

**PXV100Q-F213-SSI\***

# **Incident Light Positioning System**

**Manual**



---

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 Elek-  
troindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause:  
"Expanded reservation of proprietorship"

#### **Worldwide**

Pepperl+Fuchs Group  
Lilienthalstr. 200  
68307 Mannheim  
Germany  
Phone: +49 621 776 - 0  
E-mail: [info@de.pepperl-fuchs.com](mailto:info@de.pepperl-fuchs.com)

#### **North American Headquarters**

Pepperl+Fuchs Inc.  
8093 Darrow Road  
Twinsburg, Ohio 44087  
+1 330 425-3555  
[sales@us.pepperl-fuchs.com](mailto:sales@us.pepperl-fuchs.com)  
United States of America  
E-mail: [sales@us.pepperl-fuchs.com](mailto:sales@us.pepperl-fuchs.com)

#### **Asia Headquarters**

Pepperl+Fuchs Pte. Ltd.  
P+F Building  
18 Ayer Rajah Crescent  
Singapore 139942  
Phone: +65 6779-9091  
E-mail: [sales@sg.pepperl-fuchs.com](mailto:sales@sg.pepperl-fuchs.com)  
<https://www.pepperl-fuchs.com>

|          |                                                                    |           |
|----------|--------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Introduction .....</b>                                          | <b>6</b>  |
| 1.1      | Content of this Document .....                                     | 6         |
| 1.2      | Target Group, Personnel .....                                      | 6         |
| 1.3      | Symbols Used .....                                                 | 6         |
| <b>2</b> | <b>Product Description .....</b>                                   | <b>8</b>  |
| 2.1      | Overview of Versions .....                                         | 8         |
| 2.2      | Use and Application .....                                          | 8         |
| 2.3      | LED Indicators .....                                               | 9         |
| 2.4      | Ambient Conditions .....                                           | 10        |
| 2.5      | Accessories .....                                                  | 11        |
| <b>3</b> | <b>Planning .....</b>                                              | <b>12</b> |
| 3.1      | Position Detection: Structural Principle .....                     | 12        |
| 3.2      | Plant Design .....                                                 | 12        |
| 3.3      | Reading Tolerance of the Read Heads .....                          | 13        |
| 3.4      | Read Head Orientation .....                                        | 13        |
| 3.5      | Characteristics of the Data Matrix Codes and Code Redundancy ..... | 15        |
| 3.6      | Read Head Orientation .....                                        | 16        |
| 3.6.1    | Read Tolerance in Z Direction .....                                | 16        |
| 3.6.2    | Reading Tolerance in y Direction .....                             | 17        |
| 3.6.3    | Inclination Angle .....                                            | 19        |
| 3.6.4    | Rotational Tolerance in the z Axis .....                           | 20        |
| 3.7      | Expansion Joints / Gaps .....                                      | 21        |
| 3.8      | Behavior of the Read Head When Cornering .....                     | 27        |
| 3.9      | Behavior at x Position 0 .....                                     | 29        |
| 3.10     | Quality Grade .....                                                | 29        |
| 3.11     | Synchronization Output (Sync out) .....                            | 31        |
| <b>4</b> | <b>Installation and Commissioning .....</b>                        | <b>33</b> |
| 4.1      | Applying the Data Matrix Code Tape .....                           | 33        |
| 4.2      | Mounting the Read Head .....                                       | 35        |
| 4.3      | Electrical Connection .....                                        | 38        |
| 4.4      | Alignment Using the Alignment Gauge .....                          | 41        |
| 4.5      | Parameterization Using Code Cards .....                            | 42        |

|          |                                           |           |
|----------|-------------------------------------------|-----------|
| <b>5</b> | <b>Vision Configurator .....</b>          | <b>44</b> |
| 5.1      | Installing Vision Configurator .....      | 44        |
| 5.2      | Connecting the Read Head to the PC .....  | 44        |
| 5.3      | User Account Privileges and Rights .....  | 48        |
| 5.4      | Application Window Structure .....        | 48        |
| 5.5      | Menu Bar .....                            | 50        |
| 5.5.1    | File Menu .....                           | 50        |
| 5.5.2    | View menu .....                           | 50        |
| 5.5.3    | Sensor menu .....                         | 51        |
| 5.5.4    | Image Menu .....                          | 51        |
| 5.5.5    | Administration Menu .....                 | 51        |
| 5.5.6    | Help Menu .....                           | 52        |
| 5.6      | Toolbar .....                             | 52        |
| 5.7      | Device Data .....                         | 52        |
| 5.8      | Image Display .....                       | 53        |
| 5.9      | Position View .....                       | 54        |
| 5.10     | Configuration Window .....                | 56        |
| 5.10.1   | Sensor Information tab .....              | 56        |
| 5.10.2   | Tab Common .....                          | 56        |
| 5.10.3   | Tab Measurement .....                     | 60        |
| 5.10.4   | Tab Code tape and optics .....            | 63        |
| 5.10.5   | Tab SSI config .....                      | 64        |
| <b>6</b> | <b>Operation and Communication .....</b>  | <b>66</b> |
| 6.1      | Communication via the SSI Interface ..... | 66        |
| 6.2      | I/O Configuration .....                   | 68        |
| <b>7</b> | <b>Maintenance .....</b>                  | <b>70</b> |
| 7.1      | Maintenance .....                         | 70        |
| 7.2      | Testing .....                             | 70        |
| 7.3      | Cleaning .....                            | 71        |
| 7.4      | Repair .....                              | 72        |
| <b>8</b> | <b>Disposal .....</b>                     | <b>74</b> |

**9    Appendix ..... 75**

**9.1    Code Cards for External Parameterization..... 75**

        9.1.1    Code Cards with Special Functions ..... 75

        9.1.2    Code cards for Setting the Resolution ..... 78

        9.1.3    Code Cards for Setting the Orientation ..... 79

        9.1.4    Code Cards for Setting the Output Code ..... 81

        9.1.5    Code Cards for Setting Input/Output 2 (OUT 2 / IN 2) ..... 82

        9.1.6    Code Cards for Setting Input/Output 3 (OUT 3 / IN 3) ..... 86

**9.2    ASCII Table ..... 90**

# 1 Introduction

## 1.1 Content of this Document

This document contains information that you need in order to use your product throughout the applicable stages of the product life cycle. These can include 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](http://www.pepperl-fuchs.com).

---

---

### Note

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at [www.pepperl-fuchs.com/device-information](http://www.pepperl-fuchs.com/device-information).

---

The documentation consists of the following parts:

- Present document
- Datasheet

Additionally, the following parts may belong to the documentation, if applicable:

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

## 1.2 Target Group, Personnel

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

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

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

## 1.3 Symbols Used

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

### Warning Messages

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

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



---

**Danger!**

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

---



---

**Warning!**

This symbol indicates a possible fault or danger.

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

---



---

**Caution!**

This symbol indicates a possible fault.

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

---

### Informative Symbols



---

**Note**

This symbol brings important information to your attention.

---



---

**Tip**

This symbol brings an useful tip to your attention.

---



---

**Example**

This symbol provides an example of the issue described.

---



---

**Action**

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

## 2 Product Description

### 2.1 Overview of Versions

This manual describes the PXV100Q-F213-SSI\* read head in two connection versions. Both versions use the same sensor technology but have different cable connection types, which affect the connection and wiring concept:

- **PXV100Q-F213-SSI-3M** with open cable end (cable length 3 m)
- **PXV100Q-F213-SSI-0.3M-V19** with M12 connector (cable length 0.3 m)



#### Note

#### Terminology

The term "read head" is used generally throughout this manual. Unless expressly stated otherwise, the descriptions refer to both versions. Where content refers solely to a specific version, this is clearly indicated by the type designation (e.g., PXV100Q-F213-SSI-3M or PXV100Q-F213-SSI-0.3M-V19).

### 2.2 Use and Application

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

The **code tape** is usually mounted on a fixed part of the plant (e.g., the wall of an elevator shaft, or the rail on a monorail conveyor). The read head is mounted on a "vehicle" that moves in parallel to the code tape (e.g., on the elevator cabin or on the chassis of a monorail conveyor).

#### Maximum Length of the Code Tape

| Resolution of the read head [mm] | Maximum code tape length [km]<br>With standard configuration | Maximum code tape length [km]<br>With 25-bit coding<br>(see chapter 6.1) |
|----------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------|
| 10                               | 41.94                                                        | 100                                                                      |
| 1                                | 4.19                                                         | 33.55                                                                    |
| 0.1                              | 0.41                                                         | 3.355                                                                    |

The code tape length of up to 41.94 km is sufficient even for very large applications. It offers sufficient reserves for extensions or systems with several branches and parallel conveyor routes.

The read head can be optimally adapted to the respective application due to the comprehensive and simple parameterization and the freely configurable inputs and outputs.

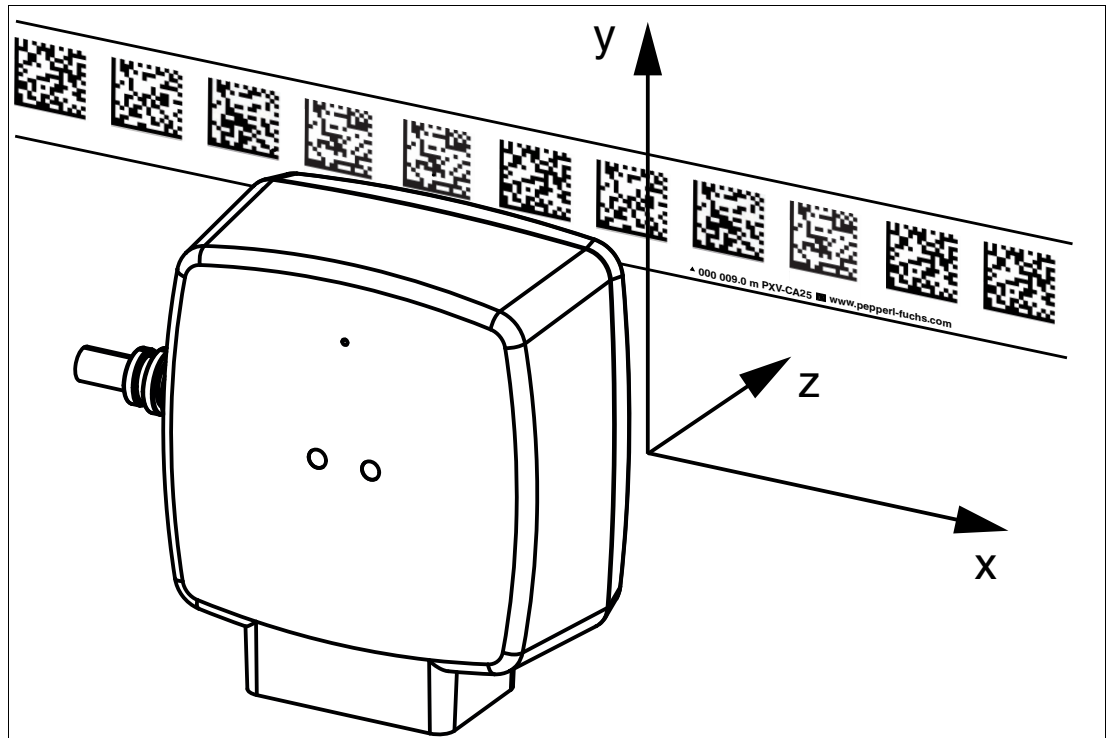


Figure 2.1 Schematic diagram of the alignment of the code tape and reader



#### Note

##### Security Information

From a security perspective, the following precautions must be taken for the product by the responsible application operator:

- Physically secure the device against unauthorized access.
- Make sure there is a point-to-point connection between the device and the higher-level controller.

2.3 LED Indicators

The read head is equipped with two indicator LEDs for carrying out visual function checks and quick diagnostics.

LED Overview

| LED | Color        | Label                       | Meaning                               |
|-----|--------------|-----------------------------|---------------------------------------|
| 1   | Green/yellow | COM STATE                   | UART configuration interface active   |
| 2   | Green/red    | POWER ON<br>NO CODE / ERROR | Code detected / not detected<br>Error |

Table 2.1 LEDs



Note

The COM STATE LED does not indicate the status of the regular SSI communication. It is used solely to indicate communication via the configuration interface. In normal operating mode, the LED remains off, even if communication is taking place.

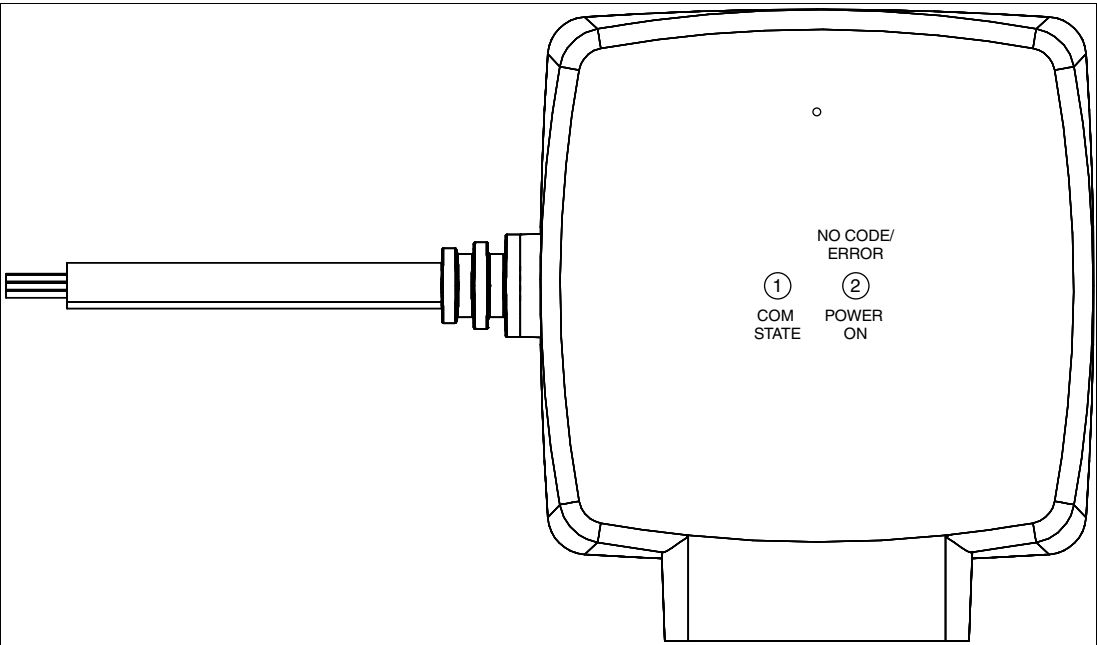


Figure 2.2 Display elements

**LED Function Overview**

| LED   | 1         |          | 2                 |                   | Description                             |
|-------|-----------|----------|-------------------|-------------------|-----------------------------------------|
| Mode  | COM STATE |          | POWER ON          | NO CODE / ERROR   |                                         |
| Color | Green     | Yellow   | Green             | Red               |                                         |
| State | Off       | On       | x                 | x                 | Connected (physical) link               |
|       | Off       | Flashing | x                 | x                 | UART communication during configuration |
|       | x         | x        | Lit               | Off               | Codes detected                          |
|       | x         | x        | Off               | Flashing          | Codes not detected                      |
|       | x         | x        | x                 | Lit               | System error                            |
|       | x         | x        | Lights up for 1 s | Off               | Code card detected                      |
|       | x         | x        | Off               | Lights up for 1 s | Code not detected                       |

Table 2.2  $F_{\text{flash}} = 2.5 \text{ Hz}$  (1 request line for flashing with 3 On states)  
x: LED status has no meaning

## 2.4 Ambient Conditions

This section describes the ambient conditions under which the positioning system can be operated. Detailed specifications on the protection class, temperature range, and applicable standards can be found in the data sheet for the read head and the positioning targets.

### Indoor Use

The positioning system is primarily designed for indoor use. Compliance with specified protection class, temperature range, and relevant standards is the basic prerequisite for proper operation.

Indoor optical interference, especially dirt on the code tape, can affect system reliability. Although the system has high redundancy, this can affect reading performance. The read head has an internal function to evaluate the optical quality of the code tape (). This function enables early detection of dirt or damage and therefore prompt corrective action. For instructions on cleaning the code tape, see see chapter 7.3.

### Outdoor Use

The read head and the code tape are generally resistant to outdoor environmental conditions. However, optical interference outdoors is often unavoidable. Uncontrollable environmental factors such as snow, ice, rain, or condensation can impair the read head's view of the positioning targets and prevent reliable positioning.



#### Tip

##### Protective Measures Outdoors

If the system needs to be used outdoors, steps must be taken to prevent optical interference. A key measure is to protect the code tape and the read head from rain, for example by using a canopy. Water droplets on the read head glass or on the code tape can impair the reading of Data Matrix codes. Ideally, a continuous canopy should be installed between the read head and the code tape. Without such a protection, extreme snowfall or rain may cause temporary system outages.

## 2.5

### Accessories

Suitable accessories for your read head can be found on the "Related products" tab of our website [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

## 3 Planning

### 3.1 Position Detection: Structural Principle

The Data Matrix positioning system uses a 2-D camera system and an integrated lighting unit to detect position marks printed on a self-adhesive code tape as two-dimensional Data Matrix codes. The 120 × 80 mm field of view can capture up to 5 codes simultaneously in a single scan. Precise position detection is only possible with just one code in the reading window. This means that large gaps in the Data Matrix code tape can be bridged. By using several Data Matrix codes as information carriers, data can be represented in a highly redundant manner. Positioning in the y direction is also possible with Data Matrix codes.

The detected absolute x position is transmitted to the control system via the SSI interface.

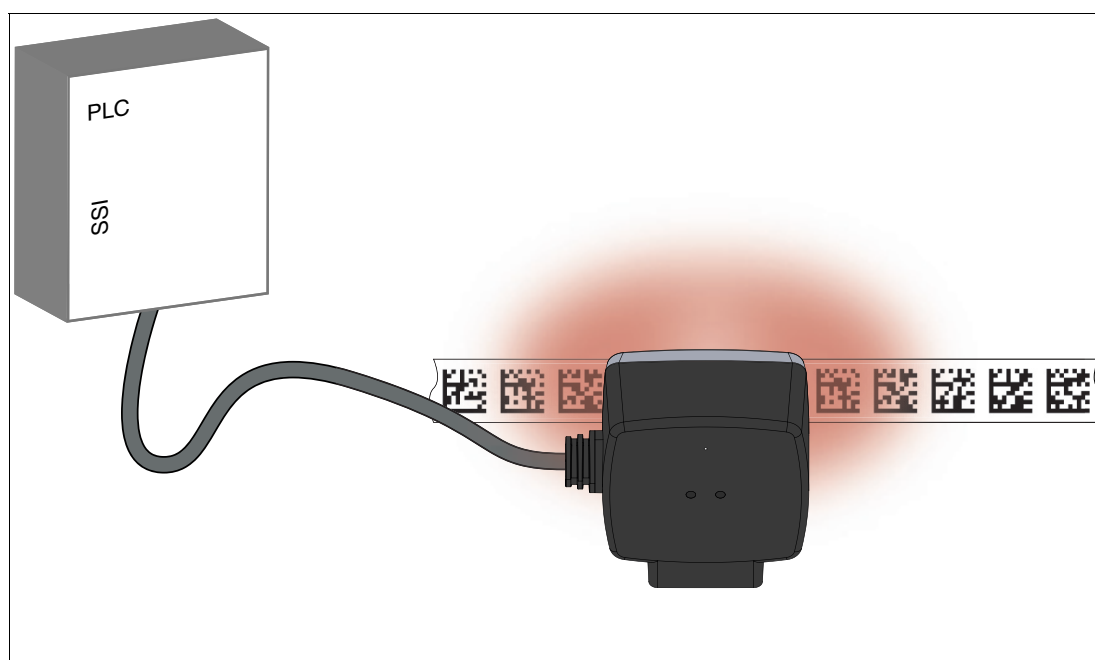


Figure 3.1 Schematic structure of the positioning system

### 3.2 Plant Design

Before selecting and using the product, the plant designer must evaluate whether this product is suitable for the intended application. Pepperl+Fuchs has no influence on the selection and use of this product. The warranty therefore only covers the consistent quality of the product.

Ensure that this device is used only in accordance with the technical specification described in these instructions. The device must not be used in a hazardous area.



#### Warning!

Danger due to ambiguous position information

Using double code areas can result in duplicate position information. This can lead to unclear position information. This can result in an incorrect control logic, which poses a risk to the personnel and plant.

During planning, make sure that the position information for the read head is unique in every component of the plant. Never use double code areas.

3.3 Reading Tolerance of the Read Heads

The reading tolerance is the part of the field of view of the read head in which Data Matrix codes can be decoded. It must be ensured that the Data Matrix code is completely in the reading tolerance. Data Matrix codes require a quiet zone (white area without coding) of at least 2 mm around the code to ensure successful reading. This quiet zone must not be violated when cutting the code.

The field of view is the maximum image on the sensor chip that is determined by the optical properties of the camera. The size of the field of view varies with the distance between the read head and the Data Matrix code tape. If the read head is positioned farther away from the Data Matrix code tape, the field of view is larger. If the read head is closer to the Data Matrix code tape, the field of view is smaller due to the shorter distance.

Field of View of the Read Head

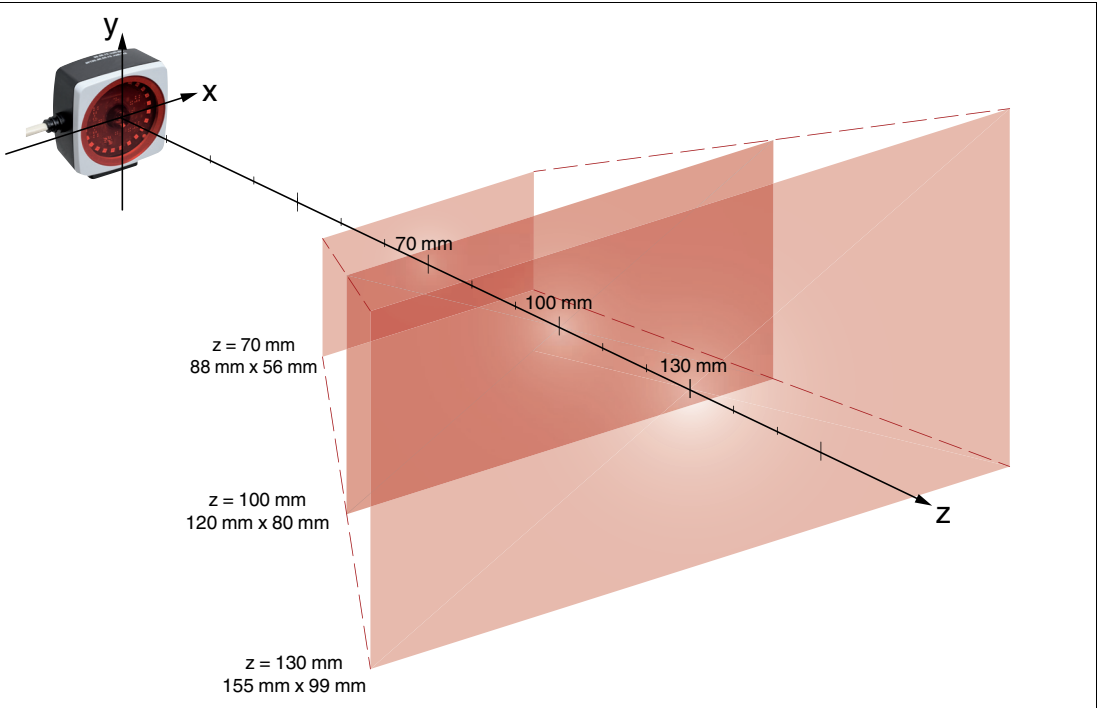


Figure 3.2 Size of read head field of view in relation to read distance  $z$

Size of Field of View at Nominal Distance 100 mm

| Read distance $z$ to Data Matrix code tape [mm] | 70      | 100      | 130      |
|-------------------------------------------------|---------|----------|----------|
| Field of view size [mm]                         | 88 x 56 | 120 x 80 | 155 x 99 |

### 3.4 Read Head Orientation

For maximum code redundancy, a read head orientation of 0 °/180 ° to the Data Matrix code tape is recommended.

The following configuration options are available for orientation:

- 0 °
- 180 °
- 0 °/180 °
- 0 °/90 °/180 °/270 °
- 90 °/270 °

#### Note

##### Alignment Accuracy

The actual orientation of the read head must not deviate too much from the configured values. Refer to the detailed information on the rotational tolerance in the z axis.

The diagram below shows how different orientations affect the alignment of the read window in relation to the Data Matrix code tape.

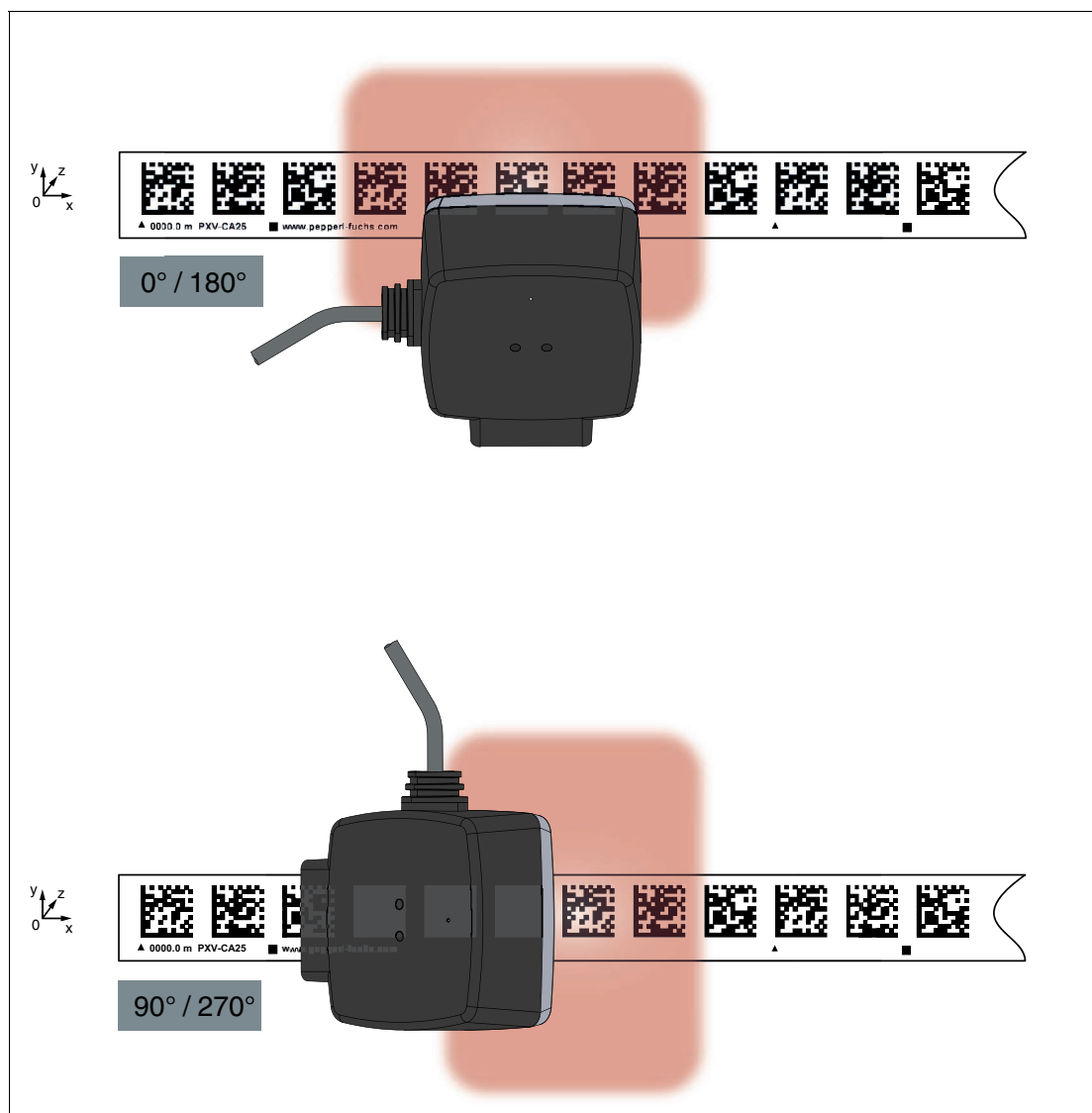


Figure 3.3 Read Head Orientation

2026-07

## 3.5 Characteristics of the Data Matrix Codes and Code Redundancy

### Characteristics of the Data Matrix Code

The position marks in the code tape contain information about the absolute position of the tape, and serve as reference points for the read head. The read head uses its camera to capture the image of the code and uses the information contained in the position marks to determine the exact position of the code in the camera image. This enables accurate positioning of the read head.

The code tape uses fail-safe Data Matrix codes. This is a special type of Data Matrix code (ECC200) that is encoded using the Error Correction Code (ECC) procedure. This means that it contains additional information to correct errors when reading or transmitting the code. As a result, codes can be damaged or partially obscured without the readability of the code being affected. This is especially important because in some cases the codes can be subject to a lot of wear and dirt.

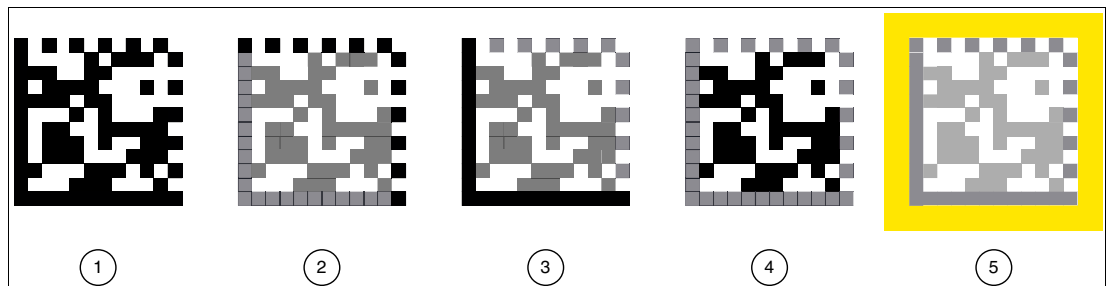


Figure 3.4 Data Matrix code ECC200

A Data Matrix code ECC200 consists of several areas that are relevant for code reading:

- 1 Data Matrix code according to ECC200, symbol size 12x12, black/white
- 2 **Alternating Pattern:** The Alternating Pattern is a pattern of alternating black and white modules. The number of modules is even. It allows the data density to be determined. The Alternating Pattern is used for symbol size recognition and ECC200 type recognition.
- 3 **Finder pattern:** The Finder Pattern is a characteristic pattern of black modules arranged in an L shape. It is used to locate the Data Matrix code in any rotation. Distortions are also detected. The Finder Pattern is used to clearly determine the location and size of the Data Matrix code.
- 4 **Data Range:** The data range is the actual data field in the Data Matrix code in which the information to be encoded is stored. It consists of a matrix of black and white squares representing the binary data.  
Error correction range: The error correction range is a portion of the Data Matrix code that contains additional data to detect and correct errors in reading and transmitting the code. The error correction range is encoded using the Error Correction Code (ECC).
- 5 **Quiet Zone:** The quiet zone (shown in yellow here) is a white area around the Data Matrix code. It is used to distinguish the code from other objects or the background. This makes it easier for the read head to read the code. The width of the quiet zone is 2 mm. To ensure that the read head can read the Data Matrix codes, the quiet zone of 2 mm around the Data Matrix code must not be violated when cutting the code tape.

## Code Redundancy

Once at least one single Data Matrix code is detected in the field of view, the position output can be performed. The system therefore offers the highest possible pollution tolerance, and can also bridge expansion joints or gaps without losing position.

