

Positioning Systems

Sophisticated Technologies for Precise Position Detection

Positioning systems are subject to a wide range of requirements. Regardless of whether the application focuses on precision, process safety, robustness, or cost efficiency, the unique technologies from Pepperl+Fuchs combine the advantages of optical, camera-based, and inductive systems in one portfolio.

Over 25 Years of Technical Perfection

The launch of the world's first absolute positioning system in 1989 marked the start of a success story that continues to this day. Our portfolio is continuously being developed, with individual products tailored to specific applications to produce a range of solutions that have already proven themselves in countless applications.

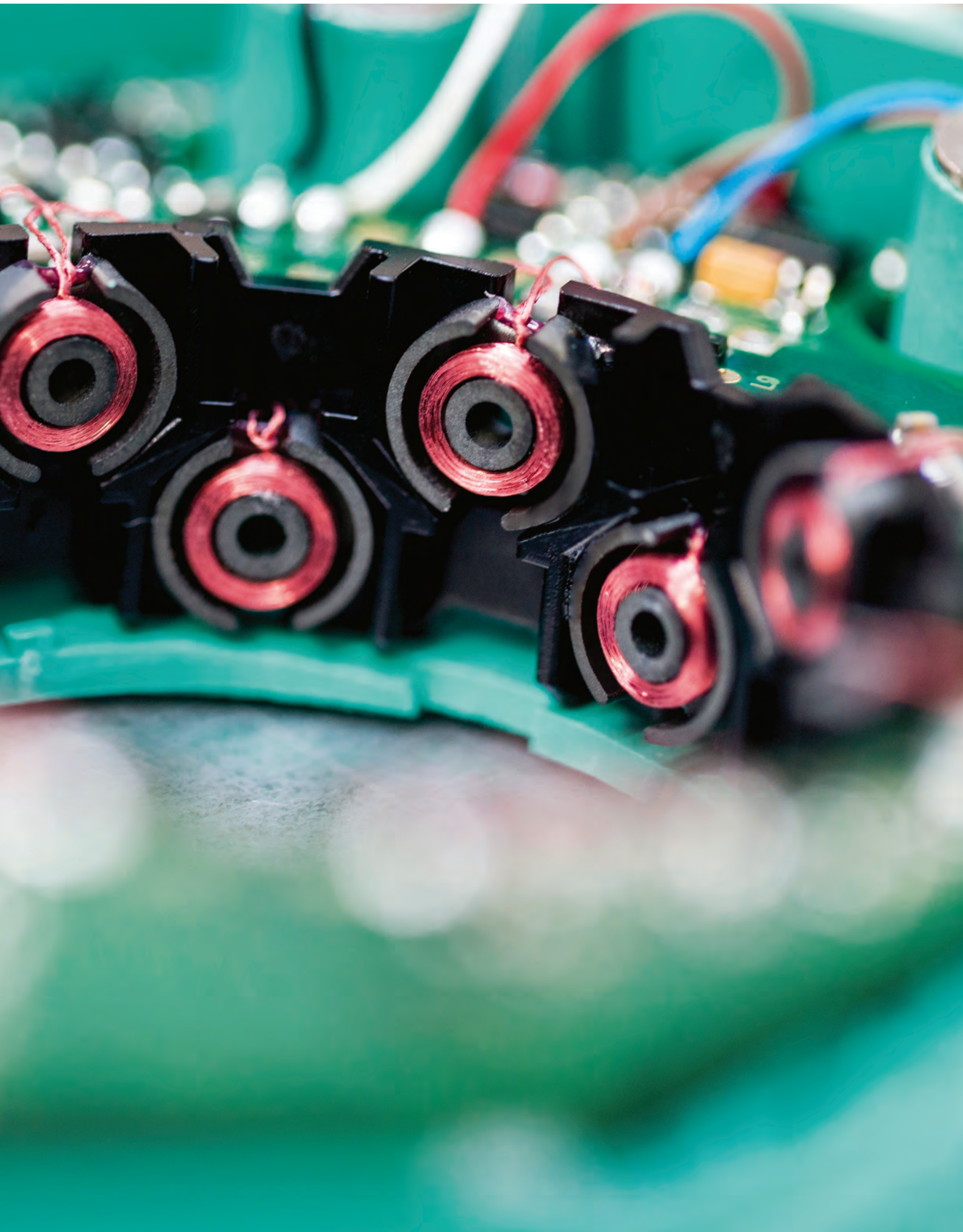
Diverse Technologies for a Wide Range of Applications

Wherever goods, production materials, or moving machine parts need to be safely and efficiently transported or precisely positioned, our customers can benefit from our unique technological expertise. Depending on the type of application, we offer inductive, optical, or camera-based systems. Whether your application is in harsh outdoor conditions, dusty environments or over long distances, the Pepperl+Fuchs portfolio always offers a solution for your positioning task.



More information is available at
www.pepperl-fuchs.com/fa-positioning





Inductive Positioning Systems

Perfection for Demanding Applications

Can be used universally for linear position detection and for measuring angles of rotation and absolutely reliable even in dusty, dirty applications or extreme temperature fluctuations. The patented PMI inductive positioning system impresses with a wide variety of applications and optimal robustness.



Typical Applications

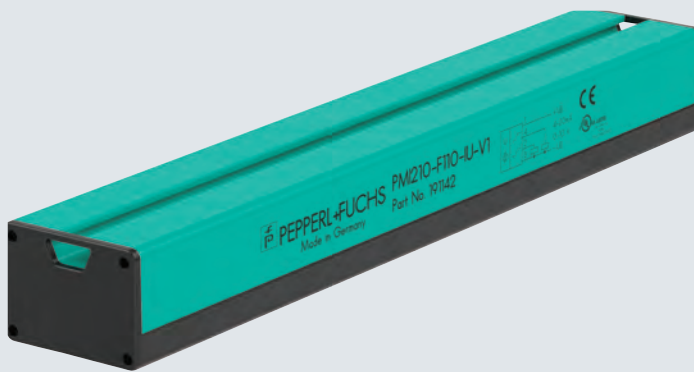
The PMI positioning system is available for linear and angular measurement. The inductive principle does not require a special target, but only a steel actuator. This makes it suitable for an infinite variety of applications.

