supply voltage to the MCU/ TPC and the bar code scanners connected to the MSP.
   The parameter set that was last stored permanently in the MCU/ TPC or BCL remains valid.

Current parameter set has been modified in MSP Config:

1. Download the modified parameter set **to the MCU/TPC**: Click the "page to bar code scanner" icon in the toolbar.
   The BCL transfers the parameter set to the MCU/ TPC and asks you to specify the desired storage option.
2. Confirm the "Permanent" storage option with "OK".
   The MCU/ TPC is now working with the modified parameter set.
3. Store the modified parameter set as a **new configuration file in MSP Config on the PC** or overwrite the existing file: choose "File", a "Save As" from the menu bar.
4. Enter and confirm the path and file name in the dialog box.
   MSP Config stores the configuration file.
5. Choose "File" and the "End" menu option in the menu bar.
   MSP Config closes.
6. Switch off the supply voltage to the MCU/ TPC and bar code scanners connected in the MSP.

8 Parameterization

8.1 Overview

The parameter settings are used to adapt the reading, evaluation, and output properties of the BCL to the application. The default settings defined at the factory or a parameter set that has already been modified is used as a starting point.

The parameter settings for the BCL can be defined as follows:

- Using the Windows-based MSP Config program (via a serial interface)
- With command strings (via a serial interface)

8.2 Quick start

8.2.1 Setting parameters with the MSP Config program

The MSP Config program provides a convenient means of configuring the MCU/TPC via a serial interface:

1. Connect the PC to the terminal port on the MCU/ TPC
2. Switch on the power supply to the MCU/TPC and bar code scanners in the MSP.
3. Start Windows and the MSP Config program.
4. Upload the parameter settings from the MCU/TPC by clicking the ‘Bar code scanner to page’ icon in the toolbar. MSP Config then transfers the values from the current parameter set from the MCU/TPC to the PC (this is carried out automatically when the program starts, provided that the PC is connected).
5. Change the required values on the tabs. You can display an explanation of the parameters and their functions by pressing the <F1> key.
6. Download the parameters to the MCU/ TPC by clicking the ‘Page to bar code scanner’ icon in the toolbar. MSP Config then transfers the modified parameter set to the MCU/TPC. The ‘Download Parameters’ dialog box is then displayed with the storage options.
7. Confirm the ‘Permanent’ storage options by clicking ‘OK’.
   The dialog box is then closed automatically.
8. Save the modified parameter set as a configuration file ‘*.scl*’ in MSP Config.

The MCU/TPC is now ready to use the new parameter settings.

The individual bar code scanners used in the MSP can also be parametrized via the terminal port on the MCU/TPC. To do so, choose the ID of the relevant bar code scanner in the menu ‘Option’ under ‘Parameters in MCU network’.

8.2.2 Setting parameters with command strings

➢ Program the host/PC in such a way that it sends the command strings to the MCU/TPC.

For further information, please refer to the ‘*Command Language of the BCL Bar Code Scanners*’ manual.

8.3 Setting parameters with MSP Config

The Windows-based MSP Config program is used to set the MCU/TPC and BCL parameters manually and to operate the device in general (choose functions and operating modes). The program supports the MCU/TPC and all standard BCL types.
MSP Config communicates with the MCU/TPC and BCL by uploading and downloading the parameter values via the serial port on the PC (online mode).
The default settings defined at the factory or a parameter set that has already been modified are used as a starting point. All of the parameter sets can be stored in configuration files in MSP Config.
You can display the context-sensitive help, which contains a description of all the MCU/TPC and BCL parameters, with the 'I-viewPro' HTML browser supplied with the program. A terminal emulator provides direct (online) access to the MCU/TPC and BCL. You can display and edit the operating data on the screen in English or German.

8.3.1 Installing the MSP Config software

Preparations:

1. Make sure you have the disks containing MSP Config at hand.
2. Connect the PC to the terminal port on the MCU/ TPC.
3. Connect the power supply to the MCU/ TPC.
4. Switch on your PC and start Windows.

Installing the software:

You can run the software on a PC with Windows 95™/ 98™ or Windows NT™. The installation program creates a main directory with a series of subdirectories and generates the necessary links. Approximately 15 MB of hard disk space is required to install MSP Config. You can also remove the program from your PC at any time by running the uninstaller.

1. Initial installation

1. Close all Windows applications.
2. Insert disk 1 in drive "a".
3. Choose "Run" in Windows.
   In the "Open" drop-down list, enter: "a\MSPxxxx.exe" (as printed on disk 1). Confirm the dialog box with OK.
   - or -
   Open the Windows Explorer, choose the "a" drive, and double-click the file "MSPxxxx.exe".
4. The installation program is started and guides you step by step through the installation process.
   The program installs 'MSP Config' and the online help 'MSP Config Help'
5. Please read the Readme file that contains the latest information on MSP Config.
6. Then confirm the installation message by clicking OK.

The MSP Config program and MSP Config Help are installed and ready.

2. Updating the program

a) Installing the new version over the old one:

Before you can install the new version of the software, you must remove the files of the old version – with the exception of the configuration files "*.scl" – using the uninstaller program.

There are two ways of removing MSP Config:

- Automatic, full deinstallation (default setting):
  All of the files in the main directory and subdirectory, with the exception of the configuration files in the 'data' directory (which contain the application-specific parameter sets of the MCU/TPC and BCL), are deleted.
- Custom deinstallation:
  The uninstaller uses the log file from the installation routine to list all of the files, with the exception of the configuration files '*.scl' in the 'data' directory. The configuration files '*.scl' only remain if you do not allow the main directory to be deleted. We recommend that you move these files to a different directory and copy them back to the "data" directory later.

Starting the uninstaller:

1. Choose the uninstaller for MSP Config under Programs in the Start menu.
   The uninstaller is then started and guides you step by step through the deinstallation process.
2. Choose the deinstallation method.
3. Install the new version of MSP Config as described in Point *1. Initial installation*, making sure to choose the same directory.

The new version of MSP Config is installed. The configuration files of the old version can be used again.

b) Installing the new version in parallel with the old one:

1. Start the installation program for the **new MSP Config** version as described under *1. Initial installation*.
2. When the program asks you for the target directory, you must specify a **new directory**.

The new version of MSP Config is then installed. We recommend that you do not run both versions simultaneously. You can also use your old configuration files with the new MSP Config version.

8.3.2 Starting MSP Config

1. Switch on your PC and start Windows.
2. Choose MSP Config from the Start menu.
   The Leuze logo is then followed by the initial screen.
3. Confirm the initial screen.
   MSP Config then checks whether a BCL is connected to the COM 1 port on the PC (default setting in MSP Config) and whether the MCU/TPC communication parameters match those in MSP Config.
4. Once the program has successfully established communication, it enters the MCU/TPC type in the 'Scanner' drop-down list in the tool bar and changes the status field to 'Connected'.

The program then loads the internal MCU/TPC or scanner description as well as the default parameter values and displays them in the tab. Finally, MSP Config uploads the parameter set that was last stored permanently in the MCU/TPC and displays the values in the tabs.

Troubleshooting

If the program cannot establish communication, it outputs a timeout warning and displays ‘No connection’ in the status field. MSP Config then enters the MCU/TPC or scanner type that it last communicated with in the ‘Scanner’ drop-down list (BCL the first time the program is started).