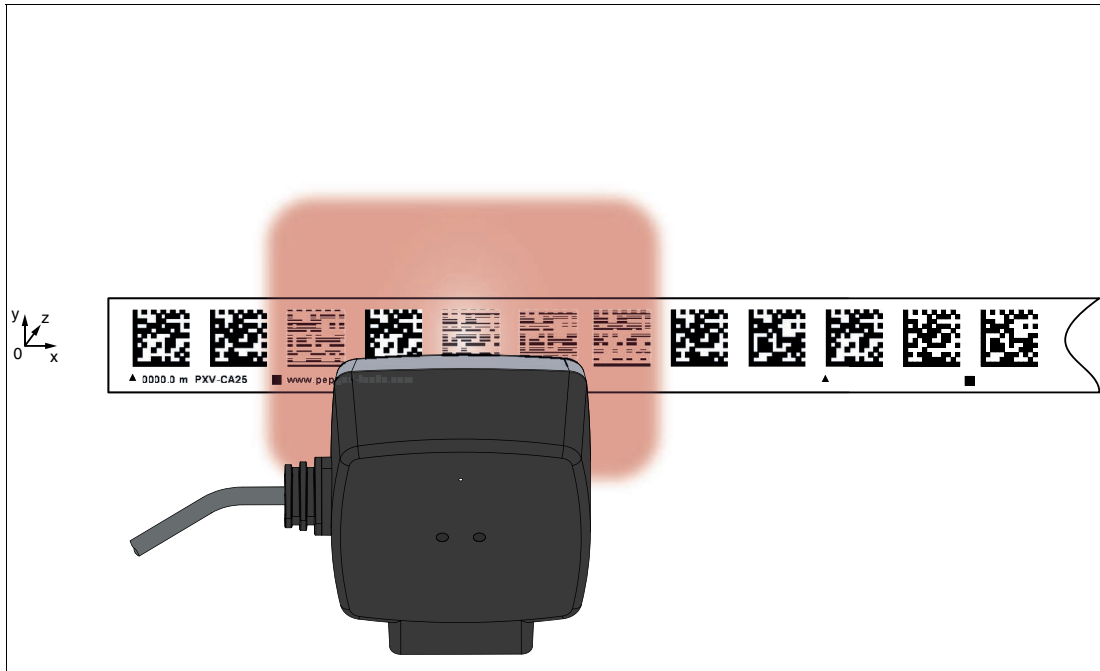


Figure 3.5 Code Redundancy

3.6 Read Head Orientation

3.6.1 Read Tolerance in Z Direction

The read head offers a high read tolerance at different reading distances. If the read head is mounted too close or too far away from the Data Matrix code tape, a warning message is issued. We recommend that the read head always be mounted at a nominal distance of 100 mm to ensure the highest possible availability of the system (due to resolution and code redundancy). Pay particular attention to the reduced mounting tolerance in the y direction and the reduced gap width, especially at extremely close reading distances.

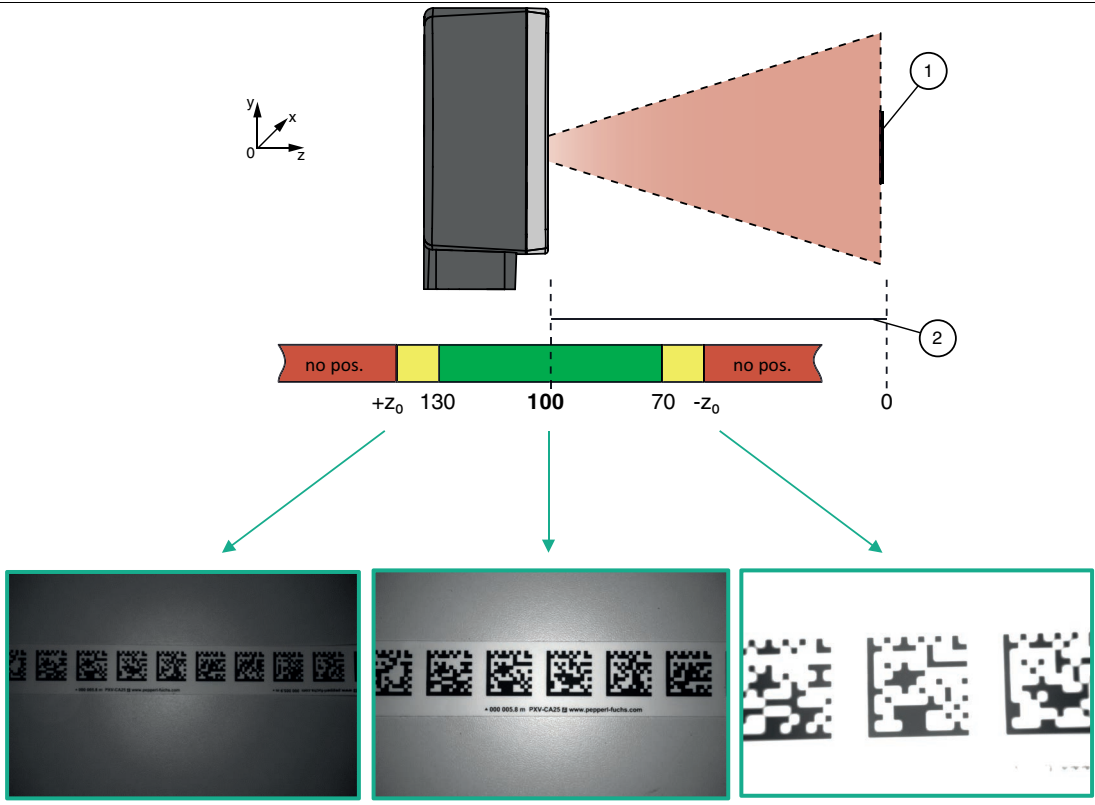


Figure 3.6

- 1 Data Matrix code tape
- 2 Read distance to the Data Matrix code tape in z direction
- Green** Recommended reading tolerance: Nominal distance 100 mm ± tolerance
- Yellow** Range in which a "warning bit" is set
- Red** Range in which a "no pos. bit" is set

| Read distance (z) | Range "warning" bit | Range "no pos." bit |
|-------------------|---------------------|---------------------|
| < -z <sub>0</sub> |                     | x                   |
| < 70 mm           | x                   |                     |
| 100 mm            |                     |                     |
| > 130 mm          | x                   |                     |
| < +z <sub>0</sub> |                     | x                   |

2026-07

3.6.2 Reading Tolerance in y Direction

When moving along the Data Matrix code tape (x-axis), the read head continuously detects its position in the y direction and compares the deviation from the zero line (y = 0) with the permissible limit value  $\pm y_0$ . If the error exceeds the limit value (shown in red in the following figures), the read head loses the position, and a "no position" message is output.

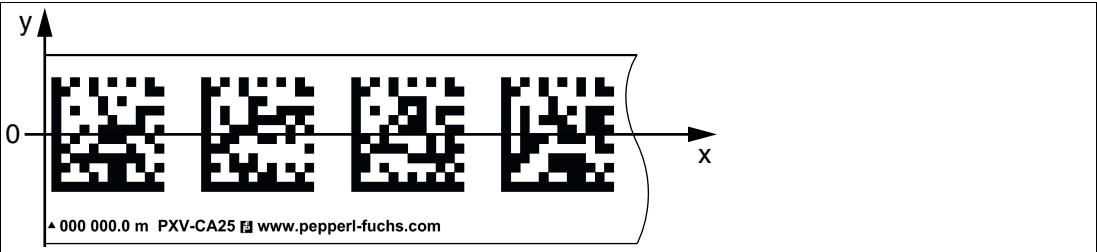
Zero Line (y = 0)

If the read head has detected a Data Matrix code tape, this code tape can move away from the zero line (y = 0) in the y direction within the field of view. The read head reacts in two stages:

- **Warning message:** in the event of a deviation from the zero line > 25 mm
- **Position loss:** when the limit values  $+y_0$  or  $-y_0$  are reached.

The limit values  $+y_0$  and  $-y_0$  depend on the distance (z) of the read head and its orientation. They are asymmetrical, especially when the read head is tilted, and are subject to component tolerances. The values here are valid for the specified nominal distance.

Nominal distance 100 mm



Nominal distance 100 mm

| Height tolerance (y) | Range "Warning message" | Range "No position message" |
|----------------------|-------------------------|-----------------------------|
| > $y_0$ mm           |                         | x                           |
| > 25 $\geq y_0$ mm   | x                       |                             |
| 0 mm                 |                         |                             |
| > -25 $\geq -y_0$ mm | x                       |                             |
| > $-y_0$ mm          |                         | x                           |

Target Range

The read head is in an optimal position with respect to the Data Matrix code tape.

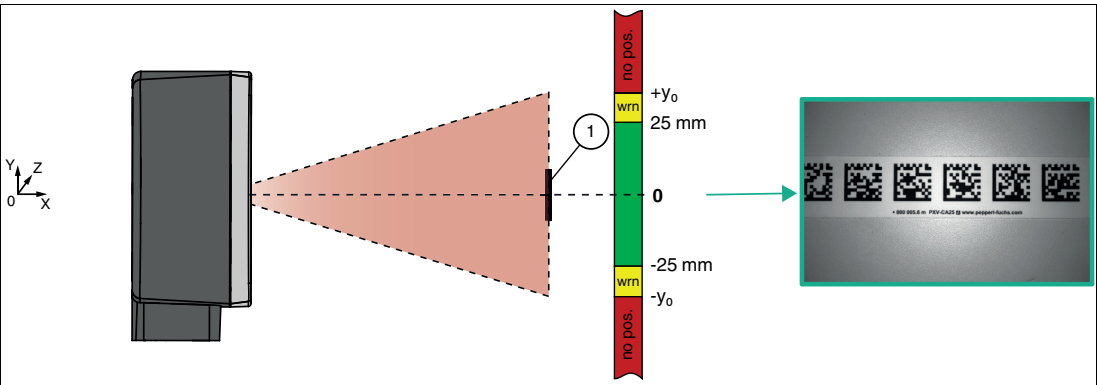


Figure 3.7      Green: recommended range  
1: Data Matrix code tape

## No-Position

The read head is positioned too low in relation to the Data Matrix code tape and loses the position. The message "No-Position" is output.

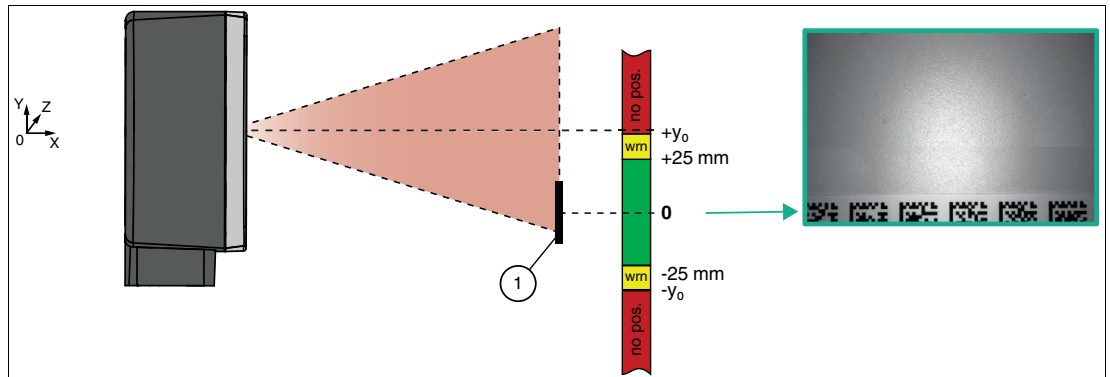


Figure 3.8 Red: Range in which a "No Position" message is set  
1: Data Matrix code tape

### 3.6.3 Inclination Angle

An inclination angle of  $\pm 30^\circ$  is possible. It should be noted that the extreme tolerances do not apply in total.



#### Note

Simultaneous tiltings in the x and y directions are allowed. It is important to note that tilting the sensor shifts the reading window. If the sensor is tilted too much, this can cause the reading window to stop covering the Data Matrix codes.

#### Angle Tolerance on the y Axis

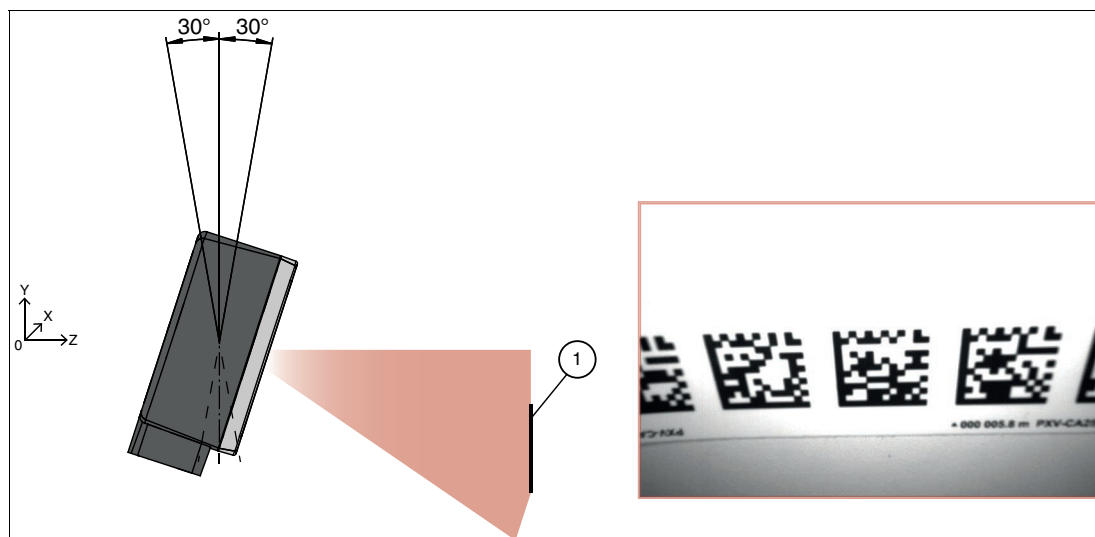


Figure 3.9 Vertical orientation tolerance

1 Data Matrix code tape

#### Angular Tolerance on the x Axis

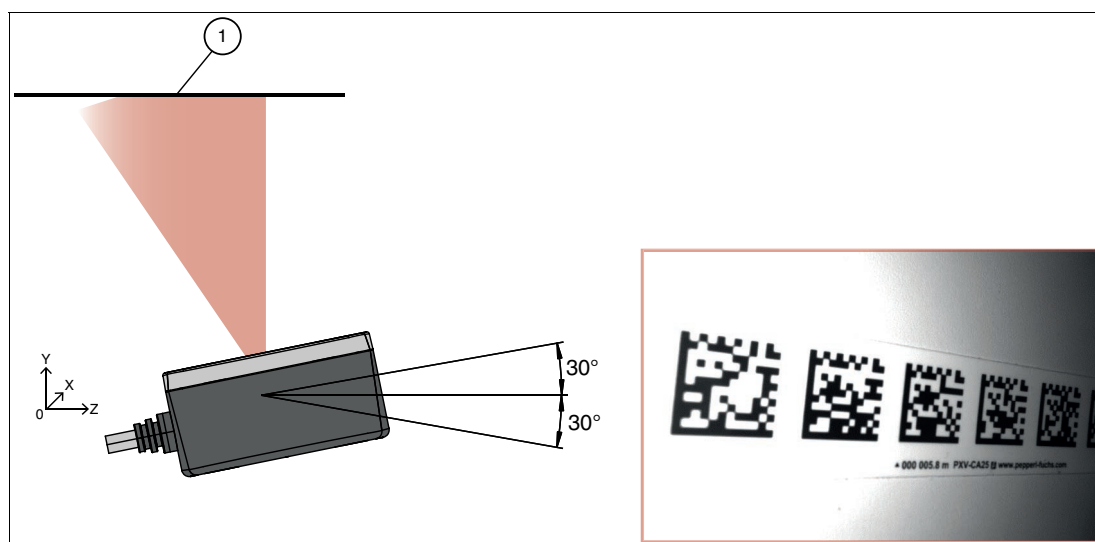


Figure 3.10 Horizontal orientation tolerance

1 Data Matrix code tape

### 3.6.4 Rotational Tolerance in the z Axis

The maximum possible rotation of the read head around the z axis in relation to the code tape is  $\pm 10^\circ$ . It should be noted that the extreme tolerances do not apply in total.

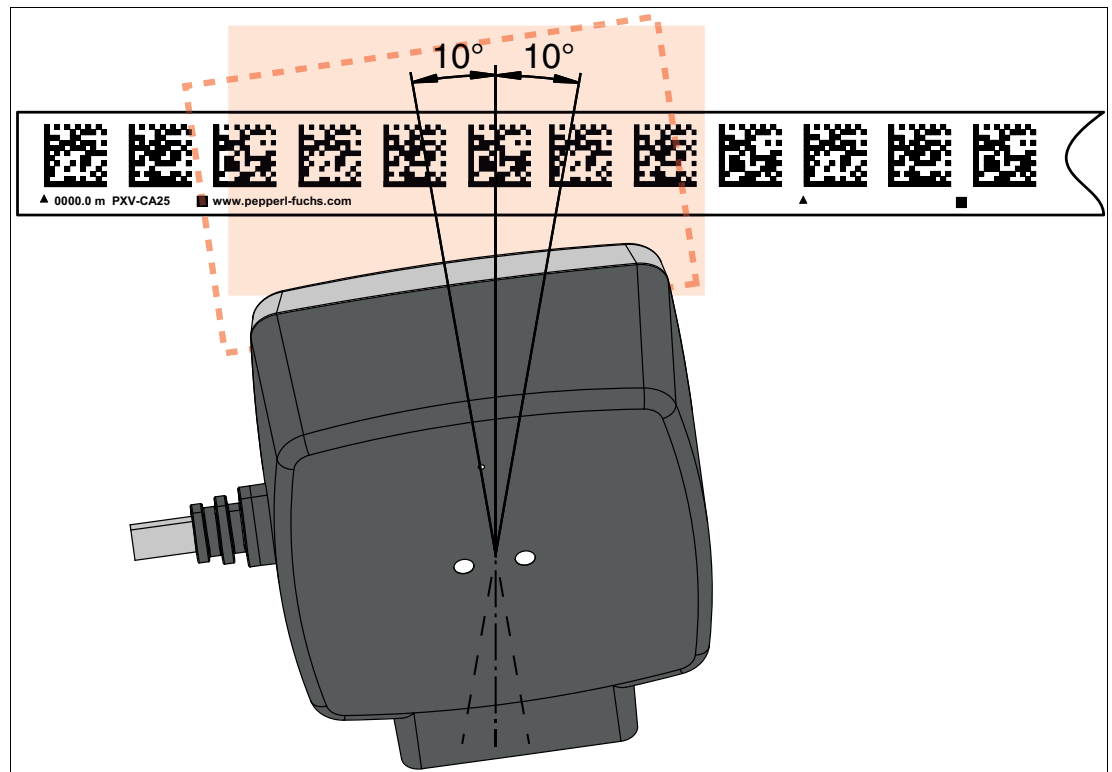


Figure 3.11 Rotational tolerance

## 3.7 Expansion Joints / Gaps

To compensate for temperature-related length changes in plant structures, expansion joints are usually required for longer tracks. If a Data Matrix code tape is applied at such locations, we recommend that you interrupt the code tape at the edge of the expansion joint and continue with a fully readable Data Matrix code tape. The read head is able to drive over expansion joints and gaps without loss of position.

The maximum gap (D) refers to the distance between two fully readable Data Matrix codes. It is therefore necessary to observe the grid of the code tape and ensure that the gaps are within the grid. The maximum gap width (D) not only depends on the reading distance, but also on the orientation of the read head.

It is therefore recommended to determine and maintain the maximum gap width based on the specific reading distance, the alignment of the read head, and the pattern of the code tape. Below are some typical values for the maximum gap width (D) depending on the read distance and the alignment of the read head.



#### Note

##### Maintain the Quiet Zone!

A quiet zone (white space without coding) of 2 mm must be maintained around the Data Matrix codes. To ensure that the read head can read the Data Matrix codes, the quiet zone of 2 mm around the Data Matrix code must not be violated when cutting the code tape.



#### Note

The following values apply only to straight sections, not curves.

Maximum Gap for Read Head Orientation 0 °/180 °

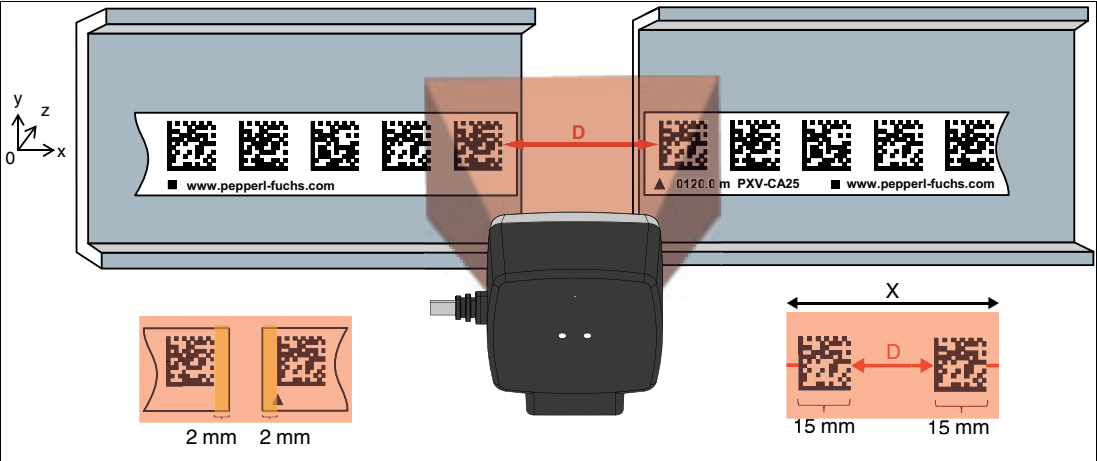


Figure 3.12 Expansion Joints / Gaps

**X = field of view**



**Note**

Note that the gap width D defines the distance between two complete Data Matrix codes and not the actual mechanical gap width.

**Maximum Gap Width (D)**

| Read distance (z) | Max. gap width (D) |
|-------------------|--------------------|
| 70 mm             | 54 mm              |
| 100 mm            | 86 mm              |
| 130 mm            | 121 mm             |

## Maximum Gap for Read Head Orientation 90 °/270 °

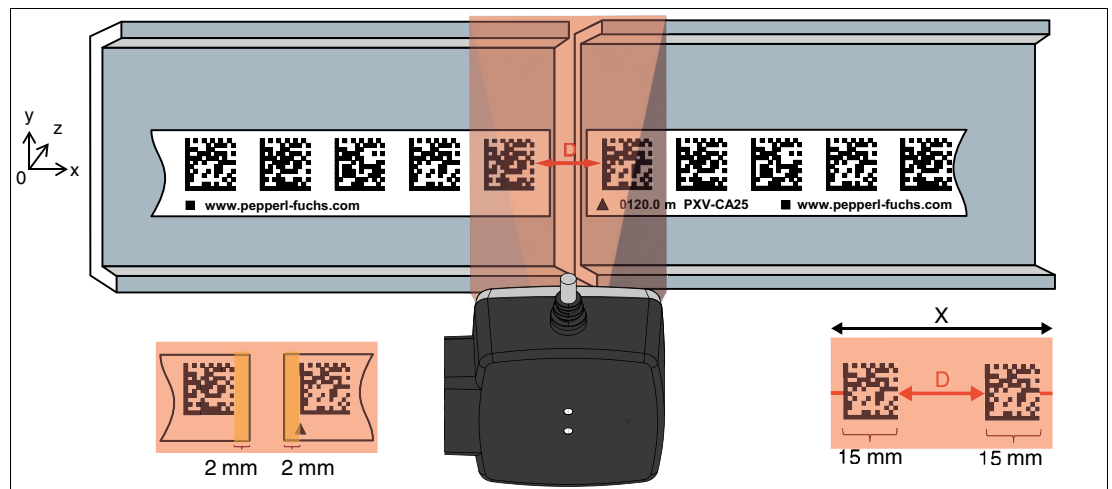


Figure 3.13 Expansion Joints / Gaps

**X = field of view**



### Note

Please note that with this alignment of the read head, the code redundancy or the gap width is reduced.

### Maximum Gap Width (D)

| Read distance (Z) | Max. gap width (D) |
|-------------------|--------------------|
| 70 mm             | 22 mm              |
| 100 mm            | 46 mm              |
| 130 mm            | 65 mm              |

## Examples of the Gap Width for Consecutive Unreadable Data Matrix Codes

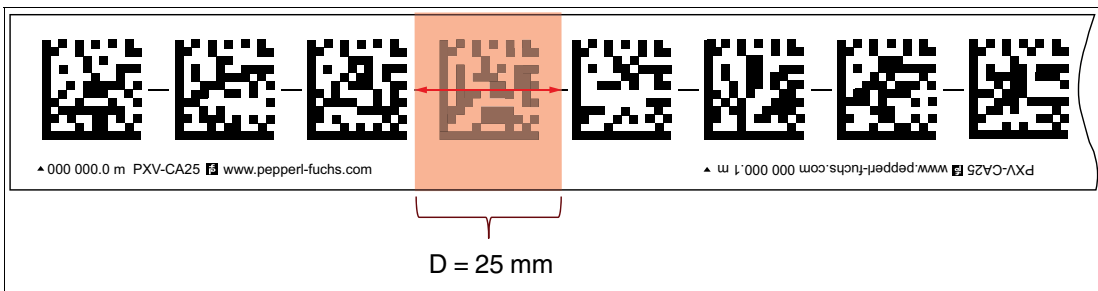
The read head expects Data Matrix codes with an ascending number sequence in a predefined grid. A new code every 20 mm. This grid should be adhered to as far as possible at the interruptions to avoid position jumps.

If the code tape is cut and glued directly to the next code number, this can lead to a position jump and therefore to a high speed value. This is because the next Data Matrix code does not come after 5 mm as expected by the positioning system, but over a longer distance, the gap width.

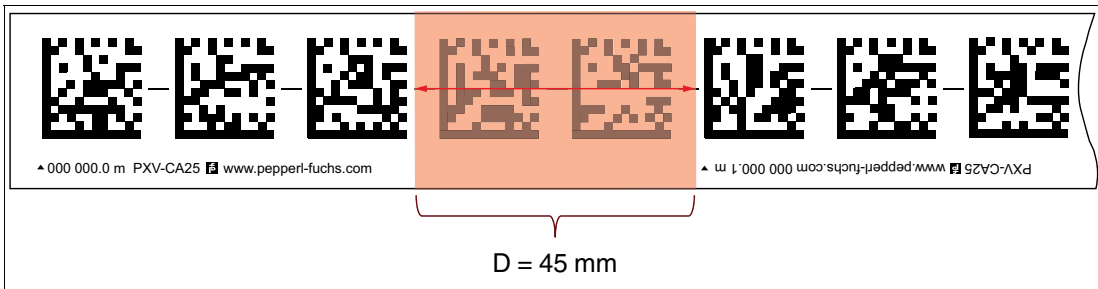
It is therefore recommended to cut the codes according to the gap width. The quiet zone of 2 mm around the code must always be observed.

The maximum number of consecutive missing Data Matrix codes is limited and depends on various factors. In particular, the reading distance, the alignment of the read head, and the pattern of the code tape are crucial here. These factors must be taken into account when applying the Data Matrix code tape. Below are some examples of the maximum allowable gap width.

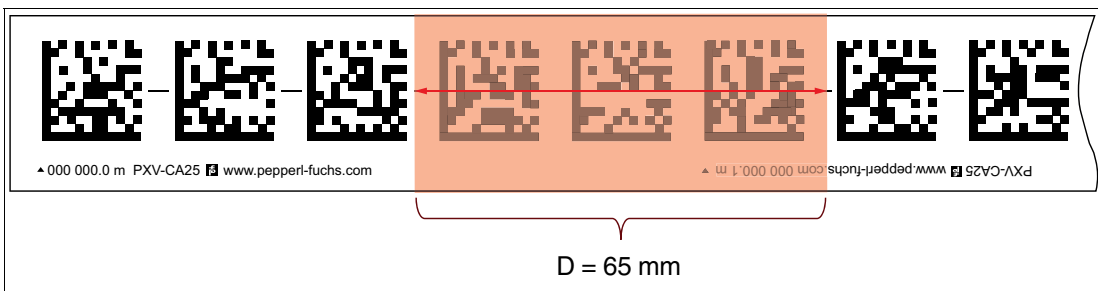
### 1 Missing Data Matrix Code



### 2 Missing Data Matrix Codes



### 3 Missing Data Matrix Codes



## Cutting Rule

The code tape is laid from right to left in ascending order of position, whereby the distances between the codes are defined by the pattern of the code tape.

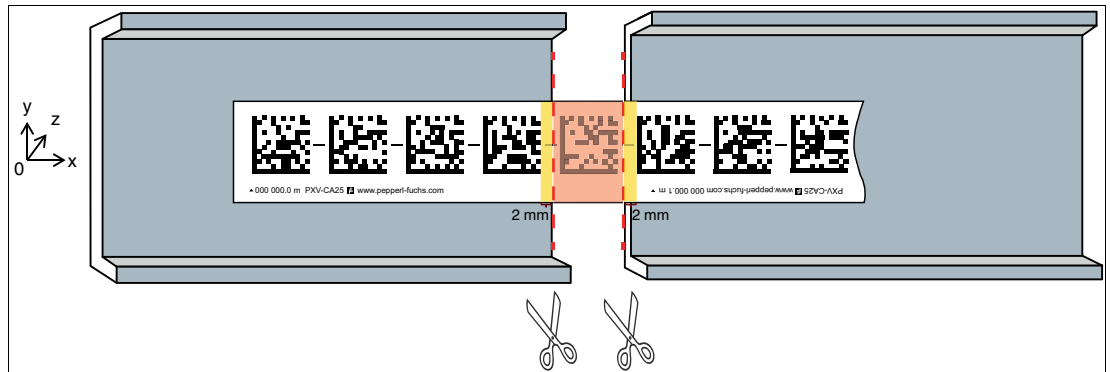


Figure 3.14

- Always cut the code tape centrally between two codes.
- In borderline situations, a projection of 2 mm of the white edge must be left.

Several methods are possible for laying the Data Matrix code tape over gaps (expansion joints or points), of which three options are shown below:

### Case 1: Continuous Bonding

Glue the Data Matrix code tape continuously and cut out the codes in the area of the gap.

**Advantage:** The codes remain continuously in the same position grid. Therefore, there is no difference between the logical and mechanical position.

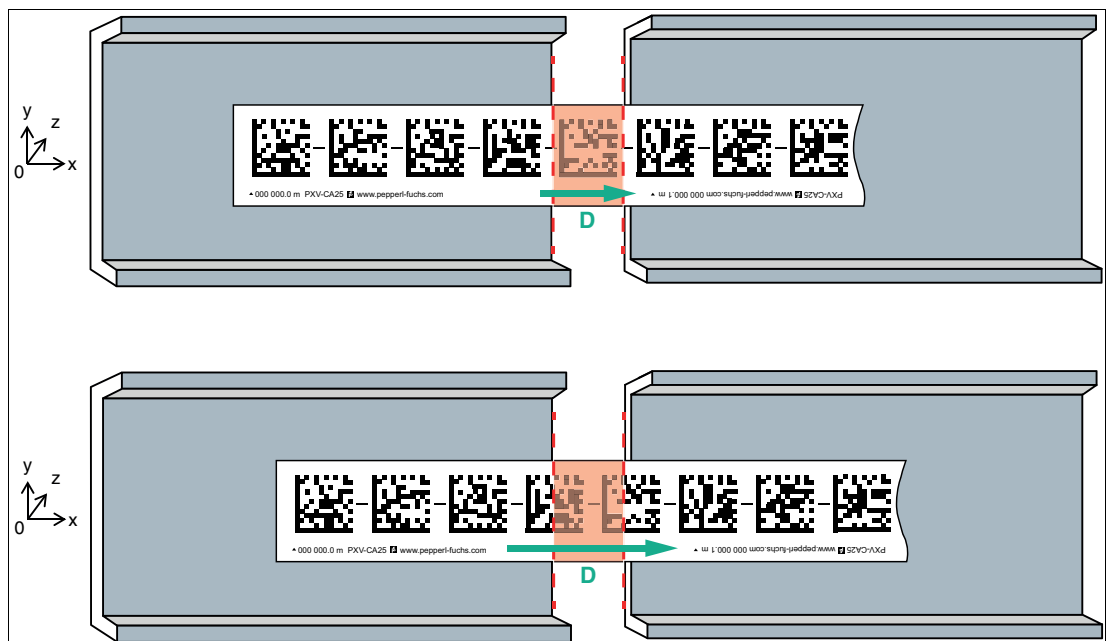


Figure 3.15

- Depending on the pattern of the Data Matrix code tape, a maximum of 1 ... 3 codes can be cut out.
- The gap condition refers to the distance D between two complete Data Matrix codes. The figure below shows that the distance D is significantly larger than in the upper figure, although the gap to be bridged is the same.
- The maximum permissible gap in relation to the selected measuring distance (z) must be observed.

## Case 2: Continuous Continuation

Glue the Data Matrix code tape up to the gap and cut out the codes in the area of the gap. Continue the code tape at the continuous component.

**Advantage:** In the case of extremely wide gaps, the Data Matrix code tape can be optimally mounted along the mechanical gap. However, a logical jump occurs in the position value or velocity value within the transition area, because the read head expects the Data Matrix codes in a fixed grid.

