SmartRunner Explorer

Light Section Sensor for High-Precision Profile Capture

Manual

Your automation, our passion.

PEPPERL+FUCHS

Worldwide

Pepperl+Fuchs Group

Lilienthalstr. 200

68307 Mannheim

Germany

Phone: +49 621 776 - 0

E-mail: info@de.pepperl-fuchs.com

North American Headquarters

Pepperl+Fuchs Inc.

1600 Enterprise Parkway

Twinsburg, Ohio 44087

USA

Phone: +1 330 425-3555

E-mail: sales@us.pepperl-fuchs.com

Asia Headquarters

Pepperl+Fuchs Pte. Ltd.

P+F Building

18 Ayer Rajah Crescent

Singapore 139942

Phone: +65 6779-9091

E-mail: sales@sg.pepperl-fuchs.com

https://www.pepperl-fuchs.com

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.

The documentation comprises the following parts:

- This document
- Datasheet

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

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

1.2 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.

Action

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

2 Product Specifications

2.1 Use and Application

This manual applies to SmartRunner Explorer light section sensors (hereinafter referred to as "Sensors"). The sensor is based on SmartRunner technology and combines the light section method for detecting height profiles with a 2-D vision sensor. Based on this unique technology, the sensor is able to output both the height profile in global coordinates and 2-D flat images.

A transmitter optic is used to project a laser line onto an object as part of the light section method. This is detected by a camera at a specific angle. A height profile is determined using the triangulation principle. This can be output via the Ethernet-TCP/IP interface and conveniently integrated into the relevant program via the programming interface supplied.

SmartRunner Explorer consequently allows the flexible implementation of numerous applications.

Design of the Sensor

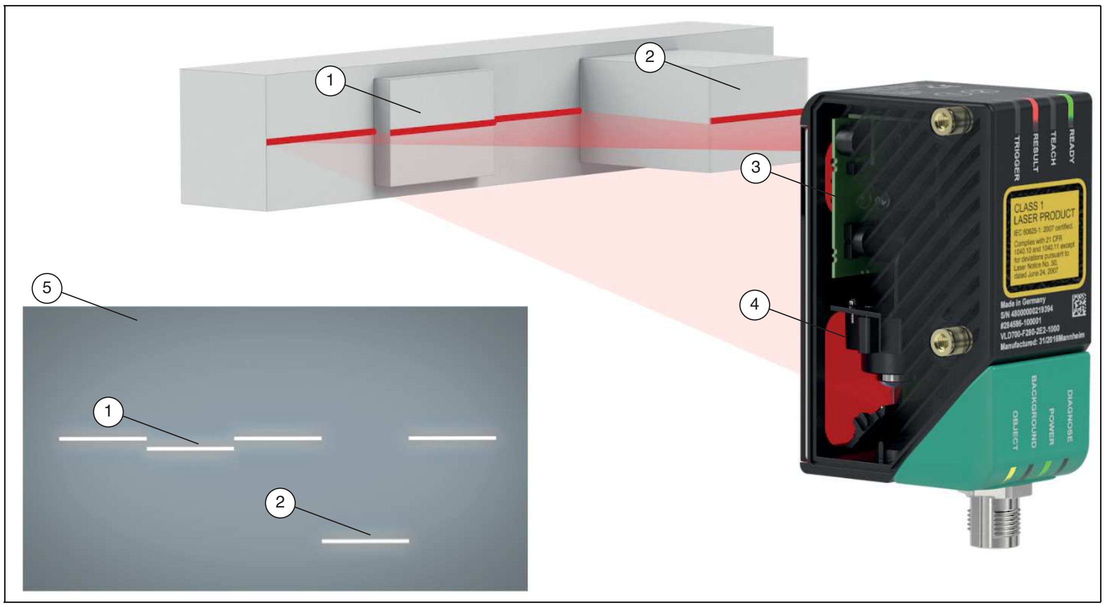


Figure 2.1 Overview of components and measurement result

1	Flat profile
2	Raised profile
3	Transmitter unit (laser for height profile and LEDs for surface lighting)
4	Camera
5	Height profile on the image sensor (measuring result)

2.2 Hazards of Laser Radiation

This section describes the contents and location of the warning label.

The sensor used corresponds to the safety standard IEC 60825-1:2007 for a laser class 1 product. In addition, the US regulation 21 CFR 1040.10 and 1040.11 is fulfilled except for **Laser Notice No. 50** dated June 24, 2007.

Warning!

Class 1 laser light

The laser light can be an irritant, especially in a dark environment. Do not point lasers at people!

Never look into the laser beam port if the sensor is operating.

Maintenance and repairs must be carried out by authorized service personnel only!

Install the device so that the warning is clearly visible and legible.

Do not remove the sensor's protective cover.

The warning label is fixed to the back of the housing as shown in the following figure.

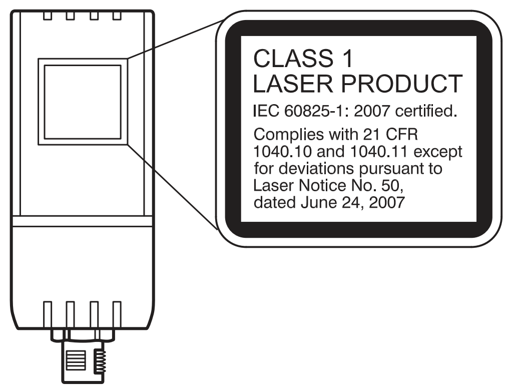

CLASS 1
LASER PRODUCT
IEC 60825-1: 2007 certified.
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

Figure 2.2 Laser radiation warning message

2.3 Dimensions

The devices in the SmartRunner series have the following identical housing dimensions.

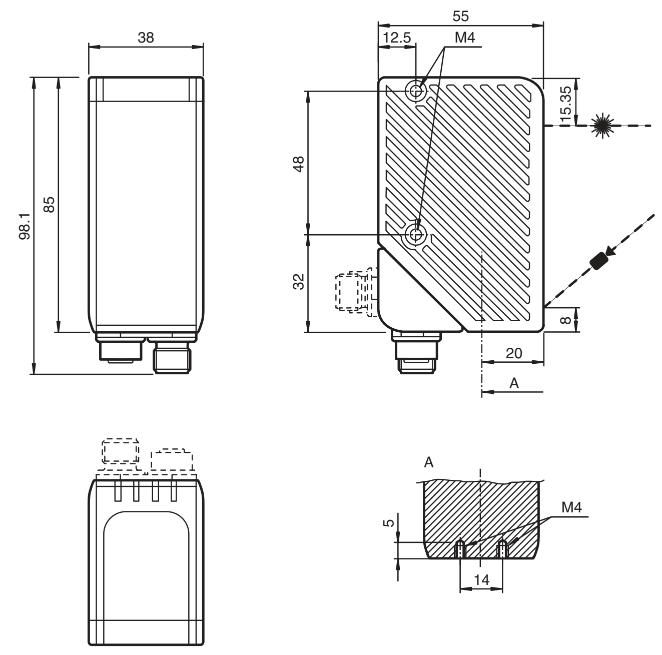


Figure 2.3 Dimensions of the SmartRunner series

2.4 Displays and Operating Elements

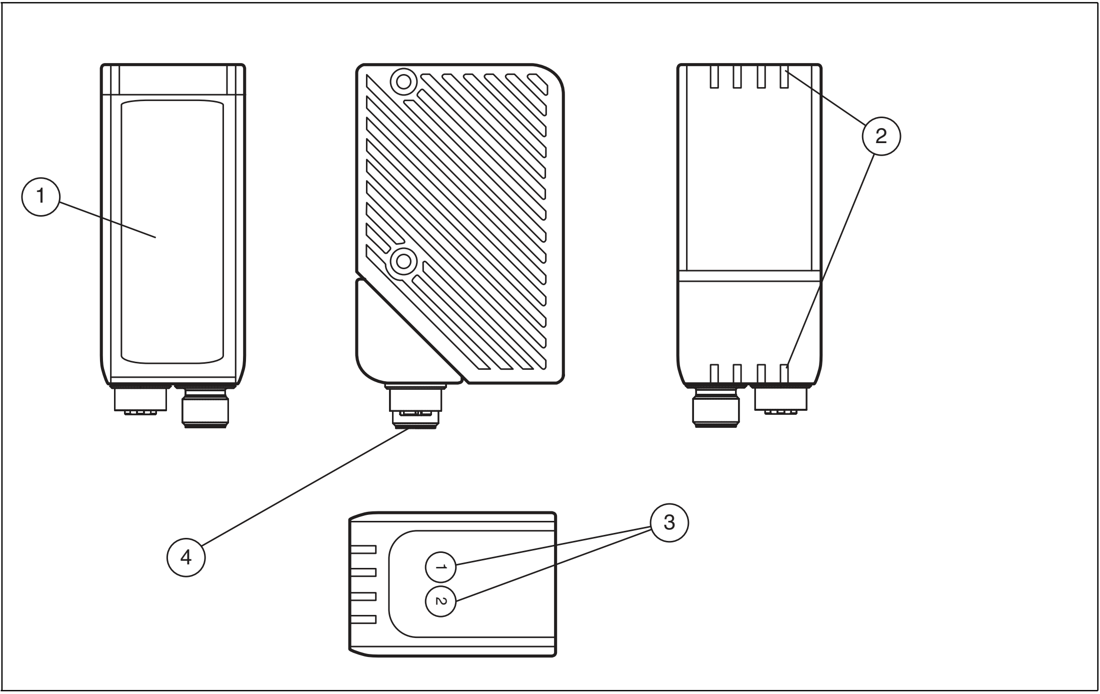


Figure 2.4 Overview of displays and operating elements

Posi-tion	Designation	Function
1	Protective cover for transmitter optics	Used to protect against damage and contamination
2	LEDs	The functional description for the LEDs can be found in the table below.
3	Function keys in Presentation mode	• Function key 1: Triggers an evaluation • Function key 2: When pressed and held for less then two seconds, activates the teach-in process. When pressed and held for longer than two seconds, activates Code Card mode
	Function keys in Runtime mode	• Function key 1: No function • Function key 2: When pressed and held for longer than two sec-onds, activates Code Card mode
4	Connections	24 V DC + IO (voltage supply, inputs, and outputs) LAN (Network)

Description of the LEDs

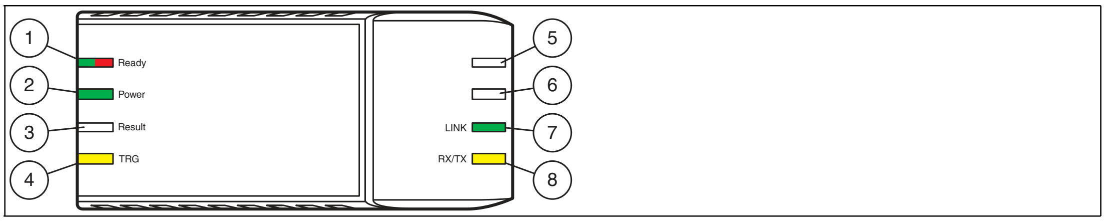


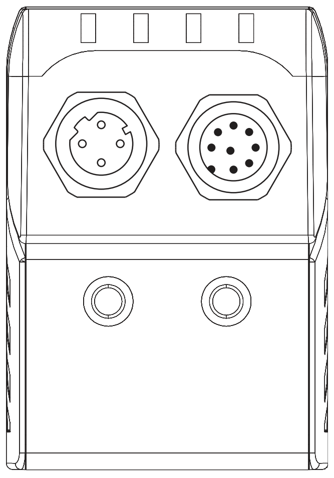
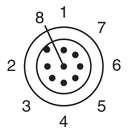
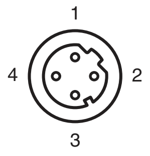
Figure 2.5 Overview of LEDs

LED	Designation	Color	State	Meaning
1	READY	● (red)	On	Illuminates red if a sensor fault is present and after an update. Flashes red during the update process. NOTE: Do not disconnect the power supply during the update!
		● (green)	On	Lights up green if the sensor is ready for operation.
		☼ (green)	Flashing	Flashes green if the sensor is in configuration mode.
2	POWER	● (green)	On	Lights up as soon as voltage is present.
3	RESULT	-	-	Reserved
4	TRIGGER	● (yellow)	On	Lights up yellow if the hardware trigger signal is activated.
5	-	-	-	-
6	-	-	-	-
7	LINK	● (green)	On	Lights up green if the sensor is connected to the Ethernet.
		● (yellow)	On	Lights up yellow if the sensor is not connected to the Ethernet.
8	RX/TX	☼ (yellow)	Flickers	Flickers yellow when data communication is active.

2.5 Interfaces and Connections

The following connections are located on the sensor.

Connection Assignment

	24 V DC + IO (voltage supply, inputs, and outputs)	
	M12 plug, A-coded, 8-pin	
		1. IN trigger 2. + UB 3. nc 4. nc 5. nc 6. nc 7. GND
	LAN (Network)	
	M12 socket, D-coded, 4-pin	
		1. TX+ Ethernet 2. RX+ Ethernet 3. TX- Ethernet 4. TX- Ethernet

Tip

The corner of the housing with the connections can be rotated. To ensure simple cabling, you can turn the connector plug in a different direction depending on the assembly position.

