2-D LiDAR Sensor

R2000 Measuring Sensors

Brief Instructions

Your automation, our passion.

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With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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1 Introduction

1.1 Purpose of These Brief Instructions

These brief instructions contains basic instructions for operating the device. How-ever, the manual takes priority over the brief instructions.

1.2 Product documentation on the internet

You can view all the relevant documentation and additional information on your product at http://www.pepperl-fuchs.com. Simply enter the product name or model number in the **Product/Key word search** box and click **Search**.

Select your product from the list of search results. Click on the information you require in the product information list, e.g., **Technical documents**.

A list of all available documents is displayed.

1.3 Intended Use

The R2000 2-D LiDAR sensor is a 360° measuring instrument with an all-round display. It is used on automated transport systems or other movable machinery in intralogistics. It is also used on stationary equipment in the area of factory and building automation.

The device is only approved for appropriate and intended use.
Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

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2 Safety

2.1 Laser Class 1

Class 1 Laser Product

This sensor is certified according to laser protection class 1.

Warning!

Class 1 laser light

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

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

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

Caution: Use of controls, adjustments, or performance of procedures other than those specified herein may result in harmful laser beam exposure.

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3 Product Description

3.1 Indicators and Operating Elements
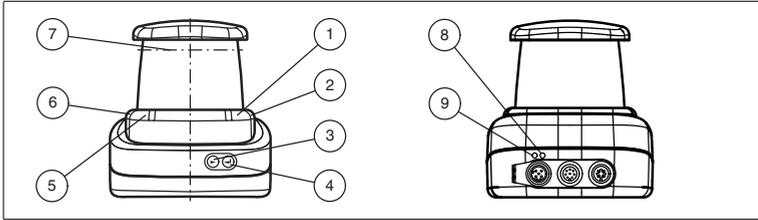
Figure 3.1   Indicators and Controls

No.	Description	Color
1	Operating indicator	Green
2	Fault indicator	Red
3	"Next" menu button	
4	"Return" menu button	
5	"Q2" signal indicator	Yellow
6	"Q1" signal indicator	Yellow
7	Laser beam outlet	
8	Ethernet activity indicator	Yellow
9	Ethernet link indicator	Green

Table 3.1   Indicators and operating elements

3.2 Interfaces and Connections

The following connections are found on all devices:

Power Supply

There is a 4-pin M12 plug on the rear of the housing for connecting the power supply. The following diagram shows the pinout:
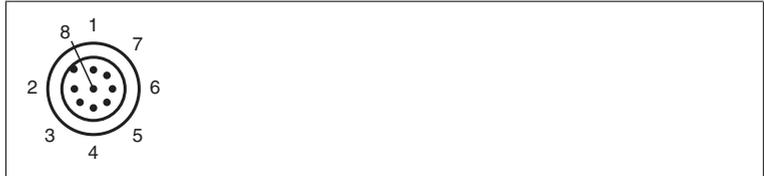

Figure 3.2   Power supply connection layout

1 24 V power supply

2 I/Q2

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3 Ground (GND)

4 I/Q1

MultiPort

There is an 8-pin M12 plug on the rear of the housing for service purposes.

1 DNC (Do not connect)

2 DNC (Do not connect)

3 DNC (Do not connect)

4 DNC (Do not connect)

5 DNC (Do not connect)

6 I/Q2

7 I/Q1

8 DNC (Do not connect)

All pins with "DNC (Do not connect)" must not be connected!

Interface:

There is a 4-pin M12 socket on the rear of the housing for connecting the Ethernet interface. The following diagram shows the pinout:

Figure 3.3   Ethernet connection layout

1 TD+

2 RD+

3 TD-

4 RD-

The connector housing is located on the shield.

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3.3 Scope of Delivery

The scope of delivery includes:

- R2000
- Quick start guide
- Protective cover
- 3 x socket cap screws, M5 x 10
- 3 x washers, size 5

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Note

Installation Instructions for North America

If a connection is made to the M12 multi-pin connector, the product shall be used with a UL-listed cable/connector (CYJV) assembly rated minimum 30 VDC, minimum 1.0 A, in the final installation for power supply.

3.4 Accessories

The following products are available as accessories.