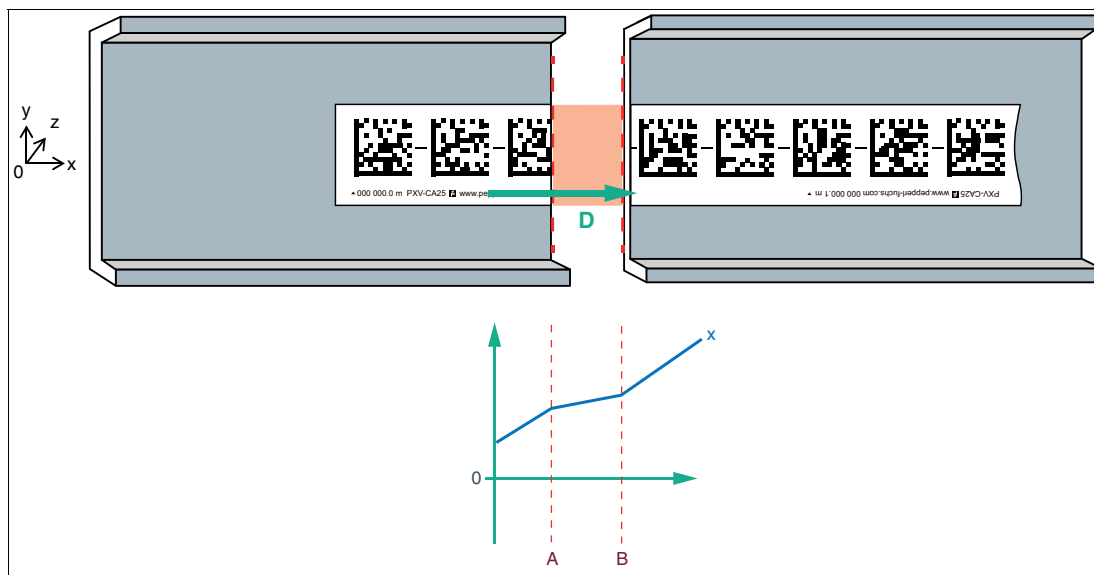


Figure 3.16

The x value is adjusted to the actual distance

## Case 3: Continuous Continuation with Position Jump

Glue the Data Matrix code tape up to the gap/expansion gap and continue the Data Matrix code tape with a position difference of  $> 1$  meter at the continuous component.

**Advantage:** In the case of extremely wide gaps, the tape can be optimally mounted on the mechanical gap. The position jump results in a transition hysteresis, a defined position change or jump.

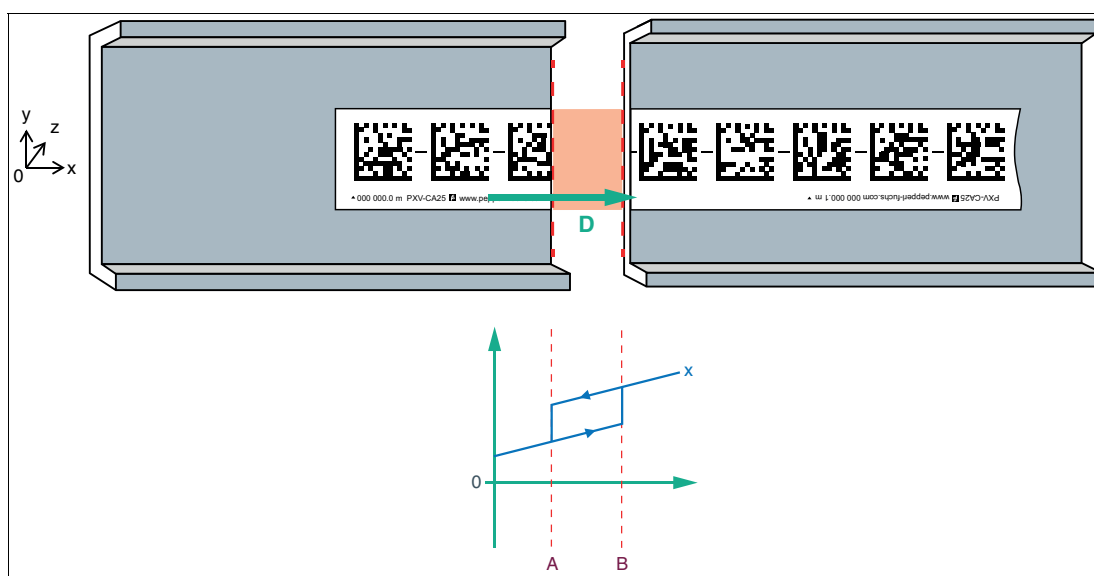


Figure 3.17

The x value remains constant at its historical value and has a hysteresis. When the center of the image approaches the next code, there is a jump.

### Case 4: Gap is Too Large

For a short period of time, the read head outputs the message "No Position."

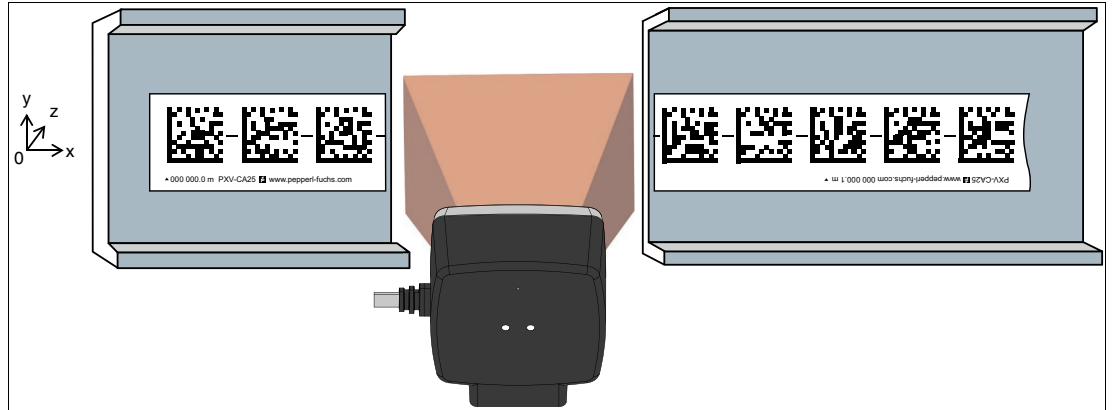


Figure 3.18

### Offset

To ensure successful detection of Data Matrix codes on a code tape, the offset **V** between the position codes must not be so large that the actual codes lie outside the reading window. It is therefore recommended to keep the offset as small as possible.

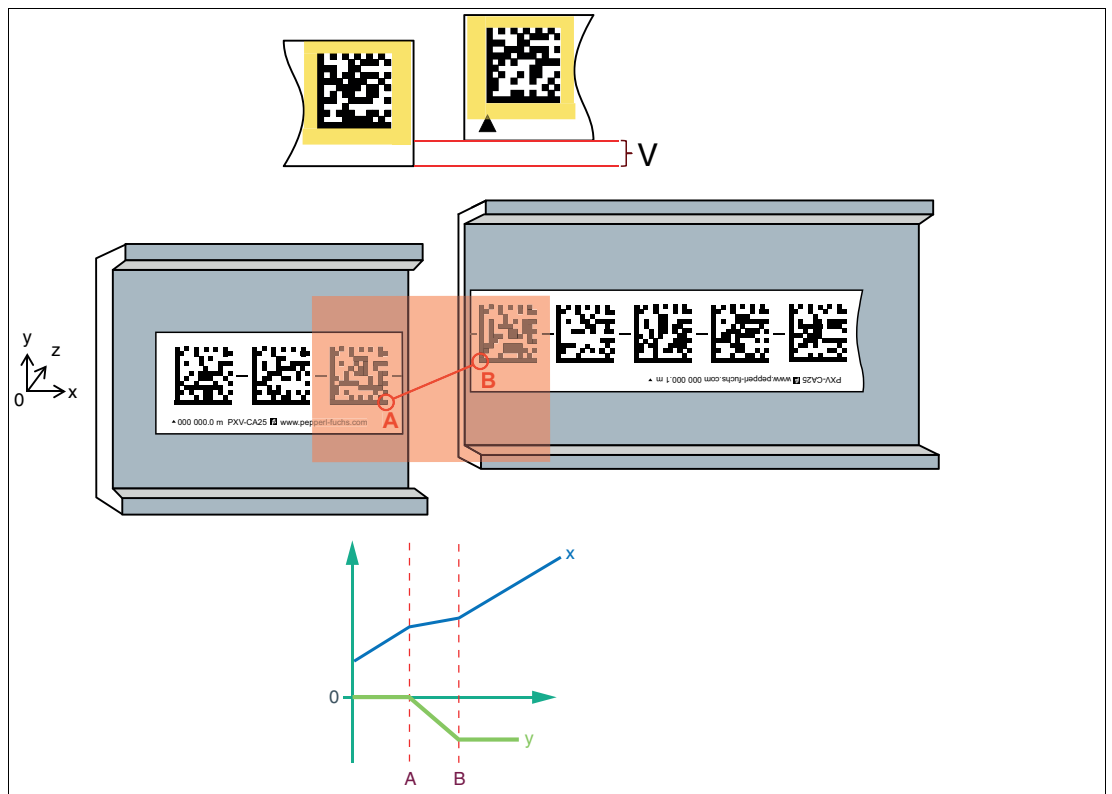


Figure 3.19

Offset

## Thermal Expansion of the Surface



### Note

#### Thermal Expansion Coefficient

The thermal expansion coefficient of the attached code tape depends on the thermal expansion coefficient of the surface.

When planning the system, consider the worst-case scenario that can be caused by thermal expansion of the surface and adjust the Data Matrix code tape to fit the expansion joint accordingly.

One way of reducing the gap between the Data Matrix code tapes in the case of thermal expansion of the surface is to move the butt edges of the Data Matrix code tapes a few millimeters toward the expansion joint. Ensure that the Data Matrix code tapes do not overlap. The quiet zone around the Data Matrix codes of 2 mm must always be observed.

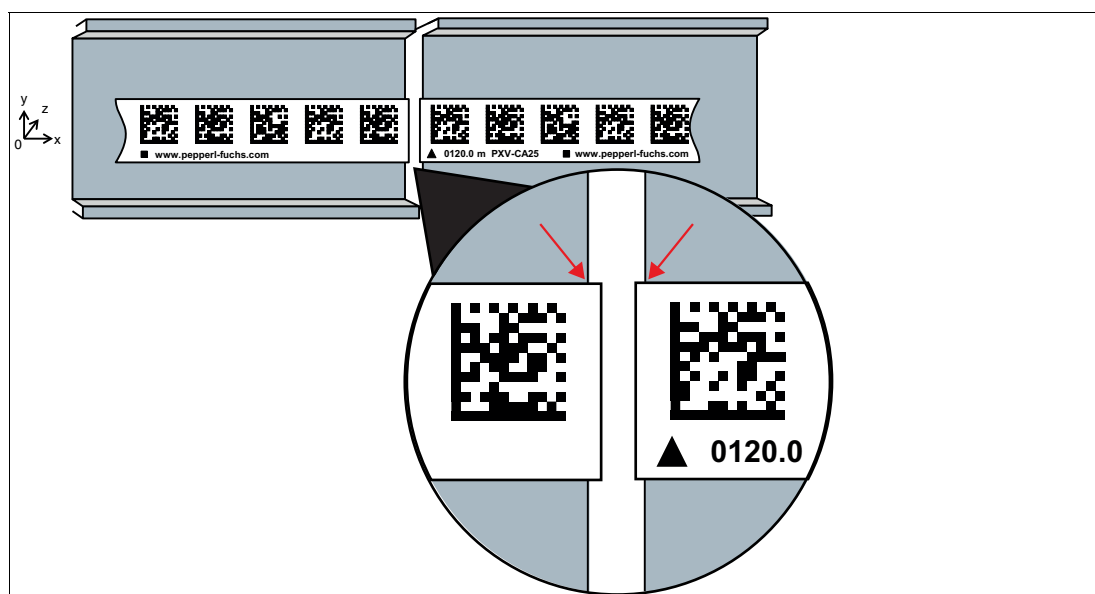


Figure 3.20

### 3.8 Behavior of the Read Head When Cornering

#### Minimum Curve Radius

When planning your system, please ensure that you do not fall below a minimum bending radius of **100 mm** for horizontal curves.

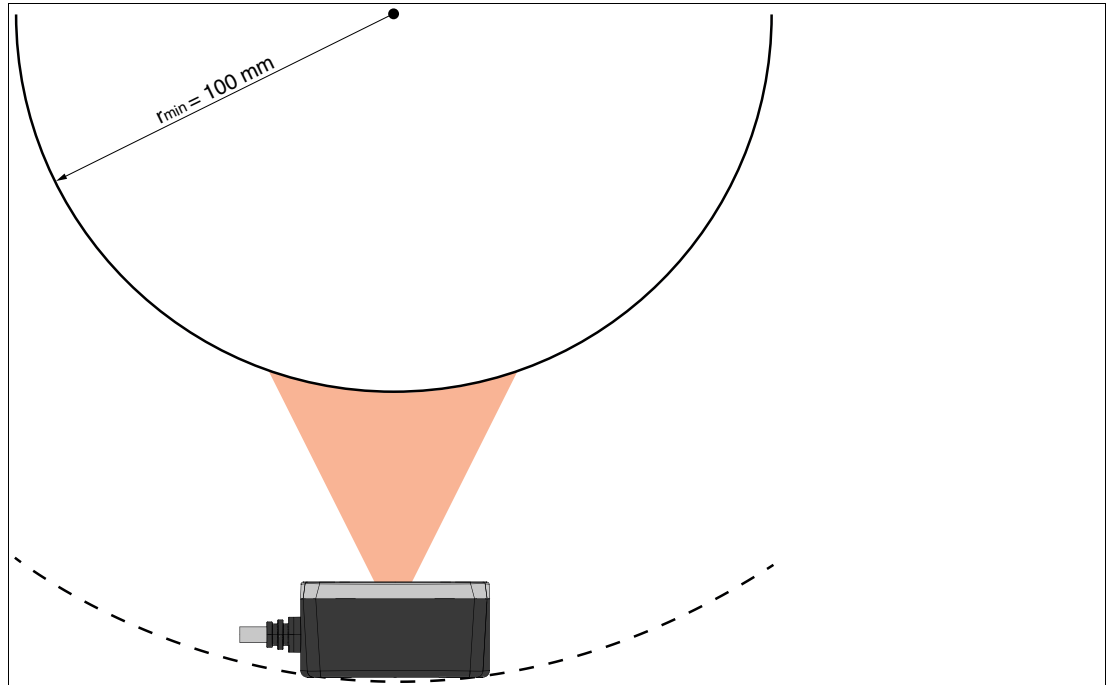


Figure 3.21

## Horizontal Curves

If the read head is not mounted in the application's axis of rotation (1), the following situation can occur for horizontal curves:

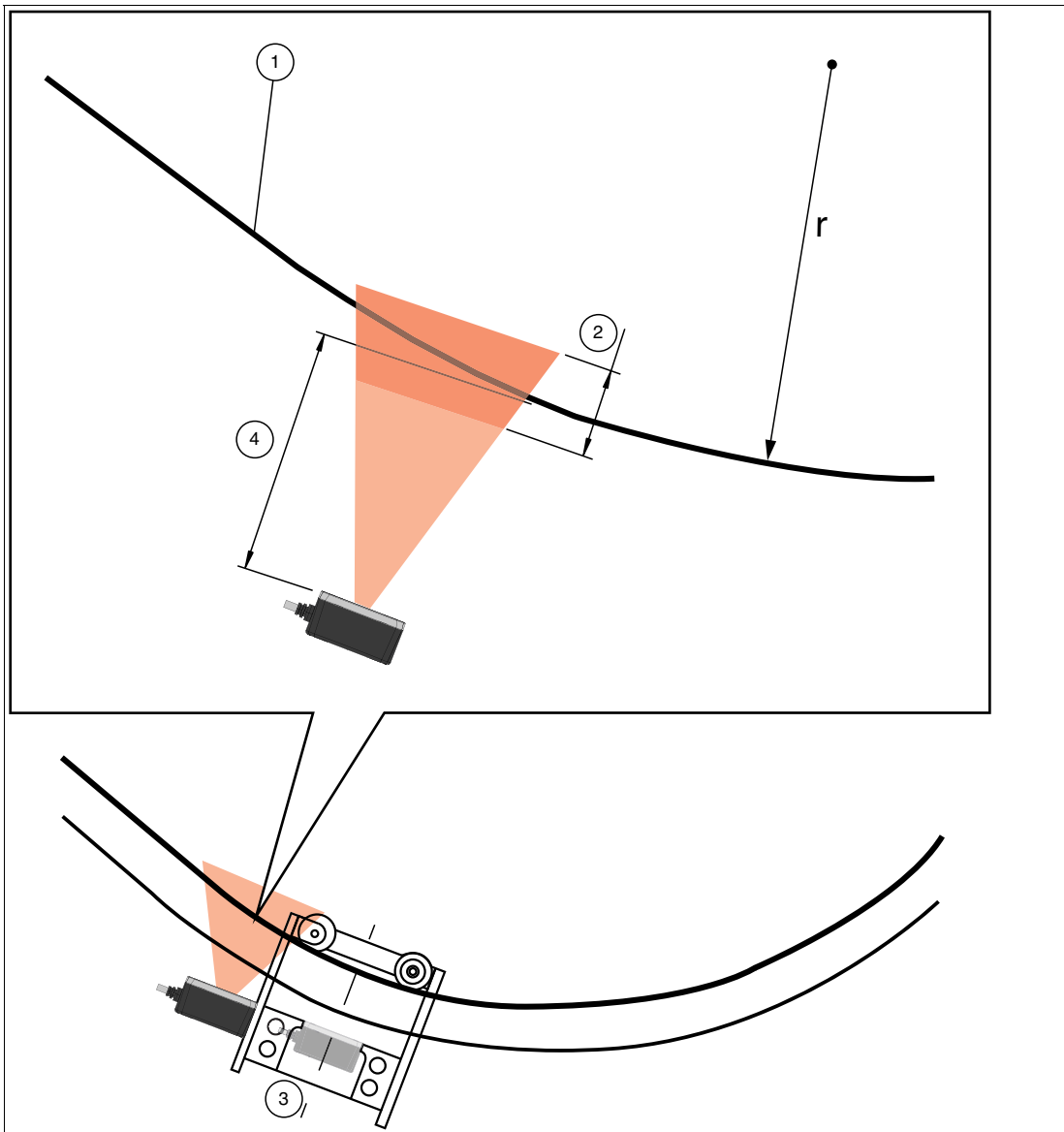


Figure 3.22

- Depending on the curve (right or left curve), the read head moves toward the code tape (1) or away from the code tape (1).
- The reading distance (4) moves out of the read head reading tolerance. If the reading distance (4) is too long, the z tolerance (2) is no longer sufficient to ensure reliable position detection.
- Note the information in .

## Inclines and Declines

If the read head is not mounted in the rotation axis (1) of the application, the following situation may occur on inclines and declines:

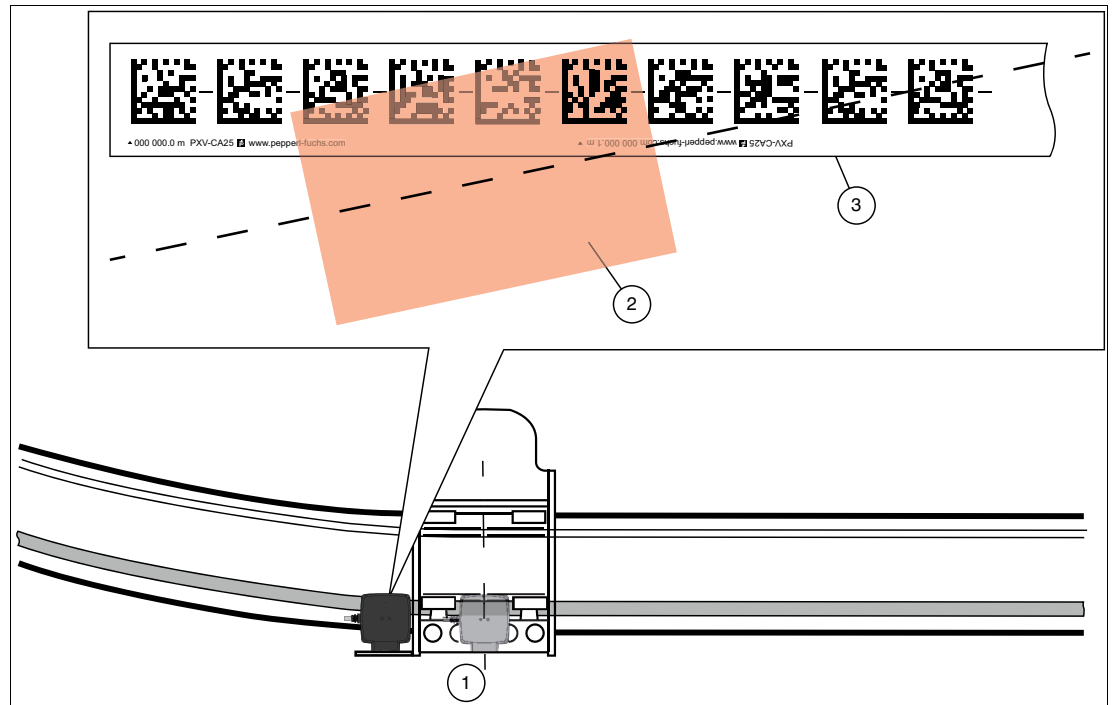


Figure 3.23

- The reading window (2) is tilted relative to the Data Matrix code tape (3). Secure position detection is only guaranteed if at least one Data Matrix code can be read.
- Note the information in the "Rotational tolerance in the z axis" chapter.

## 3.9 Behavior at x Position 0

It is advisable to use the code tape from a starting position of more than 100 mm. If the read head is started at a position value of less than 90 mm or if it moves sideways over the 0 mm position on the code tape, the "No Position Bit" remains set and the 0 mm position is permanently displayed to suppress the output of negative position values. A valid position output occurs once the read head has passed the absolute position greater than 90 mm.

### 3.10 Quality Grade

The permanent monitoring of the quality grades enables an early reaction to damage or contamination of the code tape or the camera during commissioning and during operation. This increases the overall operational safety, and in the case of a fault the problem can be located immediately.

The quality is assessed using a scale of 1 to 6, with 1 being the best reading quality. If the grade is 3 or worse, a check of the camera or distance should be performed. Grade 7 signifies "No position" because no code was detected.

The quality evaluation is based on the affixed code tape.



#### Note

An evaluation that indicates poor quality as the outcome can be due to a misalignment, an incorrect measuring distance, or because the code tape has been affixed incorrectly.

**Table for Evaluating the Quality Grade When Affixing a New Data Matrix Code Tape**

| Quality Grade | Description of the grade                        | Action                                                                                                                                                                                                                                                                                                                                        |
|---------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1             | Excellent installation                          | None                                                                                                                                                                                                                                                                                                                                          |
| 2             | Good installation                               | None                                                                                                                                                                                                                                                                                                                                          |
| 3             | Installation within tolerance range             | Check the code tape for contamination and clean if necessary.                                                                                                                                                                                                                                                                                 |
| 4             | Adequate, but unacceptable                      | Check the code tape for damage and contamination. Also check the length of the code tape; any potentially non-optimal overlaps and cross-overs are excluded from this.<br>Check the code tape for damage and contamination. The code tape routing must also be checked; unfavorable curve radii and/or inclines and slopes must be ruled out. |
| 5             | Incorrect installation                          | See Grade 4 / Not acceptable                                                                                                                                                                                                                                                                                                                  |
| 6             | Defective installation                          | See Grade 4 / Not acceptable                                                                                                                                                                                                                                                                                                                  |
| 7             | Operation not possible now nor at a later stage | See Grade 4 / Not acceptable                                                                                                                                                                                                                                                                                                                  |

**Table for Evaluating the Quality Grade for Ongoing Operation**

| Quality Grade | Description of the grade | Action                                                                                                                          |
|---------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1             | Excellent                | None                                                                                                                            |
| 2             | Good                     | None                                                                                                                            |
| 3             | Satisfactory             | Keep an eye on positions that are graded $\geq 3$ and check them during the next routine inspection; clean them if necessary.   |
| 4             | Acceptable               | Immediately inspect any positions that are graded $\geq 4$ for dirt and damage; where necessary, clean or repair them directly. |
| 5             | Poor                     | Immediately inspect any positions that are graded $\geq 5$ for dirt and damage; where necessary, clean or repair them directly. |

| Quality Grade | Description of the grade | Action                                                                                                                          |
|---------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 6             | Not acceptable           | Immediately inspect any positions that are graded $\geq 5$ for dirt and damage; where necessary, clean or repair them directly. |
| 7             | No operation possible    | Immediately inspect any positions that are graded $\geq 5$ for dirt and damage; where necessary, clean or repair them directly. |

Examples showing dirty or damaged code tape with associated quality grade:

#### Number of Codes Detected: 3 and Quality Grade: 1

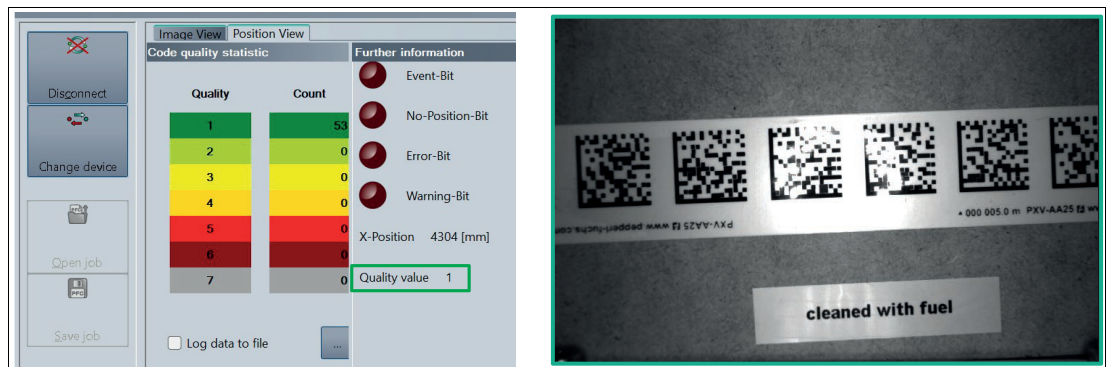


Figure 3.24 Code tape damaged by aggressive cleaning agent

#### Number of Codes Detected: 2 and Quality Grade: 3



Figure 3.25 Code tape contaminated

#### Number of Codes Detected: 2 and Quality Grade: 4

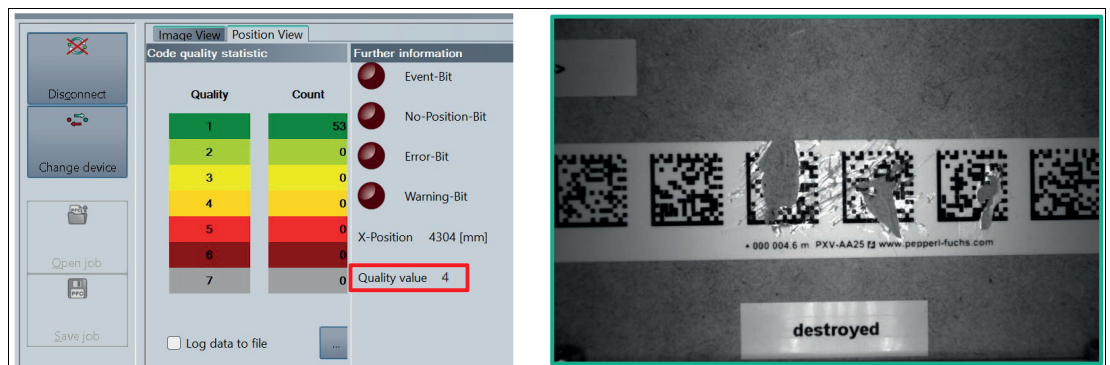


Figure 3.26 Code tape damaged

**Note**

The recommended grades and actions assume that the Data Matrix code tape has been applied in one continuous length. Please note that gaps within the code tape can lead to poorer quality grades.

### Quality Evaluation via Digital Outputs

With the SSI read head, the quality grade is not directly available via the SSI interface. Instead, the quality can be evaluated via the digital outputs OUT2 and OUT3.

The output is based on an adjustable threshold value (see chapter 5.10.2). Once the quality grade detected by the read head goes above or below the defined limit value, the corresponding output is switched.

#### How Quality Output Works:

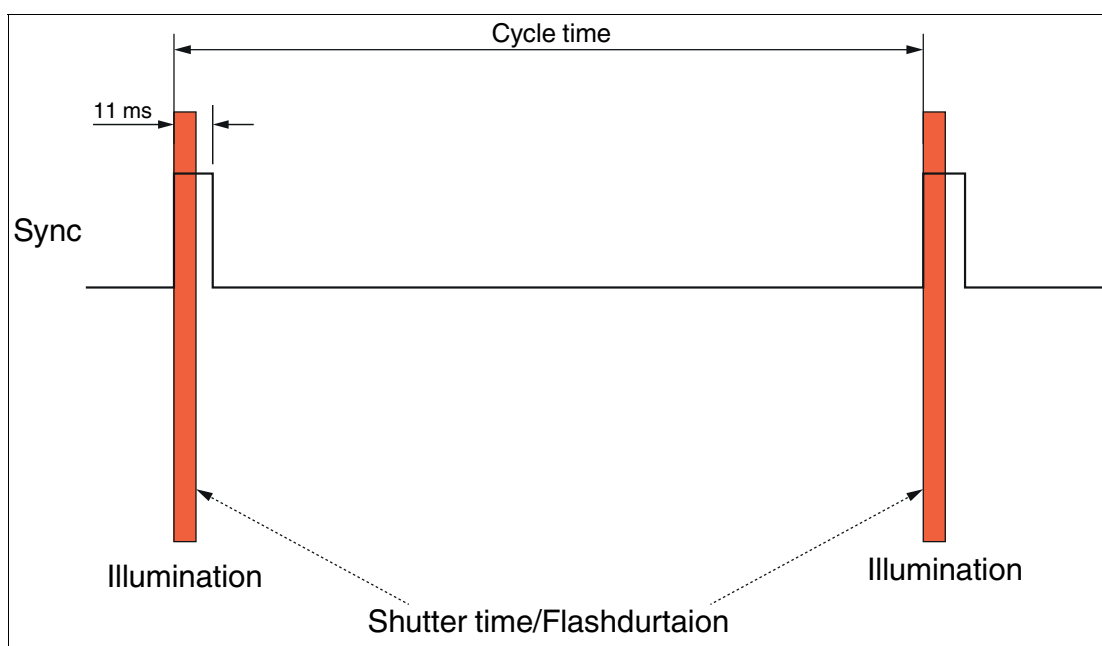
- The digital outputs OUT2 and/or OUT3 indicate the quality grade in the form of a switching signal.
- The output state changes depending on the configured threshold:
  - Default threshold: 4
  - Behavior with default value:
    - Quality grade = 1, 2, 3 >> Output = High
    - Quality grade = 4, 5, 6, 7 >> Output = Low
- The threshold can be configured using the Vision Configurator software.

## 3.11 Synchronization Output (Sync out)

The read head has two configurable switching outputs. The default setting is recorded on the datasheet.

If the switching output is set to "Sync out," a synchronization pulse will be supplied at the switching output. The pulse is synchronized with image capture. The control signal of the image capture (exposure/shutter speed) is supplied with zero latency at the output and extended to a pulse duration of 11 ms.

The exact time assignment of the position data to the acquisition time can be achieved using this synchronization pulse.



## 4 Installation and Commissioning

### 4.1 Applying the Data Matrix Code Tape

The Data Matrix code tape is made of silicone-free polyester film. A position marker appears every 100 mm along the lower edge of the Data Matrix code tape. This position marker is used for various functions, including precise positioning of the Data Matrix code tape during mounting.

The reverse side of the Data Matrix code tape carries a modified acrylate-based permanent adhesive. Affix the self-adhesive Data Matrix code tape along the desired traverse path.

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

#### Dimensions of the Code Tape

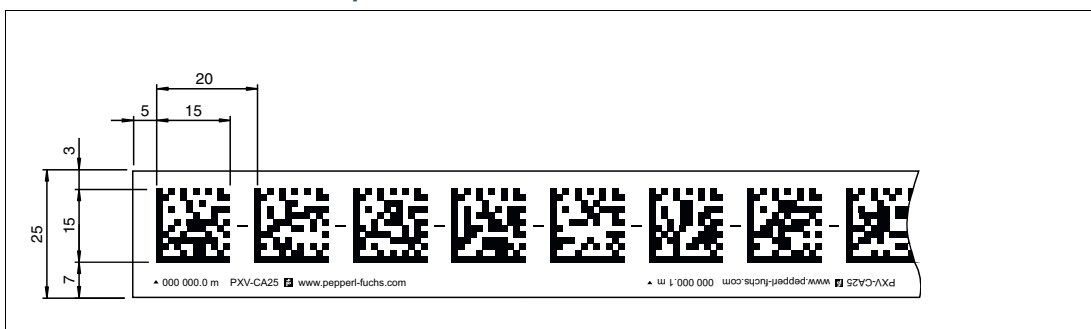


Figure 4.1 Dimensions of the Data Matrix code tape



#### Note

##### Alignment

The center of the Data Matrix code and therefore  $y = 0$  is not on the center line of the code tape.