The program then loads the internal description of the scanner type and displays the default parameter values on the tabs.

1. MCU/ TPC or BCL connected but the communication parameters differ

1. Choose the connected MCU/TPC or BCL type from the ‘Scanner’ drop-down list in the toolbar.
   MSP Config then attempts to connect to the device. Depending on whether it was successful, it displays either ‘Connected’ or ‘No connection’ in the status field.
   The program then loads the internal scanner description and displays the default parameter values on the tabs.
2. If ‘No connection’ is displayed, choose ‘Options’, ‘Serial interface’.
   MSP Config then displays the current communication parameter settings in the ‘COM parameters’ dialog box.
   If you choose the **‘Option‘, ‘Auto Baud Detect’**, MSP Config attempts to detect and set the communication parameters automatically.
3. Make sure that the communication parameters defined in MSP Config are identical to those of the BCL (9600 baud, 8 data bits, 1 stop bit, no parity) and confirm the dialog box.
   MSP Config attempts to communicate with the MCU/TPC again. If it succeeds, it displays ‘Connected’ in the status window.

You can then change the current parameter values on the tabs.

2. No MCU/TPC or BCL connected when MSP Config is started

1. Connect the PC to the terminal port on the MCU/TPC.
2. Choose the connected MCU/TPC or BCL type from the ‘Scanner’ drop-down list in the toolbar.
   MSP Config then attempts to connect to the device. If it was successful, it displays either ‘Connected’ in the status field.
   The program then loads the internal scanner description and displays the default parameter values on the tabs.
3. Click the ‘bar code scanner to page’ icon in the toolbar.
   MSP Config uploads the parameter set that was last stored permanently in the MCU/TPC and displays the values in the tabs.

You can then change the current parameter values on the tabs.

8.3.3 Functions

The graphical user interface (GUI) is largely self explanatory and comprises the following elements:

- Title bar and status display for the configuration files
- Menu bar with pull-down menus
- Toolbar with scanner selection field for connecting to the MCU/TPC or BCL
- Max. 9 tabs containing parameters that are grouped according to their functions. Some of these parameters open further dialog boxes.

The following functions are provided in MSP Config:

- Upload the default parameter set from the database
- Automatic communication attempt with the MCU/TPC and BCL when the program is started
- Automatic storage of last MCU/TPC or BCL type selected
- The Terminal Emulator window provides direct access to the MCU/TPC and can be used to select operating modes and functions. For further information, see Chapter 7 *Operation*.
- A communication window for selecting the communication port on the PC and for setting the data transfer parameters
- An “auto baud detect” function that attempts to detect the communication parameters automatically
- A menu for selecting the units of measure
- A menu for selecting the GUI language
- A function for printing the parameter sets as profile bar codes (not for MCU/ TPC and BCL 90)
- A function for displaying the last 10 configuration files
- Context-sensitive help in HTML format (<F1> Help)

The online ‘MSP Config Help’ function provides a description of how to use the program under ‘Program information’.

Default settings of MSP Config

Parameter	**Value**
Communication	COM 1, 9600 baud, 8 data bits, 1 stop bit, no parity
Units of measure	Metric
Browser	Not assigned
Language	German
Last type selected	BCL 90
File repository	‘data’ (BCLconfiguration files)

Table 8-1: MSP Config – default settings

8.3.4 Transferring parameter sets between MSP Config and the MCU/TPC or BCL

Uploading from the MCU/TPC or BCL (displaying the current parameter set in MSP Config):

Each time you select the MCU/TPC or scanner type, MSP Config loads the internal scanner description and displays the **default parameter sets** on the tabs, irrespective of whether it can communicate with the connected device.

To be able to edit the current MCU/TPC or BCL parameter set, you must first transfer it from the device to the MSP Config program.

- Click the ‘bar code scanner to page’ icon in the toolbar.
  MSP Config uploads the parameter set that was last stored permanently in the MCU/TPC and displays the values in the tabs.
  - or -
  Open the correct configuration file ‘*.scl’ (if it exists) in MSP Config.

Download the parameter set to the MCU/TPC or BCL (transfer a new parameter set to the MCU/TPC or BCL).

The parameter values displayed on the tabs only affect how the data is stored in MSP Config. **Any changes to these values do not take effect until they have been transferred to the MCU/TPC.** MSP Config always transfers the entire parameter set, i.e. all of the parameter values are overwritten in the MCU/TPC.

1. Click the ‘page to bar code scanner’ icon in the toolbar.
   MSP Config transfers the parameter set to the RAM of the TPC/MCU or BCL. The ‘Download Parameters’ dialog box is displayed with the following storage options.

   ‘PERMANENT’: MSP Config transfers the parameters to the RAM and to the non-volatile parameter store (EEprom) of the MCU/TPC or BCL.

   ‘TEMPORARY’: MSP Config transfers the parameters to the RAM. The changes are lost when the MCU/TPC or BCL is switched off.
2. Click the required storage option.
   The dialog box is closed automatically.

The new parameter set is now stored in the MCU/TPC or BCL (either temporarily or permanently).

3. **Recommendation**:
   Save the changes to the parameter set as a **new configuration file in MSP Config on the PC** or overwrite the existing file: choose ‘File’ -> ‘Save as’ from the menu bar.
4. Enter the path and file name in the dialog box and confirm your entries.
   MSP Config then saves your configuration file.

The new parameter set is then saved in MSP Config.

Unknown MCU/TPC or BCL parameters in MSP Config

If MSP Config detects unknown parameters when it uploads the parameter set to the MCU/TPC or BCL (MSP Config has not been updated for handling new parameters or the MCU/TPC or BCL is a special model), it outputs a warning and displays the unknown parameters in the window on the ‘Extras’ tab. The parameters are displayed in the form of command strings and can be edited using the command string conventions. When the parameter set is saved as a configuration file in MSP Config, these parameters are also included and are also downloaded to the MCU/TPC and BCL.

8.3.5 MSP Config – online help

The procedure for setting the BCL parameters is supported by the online help function, which is displayed in an HTML browser, such as Netscape Navigator™, Internet Explorer™, browser. You can call up context-sensitive help on each parameter as well as a description of its function and permissible values.

Displaying the help function:

- Press the <F1> key.
  The browser is launched automatically and displays the help topic.
  If the program cannot find a browser, it asks you to specify the storage location on the hard disk.
- Enter the storage location and link MSP Config with the browser.
  Confirm the dialog box.
  The link is then stored and the browser window opens.

Using the help function:

To display information on a tab, click the tab in the top, horizontal frame. The vertical frame on the left-hand side of the screen then displays a list of parameters, which you can click for a detailed explanation. To display an overview of the help function, choose ‘Help’ -> ‘Contents’ on the menu bar.

Recommendation
Use the **<ALT>+<TAB>** keys to switch between the ‘MSP Config’ and ‘MSP Config Help’ applications and prevent several browser windows from being opened.

8.3.6 Tabs (overview)

This section only describes the tabs for the MCU/TPC. For a description of the BCLs connected in the MSP, please refer to the Operating Instructions for the relevant bar code scanner. The MCU/TPC does not have a separate ‘Reading configuration’ tab. The settings required in the MSP, therefore, must be made on the respective bar code scanner.

