

ISOLATION. CONVERSION. PROTECTION.

SIGNAL CONDITIONERS



Automation is our world. A perfect application solution is

A willingness to take entrepreneurial risks, 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.

Then as now, our focus is squarely on the individual requirements of each customer. Whether as a pioneer in electrical explosion protection, or as a leading innovator of highly efficient sensors – the intensive communication with our customers is what allowed us to become the leader in automation technology. Our main objective is combining state-of-the-art technologies and comprehensive services to optimize our customers' processes and applications.

For more information, please visit our website: www.pepperl-fuchs.com



our goal.

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New Paths with Proven Technology

Our innovative explosion-protection technologies together with more than 60 years of experience in the field provide the foundation that allows Pepperl+Fuchs to continuously develop new solutions for customer applications. Our aim is to make processes as safe and efficient as possible. One solution is the use of signal conditioners for safe areas. The result: absolutely reliable signals for enhanced availability in process automation.

Established Technologies for Optimum Processes

Faulty signal transmission can lead to serious measuring and control errors. This can cause interruptions in controlled processes. Signal conditioners provide galvanic isolation that allows signals to be transmitted safely and without any problems. This in turn ensures security and plant availability.

Industries such as hydraulic and wastewater engineering, renewable energies such as wind and waterpower, as well as the food processing industry, have relied on the comprehensive industry knowledge and expertise of Pepperl+Fuchs in the field of plant safety for decades. Integrated functions ranging from level and flow measurement, frequency and rotation speed monitoring, and temperature measurement allow a wide range of uses. We have the right module for every requirement.

Reliable System Solutions with Functional Safety

Our portfolio includes more than 100 internationally approved signal conditioners with the SIL rating. The signal conditioners from Pepperl+Fuchs were developed in close collaboration with our customers to provide a high degree of flexibility and reliability. Their ease of use makes them the right practical and economical solution for the process industry – a reliable long-term investment that comes with comprehensive support for individual modules as well as system solutions for large plants.

www.pepperl-fuchs.com/signalconditioners



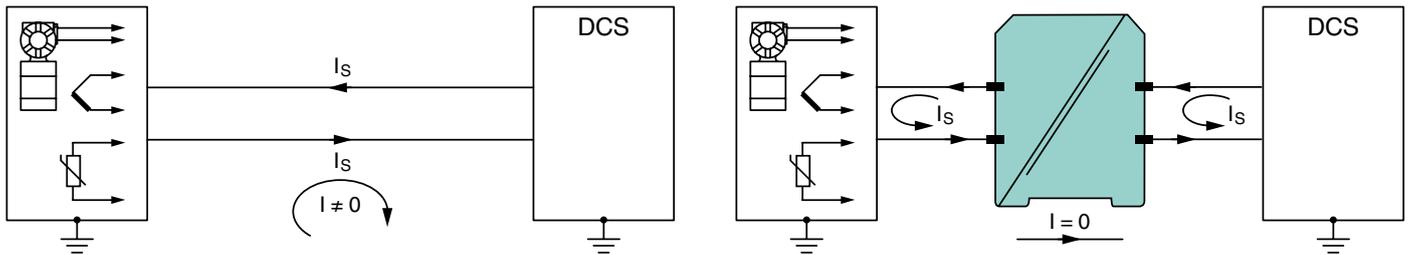
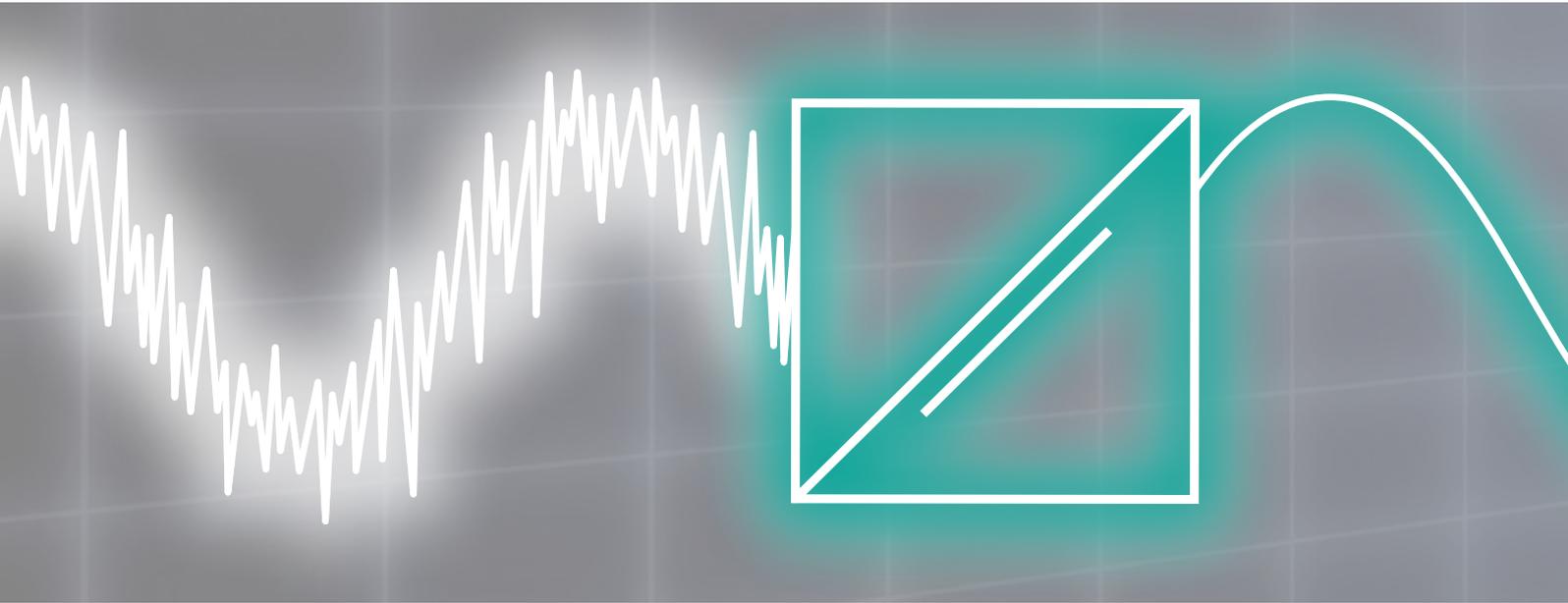
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Optimum Signal Quality for Maxi

With galvanic isolation, signal conditioners prevent interference in the signal transmission from the field device to the process control system, resulting in optimal processing.