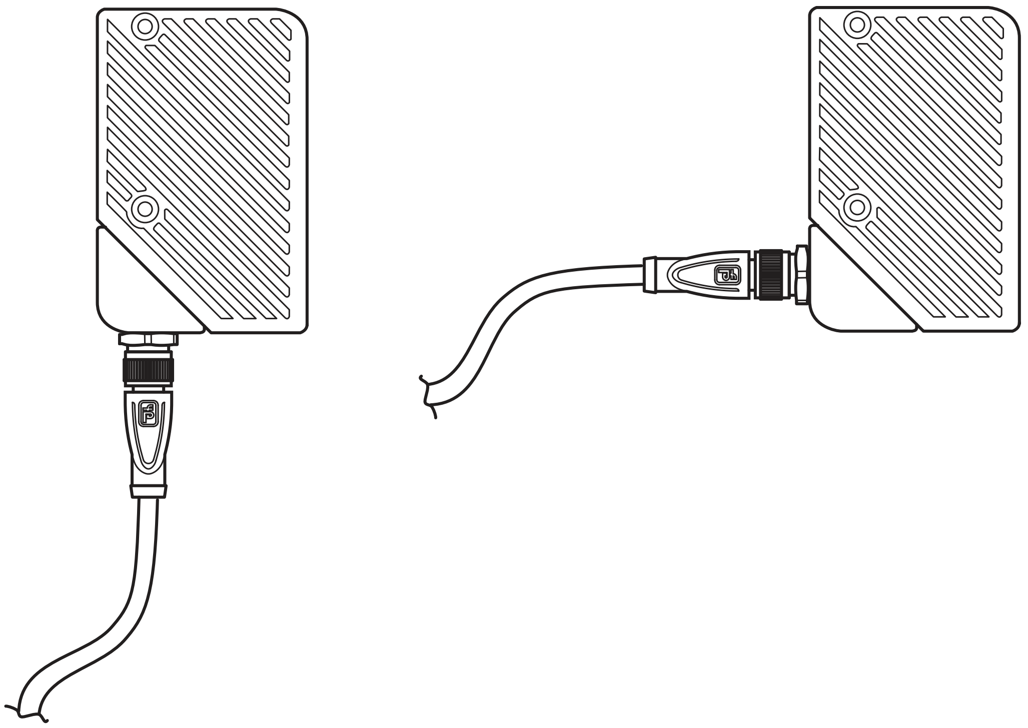


Figure 2.6 M12 connector plug

2.6 Network Interface

The network interface transfers the following data.

- Control commands (start, stop, operating mode)
- Firmware updates (data transfer from the network host to the sensor)
- Result data such as scans and images (data transfer from the sensor to the network host)

XML-embedded strings are used to transfer parameters and status requests. The transfer of data (scans, images) and firmware occurs as binary data.

The data is communicated over TCP/IP via port `50005`.

The factory default IP address is `192.168.2.3`.

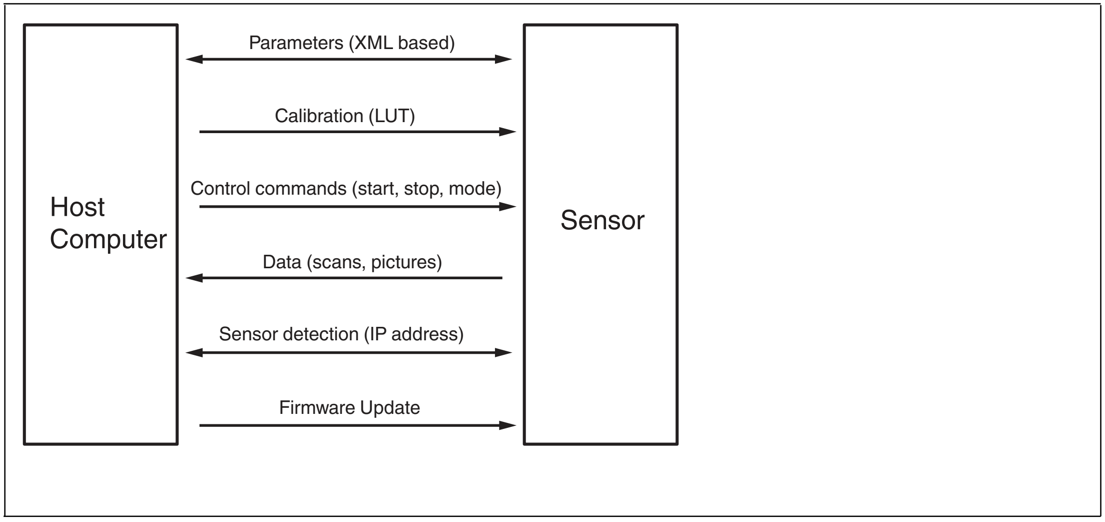


Figure 2.7 Network interface

2.7 Software Interface

SmartRunner Explorer has a VSX programming interface. The driver VsxProtocolDriver provides full access to the input and output data of the sensor and facilitates integration in a C#-based programming environment. The driver connects to the sensor and handles the communication in accordance with the communication protocol. The user can access functions for setting parameters on the sensor, retrieving parameter values from the sensor, and saving and loading entire parameter sets both locally and on the sensor. The user can also receive sensor images. Each function also contains an error object from which information can be obtained in the event of an error in the function.

A **.NET 5.0-based** software interface is provided for easy integration with PC software. This software interface takes the form of DLLs and handles the communication with the sensor. Integrate the DLLs into the programming environment and run the programming lines indicated.

Examples relate to the Visual Studio 2019 programming environment and to the C# programming language.

Note

Integrating the NuGet

In order to use the DLL, the NuGet must be integrated. This can be done in Visual Studio by the NuGet package manager, for example. The DLL can be found in the software folder on the SmartRunner Explorer product page of Pepperl and Fuchs. The NuGet is located in the ZIP file stored in this folder under the project folder ext.

Note

More information on configuration see chapter 5.1.

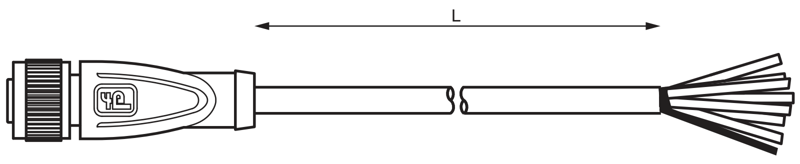
2.8 Accessories

Various accessories are available.

2.8.1 Voltage Supply

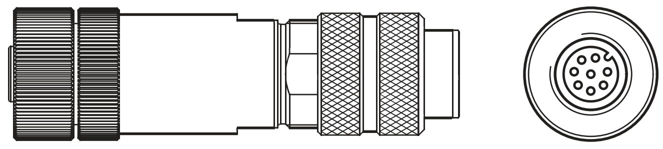
Use the following double-ended cordset to connect the voltage supply, inputs, and outputs to the sensor.

Field-Attachable Female Connector

Model number			
V19-G-2M-PUR-ABG	8-pin M12 socket, straight	L = 2 m	Open cable end with stranded conductors
V19-G-5M-PUR-ABG	8-pin M12 socket, straight	L = 5 m	Open cable end with stranded conductors
V19-G-10M-PUR-ABG	8-pin M12 socket, straight	L = 10 m	Open cable end with stranded conductors

Other lengths on request.

Field-Attachable M12 Socket

Model number	
V19-G-ABG-PG9	• 8-pin M12 socket, straight • Screw terminals for max. 0.75 mm^2 PG9 cable gland • Cable diameter: 5 ... 8 mm

PEPPERL+FUCHS

2.8.2 Network Cable

The sensor is connected to the network using an M12 plug.

Designation	Description
V45-G	RJ45 network plug, field attachable
V1S-G	M12 plug, 4-pin, field attachable
V1SD-G-2M-PUR-ABG-V45X-G	Cordset, RJ45 network plug with M12 plug, crossed, 4-pin
V1SD-G-2M-PUR-ABG-V45-G	Cordset, RJ45 network plug with M12 plug, 4-pin

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 Detection range

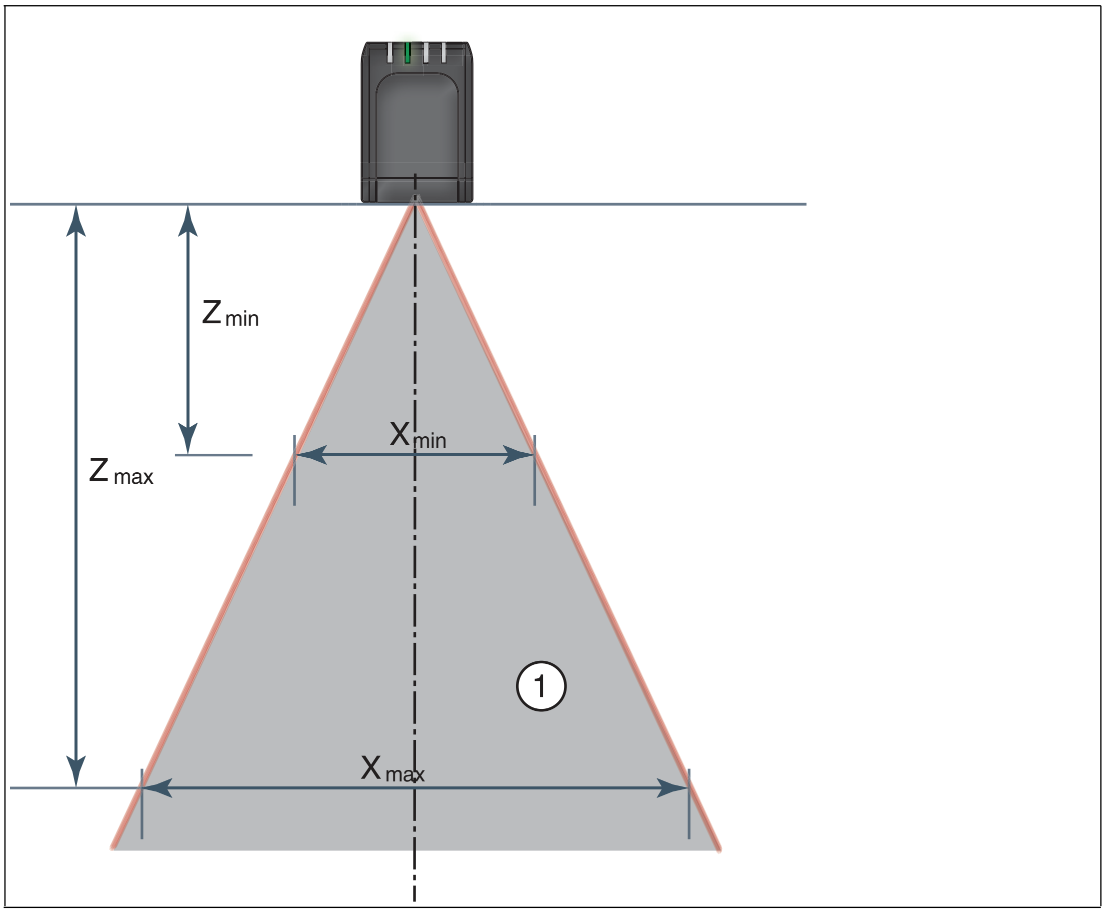


Figure 3.1 Detection range

1 Field of view

Note the detection range of the SmartRunner Matcher when planning your plant. You will find more information on the detection range in the respective data sheet of the sensor.

Note

The smallest possible resolution in the X and Z direction increases on a linear basis to the distance Z to the sensor.

3.4 Mounting the Sensor

Note

Mounting an optical device

- Do not aim the sensor at the sun.
- Protect the sensor from direct long-term exposure to sun.
- Prevent condensation from forming by not exposing the sensor to any major fluctuations in temperature.
- Do not expose the sensor to the effects of any aggressive chemicals.
- Keep the lenses and reflector of the device clean. Clean with a soft cloth, using standard commercial glass cleaner if necessary.

We recommend to clean the optical surface and to check screw fittings and electrical connections at regular intervals.

The operating distance differs depending on the sensor. The correct operating distance can be found in the datasheet for the sensor to be installed.

The following two figures show the orientation of the sensor under extraneous light:

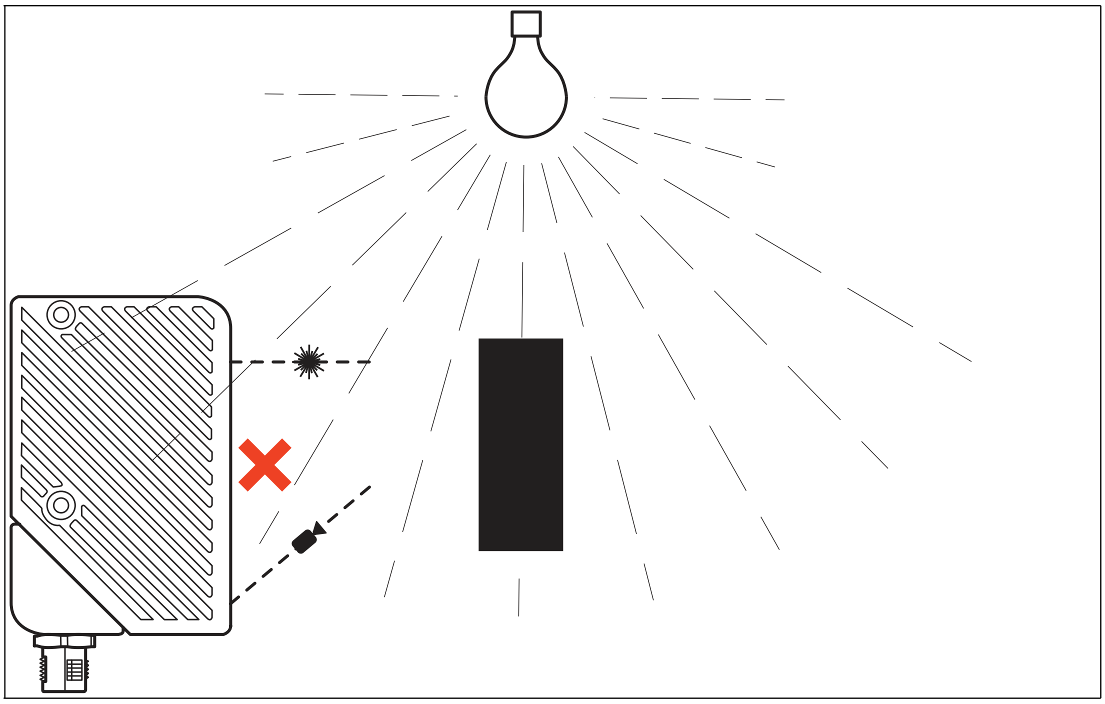


Figure 3.2 Incorrect orientation

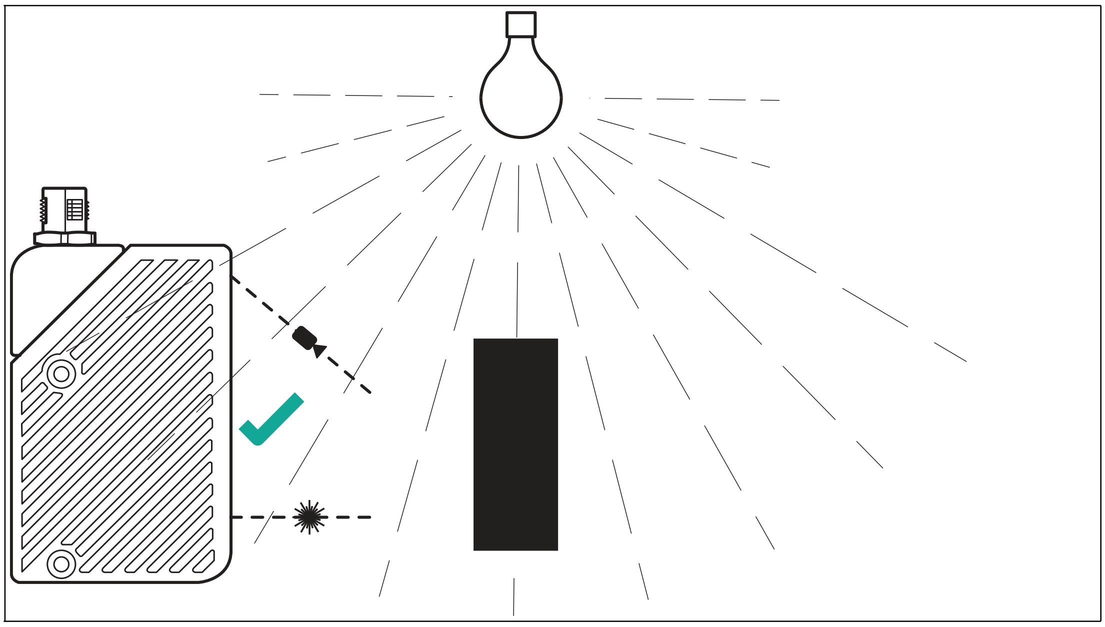


Figure 3.3 Correct orientation

The surface must be level to prevent the housing from becoming misaligned when the fittings are tightened. We advise securing the screws with spring disks to prevent the sensor becoming misaligned. Following installation of the sensor, ensure that there is still sufficient space to connect the connection cable to the sensor

Caution!

Damage to the equipment caused by improper installation!

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

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

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

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

Mounting the Housing

The device has 2 M4 threads on the base and on both sides of the housing to allow easy installation of the sensor in your plant. This means there are 3 different ways to mount the sensor in your plant.

- One-sided lateral mounting with M4 screws: You can mount the housing on its right-hand or left-hand side using the 2 M4 threaded sleeves. The maximum screw-in depth of the M4 screws is 8 mm.
- Continuous lateral mounting with M3 screws: M4 threaded sleeves are designed in such a manner that M3 screws pass all the way through the housing. Use 2 sufficiently long M3 screws with 2 lock nuts to mount the device in the plant
- Mounting on the underside of the device with M4 screws: You can use the 2 threaded sleeves to mount the housing on the underside of the device. The maximum screw-in depth of the M4 screws is 5 mm.

Positioning the Sensor

When positioning the sensor, ensure that the camera's field of vision is not obscured by the objects being scanned.

3.5 Connecting the Sensor

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.

Connecting the Supply Voltage

To supply voltage to the sensor, proceed as follows:

1. Connect the 8-pin M12 socket on the power cable to the plug located on the side 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.

Note

Shielding Cables

The shielding of connection lines is required to suppress electromagnetic interference. Establishing a low-resistance or low-impedance connection with the protective conductor or equipotential bonding circuit is an especially important factor in ensuring that these interference currents do not become a source of interference themselves. Only use connection lines with braid. Avoid connection lines with film shield because this would increase the line capacities. The shielding is integrated at both ends, i.e., in the switch cabinet **and** at the sensor. The grounding terminal available as an accessory allows easy integration in the equipotential bonding circuit.

In exceptional cases, the shielding of a connection at one end may be more favorable if:

- An equipotential bonding cable is not laid or cannot be laid.
- A film shield is used.

The following points relating to shielding must be noted:

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

Establishing a Network Connection

To establish a network connection, proceed as follows:

1. Use a network cable that has an RJ45 network connector on one side and a 4-pin M12 plug on the other. Insert the 4-pin M12 plug into the socket on the side of the sensor.
2. When delivered, the sensor has a fixed IP address. To facilitate communication within the network, you must configure your network. You can find the configuration data in the network configuration overview.

Note

Documenting the Network Configuration

The sensor communicates with the connected machine control system using the TCP/IP protocol. To ensure proper communication, you must record all the changes made to the network configuration.

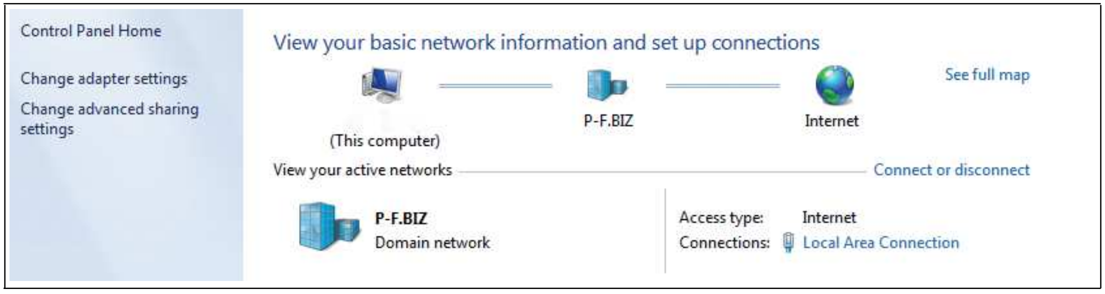
3.6 Setting up Windows Network Communication Between the Sensor and a PC/Laptop

When the sensor is delivered, it has a fixed IP address: **192.168.2.3**. 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:

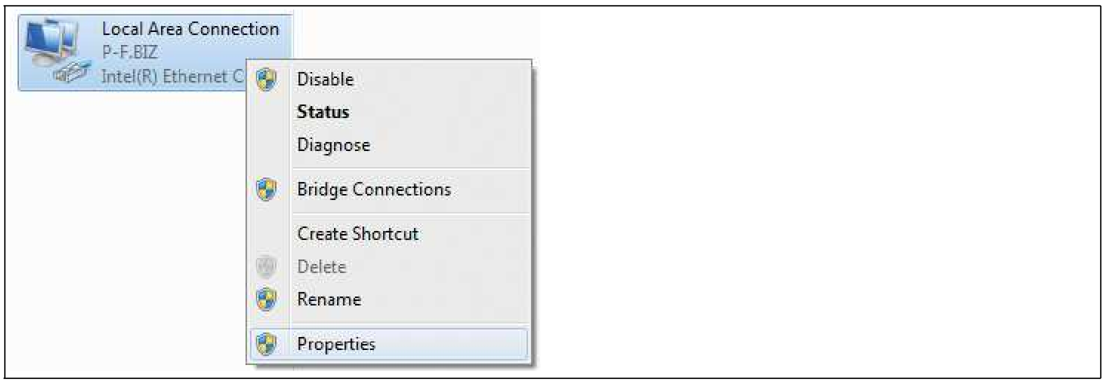
Setting the IP Address

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.

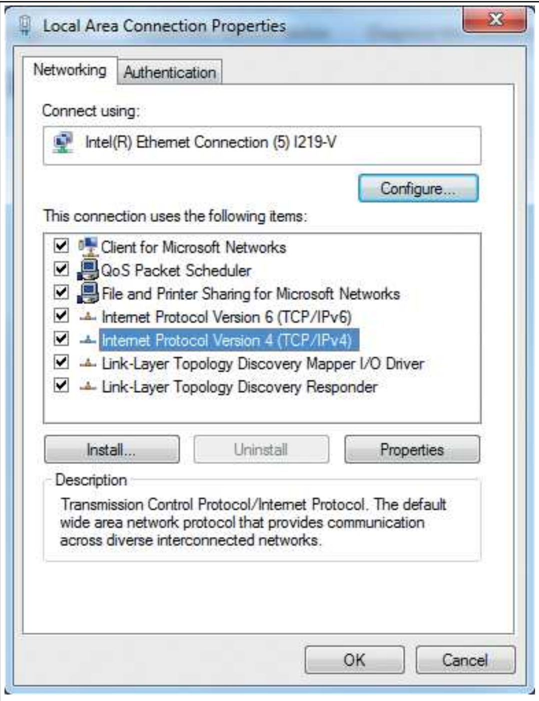
1. Click the Windows "**Start**" button.
2. Select "**Control Panel > Network and Sharing Center**."
3. Now click "**Change adapter settings**."


Control Panel Home
Change adapter settings
Change advanced sharing settings
View your basic network information and set up connections
See full map
(This computer)
P-F.BIZ
Internet
View your active networks
Connect or disconnect
P-F.BIZ
Domain network
Access type: Internet
Connections: Local Area Connection

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



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



Local Area Connection Properties

Networking | Authentication

Connect using:

Intel(R) Ethernet Connection (5) I219-V

Configure...

This connection uses the following items:

- [✓] Client for Microsoft Networks
- [✓] QoS Packet Scheduler
- [✓] File and Printer Sharing for Microsoft Networks
- [✓] Internet Protocol Version 6 (TCP/IPv6)
- [✓] Internet Protocol Version 4 (TCP/IPv4)
- [✓] Link-Layer Topology Discovery Mapper I/O Driver
- [✓] Link-Layer Topology Discovery Responder

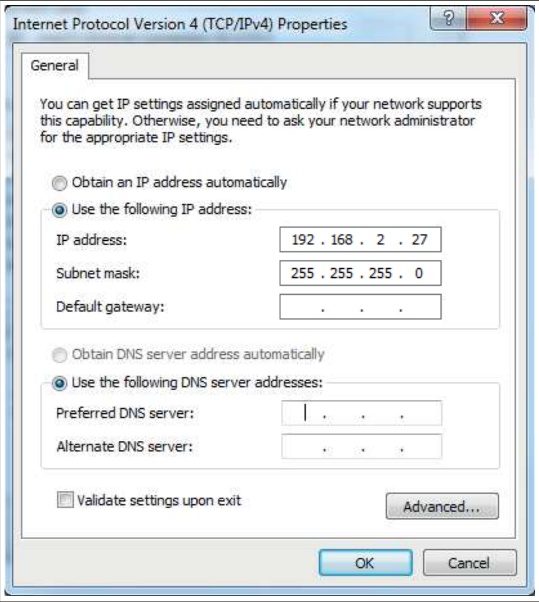
Install... | Uninstall | Properties

Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

OK | Cancel

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



Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 192 . 168 . 2 . 27

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

☐ Validate settings upon exit

Advanced...

OK | Cancel

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 first three 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.

4 Commissioning

Overview of the commissioning steps:

1. Set the operating distance, see chapter 3.3
2. Mount the sensor, see chapter 3.4
3. Connect the sensor, see chapter 3.5
4. Set up Windows network communication between the sensor and a PC/laptop, see chapter 3.6
5. Configure the sensor using the "Vision Configurator" configuration software, see chapter 6

5 Configuration

5.1 VsxProtocolDriver

General

SmartRunner Explorer has a VSX programming interface. The driver VsxProtocolDriver provides full access to the input and output data of the sensor and facilitates integration in a C#-based programming environment. The driver connects to the sensor and handles the communication in accordance with the communication protocol. The user can access functions for setting parameters on the sensor, retrieving parameter values from the sensor, and saving and loading entire parameter sets both locally and on the sensor. The user can also receive sensor images. Each function also contains an error object from which information can be obtained in the event of an error in the function.

The driver is implemented in C# and requires .NET Standard 5.0 or higher.

The functions of the driver can be used **synchronously** or **asynchronously**. For this, the required instance must be created using the Init function.

For clarity, this manual only describes the most important functions and variables. The DLL contains additional functions that are used for other Pepperl+Fuchs vision sensors. These functions are described in the corresponding product manual. There are several declaration options for some functions. In the following, the preferred functions are marked in bold.

Note

Integrating the NuGet

In order to use the DLL, the NuGet must be integrated. This can be done in Visual Studio by the NuGet package manager, for example. The DLL can be found in the software folder on the SmartRunner Explorer product page of Pepperl+Fuchs. The NuGet is located in the ZIP file stored in this folder under the project folder ext.

Synchronous and Asynchronous Functions

The auxiliary classes used in the parameters are described below.

Initialization

UDP Broadcast

The static function returns a list of the Vsx devices that are found on the network via a UDP broadcast.

Asynchronous Function

```
public static async Task<(bool Succ, List<Device> DeviceList, Error
ErrorDesc)> UdpDeviceList()
```

Synchronous Function

```
public static (bool Succ, List<Device> DeviceList, Error ErrorDesc)
UdpDeviceList()
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR

New Driver Instance for TCP/IP

Initializes a new driver instance that can be used to communicate with the device via TCP/IP. While the IP address must be specified, the default VSXPORT = 50005 can be used.

There is no plugin name for this sensor version. The port and the plugin name are only optional.

Asynchronous Function

```
public static VsxProtocolDriver Init(string ipAddress, int port =
VSXPORT, string pluginName = "")
```

Synchronous Function

```
public static VsxProtocolDriverSync Init(string ipAddress, int port
=VSXPORT, string pluginName = "")
```

Possible error IDs: None

Establish a Connection

Establishes a connection to the device using the parameters set using Init. CONNECTION_-TIMEOUT_MS = 1000 can be used as the timeout for opening the connection. A connection to the device must be established to use all non-static functions.

Asynchronous Function

```
public async Task<(bool Succ, Error ErrorDesc)> Connect(int timeout =
CONNECTION_TIMEOUT_MS)
```

Synchronous Function

```
public (bool Succ, Error ErrorDesc) Connect(int timeout = VsxProto-
colDriver.CONNECTION_TIMEOUT_MS)
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR

Disconnecting

Asynchronous Function

```
public async Task<(bool Succ, Error ErrorDesc)> Disconnect()
```

Synchronous Function

```
public (bool Succ, Error ErrorDesc) Disconnect()
```

Possible error IDs: None

IVsxMessage

An IVsxMessage is a general interface for data exchanged between the PC and the sensor.

