SmartRunner 3-D Stereo

3-D Stereo Sensor

Manual





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1 Introduction 5
1.1 Content of this Document 5
1.2 Target Group, Personnel 5
1.3 Symbols Used 6
2 Product Specifications 7
2.1 Overview of Versions 7
2.2 Use and Application 7
2.3 Symbols on the Sensor 9
2.4 Dimension Drawing 11
2.5 Display Elements 12
2.6 Accessories 12
3 Installation 13
3.1 Storage and Disposal 13
3.2 Preparation 13
3.3 Mounting 13
3.4 Electrical Connection 15
3.5 Setting up Windows Network Communication between the Sensor and a PC/Laptop 16
3.6 Access Protection 18
4 Commissioning 20
5 Configuration 21
5.1 Parameters (Features) 21
5.2 VsxProtocolDriver 22
6 Operation with ViSolution 23
6.1 Establishing a Connection to the Sensor 23
6.2 ViSolution Main Screen 26
6.2.1 User Interface 27
6.2.2 Set Up 33
6.2.3 Expert 40
6.2.4 Maintain 41
6.2.5 Transfer Configuration 43
6.2.6 Check Connectivity 44
6.2.6.1 Network Settings 45
6.2.7 Logout 46

2025-10

7 Maintenance and Repair 47
7.1 Servicing 47
7.2 Repair 47
8 Troubleshooting 48
8.1 What to Do in Case of a Fault 48

2025-10

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/device-information.

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 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.

2025-10

2 Product Specifications

2.1 Overview of Versions

This manual describes three versions of the VSE*000-F400-B12-A1000 3-D stereo sensor.

- **VSE1000-F400-B12-A1000**
- **VSE2000-F400-B12-A1000**
- **VSE3000-F400-B12-A1000**

Note

Terminology

The term "sensor" is used generally throughout this manual. Unless expressly stated otherwise, the descriptions refer to all three versions. Where content refers solely to a specific version, this is clearly indicated by the respective type designation.

2.2 Use and Application

The sensor combines two 2-D images taken from different positions and finds matches between the acquired images to create a depth image.

A bright projector, which sits between the two cameras, projects a structured light onto the object to be imaged. The auxiliary structures of the structured light enable a higher number of pixels to be detected on the surface of the object, so that complete, homogeneous depth information of the scene can be generated.

How It Works

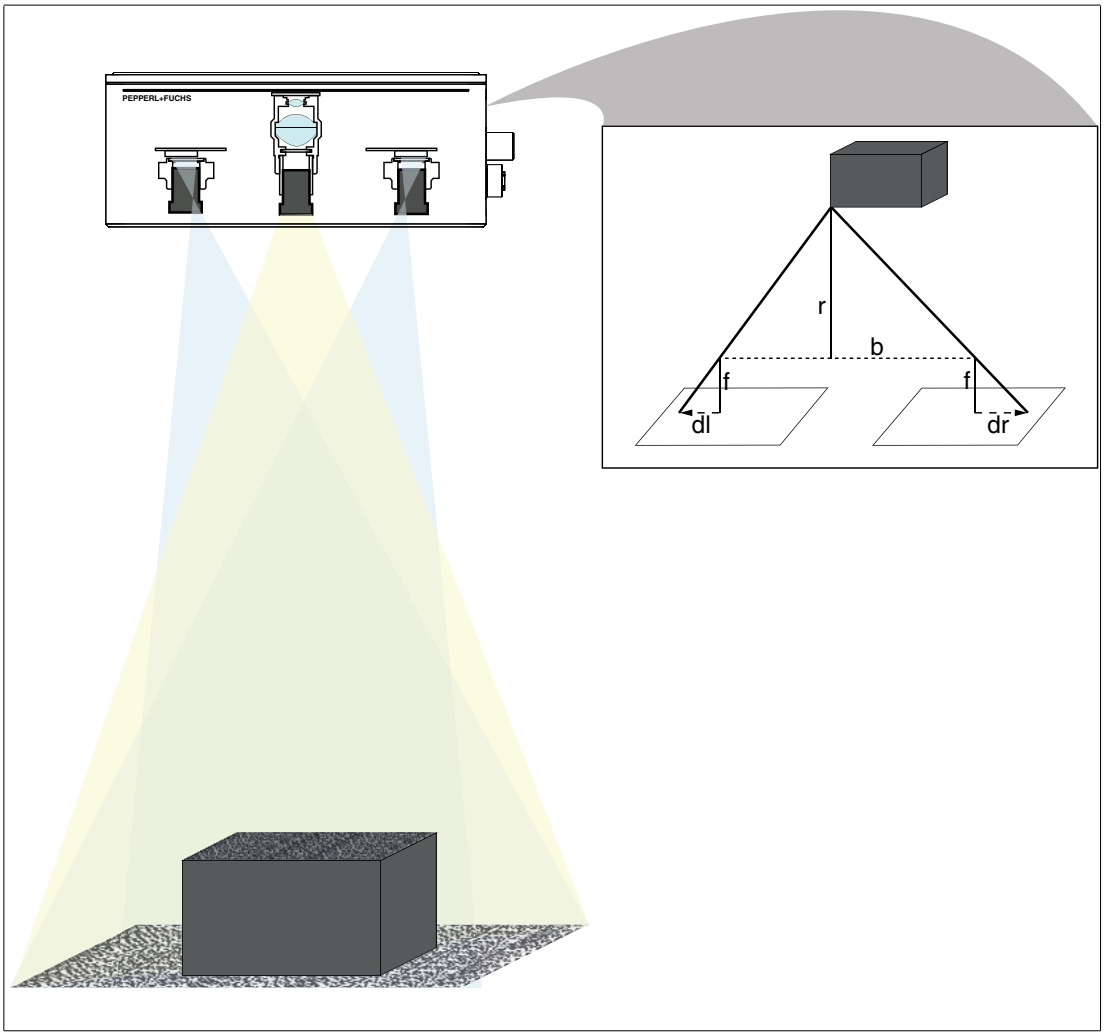


Figure 2.1 A sketch representing how it works

The two single cameras, which are offset, capture images of the same situation at the same time. The disparity, or offset, between the two images is calculated. The disparity (d), the focal length (f), and the base length (b) are used to create a depth in the image based on the geometric principle of triangulation. These measurements are transferred as raw data to a PC, which produces the depth image of the captured scene.

Step 1: Capture two images from different positions.

Step 2: Find matches between the two images.

Step 3: Create a depth image.

The sensor is connected to a PC via a Gigabit Ethernet network.

2025-10

2.3 Symbols on the Sensor

Overview of Labeling



Figure 2.2 Overview of labeling

Nameplate



Figure 2.3 Nameplate

The nameplate provides the following information:

- Part number
- CE marking
- MAC ID: 00-0D-81-0B-66-A8
- Standard IP: 192.168.2.4
- Serial number: 40000049969849
- Manufactured 02/2020 Mannheim
- UL marking
- Class 2 power source
- UB = 24 V ±10 %
- IB = 500 mA
- P0 = 12 W
- Made in Germany 07
- 68307 Mannheim, Germany
- www.pepperl-fuchs.com
- Crossed-out garbage can symbol

Disposal



Figure 2.4 Disposal

Devices marked with this symbol must not be disposed of with household waste. These devices must only be disposed of by specialist companies approved at the operating location.

Hot Surface



Figure 2.5 Hot surface

This label indicates a possible risk of burns from hot surfaces. Exercise the necessary caution when touching the sensor in this area.

2.4 Dimension Drawing

The housing of the SmartRunner 3-D Stereo has the following dimensions.

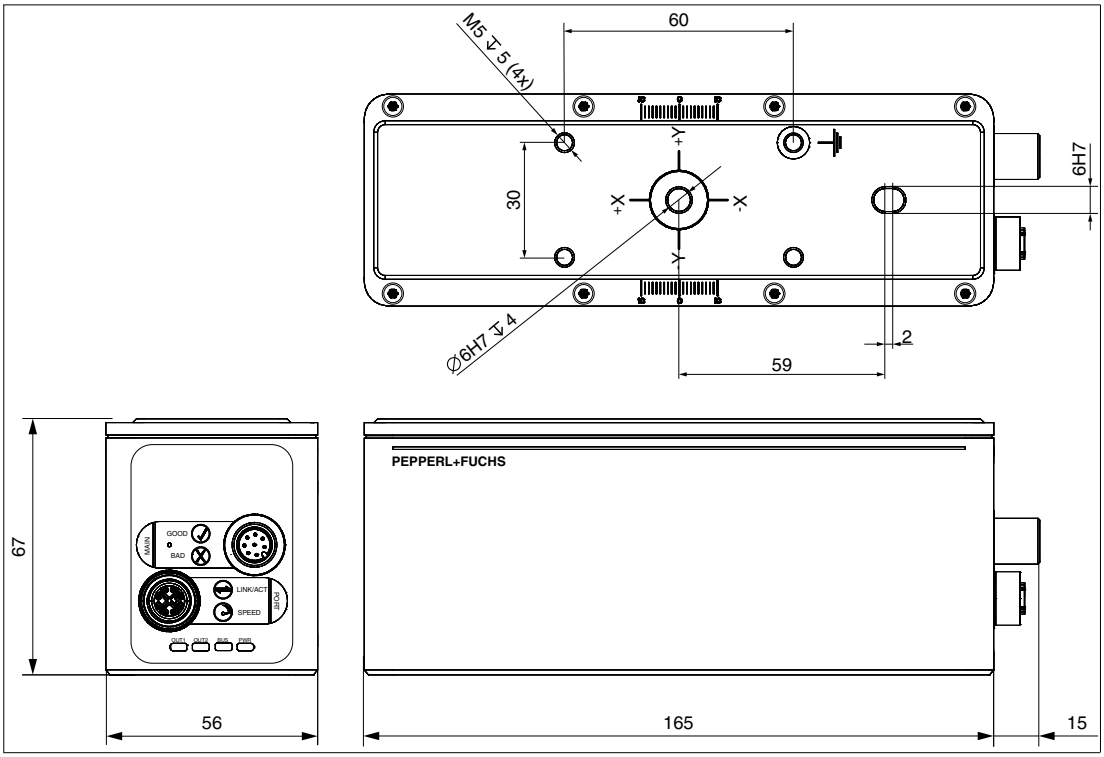


Figure 2.6 Aligning the sensor

All dimensions in mm.

Note

Further technical data can be found on the datasheet for the sensor. You will find the datasheets on our website.

2.5 Display Elements

The sensor has eight LEDs that signal various operating states or events.

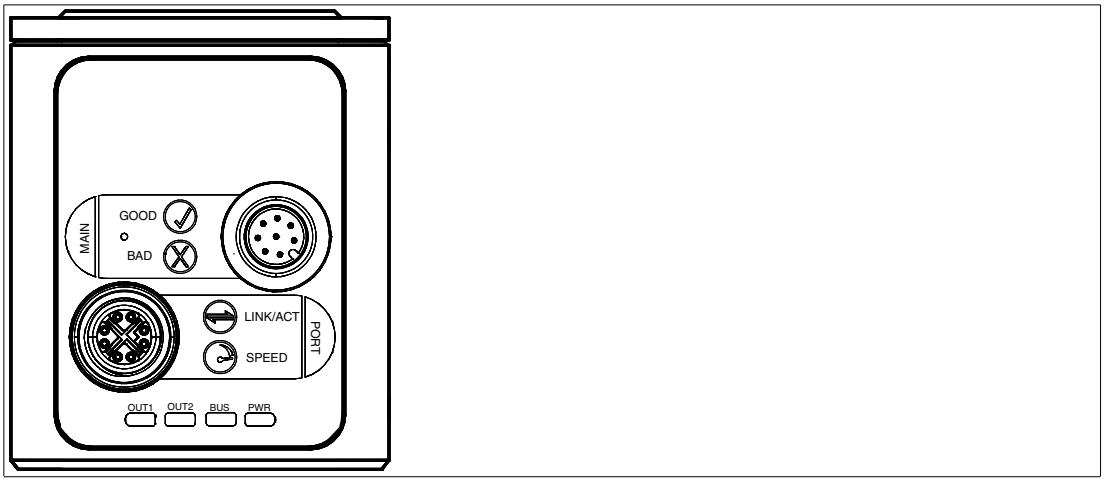


Figure 2.7 Display elements

Designation		LED color	Description
MAIN	GOOD	Green	Reserved
	BAD	Red	Reserved
PORT	LINK/ACT	Yellow	The LED flashes at short intervals when bus data is being exchanged.
	SPEED	Green/yellow	• No connection or 10 MBit connection—LED off • 100 MBit connection—LED lights up green • 1 Gbit connection—LED lights up yellow
Operating mode	OUT1	Green/yellow	Reserved
	OUT2	Yellow	The OUT2 LED flashes once briefly when a new evaluation starts.
	BUS	-	No function
	PWR	Red	• The LED lights up red when the sensor restarts or is in update mode. • The LED lights up red in the event of a system-related malfunction.

