One Critical Step Ahead.

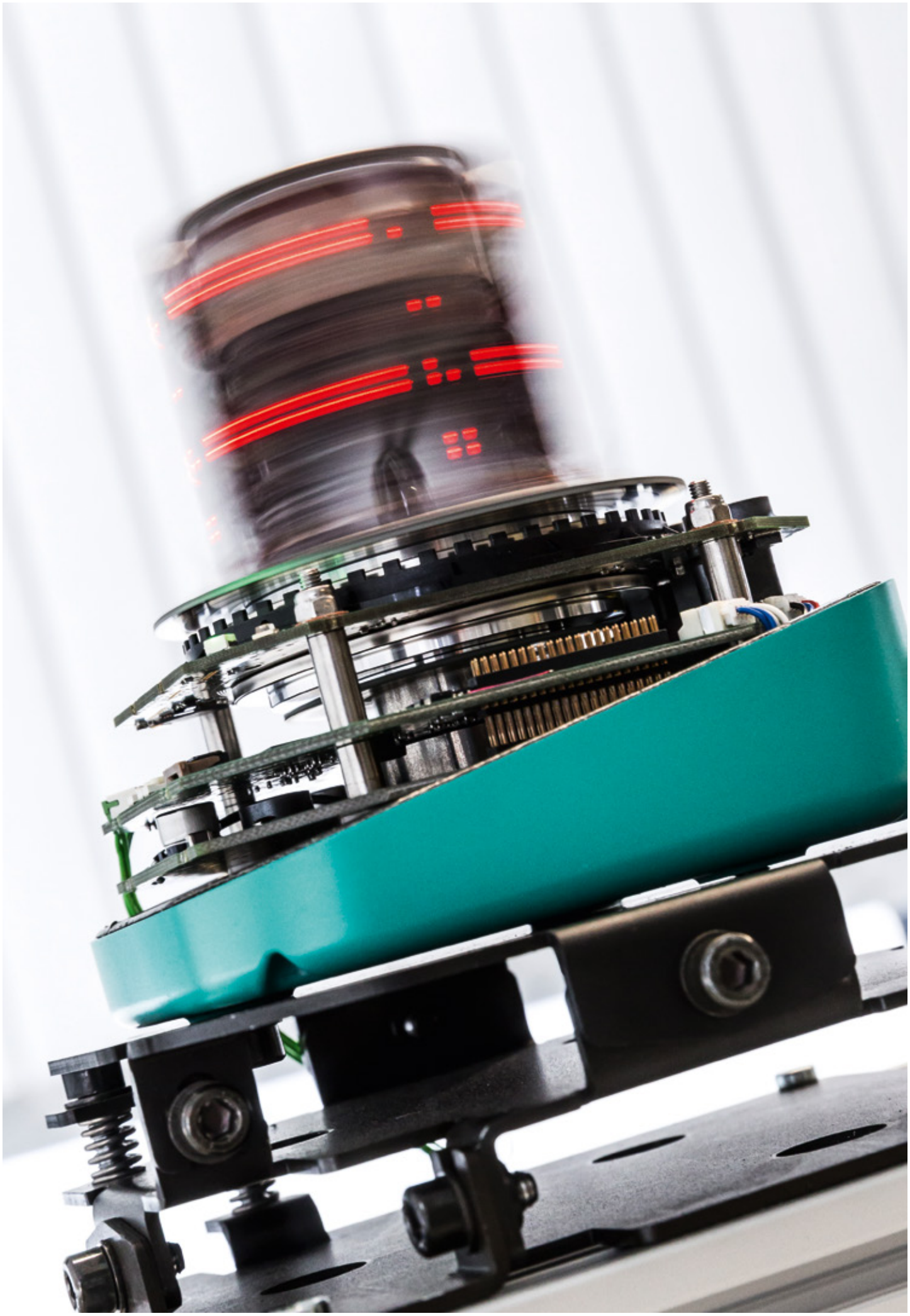
Millimeter-precise Pulse Ranging Technology reliably masters any challenge.

Product Overview
LiDAR Sensors



Your automation, our passion.

PEPPERL+FUCHS



LiDAR Sensors

Innovative Sensor Solutions for Maximum Performance

Pepperl+Fuchs draws on decades of experience and in-depth technical know-how to consistently drive forward innovative ideas. LiDAR sensors with Pulse Ranging Technology (PRT) follow this tradition—they stand out with highly precise and reliable measurement results. The company's systematic approach to developing these sensors ensures that new and even more powerful sensor solutions will be available in the future.

One Critical Step Ahead

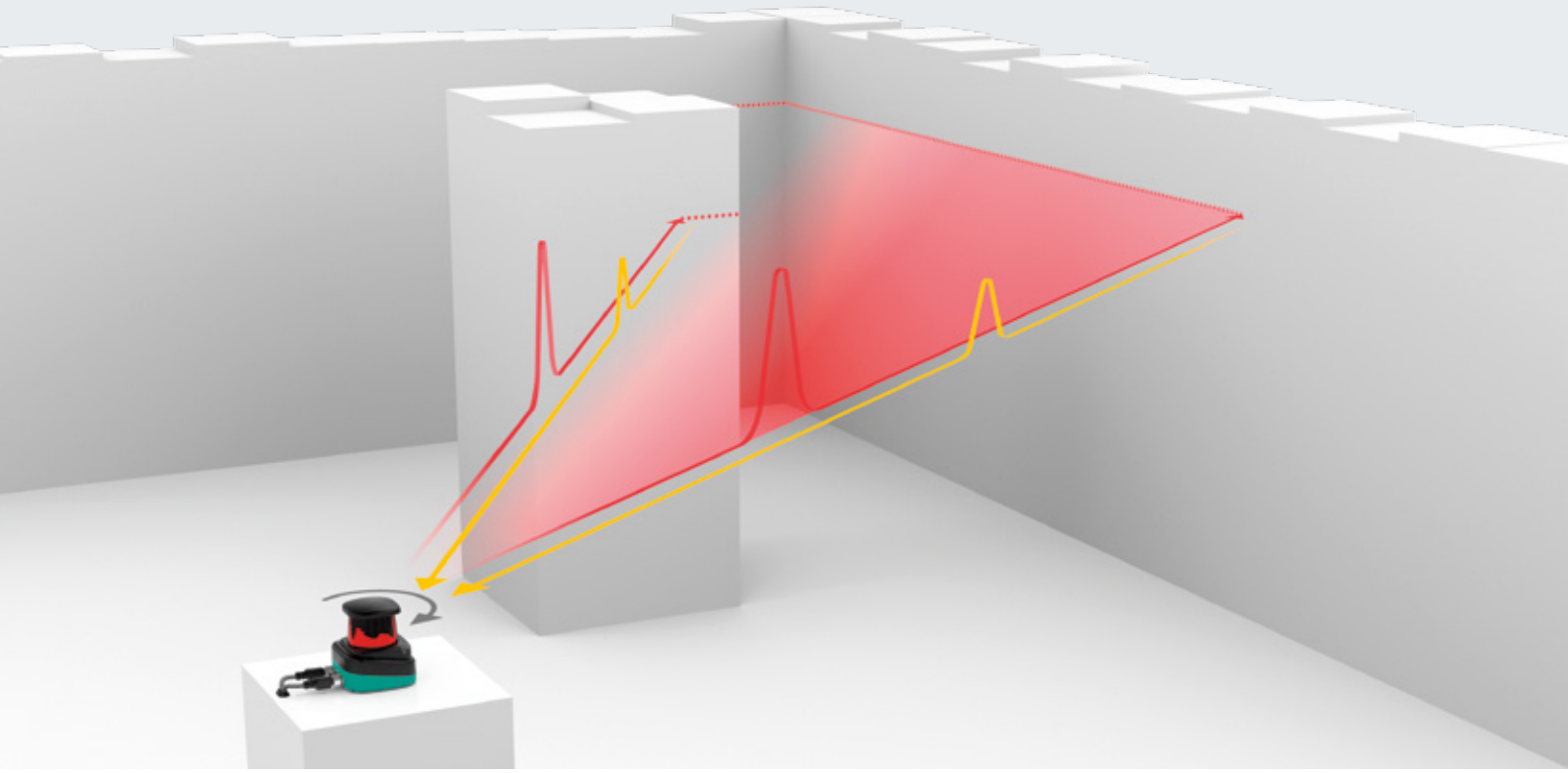
The portfolio of LiDAR sensors from Pepperl+Fuchs offers exactly the right solution for every application, from basic requirements to high-end applications. The R2000 is a 2-D LiDAR sensor that impresses with 360° performance and unmatched precision. The R2400 also offers 360° measurement but excels in applications where a compact design and cost efficiency are crucial. The R2100 is a durable multiray solid-state design LED scanner that is extremely cost-effective, making it the perfect choice for straightforward and reliable object detection.

