

A large industrial refinery or chemical plant at night, illuminated by numerous bright lights. The scene features tall distillation columns, complex piping, and storage tanks against a dark blue sky with some clouds. A tall red lattice tower is visible on the left side of the frame.

RELIABILITY BY DESIGN

**SENSOR APPLICATIONS
FOR PROCESS EQUIPMENT**



Automation is our world. Perfect application solutions are our goal.

A pioneering spirit and a firm belief in their own inventive powers – these were the assets that Walter Pepperl and Ludwig Fuchs started out with when they opened their Mannheim radio repair shop in 1945. Their invention of the proximity switch a few years later proved their strength. It was also the starting point in a successful history defined by close customer relationships as well as innovative automation technologies and procedures.

With years of experience in the field of sensor applications in the process industry, we offer complete solutions for the reliable and efficient operation of your process equipment. Specifically

developed sensor solutions for process applications provide accurate measurements and valve position feedback to monitor system status, which is necessary in an energy-efficient facility.

In a modern process plant, the monitoring of valve position is essential. We have products for both linear travel and rotary travel valves, automated and manually actuated. Our sensors are useable in both general-purpose and hazardous locations.





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Reliable solutions for your process applications

Take a look at our wide range of solutions for the process industry including products for use in hazardous areas, such as

- Chemical and petrochemical
- Offshore and marine
- Oil and gas
- Pharmaceutical
- Pulp and paper
- Food and beverage
- Water treatment and waste water
- Mining and metallurgy

www.pepperl-fuchs.com/process-equipment



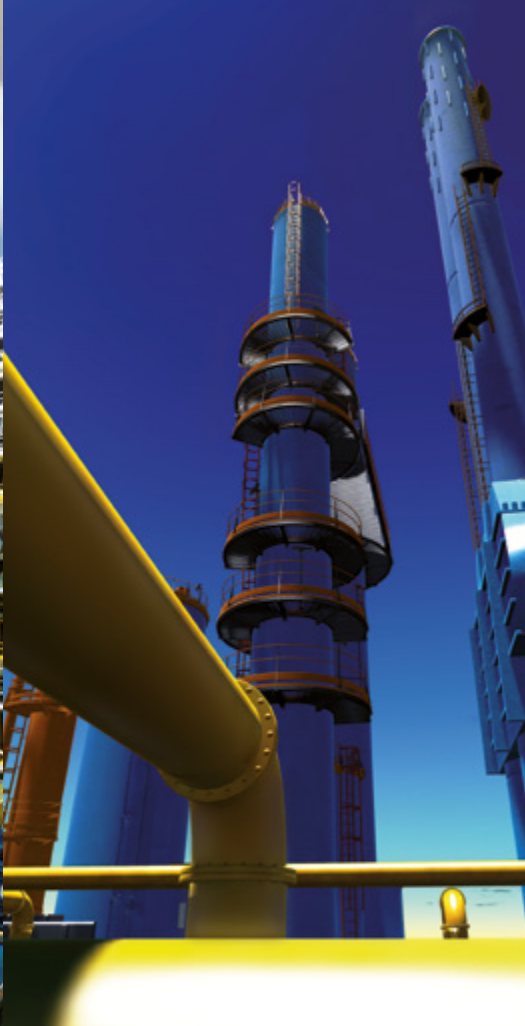
CHEMICAL AND PETROCHEMICAL



PULP AND PAPER



OFFSHORE AND MARINE



OIL AND GAS



PHARMACEUTICAL



FOOD AND BEVERAGE



WATER TREATMENT



MINING AND METALLURGY

Explosion protection and intrinsic safety. Globally.

The selection of suitable apparatus plays an important role in the design of process plants using hazardous materials. Device functionality, suitability for the expected environmental and operating conditions, and explosion protection requirements are pivotal in the selection of process equipment.

Areas in which a potentially explosive atmosphere can develop are divided into zones. This division is based on the frequency and duration of the occurrence of such an atmosphere. The table below shows the definition of the zones, and divisions of the North American market:

Zone		Division			Definition
Gas	Dust	Gas (Class I)	Dust (Class II)	Fibers (Class III)	
0	20	1	1	1	Potentially explosive atmospheres are present constantly, for long periods or frequently
1	21	1	1	1	Potentially explosive atmospheres are occasionally present during normal operation
2	22	2	2	2	No potentially explosive atmospheres are present during normal operation, but should they occur, they are infrequent and of short duration

As market leader in explosion protection, Pepperl+Fuchs offers a wide range of suitable sensors and interface technology for use in hazardous industrial areas. In addition to the explosion protection offered by the intrinsic safety of NAMUR sensors and their corresponding interface modules, components with mechanical explosion protection are being widely used for applications in Zone 2 and Zone 22.

ATEX MARKING OF PRODUCTS

The ATEX directive comprises the device categories (1, 2, or 3) describing the safety levels, and the type of ex atmosphere (G for gas and D for dust). For example:



very high safety level, sufficient safety due to two safety measures (category 1), gas atmosphere (G)

Device category and type of ex atmosphere

Category 1: Very high safety level, sufficient safety due to two safety measures
 Category 2: High safety level, sufficient safety in case of frequent device faults
 Category 3: Normal safety level, sufficient safety in case of fault-free operation

G = gas atmosphere
 D = dust atmosphere

IEC MARKING OF PRODUCTS

The IEC marking comprises the ignition protection class and the equipment protection level (EPL) describing the protection level (a, b, or c) in gas or dust atmospheres. For example:



intrinsic safety

gas atmosphere (G),
 very high protection level (a)

Equipment protection level (EPL)

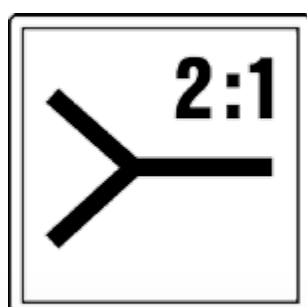
G = gas atmosphere
 D = dust atmosphere
 a = very high protection level
 b = high protection level
 c = extended protection level

Principles	International Ignition Protection Class	Zone	North American Ignition Protection Class	Division	Products and applications	IEC/EN Standard
Prevention	Intrinsic safety Ex ia, Ex ib, Ex ic	0, 1, 2 20, 21, 22	Intrinsic safety	1, 2	Inductive, magnetic and capacitive sensors, dual inductive sensors, AS-Interface	IEC 60079-11 EN 60079-11
	Non-sparking Ex nA	2	Nonincendive	2	Inductive sensors (standard and dual sensors), rotary encoders	IEC 60079-15 EN 60079-15
	Dust ignition protection Ex ta, Ex tb, Ex tc	20, 21, 22	Not recognized	–	Inductive sensors (standard and dual sensors), rotary encoders	IEC 60079-31 EN 60079-31
	Increased safety Ex e	1, 2	Not recognized	–	AS-Interface	IEC 60079-7 EN 60079-7
Explosion Containment	Flameproof Ex d	1, 2	Flameproof	1, 2	Rotary encoders, RFID	IEC 60079-1 EN 60079-1
Segregation	Encapsulation Ex ma, Ex mb, Ex mc	0, 1, 2	Not recognized	–	AS-Interface	IEC 60079-18 EN 60079-18



SAFETY INTEGRITY LEVEL (SIL)

Sensors with a safety function include inductive proximity switches with NAMUR interfaces and a defined failure characteristic. Should a component malfunction, the output automatically switches to the safe state. These sensors have been approved according to IEC 61508 and can be used in functional safety areas up to SIL2 or SIL3.



2:1 TECHNOLOGY

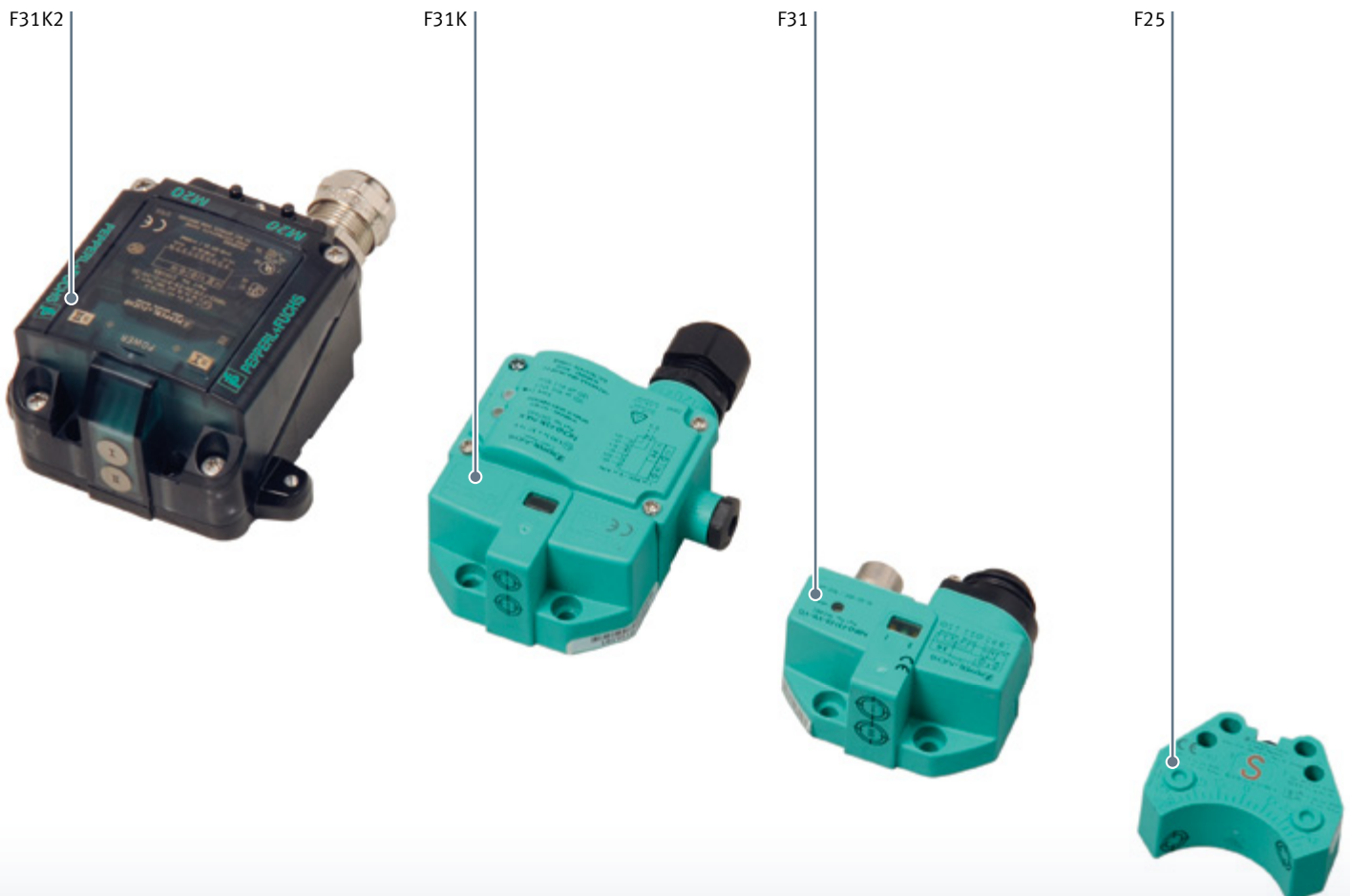
Many applications have two intrinsically safe, binary signals at one measuring point. With its 2:1 technology, Pepperl+Fuchs enables two intrinsically safe signals to be transmitted over one line, saving you 50% of the cabling costs in the hazardous area. The wiring is installed using conventional technology and the evaluation is carried out in a single switch amplifier.

