PGV...-F200/-F200A...-R4-V19

Incident Light Positioning System

Manual

CE

Your automation, our passion.

PEPPERL+FUCHS

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1 Safety

1.1 Introduction

1.1.1 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

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

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

1.1.2 Manufacturer

Pepperl+Fuchs Group Lilienthalstraße 200, 68307 Mannheim, Germany
Internet: www.pepperl-fuchs.com

1.1.3 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.

1.1.4 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

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

2 Product Description

2.1 Use and Application

Intended Use

This device, when used together with a colored tape affixed to the floor and code tapes printed with Data Matrix codes, constitute a high-resolution lane tracking and positioning system. It can be used in all applications where automated guided vehicles (AGV) are to be positioned precisely at marked positions along a given lane.

The read head forms part of the positioning system in the Pepperl+Fuchs incident light process. The read head's features include a camera module and an integrated illumination unit. The read head uses these features to detect a colored tape stuck to the floor or a painted color lane to track the lane. The read head detects Data Matrix tags to navigate within a grid. The read head also detects control codes and position markers in the form of Data Matrix codes printed on a self-adhesive code tape. Data Matrix code tapes and Data Matrix tags have priority over colored tapes or colored lanes.

The Data Matrix code tapes are installed in a fixed position instead of or along with the colored tape. The read head is located on an automated guided vehicle (AGV) and guides this vehicle along the colored tape.

Note

Priority

Data Matrix code tapes and Data Matrix tags have priority over colored tapes or colored lanes.

If the read head detects a Data Matrix code tape or Data Matrix tags in the field of view, colored tapes or colored lanes in the field of view are ignored.

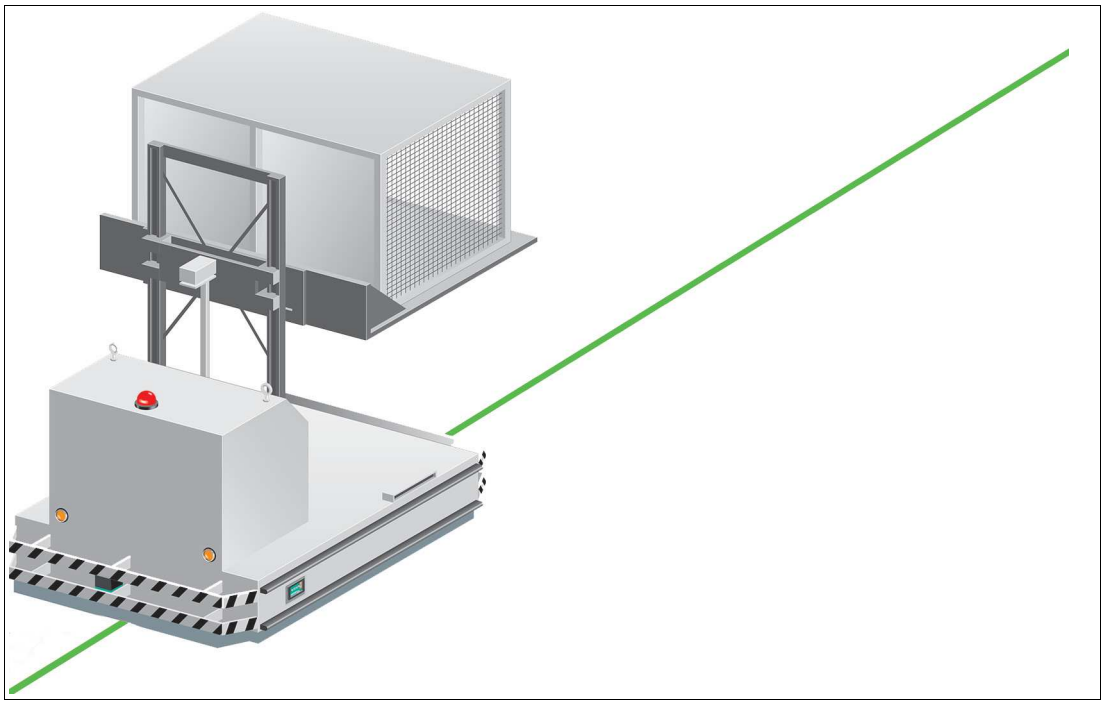


Figure 2.1 Automated guided vehicle with green colored tape

Tag Mode

In addition to the tracking, you can use the read head in tag mode. The read head detects Data Matrix tags, which are typically glued onto the floor in a grid. The individual Data Matrix tags are numbered consecutively and include position information. The read head reports the position of the AGV in relation to the zero point of the Data Matrix tag to the controller.

The tag mode allows the AGV to move freely in as large a grid as desired, without having to mark the crossing paths with lane tapes.

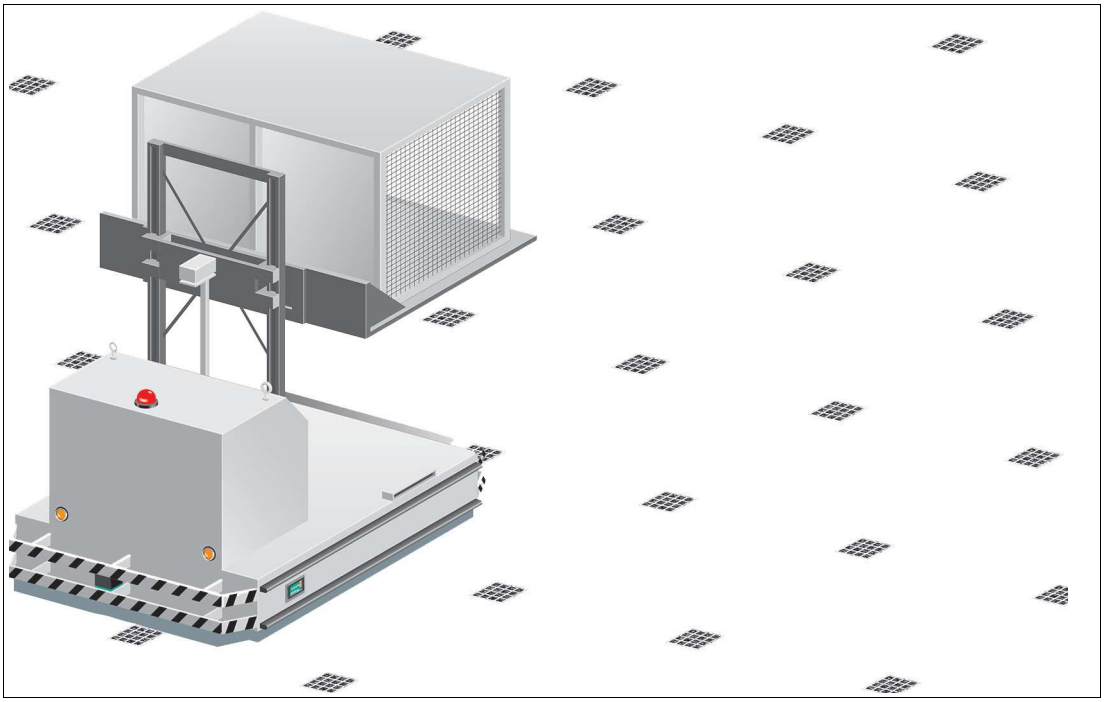


Figure 2.2 Automated guided vehicle with Data Matrix tags

The read head switches automatically between tag mode and lane tracking. This allows an automated guided vehicle to be guided from one Data Matrix tag grid via a colored or Data Matrix lane to another Data Matrix tag grid.

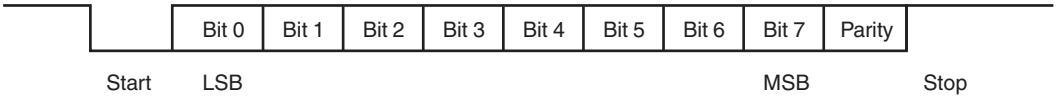
The extensive yet user-friendly parameterization options as well as the configurable inputs and outputs mean that the read head can easily be adapted to suit each application.

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 Controls

The read head is equipped with seven indicator LEDs for carrying out visual function checks and rapid diagnostics. The read head is equipped with two buttons at the back for activating parameterization mode. Button 1 is labeled ADJUST. Button 2 is labeled CONFIG.

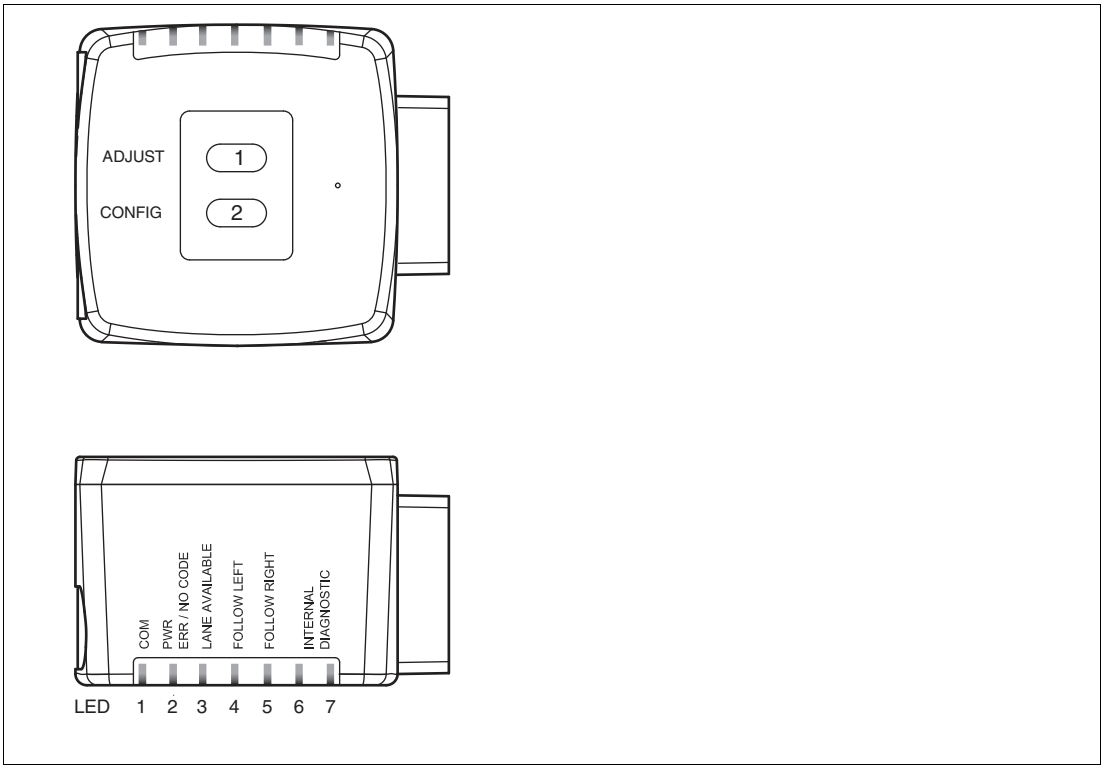


Figure 2.3

LED	[#1] COM	[#2] PWR ERR/NO CODE	[#3] LANE AVAILABLE	[#4] FOLLOW LEFT	[#5] FOLLOW RIGHT	[#6] & [#7] INTERNAL DIAGNOSTIC	
Color	**Yellow**	**Green/ red**	**Yellow**	**Yellow**	**Yellow**	**Red/ green/ yellow**	**Description**
Status	x[1]	Flashes red	x	x	x	x	Code tape outside read range f_{flash} = 2 Hz
	x	Lights up red	x	x	x	x	System errorError Codes40[2]
	x	Lights up green	x	x	x	x	Code tape detected, absolute position available
	x	x	Lights up	x	x	x	Colored tape detected
	x	x	Off	x	x	x	Colored tape outside read range
	x	x	x	Off	Off	x	No direction selection activated4[3]
	x	x	x	Lights up	Off	x	"Follow left-hand lane" activated
	x	x	x	Off	Lights up	x	"Follow right-hand lane" activated
	x	x	x	Lights up	Lights up	x	"Straight ahead" activated
	Flashes	x	x	x	x	x	RS-485 data transfer
	Flashes	Flashes red	Flashes	Flashes	Flashes	Off	Normal operation. Indication for 2 secs if a button is pressed when the time lock is enabled.
	Off	Red, 3 sec	Flashes	Off	Off	Off	Code card faulty f_{flash} = 2 Hz for 3 sec
	Off	Green, 1 sec	Flashes	Off	Off	Off	Code card detected f_{flash} = 2 Hz for 1 sec
	x	Off	x	x	x	Off	Time lock for buttons disabled
	x	x	x	x	x	Lights up	Internal error Return to Pepperl+Fuchs

Table 2.1

1. LED status has no meaning
2. No lane selected, for example. .see table "Error Codes" on page 40
3. See chapter 4

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 maintaining 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
PGV-CC25-0*	Data Matrix control codes
PGV*M-CA25-*	Data Matrix position tape
PGV-CR25	Repair tape
PGV85-CT4	Data Matrix tag
PGV25M-CD100-CLEAR	Protective film for code and colored tape
PGV33M-CB19-BU	Colored tape; blue
PGV33M-CB19-GN	Colored tape; green
PGV33M-CB19-RD	Colored tape; red
PCV-SC12 PCV-SC12A	Grounding clip
V19-G-ABG-PG9-FE	Grounding terminal and plug (set)
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
V19-G-*M-*	Configurable connection cable[1]

1. Ask your contact person at Pepperl+Fuchs

3 Installation

3.1 Mounting the Read Head

Mount the PGV... read head on the automated guided vehicle using the four screws on the mounting adapter on the read head. Mount the read head in such a way that the lens with the ring light and camera module are directed toward the colored tape.

The mounting must be stable enough so that the read head does not leave its depth of focus range during operation.

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

Optimum Read Distance

Order designation	Read distance [mm]	Depth of focus [mm]	Field of vision (w x h) [mm]
PGV100*	100	±20	117 x 75
PGV150I*	150	±30	170 x 105

Hysteresis

If the read head has detected a colored tape, this colored tape can move in the Y direction from the zero point within the viewing window. The maximum Y value at which the read head can still capture this distance is designated as **Y Value Out** in the following table.

If the read head swivels onto a colored tape, the read head can capture the distance of the colored tape from the zero point only if the tape is less than a certain distance away from the zero point. This distance is designated as **Y value In** in the following table. The difference between Y Value Out and Y Value In is the hysteresis. See "Distance Output" on page 18.

Order designation	Max. Y Value Out [mm]	Min. Y Value In [mm]
PGV100*	60	45
PGV150I*	60	60

Read Head Dimensions

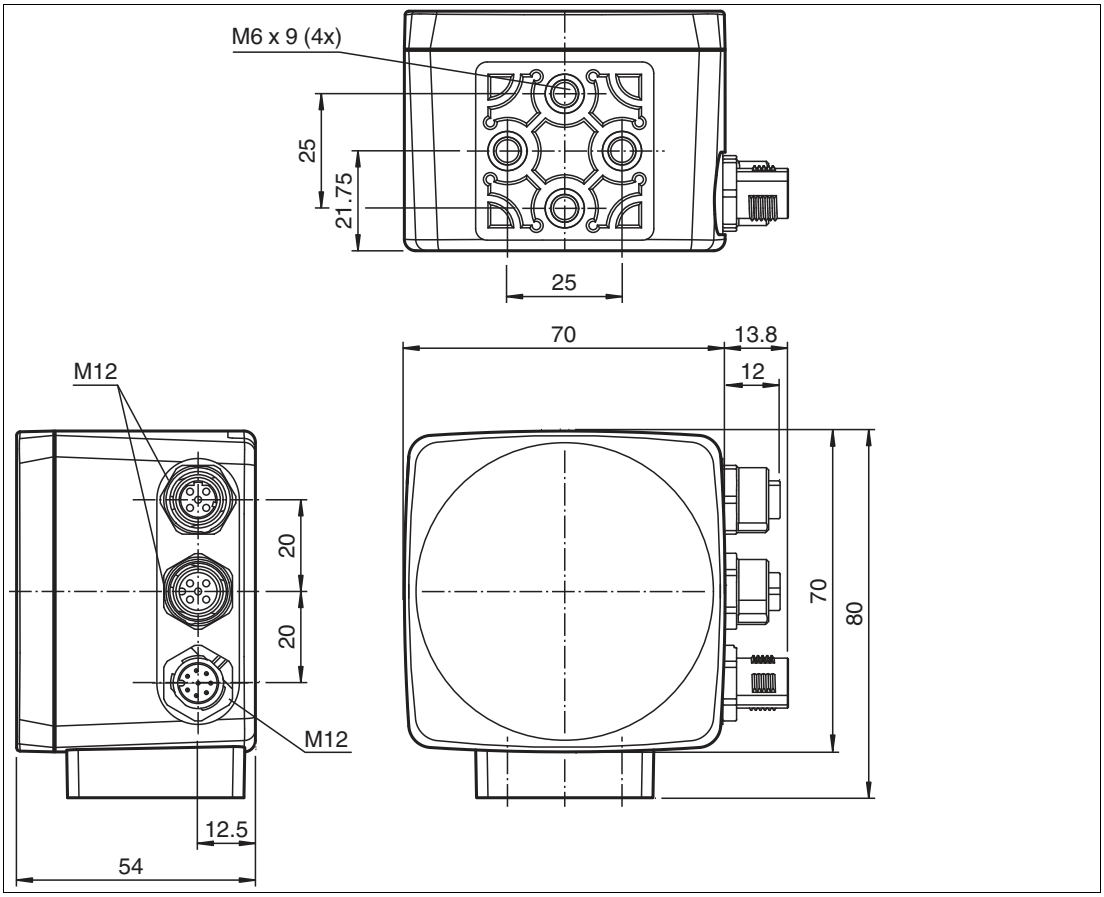


Figure 3.1 Housing *-F200-*

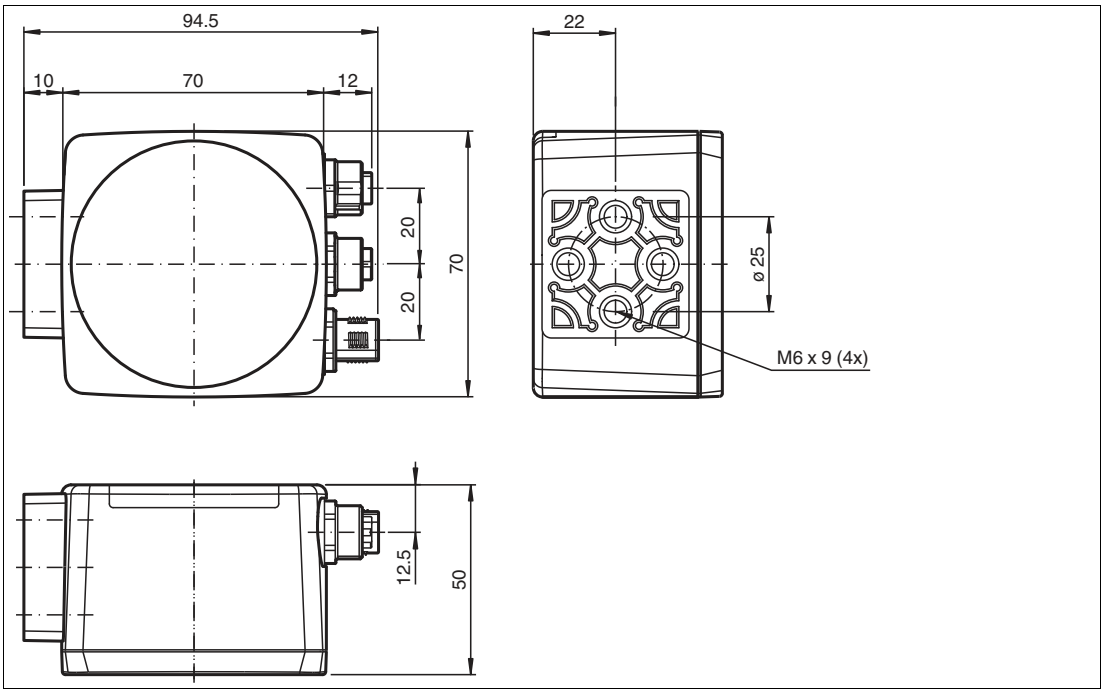


Figure 3.2 Housing *-F200A-*

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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 read head is 8 mm.

