

PGV*R*-F213-B12-0.7M*

**Incident Light
Positioning System**

Manual



**UK
CA** **CE**

Your automation, our passion.

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1 Introduction

1.1 Content of this Document

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

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



Note

For full information on the product, refer to the further documentation on the Internet at 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.

The documentation comprises the following parts:

- This document
- Datasheet

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

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

1.2 Target Group, Personnel

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

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

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

1.3 Symbols Used

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

Warning Messages

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

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



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

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



Caution!

This symbol indicates a possible fault.

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

Informative Symbols



Note

This symbol brings important information to your attention.



Action

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

2 Product Description

2.1 Use and Application

Intended Use

This device, when used together with a Data Matrix code tape affixed to the floor, constitutes a high-resolution track tracing and positioning system. It can be used in all applications where auto-guided transport systems (AGTS) must be positioned precisely at marked positions along a given track.

Read distance

Read distance z [mm]	Depth of focus [mm]	Field of view [mm]
100	± 25	115 x 72

The read head forms part of the positioning system in the Pepperl+Fuchs incident light process. The read head includes a camera module and an internal illumination unit. The read head uses this to detect a strip of Data Matrix code tape stuck to the floor for track tracing and navigation. The read head detects Data Matrix tags to navigate within a grid.

The read head is located on an auto-guided transport system and guides this system along the Data Matrix code tape.

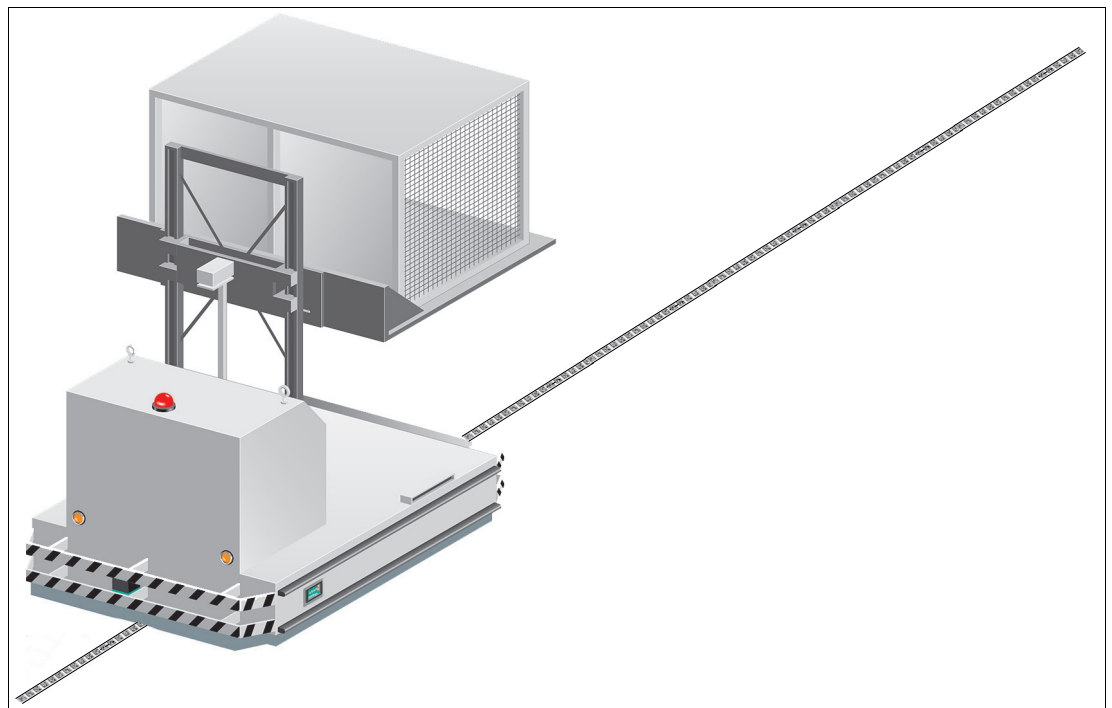


Figure 2.1 Auto-guided transport system with Data Matrix code tape

Tag Mode

In addition to track tracing, the read head can be used in tag mode. The read head detects Data Matrix tags, which are typically glued onto the floor in a grid. The individual Data Matrix tags are numbered consecutively and include position information. The read head reports the position of the auto-guided transport system in relation to the zero point of the Data Matrix tag to the controller.

Tag mode allows the auto-guided transport system to move freely in as large a grid as desired, without having to mark the traverse distances with code tapes.

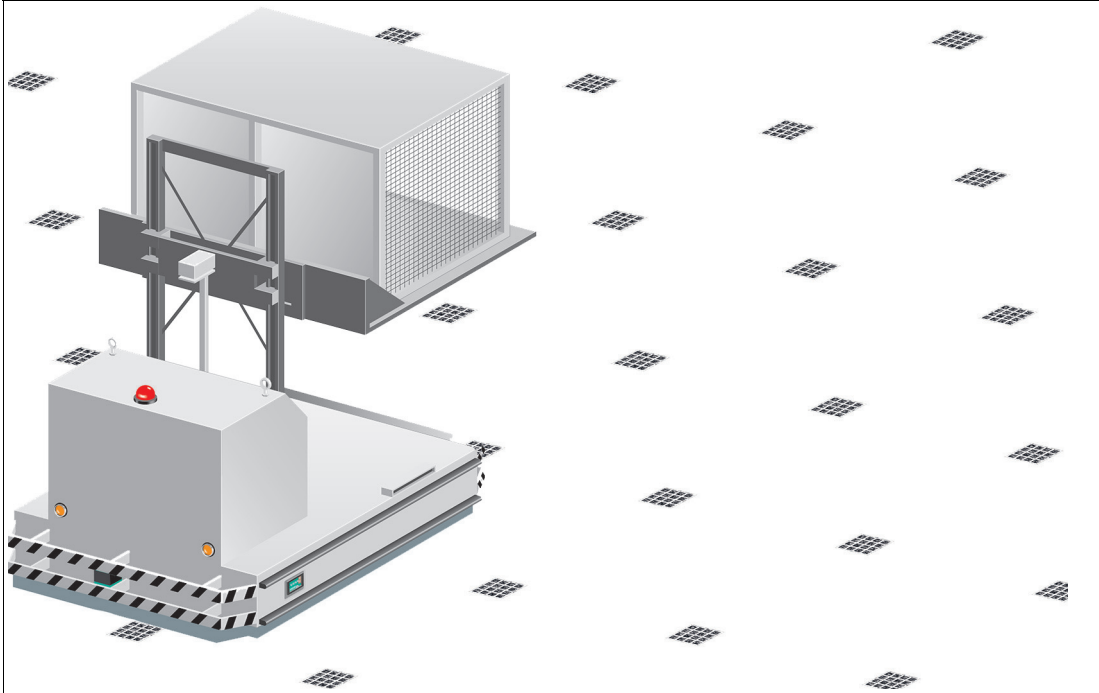


Figure 2.2 Auto-guided transport system with Data Matrix tags

The read head switches automatically between tag mode and track tracing. This allows a transport system to be guided from one Data Matrix tag grid to another via a Data Matrix code tape.

Due to its comprehensive and simple parameterization options, the read head can be optimally adapted to suit any application.

2.2 LED Indicators

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

LEDs

LED	Color	Label	Meaning
1	Green/red	POWER ON NO CODE/ ERROR	Code detected/not detected Error
2	Green/yellow	COM STATE	TCP/IP communication

Table 2.1 LEDs

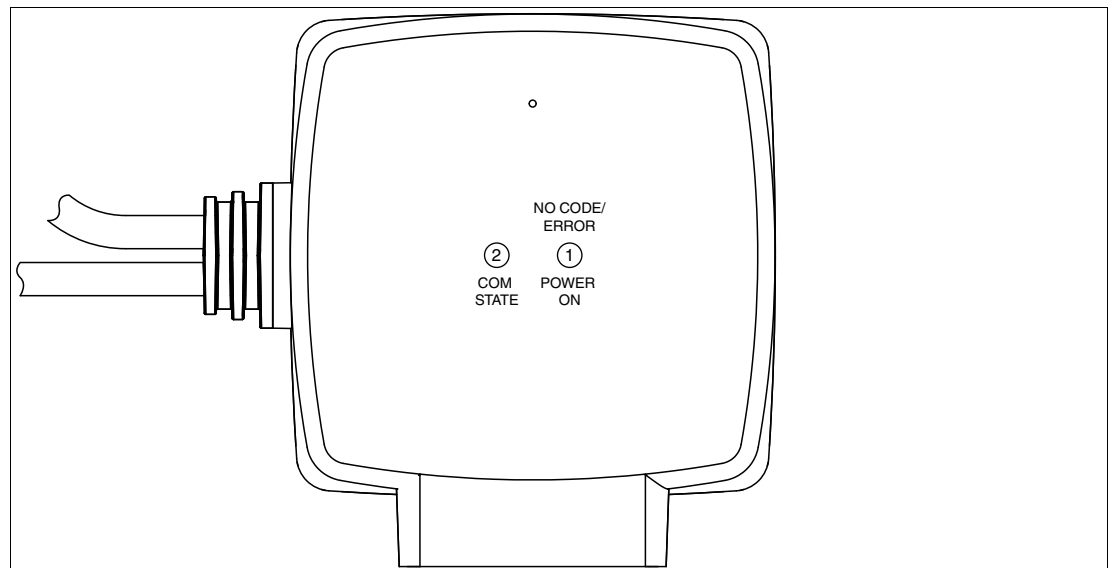


Figure 2.3 Display elements

LED 1

Mode	POWER ON	NO CODE/ ERROR	Description
Color	Green	Red	
State	Off	Off	Not ready for operation
	Lights up	Off	Codes detected
	Off	Flashing	Codes not detected
	Off	Lights up	System error
	Lights up for 1 s	Off	Code card read
	Off	Lights up for 1 s	Code card not read

Table 2.2 Read head switched on: at least one of the LEDs is lit up or flashing

LED 2

Mode	COM STATE		Description
Color	Yellow	Green	
State	Off	Off	No power/system error
	On	Off	No connection (physical) link
	Off	On	Connected (physical) link
	x	Flashing	Communication active

Table 2.3 TCP/IP communication
x: LED status has no meaning

2.3 Accessories

The following table contains special accessories that facilitate mounting and help ensure smooth operation.

Order code	Description
PCV-MB1	Mounting bracket

3 Installation and Commissioning

3.1 Affixing the Data Matrix Code Tape

Data Matrix code tapes enable the exact positioning of auto-guided transport systems (AGTS). The read head permanently reports the detected position, speed, and rotation angle of the AGTS so that reliable goods transport is guaranteed at all times.

The Data Matrix code tape is made of silicone-free polyester film. There is a positioning target every 100 mm along the lower edge of the Data Matrix code tape. This positioning target is used for various functions, including the precise positioning of the Data Matrix code tape when being affixed. The reverse side of the Data Matrix code tape features a modified acrylate-based permanent adhesive. Affix the self-adhesive Data Matrix code tape along the required traverse distance.

Dimensions of the code tape

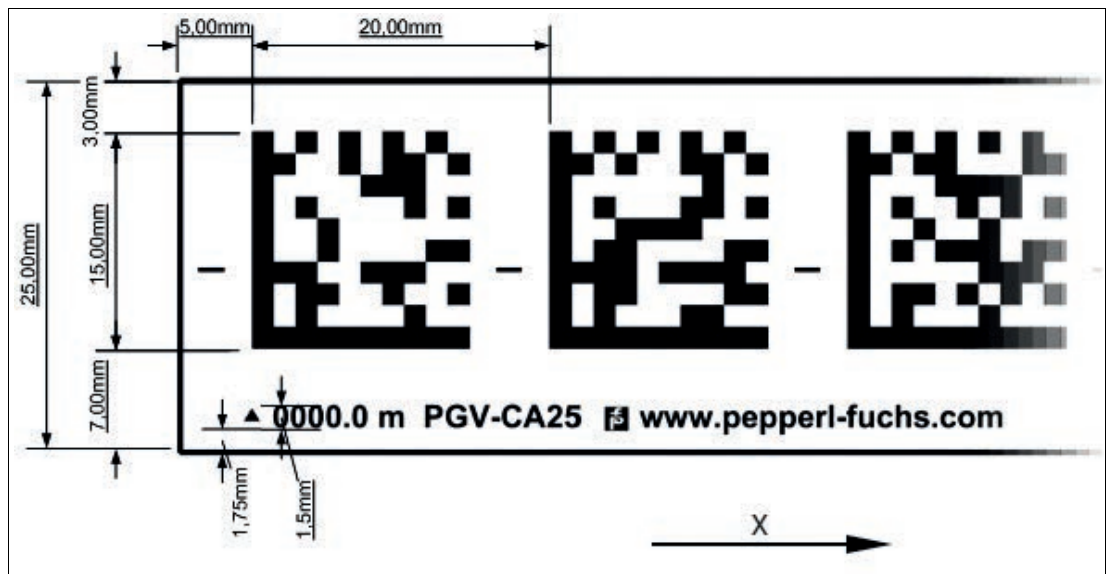


Figure 3.1 Dimensions of the Data Matrix code tape



Note

Alignment

The center of the Data Matrix code is not on the center line of the code tape.



Note

Butt edges

If you attach 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

Thermal expansion of the code tape

The affixed code tape corresponds to the heat expansion coefficient of the surface with regard to its thermal expansion. Keep this in mind when installing expansion joints, for example.

**Note****Expansion joints and code tapes**

If the system covers longer distances, the plant structure usually contains expansion joints. In this case, we recommend creating breaks along the code tape. The resulting gap must not exceed 75 mm.

**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 code corruption or 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 the 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.

**Marking the Code Tape Section**

1. Place the marker head in place of the read head in an optimal alignment with the Data Matrix code tape.
2. Drive the route with the marker head.
3. Once you have completed the entire route, the Data Matrix code tape can be affixed.



Affixing the Data Matrix Code Tape



Note

Note the type of code tape.

The positioning system only works if the read head is used together with the following type of Data Matrix code tape: **PGV*-CA25***.

The use of other code tapes is not permitted.

The following description outlines the basic procedure for installing 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.



Note

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.

3. Pull away a few centimeters of the protective film at the beginning of the code tape. Place the code tape at the precise point of the required starting position on the surface, and press to attach.
4. 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 bonded in an undesirable location. 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 bond in the wrong position and it may be 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 attach the code tape to the desired location. If it is positioned correctly, you can further peel off the protective film to fully attach 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.

Data Matrix Control Codes

In addition to track tracing, the read head can detect Data Matrix control codes. Data Matrix control codes can be used to initiate specific control operations (e.g., information on branches) along the AGTS route.

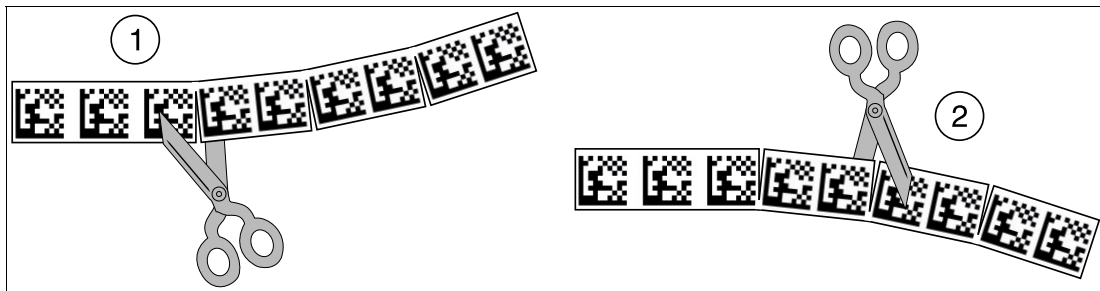
The control codes are added to the color tape, Data Matrix code tape, or metal code bars.