#### Note

##### Butt Edges

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

**Note****Application Device**

To facilitate the application of the code tape, we recommend the use of a mechanical application device. The code tape is supplied on a roll and can be cumbersome and time-consuming to apply without a mounting aid. A mechanical application device can make the process more efficient and accurate, and avoid errors when applying.

A mechanical application device can be produced in different designs, depending on the requirements of the respective application. Typically, it consists of a mount or device that can hold and position the code tape, and a mechanism that aligns the code tape at the desired location. The mounting mechanism can be operated manually or automatically and enables quick, precise, and efficient application of the code tape.

The use of a mechanical application device can reduce the risk of errors and inaccurate positioning of the code tape. In addition, a mechanical application device can help to avoid overstretching or stretching of the code tape, which can occur when applied manually due to excessive force or uneven tension. This may result in impaired readability. A well-designed application device can ensure the uniform tension of the code tape during the application process. This contributes to a higher quality and durability of the code tape.

---

**Note****Marker Head for Code Tape Section**

The marker head (PCV-LM25) is a useful aid to facilitate the application of the Data Matrix code tape. This device was specifically developed to mark the position of the Data Matrix code tape on the traverse distance. This ensures that the code tape is applied in the right position.

---



## Affixing the Data Matrix Code Tape

The following description outlines the basic procedure for mounting the Data Matrix code tape. Depending on the installation location, there are some points to be observed that are described in other sections of this chapter.

1. Clean the surface to remove greasy, oily, or dusty dirt.
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 it down firmly.
4. Affix the code tape along the desired section. Note the following instructions.



---

### Note

When removing the protective film from the code tape, make sure that the code tape is not inadvertently glued to an unwanted place. Also, ensure that no folds or waves are created in the code tape when sticking it down. The protective film should only be removed in small sections at a time.

If the protective film is removed too far, the code tape may accidentally stick in the wrong place, or form wrinkles and waves. This can make it difficult to remove and reattach the code tape in the right position.

We therefore recommend that you first remove only a small piece of the protective film and carefully affix the code tape to the desired location. If it is positioned correctly, you can further peel off the protective film to fully affix the code tape. This ensures that the code tape is positioned exactly where you want it to be and that the Data Matrix codes can be read reliably.

It is important to ensure that the code tape does not come into contact with dirt or dust particles, since this may affect the adhesion and lead to poor adhesion of the code tape.

---

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

## Inclines and Declines

When laying the Data Matrix code tape on inclines or declines, the Data Matrix code tape must be cut several times at the transition to the horizontal in the manner shown. Ensure that the Data Matrix codes are not destroyed and that a quiet zone of 2 mm is maintained so the Data Matrix codes are not damaged.

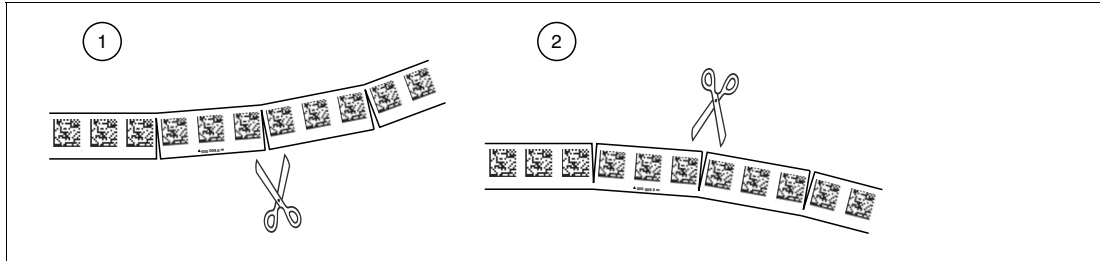


Figure 4.2 Inclines and Declines

1 Incline

2 Decline

## 4.2 Mounting the Read Head

The mounting and alignment of the read head for detecting Data Matrix codes requires precise fine adjustment of the read head. The PCV-MB1 mounting bracket is suitable for this purpose. It enables flexible and precise adjustment of the read head.

The slotted holes in the mounting bracket allow the read head to be moved in the y and z axes to achieve the most accurate alignment possible with the Data Matrix code tape.

Before mounting the read head, ensure that the z tolerance range of the read head is never exited during operation. This ensures that the read head is reliable, accurate, and provides excellent performance.

### Dimensional Drawing

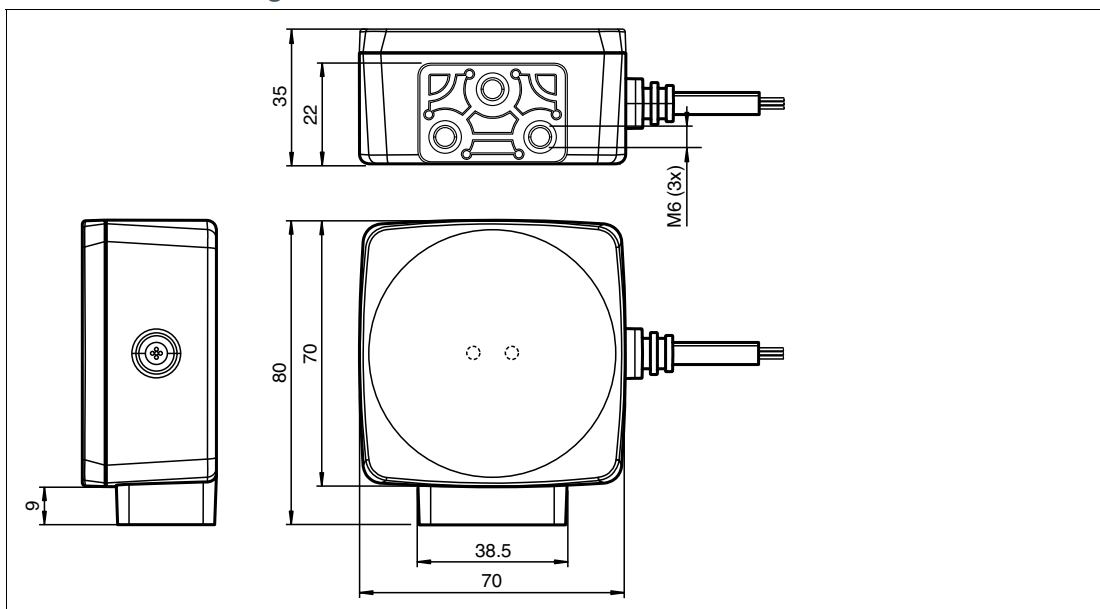


Figure 4.3 Housing dimensions



## Attaching the Mounting Bracket

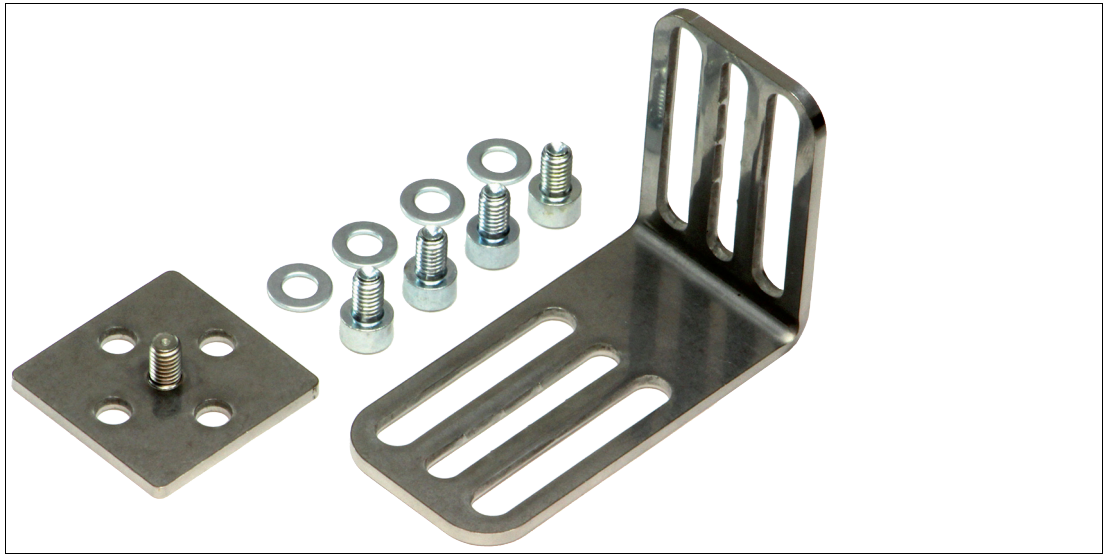


Figure 4.4 Mounting bracket (PCV-MB1)

1. Position the mounting bracket in the direction of the Data Matrix code tape so that the read head can be precisely adjusted afterward.
2. Use the three slots to mount the mounting bracket. Screw the mounting bracket onto the moving part of the system using three screws.



### Note

#### Influencing of the Measurement Result

It is important to check that the mounting bracket of the read head is firmly secured to ensure stable and safe mounting of the read head.

A loose or loosely fastened mounting bracket may cause the read head to be misaligned or move during operation. This can result in incorrect measurement results.

To check that the mounting bracket is firmly seated, carry out a visual inspection of the fasteners, such as the screws, to ensure that they are tight and secure. It may be helpful to observe the read head during operation to ensure that it does not wobble or move.



## Mounting the Read Head on the Mounting Bracket

Before installing the read head, ensure that a stable and secure mounting fixture is provided. Mount the read head so that the optics of the read head with ring light and camera module point toward the Data Matrix code tape.



### Caution!

Damage to the reader due to wrong mounting accessory

Using longer screws can damage the reader.

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



### Caution!

Damage to the reader due to inadequate attachment

If the reader is not sufficiently well and securely attached according to the requirements of the mechanical load due to the application, it can come loose and be damaged. Tightening the screws to a higher tightening torque can damage the reader.

Depending on the local installation conditions, the plant designer or commissioning engineer are responsible or the following:

tightening torque of the mounting screws: determining the minimum tightening torque for attachment according to the plant requirements.

Do not exceed the maximum tightening torque of 9 Nm.

Ensure that the attachment is in accordance with the mechanical load of the application.

Prevent the unwanted loosening of connections, e.g., by using thread-locking fluid.

3. Place the read head on the terminal block and position it in the middle. Insert the three fixing screws from below through the slots of the mounting bracket and through the terminal block. Tighten the screws so that the read head can still be moved on the terminal block.



### Note

The screws should not be tightened until the read head is precisely aligned. One option is to use the alignment guide, which allows the distance between the read head and the Data Matrix code tape to be precisely set.

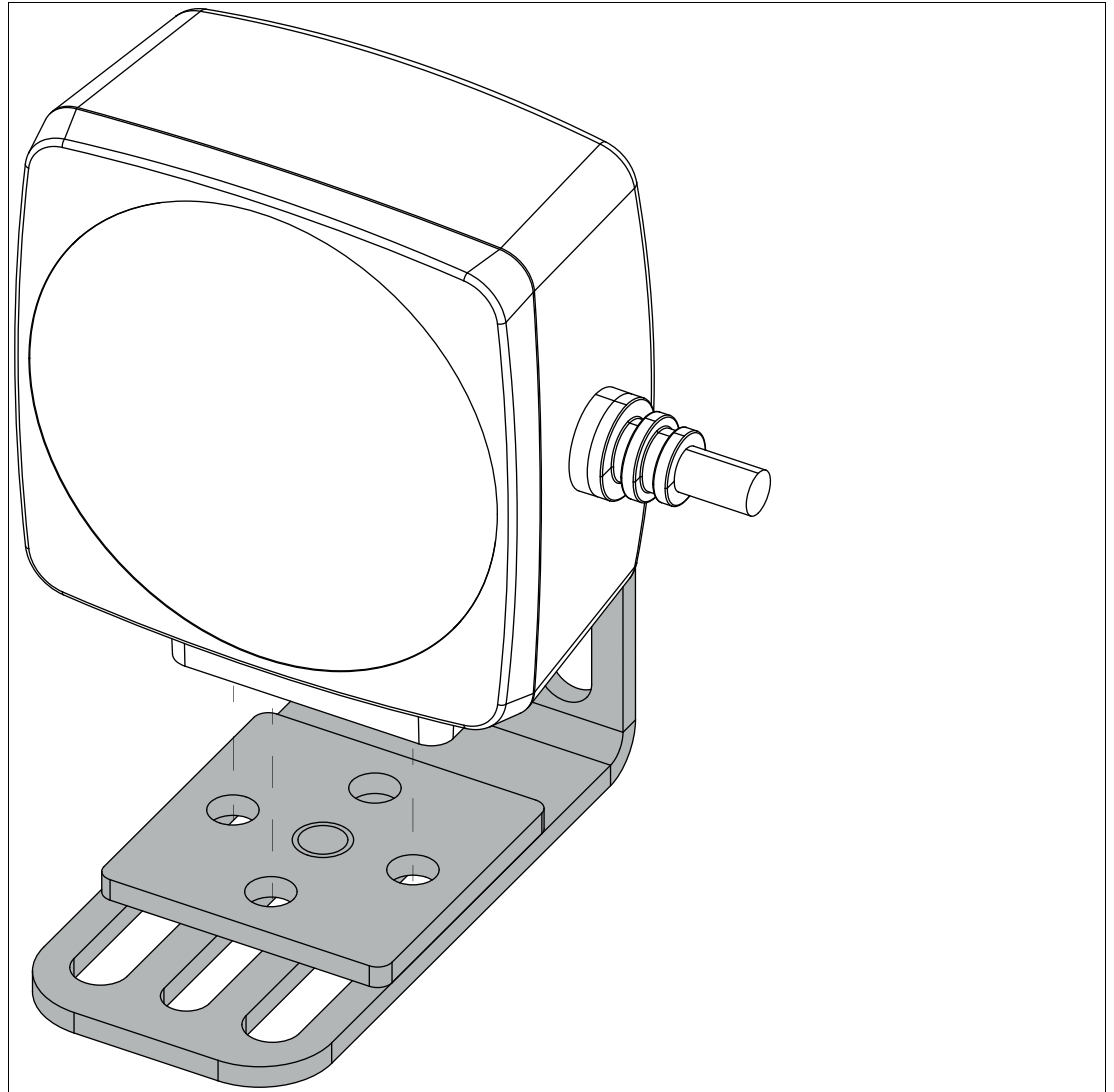


Figure 4.5 Schematic diagram for mounting the read head



#### Note

A guide pin is located in the center of the terminal block. This ensures that the read head is guided through the slots.

4.3 Electrical Connection

This chapter describes the connection assignment of the two read head versions. Both the power supply and communication with the SSI interface are established via these connections. The configurable inputs and outputs on the read head are also available here.



Note

SSI Cabling

The cabling of the SSI interface must be in the form of a twisted and shielded cable pair.

The signal lines (clock and data) must be routed separately from power cables to avoid interference.

Install the shield in accordance with the grounding concept.

Ensure that the supply voltage is correct and that the ground is properly routed to prevent transmission errors.

PXV100Q-F213-SSI-3M Connection Assignment

This version has a fixed cable that is 3 meters long. The wires are color-coded and must be connected according to the following assignment:

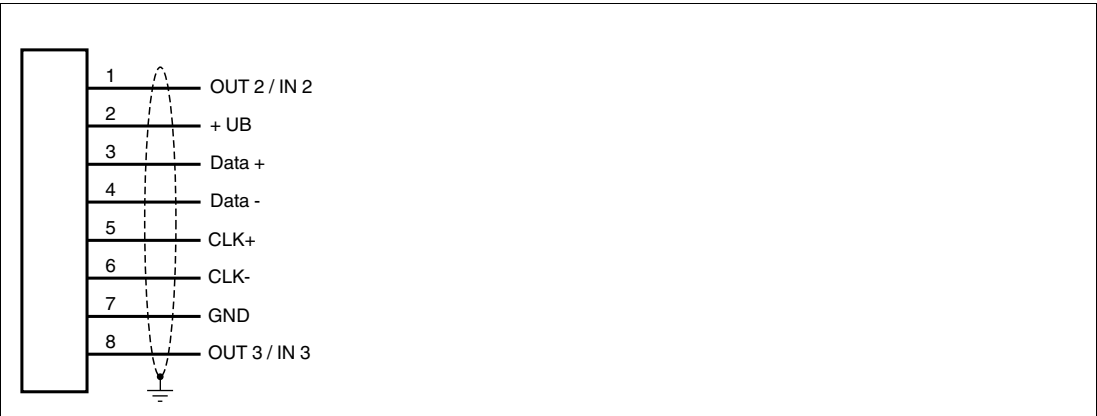


Figure 4.6 PXV100Q-F213-SSI-3M electrical connection

Color Assignment

| Connection pin | Core color | Color abbreviation |
|----------------|------------|--------------------|
| 1              | White      | WH                 |
| 2              | Brown      | BN                 |
| 3              | Green      | GN                 |
| 4              | Yellow     | YE                 |
| 5              | Gray       | GY                 |
| 6              | Pink       | PK                 |
| 7              | Blue       | BU                 |
| 8              | Red        | RD                 |

Shielding and Grounding

Grounding Concept

- Designed as 1-point grounding.
- The cable shield must be grounded on one side in the switch cabinet
- The cable shield must be placed over a large area.



## Grounding the Cable Shield

1. Remove the cable shield.
2. Attach the cable shield to the grounding rail over a large area using suitable grounding or shield terminals.



---

### Note

Direct grounding of the cable shield is not possible on the housing of the read head.

---



---

### Note

#### Handling Unused Inputs and Outputs

We recommend connecting unused wires OUT2/IN2 and OUT3/IN3 to a defined potential (typically the earth).

Configure these connections as an input (high impedance) with no function.

---



---

### Note

#### Cable Extension Limitations

Extension of the version with open cable end is not recommended. Use the following sensor version with V19 connector instead.

---



---

### Note

#### Cable Shield Grounding

Especially in environments with high interference, grounding the cable shield of the connection cable on both sides is recommended.

For this purpose, the cable sheath must be removed at a suitable location, and the shield must be connected using a grounding terminal.

---



---

### Note

#### Routing Sensor Cables

Sensor cables must always be routed separately from power cables (e.g., motor or converter cables). Parallel routing must be avoided.

---

## PXV100Q-F213-SSI-0.3M-V19 Connection Assignment

This version has a 0.3 m connection cable with an 8-pin M12 plug (type V19).

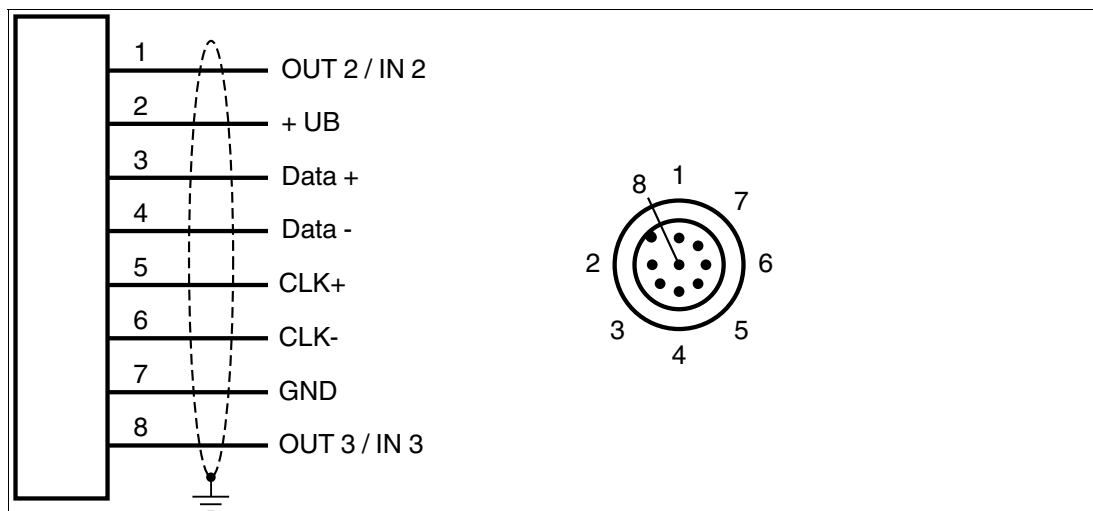


Figure 4.7 PXV100Q-F213-SSI-0.3M-V19 electrical connection

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

## Shielding and Grounding

### Grounding Concept

- Designed as 1-point grounding.
- The cable shield must be grounded on one side in the switch cabinet
- The cable shield must be placed over a large area.



### Grounding the Cable Shield

1. Remove the cable shield.
2. Attach the cable shield to the grounding rail over a large area using suitable grounding or shield terminals.



#### Note

Direct grounding of the cable shield is not possible on the housing of the read head.



#### Note

#### Handling Unused Inputs and Outputs

We recommend connecting unused wires OUT2/IN2 and OUT3/IN3 to a defined potential (typically the earth).

Configure these connections as an input (high impedance) with no function.



#### Note

#### Cable Extension Requirements

Use only shielded, twisted-pair cables.

**Note****Cable Shield Grounding**

Especially in environments with high interference, grounding the cable shield of the connection cable on both sides is recommended.

For this purpose, the cable sheath must be removed at a suitable location, and the shield must be connected using a grounding terminal.

---

**Note****Routing Sensor Cables**

Sensor cables must always be routed separately from power cables (e.g., motor or converter cables). Parallel routing must be avoided.

---

**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.

---

## 4.4 Alignment Using the Alignment Gauge

A particularly simple and precise way to align the read head to the correct height and specified reading distance is to use the alignment gauge. This is available as an accessory on the product detail page of the respective read head on our website under the "Related Products" tab.



### Installation Procedure

1. Place the alignment gauge onto the read head from the rear.



#### Note

#### Correct Positioning of the Alignment Gauge

The correct positioning depends on the selected mounting position or orientation of the read head and is shown in the following figure.

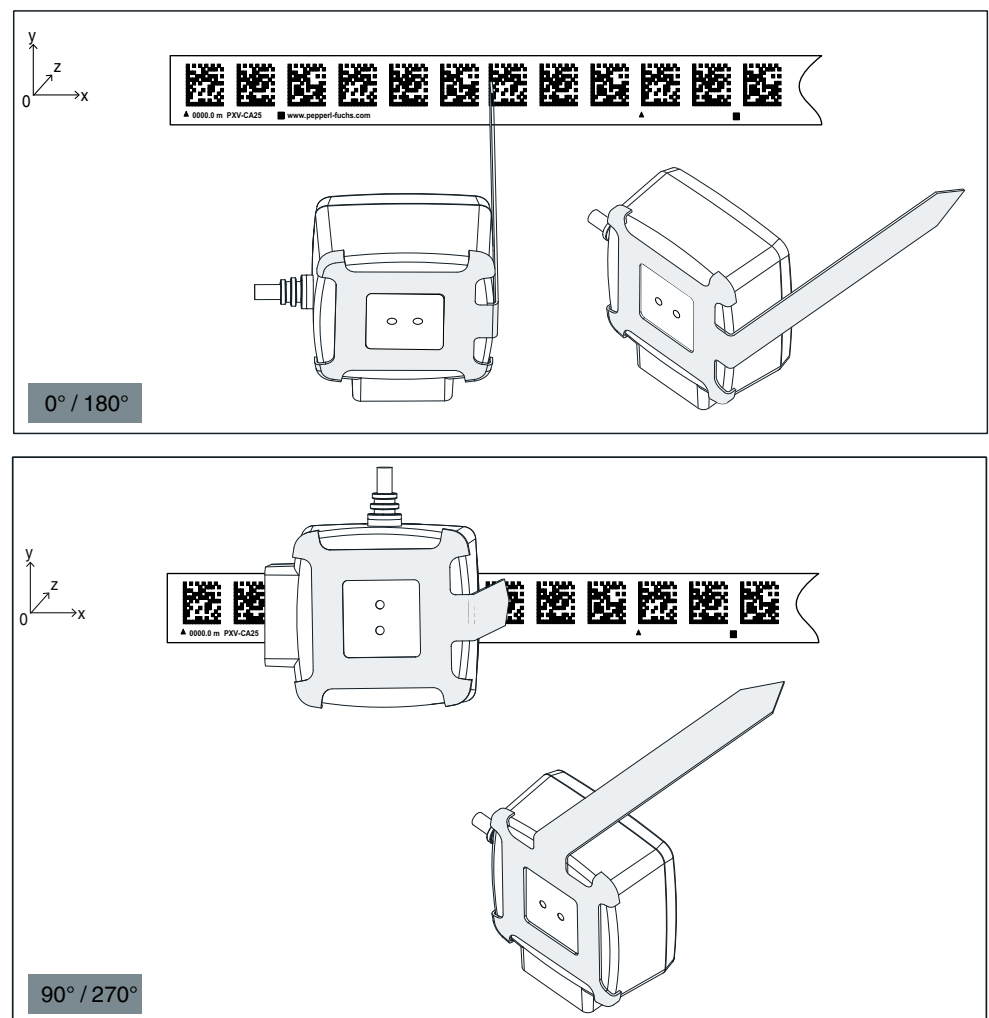


Figure 4.8

2. Align the read head so that the tip of the alignment gauge lightly touches the code tape.
3. The tip must point exactly to the  $y = 0$  line of the code tape.

## 4.5 Parameterization Using Code Cards

During parameterization, the read head 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 read head. See the appendix (see chapter 9.1) for a selection of pre-prepared standard code cards that you can use if necessary.



### Note

Parameterization mode can be activated in the first 10 minutes after voltage connection. A time lock disables the read head once this time has elapsed. If parameterization is required at a later time, switch off the supply voltage to the read head and switch it back on again. Parameterization mode can now be activated within the first 10 minutes. The time lock remains inactive during the parameterization process.



### Activating Parameterization Mode

1. To activate the read head, hold the **"ACTIVATE"** code card in the correct orientation in the field of view of the read head's camera system.
  - ↳ Once the parameterization code has been detected, the **"USER"** code card enables the activation of parameterization mode. The read head can be accessed by the controller.
2. To activate the read head, hold the **"USER"** code card in the field of view of the read head's camera system.
  - ↳ If reading is successful, the red lighting on the read head goes out for approx. 2 ... 3 seconds and is then automatically turned on again.



### Carrying Out Parameterization

1. Place the parameterization code in the field of view of the camera module.
  - ↳ Once the parameterization code has been detected, LED2 lights up green for 1 second. If the parameterization code is invalid, LED2 lights up red for 1 second.



### Completing Parameterization and Storing Parameters

1. Now hold the **"STORE"** code in front of the read head's camera system to save the configuration.
  - ↳ When the **"STORE"** memory code is detected, the LED2 lights up green for 1 second. The parameterization is stored in the non-volatile memory of the read head and parameterization mode is terminated. Parameterization of the read head is now complete. If the memory code is not detected, LED2 lights up red for 1 second.

## 5 Vision Configurator

Vision Configurator enables the read head to be operated using a user-friendly interface. The standard functions include establishing a connection to the read head, parameterizing operating parameters, saving data sets, visualizing the camera capture of the read head, and error diagnostics.



### Note

The latest version of the Vision Configurator software can be found online at <https://www.pepperl-fuchs.com>. The Vision Configurator manual outlines the properties of the operating software for multiple devices. You can access this manual from our website.

### 5.1 Installing Vision Configurator



#### Installing Vision Configurator

The following describes how to obtain the installation file from the Pepperl+Fuchs homepage and install it.

1. Go to the Pepperl+Fuchs homepage at <http://www.pepperl-fuchs.com> and enter the product designation or item number in the search function. You can find the Vision Configurator software in the **Software** section of the device's product detail page.
2. Save the installation file locally.
3. Start the exe file.
4. Follow the instructions for the installation process.

↳ After installation, several image processing functions are available in the Windows Start menu under "**Start > All programs > Vision Configurator.**"

### 5.2 Connecting the Read Head to the PC

#### Internal Parameterization of the Read Head

Internal parameterization of the read head via the UART interface must be started within 10 minutes of it being switched on. After this time, the read head is locked by an automatic time lock.



### Note

The time lock remains open while configuration is in progress. The system only locks access to the read head if no configuration activity is detected for 10 minutes.

## Connecting to the Vision Configurator

The connection to the Vision Configurator is made via the P-F213-PROG-USB programming adapter, which establishes UART communication between the read head and a PC via USB.



### Connecting the Read Head to the PC

The read head is connected to the PC as follows:

1. Connect the open cable end of the read head (PXV100Q-F213-SSI-3M) to the terminal block of the programming adapter.



#### Note

##### PXV100Q-F213-SSI-0.3M-V19 – Connection Cable with 8-Pin M12 Plug

The connection requires an 8-core cable with an 8-pin M12 socket as an adapter cable.

Connect the M12 socket of the adapter cable to the M12 plug of the read head.

Then connect the open cable end of the adapter cable to the terminal block of the programming adapter, as already described for the PXV100Q-F213-SSI-3M.

- Connect the power supply via +UB (brown) and -UB (blue).
- Data is transmitted via IO2 (white) and IO3 (red).

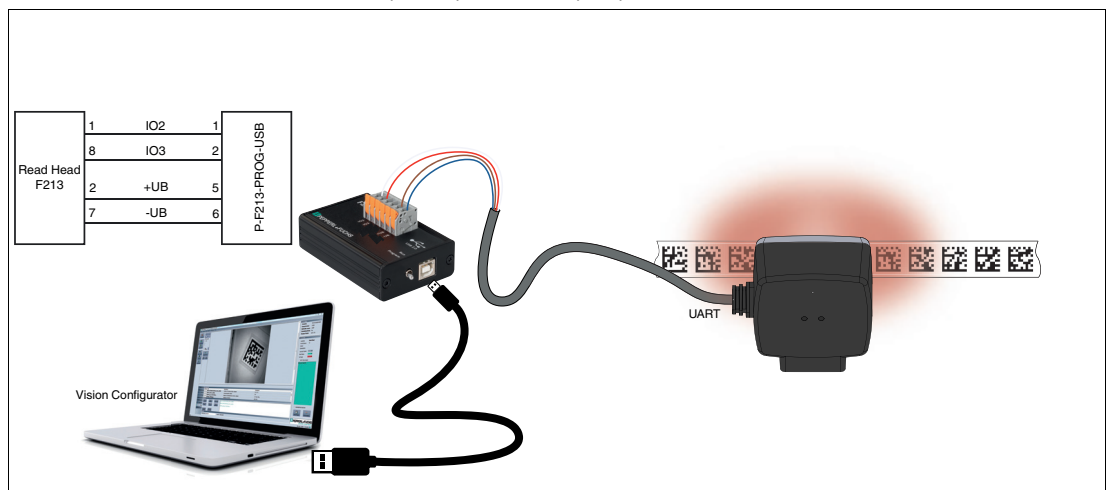


Figure 5.1



#### Caution!

Malfunctions and Damage to the Device

- Please ensure that the wires are correctly assigned to and connected to the corresponding terminals on the terminal block to avoid malfunctions and damage to the device.
- The USB cable must not exceed three meters in length. Either connect the USB cable directly to the PC or use a USB hub with its own electric power supply.

2. Make sure that the switch on the side of the programming adapter is set to "Run."



Figure 5.2 Set the switch position to Run



#### Note

##### Switch Position

The "Program" switch position is intended exclusively for Pepperl+Fuchs service personnel and serves no function for the user. Improper use can lead to unexpected malfunctions.

3. Connect the programming adapter to the PC using the USB cable. The supply voltage is provided via the USB connection. An external electric power supply is therefore not required.
4. Scan the following activation code with the read head to activate parameterization mode on the device.



#### Note

For reliable reading of the code cards, print this document. Scanning directly from the screen can be disturbed by reflections.

The read head is parameterized to a reading direction of 0° or 180° as standard. Hold the activation code in the viewing window in the set reading direction.

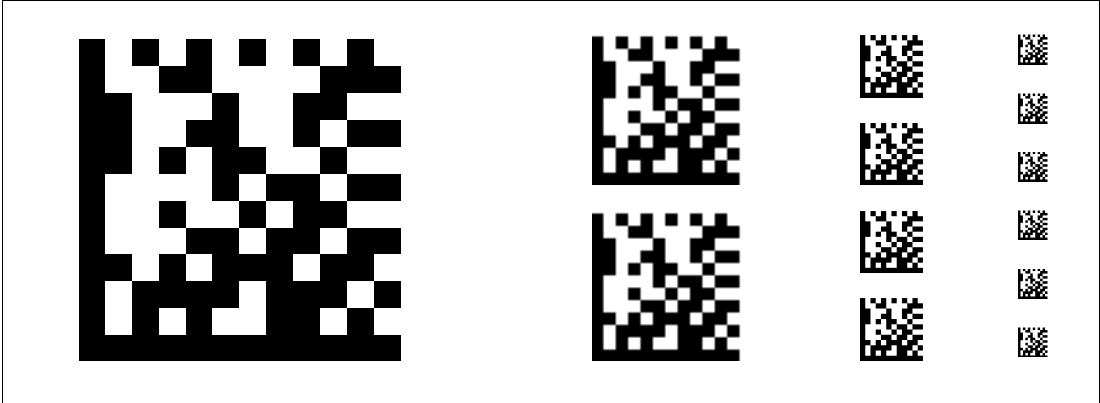


Figure 5.3      Activation code for P-F213-PROG-USB



**Note**

The activation code is located on the back of the respective programming adapter.

