IO-Link

Expanding possibilities.
Switching identically.
Adding value.

Product Overview
Reduction Factor 1 Sensors

Your automation, our passion.

PEPPERL+FUCHS

Proximity Sensors

The Best Sensing Solutions Directly from the Inventor

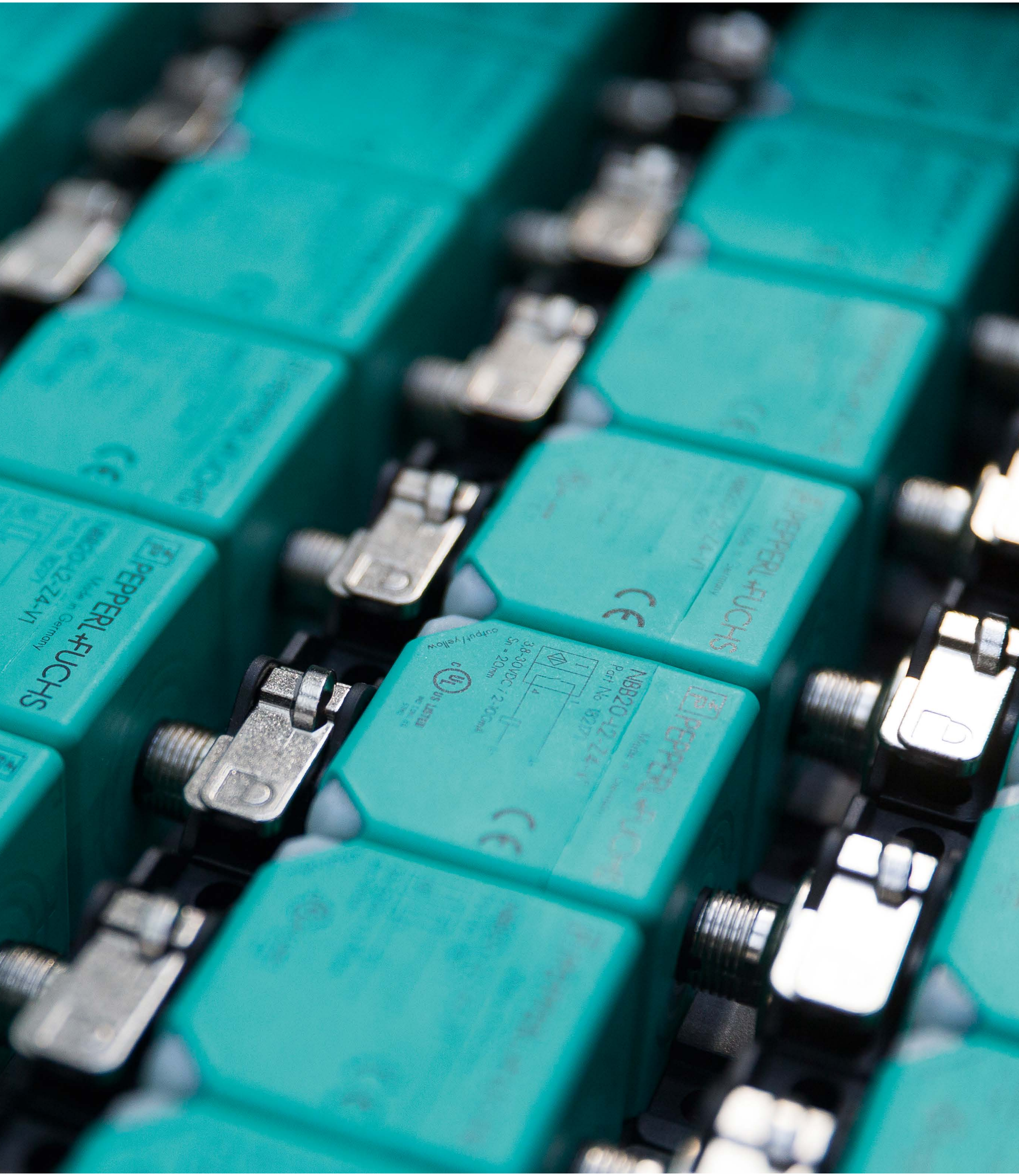
As the inventor of the proximity sensor, Pepperl+Fuchs has continuously developed and perfected this noncontact, wear-free technology. Leveraging decades of experience, we have built a comprehensive portfolio of inductive, capacitive, and magnetic sensors that offers the perfect sensing solution for every application.

Commitment to Quality beyond the Standard

Pepperl+Fuchs' proximity sensors are known for their reliability, innovative features, and high quality. As pioneers in sensing technology, we see it as our responsibility to offer unrivaled quality to customers. We are setting new benchmarks in performance and longevity with test criteria above and beyond standard requirements. Our experienced experts and global sales network offer application consulting and technical expertise.

Continuous Portfolio Development

With the invention of the proximity sensor in 1959, Pepperl+Fuchs has the most experience in the field—and we are committed to continuous development of our product portfolio. The latest addition, reduction factor 1 sensors with IO-Link offer identification, configuration, and diagnostic functions, and other unique features that maximize cost-effectiveness and durability.


