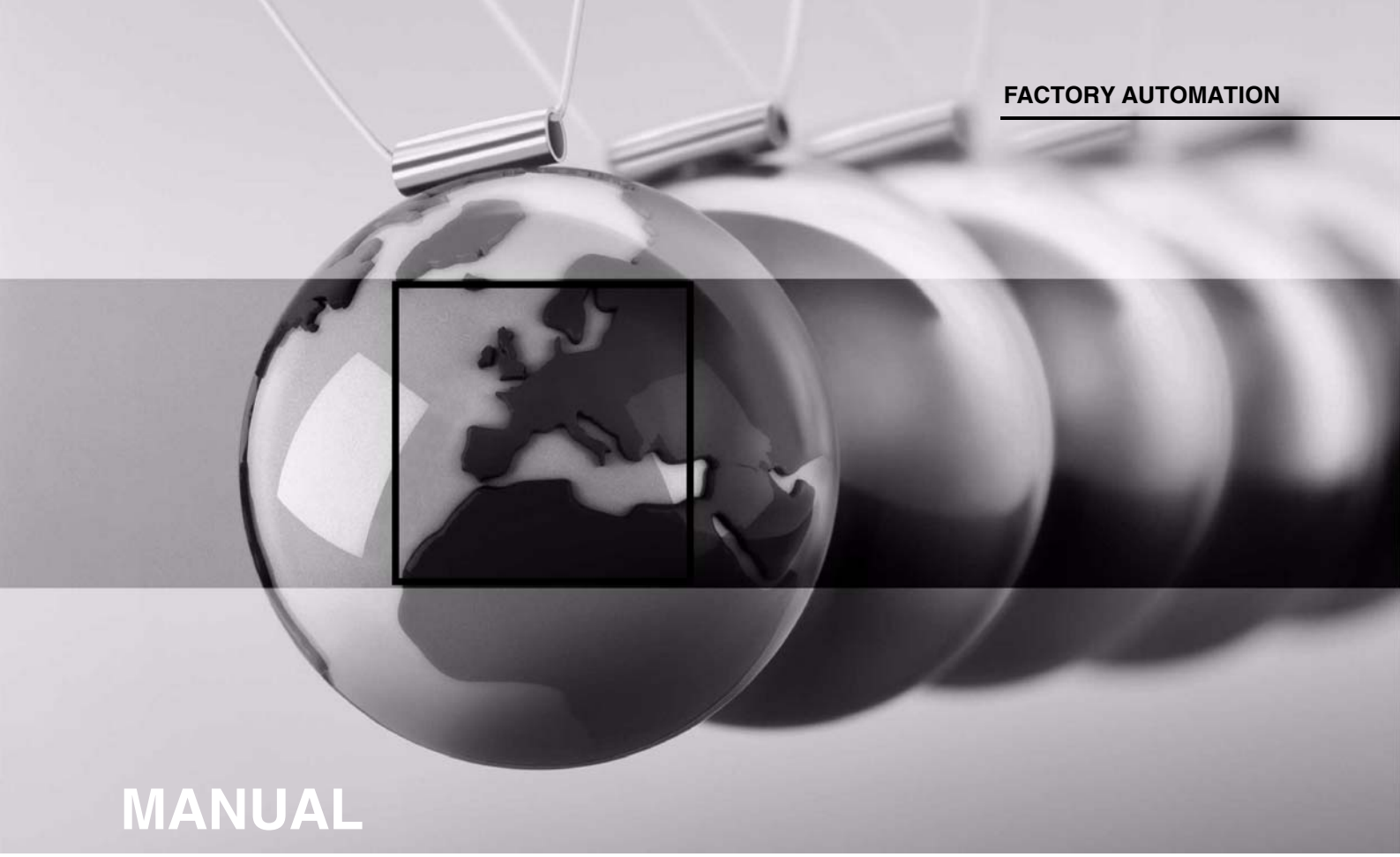

MANUAL

PXV...-F200-R4-V19

Data Matrix Positioning System

PEPPERL+FUCHS
SENSING YOUR NEEDS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

Note!

Visit www.pepperl-fuchs.com to access further documentation for full information about the product.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:

Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.

Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols

Note!

This symbol brings important information to your attention.

Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

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2 Product Description

2.1 Use and Application

The **Data Matrix Positioning System** is the positioning system in the Pepperl+Fuchs incident light process. The heart of the system is the reader, which has features including a camera module with an integrated illumination unit. This enables the reader to detect position markers printed onto a self-adhesive code tape in the form of 2-D **Data Matrix codes**.

The **code tape** is mounted on a fixed part of the plant (e.g., the wall of an elevator shaft or the rail on a monorail conveyor). The reader is mounted on a moving "vehicle" positioned in parallel with the code tape (e.g., on the elevator cab or on the chassis of a monorail conveyor).

Maximum Length of the Code Tape

Resolution of the Reader [mm]	Maximum length of the Code Tape [km]
10	10
1	10
0.1	1.5

The code tape length of up to 10 km is sufficient for even very large applications. It also offers sufficient reserves for extensions or systems with several branches and parallel conveyor routes.

The extensive yet user-friendly parameterization options as well as the freely configurable inputs and outputs mean that the reader can easily be adapted to suit each application.

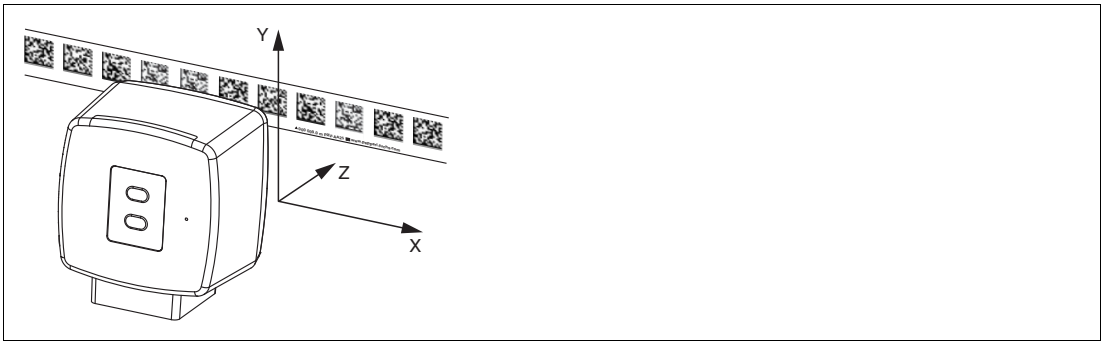


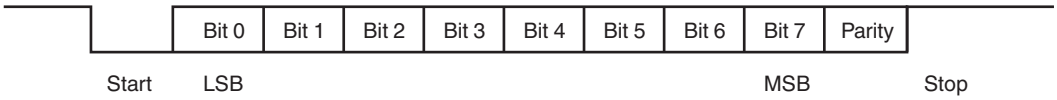
Figure 2.1 Schematic diagram of the alignment of the code tape and reader

2.2 The RS-485 Interface

The read head is equipped with an RS-485 interface for communication purposes, i.e., parameterizing the read head functions or reading out current process data during operation. This interface is operated in 8-E-1 mode and fitted with a terminator that can be activated or deactivated by parameterizing the sensor head accordingly. The RS-485 interface supports the following transfer rates:

- 38400 bit/s
- 57600 bit/s
- 76800 bit/s
- **115200 bit/s**(preset value)
- 230400 bit/s

Data structure of the RS-485 interface

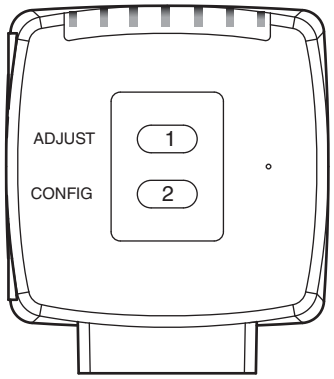


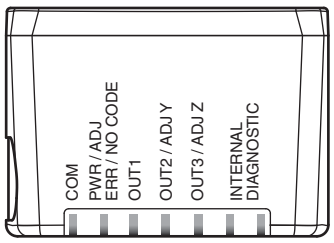
2.3 LED Indicators and Operating Elements

The reader has seven indicator LEDs for visual function checks and rapid diagnosis.

Activate the alignment aid and parameterization mode using the two control buttons on the back of the device.

Button 1 is labeled "ADJUST." Button 2 is labeled "CONFIG."





LED		[#1] COM	[#2] PWR/ADJ ERR/NO CODE	[#3] OUT 1	[#4] OUT 2/ADJ Y	[#5] OUT 3/ADJ Z	[#6] Internal diagnostics		
	Color	Yellow	(Green /red)	(Yellow)	(Yellow)	(Yellow)	(Yellow)	(Yellow)	Description
Status		Off	Flashes green	Off	Off	Off	Off	Off	Alignment Y > setpoint value f_{flash} = 2 Hz
		Off	Flashes green	Off	On	Off	Off	Off	Alignment Y < setpoint value f_{flash} = 2 Hz
		Off	Flashes green	Off	Flashes	Off	Off	Off	Alignment Y = setpoint value f_{flash} = 2 Hz
		Off	Flashes green	Off	Off	Off	Off	Off	Alignment Z > setpoint value f_{flash} = 2 Hz
		Off	Flashes green	Off	Off	On	Off	Off	Alignment Z < setpoint value f_{flash} = 2 Hz
		Off	Flashes green	Off	Off	Flashes	Off	Off	Alignment Z = setpoint value f_{flash} = 2 Hz
		Off	Flashes red	Off	Off	Off	Off	Off	Alignment Code tape outside read range f_{flash} = 2 Hz
		Off	Lights up red	Off	Off	Off	Off	Off	System error
		Off	Lights up green	x	x	x	Off	Off	Normal operation, no communication LEDs marked with x indicate the status of the relevant output.
		Flashes	Lights up green	x	x	x	Off	Off	Normal operation, communication active f_{flash} = 2 Hz LEDs marked with x indicate the status of the relevant output.
		Flashes	Flashes red	x	x	x	Off	Off	No code tape within read range, communication active f_{flash} = 2 Hz LEDs marked with x indicate the status of the relevant output.
		Flashes	Flashes red	Flashes	Flashes	Flashes	Off	Off	Normal operation. Indication for 2 secs if a button is pressed when the time lock is enabled.
		Off	Off	Flashes	Off	Off	Off	Off	Preconfiguration/configuration mode active f_{flash} = 2 Hz
		Off	Lights up red	Flashes	Off	Off	Off	Off	Code card faulty f_{flash} = 2 Hz for 3 sec

LED	[#1] COM	[#2] PWR/ADJ ERR/NO CODE	[#3] OUT 1	[#4] OUT 2/ADJ Y	[#5] OUT 3/ADJ Z	[#6] Internal diagnostics		
Color	Yellow	(Green /red)	(Yellow)	(Yellow)	(Yellow)	(Yellow)	(Yellow)	Description
	Off	Green, 1 sec	Flashes	Off	Off	Off	Off	Code card detected f_{flash} = 2 Hz for 3 sec
	x	Off	x	x	x	Off	Off	Time lock for buttons disabled
	x	x	x	x	x	Lights up	Lights up	Internal error Return to Pepperl+Fuchs

x = LED status has no meaning

2.4 Accessories

Compatible accessories offer enormous potential for cost savings. Such accessories not only save you a great deal of time and effort when commissioning for the first time, but also when replacing and servicing our products.

If products are used in harsh ambient conditions, appropriate Pepperl+Fuchs accessories can be used to extend the service life of these products.