Asynchronous Function

```
public static (bool Succ, Error ErrorDesc) SaveData(string filename,
IVsxMessage message)
```

Possible error IDs: VSX_DRIVER_DATA_ERROR, VSX_DRIVER_INVALID_DATA_ERROR, VSX_DRIVER_SAVE_FILE_ERROR

Device Information

Returns information about the device (such as MAC address, etc.).

Asynchronous Function

```
public async Task<(bool Succ, Device CurrentDevice, Error ErrorDesc)>
GetCurrentDeviceInformation()
```

Synchronous Function

```
public (bool Succ, Device CurrentDevice, Error ErrorDesc) GetCurrent-
DeviceInformation()
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR

Return the Value of a Single Device Parameter

Returns the value of an individual parameter of the device.

Asynchronous Function

```
public async Task<(bool Succ, object parameterValue, Error Error-
Desc)> GetSingleParameterValue(Parameter parameter)
```

```
public async Task<(bool Succ, object parameterValue, Error Error-
Desc)> GetSingleParameterValue(string parameterId)
```

```
public async Task<(bool Succ, object parameterValue, Error Error-
Desc)> GetSingleParameterValue(ushort settingsVersion, ushort con-
figVersion, string configId, string parameterId)
```

Synchronous Function

```
public (bool Succ, object parameterValue, Error ErrorDesc) GetSin-
gleParameterValue(Parameter parameter)
```

```
public (bool Succ, object parameterValue, Error ErrorDesc) GetSin-
gleParameterValue(string parameterId)
```

```
public (bool Succ, object parameterValue, Error ErrorDesc) GetSin-
gleParameterValue(ushort settingsVersion, ushort configVersion,
string configId, string parameterId)
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR, VSX_DRIVER_DATA_ERROR

Set the Value of a Single Device Parameter

Sets the value of a single parameter on the device. The parameter is defined by transferring the function parameters in the same way as for the GetSingleParameterValue function (see description for this function). In addition, the desired value is transferred.

Asynchronous Function

```
public async Task<(bool Succ, Error ErrorDesc)> SetSingleParameter-
Value(Parameter parameter, object value)
```

```
public async Task<(bool Succ, Error ErrorDesc)> SetSingleParameter-
Value(string parameterId, object value)
```

```
public async Task<(bool Succ, Error ErrorDesc)> SetSingleParameter-
Value(ushort settingsVersion, ushort configVersion, string configId,
string parameterId, object value)
```

Synchronous Function

```
public (bool Succ, Error ErrorDesc) SetSingleParameterValue(Parameter
parameter, object value)
```

```
public (bool Succ, Error ErrorDesc) SetSingleParameterValue(string
parameterId, object value)
```

```
public (bool Succ, Error ErrorDesc) SetSingleParameterValue(ushort
settingsVersion, ushort configVersion, string configId, string param-
eterId, object value)
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR, VSX_DRIVER_DATA_ERROR

2022-02

Change Network Settings

Changes the network settings on the device. The connection to the device is disconnected and must be re-established using the "Connect" function.

Asynchronous Function

```
public async Task<(bool Succ, Error ErrorDesc)> SetNetworkSet-
tings(string ipAddress, string networkMask, string gateway)
```

Synchronous Function

```
public (bool Succ, Error ErrorDesc) SetNetworkSettings(string ipAd-
dress, string networkMask, string gateway)
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR

Send the Firmware File

Sends the firmware file to the device under the specified path and file name. The current status can be read out via the FirmwareStateChannelReader while the update is in progress.

Asynchronous Function

```
public async Task<(bool Succ, Error ErrorDesc)> SendFirmware(string
fileName)
```

Synchronous Function

```
public (bool Succ, Error ErrorDesc) SendFirmware(string fileName)
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR, VSX_DRIVER_DEVICE_ERROR

Information about Firmware Updates

Can be read out asynchronously and contains information about the current status during a firmware update.

```
public ChannelReader<FirmwareState> FirmwareStateChannelReader
```

Reading the Parameter Set

Reads the current parameter set from the device and saves it under the specified path and file name.

Asynchronous Function

```
public async Task<(bool Succ, Error ErrorDesc)> DownloadParameter-
Set(string destinationFileName)
```

Synchronous Function

```
public (bool Succ, Error ErrorDesc) DownloadParameterSet(string des-
tinationFileName)
```

Possible error IDs: VSX_DRIVER_SAVE_FILE_ERROR

Save the Parameter Set

Saves the current parameter settings on the device. The set values are then set each time the device is started.

All parameter data is initially stored on the device in a volatile state and can be reset by a restart or by LoadParameterSetOnDevice. Only SaveParameterSetOnDevice permanently saves the parameters.

Asynchronous Function

```
public async Task<(bool Succ, Error ErrorDesc)> SaveParameterSetOnDe-
vice()
```

Synchronous Function

```
public (bool Succ, Error ErrorDesc) SaveParameterSetOnDevice()
```

Possible error IDs: VSX_DRIVER_CONNECTION_ERROR

Load Parameter Settings

Loads the parameter settings saved via SaveParametersetOnDevice() on the device. The parameters then have the previously saved values. A current parameter list is returned.

Asynchronous Function

```
public async Task<(bool Succ, List<Parameter> ParameterList, Error
ErrorDesc)> LoadParameterSetOnDevice()
```

Synchronous Function

```
public (bool Succ, List<Parameter> ParameterList, Error ErrorDesc)
LoadParameterSetOnDevice()
```

Possible error IDs: VSX_DRIVER_GENERAL_ERROR, VSX_DRIVER_DATA_ERROR, VSX-_DRIVER_CONNECTION_ERROR

Load Factory Settings

Loads the factory settings of all parameters on the device. A current parameter list is returned.

Asynchronous Function

```
public async Task<(bool Succ, List<Parameter> ParameterList, Error
ErrorDesc)> LoadDefaultParameterSetFromDevice()
```

Synchronous Function

```
public (bool Succ, List<Parameter> ParameterList, Error ErrorDesc)
LoadDefaultParameterSetFromDevice()
```

Possible error IDs: VSX_DRIVER_GENERAL_ERROR, VSX_DRIVER_DATA_ERROR, VSX-_DRIVER_CONNECTION_ERROR

Read Out Sensor Data

Starts reading out sensor data. The sensor data for each trigger is packaged in VsxDynamicContainer. The data can be called up with the GetDynamicContainer function. For more details, see the container description. The "bufferSize" specifies how many containers can be buffered by the driver, the "startCondition" specifies the container from which buffering should be performed, and the "strategy" determines what should happen if the buffer is full. DROP_OLDEST indicates that the oldest container stored is discarded, while DROP_WRITE means the latest container received is discarded.

Asynchronous Function

```
public void ResetDynamicContainerGrabber(int bufferSize, int start-
Condition = -1, DataFunction.Strategy = DataFunction.Strat-
egy.DROP_OLDEST)
```

Synchronous Function

```
public void ResetDynamicContainerGrabber(int numberOfItems, int
startCondition = -1, Strategy strategy = Strategy.DROP_OLDEST)
```

Possible error IDs: None

Output of the Oldest Buffered DynamicContainer

Returns the oldest buffered DynamicContainer (see "DynamicContainer" on page 34) (see ResetDynamicContainerGrabber). timeoutMs specifies the time in ms for which an attempt is made to read a container from the buffer. If no container is present during this time, the function returns an error.

Asynchronous Function

```
public async Task<(bool Succ, IVsxDynamicContainer Container, int
NumberOfDiscardedItems, Error ErrorDesc)> GetDynamicContainer(int
timeoutMs = System.Threading.Timeout.Inifinite)
```

Synchronous Function

```
public (bool Succ, IVsxDynamicContainer Container, int NumberOfDis-
cardedItems, Error ErrorDesc) GetDynamicContainer(int timeoutMs =
Timeout.Infinite)
```

Possible error IDs: VSX_DRIVER_INIT_ERROR, VSX_DRIVER_TIMEOUT_ERROR

Read Out Log Data

Restarts the readout of log data. The log data can be called up with the GetLogMessage function. The bufferSize specifies how many log data messages can be buffered by the driver. The typeMask specifies which log data types should be transferred from the device, and the "strategy" specifies what should happen if the buffer is full. _DROP_OLDEST indicates that the oldest stored log message is discarded, while DROP_WRITE means the latest log message received is discarded.

Asynchronous Function

```
public void ResetLogMessageGrabber(int bufferSize, int typeMask,
DataFunction.Strategy = DataFunction.Strategy.DROP_OLDEST)
```

Possible error IDs: None

Output of the Oldest Buffered LogMessage

Returns the oldest buffered LogMessage (see ResetLogMessageGrabber). timeoutMs specifies the time in ms for which an attempt is made to read a log message from the buffer. If no log message is present during this time, the function returns with an error.

Asynchronous Function

```
public async Task<(bool Succ, VsxLogMessage LogMessage, int NumberOf-
DiscardedItems, Error ErrorDesc)> GetLogMessage(int timeoutMs = Sys-
tem.Threading.Timeout.Inifinite)
```

Synchronous Function

```
public (bool Succ, VsxLogMessage LogMessage, int NumberOfDiscarded-
Items, Error ErrorDesc) GetLogMessage(int timeoutMs = Time-
out.Infinite)
```

Possible error IDs: VSX_DRIVER_INIT_ERROR, VSX_DRIVER_TIMEOUT_ERROR

Properties

Connection Status

Indicates the connection status.

```
public bool Connected { get; }
```

Timeout

Timeout in ms. This indicates how long to wait for a response to a request sent to the device. The default value is "DEFAULT_ETHERNET_TIMEOUT_MS."

```
public int WaitTimeout { get; set; }
```

Number of Discarded Dynamic Containers or Log Messages

Specifies the number of dynamic containers or log messages discarded since the last reset grabber, once there was no more space in the buffer.

```
public int MissingContainerFramesCounter { get; }
```

```
public int MissingLogMessagesCounter { get; }
```

Number of Buffered Dynamic Containers or Log Messages

Specifies how many dynamic containers or log messages can be buffered by the driver.

```
public int DynamicContainerQueueSize { get; }
```

```
public int LogMessageQueueSize { get; }
```

Indication of Containers or Log Messages to be Discarded

Specifies which containers or log messages should be discarded if the buffer is full. DROP_OLDEST discards the oldest stored container or log message, while DROP_WRITE discards the most recently received.

```
public Strategy DynamicContainerGrabberStrategy { get; }
```

```
public Strategy LogMessageGrabberStrategy { get; }
```

Events

Loss of Connection

Triggered as soon as the driver detects a loss of connection to the device. The parameters are the IP of the previously connected device and a message indicating why the connection was lost. This event is only triggered if a TCP/IP connection is used.

```
public event Action<string, string> OnDisconnect
```

Auxiliary Classes

Device

Contains information about the currently connected device.

```
public string PhysicalAddress;

public int PhysicalPort;

public string IpAddress;

public string NetworkMask;

public string Gateway;

public string MacAddress;

public string Identifier;

public string FirmwareVersion;

public string SensorType;
```

Error

Contains information about an error that has occurred.

```
public ErrorId Id;

public string Tag;

public string Message;
```

The Following Error IDs Are Possible

```
VSX_DRIVER_NO_ERROR

VSX_DRIVER_INIT_ERROR

VSX_DRIVER_TIMEOUT_ERROR

VSX_DRIVER_SAVE_FILE_ERRO

VSX_DRIVER_DATA_ERROR

VSX_DRIVER_CONNECTION_ERROR

VSX_DRIVER_INVALID_DATA_ERROR

VSX_DRIVER_DEVICE_ERROR

VSX_DRIVER_GENERAL_ERROR
```

FirmwareState

Contains information about the current status of a firmware update that is running.

```
public int Id;

public string Tag;

public string Message;
```

DynamicContainer

A DynamicContainer received by the sensor can contain the following messages:

TagName	?Type?	Status	Description
"Image"	ImageData[Mono8]	Optional	Image data
"Line"	LineMessage	Optional	Line data

Structure of the LineMessage Type

Main Property

Line

Returns a list of points. Each point consists of image and world coordinates, and quality information. In detail, the point information looks as follows:

The LineMessage has the following interface:

• ContentValue:	Reserved for future use
• ImageCoordinate:	Image coordinates in subpixels
• Intensity:	Value that correlates with the grayscale value point
• LineID:	Always 0 in single-line systems
• Quality:	Point quality as a percentage
• SegmentID:	Line segment number if supported, otherwise 0
• Valid:	True if point is valid
• WorldCoordinate:	World coordinates in mm

Additional Properties (Meta-Information)

Meta-information provides additional information about the data.

MinX

Minimum possible X value of the device family, usually negative in µm.

MaxX

Maximum possible X value of the device family, usually positive in µm.

MinZ

Minimum possible Z value of the device family, positive in µm.

MaxZ

Maximum possible Z value of the device family, positive in µm.

FrameCounter

Current frame counter, related data has the same counter.

ScaleXYZ, ScaleC

Scaling factors for the internal calculation of the line data.

Width

Maximum number of possible line points.

Format

Reserved for future use.

Status

Reserved for future use.

Lines

Returns a list of lines. Usually, the list contains only one line. Each line consists of a list of points, the points of the first line can be called directly via Line.

VsxDynamicContainerMessage : IVsxMessage

Contains a list of IVsxMessages, which in turn contain data sent by the device. The contained messages are identified in the list using a string. The possible messages are device-specific. Example of a VsxDynamicContainerMessage, see "2. Output of Line Data" on page 40.