PEPPERL+FUCHS
Made in Germany

Reduction Factor 1 Sensors

Identical Switching for All Metals

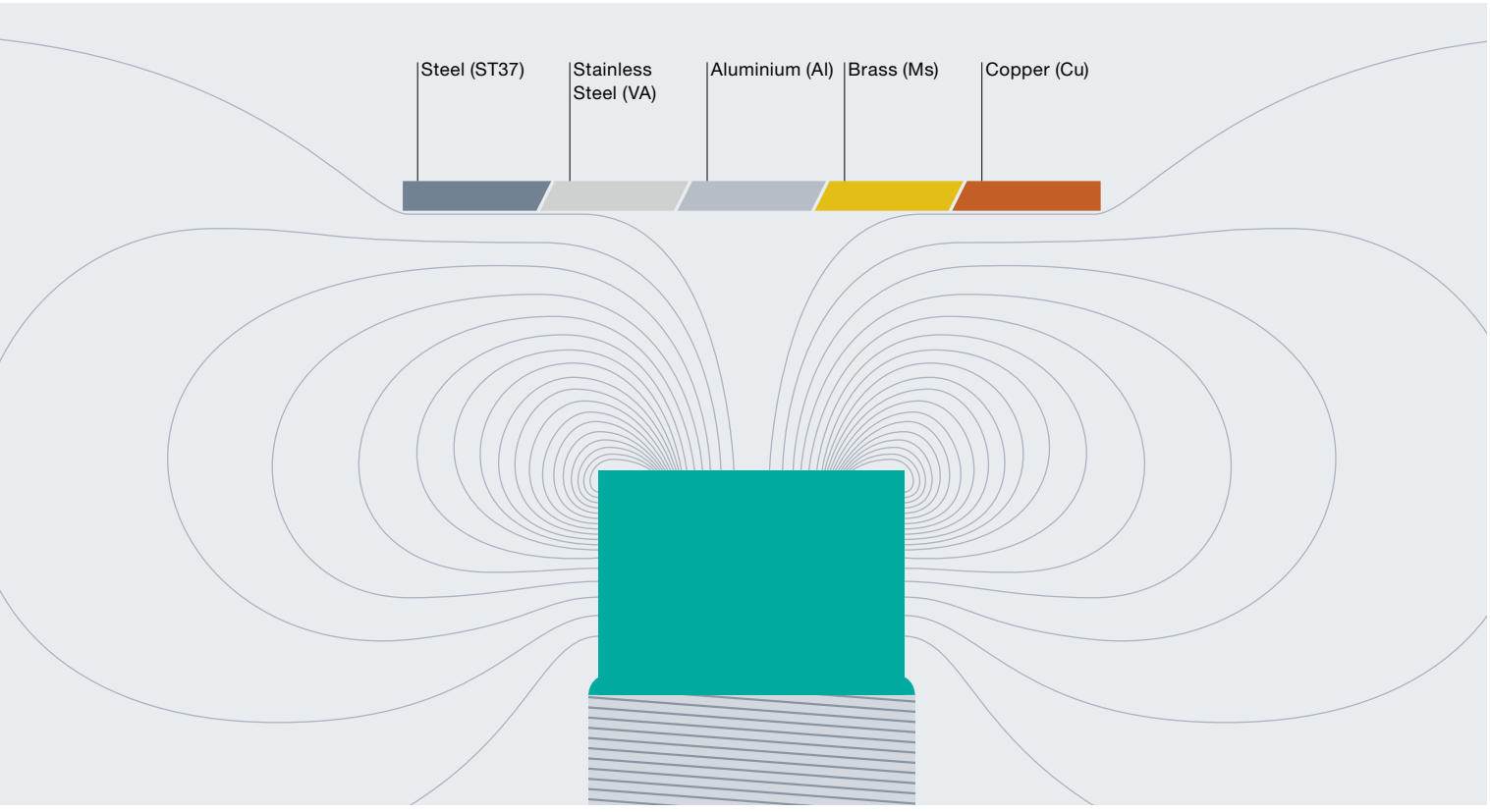
More flexible machine design and reduced production, plant, and management costs can be achieved with long and constant switching distances for all metals. Reduction factor 1 sensors are perfect for applications involving a variety of target metals on the same manufacturing line.

Inductive Sensors—Wear-Free Detection of Metal Objects

Noncontact inductive sensors can detect metal objects by means of their electromagnetic field. Designed without moving components, sensors are not subject to mechanical wear, and their reliability and long service life speak for themselves. Sensors come in an almost unlimited variety of cylindrical and cube-style designs, allowing a style to be chosen that is compatible with the machine design.

Adaptability—Even in Applications with Multiple Target Types

Starting with steel, the switching distances of conventional inductive sensors are reduced, metal to metal, by a defined reduction factor. This is not the case with reduction factor 1 sensors, which offer identical switching distances for all metals with a single sensor. Using only one sensor instead of several allows more flexibility in machine design, simplifies applications with multiple target metals, and reduces procurement, storage, and administration costs. In addition, reduction factor 1 sensors offer high magnetic field immunity for use in demanding weld cell environments.



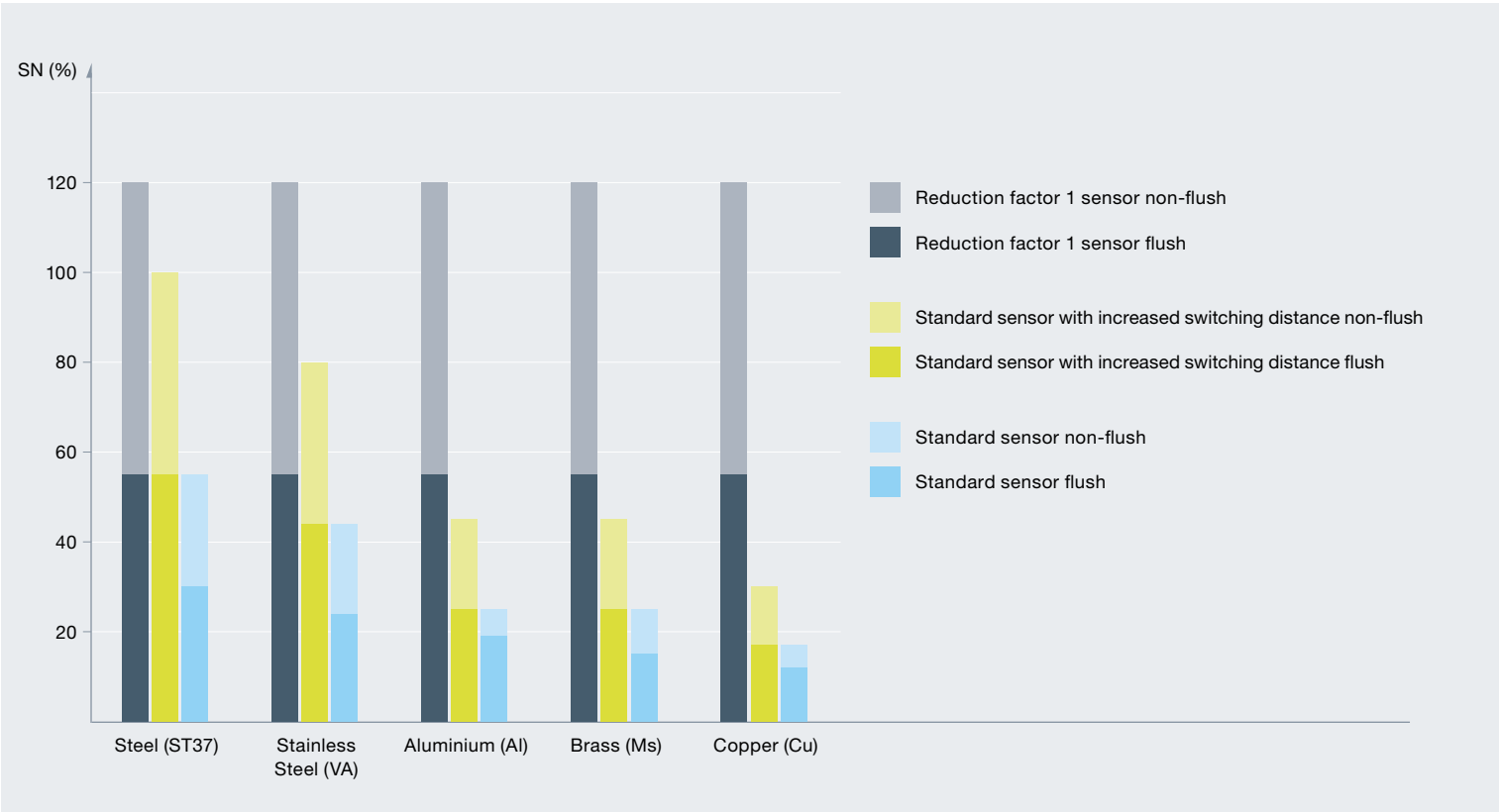
Non-flush reduction factor 1 sensors offer identical switching distances for all metals