↳ If reading is successful, the red lighting on the read head goes out for approx. 2 ... 3 seconds and is then automatically turned on again.

5.    Open Vision Configurator and select the following setting:

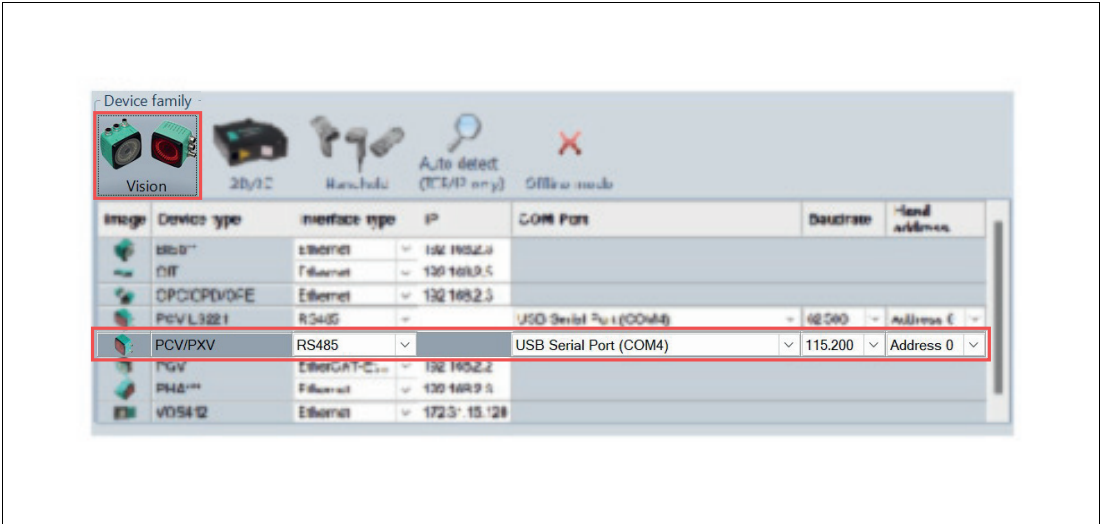


Figure 5.4      Settings in Vision Configurator

- Device family: Vision
- Device type: PCV/PXV
- Interface type: RS485
- COM port (the connected port must be selected)
- Baud rate: 115,200
- Head address: Address 0



**Note**

The read head communicates with the Vision Configurator via an RS-485 interface, not via SSI.

6.    Click "OK" to confirm your selection.

↳ The read head connects to the Vision Configurator.



**Note**

**Restart Required After Parameterization**

This UART (or RS485) interface remains active until the reader is restarted and blocks the inputs and outputs during this time. For this reason, restart the device after parameterization with the Vision Configurator.

5.3 User Account Privileges and Rights

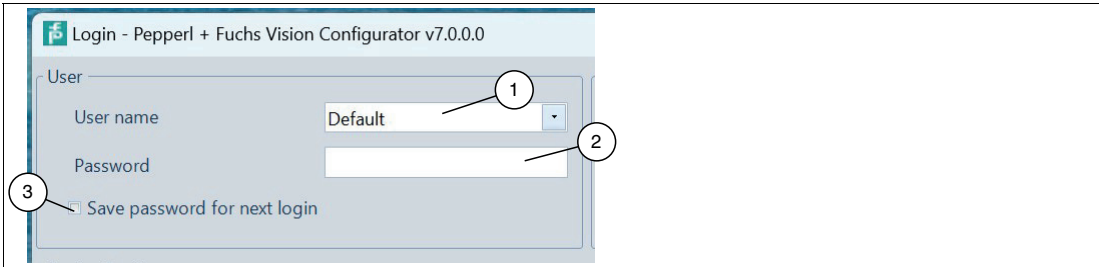


Figure 5.5 User rights



**Select Users**

- 1. Select the required user from the **User name** drop-down list (1).
- 2. Enter the appropriate password in the **Password** input field (2).
- 3. If you want to save the password for the next time you log in, select the **Save password for next login** check box (3).

**User Roles**



**Note**

On delivery, the following user roles are predefined in **User name** in the **User** screen with various authorizations.

**User Rights and Password**

| User roles       | User rights                                                                         | Password                                        |
|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------|
| Default          | View all information<br>Sensor configuration<br>Create users at same level or below | No password required                            |
| User             | View all information<br>Sensor configuration<br>Create users at same level or below | User                                            |
| Admin<br>PFAdmin | View all information<br>Sensor configuration<br>Create and delete users             | Access only for Pepperl+Fuchs service personnel |

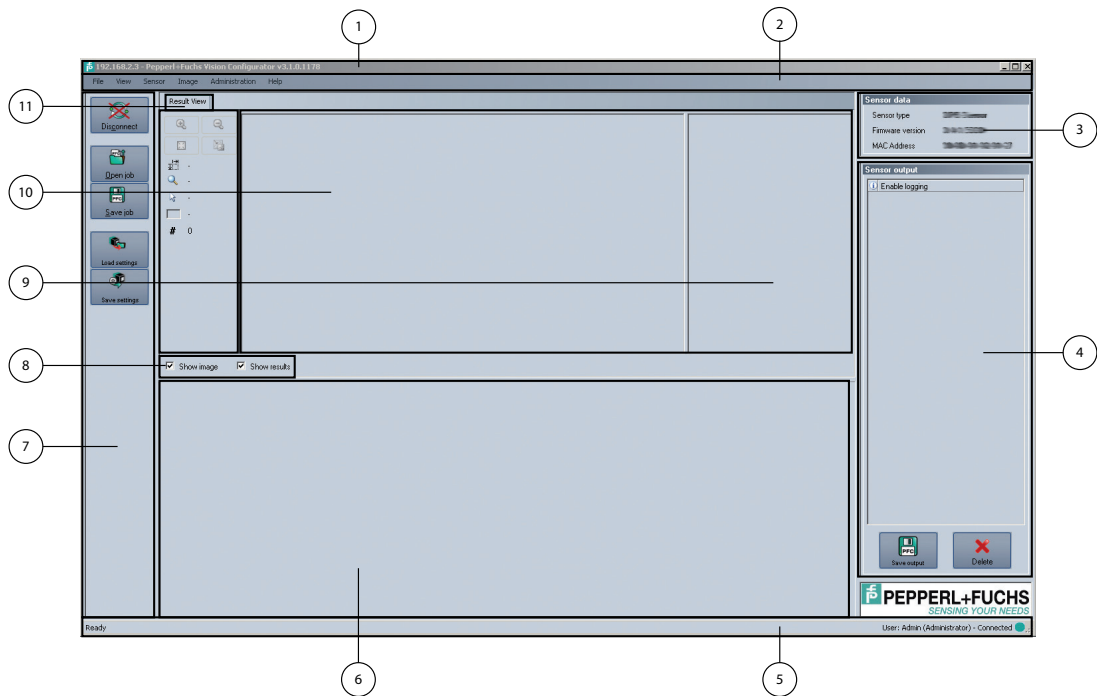
5.4 Application Window Structure

The application screen opens after you log in.



Note

The individual functions depend on the type of sensor connected and the current authorization level, so they are not always all visible.



The software is designed to be similar to most Windows applications.

|   |                      |                                                                                                                                                                                                                                                 |
|---|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Title bar            | <ul style="list-style-type: none"><li>Shows the IP address, the software name, and the version number</li><li>Contains the <b>Minimize/Maximize/Close</b> buttons</li></ul>                                                                     |
| 2 | Menu bar             | <ul style="list-style-type: none"><li>Displays all the menus in the program</li><li>Provides an overview and helps with navigation</li></ul>                                                                                                    |
| 3 | Sensor data screen   | <ul style="list-style-type: none"><li>Displays data for the connected sensor</li></ul>                                                                                                                                                          |
| 4 | Sensor output screen | <ul style="list-style-type: none"><li>Shows the log display</li></ul>                                                                                                                                                                           |
| 5 | Status bar           | <ul style="list-style-type: none"><li>Displays status information about the application</li></ul>                                                                                                                                               |
| 6 | Configuration window | <ul style="list-style-type: none"><li>Contains the sensor-specific parameters that you can set</li></ul>                                                                                                                                        |
| 7 | Toolbar              | <ul style="list-style-type: none"><li>Contains icon buttons as an extension to the menu</li></ul>                                                                                                                                               |
| 8 | Check boxes          | <ul style="list-style-type: none"><li><b>Show images:</b> Enables or disables the image display</li><li><b>Show results:</b> Enables or disables the results area</li></ul>                                                                     |
| 9 | Results area         | <ul style="list-style-type: none"><li>Displays results from the sensor</li><li>A varying number of tabs can be displayed depending on which sensor is connected</li><li>This field can be enabled or disabled via <b>Show results</b></li></ul> |

|    |               |                                                                                                                                                                                                                                                                                                              |
|----|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | Image display | <ul style="list-style-type: none"><li>Displays the images captured or stored in the error memory</li><li>This field can be enabled or disabled via <b>Show images</b></li></ul>                                                                                                                              |
| 11 | Tab           | <p>Displays information about the current image and the pixel under the mouse pointer. The following items are displayed:</p> <ul style="list-style-type: none"><li>Image size</li><li>Zoom level</li><li>Mouse position in image coordinates</li><li>Current grayscale value</li><li>Image number</li></ul> |

5.5 Menu Bar

The menu bar contains a list of menu items. The functionality depends on the type of sensor that is connected and the permissions of the user logged in.



Figure 5.6 Menu Bar

5.5.1 File Menu

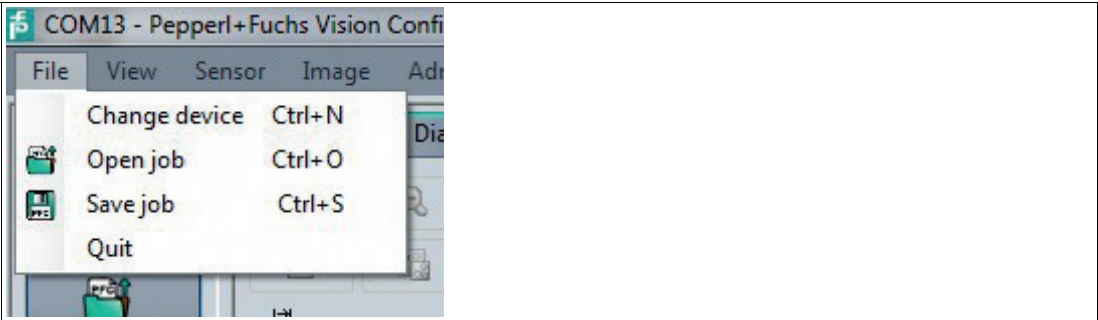


Figure 5.7 File Menu

|               |                                                         |
|---------------|---------------------------------------------------------|
| Change device | Disconnects the device and returns to the Login dialog. |
| Open job      | Loads a sensor configuration stored on the PC.          |
| Save job      | Saves the current sensor configuration on the PC.       |
| Quit          | Terminates the program.                                 |

Table 5.1 File Menu

5.5.2 View Menu

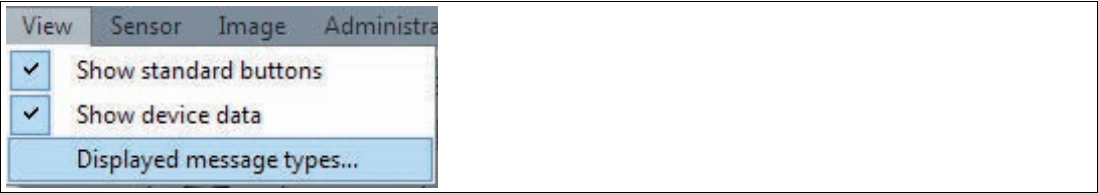


Figure 5.8 View menu

|                            |                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show standard buttons      | Show and hide the buttons in the toolbar ().                                                                                                                                       |
| Show device data           | Show and hide the device data in the display window (see chapter 5.7).                                                                                                             |
| Displayed message types... | Opens a selection window in which the following display windows can be activated or deactivated: Info, Result OK, Result not OK, Warning, Error, Critical, and Assert. <div></div> |

Table 5.2 View menu

5.5.3 Sensor Menu

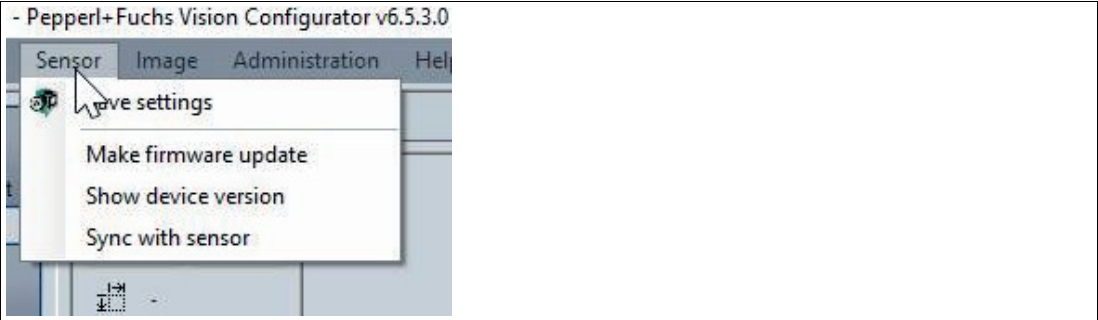


Figure 5.9 Sensor menu

|                      |                                  |
|----------------------|----------------------------------|
| Save settings        | Saves the settings to the sensor |
| Make firmware update | No function                      |
| Show device version  | Displays the device version      |
| Sync with sensor     | Synchronization with the sensor  |

Table 5.3 Sensor menu

5.5.4 Image Menu



Figure 5.10 Image menu

|                         |                                                                     |
|-------------------------|---------------------------------------------------------------------|
| Load imagefile          | Loads the image file                                                |
| Open image folder       | Opens the folder in which images are currently saved                |
| Save image              | Saves the image currently displayed on the PC                       |
| Copy image to clipboard | Loads an image file to the clipboard                                |
| Upload image to device  | Uploads an image to the device                                      |
| Show graphic            | Switches display data sent from the sensor on and off in the image. |

Table 5.4 Image menu

5.5.5 Administration Menu

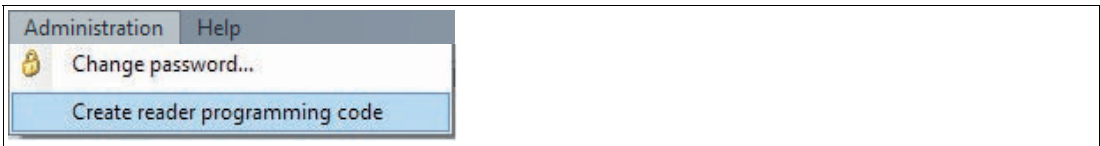


Figure 5.11 Administration menu

|                                |                                      |
|--------------------------------|--------------------------------------|
| Change password                | Changes the current user's password. |
| Create reader programming code | Creates a reader programming code    |

Table 5.5 Administration menu

5.5.6 Help Menu

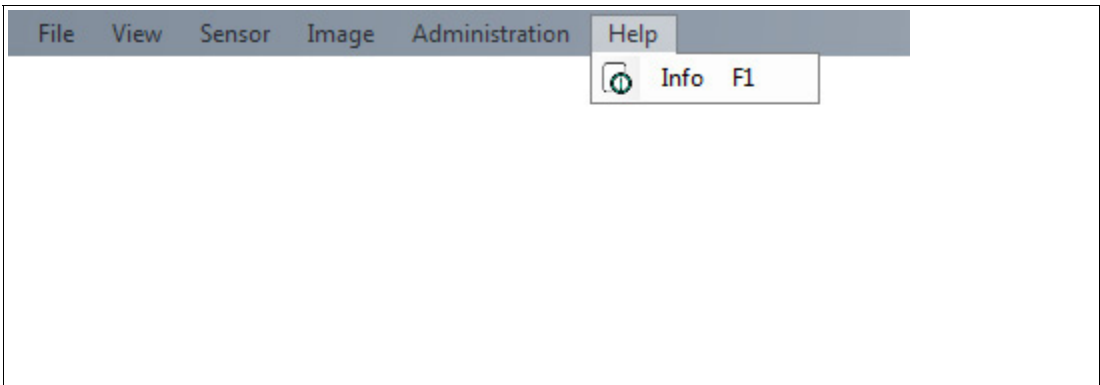


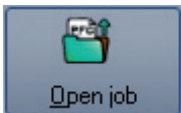
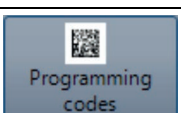
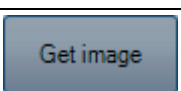
Figure 5.12 Help menu

|      |                                                 |
|------|-------------------------------------------------|
| Info | Displays information about Vision Configurator. |
|------|-------------------------------------------------|

Table 5.6 Help menu

5.6      **Toolbar**

The toolbar can be used to select various functions.

|                                                                                                      |                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|  Connect            | Selecting the Connect button establishes a connection between the PC and the read head.                                                         |
|  Disconnect         | The connection between the PC and the read head is disconnected.                                                                                |
|  Open job           | A read head configuration stored on the PC is loaded.<br>Note: Configuration is overwritten by the controller.                                  |
|  Save job           | The read head settings made are stored on a data carrier (PC, USB stick, etc.).                                                                 |
|  Save settings      | All settings made are saved on the actual read head.                                                                                            |
|  Programming codes | You will be taken to the "Control Codes" menu. Here you can generate and print different control codes for the parameterization of your device. |
|  Get image        | The read head records an image. The image can be displayed straight away in "Image View."                                                       |

5.7      **Device Data**

The connected device type (Device type) and the firmware version (Firmware) are displayed in the Device data area.



Figure 5.13      Device data

5.8 Image Display

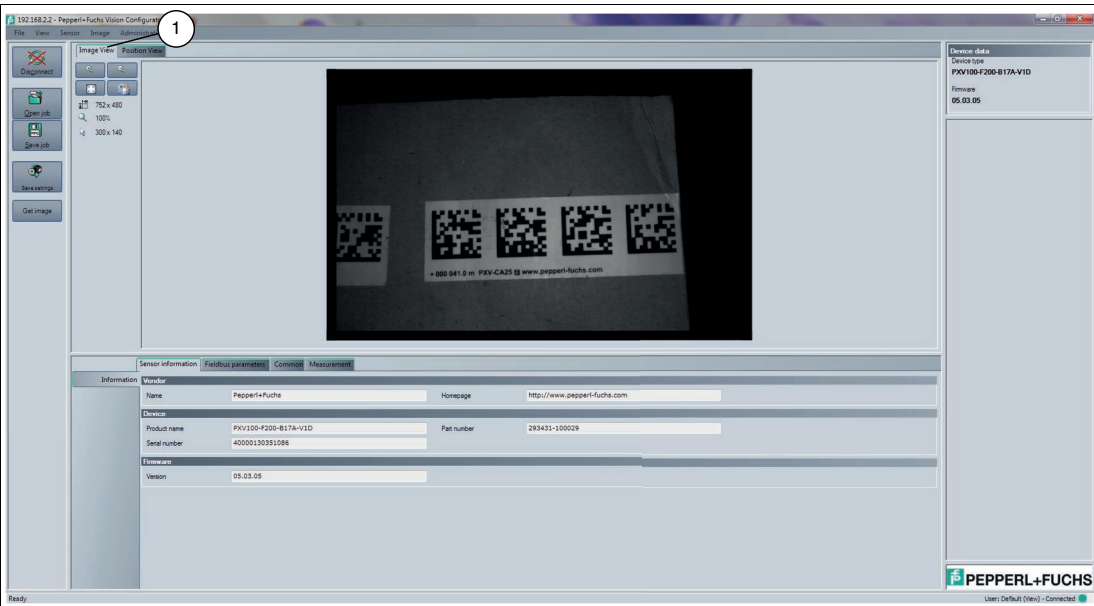
The image display [Image View] (1) allows you to view the current capture of the read head. As an example, you can move the read head into difficult mounting positions and display the capture. This allows you to detect the alignment of the read head with the Data Matrix code and readjust it.

You can open the currently recorded image under the **Image View** tab. To do this, click on **Get Image** in the toolbar.



Note

Note that the coordinate system follows the Data Matrix code tape.



Right-clicking on the captured image opens the following context menu:

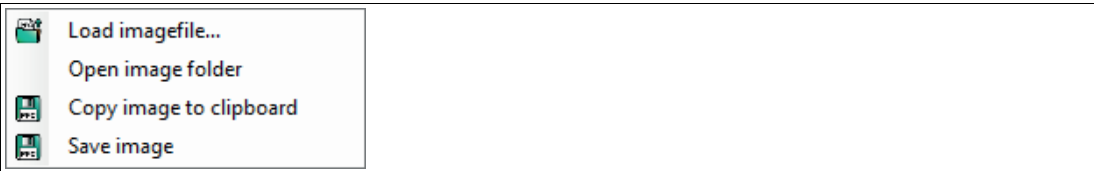


Figure 5.14 Image View context menu screen

| Designation             | Function                                               |
|-------------------------|--------------------------------------------------------|
| Load image file...      | Loads a sensor image. You can select the sensor image. |
| Open image folder       | Opens the storage location                             |
| Copy image to clipboard | Copies image to the clipboard                          |
| Save image              | Saves the displayed sensor image                       |

Toolbar

The toolbar is located on the left side under the **Image View** tab. The toolbar contains several useful functions that are used to further process recorded images. The following functions are available.

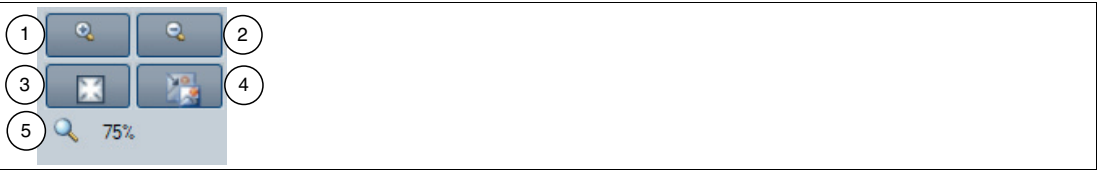


Figure 5.15      Toolbar

| Item | Designation   | Function                                                                             |
|------|---------------|--------------------------------------------------------------------------------------|
| 1    | Magnifier +   | Zoom in                                                                              |
| 2    | Magnifier -   | Zoom out                                                                             |
| 3    | Fit to window | Fit image size to the window                                                         |
| 4    | Original size | Set original image size                                                              |
| 5    | Zoom factor   | Information field for zoom factor. A zoom factor of 100 % is the original image size |

## 5.9 Position View

The position view (1) shows the detected absolute x position and various status information. The display is started with the "Start request" button and stopped with the "Stop request" button.

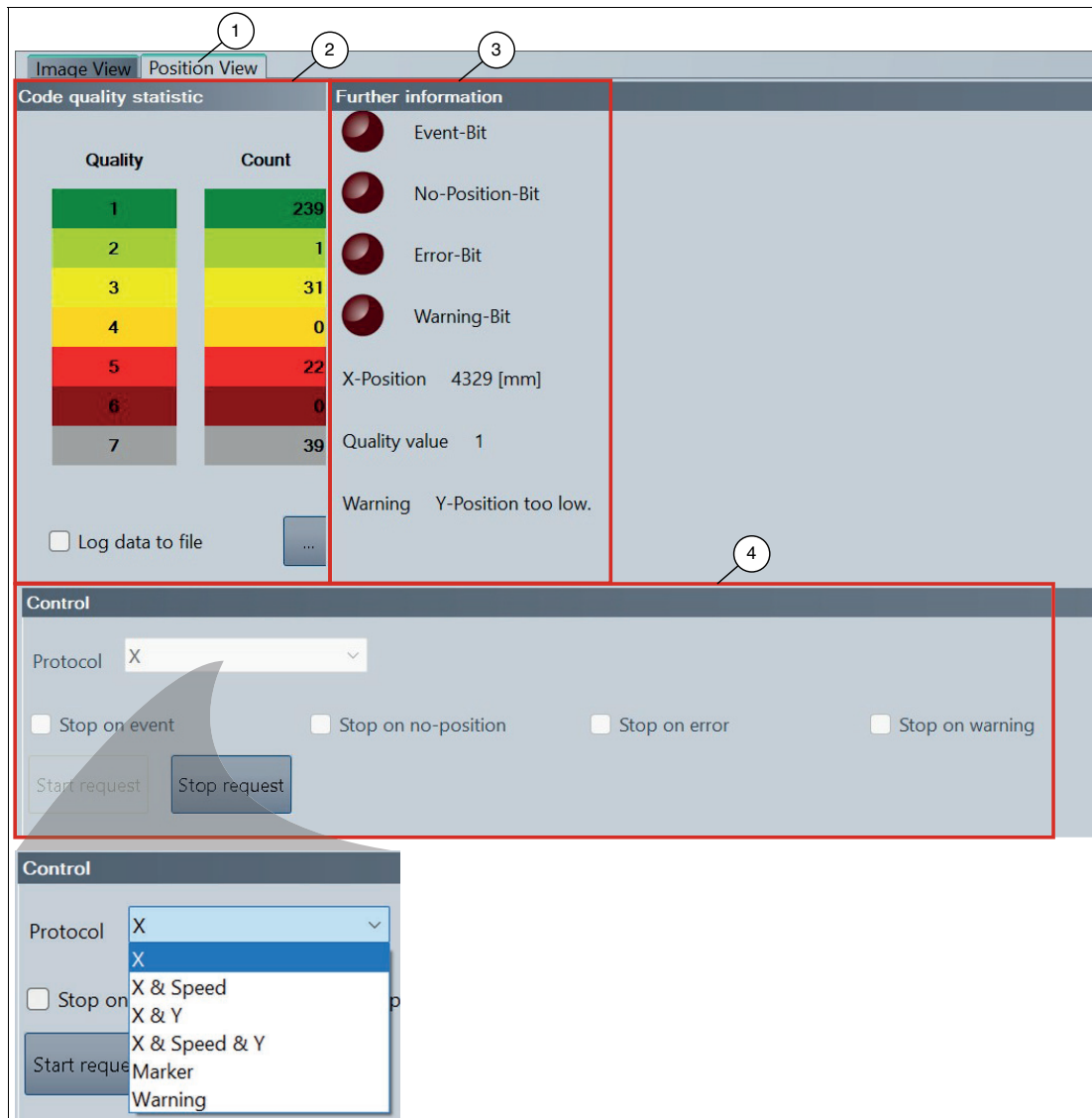


Figure 5.16

- 1 Position view
- 2 Code quality statistic
- 3 Further information
- 4 Control

## Code Quality Statistic

Output of the code quality and number of read codes.

### Further information

| Message         | Description                      |
|-----------------|----------------------------------|
| Event-Bit       | Event marker present             |
| No-Position-Bit | No absolute x position available |
| Error-Bit       | Error message                    |
| Warning-Bit     | Warning message                  |
| X-Position      | Absolute position in x direction |
| Quality value   | Quality values 1 ... 7           |
| Warning         | Warning message                  |

### Control

In the "Control" menu section, for example, default settings for the protocol used can be configured. Corresponding status information is displayed under "Further informations" depending on the selection.

The status information is started with the "Start request" button and stopped with the "Stop request" button.

5.10 Configuration Window

Various parameters are specified in the configuration window. The individual parameters depend on the current authorization level and are therefore not always all visible. Some features are available in different versions only. Depending on the parameters set, some fields will be grayed out.

5.10.1 Sensor Information tab

The **Sensor information** tab contains the **Information** menu item. The **Information** menu item allows you to view more detailed information on the sensor.

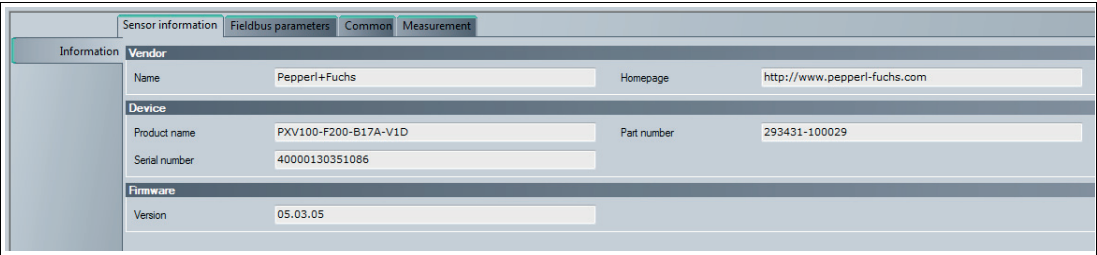


Figure 5.17 Sensor Information tab

|          |               |                       |
|----------|---------------|-----------------------|
| Vendor   | Name          | Manufacturer          |
|          | Homepage      | Manufacturer homepage |
| Device   | Product name  | Product name          |
|          | Serial number | Serial number         |
|          | Part number   | Item number           |
| Firmware | Version       | Firmware version      |

5.10.2 Tab Common

There are four menu items available in the **Common** tab. This section explains the menu items in more detail.

Communication Menu Item

You can adjust the connection parameters between the sensor and computer in the **Communication** menu item. No adjustments are required for SSI communication. This setting applies only to the connection used for parameterization via the Vision Configurator software.

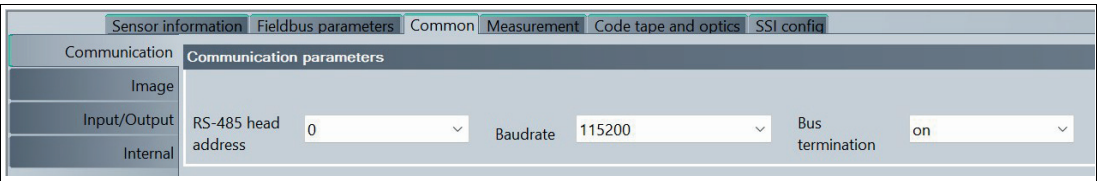


Figure 5.18 Menu item Communication

| Designation | Function                                                                                                                                                                                                                   |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Baudrate    | Data transmission speed setting. The default value of the read head is 115,200 bps. When the baud rate is changed, the baud rate of the Vision Configurator is automatically reset so that communication remains possible. |

Menu Item Image

In the **Image** menu area, you can adjust the image resolution to optimize transmission. A lower resolution makes downloading the image via the "Get image" function faster.

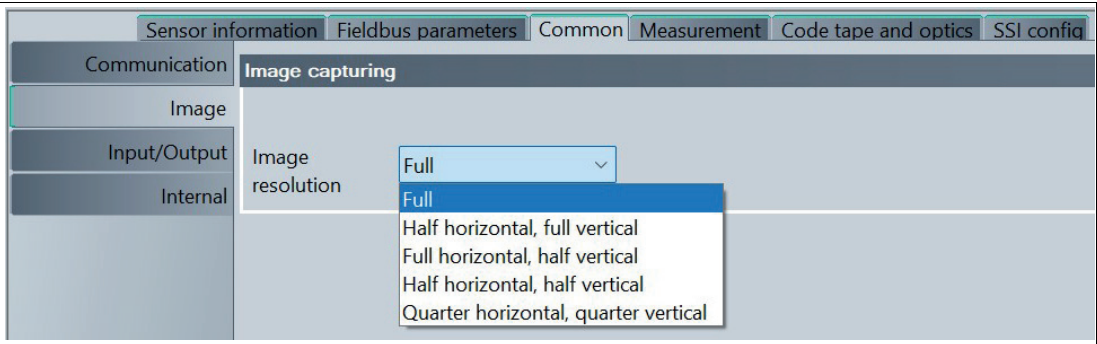


Figure 5.19 Menu Item Image

Image resolution

| Designation                               | Function                                                   |
|-------------------------------------------|------------------------------------------------------------|
| Full                                      | Maximum image resolution                                   |
| Half horizontal, full vertical            | Half horizontal resolution, full vertical resolution       |
| Full horizontal, half vertical            | Full horizontal resolution, half vertical resolution       |
| Half horizontal, half vertical            | Half horizontal resolution, half vertical resolution       |
| Quartal horizontal, quartal ver-<br>tical | Quarter horizontal resolution, quarter vertical resolution |

Menu Item Input/Output

This area contains configurable parameters for setting the inputs and outputs of the read head.