Using longer screws may damage the read head.

Caution!

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

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

3.2 Mounting the Colored Tape and Code Tape

Colored tape

The colored tape must be flexible, conformable, and resistant to abrasion, with a matte finish.

The colored tape must meet the following specifications:

- Tape width: 10 mm ... 40 mm
- Color of the tape
  - Blue = RAL 5015
  - Green = RAL 6032
  - Red = RAL 3001
- Tape thickness > 0.1 mm
  The thickness of the tape is irrelevant to read head operation.
- Breaking load > 25 N/cm
- Breaking elongation > 180%
- Adhesive strength > 2 N/cm
- Temperature resistance: -20 °C ... 70 °C

Secure the colored tape to the floor such that the following conditions are met:

- Data Matrix code tapes for positioning are used instead of the colored tape.
- Data Matrix control codes are positioned parallel to the colored tape.

Color Selection

Select the color of the colored tape so that the contrast between the floor color and the color of the colored tape is as great as possible. Ideally, use the complementary color.

Due to the integrated lighting of the read head, some floor colors appear to be different in the camera. If you have problems with the color selection of the colored tapes, please consult your contact at Pepperl+Fuchs.

Mounting the Colored Tape

1. Clean the surface of any greasy or oily deposits and dust.
2. Ensure that the surface is dry, clean, and stable.
3. Please observe the following section "Basics" when mounting the colored tape and, if necessary, the instructions from the colored tape manufacturer.

Note

Priority

Data Matrix code tapes and Data Matrix tags have priority over colored tapes or colored lanes.

If the read head detects a Data Matrix code tape or Data Matrix tags in the field of view, colored tapes or colored lanes in the field of view are ignored.

Cleaning Colored Tape/Code Tape

Significant contamination on the colored or code tapes can impair the detection by the read head. Clean the colored and code tapes with isopropanol if necessary. If the contamination is severe, you can use a non-corrosive plastic cleaner, e.g., Caramba®.

Note

To avoid polishing the surface, do not apply strong pressure when cleaning. A shiny surface of the colored or code tapes leads to impairment in detection by the read head.

Basics

The read head detects a colored tape on a floor as a lane. The width of the colored tape must be between 10 mm and 40 mm; the default width is 18 mm. The zero point is located in the center of the colored tape. You can use 3 defined colors. See the section entitled "Colored tape"

The sensor always moves in the X direction. In the sensor's field of view, X indicates an upward movement.

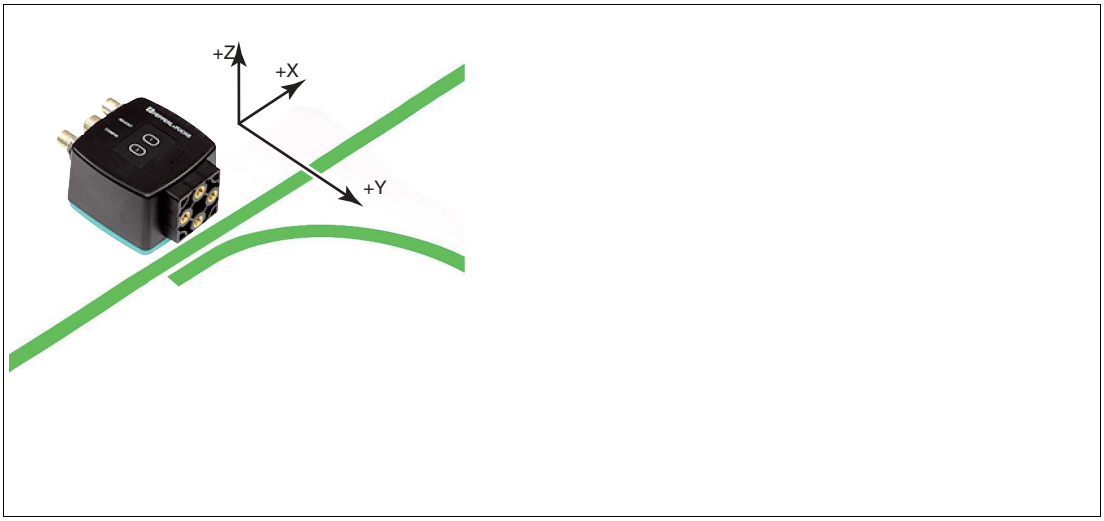

Figure 3.3 Field of view and coordinates of the sensor

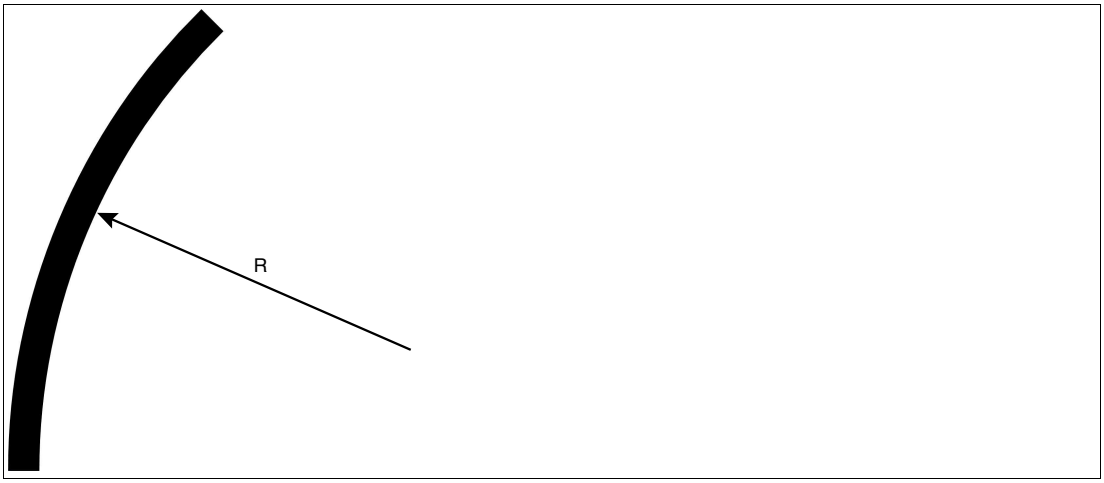

Figure 3.4 Curve radius: R ≥ 50 cm

Select a curve radius that can handle the turning circle of your automated guided vehicle. The colored tape must always be located in the reading window of the read head.

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Angle Output

Note

Angles are specified as absolute values. The respective value is calculated from the resolution selected under "Angle Resolution". With a resolution of 0.1°, an angle of **60**° is output as 60°/0.1° = **600**.

The read head detects a change of the angle of the colored tape and the Data Matrix code tape and outputs this value to the controller. The output value is different for colored tapes and Data Matrix code tapes.

Colored tape

The read head detects the angle in relation to the tracked lane with a resolution of 360 (corresponds to 1°). The angle is specified relative to the tracked lane because a colored tape does not include any direction information. The output angle covers the range from -45° to 45°. The resolution is 1°.

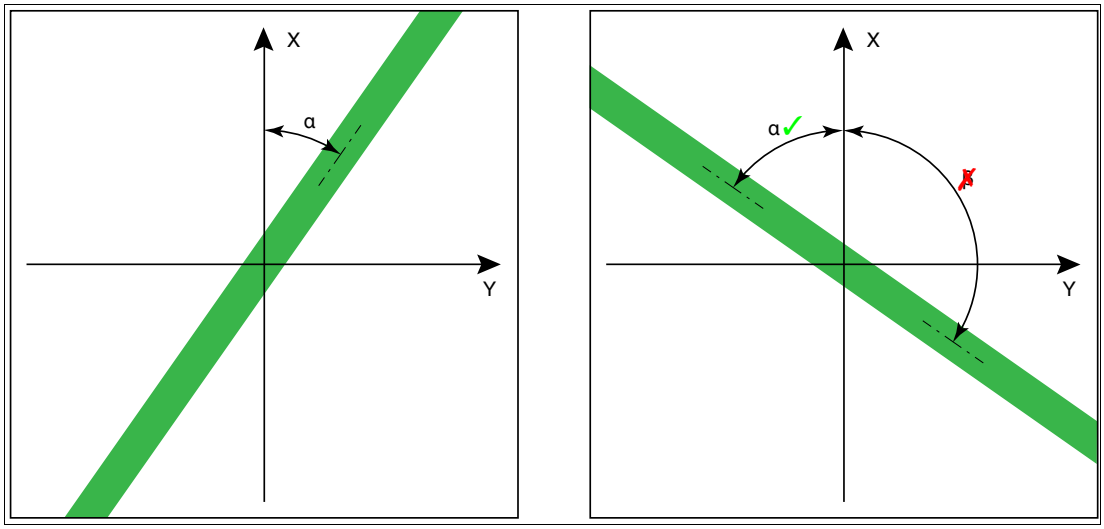

Figure 3.5 Relative angle

Data Matrix code tape

The read head detects the absolute angle in relation to the tracked lane with a maximum resolution of 0.1°. The angle is specified absolutely relative to the tracked lane, since a Data Matrix code contains tape direction information. The output angle covers the range from 0° to 360°. The resolution can be set to the following values:

- 0.1°
- 0.2°
- 0.5°
- 1°

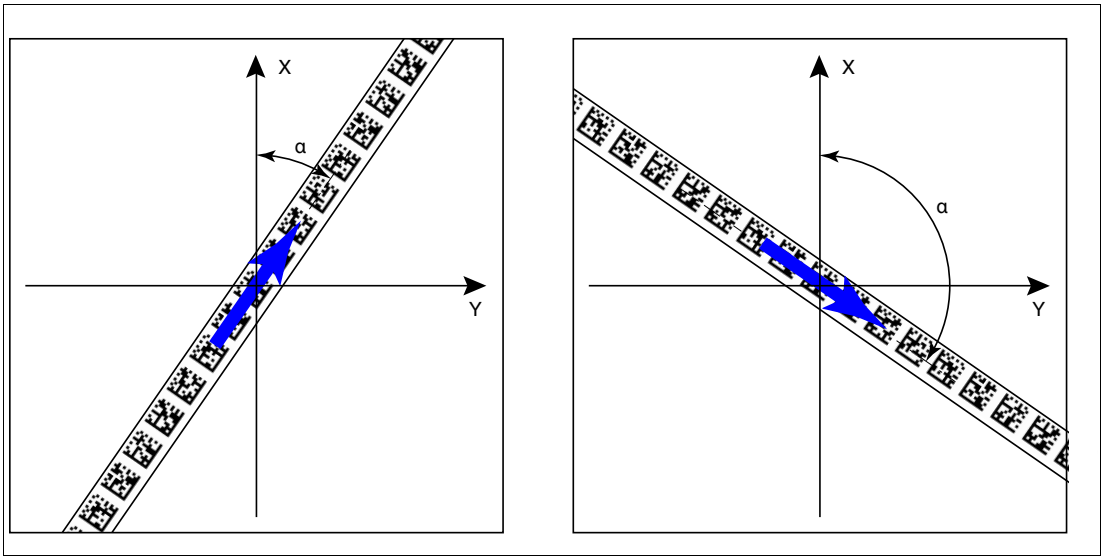

Figure 3.6 Absolute angle

Distance Output

The read head detects the distance from the zero point in the Y direction of a colored tape or a Data Matrix code tape and outputs this value to the controller. The output value is different for colored tapes and Data Matrix code tapes due to the lack of an X position for colored tapes.

Colored tape

The read head outputs the Y value at which the colored tape intersects the Y axis as the distance.

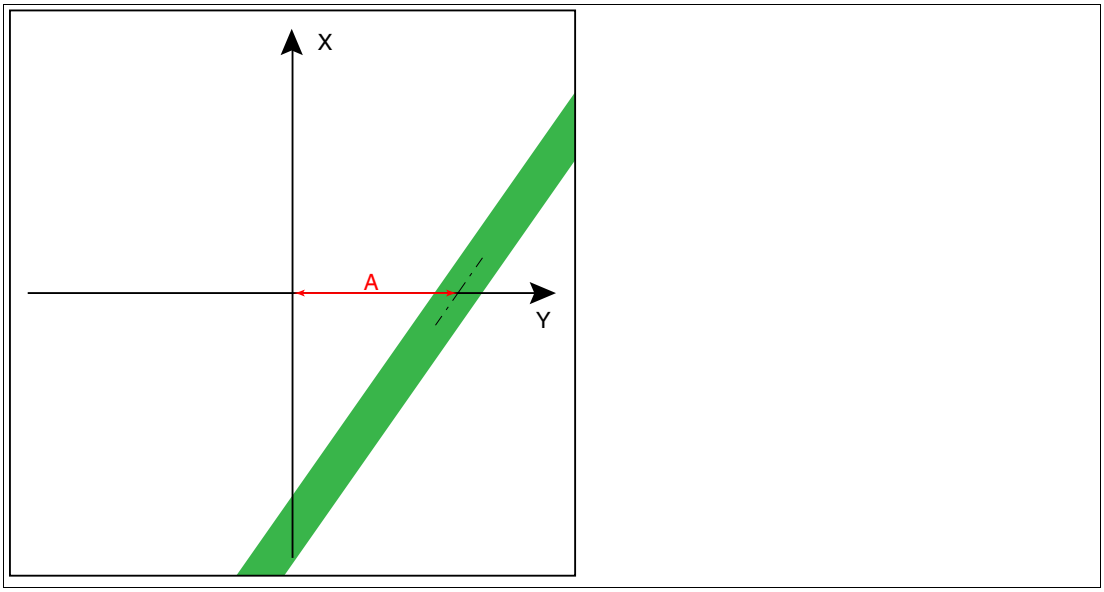

Figure 3.7 Distance A for colored tape

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Data Matrix code tape

The read head indicates the vertical distance of the zero point in relation to the Data Matrix code tape.

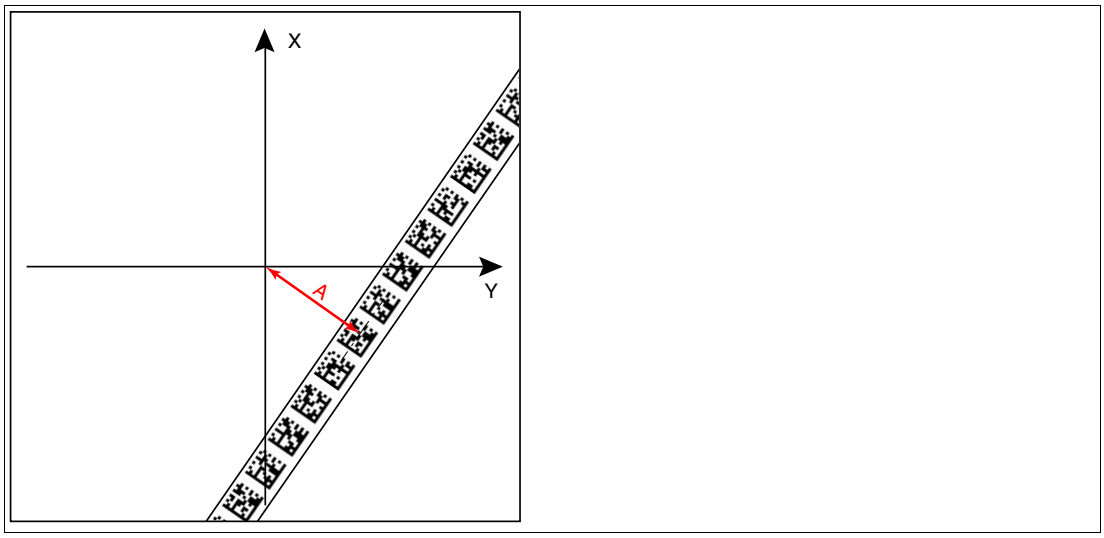


Figure 3.8 Distance A for Data Matrix code tape

Branches

The read head detects one lane at the lower edge of the field of vision and two lanes at the upper edge of the field of vision; the read head indicates this as a branch.

The read head detects two lanes at the lower edge of the field of vision and one lane at the upper edge of the field of vision; the read head indicates this as an intersection.

Branches or intersections can be displayed as follows:

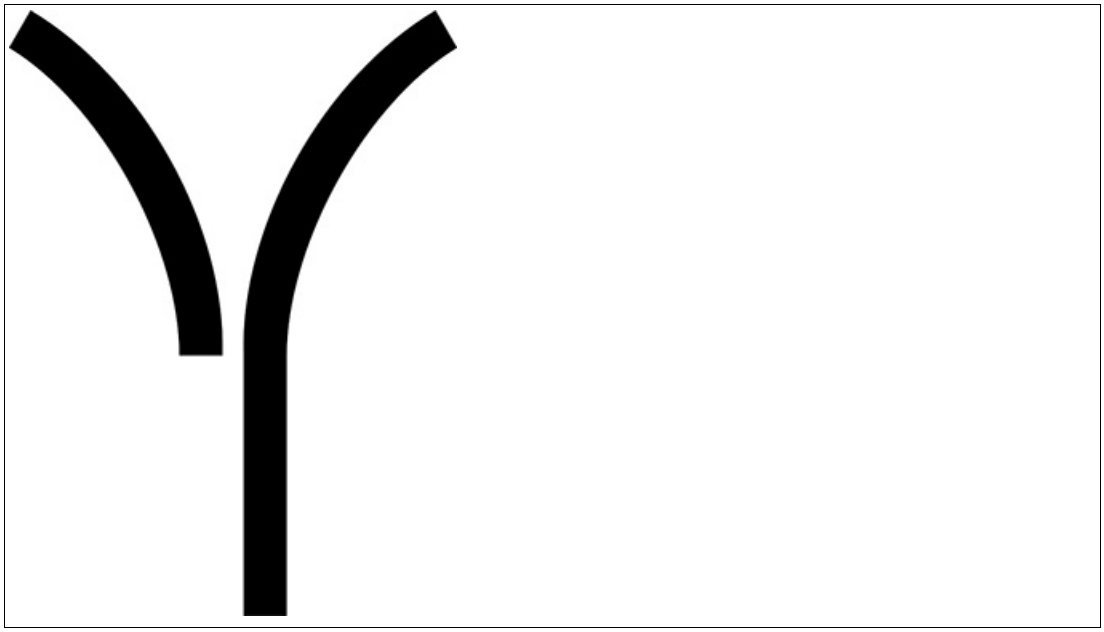


Figure 3.9 Separate lane branches off/converges

The read head can make the following direction decisions based on the lane and possible branches:

- Follow left-hand lane
- Straight ahead
- Follow right-hand lane

The direction decision is signaled to the read head via the controller. If there is no direction decision, the read head displays an error message.