Overview of Data Matrix Control Codes

Order code	Data Matrix code tape
PGV*-CC25-*	

Curves

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



- 1 Curve to the left
- 2 Curve to the right

Curve radius

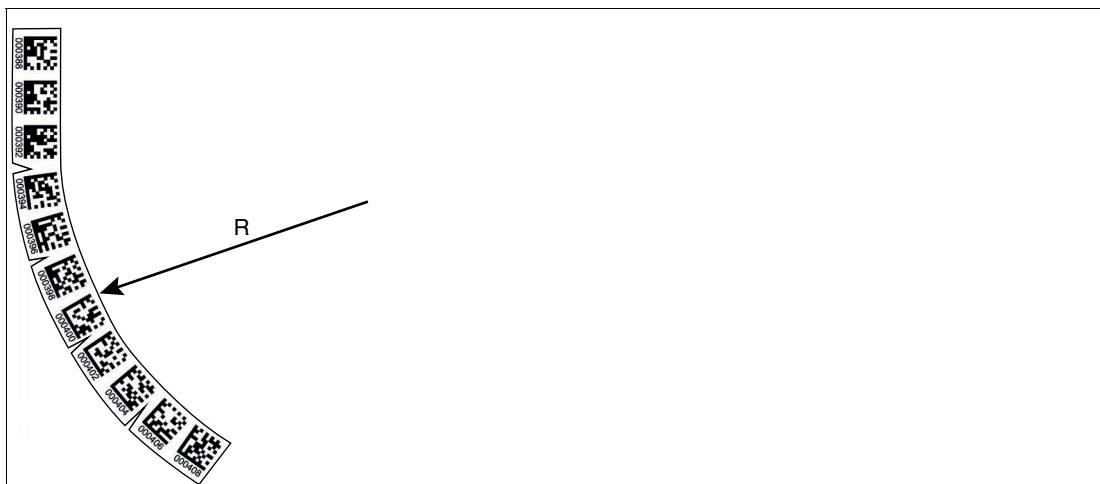


Figure 3.2 Curve radius: $R \geq 50$ cm
 Select a curve radius that can handle the turning circle of your automated guided vehicle. The Data Matrix code tape must always be located in the reading window of the read head.

Branches



Note

Direction decision

The direction decision at a branch of a Data Matrix code tape is retained until the read head has moved more than 50 cm away from the branch or the code tape is not visible for a few images. If the selected track is not visible, the system automatically switches to the alternate track.



Note

Branches/intersections with Data Matrix position code

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

- The position codes of the main lane must run continuously for two meters. The position codes of the branching/intersecting track must run continuously for one meter. The read head outputs the X-value of the Data Matrix code tape that is specified via the direction decision.
- Do not use repair tape.
- You must not use any combination of color tape.
- The difference between the absolute position of the main track and the starting position of the branching/intersecting track must be greater than one meter.

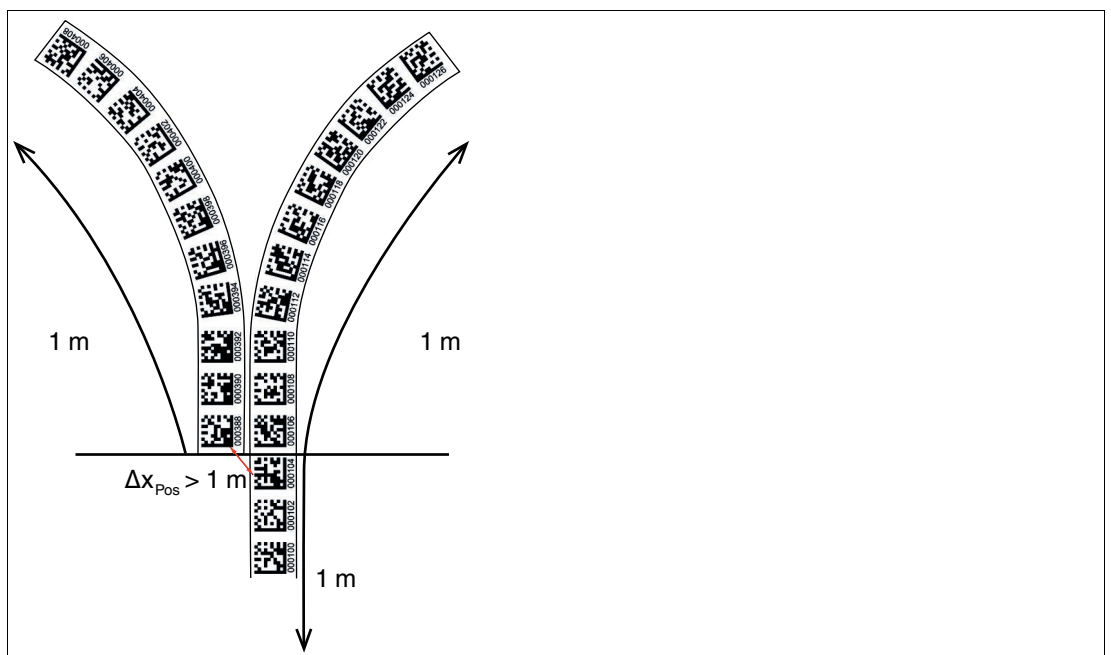


Figure 3.3 Distances

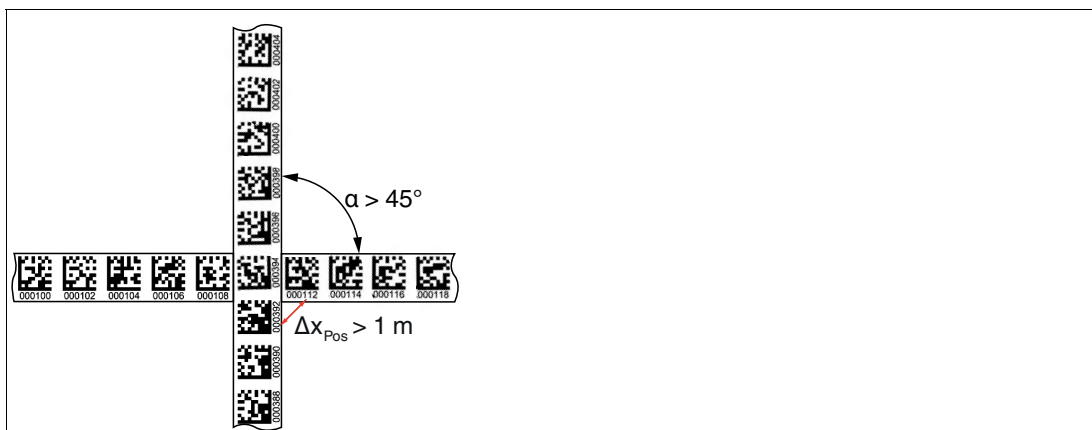


Figure 3.4 Intersection of Data Matrix code tapes

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

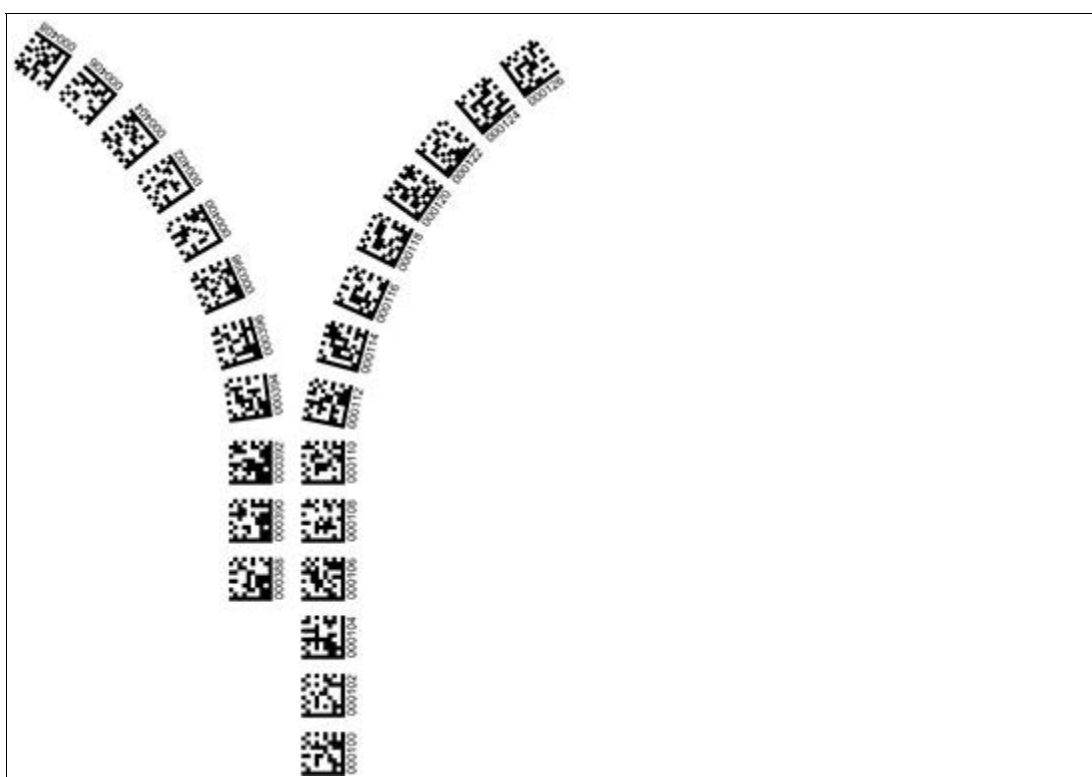


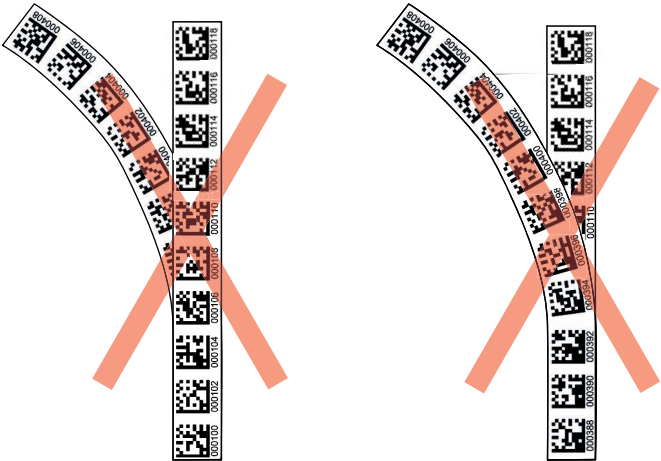
Figure 3.5 Branches/intersections



Note

Loss of information

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



Data Matrix control codes at branches

Data Matrix control codes can be moved in close proximity to a branch with Data Matrix codes for positioning. The Data Matrix control code must be routed such that the codes can be read for all relevant trips.

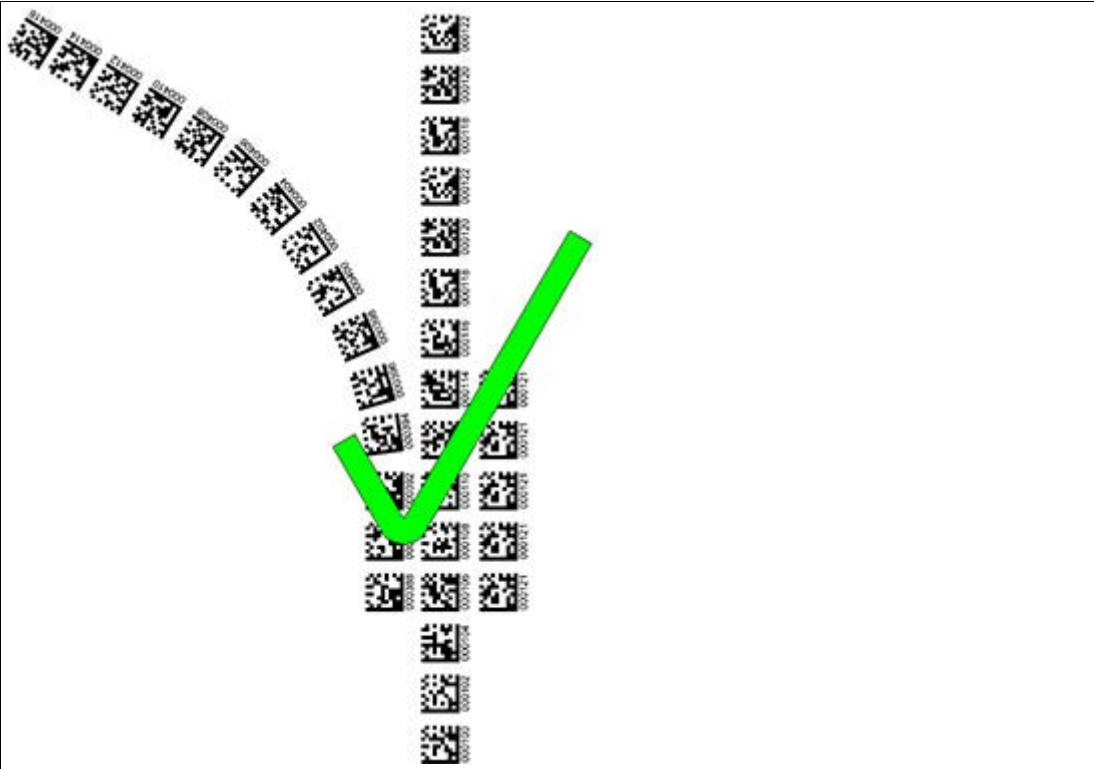


Figure 3.6 Branch with control code

Distances

To ensure that the read head can clearly detect and assign Data Matrix codes, minimum and maximum distances must be observed when mounting the code tape.

The distance between the code tapes at a branch or intersection as a separate track must be between zero mm and five mm.

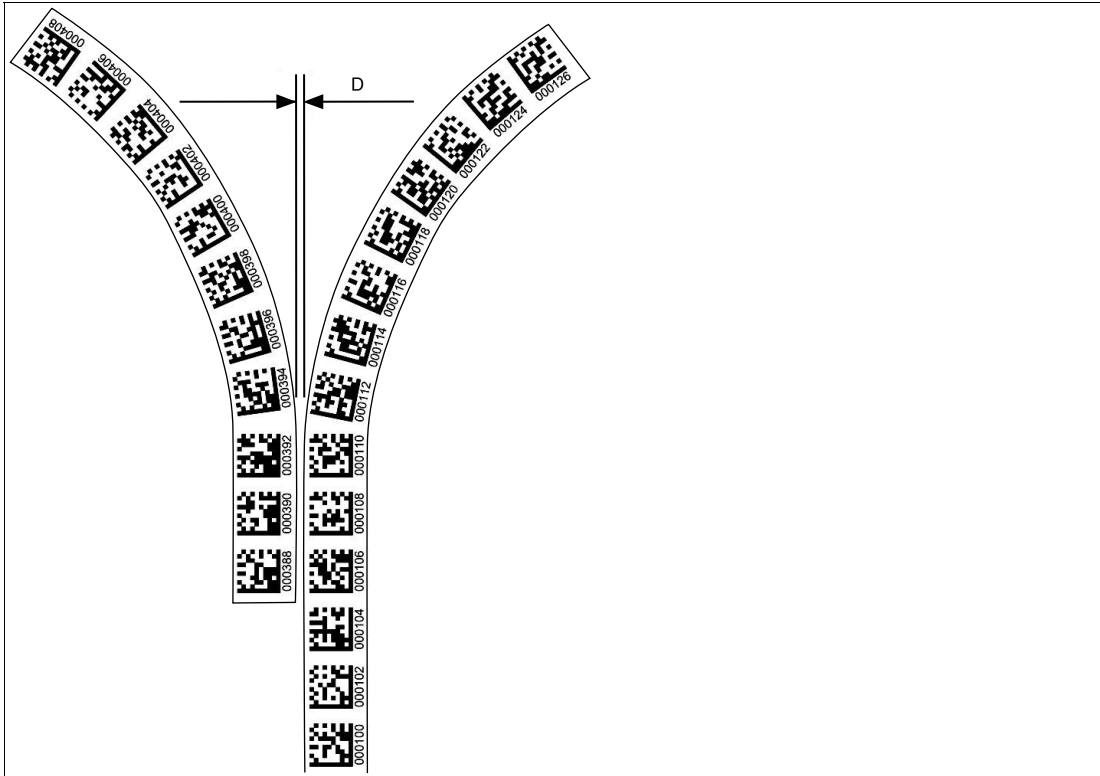


Figure 3.7 Distance: $0 \text{ mm} \leq D \leq 5 \text{ mm}$

The distance between a Data Matrix position code and a Data Matrix control code must be between zero mm and five mm.