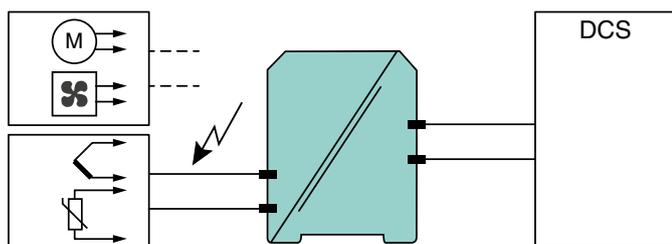
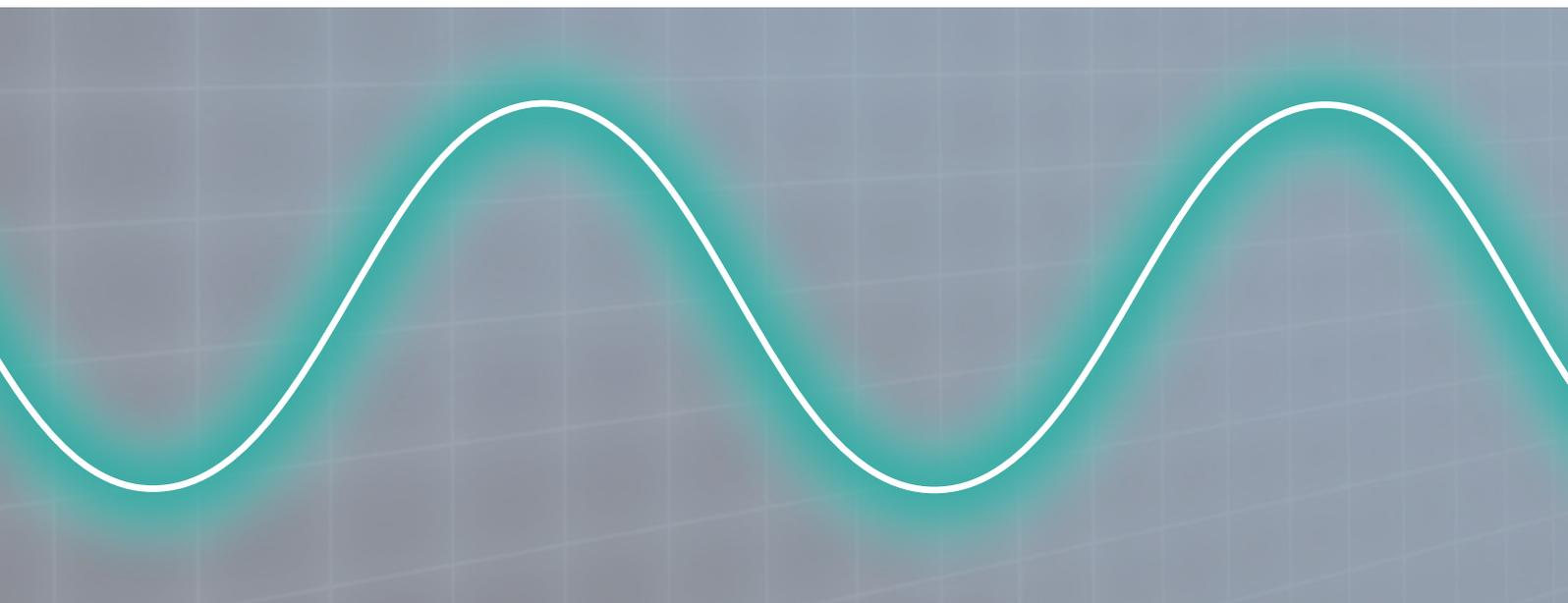


Interference-Free Communication with Galvanic Isolation

The key feature of signal conditioners is galvanic isolation. This prevents measuring and control errors caused by equalizing currents in ground loops. These currents can influence communication between the field and control level such that safe process monitoring and control is no longer guaranteed.

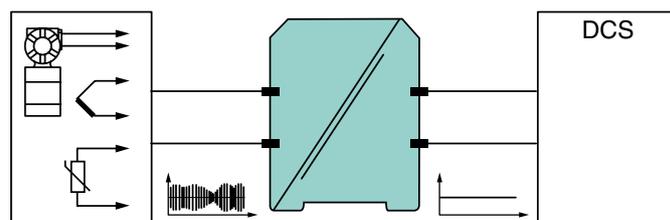
There can be many reasons for equalizing currents in ground loops: differing ground potentials can occur in the area surrounding many high-performance devices. The potential relationships can even change when the input cards of the control system are changed. In addition, galvanic isolation prevents ground loops caused by electromagnetic interference.

imum Availability



Surge Protection

Interfering signals can be fed in directly via the signal path, e.g. wiring or insulation problems occur in mains-operated devices such as pumps, motors, or fans. In this case, high voltages can enter the measuring circuit and lead to a surge. In the event of a fault, there is a risk of fatal injury for operating personnel if there is no protective device. Signal conditioners protect plants and people from this type of wiring-related risk.