Typical examples include:

- Mobile equipment: positioning of the wheel steering, position detection of crane booms
- Positioning of metal parts in mechanical engineering
- Print and paper industry: dancer control in roll printing machines, rotation detection in pile turners
- Control of packaging or filling cycles

Your Benefits at a Glance

- Excellent robustness and durability thanks to noncontact, maintenance-free, and contamination-resistant technology
- Flexibility thanks to the wide range of functions and programmable measuring and switching range
- Wide range of application possibilities using simple steel actuators as accessories or for in-house design
- Variety of different designs: small designs (14 mm), e.g., for machine tools, to large designs (960 mm) for large-scale mechanical engineering
- Process reliability due to immunity to interference
- Cost efficiency thanks to measuring and switching functions in a single device



Technical Features

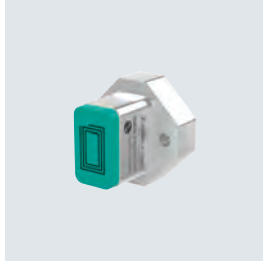
- Wide range of functions thanks to programmable measuring and switching range
- IO-Link versions available for customer-specific parameterization
- Versions available for linear or angle measurement
- Position detection independent of distance from 0 mm ... 2.5 mm to 0 mm ... 6 mm
- Fully encapsulated sensors up to IP67 for outdoor applications

Inductive Positioning Systems

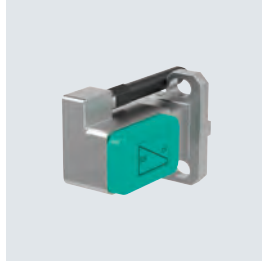
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F90 Series



Standard Technical Data

Connection type	M12 connector plug
Voltage type	DC
Operating voltage (max)	30 V
Housing material	Plastic material
Housing width W	23 mm

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

Model number	Interface	Measuring range	Output type	UB (min)	Length L	Height H	EAC	UL
PMI40-F90-3EP-IO-V15	IO-Link	40 mm	3 push-pull outputs	12	60.3	40		■
PMI40-F90-IU-IO-V15	IO-Link	40 mm	Analog voltage output, analog current output	12	60.3	40		■
PMI40-F90-IU2EP-IO-V15	IO-Link	40 mm	2 push-pull outputs, analog voltage output, analog current output	12	60.3	40		■
PMI40-F90-IU2EP-IO-V15-3G-3D	IO-Link	40 mm	2 push-pull outputs, analog voltage output, analog current output	12	60.3	40		■
PMI40-F90-U-V15		40 mm	Analog voltage output	12	60.3	40		
PMI80-F90-3EP-IO-V15	IO-Link	80 mm	3 push-pull outputs	12	95.1	40		■
PMI80-F90-IE8-V15		80 mm	2 PNP switching outputs, analog current output	18	102	41		■
PMI80-F90-IU-IO-V15	IO-Link	80 mm	Analog voltage output, analog current output	12	95.1	40		■
PMI80-F90-IU-V1		80 mm	Analog voltage output, analog current output	18	102	41		■
PMI80-F90-IU2EP-IO-V15	IO-Link	80 mm	2 push-pull outputs, analog voltage output, analog current output	12	95.1	40		■
PMI80-F90-IU2EP-IO-V15-3G-3D	IO-Link	80 mm	2 push-pull outputs, analog voltage output, analog current output	12	95.1	40		■
PMI104-F90-IE8-V15		104 mm	2 PNP switching outputs, analog current output	18	126	41		■
PMI104-F90-IU-V1		104 mm	Analog voltage output, analog current output	18	126	41	■	■
PMI120-F90-3EP-IO-V15	IO-Link	120 mm	3 push-pull outputs	12	135.2	40		■
PMI120-F90-IE8-V15		120 mm	2 PNP switching outputs, analog current output	18	142	41		■
PMI120-F90-IU-IO-V15	IO-Link	120 mm	Analog voltage output, analog current output	12	135.2	40		■
PMI120-F90-IU-V1		120 mm	Analog voltage output, analog current output	18	142	41		■
PMI120-F90-IU2EP-IO-V15	IO-Link	120 mm	2 push-pull outputs, analog voltage output, analog current output	12	135.2	40		■
PMI120-F90-IU2EP-IO-V15-3G-3D	IO-Link	120 mm	2 push-pull outputs, analog voltage output, analog current output	12	135.2	40		■

Highlights

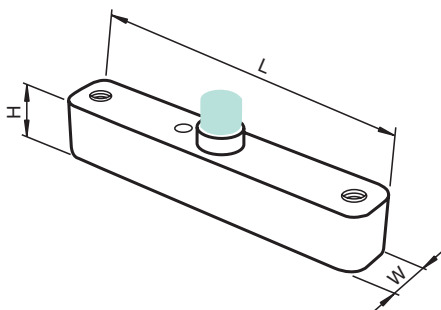
- New application possibilities thanks to IO-Link
- Measurement of the distance between two targets for solving complex applications with a single sensor
- Savings on additional sensors through simultaneous measuring and switching functions in one device
- ATEX versions for safe use in Ex zone 2/22 (3G nA, 3D tc)

Brief Description

IO-Link, simultaneous detection of two attenuator elements, and a measuring and switching function in one device—the F90 series offers an unprecedented variety of features for use in your machine. Available in four measuring lengths (40 mm, 80 mm, 104 mm, and 120 mm), there is always a perfect solution for your application. With ATEX versions for Zone 2/22 (3G nA, 3D tc), the device can even be used in hazardous areas.

Accessories

BT-F90-G	Damping element for sensors of type F90, F112, and F166; front hole
BT-F90-W	Damping element for sensors of type F90, F112, and F166; side hole
MH-F90	Mounting bracket for mounting sensors of type F90
V1-G-2M-PVC	Single-ended female cordset, M12, 4-pin, PVC cable
V15-G-2M-PVC	Single-ended female cordset, M12, 5-pin, PVC cable
V15-W-2M-PVC	Single-ended female cordset, M12, 5-pin, PVC cable



F112 Series



Standard Technical Data

Measuring range	14 mm
Voltage type	DC
Operating voltage (max)	30 V
Housing length L	35 mm
Housing width W	35 mm
UL	■

