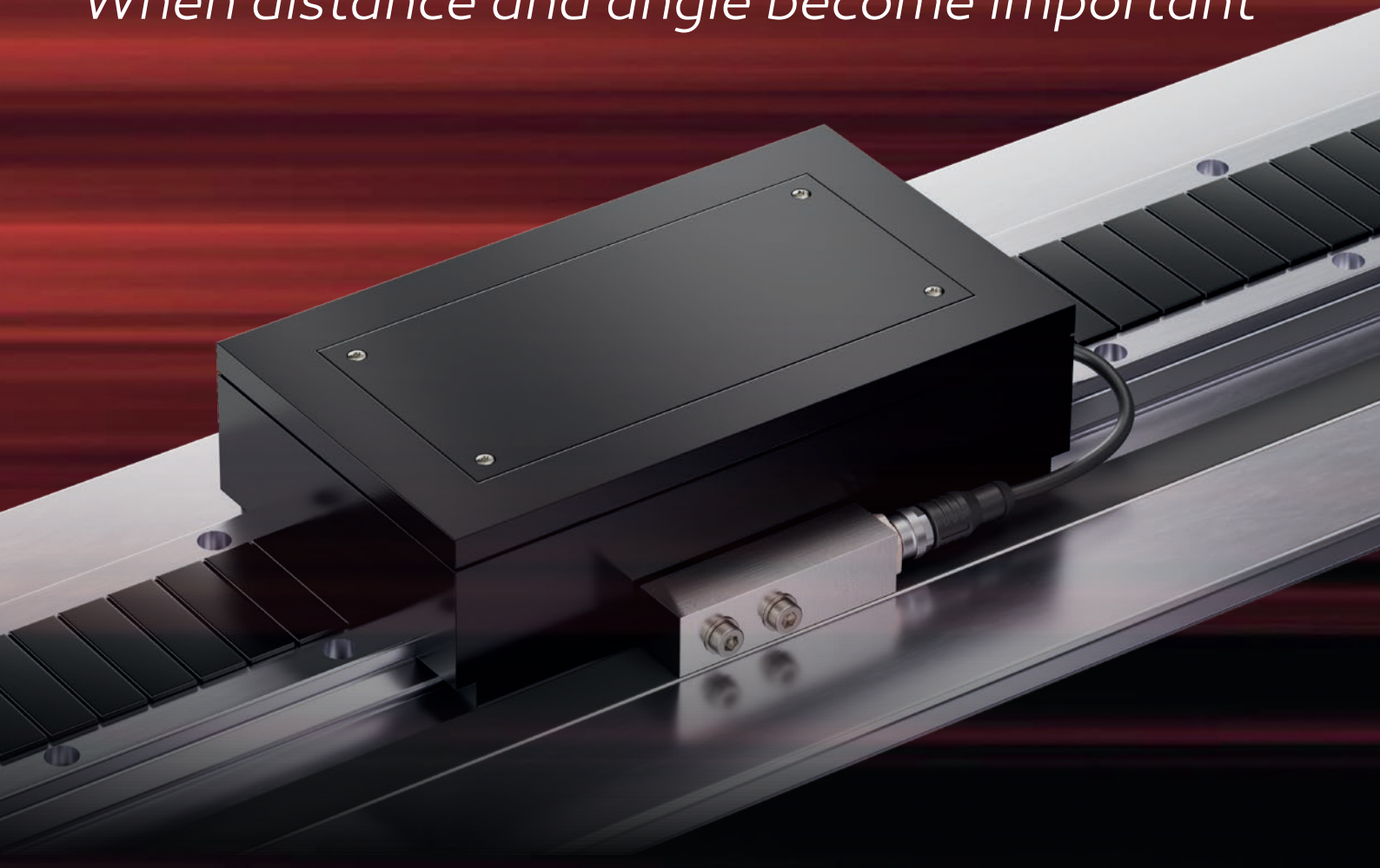
EN

intern

SENSORS FOR *DISTANCE AND ANGLE MEASUREMENT*

When distance and angle become important



IPF ELECTRONIC

SCAN QR-CODE AND
READ FLYER DIGITAL LY

PRECISE VALUES, CLEAR PATHS:

There is hardly a company that does not measure distances and/or angles in some way.

CALCULATING DISTANCE AND ANGLE? IT'S EASY, RIGHT? FAR FROM IT!

