Safety Guaranteed.

Robust systems for precise absolute positioning—
even in challenging environments.

Safe Absolute Linear Positioning Systems up to SIL 3/PL e

Your automation, our passion.

PEPPERL+FUCHS

Safe Absolute Linear Positioning

Reliable Protection for Personnel and Equipment

Numerous applications in production and logistics require the safe absolute positioning of automatic transport systems. In most cases, a high level of precision is also required. The safeWCS/PUS, safePXV/PUS, and safePXV sensors offer reliable and simple solutions, which meet the requirements for SIL 3 and PL e with minimal integration effort.

Reliable Position Data for Functional Safety

Autonomous machines are ever present in (intra)logistics, from automated storage and retrieval systems to monorail conveyors and gantry cranes in ports. The functionally safe control of the automatic operation of these machines depends on precise position data. The same applies to fully automatic production plants in which workpieces are precisely positioned. Accurate positioning is essential for smooth processes without unnecessary downtime. At the same time, it is important to protect people in the vicinity of the machines and to avoid material damage due to collisions. The safe absolute linear positioning systems from Pepperl+Fuchs provide the required data reliably and with maximum accuracy.

Highlights

- Safe absolute linear positioning systems up to SIL 3/PL e
- Reliable monitoring of safety-relevant applications through output of safe position and speed via PROFIsafe and FSoE
- Particularly robust position detection for use even in challenging environmental conditions
- Precise positioning over long distances—even on curved paths, inclines, slopes, interruptions in the code rail or tape, or path switches
- Fast and easy commissioning due to pre-certification and configuration

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

Safe Absolute Linear Positioning Systems

Rugged Technology and Precise Data up to SIL 3 and PL e

In practice, positioning systems have to meet numerous requirements. In addition to a high level of precision, these requirements include a robust principle of measurement and rugged technology that can withstand harsh conditions. Additionally, integration and operation should be cost-effective. Pepperl+Fuchs offers such solutions from a portfolio that combines the advantages of optical and camera-based systems.

Minimal Effort, Maximum Safety

One evaluation unit, two measurement procedures, three configurations—
this results in the optimal solution for a wide range of applications:

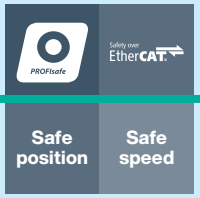
- safeWCS/PUS—extremely rugged combination for especially harsh environments
- safePXV/PUS—extremely precise safe position and safe speed
  plus EtherCAT connection
- safePXV—a single sensor with intrinsic redundancy up to SIL 3/PL e

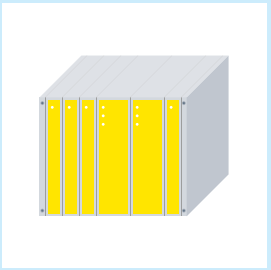
The pre-certification of the systems allows for quick and easy commissioning
and simple device replacement.

safeWCS/PUS
Combination of U-shaped read heads with stainless steel or laminate code rail

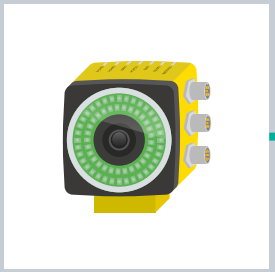
safePXV/PUS
Combination of a single 2-D camera and Data Matrix code tape

Safe evaluation unit (PUS)
Safe absolute positioning up to SIL 3/PL e





SPLC
Safety-rated programmable logic controller



safePXV
Safe absolute positioning up to SIL 3/PL e with only one sensor

Solutions for Different Requirements

In each version, the controller receives a safe absolute value for the x-axis position. The redundant sensor signals are processed and evaluated on two channels. The evaluation unit can also derive a safe monitored speed from the position value, provide non-safe values for position and speed, and output diagnostic data from the sensor. Depending on the device configuration, the common PROFINET, PROFIsafe, and EtherCAT FSoE safety protocols are available for secure communication.

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

safeWCS/PUS

The Benchmark for Rugged Positioning

Automated material handling plants often require the mobile unit to be positioned with millimeter precision. The safeWCS/PUS safe positioning system achieves this precision with maximum reliability, even under adverse conditions.