2.6 Accessories

Model number	Description
LTGLÜT 24V 2xM12 Xm 8pol ROB	M12 plug, 8-pin, straight, to M12 socket, 8-pin, straight, A-coded, 360° shielding, self-locking screw connection, PUR cable, torsion-proof, shielded, halogen-free
V19SX-G-GN5M-PUR-ABG-V45-G	Bus cable, Ethernet, M12 plug, X-coded, 8-pin to RJ45, Ethernet-coded, 8-pin, PUR cable, green, Cat6A, shielded
V19-G-BK1.5M-PUR-U/ABG	Single-ended female cordset, M12, straight, A-coded, 8-pin, PUR cable, black, shielded, UL-approved

Additional accessories can be found online at www.pepperl-fuchs.com.

2025-10

3 Installation

3.1 Storage and Disposal

Keep the original packaging. Always store and transport the device in the original packaging.

Store the device in a clean and dry environment. The permitted ambient conditions must be considered, see datasheet.

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.

3.2 Preparation

Unpacking the Device

1. Check the packaging and contents for damage.

   ↳ In the event of damage, inform the shipping company and notify the supplier.

2. Check the package contents against your order and the shipping documents to ensure that all items are present and correct.

   ↳ Should you have any questions, direct them to Pepperl+Fuchs.

3. Retain the original packaging in case the device is to be stored or shipped again at a later date.

3.3 Mounting

Note

Mounting the Sensor

To obtain reliable measurements, follow these instructions when mounting:

- Protect the sensor against direct and prolonged sunlight.
- Do not point the sensor into the sun.
- Prevent condensation from forming by ensuring that the sensor is not subjected to any major temperature fluctuations.
- Avoid placing objects in the scene that are not part of the target shot, especially mirrors or other shiny surfaces/objects.
- Avoid placing the sensor flat in the middle of a surface.
- Keep the glass on the device clean. Use soft cloths and standard glass cleaner to clean the device if necessary.
- Maintain a stable housing temperature during operation.
- Secure the sensor.

We recommend that the optical surfaces are cleaned, and that screws and electrical connections are checked, at regular intervals.

The surface must be level to prevent the housing from becoming misaligned when the fittings are tightened. Ensure that there is still sufficient space to connect the connection cable to the sensor once the sensor is mounted.

Caution!

Damage to the equipment caused by improper mounting!

Device components can be damaged if the permissible screw-in depth and the maximum permissible tightening torque is exceeded.

Note that the threads on the rear of the housing are not thru–holes.

Observe the maximum permissible screw-in depth of 5 mm to avoid damaging the device or mounting it incorrectly.

Never exceed the maximum permissible tightening speed for the fixing screws. The maximum tightening torque of the fixing screws must not exceed 2 Nm.

Note

Positioning the Sensor

The sensor has two reference bores on the rear of the housing with a diameter of 6 mm and a depth of 3.5 mm. One of these bores is located in the exact center of the sensor. The other bore is designed as a slot to prevent over-specification.

Securing the Sensor

The sensor has 4x M5 threads on the rear of the housing to ensure simple and stable mounting in your plant.

1. Carefully place the sensor in the desired location in your plant. Make sure that the M5 threaded bushings on the sensor are correctly aligned with the corresponding bores or tapped holes on the plant.
2. Turn the M5 screws clockwise by hand to ensure that they engage with the threads.

   Note

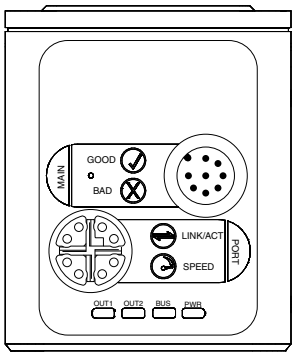
   One of the four fixing screws is not anodized, so it can be used to ground the device.

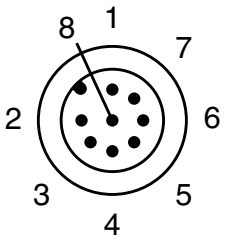
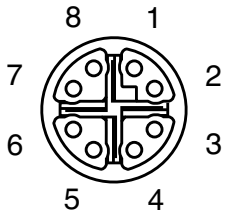
3. Tighten the M5 screws using the screwdriver. To prevent damage to the thread or sensor, do not overtighten the screws. The maximum tightening torque is 2 Nm.
4. Finally, check that the sensor is securely and firmly attached to your plant. Make sure that the connection is not loose and there is no play.

2025-10

3.4 Electrical Connection

Connection Assignment



MAIN	
M12 plug, A-coded, 8-pin	
	1. IN trigger 2. + UB 3. nc 4. nc 5. nc 6. nc 7. GND 8. nc
PORT	
M12 socket, X-coded, 8-pin	
	1. MDX0+ 2. MDX0- 3. MDX1+ 4. MDX1- 5. MDX3+ 6. MDX3- 7. MDX2+ 8. MDX2-

Connecting the Supply Voltage

The sensor is connected electricallyvia an 8-pin M12 **MAIN** connector plug on the front of the housing. The power is supplied via this connection. To connect the sensor, proceed as follows:

1. Plug the M12 8-pin socket into the plug on the front of the housing.
2. Screw the union nut onto the connector until it reaches the end stop. This ensures that the power cable cannot be pulled out inadvertently.

3.5 Setting up Windows Network Communication between the Sensor and a PC/Laptop

When the sensor is delivered, it has a fixed IP address: **192.168.2.4**. To enable communication within the network, the network settings of your PC/laptop must be synchronized with the sensor and may need to be adjusted. To do so, proceed as follows:

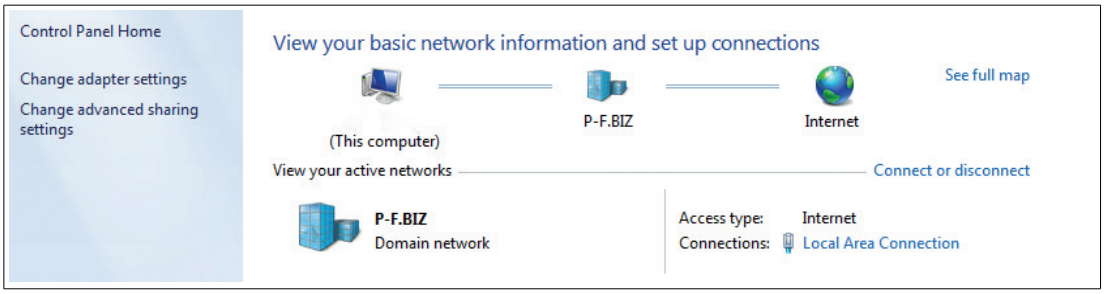
Note

Due to the large amount of datasupplied by the sensor per second,the sensor(s) must be connected to the PC via a Gigabit Ethernet networkwithout any other interfering data traffic.

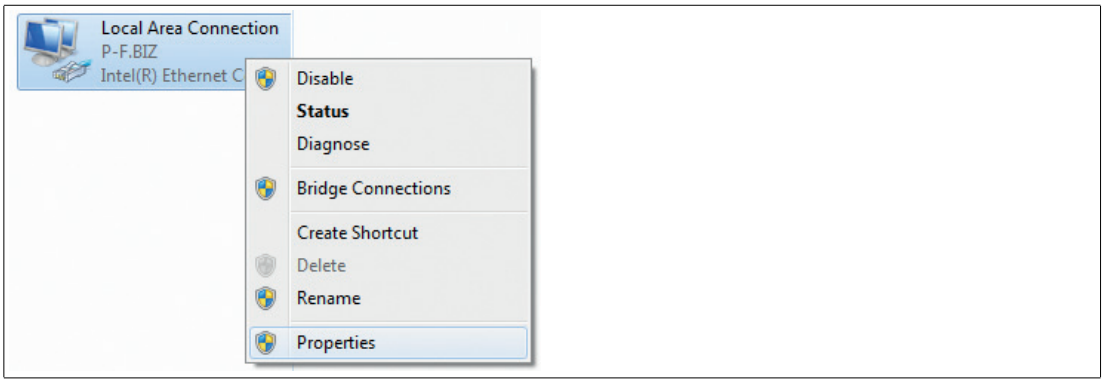
Setting the IP Address

The following section describes how to check the network connection settings of your Windows PC and adapt them accordingly. The illustrations in this description were created using Windows 7. The description below also applies to later versions of Windows.