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

Model number	Interface	Connection type	Output type	UB (min)	Height H
PMI14V-F112-2EP-IO-V31	IO-Link	M8 connector plug	2 push-pull outputs	10	30.5
PMI14V-F112-2EPE2-IO	IO-Link	Fixed cable	1 PNP switching output, 2 push-pull outputs	10	30.5
PMI14V-F112-2EPE2-IO-V15	IO-Link	M12 connector plug	1 PNP switching output, 2 push-pull outputs	10	30.5
PMI14V-F112-U-IO	IO-Link	Fixed cable	Analog voltage output	18	30.5
PMI14V-F112-U-IO-V31	IO-Link	M8 connector plug	Analog voltage output	18	30.5
PMI14V-F112-U-V3		M8 connector plug	Analog voltage output	18	30

Highlights

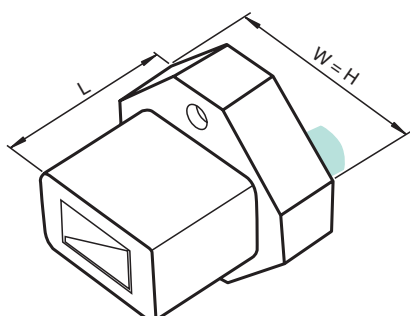
- New application possibilities thanks to IO-Link—even in challenging installation conditions
- Small and robust metal enclosure for use in extreme ambient conditions
- Flexible application by adjusting the detection range and the parameterization of switching points and windows

Brief Description

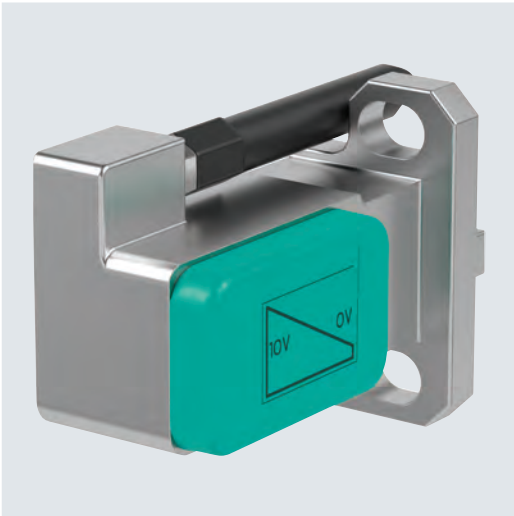
With a measurement length of 14 mm, the F112 series provides high-precision position data, or switching points or windows. Fully encapsulated with IP67 protection and equipped with a robust metal housing, the sensor withstands all external influences and offers new possibilities with IO-Link—even in applications where installation space is limited.

Accessories

BT-F90-G	Damping element for sensors of type F90, F112, and F166; front hole
BT-F90-W	Damping element for sensors of type F90, F112, and F166; side hole
V15-G-2M-PVC	Single-ended female cordset, M12, 5-pin, PVC cable
V15-W-2M-PVC	Single-ended female cordset, M12, 5-pin, PVC cable
V3-WM-2M-PUR	Single-ended female cordset, M8, 3-pin, PUR cable
V31-GM-2M-PUR-V1-G	Cordset, M8 to M12, 4-pin, PUR cable



F166 Series



Standard Technical Data	
Measuring range	14 mm
Connection type	Fixed cable
Voltage type	DC
Operating voltage (min)	18 V
Operating voltage (max)	30 V
Housing material	Plastic material, die-cast zinc
Housing length L	39 mm
Housing width W	30 mm
Housing height H	17.7 mm

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

Model number	Output type	UL
PMI14V-F166-2E2	2 PNP switching outputs	■
PMI14V-F166-2E2-1M-V15	2 PNP switching outputs	
PMI14V-F166-U	Analog voltage output	■
PMI14V-F166-U-1M-V15	Analog voltage output	

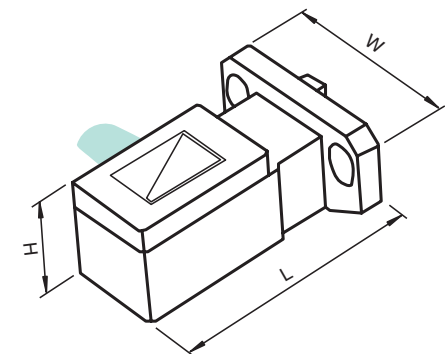
Highlights

- Especially small design for integration in the smallest spaces
- Robust metal enclosure for use in extreme ambient conditions

Brief Description

With an especially compact design and robust metal housing, the F166 series has all the features required for basic applications with limited installation space. These advantages are demonstrated especially well in the typical application in a tool spindle. With its small dimensions, the robust metal housing is easy to integrate into the compact spindle. It withstands lubricants or abrasion and guarantees that processes run smoothly.

Accessories	
BT-F90-G	Damping element for sensors of type F90, F112, and F166; front hole
BT-F90-W	Damping element for sensors of type F90, F112, and F166; side hole
PMI14V-Teach	Programming unit



F110 Series



Standard Technical Data	
Connection type	M12 connector plug
Output type	Analog voltage output, analog current output
Voltage type	DC
Operating voltage (min)	18 V
Operating voltage (max)	30 V
Housing width W	41 mm
Housing height H	30 mm
UL	■

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

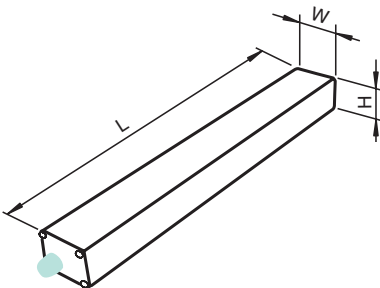
Model number	Measuring range	Length L
PMI210-F110-IU-V1	210 mm	250
PMI360-F110-IU-V1	360 mm	400
PMI510-F110-IU-V1	510 mm	550
PMI810-F110-IU-V1	810 mm	850

Highlights

- Reliable position detection via inductive measuring principle at lengths of up to 810 mm
- Exact positioning, even in the case of larger mechanical tolerances
- Simple and flexible mounting using sliding blocks
- Robust metal housing for use in mechanically demanding ambient conditions

Brief Description

The F110 guarantees optimal reliability in position detection, even over longer distances. Available in several lengths between 210 mm and 810 mm, the series is ideal for basic applications in large-scale and heavy machine construction. The especially long reading distance of up to 6 mm even copes with large mechanical tolerances without affecting the precise measurement result. Mounting is also simple, as the fixing points can be freely selected using a T-slot nut for flexible installation of the sensor.