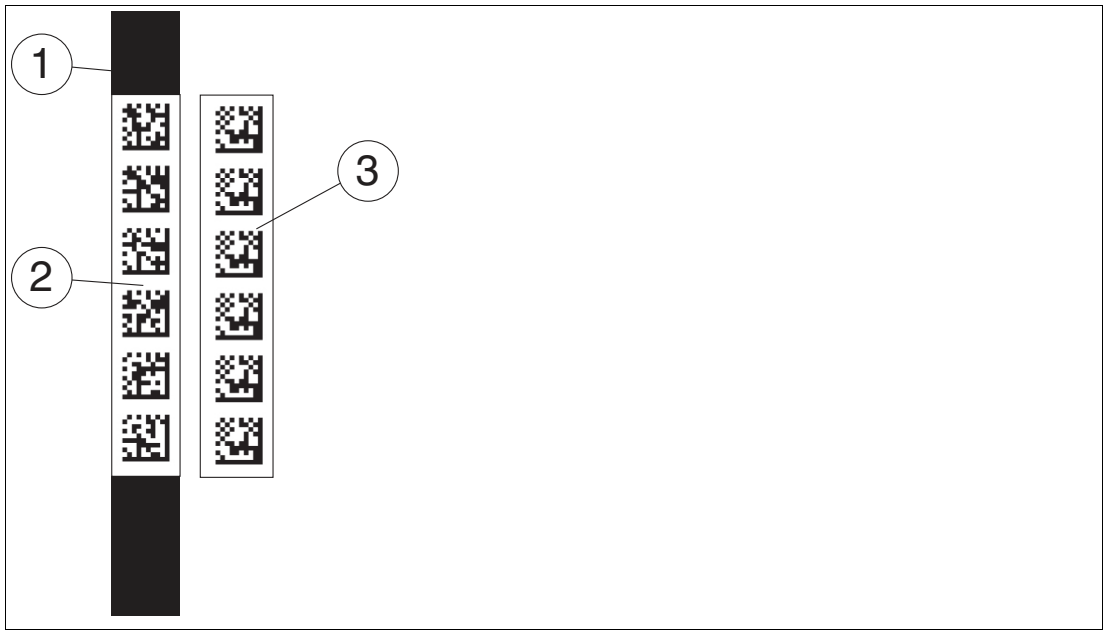
Code Tapes for Control and Positioning

In addition to tracking the lane, the read head can also detect Data Matrix codes. This process involves evaluating both control and position information. Data Matrix control codes are used as event markers. Control codes provide information on branches. Data Matrix code tapes for positioning indicate the absolute position of the read head.

Note the following conditions:

Data Matrix code tapes for positioning are used instead of the colored tape.

Data Matrix control codes are used in tandem with the colored tape or Data Matrix position code.



1 Colored tape
2 Data Matrix position code
3 Data Matrix control code

Branches or intersections with position information can be displayed as follows:

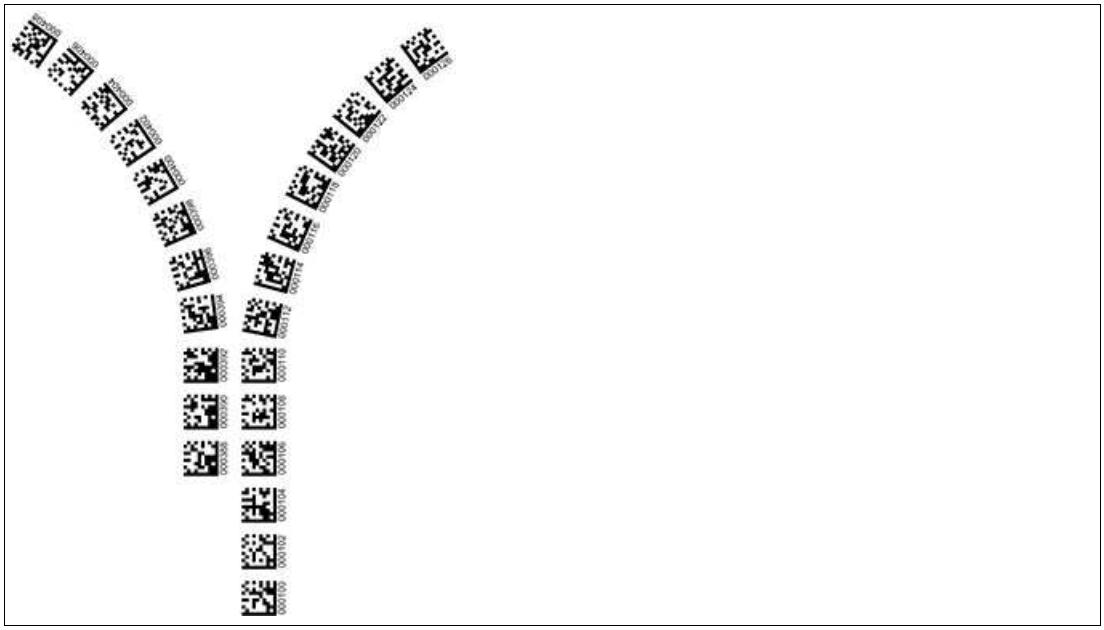


Figure 3.10 Separate lane branches off/converges

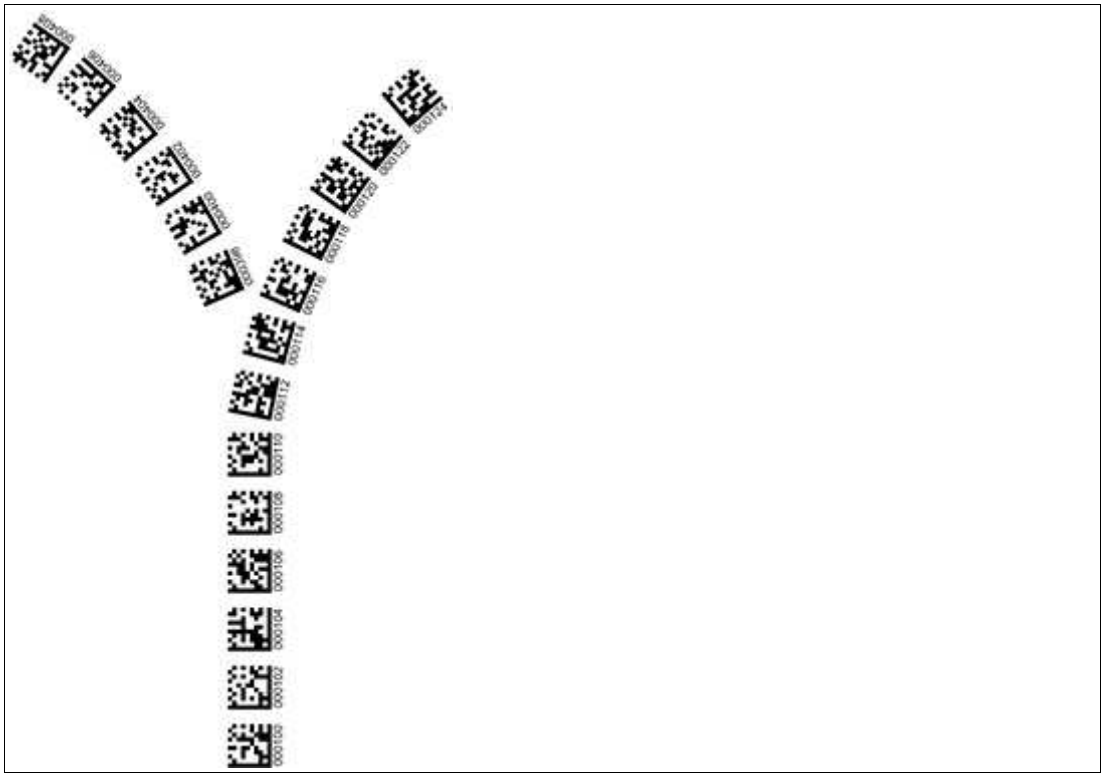


Figure 3.11 Same lane branches off/converges

Note

Direction Decision

The direction decision at a branch of a Data Matrix code tape remains in effect until the read head has moved more than 50 cm from the branch.

It is not possible to change the direction decision within a branch!

Note

Priority

Data Matrix code tapes and Data Matrix tags have priority over colored tapes or colored lanes.

If the read head detects a Data Matrix code tape or Data Matrix tags in the field of view, colored tapes or colored lanes in the field of view are ignored.

Note

Branches/Intersections with Data Matrix Position Code

Observe the following guidelines less than 1 m before and after branching or intersection of a lane with a position code:

- The position codes of the main lane must run continuously for 2 m. The position codes of the branching/intersecting lane must run continuously for 1 m. The read head outputs the X-value of the Data Matrix code tape that is specified the direction decision. See chapter 4.1.
- Do not use repair tape.
- Do not use colored tape.
- The difference between the absolute position of the main lane and the starting position of the branching/intersecting lane must be greater than 1 m.

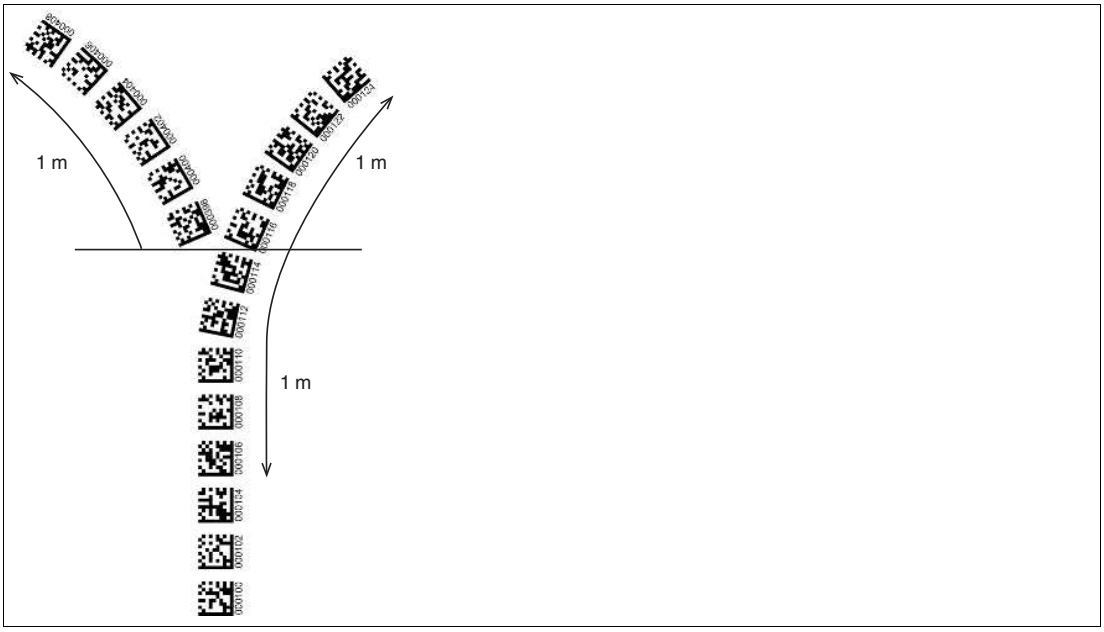


Figure 3.12 Distances

Behavior of the Read Head at Branches and Corners

The read head behaves differently depending on the type of branch and the specified lane. The read head must know the upcoming direction decision.

A second lane branches off to the left from the straight lane:

The read head follows the straight lane if the direction decision "follow right-hand lane" has been made.

A second lane branches off to the right from the straight lane:

The read head follows the straight lane if the direction decision "follow left-hand lane" has been made.

A single lane with a position code turns to the left or right:

The read head follows the position code if the direction decision "straight ahead" has been made.

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Note

Loss of Information

Ensure that Data Matrix codes are not positioned over one another at a branch, as otherwise data may be lost.

It is not permitted to create a mixture of lanes made from colored tape and Data Matrix codes at branches or intersections.

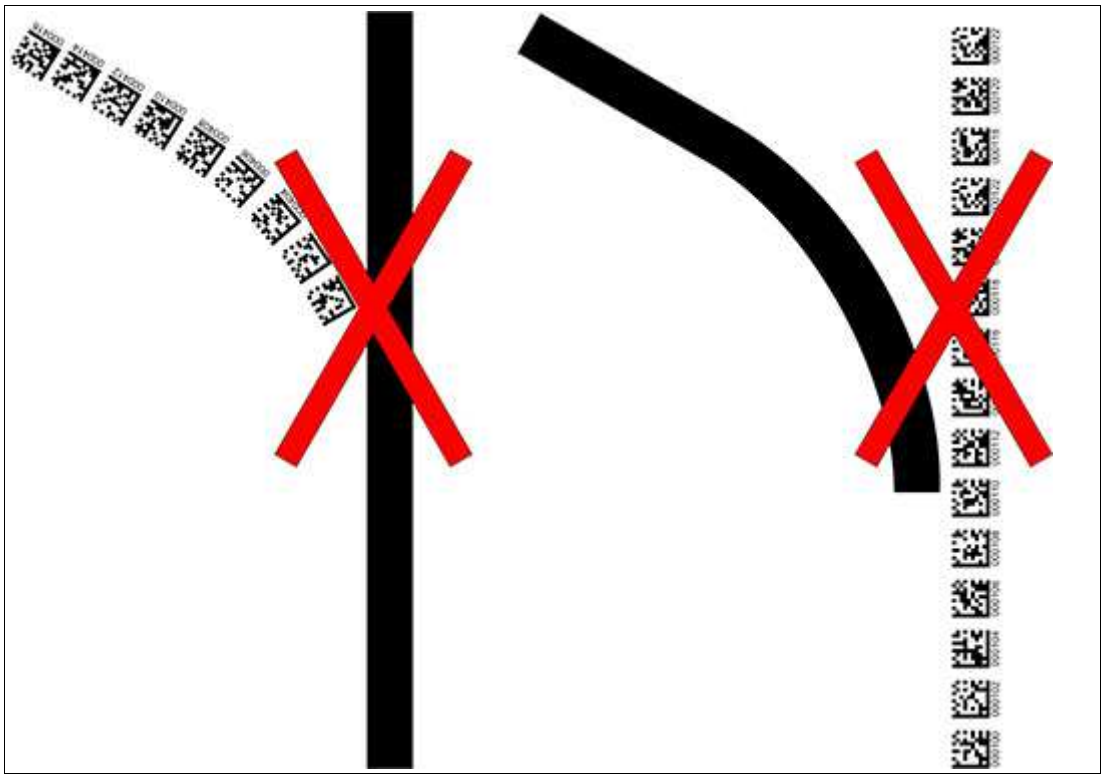

Figure 3.13 Mixture of lanes with colored tape and Data Matrix codes

Control codes can be mounted in the immediate vicinity of a branch with Data Matrix codes for positioning, but not near an intersection. The control code must be mounted directly next to the guiding lane.

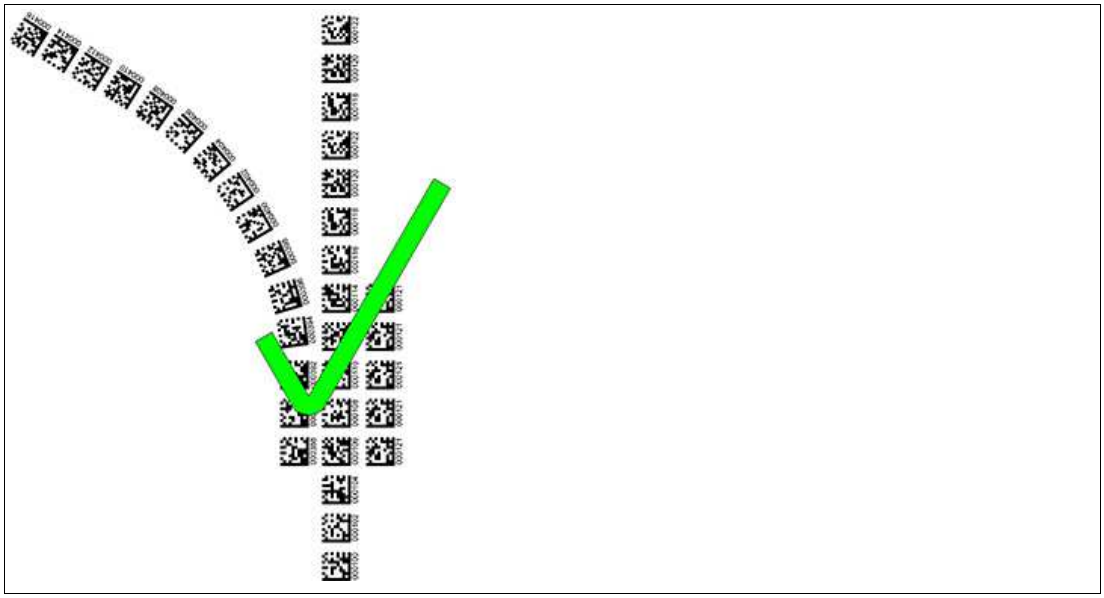

Figure 3.14 Branch with control code

Distances

To ensure that the read head can clearly detect and assign colored tapes and Data Matrix codes, minimum and maximum distances must be observed when creating the lanes.

Offset V between position codes of a lane must not be greater than 5 mm.

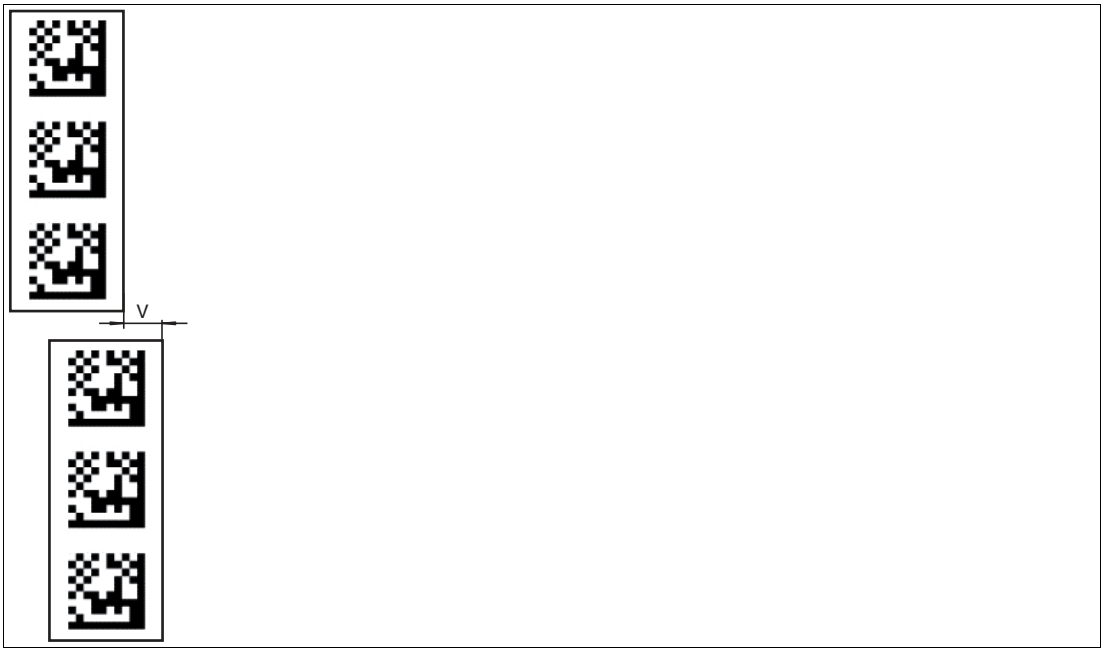

Figure 3.15 Offset: 0 mm ≤ V ≤ 5 mm

The distance D between the colored tapes at a branch or intersection as a separate lane must not exceed 15 mm. The distance decreases if the guiding colored tape cannot be detected by the read head in the center of the reading window.

