Absolutely Precise Positioning.

A unique combination of a 2-D camera and code tape—with 0.2 mm accuracy up to 100,000 m.

PXV Data Matrix
Positioning System





Your automation, our passion.

PEPPERL+FUCHS

Camera-Based Linear Positioning

Outstanding Process Safety Even with Long Measuring Lengths

In applications where crane trolleys, push skids, monorail conveyors, freight elevators, or automated storage and retrieval systems are used, their positioning must be extremely precise and reproducible over long distances. The high-performance PXV positioning system from Pepperl+Fuchs is an innovative system offering the most reliable absolute detection on the market.

Long Service Life, Low Maintenance

Camera-based positioning systems are unsurpassed in terms of their simple handling. The unique PXV technology from Pepperl+Fuchs goes one step further—the combination of a 2-D camera and Data Matrix code tape makes it the best and most reliable absolute positioning system on the market. The non-contact operating principle and the absence of moving parts guarantee maintenance-free operation and minimal consequential costs. The high reliability of the devices prevents downtimes and expensive system failures, and ensures maximum profitability for the operators due to an extremely long service life. The system is easy to install and offers the highest possible flexibility along the entire route—making it perfect for any individual application requirements.

Highlights

- Most reliable positioning/absolute detection on the market
- Provides precise position data at all times, even on complex routes
- Non-contact operation and the absence of moving parts ensure maintenance-free operation
- Extremely long service life
- Easy commissioning and quick installation











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

PXV Data Matrix Positioning System

For Maximum Performance in Absolute Positioning

With its unique combination of a 2-D camera system and multi-redundant Data Matrix code tape, the PXV from Pepperl+Fuchs provides maximum precision in position detection and absolutely uncompromising process safety.

Easy Handling, Quick Commissioning

With the PXV, Pepperl+Fuchs offers a unique system consisting of a read head with modern camera technology and a highly flexible Data Matrix code tape. The high-tech read head has an integrated illumination unit and is therefore extremely reliable at detecting position marks printed on the self-adhesive tape as 2-D Data Matrix codes, regardless of the ambient light conditions.

The extra-large field of view measures 125 × 95 mm and is able to read up to six of these codes simultaneously in just one read operation. As soon as only one code is detected in the field of view, precise position detection can be performed. This also makes it possible to bridge large gaps in the code tape.

The use of several Data Matrix codes as information carriers allows data to be displayed in a highly redundant manner—a level of multiple redundancy that makes the PXV extremely resistant to interference. Positioning in the y direction can also be performed at any time using Data Matrix codes.