Accessories	
BT-F110-G	Damping element for sensors of type F110, front hole
BT-F110-W	Damping element for sensors of type F110, side hole
MH-F110	Mounting bracket for mounting sensors of type F110
V1-G-2M-PVC	Single-ended female cordset, M12, 4-pin, PVC cable

F130 Series



Standard Technical Data	
Measuring range	360°
Connection type	M12 connector plug
Voltage type	DC
Operating voltage (min)	18 V
Operating voltage (max)	30 V
Housing material	Plastic material
Housing length L	120 mm
Housing width W	76.5 mm
UL	■

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

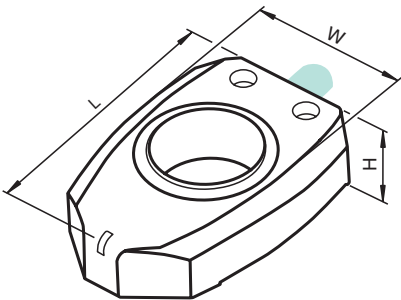
Model number	Output type	Height H
PMI360D-F130-IE8-V15	2 PNP switching outputs, analog current output	22
PMI360DV-F130-3E2-V15	3 PNP switching outputs	26.5
PMI360DV-F130-IU-V15	Analog voltage output, analog current output	26
PMI360DV-F130-IU2E2-V15	2 PNP switching outputs, analog voltage output, analog current output	26.5

Highlights

- Noncontact, wear-free angle measurement system with a measuring range from 0° to 360°
- Efficient angle position feedback thanks to optimized product versions and standardized drilling template for position feedback detectors
- Robust, fully encapsulated sensors up to IP67 for outdoor applications

Brief Description

Unlike the linear-measuring PMIs, F130 sensors convert a measuring angle from 0° to 360° into a 4 mA to 20 mA analog signal, making them ideal for valve position feedback on swivel drives and a range of other applications. The sensor can be operated either clockwise or counter-clockwise with its own steel or special standard actuator from the Pepperl+Fuchs accessories portfolio. The scalable measuring range, along with the freely parameterizable switch points and windows, complete the unique design, making the F130 series the perfect solution for angle detection.



Accessories	
BT-F130-A	Actuator for series F130
V15-G-2M-PVC	Single-ended female cordset, M12, 5-pin, PVC cable
V15-W-2M-PVC	Single-ended female cordset, M12, 5-pin, PVC cable

Optical Positioning Systems

Reliable Even Over Long Distances

Whether used in standard or special applications, these optical positioning systems offer excellent reliability. The range includes the position encoding system (WCS) for harsh outdoor conditions, the DataMatrix positioning system (PCV) for uncompromising process safety, the position guided vision (PGV) for automated guided vehicle navigation, and the PHA for high-precision positioning.



WCS—Robust Positioning Since 1989

The system combines a metal or plastic code rail with optoelectronic sensors for scanning to guarantee precise positioning even in the most hostile environments.

Typical Applications

- Storage and material handling in harsh ambient conditions
- Electroplating plants and port facilities
- Elevator technology

Your Benefits at a Glance

- Solid, dirt-resistant code rail and high-performance emitter LEDs for outstanding robustness
- Over 25 years of application experience and continuous development ensure impressive reliability

Technical Features

- Compatible with all control panels
- Code rail length of up to 327 m (modular expansion)
- Suitable for curved paths, uphill slopes, interruptions, and lane changes
- Special outdoor version available

PCV—Redundancy for Outstanding Process Reliability

The unique combination of a 2-D camera system with a multi-redundant Data Matrix code tape ensures precise position detection and uncompromising process reliability.

Typical Applications

- Positioning of skid units and monorail conveyor systems
- Lifting and elevator equipment

Your Benefits at a Glance

- Unaffected by contamination or damage to the code tape thanks to code redundancy and extra-wide reading window
- Quick commissioning through parameterization via Data Matrix control codes, PC, or directly from the control panel

Technical Features

- Self-adhesive code tape with a length of up to 10000 m
- Extensive diagnostic information, e.g., on the pollution degree or destruction of individual codes
- Additional evaluation of the Y and Z axes



PGV—Future-Proof Navigation

Optical colored tape tracking for driving, DataMatrix codes for positioning, and control codes for navigation—position guided vision (PGV) is the ideal solution for automated guided vehicles.

Your Benefits at a Glance

- Flexible navigation using colored tape, track tape, DataMatrix code tape, DataMatrix tags, or a combination of these technologies for excellent investment security
- Process safety through reliable tracking of different tracks even on highly reflective surfaces and in the event of contamination or destruction

Technical Features

- Can be used with any track tapes of different colors and widths
- Compatible with all control panels

PHA—Cost-Effective Precision Shelf Positioning

Specially developed for the high-precision positioning of shelves in high-bay warehouses, the PHA uses existing holes below the shelves to ensure accurate positioning regardless of interference factors such as contamination, extraneous light, and material fatigue.

Your Benefits at a Glance

- Outstanding reliability irrespective of warehouse lighting or contamination thanks to automatic exposure time control
- High-precision positioning for efficient use of storage space
- Carrier material savings through reliable positioning even in the event of material fatigue or warpage

Technical Features

- Range of 200 mm – 800 mm with a large detection/capture range
- Can also be used in deep-freeze storage down to -30 °C