Superior Technology: PRT for Precise and Reliable Measurement Results

By developing Pulse Ranging Technology (PRT), Pepperl+Fuchs has incorporated direct time-of-flight measurement technology into products that are available for commercial and industrial use. This means that the precise and highly reliable technology can be scaled to meet a wide range of requirements. PRT makes it possible to measure distances ranging from a few centimeters to several hundred meters with absolute precision and reliability, even in challenging conditions.

Pulse Ranging Technology

Intelligent Technology for a High Level of Precision



Pulse Ranging Technology (PRT) was specially developed by Pepperl+Fuchs for highly precise distance measurement. It can measure distances ranging from a few centimeters to several hundred meters with the utmost precision.

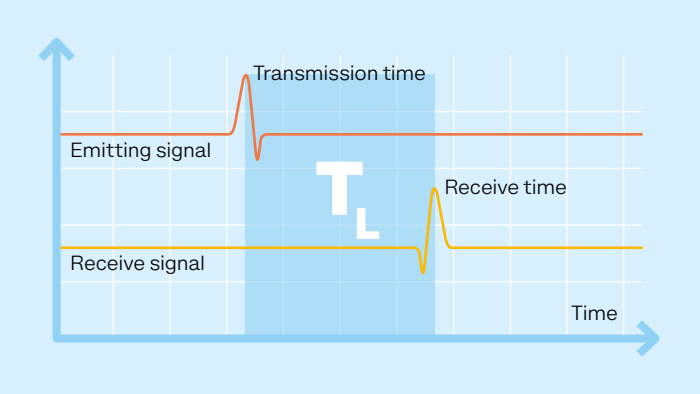
High-Energy Pulses Instead of a Continuous Beam of Light

Pulse Ranging Technology uses a powerful light source to emit short pulses of light. These pulses are reflected off the target object and detected with a high level of accuracy by a light-sensitive receiver. The exact distance to the target object is then calculated on the basis of the recorded values and the speed of light.

The energy content of a light pulse is considerably higher than that of sensors using indirect measuring methods and constant light sources. In contrast to triangulation, the measuring range of PRT is not limited by the geometrical layout of the optics. Even in relatively small housings, PRT sensors can still provide significantly larger measuring ranges and meet high requirements in terms of quality of measured values.

Pinpoint Precision, Even over Long Distances

One of the reasons why Pulse Ranging Technology has been so successful is the extremely high energy density of the light pulses. This not only makes it possible to achieve higher detection ranges, but also effectively suppresses interference from ambient light and different object properties. By directly measuring the transit time of these light pulses, PRT sensors deliver highly precise and reliable measurement results.



Maximum Performance: The R2000

The scanner's 360° measuring angle allows for all-round visibility. The 2-D LiDAR sensor offers best-in-class angular resolution and an interactive display for easy-to-see status information. The basic settings can be configured directly on the device. Operating and diagnostic information can also be viewed during operation.

An Economical and Durable Solution: The R2100

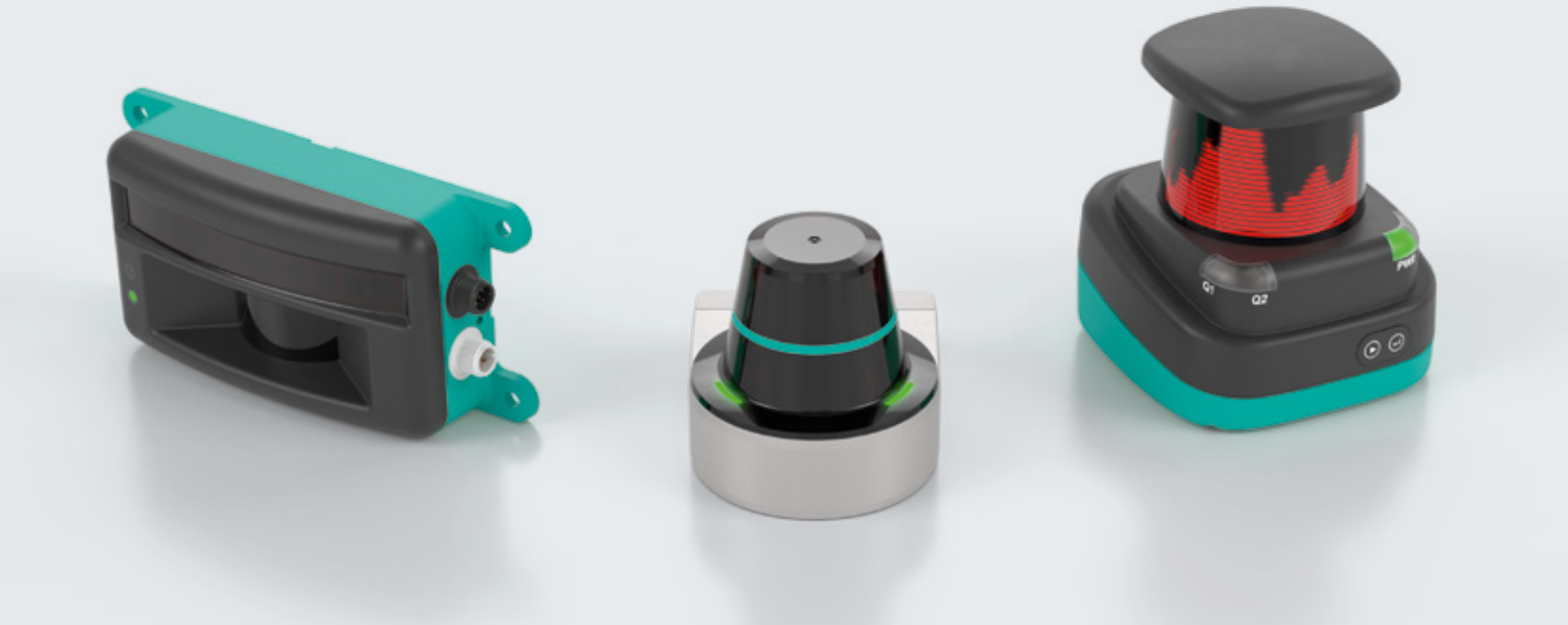
The R2100 multiray LED scanner from Pepperl+Fuchs has a solid-state design for added durability and is also cost-effective. The device performs 2-D measurements over 11 single beams for absolutely reliable measurement results. The wide-beam emitters ensure reliable object detection regardless of surface texture.

Compact with All-Round View: The R2400

The R2400 combines full 360° all-round detection with an exceptionally compact design, measuring just 81 mm in height. The robust metal construction ensures reliable performance even under mechanical stress. Due to the optical separation of the transmitter and receiver, measurement results remain stable even under challenging environmental conditions. The 2-D LiDAR sensor is the ideal solution for AMR and AGV applications where compact design and cost efficiency are critical.

Typical PRT Applications

- Medium to very large detection ranges, varying ambient conditions
- Parallel operation of several neighboring sensors
- Precise object detection and positioning
- Reliable navigation support and collision avoidance



Multiray LED scanner R2100, 2-D LiDAR sensors R2400 and R2000

R2000 UHD/HD

High Level of Precision for Demanding Applications

- Measuring range up to 120 m
- Scanning angle
- Interactive, all-around display
- Detection of very small objects



Accurate Detection of Even the Smallest Objects

The combination of unique features is what makes the R2000 really stand out. A precise light spot combined with high angular resolution makes it possible to detect objects with a length as small as one millimeter. This guarantees absolutely reliable object detection and clear measurement results, even under extremely challenging ambient conditions. The 360° measuring angle ensures all-round visibility at all times.

Precise Object Detection with a 360° Measuring Angle

The R2000 features a 360° measuring angle for all-round visibility. The interactive all-round display provides text and graphical information. Basic settings can be configured directly on the device via easy-to-access controls. These controls also make it possible to view diagnostic information during operation. This includes messages about the pollution degree of the lens, so the user can intervene before a fault occurs.