Name	Description
V1SD-G-2M-PUR-ABG-V45-G	Patch cable, M12 to RJ45, length 2 m
V1SD-G-5M-PUR-ABG-V45-G	Patch cable, M12 to RJ45, length 5 m
V1SD-G-ABG-PG9	Single-ended male cordset, M12 D-coded, 4-pin for bus cable
V1-G-2M-PUR	Single-ended female cordset, straight, M12, 4-pin, PUR cable
V1-W-2M-PUR	Single-ended female cordset, angled, M12, 4-pin, PUR cable
MH-R2000	Mounting bracket, quick-release and adjustment device

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Note

Installation note for North America

If a connection is made with the M12 multi-pin connector, in the final installation of the power supply the product must be used with a UL-listed cable/connector assembly (CYJV) that is designed for at least 30 VDC and at least 1.0 A.

Name	Description
V1-G-BK-2M-PUR-U	Single-ended female cordset, straight, M12, 4-pin, PUR cable, length 2 m, "UL recognized"
V1-G-BK-5M-PUR-U	Single-ended female cordset, straight, M12, 4-pin, PUR cable, length 5 m, "UL recognized"
V1-G-BK-10M-PUR-U	Single-ended female cordset, straight, M12, 4-pin, PUR cable, length 10 m, "UL recognized"

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To parameterize the R2000 conveniently via a software interface, you will need the corresponding device type manager (DTM) in addition to the FDT framework program (PACTware 4.x or above). PACTware and the DTM are available at www.pepperl-fuchs.com.

3.5 Further Information

Further product information and technical data are available at www.pepperl-fuchs.com.

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4 Installation

4.1 Mounting

Caution!

Aggressive environments may damage the sensor lens or cause it to malfunction

Using the device in aggressive environments may damage the sensor lens and lead to impaired sensor function.

Never use the device in aggressive environments.

Caution!

Condensation may cause property damage and malfunction

Strong fluctuations in ambient temperature and humidity may damage the sensor lens and lead to impaired sensor function.

Avoid excessive fluctuations in temperature and humidity to prevent condensation.

Caution!

Excessive sunlight may result in property damage or malfunction

Continuous exposure to direct sunlight may damage the sensor lens and lead to impaired sensor function. Taking measurements in direct sunlight may lead to erroneous measurement results.

Protect the device from continuous exposure to direct sunlight.
Do not point the device's sensor at the sun.

Mounting the 2-D LiDAR Sensor

Only mount the sensor in locations that fulfill the following safety-relevant requirements: no aggressive environments, no direct sunlight, no excessive fluctuations in temperature and humidity.

1. In addition, note the following when selecting a mounting location:
   - The sensor must not be obstructed visually, e.g., behind a cover.
   - The sensor should be installed so it is protected from rain.

2. Mount the device on the underside using the supplied socket head screws with washers.

Caution!

The wrong screw-in depth may result in property damage

If you screw the screws deeper than 8 mm into the base, the device will be mechanically destroyed.

When mounting, make sure that the screw-in depth on the base is ≥ 5 mm ... ≤ 8 mm.

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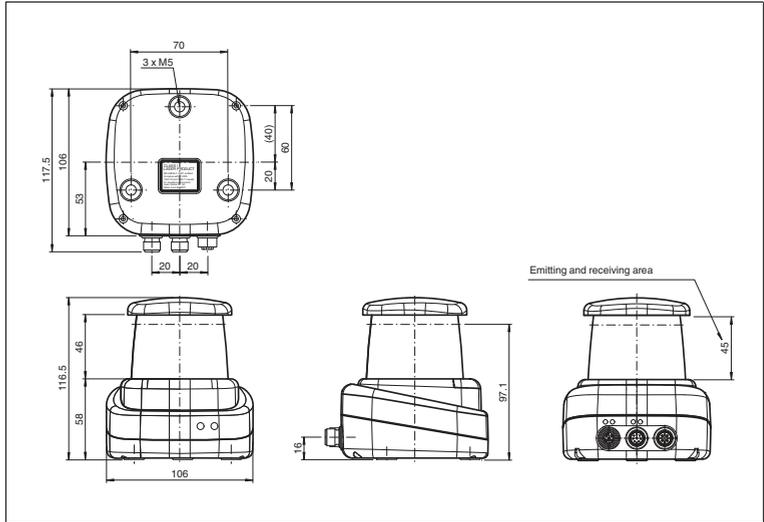
Figure 4.1   Dimensional drawing of R2000 2-D LiDAR sensor

3. Check that the sensor is securely seated.

> **Note**
>
> **Keep the emitting/receiving area clear**
>
> When mounting, make sure the emitting area and the receiving area are kept clear. Covering the emitting/receiving area reduces the performance of the 2-D LiDAR sensor.

