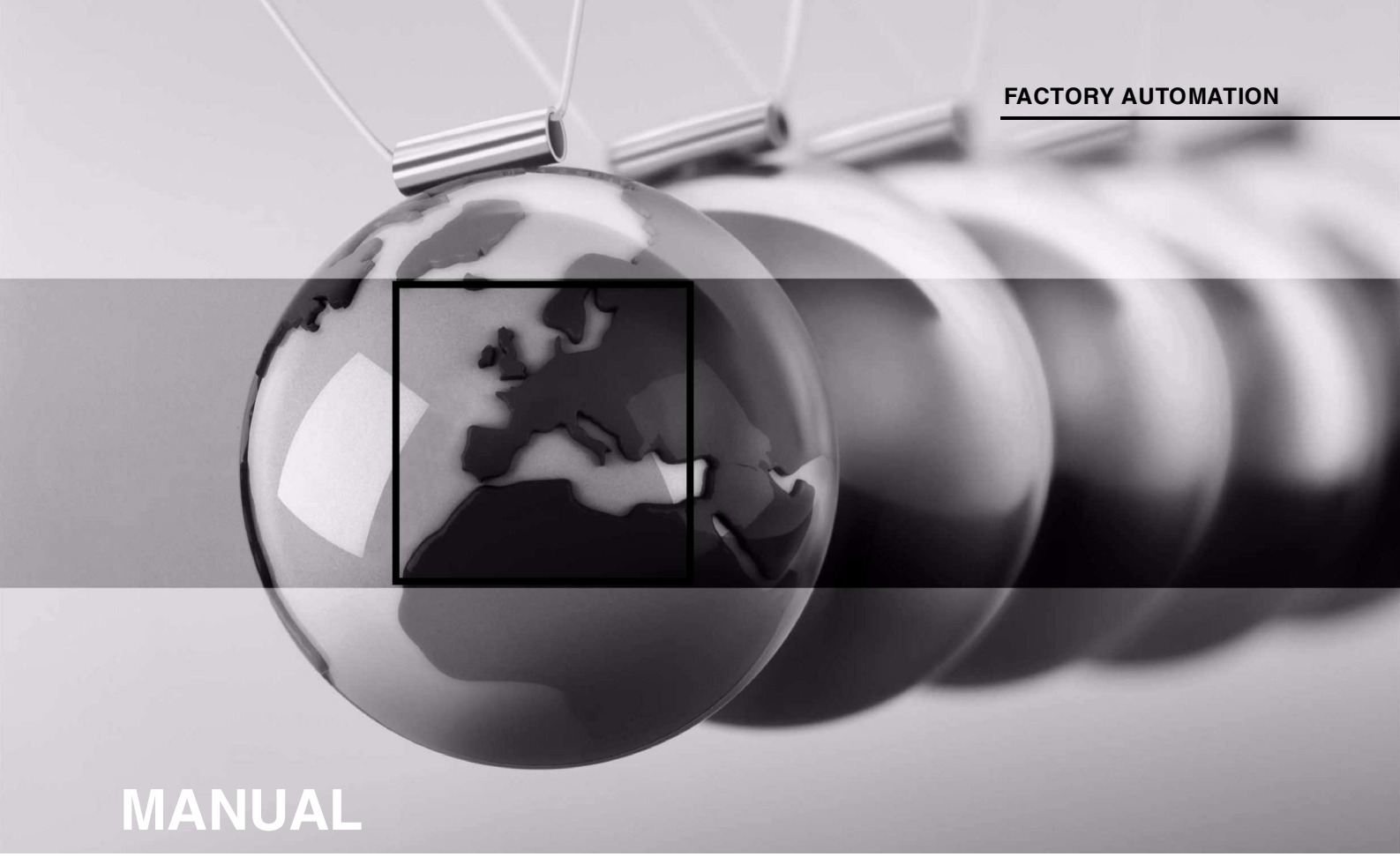
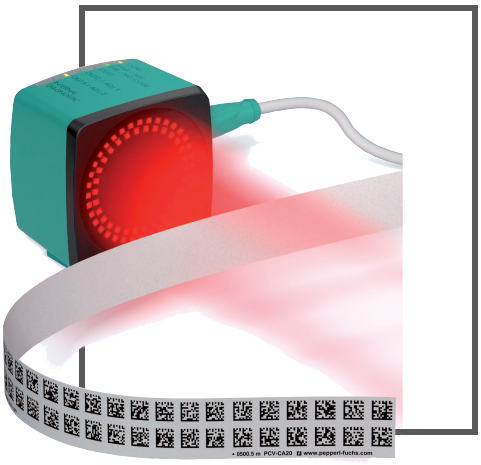


MANUAL

PCV...-F200-SSI-V19

Data Matrix Positioning System



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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

Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Symbols used

The following symbols are used in this manual:

Note!

This symbol draws your attention to important information.

Handling instructions

You will find handling instructions beside this symbol

Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

Pepperl+Fuchs GmbH
Lilienthalstraße 200
68307 Mannheim
Telephone: +49 621 776-4411
Fax: +49 621 776-274411
E-Mail: fa-info@pepperl-fuchs.com

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2 Declaration of conformity

2.1 CE conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.

Note!

A declaration of conformity can be requested from the manufacturer.

3 Safety

3.1 Symbols relevant to safety

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.

3.2 Intended use

Combined with a code strip with printed Data Matrix codes, this device represents a high-resolution positioning system that can be used in all applications where precision positioning is required along extremely long travel paths, irrespective of whether the travel path is straight, curved or with inclines or declines.

Read through these instructions thoroughly. Familiarize yourself with the device before installing, mounting, or operating.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and plant is only guaranteed if the device is operated in accordance with its intended use.

3.3 General safety instructions

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

Installation and commissioning of all devices must be performed by a trained professional only.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.

Note!

Disposal

Electronic waste is hazardous waste. When disposing of the equipment, observe the current statutory requirements in the respective country of use, as well as local regulations.

4 Product Description

4.1 Use and Application

The PCV… read head is part of the positioning system in the Pepperl+Fuchs incident light process. Its features include a camera module and an integrated illumination unit, enabling it to detect position markers printed onto an adhesive code reel in the form of Data Matrix codes.

The code reel is usually mounted to a fixed part of the equipment in a stationary manner (e.g., elevator shaft, overhead conveyor mounting rails) and the read head is then mounted in parallel to a moving "vehicle" (e.g., elevator car, overhead conveyor chassis).

Maximum Length of the Code Reel

Resolution of the Read Head [mm]	Maximum Length of the Code Reel [km]
10	10
1	10
0.1	1.5

This positioning system can be used with an appropriate resolution in equipment with extremely large layouts without restrictions.

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

4.2 USB Interface

The user-friendly **PCV Parameterization Tool** can be used for extensive and optimum configuration of the read head. 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.

You will need the parameterization cable (see Accessories) to establish a connection to the PC (required for parameterization) and to set up an electrical power supply to the read head for parameterization. The read head is connected to the "Service" connector.

Connecting the Service Interface

1. First connect the round plug connector to the read head.
2. Connect the plug-in power supply to the parameterization cable.
3. Plug the plug-in power supply into a socket.

   ↳ The ring light of the read head and the "PWR/ADJ/ERR/NO CODE" LED2 lights up or flashes.
4. You can now connect the USB plug-in connector to your PC.

4.3 SSI Interface

The controller and read head communicate via the SSI interface during operation. This is an optically isolated RS422 interface. The controller sends a series of pulses via the clock+ and clock- lines, and the read head responds synchronously with the 25-bit comprehensive response telegram. You can define the structure and content of the response telegram using the configuration software **PCV Parameterization Tool**.

This may include position data in an X- and Y-direction as well as speed and diagnostic data. The read head is connected for communication via the SSI interface during live operation via the "Main" connector.

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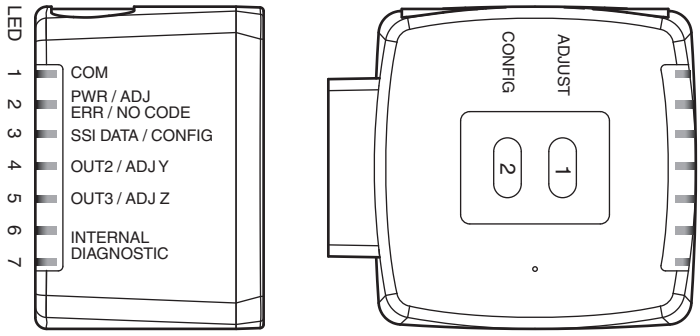
4.4 LED indicators and controls

The PCV... reading head is equipped with 7 indicator LEDs for performing visual function checks and rapid diagnosis. For activating the alignment aid see chapter 6.1 and programming mode, there are two buttons on the back of the reading head. ADJUST appears next to button 1 and CONFIG next to button 2.



LED	[#1] COM	[#2] PWR / ADJ ERR / NO CODE	[#3] SSI DATA / CONFIG	[#4] OUT 2 / ADJ Y	[#5] OUT 3 / ADJ Z	[#6] +[#7] Internal diagnostics		
Color	yellow	green/red	yellow	yellow	yellow	yellow	yellow	Description
State	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 strip outside read range; f_{flash} = 2 Hz
	Off	Lights up red	Off	Off	Off	Off	Off	System error
	Off	Lights up green.	Flashes	x	x	Off	Off	Normal mode, SSI communication active f_{flash} = 2 Hz LEDs marked with x indicate the status of the relevant output.
	Off	Flashes red	Flashes	x	x	Off	Off	No code within read range, communication active f_{flash} = 2 Hz LEDs marked with x indicate the status of the relevant output.
	Off	Flashes red	Off	x	x	Off	Off	No code within read range, no SSI communication; 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. Displays for 2 s if a button is pressed when the time lock is enabled.
	Off	Off	Flashes	Off	Off	Off	Off	Configuration mode active; f_{flash} = 2 Hz
	Off	Red, 3 s	Flashes	Off	Off	Off	Off	Code card faulty; f_{flash} = 2 Hz
	Off	Green, 1 s	Flashes	Off	Off	Off	Off	Code card detected f_{flash} = 2 Hz
	x	Off	x	x	x	Off	Off	Time lock for buttons disabled
	Flashes	Green	Off	Off	Off	Off	Off	Position detection via USB interface, code within read range
	Flashes	Flashes red	Off	Off	Off	Off	Off	Position detection via USB interface, no code within read range
	x	x	x	x	x	On	On	Internal error Return to Pepperl+Fuchs

x = LED status has no meaning.