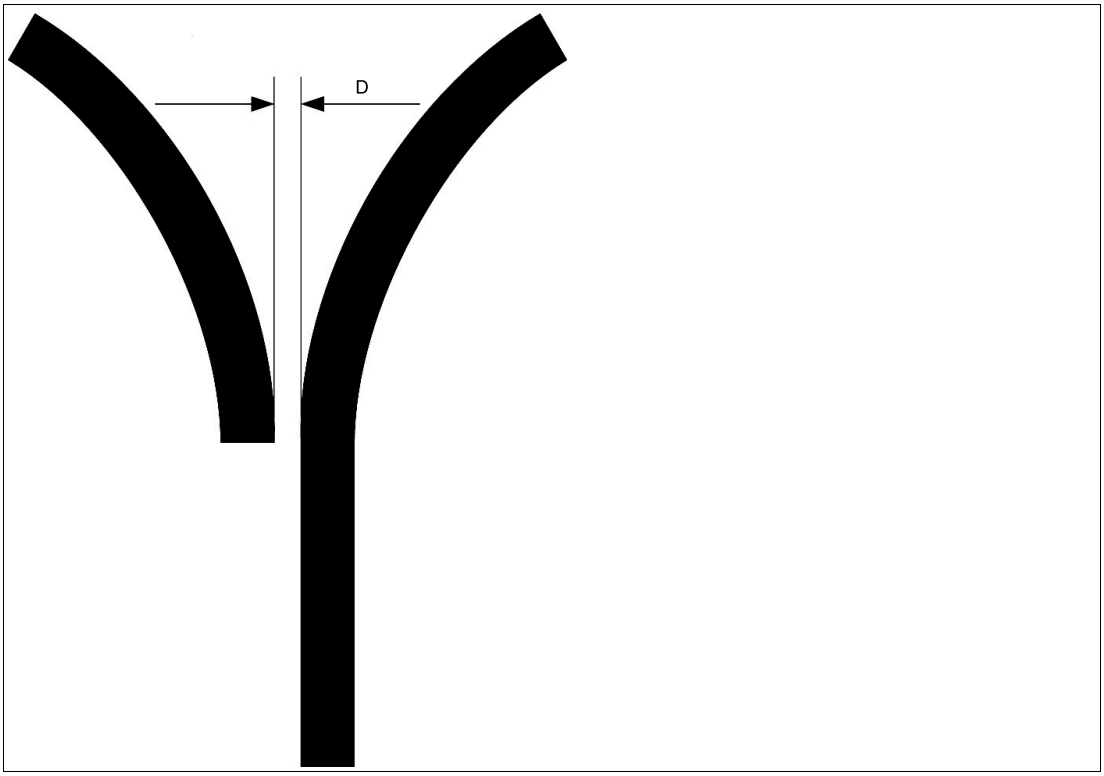

Figure 3.16 Distance: 7.5 mm ≤ D ≤ 15 mm

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The distance between the Data Matrix code tapes at a branch or intersection as a separate lane must be between 0 mm and 5 mm.

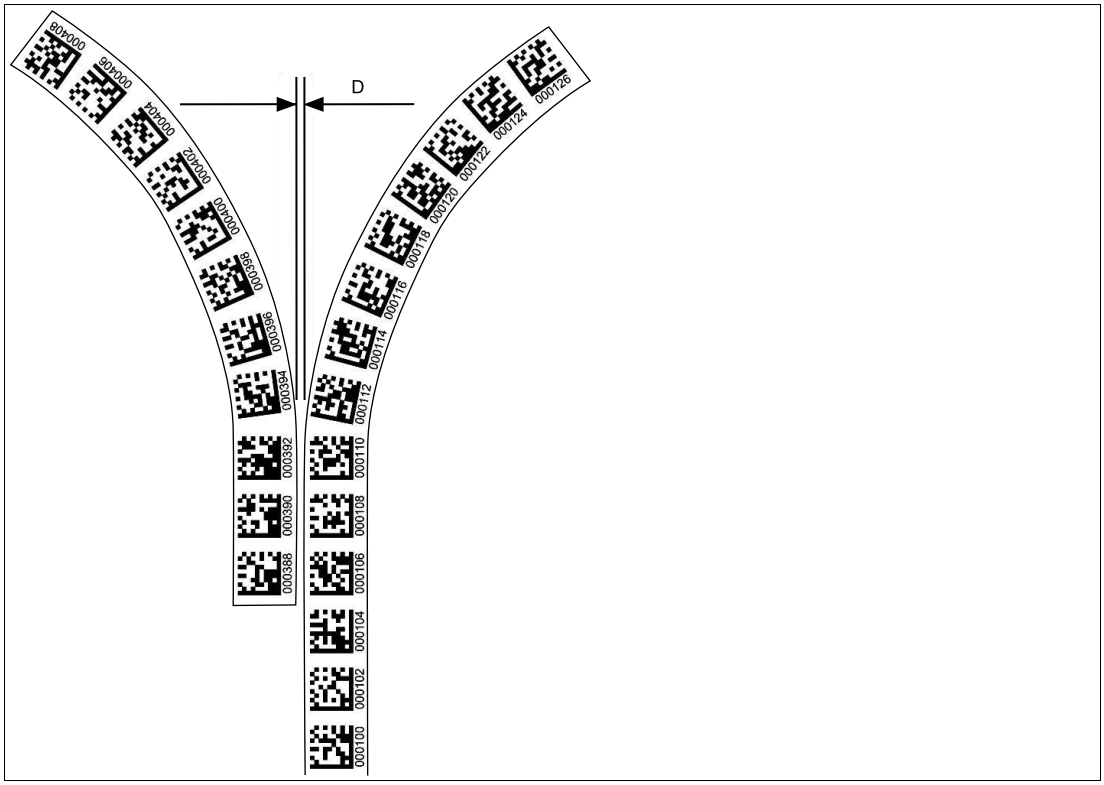

Figure 3.17 Distance: 0 mm ≤ D ≤ 5 mm

The distance between a colored tape and a Data Matrix control code must be between 0 mm and 5 mm.

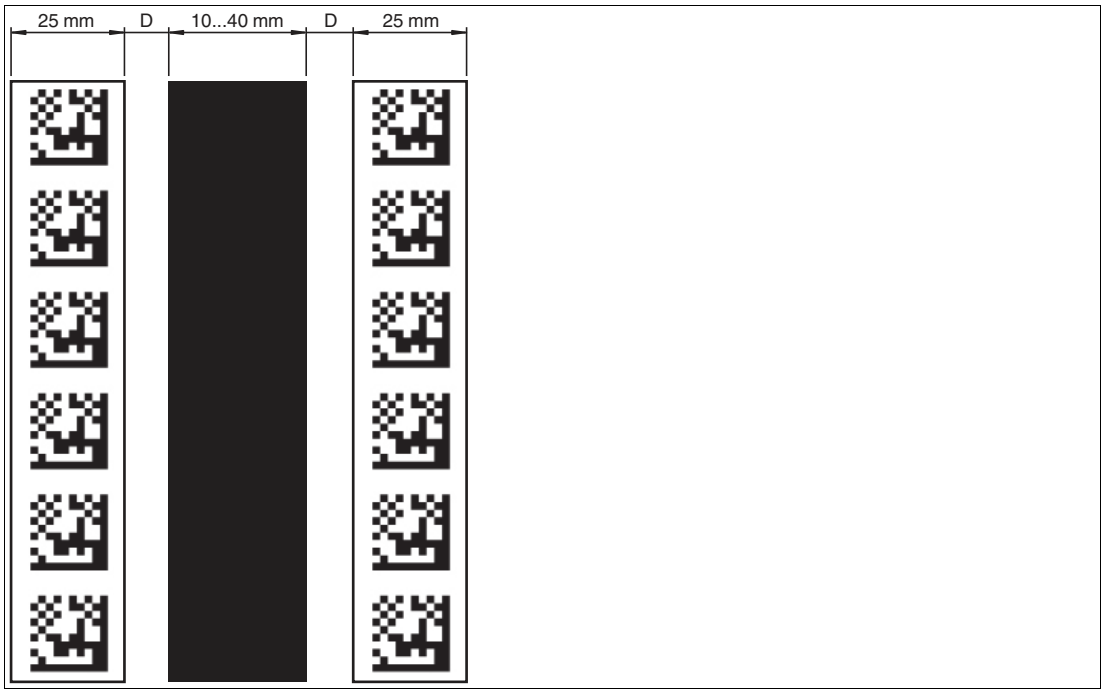

Figure 3.18 0 mm ≤ D ≤ 5 mm

The distance between a Data Matrix position code and a Data Matrix control code must be between 0 mm and 5 mm.

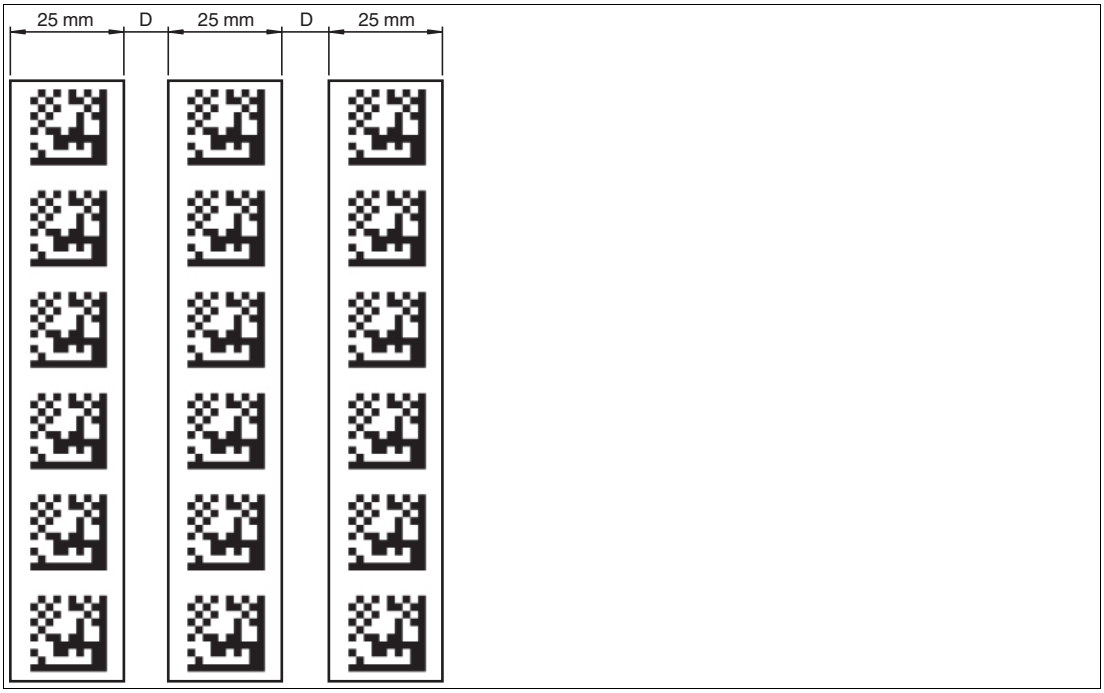

Figure 3.19 0 mm ≤ D ≤ 5 mm

A lane can switch from a colored tape to a Data Matrix code tape and back again as often as required. The distance between the colored tape and the edge of the Data Matrix code must be between 0 mm and 10 mm

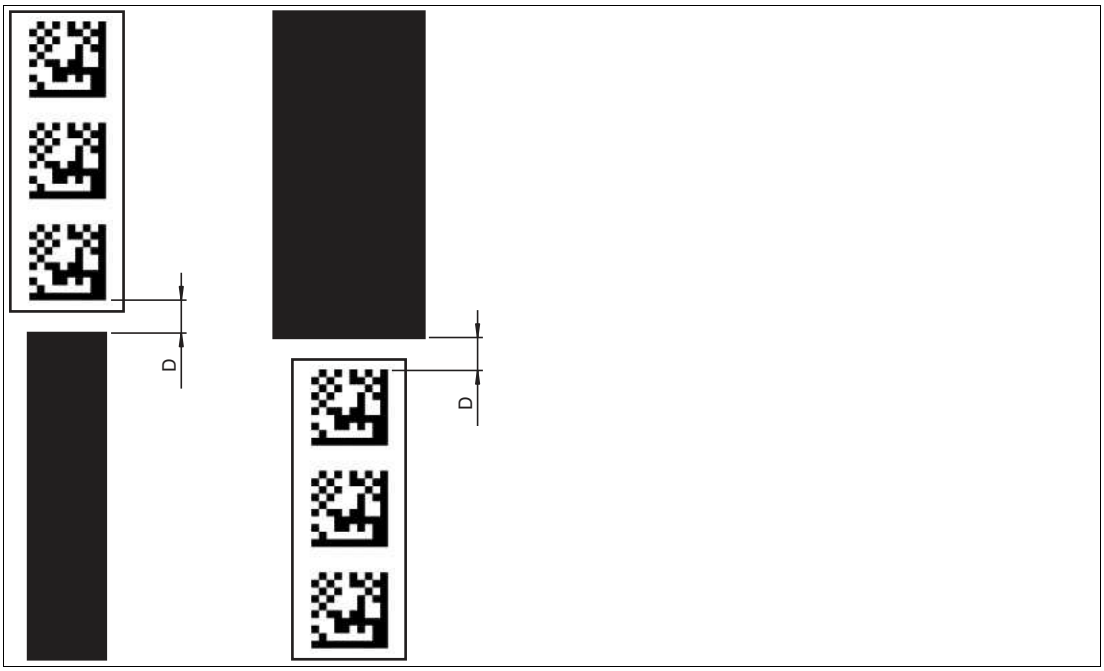

Figure 3.20 0 mm ≤ D ≤ 10 mm

The Y value does not change if the colored tape and the Data Matrix code tape are aligned. Ensure that the center line of the colored tape and the center line of the Data Matrix code are on a line.

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Caution!

Alignment

The Data Matrix code is not on the center line of 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"). This position marker is used for various functions, including precise positioning of the code tape during installation. The reverse side of the code tape carries a permanent modified acrylate-based adhesive. Affix the self-adhesive code tape along the desired travel path. To do so, proceed as follows:

Installing 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 travel path. 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 affixed code tape corresponds to the heat expansion coefficient of the surface with regard to its thermal expansion.

Code Tape Dimensions

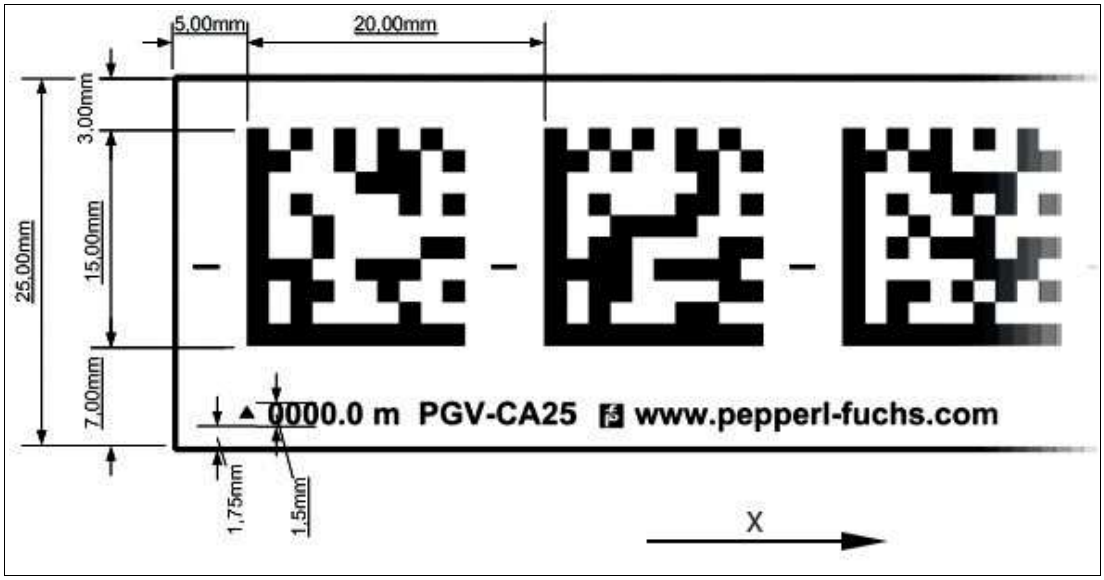


Figure 3.21 The center line indicates the center of the code tape and not the center of the code

Position the code tape so that the **www.pepperl-fuchs.com** label and the position markings are to the right of the Data Matrix code in the X direction. The position values then increase along the X direction.

Data Matrix Code Tapes with a Starting Position of 0 m

Order designation	Description
PGV10M-CA25-0	Code tape, length: 10 m
...	...
PGV100M-CA25-0	Code tape, length: 100 m

Table 3.1 See also data sheet PGV*-CA25-* at www.pepperl-fuchs.com

Data Matrix control codes

Order designation	Description
PGV-CC25-001	Code tape, Control Code 001, length: 1 m
...	...
PGV-CC25-999	Code tape, Control Code 999, length: 1 m

Caution!

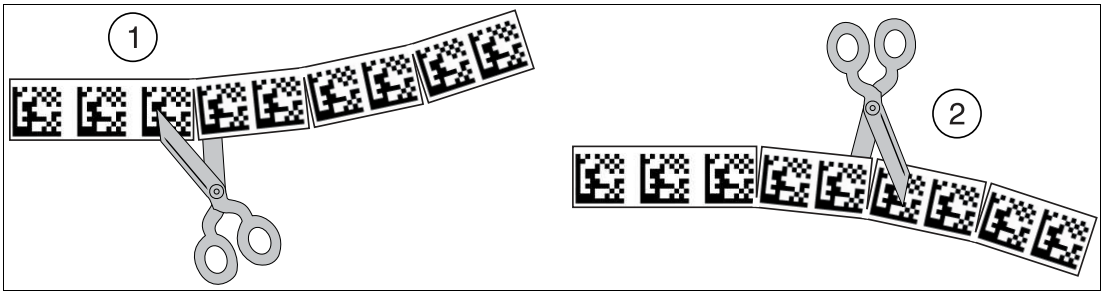
Stop edges

If you attach another code tape at the end of a previous code tape, the code pattern of 20 mm must be retained.