4.2   Device Connection

> **Electrical connection in accordance with IP65**
>
> **1.** Put protective covers on unused M12 connectors.
>
> ↳ The IP65 degree of protection is achieved. The protective covers can be ordered as accessories; see chapter 3.4.

> **Danger!**
>
> Danger to life from electric shock
>
> Absent or insufficient insulation can result in electric shock.
>
> Only connect supplies that provide protection against electric shock (e. g. SELV or PELV).

The device conforms to protection class III. This means the power supplied to the device must be a safety extra-low protective voltage (PELV).

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The power supply of the device uses a direct current of 10 V DC ... 30 V DC. Due to the integrated motor, a higher startup current is required than with normal operation. We recommend the use of power supplies with 1 A (for 24 V) or with 2 A (for 12 V).

The maximum cable length is 30 m.

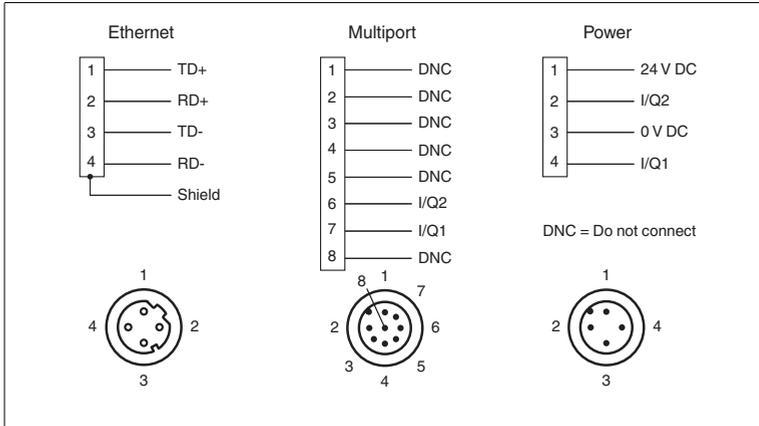The pin assignment is as follows:

Ethernet	Multiport	Power
1 — TD+	1 — DNC	1 — 24 V DC
2 — RD+	2 — DNC	2 — I/Q2
3 — TD-	3 — DNC	3 — 0 V DC
4 — RD-	4 — DNC	4 — I/Q1
— Shield	5 — DNC	
	6 — I/Q2	DNC = Do not connect
	7 — I/Q1	
	8 — DNC	

Figure 4.2   R2000 pin assignment

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5 Commissioning

The sensor has been tested and calibrated before delivery. It can be put into operation immediately.

Commissioning the LiDAR sensor

Danger!

Danger to life from electric shock

Absent or insufficient insulation can result in electric shock.

Only connect supplies that provide protection against electric shock (e. g. SELV or PELV).

1. Connect the device to the appropriate power supply.

   ↳ The initialization phase lasts approx. 15 seconds. This phase is shown by circles moving down the all-round display.

2. After the initialization phase, the Pepperl+Fuchs logo will appear on the all-round display.

   ↳ The device is now ready for operation.

Tip

Factoring in a warm-up phase

To achieve the best measurement accuracy, allow the device to warm up for at least 30 minutes after switching on.

5.1 Ethernet Configuration

The sensor has 3 different addressing options that can be used as required. The setting is configured using the menu interface on the sensor itself.

Note

Point-to-point connection

The sensor does not meet the requirement of the modern cybersecurity directives and therefore is an unsafe component in the network structure.

We recommend establishing an isolated point-to-point connection between sensor and the higher-level control.
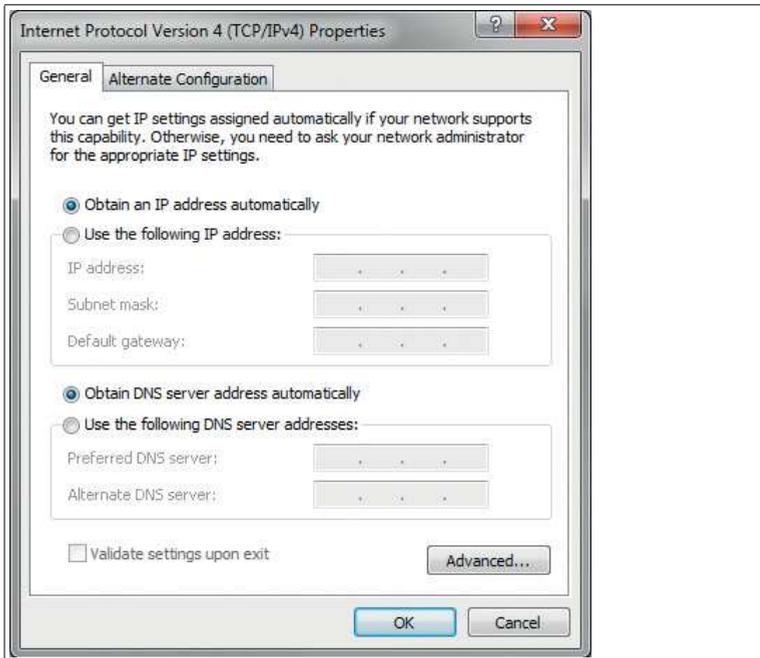
Auto IP