Dual sensor portfolio for valve position sensing by direct mounting on actuators

Valve position sensor solutions for standard pneumatic actuators are typically used in process automation applications. In today's valve automation market, direct mount solutions are gaining in popularity due to their compact design and easy installation. Direct mount valve position sensors minimize space requirements, maintain assured sensing distance, and offer simplicity and sophistication in monitoring and reliability.

Our product line of dual inductive sensor models includes the F25 basic series, the F31 and F31K standard series, and the F31K2 premium series. Designed to meet the requirements of

the process valve market, our dual sensors mount directly onto the actuator, and targets mount directly to the actuator stem.



Dual sensors	F25 Series	F31 Series	F31K Series	F31K2 Series
Highlights	■ Dual sensor ■ Direct mount to small actuators and manual valves	■ Dual sensor ■ Direct mount to all standard pneumatic actuators	■ Dual sensor ■ Direct mount to all standard pneumatic actuators	■ Dual sensor ■ Direct mount to all standard pneumatic actuators ■ Extremely robust and suitable for harsh environments
Application range	For manually operated valves as well as small and medium-sized actuators	For direct mounting on actuators in indoor and outdoor areas	For direct mounting on actuators in indoor and outdoor areas	Optimized solution for unlimited outdoor use
Design	Very compact design	Compact design	Compact design with terminal compartment	Modular, robust "dual housing" design with large terminal compartment
Housing material	Plastics (PBT)	Plastics (PBT)	Plastics (PBT)	Translucent plastics (PC), aluminum
Connectivity (mech. and electr.)	■ 5 m cable ■ M12 plug and socket	■ 5 m cable ■ M12, M18, RD24x1/8 plug and socket	■ Terminal block ■ Cable glands	■ Plug-in terminal block ■ Cable glands or conduit connections ■ Metric or inch threads
Temperature range	-25 °C ... +70 °C	-25 °C ... +70 °C	-25 °C ... +70 °C	-40 °C ... +75 °C
IP protection	IP67	IP67	IP67	IP66, IP67, IP69K
Electronics	NAMUR  (Ex i) Safety NAMUR  (Ex i), SIL3 DC 2-wire DC 3-wire	NAMUR  (Ex i), SIL2 DC 2-wire DC 3-wire AC/DC AS-Interface 	NAMUR  (Ex i), SIL2 DC 2-wire DC 3-wire AS-Interface 	NAMUR  (Ex i), SIL2* DC 2-wire  (Ex nA, Ex tc), low leakage current DC 3-wire  (Ex nA, Ex tc)
Solenoid outputs	none	1 output	1 or 2 outputs	1 or 2 outputs

* Pending

Sensor targets

You only need to know if the actuator has a mounting pattern of 30 mm x 80 mm or 30 mm x 130 mm. Stem height and diameter are covered automatically.

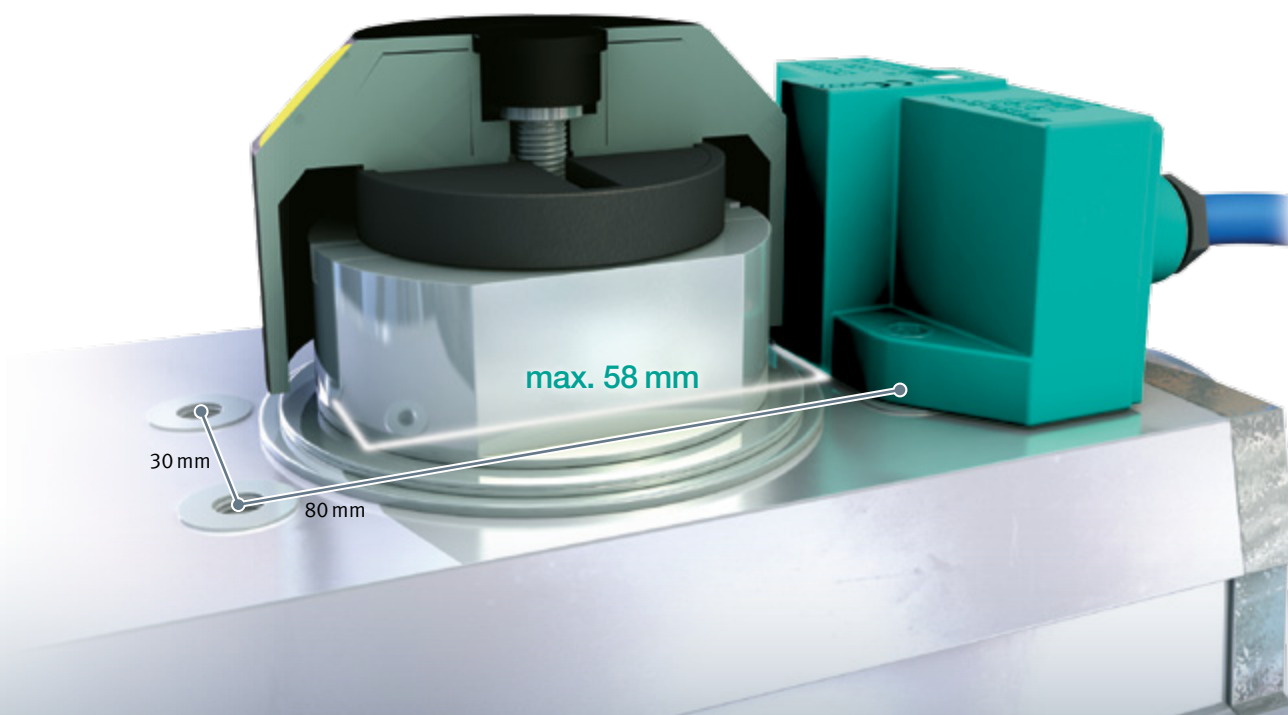
For detecting the open/closed position of quarter-turn valves, every sensor needs a sensor target, which is the activating element. The unique concept of dual inductive sensors developed by Pepperl+Fuchs provides matching sensor targets for the complete size range of modern actuators.



Choose from our available target elements for your dual sensor device. The newest target highlight is a beacon with highly visible signal colors and features an impact-resistant plastic housing.

Sensor target	BT32 Series	BT65 Series	BT115 Series	BT65-F31K2-RG-EN
Matching sensor F25 Series	■			
Matching sensor F31 and F31K Series		■	■	
Matching sensor F31K2 Series		■	■	■
Standard actuator top plate mounting of 30 mm x 80 mm	■	■		■
Standard actuator top plate mounting of 30 mm x 130 mm			■	■
4 actuating elements (fixed at 90° offset)		■	■	
90° clockwise and counterclockwise rotation	■	■	■	■
180° clockwise and counterclockwise rotation		■	■	■
Reverse working direction	■	■	■	
For shaft heights of 20 mm and 30 mm*	■	■		■
For shaft heights of 30 mm and 50 mm*	■		■	
Fully adjustable damping		■		■
Antistatic (conductive) construction		■	■	■
Noncontact design	■	■	■	■
Integrated beacon				■

*Spacers included in delivery package



Basic series for manually operated valves and medium-sized actuators

The F25 Series of inductive sensors is an effective solution for valve positioning. This series combines two sensing elements in one device inside one enclosure, reducing installation and maintenance costs considerably.

APPLICATION RANGE

- Manually operated valves
- Direct mounting on small and medium-sized actuators
- Switch box enclosure

TYPICAL MARKETS

- Water treatment and waste water
- Pulp and paper industry

HIGHLIGHTS

- Dual sensor with two active zones
- Adjustment-free mounting: maintains accurate sensing distance
- Cable or plug connection
- Intrinsic safety versions (Ex i) available

Mounting

Sensor directly mounts to manual or automated rotary valves using NAMUR 30 mm-spaced mounting holes

Transparent

Clear LED indication of switch status and supply voltage

Adjustment-free

Actuator target for position monitoring applications

Safe

Finger-safe design prevents object obstruction

Display

Visual position indicator

Universal

90° clockwise or counterclockwise rotation

Standard series for indoor and outdoor applications

The standard F31 and F31K Series are best suited for position feedback on automated quarter-turn valves that enable direct, stable, and durable mounting of the sensor to the actuator. The variable dual inductive sensors are suitable for all standard actuators and are easy to mount.