Safety over EtherCAT

Safe position

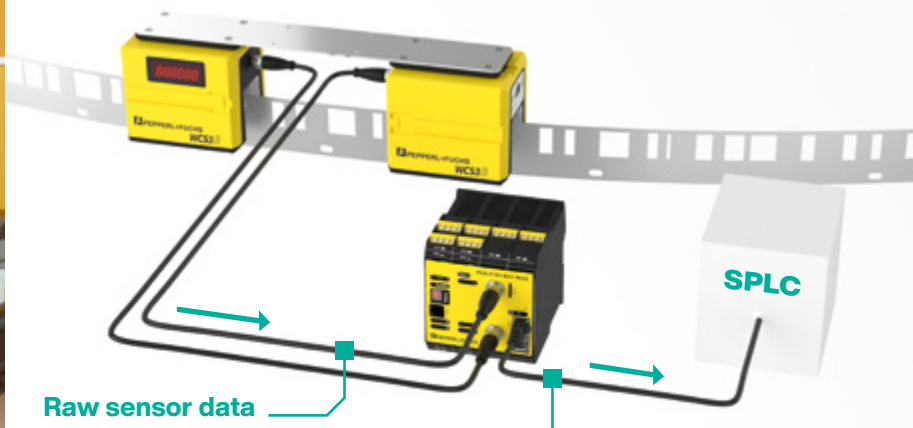
Safe speed

Reliable Data in the Field

The photoelectric sensor technology of the rugged WCS position encoding system has proven its worth in tough outdoor applications over decades. A metal or plastic code rail provides reliable orientation points over a length of up to 314.5 m. With various mounting systems and rail versions (including switch points, curved paths, and inclines), the system can be flexibly adapted to the requirements of the application. An outdoor version can even withstand extreme outdoor conditions.

Redundant Signals and Secure Gateway

Two read heads—one configured for forward movement and one for reverse movement—are arranged in series. The safe evaluation unit receives separate, redundant signals and acts as a secure gateway to the fieldbus. The evaluation unit derives a safe speed value from the safe position value and transmits diagnostic data for condition monitoring. The common FSoE safety protocol enables easy integration and communication with a safe controller.



Raw sensor data

Safe fieldbus

- Safe position (up to SIL 3/PL e)
- Safe speed (up to SIL 3/PL e)
- Sensor diagnostic data

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

Maximum Precision under the Most Adverse Conditions

Port facilities are exposed to wind, weather, corrosion, and severe mechanical stress. The safeWCS/PUS absolute linear positioning system offers the optimal solution for safe applications in harsh conditions: with its outdoor protective enclosure (IP69 degree of protection), it is extremely impermeable to moisture and can withstand both salt water and salty air. The system enables the reliable, safe positioning of trolleys, for example, for highly efficient loading processes.

Technical Data	PUS-F161-B*-WCS* and WCS3B-LS221-U*
Measurement length	Up to 314.5 m
Positioning accuracy	±0.4 mm or 1,250 positions/m (x-position)
Free tolerance to the code tape/code rail	**Standard:** Horizontal: 31 mm (±15.5 mm) Vertical: 28 mm (±14 mm) **Outdoor:** Horizontal: 28 mm (±14 mm) Vertical: 25.5 mm (+11.5 mm/-14 mm)
Speed	Up to 12.5 m/s
Available interfaces	EtherCAT/FSoE
Standards	Certified up to SIL 3 in accordance with IEC 61508 and up to category 4/PL e in accordance with EN 13849-1
Output values	Safe position, safe speed, non-safe position, non-safe speed, diagnostic data

safePXV/PUS

Complete Process Reliability over Long Distances

The unique combination of a 2-D camera system and multicolored code tape provides multiple intrinsic redundancy in signaling. The safePXV/PUS system combines maximum precision with safe position detection forprocess reliability without compromise.