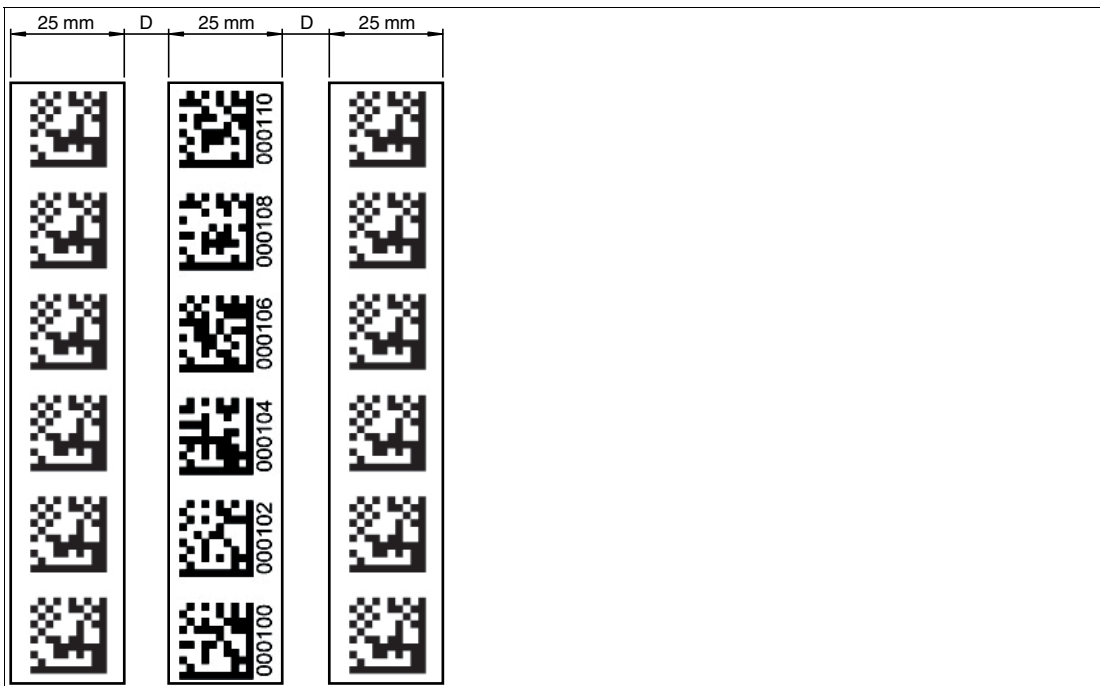


Figure 3.8 Distance: $0 \text{ mm} \leq D \leq 5 \text{ mm}$

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Offset

The offset (V) between the position codes on the code tape must be such that the Data Matrix codes remain within the reading window. In addition, a rest zone of at least two mm around the Data Matrix codes must be maintained. This results in a maximum offset (V) of five mm.

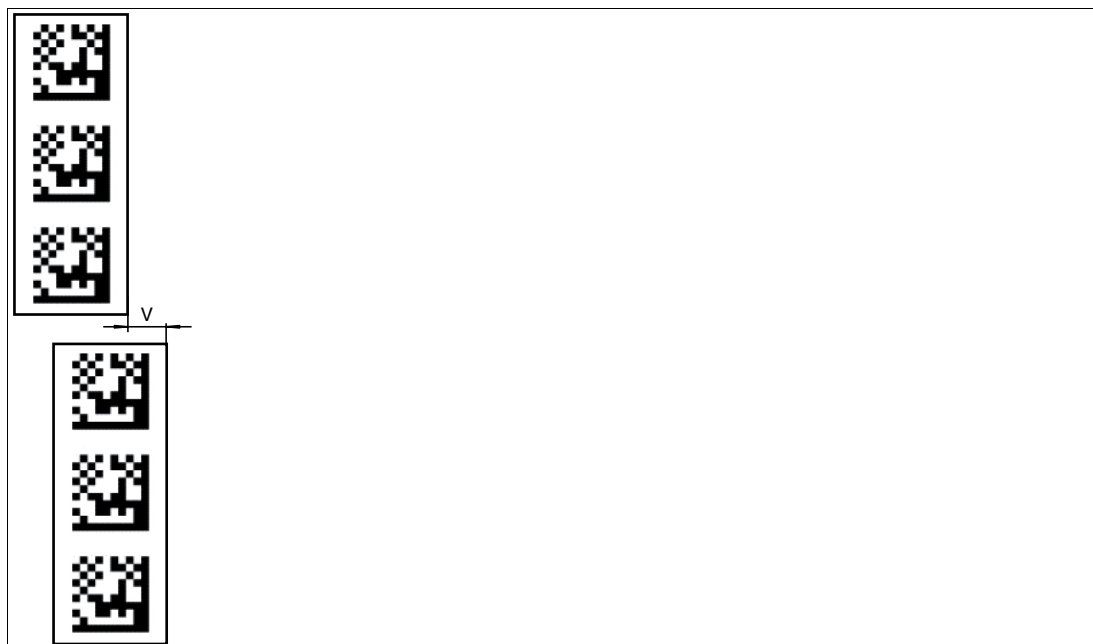


Figure 3.9 Offset: $0 \text{ mm} \leq V \leq 5 \text{ mm}$

Data Matrix Tag (8 Digit Number)

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



Note

Depending on the material used, the dimensions may vary. Please refer to the relevant datasheets of the Data Matrix tags.

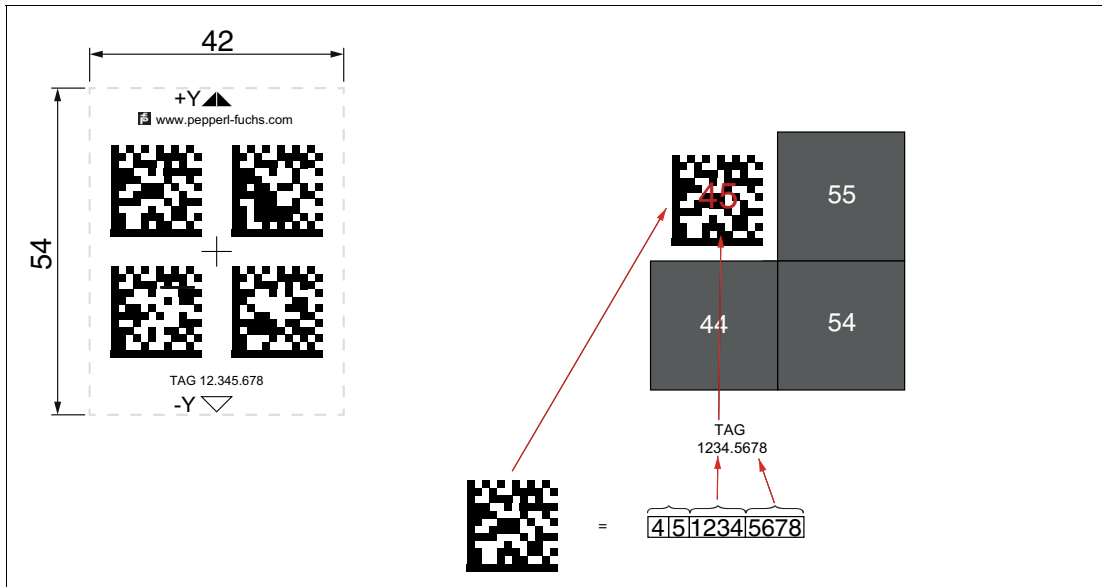


Figure 3.10 2x2 Data Matrix tag with the number 12345678 and position information

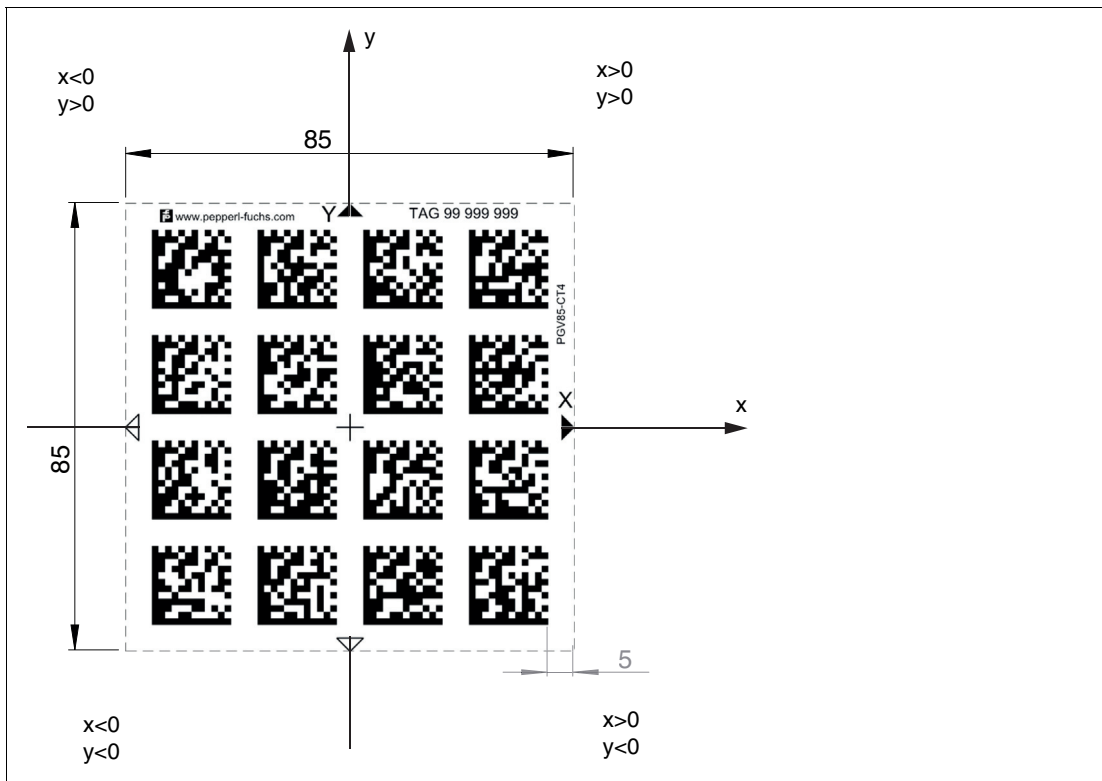


Figure 3.11 4x4 Data Matrix tag with the number 99999999 and position information

Data Matrix Tag Extended (14 Digit Number)

A Data Matrix tag contains position information and a specific 14 digit number. A cross in the center of the Data Matrix tag marks the zero point. The X and the Y axes are marked starting from the zero point. The black arrow indicates the positive axis and the white arrow indicates the negative axis.



Note

Depending on the material used, the dimensions may vary. Please refer to the relevant datasheets of the Data Matrix tags.

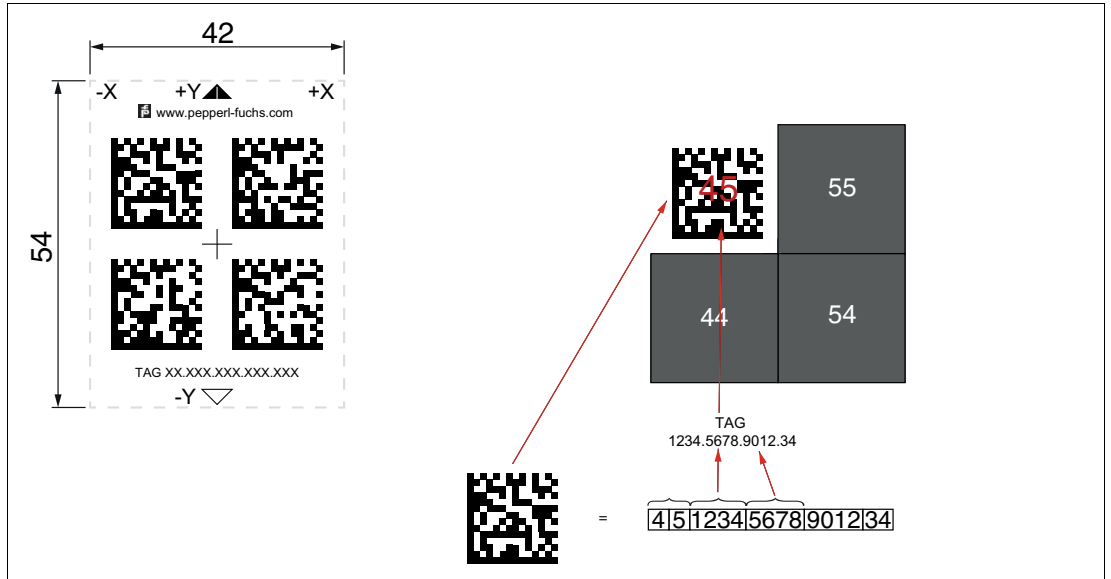


Figure 3.12 2x2 Data Matrix tag with number 12345678901234 and position information

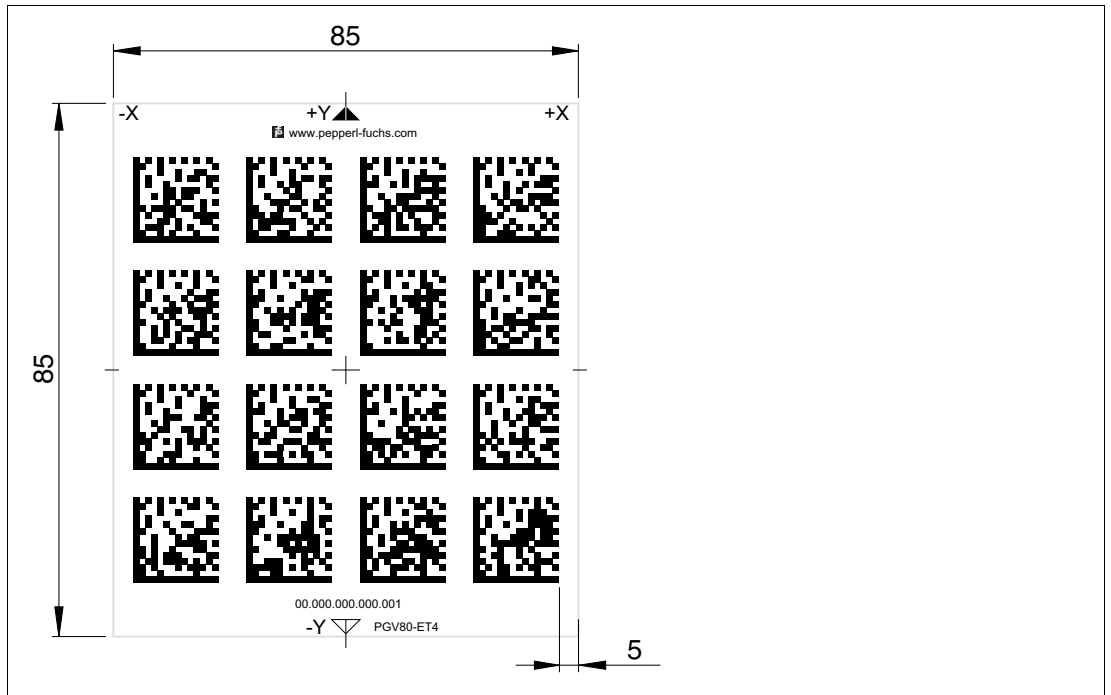


Figure 3.13 4x4 Data Matrix tag with the number 00000000000001 and position information

3.2 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 depth of field area of the read head is never exited during operation. This ensures that the read head is reliable, accurate, and provides excellent performance.