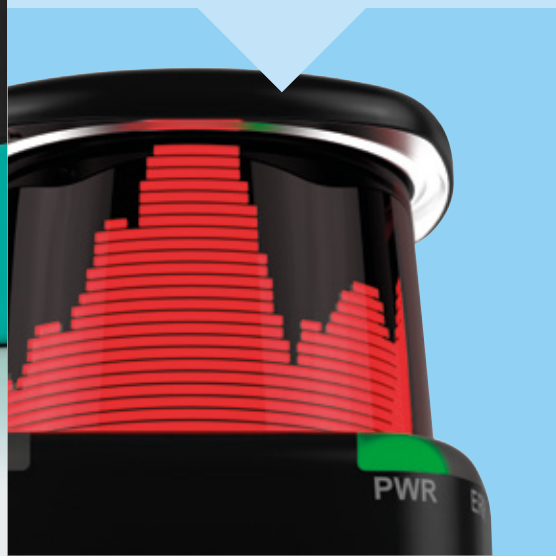
Extremely High Sampling Rate, High Degree of Angular Resolution, Large Detection Range

The R2000 combines extreme speed with a market-leading angular resolution of 0.014°. The high sampling rates of 3,000 revolutions per minute and 250,000 individual measurements per second guarantee the highest possible performance. Switchable filters can be used to adjust the measured value output easily and quickly to the relevant application. In addition to providing precise distance and angle measurements, the R2000 can differentiate between natural objects and reflectors. An accurate timestamp in the measurement data allows precise integration into dynamic measurement tasks.



Easy-access controls

R2000 HD and UHD display



Technical data	R2000 UHD (Ultra High Density)	R2000 HD (High Density)
Order code	OMD15M-R2000-B23-V1V1D OMD30M-R2000-B23-V1V1D-1L OMD60M-R2000-B23-V1V1D-1L OMD120M-R2000-B23-V1V1D	OMD30M-R2000-B23-V1V1D-HD-1L OMD60M-R2000-B23-V1V1D-HD-1L
Measuring range	15 m to object/60 m to reflector (OMD15M) 30 m to object/200 m to reflector (OMD30M) 60 m to object/200 m to reflector (OMD60M) 120 m to object/200 m to reflector (OMD120M)	30 m to object/30 m to reflector (OMD30M) 60 m to object/120 m to reflector (OMD60M)
Light type	Red light, laser infrared light	Laser infrared light
Angle resolution	≥ 0.014°	≥ 0.043°
Measuring rate	Up to 250,000 measurements/s	Up to 84,000 measurements/s
Scanning angle	360°	
Repeat accuracy	< 12 mm	
Resolution	1 mm	
Interface	Ethernet TCP/IP, UDP, 100 Mbit/s	
Data output	Distance/angle/echo/timestamp	
Laser class	1	

Highlights

- Output of highly precise measurement data
- Sharp light spot for small-object detection and precise edge detection
- All-round visibility with 360° measuring angle
- Compact design for simple mechanical integration
- Interactive, wraparound LED display provides easy-to-see status information

For more information, visit
pepperl-fuchs.com/pf-r2000h

R2000 UHD/HD

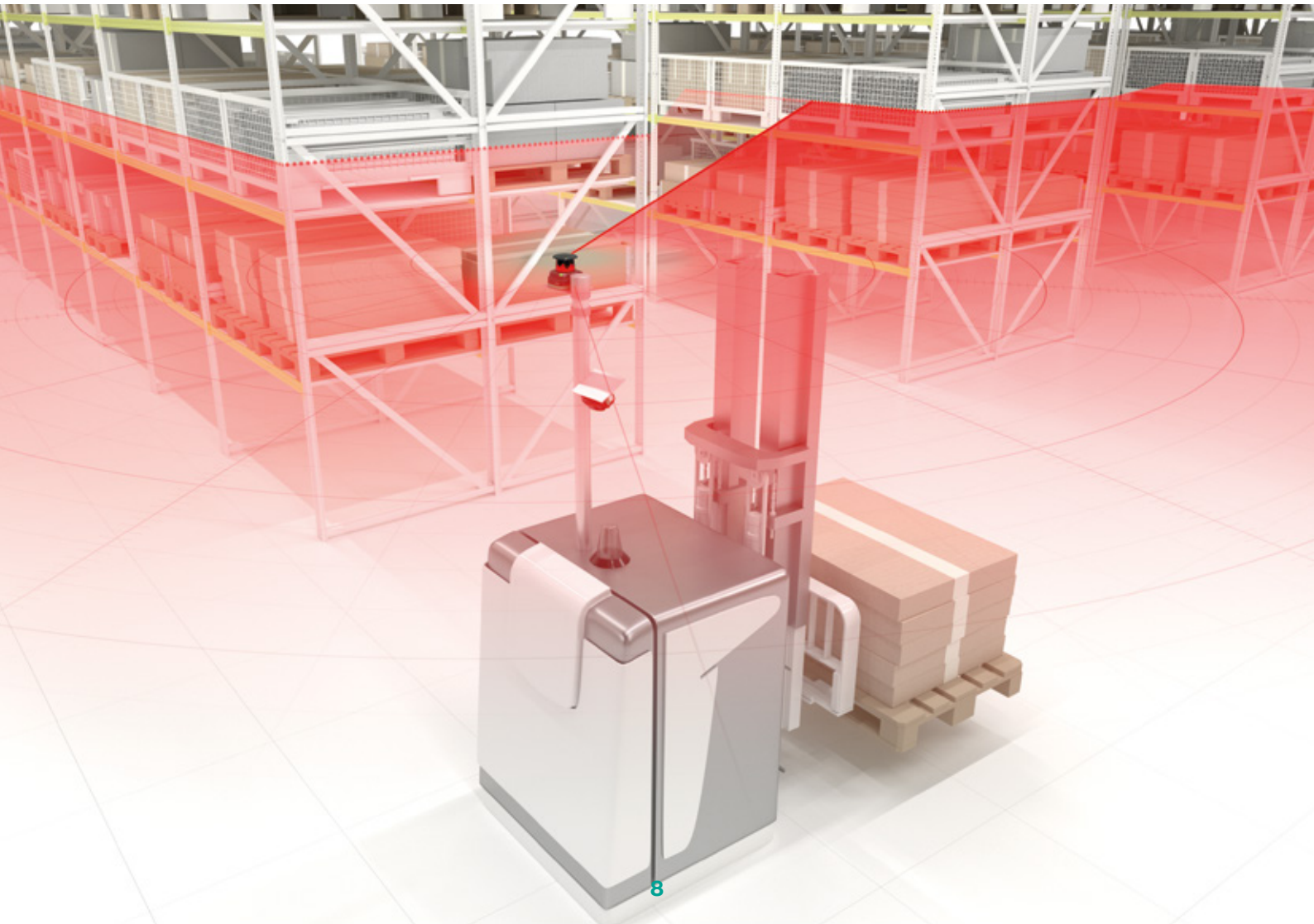
Intelligent Solution for Highly Complex Tasks

The strengths of the R2000 UHD/HD come into play whenever peak performance is required. In robotics applications, for example, the combination of a precise light spot and a high measuring rate makes it possible to detect even the finest contours and structures in real time.

Perfect Navigation Without Collisions

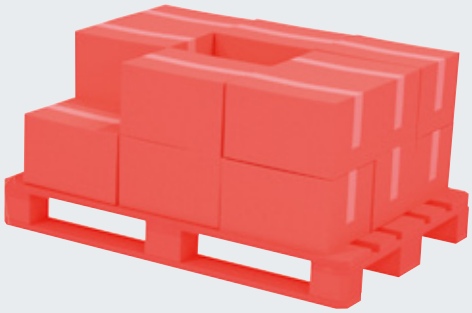
Logistics companies use driverless transport vehicles to make their processes as efficient as possible. These vehicles drive up to continuous conveyors autonomously and receive pallets, for example. The 360° measuring angle of the R2000 means that it meets one of the key requirements for navigation applications of this type. The precise light spot and angle resolution of 0.014° guarantee reliable localization of other vehicles and objects.