Device configuration

You can use this tab to define:

- The device number
- How odette filters are processed
- How the information on the focus position is distributed
- The configuration (master / slave / standalone)
- The function assignment of the switching outputs (outputs 1...4 and relay output)
- How the reading pulse is processed
- How the incremental input(s) is/are processed
- How the switching inputs are processed (sensors 1-1 ... 1-7, 2-1 ... 2-4)
- How the match code is processed

Code configuration

You can use this tab to define:

- The individual codes that are activated for evaluation
- The number of identical reads
- The min. and max. number of bar codes to be read/output
- The code position comparison for identical bar codes

Recommendation

To enhance the reading reliability, we recommend that you only activate those code types and code lengths that are relevant.

Host interface

You can use this tab to define:

- The active interface version (RS 422/485 or RS 232)
- The protocol for data transfer
- The start and stop characters
- The data format and transfer rate

Data string

You can use this tab to define:

- The data output format on the host interface
- The constants and reading diagnosis data in the header, separator, and terminator
- The position of the separator in the data string
- The output format for no reads and the contents of the error string
- The test string function
- The output sequence and sort criteria if more than one bar code is read during each reading interval
- The activation criteria and structure of the format mask
- Special features (S2000, Cancel/Bell...)

Auxiliary interface

You can use this tab to define:

- The operating mode of the terminal interface

Slave configurations

You can use this tab to define:

- The CAN data rate[1)]
- The end of the reading field
- The list of salves in the network

1) it is important that the same CAN data rate be set in the MCU/TPC and on the connected bar code scanner.

Extras

These tabs can be used to edit unknown parameters after they have been uploaded to MSP Config from the MCU/TPC or BCL.

8.3.7 Parameterization guide

Change the following parameter settings in the default parameter set:

1a. Read: 1 bar code per reading pulse

- Code types ⇒ 'Code configuration'
- Decoder ⇒ 'Code configuration'
- Scanning frequency ⇒ under 'Reading configuration' in connected BCLs
- Assignment table ⇒ under 'Reading configuration' in connected BCLs
- Trigger source for dynamic focus control ⇒ under 'Reading configuration' in connected BCLs
- Autofocus function ⇒ under 'Reading configuration' in connected BCLs
- Focus positions (DC) ⇒ under 'Reading configuration' in connected BCLs
- Edit tracking parameters ⇒ under 'Reading configuration' in connected BCLs
- Trigger source for the reading pulse ⇒ 'Device configuration'

1b. Read: several bar codes per reading pulse

in addition to a:

- Minimum and maximum number of codes ⇒ 'Code configuration'

1c. Read: identical code type with identical data contents

in addition to b:

- Code distance ⇒ 'Device configuration'
- Code comparison ⇒ 'Device configuration'

1d. Restrict evaluation range of the scan line (per distance configuration)

in addition to a and b:

- Minimum code position and Max. CP ⇒ under 'Reading configuration' in connected BCLs

2. Host interface

- Type ⇒ 'Host interface'
- Communication parameters ⇒ 'Host interface'
- Protocol (if necessary) ⇒ 'Host interface'

3. Data output string on the host interface

- Contents of the header, separator, terminator ⇒ 'Data string'
- No read format ⇒ 'Data string'
- Test string (if required) ⇒ 'Data string'
- Output string (if required) ⇒ 'Data string'

8.3.8 Completing parameterization

Current parameter set unchanged:

1. If you **have not made any changes**, or if you want to reject these changes, choose ‘File’ -> ‘Exit’.
   MSP Config then closes.
2. Switch off the power supply to the MCU/TPC and bar code scanners in the MSP.
   The parameter set that was last saved permanently remains valid.

Current parameter set was changed:

1. **Download the modified parameter set to the MCU/TPC or BCL**: Click the ‘page to bar code scanner’ icon in the toolbar.
   MSP Config transfers the parameter set to the MCU/TPC or BCL and asks you to select the storage option.
2. Choose the ‘Permanent’ option.
   The MCU/TPC or BCL then uses the new parameter set.
3. Save the changes **as a new configuration file in MSP Config on the PC** or overwrite the existing file: from the ‘File’ menu, choose ‘Save as’.
4. Enter the path and file name in the dialog box and confirm your entries.
   MSP Config saves your configuration file.
5. From the ‘File’ menu, choose ‘Exit’.
   MSP Config closes.
6. Switch off the power supply to the MCU/TPC and bar code scanners in the MSP.

8.4 Backup concept for parameter sets

You can use the following methods to activate the current parameter set:

MCU/TPC or BCL:

1. Download it from MSP Config to the MCU/TPC or BCL and save it permanently. See also Section 8.3.4 *Transferring parameter sets between MSP Config and the MCU/TPC or BCL*.

MSP Config

2. Save the configuration file ‘*.scl’ in MSP Config. See also Section 8.3.8 *Completing parameterization*.

8.5 Editing tracking parameters

You must enter each individual bar code scanner in the MSP in a coordinate system.

➢ To do so, enter the relevant data for all of the connected BCL in the following window (*Fig. 8-1*) under 'Code configuration':

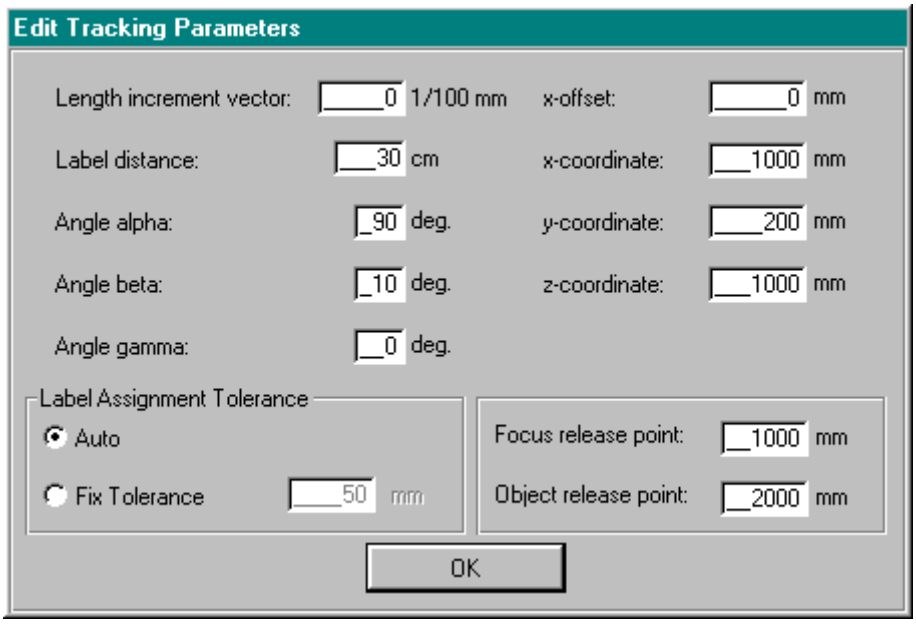

Fig. 8-1: Edit tracking parameters

Fig. 8.2 shows the angles and coordinates.