```
public bool ContainsMessage(string tag)
```

```
public IVsxMessage GetMessage(string tag)
```

VsxImageData2Message : IVsxMessage

Contains image data of a specific image. The individual image values are stored as bytes.

```
public ImageData2Format;

public int Width;

public int Height;

public int LinePitch;

public long FrameCounter;

public double CoordinateScale;

public double CoordinateOffset;

public double AxisMin;

public double AxisMax;

public double InvalidDataValue;

public byte[] ImageData;

public float[] ImageDataFloats;
```

5.2 Configuration Parameters

Before the sensor can be used in the system, it must be parameterized. The parameters used for the sensor are listed below.

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

Config ID	Parameter ID	Parameter name	Values	read (r)/ write (w)	Description
Toolbar	0x640001	Trigger Laser	0.1	-/w	Perform manual trigger.
	0x640002	LED trigger	0.1	-/w	Perform LED trigger. NOTE: If auto trigger mode is enabled, a line image is output via the "LED trigger."
	GetImage	Get Image	0.1	-/w	Resend last image.
	0x6D0001	Teach	0.1	-/w	Automatically adjust exposure time with next trigger.

Config ID	Parameter ID	Parameter name	Values	read (r)/ write (w)	Description
General	0xCC0001	Custom Name	Char[32]	r/w	User-defined name
	0x510001	AutoTrigger	0.1	r/w	Deactivation/activation of cyclical image capture.
	0x680001	Exposure time	1 .. 1000 0	r/w	Sets the manual exposure time. To set the exposure time manually, the "Use manual exposure time" (see "Illumination Menu Item" on page 54) function must be activated. Increasing the value increases the exposure time and therefore the image brightness. Values below 1000 µs are suitable in most cases.
	0xBE0001	Use manual exposure time	0.1	r/w	When enabled, the manually set exposure time is used. If this box is not checked, the exposure time is regulated automatically during the "teach-in" process
	0x100001	Flash time	1 .. 1000 0	r/w	Exposure time of used flash light when triggering LEDs in µs (see 0x640002)
	0x9F0001	Object contrast	1 .. 100	r/w	Contrast threshold for detecting laser line on object in % (default value: 45)
	0xC90001	ROI min X	- 3200 ... 3200	r/w	The lowest value on the x-axis of the ROI (in mm).
	0xC90002	ROI max X	- 3200 ... 3200	r/w	The highest value on the x-axis of the ROI (in mm).
	0xC90003	ROI min Z	1 ... 3200	r/w	The lowest value on the z-axis of the ROI (in mm).
	0xC90004	ROI max Z	1 ... 3200	r/w	The highest value on the z-axis of the ROI (in mm).
	ImageTransferActive	Transfer images	0.1	r/w	Automatically transfer images. NOTE: may increase analysis time.

PEPPERL+FUCHS

Examples of the Application of Configuration Parameters

The following declarations are used in these examples:

```
public static class Sr2DParameterIdentifier
    {
        public static string    Name_0x010001 = "0x010001";
        public static string    Homepage_0x020001 = "0x020001";
        public static string    Productname_0x030001 = "0x030001";
        public static string    Version_0x070001 = "0x070001";
        public static string    Firmware_0xC30001 = "0xC30001";
        public static string    Autotrigger_0x510001 = "0x510001";
        public static string    Exposuretime_0x680001 = "0x680001";
        public static string    Usemanualexposuretime_0xBE0001 = "0xBE0001";
        public static string    Flashtime_0x100001 = "0x100001";
        public static string    Presentationmode_0xFD0001 = "0xFD0001";
        public static string    Objectcontrast_0x9F0001 = "0x9F0001";
        public static string    HighPositionResolution_0x280001 = "0x280001";
        public static string    ROIMinX_0xC90001 = "0xC90001";
        public static string    ROIMaxX_0xC90002 = "0xC90002";
        public static string    ROIMinZ_0xC90003 = "0xC90003";
        public static string    ROIMaxZ_0xC90004 = "0xC90004";
        public static string    Triggerlaser_0x640001 = "0x640001";
        public static string    TriggerLED_0x640002 = "0x640002";
        public static string    Getimage_GetImage = "GetImage";
        public static string    Teach_0x6D0001 = "0x6D0001";
        public static string    CustomName_0xCC0001 = "0xCC0001";
        public static string    ImageTransferActive = "ImageTransferActive";
    }
```

Setting the Auto Trigger Mode:

```
var setParamResult = await _vsxProtocolDriver.SetSingleParameterValue(1, 1, "General",
Sr2DParameterIdentifier.Autotrigger_0x510001, "1");
```

Note

In the current version, the first two parameters (SettingsVersion and ConfigVersion) are always set to 1.

Executing an Area Image Capture Using LED Trigger

```
var setParamResult = await_vsxProtocolDriver.SetSingleParameterValue(1, 1,"Toolbar",
Sr2DParameterIdentifier.TriggerLED_0x640002,"1");
```

Switching on Image Transfer

```
var ret3 = await_vsxProtocolDriver.SetSingleParameterValue(1, 1,"General",Sr2DParame-
terIdentifier.ImageTransferActive,"1");
```

Example Program

The example program "ExampleSr2D.cs" is located in the "VSX-Interface libraries..." package. It is intended to make the initial steps of integrating the SmartRunner Explorer easier. The following steps are performed in this example program:

- TCP/IP connection
- Command to start permanent trigger
- Line data is saved in a container with each trigger
- A specific number (number must be determined) of containers can be stored temporarily in the API
- Retrieve line data from container (polling)
- Example access for line data

Examples of Using the Programming Interface

1. Establishing the TCP/IP Connection

First, all available devices are listed via UDP and an attempt is made to connect to the first device. If no device was found via UDP, an attempt is made to establish a connection via a fixed IP address (in this case the default IP).

```
//First discover devices via UDP and use the IP of the first device found
        var sensors = await VsxProtocolDriver.UdpDeviceList();
        if (sensors.Succ && sensors.DeviceList.Count > 0)
        {
                // create a new VsxProtocolDriver instance
                _vsxProtocolDriver = VsxProtocolDriver.Init(sen-
                sors.DeviceList[0].IpAddress);
        }
        else //use fixed IP address
        {
                // create a new VsxProtocolDriver instance with fixed IP address
                _vsxProtocolDriver = VsxProtocolDriver.Init("192.168.2.3");
        }
        // Connect with device
        var connRes =await_vsxProtocolDriver.Connect();
```

2. Output of Line Data

Wait for the container to be filled. The time for this can be limited to 500 ms, as in this case. This timeout period should be set depending on the data to be received. If there is only one line, about 40 ms is sufficient. A check is then made as to whether the container exists and whether it contains data — in this case, whether it contains lines. The data of the line is then transferred to the singleLine variable.

```
// try to get a data container within 500 ms
    var dataItem = await _vsxProtocolDriver.GetDynamicContainer(500);
    // dataItem.Container now contains an image/result/line package
    if (dataItem.Succ && (dataItem.Container !=null))
    {
        // Check if there is a line message contained
        if (dataItem.Container.ContainsMessage("Line"))
        {
                    var lineMessage = dataItem.Container.GetMessage("Line")
                    as VsxLineMessage;
                    // Get line from package
                    var singleLine = lineMessage.Line;
        }
    }
```

Note

For the data structure of the "line," see "Structure of the LineMessage Type" on page 34.

3. Access to a Line Coordinate

To do this, the container must first be collected, as in example 2. Any line coordinate can then be accessed via the following program line. In this case, it is the first coordinate.

```
Coordinate coord = singleLine[0];
```

4. Output of Area Image Data

Wait for the first container. The time for this can be limited to 500 ms, as in this case. This timeout period can be set depending on the data to be received. A check is then made as to whether the container exists and whether it contains an image. If it contains an image, it is saved to the BMP variable and the image is stored in png format in the Temp directory.