APPLICATION RANGE

- Direct mounting on all standard actuators
- Indoor and outdoor use
- Suitable for hazardous areas (gas)

TYPICAL MARKETS

- Chemical industry
- Food and beverage industry
- Mining and metallurgy
- Pharmaceutical industry

HIGHLIGHTS

- Small sensing face ensures no pinch point hazard between sensor and puck
- Fixed mounting holes in the sensor housing ensure that no adjustment is necessary when installing the sensor
- Choices include cable connection, plug and socket, and terminal compartment
- Clear LED indication of switch status, supply voltage, and solenoid activation
- Intrinsic safety versions (Ex i) with SIL2 approval available

Variable

Only two target sizes needed to fit all standard pneumatic actuators

Direct mounting

Directly mounts to existing NAMUR mounting holes 30 mm x 80 mm or 30 mm x 130 mm actuator top plate drilling

Fixed

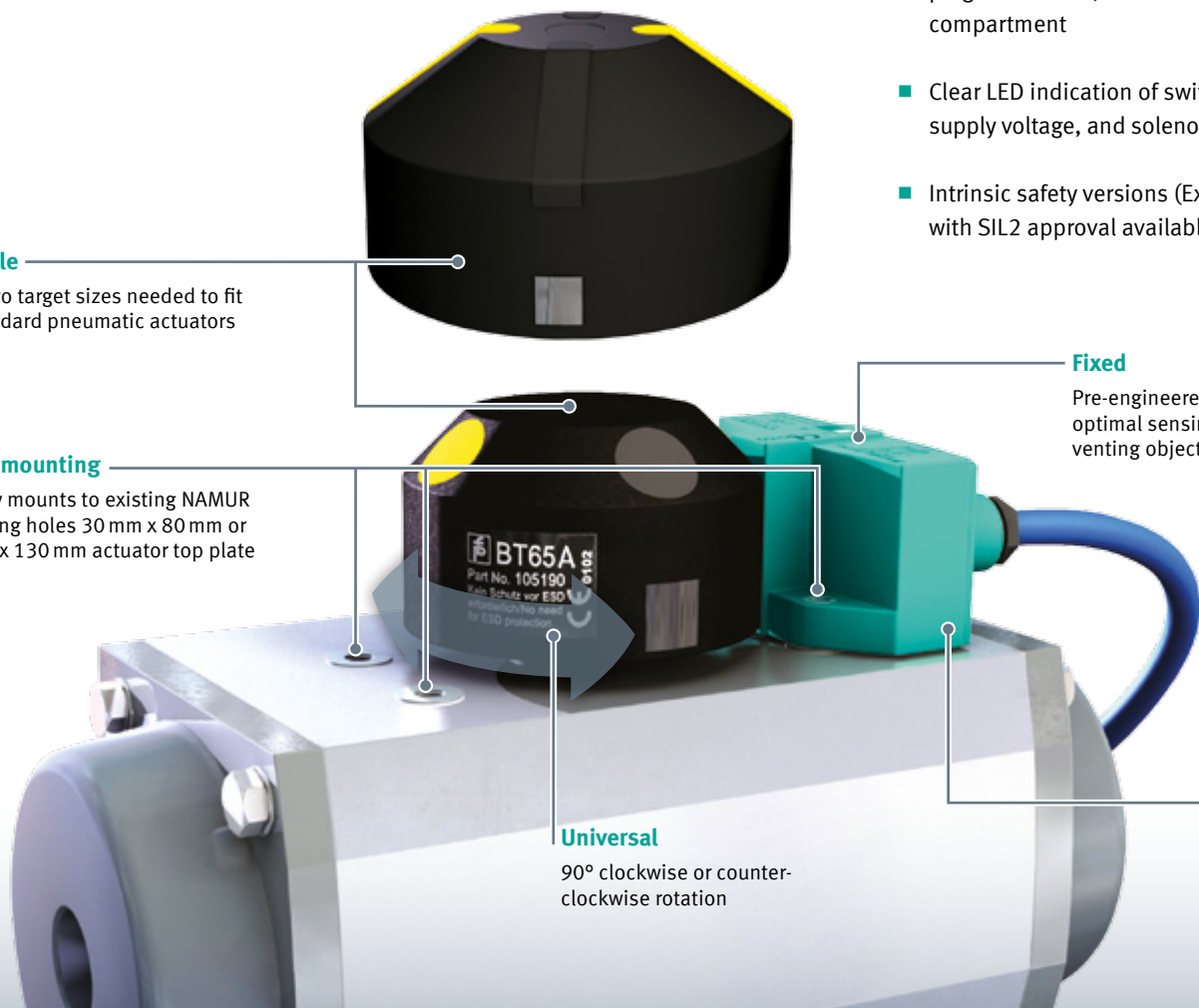
Pre-engineered spacing for optimal sensing and preventing object obstruction

Universal

90° clockwise or counter-clockwise rotation

Housing

Low-profile housing



Premium series for use in harsh environments

The F31K2 Series is designed for uncompromised use in outdoor areas. It combines flexibility with robustness and great performance under extreme conditions. The ingress protection of IP66, IP67, and IP69K cover a wide variety of applications. Typical areas of use include outdoor applications with Ex nA and Ex tc approval (nonincendive) for Zone 2 and 22.

APPLICATION RANGE

- For direct mounting on all standard actuators
- Uncompromised outdoor solution for use in harsh environments

TYPICAL MARKETS

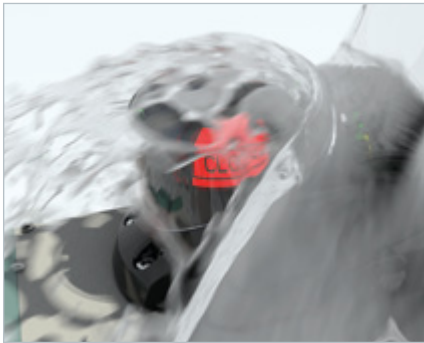
- Petrochemical industry
- Oil and gas industry
- Offshore and marine
- Mining and metallurgy

HIGHLIGHTS

- Unique double housing construction provides double mechanical protection and impermeability
- Construction materials ensure high UV, elevated temperature, and corrosion resistance
- DC 2-wire with very low leakage current (inductive dry contact) and Ex nA approval
- Extended sensing range
- Customized versions available



UNLIMITED OUTDOOR USE



Waterproof



Temperature resistant



UV resistant

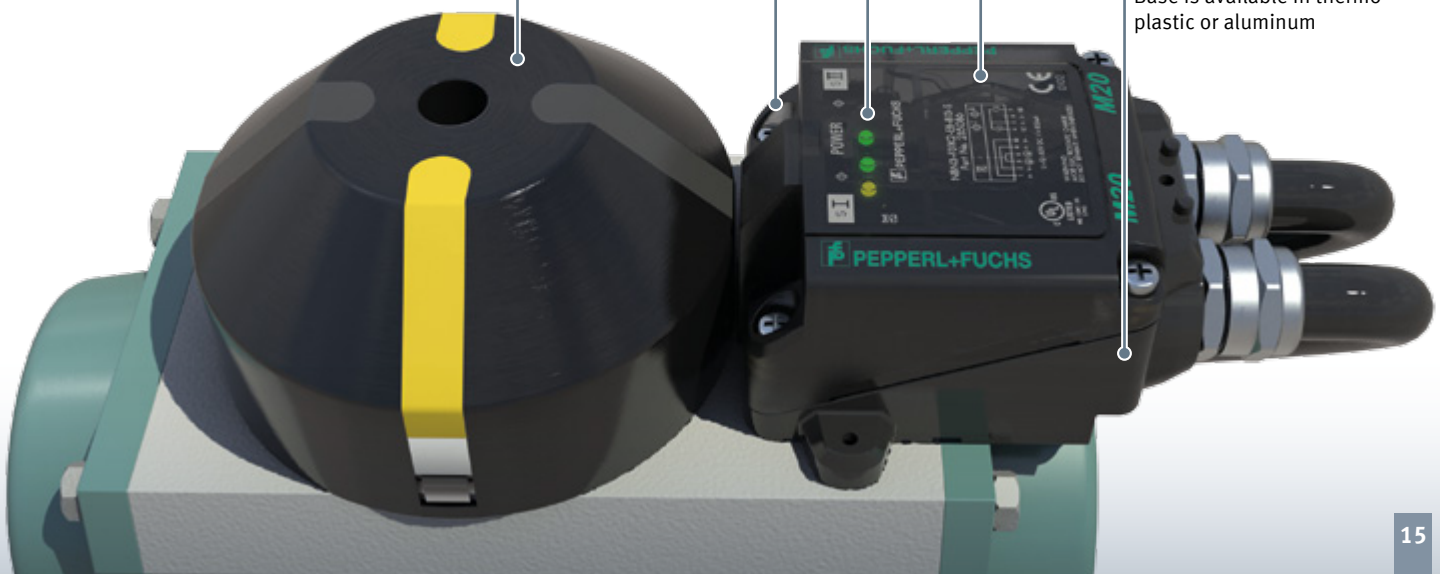
Option

Integrated beacon as valve position indicator: OPEN/CLOSED in signal colors with high visibility and impact-resistant plastic housing SH-F31K2



Variable

Different sensor targets available, from standard to impact-resistant housing with highly visible beacon



Mounting

Simple, direct mounting on all standard pneumatic actuators without any adjustment

Translucent

Clear LED indication of switch status, supply voltage, and solenoid valve activation

Inductive dry contact

Electrical 2-wire DC output compatible with all PLC or DCS systems

Ruggedized

Base is available in thermo-plastic or aluminum

Sensors with analog position feedback for quarter-turn applications

The inductive positioning system PMI F130 Series is a noncontact angular positioning system that converts a 0° to 360° measurement angle into a 4 mA to 20 mA analog current signal. In addition to the analog angular position feedback signal, the sensor also has two programmable signaling zones for independent end position monitoring.

The preconfigured PMI90-F130-I2E2 sensor is available for providing position feedback in the process field. All preconfigured settings, such as direction of rotation, swivel angle, signaling zone position and width, can be reprogrammed as required.