Standard, Weld-Immune, and Chemical-Resistant—Reliable in All Areas

Pepperl+Fuchs' broad portfolio of reduction factor 1 sensors creates absolute flexibility in automation machinery design. Industry-friendly cylindrical and cube-style designs, cabled versions, and IO-Link, weld-resistant, and chemical-resistant versions for harsh applications make this possible. Pepperl+Fuchs' technological expertise and years of experience as a pioneer in inductive sensor technology are beneficial to users interested in custom solutions.

Highlights

- Complete IO-Link solution from a single source
- Smart maintenance via stability alarm and temperature indicator
- Flexible—a broad portfolio of sensors with identical switching distance, regardless of a target's material
- Rugged, weld-immune PTFE-coated sensors for harsh welding environments



Comparing standard sensors and reduction factor 1 sensors

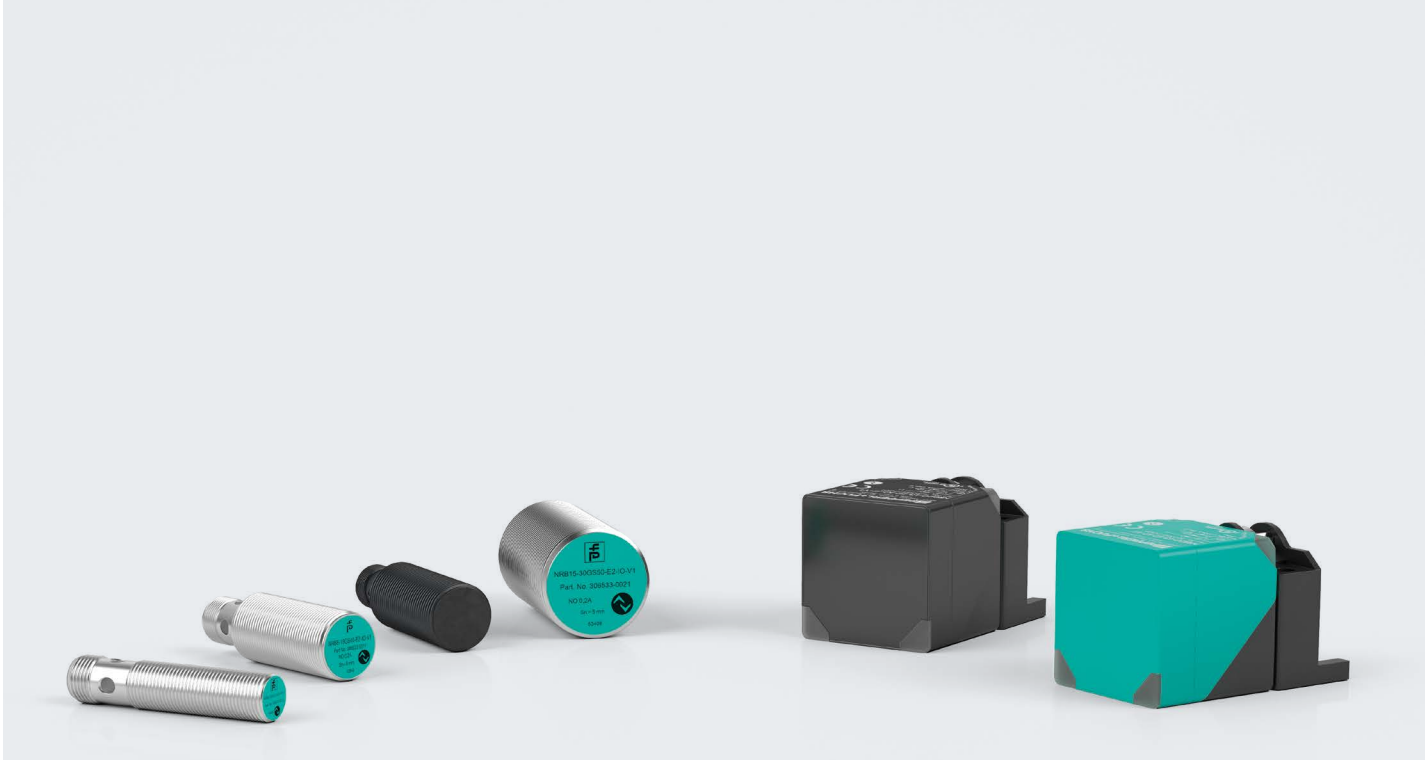
Reduction Factor 1 Sensors with IO-Link

The Standard for Long-Term Solutions

IO-Link stands for sustainable technology, cost reduction, and comprehensive device diagnostics down to the sensor level. Pepperl+Fuchs' IO-Link portfolio provides flexible solutions for a wide range of applications.