Optical Positioning Systems

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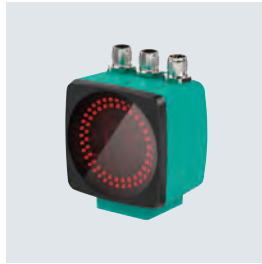
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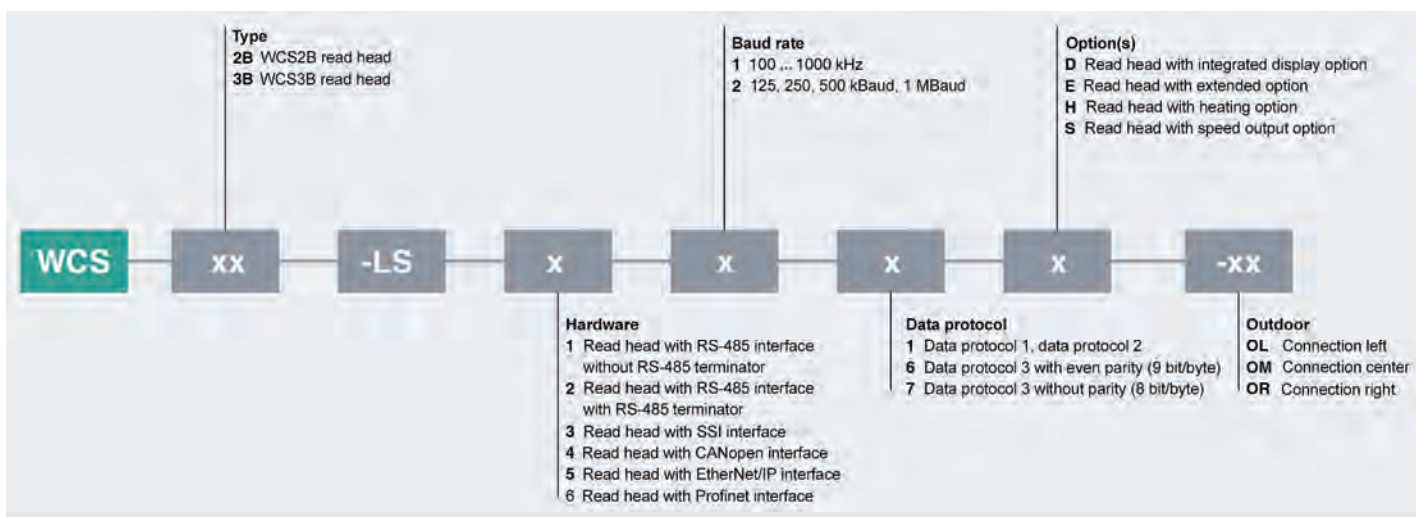
WCS2B/WCS3B Series



Standard Technical Data

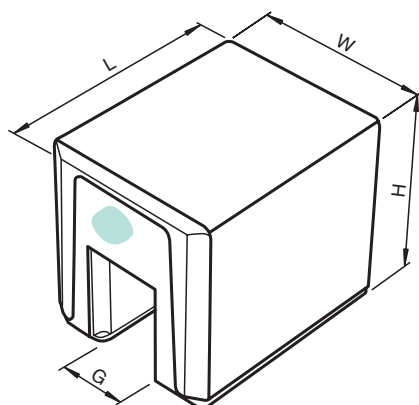
Voltage type	DC
Operating voltage (min)	10 V
Operating voltage (max)	30 V
Housing material	Plastic material
CSA	■

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.



Highlights

- Reliable absolute position detection with the advanced WCS position encoding system
- Precise position data despite curved paths, ascents, descents, interruptions, and lane changes
- IP69 protective housing: optimized for use in extreme outdoor conditions (e.g., port facilities and electroplating plants)
- Simple commissioning concept and immediate error notification thanks to highly visible displays and indicator LEDs
- Extended option: precise positioning on traverse distances of up to 629 m



Brief Description

With its specially designed code rail and noncontact scanning of the read head, the WCS reliably detects a new position value every 0.8 mm in real time and even at high travel speeds. Powerful transmission LEDs make the sensors especially resistant to contamination and insensitive to smoke, fog, or dusty environments. The position data is reliably recorded and transmitted to the control via standard interfaces.

Accessories

V15S-G-ABG-PG9	Single-ended male cordset, M12, 5-pin, shielded, field-attachable
V15S-W-ABG-PG9	Single-ended male cordset, M12, 5-pin, shielded, field-attachable
V19SY-G-BK10M-PUR-ABG	Single-ended male cordset, M12, 8-pin, Y encryption, PUR cable, shielded
V19SY-G-BK2M-PUR-ABG	Single-ended male cordset, M12, 8-pin, Y encryption, PUR cable, shielded
V19SY-G-BK5M-PUR-ABG	Single-ended male cordset, M12, 8-pin, Y encryption, PUR cable, shielded
V45-G	Single-ended male cordset, field-attachable
V45-GP	Push-pull single-ended male cordset, field-attachable
WCS-MP1	Mounting plate for WCS2 and WCS3 read heads

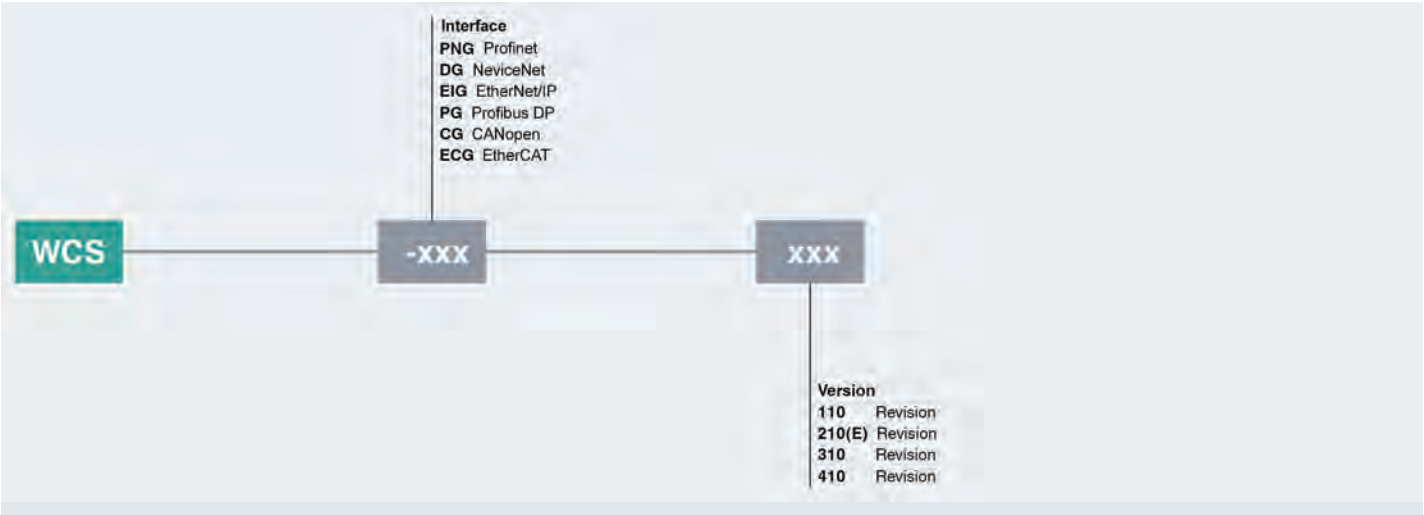


WCS Interface



Standard Technical Data	
Interface	Ethernet, RS-485
Connection type	RJ-45 connector socket
Housing material	Plastic material
Housing length L	115 mm
Housing width W	23 mm
Housing height H	118 mm

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

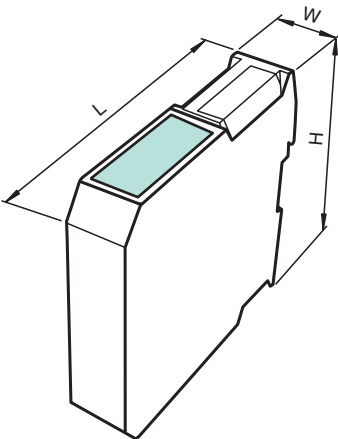


Highlights

- Wide range of interface modules available
- Can accommodate up to four RS-485 read heads
- Enables simplified system expansion

Brief Description

The system combines a metal or plastic code rail with optoelectronic sensors for scanning. This guarantees precise positioning even in the most hostile environments. In addition to the internal interfaces, a wide range of interface modules is available for connection to various bus systems.