TYPICAL MARKETS

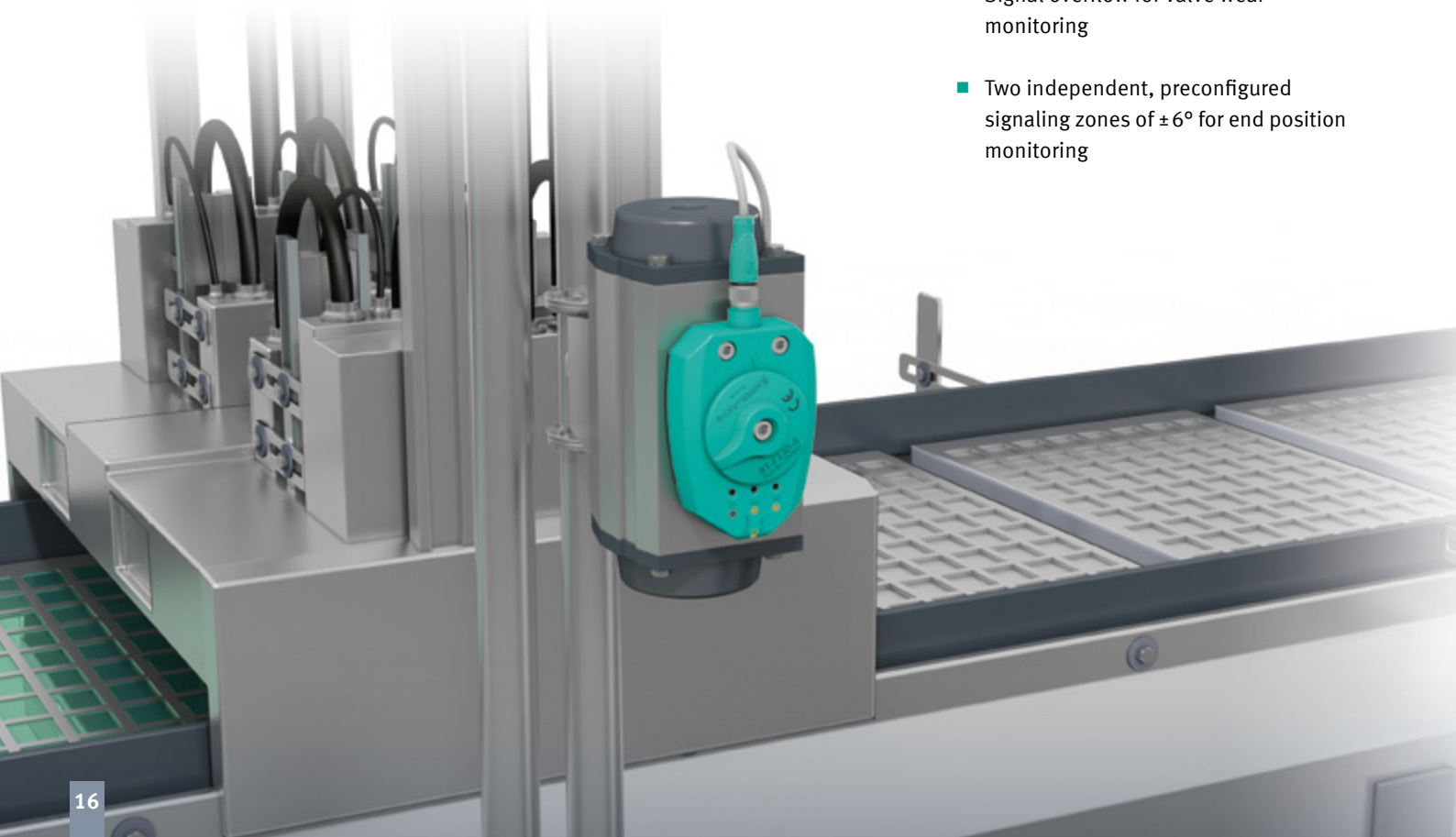
- Food and beverage industry
- Pharmaceutical industry
- Pulp and paper industry
- Water treatment and waste water industry

APPLICATION RANGE

- For direct mounting on standard pneumatic actuators

HIGHLIGHTS

- Preconfigured swivel angle from 0° to 90° corresponding to 4 mA to 20 mA
- Signal overflow for valve wear monitoring
- Two independent, preconfigured signaling zones of ±6° for end position monitoring



Switch box solutions

Pepperl+Fuchs provides a wide range of sensors applicable for mounting into a customer-supplied enclosure. The sensors are actuated by targets mounted to a rotating stem mechanically coupled to the pneumatic actuator.

Leading actuator manufacturers offer standard switch boxes equipped with Pepperl+Fuchs sensors. The sensor portfolio ranges from products with intrinsic safety (Ex i) and non-incendive versions (Ex nA, Ex tc), which are easily incorporated into the enclosure. The pneumatic actuator coupled to the switch box enables a target to activate the noncontact sensor.

A circuit board version features a terminal compartment for connecting both the sensor and the solenoid. For this purpose, coded, plug-in terminals are provided.

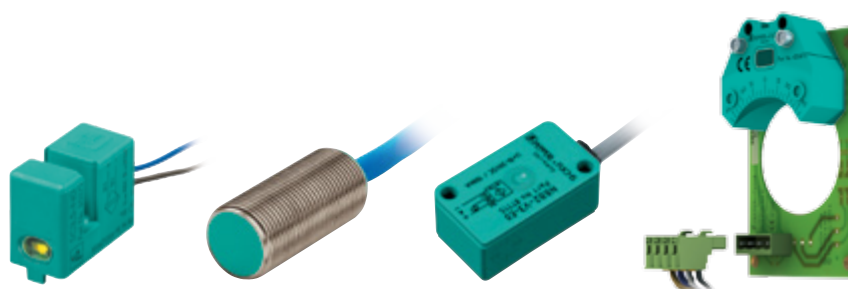


HIGHLIGHTS

- Box supports individual connection options
- System is integrated in a tamper-proof and contamination-proof box
- Mounting via preadjusted sensors
- The terminal assignment of process control and instrumentation devices conforms to DIN 45140 Part 1 and the mechanical mounting to VDI/VDE 3845
- Standard Namur version with SIL2 approval

TYPICAL MARKETS

- Chemical and petrochemical industry
- Oil and gas industry
- Offshore and marine



Sensor options	Slot	Cylindrical	Rectangular	Circuit board
NAMUR versions 	■	■	■	■
2-wire DC*	■	■	■	■
3-wire DC*	■	■	■	■
2-wire AC/DC	■	■	■	■
SIL3 Functional Safety**	■	■	■	■
SIL3 Functional Safety** inverse operating targets	■	■	■	■
AS-Interface 	■	■	■	■
LEDs	■	■	■	■

* Sensors also available with Ex-approvals for applications in Zone 2 and 22

** SIL3 only in conjunction with fail-safe switch amplifier KFD2-SH-EX1



Valve position sensing on linear valves

SENSORS FOR DIAPHRAGM VALVES

Hygienic linear valves are commonly used in pharmaceutical, biotechnological as well as food and beverage applications. Standard cylindrical or rectangular sensors are often built into the control head of the valve. Depending on the mechanical design of the control head, customized solutions are also available, e.g., with bus communication such as AS-Interface.

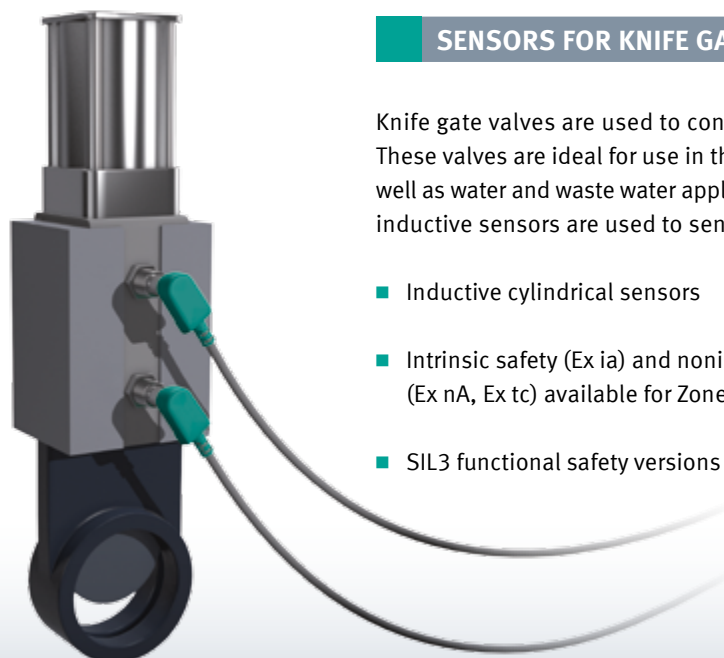
- Inductive cylindrical and rectangular sensors
- Intrinsic safety (Ex ia) and nonincendive versions (Ex nA, Ex tc) available for Zone 0, 1, 2, and 22



SENSORS FOR KNIFE GATE VALVES

Knife gate valves are used to control viscous fluids and solids. These valves are ideal for use in the pulp and paper industry as well as water and waste water applications. In general, cylindrical inductive sensors are used to sense the valve position.