Note

Bends

If mounting the code tape in corners, cut the code tape several times as illustrated.



1 Bend to the left

2 Bend to the right

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Data Matrix Tag

A Data Matrix tag contains position information in addition to a specific number. A cross in the center of the Data Matrix tag marks the zero point. The X and the Y axes are marked starting from the zero point. The black arrow indicates the positive axis and the white arrow indicates the negative axis.

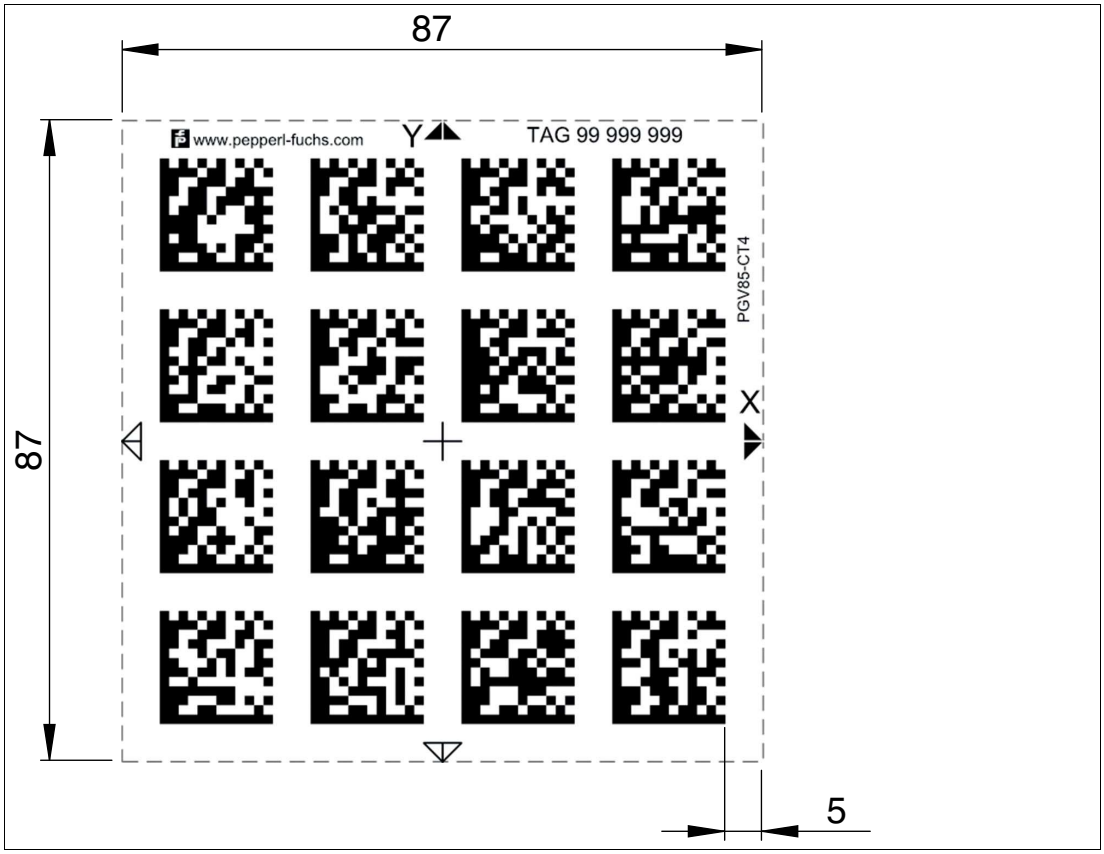

Figure 3.22 Data Matrix tag with the number 99999999 and position information

3.3 Electrical Connection

The read head is connected electrically via an 8-pin M12 x 1 connector on the side of the housing. The power is supplied via this connection. The configurable inputs and outputs on the read head are also located at this connection.

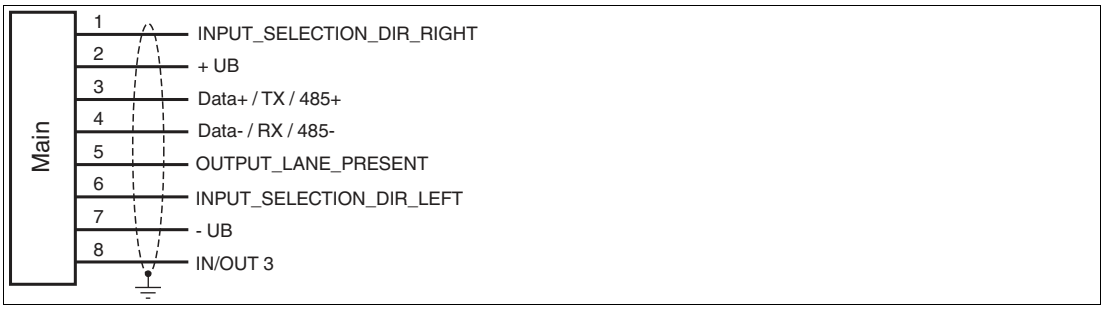

Figure 3.23

Connector Assignment

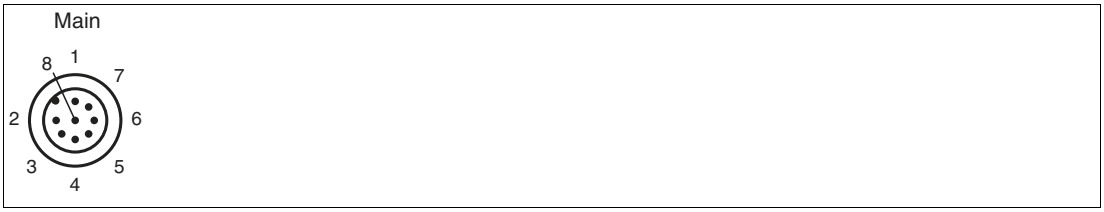

Figure 3.24

Color assignment

Pepperl+Fuchs female cordsets are manufactured in accordance with EN60947-5-2. When using a type V19-... () female cordset with an open cable end on the **Main** connection, the colors are assigned as follows:

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

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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 or on the PLC, **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 be noted:

- Use metal cable clips that cover large areas of the shielding.
- Place the cable shield onto the equipotential bonding rail immediately on entering the switch cabinet.
- 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.
PCV-SC12A	

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.

4 Commissioning

4.1 Specifying the First Direction Decision

To ensure that the read head does not report any error messages after being switched on, a direction decision must be specified. You can control the direction decision via the INPUT_SELECTION_DIR_RIGHT and INPUT_SELECTION_DIR_LEFT inputs. See chapter 3.3.

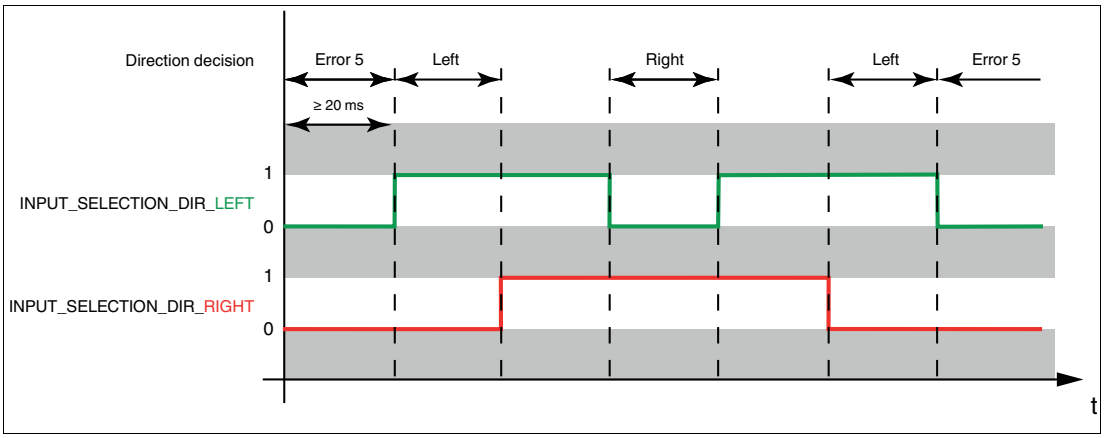

Figure 4.1

Direction decision via protocol

If a decision on the direction to take is sent to the read head via a protocol, the input signals are ignored until the read head is reset. See chapter 5.1.

4.2 Direction Decision

The read head has several ways of following colored tapes and Data Matrix code tapes depending on the parameterization. Depending on the input signal, the read head follows the right-hand, the left-hand, or the better lane.

Direction Decision via Input Signal

Input 2 INPUT_SELECTION_DIR_LEFT	Input 1 INPUT_SELECTION_DIR_RIGHT	Direction Decision
0	0	No lane is selected Error code 5
0	1	Follow right-hand lane
1	0	Follow left-hand lane
1	1	Colored tape: follow lane with better quality Data Matrix code tape: follow lane with more detailed position information Data Matrix tag: no significance

Table 4.1

Following Lane with Better Quality

You can parameterize the read head so that it follows the better quality color lane.

Example

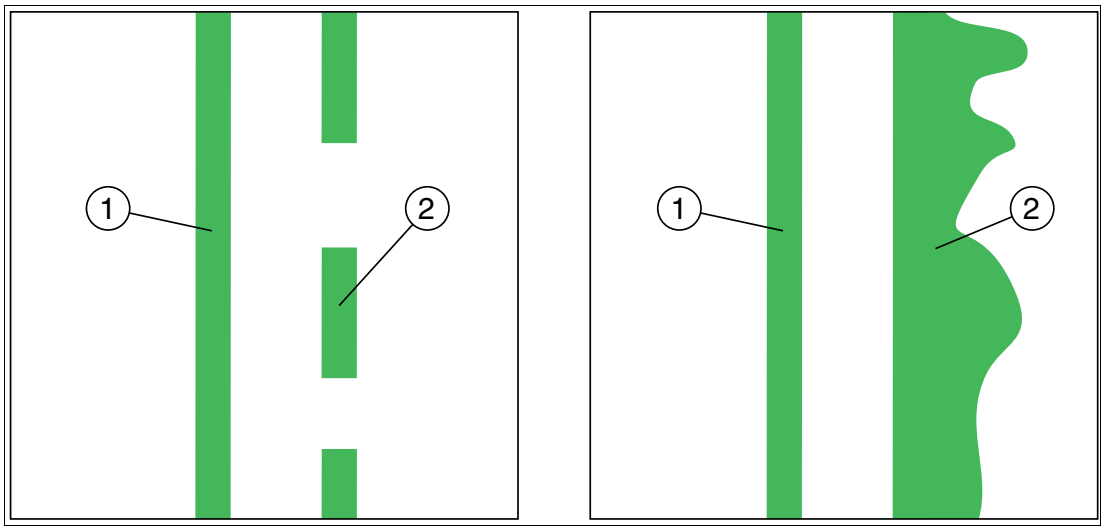

Figure 4.2 1 - Better color lane
2 - Worse color lane

Following Lane with More Detailed Position Information

You can parameterize the read head so that it follows the Data Matrix code tape that continues the current location information.

Example

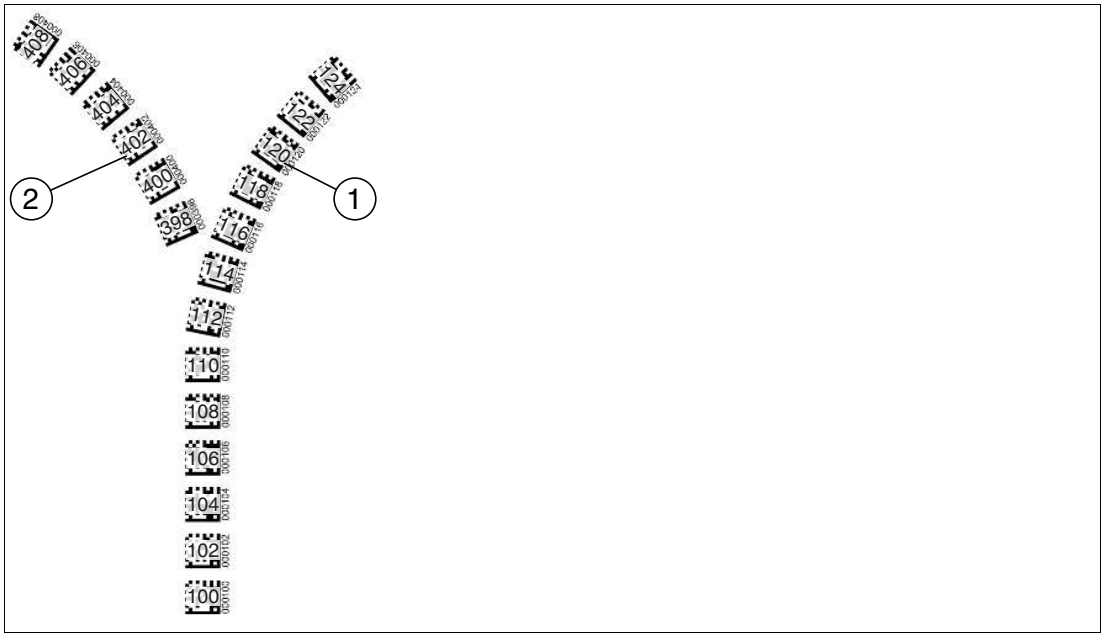

Figure 4.3 1 - More detailed position information
2 - New position Information

4.3 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).

4.3.1 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 ().

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.

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4.3.2 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]

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

1. 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

1. 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.

4.3.2.1 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.

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, but with the 8 data bits of the first byte inverted.

Structure of a Request Telegram

Byte/ bit	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Function
Byte 1	Parity	1[1]	Req. bit 4	Req. bit 3	Req. bit 2	Req. bit 1	Req. bit 0	A1	A0	Request
Byte 2	Parity	0	~Req. bit 4	~Req. bit 3	~Req. bit 2	~Req. bit 1	~Req. bit 0	~A1	~A0	Checksum

1. 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	Read head address 0
Parity	1	x	x	x	x	x	0	1	Read head address 1
Parity	1	x	x	x	x	x	1	0	Read head address 2
Parity	1	x	x	x	x	x	1	1	Read head address 3
Parity	1	1	0	0	1	0	x	x	Position inquiry See chapter 5.1.2
Parity	1	1	1	0	LL	RL	x	x	Selection of direction See chapter 5.1.3
Parity	1	1	0	R=0	G=0	B=1	x	x	Choice of color blue See chapter 5.1.4
Parity	1	0	0	R=0	G=1	B=0	x	x	Choice of color green See chapter 5.1.4
Parity	1	0	0	R=1	G=0	B=0	x	x	Choice of color red See chapter 5.1.4

5.1.2 Position Response Telegram

A response telegram is 21 bytes long. Bytes 1 and 2 contain the read head address and status information.

Response telegram from the read head – lane tracking

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	CC2	A1	A0	CC1	WRN	NP	ERR
Byte 2	Parity	0	TAG [0][1]	LC1	LC0	RP	NL	LL	RL
Byte 3	Parity	0	Reserved	Reserved	Reserved	Reserved	XP23	XP22	XP21
Byte 4	Parity	0	XP20	XP19	XP18	XP17	XP16	XP15	XP14
Byte 5	Parity	0	XP13	XP12	XP11	XP10	XP09	XP08	XP07
Byte 6	Parity	0	XP06	XP05	XP04	XP03	XP02	XP01	XP00
Byte 7	Parity	0	YPS13	YPS12	YPS11	YPS10	YPS09	YPS08	YPS07
Byte 8	Parity	0	YPS06	YPS05	YPS04	YPS03	YPS02	YPS01	YPS00
Byte 9	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 10	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 11	Parity	0	ANG13	ANG12	ANG11	ANG10	ANG09	ANG08	ANG07
Byte 12	Parity	0	ANG06	ANG05	ANG04	ANG03	ANG02	ANG01	ANG00
Byte 13	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 14	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 15	Parity	0	O1_1	O1_0	S1_1	S1_0	CC1_09	CC1_08	CC1_07
Byte 16	Parity	0	CC1_06	CC1_05	CC1_04	CC1_03	CC1_02	CC1_01	CC1_00
Byte 17	Parity	0	O2_1	O2_0	S2_1	S2_0	CC2_09	CC2_08	CC2_07
Byte 18	Parity	0	CC2_06	CC2_05	CC2_04	CC2_03	CC2_02	CC2_01	CC2_00
Byte 19	Parity	0	WRN13	WRN12	WRN11	WRN10	WRN09	WRN08	WRN07
Byte 20	Parity	0	WRN06	WRN05	WRN04	WRN03	WRN02	WRN01	WRN00
Byte 21	Parity	0	XOR B1.6 ... B20.6	XOR B1.5 ... B20.5	XOR B1.4 ... B20.4	XOR B1.3 ... B20.3	XOR B1.2 ... B20.2	XOR B1.1 ... B20.1	XOR B1.0 ... B20.0

Table 5.1

1. If bit = 0: read head follows color/Data Matrix lane

Response telegram from the read head - Data Matrix tag

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	CC2	A1	A0	CC1	WRN	NP	ERR
Byte 2	Parity	0	TAG [1][1]	LC1	LC0	RP	NL	LL	RL
Byte 3	Parity	0	Reserved	Reserved	Reserved	Reserved	XPS23	XPS22	XPS21
Byte 4	Parity	0	XPS20	XPS19	XPS18	XPS17	XPS16	XPS15	XPS14
Byte 5	Parity	0	XPS13	XPS12	XPS11	XPS10	XPS09	XPS08	XPS07
Byte 6	Parity	0	XPS06	XPS05	XPS04	XPS03	XPS02	XPS01	XPS00
Byte 7	Parity	0	YPS13	YPS12	YPS11	YPS10	YPS09	YPS08	YPS07
Byte 8	Parity	0	YPS06	YPS05	YPS04	YPS03	YPS02	YPS01	YPS00
Byte 9	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 10	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 11	Parity	0	ANG13	ANG12	ANG11	ANG10	ANG09	ANG08	ANG07
Byte 12	Parity	0	ANG06	ANG05	ANG04	ANG03	ANG02	ANG01	ANG00
Byte 13	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 14	Parity	0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Byte 15	Parity	0	TAG_27	TAG_26	TAG_25	TAG_24	TAG_23	TAG_22	TAG_21
Byte 16	Parity	0	TAG_20	TAG_19	TAG_18	TAG_17	TAG_16	TAG_15	TAG_14
Byte 17	Parity	0	TAG_13	TAG_12	TAG_11	TAG_10	TAG_09	TAG_08	TAG_07
Byte 18	Parity	0	TAG_06	TAG_05	TAG_04	TAG_03	TAG_02	TAG_01	TAG_00
Byte 19	Parity	0	WRN13	WRN12	WRN11	WRN10	WRN09	WRN08	WRN07
Byte 20	Parity	0	WRN06	WRN05	WRN04	WRN03	WRN02	WRN01	WRN00
Byte 21	Parity	0	XOR B1.6 ... B20.6	XOR B1.5 ... B20.5	XOR B1.4 ... B20.4	XOR B1.3 ... B20.3	XOR B1.2 ... B20.2	XOR B1.1 ... B20.1	XOR B1.0 ... B20.0

Table 5.2

1. If bit = 1: read head detects Data Matrix tag

Note

Sign

If the read head is following a lane, the specification of the X position is unsigned.