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4.5 Accessories

Compatible accessories offer enormous savings potential. Not only do you save a great deal of time and work when commissioning, but also when replacing and servicing our products.

If harsh external environmental conditions prevail, appropriate Pepperl+Fuchs accessories can extend the service life of the products used.

Model Number	Description
V19-G-ABG-PG9-FE	Grounding terminal and plug (set)
PCV-KBL-V19-STR-USB	Cable unit for power supply
VAZ-V1S-B	Cap for service connector
PCV-CM20-*	Event marker

You can find the right connecting cable in the Accessories section of the read head data sheet at http://www.pepperl-fuchs.com.

5 Installation

5.1 Installing the Code Reel

The code reel is made of silicone-free polyester film. A position marker appears every 100 mm along the lower edge of the code reel (see "Dimensions, Code Reel"). This position marker is used for various functions including precise positioning of the code reel during assembly.
The reverse side of the code reel carries a permanent modified acrylate-based adhesive. Affix the self-adhesive code reel along the desired travel range. Proceed as follows:

Installing the Code Reel

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

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

Note!

Thermal Expansion of the Code Reel

The heat expansion coefficient of the attached code reel corresponds to the heat expansion coefficient of the underside.

Dimensions, Code Reel

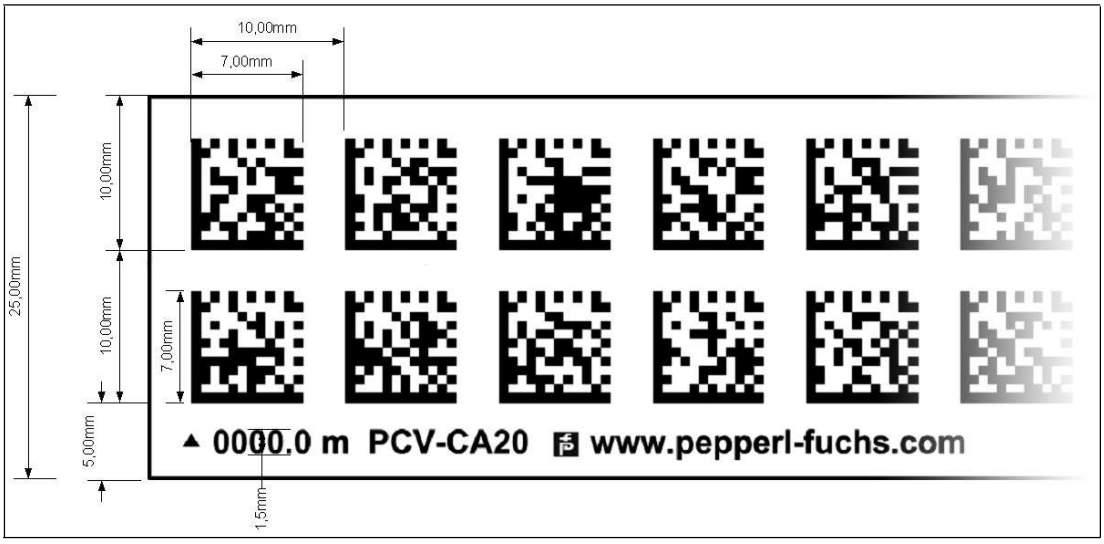


Figure 5.1

Orientation of the Code Reel and Read Head

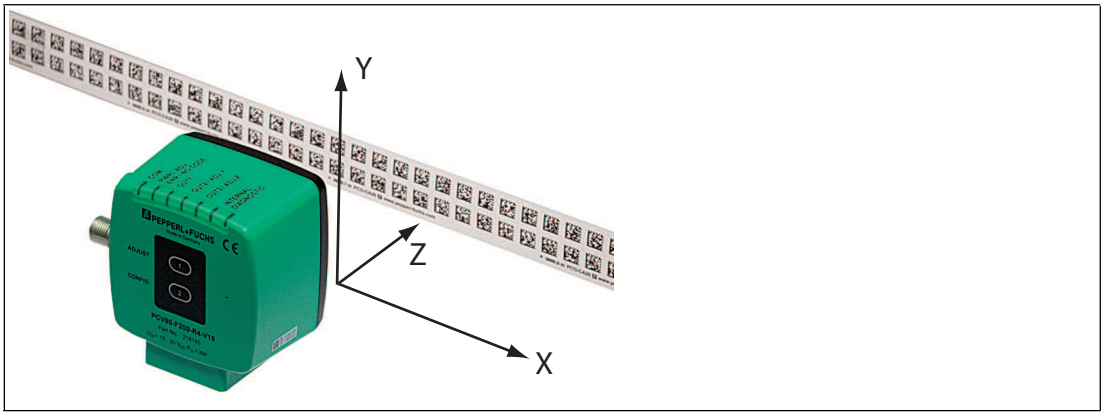


Figure 5.2

Position the code reel so that the **www.pepperl-fuchs.com** label and the position markings are below the data matrix code. The position values then increase along the X-direction. The diagram shows the orientation of a read head in the default position of 0°. The read head can be configured in the interface for other installation situations.

Code Reels with a Starting Position of 0 m

Model Number	Description
PCV6M-CA20-0	Code reel, 2-track, length: 6 m
...	...
PCV100M-CA20-0	Code reel, 2-track, length: 100 m

Code Reels with Different Starting Positions

Model Number	Description
PCV100M-CA20-0	Code reel, 2-track, length: 100 m, starting position: 0 m
PCV100M-CA20-10000	Code reel, 2-track, length: 100 m, starting position: 100 m
...	...
PCV100M-CA20-990000	Code reel, 2-track, length: 100 m, starting position: 9,900 m

Caution!

Stop Edges

If you attach another code reel at the end of a previous code reel, the code pattern of 10 mm must be retained.

Note!

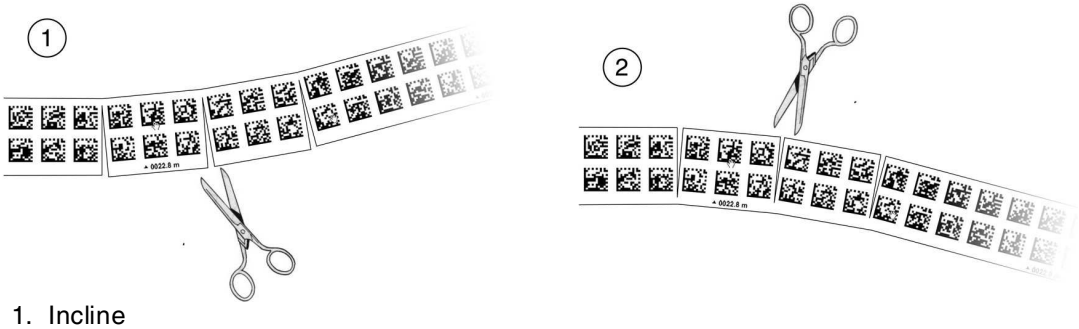
Expansion Joints

If the system covers longer distances, expansion joints are integrated in the system structure. We recommend creating breaks along the code reel. The resulting gaps should be 20 mm (2 code grids).

Note!

Inclines and Declines

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



1. Incline
2. Decline

Note!

Code Reels with Different Row Numbers

The PCV-CA20 code reel has two rows of code to compensate for slight deviations in the travel range in the Y-direction. The code reel is also available with other row numbers. The order code for the code reel is PCV-CAx0, whereby x represents the number of rows of code, which can be either 1 or 2. More rows are available on request–contact us for more information.

Code Reels with Different Numbers of Tracks

Model Number	Description
PCV*M-CA10-*	Code reel, 1-track
PCV*M-CA20-*	Code reel, 2-track
PCV*M-CA40-*	Code reel, 4-track
...	...