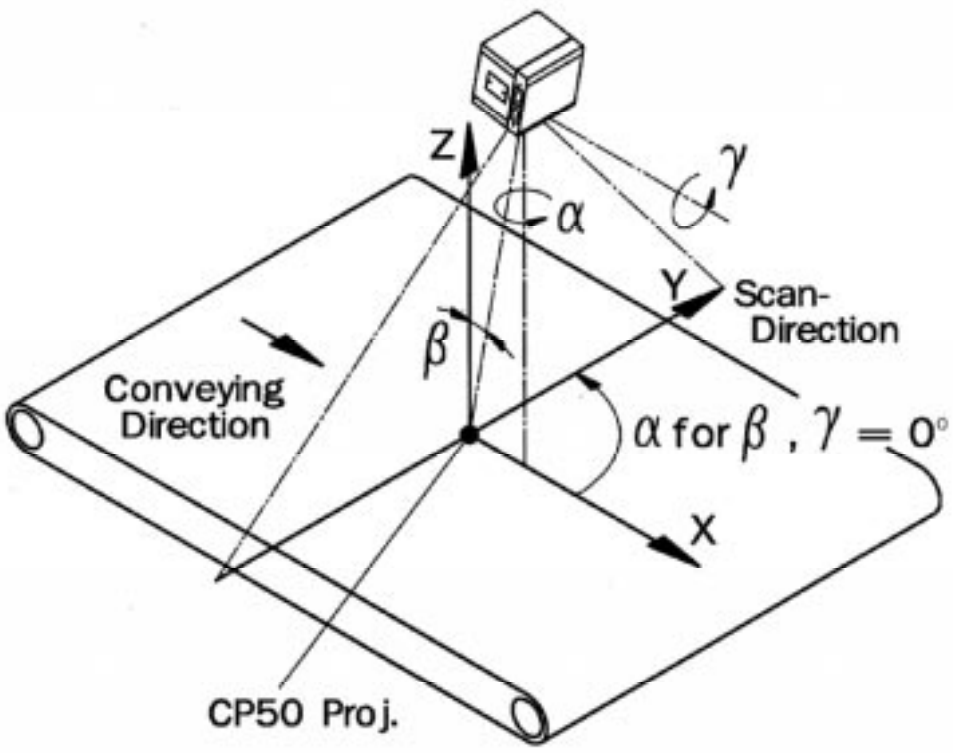

Fig. 8-2: The MSP coordinate system

Parameters:

Coordinate	**X**	**y**	**z**
Orientation	Transport direction	Perpendicular to TD	Vertical on belt
Zero point	Trigger - PS (second PS if 2 PS)	Belt edge right, in transport direction	Top edge of belt

Table 8-2: Coordinates

Each bar code scanner must be provided with 3 angles for assigning the code to the object (counterclockwise):

- *alpha* : angle of rotation of the scanning direction from the conveyor direction
- *beta* : skew angle of scanner (for oscillating mirror: direction of oscillation), rotation about an axis through the scanner that is parallel to the scanning direction, after alpha has been applied. Negative angle values are not allowed in MSP Config. An angle of –10°, therefore, corresponds to 350°.
- *gamma* : angle of rotation of the scanner about an axis that is parallel to the conveyor direction; value 0 : vertically downwards, after alpha and beta have been applied

Parameter	**Description**	**Resolution, unit**	**Min. value**	**Max. value**
x coordinate	Distance: MSP – frame pos. to scanner (center light emission front panel)	1 mm	-9999	+9999
x Offset	Distance: start – PS to MSP frame pos. (start) (identical for all bar code scanners)	1 mm	-3000	+3000
y coordinate	Scanner position perpendicular to conveyor direction	1 mm	-3000	+3000
z coordinate	Scanner height above belt	1 mm	-2000	+2000
Alpha	Angle of rotation of scanning direction from conveyor direction	1 degree	0	360
Beta	Skew (scanner)	1 degree	0	360
Gamma	Angle of rotation of scanner perpendicular to conveyor direction	1 degree	0	360
INC Scale	Travel increment scale	0.01 mm	0 (no increment)	100 mm

Table 8-3: Tracking parameters

In the case of scanners with oscillating mirrors, the geometry parameters apply in a similar manner to the zero position of the oscillating mirror (CW 50).

8.5.1 Object assignment

Known parameters:

The scanner knows the following information: (x*, y, z)* - position of the scanner and the *alpha, beta, gamma* angles. The following information on the read bar code is known: scanning angle CP, deflection angle CW (for devices with an oscillating mirror), the incremental encoder value CI, and the distance between the scanner and the bar code d0 (bar code distance).

Solution:

In order to assign the code to the object, the scanner needs to know the position of the bar code (x, y, z), whereby only x is relevant. The y and z coordinates, however, are necessary to determine the plausibility of the reading results.
The calculated position of the bar code is then assigned to an object by comparing it with the positions of the objects in the reading field.

8.5.2 Further tracking parameters

- Code distance:
  minimum distance between two codes. Identical codes within the parameterized distance are grouped together.
- Focus release point:
  distance from the initial photoelectric switch to the point at which the focus is to positioned at the latest on the following object, even if the bar code scanners in the MSP have not yet detected the required number of bar codes on the current object.
- Object release point:
  distance from the initial photoelectric switch to the point at which an object is no longer to be tracked. This is used to deactivate the bar code scanner as soon as there are no more objects in the reading field.
- Label assignment tolerance:
  distance of a code that is detected outside (upstream or downstream of) an object; assigned to the object nevertheless within the entered limit.

  You can select an automatic or a fixed tolerance value.
  Automatic: a permanent value of 100 mm is used, i.e. a bar code that is at a distance of up to 100 mm from the actual object is assigned to the object.
  Fixed tolerance: a value ranging from –999 to +999 is allowed. This must be set for the application and minimum object distance. Negative values ignore bar codes on the edge of objects.

9 Maintenance

9.1 Maintenance during operation

Information on maintaining and repairing the bar code scanners is provided in the relevant Operating Instructions.

The optical surfaces in the MSP must be cleaned at regular intervals.

- Clean the optical surfaces on external reading pulse generators and/or object-height detection systems using sensors (e.g. photoelectric reflex switches) with a mild, water-soluble, non-scouring detergent and a soft, lint-free cloth. Dirt on these surfaces may affect the switching behavior.

The MCU/TPC, for example, does not require further maintenance.

9.2 Maintenance

The MSP does not require maintenance. Its self-monitoring functions ensure fault-free operation over a long period of time. Any device or malfunctions on the MCU/TPC or BCL are output via the terminal interface (see Chapter 10 *Error messages*).

9.3 Disposal

Defective devices that have been removed from service should always be disposed of in an environmentally friendly manner. Further information for the bar code scanners used in the MSP are provided in the respective Operating Instructions.

In the case of the MCU/MSP, please note the following:

1. Always observe the national waste disposal guidelines.
2. Disassemble the housing of the MCU and TPC and submit it for recycling.
3. Disassemble electronic modules and connecting cables and dispose of them as special treatment waste.
4. Remove the reading window from the MCU and submit it for recycling.

Leuze electronic does not accept any unusable or irreparable devices at present.

10 Troubleshooting

10.1 Overview of errors and malfunctions

10.1.1 Mounting errors

- BCLs are not aligned correctly with the object
- Reading pulse sensor is positioned incorrectly
- Sensor for object-height detection is positioned incorrectly

10.1.2 Electrical installation errors

- Ports on the MCU/ TPC are connected incorrectly (wiring error)

10.1.3 Parameterization errors

- Functions are not adapted to the local conditions, e.g. communication parameters on the host interface are incorrect
- The technical limits of the bar code scanners have not been taken into account, e.g. the relationship between the available scanning frequency and the reading distance
- The coordinates of the bar code scanner in the MSP are incorrect

10.1.4 Malfunctions

- Safety timer for incomplete reading interval has expired
- Device error (hardware/software)

10.2 Error messages

The MSP outputs error messages on the auxiliary interface of the TPC.