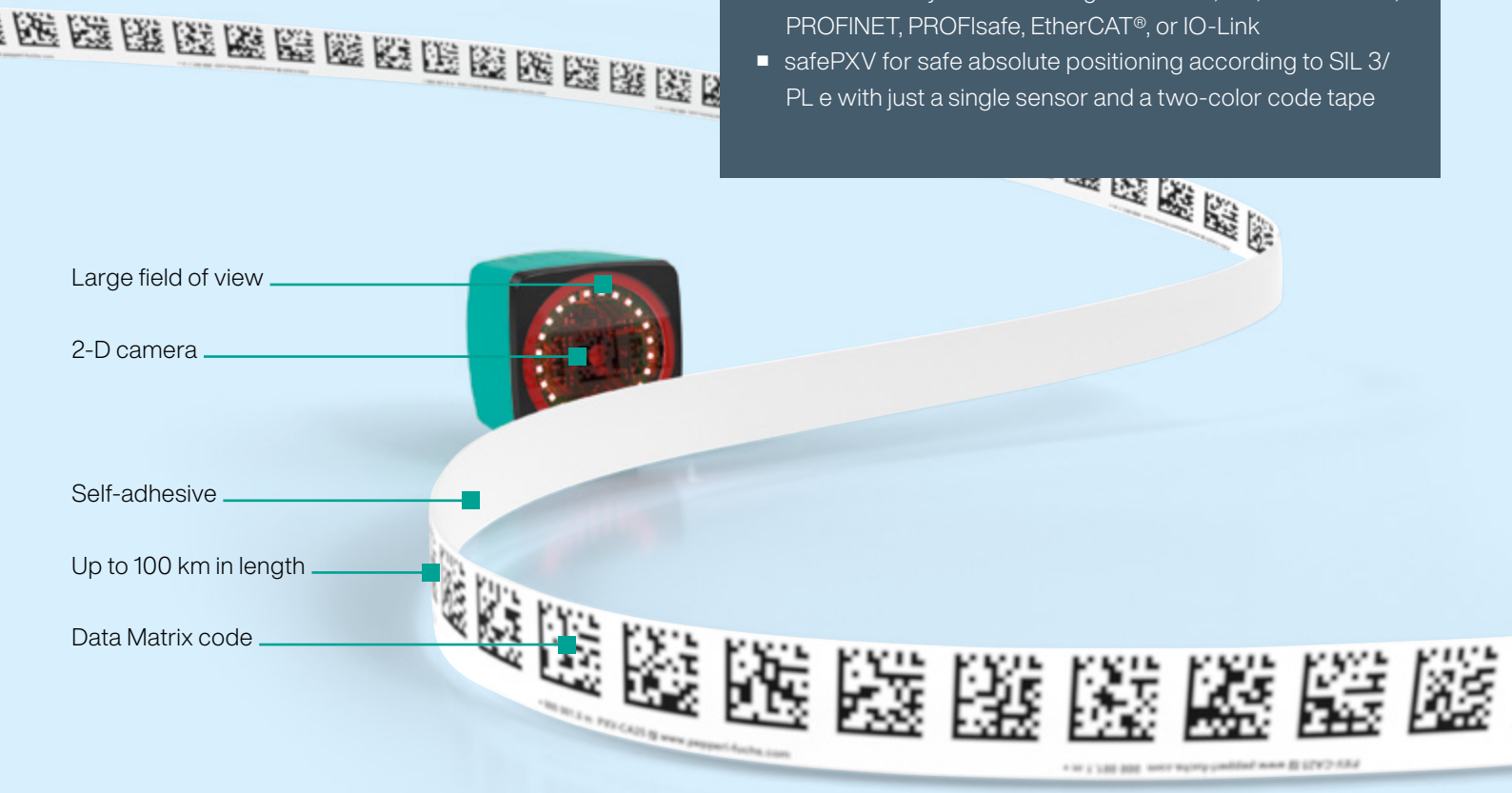
Since the entire system is non-contact and requires no moving parts, it is completely maintenance-free and can be operated very cost-effectively. The device is comprehensive, can be easily parameterized, and the freely configurable inputs and outputs mean the device can be adapted as necessary to provide the optimal solution for each individual application.

Mounting is quick and easy; the PXV simply needs to be aligned at the nominal distance to the code tape and can be put into operation quickly. Parameterization is easily achieved using Data Matrix control codes, a PC, or directly from the control panel.



Highlights

- Highly reliable absolute positioning system featuring a unique combination of a 2-D camera and a Data Matrix code tape for non-contact positioning over distances of up to 100,000 m
- Maximum system availability: Immunity to contamination or damage to the code tape thanks to multiple code redundancies
- Cost-effective solution with a compact housing design opens up new application possibilities
- Quick and easy commissioning via RS-485, SSI, EtherNet/IP™, PROFINET, PROFIsafe, EtherCAT®, or IO-Link
- safePXV for safe absolute positioning according to SIL 3/ PL e with just a single sensor and a two-color code tape



Extract from Technical Data	PXV*F200* 	PXV*F213* 	PCV 	safePXV 
Max. route length	0 ... 100 km	0 ... 100 km	0 ... 100 km	0 ... 100 km
Reading distance z (tolerance)	100 mm (±50 mm)	100 mm (±30 mm)	100 mm (±45 mm)	100 mm (±30 mm)
Position accuracy	0.2 mm	0.2 mm	0.1 mm	0.2 mm
Interfaces	PROFINET, EtherCAT, EtherNet/IP, RS-485, SSI	SSI, IO-Link	PROFINET, EtherCAT, EtherNet/IP, RS-485, SSI	PROFIsafe
Housing dimensions	80 × 84.5 × 50 mm	80 × 70 × 35 mm	80 × 84.5 × 50 mm	80 × 84.5 × 50 mm
Code Tape	PXV*CA25*	PXV*CA25*	PCV*CA20*, PCV*CA10*	PXV*AA25*

PXV Data Matrix Positioning System

With Multiple Redundancy for Uncompromising Process Safety

Durability and exceptional resistance are the hallmarks of the Data Matrix code tape from Pepperl+Fuchs. Excellent redundancy also enables a high tolerance for contamination and damage, and ensures completely reliable processes.