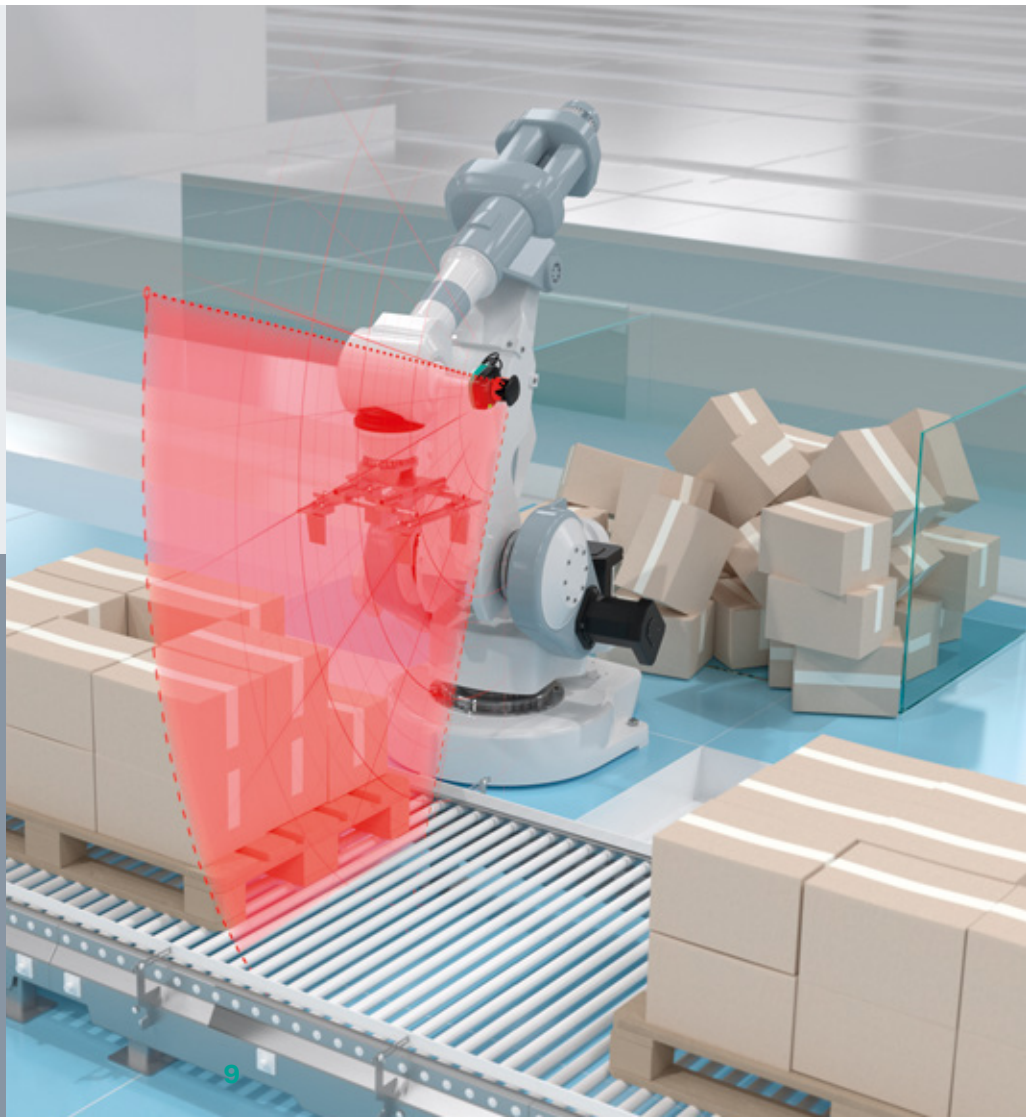
The precise measuring spot ensures that even the smallest objects are detected so that collisions can be avoided. A range of different evaluation modes also offers maximum flexibility, allowing optimal adjustment to individual application requirements.



Accurate Contour Measurements for Robotic Applications

In the field of warehousing and material handling, robots are used with horizontal conveyors to accurately place packages in gaps on passing pallets. When attached to a robot's arm, the R2000 can provide the data required for precise position calculations. This makes it possible to detect empty spaces into which boxes can be inserted. The precise light spot and high measuring rate ensure that even the finest contours and structures are detected in real time.





R2000 Detection

The All-Rounder for Demanding Monitoring and Detection Tasks

- Measuring range 30 m
- Scanning angle
- Interactive, all-around display
- Configurable detection fields



Ideal for the Smallest Objects and Dynamic Applications

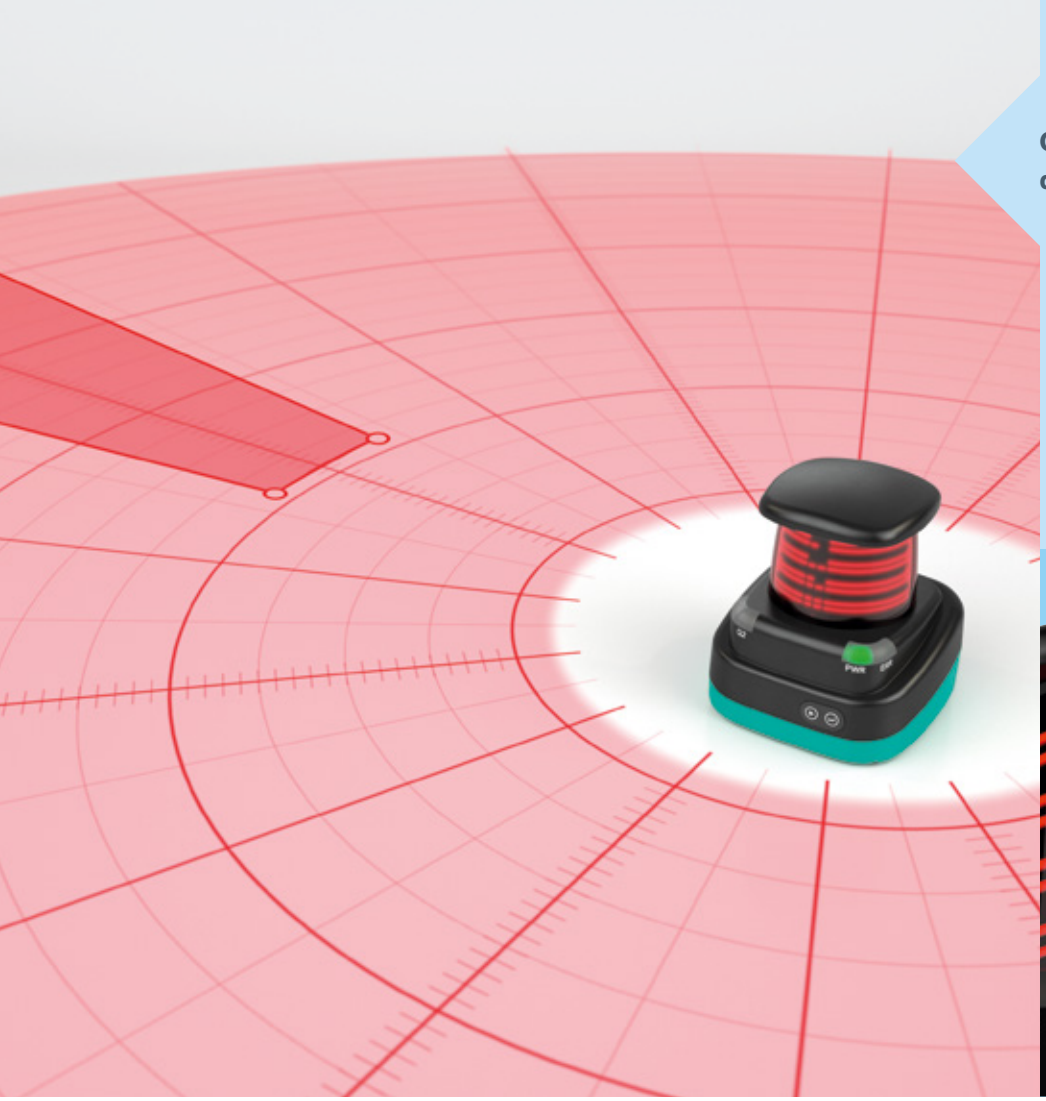
The R2000 Detection boasts a simple operating concept, a highly stable scanning axis, and best-in-class angular resolution. It is ideal for tasks such as gap control and empty storage-bay detection. The devices have four freely configurable detection fields and are available in infrared light (OBD30M) or red light (OBD10M) versions upon request. Both versions allow reliable natural-object monitoring at a range of up to 30 meters.

All-Round Visibility

The R2000 Detection is a 2-D LiDAR sensor that combines a high level of performance with a particularly compact design. The device offers 360° all-round visibility and best-in-class angular resolution. The R2000 Detection features not only a short response time, but also an extremely high resolution of 0.071 degrees. When combined with the precise light spot, this resolution allows even the smallest of objects to be detected.