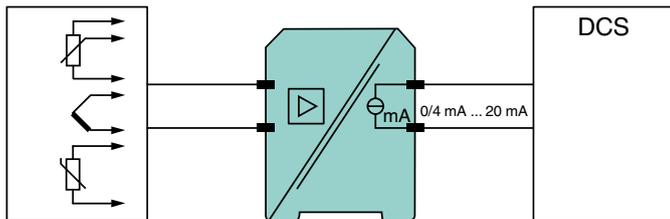
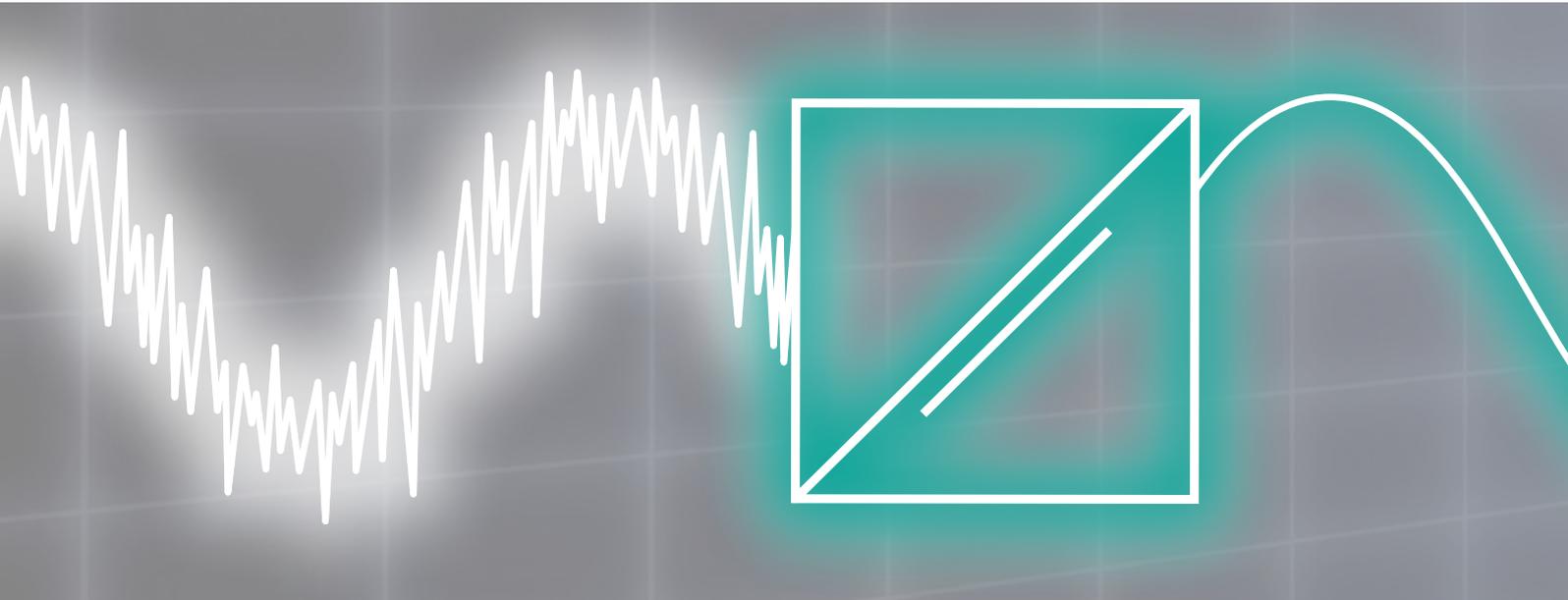


Eliminate Faults

Input filters are integrated to provide protection against common mode noise caused by electrical drives with frequency converters. They prevent faults from reaching the control system and distorting the measuring signals.

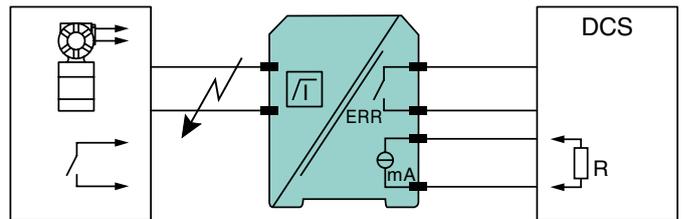
Efficient and Powerful: Signal Cond

In addition to maintaining signal quality, signal conditioners offer a whole range of additional functions. These include parallel, galvanically isolated outputs for signal splitting and short-circuit or surge protection for every single measuring channel.



Work the Easy Way with Standard Signals

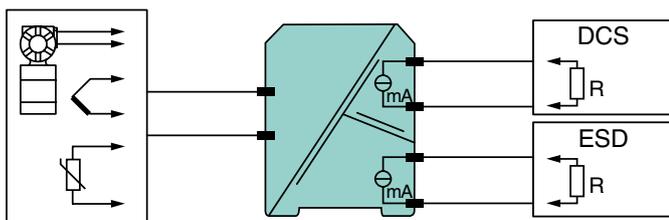
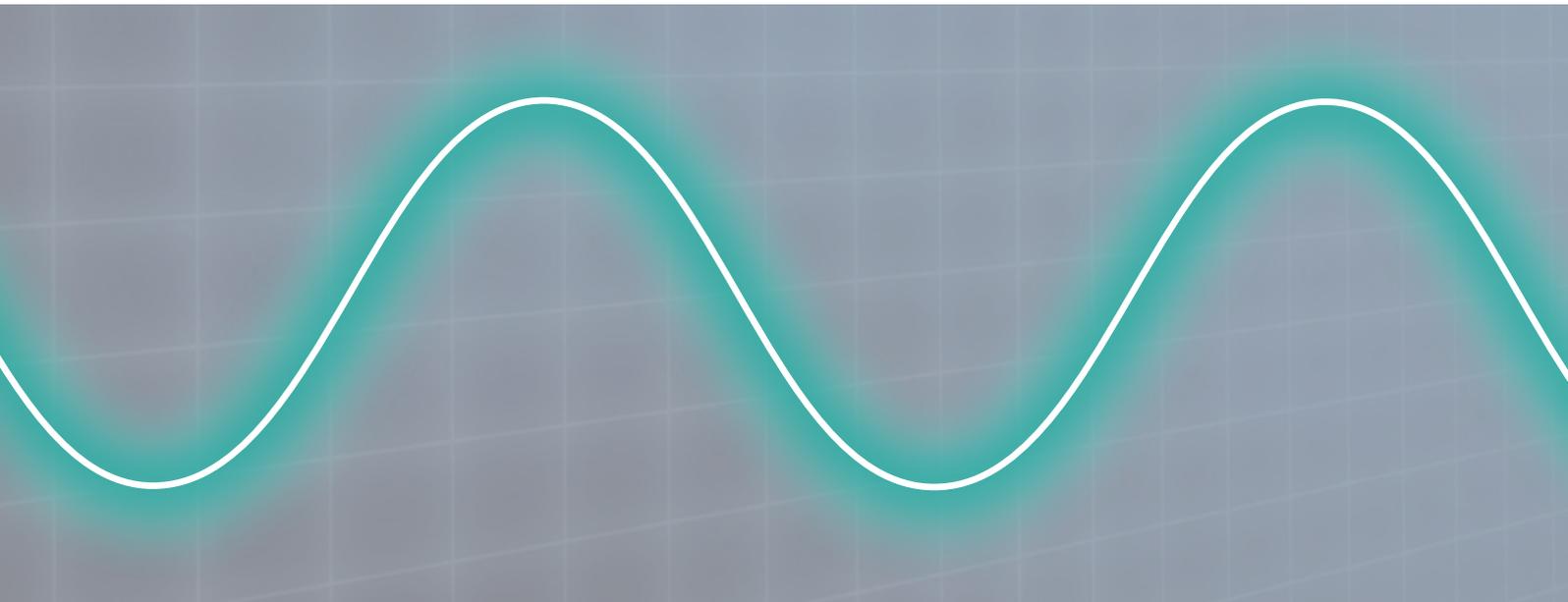
Expensive input cards are no longer required in the control system when standard signals are used. Therefore, an important additional function is converting sensor measuring signals into standard signals, frequently converted to 0/4 mA ... 20 mA, for further processing at the control level.