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

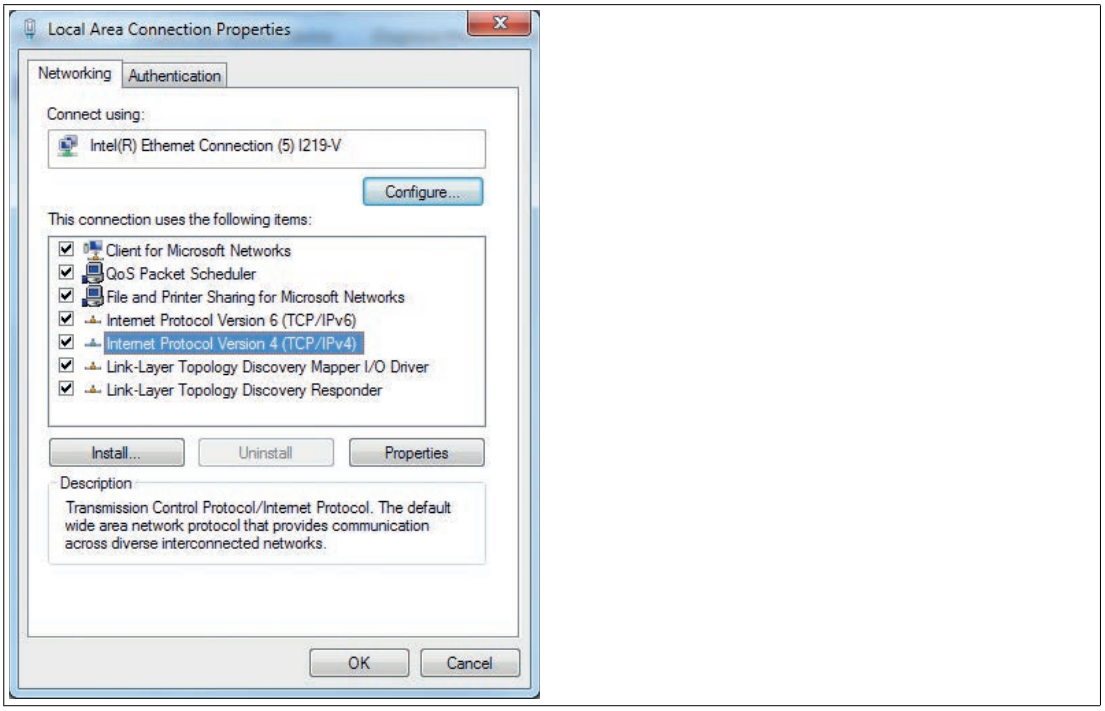


4. Select the requiredconnection and right-click on your selection. In the selection window, select **Properties**.

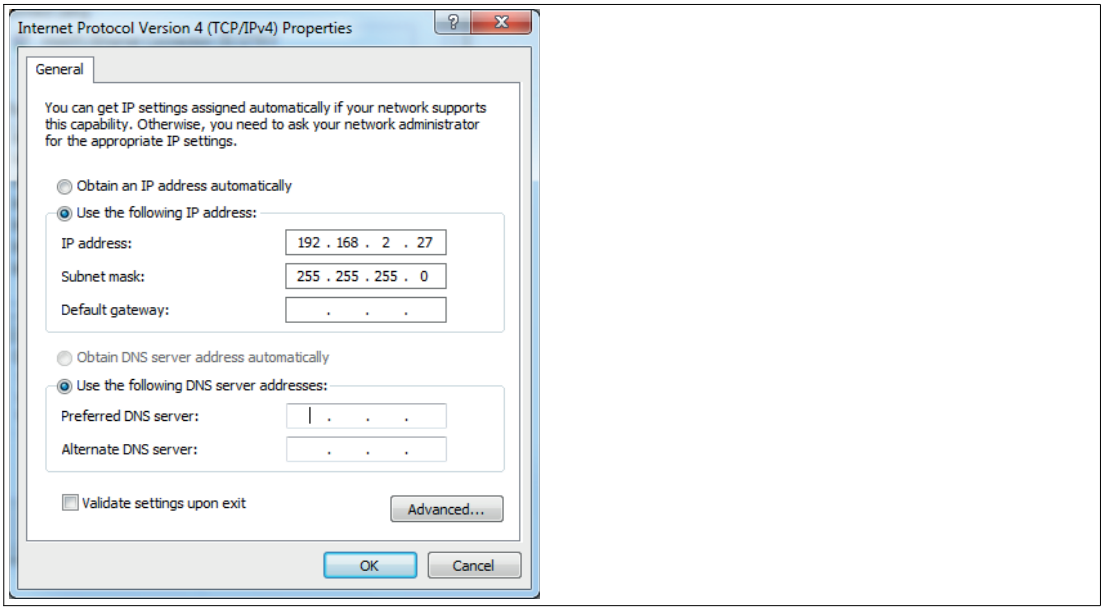


5. Double-click **"Internet Protocol Version 4 (TCP/IPv4)."**

2025-10



↳ 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 IP address of the sensor, but only the firstthree segments of the IP address. The last segment must be different from the IP address of the sensor.
9. In this example, enter the following IP address and subnet mask:
   - **IP address: 192.168.2.27**
   - **Subnet mask: 255.255.255.0**
10. Click **OK** and click **Cancel** in the next dialog.

    ↳ This completes the network configuration so that the device can be used.

Note

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

3.6 Access Protection

To establish communication with the sensor, the desired access protection must be specified once.

Note

After the access protection is selected, it can only be subsequently changed by completely resetting the sensor.see chapter 6.2.4

Access Protection Options

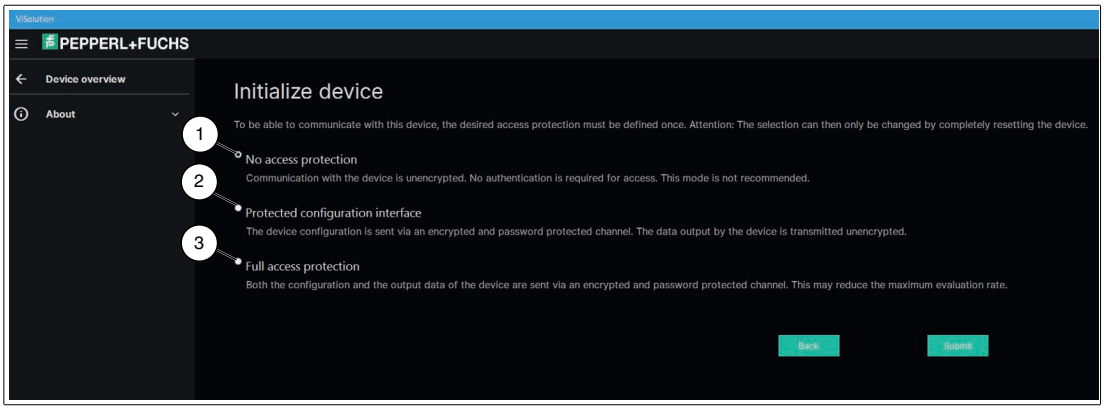


Figure 3.1

1. No access protection
   - Communication with the sensor is unencrypted.
   - No authentication is required for access.
   - **Recommendation**: This setting is not recommended for safety reasons.
2. Protected configuration interface
   - The sensor configuration is transmitted via an encrypted and password-protected channel.
   - The data output by the sensor is transmitted unencrypted.
3. Full access protection
   - Both the configuration and the output data of the sensor are sent via an encrypted and password-protected channel.
   - **Note**: This option can reduce the maximum evaluation rate.

Setting Up Access Protection

The login information must be defined before setting up the access protection. This will be used to log in to the sensor in the future.

- **Username**: The username is set to "**admin**" and cannot be changed.
- **Password**: The user sets their own password.

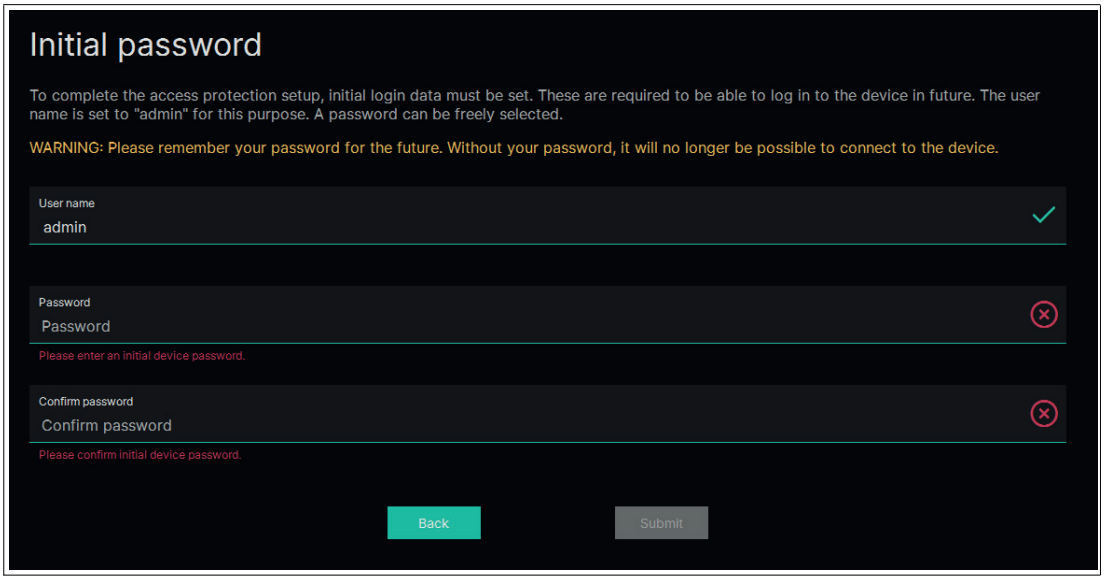


Figure 3.2

Note

Please make a note of the password and keep it in a safe place. The sensor cannot be accessed without the password.

4 Commissioning

Overview of the commissioning steps:

1. Mount the sensor, see chapter 3.3
2. Establish the electrical connection, see chapter 3.4
3. Set up Windows network communication between the sensor and a PC/laptop, see chapter 3.5
4. Configure the sensor using the ViSolution configuration software, see chapter 6

2025-10

5 Configuration

5.1 Parameters (Features)

Before the sensor can be used in the system, it must be parameterized. The features (parameters) used for the sensor are listed below. The GenICam™ standard uses the term "feature" as the common term for parameters.

The "read (r)/write (w)" column indicates whether the feature is readable ("r"), writable ("w"), or both ("r/w").

AcquisitionControl

Provides features associated with image capture, trigger control, and exposure control. This includes:

Feature Name	Data Type	read(r)/ write(w)	Value		enum Values/ Default String Value	SFNC 2.6	Description
			Min	Max			
Trigger Enabled	bool	r/w	-	-	-	-	-
AutoTrigger-FrameRate	float	r/w	-	-	-	5.5.6	Controls the capture rate (in hertz) at which the images are captured. Frame rate in Hz (Autotrigger)
Exposure-Time	float	r/w	10	10,000	-	5.7.4	Specifies the exposure time (in ms)
TriggerSoft-ware	command	-/w	-	-	-	5.6.3	Generates an internal trigger.
Trigger-Source	enum	r/w	-	-	Software, Hard-ware, AutoTrig-ger	5.6.4	Specifies the internal signal or physical input line to be used as the trigger source.
TriggerActi-vation	enum	r/w	-	-	RisingEdge	5.6.5	Specifies the trigger activation mode.
OutputMode	enum	r/w	-	-	DisparityC, CalibratedAB-C_Grid, Lef-tRaw, RightRaw, Lef-tRectified, RightRectified, StereoRaw, StereoRecti-fied, Disparity-CAndRaw, DisparityCAn-dRectified	21.4.7	Specifies the content for the output data

Stereo proprietaryparameters

Contains features related to control and to general information about the sensor. These are used to identify the sensor during the enumeration process and to obtain information about the sensor resolution. Additional information and controls that affect the general status of the sensor are also included in this category.

Feature Name	Data Type	read(r)/ write(w)	Value		enum Values/ Default String Value	SFNC 2.6	Description
			Min	Max			
SGBMPenalty1	int	r/w	0	31	-	-	Tuning parameter (effort to smooth a disparity jump of 1 in the output)
SGBMPenalty2	int	r/w	0	31	-	-	Tuning parameter (effort to smooth a disparity jump of more than 1 in the output)
SGBMUnique-ness	int	r/w	0	100	-	-	Tuning parameter (maximum relative effort for the best disparity compared to the second best disparity, in percent)
SGBMEnable-Median	bool	r/w	0	1	-	-	Allows media filtering of the output disparity card
Illumination	enum	r/w	-	-	Projector, None, Onboard	-	Light source to be used
Gain	int	r/w	0	480	-	-	Amplification of light sensitivity in 1/10 dB

5.2 VsxProtocolDriver

General

The **VsxProtocolDriver** is used to facilitate creating a graphical user interface for sensors that use the VSX protocol. It handles connection to and communication with the sensor and provides related functions, for example, for setting, querying, or saving parameters. It can also receive sensor data, such as images.

The driver is implemented in C#.

Documentation is automatically generated for the driver, which is included in the Driver-Package.

6 Operation with ViSolution

The **ViSolution** software can be used to configure sensor parameters, evaluate measurement results, and visualize recordings. The software is also very helpful when mounting the sensor, for adjusting camera parameters such as the exposure time.

The user interface offers various options for displaying the measurement results and image data. You can also save measurement result to a file for later use. You can change the settings for the sensor and immediately see how the changes affect the measurement result. The user interface is therefore useful for determining the best parameter settings for a particular application.

After the sensor has been set up to provide measurement data, the settings can be saved to a parameter file on the PC.

To do this, you must have the **ViSolution** configuration software installed on your PC/laptop. This configuration software for a PC/laptop can be downloaded free of charge from www.pepperl-fuchs.com.