Order Designation	Description
V19-G-ABG-PG9	M12 single-ended female cordset, 8-pin, shielded, field-attachable
V19-G-ABG-PG9-FE	Grounding terminal and plug (set)
PCV-SC12	Grounding clip
PCV-USB-RS485-Converter Set	USB/RS-485 interface converter
PCV-KBL-V19-STR-RS485	Cable unit with 24 V power supply and V19 connection cable to RS–485 interface
PCV-AG100	Alignment guide
PCV-MB1	Mounting bracket
Vision Configurator	Configuration software

More information on accessories can be found in the datasheet for the reader at www.pepperl-fuchs.com.

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3 Installation

3.1 Affixing the Code Tape

The code tape is made of silicone-free polyester film. A position marker appears every 100 mm along the lower edge of the code tape (see "Code Tape Dimensions"). These position markers are used to affix the code tape in the correct position.
The back of the code tape is covered with a modified acrylate-based adhesive designed for permanent adhesion. Affix the self-adhesive code tape along the desired traverse distance. To do so, proceed as follows:

Affixing the Code Tape

1. Clean the surface of any greasy or oily deposits and dust.
2. Ensure that the surface is dry, clean, and stable.
3. Pull away a few centimeters of the protective film at the beginning of the code tape. Place the code tape at the precise point of the required starting position on the surface, and press to attach.
4. Then affix the code tape along the desired traverse distance. Remove the protective film gradually so that the code tape does not accidentally adhere to the surface in the incorrect position. When affixing, ensure that the code tape does not crease or trap air bubbles.

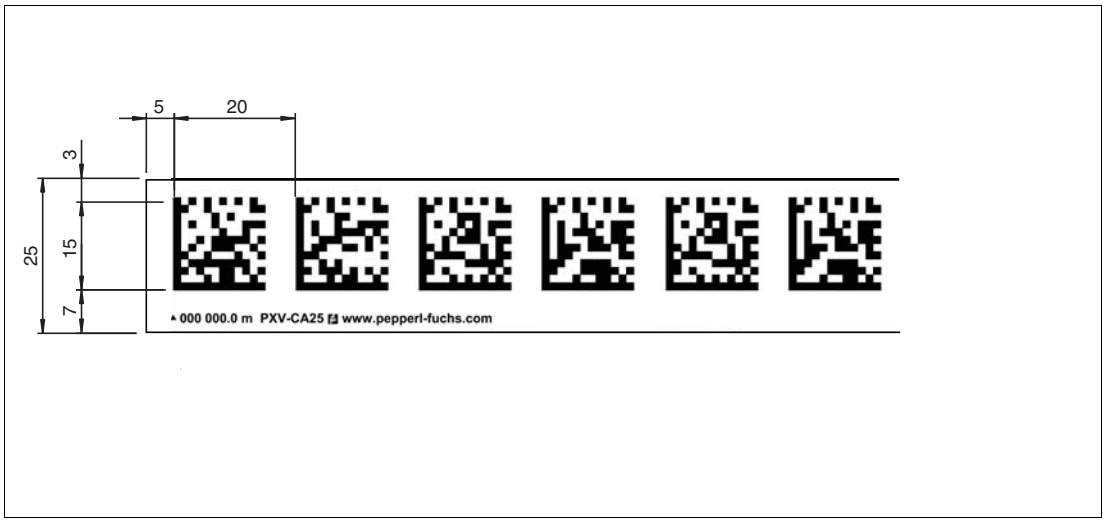
   ↳ The adhesive on the code tape hardens after 72 hours.

Note!

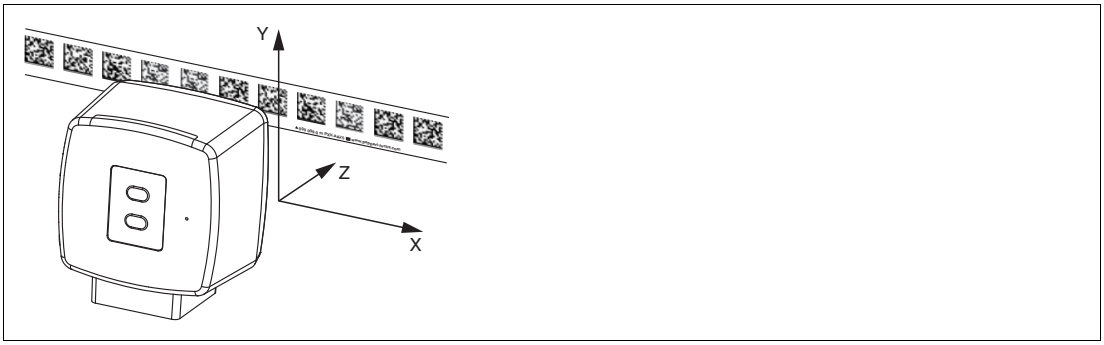
Thermal Expansion of the Code Tape

The heat expansion coefficient of the adhered code tape corresponds to the heat expansion coefficient of the underside.

Dimensions of the Code Tape



Alignment of the Code Tape and Reader



Position the code tape so that the **PEPPERL+FUCHS** logo and position markers are below the data matrix code. The position values then increase along the X direction. The diagram shows the orientation of a reader in the default setting of 0°. The reader can be configured in the interface for other installation situations.

Code Tapes with a Starting Position of 0 m

Order Designation	Description
PXV00001-CA25-*	Code tape, 1-track, length: 1 m
...	...
PXV100000-CA25-*	Code tape, 1-track, length: 100,000 m

Note!

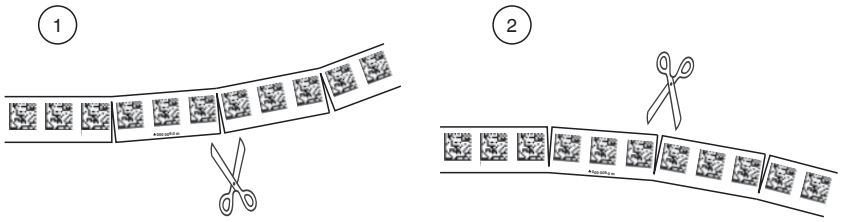
Expansion Joints and Code Tapes

If the system covers longer distances, expansion joints are integrated in the system structure. We recommend creating breaks along the code tape. The resulting gap must not exceed 75 mm.

Note!

Inclines and Declines

If you affix the code tape on inclines or declines, cut the code tape several times at the transition point to the horizontal as shown.



1. Incline
2. Decline

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Hysteresis Y-Axis

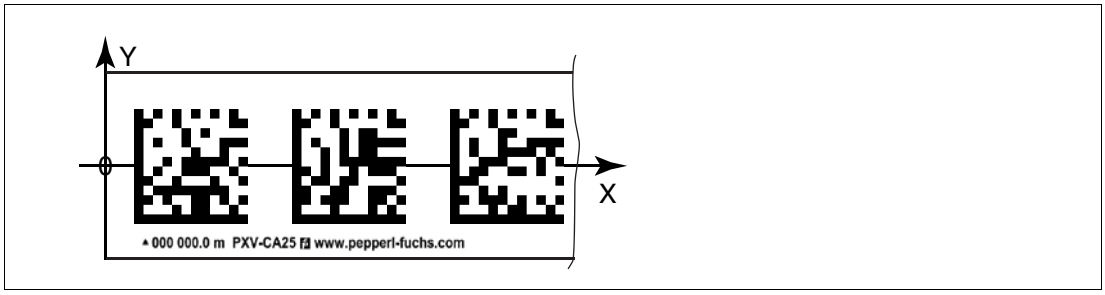


Figure 3.1 Zero line for code tapes

If the reader leaves the zero line when traversing along the X-axis, the threshold may deviate. If the deviation exceeds the defined threshold, a warning code is issued.

Y-Axis Deviation Thresholds

Code Tape		Threshold	
Number of Tracks	Width	Exit	Entry
1	15 mm	± 29 mm	± 25 mm

3.2 Mounting of the Reader

Mounting the Reader

Make sure that you are able to mount the reader in a stable position. Before mounting the reader, make sure that the travel of the moving system part is arranged so that this part does not move outside of the reader's depth of focus range during operation.

1. Mount the reader on the moving part of the system and secure the reader in place using four screws through the mounting adapter on the reader.
2. Mount the reader **vertically** so that the lens of the reader with the ring light and camera module is aligned toward the code tape.

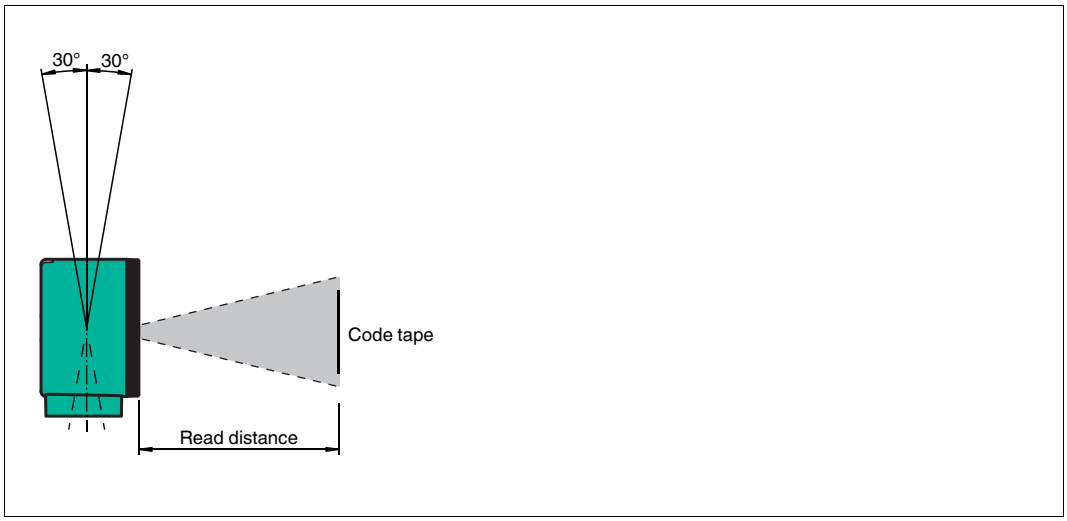


Figure 3.2 Vertical alignment tolerance

3. Alternatively, mount the reader **horizontally** so that the lens of the reader with the ring light and camera module is aligned toward the code tape.