- Inductive cylindrical sensors
- Intrinsic safety (Ex ia) and nonincendive versions (Ex nA, Ex tc) available for Zone 0, 1, 2, and 22
- SIL3 functional safety versions

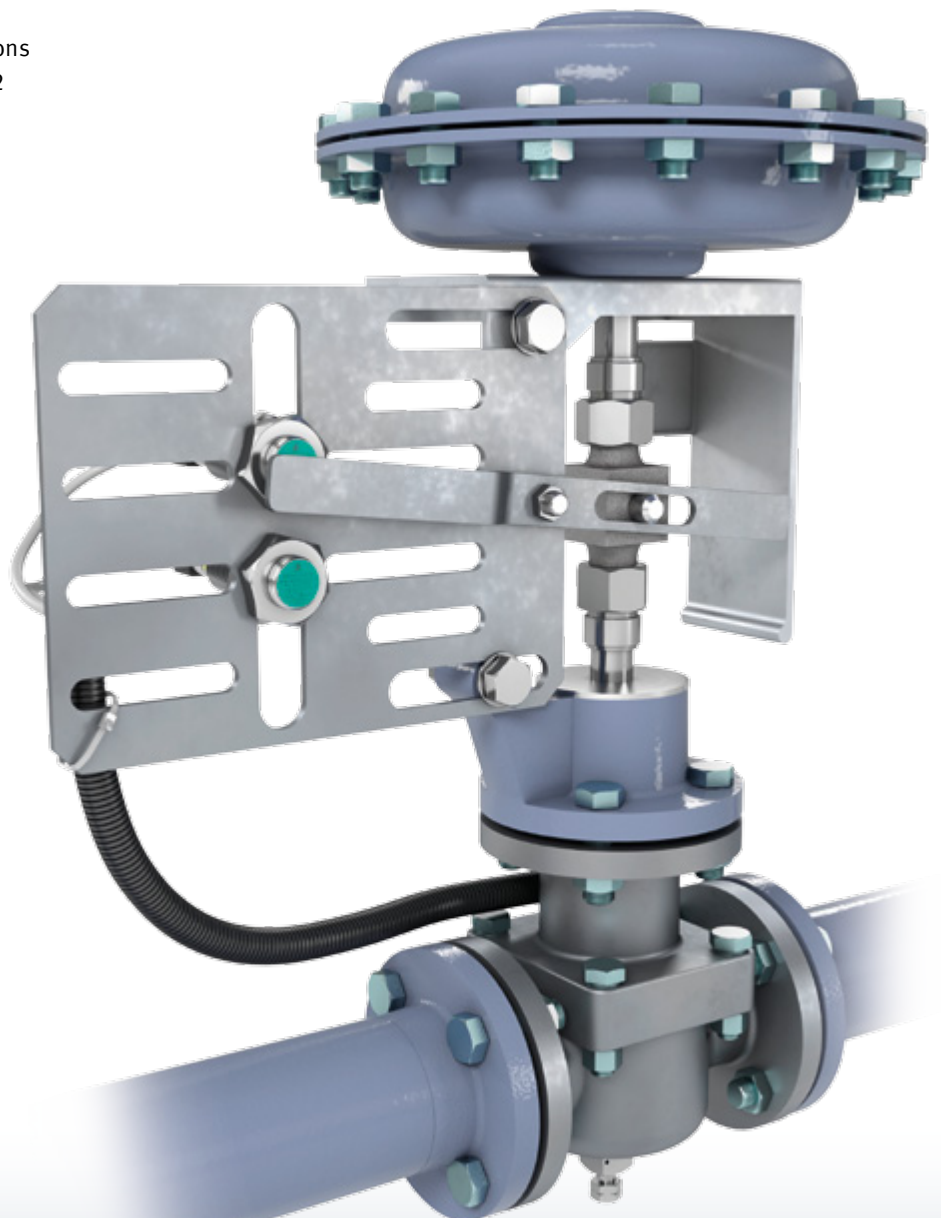


Valve position sensing on linear valves

SENSORS FOR LINEAR CONTROL VALVES

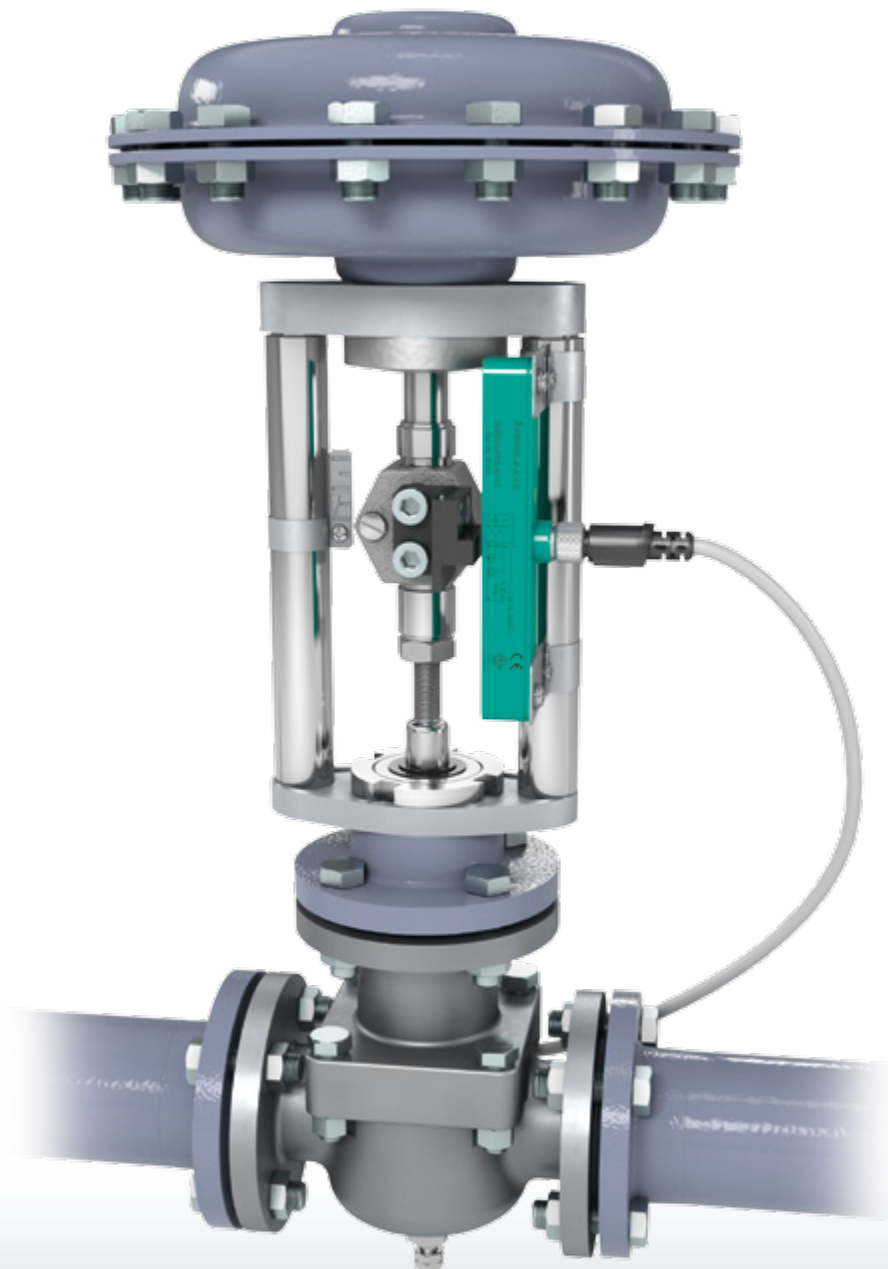
Control valves are used where fine control of fluids is required. They are used to control temperature, level, and flow in numerous process applications. Whether for on/off or modulating service, Pepperl+Fuchs has products suitable for manual, pneumatic, or electrically actuated valves. The open/closed position can be detected by two standard cylindrical sensors. The inductive positioning system PMI F90 or F110 Series with continuous analog output is another easy way to monitor the valve position.

- Inductive cylindrical sensors
- Intrinsic safety (Ex ia) and nonincendive versions (Ex nA, Ex tc) available for Zone 0, 1, 2, and 22
- SIL3 functional safety version
- Inductive positioning system PMI Series with analog position feedback



Sensors with analog position feedback for linear valves

The inductive noncontact positioning systems PMI F90 and F110 Series are easy to install on pneumatically operated diaphragm valves or linear control valves. These sensors provide a continuous analog output and therefore are an ideal solution for exact valve position detection in every position.



The F90 Series is designed for stem travel from 80 mm to 120 mm and the F110 sensors are designed for longer stem travel distances up to 960 mm.

HIGHLIGHTS

- Pepperl+Fuchs-supplied target or customized 8 mm steel target
- High resolution and accurate positioning
- Choice of adjustable output signals: 4 mA ... 20 mA or 0 VDC ... 10 VDC
- Suitable for outdoor use (IP67, temperature range: -25 °C ... +70 °C)

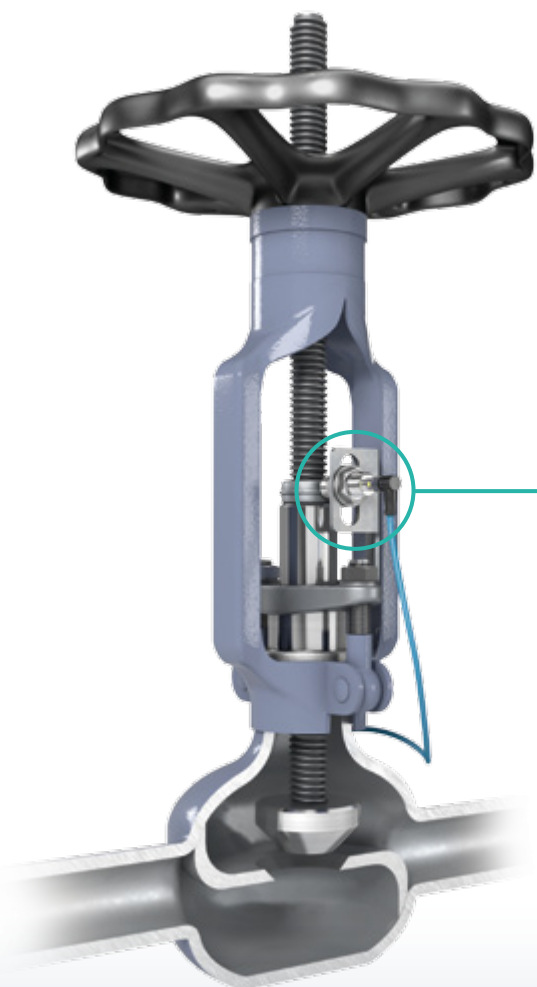
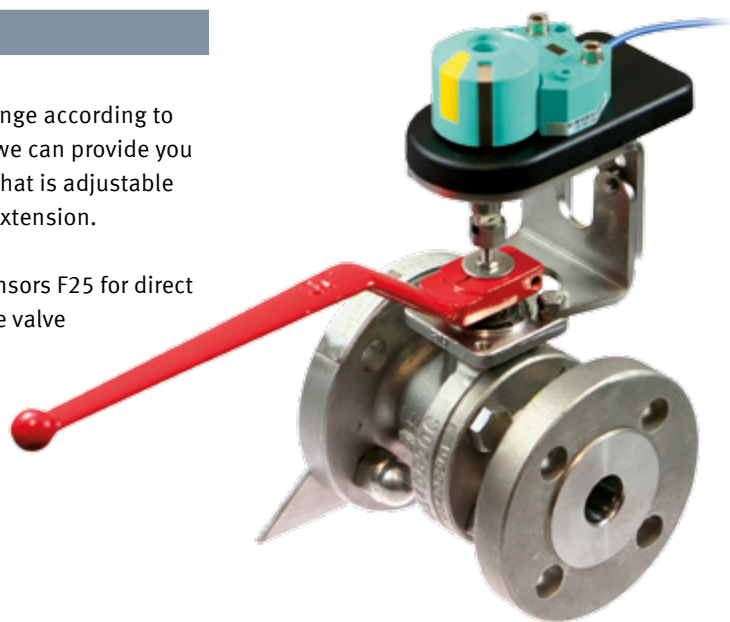
Valve position sensing on manual valves