If the read head is above a Data Matrix tag, the X position is signed.

Designation	Function
A	Address of the read head
ANG	Absolute angle specification
CC1/CC2_#_#	Control code 1 or 2 with number # detected Control code 2 is evaluated via the "Split value" function.[1]
CC1/CC2	Associated control code is detected.
ERR	Fault message Error codes are stored in XP00 ... XP23. Additional information on the codes can be found in the **Error Codes** table.
LC	Number of lanes in the reading window. Refer to section "**Number of Lanes LC**"
LL/RL	Selected direction decision
NL	No colored lane detected
NP	No absolute X position
O1_#/O2_#	Orientation control code for lane. Refer to section "**Orientation O**"
RP	Repair tape detected
S1_#/S2_#	Relative position control code for lane. Refer to section "**Side S**"
TAG	Data Matrix tag detected
TAG_#	Data Matrix tag with number # detected
WRN	Warning message Warnings are stored in WRN00 ... WRN13. Additional information on the codes can be found in the **Warning Messages** table.
XP	Absolute position in the X direction, unsigned
XPS	Absolute position in the X direction, signed
YPS	Absolute position in the Y direction, signed

Table 5.3

1. Should you have any questions, please contact Pepperl+Fuchs

Error Codes

Error code	Description	Priority
2	No clear position can be determined, e.g., difference between codes is too great, code distance incorrect	4
5	No direction decision available, see chapter 4.1, see chapter 5.1.3	2
6	No color choice available, see chapter 5.1.4	3
> 1000	Internal fault	1

Table 5.4

Warning Messages

Warning message	Description
WRN00	Code with content not typical of PGV found
WRN01	Read head too close to code tape
WRN02	Read head too far from code tape
WRN03	Reserved
WRN04	Reserved
WRN05	The read head is rotated or tipped in relation to the code tape
WRN06	Low level of code contrast
WRN07	Repair tape detected
WRN08	Temperature too high
WRN09	Position code near branch/crossover detected
WRN10	More than the specified number of code lanes present
WRN11	Reserved
WRN12	Reserved
WRN13	Reserved

Table 5.5 If no warnings are present, the bits are set to 0.

Note

16-bit/32-bit

In order for the response telegrams from the read head to be transferred in 16-bit or 32-bit values, fill in the missing bits as follows:

1. Unsigned: Fill in the missing upper bits with "0".
2. Signed: Fill in the missing upper bits with the highest bit of the response telegram.

Should you have any questions about this, please contact Pepperl+Fuchs.

5.1.2.1 Number of Lanes LC (Lane Count)

The lane count, LC, indicates the number of found fab or Data Matrix tracks in the reading window. A variety of causes may be responsible if the lane count does not match the expected number of lanes:

LC < actual number

- Lane is not located in the reading window
- Color of the lane does not match the configured color

LC > actual number

- Contrast between the ribbon and the floor is too low

Tip

Increase contrast

To ensure maximum contrast between the floor and the ribbon, please note the following contrast colors:

Basic color green: contrast color red

Basic color blue: contrast color red

Basic color red: contrast color green

Meaning of Bits

LC1	LC0	Meaning
0	0	No lane found
0	1	1 lane found
1	0	2 lanes found
1	1	3 or more lanes found

5.1.2.2 Orientation O

The orientation O indicates the orientation of the control codes in the reading window.

Meaning of Bits

O1	O0	Meaning
0	0	Control code has the same orientation as ascending Data Matrix lane
0	1	Orientation of control code rotated 90° clockwise in relation to ascending Data Matrix lane
1	0	Orientation of control code rotated 180° clockwise in relation to ascending Data Matrix lane
1	1	Orientation of control code rotated 270° clockwise in relation to ascending Data Matrix lane

Orientation

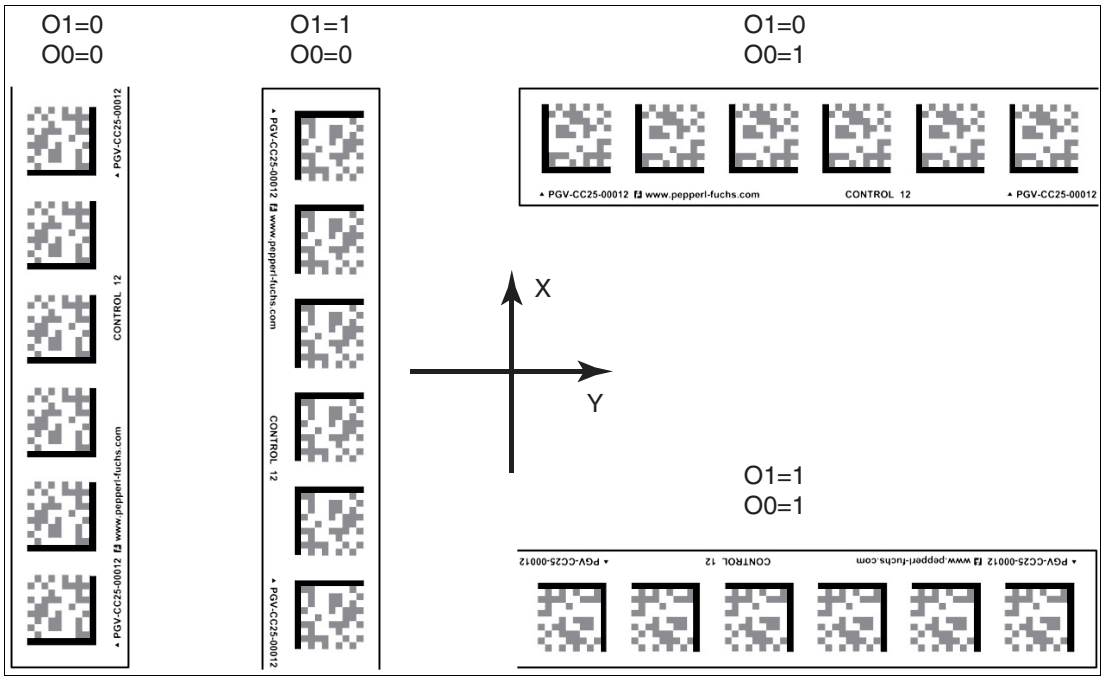

Figure 5.1

5.1.2.3 Side S

Side S specifies the side of the Data Matrix lane on which the control codes are present.

Meaning of Bits

S1	S0	Meaning
0	0	No control code is present or found Reserved
0	1	Control code to the right of the Data Matrix or color lane
1	0	Control code to the left of the Data Matrix or color lane
1	1	Not detectable[1]

1. Control code laid on Data Matrix lane
No Data Matrix lane

Example

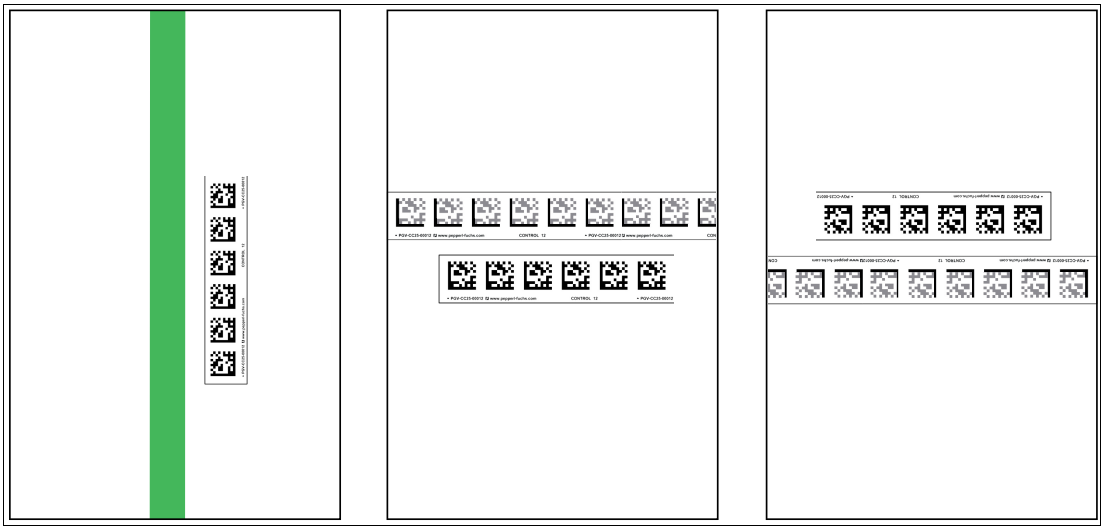

Figure 5.2 Control code to the **right** of the Data Matrix or color lane

5.1.2.4 Position/Lane

You can use the following table to draw conclusions on the current section in the reading window from the feedback of the read head regarding Data Matrix **TAG**, No Lane **NL**, No X Position **NP**, absolute X position **XP** and the Y position and angle **YPS/ANG**.

Meaning of Bits

TAG	NL	NP	XP	YPS/ANG	Meaning
0	0	0	+[1]	+	Color and Data Matrix lane present. Position and angle refer to the Data Matrix lane.
0	0	1	-[2]	+	Color lane available.
0	1	0	+	+	Data Matrix lane.
0	1	1	-	-	No evaluable objects exist.
1	-	0	+	+	Position on the basis of a Data Matrix tag, X position is signed.

1. Valid data present

2. No valid data available

5.1.3 Direction Decision Request Telegram

Byte/ bit	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Function
Byte 1	Parity	1	1	1	0	LL	RL	A1	A0	Request
Byte 2	Parity	0	0	0	1	~LL	~RL	~A1	~A0	Checksum

Response Telegram for Direction Decision

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	CC2	A1	A0	CC1	WRN	NP	ERR
Byte 2	Parity	0	0	0	0	0	0	LL	RL
Byte 3	Parity	0	XOR B1.6 ... B2.6	XOR B1.5 ... B2.5	XOR B1.4 ... B2.4	XOR B1.3 ... B2.3	XOR B1.2 ... B2.2	XOR B1.1 ... B2.1	XOR B1.0 ... B2.0

Meaning of Bits

LL	RL	Meaning
0	0	Error code 5
0	1	Follow right-hand lane
1	0	Follow left-hand lane
1	1	Straight ahead

Table 5.6 See chapter 4.2

Example

Request telegram when read head address = 0

Request	Response	Description	Example
0xE8, 0x17	See "**Response Telegram for Direction Decision**"	Follow left-hand lane	--"0x02"--
0xE4, 0x1B		Follow right-hand lane	--"0x01"--
0xEC, 0x13		Straight ahead	--"0x03"--
0xE0, 0x1F		No lane is selected Error code 5	--"0x00"--

5.1.4 Color Choice Request Telegram

Blue

Byte/ bit	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Function
Byte 1	Parity	1	1	0	R=0	G=0	B=1	A1	A0	Request
Byte 2	Parity	0	0	1	1	1	0	~A1	~A0	Checksum

Green

Byte/ bit	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Function
Byte 1	Parity	1	0	0	R=0	G=1	B=0	A1	A0	Request
Byte 2	Parity	0	1	1	1	0	1	~A1	~A0	Checksum

Red

Byte/ bit	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Function
Byte 1	Parity	1	0	0	R=1	G=0	B=0	A1	A0	Request
Byte 2	Parity	0	1	1	0	1	1	~A1	~A0	Checksum

Note

You can only ever request one color.

Response telegram for color choice

Byte/bit	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Parity	0	0	A1	A0	0	R	G	B
Byte 2	Parity	0	0	A1	A0	0	R	G	B

Meaning of Bits

R	G	B	Meaning
0	0	1	Choice of color blue
0	1	0	Choice of color green
1	0	0	Choice of color red

Example

Request telegram when read head address = 0

Request	Response	Description
0xC4, 0x3B	0x01, 0x01	Choice of color blue
0x88, 0x77	0x02, 0x02	Choice of color green
0x90, 0x6F	0x04, 0x04	Choice of color red

5.2 Operation Using Control Codes

In numerous positioning system applications, defined processes (= event) must be started at specific positions. This means that the exact positions must be defined via code tapes for positioning, instead of simple colored tapes. In the context of lane tracking, it is advisable to mark branches using control codes to facilitate the control of the direction decision.

The layout of the lane can be adjusted according to the application in question. If an automated guided vehicle must be positioned exactly, a code tape is mounted for positioning purposes instead of the colored tape. If an event needs to start at a particular position or a direction decision needs to be made, a control code is mounted parallel to the actual lane.

Only a specific event and the associated process then have to be programmed into the system controller. The position in which the corresponding control code is placed next to the colored tape or code tape for positioning does not have to be determined until final commissioning. Even if subsequent changes are made to the layout of a system, the relevant control code is simply moved to the new position without requiring program modifications to be made.

Control codes are short code tapes one meter in length. The control code has an encrypted number. Control codes exist with numbers ranging from 001 to 999.

When the read head enters the range of a control code, it sets the control code flag in its output data.

The 1-meter-long control code can be shortened. However, the minimum length should be 3 codes (60 mm). If the speed of the read head increases, a longer control code is required. If the read head travels at maximum speed, a full-length control code of 1 meter must be positioned next to the colored tape or code tape for positioning.

The minimum length of a control code can be calculated according to the following formula depending on the travel speed and trigger period:

$L_{control\ code} = 60\ mm + V_{max}\ [m/s] * T_{Trigger}\ [s] \times 2$

The trigger period is 40 ms.

Example

Example calculation

The minimum length of the control code at a speed of 3 m/s and a trigger period of 40 ms is:
$L_{Event\ marker} = 60\ mm + 3\ m/s * 40\ ms * 2 =$ **300 mm**

Control codes are identified by the printed number, in this case "Control 12".

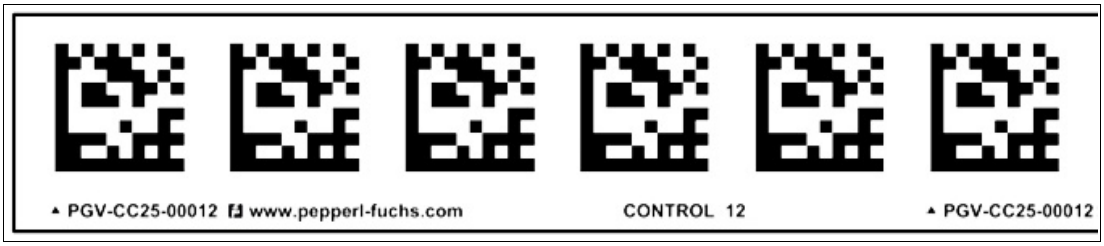

Figure 5.3 PGV-CC25-0012

The illustration shows part of control code #12

Refer to the "Accessories" chapter for order information relating to control codes.

5.3 Operation Using Repair Tape

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

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

Note

When placing a repair tape on the code tape, make sure that the repair tape continues the pattern on the code tape as accurately as possible.

When the read head enters the range of a repair tape, it sets the repair tape flag in its output data.

Note

The repair tape works incrementally. In so doing, it adds one value to the previous read position on the code tape. 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 tape away from the repair tape to read the absolute value.

Tip

If repairs are required, the **Code Tape Generator** at www.pepperl-fuchs.com can be used as a short-term workaround. This generator enables segments of code tape to be produced and printed out online.

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

The printout must be used only as an emergency solution. The durability of the paper strip is extremely limited depending on the application!

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

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

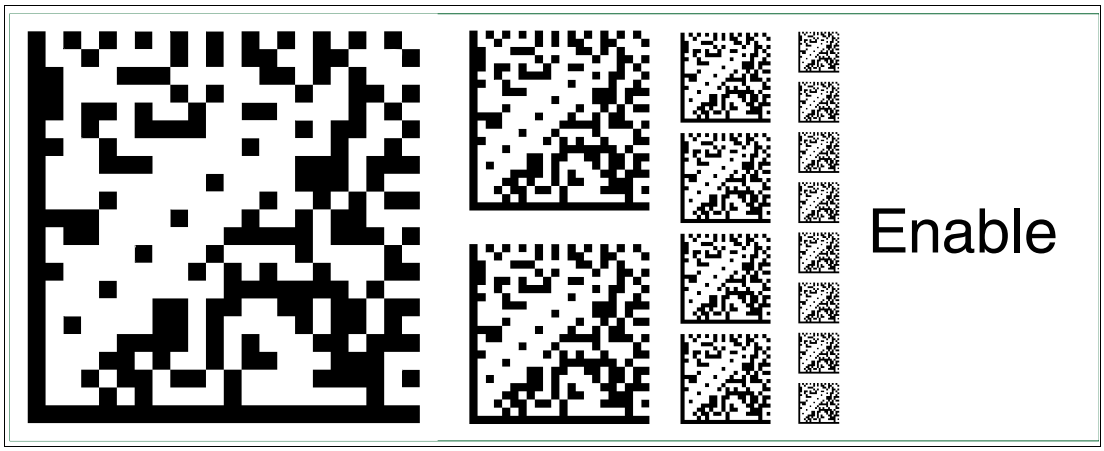

Figure 6.1 The code card "ENABLE" is used to activate external parameterization operating mode.

Store

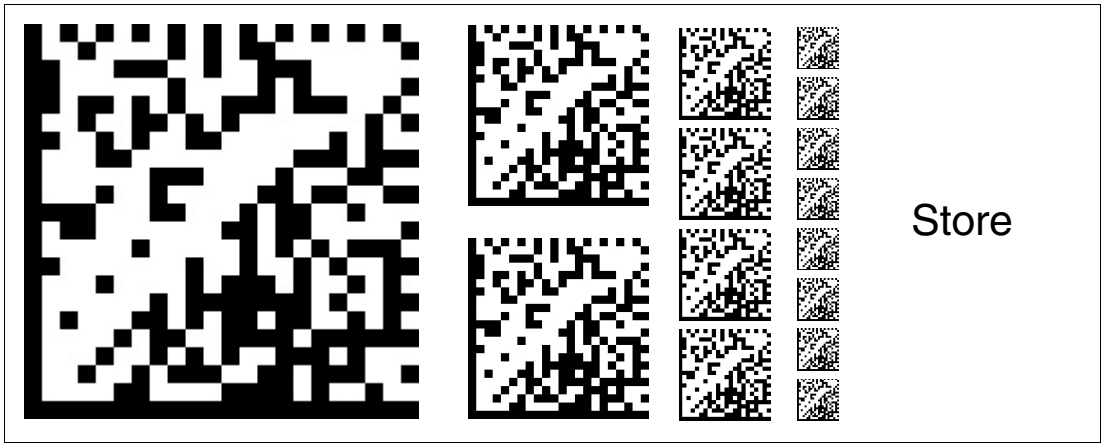

Figure 6.2 The "STORE" code card stores the modified parameterization in the nonvolatile memory of the read head and terminates external parameterization operating mode.