```
// try to get a data container within 500 ms
var dataItem =await_vsxProtocolDriver.GetDynamicContainer(500);
    // Check if dataItem.Container now exists
    if (dataItem.Succ && (dataItem.Container !=null))
    {
              // Check if there is an Image message contained
              if (dataItem.Container.ContainsMessage("Image"))
              {
           var Img = dataItem.Container.GetMessage("Image") as VsxIm-
           ageDataRegionMessage;
           var Bmp = Img.Image;
           Bmp.Save("C:/Temp/Bild.png");
              }
    }
```

6 Vision Configurator Software

The sensor is commissioned and operated using the Vision Configurator software.

The Vision Configurator software makes it easy to operate the sensor with its user-friendly interface. Standard functions include making connections to the sensor, specifying the operating parameters, saving data sets, and displaying data and error diagnostics.

Note

The following user roles are predefined with different authorizations in the Vision Configurator.

User Rights and Password

User rights	Description	Password
Default	View all information Sensor configuration Create users at same or lower level	A password is not required
User	View all information Sensor configuration Create users at same or lower level	User
Admin	View all information Sensor configuration	Request the admin password from Pepperl+Fuchs

Table 6.1 The users have different access and administration rights depending on the respective user role.

Establishing a Network Connection

To establish a network connection with the sensor, proceed as follows:

1. Supply the sensor with power.
2. Start the Vision Configurator software.
3. Enter your user name and password.

Note

Additional steps for user-defined installation and installation of additional components are described in the Vision Configurator manual. The Vision Configurator manual can be found online at www.pepperl-fuchs.com.

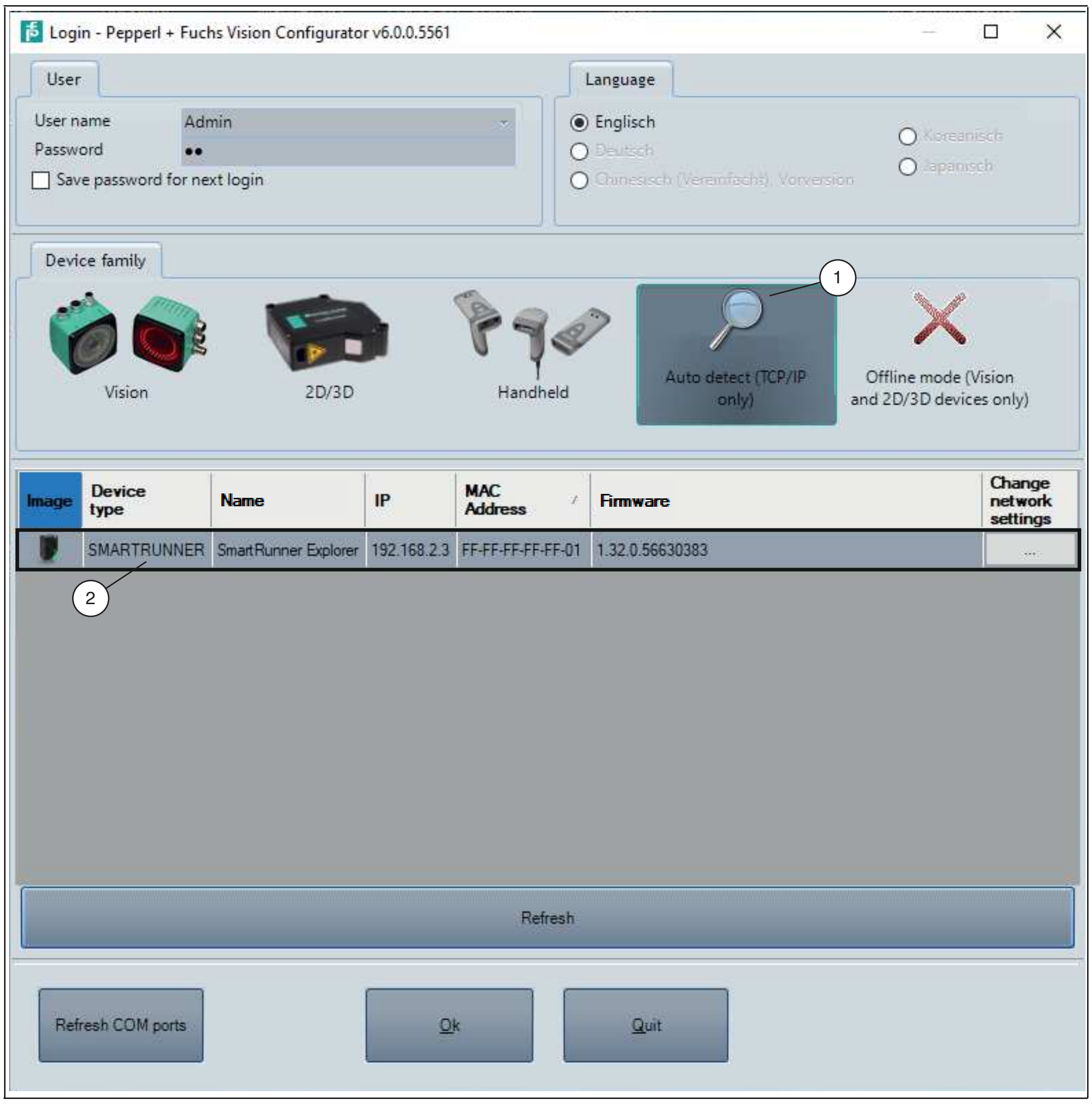
6.1 Connecting to Vision Configurator

Connecting Sensors

Connected sensors can be searched for using the "Auto detect" function (1). To do so, 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 on the "Auto detect (TCP/IP only)" button (1) to search for connected sensors.

↳ If a sensor (2) is detected, it appears in the overview window.



Login - Pepperl + Fuchs Vision Configurator v6.0.0.5561

User name: Admin
Password: ••
☐ Save password for next login

● Englisch
○ Deutsch
○ Chinesisch (Vereinfacht), Vorversion
○ Koreanisch
○ Japanisch

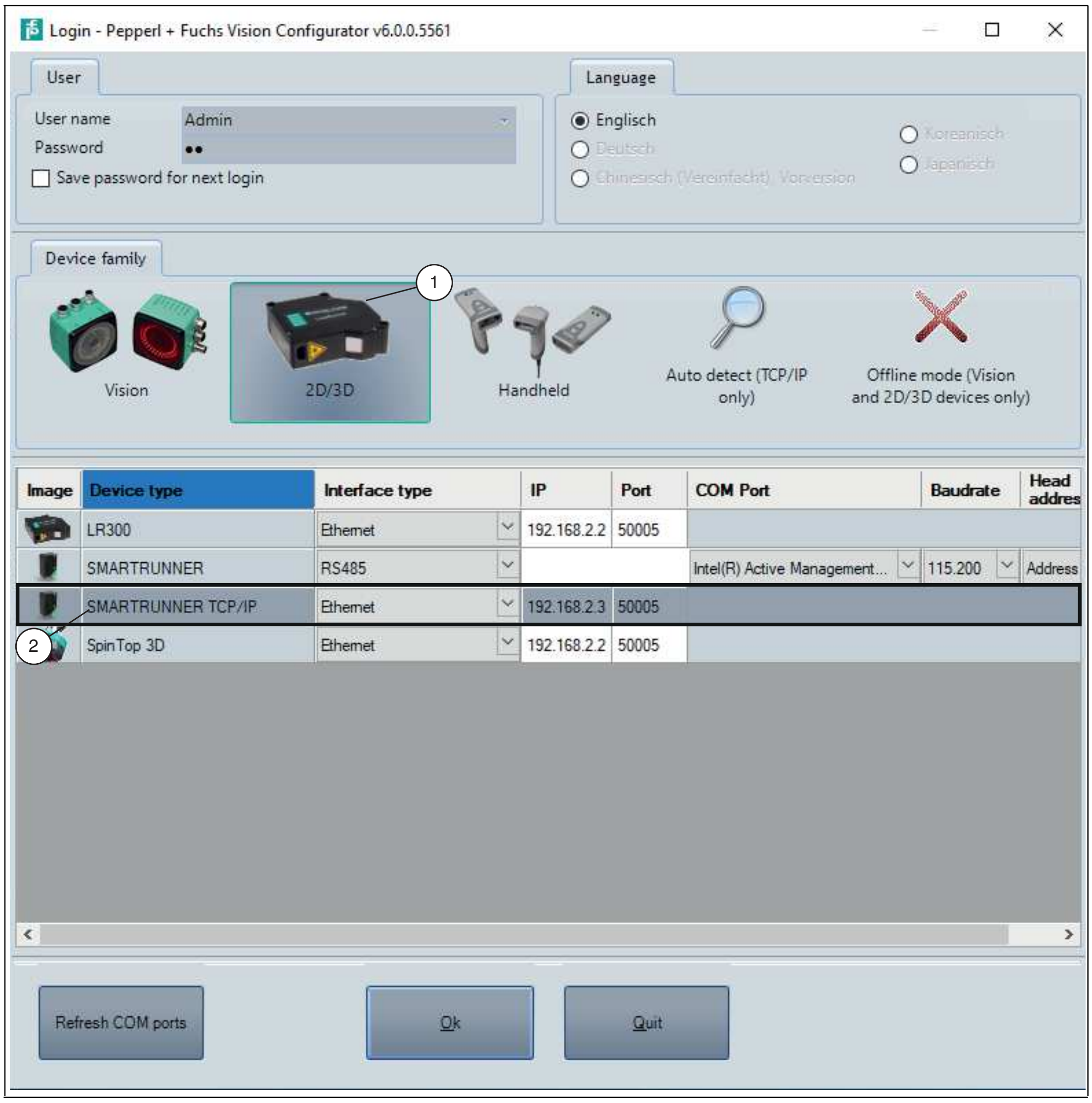
Image	Device type	Name	IP	MAC Address	Firmware	Change network settings
	SMARTRUNNER	SmartRunner Explorer	192.168.2.3	FF-FF-FF-FF-FF-01	1.32.0.56630383	...

Figure 6.1 "Auto Detect" in Vision Configurator

3. Click on the "OK" button.

↳ The sensor (2) is shown on the home screen of all sensors found.

4. Select the **2-D/3-D** button (1) under the "Device family" tab on the home screen.


1
2
Vision
2D/3D
Handheld
Auto detect (TCP/IP only)
Offline mode (Vision and 2D/3D devices only)
Refresh COM ports
Ok
Quit

Login - Pepperl + Fuchs Vision Configurator v6.0.0.5561

User

User name: Admin
Password: ••
☐ Save password for next login

Language

● Englisch
○ Deutsch
○ Chinesisch (Vereinfacht), Vorversion
○ Koreanisch
○ Japanisch

Device family

Image	Device type	Interface type	IP	Port	COM Port	Baudrate	Head addres
	LR300	Ethernet	192.168.2.2	50005			
	SMARTRUNNER	RS485			Intel(R) Active Management...	115.200	Address
	SMARTRUNNER TCP/IP	Ethernet	192.168.2.3	50005			
	SpinTop 3D	Ethernet	192.168.2.2	50005			

Figure 6.2 Home screen

5. Select the sensor "SMARTRUNNER TCP/IP" (2) from the overview window.
6. Click on the "OK" button.

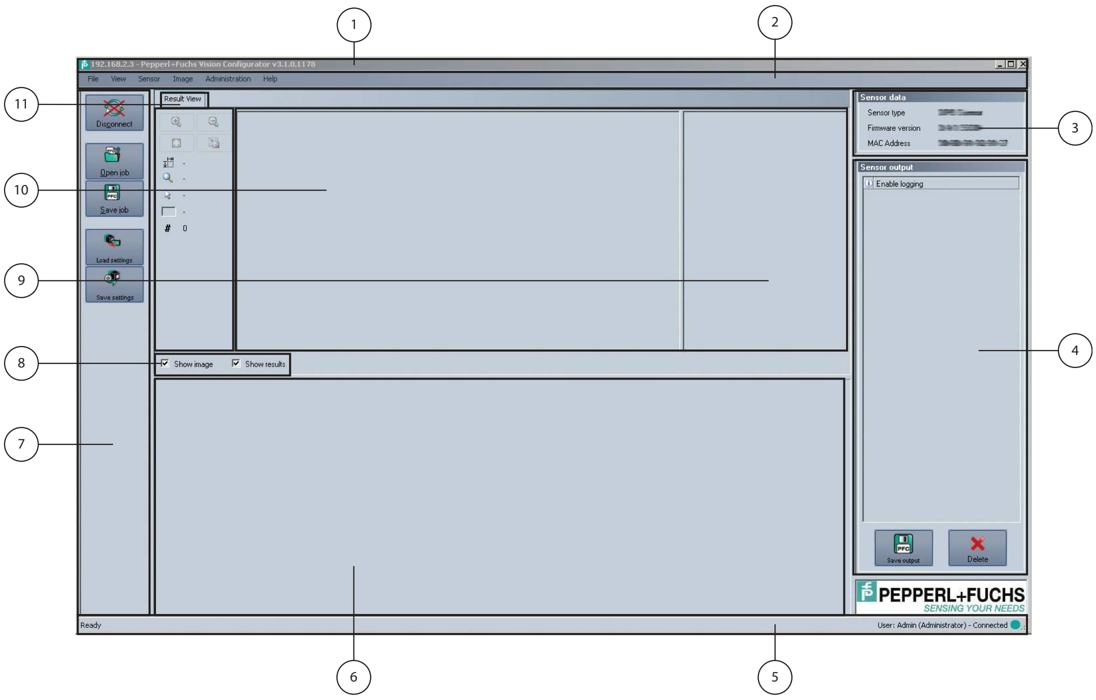
↳ The sensor is connected and appears in the application window.

6.2 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	• Shows the IP address, the software name, and the version number • Contains the **Minimize/Maximize/Close** buttons
2	Menu bar	• Displays all the menus in the program • Provides an overview and helps with navigation
3	**Sensor data** screen	• Displays data for the connected sensor
4	**Sensor output** screen	• Shows the log display
5	Status bar	• Displays status information about the application
6	Configuration window	• Contains the sensor-specific parameters that you can set
7	Toolbar	• Contains icon buttons as an extension to the menu
8	Check boxes	• **Show images**: Enables or disables the image display • **Show results**: Enables or disables the results area
9	Results area	• 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	• Displays the images captured or stored in the error memory • This field can be enabled or disabled via **Show images**
11	Tab	Displays information about the current image and the pixel under the mouse pointer. The following items are displayed: • Image size • Zoom level • Mouse position in image coordinates • Current grayscale value • Image number

6.3 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.

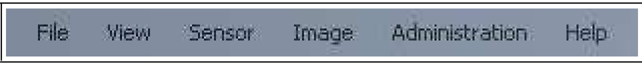


Figure 6.3 Menu Bar

6.3.1 *File* Menu

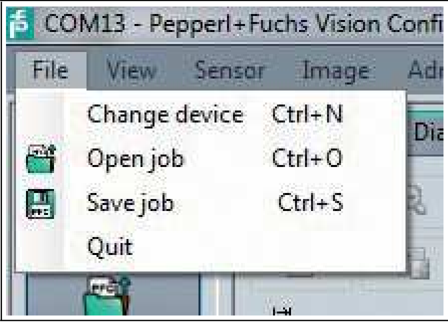


Figure 6.4 **File** Menu

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 6.2 **File** Menu

6.3.2 *View* Menu

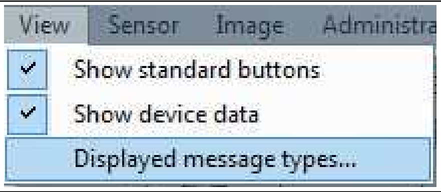


Figure 6.5 **View** Menu

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 6.3 **View** menu

6.3.3 *Sensor* Menu

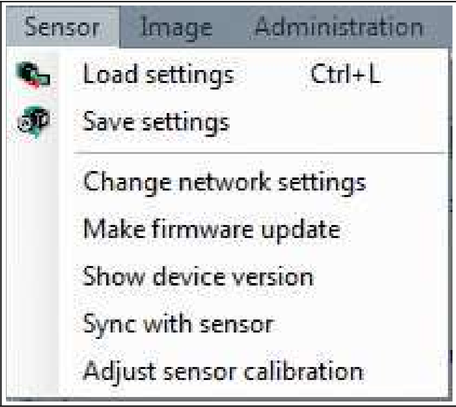


Figure 6.6 **Sensor** menu

Load settings	Loads the saved settings from the sensor
Save settings	Saves the settings to the sensor
Change network settings	Change the network settings. The settings window allows you to set the IP address, subnet mask, gateway address, and DHCP
Make firmware update	Performs firmware updates. This command should be used by experienced users only
Show device version	Displays the device version
Sync with sensor	Synchronization with the sensor
Adjust sensor calibra-tion	Adjust the sensor calibration

Table 6.4 **Sensor** menu

Note

Firmware Update