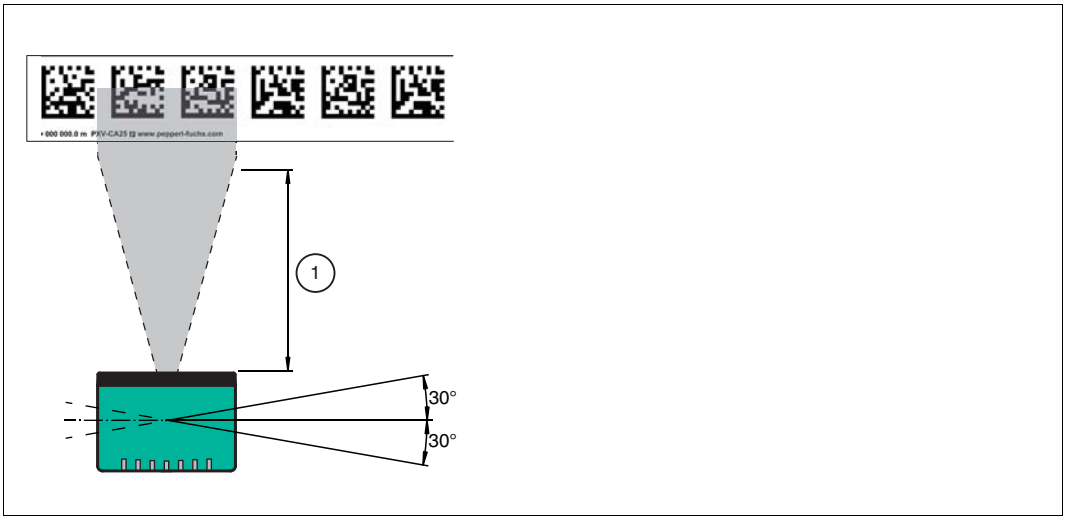


Figure 3.3 Horizontal alignment tolerance

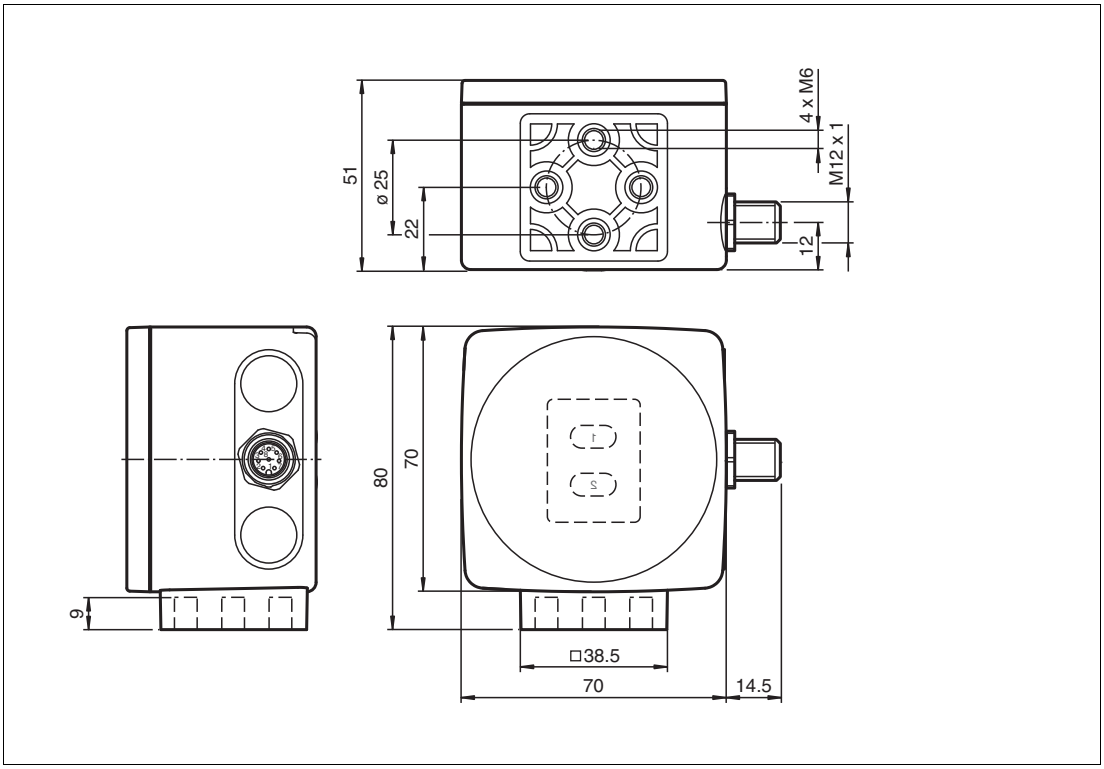
1 Read Distance

4. Check that the distance between the reader and the code tape is equal to the read distance of the reader:

Optimal Read Distance (Z-Axis)

Order Designation	Read Distance [mm]	Depth of Focus [mm]
PXV100*	100	± 50

Dimensions of the Reader



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Caution!

When selecting the length of the mounting screws, ensure that the maximum insertion depth of the screws in the threaded inserts on the reader is 8 mm.

Using longer screws may damage the reader.

Caution!

The maximum torque of the mounting screws must not exceed 9 Nm.

Tightening the screws to a higher torque may damage the reader.

3.3 Electrical Connection

The reader is connected electrically via an 8-pin M12 x 1 connector plug on the side of the housing. The power supply and communication with peripheral devices are established via this connection. The configurable inputs and outputs on the reader are also located at this connection.

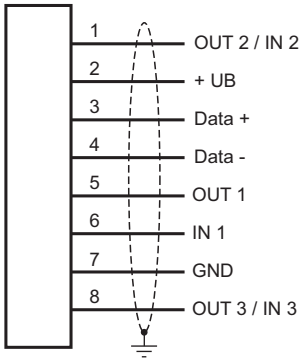

Figure 3.4 Electrical connection

Connections 1 and 8 can be configured as inputs or outputs.

Connector Assignment

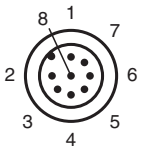

Figure 3.5 Connector assignment

Color Assignment

Pepperl+Fuchs single-ended female cordsets are manufactured in accordance with EN60947-5-2. When using a type V19-... single-ended female cordset with an open cable end () the following color assignment applies:

Connection Pin	Strand Color	Color Abbreviation
1	White	WH
2	Brown	BN
3	Green	GN
4	Yellow	YE
5	Gray	GY
6	Pink	PK
7	Blue	BU
8	Red	RD

Shielding Cables

The shielding of connection lines is required to suppress electromagnetic interference. Establishing a low resistance or low impedance connection with the protective conductor or equipotential bonding circuit is a particularly important factor in ensuring that these interference currents do not become a source of interference themselves. Only use connection lines with braid. Avoid connection lines with foil shield because this would increase the line capacities. The shielding is integrated at both ends, i.e., in the switch cabinet, on the control panel, **and** on the reader. The grounding terminal available as an accessory allows easy integration in the equipotential bonding circuit.

In exceptional cases, the shielding of a connection at one end may be more favorable if:

- An equipotential bonding cable is not laid or cannot be laid.
- A film shield is used.

The following points relating to shielding must also be noted:

- Use metal cable clips that cover large areas of the shield.
- After installing the cable shield in the control cabinet, place it directly on the equipotential bonding rail.
- Direct the protective grounding connections to a common point in a star configuration.
- The cross-section of the cables used for grounding should be as large as possible.

Additional Ground Connection

Order Designation	Description
PCV-SC12	Clip for mounting an additional ground connection.

Caution!

Damage to the device

Connecting an alternating current or excessive supply voltage can damage the device or cause the device to malfunction.

Electrical connections with reversed polarity can damage the device or cause the device to malfunction.

Connect the device to direct current (DC). Ensure that the supply voltage rating is within the specified device range. Ensure that the connecting wires on the female cordset are connected correctly.

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4 Commissioning

4.1 Aligning the Reader

The reader provides an integrated alignment aid to enable simple optimal alignment of the reader relative to the code tape in the Y-coordinate and the Z-coordinate.

Note!

The alignment aid may only be activated within 10 minutes of switching on the reader.

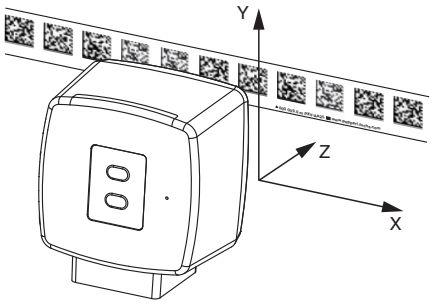
You can also switch the reader from normal operation to parameterization mode, if necessary. Press button 1 on the rear of the reader and hold for at least 2 seconds.

Activating the Alignment Aid

1. Press button 1 for longer than 2 seconds.

   ↳ If the reader has recognized the code tape, LED2 flashes green. If the reader has not recognized the code tape, LED2 flashes red. .

2. Align the reader in the Z and Y coordinates. The LEDs on the reader will support you.



Z coordinate: If the distance between the camera and the code tape is too small, the yellow LED5 lights up. If the distance between the camera and the code tape is too large, the yellow LED5 goes out. Within the target range, the yellow LED5 and the green LED2 flash synchronously.
Set the distance between the reader and the code tape so that the yellow LED5 and the green LED2 flash synchronously.

Y coordinate: If the optical axis of the reader is too low relative to the middle of the code tape, the yellow LED4 lights up.
If the optical axis is too high, the yellow LED4 goes out. Within the target range, the yellow LED4 and the green LED2 flash synchronously.
Set the optimal height of the reader relative to the code tape so that the yellow LED4 and the green LED2 flash synchronously.
Briefly press button 1 to close the alignment aid. The reader now switches to normal operation.

4.2 Parameter assignment

The reading head can be adapted to specific requirements through parameterization. The reading head can be parameterized via the interface itself (internal parameterization) or via an optical parameterization code (external parameterization).

4.2.1 Internal Parameterization Using Parameterization Software

Internal parameterization of the reader via the USB interface must be started within 10 minutes of the reader being switched on. A time lock disables the reader once this time has elapsed. The time lock remains inactive during the parameterization process. The time lock disables the reader only if no parameterization activities take place for more than 10 minutes.

The **Vision Configurator** software is available for comprehensive, optimal configuration of the reader. This configuration software is available as a free download from www.pepperl-fuchs.com. Follow the instructions that appear on your screen during the installation.

If your PC does not have a built-in RS-485 interface, you will need a USB/RS-485 interface converter (see chapter 2.4).

Parameterizing the Reader

1. Connect the reader to your PC via the interface converter. Information on how to do this can be found in the manual for the interface converter.
2. Connect the reader to a suitable power supply.
3. Switch on the power supply.
4. Start the "Vision Configurator" software.

Note!

Additional steps for customizing the installation are described in the **Vision Configurator** manual. The Vision Configurator manual can be found online at www.pepperl-fuchs.com.

5. Configure the reader using the "Vision Configurator" software.
6. Transfer the parameter list to the reader.
7. Save the parameterization.
8. Switch off the power supply on the reader.
9. Disconnect the reader from the interface converter and from the power supply.

   ↳ The reader is parameterized according to your specifications and can be used in your application.

4.2.2 External Parameterization Using Code Cards

During external parameterization, the reader scans special code cards optically and configures the relevant parameters. Simply hold the corresponding code cards at the correct distance in front of the lens on the reader. The standard code cards are in the appendix.

The following parameters can be configured using code cards:

- Reader resolution [0.1 mm, 1 mm, 10 mm]
- Reader orientation [0°; 180°; 0° or 180°, 0°, 90°, 180° or 270°]
- Trigger source [auto, hardware]
- Function of input 1 [none, trigger input]
- Function of output 1 [none, speed exceeded, warning, fault, contamination, event, no position]
- Function of output 2 [none, speed exceeded, warning, fault, contamination, event, no position]
- Function of output 3 [none, speed exceeded, warning, fault, contamination, event, no position]

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Activating Programming Mode

Note!

External parameterization of the reader using code cards must be started within 10 minutes of the reader switching on. A time lock disables the reader once this time has elapsed. The time lock remains inactive during the parameterization process. The time lock disables the reader only if no parameterization activities take place for more than 10 minutes.

If a button is pressed when the time lock is enabled, all LEDs flash and remain lit for 2 seconds during each flashing cycle.

The changeover from normal operation to parameterization mode is made by pressing button 2 on the back of the reader.

Activating Parameterization Mode

1. Press button 2 for longer than 2 seconds.

   ↳ Yellow LED3 now flashes.

2. Hold the "ENABLE" code in front of the camera system on the reader to trigger final activation

   ↳ If the "ENABLE" activation code is detected, the green LED2 lights up for 1 second. If the activation code is not detected, LED2 lights up red for 2 seconds.

Completing Parameterization

Place the parameterization code in the field of vision of the camera module.

↳ After the parameterization code is detected, the green LED2 lights up for 1 second. In the event of an invalid parameterization code, LED2 lights up red for 2 seconds.

Exiting Parameterization Mode

Hold the "STORE" code in front of the camera system on the reader to save the configuration

↳ If the "STORE" memory code is detected, the green LED2 lights up for 1 second. The parameterization is stored in the nonvolatile memory of the reader and parameterization mode is terminated. Parameterization of the reader is now complete. If the memory code is not detected, LED2 lights up red for 2 seconds.