PROFIsafe

Safety over EtherCAT

Safe position

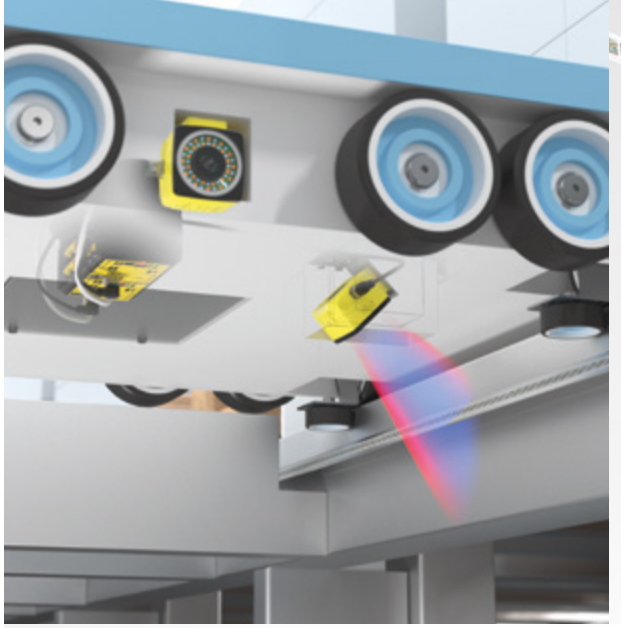
Safe speed

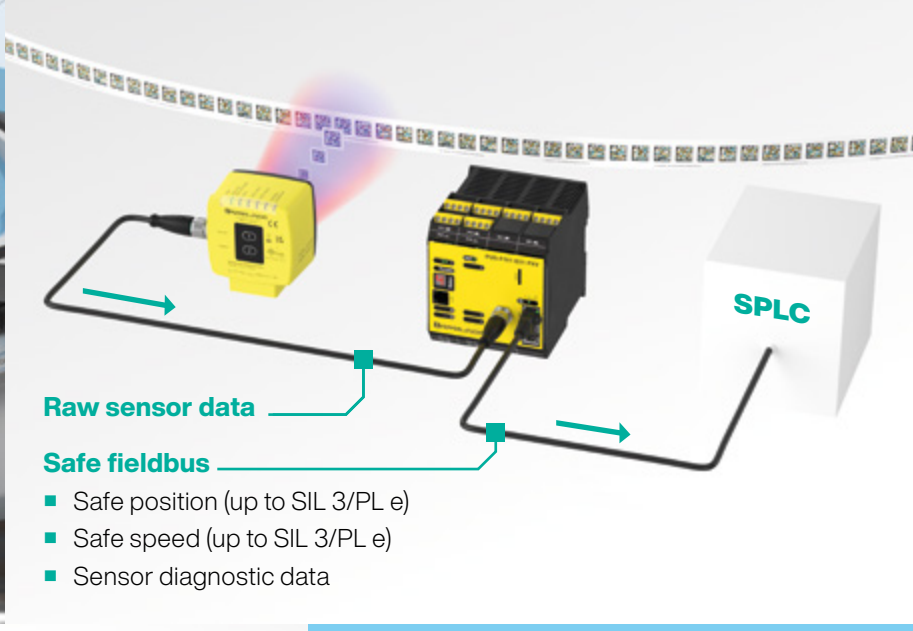
Colored Codes, Large Reading Window

The large, multicolored Data Matrix codes of the code tape are detected by just one camera-supported sensor. With a random sequence of differently colored LED lighting, the signaling is redundant several times over. The large reading window and a large depth of focus range enable reliable positioning over a route length of up to 10,000 m, even with compromised codes. The code tape is secured using an acrylate-based adhesive; the read head only needs to be roughly aligned with the tape.

Multiple Redundancy and Diagnostic Data

The safe evaluation unit processes and evaluates the redundant signals of the read head and transmits them to the safe controller. In addition to the safe position and speed value and non-safe data, the evaluation unit outputs diagnostic data for condition monitoring and predictive maintenance. The safePXV/PUS positioning system supports the PROFIsafe and FSoE safety protocols, can be easily integrated into higher-level systems, and is certified for safe applications up to SIL 3 and PL e.





- Safe position (up to SIL 3/PL e)
- Safe speed (up to SIL 3/PL e)
- Sensor diagnostic data

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

Positioning, Guidance, and Safety

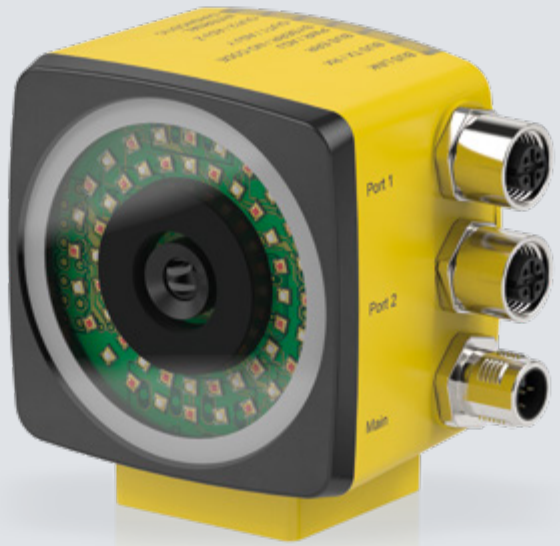
Autonomous shuttles are used in modern pallet warehouses, which require accurate guidance and positioning to accomplish their tasks. At the same time, this data is required to protect people and materials from collisions. The safePXV/PUS safe positioning system reliably records the position and speed of the vehicles. The system therefore creates an essential basis for functional safety—even in similar applications such as monorail conveyors, push skid systems, and automated storage and retrieval systems.