When you consider the wide range of possible applications, you realize the full complexity involved in the most diverse tasks.

For distance measurement, e.g., for monitoring and controlling travel distances in automation and logistics, for positioning tools on machines and systems, for precise distance measurement of telescopic arms, for diameter control of coils, for monitoring press-fitting and joining processes, for measuring linear and rotary movements in pneumatics and hydraulics, for checking fill levels and distances in tanks or containers.

The same applies to angle measurement, whether for position detection and control in automated processes, for monitoring bending process equipment, for controlling tilting devices in metalworking, for positioning and leveling mobile construction, work, and agricultural machinery, for adjusting tools and machine axes, or for the precise positioning of components and circuit boards.

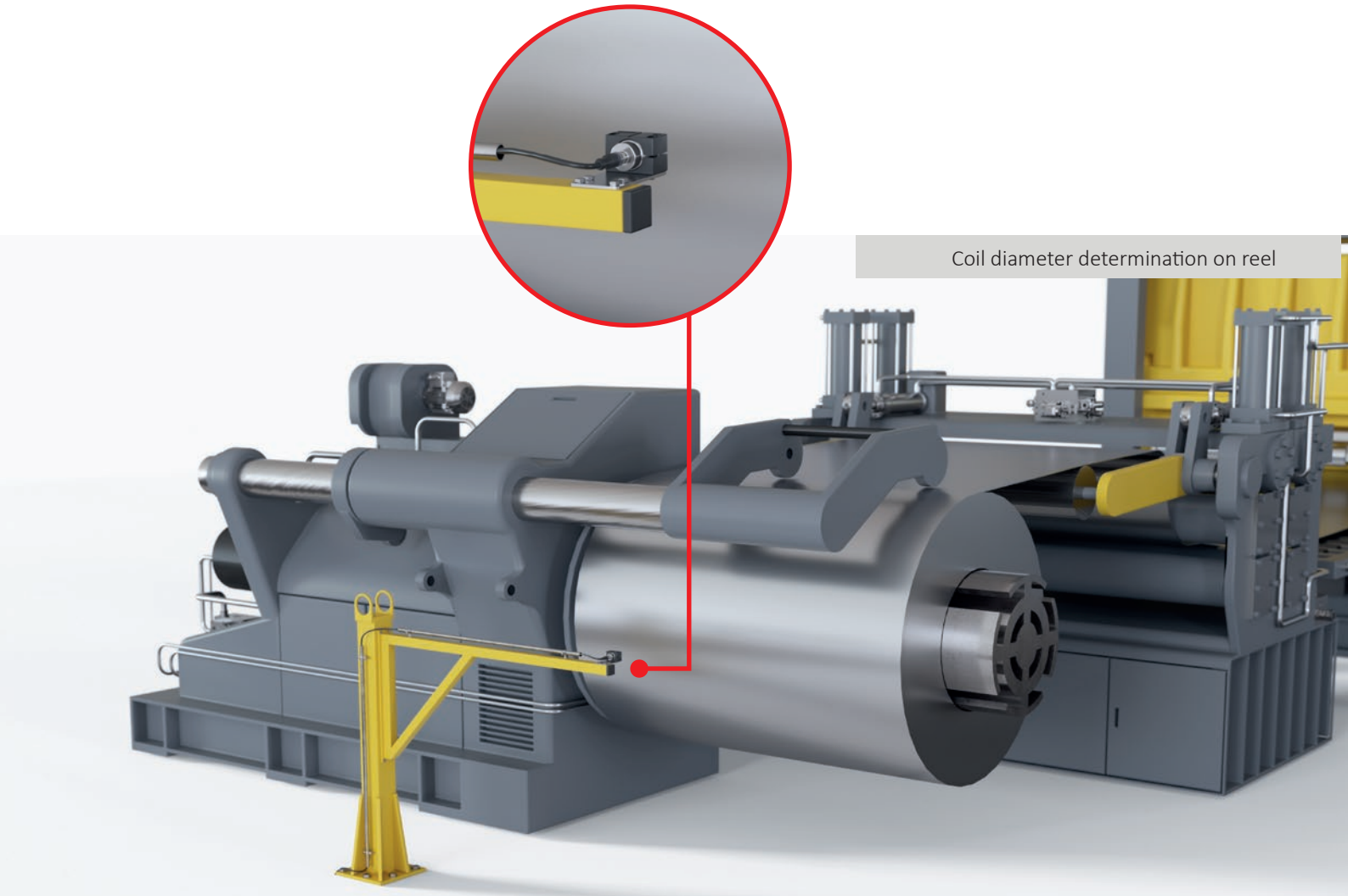
WHAT QUALITIES ARE REQUIRED?