In addition to the technological benefits of reduction factor 1 sensors, the IO-Link models offer a range of functions for completely new applications in the field of inductive sensors:

- **Identification and diagnostics**—Access to device-specific information directly from the sensor
- **Automatic configuration**—Standard or double switching distance and NO or NC configuration
- **Switch point mode with stability alarm**—Monitoring of assured operating distance
- **Window mode with stability alarm**—Detection of unintended proximity to an object
- **Temperature indicator**—Preset temperature thresholds for diagnostics on the surrounding area
- **Pulse extension**—Reliable detection of fast targets



Sensorik 4.0

Sensorik4.0®—Paving the Way for the Smart Factory

Equipped with IO-Link, reduction factor 1 sensors are paving the way for the fourth industrial revolution. In the Industry 4.0 future of fully networked production systems, communication-ready sensors play a vital role: they send and receive sensor data within production processes and to higher-level local or cloud-based information systems.

Innovative Sensorik4.0 technologies from Pepperl+Fuchs pave the way for Industry 4.0. by using the standard IO-Link interface to support the digitalization of industrial applications.

	M12	M18	M30	Cube-Style
IO-Link standard	**NR*-12GS40-E2-IO***	**NR*-18GS40-E2-IO***	**NR*-30GS50-E2-IO***	**NR*-L3*-E2-IO-V1**
IO-Link weld-immune	**NR*-12GM40-E2-IO-C***	**NR*-18GM40-E2-IO-C***	**NR*-30GM50-E2-IO-C***	**NR*-L3*-E2-IO-C-V1**
Switching distance flush non-flush	 4 mm 10 mm	 8 mm 15 mm	 15 mm 30 mm	 20 mm 40 mm
Output	3-wire, PNP, NO/NC programmable			
Housing	Threaded barrel M12 x 1	Threaded barrel M18 x 1	Threaded barrel M30 x 1.5	40 x 40 x 40 mm 40 x 40 x 120 mm
Housing material weld-immune	Brass PTFE-coated, PPS			GD-ZnAl4Cu1, PTFE-coated, PA 6 Grivory
Housing material standard	Stainless steel 303, PBT			GD-ZnAl4Cu1 coated PA 6 Grivory

See page 10 for more information about standard sensors and page 12 for more information about weld-immune sensors.

IO-Link V1.1

Standard versions

Weld-immune versions

Selected products. For more models, visit
www.pepperl-fuchs.com/pf-r1-iolink

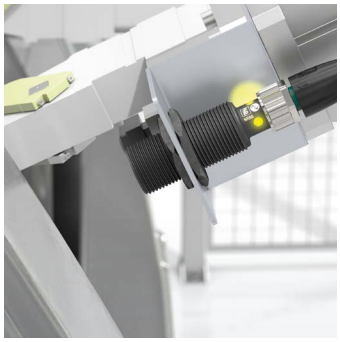
Reduction Factor 1 Sensors with IO-Link

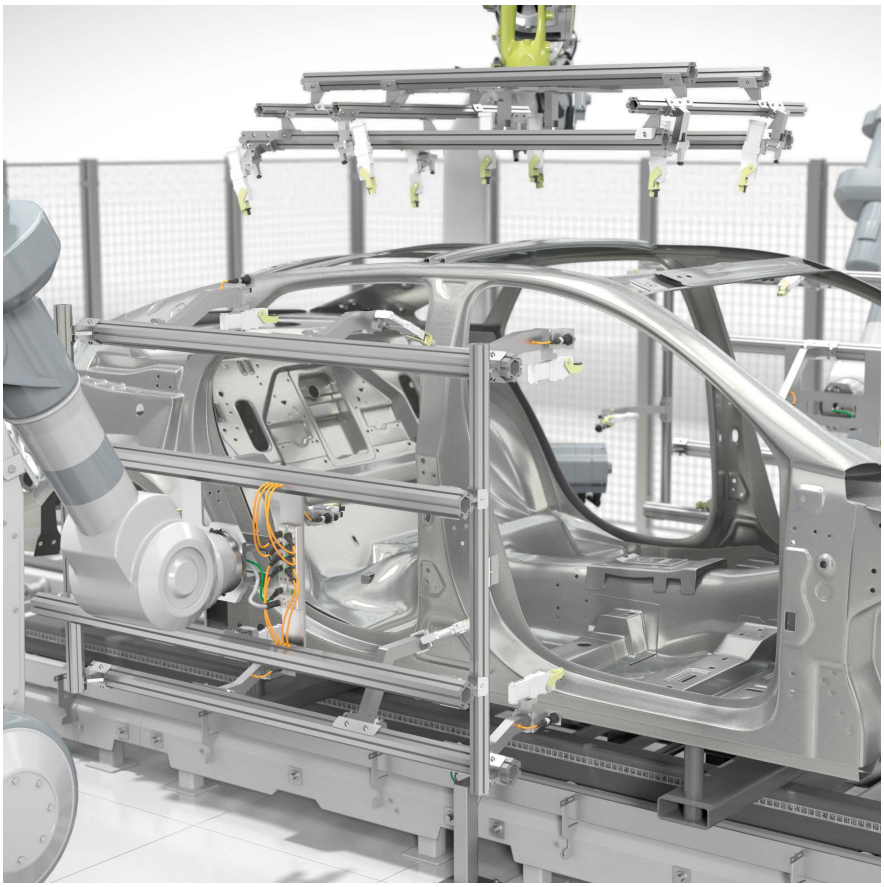
New Application Possibilities

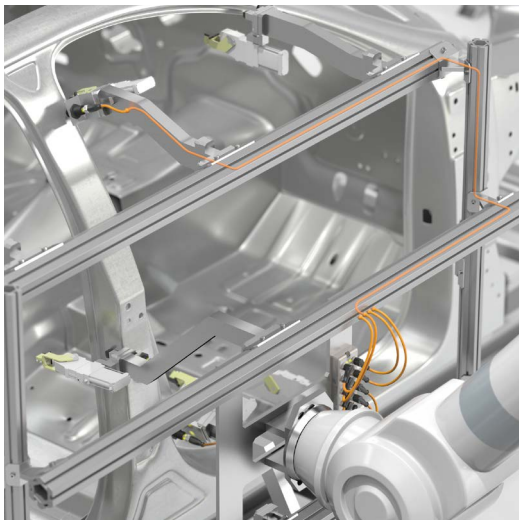
Identical switching distances for all metals, weld-immune versions in different styles, and IO-Link in every model. Reduction factor 1 sensors simplify installation and optimize automotive production lines.