Dimensional drawing

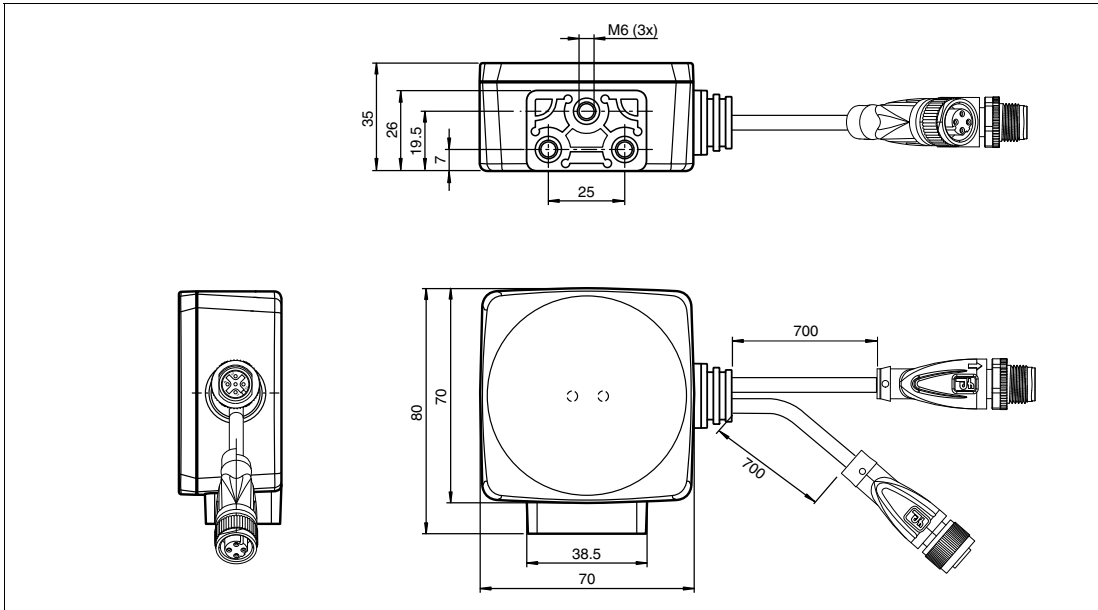


Figure 3.14 Housing dimensions



Attaching Mounting Brackets to the AGTS

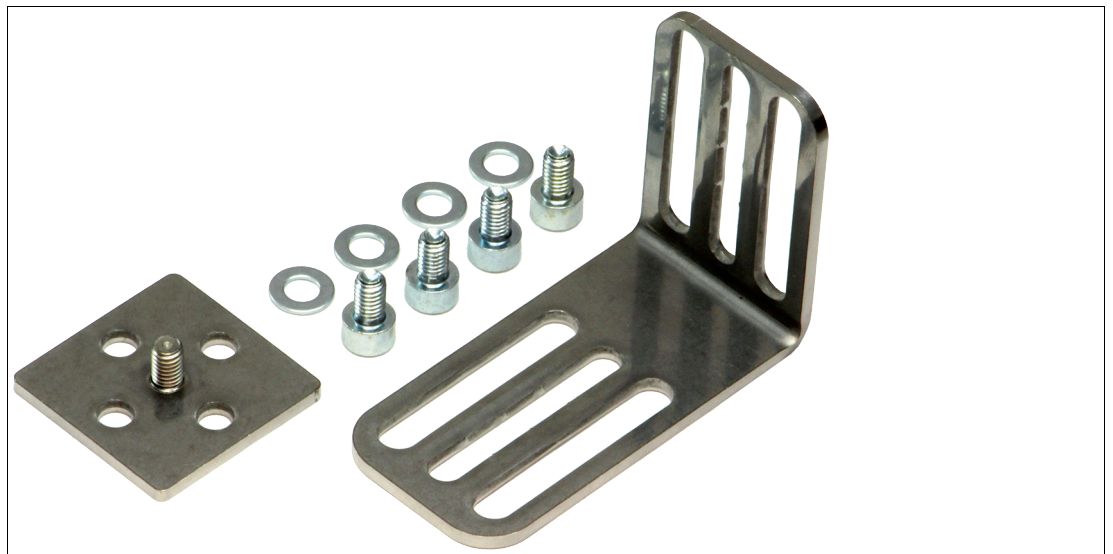


Figure 3.15 Mounting bracket (PCV-MB1)

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.

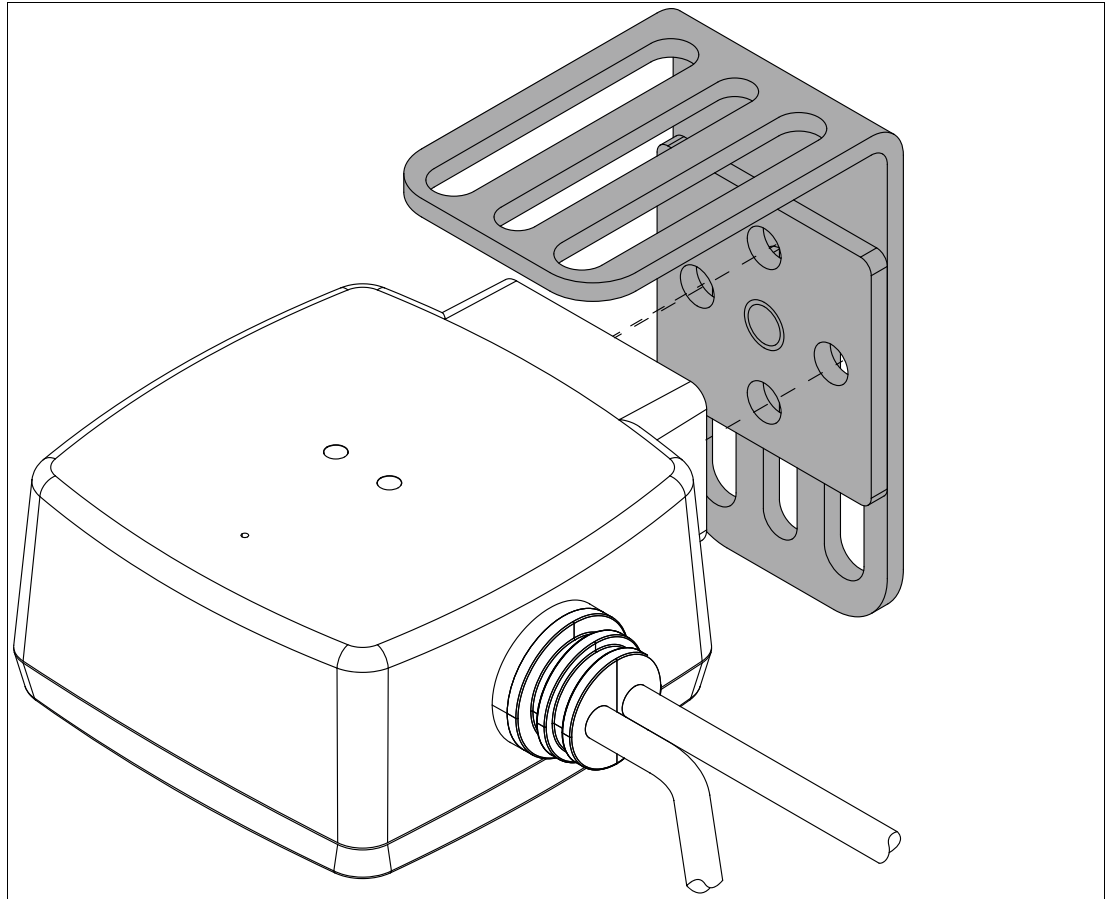


Figure 3.16 Schematic diagram for mounting the read head



Note

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

3.3 Electrical Connection

Electrical connection of the read head is established using a fixed cable with open cable end on the housing side with open wires. This provides both the voltage supply and the configurable inputs and outputs of the read head. There is a second fixed cable with open cable end with an M12 socket for LAN connections.

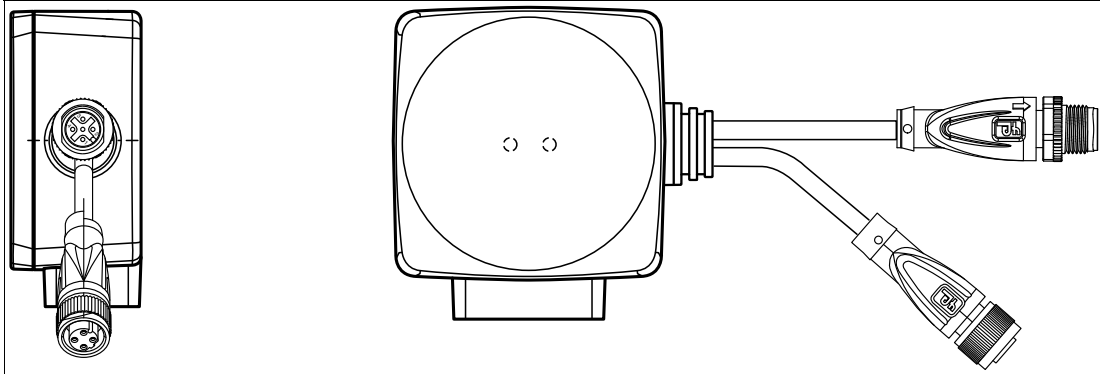


Figure 3.17 Electrical connection

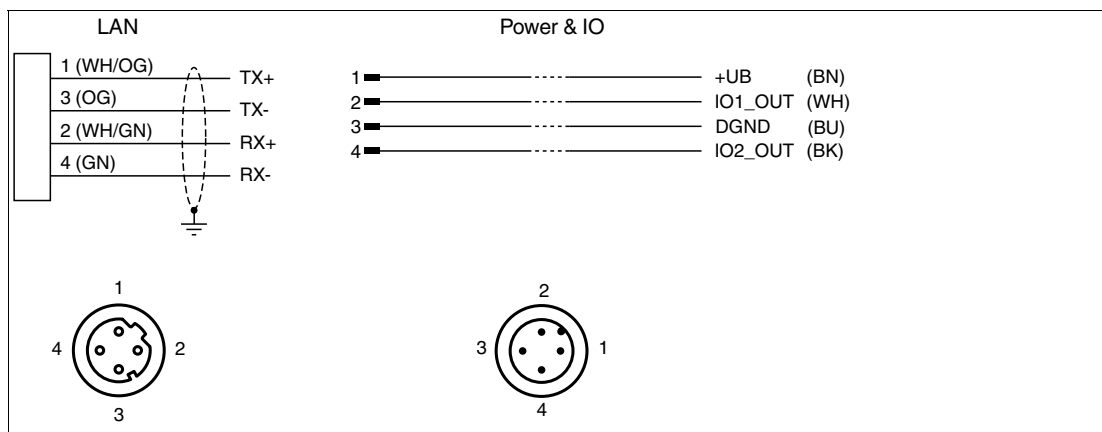


Figure 3.18 Connection assignment

Shielding Cables

The shielding of cables is required to suppress electromagnetic interference. Establishing a low-resistance or low-impedance connection with the protective conductor or equipotential bonding circuit is an especially important factor in ensuring that these interference currents do not become a source of interference themselves. The shield on the connection cable of the read head must be connected to the potential equalization on the control cabinet.

The following points relating to shielding must be noted:

- Use metal cable clips that cover large areas of the shielding.
- Place the cable shield onto the potential equalization rail immediately on entering the switch cabinet.
- Direct the protective grounding connections to a common point in a star configuration.
- The conductor cross section used for grounding should be as large as possible.



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.

3.4 Connecting the Read Head

The read head has an open cable end for voltage supply and is connected to the PC by an Ethernet port.

You can use the Vision Configurator software to make additional settings on the read head. This software enables you to make various settings on the read head, such as the IP address. To use the Vision Configurator software, you must first ensure that the read head is properly connected to your PC and has a power supply.



Connecting the Read Head

The read head is connected as follows:

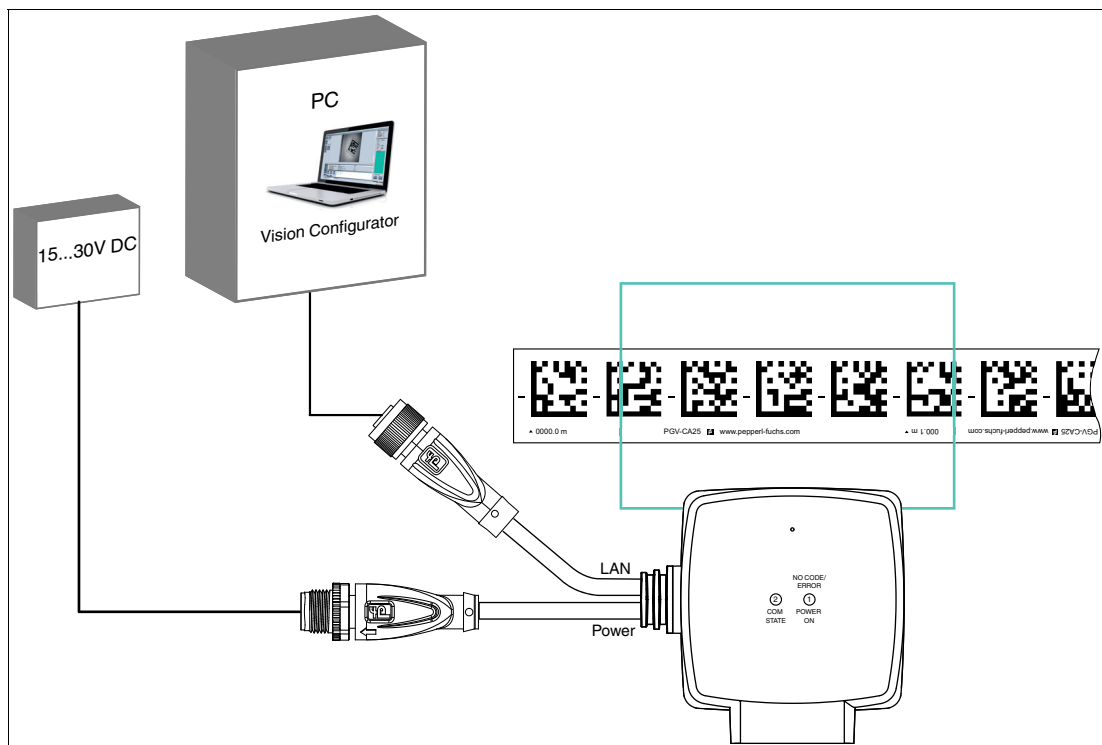


Figure 3.19 Basic setup

1. Connect the open end of the read head cable to the electric power supply. Make sure that the connection assignment (see chapter 3.3) is right to prevent damage to the read head.
2. Connect one end of the Ethernet cable to the Ethernet port on the read head.
3. Connect the other end of the Ethernet cable to an available Ethernet port on your PC.
4. Start your PC and the read head.
5. Check that the network connection between the read head and your PC has been successfully established by checking the indicator LEDs on the read head (see chapter 2.2).
6. Once the connection has been established, you may need to configure the network settings on your PC to establish a connection to the read head (see chapter 3.5).



Note

To establish a connection to the read head, the PC must be in the same subnet as the read head.

3.5 Setting up a Network Connection

In delivery state, the read head has a fixed IP address. To enable communication within the network, the network settings of your PC/laptop must be synchronized with the device and may need to be adjusted. To do so, proceed as follows.



Note

IP address

In delivery state, the read head has a fixed IP address.

- **192.168.2.2**

To enable communication within the network, the network settings of your PC/laptop must be synchronized with the read head and may need to be adjusted.



Note

Changing the IP address

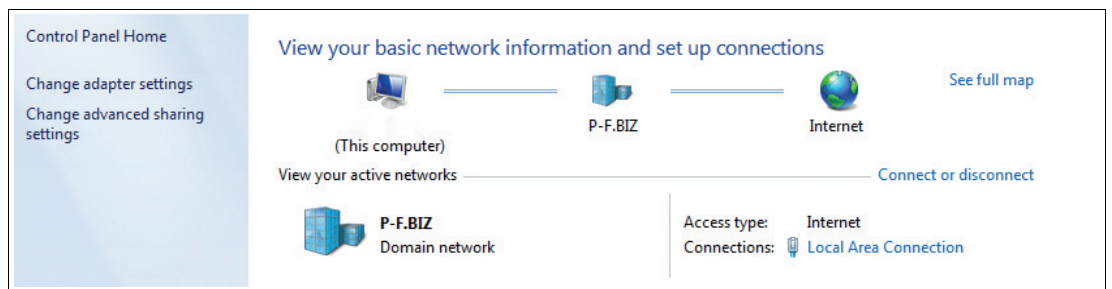
If you want to change the default IP address of the read head, you can do so using the Vision Configurator, see chapter 4.3.



Setting the PC IP Address

The following section describes how to check the network connection settings of your Windows PC and adapt them accordingly. The images in this description were created using Windows 10. The description below applies to later versions of Windows.