SENSORS FOR BALL VALVES

Ball and butterfly valves are used in all industrial process applications. Because ball valves are long lasting, they are often used for shutoff or flow control applications. An ideal solution to detect the open/closed position of the ball valve is the dual inductive sensor F25 Series that directly mounts onto the valve. For simple mounting onto a ball

valve with an ISO flange according to ISO 5211-DIN3337, we can provide you with a mounting kit that is adjustable in height and shaft extension.

- Dual inductive sensors F25 for direct mounting onto the valve



SENSORS FOR MANUAL GLOBE VALVES

Globe valves are usually used for regulating the flow in a pipeline, and are operated by turning a handwheel. The detection of the open/closed position can be done by using a cylindrical inductive sensor with increased sensing distance.

- Inductive cylindrical sensors
- Intrinsic safety (Ex ia) and nonincendive versions (Ex nA, Ex tc) available
- Magnetic sensors with intrinsic safety (Ex i)
- Namur versions with SIL2 or SIL3 approval

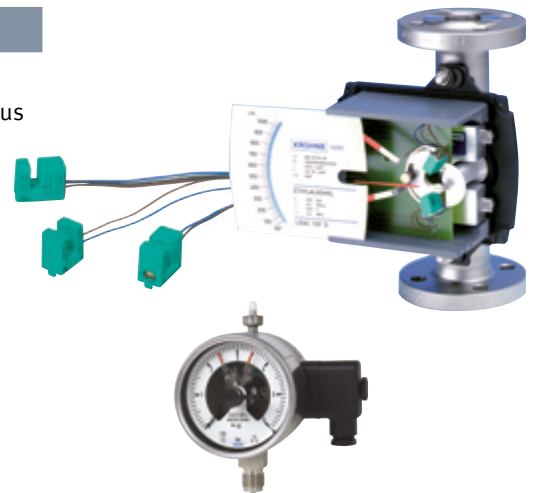
Applications for sensors in measurement devices

Pepperl+Fuchs provides reliable and accurate inductive sensors for applications involving positioners and measurement devices like flow meters and manometers for hazardous areas. For critical applications, we have a range of inductive sensors that are intrinsically safe (Ex i) and SIL3 approved in conjunction with our fail-safe switch amplifier.

SLOT SENSORS

The inductive slot sensors SJ and SC Series are used to detect the target presence between the sensor slot walls and are ideal for “vane monitoring” in flow meters.

- Compact dimensions enable various applications
- Meets functional safety criteria (SIL2/SIL3) based on IEC 61508
- The SC Series LED allows you to visually verify functionality



RING-STYLE SENSORS

The RC Series inductive ring-style sensors have been specially developed to detect materials passing through the ring. These ring-style sensors have inner diameters from 10 mm to 43 mm with a standard or bistable function and a sensitivity designed for common targets.

- 10 mm and 15 mm diameters for rotameter applications
- Reliable NAMUR electronics
- Bistable versions can be operated with standard NAMUR amplifiers and do not require a separate control unit



Sensor options	Slot	Ring-style
NAMUR versions 	■	■
2-wire DC*	■	
3-wire DC*	■	■
SIL3 Functional Safety**	■	
SIL3 Functional Safety** inverse operating targets	■	
Bistable		■
LEDs	■	

* Sensors also available with Ex-approvals for applications in Zone 2 and 22

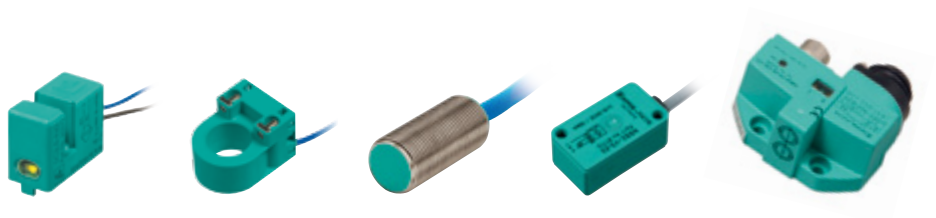
** SIL3 only in conjunction with fail-safe switch amplifier KFD2-SH-EX1

Sensors for automated processes in hazardous areas

Pepperl+Fuchs offers a wide range of sensors with high protection, extended temperature range, and high-pressure resistance for use in hazardous areas. Applications include valve position detection and the monitoring of limit values.

Inductive, capacitive, and magnetic sensors are available in a wide selection of detection ranges, dimensions, and rugged housing materials to meet various applications. Sensor solutions include intrinsically safe and nonincendive products.

- Cylindrical sensors with dimensions from 4.5 mm to 30 mm
- Slot sensors with 2 mm to 30 mm width
- Rectangular sensors with a detection range of 1.5 mm to 50 mm



Sensor options	Slot	Ring-style	Cylindrical	Rectangular	Direct mount dual sensors
Inductive technology	■	■	■	■	■
Capacitive technology			■	■	
Magnetic technology			■	■	
Ex i Zone 0 and 1	■	■	■	■	■
Ex nA 3G-3D			■	■	■
SIL2	■		■	■	■
SIL3	■		■	■	■
High temperatures to +250 °C				■	
High temperatures to +150 °C			■	■	
High temperatures to +100 °C	■		■	■	■
Low temperatures to -40 °C	■		■	■	■
Low temperatures to -50 °C	■		■		
High pressure 1,000 bar			■		
IP69K			■	■	■

Always the right connection

Pepperl+Fuchs offers sensors and devices with integral cable or quick-disconnects. The advantage of connectors is that the devices can be easily replaced, saving time and money. Wiring mistakes can be eliminated by using prewired assemblies. They tolerate oily, dirty, and wet industrial environments by offering the high protection class IP68/IP69K. We also provide customized solutions on request.

CONNECTORS FOR ZONE 0 AND 20 & ZONE 1 AND 21

For applications in Zone 0 and 20 and Zone 1 and 21, Pepperl+Fuchs offers cordsets suitable for devices with Ex i type of protection (ATEX categories 1G/1D and 2G/2D).

- Single-ended or double-ended sensor/actuator cordsets
- 2- or 4-wire PUR and PVC cables
- Blue cable jacket according to NAMUR requirements

CONNECTORS FOR ZONE 2 AND 22

For applications in Zone 2 and 22, we offer cordsets suitable for Pepperl+Fuchs devices with Ex ic or Ex nA/Ex tc type of protection (ATEX category 3G/3D).

- Single-ended or double-ended sensor/actuator cordsets
- Special 4-wire PUR cables
- Optimized for harsh ambient conditions
- Blue cable jacket according to NAMUR requirements (for Ex ic)

STANDARD CONNECTORS

For nonhazardous areas, there is a wide range of connectivity products available.

- Standard sensor/actuator cordsets
- Field connectors
- Junction boxes
- Valve connectors

Valve connectors are needed for our F31 and F31K dual sensor lines with solenoid output. To save time and money, you can connect the solenoid using a prewired solution.



Unmatched versatility in hazardous areas

The new 78E Series Ex encoder is especially designed for applications in hazardous areas. The 78E Series with its “flameproof enclosure” meets the ignition protection class (Ex d) and the international ATEX and IECEx requirements for gases according to Zones 1 and 2 and dust according to Zones 21 and 22.

The output from the absolute rotary encoder is a uniquely coded numerical value at each shaft position, even over several rotations. The output data is transmitted to the controller via these protocols: SSI interface, PROFIBUS, CANopen, or DeviceNet fieldbus.



APPLICATION RANGE

- Positioning and speed feedback in hazardous areas

TYPICAL MARKETS

- Offshore and marine
- Oil and gas industry
- Chemical and petrochemical industry
- Mining and metallurgy

HIGHLIGHTS

- Removable cover for flexible mounting and cabling in the field
- Separable cable, terminal compartment, and encoder for easy installation and maintenance
- Globally accepted approvals include ATEX and IECEx
- Diversity of variants for easy adaptation to the application
- Specially designed for extreme offshore applications
- Robust design for long service life

Mechanical features	78E Series
Housing diameter	78 mm
Temperature range	-40 °C ... +70 °C
Max. speed	3,000 rpm (@ IP66)

Electrical features	78E Series
Resolution singleturn	up to 16 bit
Resolution multiturn	up to 14 bit
Interfaces	SSI, PROFIBUS, CANopen, DeviceNet
Gas certificates	Ex II 2G Ex db IIC T5 Gb
Dust certificates	Ex II 2D Ex tb IIIC T100 °C Db IP6X
Mining certificates	Ex I M2 Ex db I/IIC T5



Rotary encoders in explosive areas

The Pepperl+Fuchs product range includes incremental and absolute rotary encoders for Zone 1 and 21 and Zone 2 and 22.