Once you have upgraded the firmware and **Update complete** is displayed, restart the sensor.

6.3.4 *Image* Menu

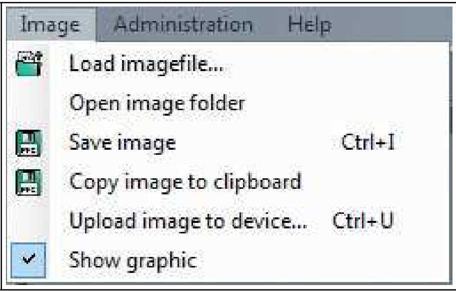


Figure 6.7 **Image** menu

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

Table 6.5 **Image** menu

6.3.5 *Administration* Menu

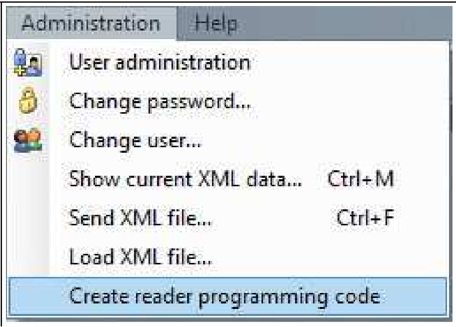


Figure 6.8 **Administration** menu

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 also 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.
Send XML file...	Saves the XML data on a computer.
Load XML file...	Loads XML data from a computer.
Create reader programming code	Creates a reader programming code

Table 6.6 **Administration** menu

6.3.6 *Help* Menu

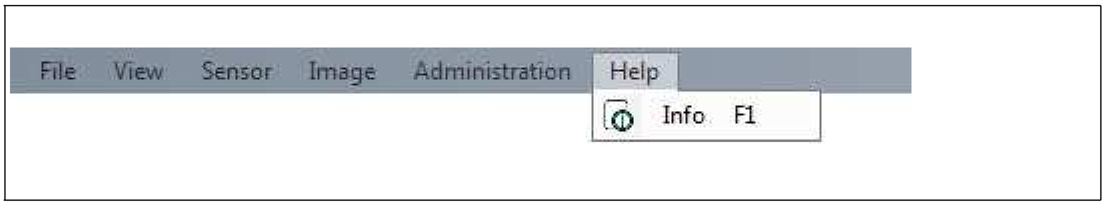


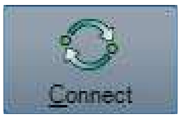
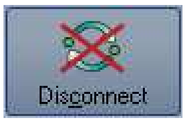
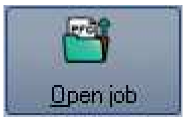
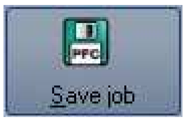
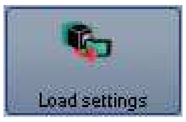
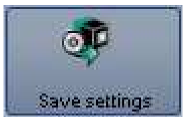
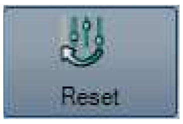
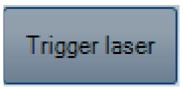
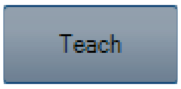
Figure 6.9 **Help** menu

Info	Displays information about Vision Configurator.

Table 6.7 **Help** menu

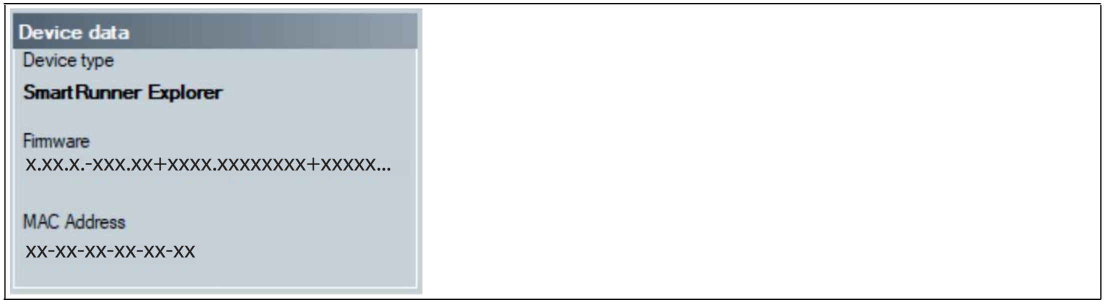
6.4 Toolbar

The toolbar can be used to select various functions.

	Selecting the Connect button establishes a connection between the PC and the sensor.
	The connection between the PC and the sensor is disconnected.
	Opens a saved setting.
	Saves the settings made.
	Settings are read out from the sensor.
	All settings made are saved on the sensor.
	Reset to default settings.
	Perform laser trigger to take a line image.
	Perform LED trigger to take an area image. NOTE: With autotrigger activated, a line image is output with "Trigger LED," not an area image.
	Loads the current sensor image.
	Teaches the exposure time.

6.5 Device Data

The "Device data" area shows the connected device type, firmware version, and MAC ID.



Device data
Device type
Smart Runner Explorer

Firmware
x.xx.x.-xxx.xx+xxxx.xxxxxxxx+xxxxx...

MAC Address
xx-xx-xx-xx-xx-xx

Figure 6.10 Device data

6.6 Image and Line Display

Pictures can be analyzed in the image and line display. By analyzing the recorded profile form, it is possible to use the measurement result to make a qualitative assessment. This enables intrusive reflections to be identified and eliminated. There is a relationship between the exposure time and image blur. A correct exposure is dependent on the brightness of the profile and the incident amount of light. An exposure time that is too short leads to underexposed (too dark) images, an exposure time that is too long to overexposed images.

There are various options available to you to display and correct recorded data to avoid errors during recording.

Result View - Line Display

You can open the currently recorded image including height profile under the **Result View** tab. To do this, click on the **Trigger laser** buttons in the toolbar.

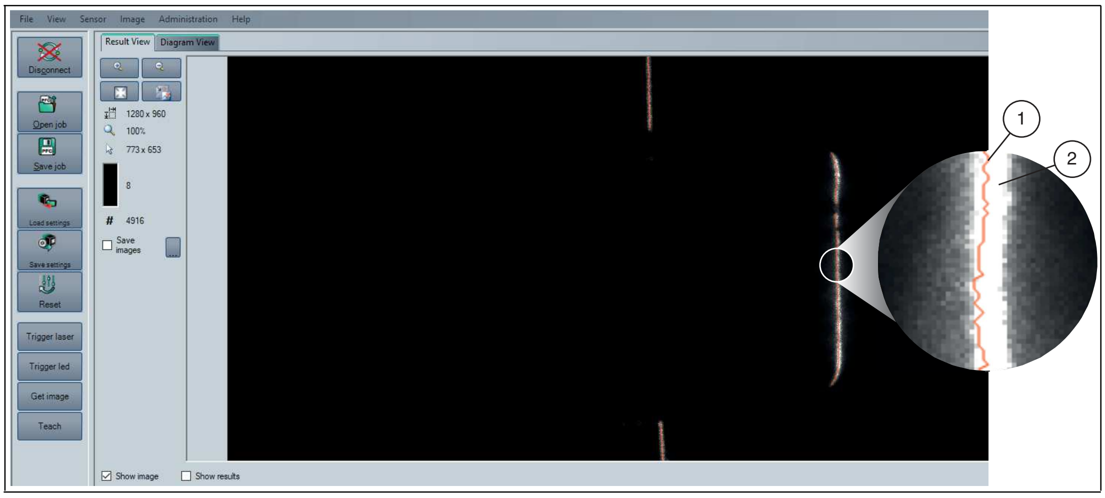


Figure 6.11 Line display

1 The line found is shown in red.

2 The laser light is shown in white.

The following context menu appears when you right-click the recorded image:

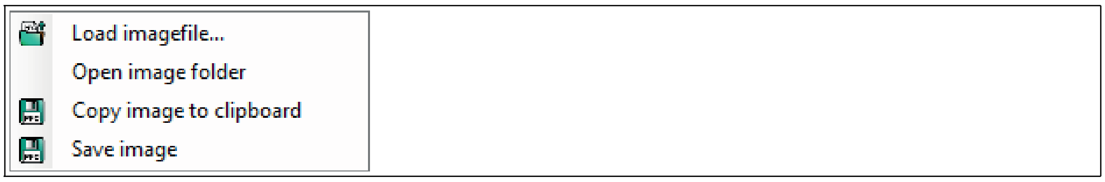


Figure 6.12 Result View context menu screen

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

Result View - Area Image

You can open the currently recorded image including height profile under the **Result View** tab. To do this, click on the **Trigger LED** buttons in the toolbar.

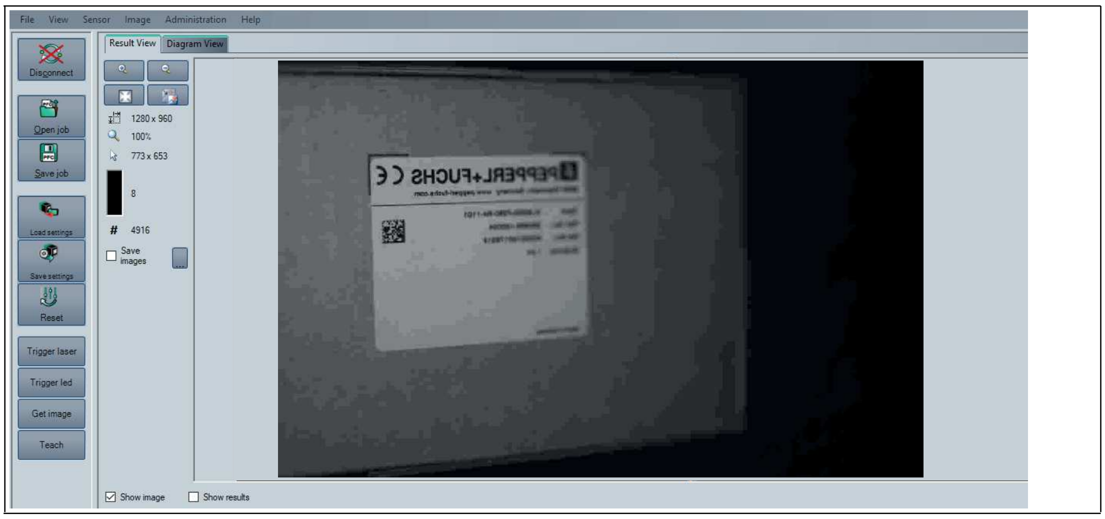


Figure 6.13 Area image

Note

Note that the "Image Transfer active" (see "Image Menu Item" on page 55) function is activated to show the area image.

The following context menu appears when you right-click the recorded image:

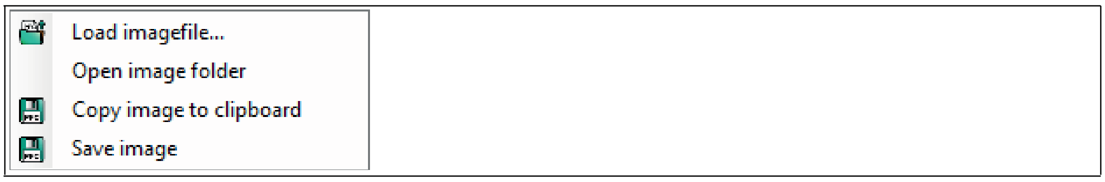


Figure 6.14 Result View context menu screen

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

Result View - Toolbar Menu

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

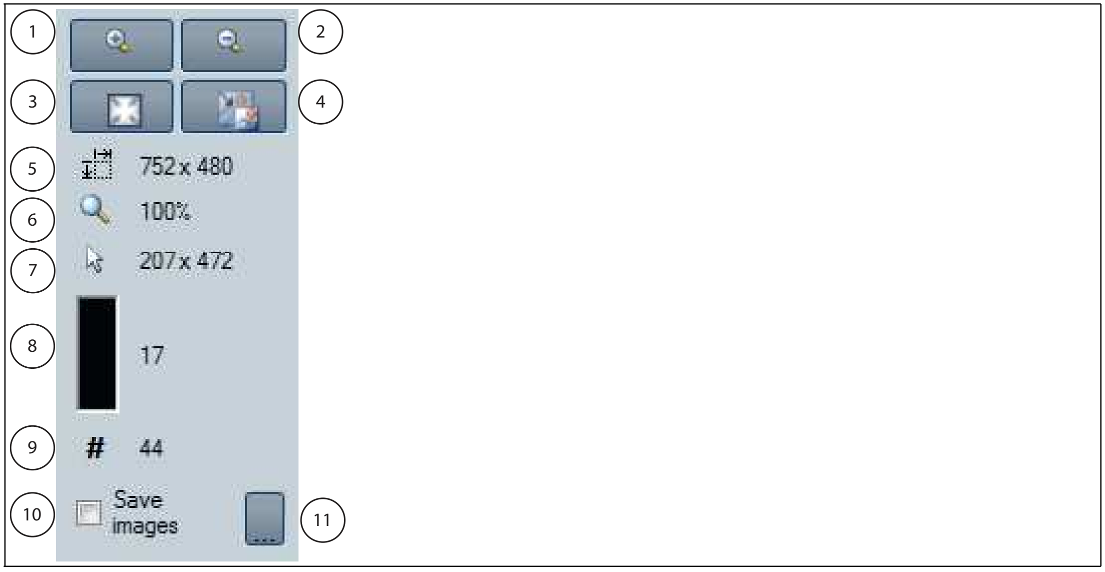


Figure 6.15 Toolbar

Position	Designation	Function
1	Magnifier +	Zoom in
2	Magnifier -	Zoom out
3	Fit to window	Fit image size to the window
4	Original size	Set original image size
5	Size details	Information field for image size
6	Zoom factor	Information field for zoom factor. A zoom factor of 100 % is the original image size
7	Position details	Shows the position of the mouse cursor
8	Gray scale value details	Gray scale value details for the pixel indicated by the mouse cursor
9	Image counter	Displays the current image number
10	Save image	Saves image following transfer
11	Select path	Select path on the storage medium

Diagram View

You can open the result data (height profile) graphic under the **Diagram View** tab. To do this, click on the **Trigger laser** buttons in the toolbar. The graphic can be retrieved using the **Diagram View** tab.

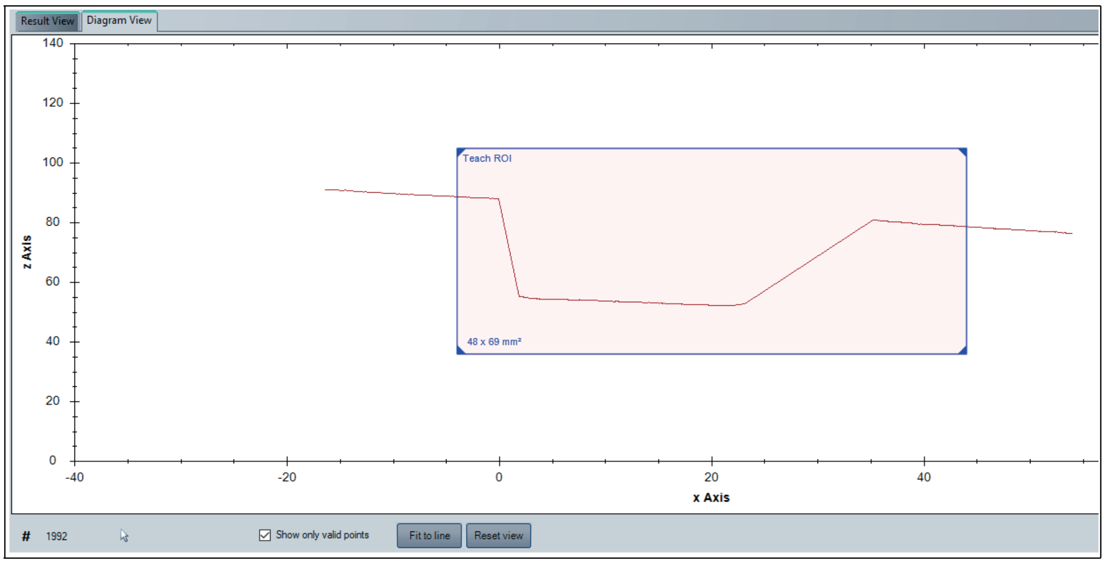


Figure 6.16 Diagram View

The following context menu appears when you right-click the graphic:

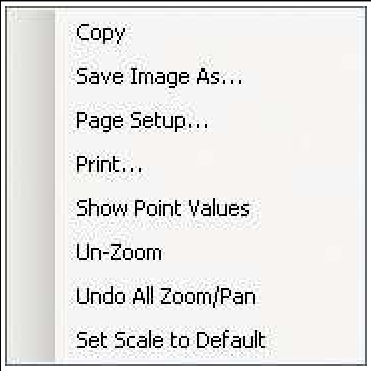


Figure 6.17 Diagram View context menu screen

Designation	Function
Copy	Copies diagram into working memory
Save Image As...	Saves diagram to hard drive
Page Setup...	Page setup for print function
Print...	Print diagram
Show Point Values	Shows the values of the discrete line points in world coordinates [mm] as tooltip.
Un-Zoom	Undo the last zoom action
Undo All Zoom/Pan	Undo all the zoom and pan actions
Set Scale to Default	Scales the measure using the line data

Diagram View - Toolbar

The toolbar is located below the diagram view. The toolbar contains several useful functions that are used to further process the diagrams. The following functions are available.

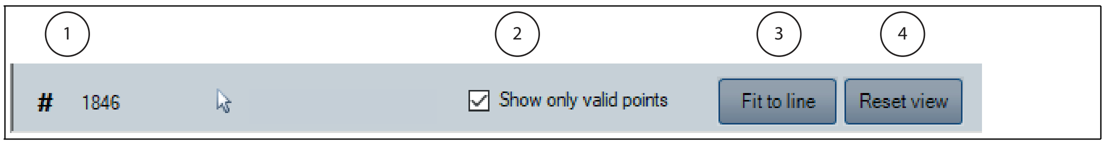


Figure 6.18 Diagram View - Toolbar

Position	Designation	Function
1	Grayscale value	Grayscale value of the pixel
2	Show only valid points	Shows all available points
3	Fit to line	Entire visible line in field of view