Standard Identification with IO-Link

The IO-Link automation interface makes it possible to communicate continuously and share data digitally from the control level to sensors and actuators in the field. Every IO-Link sensor can be easily identified by manufacturer, product number, serial number, and firmware version. This information has been standardized in each sensor and can be easily read by the control system. If a sensor has to be replaced, the new device can be automatically verified by the control system, which prevents replacement with an unsuitable sensor.







A Variety of Diagnostic Functions Make Plants More Efficient

Switch point mode with stability alarm monitors the assured operating distance between sensors and targets. If there is a problem—including even minimal misalignment of the sensor—it is recognized by the device, registered via IO-Link, and indicated by a blinking LED on the sensor. This makes it possible to conduct maintenance during planned downtime without compromising system availability.

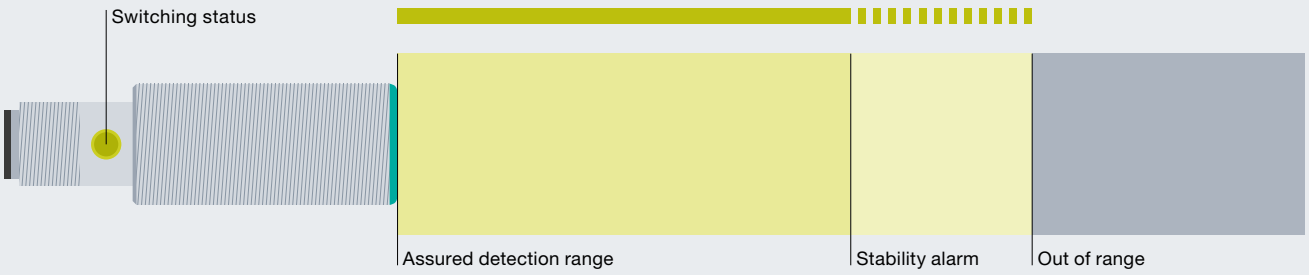
Monitoring the correct operating distance using **window mode with stability alarm** enables additional detection and switching reliability. If an object is closer than the defined switch point or is in the switching window, an LED will indicate that the stability alarm has been triggered.

Simplified Setup and Data Storage for Quick Sensor Replacement

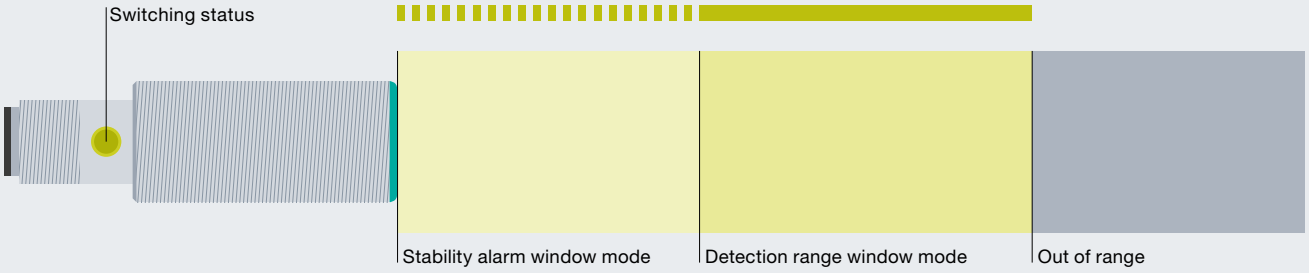
IO-Link standardizes sensor communication across devices. Sensors no longer need to be programmed manually and can now be configured via the control system. This allows reduction factor 1 sensors with IO-Link to offer every possible grade of freedom during integration and configuration.

Thanks to the data storage function, IO-Link enables on-the-job device replacement. Parameters that were saved during configuration can be loaded onto the replacement sensor using the control system. Individual and manual teach-in is no longer required to configure replacement parts.

Switch point mode with stability alarm

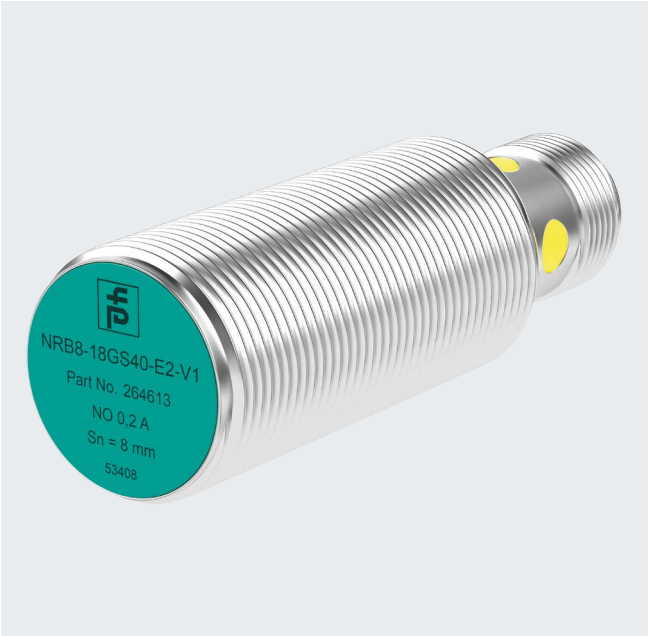


Window mode with stability alarm



Reduction Factor 1 Sensors—Standard Versions

More Flexibility in Machine Design

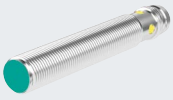
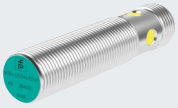
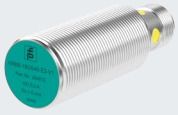


More Adaptability and Cost-Effectiveness

Reduction factor 1 sensors adapt to the characteristics of different metals and enable identical switching distances, no matter whether the object is steel, stainless steel, aluminum, brass, or copper. This reduces the variety of models being used in applications with multiple target metals, which results in cost efficiency for storage, purchasing, and administration.