In the Auto IP setting, the sensor independently assigns a "link-local" IP address in the 169.254.0.0/16 range. During this process, the system ensures that the selected address is not already being used by another device.

> ## Configuring a Connection via Auto IP
>
> The sensor is set to Auto IP by default. The Auto IP setting is the best way to connect directly to a PC.

1. If the network configuration of the sensor no longer matches the factory setting:

> 1. Under **Ethernet Setup > Address Mode**, set the sensor to "Auto IP."
> 2. Restart the sensor to apply the configuration.

3. To connect the sensor to the PC, set the PC to Dynamic Host Configuration Protocol (DHCP).

4. Adjust the properties of the PC network card accordingly. To do this, select the TCP/IP protocol in the network card properties.

5. In the Internet protocol properties, select **Obtain an IP address automatically**.

6. Click **OK** to confirm.

↳ After approx. 30 seconds, Microsoft® Windows® assigns an auto IP for the PC.

DHCP

Connecting via DHCP requires the availability of a DHCP server, such as a router, on the local network; see Auto IP, PC network card settings.

If this requirement is fulfilled, you can set the sensor to DHCP.

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Configuring a Connection via DHCP

1. Under **Ethernet Setup > Address Mode**, set the sensor to "DHCP."

2. Restart the sensor to apply the configuration.

Manual IP

You can also address the sensor via an IP address set manually. You can set the PC network card and the sensor to an IP address of your choice.
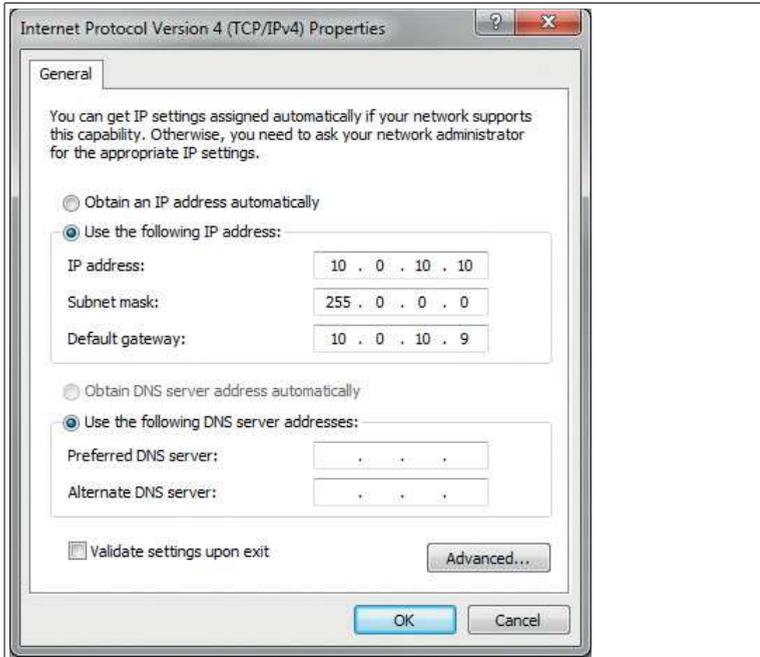
Note

The IP address of the sensor is set to 10.0.10.9 and the subnet mask to 255.0.0.0 by default.

Configuring a Connection via a Manual IP Address

1. Configure the sensor:
    1. Under **Ethernet Setup > Address Mode**, set the sensor to "Manual."
    2. Enter the required address under **Ethernet Setup > IP Address**.

3. Restart the sensor to apply the configuration.

4. To connect the sensor to the PC, enter the required IP address in the menu for the PC network card. Select the TCP/IP protocol in the PC network card properties.

5. Select "Use the following IP address" and enter the required IP address and subnet mask.

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6. Click **OK** to confirm.

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Note

Device restart

You must restart the sensor after changing the Ethernet configuration.

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