Maximum Signal Availability

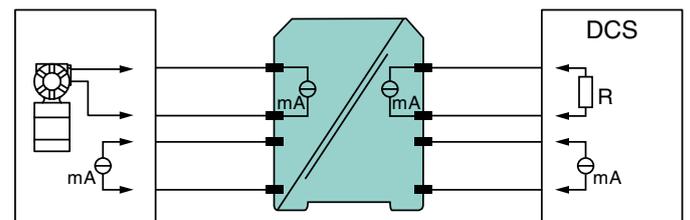
A high level of signal integrity in a field circuit is ensured only when the field circuit is protected against short circuits. Signal conditioners individually power the field device and offer short-circuit protection for each current circuit. If a line fault occurs, the signal conditioner switches the outputs on the control side to a safe state. Additional channels with connected measuring devices are therefore not influenced by the failure.

Conditioners with Special Functions



Signal Splitting – Multiple Use of Signals

Measured values are frequently sent to emergency shutdown and data-collection systems in addition to control systems. Versions with an integrated splitting function that supplies the measured signal to parallel, galvanically isolated outputs are available for this case. The splitting function ensures that information is reliably transmitted to other systems even when one signal circuit is experiencing problems. This technology circumvents the disadvantages of serial wiring in which downstream systems receive no or false information when an error occurs.



Interference-Free Combination of Sources and Sinks

Signal conditioners guarantee that a measuring channel works correctly even when the field device and control system try to absorb or supply a current at the same time. If an active current source of a four-wire transmitter is wired together with the active current output of a control system, both components supply current to the field circuit. In contrast, the use of a two-wire transmitter and a passive input card represents a system with two sinks. The signal conditioner ensures that current sources, current sinks, and voltage sources can be combined with no interference.

Undistorted signals ensure optim In every industry.

Detailed industry knowledge and years of experience in plant safety – Pepperl+Fuchs has developed an extensive range of signal conditioners based on these strengths. This product range has all standard international certifications and is suitable for use in safety applications. It has the right solution for every application.

Seamless Communication from the Field to the Control System – Regardless of the Application Area

Anywhere the transmission of measuring and control signals can be disrupted, signal conditioners ensure seamless communication between the field and control level. Interference can occur in large plants with long transmission paths. Wiring-related signal distortions can occur as a result of powerful,

grounded components such as pumps and motors, or wireless coupling, for example, through communication equipment.

These conditions occur in particular in these industries:

- Energy production
- Steel industry
- Cement industry
- Water/wastewater
- Paper industry
- Food industry



al processes.

Multifaceted Applications Require a Wide Range of Solutions

It is not uncommon to find similar processes and tasks in the industries listed here. Material transport and the storage of bulk goods, for instance, are typical for industrial production. Solid goods are generally transported to, and stored in, containers via conveyor belts, liquids via pumps and worm conveyors in piping. The material is mechanically treated, such as being ground, and converted by chemical reaction.

During energy production, kinetic energy is converted into electrical energy via rotors or turbines, rotating drive shafts, and generators. The energy is provided either directly via wind or water current, or is generated via combustion and steam circuits.

Typical Process-Related Plant Parts and Components

- Conveyor belts
- Containers
- Piping
- Electrical drives
- Worm conveyors
- Generators
- Pumps
- Turbines

To ensure a seamless process, numerous measurements such as rotational speed, frequency, slip, pressure, temperature, and filling levels must be monitored and transmitted with no interference.



Precise Transfer of Digital Field

In control technology, a number of digital field signals are required for measuring and control tasks. Signals from hub and swivel movements must be evaluated and monitored in the same way as quantities, rotational speeds, and flows. The signal conditioner product range has the right module to suit all of these applications.



Safe Position Monitoring from the Field

The units providing pulses are digital sensors that are mounted on rotating shafts or machines with linear movements. Switch amplifiers with different output functions are used for safe line-monitored evaluation of the digital signals.



Precise Frequency Monitoring

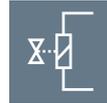
Periodic input pulses are recorded by frequency-evaluation units. Signal conditioners as standstill monitors and rotation speed monitors as well as current converters are available for this purpose. In addition to pure rotation speed monitoring, they record the direction of rotation, slip, and synchronization.

Signals



Overflow Protection

Conductive measurement processes are particularly suited to recording fill-level limits. The operator can use them to implement a min./max. control system as well as to quickly and easily monitor limit levels, such as overflow and dry operation. Wherever conductive liquid media are recorded or controlled, conductive measuring processes offer a cost-effective alternative to continuous measurement processes.



Efficient Signal Switching

Pepperl+Fuchs offers signal conditioners that work as safety relays for the reliable galvanic isolation of high loads – an intelligent solution that prevents random switching events and functions without positively driven contacts during plant checks.