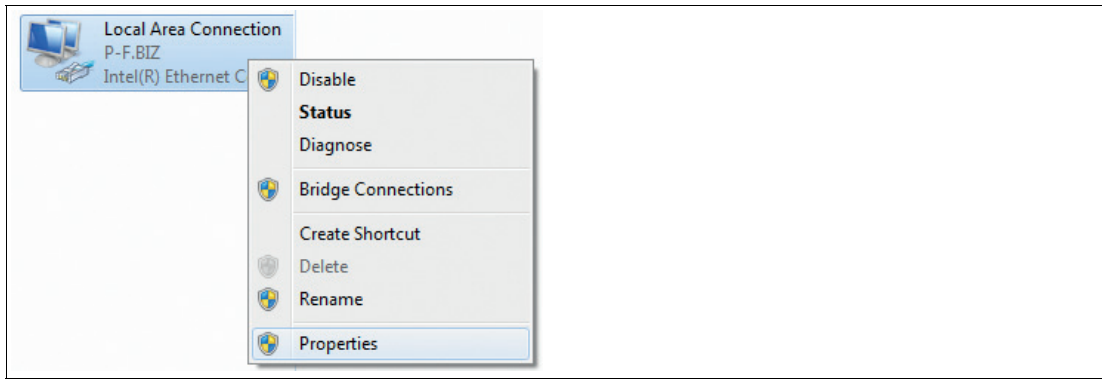
1. Click on the Windows **"Start"** button.
2. Select **"Control Panel > Network and Sharing Center."**
3. Now click on **"Change adapter settings."**



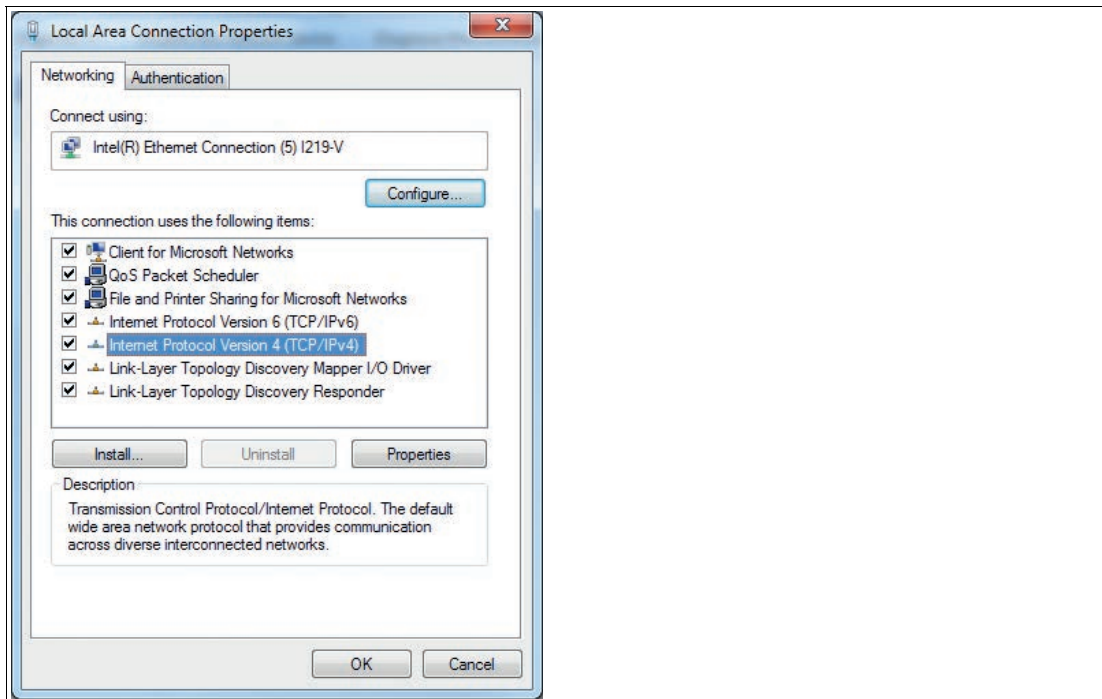
Note

Changes to the network settings of the PC/laptop require advanced user rights. If necessary, consult with your administrator.

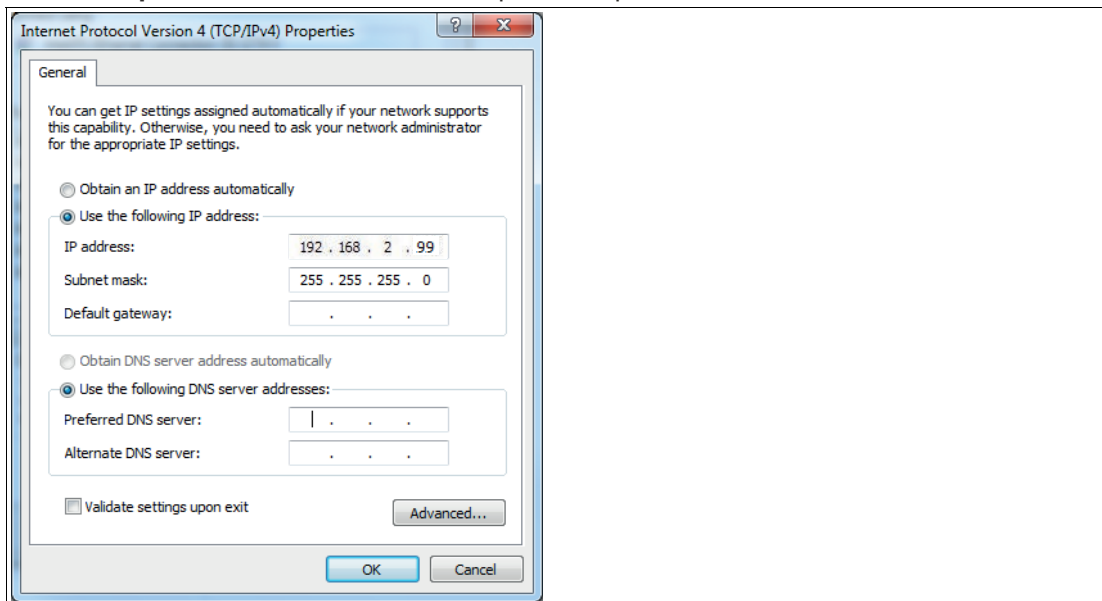
4. Select the required connection and right-click on your selection. In the selection window, select **"Properties."**



5. Double-click on "Internet Protocol Version 4 (TCP/IPv4)."



↳ The **Properties** window for the TCP/IP protocol opens.



6. Select the **"General"** tab.
7. Select the input function **"Use the following IP address."**
8. Enter the read head's IP address, but only the first three segments of the IP address. The last segment must be different from the read head's IP address.
9. In this example, enter the following IP address and subnet mask:
 - **IP address: 192.168.2.99**
 - **Subnet mask: 255.255.255.0**

**Note****Subnet mask**

To ensure seamless communication between the computer and the read head, both devices must be on the same subnet. Ensure that the IP addresses and subnet masks of both devices are configured correctly and are in the same IP address range. Otherwise, communication problems may occur and the read head may not be able to access the computer properly or vice versa.

10. Click on **"OK"** and click on **"Cancel"** in the next dialog.
 - ↳ This completes the network configuration. The read head is ready for use.

4 Vision Configurator

Vision Configurator enables the read head to be configured and used with a user-friendly operator interface. The standard functions include establishing a connection to the read head, the parameterization of operating parameters, saving data sets, visualizing the camera capture of the read head, and error diagnosis.



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.



Note

Documenting the network configuration

The TCP/IP communication protocol is used for communication between the read head and the connected PC. To ensure smooth communication, you should carefully log any changes to the network configuration.

4.1 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.**"

4.2 Getting Started

After starting the Vision Configurator, you should perform the following steps:

- Select a corresponding user role depending on the settings you want to make in Vision Configurator.
- Select the device family to which your read head belongs (Vision).
- Select the type of sensor that is compatible with your read head (PGV).
- Select the connection type that connects your read head to the PC (TCP/IP).
- Enter the IP address of the read head to establish the connection.
- As an option, the "Auto detect (TCP/IP only)" function can be used to display all connected TCP/IP Ethernet devices, see chapter 4.3.

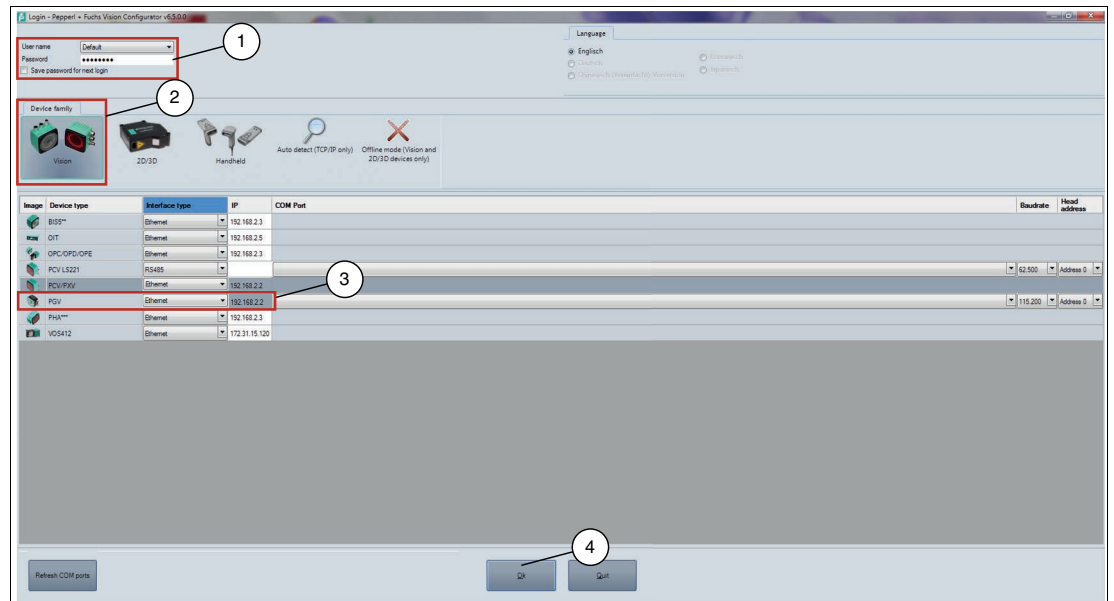


Figure 4.1



Selecting Users (1)

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

User Account Privileges and Rights



Note

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

User Rights and Password

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



Selecting a Device Family (2)

The device family is selected in the **Device family** screen as follows:

1. Left-click on the "Vision" device family.
↳ A list of the available sensor types is displayed.



Selecting the Sensor Type (3)

1. Left-click on the "PGV" device family.
↳ The selected sensor type is highlighted in dark gray.



Selecting the Connection Type (3)

The connection type is selected in the **Interface type** screen as follows:

1. Select "Ethernet" from the **Interface type** drop-down list.



Entering the IP Address (3)

The IP address required to establish the connection is set in the **IP** screen.

1. Enter the IP address.



Note**IP Address**

In delivery state, the read head has a fixed IP address.

- **192.168.2.2**

To ensure seamless communication between the computer and the read head, both devices must be on the same subnet. Ensure that the IP addresses and subnet masks of both devices are configured correctly and are in the same IP address range. Otherwise, communication problems may occur and the read head may not be able to access the computer properly or vice versa.

4.3 Auto Detect—Changing the IP Address

The **Auto detect (TCP/IP only)** function is available in Vision Configurator. This function allows you to view all connected TCP/IP Ethernet devices. You can select the device you are looking for in the output window and read or change information such as the device's IP address. This function is useful if you have inadvertently changed the IP address and no longer know it.



Changing the IP Address—Option 1

You can only perform the following description if UDP broadcasts are not blocked by the fire-wall. Otherwise, follow the description below (Changing the IP Address—Option 2).

1. Select the "Auto detect (TCP/IP only)" function (1).

↳ If a read head is detected, the following output window appears with the corresponding read head.

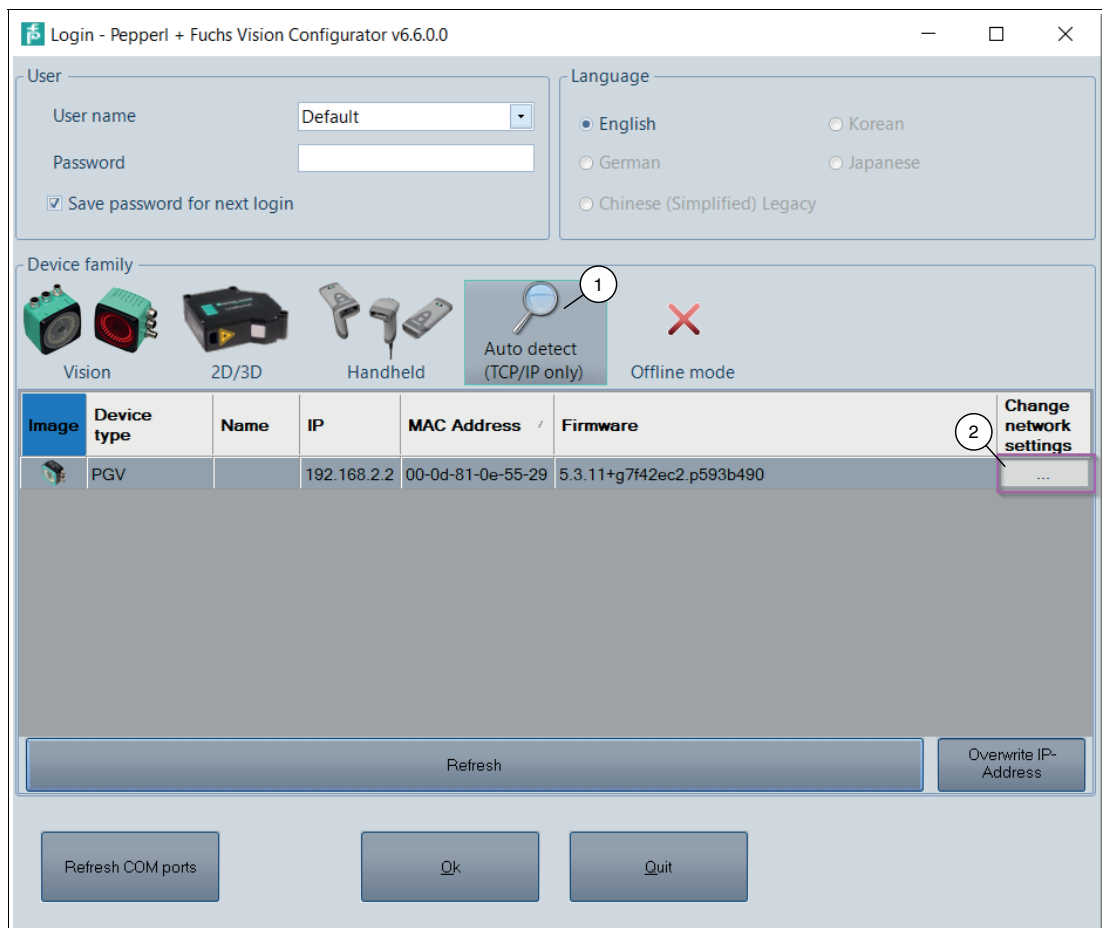
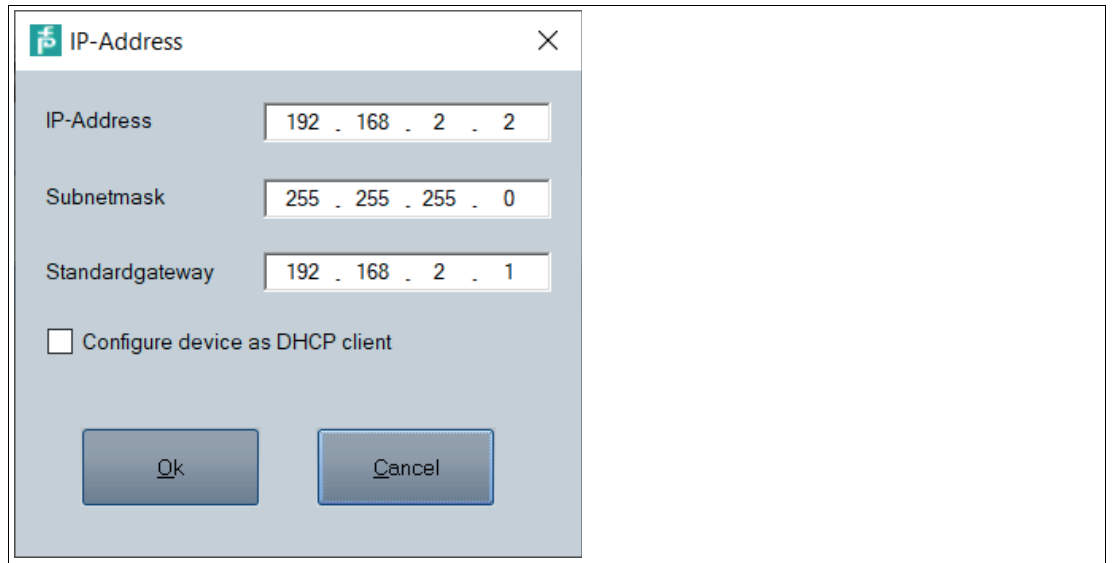


Figure 4.2 Auto Detect

2. Click on the three dots "..." in "Change network settings" (2).

↳ The "IP-Address" window opens. You can now change the read head's IP address.