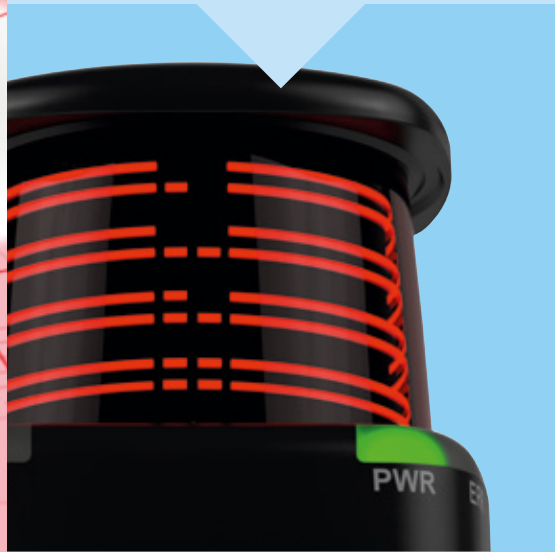
Highly Flexible and Adjustable Monitoring Fields

The stable, wobble-free scanning axis of the R2000 Detection guarantees precise and reliable monitoring of the scan surface. The device has four detection fields that can be configured easily and intuitively via DTM. This makes the scanner the ideal choice for detecting gaps and protruding parts. Fields and inputs are linked logically to the outputs and make configuration very simple and user-friendly. The parameterization of the field evaluation guarantees rugged object detection even under the most difficult ambient conditions and with heavy contamination. The R2000's field evaluation feature also ensures that large and small objects can be reliably distinguished.



Configuration of up to four detection fields

R2000 Detection display



Technical data	R2000 Detection
Order code	OBD15M-R2000-4EP-V1V17 OBD30M-R2000-4EP-V1V17-1L
Measuring range	15 m to object/30 m to reflector (OBD15M) 30 m to object/30 m to reflector (OBD30M)
Scanning angle	360°
Min. object width	< 12 mm
Angle resolution	≥ 1 mm
Repeat accuracy	≥ 0.071°
Number of switch fields	4 freely programmable fields
Signal output	4 switching inputs/outputs (selectable)
Parameterization	R2000 DTM for integration into PACTware
Laser class	1

Highlights

- R2000 Detection: Switching sensor for field monitoring
- A stable, wobble-free scanning axis guarantees precise monitoring of the scan surface
- Highest degree of angular resolution of any digital I/O scanner on the market—0.071°—ensuring detection of extremely small objects
- Easy to operate with four freely configurable detection fields
- Available with a visible red laser or infrared laser

For more information, visit
pepperl-fuchs.com/pf-r2000d

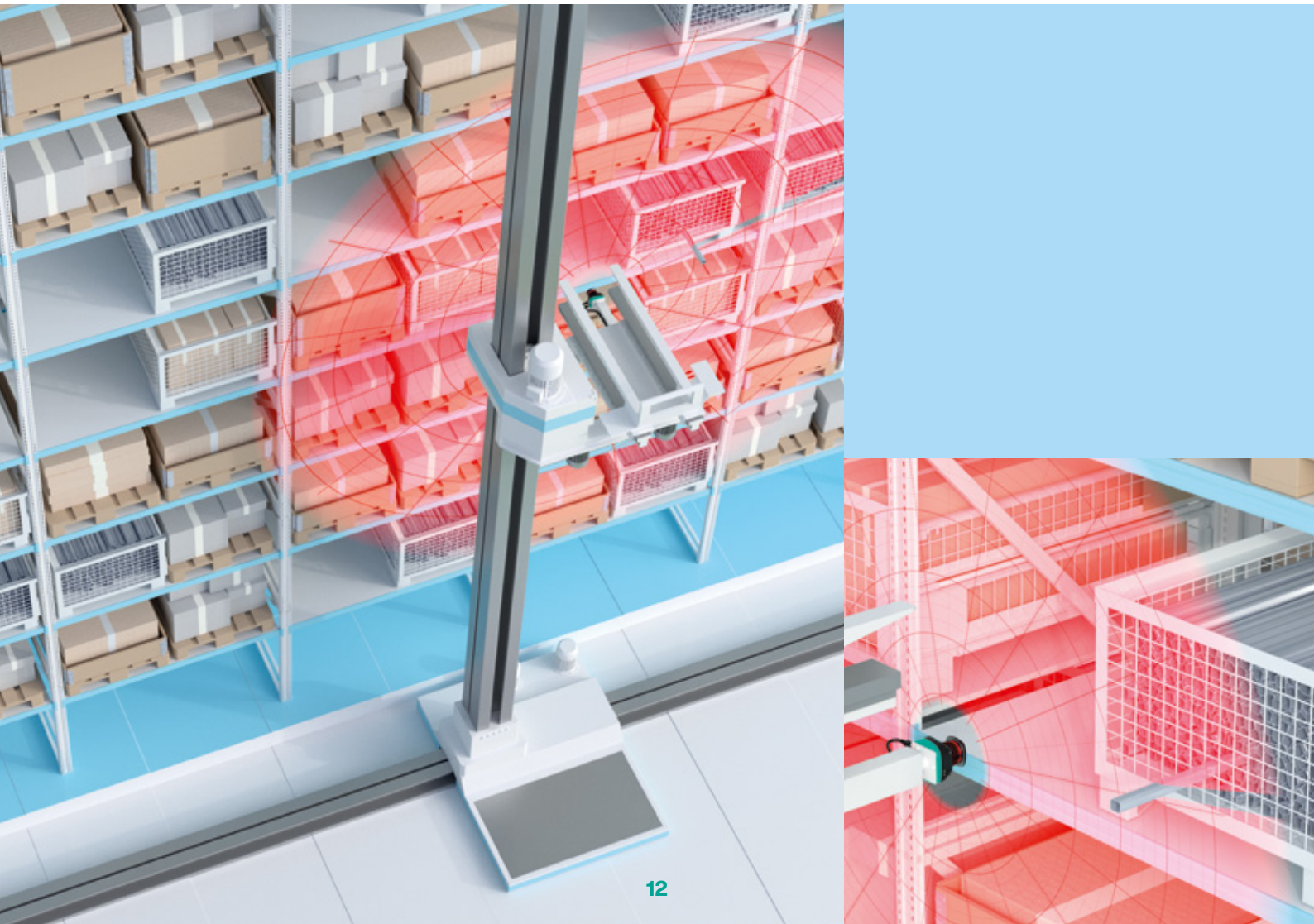
R2000 Detection

Zero Collisions, Even at Top Speed

Sensors are used to prevent collisions in many areas from automotive manufacturing to warehousing and logistics. The R2000 Detection LiDAR sensor is the ideal choice for exactly these tasks. Its four detection fields can be precisely defined so that they can detect even the smallest objects at any time and with absolute reliability.

Reliable Gap Control in High-Bay Warehouses

Automated storage and retrieval systems are used to transport goods at high speeds in modern high-bay warehouses. Even a minor collision can bring the whole plant to a stop, significantly increasing process costs. R2000 Detection LiDAR sensors can be attached to an automated storage and retrieval system or even to the rack itself, making it possible to detect even the smallest objects due to a high degree of angular resolution of up to 0.071 degrees. Potential hazards can be detected at an early stage allowing collisions to be reliably avoided.



Accurate Small-Parts Detection in Automotive Production

A typical vehicle assembly process involves car bodies moving along a production line. It must be ensured that they can pass through each assembly step without errors to avoid faults or downtime during the production process. Every part, no matter how small, that is on the track must therefore be reliably detected. R2000 LiDAR sensors monitor the underside of the vehicle so the production line can be stopped as soon as an object is detected underneath the body.

Other Typical Applications

- Overhang monitoring
- Empty storage-bay detection
- Collision avoidance for AGVs and self-navigating platforms

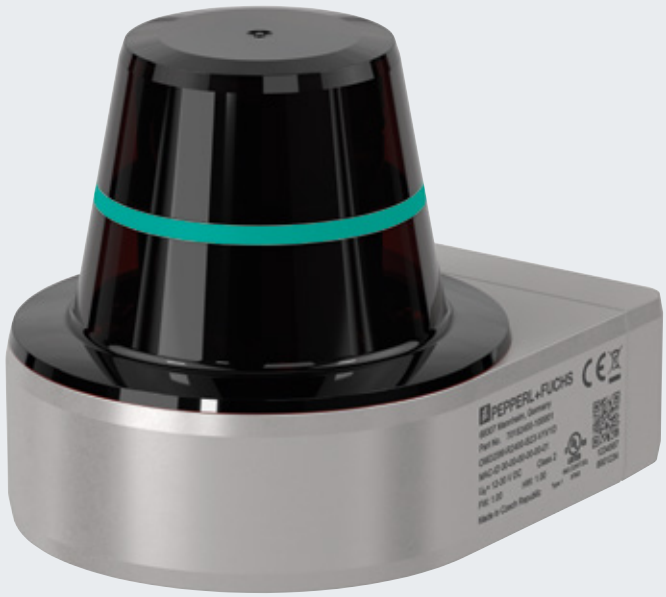




R2400

Compact, Durable, and Efficient: Exceptional Performance Package in 360°

- Measuring range 25 m
- Scanning angle
- Rugged device design
- Compact housing
  81 mm height