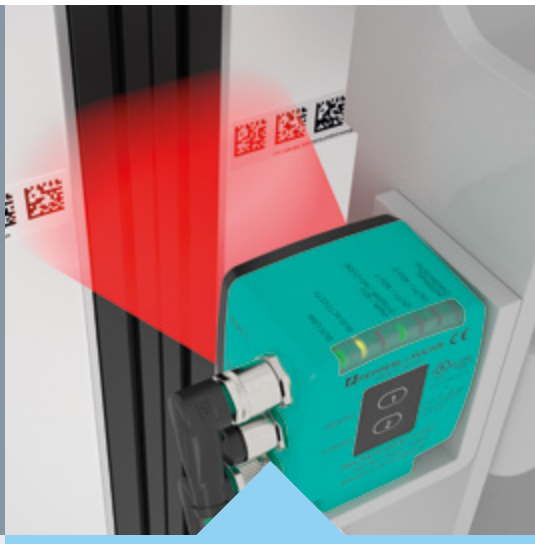
Customized and Highly Flexible Configuration

The Data Matrix code tape is precisely tailored to suit individual applications and can be supplied in sections ranging from 1 m to 100 km in length. To install the self-adhesive tape, simply remove the protective film and apply the code tape to a grease-free surface. The tape is highly flexible, meaning that not only can it be laid on straight routes, but also on curves, circular shapes, uphill and downhill gradients, or hollow shafts, if required by the application.

The read head travels parallel to the code tape and provides the x absolute position, a y offset to the center of the code tape, the movement speed, and various status values with quality values that can be read out via the control panel. Even gaps of up to 91 mm and large y tolerances have no effect on its performance.



Reliable processes even with contaminated codes



Exact absolute positioning with a measurement accuracy of ±0.2 mm over routes up to 100 km in length



Reliable positioning over gaps of up to 91 mm

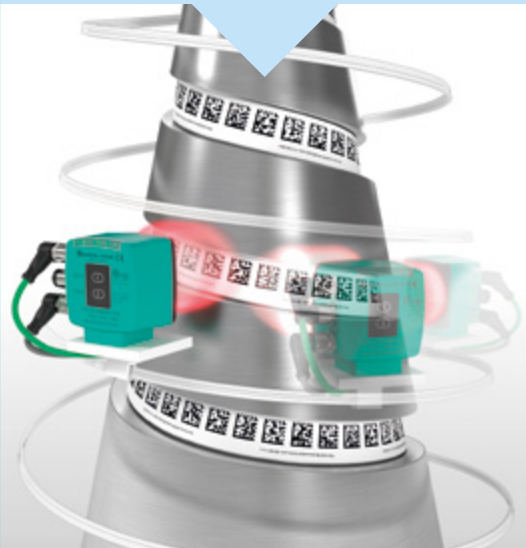
Online Code Tape Generator: Quick Replacement for Short-Term Repairs

Despite its extremely high resistance, in isolated cases a Data Matrix code tape may be mechanically damaged during use. To completely eliminate downtimes, the required part of the tape can be generated online in an emergency using the code tape generator, printed out straight away, and applied directly to the affected location. At the same time, the section that needs to be replaced is reordered and the application can continue to run reliably and without interference until the replacement arrives.