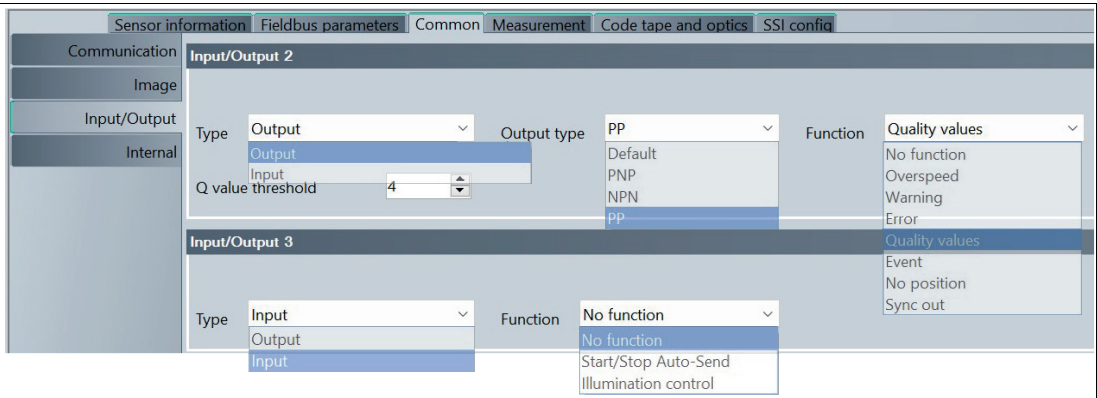


Figure 5.20 Menu Item Input/Output

## Input/Output 2 and Input/Output 3

| Designation                        |                      | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                               | Output               | The connection is identified as an output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                    | Input                | The connection is identified as an input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Output type                        | PP (Push-Pull)       | Can actively switch to either "High" or "Low."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                    | NPN                  | Switches to earth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                    | PNP                  | Switches to positive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                    | Default              | Default setting (= PP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Function<br>(If Input is selected) | No function          | The "No function" setting deactivates the output.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                    | Start/Stop Auto-Send | "Start/Stop Auto Send" is not relevant for the SSI interface because SSI implements automatic transmission (Auto Send) via the FPGA update interval. By default, the current position is written to the SSI register every 3000 µs and is available for querying.                                                                                                                                                                                                                                                                                                                                                       |
|                                    | Illumination control | <p>If one of the two inputs and outputs is configured as an input and the "Illumination control" function is activated, the following applies:</p> <ul style="list-style-type: none"> <li>• If the input is <u>not set</u>, read head captures an image as usual and simultaneously triggers the flash to illuminate the scene.</li> <li>• If the input is <u>set</u>, flash is not triggered during image capture.</li> </ul> <p>This option can be used to save energy, for example, as the sensor does not have to supply any values in this case. In addition, repeated flashes can be perceived as disruptive.</p> |

| Designation                         |                | Function                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function<br>(If Output is selected) | No function    | The "No function" setting deactivates the output.                                                                                                                                                                                                                                                                                                                                                             |
|                                     | Overspeed      | "Overspeed" activates the output if the speed is exceeded.                                                                                                                                                                                                                                                                                                                                                    |
|                                     | Warning        | "Warning" activates the output if a warning occurs.                                                                                                                                                                                                                                                                                                                                                           |
|                                     | Error          | "Error" activates the output if the error bit is set.                                                                                                                                                                                                                                                                                                                                                         |
|                                     | Quality values | If the "Quality values" function is selected, the quality value of the measurement result is sent as a switching signal via the defined digital output.<br>The output switches according to the adjustable "Q value threshold."<br>If the measured quality value is below the threshold, the output switches to High.<br>If the quality value is equal to or above the threshold, the output switches to Low. |
|                                     | Event          | If an event marker is detected by the read head, "Event" activates the output.                                                                                                                                                                                                                                                                                                                                |
|                                     | No position    | "No position" activates the output if the position cannot be determined. (e.g., no code tape in the field of view of the read head)                                                                                                                                                                                                                                                                           |
|                                     | Sync out       | With "Sync out," a pulse synchronized with image capture is sent at the switching output, allowing precise timing of the position data at the time of capture.<br>More information can be found in the section.                                                                                                                                                                                               |
| Q value threshold                   |                | Threshold for quality evaluation.                                                                                                                                                                                                                                                                                                                                                                             |
| Overspeed value                     |                | Defines the threshold at which overspeed is detected. If an output is configured to "Overspeed," it is activated if the specified speed is exceeded.                                                                                                                                                                                                                                                          |

Menu Item Internal

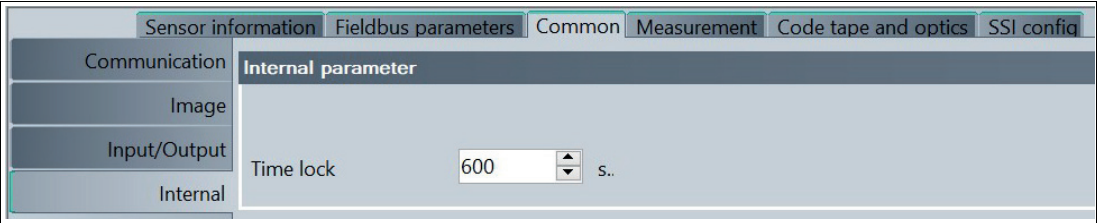


Figure 5.21

Internal Parameter

| Designation | Function                                                                                                                                                                                         |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time lock   | Defines after what length of time without parameterization activity the time lock of the read head is locked. Entered in seconds as an integer value.<br>0 means that the read head is inactive. |

5.10.3 Tab Measurement

There are three menu items available in the **Measurement** tab. This section explains the menu items in more detail.

Measurement

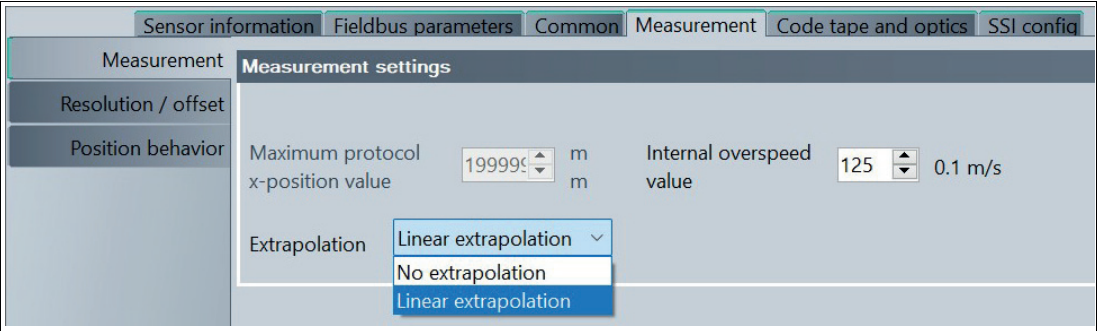


Figure 5.22

Measurement settings

| Designation                       |                      | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum protocol x-position value |                      | Maximum logging range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Internal overspeed value          |                      | Determines the speed above which an overspeed message should be displayed. If one of the outputs is configured to "Overspeed," this is activated when the speed is exceeded.                                                                                                                                                                                                                                                                                                                           |
| Extrapolation                     | No extrapolation     | Extrapolation deactivated                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                   | Linear extrapolation | Linear extrapolation enabled<br>Extrapolation uses a list of the most recent position readings to continuously calculate a list of speed values. The read head can use these two value sequences to calculate future positions for a certain period of time, even without new code captures.<br>This process is especially useful in situations where the code tape is damaged or dirty. The user is notified via the corresponding warning or error bits, but still receives a valid position output. |

Resolution / offset

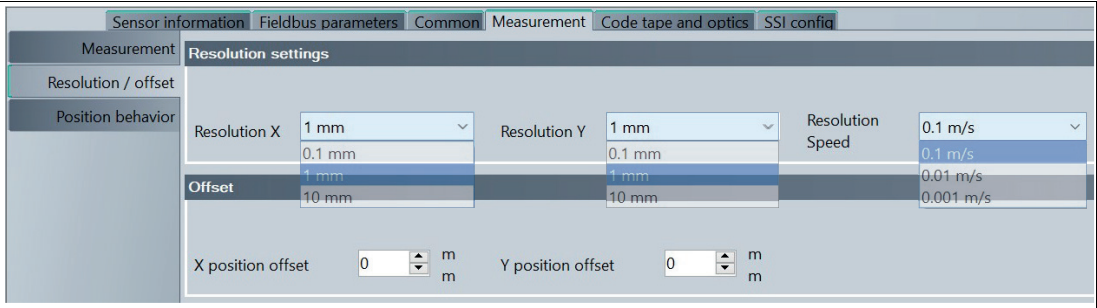


Figure 5.23

Resolution settings

| Designation      | Function                                                                                                                                                  |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resolution X     | Determines the position resolution of the read head in the x direction. <ul style="list-style-type: none"><li>0.1 mm</li><li>1 mm</li><li>10 mm</li></ul> |
| Resolution Y     | Determines the position resolution of the read head in the y direction. <ul style="list-style-type: none"><li>0.1 mm</li><li>1 mm</li><li>10 mm</li></ul> |
| Resolution Speed | Determines the speed resolution of the read head. <ul style="list-style-type: none"><li>0.1 m/s</li><li>0.01 m/s</li><li>0.001 m/s</li></ul>              |

Offset

| Designation       | Function                                                                                                         |
|-------------------|------------------------------------------------------------------------------------------------------------------|
| X position offset | Specifies a position offset in the x direction that the system may be require. Entry in mm as an integral value. |
| Y position offset | Specifies a position offset in the y direction that the system may require. Entry in mm as an integral value.    |

Position behavior

Sensor informationFieldbus parametersCommonMeasurementCode tape and opticsSSI config

Measurement

Resolution / offset

Position behavior

No-position X value

No-position X

Specified positionLast valid position

No-position X value

Specified position0

No-position Y value

No-position Y

Specified positionLast valid position

No-position Y value

Specified position0

No-position speed value (x)

No-position speed X

Specified speedLast valid speed

No-position speed X value

Specified speed2147483

X value at error

X value at error

Error-No.

Y value at error

Y value at error

Error-No.

Speed value at error

Speed value at error

Error-No.

Figure 5.24

| Designation   |                     | Function                                                                                                      |
|---------------|---------------------|---------------------------------------------------------------------------------------------------------------|
| No-position X | Last valid position | "Last valid position" outputs the last valid x position.                                                      |
|               | Specified position  | "Specified position" outputs a defined x position value. Enter this value in the "No-position X value" field. |

64

 PEPPERL+FUCHS

2026-07

| Designation               |                     | Function                                                                                                                                                                                        |
|---------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No-position X value       |                     | Determines the x position value that should be output by the read head if no position information is available (e.g., if the code tape is dirty or damaged).                                    |
| No-position Y             | Last valid position | "Last valid position" outputs the last valid y position.                                                                                                                                        |
|                           | Specified position  | "Specified position" outputs a defined y position value. Enter this value in the <b>"No-position Y value"</b> field.                                                                            |
| No-position Y value       |                     | Determines the y position value that should be output by the read head if no position information is available (e.g., if the code tape is dirty or damaged).                                    |
| No-position speed X       | Last valid speed    | "Last speed value" outputs the last valid speed.                                                                                                                                                |
|                           | Specified speed     | "Specified speed" outputs a specified speed value. Enter this value in the <b>"No-position speed X value"</b> field.                                                                            |
| No-position speed X value |                     | Determines the speed value that should be output by the read head if no position and speed information is available (e.g., if there is no code tape in the reading tolerance of the read head). |
| X value at error          | Error-No.           | "Error-No." displays the error code.                                                                                                                                                            |
|                           | Last valid value    | "Last valid value" outputs the last valid x position.                                                                                                                                           |
|                           | Specified value     | "Specified value" outputs a specified x position value.                                                                                                                                         |
| Y value at error          | Error-No.           | "Error-No." displays the error code.                                                                                                                                                            |
|                           | Last valid value    | "Last valid value" outputs the last valid y position.                                                                                                                                           |
|                           | Specified value     | "Specified value" outputs a specified y position value.                                                                                                                                         |
| Speed value at error      | Error-No.           | "Error-No." displays the error code.                                                                                                                                                            |
|                           | Last valid value    | The last valid speed is output with "Last valid value."                                                                                                                                         |
|                           | Specified value     | "Specified value" outputs a specified speed.                                                                                                                                                    |

5.10.4 Tab Code tape and optics

There is one menu item available in the **Code tape and optics** tab. This section explains the menu item in more detail.

Code tape

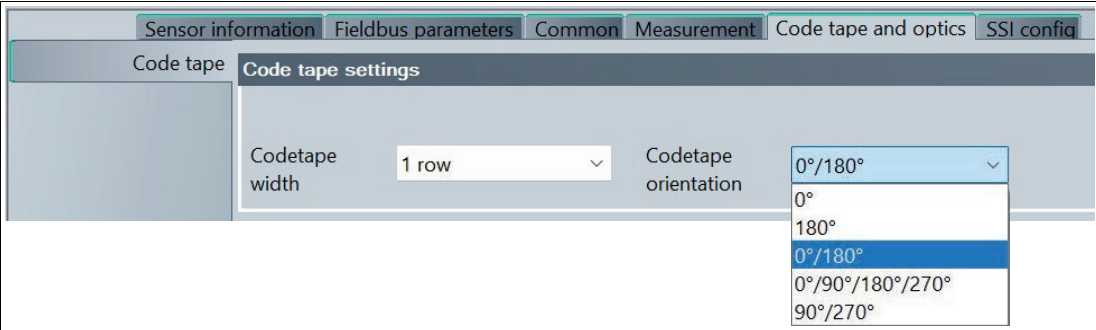


Figure 5.25

Code tape settings

| Designation          | Function                                                                                                      |
|----------------------|---------------------------------------------------------------------------------------------------------------|
| Codetape width       | The number of code tape tracks can be defined here. The PXV read head only supports the single-row code tape. |
| Codetape orientation | You can set the orientation of the read head in relation to the Data Matrix code tape here.                   |

5.10.5      **Tab SSI config**

There is one menu item available in the **SSI config** tab. This section explains the menu item in more detail.



**Setting the SSI Response Telegram**

- 1. Select "SSI Config" in the program navigation to set the SSI telegram.  
↳ In the window, a representation of the 25-bit SSI telegram appears with the bits assigned. Bits 1 (MSB) to 22 (LSB) are initially preassigned with the data for the x position of the read head. Bits 23 to 25 are configured as the status bits "No Position," "Warning," and "Error."
- 2. To change the bit assignment, click on the content under the bit number to be changed (in the example: Bit 25, Error).

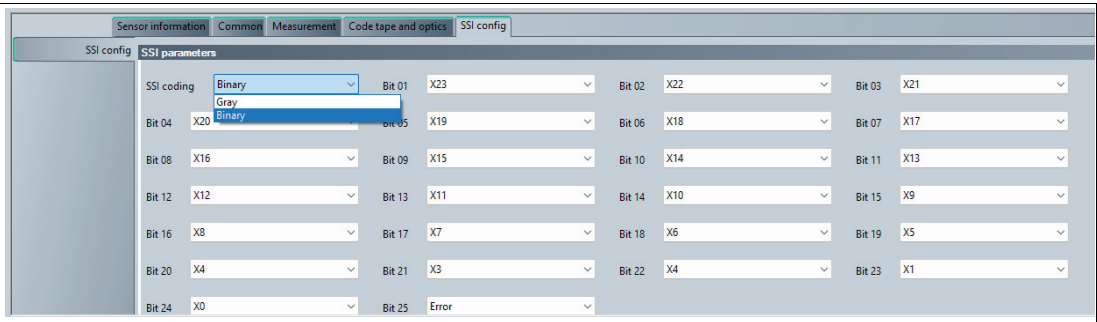


Figure 5.26

- ↳ A list of options that you can assign to this bit is displayed below. Click to make your selection.
- 3. This allows you to configure the response telegram of your read head with SSI interface.
- 4. Set the encoding of the position data according to your required configuration (Gray code or binary code).



**Note**

The number of position bits required in the x direction depends on the track length of your system and the required position resolution.  
**Example:** max. track length = 300 m, required position resolution = 1 mm. 19 bits is sufficient to represent the 300,000 possible x position values. This means you can use 6 bits for other data.

## 6 Operation and Communication

### 6.1 Communication via the SSI Interface

#### Overview

The reader has an SSI interface (Synchronous Serial Interface) that enables it to transmit current process data during operation. This is physically based on an optically isolated RS-422 interface that synchronously transmits the clock and data signals.

#### How Data Transmission Works

Transmission is initiated by the control system. It sends a defined clock sequence, prompting the read head to synchronously transmit a 25-bit data telegram.

##### Clock-to-Data Ratio

- Transfer is initiated with the first falling edge change of the cycle.
- With each rising edge, the next data bit is output, starting with the most significant bit (MSB, D24) and ending with the least significant bit (LSB, D0).

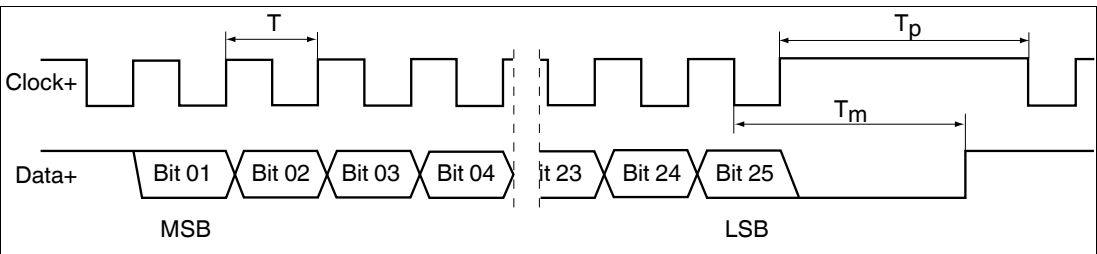
##### Signal Level in Idle State

| Signal           | Level        |
|------------------|--------------|
| Data + / Clock + | High (3.3 V) |
| Data - / Clock - | Low (-3.3 V) |

After the transmission, the data line remains low until the monoflop time ( $T_m$ ) has expired.

##### Note

If clock lines are reversed, the data word may be output with an offset.



- $T$ : Duration of the clock signal
- $T_p$ : Pause time of the clock signal
- $T_m$ : Monoflop time
- Bit 01 ... Bit 25: Data bits
- MSB: Most significant bit
- LSB: Least significant bit

#### SSI Output Format

##### Standard Mode

After the final falling edge of the clock signal, the monoflop time ( $T_m$ ) is triggered. This defines the minimum pause time between two telegrams. A new transmission can only begin once this time or the clock pause ( $T_p$ ) has elapsed.

### Double Query (Ring Slide Operation)

The same data word can be transmitted multiple times for error detection. If the clock signal is not interrupted, ring slide operation starts automatically:

- $\leq T_m$ : The same data word is sent again
- $> T_m$ : A new query is started and a new data word is transmitted.

### Telegram Structure and Configuration

You can define the structure and content of the response telegram using the **Vision Configurator** configuration software. Position values are output either in Gray code or in binary code. The following data can be transmitted:

- Position data (x and y directions)
- Speed data
- Diagnostic data
- Status information

| Bit  | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23          | 24  | 25  |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|-----|-----|
| Data | XP21 | XP20 | XP19 | XP18 | XP17 | XP16 | XP15 | XP14 | XP13 | XP12 | XP11 | XP10 | XP9 | XP8 | XP7 | XP6 | XP5 | XP4 | XP3 | XP2 | XP1 | XP0 | Out         | Wrn | Err |
|      | MSB  |      |      |      |      |      |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     | LSB | Status bits |     |     |

Figure 6.1 Telegram structure



#### Note

##### Example Position Resolution

The number of position bits required in the x direction depends on the track length of your system and the required position resolution.

##### For example:

maximum track length = 300 m, required position resolution = 1 mm.  
19 bits are enough to display the x position. This means you can use 6 bits for other data.

#### Status Bits

| Out | Wrn | Err | Meaning                                                  |
|-----|-----|-----|----------------------------------------------------------|
| x   | 1   | x   | Reserved                                                 |
| x   | x   | 1   | Error, error code in XP0 ... XP21                        |
| 1   | x   | x   | No position codes in the reading window (XP0 ... XP21=0) |

#### Error Codes

| Error code | Meaning        |
|------------|----------------|
| >1000      | Internal error |

#### Output Data

| Type          | Designation | Description                                            |
|---------------|-------------|--------------------------------------------------------|
| Status (bits) | Error       | Error message is present (see error codes for details) |
|               | No Position | No valid absolute x position available                 |
|               | Warning     | Warning message (see note on warning bits below)       |
|               | Event       | Set once an event marker has been detected             |
|               | Even parity | Parity bit for error detection                         |

| Type          | Designation            | Description                                 |
|---------------|------------------------|---------------------------------------------|
| Position data | x position X0 ... X23  | Absolute position in x direction            |
|               | y position Y0 ... Y12  | No absolute position in x direction         |
|               | y+/-                   | Sign bit for y position (positive/negative) |
| Speed         | Speed<br>SPD0 ... SPD6 | Current determined speed                    |
| Static bit    | 0                      |                                             |
|               | 1                      |                                             |

**Note****Warning Bit Behavior**

The warning bit is set automatically when a warning occurs. It remains active until:

- The warning has been explicitly queried via the Vision Configurator, or
- The read head is restarted.

**6.2****I/O Configuration**

| I/O                 | Function                                  | Description                                                                                                                                          |
|---------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input 2             | No function                               | No function, I/O deactivated                                                                                                                         |
|                     | Illumination Control                      | Switches the lighting on and off                                                                                                                     |
| Output 2            | No function                               | No function, I/O deactivated                                                                                                                         |
|                     | Overspeed                                 | Activates the output if the speed is exceeded                                                                                                        |
|                     | Warning                                   | Activates the output if a warning is generated                                                                                                       |
|                     | Error                                     | Activates the output if the error bit is set                                                                                                         |
|                     | Quality values                            | The output switches according to the adjustable "Q value threshold."                                                                                 |
|                     | Event                                     | Activates the output if an event code is present                                                                                                     |
|                     | No Position                               | Activates the output if position determination is not possible (e.g., no code tape in the field of view)                                             |
|                     | Sync Out                                  | Provides a synchronous pulse at the output                                                                                                           |
| Overspeed value 2   | 0 ... 65534 mm/s<br>12500 mm/s (Standard) | Defines the threshold at which overspeed is detected. If an output is configured to "Overspeed," it is activated if the specified speed is exceeded. |
| Q-value threshold 2 | 1 ... 7<br>4 (Standard)                   | Q threshold for activating the output                                                                                                                |
| Input 3             | No function (Standard)                    | No function, I/O deactivated                                                                                                                         |
|                     | Illumination Control                      | Switches the lighting on and off                                                                                                                     |

| I/O                 | Function                                  | Description                                                                                                                                          |
|---------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output 3            | No function                               | No function, I/O deactivated                                                                                                                         |
|                     | Overspeed                                 | Activates the output if the speed is exceeded                                                                                                        |
|                     | Warning                                   | Activates the output if a warning is generated                                                                                                       |
|                     | Error                                     | Activates the output if the error bit is set                                                                                                         |
|                     | Quality values                            | The output switches according to the adjustable "Q value threshold."                                                                                 |
|                     | Event                                     | Activates the output if an event code is present                                                                                                     |
|                     | No Position                               | Activates the output if position determination is not possible (e.g., no code tape in the field of view)                                             |
|                     | Sync Out                                  | Provides a synchronous pulse at the output                                                                                                           |
| Overspeed value 3   | 0 ... 65534 mm/s<br>12500 mm/s (Standard) | Defines the threshold at which overspeed is detected. If an output is configured to "Overspeed," it is activated if the specified speed is exceeded. |
| Q-value threshold 3 | 1 ... 7<br>4 (Standard)                   | Q threshold for activating the output                                                                                                                |

## 7 Maintenance

### General Procedure

When replacing devices, follow the same work instructions as for initial commissioning. For detailed information, see chapter 4.

### Using an Original Device

In the event of a defect, the device must always be replaced with an original device from the manufacturer. After replacing the device, the plant operator is obligated to reconnect the device and, if necessary, change the device name, address, and device configuration to match the replaced device.

### Manufacturer-Specified Accessories

When replacing other system components, only use accessories that have been specified by the manufacturer. As an interim solution, defective or very dirty code tape can be temporarily replaced with a self-printed replacement tape.



#### Caution!

Heat generation on the device

The device may heat up when used for a long period of time. The temperature of metal surfaces and the housing of the read head may increase after a long period of operation.

Allow the device to cool down before carrying out any work.



#### Caution!

Altered position information

If a defective code tape is replaced with a section with different position information, the previously learned reference points are lost. Multiple use of identical code areas can lead to ambiguous position information, meaning that the actual position of the device cannot be precisely determined. Before installing a replacement code tape, ensure that the position information for the read head is unique in the entire plant area.

If the code tape is not replaced with sufficient precision or the read head is not aligned differently relative to the vehicle, the learned reference points will shift accordingly. This can lead to reduced positioning accuracy within the plant. Therefore, make sure that the replacement is carried out carefully and precisely.

### 7.1 Maintenance

The device is maintenance-free.

### 7.2 Testing

#### Regular Inspection

To ensure high operational availability, we recommend regularly inspecting the read head and the Data Matrix code tape for mechanical damage and removing any contamination. There is no need for an additional proof test because the prescribed interval is longer than the normal service life of the device.

## Additional Inspection under Exceptional Ambient Conditions

If the device is exposed to ambient conditions in the plant that could cause potential mechanical damage or vibration, it is advisable to regularly inspect the integrity of the device housing (especially water ingress) and the correct seating of fasteners (e.g., loose fastening screws).

### 7.3

## Cleaning



### Note

#### General Information

Even with the correct sensor alignment, read errors can occur due to contamination. This is especially likely when the code tape is installed on the floor. This chapter describes the correct cleaning procedures for the code tape and read head.

## Cleaning the Code Tape

### Cleaning intervals

Because contamination levels vary between installations, fixed cleaning intervals cannot be defined. Note the following:

- In some circumstances, the read head may fail to read codes that still appear to be legible.
- It is difficult for the human eye to assess readability for the read head.
- To maintain system performance, early cleaning is recommended when there is visible contamination.
- Quality grades are used for early detection of contamination.
- Cleaning becomes essential once read errors begin to occur.

The image below shows a heavily soiled code tape that is barely legible. At this level of contamination, individual codes may already be unreadable, which can lead to system disruptions.

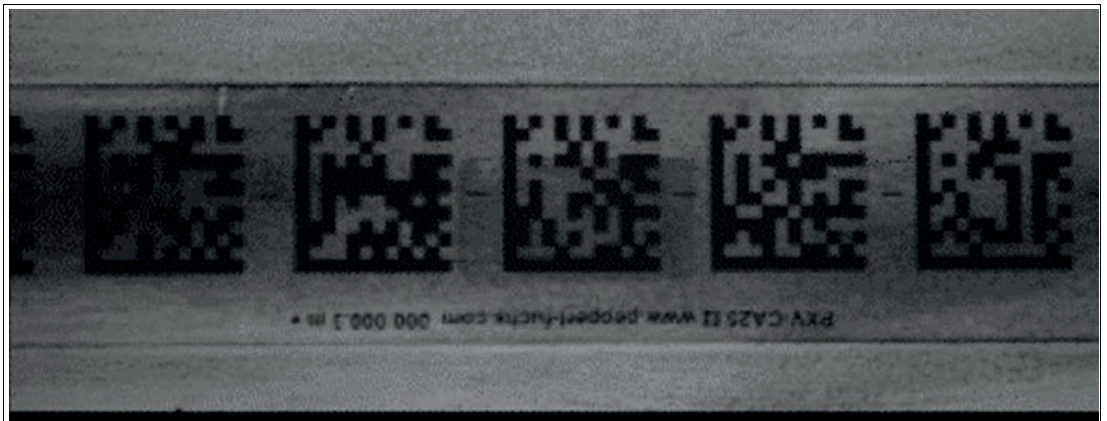


Figure 7.1

### Correct cleaning method

The surface of the code tape is designed to diffuse incident light and minimize disruptive reflections.



### Note

#### Impaired Functionality Due to Incorrect Cleaning

Incorrect cleaning may polish the code tape, causing reflections that may not be visible to the human eye but that interfere with system performance. To check this, capture an image with the read head.

The image below shows a reflective code tape with visible reflections of the lighting ring.



Figure 7.2

### Recommended Cleaning Agents and Materials

|                        | Recommendation              | Do not use                                     |
|------------------------|-----------------------------|------------------------------------------------|
| <b>Cleaning cloths</b> | Cotton or microfiber cloths | Brushes or rough cloths (e.g., paper towels)   |
| <b>Cleaning agents</b> | Plastic-safe cleaner only   | Acetone, petroleum, brake cleaner, isopropanol |

### Cleaning technique

Avoid applying excessive pressure so as not to polish the surface.

### Automated cleaning

- Recommended: Contactless cleaning systems (e.g., mobile suction systems)
- Not recommended: Cleaning systems in continuous direct contact with the code tape (e.g., mobile brushes) because these may polish the surface over time and cause disruptive reflections

### Code tape replacement

If cleaning is not possible, a temporary workaround is to generate and print a new code tape using a generator.

## Cleaning the Read Head

### Cleaning intervals

Because contamination levels vary between installations, fixed cleaning intervals cannot be defined. The impairment of read performance depends heavily on the type of contamination. If in doubt, capture an image with the read head to check whether contamination is affecting the optical surfaces.

### Components to be cleaned

Only the optically active surfaces of the read head need to be cleaned:

- Front glass (located in front of the lighting unit and lens)

|                        | Recommendation                        | Alternative                    |
|------------------------|---------------------------------------|--------------------------------|
| <b>Cleaning cloths</b> | Water                                 | Non-aggressive cleaning agents |
| <b>Cleaning agents</b> | Lint-free cotton or microfiber cloths | -                              |

## 7.4

### Repair

Do not repair or manipulate the device.

If there is a defect, always replace the device with an original device.

Only use accessories specified by the manufacturer.

## 8 Disposal

The device, built-in components, packaging, and any batteries contained within must be disposed in compliance with the applicable laws and guidelines of the respective country.

## 9 Appendix

### 9.1 Code Cards for External Parameterization

These are the code cards for parameterizing some of the basic functions of the read head in a step-by-step process. For information on the exact procedure for external parameterization, refer to see chapter 4.5.



#### Note

##### Note on Using Code Cards

When performing external parameterization with code cards, we recommend printing or copying the relevant pages in this manual and cutting out the required code cards.

This will prevent the read head from accidentally scanning an unintended code card on the same page.

If using the manual directly for parameterization, make sure to cover all unused code cards to avoid unintentional scanning.

#### The following parameters can be configured using the code cards:

- Resolution in x direction of read head: **[0.1 mm, 1 mm, 10 mm]**
- Orientation: **[0°/180°, 90°/270°, 0°/90°/180°/270°]**
- Data transmission: **Binary code or gray code**
- Function of input/output 2:  
As input: **No function**  
As output: **No function, Overspeed, Warning, Error, Quality values, Event, No Position**
- Function of input/output 3:  
As input: **No function**  
As output: **No function, Overspeed, Warning, Error, Quality values, Event, No Position**

#### 9.1.1 Code Cards with Special Functions

The following code cards perform special control functions during the parameterization process:

- **ACTIVATE** – Activates the operating mode for external parameterization
- **USER** – Enables the user level in external parameterization operating mode
- **STORE** – Saves modified parameters permanently
- **CANCEL** – Discards all unsaved changes
- **USE** – Temporarily applies modified parameters for testing
- **DEFAULT** – Restores all parameters to factory settings
- **Activate parameterization mode** – Activates parameterization mode

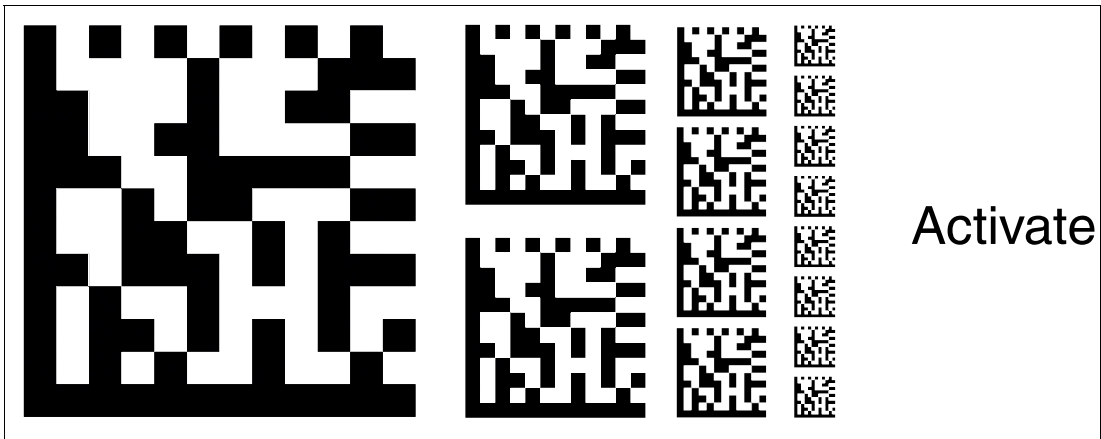
**Activate**

Figure 9.1 The "ACTIVATE" code card is used to activate external parameterization operating mode.