These messages are structured as follows: *type SYS-FAILURE: xxx*

Device	Error message	Range
BCL bar code reader	*typ = BCL-FAILURE: xxx*	xxx= 000 ... 299
MCU/ TPC	*typ = TPC-FAILURE: xxx*	xxx= 500 ... 599
CAN OPEN protocol	*typ = COP-FAILURE: xxx*	xxx= 300 ... 399
network management	*typ = NMM-FAILURE: xxx*	xxx= 400 ... 499

Table 10-1: Types of error messages

In addition to error messages (*FAILURE)*, the MSP also outputs general messages (*MESSAGE*) that contain information only.

10.2.1 Overview of the error messages for the BCL 90 bar code scanner

The following table contains a general overview of the error messages for the bar code scanner. For a more detailed description, please refer to the relevant Operating Instructions.

1. To display the error messages in MSP Config, select the bar code scanner (under *Options*, *Parameters in the MCU network*)
2. Select the *extended* terminal mode.

Message	Meaning	Remedy
“BCL SYS- Failure: xxx” (BCL system error) xxx = 000 ... 299 Error code: 011 data error (external RAM) 012 address error (external RAM) 013 insufficient RAM (external RAM) 051 speed out of tolerance (mirror wheel) 061 Mirror interval out of tolerance 071 Laser shutter failure 091 ... 095 focus adjustment error 101 ... 118 parameter memory error 130 amplifier setting 131 invalid background profile 132 center position CP-50 not plausible 133 brightness value overrun 201 ... 215 DSP failure	The BCL has diagnosed a system error. The “Device Ready” LED does not light up or extinguishes. The system is restarted.	If the error occurs again after the BCL has restarted, contact the Leuze electronic Service department.

Table 10.2: SYS failures – BCL 90 bar code scanner (excerpt)

10.2.2 Overview of the error messages for the MCU/ TPC

The MCU/TPC displays an error message for each bar code scanner if it does not respond in the CAN network. Error messages 502 to 525 are used for this purpose (502 for BCL 1, 503 for BCL 2.... 525 for BCL 24).
Internal bar code scanner errors are in the range from 527 to 550 (527 for BCL 1, 528 for BCL 2... 550 for BCL 24). To determine the exact error, see *Table 10.2*.

➢ If the error occurs again after the BCL has restarted, contact the Leuze electronic Service department. This also applies to error messages between 300 and 499.

10.3 Troubleshooting table

Table 10.3 contains a list of further malfunctions that can occur as a result of incorrect parameter settings or errors during operation. It is assumed in each case that only one bar code is read with each reading pulse. By connecting a terminal/PC to the auxiliary interface of the TPC, you can display error messages and monitor data traffic on the host interface.

Malfunction	Possible cause	Remedy
The MCU/TPC is not ready. The “Device Ready” LED is not lit. The “Dev Rdy” switching output (default setting of output 1) is blocked.	- The power supply to the MCU/ TPC has not been switched on	- Check the power supply. Check the BCL (listen to the housing): can you hear the polygon mirror wheel running?
	- The MCU/ TPC is not in “Reading mode”	- Exit the control menu
	- The MCU/ TPC has diagnosed a device error during the self-test	- Analyze the error messages using *Section 10.2.2*. Switch the device off and on again
The connected BCLs cannot be clocked via the “Sensor” switching input. The “Sensor” LED on the individual LEDs does not light up. The scan line is not visible.	- Sensor not connected correctly	- Check the electrical connection and functioning of the sensor
	- Incorrect trigger source set	- Check the setting under the “trigger source” menu option
	- MCU mode not activated in bar code scanner	
	- CAN baud rate in the MCU/ TPC and bar code scanner do not match	
The “Read Result” LED does not light up when the event occurs that triggers the parameterized function. The “Good Read” switching output does not supply a pulse.	- Incorrect function parameterized	- Check the setting under the “Good Read - Output” menu option
The MCU/TPC does not transmit a reading result to the host. The “Data” LED is not lit.	- The MCU/TPC is not in “Reading mode”	- Switch to “Reading mode”
	- No reading pulse present (e.g. sensor signal or command string missing)	- Check reading pulse supply
	- No incremental signal present	
The MCU/ TPC only transfers the error status ST=3 in the reading result to the host	- The MCU/ TPC has diagnosed as device error during the self-test	- Analyze the error messages using *Section 10.2.2*.

Table 10-3: Troubleshooting table

Malfunction	Possible cause	Remedy
The MCU/TPC repeatedly transmits the error status ST=2 in the reading result to the host (message on terminal interface: “No code!”)	- There is no bar code in the reading field during the reading pulse	- Synchronize the pulse supply to the BCL with the appearance of the bar code in the reading field
	- The evaluation criteria, e.g. code type and code length, are incorrectly set	- Check the individual menu options of the enabled code types (code configuration)
	- The tracking parameters in the scanner are incorrect	- Check the “Reading configuration” menu option
	- If the autofocus function is not used: the focus position has not been adapted to the reading situation (code outside reading range)	- Check the tracking parameters
	- The bar code quality is too poor	- Check the reading function using a standard reference code
Control characters contained in the code, header, separator, or terminator appear as “@” in the data output string (Code 39, Code 128, Code 93, and EAN 128)	- When the data is output in ASCII format, the MCU/TPC replaces each control character in the protocol frame with the character “@” in order to avoid transmission errors	- Set the “Output Hex-ASCII” menu option to “yes” (The MCU/ TPC then outputs the code contents in Hex format)
	- The format mask refers to characters that are not contained in the code	- Correct or delete the format mask
In “immediate” output mode, the BCL outputs the reading result as a no read at the end of the reading pulse	- The parameterized minimum number of bar codes to be read is greater than the actual number that occurred in the reading pulse	- Check the “Min. number of codes” menu option
	- The evaluation criteria, e.g. bar code type, bar code length, have been defined incorrectly	- Check the individual menu options for the enabled code type(s) (code configuration)
The BCL suppresses the last character of the code in the data output string	- The output of the last character (check digit) may have been disabled	- Check the “Transfer check digit menu option

Table 10-3: Troubleshooting table (continued)

10.4 Error status ST in the reading result of a code

Value	Meaning	Possible cause	Remedy
0	Good read	-	-
1	Check digit error	• The check digit calculated by the BCL during the read operation does not match the value printed in the bar code field	• Check whether the check digit calculated in the bar code field during the printing operation is correct • If the check digit of the bar codes used are sometimes incorrect, deactivate the check digit function
2	No code found that matches the evaluation criteria	• No code present in the reading field of the BCL during the reading pulse • Code type/length not enabled for decoding in the BCL • Reading window covered/dirty • Tracking parameters defined incorrectly	• Synchronize the pulse supply to the BCL with the appearance of the bar code in the reading range • Correct the code configuration parameters • Check the reading window • Check the tracking parameters
3	Device error	• Device defective	Start self-test. If result ≠ 000: inform Leuze electronic Service department
5	Required number of identical multiple reads for the code not reached	• Conveyor speed of object too high • Scanning frequency too low • With ladder-type arrangement of the bar code relative to the conveyor direction: code height (bar length) too small • Print quality too poor	• Check conveyor speed • Adjust scanning frequency • Check code height • Check print quality
7	The source of the reading result is the auxiliary input on the terminal interface	• The code was not read by the MCU/TPC, but entered subsequently via the auxiliary function of the terminal interface and transferred to the host in a separate data string.	-
9	The “Filter for output” function is also active during the code comparison. The MCU/TPC has detected valid codes. However, these do not match the active match code(s)	• The scanned object is not carrying a code that matches the specified match code	-