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Hysteresis Y-Axis

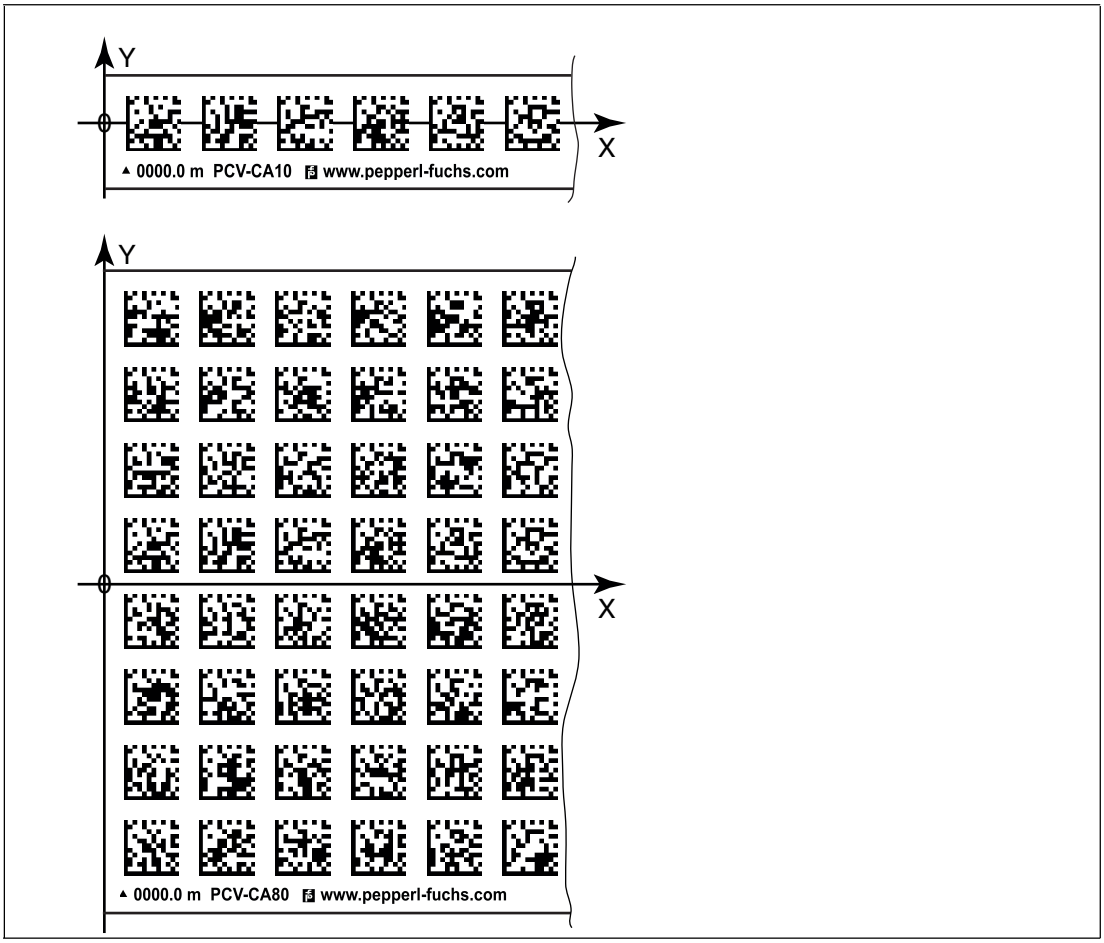

Figure 5.3 Zero line for code reels

If the read head leaves the zero line when traveling the X-axis, different threshold values will result depending on the number of tracks. If the deviation exceeds this threshold, a warning code is issued.

Y-Axis Deviation Thresholds

Code reel		Threshold	
Number of tracks	Width	Exit	Entry
1	15 mm	± 10 mm	± 6 mm
2	25 mm	± 15 mm	± 11 mm
4	45 mm	± 25 mm	± 21 mm
6	65 mm	± 35 mm	± 31 mm
8	85 mm	± 45 mm	± 41 mm

5.2 Mounting the Read Head

Mount the PCV... read head on the moving part of your equipment using the four screws on the mounting adapter of the read head. Mount the read head in such a way that the lens with ring light and camera module are aligned toward the code tape.

The stability of the mounting and the guidance of the moving system component must be such that the field of the depth of focus of the read head is not exited during operation.

The distance between the read head and the code tape should be the same as the read distance of the read head.

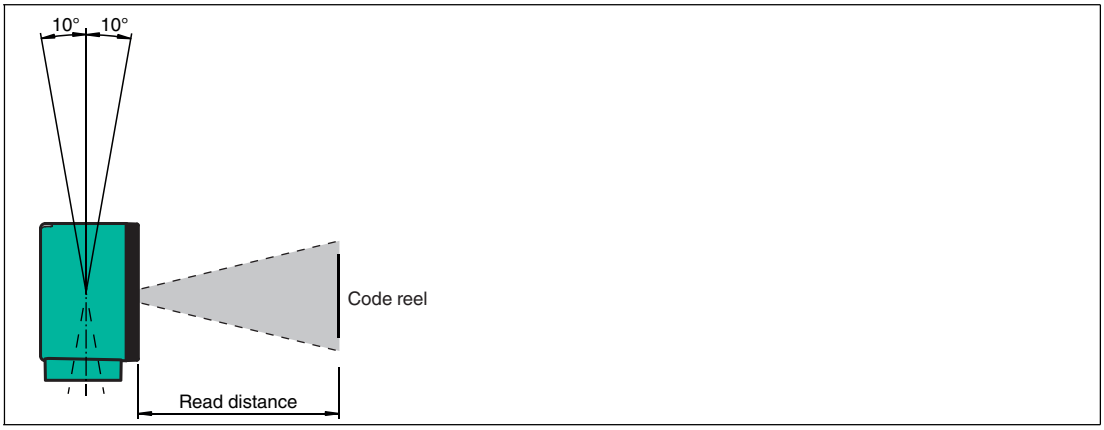

Figure 5.4 Vertical alignment tolerance

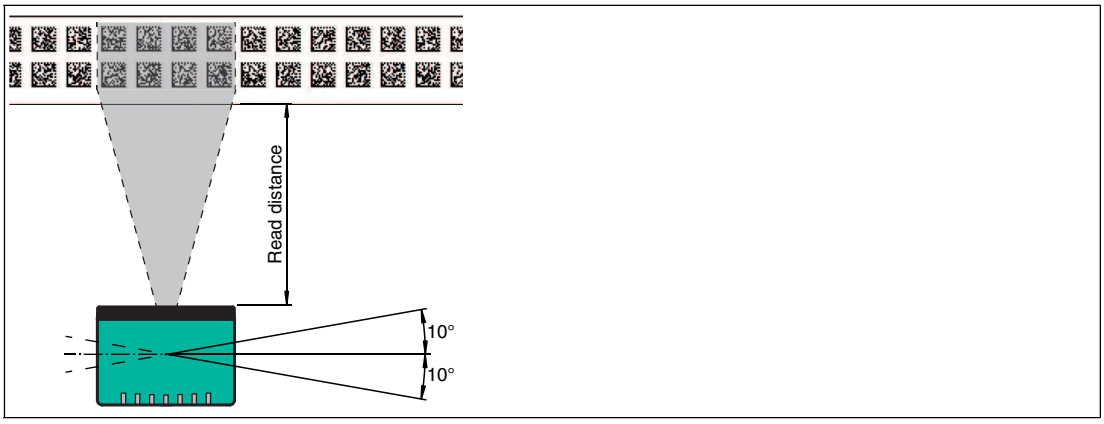

Figure 5.5 Horizontal alignment tolerance

Optimum Read Distance (Z-Axis)

Model Number	Read Distance [mm]	Depth of Focus [mm]
PCV50*	50	± 25
PCV80*	80	± 15
PCV100*	100	± 20
PCV100*-...-6011	100	± 40

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Read Head Dimensions

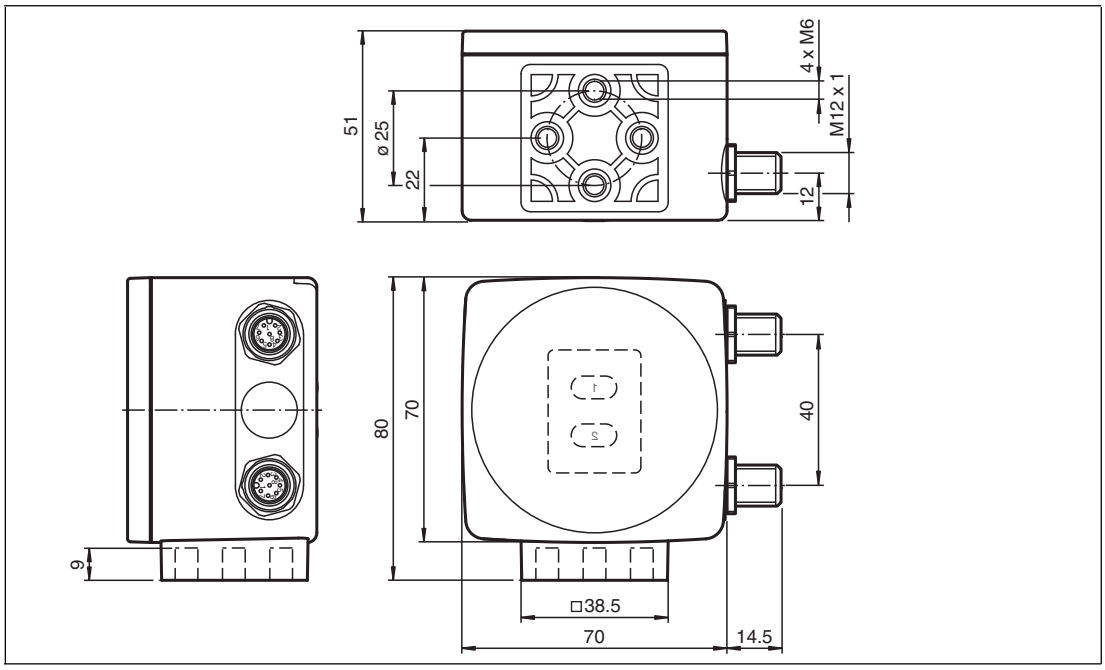


Figure 5.6

Caution!

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

Using longer screws can damage the read head.

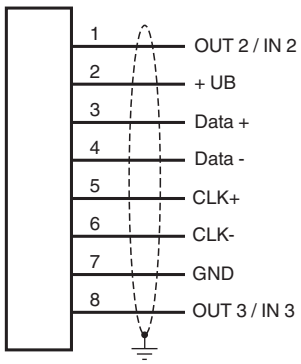
Caution!

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

Tightening the screws to a higher torque can damage the read head.

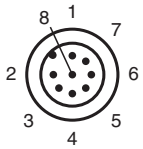
5.3 Establishing the Electrical Connections

The electrical connection of the PCV... read head for live operation is connected via the 8-pin M12 x 1 connector to the side of the housing with the label "**Main**". The power supply and communication with the SSI interface is established via this connection. The configurable inputs and outputs of the read head are present at this connection.



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

Connector assignment



Color assignment

Female cordsets by Pepperl+Fuchs are manufactured according to EN60947-5-2. When using a type V19-... () 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

Note!

"Service" Plug Connector

The plug connector marked with **"Service"** is used only to set the parameters of the read head. Communication with the PC on which the configuration software is running and the power supply itself are both fed through the parameterization cable (cable unit for service interface with the power supply). A description of the connection can be found in the configuration software manual "PCV Parameterization Tool."