Highlights

- Incredibly flexible with industry-grade cylindrical and cube-style housings
- Rugged housing made of 303 stainless steel and an impact-resistant, plastic sensing face
- Identical switching distances for all metals with a single sensor

	M8	M12	M18	M30	Cube-Style	FP
Type code	**NR*-8GS40-E2***	**NR*-12GS40***	**NR*-18GS40***	**NR*-30GS50***	**NR*-L3***	**NR*-FP*-P3***
Standard						
Switching distance flush non-flush	 2 mm 6 mm	 4 mm 10 mm	 8/12 mm 15 mm	 15 mm 30 mm	 20 mm 35/40 mm	 50 mm 75 mm
Switching frequency flush non-flush	 4,000 Hz 2,500 Hz	 2,400 Hz 1,500 Hz	 1,400 Hz 600 Hz	 750 Hz 300 Hz	 100 Hz	 80 Hz 50 Hz
Output	3-wire PNP, NO	3-wire PNP, NO	3-wire PNP, NO	3-wire PNP, NO	3-wire PNP, NO 4-wire, PNP, NO/NC complementary	3-wire PNP, NO 4-wire, PNP, NO/NC complementary
Housing	Threaded sleeve M8 x 1 Smooth body 6.5 mm	Threaded sleeve M12 x 1	Threaded sleeve M18 x 1	Threaded sleeve M30 x 1.5	40 x 40 x 40 mm 40 x 40 x 120 mm	80 x 80 x 40 mm
Housing material	Stainless steel V2A, LCP	Stainless steel 303, PBT	Stainless steel 303, PBT	Stainless steel 303, PBT	GD-ZnAl4Cu1 coated, PA 6 Grivory	PBT/metal

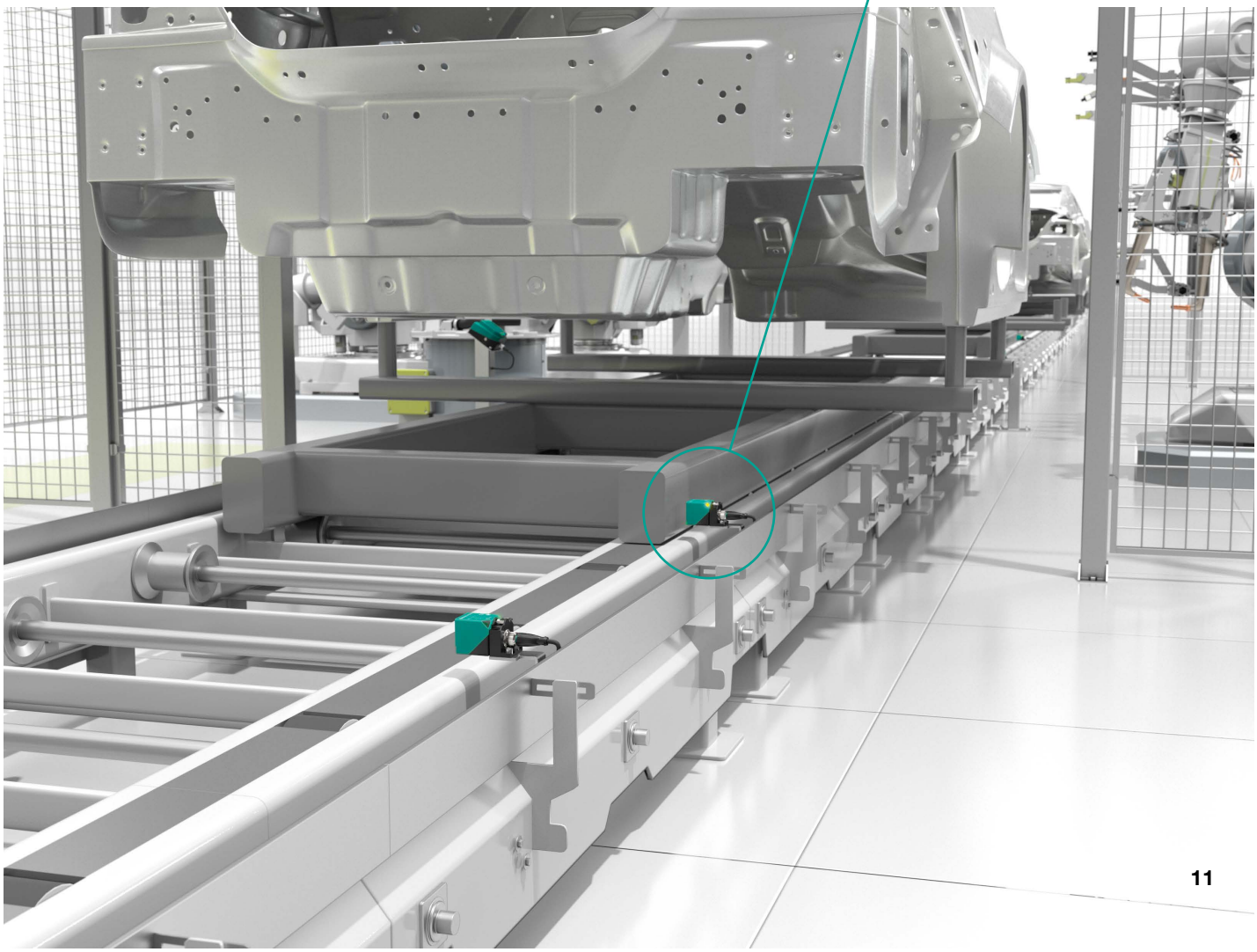
Temperature range

Protection class up to IP68

Selected products. For more models, visit
www.pepperl-fuchs.com/pf-r1

Reliable Skid Control in Automotive Production

In automotive plants, robots weld parts to chassis that are transported to production cells on platforms known as skids. Reduction factor 1 sensors ensure process-compliant skid position in weld cells. As soon as the skid reaches the required position, the welding robots in the production cells are triggered to start the welding process for vehicle side and roof components. Inductive reduction factor 1 sensors make it possible to position skids correctly at every station for uninterrupted, reliable control of the whole process.