Safety with Intelligent Checks

Additional control inputs are available for an emergency shut-down of the outputs for safety applications. The option of a check interval using test inputs on the device provides further safety in plant operation. This uncovers undetected faults during checks of the plant.



Greater Precision of Continuous

Analog sensor signals from temperature sensors, potentiometers, load cells, and resistance bridges are used in numerous measurement and control tasks. To enable efficient further processing, it is useful to convert these signals into a standard signal, such as 4 mA ... 20 mA.



HART

Easy-to-Measure Standard Signals

Signal converters convert analog-sensor-measured values from the field into standard signals and supply the sensor with the energy required. In addition, the converters report sensor and line faults caused by a harsh process environment in the measurement of filling levels, flows, and process pressures. Conversion to a 4 mA ... 20 mA standard signal reduces the number of different input cards required in the control system. It means that measurement and control technicians have access to easy-to-measure signals that are valid for all manufacturers. The simplest of tools can be used for commissioning and service. The analog 4 mA ... 20 mA standard signal enables digital HART signals to be transmitted for parameterization of the field devices.

High Availability with Signal Splitting

Transmitter power supplies with a splitting function lend themselves to areas in which measured values are available to both the control system and other systems, such as displays and safety control systems. They split the field signal across two parallel, galvanically isolated outputs, ensuring reliable forwarding to other systems even if a channel is interrupted. Some models of Pepperl+Fuchs devices are transparent for the HART signal.

Measurements



Precise Temperature Measurement for Efficient Production

Temperature sensors are required in the majority of industrial processes. The application area ranges from the chemical industry, numerous applications in mechanical engineering, and energy production. Fast and precise temperature measurement impacts the service life of machines and plants as well as parameters such as process and production speeds, material consumption, and yield. Temperature converters convert sensor-measured values into standard signals or switch commands, and offer a high level of safety for measurement and control circuits.



Prepared for Further Processing

Universal temperature converters convert signals from different temperature sensors into a standard signal. This conversion efficiently prepares measured values from thermocouples and resistance thermometers for further use. In addition, the values provide complete transparency in the signal circuit – from redundant, galvanically isolated inputs and line fault detection, to detecting faults in thermocouples.

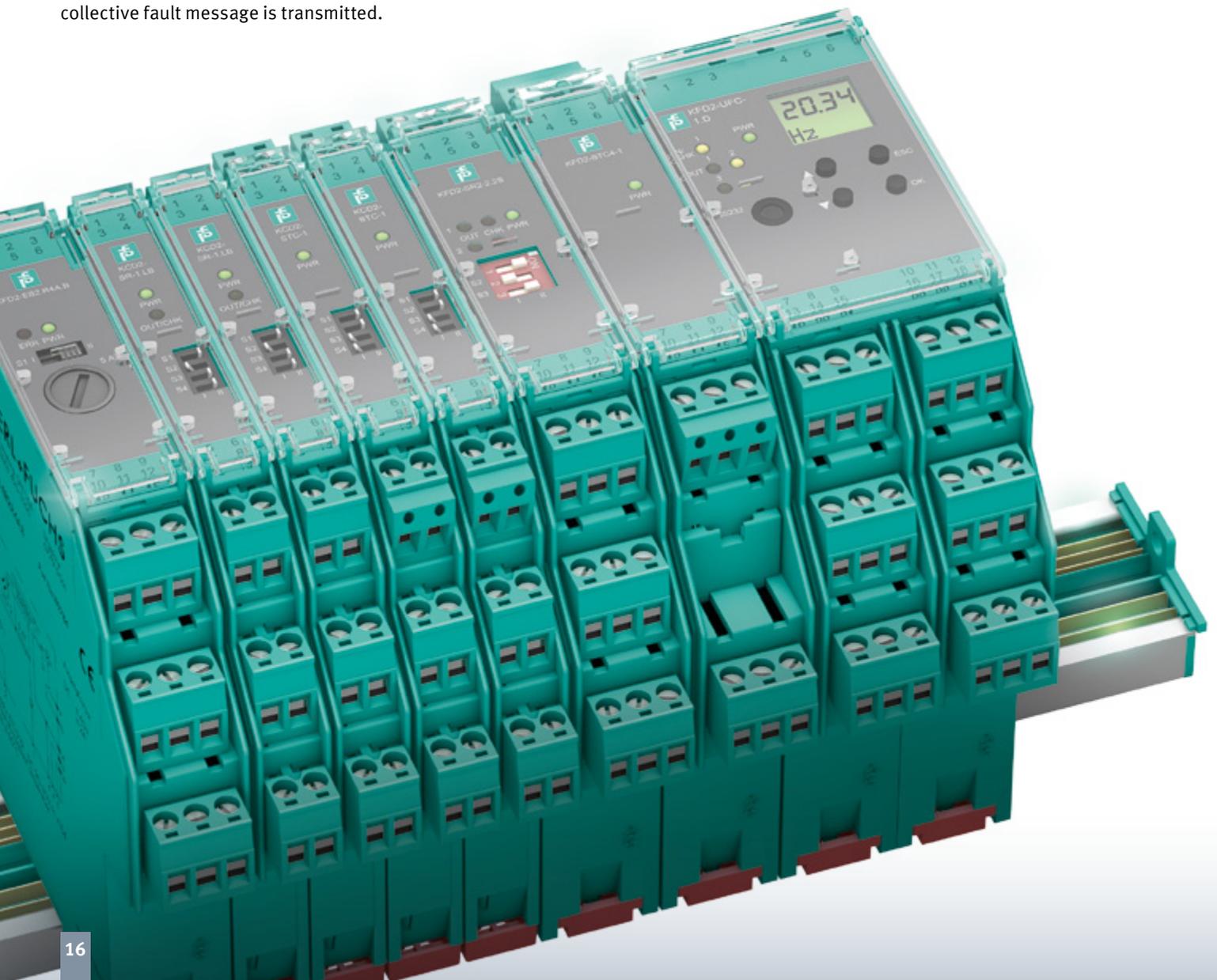


The K-System: Flexible Interface for Your Applications

The K-System connects and provides continuous isolation for your control and field signals.