Shielding Cables

The shielding of connection lines is required to suppress electromagnetic interference. Establishing a low resistance or low impedance connection with the conductor or equipotential bonding circuit is a particularly important factor in ensuring that these interference currents do not become a source of interference themselves. Always use connection lines with braided shield; never use connection lines with a film shield. The shield is integrated at both ends, i.e., in the switch cabinet or on the controller **and** on the read head. 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.

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Additional Ground Connection

Model Number	Description
PCV-SC12	Clip for fastening 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.

6 Commissioning

6.1 Aligning the Read Head

An integrated alignment aid is available to help you align the Y and Z coordinates of the read head easily and precisely with respect to the code reel.

Note!

The activation of the alignment aid is possible only within 10 minutes of switching on the read head.

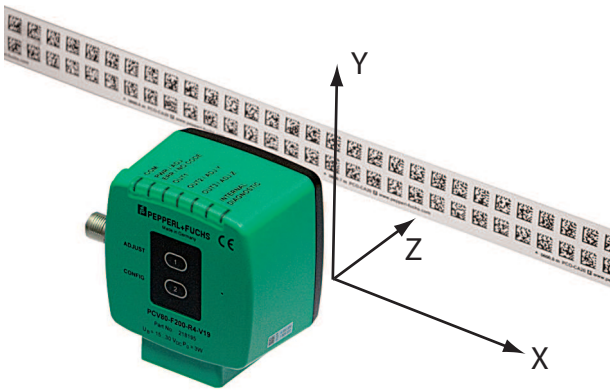
The switchover from normal operation to parameterization mode is via button 1 on the back of the read head.

Activating the Alignment Aid

1. Press button 1 for longer than 2 seconds.

   ↳ LED2 flashes green for a recognized code reel. LED2 flashes red for an unrecognized code reel. .

2. Align the Z and Y coordinates of the read head. The integral LED indicators provide assistance here.



Z coordinate: If the distance of the camera to the code reel is too small, the yellow LED5 lights up. If the distance is too great, the yellow LED5 goes out. The yellow LED5 flashes at the same time as the green LED2 when within the target range. .
Set the distance between the read head and the code reel so that the yellow LED5 and the green LED2 flash synchronously.

Y coordinate: If the optical axis of the read head is too low relative to the middle of the code reel, the yellow LED4 lights up, . If the optical axis is too high, the yellow LED4 goes out. Within the target range, the yellow LED4 flashes at the same time as the green LED2.
Set the optimal height of the read head relative to the code reel so that the yellow LED4 flashes in rhythm with the green LED2.
Briefly pressing button 1 ends the alignment aid, and the read head returns to normal operation.

6.2 Parameterizing

The PCV... reading head can be adapted to specific requirements through parameterization. The reading head can be parameterized via the service interface (internal parameterization) or via optical parameterization codes (external parameterization).

6.2.1 Internal Parameterization Using Parameterization Software

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

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The user-friendly **PCV Parameterization Tool** can be used for extensive and optimum configuration of the read head. 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.

Connecting the Service Interface

1. 1. First connect the round plug connector to the read head.
2. 2. Connect the plug-in power supply to the parameterization cable.
3. 3. Plug the plug-in power supply into a socket.

   ↳ The ring light of the read head and the "PWR/ADJ/ERR/NO CODE" LED2 lights up or flashes.
4. 4. You can now connect the USB plug-in connector to your PC.

Parameterizing the Read Head

1. Start the parameter tool
2. Parameterize the read head using the manual accompanying this parameter tool.
3. Transfer the parameter list to the read head
4. Save the parameterization
5. Switch off the power supply to the read head
6. Remove the parameterization cable's USB plug-in connector from your PC
7. Remove the parameterization cable from the read head and connect the round plug connector for the service interface to the stopping plug.

   ↳ The read head is now parameterized according to your specifications and can now be used in your application.

6.2.2 External parameterization using code cards

During external parameterization, the reading head optically scans the special code cards and configures the relevant parameters. Simply hold the corresponding code cards at the correct distance in front of the lens on the PCV...-F200- reading head. The Appendix contains information on standard code cards.

The following parameters can be configured using code cards:

- Output code [binary, gray]
- Reading head resolution [0.1 mm, 1 mm, 10 mm]
- Trigger source [auto, hardware]
- Function of input/output 2 [as input: none, trigger input / as output: none, speed exceeded, warning, fault, contamination, event, no position]
- Function of input/output 3 [as input: none, trigger input / as output: none, speed exceeded, warning, fault, contamination, event, no position]

Activation of programming mode

Note!

External parameterization of the reading head using code cards must be started within 10 minutes of the read head switching on. A time lock disables the reading head when this time has elapsed. The time lock remains inactive for the duration of the parameterization process. If no parameterization takes place for more than 10 minutes, the time lock disables the reading head.

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 switch from normal to parameterization mode is achieved by pressing button 2 on the back of the reading head.

Activation of parameterization mode

1. Press button 2 for longer than 2 s.

   ↳ Yellow LED3 now flashes.

2. Hold the "ENABLE" code in front of the camera system on the reading head for final activation

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

Parameterizing

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

↳ After the parameterization code is detected, the green LED2 lights up for 1s. If the parameterization code is invalid, the LED2 lights up red for 2 s.

Exiting programming mode

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

↳ When the "STORE" memory code is detected, the green LED2 lights up for 1s. The parameterization is stored in the non-volatile memory of the reading head and parameterization mode is terminated. Parameterization of the reading head is now complete. If the memory code is not detected, the 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 reading head operates with the last valid parameters that were saved.

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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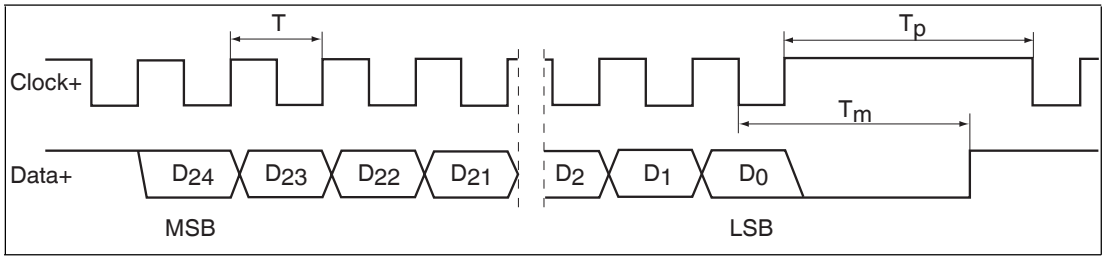
7 Operation and communication

7.1 Communication via the SSI Interface

In order to read the current process data during operation, the read head has an SSI interface. This is an optically isolated RS422 interface. The controller sends a start sequence, and the read head responds synchronously with the 25-bit comprehensive data telegram.

SSI pulse diagram



- T: Duration of the pulse signal
- T_p: Pause time of the pulse signal
- T_m: Monoflop time
- D24 ... D0: Data bits
- MSB: Most important data bit (Most Significant Bit)
- LSB: Least important data bit (Least Significant Bit)

SSI output format, standard

In an idle state, the “Data +” and “Clock +” signal cables are set to high (3.3 V) and the “Data -” and “Clock -” signal cables are set to low (-3.3 V). When the pulse signal changes from high to low for the first time, the current status (e.g. position data, error codes, etc.) is stored temporarily to initiate the data transfer. With the first rising pulse edge, the most important data bit D_{24} (MSB) is available at the serial data output on the reading head. The next most important bit is then transferred with every additional rising pulse edge. When the least important data bit D_0 (LSB) has been transferred, the data cable switches to low until the monoflop time T_m has elapsed. A further data transfer can only be initiated when the data cable switches to high again or the pulse interval time T_p has elapsed. At the end of the pulse sequence, the last falling pulse edge triggers the monoflop time T_m. The monoflop time T_m determines the lowest transfer frequency.

SSI output format, dual request (slide valve mode)

With dual requests, the same data word is transferred several times via the SSI interface to allow the detection of transmission errors. During multiple transfers, 25 bits are transferred for each data telegram. If the pulse change is not interrupted after the last falling pulse edge, slide valve mode is activated automatically, which means that the information stored temporarily during the first pulse change is transmitted again. After the first transfer, the 26th pulse controls the repeat transfer of data.
Therefore, if the 26th pulse occurs after a time shorter than the monoflop time T_m, the same data word is transmitted again. If the 26th pulse occurs after a time longer than the monoflop time T_m, this represents the 1st pulse in a new query sequence and the pulses that follow transmit a new, updated data word.

Note!

If the clock line is inverted, the data word is moved.

You can define the structure and content of the response telegram using the configuration software PCV_config. This may include position data in an X- and Y-direction as well as speed and diagnostic data. Make sure that the required settings have been configured, transmitted to the read head, and stored there. The factory default structure of the response telegram is as follows:

Bit	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Data	XP 21	XP 20	XP 19	XP 18	XP 17	XP 16	XP 15	XP 14	XP 13	XP 12	XP 11	XP 10	XP 9	XP 8	XP 7	XP 6	XP 5	XP 4	XP 3	XP 2	XP 1	XP 0	Out	Wrn	Err
	MSB																					LSB	Status bits		

Note!

The number of position bits required along the X-axis depends on the length of the track and the required position resolution.

Example:
max. track length = 300 m, required position resolution = 1 mm.
19 bits are enough to display the X position. 6 bits can therefore be occupied to output additional data.

Meaning of status bits

Out	Wrn	Err	Description
x	1	x	Reserved
x	x	1	Error, error code in XP0 ... XP21
1	x	x	No position codes in the read window (XP0 ... XP21 = 0)

Error codes:

Error code	Description
1	Read head aligned incorrectly (rotated 180°)
2	Position error: Position codes in the read window are not unique
>1000	Internal fault

7.2 Operating with event markers

In numerous position coding system applications, defined processes must be started at specific positions so that the controller can evaluate the position data measured by the reading head. However, this means that the exact positions for triggering events of this kind must be defined as early as the planning stage and can no longer be modified during the construction phase or commissioning. If modifications are made, the position data stored in the control software must be adapted accordingly, which involves a great deal of time and effort.