Cancel

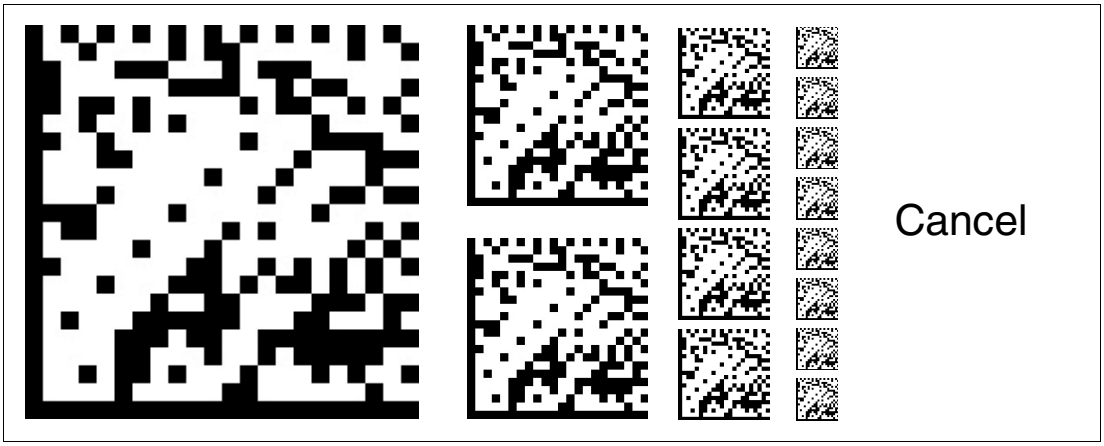

Figure 6.3 The "CANCEL" code card discards the modified parameterization and terminates external parameterization operating mode. The read head switches to normal mode and adopts the last valid configuration that was saved.

Use

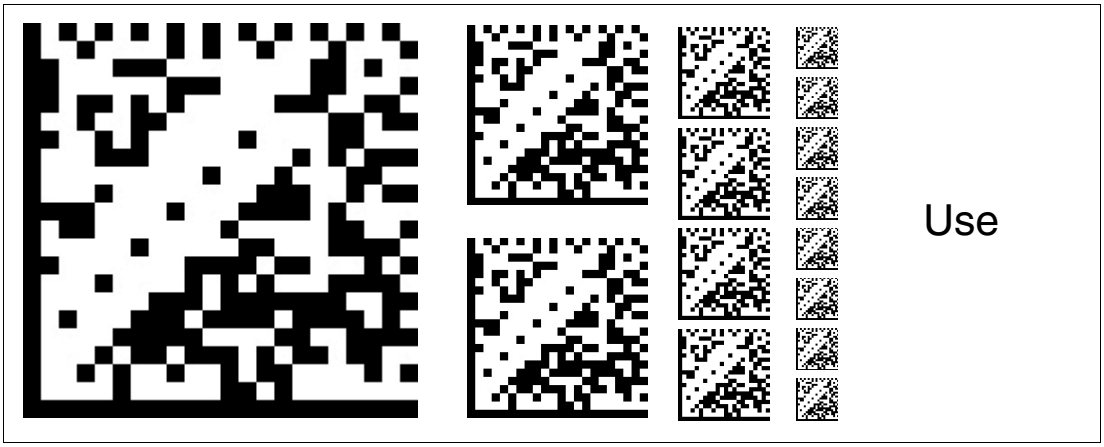

Figure 6.4 The "USE" code card takes over the set configuration **volatile** in the read head working memory and terminates the external parameterization operating mode. The read head then operates with this configuration. However, if the read head is switched off and on again, the configuration is lost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

Default

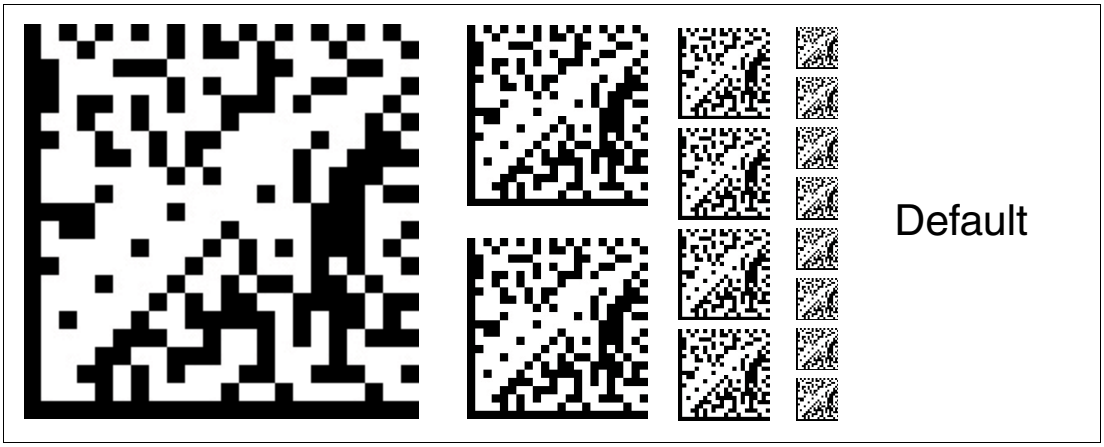

Figure 6.5 The "DEFAULT" code card restores the settings of the read head to default and terminates external parameterization operating mode.

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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

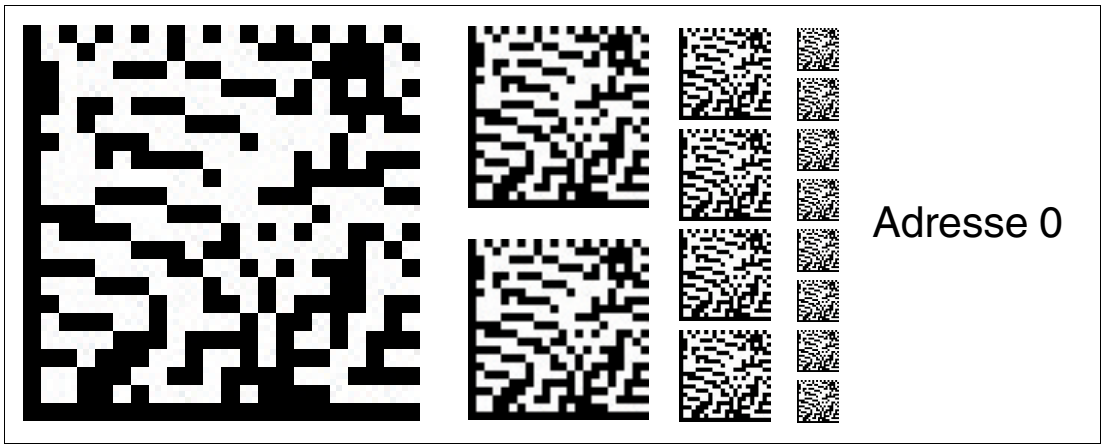

Figure 6.6 The code card assigns address 0 to the read head.

Read Head Address 1

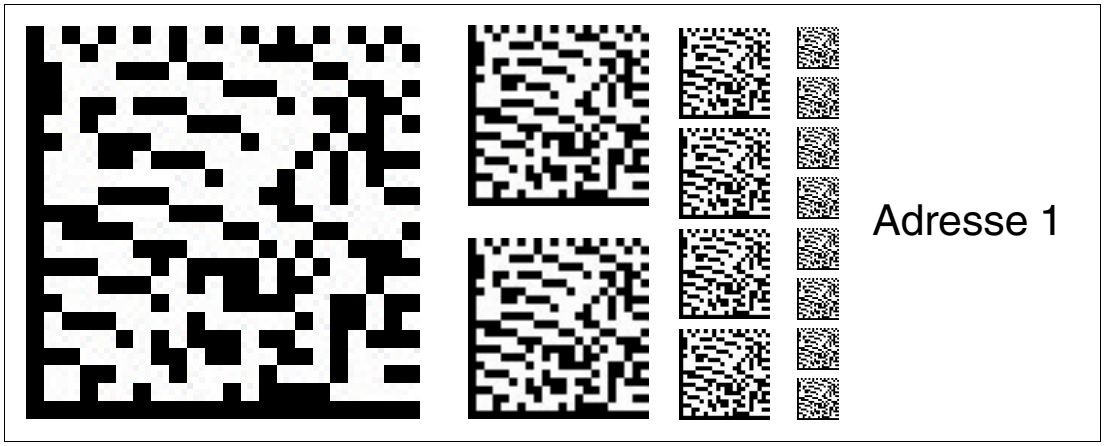

Figure 6.7 The code card assigns address 1 to the read head.

Read Head Address 2

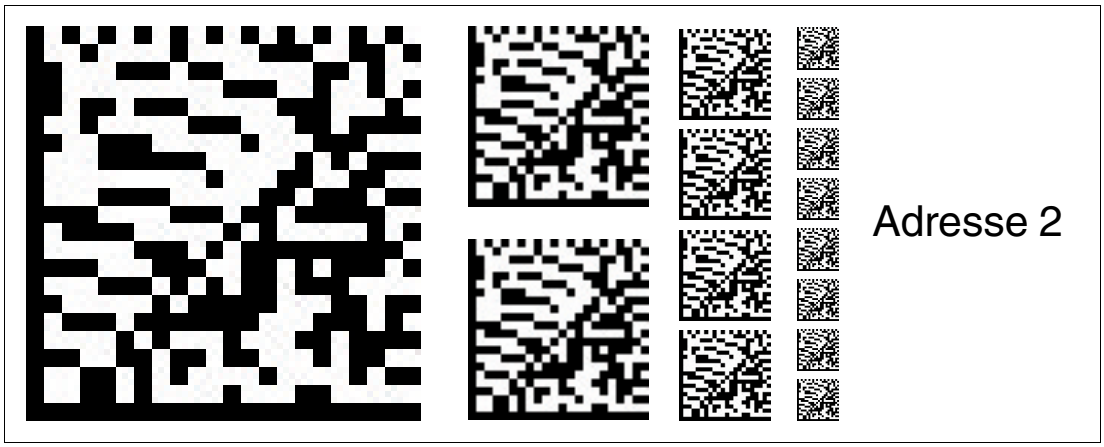

Figure 6.8 The code card assigns address 2 to the read head.

Read Head Address 3

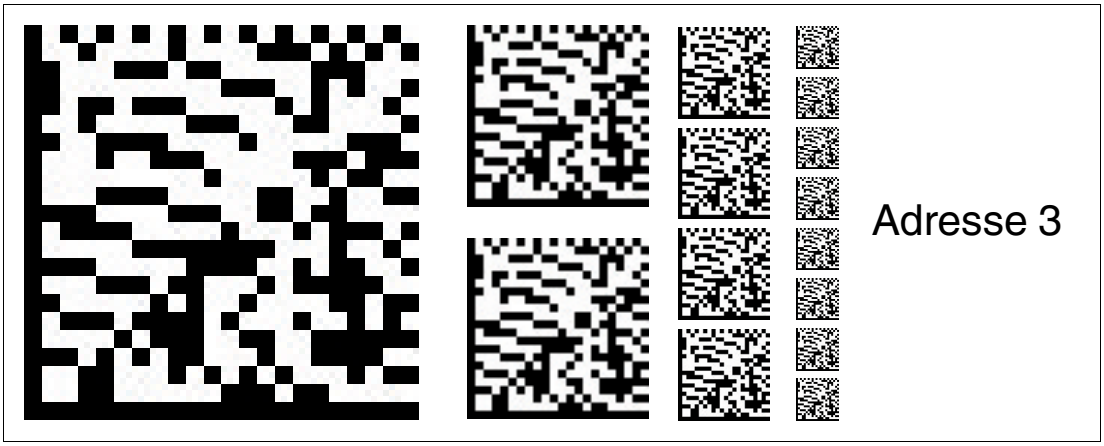

Figure 6.9 The code card assigns address 3 to the read head.

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

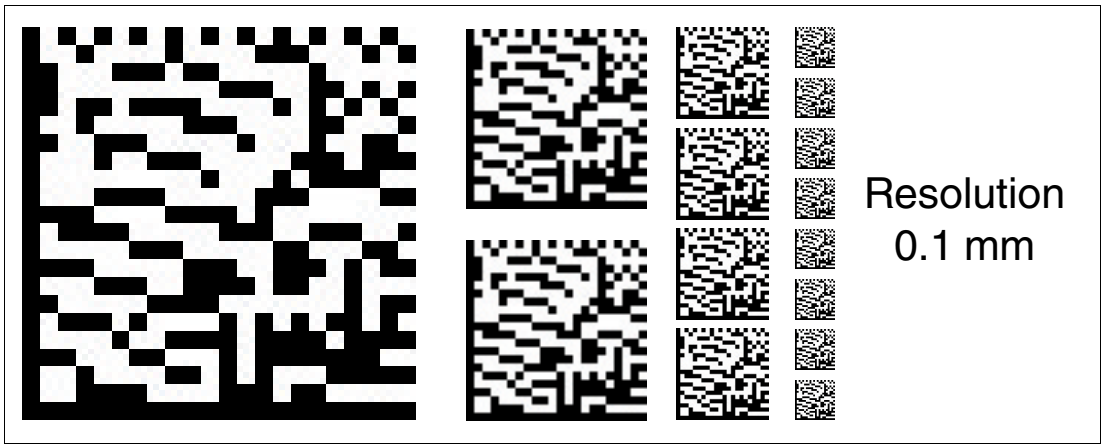

Figure 6.10 The code card assigns a position data resolution of 0.1 mm to the read head.

Resolution: 1 mm

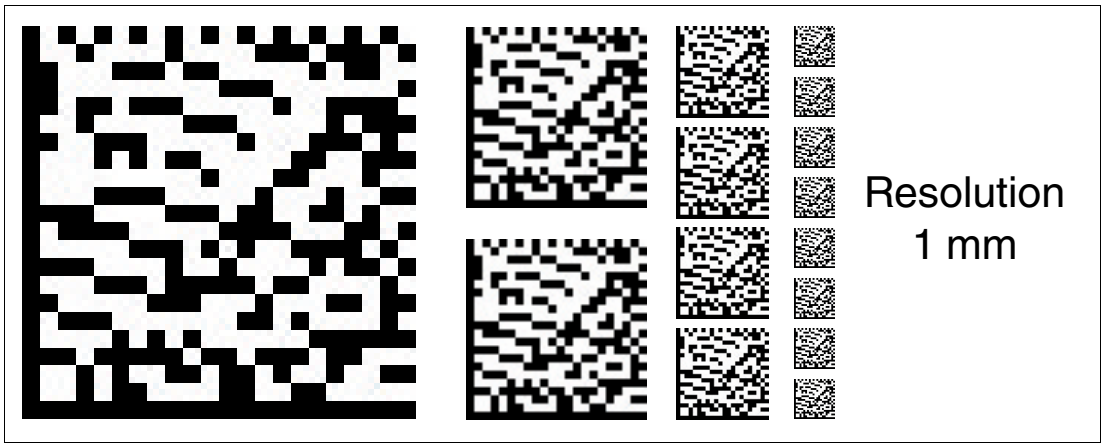

Figure 6.11 The code card assigns a position data resolution of 1 mm to the read head.

Resolution: 10 mm

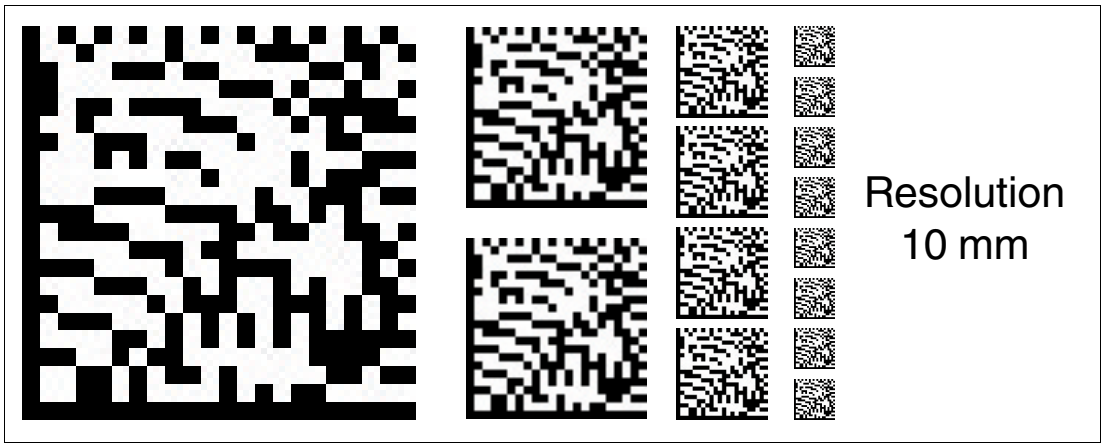

Figure 6.12 The code card assigns a position data resolution of 10 mm to the read head.

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 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

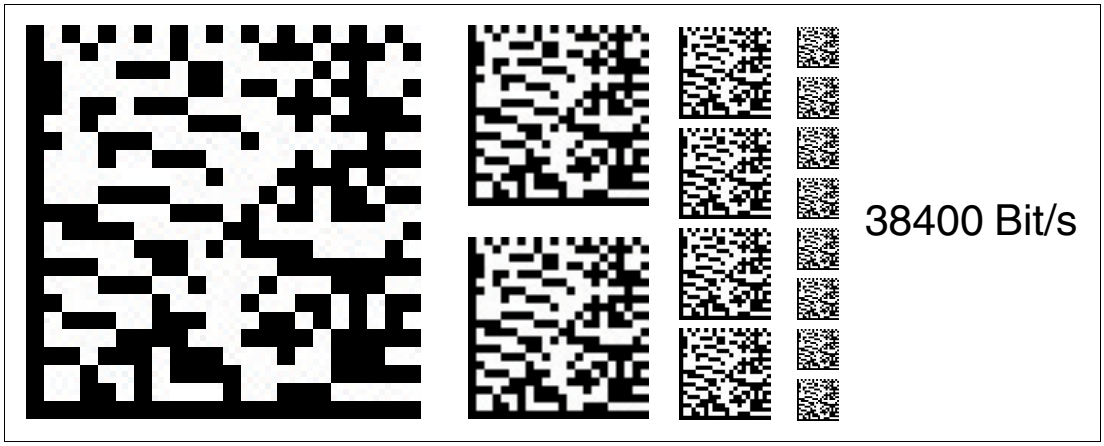

Figure 6.13 The transfer rate of the read head for communication via the interface is preset to 38400 bit/s.

Transfer rate: 57600 bit/s

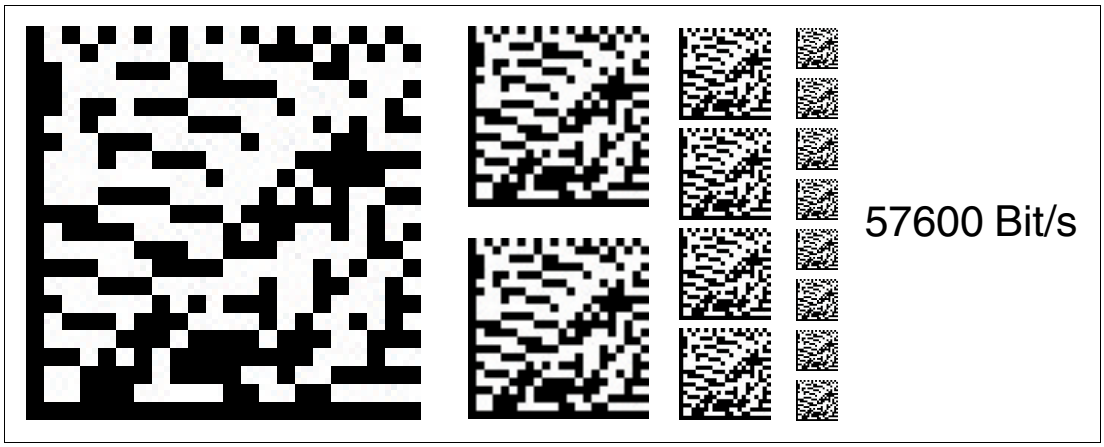

Figure 6.14 The transfer rate of the read head for communication via the interface is preset to 57600 bit/s.