Note!

Press button 2 briefly to exit parameterization mode. Any parameter changes that are made but have not yet been saved are discarded. The reader then operates with the last valid parameters that were saved.

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The code cards "CANCEL", "USE", and "DEFAULT"

Holding one of these cards in front of the reading head exits parameterization mode with the following consequences:

- **CANCEL:**

  All parameter changes that are made but have not yet been saved are discarded. The reading head operates with the last valid parameters that were saved.

- **USE:**

  For test purposes, the reading head operates with the parameters that have just been modified. The parameterization is not saved, however. After being switched off and on again, the reading head operates with the last valid parameters that were saved.

- **DEFAULT:**

  All parameters in the reading head are overwritten with the original default settings. Re-enter the configuration mode and save the default settings nonvolatile with the code card STORE.

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5 Operation and communication

5.1 Communication via the RS-485 Interface

The controller and read head communicate via the RS-485 interface during operation. Make sure that the basic communication settings have been made on the read head, such as setting the read head address and baud rate.

A distinction is made between request telegrams that the controller sends to the read head and response telegrams that the read head sends to the controller. Each byte of a request or response telegram consists of 9 bits (8 data bits + 1 parity bit).

5.1.1 Request telegram

A request telegram always consists of 2 bytes. The second byte corresponds to the first byte, however the 8 data bits of the first byte are inverted.

Structure of a request telegram

		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	R/W	Req. bit 4	Req. bit 3	Req. bit 2	Req. bit 1	Req. bit 0	A1	A0
Byte 2	Parity	~R/W	~Req. bit 4	~Req. bit 3	~Req. bit 2	~Req. bit 1	~Req. bit 0	~A1	~A0

Meaning of bits:

R/W: 0 = response, 1 = request

Meaning of bits

PAR	R/W	Req. bit 4	Req. bit 3	Req. bit 2	Req. bit 1	Req. bit 0	A1	A0	Function
Parity	1	x	x	x	x	x	0	0	Reading head address 0
Parity	1	x	x	x	x	x	0	1	Reading head address 1
Parity	1	x	x	x	x	x	1	0	Reading head address 2
Parity	1	x	x	x	x	x	1	1	Reading head address 3
Parity	1	0	0	0	0	1	x	x	X coordinate
Parity	1	0	0	0	1	0	x	x	X coordinate + speed output
Parity	1	0	0	1	0	0	x	x	X+Y coordinate
Parity	1	0	1	0	0	0	x	x	X+Y coordinate + speed output
Parity	1	1	0	1	0	1	x	x	Final event
Parity	1	1	0	0	0	0	x	x	WRN data set

5.1.2 Response Telegram

The response telegram may contain 6 to 9 bytes depending on the content. The first byte contains the address of the responding read head and status information. The X position of the read head is transferred in bytes 2 to 5, starting with the MSB. Depending on the controller request, information such as speed and the Y position is transferred in the subsequent bytes. These bytes are omitted if a corresponding request is not sent. The last byte is used to detect faults during the data transfer.

Response Telegram from the Read Head, X Position and/or Event

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	-	A1	A0	EV	WRN	NP	ERR
Byte 2	Parity	0	-	-	-	-	XP23	XP22	XP21
Byte 3	Parity	0	XP20	XP19	XP18	XP17	XP16	XP15	XP14
Byte 4	Parity	0	XP13	XP12	XP11	XP10	XP09	XP08	XP07
Byte 5	Parity	0	XP06	XP05	XP04	XP03	XP02	XP01	XP00
Byte 6	Parity	XOR byte 1_7 — byte 5_7	XOR byte 1_6 — byte 5_6	XOR byte 1_5 — byte 5_5	XOR byte 1_4 — byte 5_4	XOR byte 1_3 — byte 5_3	XOR byte 1_2 — byte 5_2	XOR byte 1_1 — byte 5_1	XOR byte 1_0 — byte 5_0

Note!

Event Query

For an event query (last event) see chapter 5.1.1, the event number is coded in bits XP00 ... XP23. Any event flags set are reset. For an event query where no event flags have been set, the number of the last event is transferred. If no events have occurred since the read head was switched on, XP00 ... XP23 = 0 is output.

Response Telegram from the Read Head X Position and Velocity Output

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	-	A1	A0	EV	WRN	NP	ERR
Byte 2	Parity	0	-	-	-	-	XP23	XP22	XP21
Byte 3	Parity	0	XP20	XP19	XP18	XP17	XP16	XP15	XP14
Byte 4	Parity	0	XP13	XP12	XP11	XP10	XP09	XP08	XP07
Byte 5	Parity	0	XP06	XP05	XP04	XP03	XP02	XP01	XP00
Byte 6	Parity	0	SP6	SP5	SP4	SP3	SP2	SP1	SP0
Byte 7	Parity	XOR byte 1_7 — byte 6_7	XOR byte 1_6 — byte 6_6	XOR byte 1_5 — byte 6_5	XOR byte 1_4 — byte 6_4	XOR byte 1_3 — byte 6_3	XOR byte 1_2 — byte 6_2	XOR byte 1_1 — byte 6_1	XOR byte 1_0 — byte 6_0

Response Telegram from the Read Head, X Position and Y Position

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	-	A1	A0	EV	WRN	NP	ERR
Byte 2	Parity	0	-	-	-	-	XP23	XP22	XP21
Byte 3	Parity	0	XP20	XP19	XP18	XP17	XP16	XP15	XP14
Byte 4	Parity	0	XP13	XP12	XP11	XP10	XP09	XP08	XP07
Byte 5	Parity	0	XP06	XP05	XP04	XP03	XP02	XP01	XP00
Byte 6	Parity	0	Y±	YP12	YP11	YP10	YP09	YP08	YP07
Byte 7	Parity	0	YP06	YP05	YP04	YP03	YP02	YP01	YP00
Byte 8	Parity	XOR byte 1_7 — byte 7_7	XOR byte 1_6 — byte 7_6	XOR byte 1_5 — byte 7_5	XOR byte 1_4 — byte 7_4	XOR byte 1_3 — byte 7_3	XOR byte 1_2 — byte 7_2	XOR byte 1_1 — byte 7_1	XOR byte 1_0 — byte 7_0

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Response Telegram from the Read Head, X Position, Velocity Output, and Y Position

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	-	A1	A0	EV	WRN	NP	ERR
Byte 2	Parity	0	-	-	-	-	XP23	XP22	XP21
Byte 3	Parity	0	XP20	XP19	XP18	XP17	XP16	XP15	XP14
Byte 4	Parity	0	XP13	XP12	XP11	XP10	XP09	XP08	XP07
Byte 5	Parity	0	XP06	XP05	XP04	XP03	XP02	XP01	XP00
Byte 6	Parity	0	SP6	SP5	SP4	SP3	SP2	SP1	SP0
Byte 7	Parity	0	Y±	YP12	YP11	YP10	YP09	YP08	YP07
Byte 8	Parity	0	YP06	YP05	YP04	YP03	YP02	YP01	YP00
Byte 9	Parity	XOR byte 1_7 — byte 8_7	XOR byte 1_6 — byte 8_6	XOR byte 1_5 — byte 8_5	XOR byte 1_4 — byte 8_4	XOR byte 1_3 — byte 8_3	XOR byte 1_2 — byte 8_2	XOR byte 1_1 — byte 8_1	XOR byte 1_0 — byte 8_0

Meaning of Bits

- **Position output XP00–XP23:**
  MSB first
  At a resolution of 1 mm/10 mm: L_{max} = 10.00 km = 10,000,000 mm (XP = 989680[hex])
  At a resolution of 0.1 mm: L_{max} = 1.5 km (XP = E4E1C0[hex])
- **Velocity output SP0–SP6:**
  Resolution: 0.1 m/s, binary coded
  Speed of 0 ... 12.5 m/s
  Example: speed = 4.7 m/s --> velocity output = 47
  126 at speeds over 12.5 m/s
  127 at unknown speeds
- **Y position YP0–YP12; Y±:**
  At a resolution of 1 mm/10 mm: Y_{max} = ±8191 mm (YP = 1FFF; YP = 3FFF)
  At a resolution of 0.1 mm: L_{max} = ±819.1 mm
  Y± = sign bit (1 = "-")

Meaning of Status Bits in Byte 1

EV	NP	ERR	WRN	Function
x	x	x	1	Warnings present (must be requested!). Once the warning has disappeared, the warning flag is immediately reset. In the case of queries, the last warning data set is returned and then deleted (LIFO). A total of ten warnings are saved. Warning message (warning code in XP00–XP15); remaining bits = 0
x	x	1	x	Error message (error code in XP00–XP15); remaining bits = 0
x	1	x	x	No position information/OUT (XP = 0, YP = 0, SP = 0)
1	x	x	x	EVENT present (must be requested!). Event flag is reset after the last event number has been queried.

Warning Codes

Warning code	Description	Priority
0	No other warning present. This code appears when all warnings have been read.	-
1	A code with non-PXV content was found.	1
2	Read head too close to code reel.	2
3	Distance between read head and code reel too great.	3
4	Y position too large. The sensor is just before OUT.	4
5	Y position too small. The sensor is just before OUT.	5
6	The read head is rotated or tilted in relation to the code reel.	6
7	Low level of code contrast.	7

Error Codes

Error code	Description	Priority
1	Read head tilted 180°.	2
2	No clear position can be determined (difference between codes is too great, code distance incorrect, etc.).	3
> 1000	Internal error.	1

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6 Appendix

6.1 Code Cards for External Parameterization

Here, you can find the code cards that enable you to parameterize some basic read head functions step by step. For the exact external parameterization procedure .

Note!

When performing external parameterization with code cards, we recommend copying and printing out the relevant pages in this manual and cutting out the code cards. This prevents the read head from mistakenly detecting another code card on the same page. If you intend to use this manual directly for parameterization, cover the code cards that you do not require with a sheet of paper, for example.

6.1.1 Code Cards with Special Functions

The following code cards have special functions:

- ENABLE
- STORE
- CANCEL
- USE
- DEFAULT

Enable

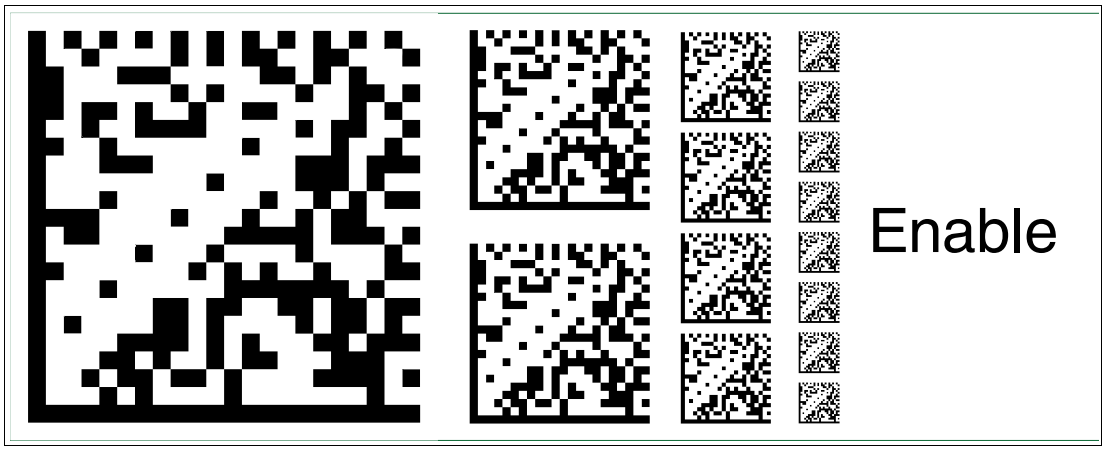

Figure 6.1 The code card "ENABLE" is used to activate external parameterization operating mode.