3. Click on "OK" to confirm the entry.



Changing the IP Address—Option 2

If incoming UDP broadcasts are blocked by the firewall but outgoing broadcasts are allowed, no read head is displayed at this point. Proceed as follows to change the IP address:

1. Select the "Auto detect (TCP/IP only)" function (1).

↳ No read head is displayed at this point, since incoming UDP broadcasts are blocked by the firewall.

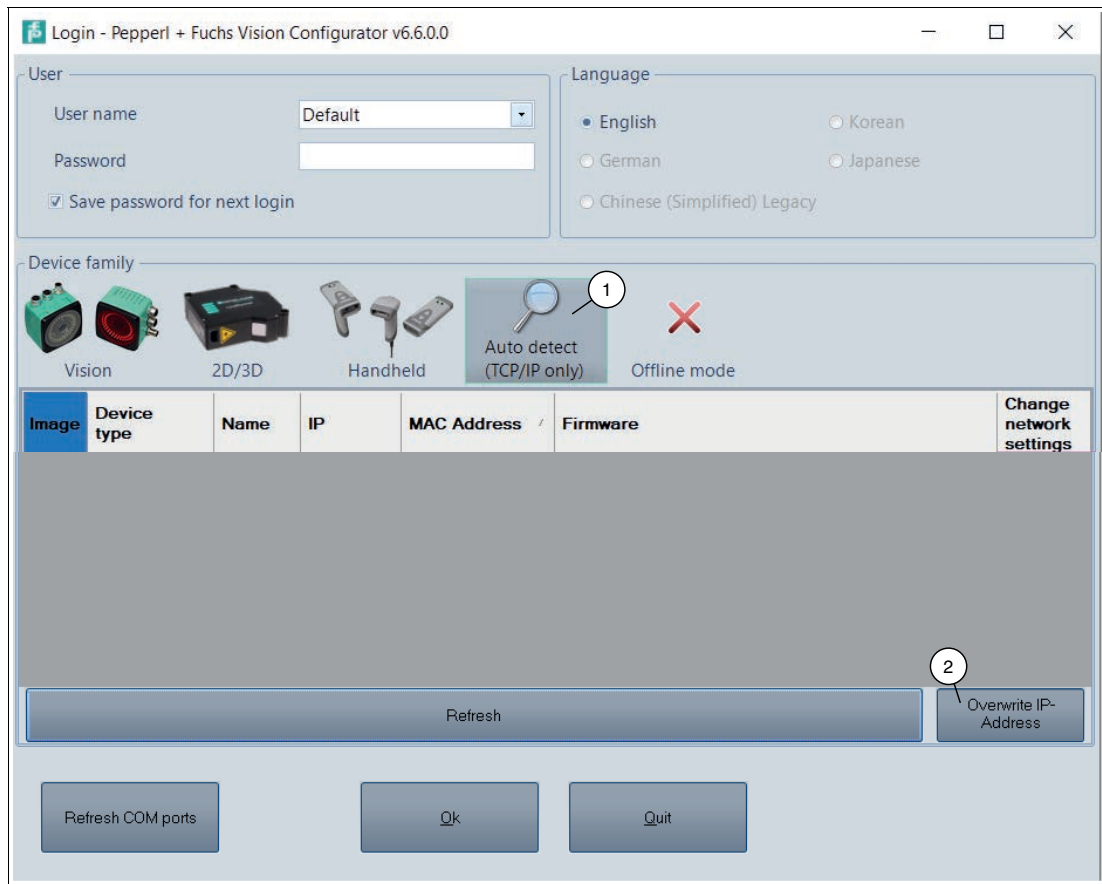
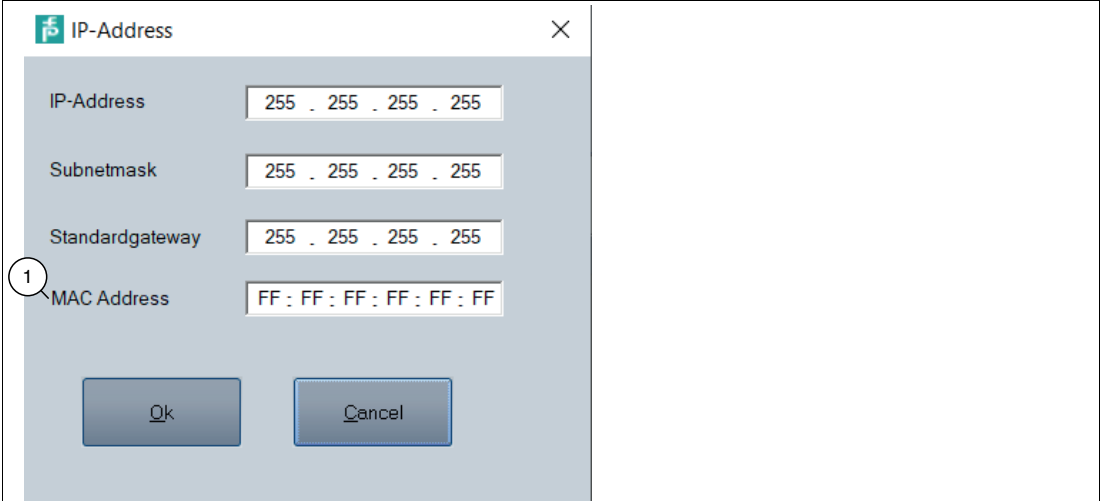


Figure 4.3 Auto Detect

2. Select "Overwrite IP-Address" (2).

↳ The "IP-Address" window opens. You can now overwrite the read head's IP address.



IP-Address

IP-Address 255 . 255 . 255 . 255

Subnetmask 255 . 255 . 255 . 255

Standardgateway 255 . 255 . 255 . 255

MAC Address FF : FF : FF : FF : FF : FF

Ok Cancel

3. Enter the MAC address of the read head in the input window. You can find this address on the read head.
4. Click on "OK" to confirm the entry.

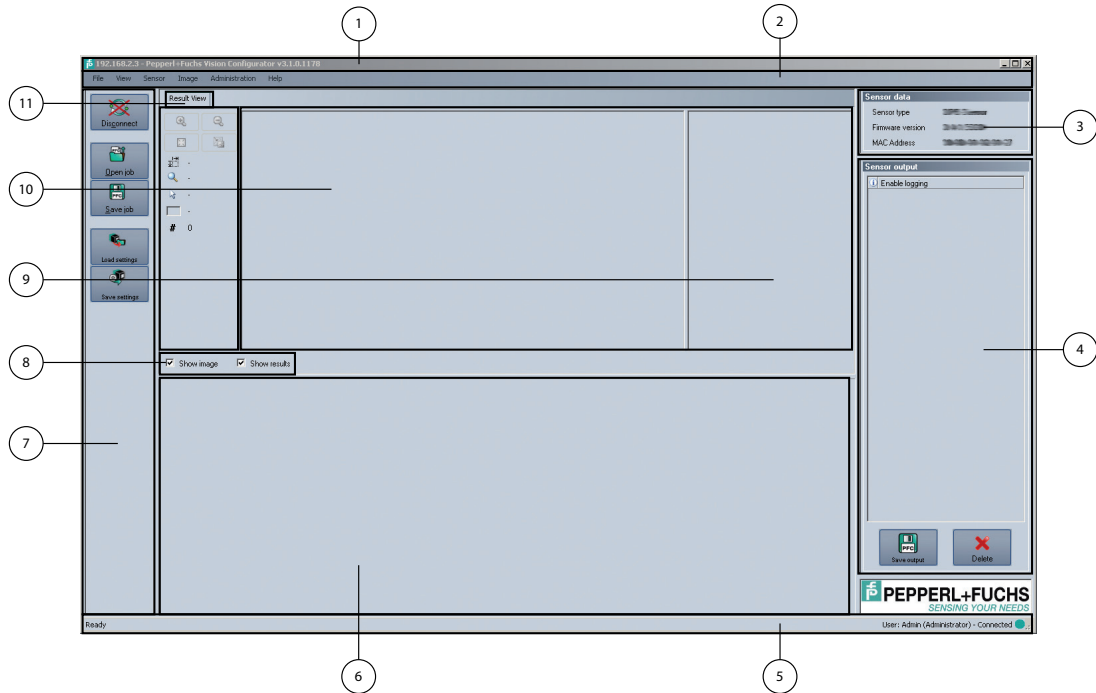
4.4 Application Window Structure

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

10	Image display	<ul style="list-style-type: none"> • Displays the images captured or stored in the error memory • This field can be enabled or disabled via Show images
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"> • Image size • Zoom level • Mouse position in image coordinates • Current grayscale value • Image number

4.5 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.

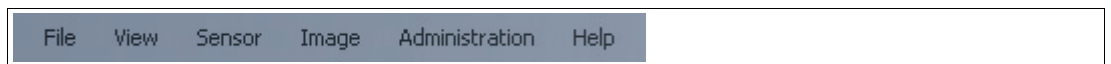


Figure 4.4 Menu Bar

4.5.1 File Menu

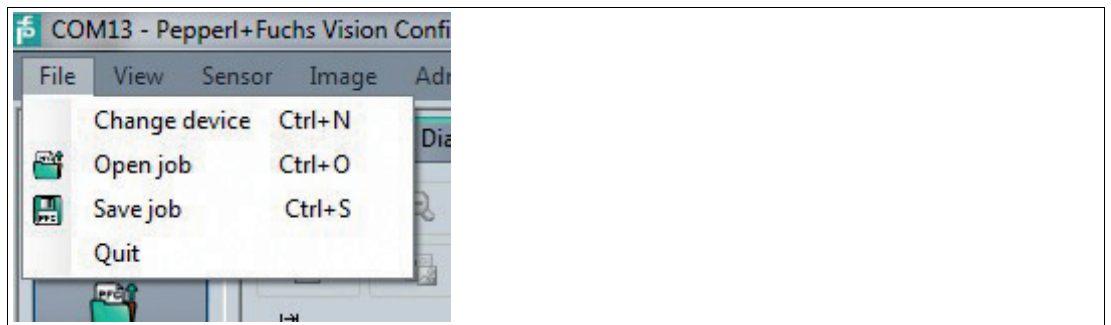


Figure 4.5 File Menu

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 4.1 File Menu

4.5.2 View Menu

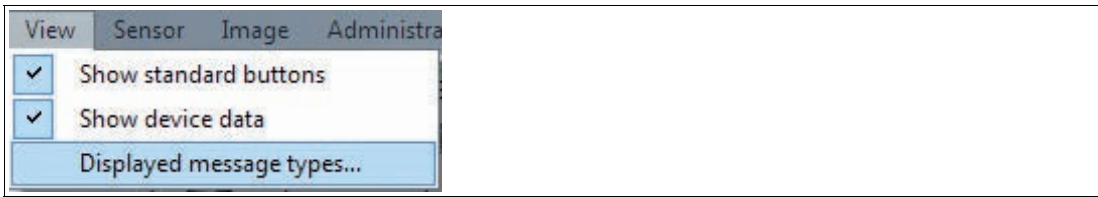


Figure 4.6 View Menu

Show standard buttons	Toggles the display of the buttons in the bar on the left on and off.
Show device data	Hides the display of the sensor data in the top right of the screen.
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, Assert.

Table 4.2 View menu

4.5.3 Sensor menu

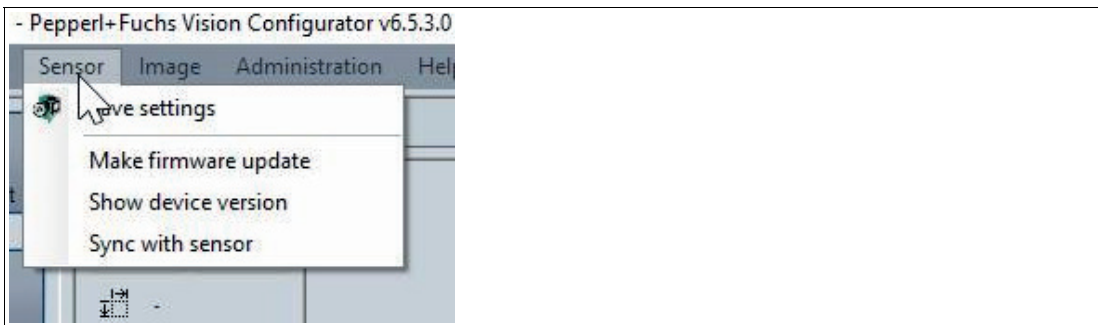


Figure 4.7 Sensor menu

Save settings	Saves the settings to the sensor
Make firmware update	Performs a firmware update. This command should only be used by experienced users.
Show device version	Displays the device version
Sync with sensor	Synchronization with the sensor

Table 4.3 Sensor menu



Note

Firmware Update

Restart the read head after the firmware update.

4.5.4 Image Menu



Figure 4.8 Image menu

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
Show graphic	Switches display data sent from the sensor on and off in the image.

Table 4.4 Image menu

4.5.5 Administration Menu



Figure 4.9 Administration menu

User administration	Opens a window that shows all currently created users at the same authorization level or lower. New users at the same authorization level or lower can be created and deleted here. In addition, a user password can be reset to the default password for the relevant user level.
Change password	Changes the current user's password.
Change user	The login screen opens and a different user and/or sensor can be selected.
Load XML file...	Loads XML data from a computer.
Create reader programming code	Creates a reader programming code

Table 4.5 Administration menu

4.5.6 Help Menu

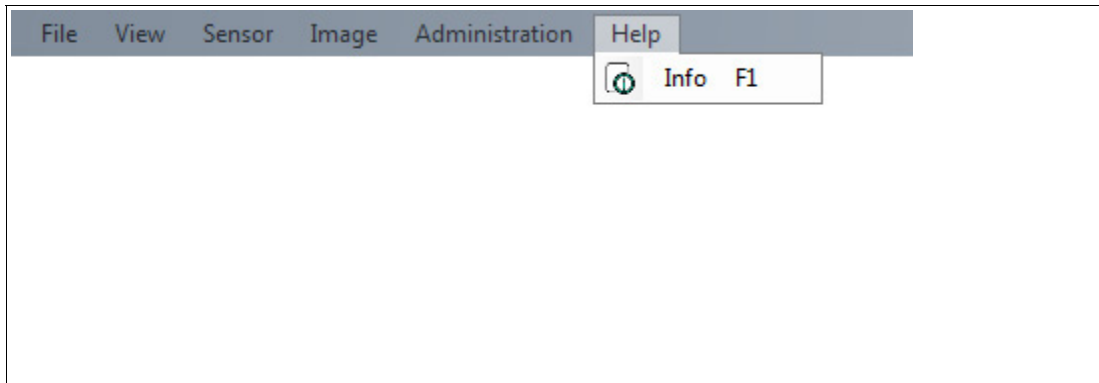




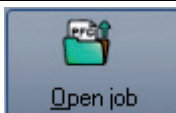
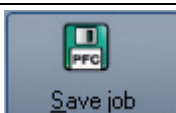

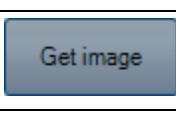
Figure 4.10 Help menu

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

Table 4.6 Help menu

4.6 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	Load the saved read head settings to a read/write tag.
 Save job	The settings you have made are saved to a read/write tag (PC, USB stick, etc.).
 Save settings	All settings made are saved on the actual read head.
 Get image	The read head records an image. The image can be displayed straight away in "Image View."