Table 10.4: Error status ST

Value	Meaning	Possible cause	Remedy
A	The “Check max. number of codes” function is activated. The BCL has detected more codes in the reading pulse than was specified under “Max. number of codes”. Instead of the codes, it outputs the error string repeatedly until the “Max. number of codes” is reached.	• One object in a set of objects with a constant number of codes, for example, contains more codes than is allowed	• This message indicates an error on the object (e.g. check whether they have been sorted correctly or if one of the objects is incorrect)
D	The Code 32 evaluation option is activated for 39. The BCL is attempting to interpret 6-character C39 codes as C32 codes (⇨ output of 9-digit decimal values)	• The read 6-character code is not a C32 code. The BCL outputs the error string instead	-

Table 10.4: Error status ST (continued)

10.5 LEUZE Support department

If you cannot correct the error using the above measures, the device may be defective. The MSP does not contain any components that can be repaired by the user.

Please contact your local Leuze electronic office or subsidary:

- The telephone and fax numbers are listed on the back page of this manual.

➢ Please contact Leuze electronic before submitting the device for repair.

11 Technical data

11.1 MCU/TPC data sheet

Type	MCU	TPC
No. of bar codes per object	max. 10 (with max. 4 scanners)	
No. of objects per reading field	max. 20 (autodiscriminating)	
Bar code types	Code 39, Code 128, Code 93, Codabar, EAN, EAN 128, UPC, 2/5 Interleaved	
Bar code length	max. 50 characters (max. 600 characters across all bar codes per reading interval)	
Print ratio	2:1 ... 3:1	
No. of multiple reads	1 ... 99	
Optical indicators	26 x LED status and function indicators	
Reading pulse	3 switching inputs (“Trigger 1, 2, and 3”) /software triggers	
“Host” data interface	RS 232 or RS 422/485, variable data output format, optional bus connection	
Data transfer rate	300 ... 38 400 bits/ s	
Protocols	Leuze Standard , Leuze multiNet, 3964(R)/ RK 512/ Crisplant S 2000	
Physical configurations	Stand-alone, network (Bus), daisy chain (pass-through or master/slave)	
“Terminal” data interface	RS 232, 9600 baud, 8 data bits, no parity, 1 stop bit, fixed output format	
Functional switching inputs	16 (“Trigger 1..3”, “Travel increment 1..2”, “Sensor 1-1..1-7”, “Sensor 2-1..2-4”) - all inputs are assigned LEDs - optodecoupled, $V_{i\,max}$= +30V, non-interchangeable	
Functional switching outputs	- 4 (“Output 1 ... 4”) PNP, $I_{o\,max}$ = 30 mA, short-circuit proof, variable pulse duration (10 ... 990 ms/ 100 ... 9900 ms), variable result indicator function - 1 (relay output), 24 V DC: max. 1.5 A; 250 V DC: max. 0.2 A; 250 V AC: max. 1.5 A; variable pulse duration (10 ... 990 ms/ 100 ... 9900 ms), variable result indicator function	
Electrical connections	1 x diagnosis (“AUX” terminal, 9-pin D Sub HD connector) 1 x serial (“CAN” terminal, 9-pin D Sub HD socket)	
Operating voltage	230 V AC –15%/ +10% 50 Hz	24 V DC +20%/ –10%
Housing	Sheet steel, lacquered, PC reading window	extruded aluminum section
Enclosure rating	IP 65 (to DIN 40 050)	IP 20
Protection class	Class 3 (to VDE 0106/IEC 1010-1)	
EMC/vibration/shock tested	to IEC 801/ to IEC 68-2-6 Test FC/ to IEC 68-2-27 Test EA	
Weight	approx. 10.3 kg (incl. power pack and automatic circuit-breaker)	approx. 1.3 kg
Operating/storage temperature	0 ... +50 °C/ –25 ... +70 °C	
Max. relative humidity	90%, non-condensing	