But that's not all! Each application usually requires very specific properties from the corresponding solutions – and these can vary greatly: resistance to dirt, moisture, temperature, and vibrations; high precision and range; high dynamics and travel speeds; measurements independent of material properties; high flexibility; easy integration; easy installation; easy operation; and much more.

AND WHO PROVIDES THE APPROPRIATE TECHNOLOGIES FOR ALL OF THIS?

ipf electronic, of course! Our wide range of sensor technologies specializes in either displacement or angle measurements, or can do both, combined in a single device.

If distance and angle are becoming increasingly important to you, the ideal solution may be just a few pages away.



Coil diameter determination on reel

DISTANCE-MEASURING LASER SENSORS

EXTREMELY PRECISE, VERY LONG RANGE, EXTREMELY ROBUST AND SPECIALIZED

Laser sensors are known for their high precision. In this case, devices from ipf electronic are the first choice when distance measurements with very fine resolutions are required. And they stand out from other solutions thanks to a number of **outstanding features**: impressive ranges of up to 150m, absolute reliability even under particularly difficult operating conditions, e.g. in heavy industry, measurements independent of the shape, color, structure, and surface of the material to be detected..

Laser sensors: PT23,**PT73**, **PT90**, **PT98E294**, **PT34**, **PT44** and **PT64**

How phase comparison measurement and the triangulation principle work:
Sensors such as the **PT23, PT73, PT90** and **PT98E294** emit a light beam modulated at a specific frequency, which generates a periodic waveform. When the light beam is reflected by an object, it hits the sensor receiver with a phase shift. This phase shift (difference between the transmitted and received light wave) depends directly on the distance traveled by the light and can be converted into an analog signal for distance measurement.

The **PT34**, **PT44** and **PT64** sensors aoperate using the highly accurate triangulation method. The sensor emits a focused beam of light onto an object, where it is reflected and hits the receiver with an integrated CCD line sensor. The position of the reflected light spot on the receiving element depends on the distance between the sensor and the object. Thus, the angle of incidence of the light beam reflected by an object is evaluated and output as an analog signal proportional to the distance.