6.1 Establishing a Connection to the Sensor

After starting the ViSolution software, the following "Device overview" window is displayed:

Device Overview

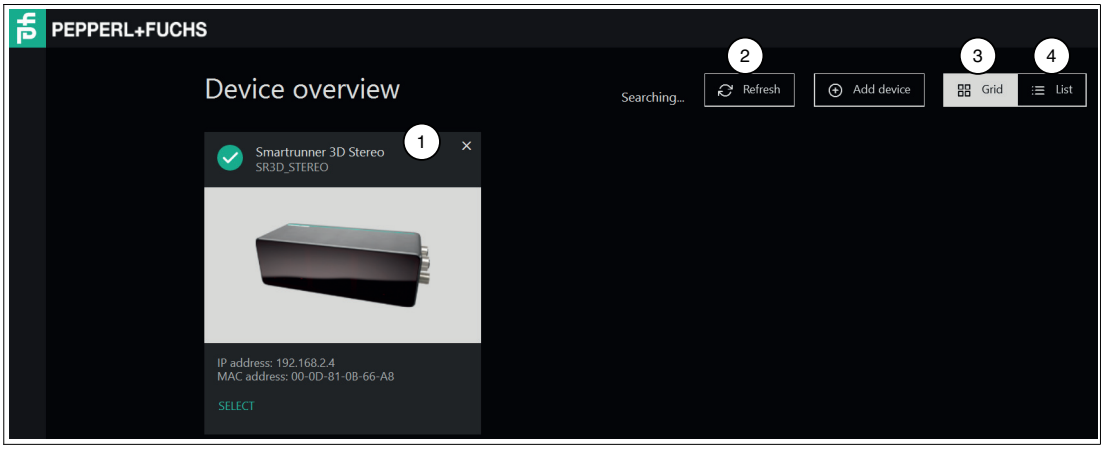


Figure 6.1 Device overview

Position	Designation	Function
1	Device overview	All identified sensors are displayed here. You will also receive information about the sensor. • Name of the sensor • Sensor type • IP address of the sensor • MAC address of the sensor SELECT is highlighted in green for sensors to which a connection can be established; if no connection can be established, SELECT is grayed out. If the list contains multiple sensors, you can use the SELECT button to select the sensor that you wish to connect to.
2	Refresh	You can use the "Refresh" button to start a sensor search.

Position	Designation	Function
3	Grid	You can use the "Grid" button to change the way the sensors found are displayed. If you select "Grid," the sensors found are displayed as tiles.
4	List	You can use the "List" button to change the way the sensors found are displayed. If you select "List," the sensors found are displayed in a list.

Selecting a Sensor

1. Click the button highlighted in green SELECT for the sensor that has been found.

   ↳ A connection to the sensor is established. The main screen of the software opens.

   If your sensor is not recognized in the device overview, connectyour sensor as follows:

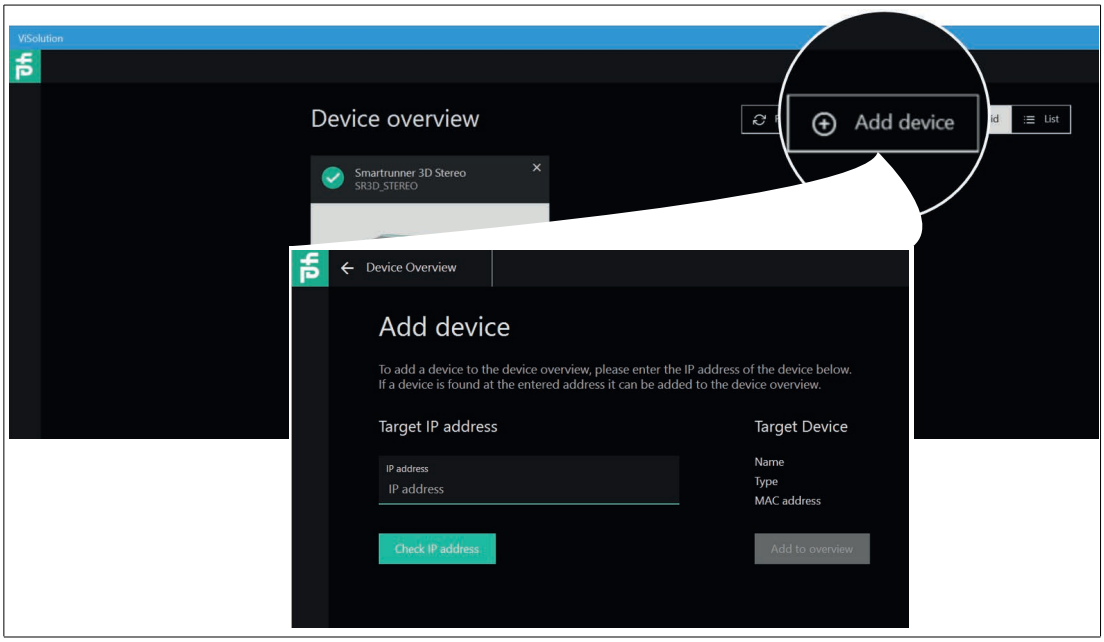


Figure 6.2 Device overview

Finding a Sensor

This function can be used to search for connected sensors. Proceed as follows:

1. Ensure that the sensor and the PC/laptop are ready for operation and that there is an Ethernet connection.
2. Click the "Add device" button to search for sensors.

   ↳ The "Add device" input window opens.

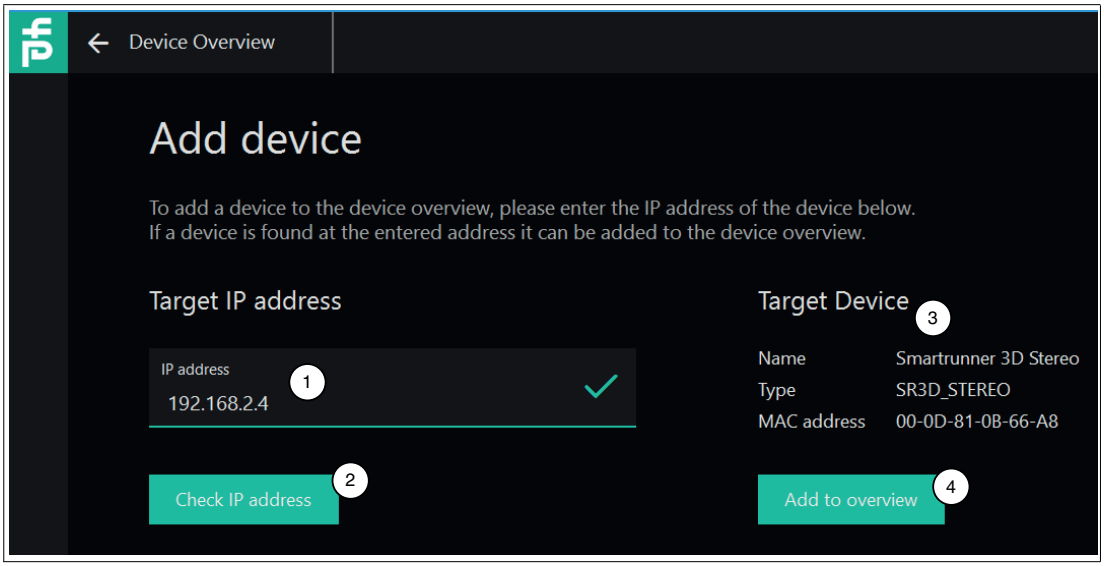


Figure 6.3 Entering the IP address

3. Enter the IP address of your sensor in the "Target IP address" input field (1). The default IP address of the sensor can be found on the device.
4. Click the "Check IP address" button (2) to search for the device with the entered IP address.

   ↳ A green check mark in the search field indicates that the device with the entered IP address has been found. In addition, the following information on the sensor is displayed under "Target Device" (3):
   - Name of the sensor
   - Sensor type
   - MAC address
5. Click the "Add to overview" button (4).

   ↳ The sensor is displayed on the overview screen (see "Device Overview" on page 23) of all sensors found.

Note

If no sensor is detected:

- Check that the sensor is connected properly and ready for operation. See chapter 3.4, .
- Check that Windows network communication is set up correctly between the device and the PC/laptop; see chapter 3.5.

6.2 ViSolution Main Screen

The basic ViSolution functions can be selected on the main screen.

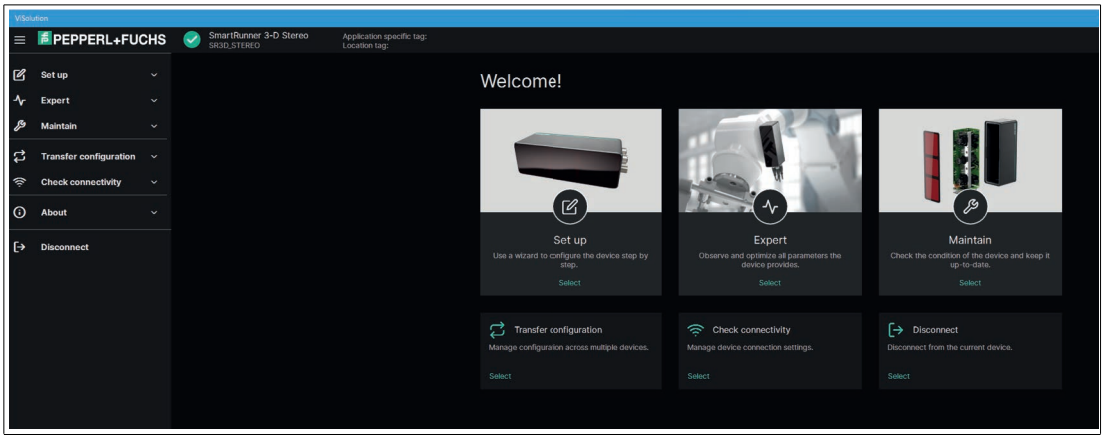


Figure 6.4 Main screen

Basic functions on the main screen:

Designation	Description
Set Up	Manage and configure the sensor and applications. See chapter 6.2.2.
Expert	Monitor and optimize the performance of the device during operation. See chapter 6.2.3.
Maintain	You can use the Maintain function to check the status of the sensor and keep it up to date. See chapter 6.2.4.
Transfer Configuration	Manage configurations across multiple sensors. See chapter 6.2.5.
Check Connectivity	Use this menu to manage connections to the network and display connection data. See chapter 6.2.6.
Disconnect	Use "Disconnect" to exit the user interface and access the device overview screen. See chapter 6.2.7.