Technical Data	PUS-F161-B*-PXV* and PXV*AQS-F200-R4-V19-*
Measurement length	Up to 10,000 m
Positioning accuracy (non-safe)	±0.2 mm (x- and y-position)
Free tolerance to the code tape/code rail	**PXV80AQS:** Horizontal: 50 mm (±25 mm) Vertical: 40 mm (±20 mm) **PXV100AQS*6011:** Horizontal: 60 mm (±30 mm) Vertical: 16 mm (±8 mm) Inclination angle: ±30°
Speed	Standard ≤8 m/s
Available interfaces	PROFINET/PROFIsafe EtherCAT/FSoE
Standards	Certified up to SIL 3 in accordance with IEC 61508 and up to category 4/PL e in accordance with EN 13849-1
Output values	Safe position, safe speed (PXV*6011), non-safe x-position, non-safe speed, code tape quality grade, diagnostic data

safePXV

Safe with Just One Sensor

With innovative technology, the safePXV system achieves safe absolute positioning up to SIL 3/PL e with just one sensor. The highly reliable device supplies the safe data directly to the controller and requires minimal integration effort.



PROFIsafe

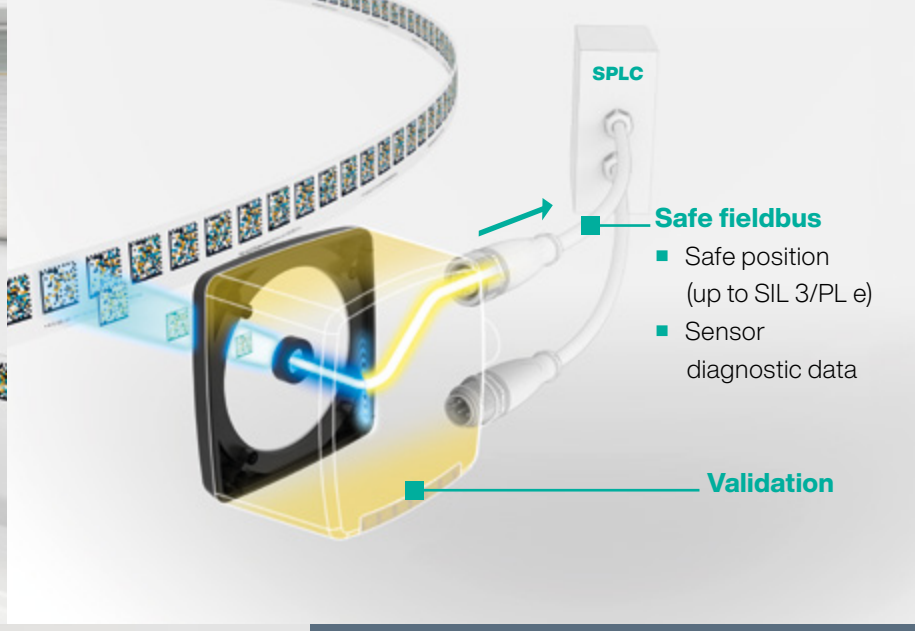
Safe position

Intrinsically Redundant

The safePXV system combines a 2-D read head with multicolored Data Matrix codes. Only part of the code information appears in the random flash sequence of the red and blue LED rings, which is evaluated and compared separately. Another level of redundancy is created by the large reading window, which always records several of the already redundant codes. Safe position data up to SIL 3 and PL e is available even in the case of heavily soiled or damaged codes.

Highly Efficient and Secured Several Times Over

The intrinsic redundancy of the safePXV enables a simple and safe solution with just one device, minimizing the cost of procurement, wiring, and installation. The integrated safety section continuously checks the correct functioning of the camera software. The firmware uses an algorithm that is rated as safe for the plausibility check directly in the sensor. This means that the safe controller (SPLC) receives validated data for direct further processing without additional checks.



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

Smooth Processes and Safe Operation

In push skid systems, the skids must be positioned with a high level of precision to ensure smooth processes, avoid interruptions, and enable safe operation. The safePXV system provides reliable position data at all times. The system enables narrow curve radii as well as uphill and downhill gradients. The sensor operates without contact, does not require moving parts, and is maintenance-free. The code tape is secured using an acrylate-based adhesive; the read head only needs to be roughly aligned with the tape.

Technical Data	PXV100A(Q)-F200-B28-V1D
Measurement length	Up to 100,000 m
Positioning accuracy (non-safe)	±0.2 mm (x- and y-position)
Free tolerance to the code tape/code rail	Horizontal: 100 mm (±50 mm) Vertical: 50 mm (±25 mm) Inclination angle: ±30°
Speed	≤8 m/s
Available interfaces	PROFINET/PROFIsafe
Standards	Certified up to SIL 3 in accordance with IEC 61508 and up to category 4/PL e in accordance with EN 13849-1
Output values	Safe position, non-safe position, non-safe speed, code tape quality grade, diagnostic data

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