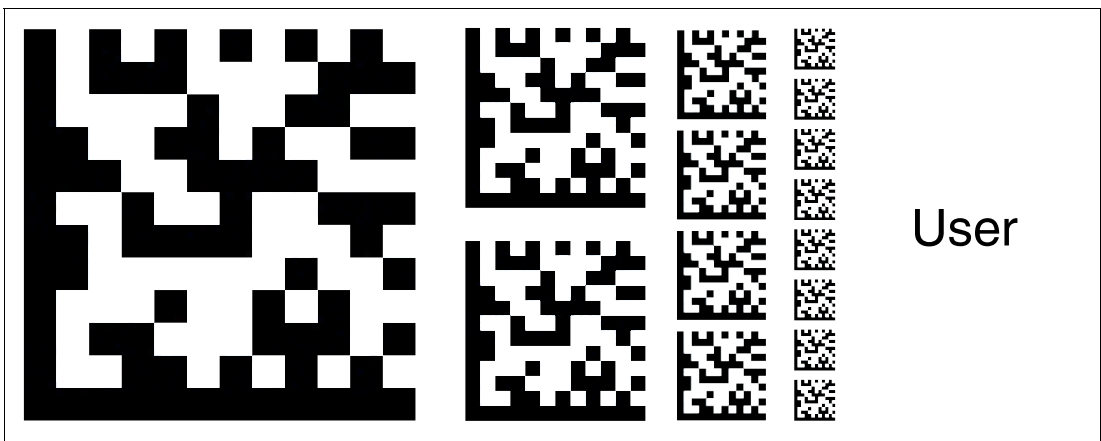
**User**

Figure 9.2 The "USER" code card is used to activate the user level in the external parameterization operating mode.

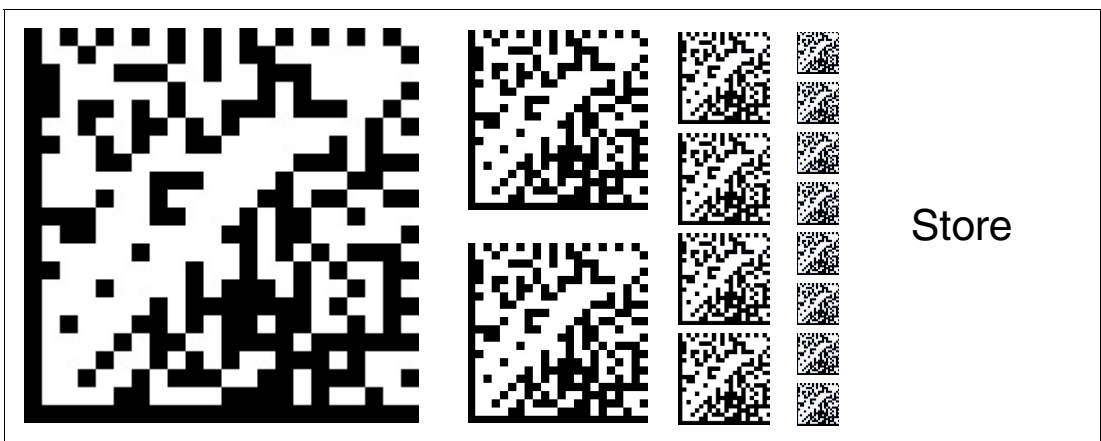
**Store**

Figure 9.3 The "STORE" code card stores the modified parameterization in the nonvolatile memory of the read head and terminates external parameterization operating mode.

Cancel

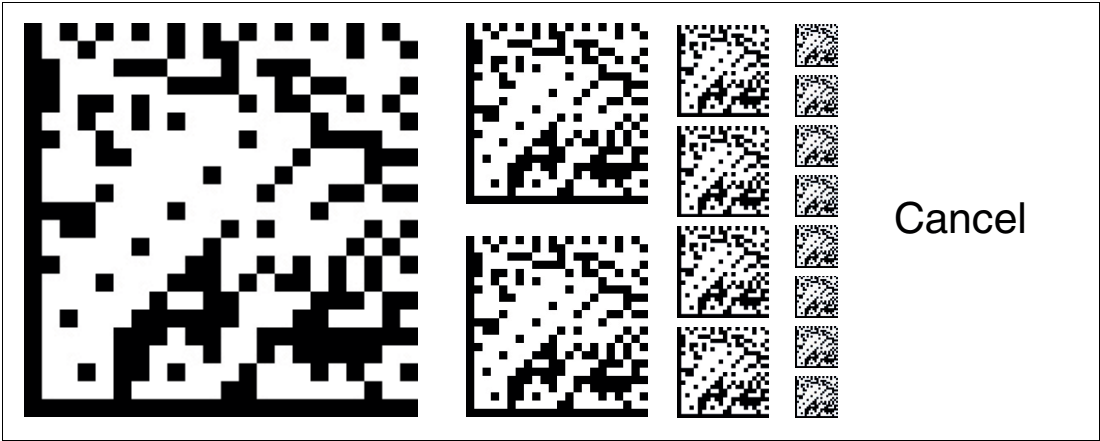


Figure 9.4 The "CANCEL" code card discards the modified parameterization and terminates external parameterization operating mode. The read head switches to normal mode and adopts the last valid configuration that was saved.

Use

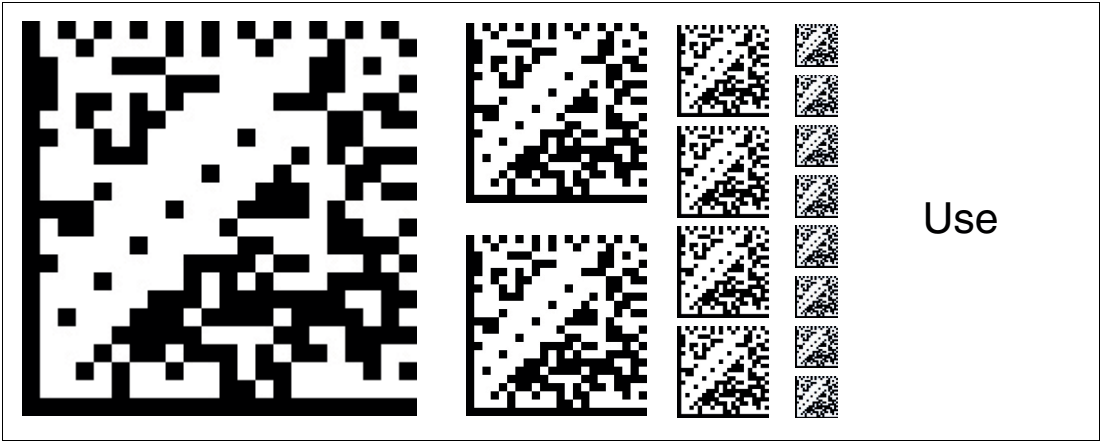


Figure 9.5 The "USE" code card takes over the set configuration **volatile** in the read head working memory and terminates the external parameterization operating mode. The read head then operates with this configuration. However, if the read head is switched off and on again, the configuration is lost and the read head operates with the last valid configuration that was saved. This function is used primarily for test purposes.

Default

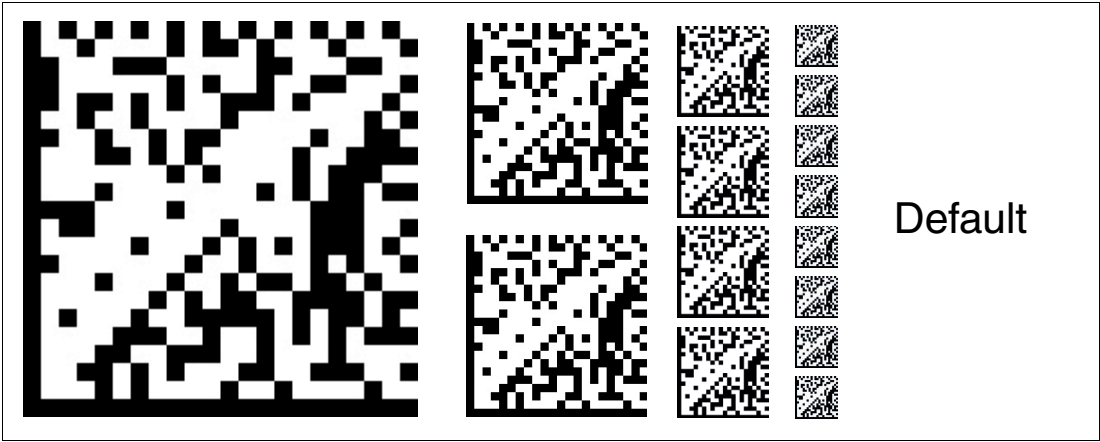


Figure 9.6 The "DEFAULT" code card restores the settings of the read head to default and terminates external parameterization operating mode.

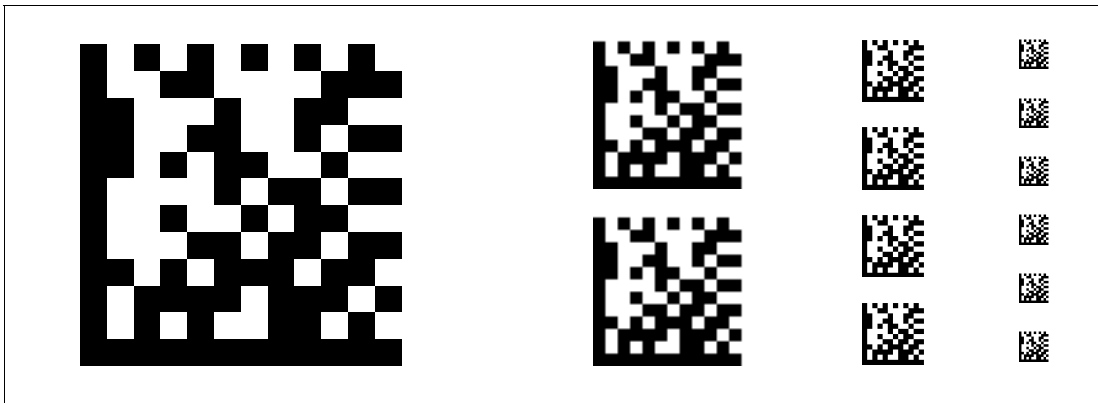
**Activating Parameterization Mode**

Figure 9.7 The UART (or RS485) interface is activated using the "Activate parameterization mode" code card.

**Note**

This UART (or RS485) interface remains active until the read head is restarted and blocks the IOs during this time. For this reason, restart the device after parameterization with the VC.

**Note****Read Head Alignment 0°/180°**

The read head is parameterized to a reading direction of 0° or 180° as standard. Make sure that the code is positioned in the field of view according to the set reading direction to ensure correct detection.

### 9.1.2 Code Cards for Setting the Resolution

You can configure a position resolution of **0.1 mm**, **1 mm**, or **10 mm** for the read head.

#### Resolution: 0.1 mm

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

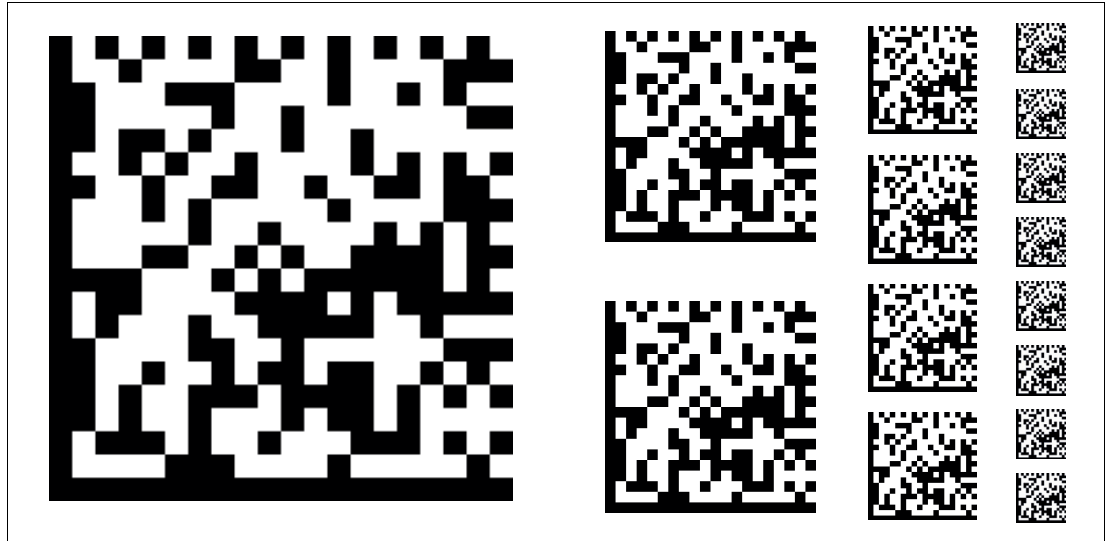
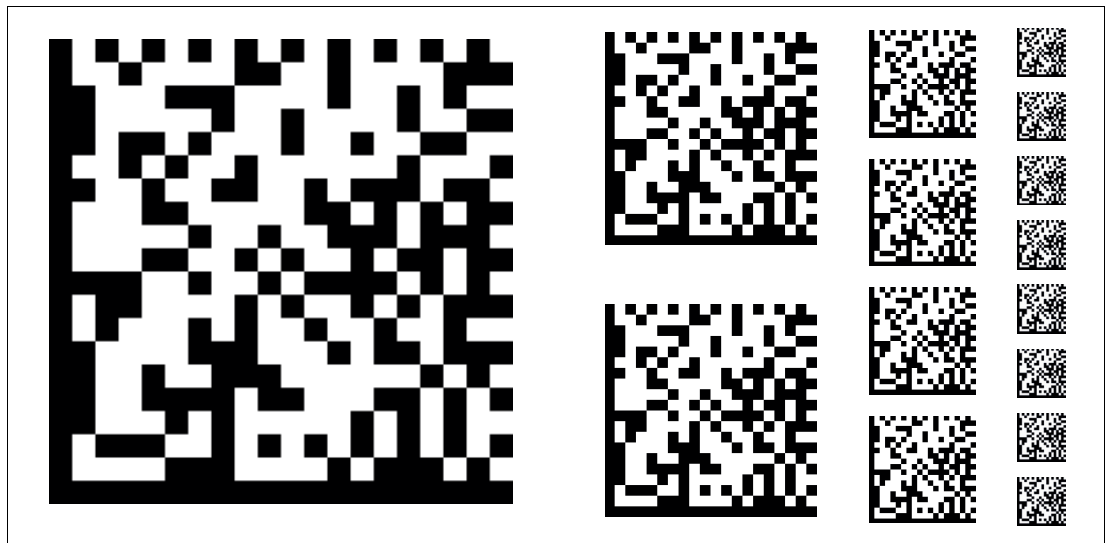


Figure 9.8

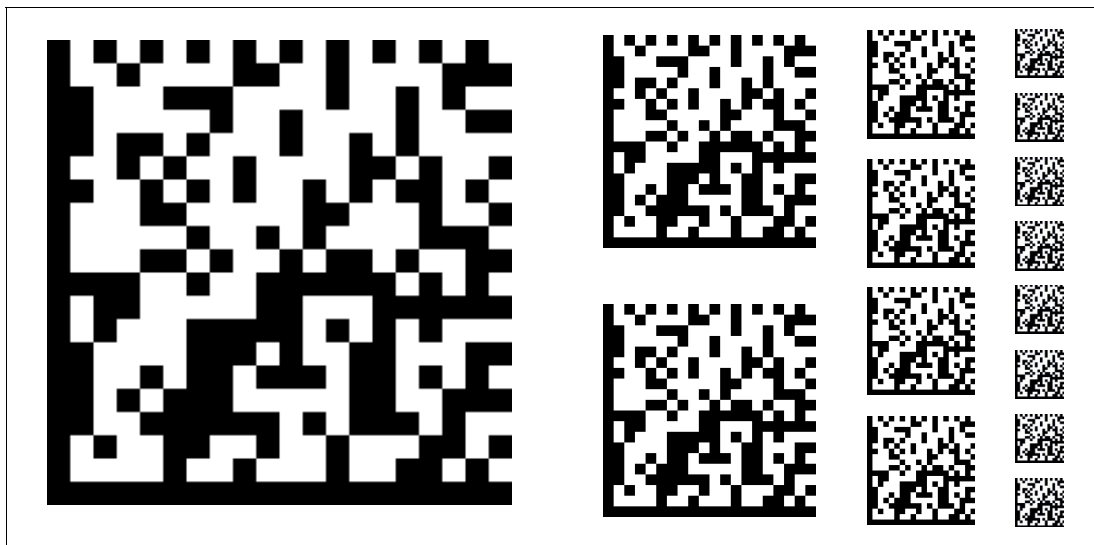
#### Resolution: 1 mm

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



### Resolution: 10 mm

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



#### 9.1.3

### Code Cards for Setting the Orientation

If the alignment of the read head to the code tape is not the same as the default setting, the orientation must be adjusted.

The angles that can be set are: 0 °/180 °, 90 °/270 ° or 0 °/90 °/180 °/270 °.

#### Orientation 0 °/180 °

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

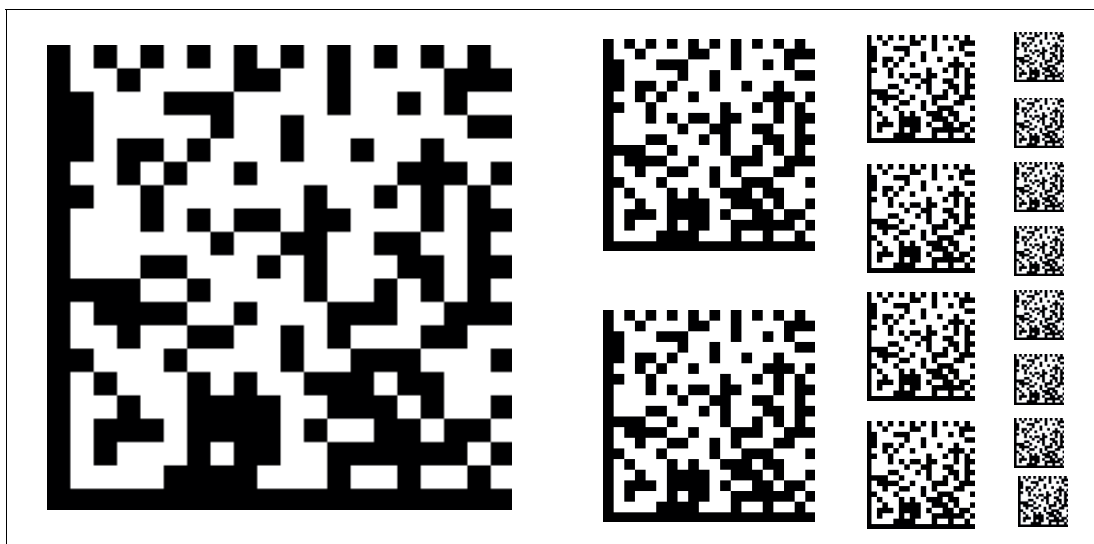


Figure 9.9 Orientation 0 °/180 °

### Orientation 90 °/270 °

The code card assigns the orientation 90 ° and 270 ° to the read head. With this setting, the read head can detect the Data Matrix code tape in 90 ° and 270 ° orientation.

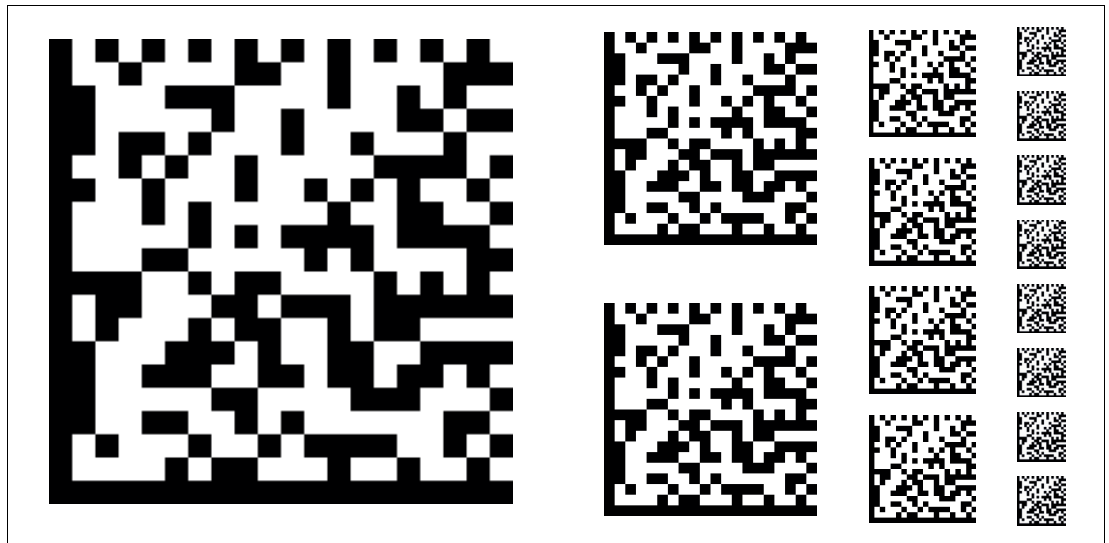


Figure 9.10 Orientation 90 °/270 °

### Orientation 0 °/90 °/180 °/270 °

The code card assigns the orientation 0 °, 90 °, 180 °, and 270 ° to the read head. With this setting, the read head can detect the Data Matrix code tape in 0 °, 90 °, 180 °, and 270 ° orientation.

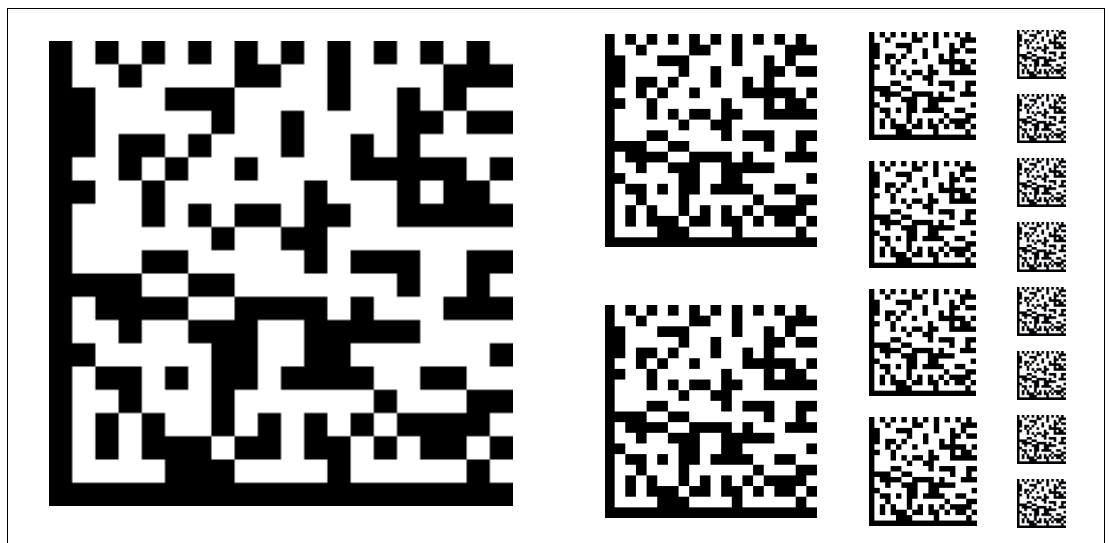


Figure 9.11 Orientation 0 °/90 °/180 °/270 °

### 9.1.4 Code Cards for Setting the Output Code

The read head can transmit data in binary code or gray code.

#### Binary Code

The code card assigns data transmission to the read head in binary code.

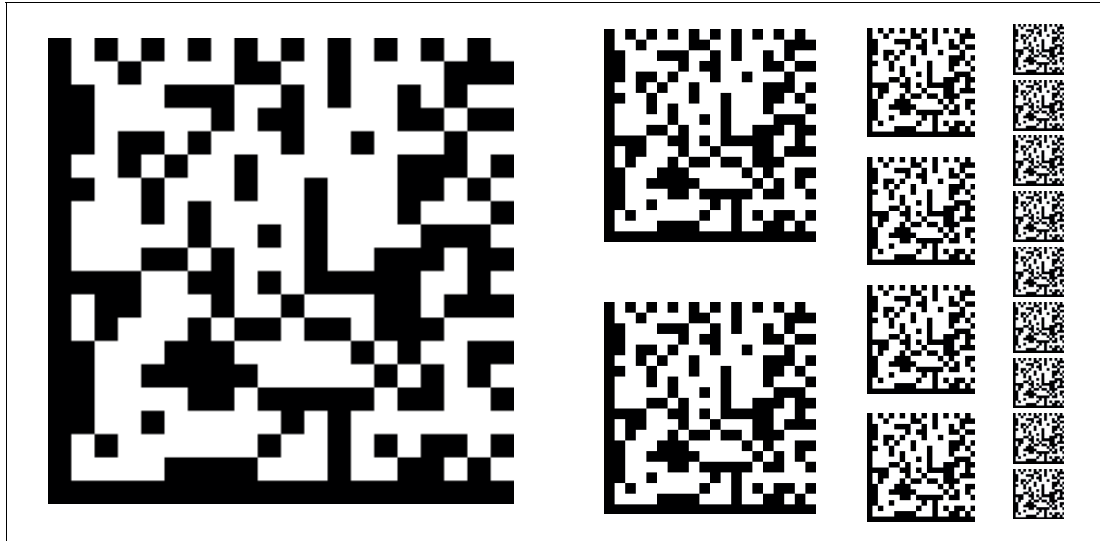


Figure 9.12 Binary code

#### Gray Code

The code card assigns data transmission to the read head in gray code.

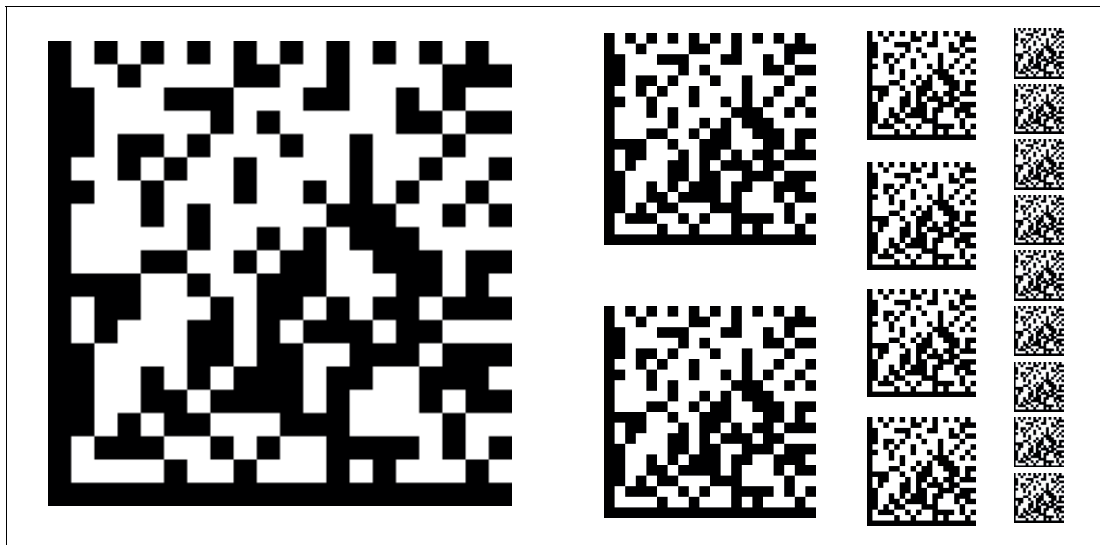


Figure 9.13 Gray code

### 9.1.5 Code Cards for Setting Input/Output 2 (OUT 2 / IN 2)

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

- Input 2: No function
- Output 2: No function
- Output 2: Overspeed
- Output 2: Warning
- Output 2: Error
- Output 2: Quality values
- Output 2: Event
- Output 2: No Position

#### Input 2: No function

Input 2 has no function.

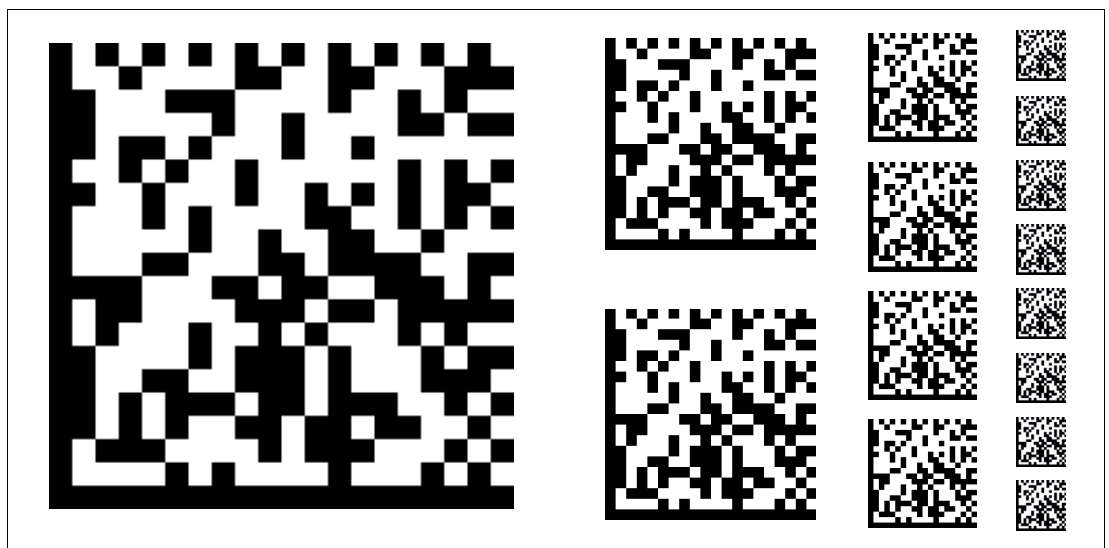


Figure 9.14 Input 2: No function

#### Output 2: No function

Output 2 has no function.

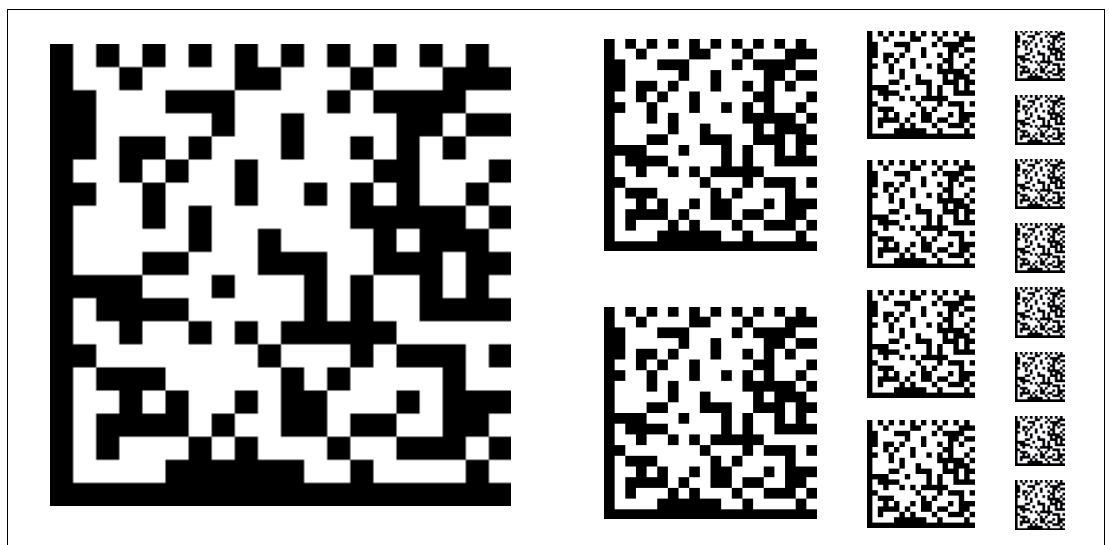


Figure 9.15 Output 2: No function

### Output 2: Overspeed

Output 2 defines. This output carries the potential  $+U_B$  while the defined maximum speed is exceeded.