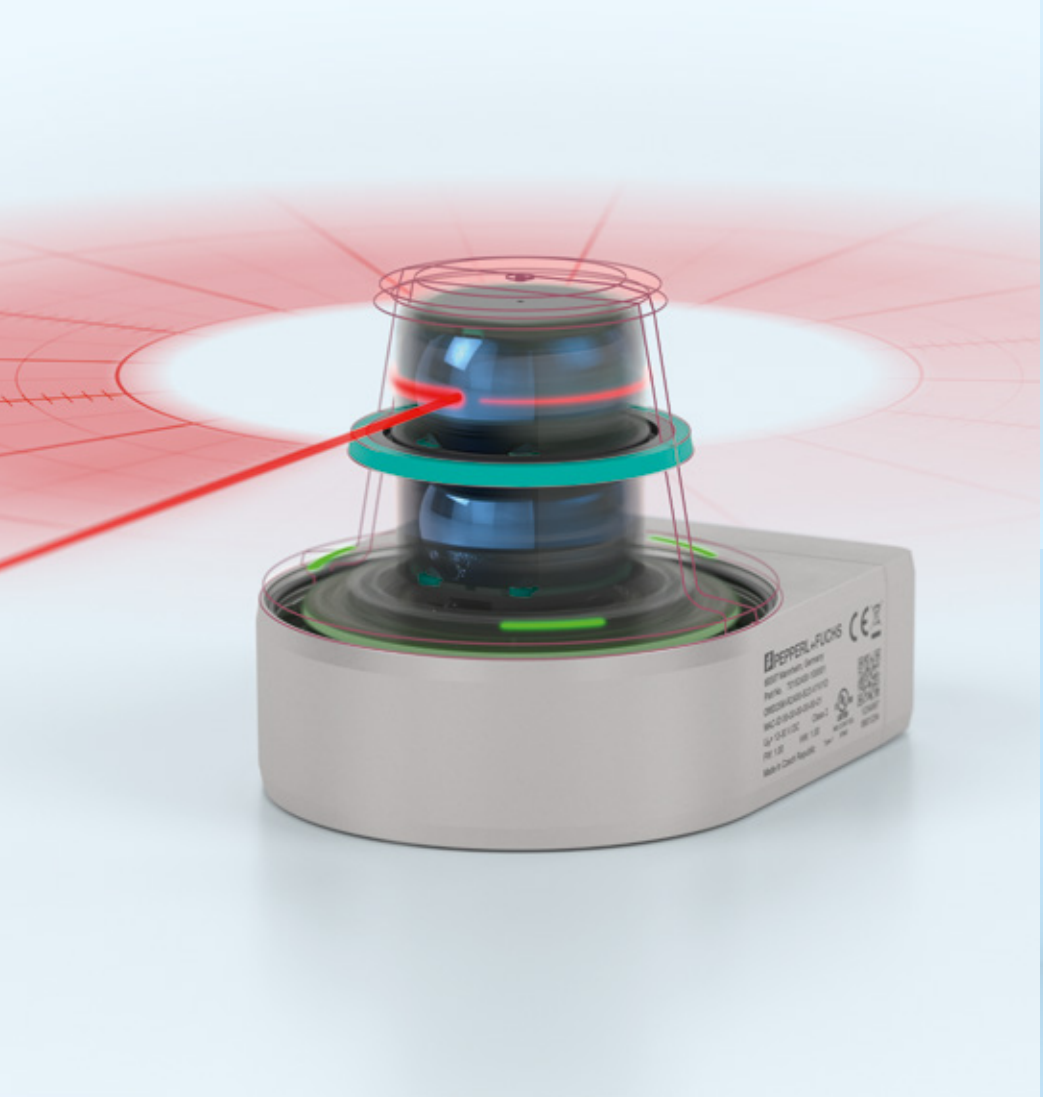


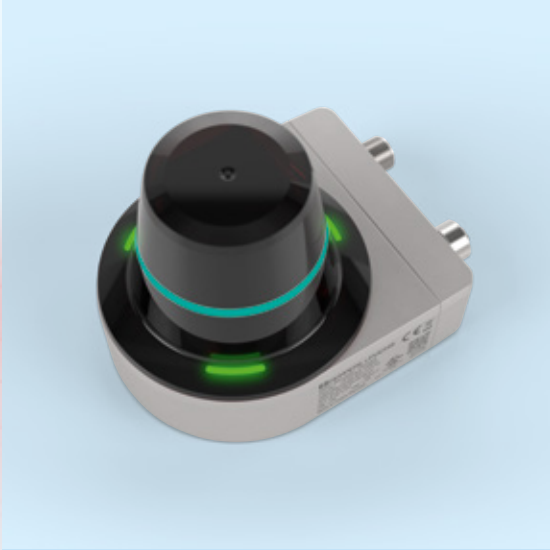
Beyond the Limits of Its Device Class

The R2400 bridges the gap between compact entry-level sensors and high-end industrial LiDAR systems by combining cost-effectiveness with enhanced mechanical robustness and resistance to environmental influences. Its industrial design ensures reliable 360° measurement, stable operation under demanding conditions, and consistent performance that goes beyond the typical limits of its device class.

Rugged and Easy to Integrate

The sensor features a durable metal housing and robust threaded inserts (tightening torque: 2.5 Nm), ensuring secure and reliable mounting. A sturdy rotating head and reinforced bearings enhance mechanical durability. Alignment holes enable precise, repeatable positioning without lateral displacement. This smart design ensures quick installation and easy sensor replacement. The height of just 81 mm allows for particularly space-saving integration.







Precise 360° Environmental Detection

The 360° all-round view enables optimized navigation, complete environmental detection, and greater cost efficiency. Precise object detection is achieved through the combination of light spot geometry, high measurement accuracy, and 0.05° angular resolution. A repeat accuracy of < 16 mm ensures stable results. The planar scan plane generated by the rotation of the entire measurement device is free of distortions, as there is no mirror-based deflection. This prevents conical or wavy measurement profiles and ensures particularly reliable contour and object detection.

Technical data	R2400
Order code	OMD25M-R2400-B23-V1V1D
Measuring range	25 m to object/40 m to reflector
Angular resolution	0.05°
Scan rate	10–20 Hz
Scanning angle	360°
Repeat accuracy	<16 mm

For more information, visit
pepperl-fuchs.com/pf-r2400

R2400

Reliable Measurement in Confined Spaces

In AMR applications, every millimeter matters. With a height of just 81 mm, the R2400 LiDAR sensor slips into the tightest installation spaces—while its rugged design and proven reliability ensure it performs day after day, even under harsh industrial conditions.

Precise Navigation of Mobile Robots

In modern production and logistics facilities, Autonomous Mobile Robots (AMRs) move materials and containers through constantly changing environments—without human intervention. To keep traffic flowing and avoid collisions, reliable navigation is essential.

This is where the R2400 LiDAR sensor comes in. It delivers the data foundation for SLAM-based localization and mapping, capturing dense 360° point clouds with high angular resolution to detect both contours and reflectors with precision. And with a profile of just 81 mm, it integrates seamlessly into compact vehicle platforms—enabling dependable navigation even where installation space is limited.





Reliable Load Detection on AGV Forklifts

Automated forklifts detect pallet feet for precise positioning of the forks, enabling safe pallet handling in logistics automation. The challenge lies in compact integration into the fork carrier while withstanding high mechanical stress.

With a height of 81 mm, the R2400 allows for easy installation in compact structures. The 360° all-around detection supports flexible sensor alignment, while the robust metal construction ensures consistently stable performance under industrial conditions. The result is reliable handling of load carriers with high process reliability, reduced maintenance costs, and optimal cost efficiency.



R2100

Top Performance with the Highest Level of Efficiency

Measuring range 8 m

88° Scanning angle

CANopen

RS232



Innovative Technologies for Reliable Measurement Results

The R2100 2-D multiray LED scanner is the perfect combination of Pulse Ranging Technology (PRT) and multi-channel measurement. Multiple LED emitters arranged side by side evaluate a 2-D area within an 88° zone. This ensures that the scanner supplies absolutely reliable and stable measurement results, regardless of the ambient conditions. As a result, the R2100 is the perfect choice for applications in the fields of mobile equipment, intralogistics, and machine and plant engineering.

Minimum Response Times for Quick Processes

The intelligent sensor electronics of the R2100 provide fast response times, ensuring precise detection and quick processing speeds. The LED measuring system is not harmful to the eyes, provides optimal protection for operating personnel, and can be used in all work areas without posing a hazard. The device also features optical channel separation, which significantly increases its pollution tolerance. This delays cleaning intervals, which in turn significantly reduces downtime.