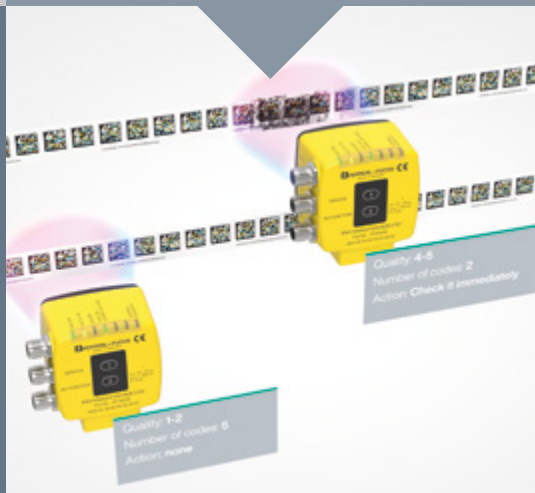
High inclination tolerance of ±30° and high depth of focus of 50 mm for very narrow curve radii and uphill and downhill gradients



Continuous monitoring and contamination detection using data output for reading quality and number of codes read allow predictive maintenance.



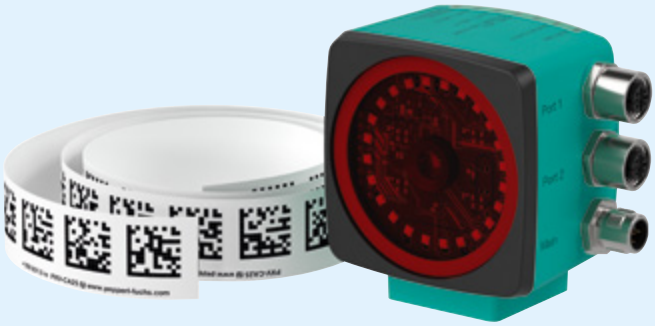
Maximum functional safety and route control through continuous monitoring of the y position



PXV Portfolio

The Right Solution for Every Application

The PXV portfolio from Pepperl+Fuchs comprises four device versions, each precisely tailored to suit a wide range of application requirements. Whether standard or safety-relevant applications, the portfolio offers the appropriate read head version.



PXV*F200*: The All-Rounder for More Demanding Positioning Tasks

This read head version offers submillimeter accuracy of 0.2 mm. Standard versions can achieve speeds of up to 12.5 m/s over routes up to 100 km in length. Large codes ensure a high level of reading reliability even when encountering dirt, while integrated quality values enable continuous evaluation of the read quality.



PXV*F213*: The Particularly Compact and Cost-Effective Solution

Thanks to its compact design, this cost-effective solution can be installed even in confined spaces, thereby opening up new application possibilities. The devices feature a fixed cable and are available with SSI or IO-Link interfaces. Contaminated or defective codes can be detected early and corrected thanks to the quality value output. To optimize system availability, process reliability, and maintenance efficiency, additional diagnostic data can also be provided via IO-Link.



PCV*F200*: Maximum Reading Reliability at Minimum Reading Distance

The PCV read heads have a field of view of 70 × 50 mm. Even a single Data Matrix code in the field of view is sufficient to determine the absolute position. Up to 14 codes can be in the field of view at the same time, ensuring a high level of reading reliability and system availability, even when encountering dirt. Special PCV near range read head variants can be installed at a distance of just 50 mm from the code tape and are therefore also suitable for short reading distances caused by confined installation conditions.



PXV100A*F200*: Safe Positioning Up to SIL 3/PL E with Just One Sensor

The safety technology combines a 2-D read head with a multicolored Data Matrix code tape. LED rings in red and blue make it possible to read the various color codes. The innovative, unique firmware is based on a safe-rated algorithm; the plausibility of all data is checked in the sensor, and only then is it passed on to the safety-rated PLC (SPLC). Further processing of the data can then take place directly at the SPLC without laborious testing due to fully reliable sensor technology that continuously self-tests.