Power Rail for Mounting Rail Assembly

The modules of the K-System are mounted on a 35 mm DIN mounting rail with the option of Power Rail. No tools are required to mount the modules. Using the Power Rail means that the interface modules receive a safe power supply and a collective fault message is transmitted.



Technology

Efficient Supply with Power Rail

- Reduces wiring and assembly costs
- Ensures protection of the group with infeed modules or protected power supplies
- Enables redundant power supply

Compact Modules for Range of Applications

- Features 12.5 mm housing width for optimum signal integrity of single-channel modules
- Has maximum channel density of only 5 mm per channel in the 20 mm housings
- Features a wide range of modules, from simple switch amplifiers to highly functional modules for temperature, frequency, and strain gage bridges

Simple and Safe Planning

- Devices with SIL2 and SIL3
- International approvals and SIL manuals available
- Simple documentation with 2D, 3D drawings, and EPLAN macros

Cost-Effective Assembly

- Horizontal and vertical assembly possible with no reduction in operating values
- Modules can be swapped and extended during operation (hot swap)
- Reduced assembly costs with simple snap-on function

Simple Configuration

- Setup possible with front DIP switches or software
- Configuration and documentation via PC
- Measured-value display available

High Availability

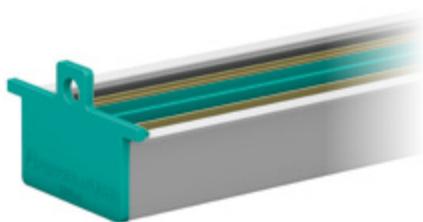
- Detection of field circuit line faults
- Long module service life with low power consumption
- Minimal heat dissipation reduces the need for cooling in the switch cabinet

Simple Maintenance

- Internal diagnostics
- Fault, current, and input signal status with LEDs for every device
- HART signal transparency for simple access to field devices
- Removable terminal blocks with test sockets

Powering and Mounting Options for the K-System

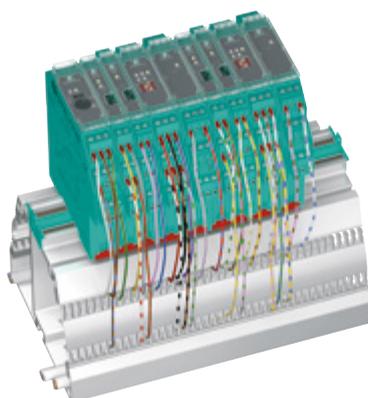
There is a series of matching accessories available, specially tailored to the K-System.



Power Rail: Reduced Wiring

The Power Rail forms the basis of the K-System and reduces wiring. The entire system consists of one mounting rail with an insert for a 35 mm standard

rail according to DIN EN 60715. Three gold-plated conductors are integrated – two for the power supply and one for transmission of the fault signals.



Profile Rail: Space-Saving with Cable Management

Interface modules are mounted on the Power Rail in a space-saving manner and are wired using integrated cable ducts. The wiring for the field and control signals is under the installed

modules, separated by an integrated element. Additional conduits are not necessary. The Power Rail provides the power supply and the collective error message.



Power Infeed Module: Convenient Power Supply

The Power Rail can be supplied with 24 V DC and a maximum current of 4 A by means of an infeed module. This eliminates the need for individual module wiring, while a second module enables a redundant supply. Additional safety is offered through a collective fault message that notifies the controls when there is a line or device fault.

- 4 A supply current, available redundantly via the Power Rail
- Exchangeable fuse at the front
- Fault signal output, reversible direction of operation



Regulated Power Supplies: DIN Rail Mounting

The interface modules of the K-System can be supplied directly by regulated power supplies. The power supplies are simply snapped on to the 35 mm DIN mounting rail with the integrated Power Rail.

- Exchangeable fuse at the front
- Secured output

Automation Solutions from a Single Source

Automation technology for a range of industries and all types of applications forms the core expertise of Pepperl+Fuchs. Established around the world and in a variety of markets, we offer comprehensive solutions with complementary products – from recording measured values via sensors, conversion with signal conditioners, isolated barriers for transmission, and process automation control systems.



Noncontact and Wear-Free: Inductive Proximity Switches

The digital sensor product group includes inductive proximity switches. They can be used as pulse generators for metering; they record rotational speeds and provide measured values for positions and end positions. Inductive proximity switches are noncontact and wear-free; they deliver precise measurements for high switching frequencies, and are resistant to vibrations, dust, and moisture.

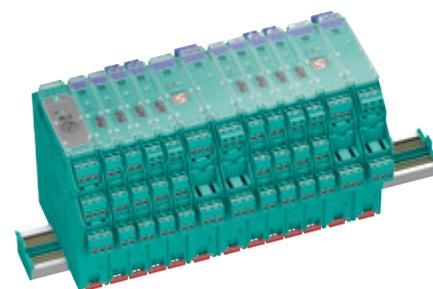
- Pressure-resistant design up to 500 bar
- Active stainless-steel face
- Reduction factor 1



Precise Measurements in Every Medium: Fill-Level Technology

Level-measurement devices allow the fill level for a variety of media to be measured precisely and reliably even under the most difficult conditions. The measuring methods vary from situation to situation depending on whether large-grain bulk goods, aggressive media, gases, or oils are being measured.

- Limit value detection using vibration trip amplifiers or floating switches
- Continuous level measurement using pressure transmitters and sensors based on ultrasound and guided microwave



Isolated Barriers for Intrinsically Safe Applications

Isolated barriers are designed for intrinsically safe applications in process technology. In addition to the typical functions of a signal conditioner, they offer a further barrier function. They limit current, voltage, and power in the field circuit to prevent hazardous sparks from being generated, and ensure safe communication with field devices even in hazardous areas.

Like signal conditioners, the comprehensive line of isolated barriers from Pepperl+Fuchs are part of the K-System for mounting on standard 35 mm DIN mounting rails.