6.2.1 User Interface

The ViSolution user interface is structured as follows:

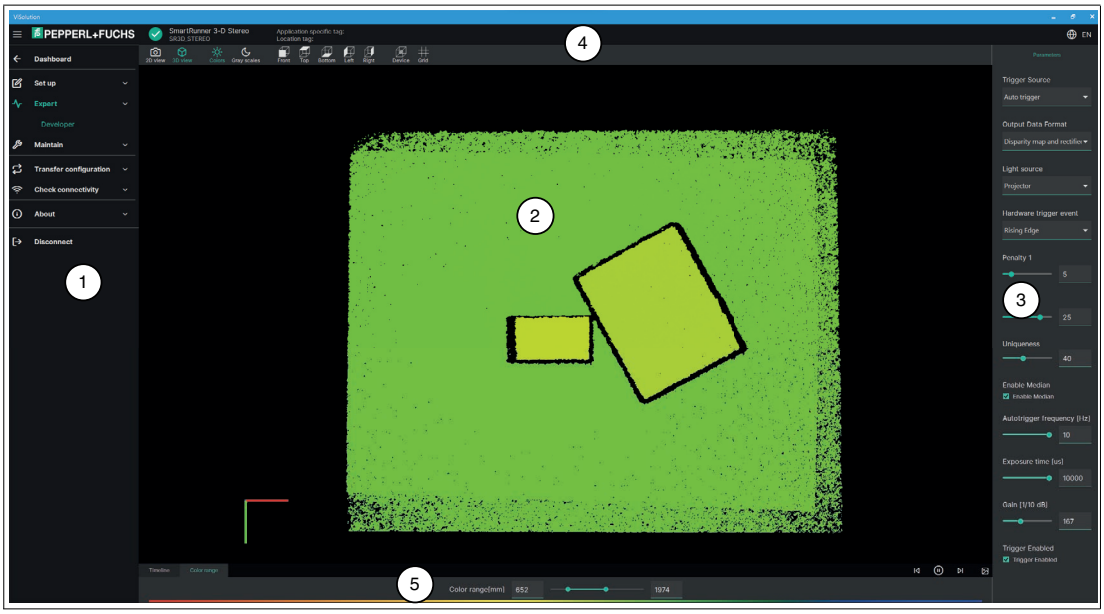


Figure 6.5 Structure of the user interface

Item	Designation	Function
1	Menu bar	Use the menu bar to access the sensing modes.
2	Main area	The image data can be displayed in the main area.
3	Configuration window	The sensor-specific parameters for the sensor can be set in this area.
4	Navigation bar	The desired option can be selected from the navigation bar.
5	Information bar and controls	The information bar provides information about the captured scene. In addition, other controls are available for visualizing the captured scene.

Controls in the Navigation Bar

Different controls are displayed in the navigation bar depending on whether "Camera" or "Data" is selected.

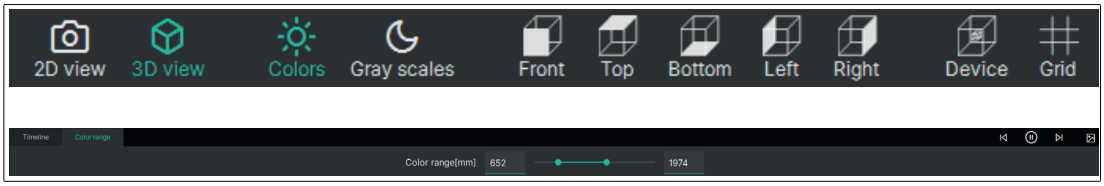
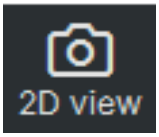
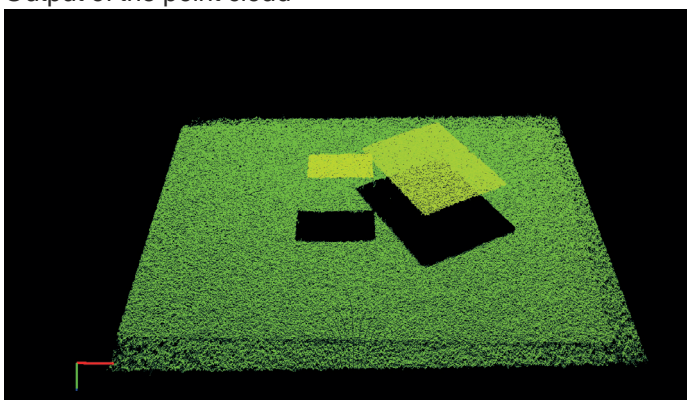
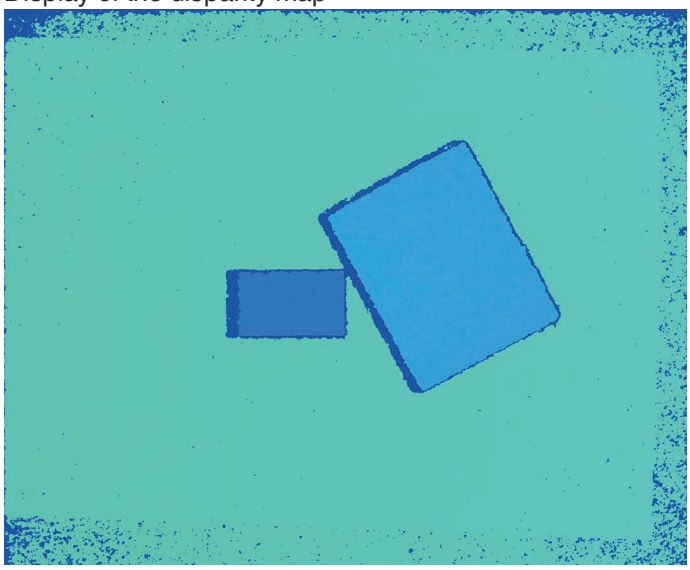
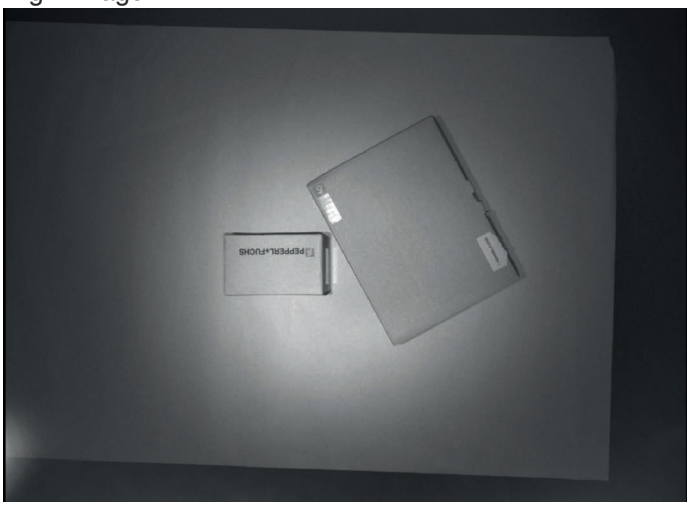
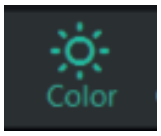
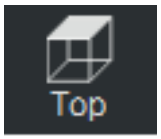
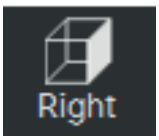
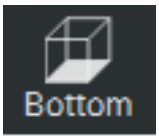
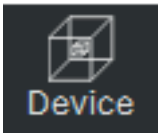


Figure 6.6 Navigation bar

Controls

Control	Designation	Function
	2D view	Switch to camera. Raw images, disparity images, or camera images illuminated with area lighting can be displayed here.
	3D view	Output of the point cloud 
	Disparity	Display of the disparity map 

Control	Designation	Function
	Left	Left image 
	Right	Right image 
	Color	The disparity map and the generated point cloud can be displayed either in grayscale or in color.
	Gray	Switch from color image to grayscale.
	Front	3-D orientation: Front view
	Top	3-D orientation: Top view

Control	Designation	Function
	Left	3-D orientation: Side view (left)
	Right	3-D orientation: Side view (right)
	Bottom	3-D orientation: Bottom view
	Device	Show or hide sensor in 3-D view
	Grid	Show or hide coordinate system

Information Bar + Controls

Timeline

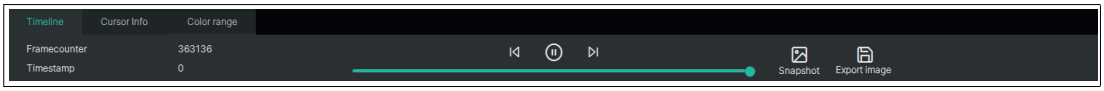
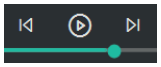
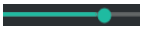
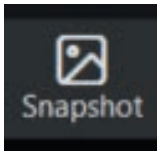
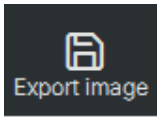


Figure 6.7

Control		Designation	Function
Framecounter		Framecounter	Displays all captured images
Timestamp		Timestamp	Counts all captured images from a specific time
 Playback option		Start	Previously recorded process data can be played back with this function
		Stop	Stop recording
		Forward	Fast-forward the recording
		Back	Rewind the recording
		Progress bar	The progress bar indicates the current position in the recording. Clicking on a position in the progress bar will resume playback from the corresponding image.
		Snapshot	Single image capture when the sensor is in the "Pause" position.
		Export image	Export image.

Color range

The slider bar can be used to manually adjust the color range of the display. This will not cause the results of the application to change.

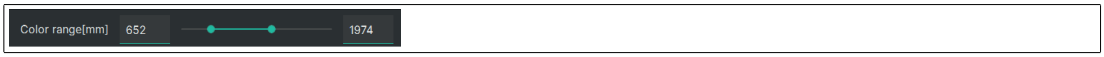


Figure 6.8

Control	Designation	Function
Color range [mm]	Color range	The shade depends on the measured distance of the point and the color scale setting. Red (black for grayscale): z coordinate value ≤ minimum of the set color scale. Blue (white for grayscale): z coordinate value ≥ maximum of the set color scale.

6.2.2 Set Up

The "Set Up" menu allows you to set up and manage the sensor and its parameters.

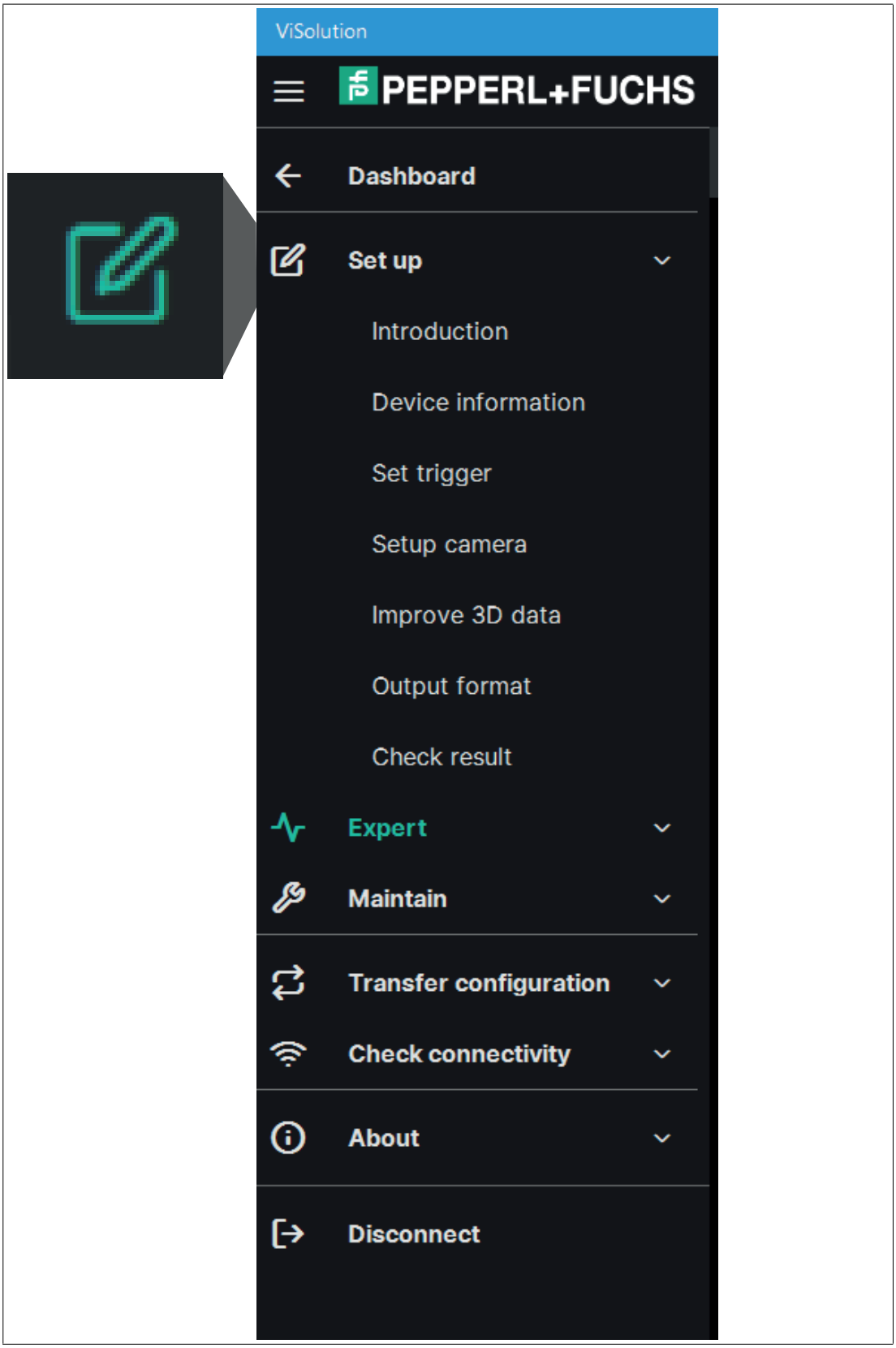


Figure 6.9 Set Up

Introduction

In the Introduction section, you will be asked whether the application should be started with the default parameters or with the most recently used current parameters.