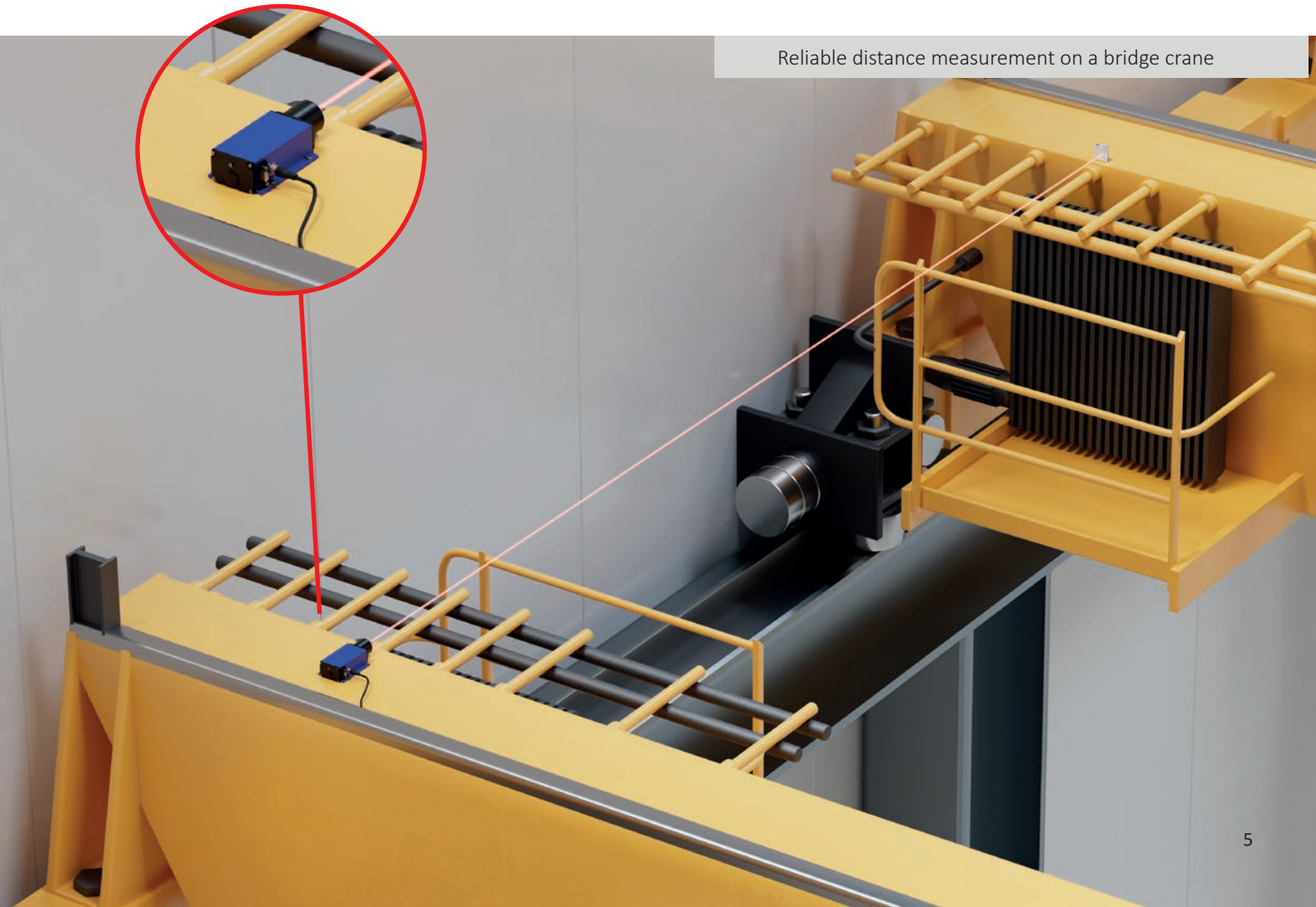
HIGHLIGHTS:

- ☑ Highly accurate distance measurements (resolutions of up to 10 µm with **PT440300**)
- ☑ Distance measurements over long distances up to 150 m (**PT98E294** with reflector)
- ☑ Use in extremely harsh conditions (**PT98E294** with integrated dust trap for the optics)
- ☑ High-precision laser diodes (laser class 2)
- ☑ Non-contact, wear-free distance measurement
- ☑ Easy installation thanks to visible red light
- ☑ Analog output (4...20 mA, 0...10 V)

APPLICATION EXAMPLE:

- Collision monitoring of crane runways on bridge cranes
- Assembly supervision
- Component positioning in automated production lines
- Positioning of robots in automated applications
- Measurement on difficult surfaces, e.g., red-hot metal parts, molten aluminum, etc.
- Precise measurements of material thicknesses, widths and diameters
- Concentricity check of shafts
- Ovality control of pipes

...and your application?



Reliable distance measurement on a bridge crane

Precise distance measurement on a transparent film in confined spaces

ULTRASONIC SENSORS

LOTS OF FREEDOM REGARDLESS OF SHAPE, COLOR OR TRANSPARENCY

Non-contact distance measurements over long distances with rather difficult materials? ipf electronic recommends ultrasonic sensors. The sensors achieve long ranges of up to 6,000mm and detect even transparent objects such as foils with extreme reliability. Distance measurements through even the smallest openings are possible.

Ultrasonic sensors: UT189023, **UT129021**, **UT309023**

Operating principle: The sensors operate according to the echo time-of-flight method and integrate a sound transducer that cyclically emits sound waves. If these waves are reflected by a material, the sensor switches to reception mode and detects the sound echoes. The time taken for the sound to travel between the transmitter and receiver is proportional to the distance between the sensor and the material surface and is output as an analog signal.

HIGHLIGHTS:

- ☑ Reliable displacement measurements on transparent, thin materials
- ☑ High ranges up to 6,000mm
- ☑ Problem-free use even in environments with high levels of dirt and smoke
- ☑ Measurements even through the smallest openings (sensor with sound reduction piece)
- ☑ Non-contact, wear-free distance measurement
- ☑ Easy measuring range setting via teach-in
- ☑ Flexibly configurable via IO-Link interface

APPLICATION EXAMPLES:

- / Reliable measurements on transparent glass and thin transparent films
- / Level control in silos or cisterns
- / Measurement of coil diameters (plastic or metal foil)
- / Level measurements in small containers such as test tubes
- / Loop control on reels
- / Collision control and navigation of autonomous transport systems
- / Control of belt conveyors and height sensors in production facilities

...and your application?