INCREMENTAL ROTARY ENCODERS FOR ZONE 1 AND 21

Incremental rotary encoders of Series 14 have been specially developed for use in areas with a high level of mechanical demand. The encoder is specially equipped with a feather key groove for receiving a belt pulley wheel.

This series is approved for Zone 1 and 21 and comes with pulse counts up to 5,000 and either RS422 or push-pull interface.



Incremental rotary encoder
Series 14

Features	Incremental rotary encoders Series 14
Gas certificates	Ex II 2G Ex db IIC T6 Gb
Dust certificates	Ex II 2D Ex tb IIIC T80°C Db IP66
EC-type-examination certificate	ZELM 02 ATEX 0078 X
Certificates	 KOSHA
Pulse count	≤ 5,000
Housing diameter	ø 116 mm
Flange type	Clamping flange
Solid shaft	ø 10 mm
Recessed hollow shaft	—
Maximum rpm	6,000 rpm
Output type	Push-pull, RS422
Protection class	IP66

ROTARY ENCODERS FOR ZONE 2 AND 22

In addition to ignition protection classes Ex d, Pepperl+Fuchs now supplies rotary encoders for use in Zone 2 and 22, based on ignition protection classes Ex nA and Ex tc.

Incremental rotary encoder

RV158X and RSI58X Series



Absolute rotary encoder

PVS/PVM58X Series or
PSS/PSM58X Series
with PROFIBUS interface



Features	Incremental rotary encoders RV158X Series	RSI58X Series	Absolute rotary encoders PSS58X, PSM58X, PVS58X, PVM58X Series
Gas certificates	Ex II 3G Ex nA IIB T4 Gc	Ex II 3G Ex nA IIB T4 Gc	Ex II 3G Ex nA IIB T4 Gc
Dust certificates	Ex II 3D Ex tc IIIC T105°C Dc IP64	Ex II 3D Ex tc IIIC T105°C Dc IP54	Ex II 3D Ex tc IIIC T120°C Dc IP64
EC-type-examination certificate	ZELM 96 ATEX 3297 X	ZELM 96 ATEX 3297 X	ZELM 06 ATEX 3290 X
Pulse count	≤ 5,000	≤ 5,000	–
Single-turn resolution	–	–	up to 16 bit
Multi-turn resolution	–	–	up to 14 bit
Housing diameter	ø 58 mm	ø 58 mm	ø 58 mm
Flange type	Clamping flange or servo flange	Hollow shaft flange	Clamping flange, servo flange, hollow shaft flange
Solid shaft	ø 10 mm or ø 6 mm	–	ø 10 mm or ø 6 mm
Recessed hollow shaft	–	ø 12 mm or ø 10 mm	ø 10 mm, ø 12 mm or ø 15 mm
Maximum rpm	6,000 rpm	6,000 rpm	6,000 rpm
Output type	Push-pull, RS422	Push-pull, RS422	–
Interfaces	–	–	PROFIBUS
Protection class	IP64	IP54	IP64

AS-Interface in the process industry

AS-Interface is a very flexible and reliable networking solution that is easy to install. On one AS-Interface flat cable, power as well as digital, analog, and safety signals can be transferred. This avoids parallel wiring and saves time and money.

The system can be used in hazardous areas and there are AS-Interface modules available for use in Zone 1 and Class I Div. 2 locations. A wide variety of gateways, field and cabinet mounted modules, pneumatic modules, power supplies, and custom-made solutions complete the product range.

APPLICATION RANGE

- Networking solution for monitoring valve positions on all connected actuators
- Field system for digital communication in process applications

TYPICAL MARKETS

- Chemical and petrochemical industry
- Pharmaceutical industry
- Food and beverage industry
- Water treatment and waste water

HIGHLIGHTS

- Modules applicable in Zone 1 with NAMUR sensor input and additional outputs
- About 1,000 I/Os can be handled by one double master/gateway device
- Open standard with connection to all well-known fieldbus systems
- Integrated safety function offers easy configuration setting
- Automatic addressing in case of replacement allows easy maintenance
- Bus terminator and repeaters for extended segments and network length





G5

The encapsulated G5 module with ignition protection Ex m/Ex ia can be used in hazardous areas up to Zone 1 (2D/2G).



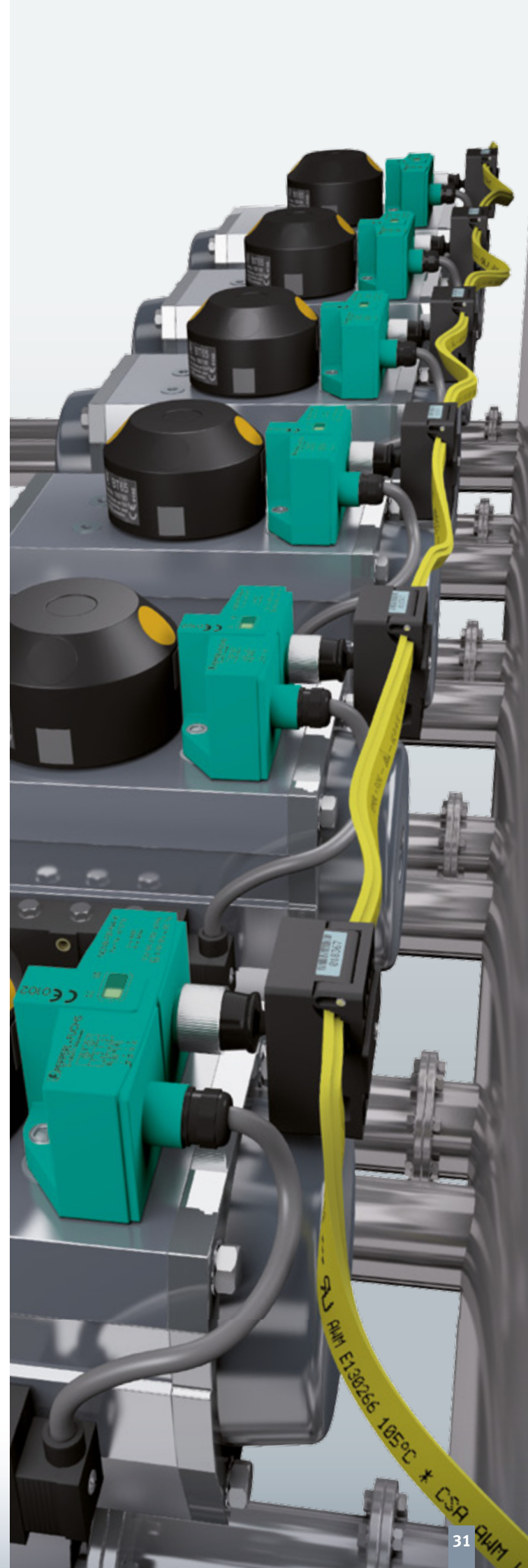
G10

Ultracompact G10 modules with direct connection offer a perfect solution for decentralized sensor signals.



G11

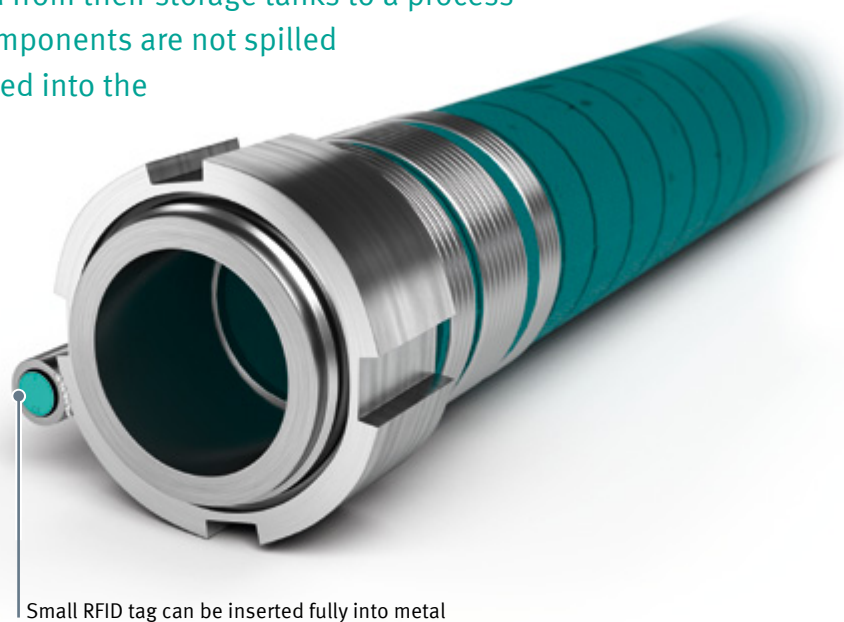
The G11 Series is designed for harsh environments and meets IP68/69K ingress ratings.



RFID solution for process applications in harsh environments

Components and liquids must be transported from their storage tanks to a process reactor. It is of vital importance that these components are not spilled and that the wrong liquids are never introduced into the reactor, as this could result in costly process interruptions. Hose couplings equipped with RFID technology protect such processes with 100 % reliability.

The RFID tag is attached to the hose and the reader to the coupling. A hose connection with an incorrect process medium for the current process can be securely identified. The transport valves for this invalid connection will not open and the error is clearly displayed, allowing the operators to immediately respond.



Small RFID tag can be inserted fully into metal

APPLICATION RANGE

- Automated identification of hose connections in hazardous and nonhazardous areas
- Monitoring and maintenance of equipment, e.g., installed valves
- Access control

TYPICAL MARKETS

- Chemical industry
- Pharmaceutical industry
- Food and beverage industry

HIGHLIGHTS

- RFID system suitable for Zone 1 and 21 (2G/2D) applications, Ex d versions available
- RFID tag and reader can be inserted fully into metal
- Extremely robust



Barcode reading in hazardous areas

The PowerScan is an industrial handheld barcode reader family designed for use in harsh environments and suitable for hazardous areas in Zone 1 and 21. Data transfer is either wired or wireless, depending on the model.