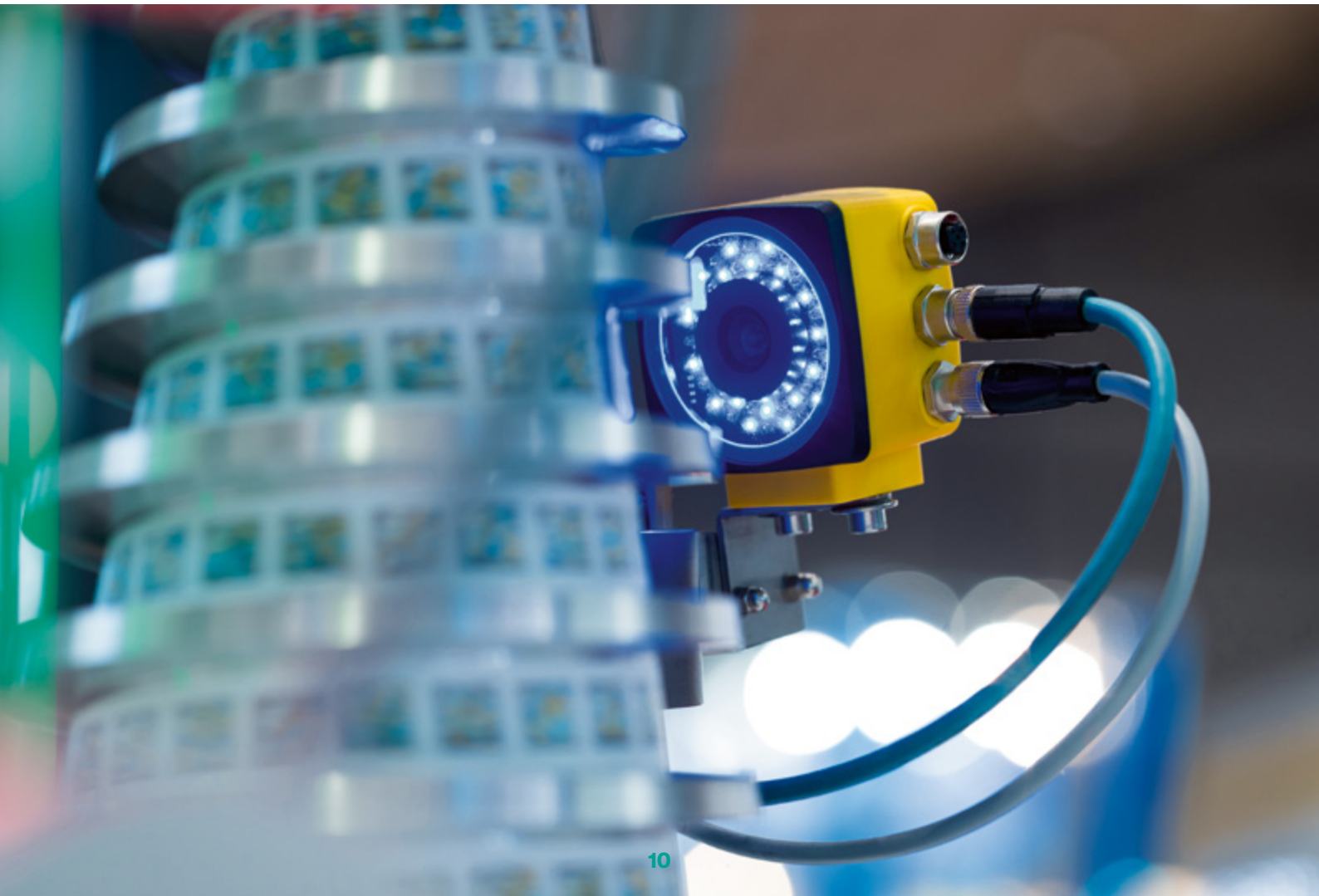
safePXV and safePGV

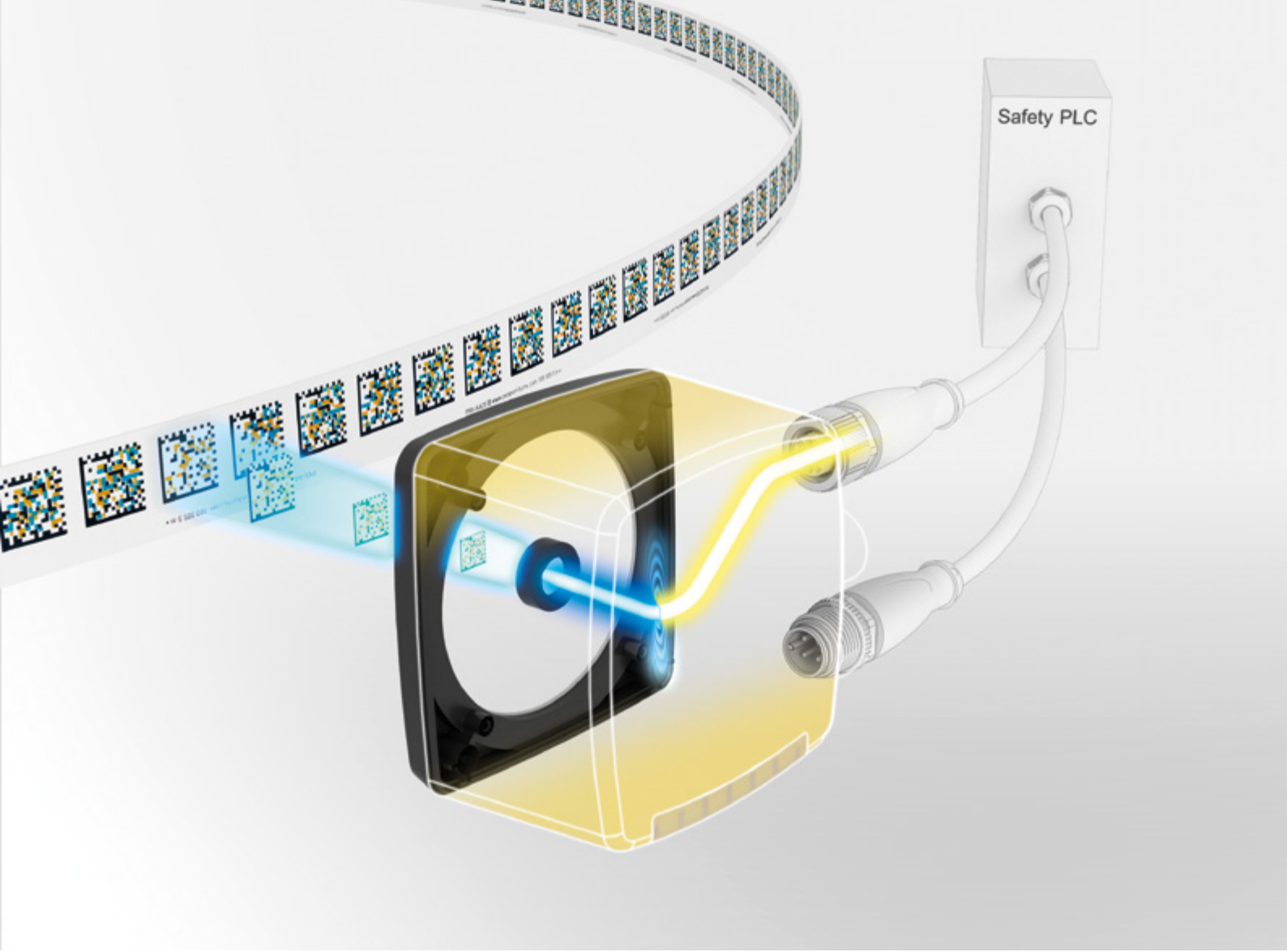
Unique Safety: SIL 3/PL e with Just One Sensor

Innovative technology for safe data directly from the sensor. For the first time, the safePXV and safePGV enable safe absolute positioning in accordance with SIL 3/PL e with just one sensor. Extremely reliable and highly efficient.

SIL 3/PL e for Maximum Safety

Safety applications must meet the strictest safety standards to ensure the safety of personnel and machinery. Previously, this required various redundant systems, resulting in a significant amount of effort. With the safePXV and safePGV, Pepperl+Fuchs has now developed a new generation of positioning systems that, for the first time, enable safe absolute positioning in accordance with SIL 3/PL e with just one sensor.





Highly Efficient Solution

Until now, safe absolute positioning in accordance with SIL 3/ PL e has been virtually unachievable because it required multiple redundant systems, resulting in excessive cost and complexity. A plausibility check of the data in the safety-rated PLC was necessary and the entire development had to be monitored by TÜV. With the new safePXV and safePGV from Pepperl+Fuchs, a single sensor provides the already safe data to the SPLC—a system that meets the highest safety requirements while also remaining highly efficient.