4.7 Device Data

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



Figure 4.11 Device data

4.8 Sensor Output

This area shows the communication between the Vision Configurator and the connected sensor. To select which messages are to be displayed, select **View > Displayed message types**.



Figure 4.12 Sensor output

Two buttons are located in the lower area.



Save output	Saves the content of the window to a text file.
Delete	Deletes the contents of the window.

4.9 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 captured image under the **Image view** tab. To do this, click on **Get Image** in the toolbar.

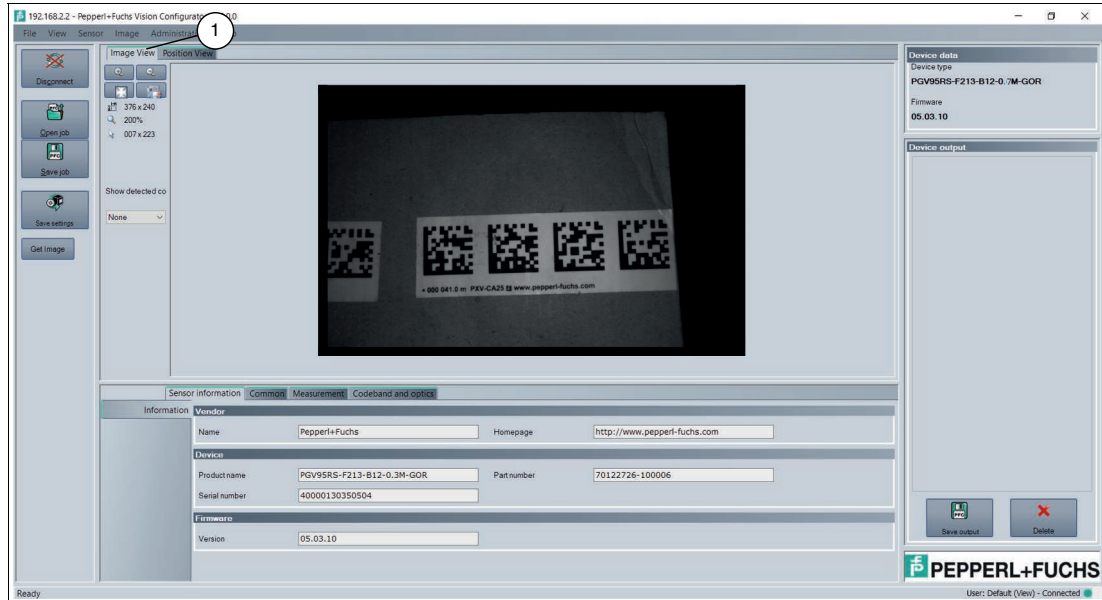


Figure 4.13

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



Figure 4.14 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.

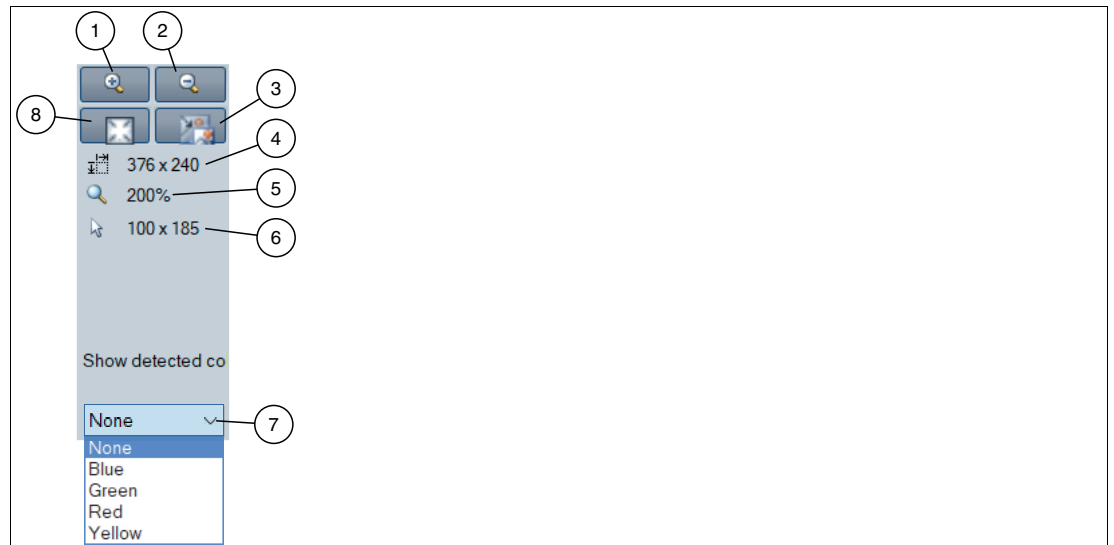


Figure 4.15 Toolbar

Position	Designation	Function
1	Magnifier +	Zoom into the image.
2	Magnifier -	Zoom out of the image.
3	Original size	Displays image in original size.
4	Size details	Image size information box (length and width in pixels)
5	Zoom factor	Current zoom factor in percent (zoom factor 100% is original image size)
6	Position details	Position of the cursor within the image
7	Displays the detected color track	This selection is a tool for finding color tracks. Not relevant for this device, since no color tracks are used.
8	Fit to window	Adjusts the image display in relation to the size of the image display area.

4.10 Position Display

In the position display [Position View] (1), you can display the recorded x absolute positioning, the y offset to the center of the code, the angle output, and various status values.

The display is started with the "Start request" button (2) and stopped with the "Stop request" button (3).

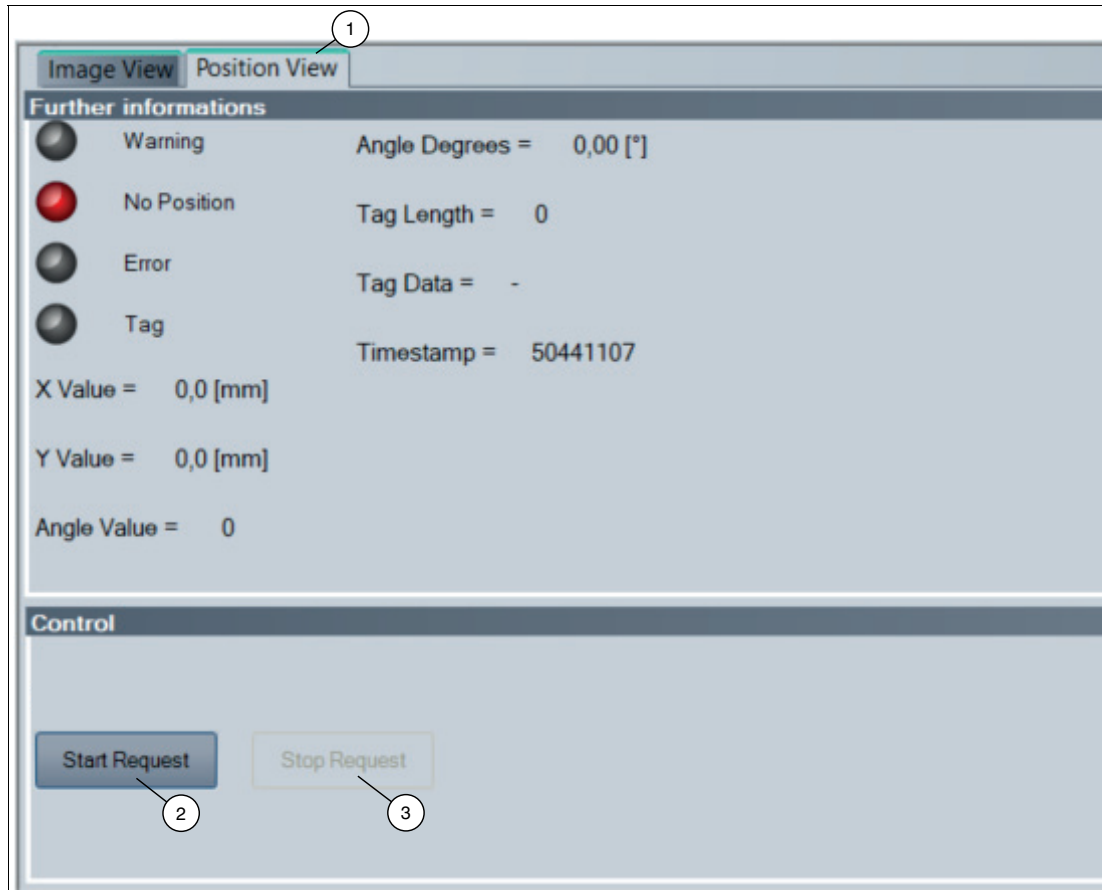


Figure 4.16

Further information

Message	Description
Warning	Warning message, code reading is restricted. Additional information about the codes can be found in the "Warning Messages" table (see chapter 5.1.2).
No Position	No absolute position
Error	Error message
Tag	Data Matrix tag detected
X value	x position in mm
Y value	y position in mm
Angle Value	Scaled angle of the code relative to the read head
Angle Degrees	Angle of the code relative to the read head in °.
Tag Length	Number of characters of the code content
Tag Data	Code content
Timestamp	Timestamp

4.11 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.



Note

Making changes

If you want to make changes, you must complete the two steps below for the changes to take effect:

- Save the settings: After you have made the changes you want, save the settings in "Save settings."
- Restart the read head: Once you have saved the settings, the read head must be restarted for the changes to take effect.

4.11.1 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 4.17 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

4.11.2 Common Tab

There are three menu items available in the **Common** tab. The purpose of this section is to present the menu items in more detail.

Trigger Menu Item

To use the "Trigger Source" input, "Trigger Source" must be set to "Input." Otherwise, the input is ignored. Note that the input only becomes effective when it changes to "High" state. In this case, a trigger is activated. This triggers both the flash and the image capture. After triggering, an evaluation is performed and the result is transferred using a protocol.

This setting can be used to specify the required time for the position query. To obtain the result, a protocol query must be performed or the sensor must be in automatic transmission mode. However, the latency of the result must be taken into account.

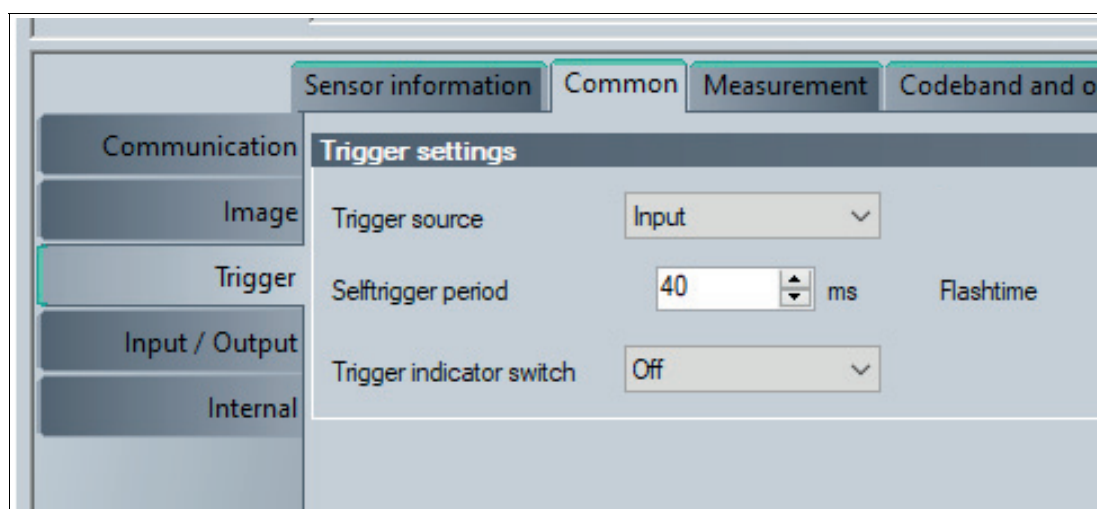


Figure 4.18

Input/Output Menu Item

This section contains editable parameters for configuring the digital inputs, digital outputs, and read head inputs/outputs.

Inputs always have the input function (cannot be changed).

Outputs always have the output function (cannot be changed).

- Input/output**
 Identifies the connection as an input or output.
 "Input" identifies the connection as an input.
 "Output" identifies the connection as an output.
- Function**
 Assigns a function to the connection. The possible functions depend on whether the connection is an input or output.

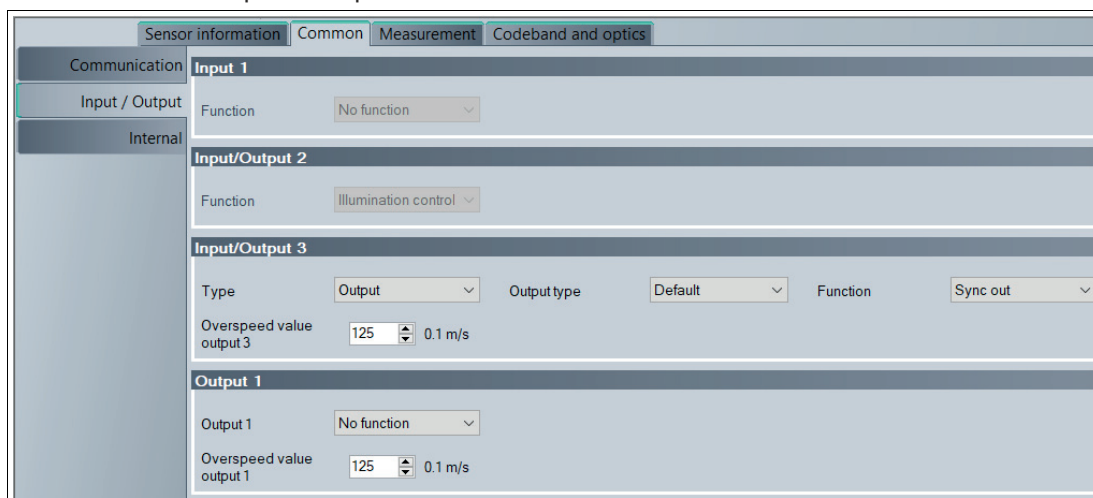


Figure 4.19

Input 1

Grayed out, no function

Output 1

Grayed out, no function

Input/Output 2

Illumination control

If one of the two inputs and outputs is configured as an input and the "Illumination control" function is activated, it means as follows:

- If the input is not set, the read head captures an image as usual and simultaneously triggers the flash to illuminate the scene.
- If the input is set, no flash is triggered for the image capture.
 This option can be used to save energy, since the sensor does not have to provide values in this case. In addition, repeated flashes can be perceived as disruptive.

Input/Output 3



Figure 4.20

Designation		Function
Type	Output	The connection is identified as an output
	Input	The connection is identified as an input
Function	No function	The "No function" setting deactivates the input or 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.
	Dirty	"Dirty" activates the output if there is a critical level of contamination on the read head or code tape.
	Event	Option is not used.
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)	
Overspeed value output 3	Overspeed value output 3	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.

Internal Menu Item

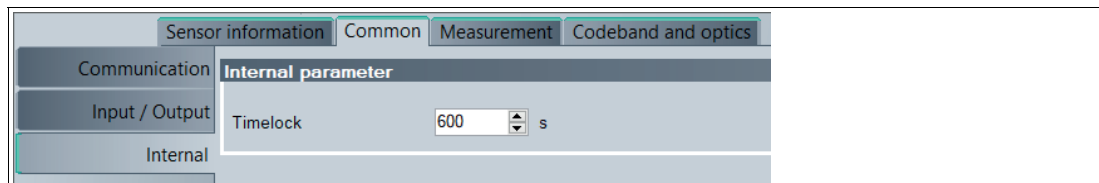


Figure 4.21

Internal parameter

Designation	Function
Timelock	Defines after which time <u>without parameterization activity</u> the time lock of the read head is locked. Entered in seconds as an integer value. 0 means that this functionality is inactive and the read head can always be parameterized.

4.11.3 Measurement Tab

Two menu items are available in the **Measurement** tab. The purpose of this section is to present the menu items in more detail.