Activating a process through the detection of so-called event markers is a much more flexible method. Only a specific event and the process linked with the event have to be programmed into the system controller. The position in which the corresponding event marker is placed along the code strip can be decided immediately before final commissioning of the system. Even if subsequent changes are made to the layout of a system, the relevant event marker is simply moved to the new position without requiring program modifications.

Event markers are short code strips one meter in length. The event marker bears the encoded event number and position information in incremental form. Event markers are available with event numbers from 001 to 999.

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When the reading head enters the range of an event marker, it sets an event flag in the output data. You also have the option of triggering a defined action when an event occurs by parameterizing one of the outputs accordingly (see parameterization software description). These actions can be initiated when a certain event, all events or events from an event list occur.

Note!

The reading head does not transfer any position data within the range of an event marker. Instead, the reading head transfers the event number.

The 1 meter long event marker can be shortened. However, the minimum length should be 30 mm (3 codes). If the travel speed of the reading head increases, a longer event marker is required. If the reading head travels at maximum speed, a full length event marker of 1 meter must be positioned over the code strip.

The minimum length of an event marker can be calculated according to the following formula depending on the travel speed and the trigger period:

$L_{event\ marker} = 30\ mm + V_{max}\ [m/s] * T_{trigger}\ [s] \times 2$

Trigger period

Read head	Duration
PCV80-F200-SSI-V19	0,025 s
PCV80I-F200-SSI-V19	
PCV100-F200-SSI-V19	
PCV100I-F200-SSI-V19	
PCV80S-F200-SSI-V19	0,01 s

Table 7.1 Trigger period with auto trigger

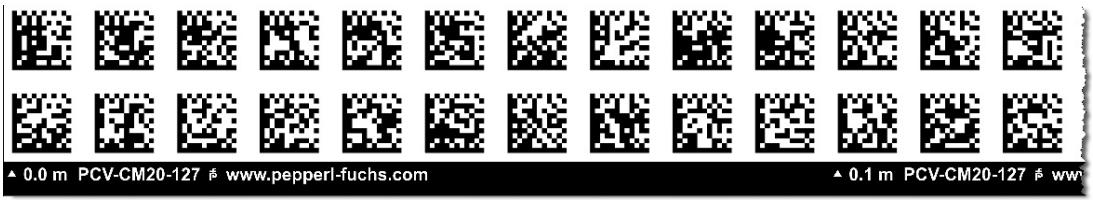
Example calculation

At a speed of 3 m/s and with a trigger period of 25 ms, the minimum length of the event marker is therefore:
$L_{event\ marker} = 30\ mm + 3\ m/s * 0.025\ s * 2 =$ **180 mm**

Note!

When placing an event marker on the code strip, make sure that the event marker represents an accurate continuation of the grid on the code strip where possible.

The printed event number and the inverted text identify event markers in contrast to the identification on code strips (white text on a black background).



The illustration shows part of the event marker #127

Refer to the Accessories chapter for order information relating to event markers.

7.3 Operation with Repair Tape

The repair tape is a short code reel with a length of one meter. The repair tape is used to bridge defective or damaged areas of an existing code reel.

1. Cut the repair tape to the required length
2. Cover the defective area of the code reel with the repair tape

Note!

When placing a repair tape on the code reel, make sure that the repair tape represents as accurate a continuation of the grid on the code reel as possible.

When the read head enters the range of a repair tape, it sets an event flag in the output data. You also have the option of triggering a defined action when an event occurs by parameterizing one of the outputs accordingly (see parameterization software description). Actions of this type can be initiated when a certain event, all events, or events from an event list occur.

Note!

The repair tape works incrementally. In so doing, it adds one value to the previous read position on the code reel. If the read head starts on a repair tape, the read head reports an error. Move the read head to a position on the code reel away from the repair tape to read the absolute value.

Tip

If repairs are required, the **Code Reel Generator** at www.pepperl-fuchs.com can be used as a short-term workaround. This allows code reel segments to be generated and printed out online.

Enter the start value in meters and the code reel length of the section to be replaced in meters. This produces a printable PDF file with the required segment of the code reel.

Only use the printout as an emergency solution. The durability of the paper strip varies greatly depending on the application!

Refer to the Accessories chapter for order information relating to repair tape.

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8 Appendix

8.1 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.

8.1.1 Code Cards With Special Functions

The following code cards have special functions:

- ENABLE
- STORE
- CANCEL
- USE
- DEFAULT

The code card "ENABLE"

Figure 8.1 The code card "ENABLE" is used to activate external parameterization operating mode.

The code card "STORE"

Figure 8.2 The code card "STORE" stores the modified parameterization in the non-volatile memory of the reading head and terminates external parameterization operating mode.

The code card "CANCEL"

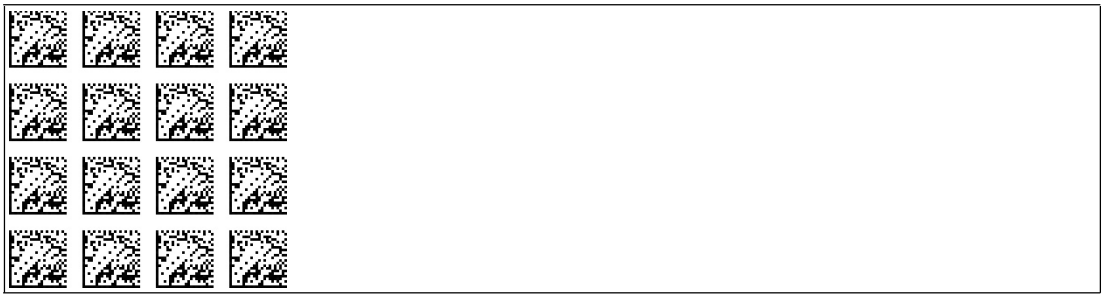

Figure 8.3 The code card "CANCEL" discards the modified parameterization and terminates external parameterization operating mode. The reading head switches to normal mode and adopts the last valid configuration that was saved.

The "USE" code card

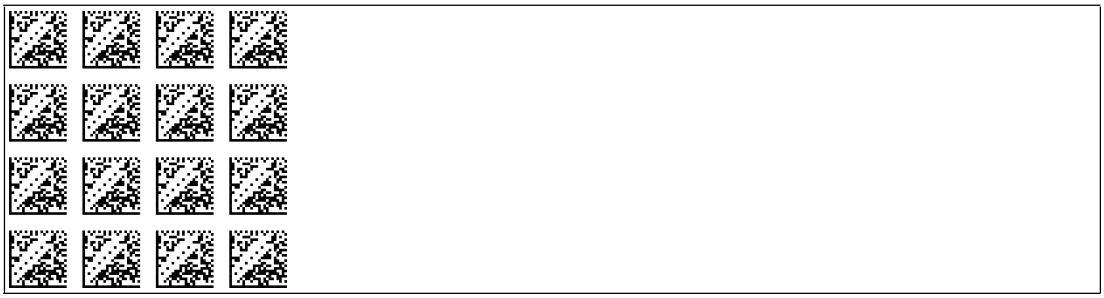

Figure 8.4 The "USE" code card takes over the set configuration **volatile** in the read head working memory and terminates the external parameterization operating mode. The read head then operates with this configuration. However, if the read head is switched off and on again, the configuration is lost and the read head operates with the last valid configuration that was saved. This function is used primarily for test purposes.

The "DEFAULT" code card

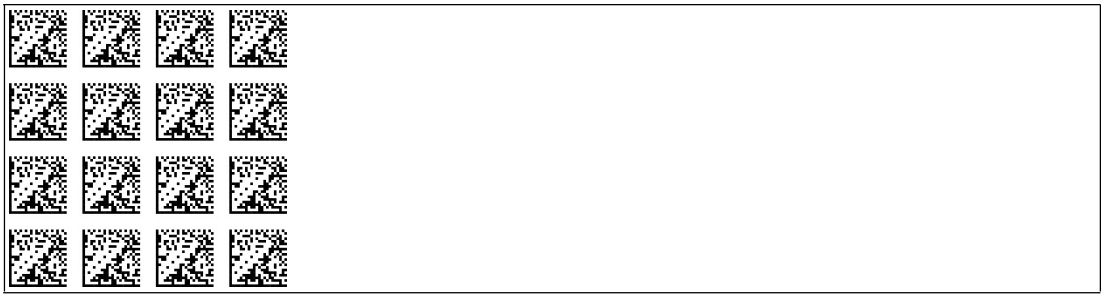

Figure 8.5 The "DEFAULT" code card restores the read head settings to default and terminates external parameterization operating mode.

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8.1.2 Code cards for adjusting the output code

The reading head can transmit the data in a binary or gray code.

Digital code

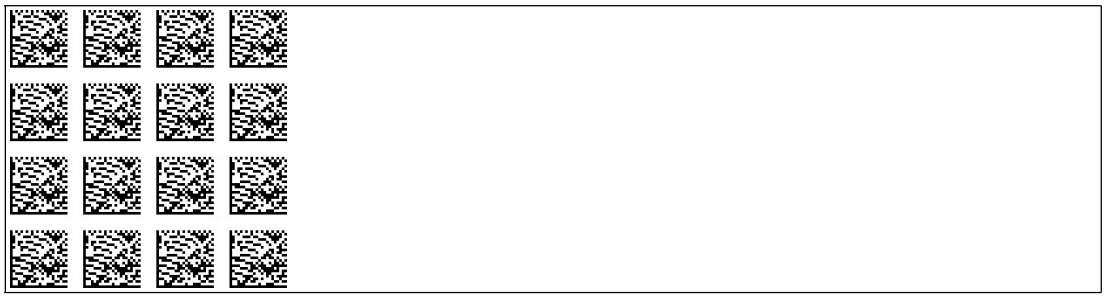

Figure 8.6 The code card assigns the data transfer to the reading head in the digital code.