Device Information

Use "Set up" > "Device Information" to access the "Device Information" window. A preview image of the camera shot and basic information about the sensor are displayed.

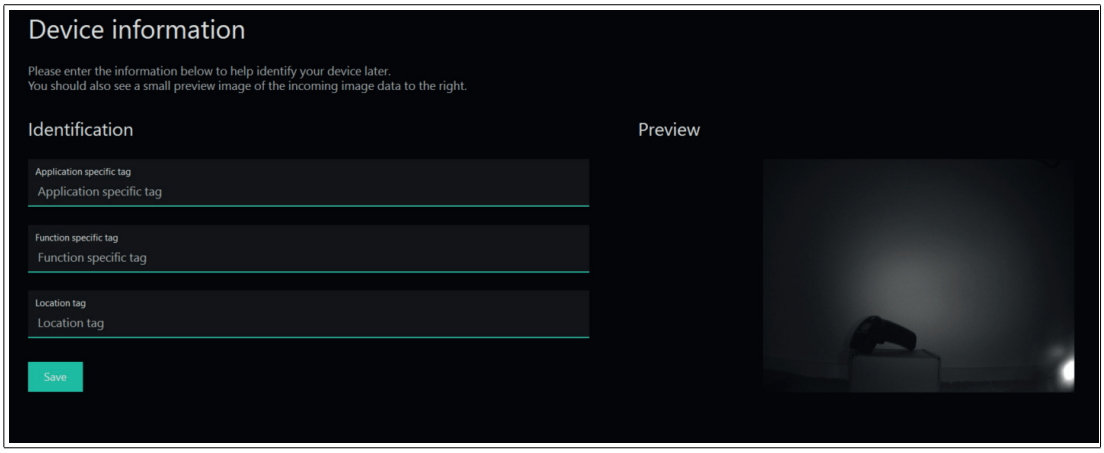


Figure 6.10 Device information

Enter the following information to identify your sensor at a later time. Make sure that the preview of the incoming image data appears on the right.

Information	Description
Application specifictag	Application-specific tag
Functionspecifictag	Function-specific tag
Locationtag	Location tag
Preview	A live preview of the camera shot is displayed in the right window range.

Set Trigger

Use "Set Up" > "Set Trigger" to access "Set Trigger." The trigger signal starts an event. It triggers the capture and evaluation of images. The trigger mode and trigger frequency can be set in the user interface, under "Set Trigger" in the configuration window.

There are different ways to trigger object detection by the camera. An external signal can be used to trigger the recording. The camera can also be configured to capture objects at regular intervals without any external trigger signal.

The sensor distinguishes between different trigger sources:



Figure 6.11 Trigger sources

Trigger source

Option	Description
Auto trigger	The sensor captures images at a preset frequency.
Hardware trigger	External trigger via hardware input "IN Trigger."
Software trigger	The sensor is triggered via the process interface.

Additional options are available via the advanced settings:

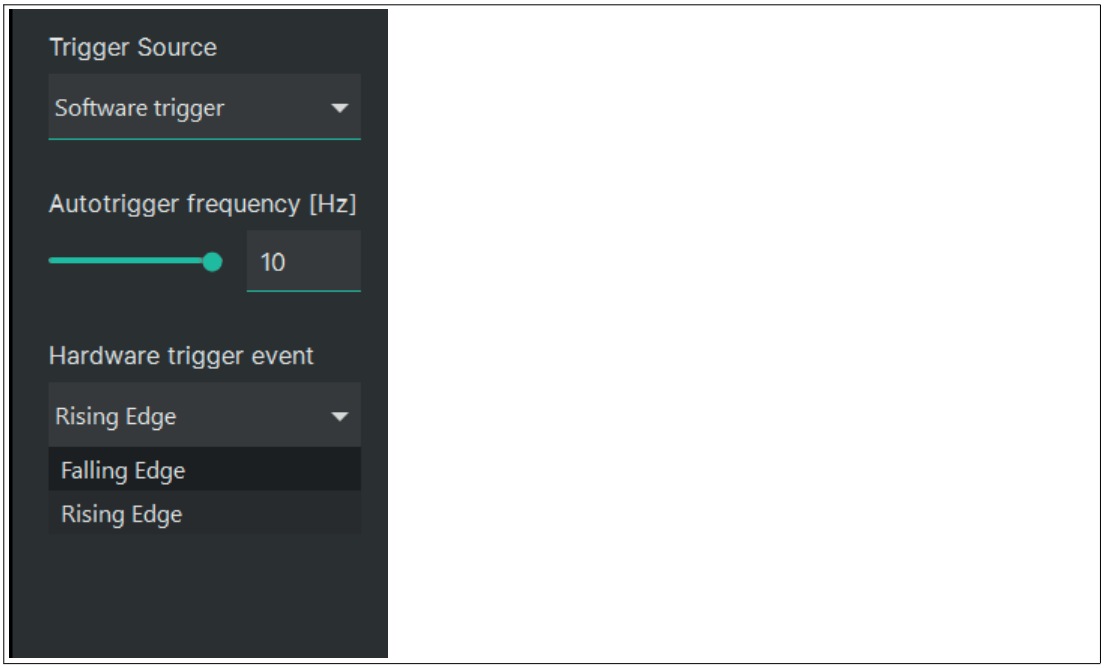


Figure 6.12 Advanced settings

Advanced Settings

Option		Description
Auto trigger frequency [Hz]		If "Auto trigger" is selected as the trigger source, the frame rate can be set in Hz. The "Auto trigger frequency" slider can be used to change the frame rate or the rate can be entered in the display window. The maximum frame rate that can be set is 10 Hz.
Hardware trigger event	Falling Edge	The sensor is triggered by hardware via the rising edge of an input signal.
	Rising Edge	The sensor is triggered by hardware via the falling edge of an input signal.

Improve 3-D Data

Use "Set Up" > "Improve 3-D Data" to access the "Improve Data" window.

Camera Settings

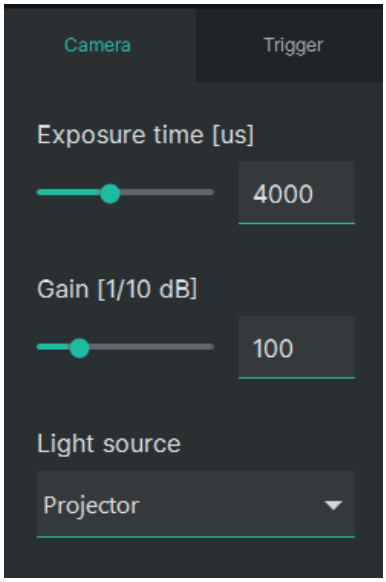


Figure 6.13

Option	Description
Exposure time in µs	Exposure times are displayed in µs. The value for the exposure time can be adjusted using the slider or entered in the display window.
Gain	The gain is used if the image is too dark and if the exposure time cannot be increased further because the object is moving. To increase the image brightness and contrast, the pixel values read out are amplified in a similar manner. The gain is expressed in decibels [1/10 dB]. The higher the gain, the more image noise is present.

Option		Description
Light source	None	No additional active lighting is used. The sensor works only using the ambient light.
	Onboard	The sensor uses the internal illumination unit. This is especially suitable when evaluating monochrome 2-D images. 
	Projector	The sensor uses a structured light projector that facilitates the generation of 3-D data. 

3-D Data Optimization

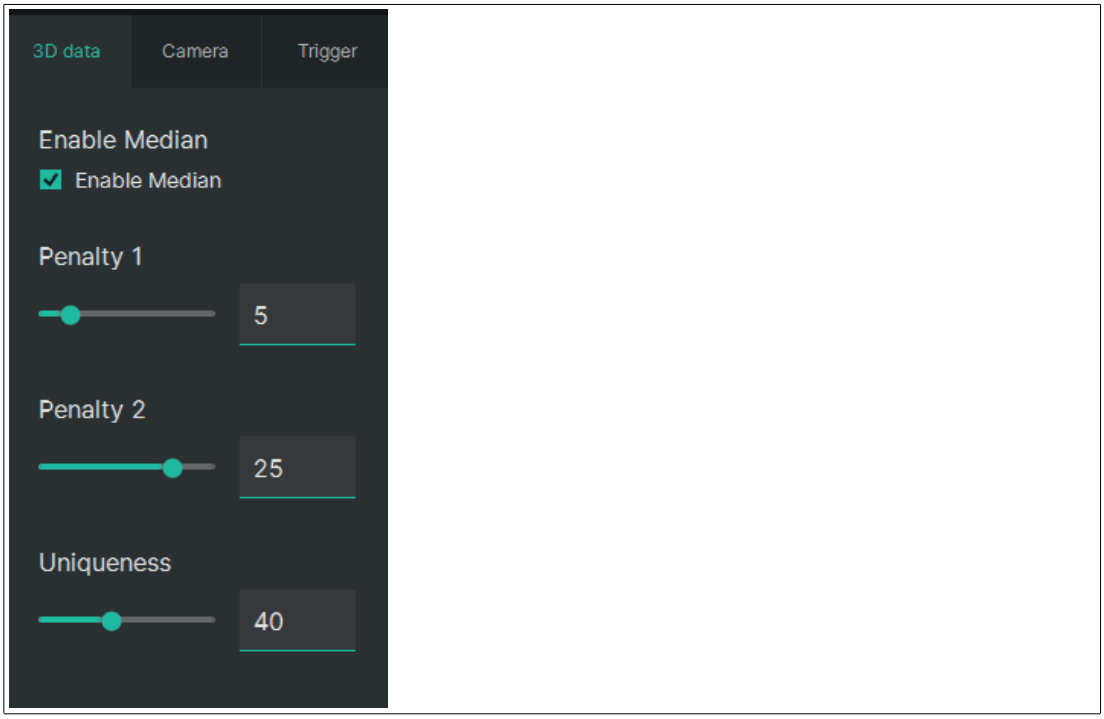


Figure 6.14

Option	Description
Enable Median	Point cloud is smoothed by a median filter.
Penalty 1	Tuning parameter (effort to smooth a disparity jump of 1 in the output)
Penalty 2	Tuning parameter (effort to smooth a disparity jump of more than 1 in the output)
Uniqueness	Tuning parameter (maximum relative effort for the best disparity compared to the second best disparity, in percent)

Output Format

Use "Set Up" > "Output format" to access the "Output Data Format" window.