Unique Technology

The new safety technology combines a 2-D read head with a multicolored Data Matrix code tape. LED rings in red and blue make it possible to read the various color codes. However, the innovative, unique firmware is the truly ingenious aspect of the positioning systems. It is based on a safe-rated algorithm; the plausibility of all data is checked in the sensor, and only then is it passed on to the safety-rated PLC (SPLC). Data processing can then take place directly at the SPLC, eliminating the need for time-consuming testing due to highly reliable sensor technology with continuous self-monitoring.

Applications

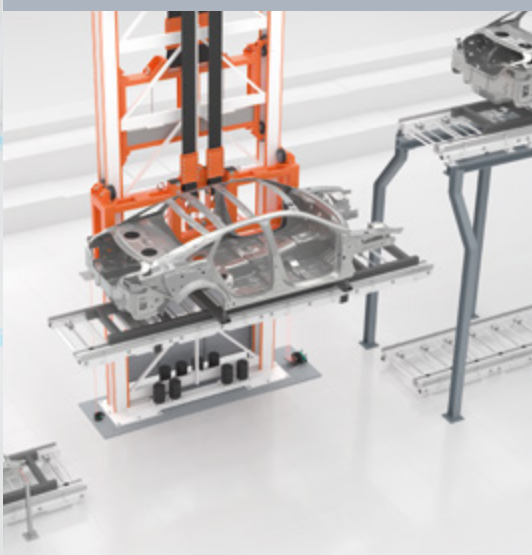
Exact Positioning for All Application Requirements

Automated storage and retrieval systems or monorail conveyors with tracks measuring up to 100 km, position accuracy of ±0.2 mm, and traverse distances in the x or y direction—when it comes to high-precision absolute positioning over long, complex routes, PXV technology is ideal for meeting individual application requirements down to even the smallest detail.