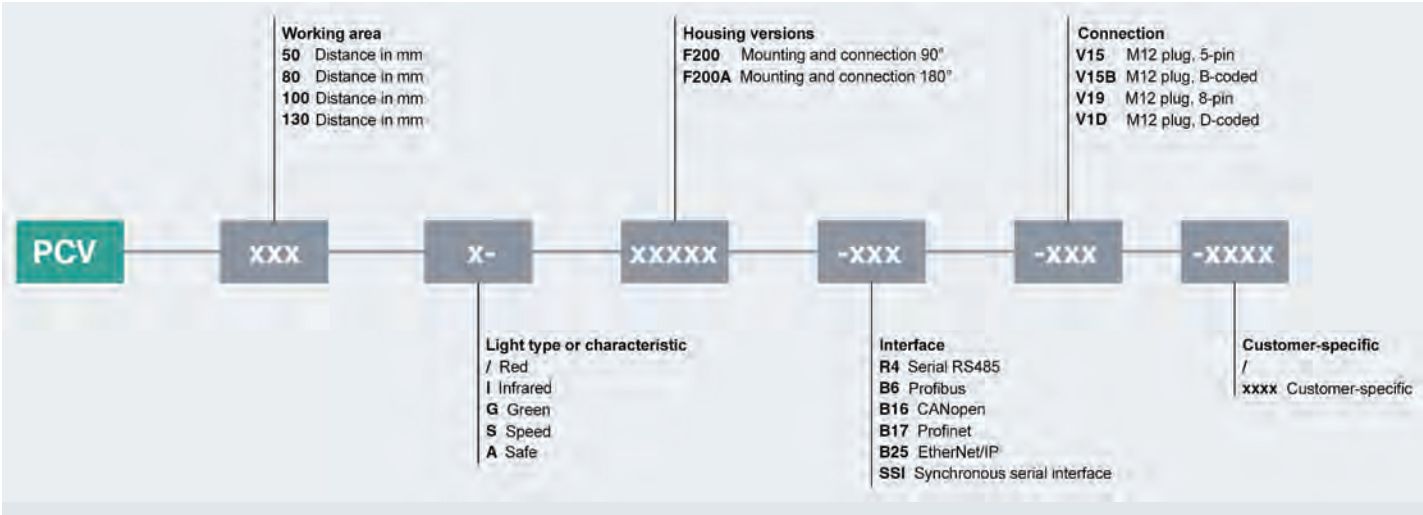


PCV Series



Standard Technical Data	
Connection type	M12 connector plug
Voltage type	DC
Operating voltage (min)	15 V
Operating voltage (max)	30 V
Housing material	Plastic material
Housing length L	50 mm
Housing width W	70 mm
Housing height H	70 mm

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

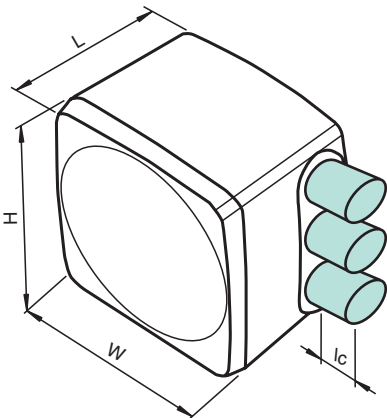


Highlights

- Self-adhesive code tape with a length of up to 10000 m
- Extensive diagnostic information, e.g., on the pollution degree or destruction of individual codes
- Additional evaluation of the Y and Z axes

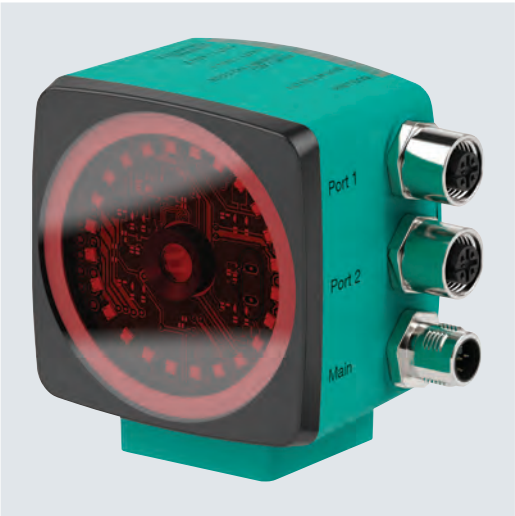
Brief Description

The unique combination of a 2-D camera system with a multi-redundant Data Matrix code tape ensures precise position detection and uncompromising process reliability.