INDUCTIVE SENSORS

ALWAYS RELIABLE, EVEN WITH EXTREME CONTAMINATION

Robust endurance runners: Inductive sensors from ipf electronic detect all metallic objects at short distances, regardless of whether they are moving or not. These extremely robust and therefore durable sensors are particularly suitable for distance measurements in environments with very high levels of contamination (dust, oils, lubricants etc.).

Inductive sensors: IB120026, **IB180026**, **IB300026** and **IB98C798**

Operating principle: Inductive sensors integrate an oscillating circuit from which energy is extracted as soon as a metallic object approaches the active sensor surface. This influence on the oscillating circuit allows the distance between the sensor and an object to be determined and output as an analog signal proportional to the distance.

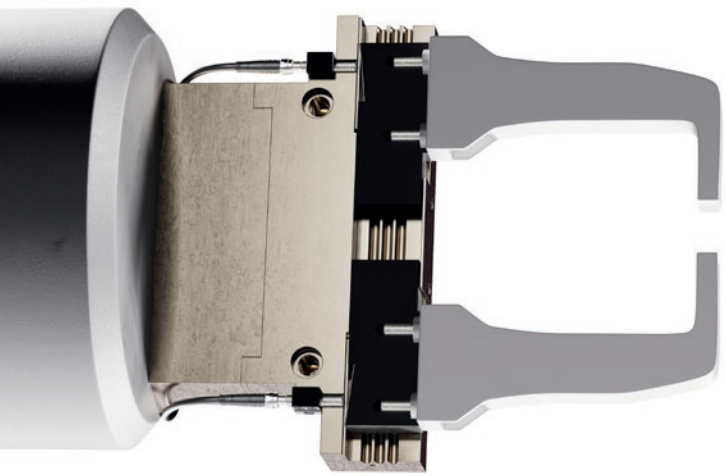
HIGHLIGHTS:

- ☑ Reliable detection of all metallic objects (movable, stationary)
- ☑ Ideal for the harshest environmental conditions with high levels of dirt contamination
- ☑ Insensitive to strong vibrations
- ☑ Non-contact, wear-free distance measurement
- ☑ Cylindrical or flat sensor designs
- ☑ Measuring ranges from 4mm to 20mm
- ☑ High protection class IP67
- ☑ Analog output (4...20mA, 0...10V)

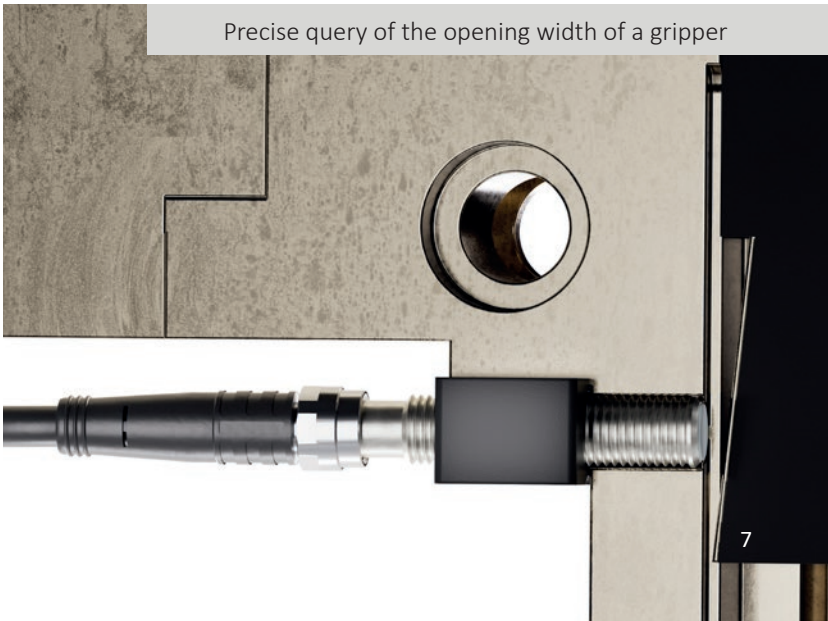
APPLICATION EXAMPLES:

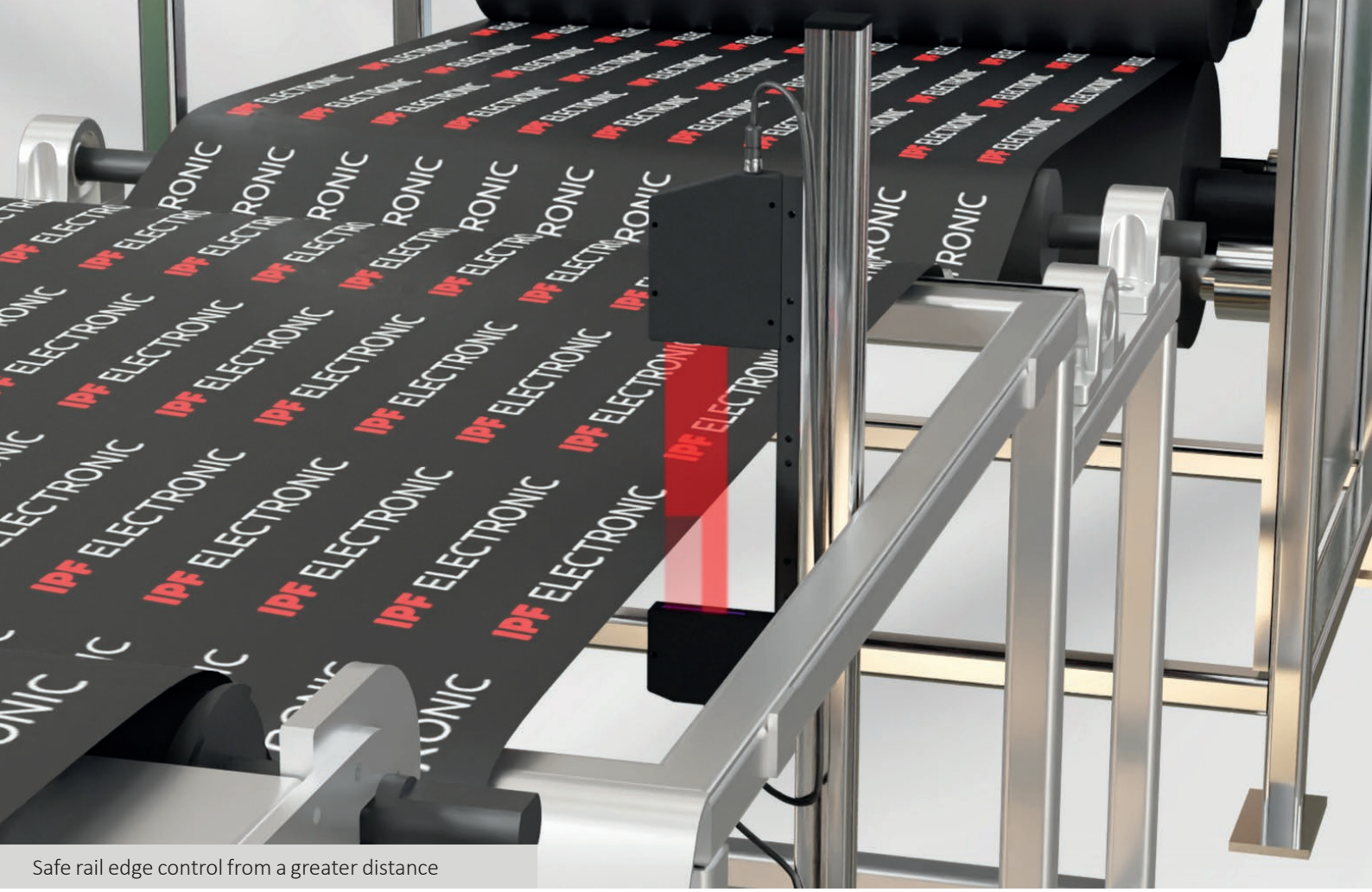
- / Distance measurements (e.g., press-fit inspection of components)
- / Distance measurement and detection of the direction of rotation, e.g. of encoder discs
- / Positioning, e.g. of drive shafts
- / Control of conveyor belts, rollers or actuators
- / Referencing the zero position of movable metal parts, e.g. in robotics

...and your application?