Store

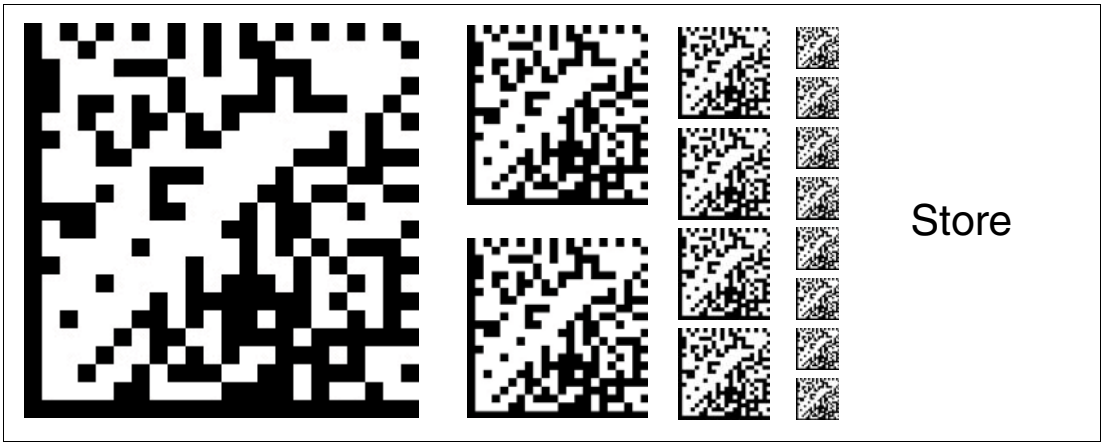

Figure 6.2 The "STORE" code card stores the modified parameterization in the nonvolatile memory of the read head and terminates external parameterization operating mode.

Cancel

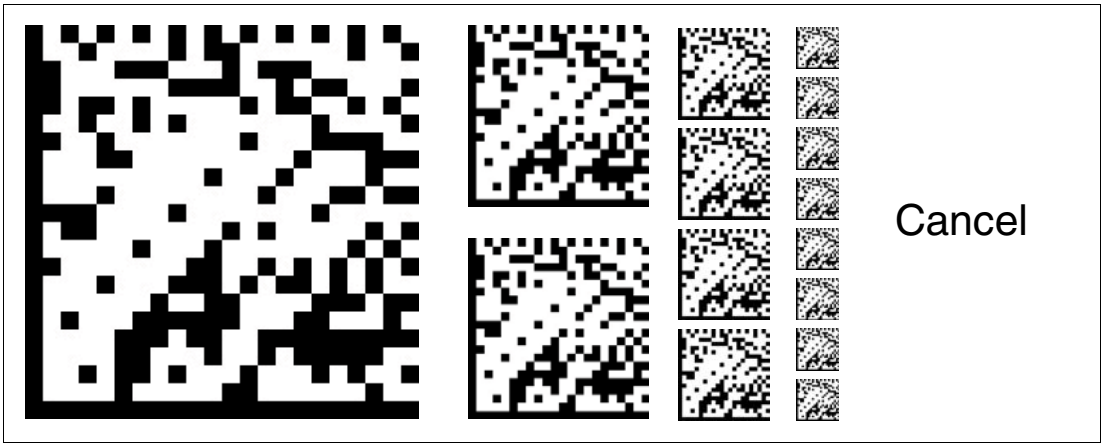

Figure 6.3 The "CANCEL" code card discards the modified parameterization and terminates external parameterization operating mode. The read head switches to normal mode and adopts the last valid configuration that was saved.

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Use

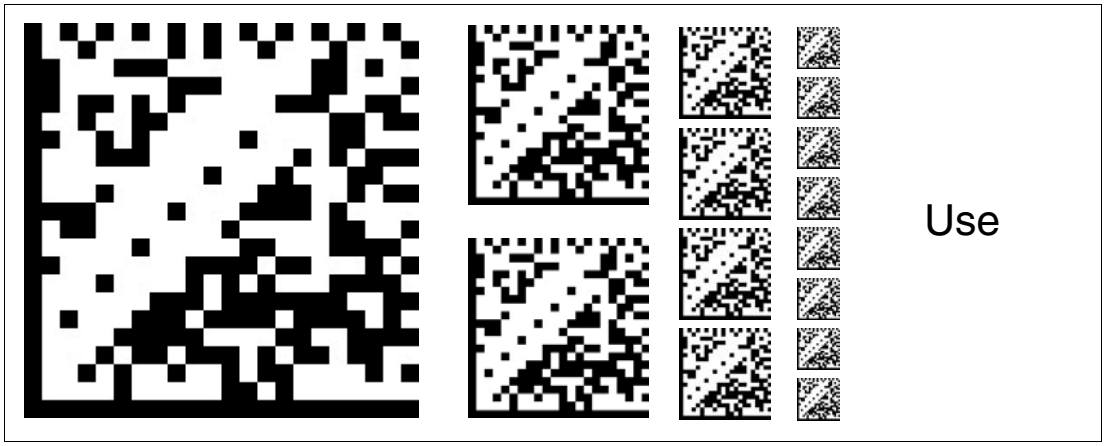

Figure 6.4 The "USE" code card takes over the set configuration **volatile** in the read head working memory and terminates the external parameterization operating mode. The read head then operates with this configuration. However, if the read head is switched off and on again, the configuration is lost and the read head operates with the last valid configuration that was saved. This function is used primarily for test purposes.

Default

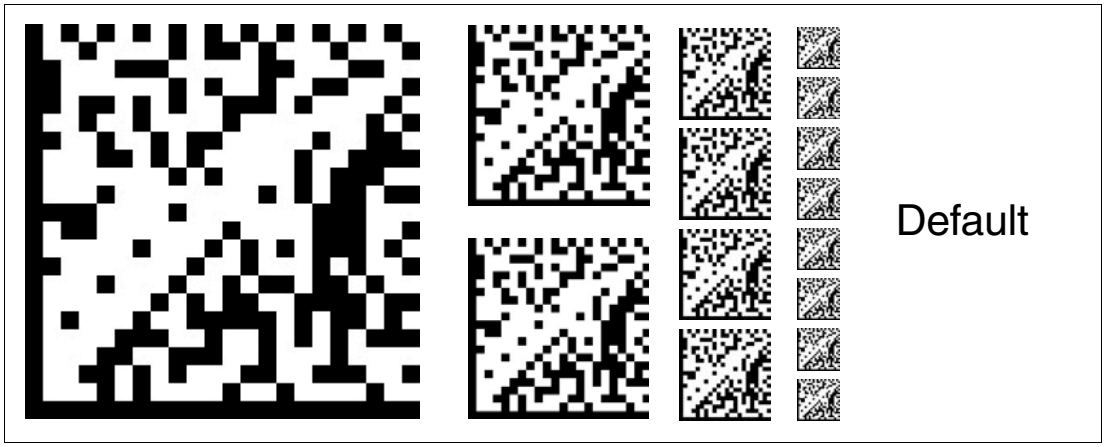

Figure 6.5 The "DEFAULT" code card restores the settings of the read head to default and terminates external parameterization operating mode.

6.1.2 Code Cards for Setting the Read Head Address

A unique address must be assigned to the read head so that it can be activated via the interface. The address range extends from 0 ... 3.

Read Head Address 0

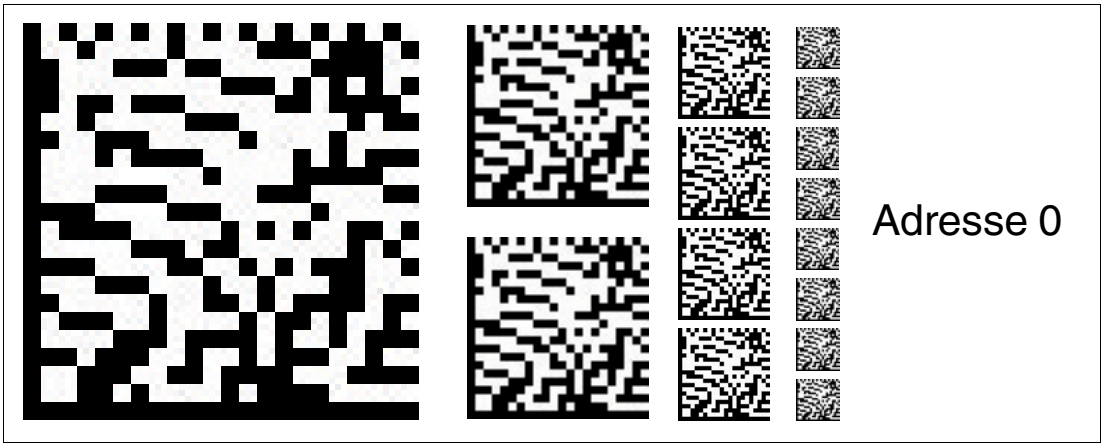

Figure 6.6 The code card assigns address 0 to the read head.

Read Head Address 1

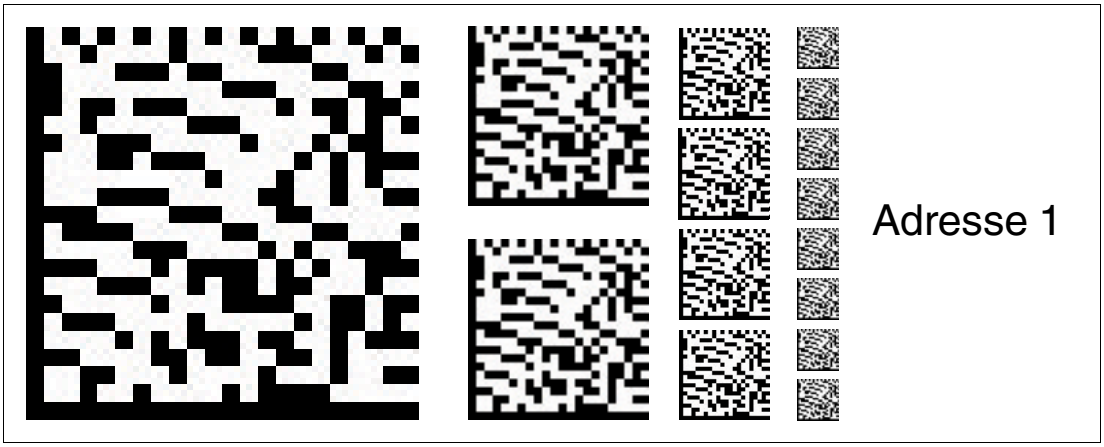

Figure 6.7 The code card assigns address 1 to the read head.

Read Head Address 2

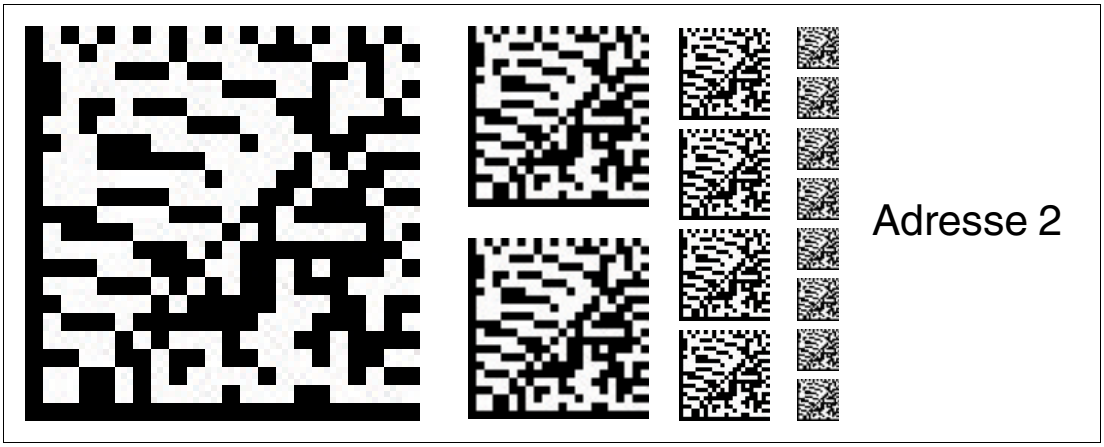

Figure 6.8 The code card assigns address 2 to the read head.