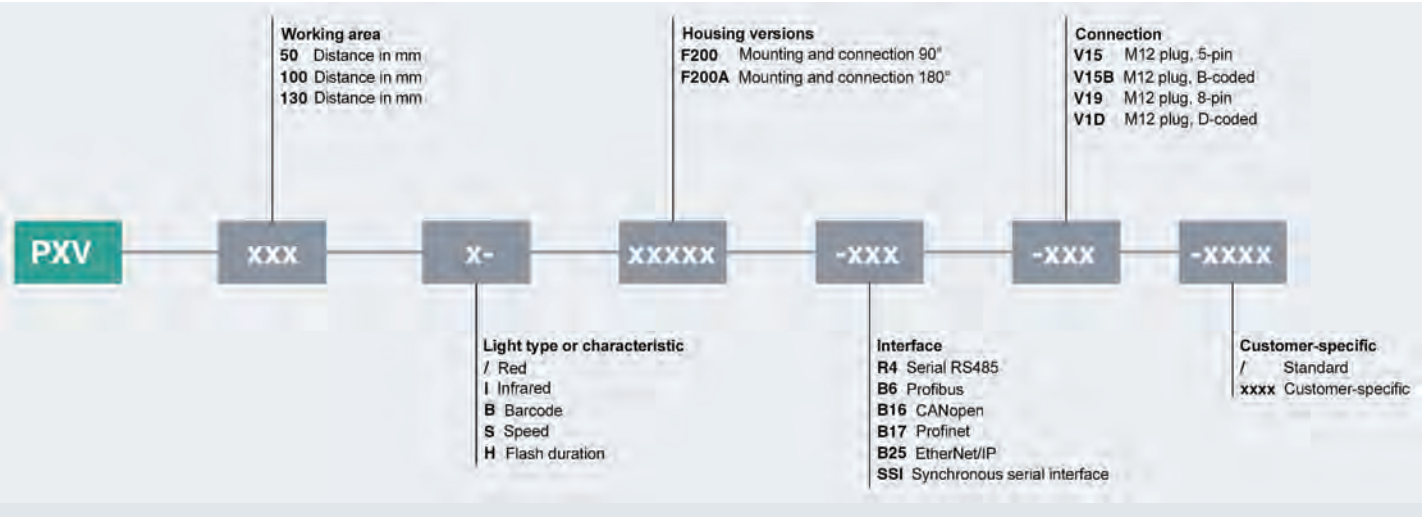
Accessories	
ICZ-TR-V15B	Terminator for PROFIBUS
PCV*-CA10-*/PCV*-CA20-*	Data Matrix code tape
PCV-AG100	Alignment guide for PCV100-* read head
PCV-AG80	Alignment guide for PCV80-* read head
PCV-CM20-001-001-SET	Event marker for PCV system
PCV-CM20-001-050-SET	Event marker for PCV system
PCV-CM20-001-135-SET	Event marker for PCV system

PXV Series



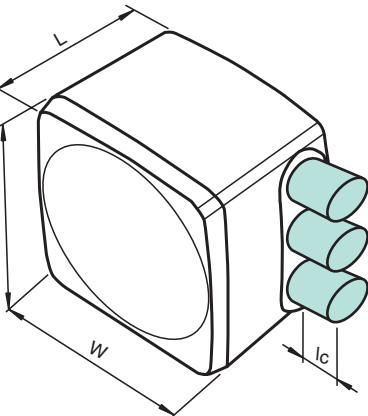
Standard Technical Data	
Connection type	M12 connector plug
Voltage type	DC
Operating voltage (min)	15 V
Operating voltage (max)	30 V
Housing material	Plastic material
Housing length L	50 mm
Housing width W	70 mm
Housing height H	70 mm

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.



Highlights

- Noncontact positioning on Data Matrix code tape
- Mechanical robustness: no wear, long service life, maintenance-free
- High resolution and precise positioning, especially for facilities with curves and switch points as well as inclines and declines.
- Traverse distance up to 100 km



Brief Description

The DataMatrix positioning system (PXV) is the positioning system in the Pepperl+Fuchs incident light process. The heart of the system is the 2-D reading head. Among other things, it consists of a camera module with an integrated lighting unit. This enables the read head to detect position markers printed onto a self-adhesive code tape in the form of 2-D Data Matrix codes. The PXV positioning system has a 120 mm x 80 mm reading window which can read up to five Data Matrix codes at once. Using Data Matrix codes as information carriers allows redundancy in data representation. This multiple redundancy makes the PXV extremely reliable.

Accessories	
PCV-AG100	Alignment guide for PCV100-* read head
PCV-KBL-V19-STR-RS485	Cable unit with power supply for USB/RS-485 interface converter
PCV-KBL-V19-STR-USB	USB cable unit with power supply
PCV-LM25	Marker head for 25 mm code tape
PCV-MB1	Mounting bracket for PCV* read head
PCV-SC12	Grounding clip for PCV system
PCV-USB-RS485-Converter Set	USB to RS 485 interface converter

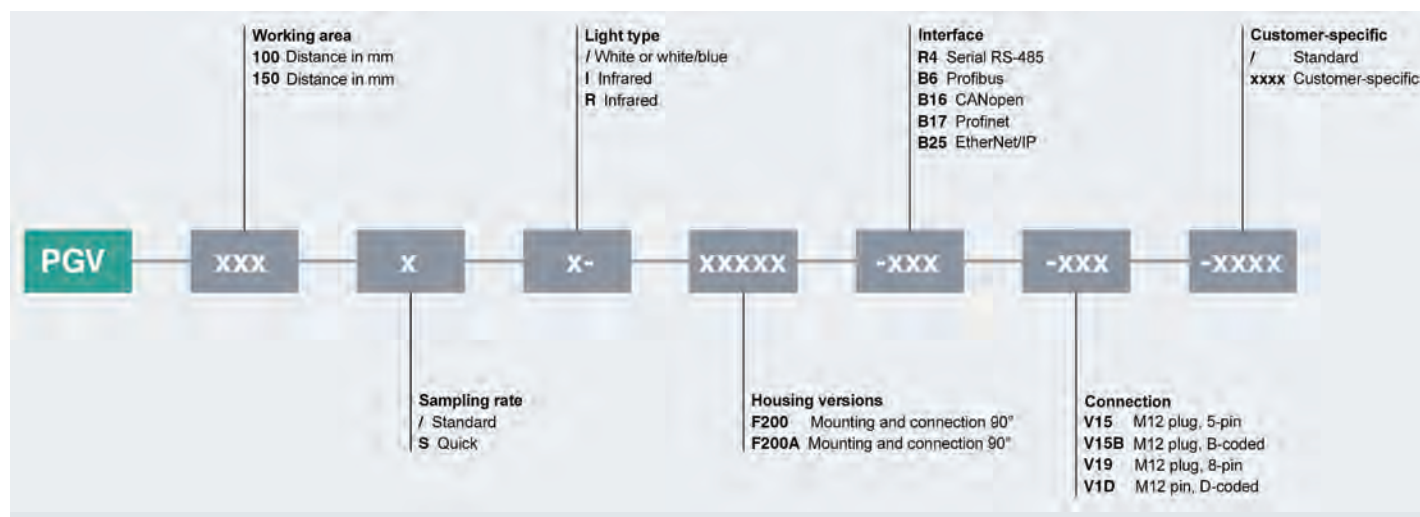
PGV Series



Standard Technical Data

Connection type	M12 connector plug
Voltage type	DC
Housing material	Plastic material
Housing length L	50 mm
Housing width W	70 mm
Housing height H	70 mm