Gray code

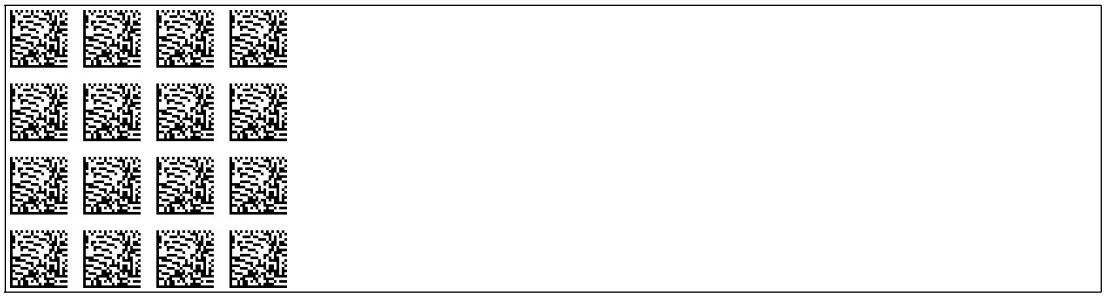

Figure 8.7 The code card assigns the data transfer to the reading head in the gray code.

8.1.3 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

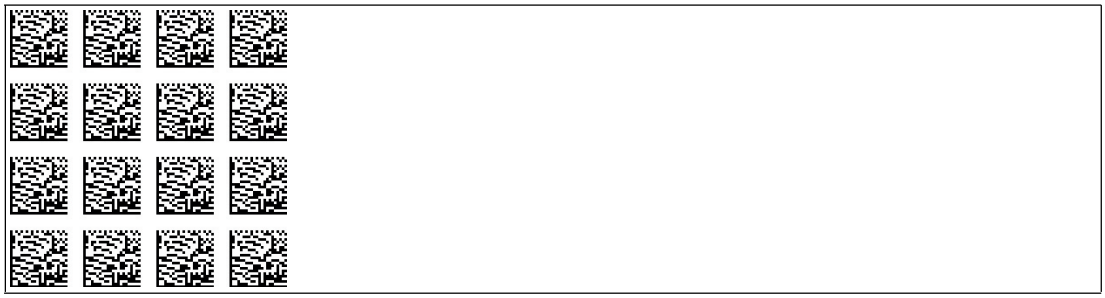

Figure 8.8 The code card assigns a position data resolution of 0.1 mm / 1 mm / 10 mm to the reading head.

Resolution: 1 mm

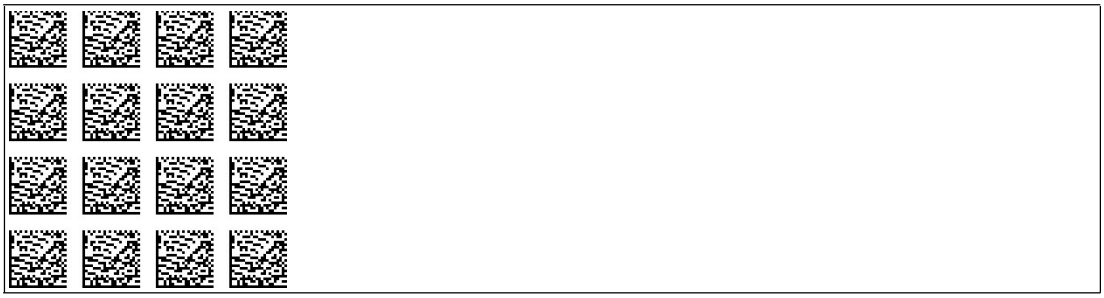

Figure 8.9 The code card assigns a position data resolution of 0.1 mm / 1 mm / 10 mm to the reading head.

Resolution: 10 mm

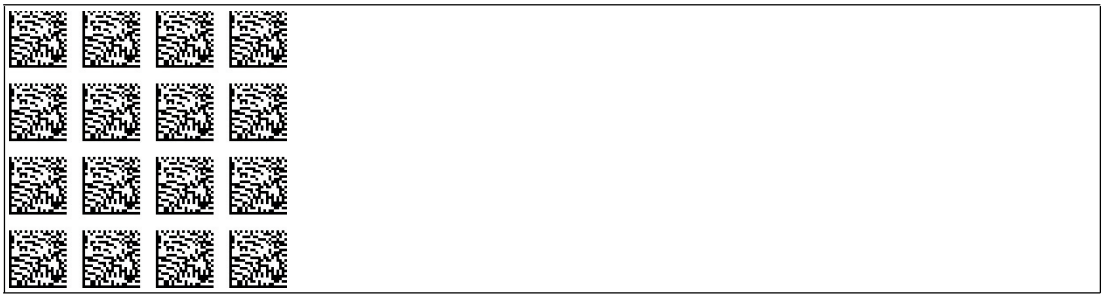

Figure 8.10 The code card assigns a position data resolution of 0.1 mm / 1 mm / 10 mm to the reading head.

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	10

8.1.4 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 automatic detection in 90° increments.

Orientation 0°

Figure 8.11 The code card assigns the orientation 0° to the read head.

Orientation 180°

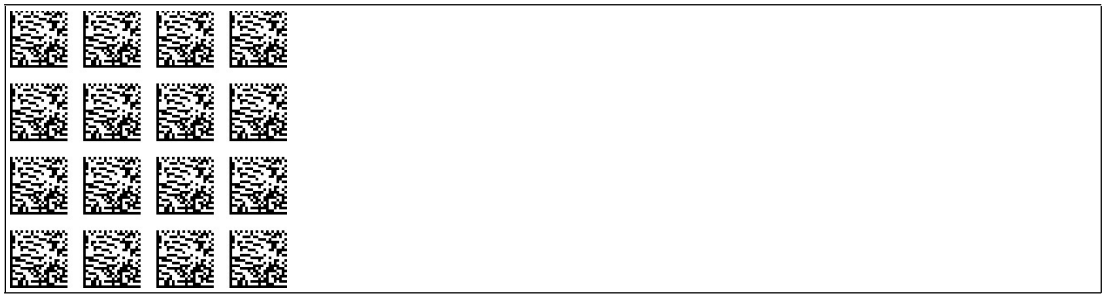

Figure 8.12 The code card assigns the orientation 180° to the read head.

Orientation 0° or 180°

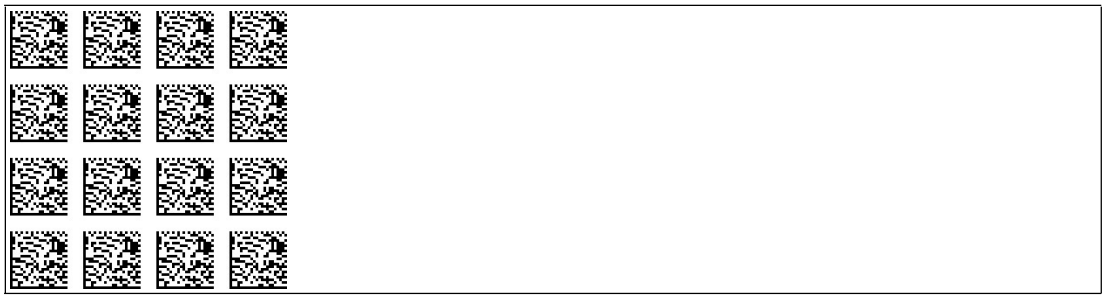

Figure 8.13 The code card automatically assigns the orientation 0° or 180° to the read head.

Orientation 0°, 90°, 180°, or 270°

Figure 8.14 The code card automatically assigns the orientation 0°, 90°, 180°, or 270° to the read head.

8.1.5 Code cards for controlling image capture

Parameterization allows you to assign various methods for controlling image capture to the reading head.

Trigger source: auto

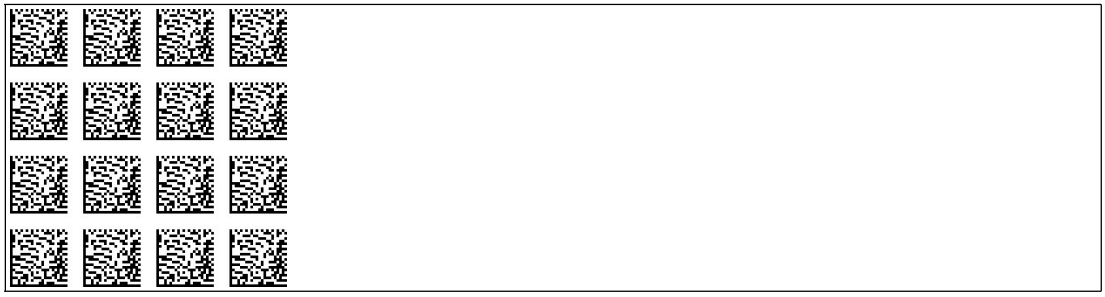

Figure 8.15 The image capture is controlled automatically by an internal pulse generated in the reading head.

Trigger source: hardware

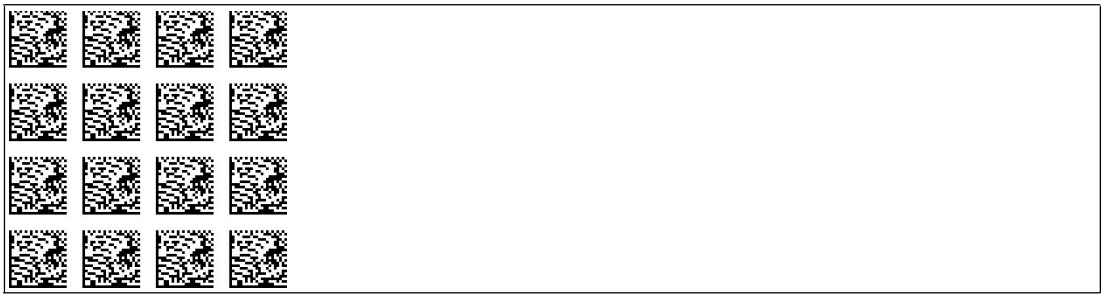

Figure 8.16 The image capture is controlled by a trigger signal at one of the reading head inputs, which can be an electrical signal from a controller or an external sensor, for example. The image is captured immediately.