Extremely Robust and Highly Efficient

The R2100's emitter elements are arranged side by side to evaluate a 2-D area within an 88° zone, enabling multi-channel measurement. Unlike other 2-D LiDAR sensors, the device features a solid-state design. This makes the R2100 extremely robust and an ideal choice for mechanically demanding applications. The scanner's energy consumption is also extremely low, making it a particularly economical solution.



Ultra-flat housing



Multi-channel measurement



Separation of emitter and receiver

Technical data	R2100
Order code	OMD8000-R2100-R2-2V15 (RS232/serial) OMD8000-R2100-B16-2V15 (CAN/CANopen)
Measuring range	0.2 ... 8 m
Scanning angle	88°
Resolution	1 mm
Light type	Infrared LEDs, modulated light, 850 nm
Scan rate	50 s^{-1} (1 scan = 11 measurements)
Operating voltage	10 ... 30 V DC
No-load current	≤ 120 mA/24 V DC
Degree of protection	IP67
Ambient temperature	–30 ... +50 °C (–22 ... +122 °F)
Dimensions (L × W × H)	157 × 81 × 45 mm

Highlights

- Ultra-IR LEDs guarantee powerful performance and a long lifetime
- No moving parts for added durability
- 2-D measurement with multiray scan
- Not harmful to the eyes due to LEDs
- Multiple wide-beam emitters ensure reliable object detection regardless of surface texture

For more information, visit
pepperl-fuchs.com/pf-r2100

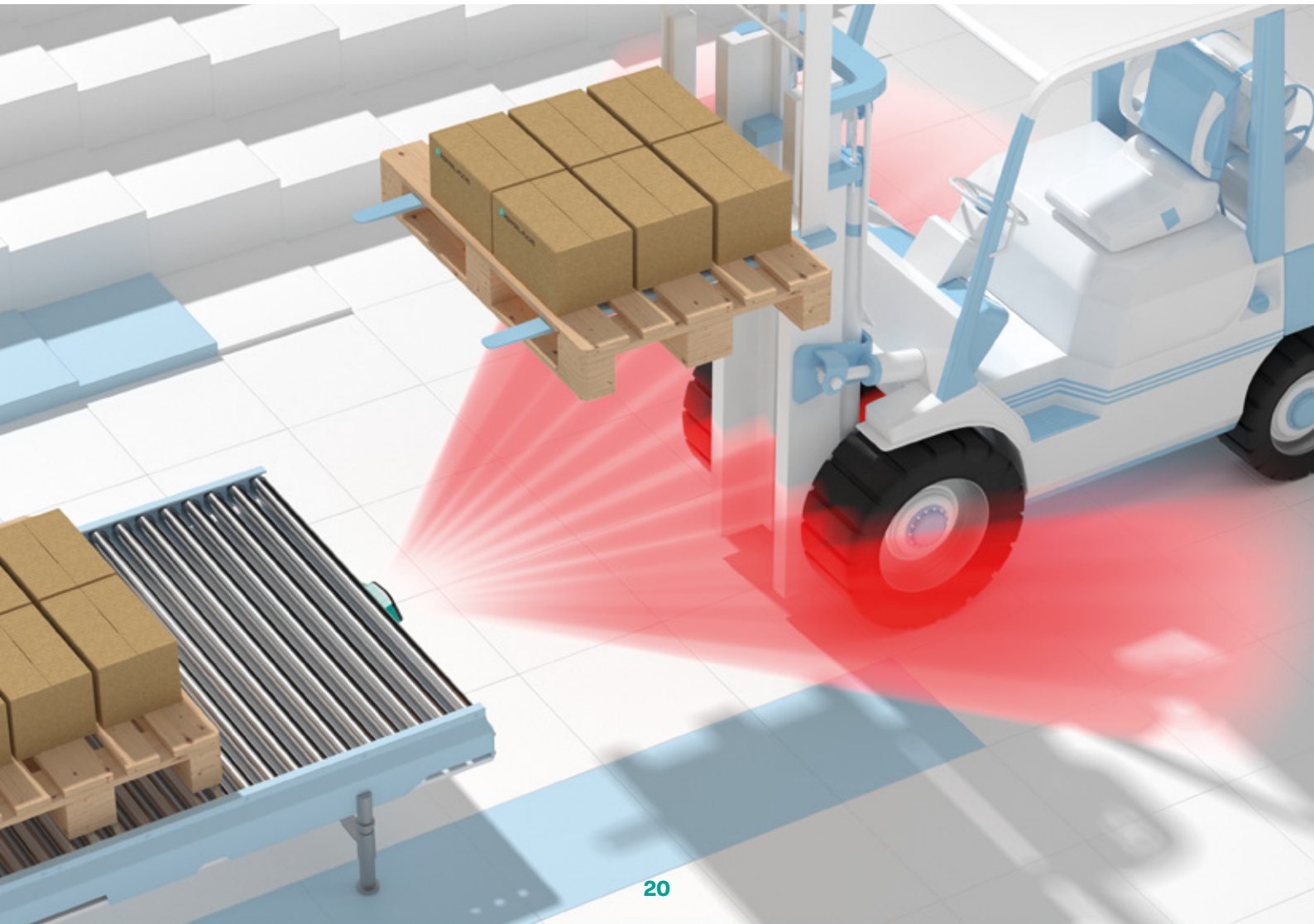
R2100

Focusing on What Matters

Robust, quick, and cost-effective—the R2100 is the perfect sensor solution for mechanically demanding tasks. This multiray LED scanner is a particularly good choice when it comes to simple and reliable object detection.

Reliable Object Detection

One of the ways in which the R2100 2-D LiDAR sensor can be used in the warehousing sector is to detect forklift trucks reliably at transfer stations. When used for this purpose, the device is mounted on the station in the direction which the vehicles navigate. From this position, the sensor can detect an approaching vehicle, such as a forklift; the 2-D technology means that the direction of approach is irrelevant. The device uses PRT to determine the exact distance to the forklift, and can then react according to the operating situation, for example stopping the belt. The multiple wide-beam emitters ensure that only relevant events are evaluated and that disturbances caused by small objects do not affect plant availability.



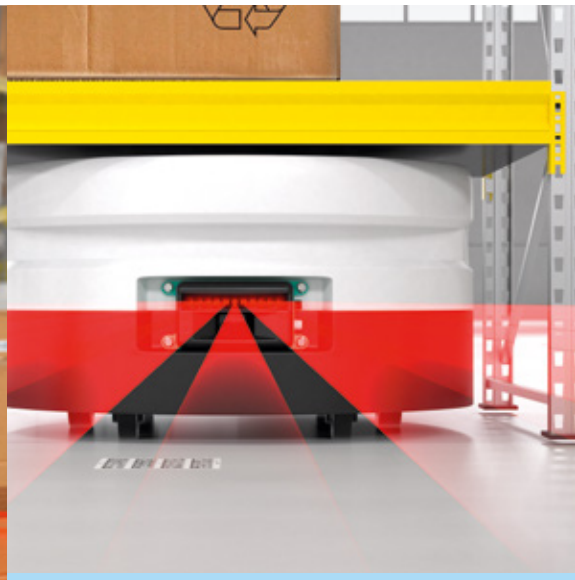
Safe Collision Avoidance

In warehouses where driverless AGVs move racks, the R2100 is used for object detection to prevent collisions with objects or other vehicles in the path of travel. The sensor provides reliable information on the distance and location of any obstacle to the control panel. Since the device features no moving parts, the level of mechanical stress during use is low, making it extremely robust. The R2100 is also the ideal solution for such tasks due to its price-performance ratio. The scanner also features LEDs with an infrared transmitter light. These are invisible to the user, eliminating any possibility of irritation.