Product Selection Guide for Signal

Features	Digital Input						
	Switch Amplifier				Conductivity Switch Amplifier	Frequency Converter	
Title							
Channel	1 channel	2 channels	2 channels	1 channel	1 channel	2 channels	1 channel
Input	NAMUR/ Dry contact	NAMUR/ Dry contact	NAMUR/ Dry contact	NAMUR/ Dry contact, 2-wire sensor, 3-wire sensor	Conductive sensor	NAMUR/ Dry contact	NAMUR/ Dry contact, 2-wire sensor 3-wire sensor
Output	Relay	Relay	Relay	Relay	Relay	Relay	Relay
Supply	24VDC	24VDC	24VDC	Universal	24VDC	24VDC	Universal
SIL	2	2	2	2	3	2	2
Additional Features	Line fault detection, 2nd relay for fault or signal	Line fault detection	Line fault detection, 2 outputs per channel	Min./max. function	Line fault detection	Direction monitor, Standstill monitor, start-up override	2nd relay for fault or signal, speed monitor, start-up override, display, 0.001 MHz to 12 kHz
Housing Width	12.5 mm	12.5 mm	20 mm	20 mm	20 mm	20 mm	40 mm

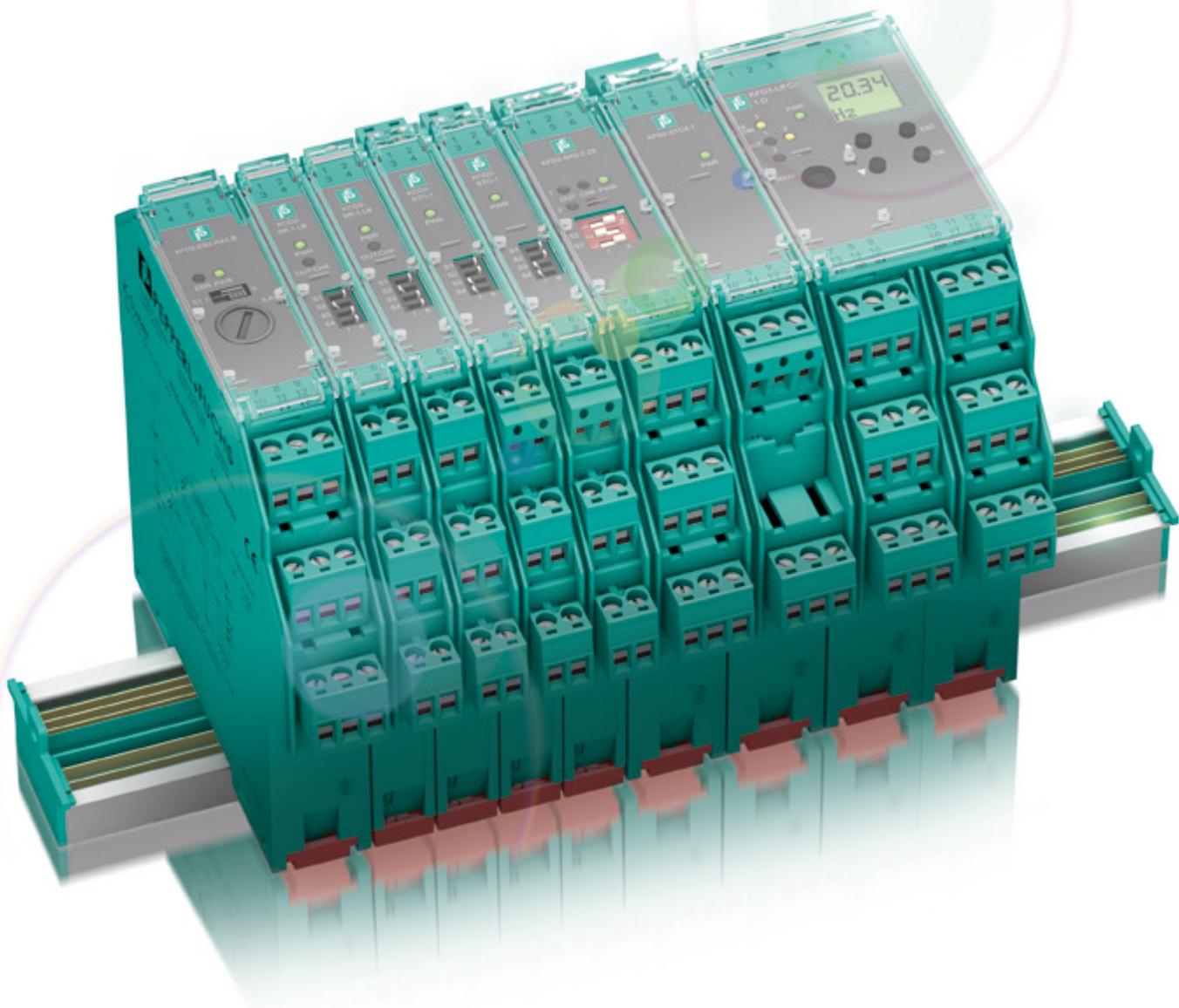
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Conditioners

	Digital Output	
	Solenoid Driver	Relay Module
		
KFU8-UFC-1.D	KFD2-SL-4	KFD0-RSH-1.4S.PS2
1 channel	4 channels	1 channel
NAMUR/ Dry contact, 2-wire sensor 3-wire sensor	Logic input	Logic input
Relay, transistor, 0/4 to 20 mA	High power output	Relay
Universal	24VDC	Loop powered
2	2	3
Speed monitor, start-up override, frequency converter, pulse divider, programming jack, display, 0.001 MHz to 12 kHz	Output 600 mA per channel, sustained short-circuit-proof and overload-proof	Energized to safe (ETS), de-energized to safe (DTS)
40 mm	20 mm	20 mm

Features	Analog Input		
	Transmitter Power Supply		
			
Title	KCD2-STC-1	KFD2-CR4-1.20	KFD2-STC4-1.20
Channel	1 channel	1 channel	1 channel
Input	2-wire sensor, active sources	2-wire sensor, 3-wire sensor, active sources	2-wire sensor, 3-wire sensor, active sources
Output	0/4 to 20 mA (active and passive)	0/4 to 20 mA	0/4 to 20 mA
Supply	24 VDC	24 VDC	24 VDC
SIL	2	2, 3	2, 3
Additional Features	HART	Signal splitting (1 input – 2 outputs)	HART, signal splitting (1 input – 2 outputs)
Housing Width	12.5 mm	20 mm	20 mm