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

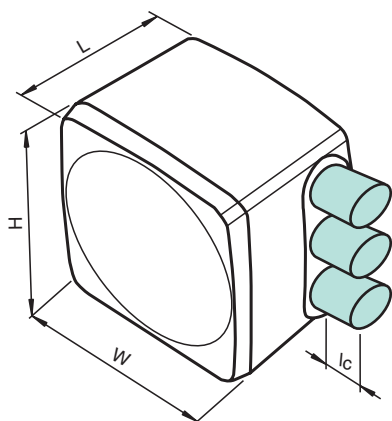


Highlights

- Noncontact positioning on Data Matrix code tape
- Reading of Data Matrix control codes
- Mechanical robustness: no wear, long service life, maintenance-free
- Can be used with any track tapes of different colors and widths
- Compatible with all control panels

Brief Description

Optical colored tape tracking for driving, DataMatrix codes for positioning, and control codes for navigation—position guided vision (PGV) is the ideal solution for automated guided vehicles.



Accessories

PCV-AG100	Alignment guide for PCV100-* read head
PCV-KBL-V19-STR-USB	USB cable unit with power supply
PCV-LM25	Marker head for 25 mm code tape
PCV-MB1	Mounting bracket for PCV* read head
PCV-SC12	Grounding clip for PCV system
PGV*-CA25-*	Data Matrix code tape
PGV*-CC25-*	Control code tape for PGV system
PGV25M-CD100-CLEAR	Protective film for PGV code tape

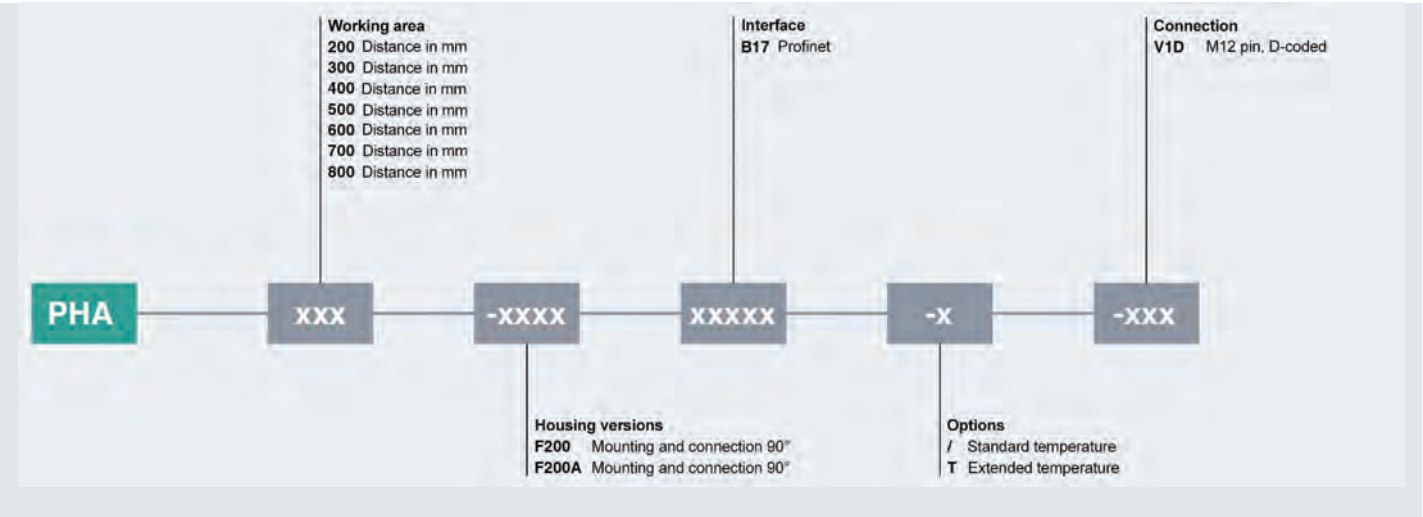


PHA Series



Standard Technical Data	
Connection type	M12 connector plug
Voltage type	DC
Operating voltage (min)	24 V
Operating voltage (max)	24 V
Housing material	Plastic material
Housing length L	50 mm
Housing width W	70 mm
Housing height H	70 mm

For detailed data and description, see the datasheet. Further products can be found online at www.pepperl-fuchs.com.

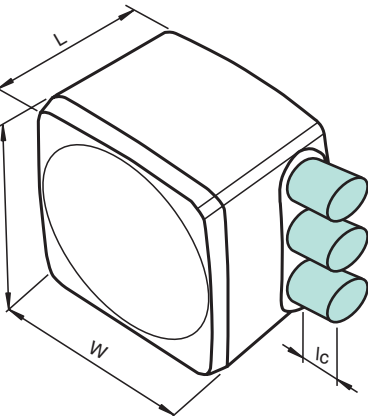


Highlights

- Detects the position of an index hole
- Detection range of 200 mm...800 mm with a large detection/capture range
- Can also be used in deep-freeze storage down to -30 °C
- Integrated illumination

Brief Description

The PHA vision sensors from Pepperl+Fuchs are the right solution for the safe and efficient transport and positioning of goods and production materials. Developed specifically for the precise positioning of stacker cranes, they boast a variety of high-performance product features. The PHA positioning systems are equipped with a unique camera system. With this, they detect the circular holes already present in the racking system and determine their position deviation in the X and Y directions relative to the target position. Positioning through existing holes allows consistently precise position detection.



Accessories	
CBL-PUR-ABG-GY-04x034-100M	Cable, PUR/PP, 4-wire, shielded
PCV-MB1	Mounting bracket for PCV* read head
PCV-SC12	Grounding clip for PCV system
PCV-SC12A	Grounding clip for PCV system
V15S-G-5M-PUR-ABG	Single-ended male cordset, M12, 5-pin, shielded, PUR cable
V19-G-10M-PUR-ABG	Single-ended female cordset, M12, 8-pin, shielded, PUR cable
V19-G-2M-PUR-ABG	Single-ended female cordset, M12, 8-pin, shielded, PUR cable
V19-G-5M-PUR-ABG	Single-ended female cordset, M12, 8-pin, shielded, PUR cable