Table 11-1: Technical specifications of the MCU/ TPC

11. 2 Dimensioned drawing TPC

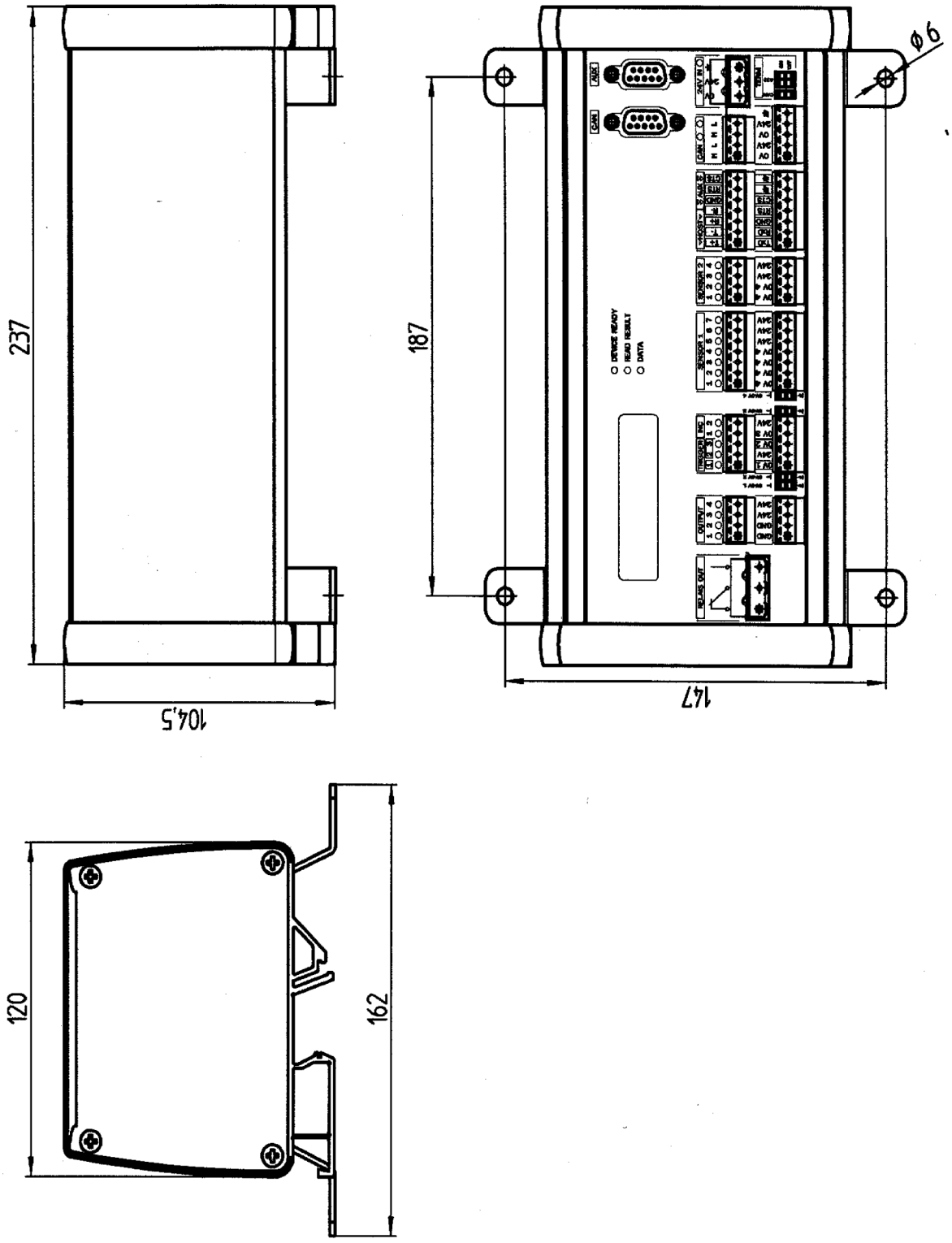

Fig. 11-1: Dimensioned drawing - TPC

11. 3 Dimensioned drawing MCU

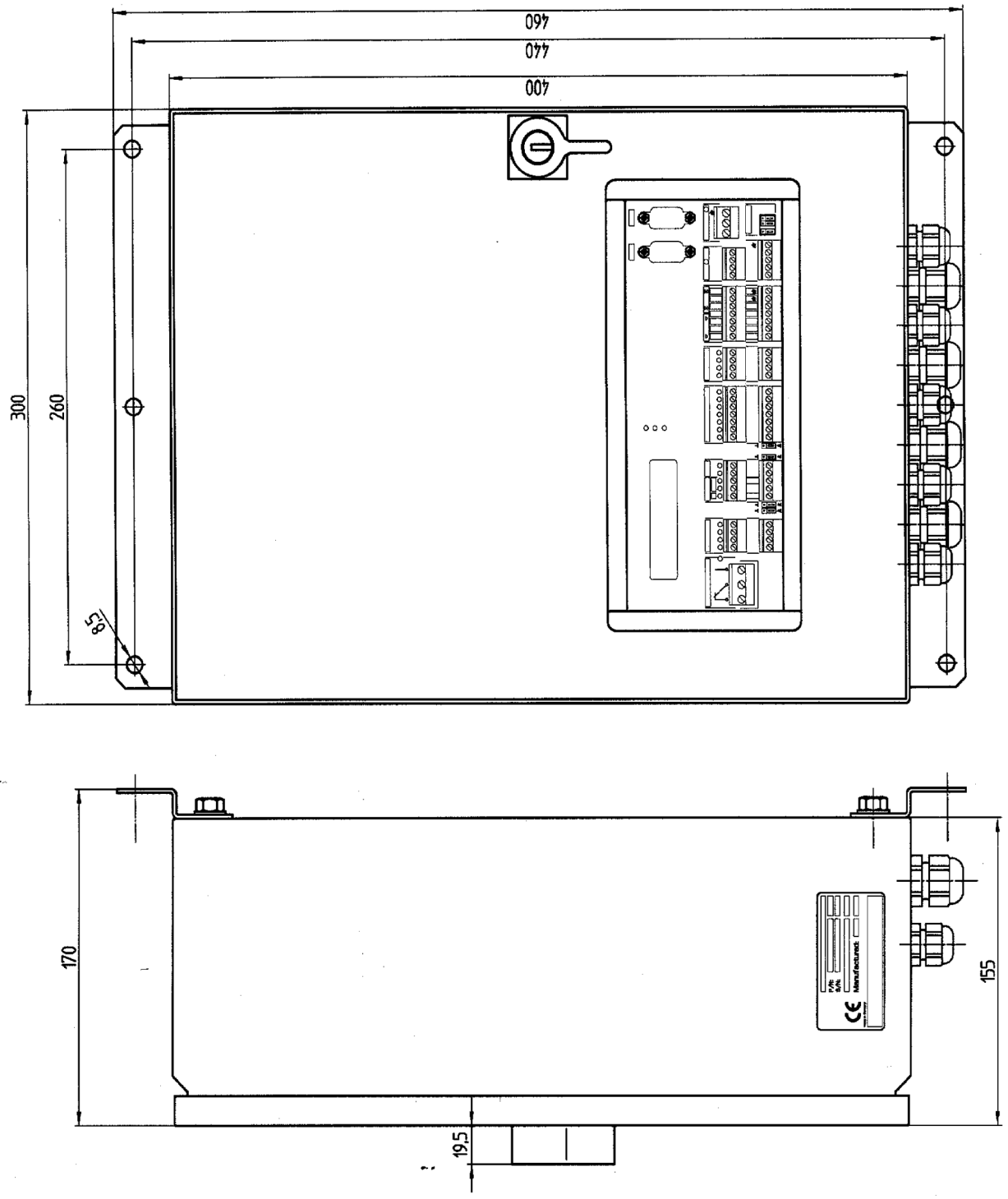

Fig. 11-2: Dimensioned drawing – MCU

12 Appendix

12.1 Fundamental principles of omni directional reading and system technology

12.1.1 Why is it necessary to use Modular Scanner Portal?

In many cases, one bar code scanner is not sufficient to perform the task at hand. This is the case, for example, if the bar code is oriented randomly on one side of the object, or if several bar codes are located on more than one side. For this reason, several bar code scanners are used. The individual reading results are then combined in the MCU/TPC and forwarded to the host as one reading result per object.

12.1.2 What are the basic parameters?

- Path width/ required object width coverage
- Required depth of field (with readings from above: max. height differences per object)
- Code type
- Module width
- Bar length (height)
- Velocity used in the application

12.1.3 Basic principles

- Specified reading ranges apply to skew and pitch angles ≤ ± 15°. Applications involving larger pitch and skew angles should be examined carefully.
- Objects containing a bar code covered by a film can reduce the reading rate of the system. These objects should be examined carefully.
- Code quality, e.g. EN 1635 3 or 4. Closer examination is required if the code quality is poorer.