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Read Head Address 3

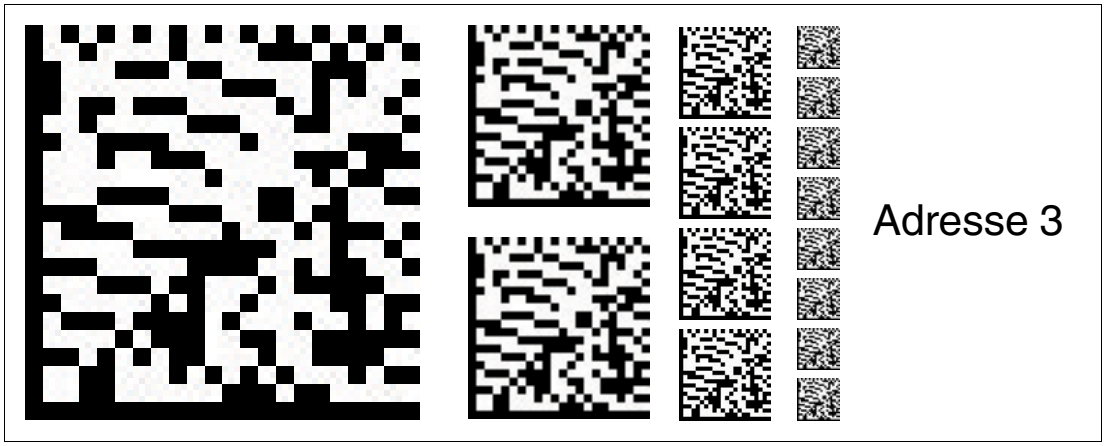

Figure 6.9 The code card assigns address 3 to the read head.

6.1.3 Code Cards for Adjusting the Resolution

Parameterization enables you to assign a position data resolution of 0.1 mm / 1 mm / 10 mm to the read head.

Resolution: 0.1 mm

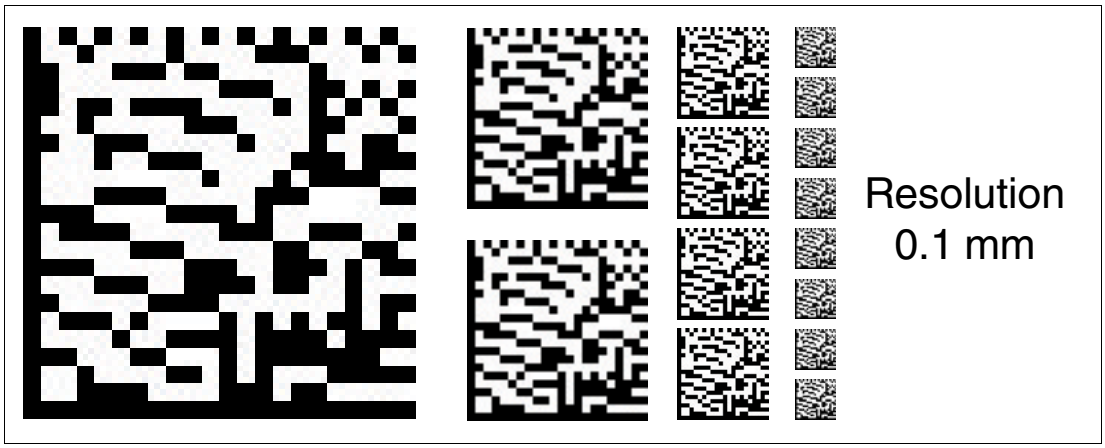

Figure 6.10 The code card assigns a position data resolution of 0.1 mm to the read head.

Resolution: 1 mm

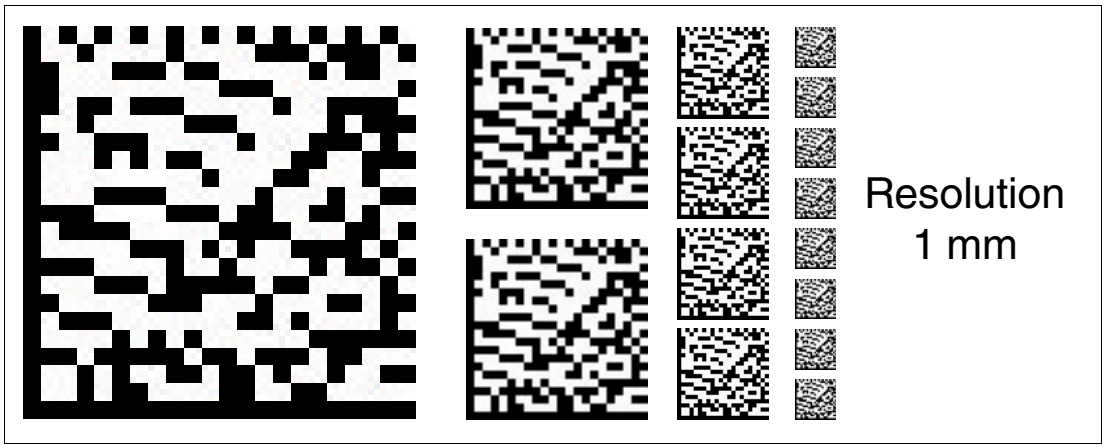

Figure 6.11 The code card assigns a position data resolution of 1 mm to the read head.

Resolution: 10 mm

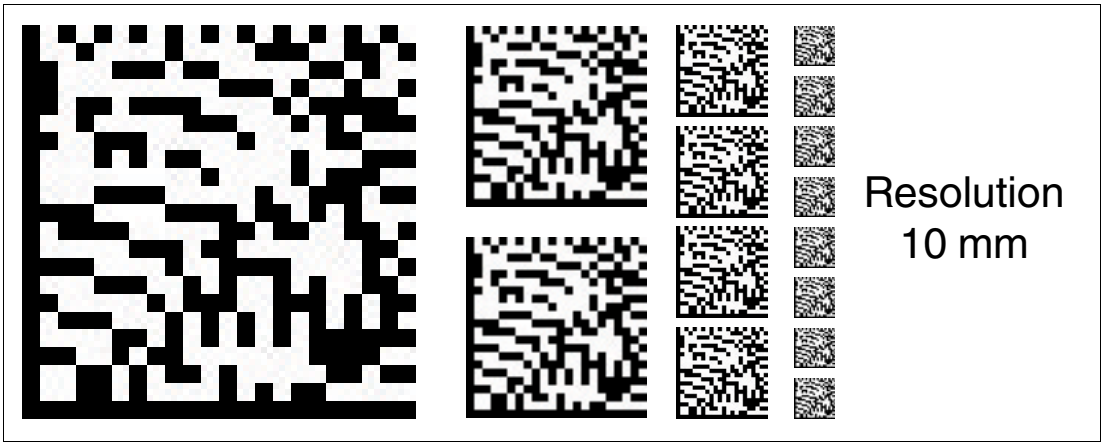

Figure 6.12 The code card assigns a position data resolution of 10 mm to the read head.

Maximum Length of the Code Tape

Resolution of the read head [mm]	Maximum length of the code tape [km]
10	10
1	10
0.1	1.5

6.1.4 Code Cards for Setting the Orientation

If the alignment of the read head to the code tape does not correspond to the default setting, the orientation must be adjusted. The orientation can be set at an angle of 0°, 180°, or 0°/180°.

Orientation 0°

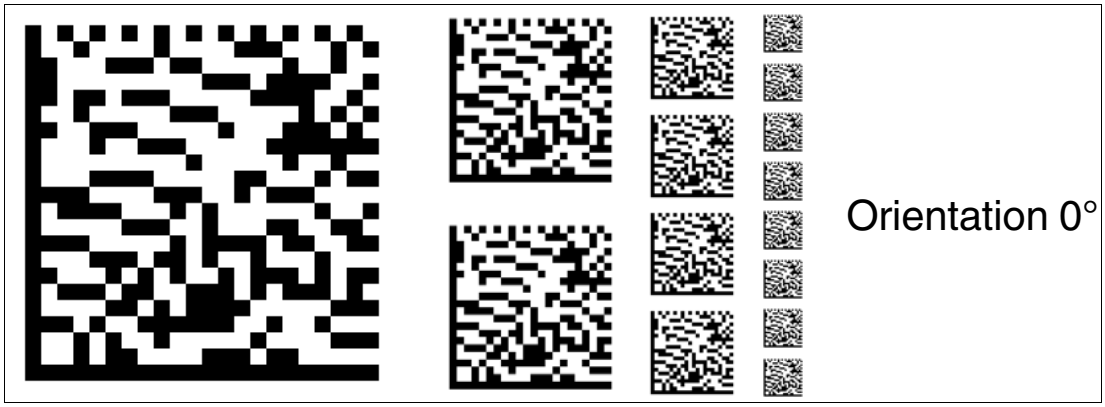

Figure 6.13 The code card assigns the orientation 0° to the read head.

Orientation 180°

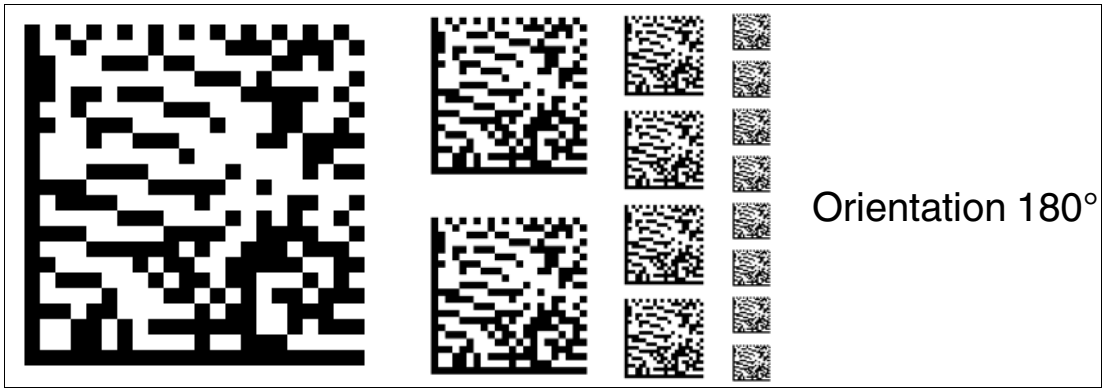

Figure 6.14 The code card assigns the orientation 180° to the read head.