Transfer rate: 76800 bit/s

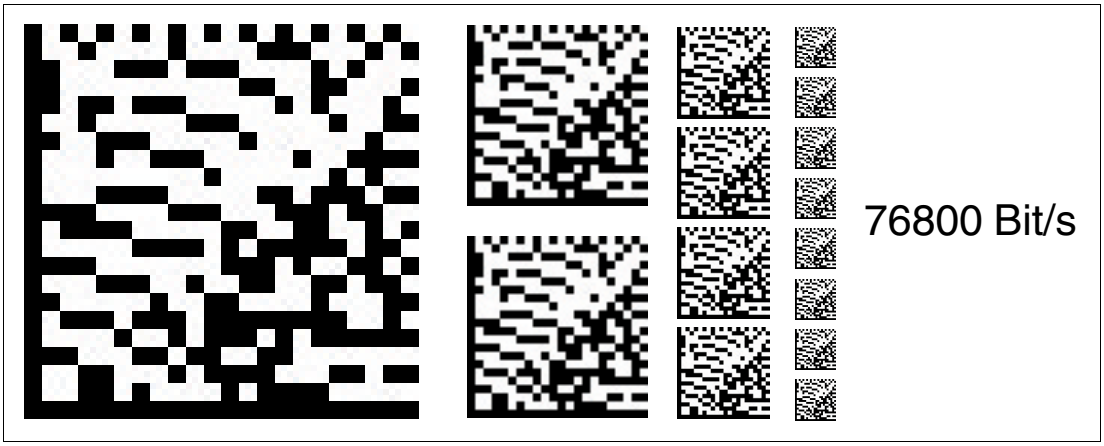

Figure 6.15 The transfer rate of the read head for communication via the interface is preset to 76800 bit/s.

Transfer rate: 115200 bit/s

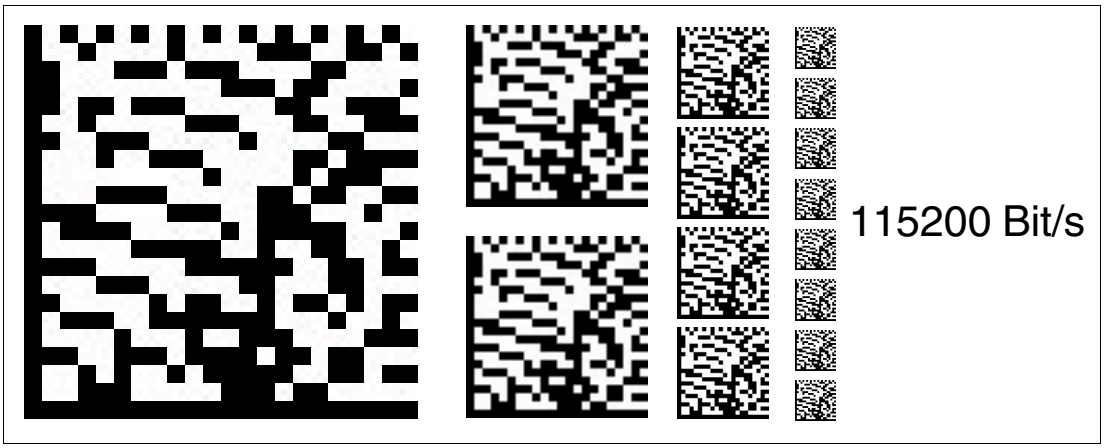

Figure 6.16 The transfer rate of the read head for communication via the interface is preset to 115200 bit/s.

Transfer rate: 230400 bit/s

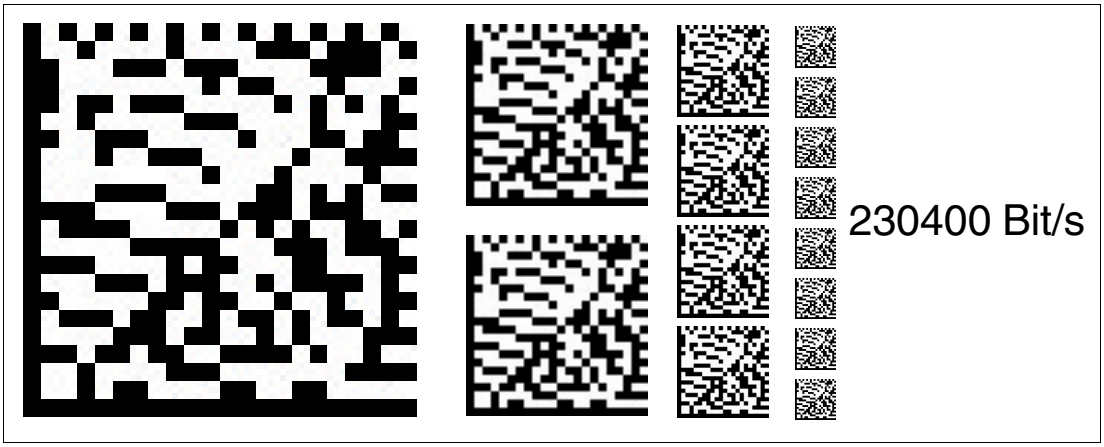

Figure 6.17 The transfer rate of the read head for communication via the interface is preset to 230400 bit/s.

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6.1.5 Code cards for adjusting the terminator

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

Terminator: OFF

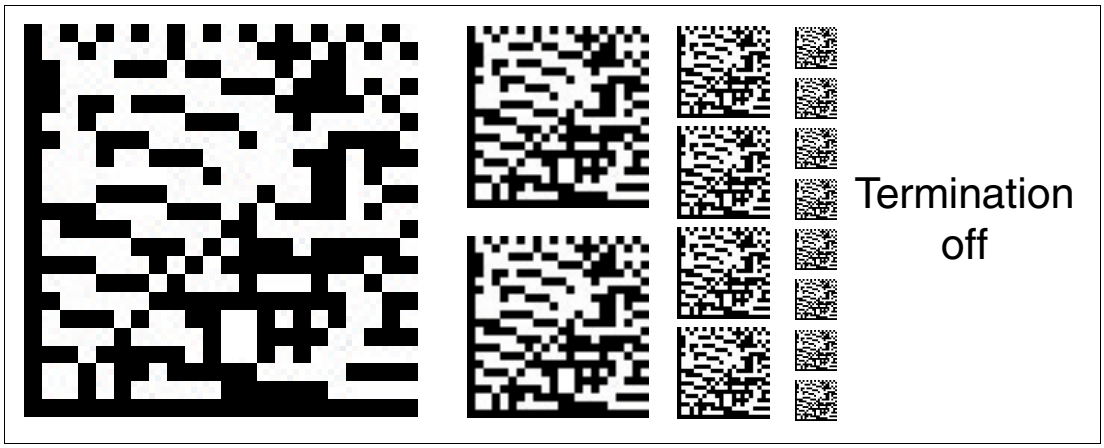

Figure 6.18 The terminator is deactivated.

Terminator: ON

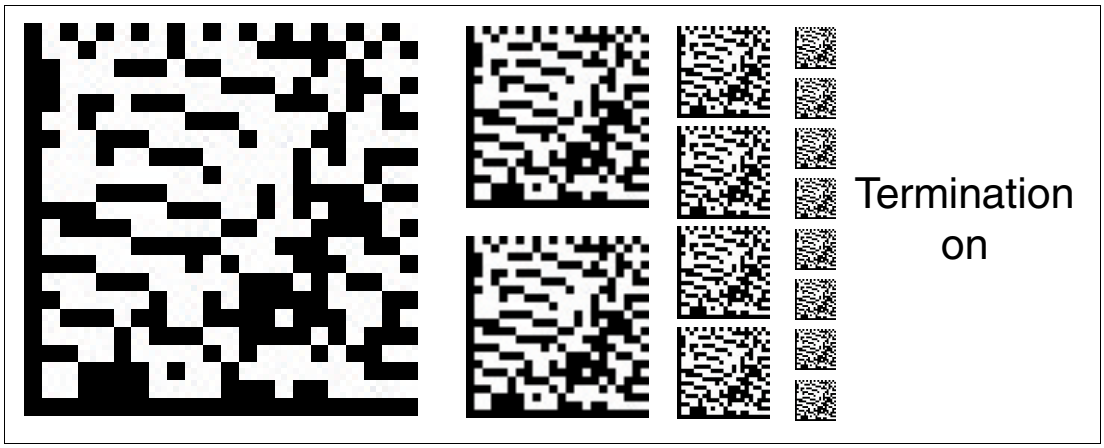

Figure 6.19 The terminator is connected.

6.1.6 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

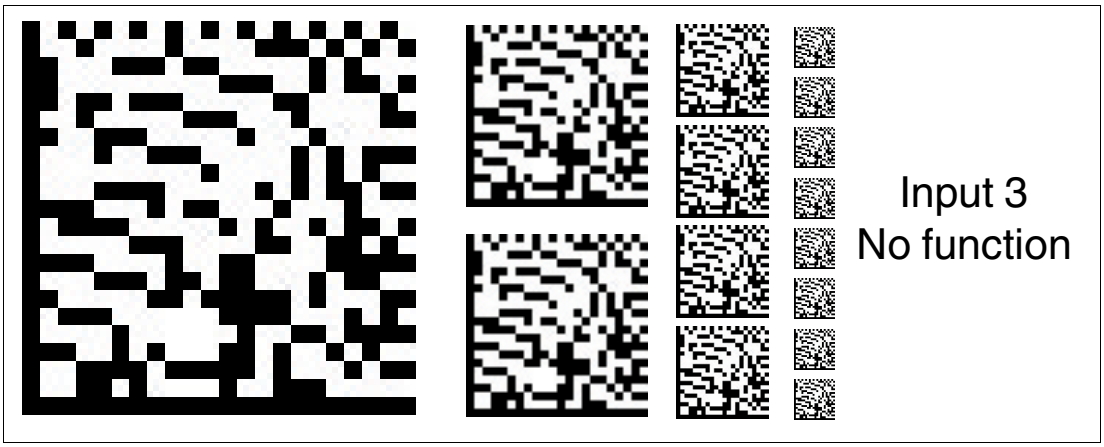

Figure 6.20 Input/output 3 is defined as an input but has no function.

Output 3: Overspeed

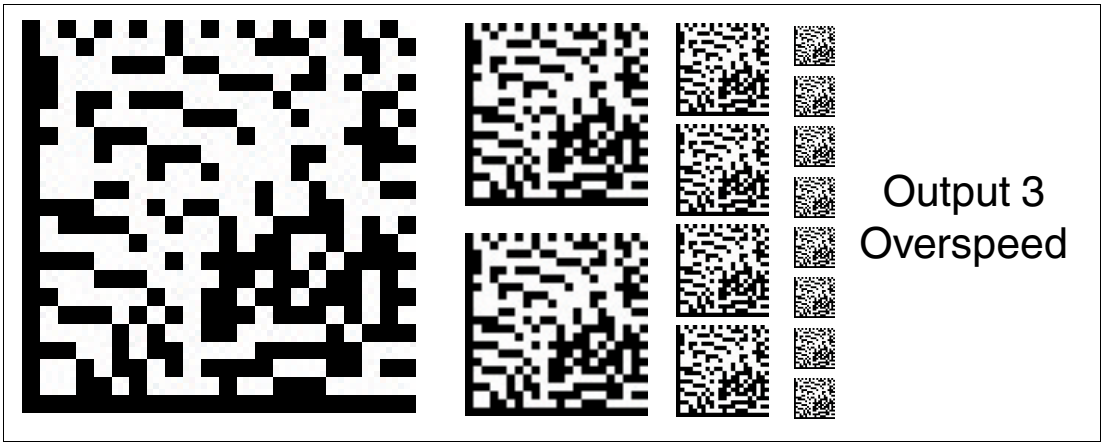

Figure 6.21 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as the defined maximum speed is exceeded.

Output 3: Warning

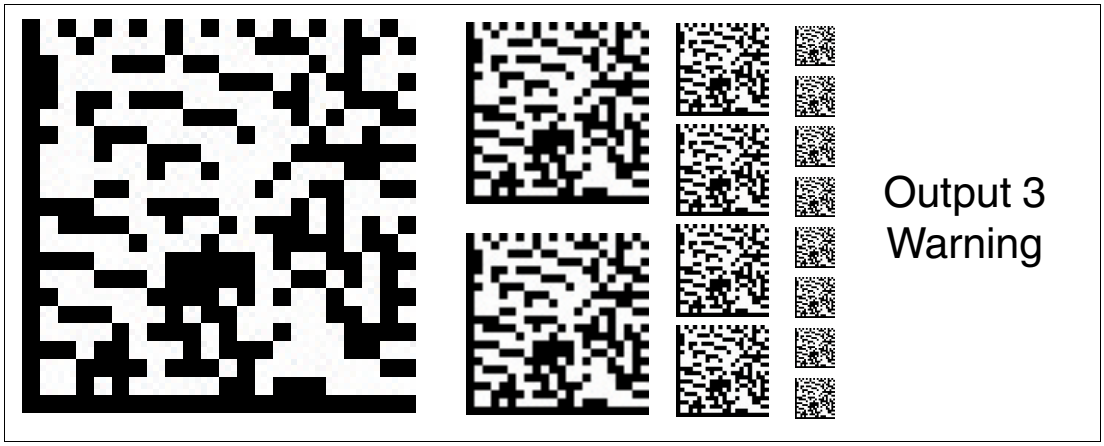

Figure 6.22 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as a warning message is present in the read head.

Output 3: Fault

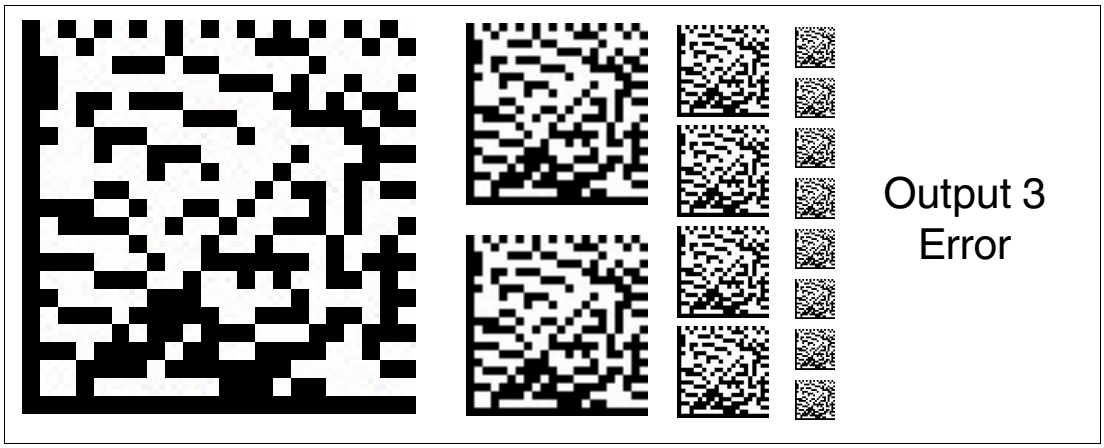

Figure 6.23 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as an error message is present on the read head.

Output 3: Event

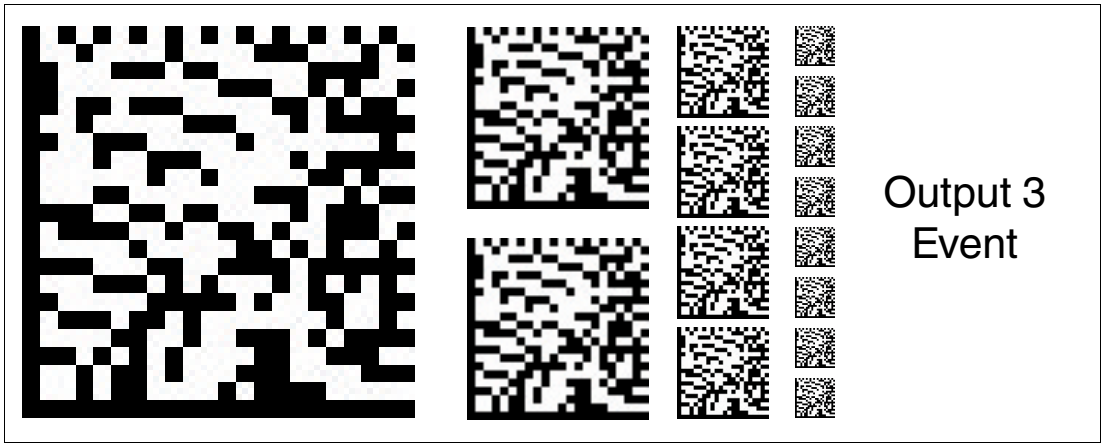

Figure 6.24 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as an event marker is present in the read field of the read head.

Output 3: No position

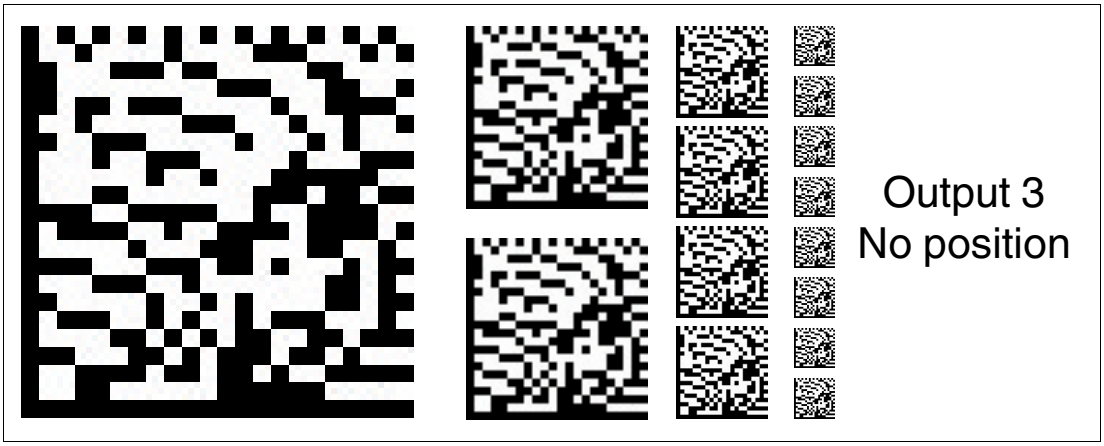

Figure 6.25 Input/output 3 is defined as an output. This output carries the potential $+U_B$ as long as the read head is not reading any position information.

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