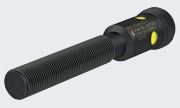
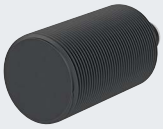
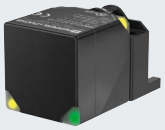


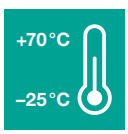
Reduction Factor 1 Sensors—Weld-Immune Versions

Extremely Rugged, Even in Harsh Conditions

Electromagnetic Field Resistant and Weld-Immune

Weld-immune sensors with IP68 protection are the ideal detection solution in welding and other harsh process environments. An air-coil system and advanced electronics make the sensors resistant to electromagnetic fields that they might encounter in weld cells or where variable frequency drive controls exist. The housing design ensures longevity and reliability, and the brass housings of the cylindrical sensors are coated with PTFE, which protects against weld sparks and metal shavings. The cube-style version has a housing made of metal and special weld-immune plastic.

	M8	M12	M18	M30	Cube-Style	FP
Type code	**NR*-8GM40-E2-C***	**NR*-12GM40***	**NR*-18GM40***	**NR*-30GM50***	**NR*-L3*-C-V1**	**NR*-FP*-C-P3***
Weld-immune						
Switching distance flush non-flush	 2 mm 6 mm	 4 mm 10 mm	 8/12 mm 15 mm	 15 mm 30 mm	 20 mm 35/40 mm	 50 mm 75 mm
Switching frequency flush non-flush	 1,000 Hz 400 Hz	 2,000 Hz 1,000 Hz	 600 Hz 500 Hz	 750 Hz 300 Hz	 100 Hz	 1 Hz
Output	3-wire PNP NO	3-wire PNP	3-wire PNP	3-wire PNP	3-wire PNP, NO 4-wire, PNP, NO/NC	3-wire PNP, NO 4-wire, PNP, NO/NC
Housing	Threaded sleeve M8 x 1	Threaded sleeve M12 x 1	Threaded sleeve M18 x 1	Threaded sleeve M30 x 1.5	40 x 40 x 40 mm 40 x 40 x 120 mm	80 x 80 x 40 mm
Housing material	Brass PTFE-coated, LCP	Brass PTFE-coated, PPS	Brass PTFE-coated, PPS	Brass PTFE-coated, PPS	GD-ZnAl4Cu1, PTFE-coated, PA 6 Grivory	PBT/metal PTFE-coated



Temperature range

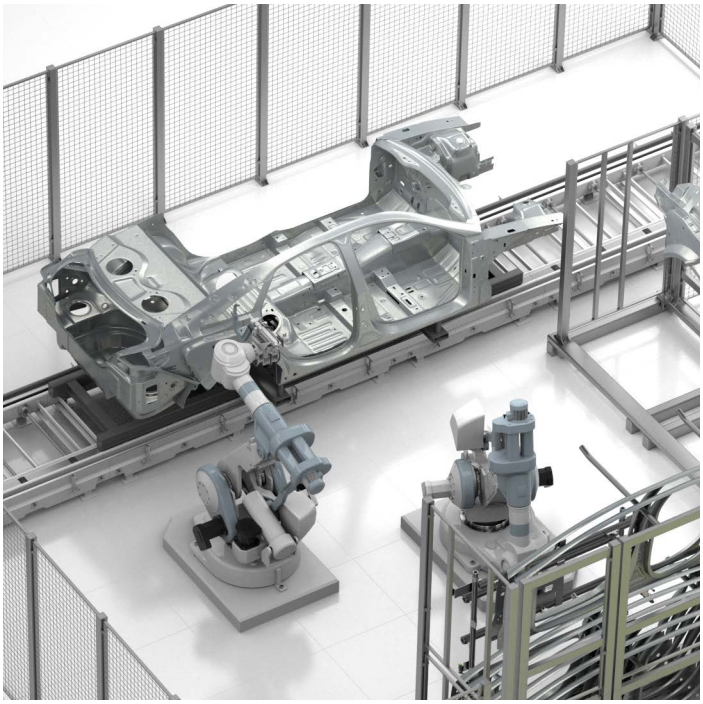
Protection class up to IP68

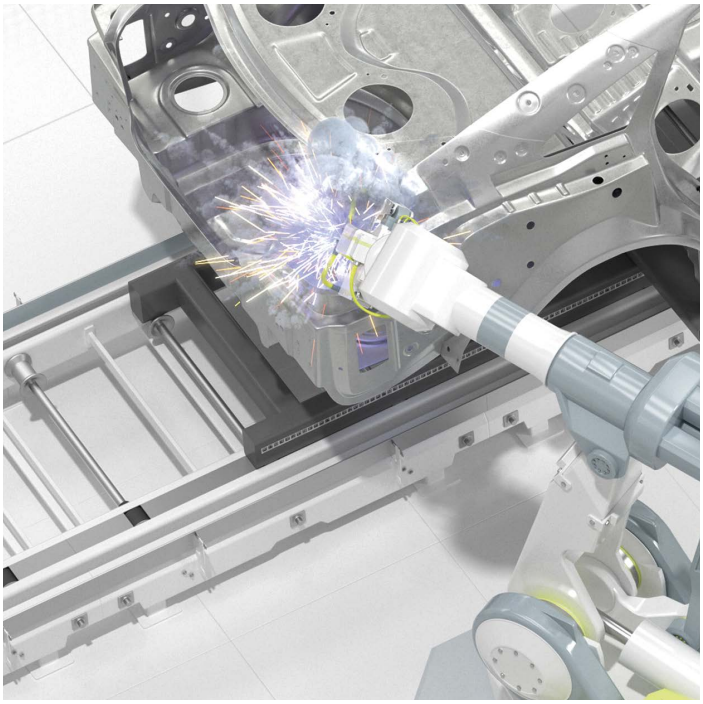
Weld-immune versions

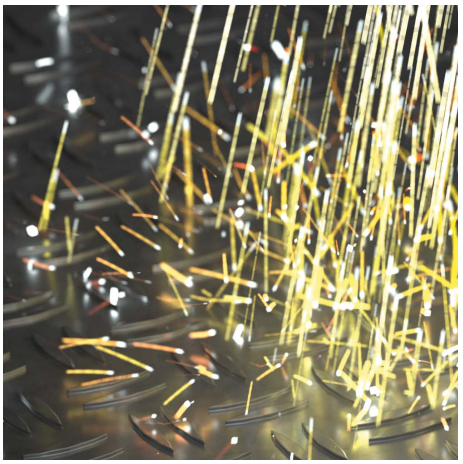
Selected products. For more models, visit
www.pepperl-fuchs.com/pf-r1w