Resolution/offset

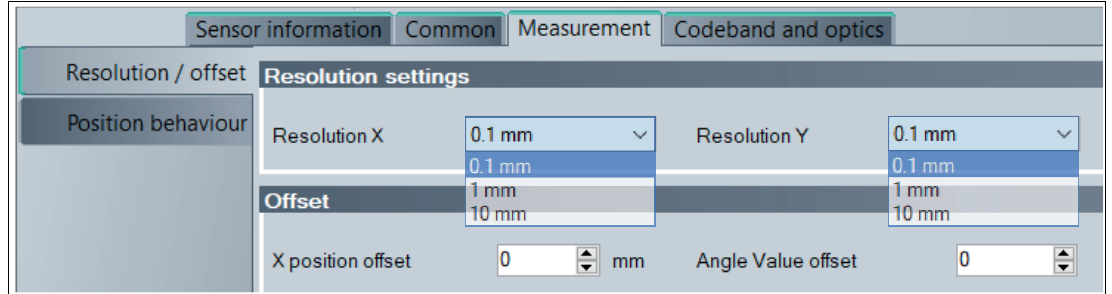


Figure 4.22

Resolution settings

Designation	Function
Resolution X	0.1 mm 1 mm 10 mm
Resolution Y	0.1 mm 1 mm 10 mm

Position behavior

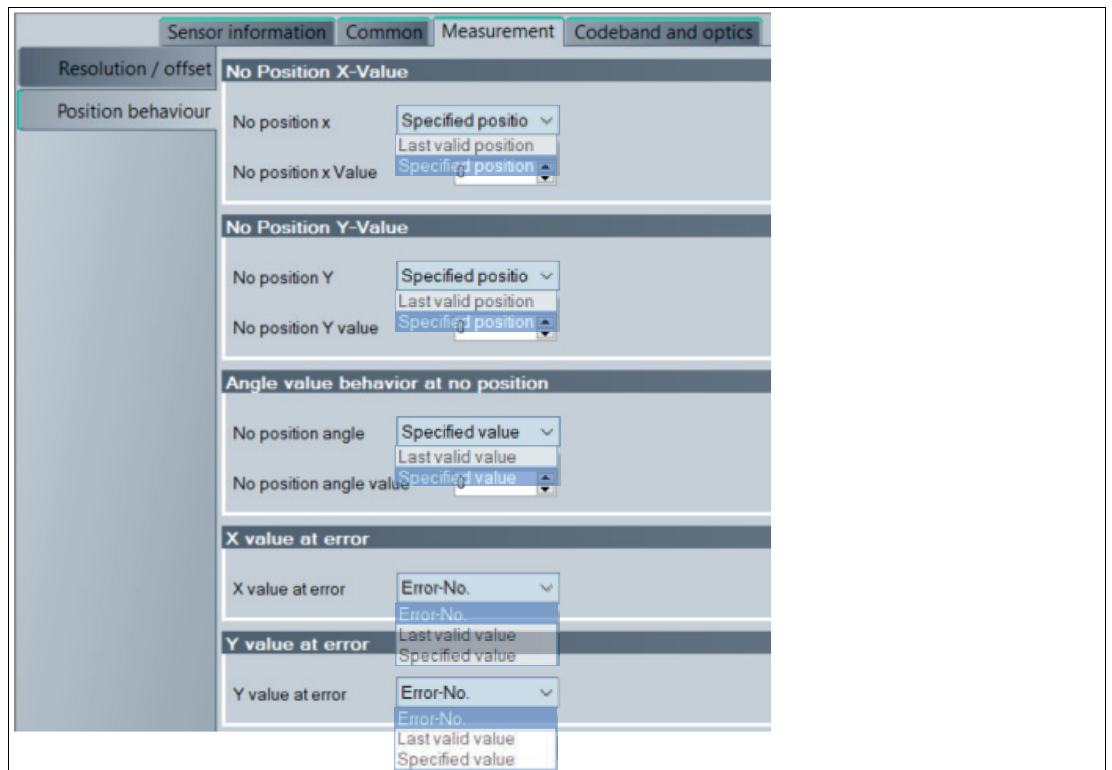


Figure 4.23

No Position X-Value

No position x

Designation	Function
Last valid position	The last valid x position is output with "Last valid position."
Specified position	"Specified position" outputs a defined x position value.

No position x value

No Position Y-Value

No position Y

Designation	Function
Last valid position	The last valid y position is output with "Last valid position."
Specified position	"Specified position" outputs a defined y position value.

No position y value

Angle value behavior at no position

No position angle

Designation	Function
Last valid value	The last valid position angle is output with "Last valid value."
Specified value	"Specified value" outputs a specified angle value.

No position angle value

X value at error

Defines the output value when an error occurs in the x direction.

X value at error

Designation	Function
Error-No.	"Error-No." displays the error code.
Last valid value	The last valid x position is output with "Last valid value."
Specified value	"Specified value" outputs a specified x position value.

Y value at error

Defines the output value when an error occurs in the y direction.

Y value at error

Designation	Function
Error-No.	"Error-No." displays the error code.
Last valid value	The last valid y position is output with "Last valid value."
Specified value	"Specified value" outputs a specified y position value.

5 Operation and Communication

5.1 TCP/IP Communication

The TCP/IP protocol enables communication between the PC and read head. The individual telegrams exchanged during communication are described in the following sections.



Note

Security information

The read head has a configuration interface on TCP port 50021 with a fixed IP address. This interface is used for parameterization and firmware updates. The configuration interface is disabled when the read head is in operating mode.

The read head can be set to a recovery mode by restarting with 8 V input voltage, which allows firmware updates to be completed.

From a safety point of view, the operator responsible for the application must therefore take the following precautions for the read head:

- Physically secure the read head against unauthorized access
- Ensure that the device is only operated on an isolated network without connection to the company network, internet, or cloud services;
 - The device may only communicate with a higher-level controller, or with a defined, trusted circle of network participants



Note

Maximum request rate

Please note that request rates above 100 Hz may have a negative impact on the read head's decoding performance. To ensure optimal performance of the read head, we recommend limiting the request rate to 100 Hz. A higher request rate may have a negative impact on the device performance.

5.1.1 Position Request Telegram

A request telegram always consists of two bytes. The second byte corresponds to the first byte, but with the eight data bits of the first byte inverted.

Structure of a request telegram

Byte/bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Function
Byte 1	1	1	0	1	0	0	(0)	(0)	Request
Byte 2	0	0	1	0	1	1	(0)	(0)	Check-sum

Table 5.1 Structure of a request telegram

5.1.2 Position Response Telegram

Byte/bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	(0)	(0)	(0)	(0)	WRN	NP	ERR
2	0	TAG [1]	(0)	(0)	RP/FAST	(0)	(0)	(0)
3	0	(0)	(0)	(0)	(0)	XP23	XP22	XP21
4	0	XP20	XP19	XP18	XP17	XP16	XP15	XP14
5	0	XP13	XP12	XP11	XP10	XP09	XP08	XP07
6	0	XP06	XP05	XP04	XP03	XP02	XP01	XP00

Byte/bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
7	0	YP13	YP12	YP11	YP10	YP09	YP08	YP07
8	0	YP06	YP05	YP04	YP03	YP02	YP01	YP00
9	0	ANGLE13	ANGLE12	ANGLE11	ANGLE10	ANGLE09	ANGLE08	ANGLE07
10	0	ANGLE06	ANGLE05	ANGLE04	ANGLE03	ANGLE02	ANGLE01	ANGLE00
11	0	Res[0]	LEN05	LEN04	LEN03	LEN02	LEN01	LEN00
12	0	D00_7	D00_6	D00_5	D00_4	D00_3	D00_2	D00_1
13	0	D00_0	D01_7	D01_6	D01_5	D01_4	D01_3	D01_2
14	0	D01_1	D01_0	D02_7	D02_6	D02_5	D02_4	D02_3
15	0	D02_2	D02_1	D02_0	D03_7	D03_6	D03_5	D03_4
16 ... 51	0	D03_3 ... D034_0						
52	0	D035_7	D035_6	D035_5	D035_4	D035_3	D035_2	D035_1
53	0	D035_0	Res[0]	Res[0]	Res[0]	Res[0]	Res[0]	Res[0]
54	0	WRN13	WRN12	WRN11	WRN10	WRN09	WRN08	WRN07
55	0	WRN06	WRN05	WRN04	WRN03	WRN02	WRN01	WRN00
56	0	Res[0]	Res[0]	Res[0]	T31	T30	T29	T28
57	0	T27	T26	T25	T24	T23	T22	T21
58	0	T20	T19	T18	T17	T16	T15	T14
59	0	T13	T12	T11	T10	T9	T8	T7
60	0	T6	T5	T4	T3	T2	T1	T0
61	0	xor B1.6 ... B20.6	xor B1.5 ... B20.5	xor B1.4 ... B20.4	xor B1.3 ... B20.3	xor B1.2 ... B20.2	xor B1.1 ... B20.1	xor B1.0 ... B20.0

Legend

Designation	Function
(0)	Reserved for compatibility
WRN	Warning message Warnings are stored in WRN00 ... WRN13. More information about the codes can be found in the Warning Messages table.
NP	No absolute position in the x direction
ERR	Error message Error codes are stored in XP00 ... XP23. More information about the codes can be found in the Error Codes table below.
TAG_#	Data Matrix tag with content detected
RP/FAST	Read head information, more information can be found in the Combination of NP and RP/FAST table below.
XP	Relative x position (two's complement)
YP	Relative y position (complement of two)
ANGLE	Absolute angle
LEN	Valid length of ASCII data in Dnn_b (first character = D00).
Dnn_b	ASCII data (nn = position, b = bit)
T	Timestamp

Table 5.2 Functional description of the bits

Error Codes

Error code	Description	Priority
2	No clear position can be determined, e.g., difference between codes is too great, code distance incorrect	4
5	No direction decision available	2
6	Internal	3
> 1000	Internal error	1

Table 5.3 Error codes

Warning Messages

Warning message	Description
WRN00	Code with content not typical of PGV found
WRN01	Read head too close to code tape
WRN02	Read head too far from code tape
WRN03	Reserved
WRN04	Reserved
WRN05	Read head is rotated/tilted in relation to the code tape
WRN06	Low level of code contrast
WRN07	Reserved
WRN08	Temperature too high
WRN09	Position code near branch/intersection detected
WRN10	More than the specified number of code tracks present
WRN11	Selected track not visible. The position data comes from another track in the field of view.
WRN12	Reserved
WRN13	Reserved

Table 5.4 If no warnings are present, the bits are set to zero.

Combination of NP and RP/FAST

The status can be derived from the feedback of the read head relating to bits **NP** and **RP/FAST** using the table below.

NP	RP/FAST	Meaning
0	0	Position ok
1	0	No position
1	1	Read head is switched off
0	1	Position on the repair tape

Table 5.5 Meaning of bits

5.1.3 Request for Image Download

The read head must be switched to configuration mode to start an image download. Note that **no** position data is output in configuration mode. A new image can be requested at any time as long as configuration mode is not exited using 0x00 0xFF 0xFF. To return to operating mode, you must exit configuration mode again.



The communication between the controller and the read head is explained in more detail below:

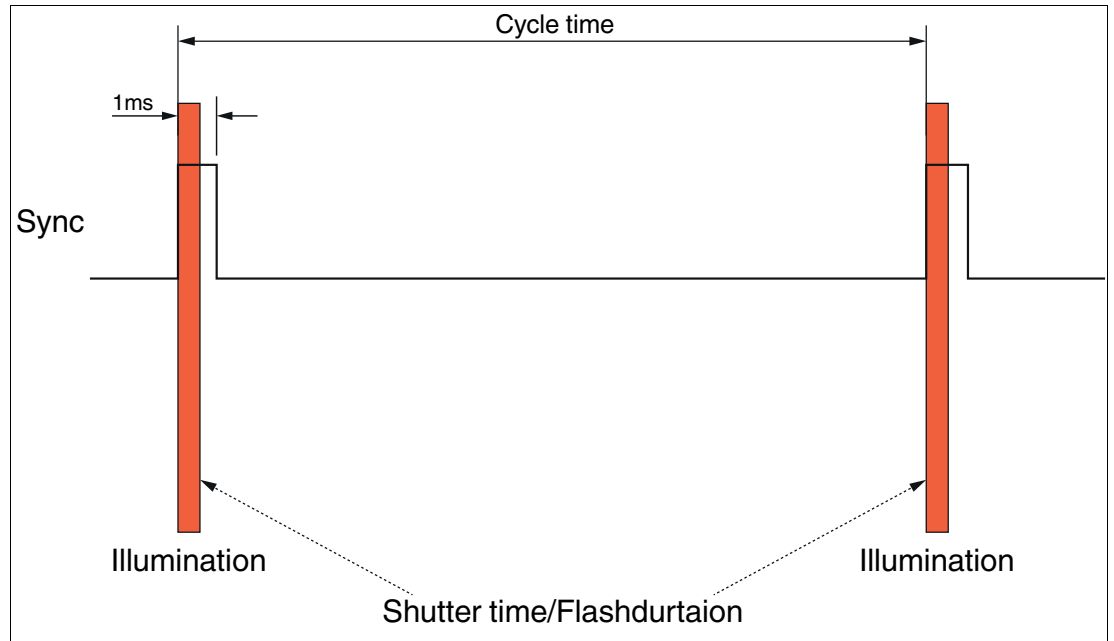
1. The controller switches the read head from operating mode to configuration mode:
0xA8 0x57
↳ The read head responds with an acknowledge:
0x81 0xAC 0x00 0x2D
2. The controller requests the complete image data (full resolution):
0x08 0xE0 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0xE8
↳ The read head sends the image data:
7F E0 nn nn nn nn ww ww hh hh 01 00 <image data> <reserved-byte>
nn = Number of following bytes without <reserved-byte>
ww = reserved
hh = reserved
(LSB first)
<reserved-byte> one byte for internal purpose
3. The controller resets the read head to operating mode:
0x00 0xFF 0xFF
↳ The read head responds with an acknowledge:
0x81 0xAC 0x00 0x2D

5.2 Electrical Switching Output

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 1 ms.

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



6 Maintenance



Caution!

Device may become hot during prolonged operation

After a long operation time, the metal surfaces (plug) and the housing of the sensor have an elevated temperature relative to the environment.

This must be taken into account during service work. Let the device cool down before operating.

If the read head is faulty, it must be replaced with a new device. The read head may not be repaired.

No position values can be determined wherever sections of the Data Matrix code tape are dirty or destroyed.



Maintaining, Repairing, or Replacing the Device

In case of maintenance, repair, or replacement of the device, proceed as follows:

1. Implement appropriate maintenance schedules for regular maintenance of the safety loop.
2. While the device is maintained, repaired, or replaced, the safety function does not work. Take appropriate measures to protect personnel and equipment while the safety function is not available. Secure the application against accidental restart.
3. Do not repair a defective device. A defective device must only be repaired by the manufacturer.
4. If there is a defect, always replace the device with an original device.

6.1 Maintenance

The device is maintenance-free.

6.2 Testing

To ensure adequate availability, we recommend regularly inspecting the read head for mechanical damage and removing any contamination.

A regular proof test is not required since the minimum interval for a proof test is longer than the useful working period. If the read head is exposed to sources of potential mechanical damage or vibration in the vehicle, we recommend regularly inspecting the read head to ensure that the housing is undamaged (water ingress) and that it is fastened correctly (loose fixing screws).

6.3 Cleaning



Caution!

Material damage due to improper cleaning

Treating surfaces with the wrong cleaning agents and liquids can damage the surface and therefore disrupt the function of the read head or make the Data Matrix codes illegible.

Cleaning the Read Head

Check that the components are securely mounted and that optical surfaces are clean.

Clean the surface of the read head lens at regular intervals. The cleaning interval depends on the ambient conditions and the climate within the plant.

Use a soft, lint-free cloth to clean the surfaces.

Cleaning Data Matrix Codes and Data Matrix Tags

The surface of the Data Matrix codes and tags must always have a matte surface for diffuse reflection. The use of incorrect cleaning agents or constant brushing can lead to the risk of the matte surface being polished smooth. A shiny surface will impair the read head detecting the codes. When cleaning the Data Matrix codes and Data Matrix tags, do not apply strong pressure to avoid polishing the surface.

Only use a non-aggressive plastic cleaner such as Caramba® to clean the code tapes.



Note

We do not recommend the use of conveyor brushes or permanent cleaning systems. Both of these may damage the surface of the Data Matrix codes and Data Matrix tags and make them unreadable.

6.4 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.

7 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.

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Explosion Protection

- Intrinsic Safety Barriers
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- FieldConnex® Fieldbus
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- Wireless Solutions
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Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
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