The identified barcodes can be made available to PCs, PLCs, and DCSs by means of a communication and power supply device, and a junction box for PScan-D. Both barcode handhelds, wired and wireless, are approved according ATEX Zone 1 and 21. PScan-D is approved for use in Class I, Div. 1 and Div. 2.

APPLICATION RANGE

- Data capturing
- Recipe handling
- Procedure/operator validation
- Traceability of raw material in batch

HIGHLIGHTS

- Intrinsically safe
- Fast and accurate reading of all common barcode formats
- Audible and visual LED signals permit flexible use and safe operation
- Reading range between 60 mm to 1,100 mm
- Rugged construction



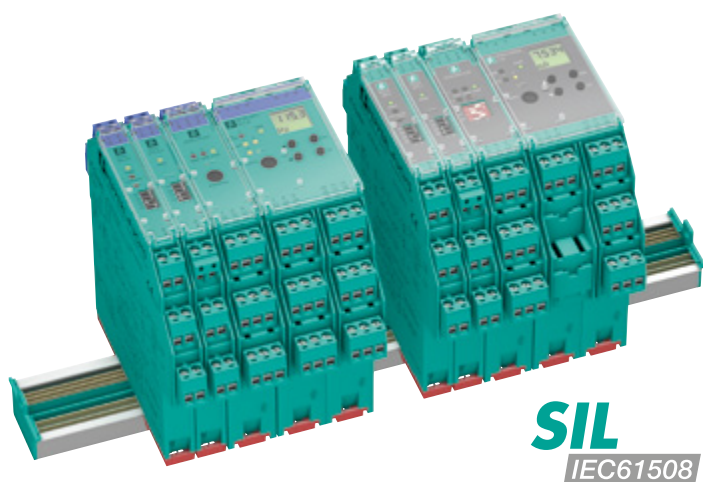
PowerScan	Pscan-D (wired)	Pscan-M (wireless)
ATEX-APPROVAL	Zone 1 and 21 (ATEX)	Zone 1 and 21 (ATEX)
Group	IIB	IIB
Temperature class	T4	T4
Ignition protection	Ib [op is]	Ib [op is]
DIVISION-APPROVAL	Class I, Div. 1	Class I, Div. 2
Group	A, B, C, D	C, D
Temperature class	T4	T4
Ignition protection	IS	NI

K-System Interface Technology

Pepperl+Fuchs is the leading supplier of isolated barriers for intrinsic safety applications and signal conditioners. With its convincing advantages from the planning stage through startup, the K-System guarantees a reliable and economic transfer of signals between field devices and the control system.

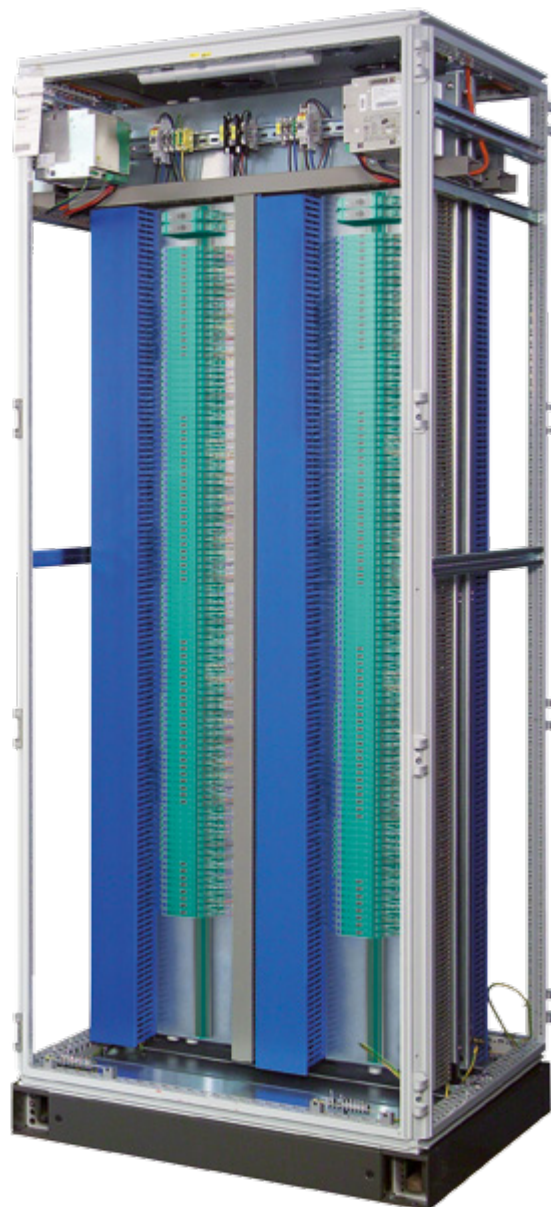
K-System modules are suitable for mounting to a 35 mm DIN-rail. The components are easy to specify, integrate, and expand. It has become synonymous with safety and reliability.

In addition to reducing safety risks, Pepperl+Fuchs has incorporated SIL levels into the standard K-System. SIL3 can be achieved by using Pepperl+Fuchs' SN and S1N sensors in combination with SH Series switch amplifiers.



HIGHLIGHTS

- Modular housing with removable screw terminals
- Saves time and costs: voltage supply and collective fault message via power rail
- Compact: standard housing widths from 12.5 mm up to 40 mm
- Vertical or horizontal mounting without spacing and derating
- Functional safety (SIL2/SIL3) according to IEC 61508
- Standard lead breakage and short-circuit monitoring



SN sensors with safety function are available for a temperature range from -50 °C to +100 °C.

K-SYSTEM WITH 2:1 TECHNOLOGY – UP TO 50% SAVINGS IN WIRING COSTS

Many applications have two intrinsically safe, binary signals at one measuring point. With Pepperl+Fuchs' 2:1 technology, two intrinsically safe signals can be transmitted over one line, saving you 50% of the wiring costs in the hazardous area.

This unique system is ideally suited for applications where two signals are transferred for each node.

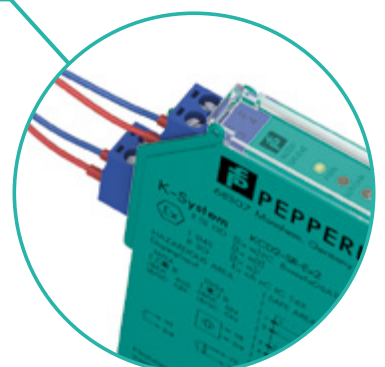
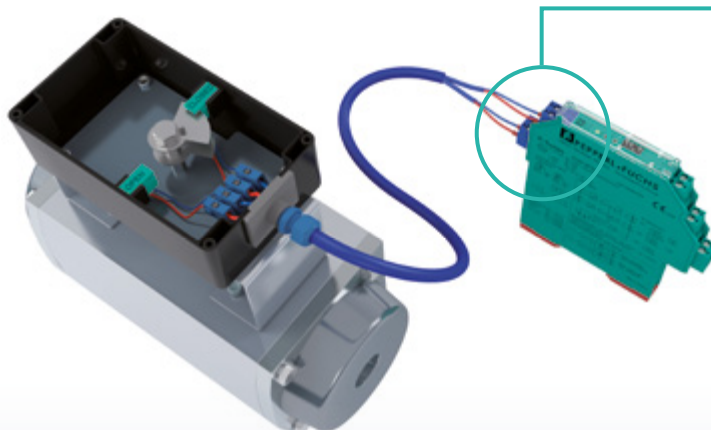
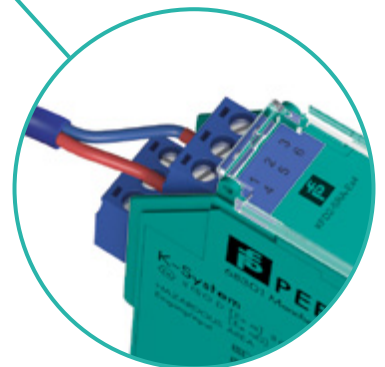
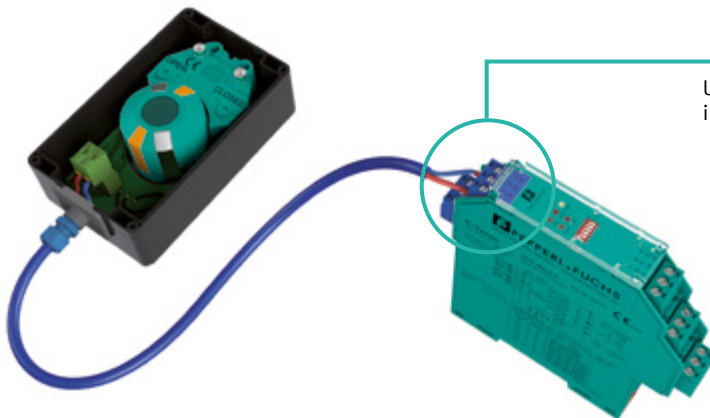


APPLICATION RANGE

- Minimum and maximum dial instruments (manometers)
- Magnetic immersion probes in level measurement
- Flow rate measurement via monostable ring sensors
- Position feedback of valves and rotary actuators, particularly in combination with the Pepperl+Fuchs F25, F31 and F31K Series

HIGHLIGHTS

- Up to 50% reduction in wiring costs for binary signals, e.g., from Namur sensors to EN 60947-5-6
- With our dual sensors for valve position detection, only one sensor and one loop are needed for both signals
- Sensors with integrated reverse polarity protection diodes can be operated directly with back-to-back connection
- Simple lead monitoring



YOUR APPLICATION. OUR CHALLENGE.

EXPLOSION PROTECTION

- Intrinsically Safe Barriers
- Signal Conditioners
- Fieldbus Infrastructure
- Remote I/O Systems
- HART Interface Solutions
- Wireless Solutions
- Level Measurement
- Purge and Pressurization Systems
- Industrial Monitors and HMI Solutions
- Electrical Explosion Protection Equipment
- Solutions for Explosion Protection

INDUSTRIAL SENSORS

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- AS-Interface
- Identification Systems
- Logic Control Units