Other Typical Applications

- Object detection and classification
- Detection of simple height profiles
- Vehicle detection
- Occupied-compartment check





The Software for Simple Handling: PACTware

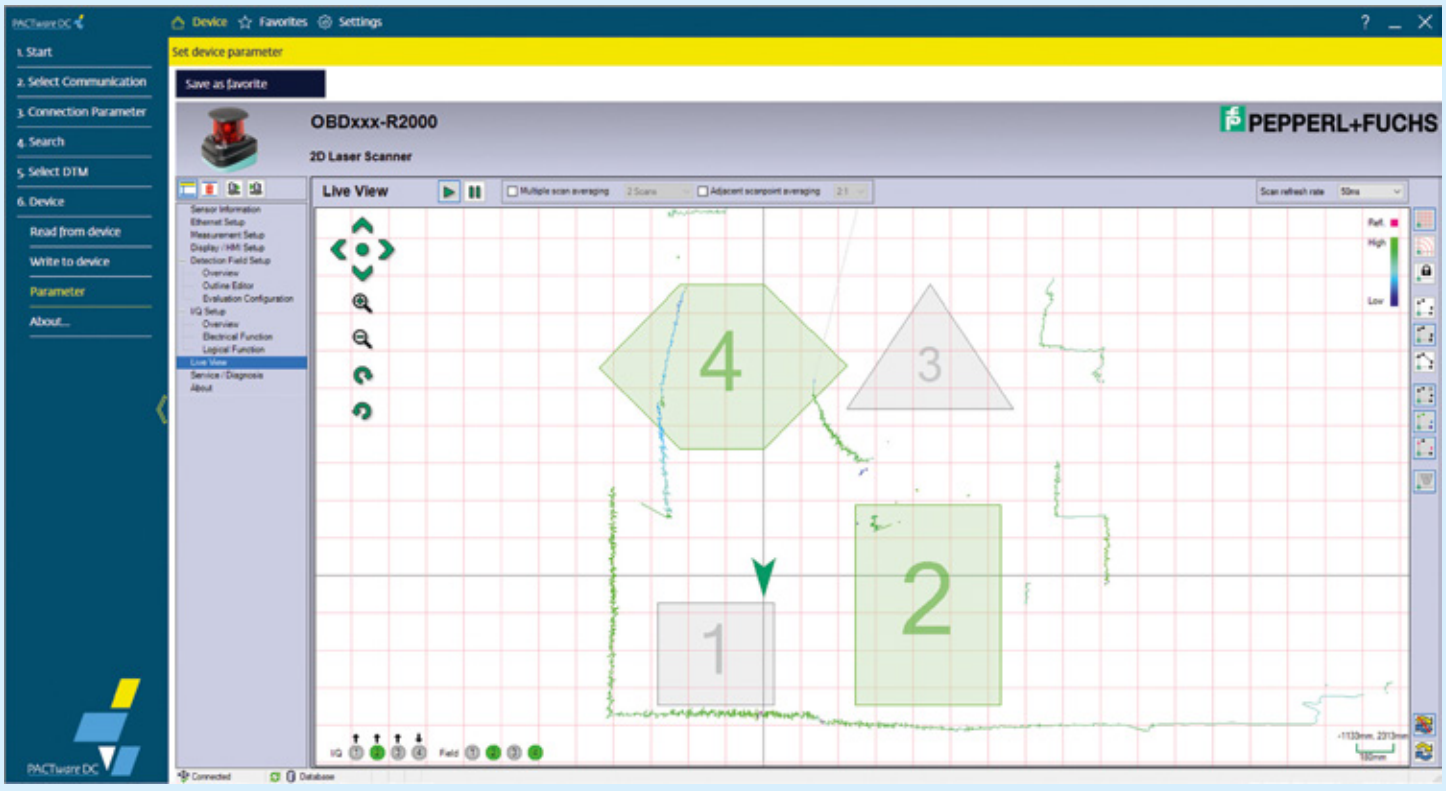
PACTware is all about straightforward and user-friendly operation. The convenient user interface, coupled with the matching Device Type Manager (DTM), guarantees perfect visualization and allows easy configuration and parameterization of sensors.

Perfect Communication with a Modern Design

The PACTware operating software is an FDT frame application for optimal communication with field devices. The FDT technology underpinning PACTware makes it possible to overcome the hierarchical levels of the automation pyramid. The latest version of the software, PACTware DC, has been optimized for point-to-point communication with field devices and has a particularly effective modern design. Since the project setup runs independently in the background, the user can concentrate fully on the device interface.

PACTware for Sensor Communication

Pepperl+Fuchs offers a DTM for each of the following: the R2000 HD/UHD, the R2000 Detection and the R2400. In addition to device identification and diagnostics, the DTM offers many other options, including extensive parameterization of device tags, direction of rotation, and scanning frequency. It allows quick and easy programming of the display and the configuration of parameters for Ethernet communication.

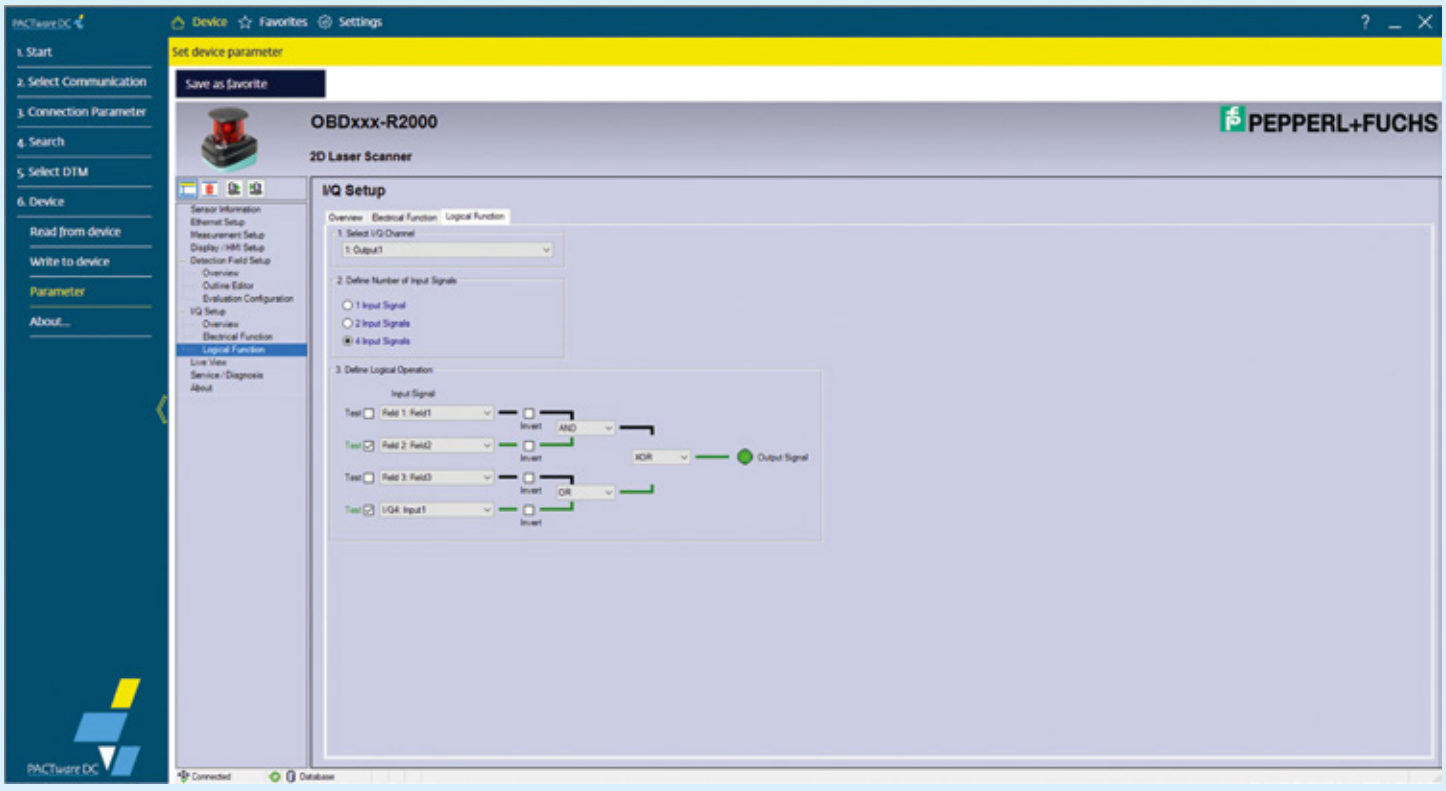


Adjustable monitoring fields in the live view.

The DTM for the R2000 Detection makes it possible to set up monitoring fields quickly and flexibly using the intuitive editor. Simple logic functions can be implemented directly in the DTM on the basis of logical links between field states and inputs.

Highlights

- Simplifies identification, parameterization, and diagnosis of the devices
- Very user-friendly and intuitive to use
- Manufacturer- and network-independent operating software for field devices
- Visual support of the operation and documentation of the device settings



Logic function for logical links between field states and inputs.

Your automation, our passion.

- Industrial Sensors
- Industrial Communication and Interfaces
- Enterprise Mobility
- Hazardous Area Products and Solutions

www.pepperl-fuchs.com

Subject to modifications • © Pepperl+Fuchs
Printed in Germany • Part. No. 70210108 08/26 • public

Pepperl+Fuchs Quality
Download our latest policy here:

www.pepperl-fuchs.com/quality

PEPPERL+FUCHS