Orientation 0° and 180°

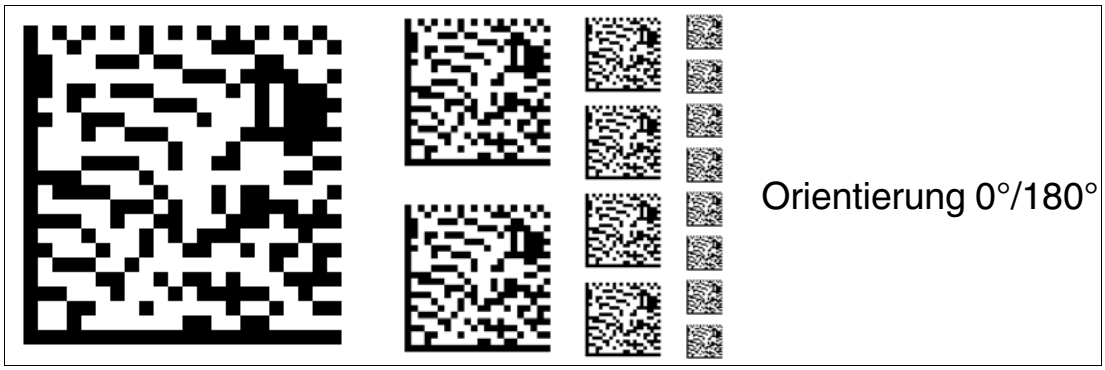

Figure 6.15 The code card assigns the orientation 0° and 180° to the read head. With this setting, the read head can read the Data Matrix code band in 0° and 180° orientation.

6.1.5 Code cards for setting the transfer rate

Parameterization allows you to assign various transfer rates to the reading head for communication via the interface. The following transfer rates are available:

- 38400 bit/s
- 57600 bit/s
- 76800 bit/s
- 115200 bit/s
- 230400 bit/s

Transfer rate: 38400 bit/s

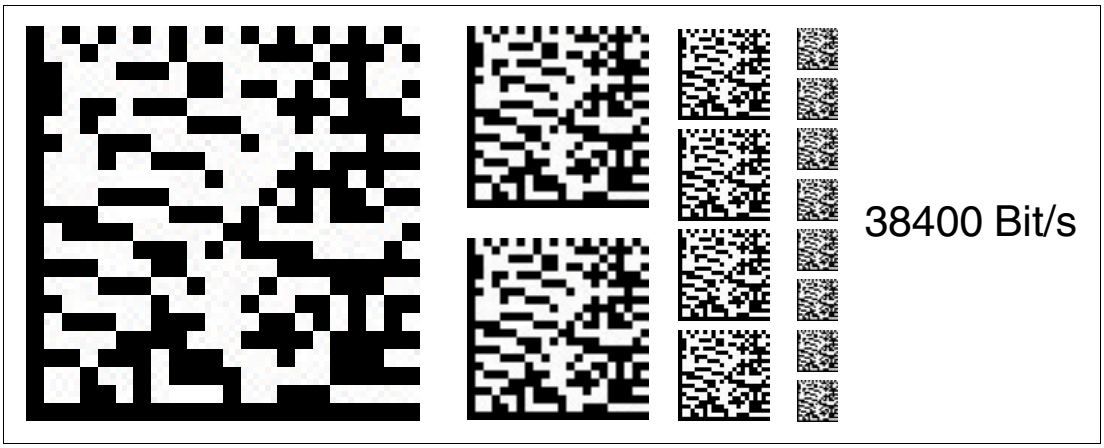

Figure 6.16 The transfer rate of the read head for communication via the interface is preset to 38400 bit/s.

Transfer rate: 57600 bit/s

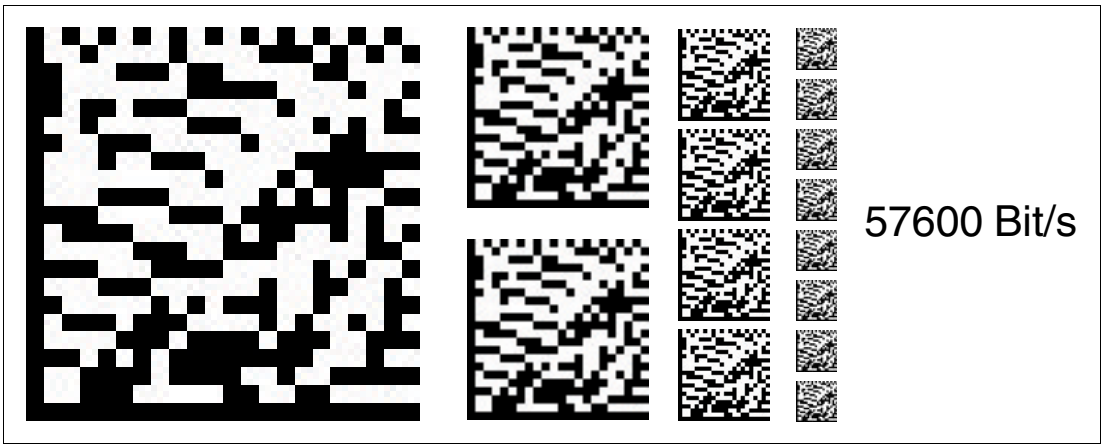

Figure 6.17 The transfer rate of the read head for communication via the interface is preset to 57600 bit/s.

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Transfer rate: 76800 bit/s

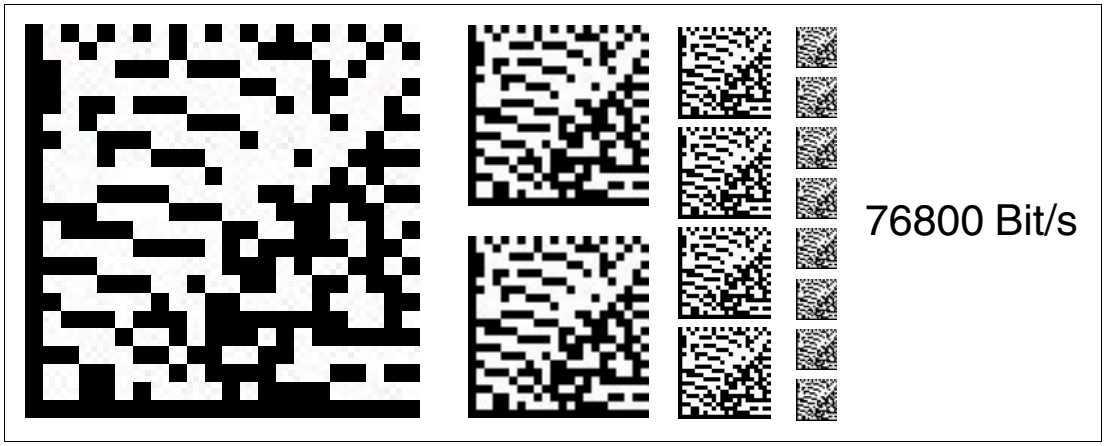

Figure 6.18 The transfer rate of the read head for communication via the interface is preset to 76800 bit/s.

Transfer rate: 115200 bit/s

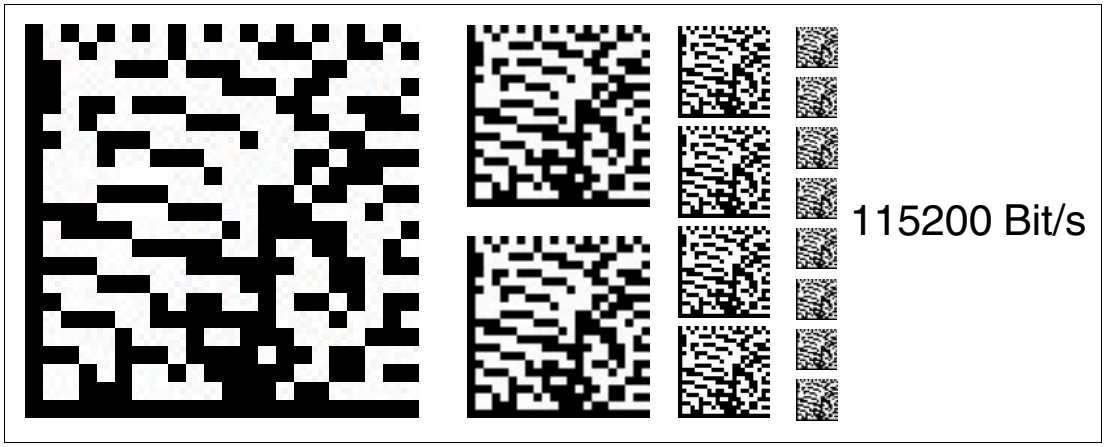

Figure 6.19 The transfer rate of the read head for communication via the interface is preset to 115200 bit/s.

Transfer rate: 230400 bit/s

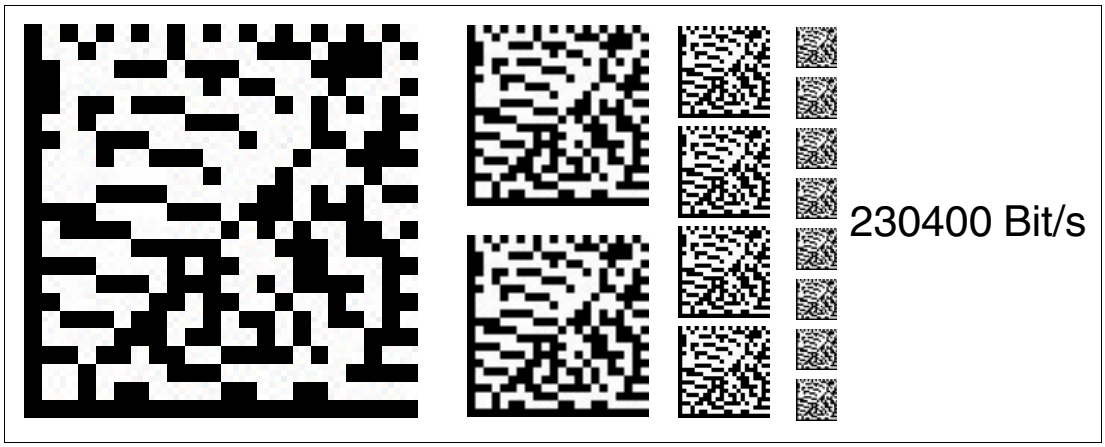

Figure 6.20 The transfer rate of the read head for communication via the interface is preset to 230400 bit/s.

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6.1.6 Code cards for adjusting the terminator

Parameterization enables you to switch a terminator on and off in the read head:

Terminator: OFF

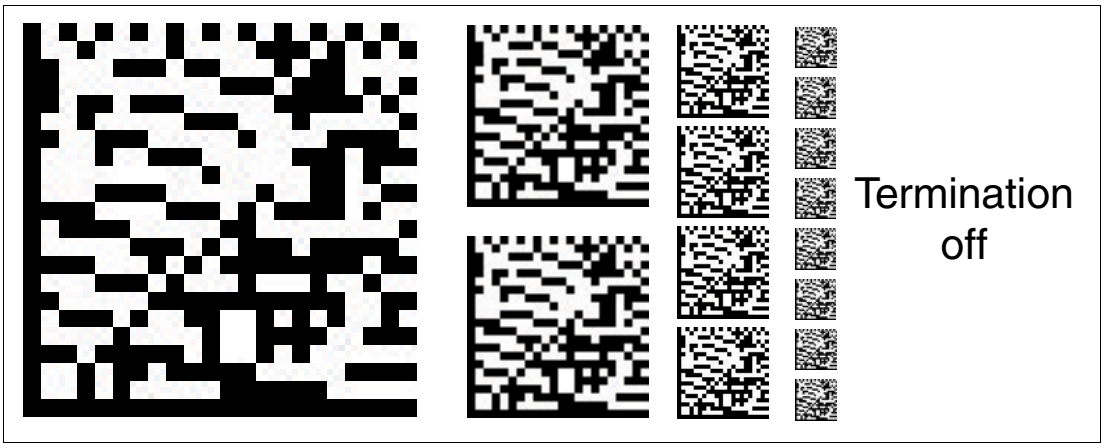

Figure 6.21 The terminator is deactivated.