Highlights

- Reliable switching performance with electromagnetic field resistance
- Durable design with tough PTFE coating and weld-immune plastic sensing face
- Available with IO-Link
- Proven technology for solving applications worldwide





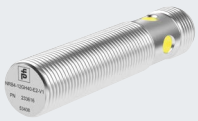
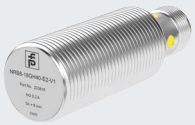
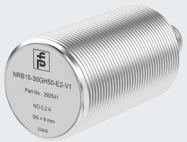


Reduction Factor 1 Sensors—Stainless Steel Versions

Durable Sensors for the Food Industry

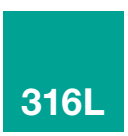
Specially Designed for Wet Areas

Cleaning agents, disinfectants, and cleaning processes that involve high pressures and temperatures place unique demands on sensors in the food and beverage industry. Reduction factor 1 sensors with 316L stainless steel housings and FDA-certified LCP withstand extreme conditions. Designed to be rust-free and resistant to cleaning agents, they are used in areas that must be cleaned and disinfected. With washdown-rated IP68/IP69K protection, these inductive sensors fulfill the challenging requirements in washdown areas.

	M8	M12	M18	M30
Type code	**NR*-8GH40-E2***	**NR*-12GH40***	**NR*-18GH40***	**NR*-30GH50-***
Stainless steel V4A				
Switching distance flush non-flush	 2 mm 6 mm	 4 mm 10 mm	 8 mm 15 mm	 15 mm 30 mm
Switching frequency flush non-flush	 4,000 Hz 2,500 Hz	 2,000 Hz 1,500 Hz	 1,500 Hz 500 Hz	 750 Hz 300 Hz
Output	3-wire PNP NO	3-wire PNP	3-wire PNP	3-wire PNP
Housing	Threaded sleeve M8 x 1	Threaded sleeve M12 x 1	Threaded sleeve M18 x 1	Threaded sleeve M30 x 1.5

Temperature range

Protection class up to IP68/IP69K

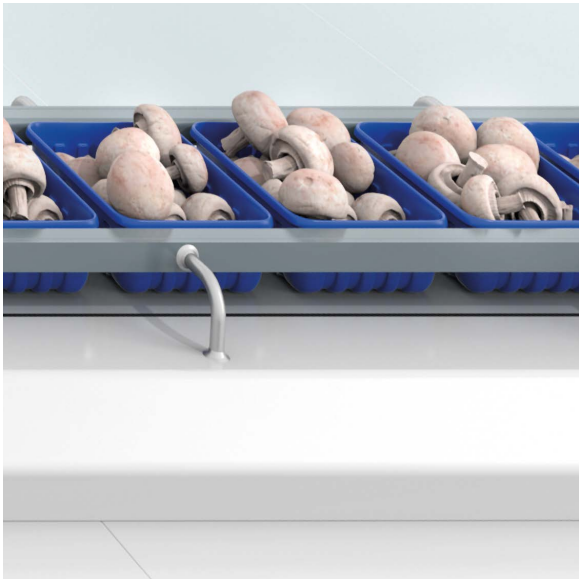


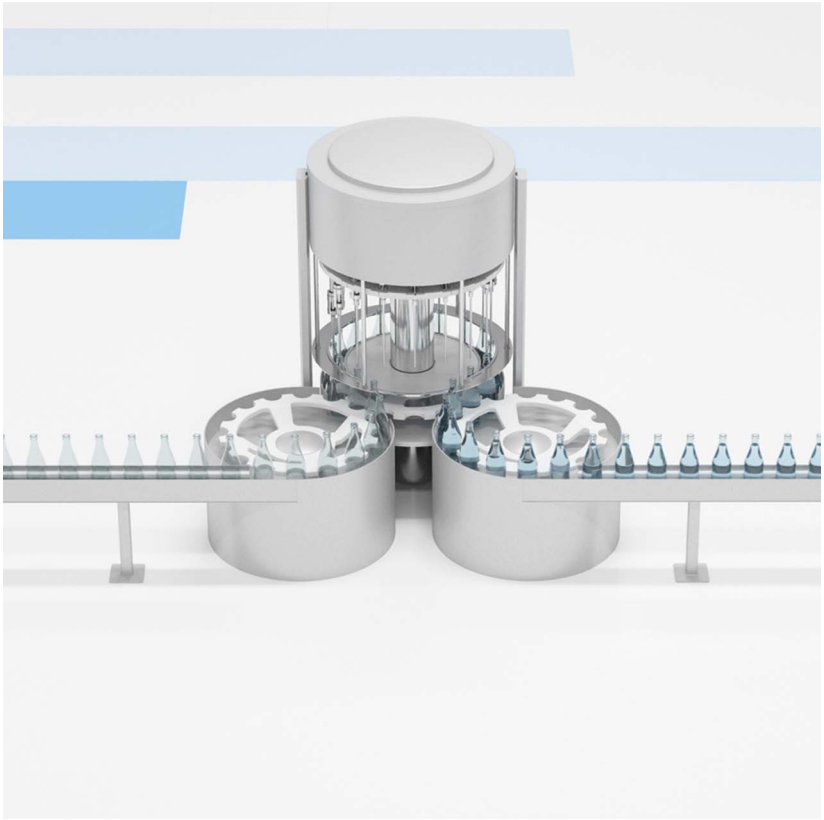
Stainless steel 316L

Selected products. For more models, visit
www.pepperl-fuchs.com/pf-r1v4a

Highlights

- Resistant to aggressive substances and cleaning solutions
- Reliable position monitoring and detection of metal food containers
- Designed with food-safe and FDA-certified materials





Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

Pepperl+Fuchs Quality
Download our latest policy here:

www.pepperl-fuchs.com/quality

PEPPERL+FUCHS

www.pepperl-fuchs.com
Subject to modifications · © Pepperl+Fuchs
Printed in USA · Part. No. 70105137 4/19 00