12.1.4 Configurations

MSP 290

2 line scanner 45° with respect to the conveyor direction

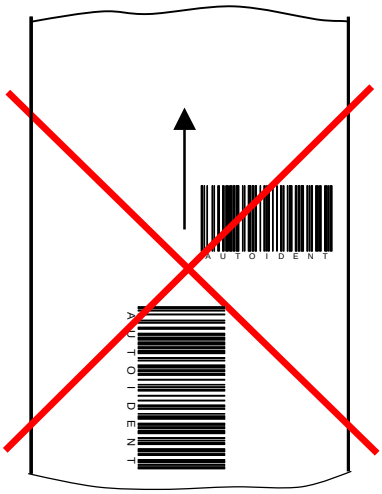

Fig. 12-1: Typical scan line field of an MSP 290

- Scanning rate up to 1200 Hz per scan line
- Coverage for module width 0.35 ... 0.5 mm for reads from above:
  Path width/required object width coverage: 800 mm
  Object height, max. object height differences: 800 mm
- Required minimum bar length (bar code height) for 2 typical code types:

Velocity	Bar length for Code 128	Bar length for Interleaved 2/5 (PR 2:1 ... 3:1)
≤ 1 m/s	≥ 18 mm	≥ 17 ... 20 mm
≤ 2 m/s	≥ 20 mm	≥ 22 ... 25 mm

MSP 490

4 Line scanners 45° with respect to conveyor direction

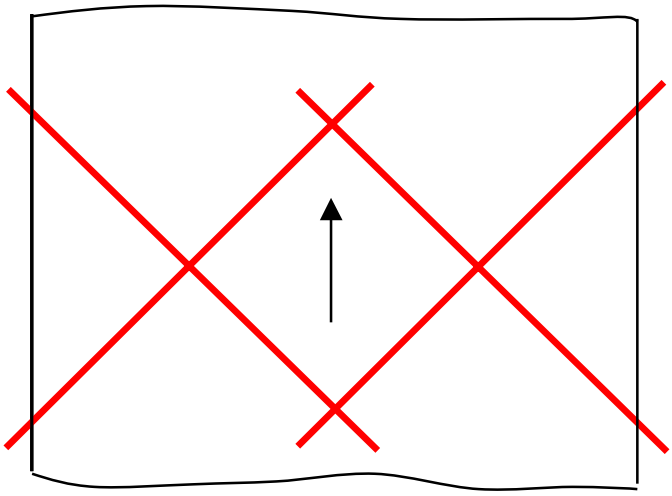

Fig. 12-2: Typical scan line field of an MSP 490

- Scanning rate up to 1200 Hz per scan line
- Coverage for module width 0.35 ... 0.5 mm for reads from above:
  Path width/required object width coverage: typically 1500 mm
  Object height, max. object height differences: 800 mm
- Maximum required bar length (bar code height) for 2 typical code types:

Velocity	Bar length for Code 128	Bar length for Interleaved 2/5 (PR 2:1 ... 3:1)
≤ 1 m/s	≥ 18 mm	≥ 17 ... 20 mm
≤ 2 m/s	≥ 20 mm	≥ 22 ... 25 mm

MSP 360

2 Line scanners 30° with respect to the conveyor direction
1 Line scanners 90° with respect to the conveyor direction

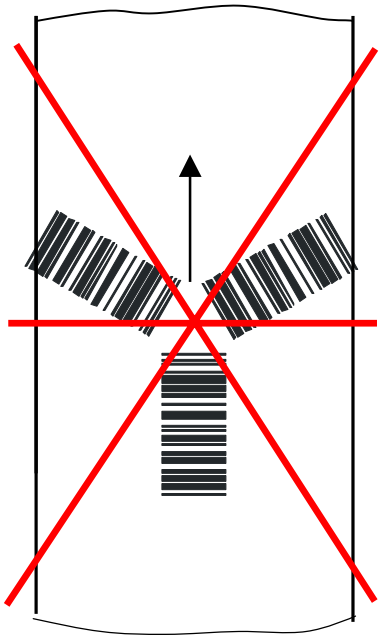

Fig. 12-3: Typical scan line field of an MSP 360

- Scanning rate up to 1200 Hz per scan line
- Coverage for module width 0.35 ... 0.5 mm for reads from above:
  Path width/required object width coverage: 600 mm
  Object height, max. object height differences: 800 mm
- Minimum required bar length (bar code height) for 2 typical code types:

Velocity	Bar length for Code 128	Bar length for Interleaved 2/5 (PR 2:1 ... 3:1)
≤ 1 m/s	≥ 12 mm	≥ 13 ... 15 mm
≤ 2 m/s	≥ 17 mm	≥ 19 ... 21 mm

MSP 560

4 Line scanners 30° with respect to the conveyor direction
1 Line scanners 90° with respect to the conveyor direction

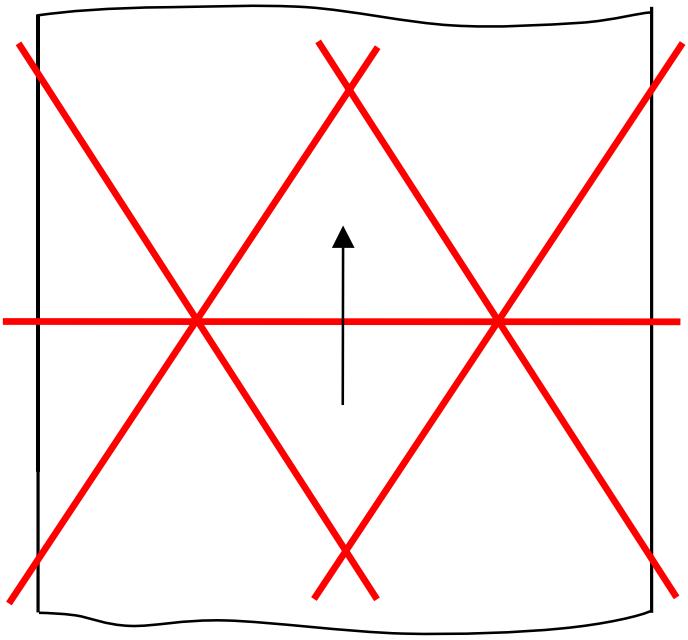

Fig. 12-4: Typical scan line field of an MSP 560

- Scanning rate up to 1200 Hz per scan line
- Coverage for module width 0,35 ... 0,5 mm for reads from above:
  Path width/required object width coverage: typically 1100 mm
  Object height, max. object height differences: 800 mm
- Minimum required bar length (bar code height) for 2 typical code types:

Velocity	**Bar length for Code 128**	**Bar length for Interleaved 2/5 (PR 2:1 ... 3:1)**
≤ 1 m/s	≥ 12 mm	≥ 13 ... 15 mm
≤ 2 m/s	≥ 17 mm	≥ 19 ... 21 mm

The typical MSP systems for standard applications are shown here. A set of precise criteria for determining the optimum solution, from both a technical and economical perspective, for your application will be drawn up by the trained product specialists at Leuze electronic using the necessary resources.

12.2 Accessories

12.2.1 Mounting accessories

No.	Article
500 35 514	Quick-change clamping device, with securing material
500 35 515	Angle bracket, simple, with two bolts M 6 x 10, self-locking
500 35 516	Articulated bracket, with two bolts M 6 x 10, self-locking

Table 12-1: Mounting accessories

12.2.2 Cables, connector covers, and terminating resistor

No.	Length	Article
500 35 521	5 m	Supply cable (1x open end/ 1x CAN bus socket)
500 35 522	10 m	Supply cable (1x open end/ 1x CAN bus socket)
500 35 528	0.7 m	Cable (1x CAN bus connector/ 1x CAN bus socket)
500 35 529	3 m	Cable (1x CAN bus connector/ 1x CAN bus socket)
500 35 530	5 m	Cable (1x CAN bus connector/ 1x CAN bus socket)
500 35 523	10 m	Return cable (1x CAN bus connector/ 1x open end)
500 35 525	-	Connector cover with EEPROM parameter memory
500 35 524	-	Terminating resistor
500 32 842	3 m	RS 232 data cable for connecting the PC to the terminal interface on the TPC (2 x Sub D socket, 9-pin)

Table 12-2: Cables, connector covers, and terminating resistor

Temperature range of cables: stationary: –40°C ... +70°C
moving: –20°C ... +70°C

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