Terminator: ON

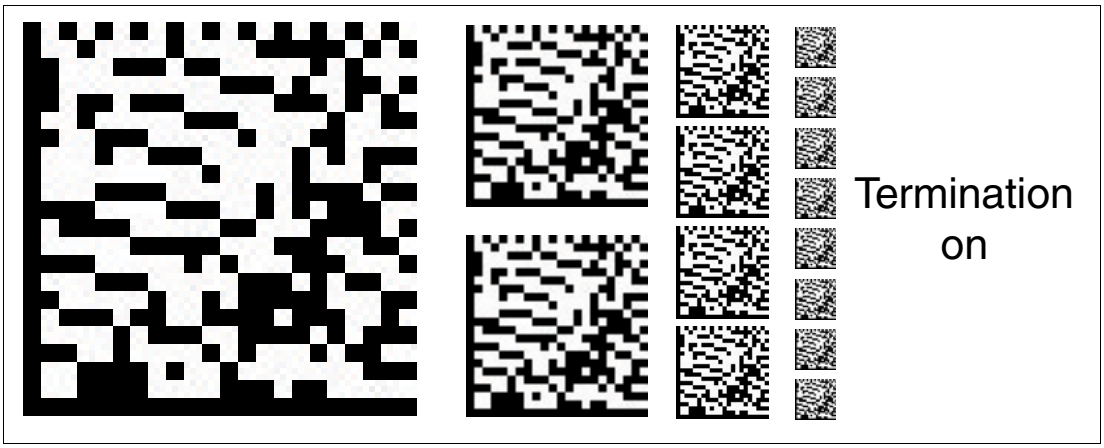

Figure 6.22 The terminator is connected.

6.1.7 Code Cards for Adjusting Input/Output 3

Parameterization enables you to assign various functions to input/output 3 on the read head. The following input/output functions are available:

- Input: none
- Output: Overspeed
- Output: Warning
- Output: Fault
- Output: Event
- Output: No position

Input 3: No Function

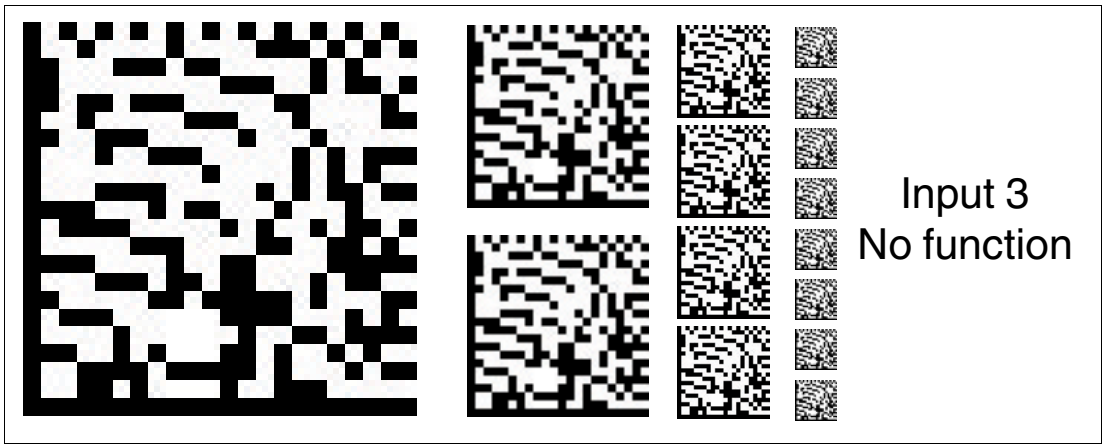

Figure 6.23 Input/output 3 is defined as an input but has no function.

Output 3: Overspeed

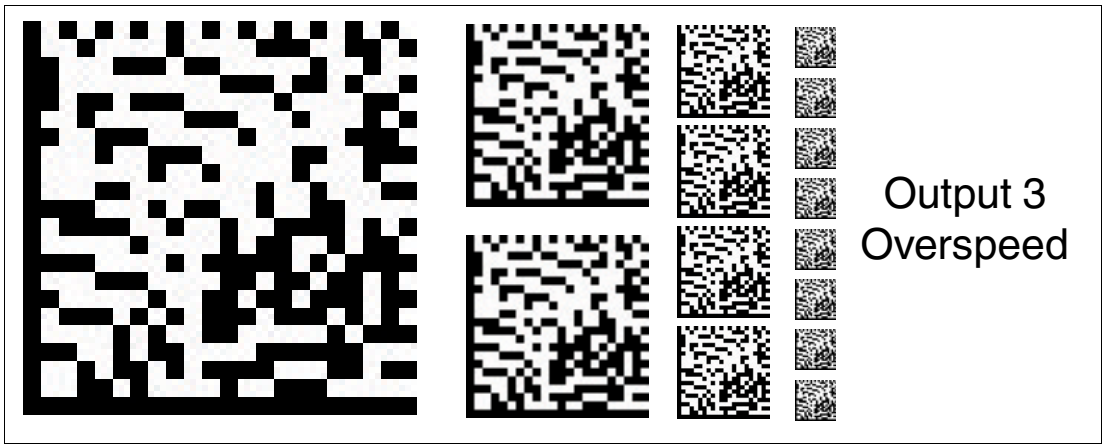

Figure 6.24 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as the defined maximum speed is exceeded.

Output 3: Warning

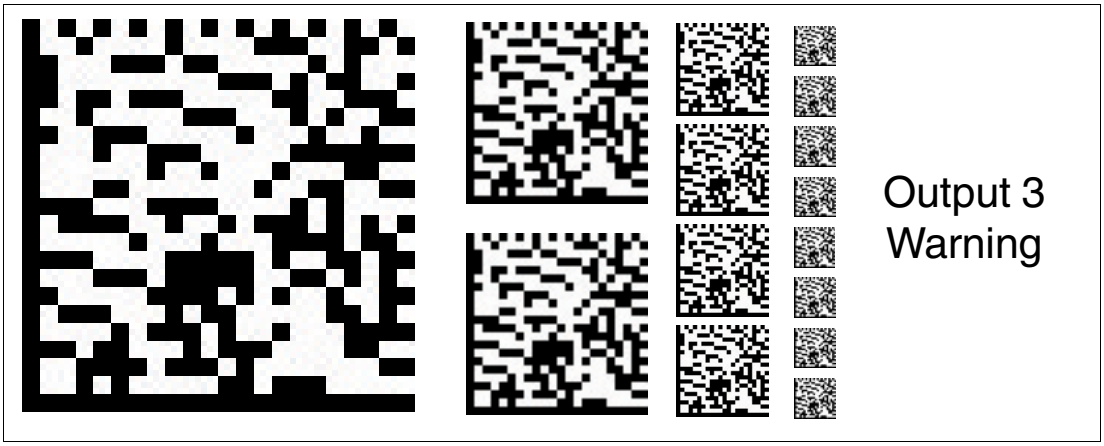

Figure 6.25 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as a warning message is present in the read head.

Output 3: Fault

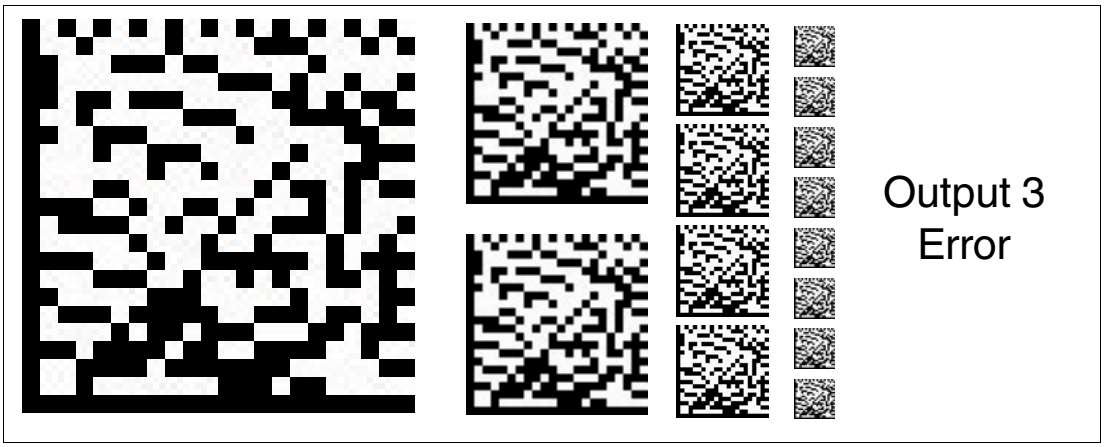

Figure 6.26 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as an error message is present on the read head.

Output 3: Event

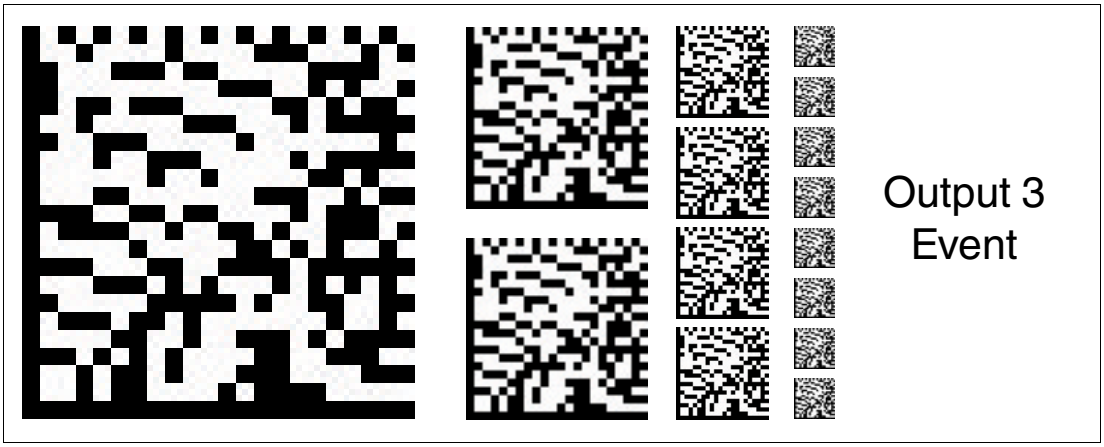

Figure 6.27 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as an event marker is present in the read field of the read head.

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Output 3: No position

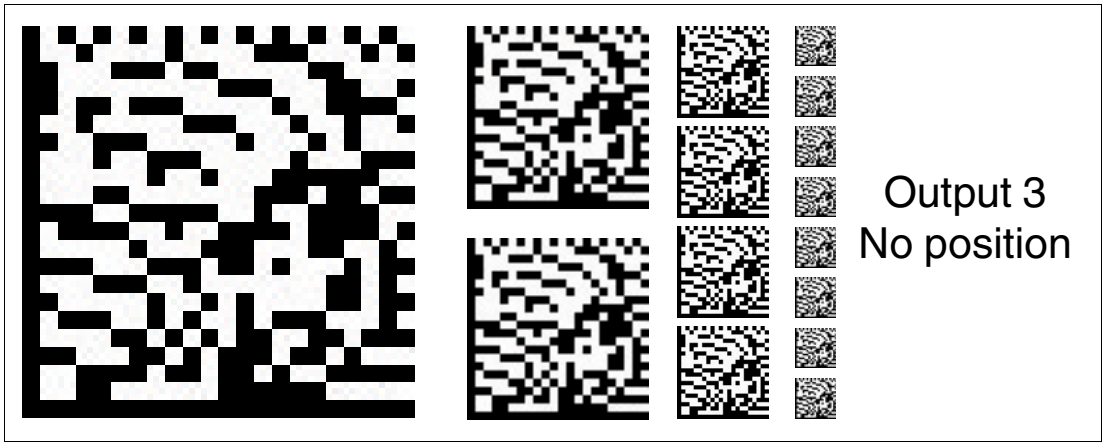

Figure 6.28 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as the read head is not reading any position information.

FACTORY AUTOMATION – SENSING YOUR NEEDS

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