8.1.6 Code cards for adjusting input / output 2

Parameterization enables you to assign various functions to input / output 2 on the reading head. The following input / output functions are available:

- Input: none
- Input: trigger
- Output: none
- Output: speed exceeded
- Output: warning
- Output: fault
- Output: contamination
- Output: event
- Output: no position

Input 2: no function

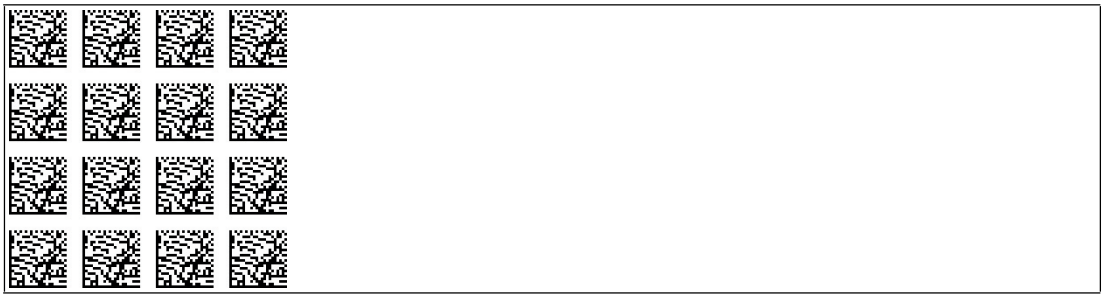

Figure 8.17 Input/output 2 is defined as an input but has no function.

Input 2: trigger

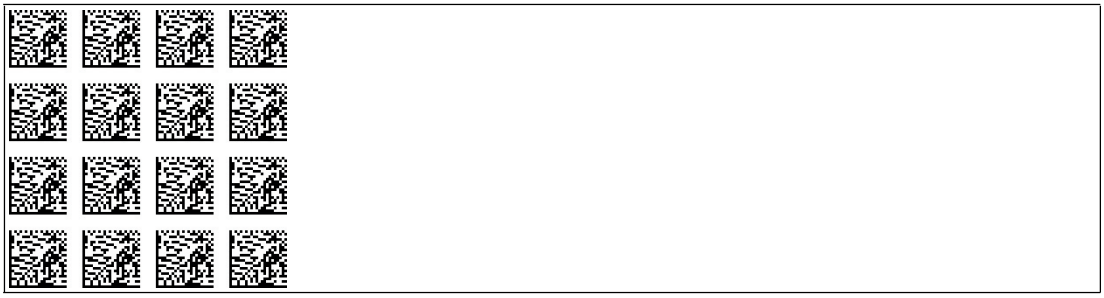

Figure 8.18 Input/output 2 is defined as an input for external triggers.

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Output 2: no function

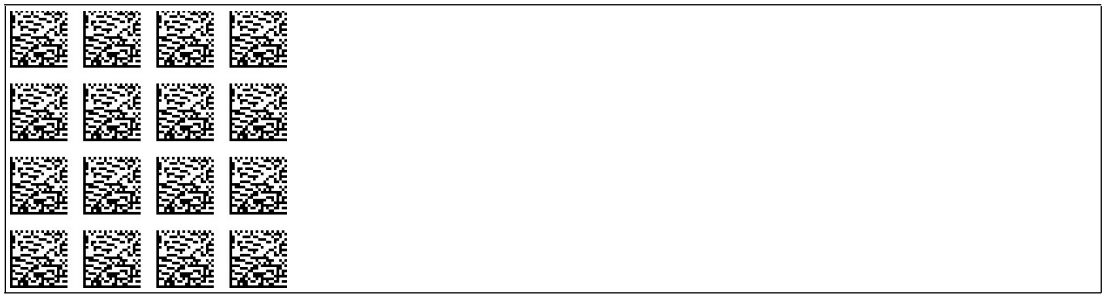

Figure 8.19 Input/output 2 is defined as an output but has no function.

Output 2: speed exceeded

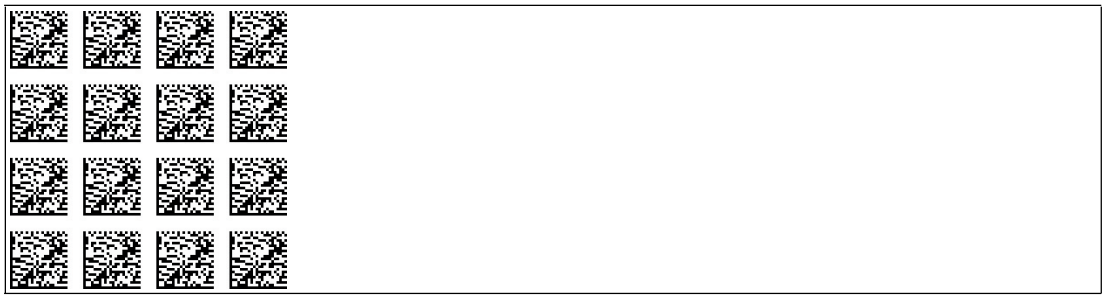

Figure 8.20 Input/output 2 is defined as an output. This output carries the potential $+U_B$ if the speed exceeds the defined maximum speed.

Output 2: Warning

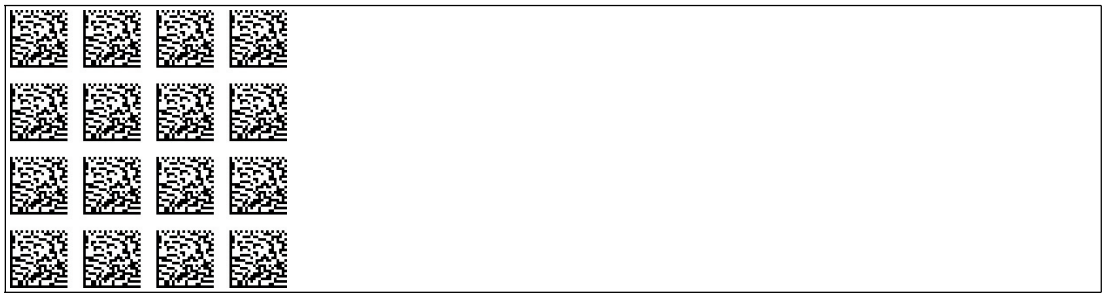

Figure 8.21 Input/output 2 is defined as an output. This output carries the potential $+U_B$ as long as a warning message is present in the read head.

Output 2: Fault

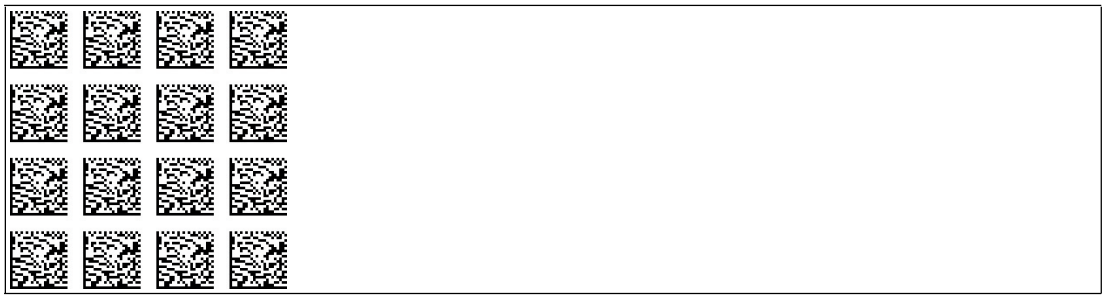

Figure 8.22 Input/output 2 is defined as an output. This output carries the potential $+U_B$ as long as an error message is present on the read head.

Output 2: Pollution

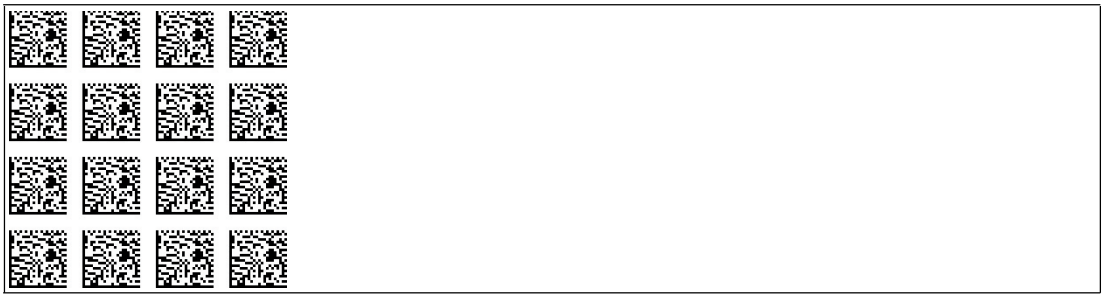

Figure 8.23 Input/output 2 is defined as an output. This output carries the potential $+U_B$ as long as a pollution message is present in the read head.

Output 2: Event

Figure 8.24 Input/output 2 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.

Output 2: no position

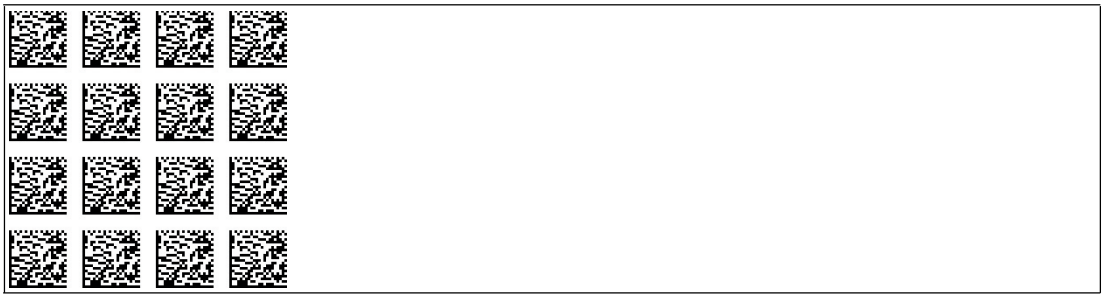

Figure 8.25 Input/output 2 is defined as an output. This output carries the potential $+U_B$ when the reading head is not reading position information.