					Temperature Input	
		Current Repeater	Converter / Trip Amplifier		Converter / Trip Amplifier	
						
KFU8-VCR-1	KFU8-CRG2-1.D	KFD0-CS-1.50	KFU8-USC-1.D	KFD2-GS-1.2W	KCD2-UT2-1	KFU8-GUT-1.D
1 channel	1 channel	1 channel	1 channel	1 channel	1 channel	1 channel
2-wire sensor, 3-wire sensor, active sources, voltage	2-wire sensor, 3-wire sensor, active sources	0/4 to 20 mA	mA, mV, V	mA, V	V, RTD, TC, Poti	V, RTD, TC, Poti
0/4 to 20 mA (active and passive), 0/2 to 10V	Relay, 0/4 to 20 mA	0/4 to 20 mA	Relay, 0/4 to 20 mA, 0 to 10V	Relay	0/4 to 20 mA	0/4 to 20 mA, relay
Universal	Universal	Loop powered	Universal	24 VDC	24 VDC	Universal
	2	2				2
Transmitter power supply/signal converter for standard signals	Linearization table, programming jack, display		Converter and trip function, display	2 trip points	Programming jack	Redundant inputs for TC, programming jack, display
20 mm	40 mm	20 mm	20 mm	20 mm	12.5 mm	40 mm



Staying in touch. The world over.

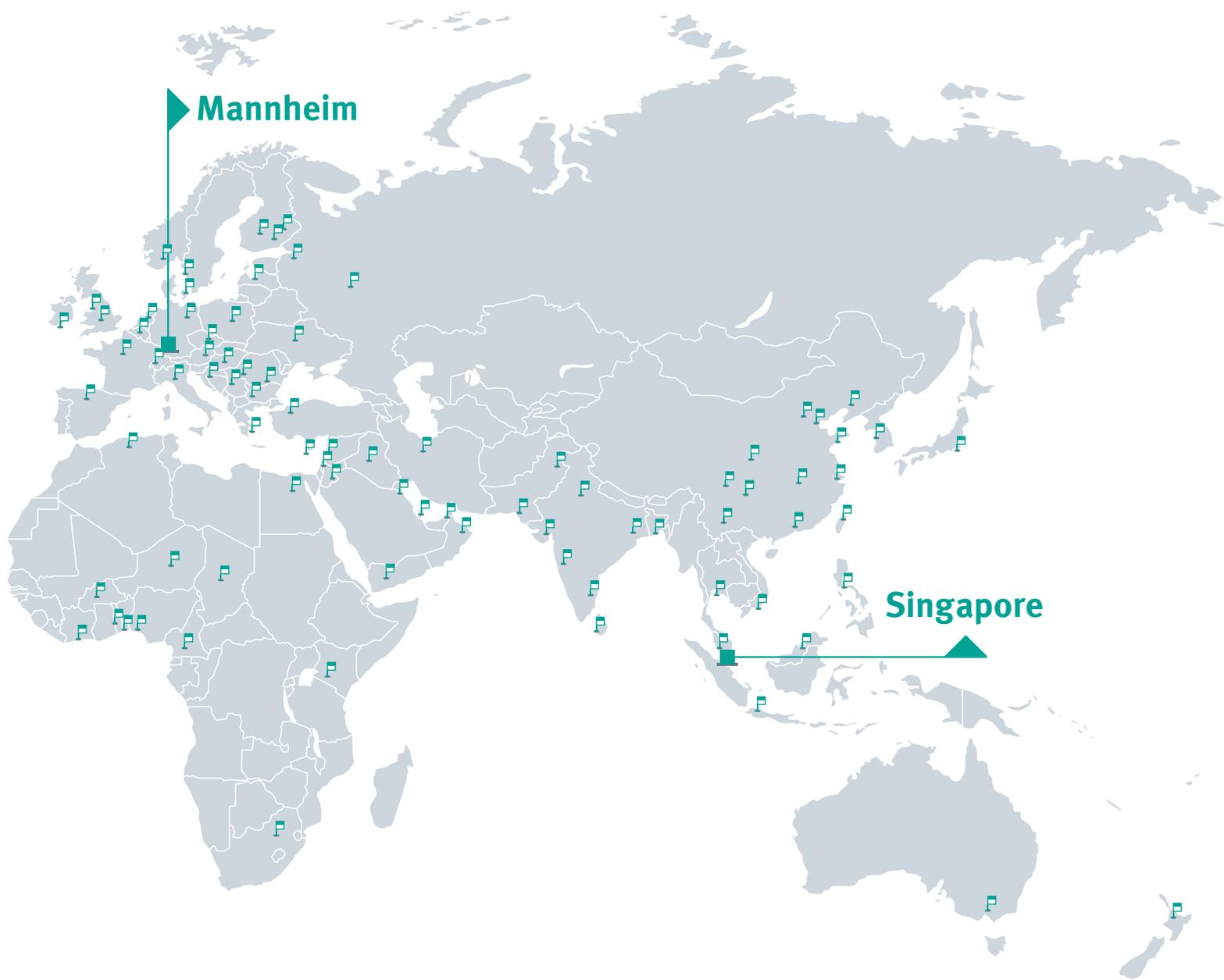
Good customer relationships need care and attention. They are an indication of genuine interest, trust, and a cooperative spirit: the foundation of Pepperl+Fuchs' strengths. No matter where you might be, we are always nearby. And we speak your language – in more than 140 countries the world over.



At home on all continents

Our customers are at the center of all our activities. Our worldwide network ensures that we provide them with the best possible service and support. Our world headquarters in Mannheim services Europe through a network of more than 40 affiliates. Asia is handled by our office in Singapore, with more than 1,000 employees in manufacturing, service, and sales. And our North American headquarters in Twinsburg, Ohio, is responsible for a comprehensive network of offices and sales partners in the USA, Canada, and Mexico.

No matter where in the world you may be, Pepperl+Fuchs is right nearby – and always there for you.



Mannheim

Singapore

YOUR APPLICATION. OUR CHALLENGE.

PROCESS INTERFACES

- 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
- Explosion protection equipment
- Solutions with process interfaces

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



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