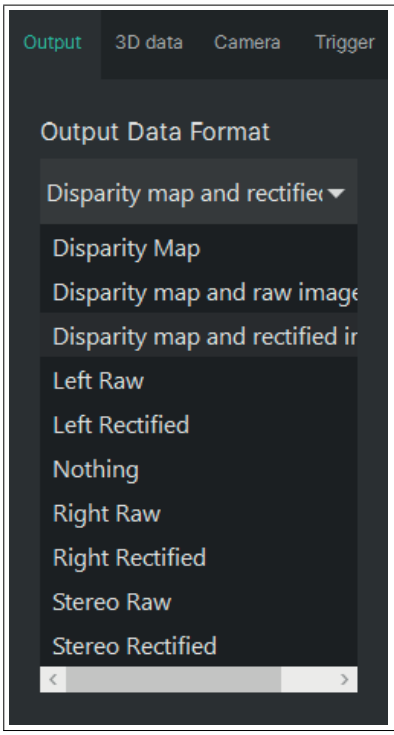


Figure 6.15

Output Data Format

Output Data Format	Description
Disparity Map	Disparity map
Disparitymap and rawimages	Disparity map and raw images
Disparitymap and rectifiedimages	Disparity map and rectified (corrected) raw images
LeftRaw	Left camera raw image
LeftRectified	Left camera rectified image
Nothing	Nothing
RightRaw	Right camera raw image
RightRectified	Right camera rectified image
Stereo Raw	Right and left raw image
Stereo Rectified	Right and left raw image

Check Result

Use "Set Up" > "Check result" to access the "Check result" window. In this window, all previously set parameters are clearly summarized and displayed for checking.

6.2.3 Expert

The "Expert" menu is available in Expert mode. It can be used to monitor the performance data of the sensor in real time during operation and optimize this data in a targeted manner if necessary.

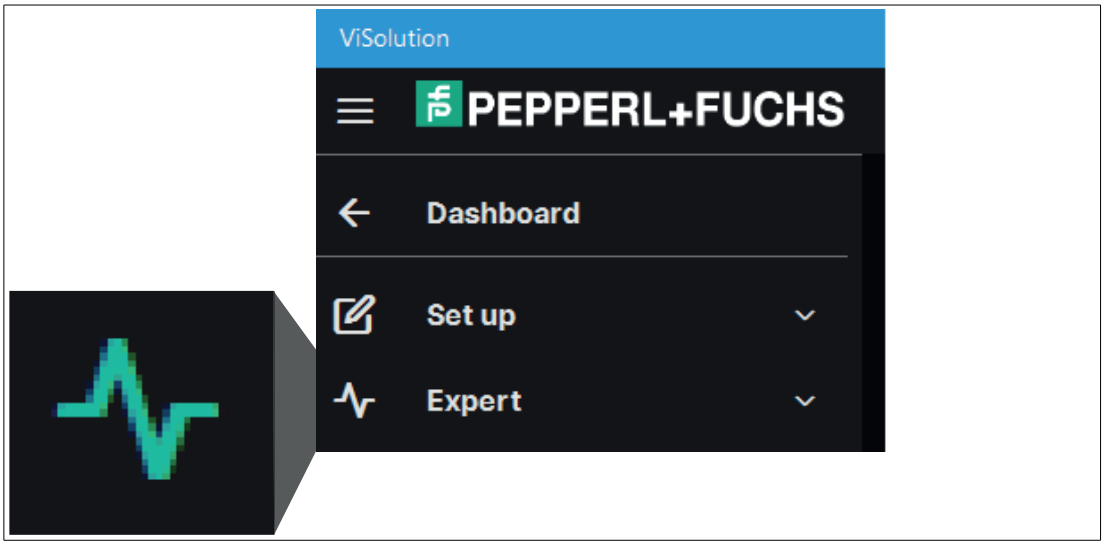


Figure 6.16

6.2.4 Maintain

The Maintain function can be used to check the status of the sensor and keep the device functionality up to date.

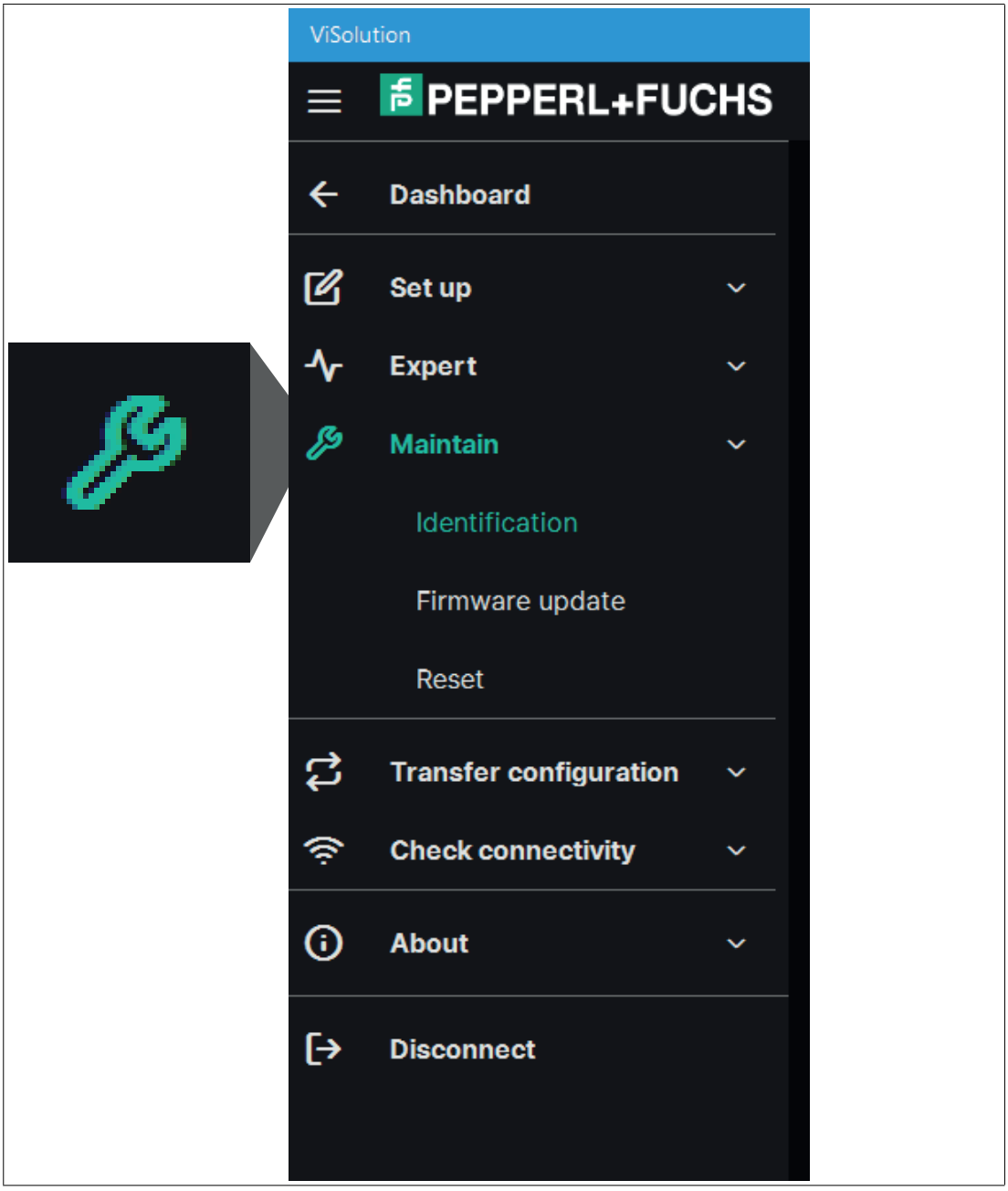


Figure 6.17 Maintain

Identification

Use "Maintain" > "Identification" to access the "Identification" window.

Information	Description
Application specifictag	Application-specific tag
Functionspecifictag	Function-specific tag
Locationtag	Location tag

Identification parameters

ID card	Description
VendorName	Manufacturer
VendorURL	Manufacturer's URL
ProductName	Product name
PartNumber	Product number
ProductClass	Product class
SerialNumber	Serial number
FirmwareVersion	Firmware version
HardwareVersion	Hardware version
ProtocolStackRevision	Protocol stack revision
UniqueProductID	Unique product ID

Firmware Update

Use "Maintain" > "Firmware update" to access the "Firmware Update" screen.

Updating Firmware

To update the firmware on your device, proceed as follows:

1. Select a valid update file.
2. Start the update process.

↳ The selected file is uploaded to the sensor. Once it is uploaded, the update will start automatically.

Note

The update process may take a few minutes. Do not switch off the sensor during this time.

Reset

In the reset menu, the sensor settings can be reset to the factory defaults. Two options are available for this purpose, each of which is executed via its own button:

Parameter Reset

- Resets only the sensor settings (parameters).
- Security-relevant settings such as encryption and password protection remain unchanged.
- The process is started by clicking on the "Reset parameters" button (1).

Factory Reset

- Fully resets the sensor to the delivery state.

2025-10

- In addition to the sensor settings, all security configurations (e.g., encryption and password protection) are also deleted.
- All settings must be re-initialized after a factory reset.
- The process is started by clicking on the "Factory reset" button (2).

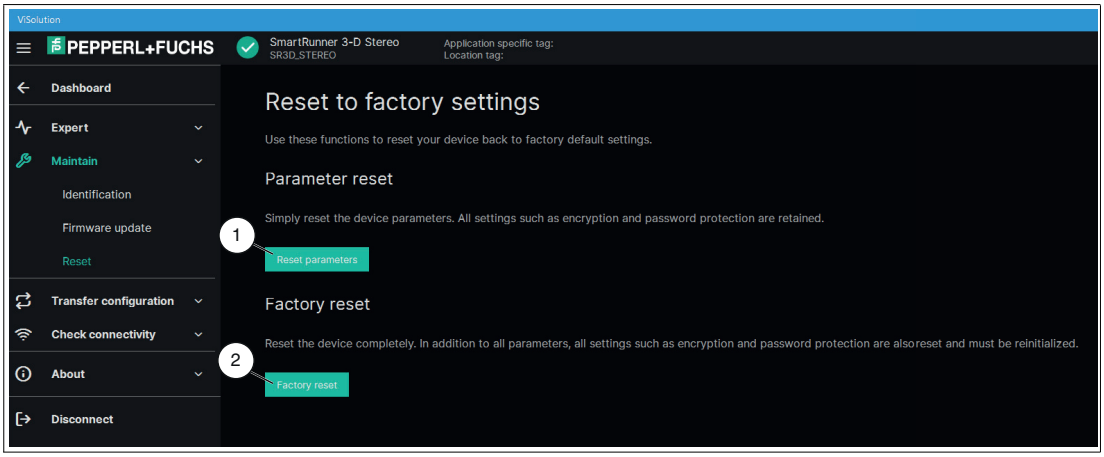


Figure 6.18

6.2.5 Transfer Configuration

The "Transfer Configuration" menu allows you to manage configurations across multiple sensors. This menu is not available in the current software version.

6.2.6 Check Connectivity

Manage connections to the network.