8.1.7 Code cards for adjusting input / output 3

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

- Input: none
- Input: trigger
- Output: none
- Output: speed exceeded
- Output: warning
- Output: fault
- Output: contamination
- Output: event

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- Output: no position

Input 3: no function

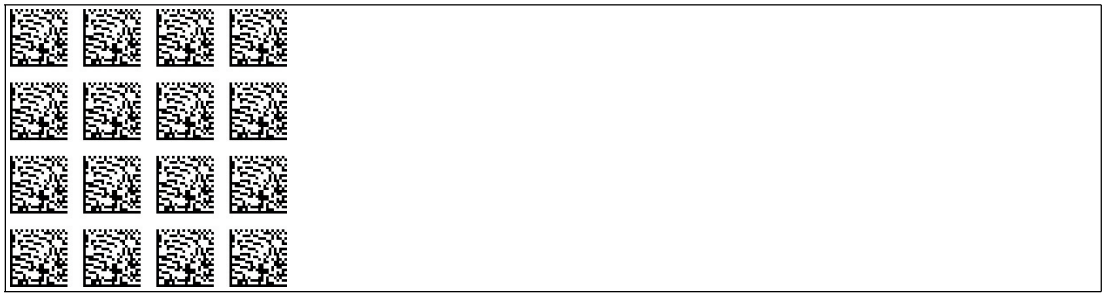

Figure 8.26 Input/output 3 is defined as an input but has no function.

Input 3: trigger

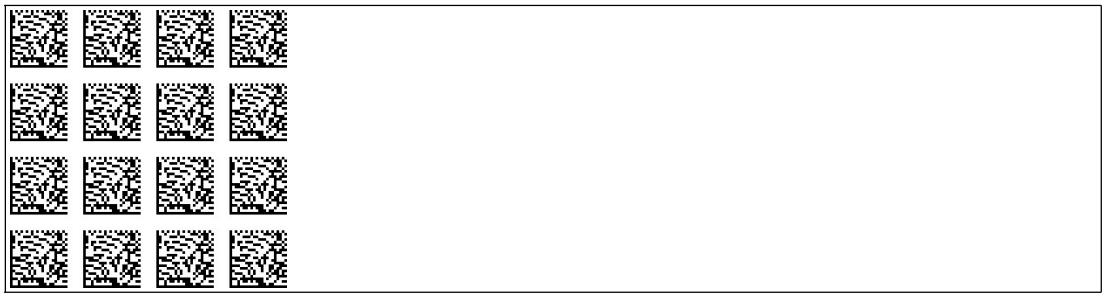

Figure 8.27 Input/output 3 is defined as an input for external triggers.

Output 3: no function

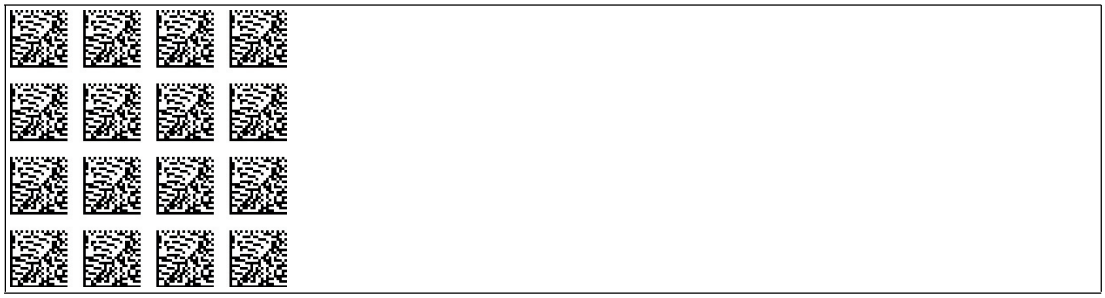

Figure 8.28 Input/output 3 is defined as an output but has no function.

Output 3: speed exceeded

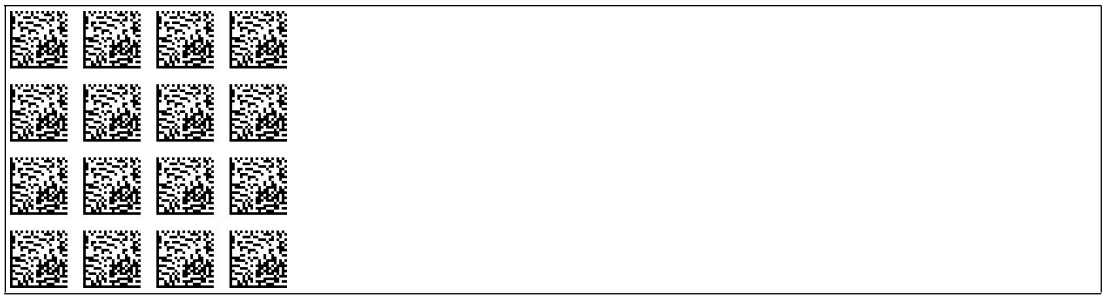

Figure 8.29 Input/output 3 is defined as an output. This output carries the potential $+U_B$ if the speed exceeds the defined maximum speed.

Output 3: Warning

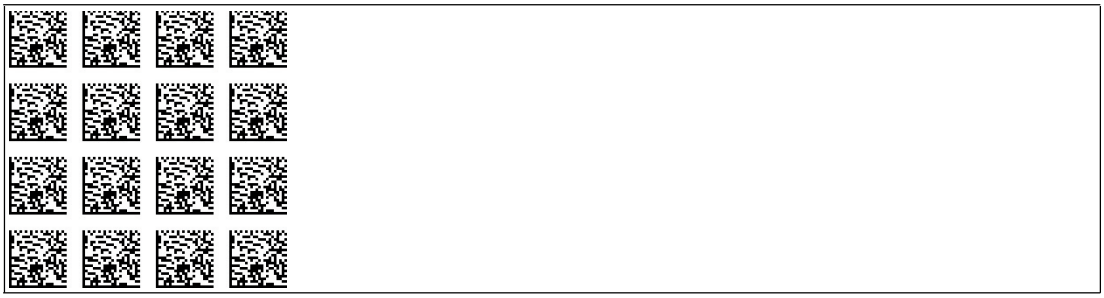

Figure 8.30 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as a warning message is present in the read head.

Output 3: Fault

Figure 8.31 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: Pollution

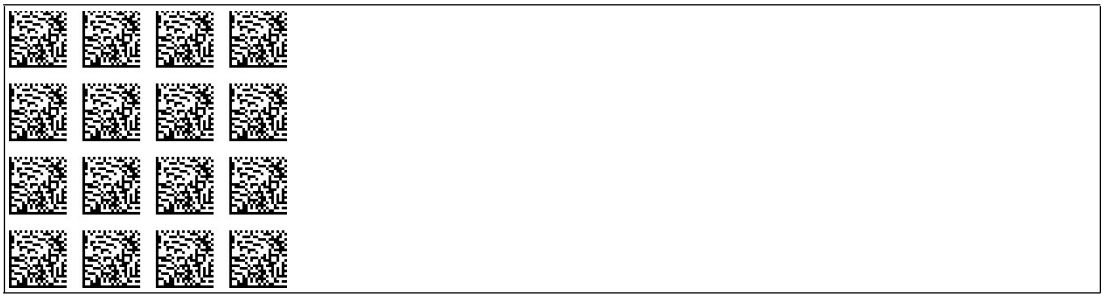

Figure 8.32 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as a pollution message is present in the read head.

Output 3: Event

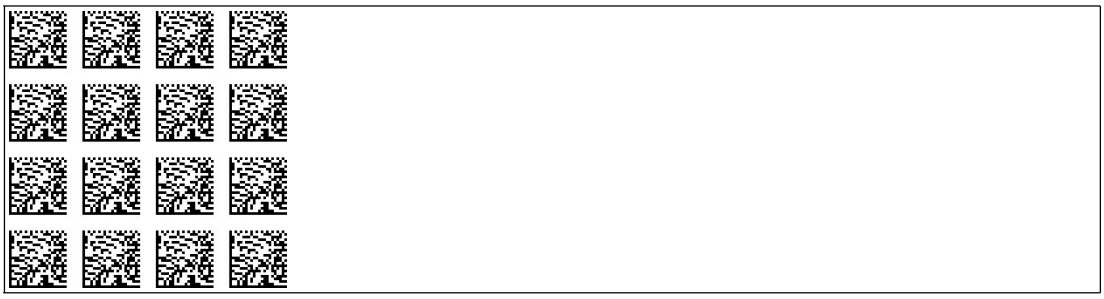

Figure 8.33 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as an event marker is present in the read field of the read head.

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Output 3: no position

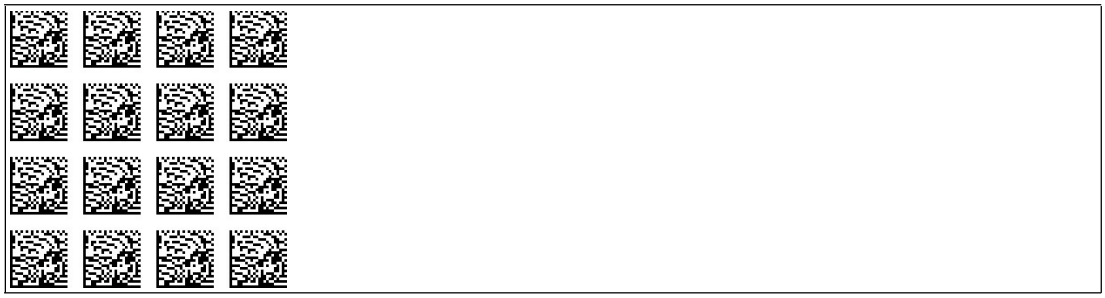

Figure 8.34 Input/output 3 is defined as an output. This output carries the potential $+U_B$ when the reading head is not reading position information.

FACTORY AUTOMATION – SENSING YOUR NEEDS

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