Precisely Determining the Absolute Position of Monorail Conveyors

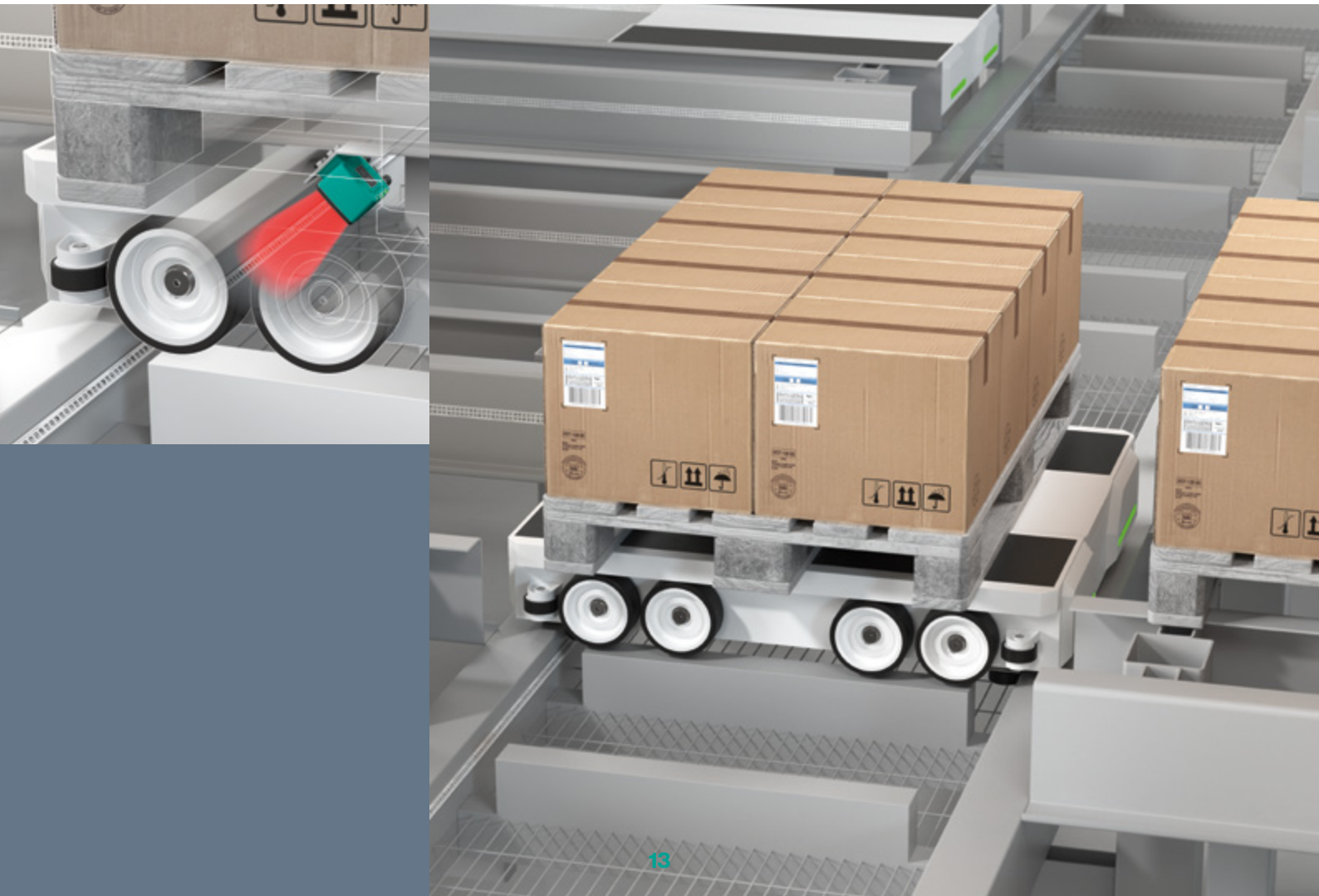
Monorail conveyors are used to ensure smooth, in-house transportation during the production process. An example of an important area of application for these systems is in the automotive manufacturing sector. Each monorail conveyor consists of a rail system with power rails and several monorail conveyor hangers. Depending on the route, the rail system consists of straight elements, curves, or inclines and declines, which are attached to the ceiling. To ensure maximum safety, transparent production, and quick analysis in the case of a fault, the central control system must know the exact position of the individual monorail conveyor hangers on the route at all times. The PXV cameras from Pepperl+Fuchs constantly pass on the absolute position to the affixed Data Matrix code tape—precisely and with maximum reliability.





Efficient Warehouse Automation Due to Precise Shuttle Positioning

In automatic pallet shuttle warehouses, automated guided vehicles move along aisles and storage channels, enabling an efficient flow of goods at a high storage density. Four-way shuttles travel in the x and z direction within the rack system and also switch between the levels along the y axis using a lifter. The challenge in multi-depth storage is that several pallets are placed one after the other in one channel, which requires precise position determination of all shuttles and pallets. The PCV Data Matrix positioning system enables absolute positioning and 3-D mapping of the entire warehouse. The code tapes measuring just 15 mm in width and the short reading distance of 50 mm are ideal for confined installation situations. At the same time, the rugged read heads ensure reliable detection even when tilted.



Applications

Safe Positioning for Dynamic Processes

Where automated storage and retrieval systems require maximum precision and availability, safePXV provides the basis for safe and stable plant operation. The non-contact technology ensures high process safety, maximum plant availability, and maintenance-free operation even with high dynamics.

Excellent Reliability for Automated Storage and Retrieval Systems

Automated storage and retrieval systems are used to store or retrieve materials in high bays quickly and precisely. The safePXV positioning system with Data Matrix code tape is used to ensure highly reliable positioning in this application. The device can be used both horizontally in the aisles and vertically in the lifting axis area.

For this purpose, the Data Matrix code tape is installed on the mounting rail, while the 2-D read head is mounted on the chassis that moves parallel to it. Both the tape and the read head can be attached very quickly and easily. Because the system is non-contact and has no moving parts, it is extremely durable and does not require any costly maintenance intervals.





Other Applications

- Automotive (skid, skillet, lifting gear/lifts, rotary tables)
- Material handling (automated storage and retrieval systems, mobile robots)
- Machine building (assembly handling, rotary tables)
- Renewable energies (wind turbines)





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