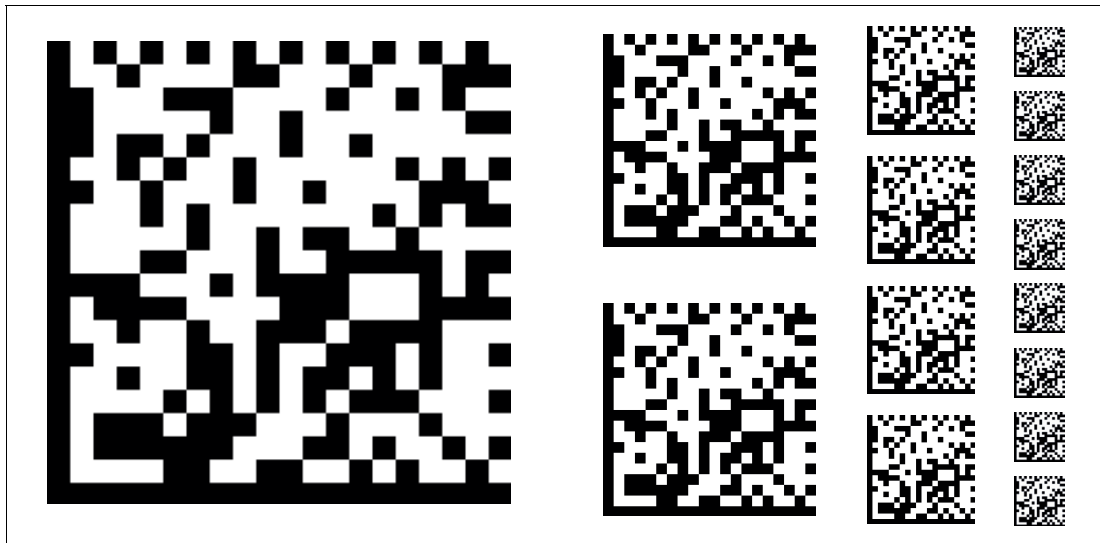


Figure 9.16 Output: Overspeed

### Output 2: Warning

Output 2 carries the potential  $+U_B$  while a warning message is present on the read head.

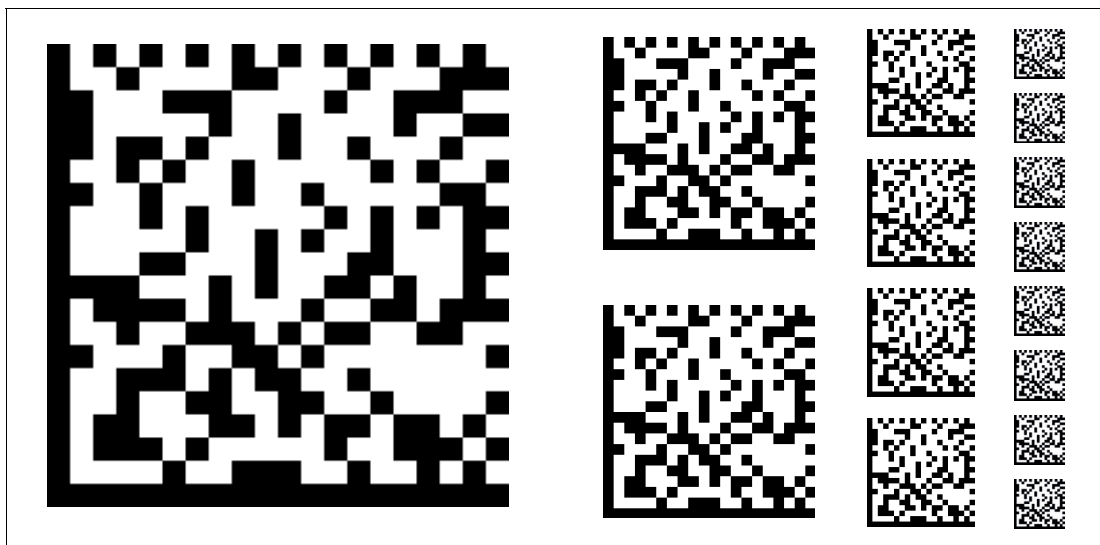


Figure 9.17 Output 2: Warning

Output 2: Error

Output 2 carries the potential  $+U_B$  while an error message is present on the read head.

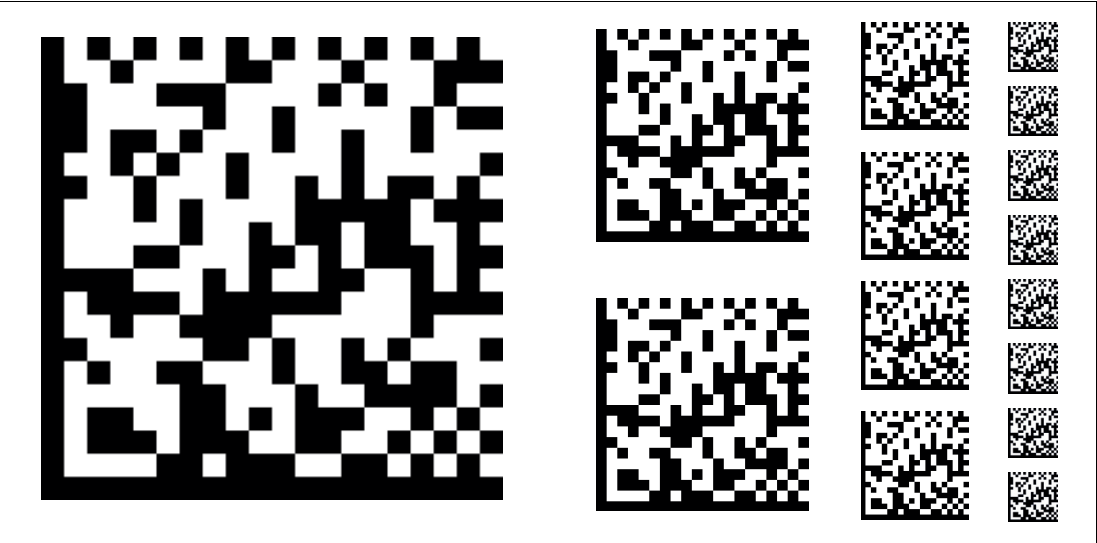


Figure 9.18      Output 2: Error

Output 2: Quality values

Output 2 carries the  $+U_B$  potential as soon as the quality value threshold of the read head is exceeded.

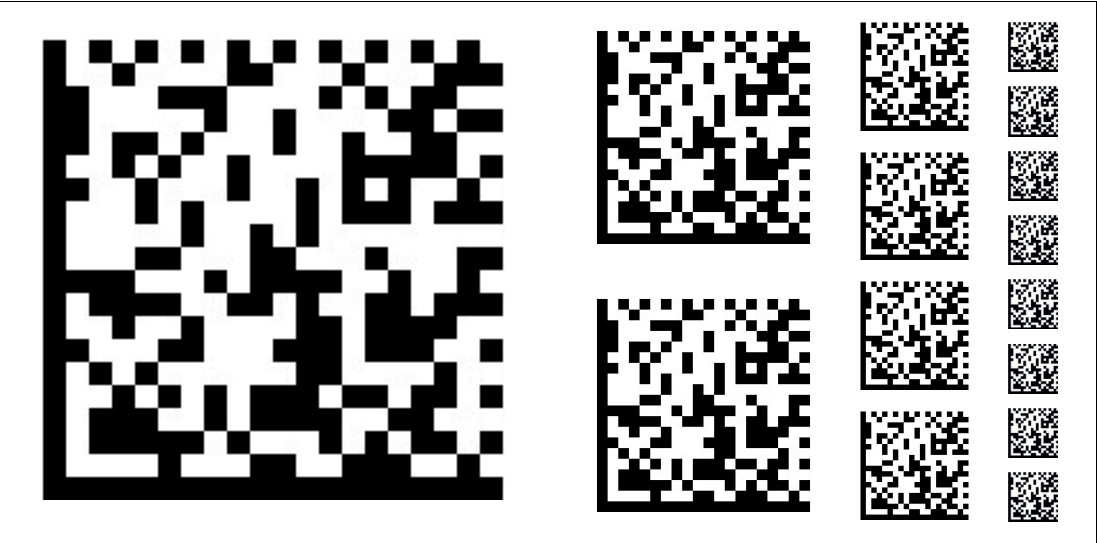


Figure 9.19      Output 2: Quality values

### Output 2: Event

Output 2 carries the potential  $+U_B$  while an event marker is present in the reading field of the read head.

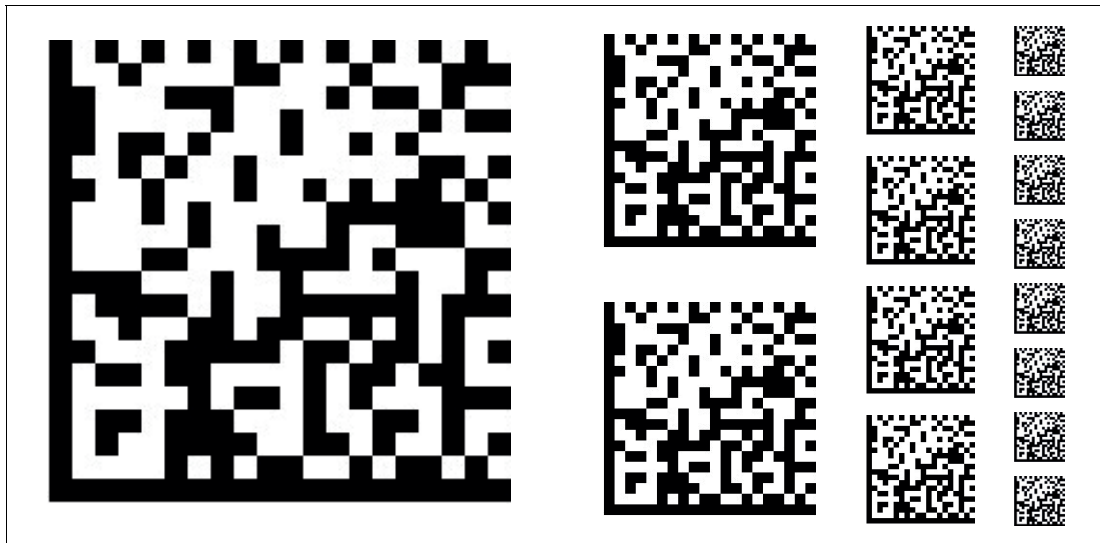


Figure 9.20 Output 2: Event

### Output 2: No Position

Output 2 carries the potential  $+U_B$  while the read head is not reading any position information.

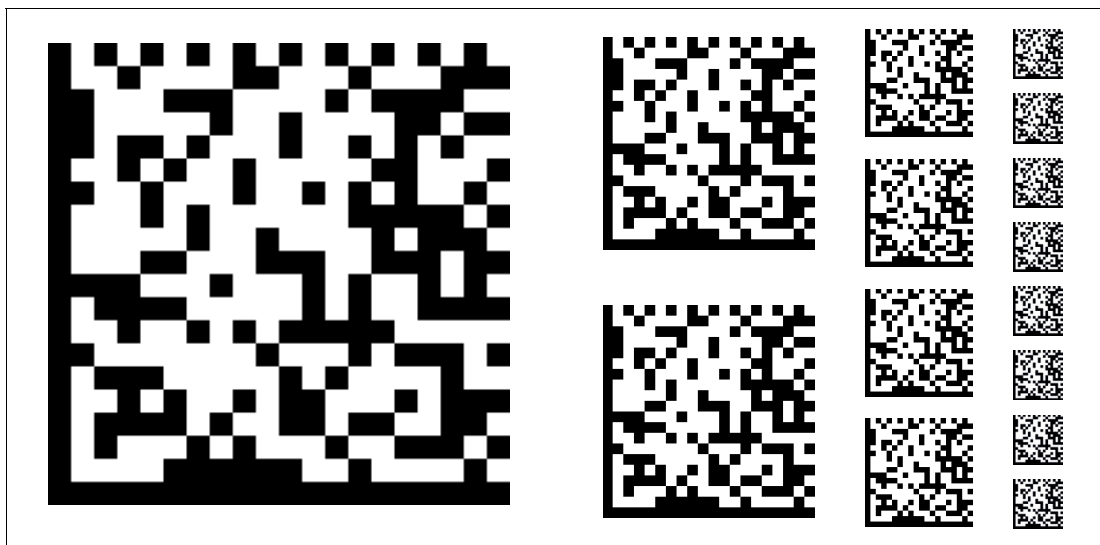


Figure 9.21 Output 2: No Position

### 9.1.6 Code Cards for Setting Input/Output 3 (OUT 3 / IN 3)

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

- Input 3: No function
- Output 3: No function
- Output 3: Overspeed
- Output 3: Warning
- Output 3: Error
- Output 3: Quality values
- Output 3: Event
- Output 3: No Position

#### Input 3: No function

Input 3 has no function.

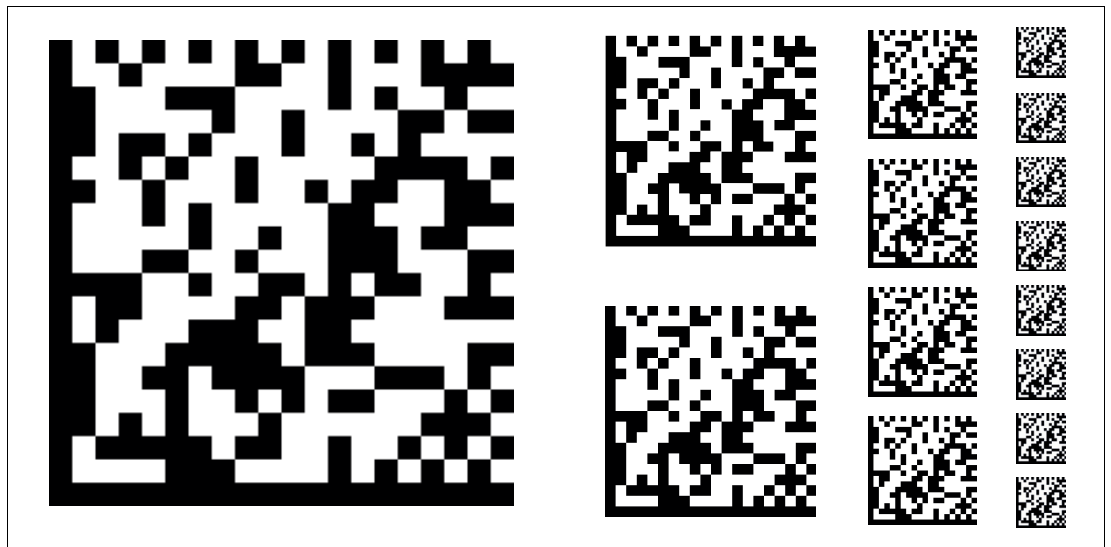


Figure 9.22 Input 3: No function

#### Output 3: No function

Output 3 has no function.

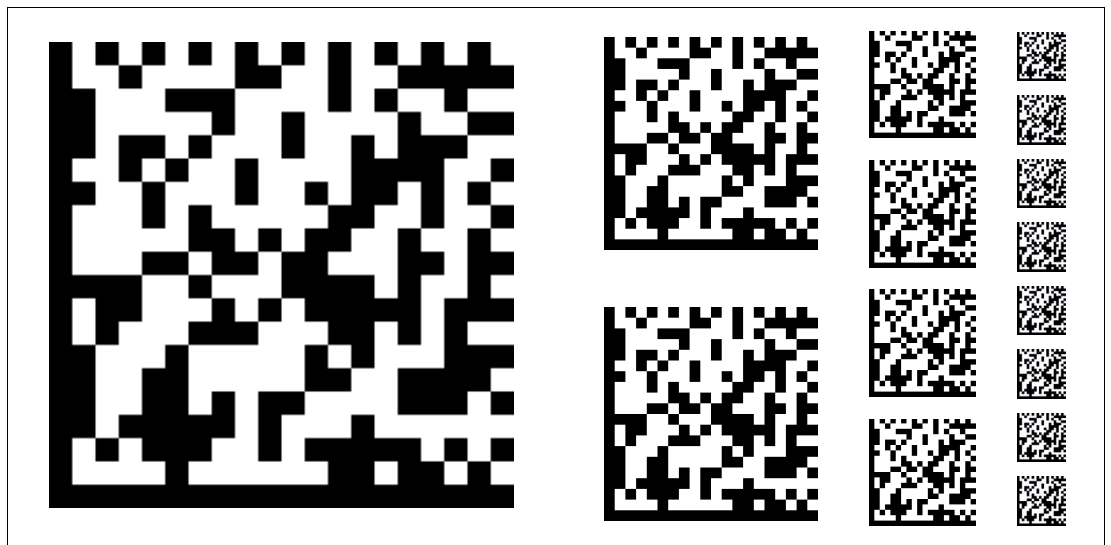


Figure 9.23 Output 3: No function

### Output 3: Overspeed

Output 3 defines. This output carries the potential  $+U_B$  while the defined maximum speed is exceeded.

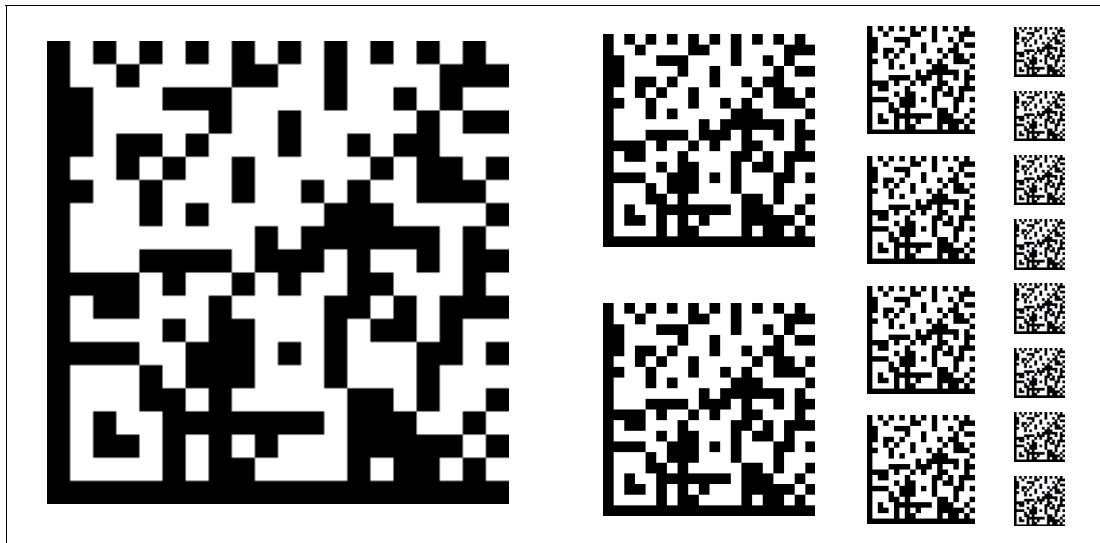


Figure 9.24 Output 3: Overspeed

### Output 3: Warning

Output 3 carries the potential  $+U_B$  while a warning message is present on the read head.

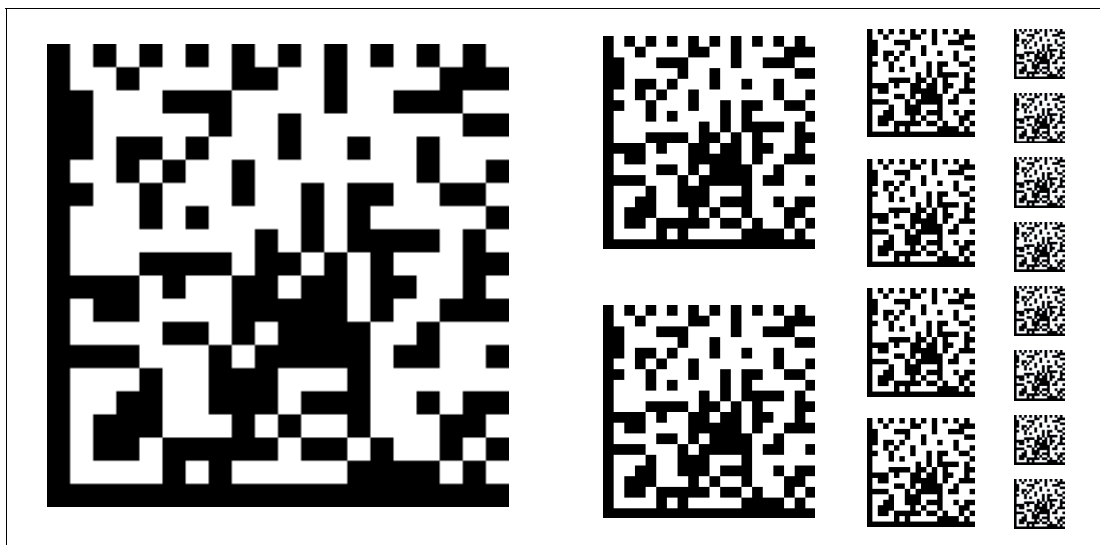


Figure 9.25 Output 3: Warning

### Output 3: Error

Output 3 carries the potential  $+U_B$  while an error message is present on the read head.

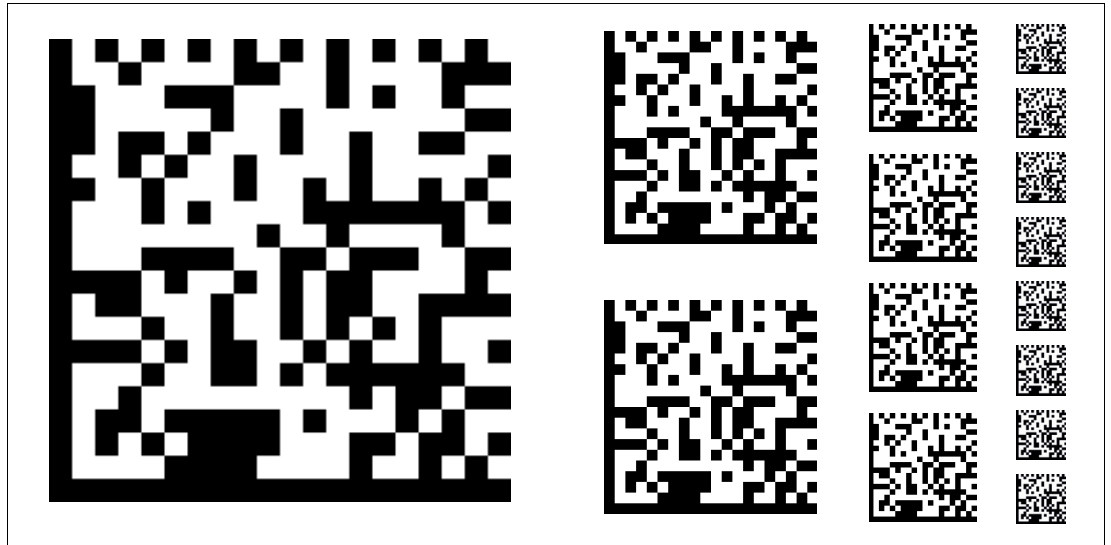


Figure 9.26 Output 3: Error

### Output 3: Quality values

Output 3 outputs the  $+U_B$  voltage as soon as the read head's quality threshold is exceeded.

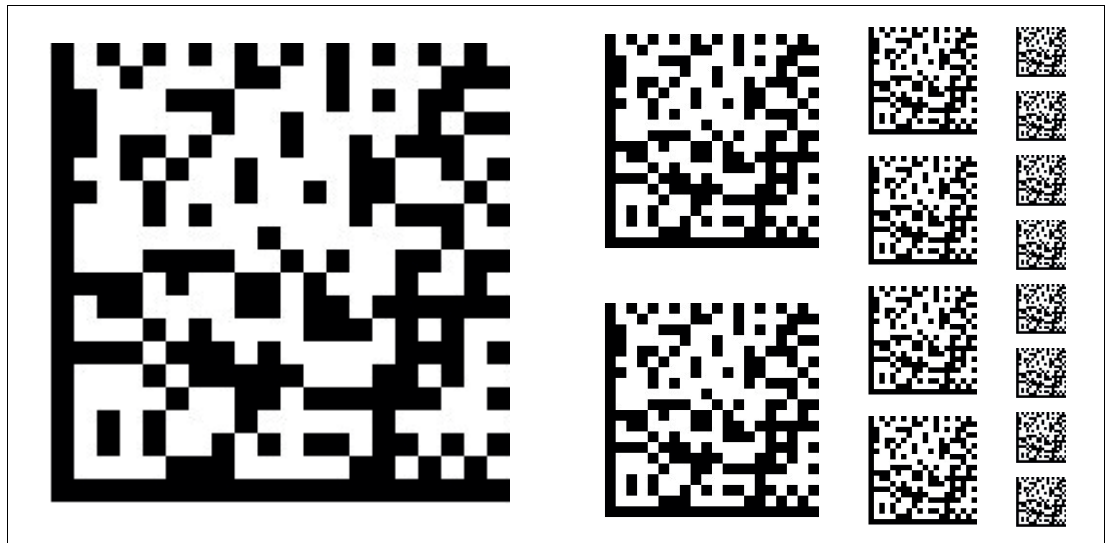


Figure 9.27 Output 3: Quality values

### Output 3: Event

Output 3 carries the potential  $+U_B$  while an event marker is present on the reading field of the read head.

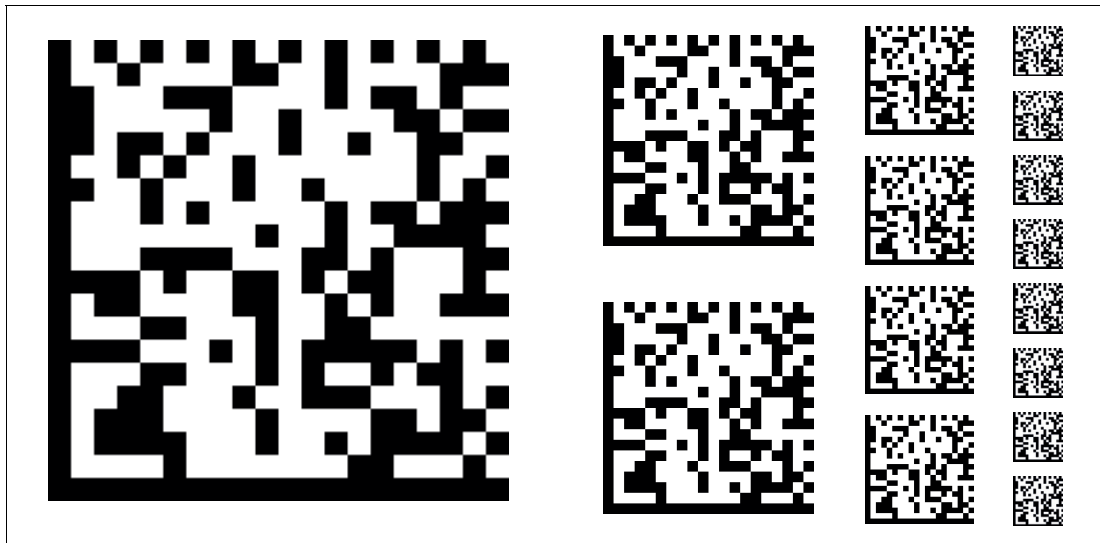


Figure 9.28 Output 3: Event

### Output 3: No Position

Output 3 carries the potential  $+U_B$  while the read head is not reading any position information.

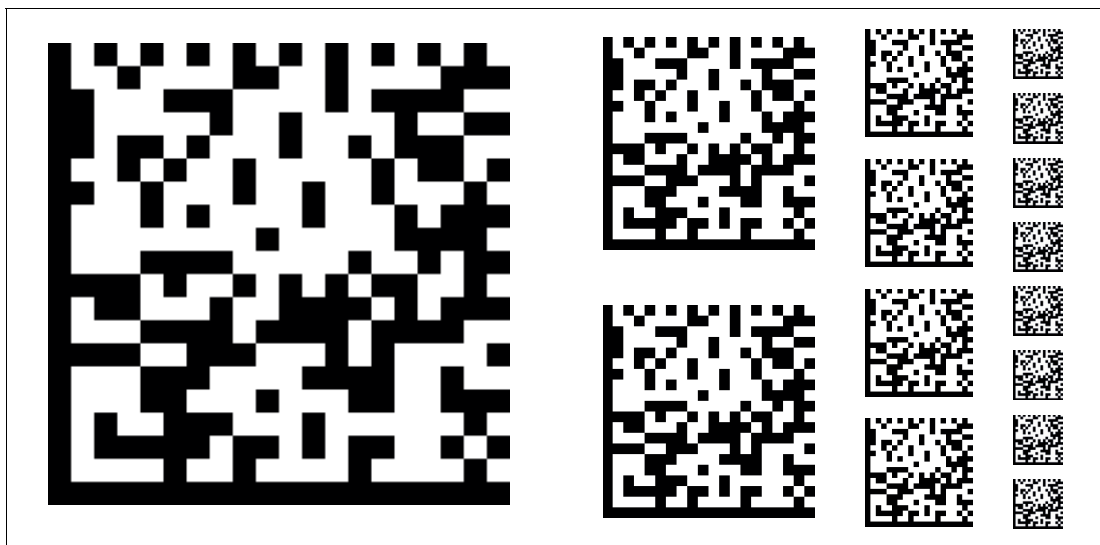


Figure 9.29 Output 3: No Position

## 9.2

## ASCII Table

| hex | dec | ASCII | hex | dec | ASCII | hex | dec | ASCII | hex | dec | ASCII |
|-----|-----|-------|-----|-----|-------|-----|-----|-------|-----|-----|-------|
| 00  | 0   | NUL   | 20  | 32  | Space | 40  | 64  | @     | 60  | 96  | '     |
| 01  | 1   | SOH   | 21  | 33  | !     | 41  | 65  | A     | 61  | 97  | a     |
| 02  | 2   | STX   | 22  | 34  | "     | 42  | 66  | B     | 62  | 98  | b     |
| 03  | 3   | ETX   | 23  | 35  | #     | 43  | 67  | C     | 63  | 99  | c     |
| 04  | 4   | EOT   | 24  | 36  | \$    | 44  | 68  | D     | 64  | 100 | d     |
| 05  | 5   | ENQ   | 25  | 37  | %     | 45  | 69  | E     | 65  | 101 | e     |
| 06  | 6   | ACK   | 26  | 38  | &     | 46  | 70  | F     | 66  | 102 | f     |
| 07  | 7   | BEL   | 27  | 39  | '     | 47  | 71  | G     | 67  | 103 | g     |
| 08  | 8   | BS    | 28  | 40  | (     | 48  | 72  | H     | 68  | 104 | h     |
| 09  | 9   | HT    | 29  | 41  | )     | 49  | 73  | I     | 69  | 105 | i     |
| 0A  | 10  | LF    | 2A  | 42  | *     | 4A  | 74  | J     | 6A  | 106 | j     |
| 0B  | 11  | VT    | 2B  | 43  | +     | 4B  | 75  | K     | 6B  | 107 | k     |
| 0C  | 12  | FF    | 2C  | 44  | ,     | 4C  | 76  | L     | 6C  | 108 | l     |
| 0D  | 13  | CR    | 2D  | 45  | -     | 4D  | 77  | M     | 6D  | 109 | m     |
| 0E  | 14  | SO    | 2E  | 46  | .     | 4E  | 78  | N     | 6E  | 110 | n     |
| 0F  | 15  | SI    | 2F  | 47  | /     | 4F  | 79  | O     | 6F  | 111 | o     |
| 10  | 16  | DLE   | 30  | 48  | 0     | 50  | 80  | P     | 70  | 112 | p     |
| 11  | 17  | DC1   | 31  | 49  | 1     | 51  | 81  | Q     | 71  | 113 | q     |
| 12  | 18  | DC2   | 32  | 50  | 2     | 52  | 82  | R     | 72  | 114 | r     |
| 13  | 19  | DC3   | 33  | 51  | 3     | 53  | 83  | S     | 73  | 115 | s     |
| 14  | 20  | DC4   | 34  | 52  | 4     | 54  | 84  | T     | 74  | 116 | t     |
| 15  | 21  | NAK   | 35  | 53  | 5     | 55  | 85  | U     | 75  | 117 | u     |
| 16  | 22  | SYN   | 36  | 54  | 6     | 56  | 86  | V     | 76  | 118 | v     |
| 17  | 23  | ETB   | 37  | 55  | 7     | 57  | 87  | W     | 77  | 119 | w     |
| 18  | 24  | CAN   | 38  | 56  | 8     | 58  | 88  | X     | 78  | 120 | x     |
| 19  | 25  | EM    | 39  | 57  | 9     | 59  | 89  | Y     | 79  | 121 | y     |
| 1A  | 26  | SUB   | 3A  | 58  | :     | 5A  | 90  | Z     | 7A  | 122 | z     |
| 1B  | 27  | ESC   | 3B  | 59  | ;     | 5B  | 91  | [     | 7B  | 123 | {     |
| 1C  | 28  | FS    | 3C  | 60  | <     | 5C  | 92  | \     | 7C  | 124 |       |
| 1D  | 29  | GS    | 3D  | 61  | =     | 5D  | 93  | ]     | 7D  | 125 | }     |
| 1E  | 30  | RS    | 3E  | 62  | >     | 5E  | 94  | ^     | 7E  | 126 | ~     |
| 1F  | 31  | US    | 3F  | 63  | ?     | 5F  | 95  | _     | 7F  | 127 | DEL   |

# Your automation, our passion.

- Industrial Sensors
- Industrial Communication and Interfaces
- Enterprise Mobility
- Products and Solutions for Hazardous Areas

[www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

**Pepperl+Fuchs Quality**

Download our latest policy here:

[www.pepperl-fuchs.com/quality](http://www.pepperl-fuchs.com/quality)