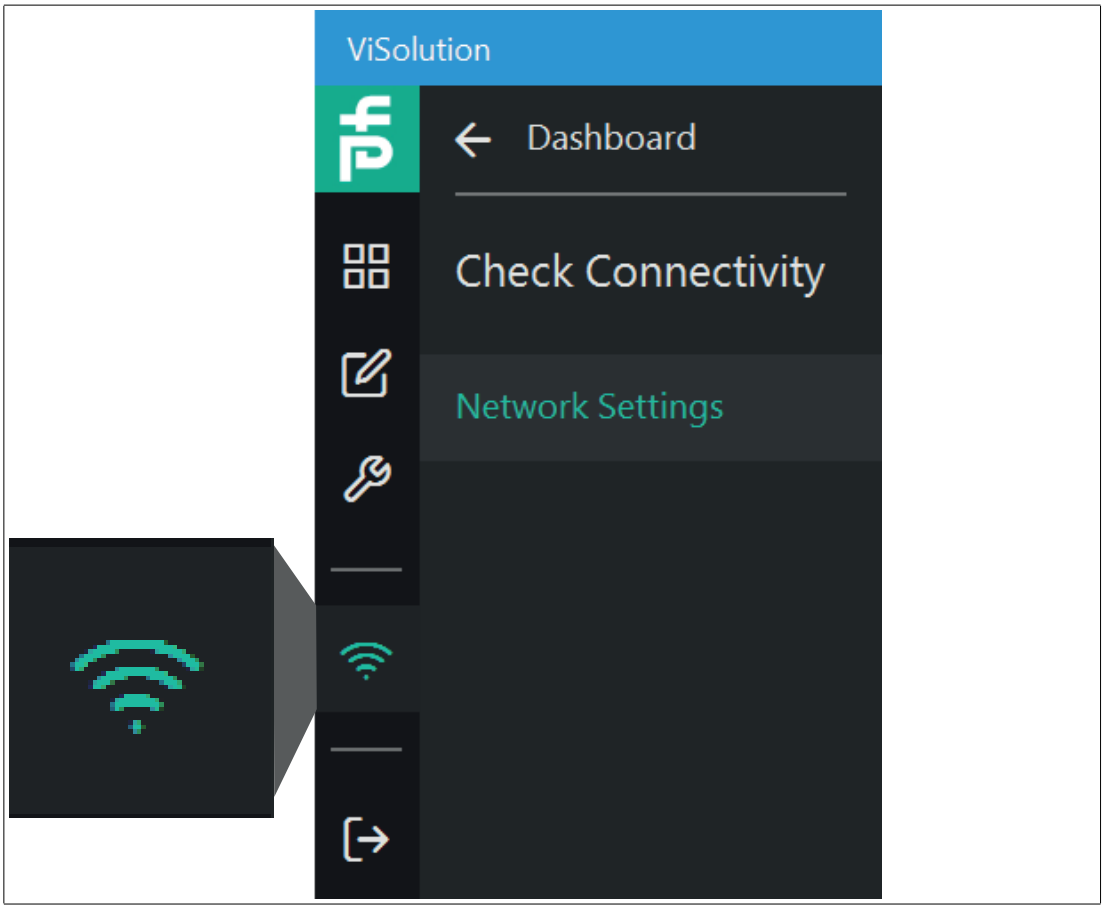


Figure 6.19 Check Connectivity

Link to chapter

Function	Link
Network Settings	See chapter 6.2.6.1.

6.2.6.1 Network Settings

Use "Check Connectivity" > "Network Settings" to access the "Network Settings" window.

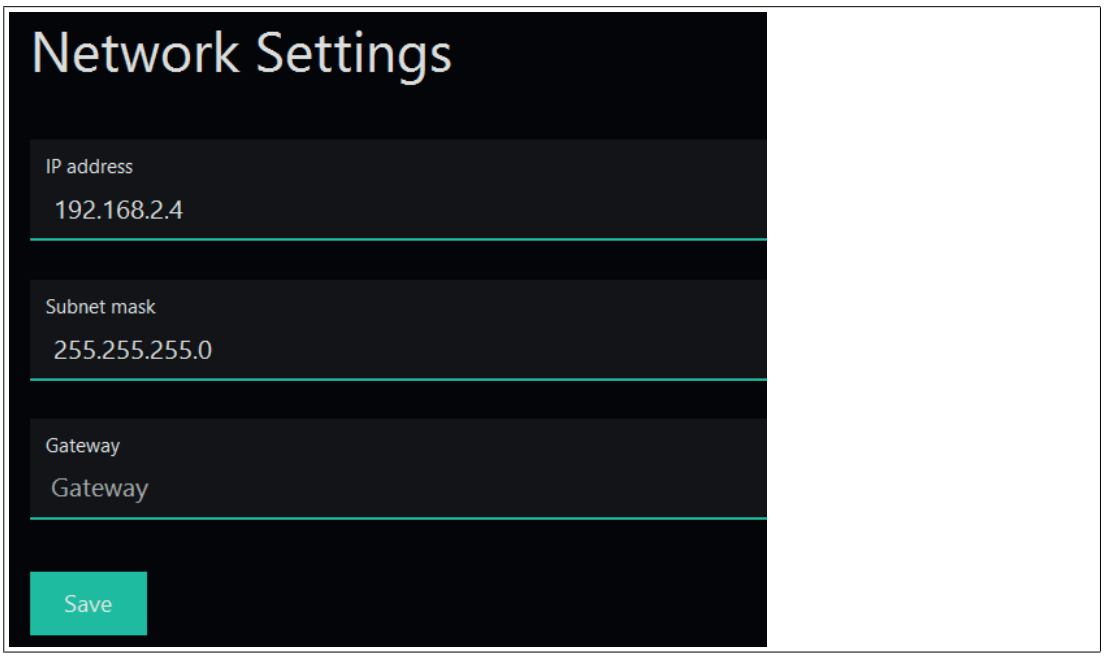


Figure 6.20 Network settings

Information	Description
IP address	IP address setting
Subnet mask	Subnet mask setting
Gateway	Gateway setting

6.2.7 Logout

Use "Logout" to exit the user interface and access the device overview screen (see "Device Overview" on page 23).

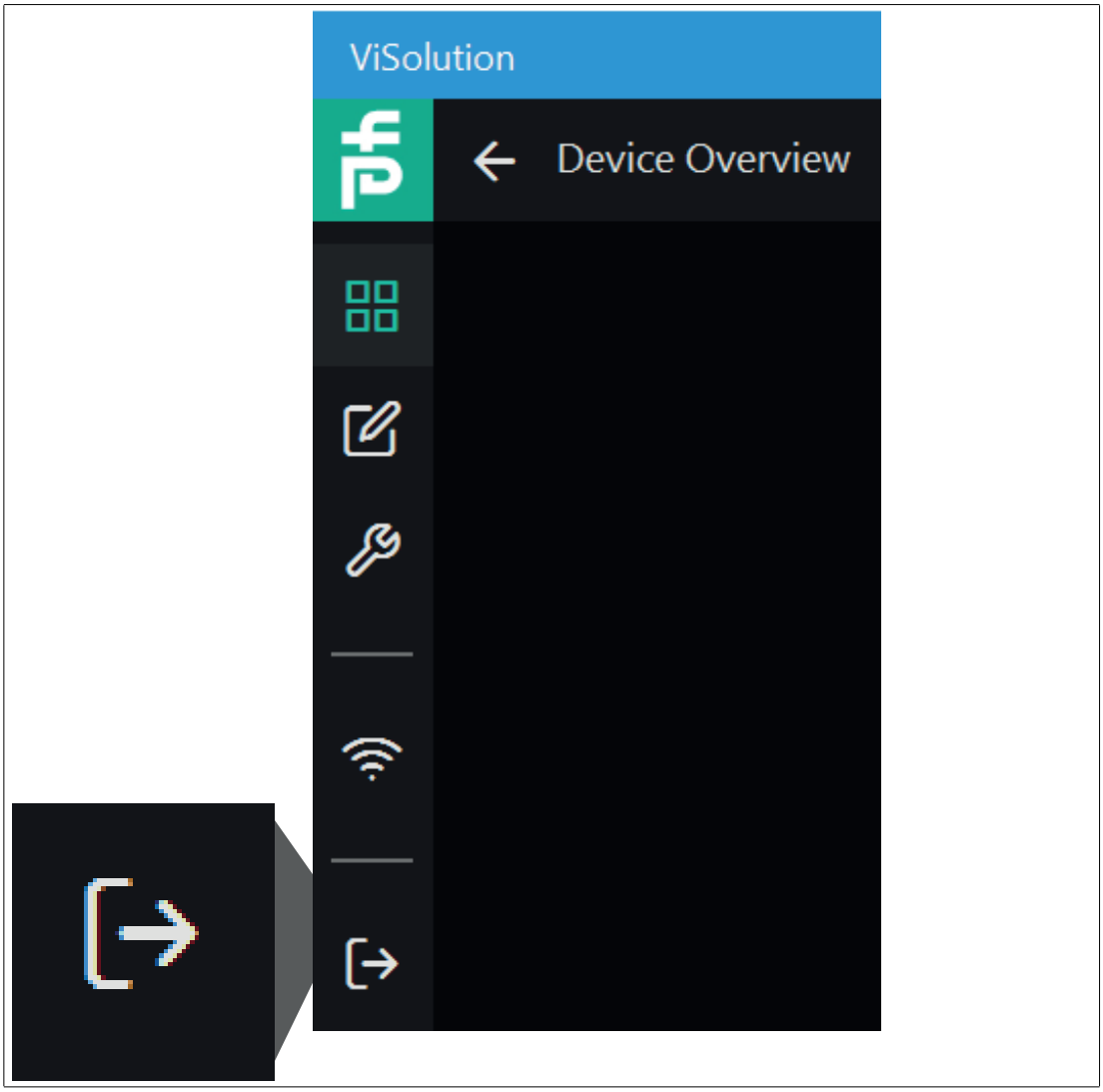


Figure 6.21 Logout

7 Maintenance and Repair

7.1 Servicing



Danger!

Danger to life due to electrical current!

Contact with live parts causes immediate danger to life.

- Allow only qualified electricians to carry out work on the electrical installation.
- Switch off the power supply before carrying out servicing, cleaning, and repairs, and prevent the supply from being switched on again.
- Keep the live parts free from moisture.

The device is maintenance-free. To get the best possible performance out of your device, keep the optical unit on the device clean, and clean it when necessary.

Observe the following instructions when cleaning:

- Do not touch the optical unit with your fingers.
- Do not immerse the device in water. Do not spray the device with water or other liquids.
- Do not use abrasive agents to clean the surface of the device.
- Use a cotton or paper cloth moistened (not soaked) with water or isopropyl alcohol.
- Remove any residual alcohol using a cotton or paper cloth moistened (not soaked) with distilled water.
- Wipe the device surfaces dry using a lint-free cloth.

7.2 Repair

The device must not be repaired, changed, or manipulated. In case of failure, always replace the device with an original device.

8 Troubleshooting

8.1 What to Do in Case of a Fault

Before you have the device repaired, perform the following actions:

- Test the system according to the checklist below.
- Contact our service centerto pinpoint the problem.

Checklist

Fault	Cause	Remedy
"PWR" LED does not light up	The power supply is switched off	Check whether there is a reason why the power supply is switched off (installationor maintenance work, etc.). Switch on the power supply if necessary.
	Wiring error, cable break	Check the wiring carefully and repair any faults with the wiring. Check the cables to ensure that they are functioning properly. See chapter 3.4.
Control panel receiving no measurement data	Connection cable not connected	Connect the connection cable.
	Incorrect connection cable used	Use the appropriate connection cable only. See chapter 2.6.
	Sensor incorrectly parameterized	Make sure that you have set the correct parameterization. See chapter 6.
Test object not detected	Incorrect operating distance	Set the operating distance;
	Front panel dirty	Clean the front panel. See chapter 7.1.
	Reflections	Avoid reflections.
	Foreign exposure	Avoid foreign exposure.
Measurement errors	Test object outside the sensing range	Betterpositioning of the test object.
	Incorrect distance to the test object	Observe the distance values;
	Housing incorrectly mounted	Mount the housing correctly;
No connection to the sensor	Alternating-current voltage or supply voltage too high	Connect the sensor to direct-current voltage (DC) only. Ensure that the supply voltage level is within the specified sensor range.
	Network settings	Set up Windows network communication between the sensor and a PC/laptop; see chapter 3.5
		Due to the large amount of datasupplied by the sensor per second,thesensor(s) must be connected to the PC via a Gigabit Ethernet network.

- If none of the above remedies the problem, please contact ourservice center. Please have the error images and the firmware version number available. The firmware version number can be found at the top right of the user interface.

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- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

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