4	Reset view	Resets to the original view

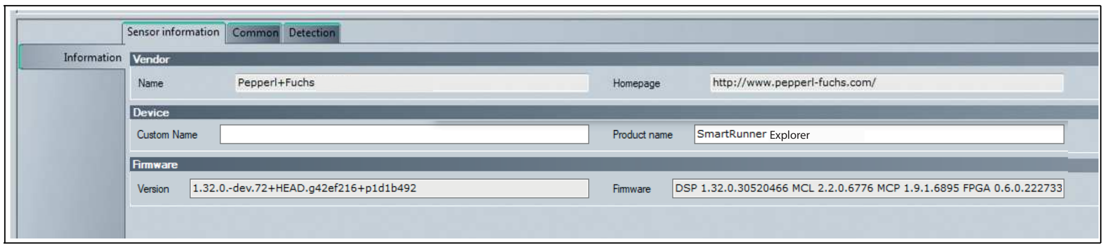
PEPPERL+FUCHS

6.7 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 variants only. Depending on the parameters set, some fields will be grayed out.

6.7.1 Sensor Information Tab

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



Name: Pepperl+Fuchs
Homepage: http://www.pepperl-fuchs.com/
Custom Name:
Product name: SmartRunner Explorer
Version: 1.32.0.-dev.72+HEAD.g42ef216+p1d1b492
Firmware: DSP 1.32.0.30520466 MCL 2.2.0.6776 MCP 1.9.1.6895 FPGA 0.6.0.222733

Figure 6.19 Sensor Information Tab

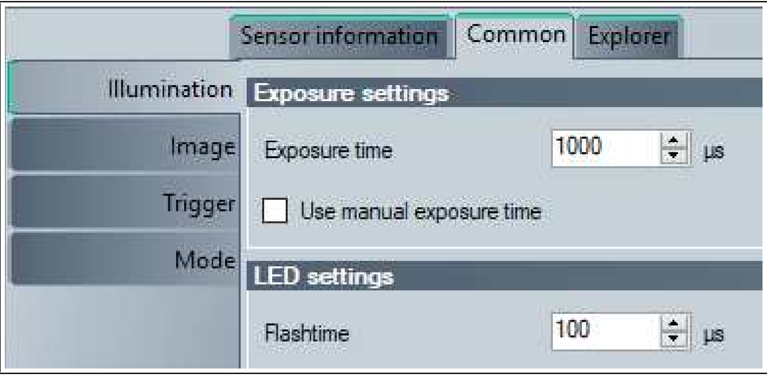
Vendor	Name	Manufacturer
	Homepage	Manufacturer homepage
Device	Custom name	User-defined name
	Product name	Product designation
Firmware	Version	Firmware version
	Firmware	Firmware designation

6.7.2 Common Tab

Five menu items are available under the **Common** tab. The purpose of this section is to present the menu items in detail.

Illumination Menu Item

You can adjust the sensor's exposure under the **Illumination** menu item.



Exposure time 1000 µs

☐ Use manual exposure time

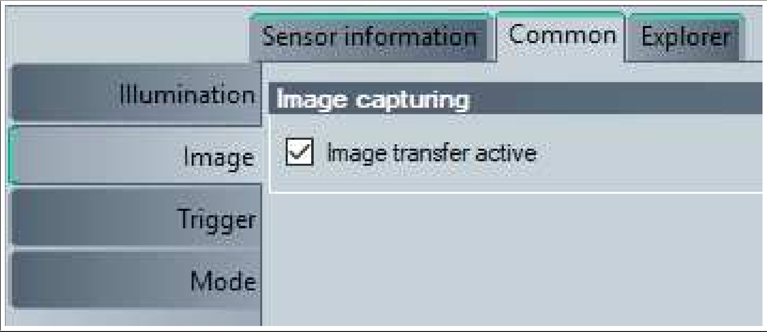
Flashtime 100 µs

Figure 6.20 Illumination menu item

Designation	Function
Exposure time	Setting the manual exposure time. The "Use manual exposure time" function must be activated to manually adjust the exposure time. Increasing the value increases the exposure time and therefore the image brightness. Values below 1000 µs are suitable in most cases
Use manual exposure time	When enabled, the manually set exposure time is used. If this box is not checked, the exposure time is regulated automatically during the "teach-in" process
Flashtime	Sets the exposure time of the LED lighting in µs.

Image Menu Item

Under the **Image** menu item, you can adjust the image capture.



☑ Image transfer active

Figure 6.21 Image menu item

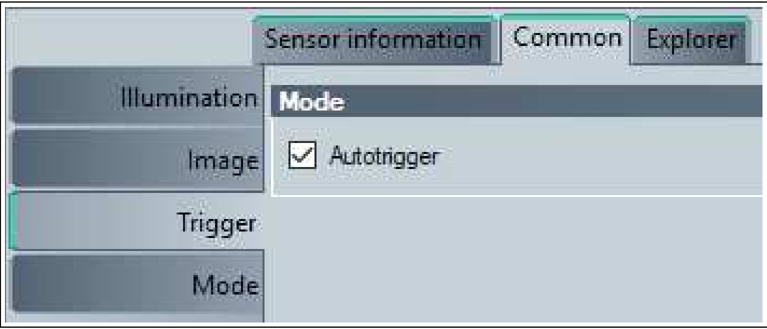
Designation	Function
Image transfer active	This function transfers images automatically with each image capture. If the function is disabled, no images are output in the "Result View."

2022-02

PEPPERL+FUCHS

Trigger Menu Item

You can enable or disable the autotrigger under the **Trigger** menu item.



Mode

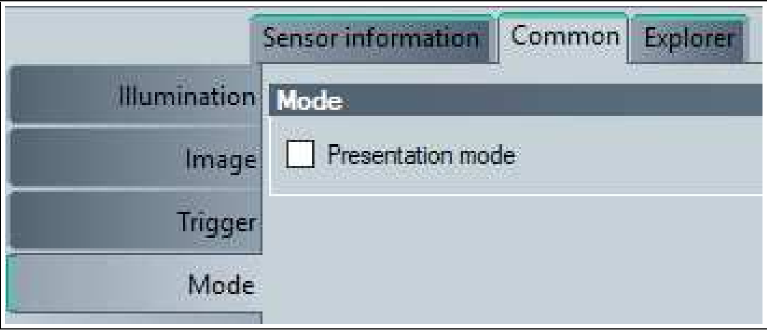
☑ Autotrigger

Figure 6.22 Trigger menu item

Designation	Function
Autotrigger	Checking the box activates a cyclically recurring trigger. The autotrigger must be activated in "Presentation mode". NOTE: With autotrigger activated, a line image is output with "Trigger LED," not an area image.

Mode Menu Item

Under the **Mode** menu item, you can enable or disable "Presentation mode" and "function keys 1 and 2". "Presentation mode" and "function keys 1 and 2" are activated if checked and deactivated if unchecked.



Mode

☐ Presentation mode

Figure 6.23 Mode menu item

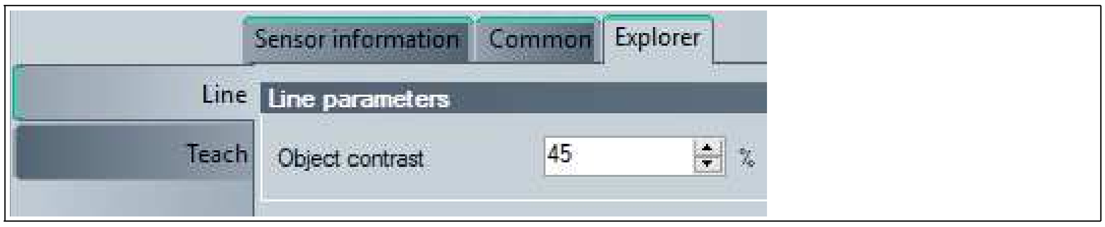
Designation	Function
Presentation mode	Operating mode for presentation or testing without the assistance of a PC

6.7.3 Explorer Tab

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

Line Menu Item

Under the **Line** menu item, you can adjust the x and z tolerance range for the sensor. The tolerance range determines by how much the height profile may move within the evaluation range and still be recognized.



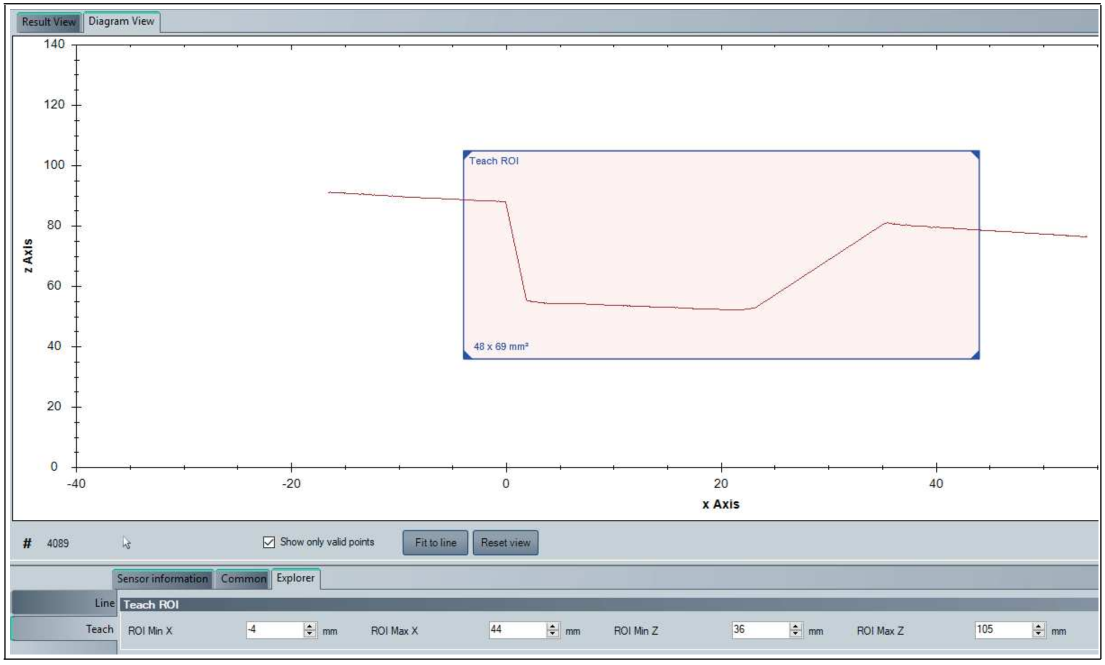
Object contrast 45 %

Figure 6.24 Match menu Item

Designation	Function
Object contrast	Contrast threshold used to detect the laser line on the object.

Teach Menu Item

The **Teach** menu item is used to adjust the exposure time. The required "Teach ROI" teach-in range is adjusted using the line profile under the "Diagram View" tab. The coordinates of the x and z axis are shown in the display field below the graphic.



ROI Min X -4 mm ROI Max X 44 mm ROI Min Z 36 mm ROI Max Z 105 mm

Figure 6.25 Teach Menu Item

Designation	Function
ROI Min X	The smallest value on the x axis
ROI Max X	The largest value on the x axis
ROI Min Z	The smallest value on the z axis
ROI Max Z	The largest value on the z axis

2022-02

PEPPERL+FUCHS

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:

Checklist

Fault	Cause	Remedy
"Power" LED does not light up	The power supply is switched off	Check whether there is a reason why the power supply is switched off (installation or maintenance work, etc.). Switch on the power supply if necessary.
	Wiring fault in the splitter or switch cabinet, cable break	Check the wiring carefully and repair any faults with the wiring. Check the cables to ensure that they are functioning properly.
Control panel receiving no measurement data	Connection cable not connected	Connect the connection cable.
	Incorrect connection cable used	Use the appropriate connection cable only.
Measurement object not recognized	Reflections	Avoid reflections
	Foreign exposure	Avoid foreign exposure
	Exposure time control	Set exposure (see chapter 6.7.2)
	Teach-in range set incorrectly	Set teach-in range (see chapter 6.7.3)
Measurement errors	Surfaces with pronounced scored structure and reflective surfaces	Improved arrangement of sensor components to the measurement object
	Temperature change in the sensor	Allow sensor to warm up for around 15 minutes before the measuring process is started.
	Incorrect distance to the measuring object	Note distance values
	Housing incorrectly mounted	Install housing correctly (see chapter 3.4)
Presentation mode not working	Presentation mode not activated	Enable **Presentation mode** and **Autotrigger** and confirm using "Save settings"
No connection to the sensor	Alternating-current voltage or supply voltage too high	Connect sensor to direct-current voltage (DC) only. Ensure that the supply voltage level is within the specified sensor range.

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

Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- 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
- Displays and Signal Processing
- Connectivity

Pepperl+Fuchs Quality
Download our latest policy here:

www.pepperl-fuchs.com/quality

PEPPERL+FUCHS