Precise query of the opening width of a gripper





Safe rail edge control from a greater distance

LINE SCAN CAMERAS AND LASER LINE SENSORS

HIGH-PRECISION MEASUREMENTS OVER LARGE OBJECT AREAS AND DISTANCES

High resolutions for highly accurate distance measurements and easy installation: these are just a few of the key advantages of line scan cameras and line scan sensors from ipf electronic. The line scan cameras feature an integrated C-mount lens connection. By selecting the appropriate lens and combining it with an LED line light, these systems enable distance measurements even over larger measuring ranges on objects with long ranges.

Line camera PYSI0317 and **laser line sensor PS75** (transmitter) and **PE75** (receiver)

Funktionsweise: line sensors and line cameras
As transmitter-receiver systems (through-beam sensors), line sensors generate a type of light curtain with a very homogeneous linear light beam. If, for example, a material web enters the detection range of the transmitter and receiver, its shadow image is displayed on the line detector of the receiver. The respective position of the detected object can be determined by the degree of coverage or the size of the shadow cast. The size of the shadow cast is therefore directly dependent on the movement of the object into the light beam. The change in the shadow cast is converted into an analog signal for high-precision path measurements.

Line scan cameras from ipf electronic work in a similar way. However, a line-shaped light is used as a counter element (transmitter) for the camera with the CCD receiver lines. Like line sensors, line scan cameras work in proportion to coverage. The change in the shadow cast on the line detector of the camera can therefore be output as an analog signal for high-precision path measurement.

HIGHLIGHTS:

- ☑ Non-contact, high-precision displacement measurement
- ☑ Ideal for web edge control of thin materials
- ☑ High ranges up to 2,000mm
- ☑ Dynamic power control and contamination compensation
- ☑ High resolution <0.5mm
- ☑ Simple monitoring of larger web edge areas
- ☑ Accurate measurement results even with height fluctuations of web edges due to low material stress in the production process
- ☑ Individual parameterization via PC software
- ☑ Simple installation thanks to visible red light
- ☑ Analog output (4...20mA, 0...10V)

APPLICATION EXAMPLES:

- *I* Wear-free displacement measurements even on thin material webs such as fabrics, foils, paper, etc.
- *I* Precise web edge control
- *I* Diameter control of coils

...and your application?

LIGHT CURTAINS

FLEXIBLE MEASUREMENTS WITH LARGE DISTANCES AND DIFFERENT RESOLUTIONS

If something cannot be detected due to its dimensions, for example, light grids from ipf electronic can usually help. Thanks to flexibly selectable field heights and resolutions (depending on the number of light beams generated by the transmitter), the light grids are ideal for reliably detecting particularly large objects over long distances.

Ligth curtains: series **OY41002x**

Operating principle: As transmitter-receiver systems, light grids transmit individual light beams instead of a homogeneous linear light beam such as line sensors. The covering or interruption of the light beams by an object results in path information that is converted into an analog signal (0...10V or 4...20mA).

HIGHLIGHTS:

- ☑ Flexible choice of measuring range (from 232mm to 1418mm) and resolution (from 6mm to 14mm)
- ☑ Range up to 4m
- ☑ Easy installation thanks to integrated threaded holes or optional mounting brackets

APPLICATION EXAMPLES:

- Height measurements (stack heights) in wood processing companies (e.g. sawmills)
- Diameter control of coils
- Checking pallet heights
- Determination of permissible vehicle heights, e.g. in car washes, at loading ramps or driveways, etc.
- Distance measurement of objects in automated processes

...and your application?

Safe height control of pallets with OSB boards

Non-contact, non-slip, surface-independent displacement measurement

INCREMENTAL OPTICAL SENSOR

CONTACTLESS, SURFACE-INDEPENDENT AND MUCH MORE

Finally, a device that many have been waiting for: Thanks to its particularly sophisticated technology, the incremental sensor VO33 is an extremely versatile and individually parameterizable system for wear-free and therefore slip-free displacement measurement on objects - even with very different material surfaces. Another unique feature is the wide range of functions that the device combines.

Incremental optical sensor: VO330570

Operating principle: The sensor has a laser that works with infrared light (laser class 1), which periodically emits light pulses that are reflected by an object surface. The photosensor integrated in the device receives the reflection signals and records the pixel changes that occur from image to image due to a moving object surface. These pixel changes can be used to determine the distance the object has traveled.

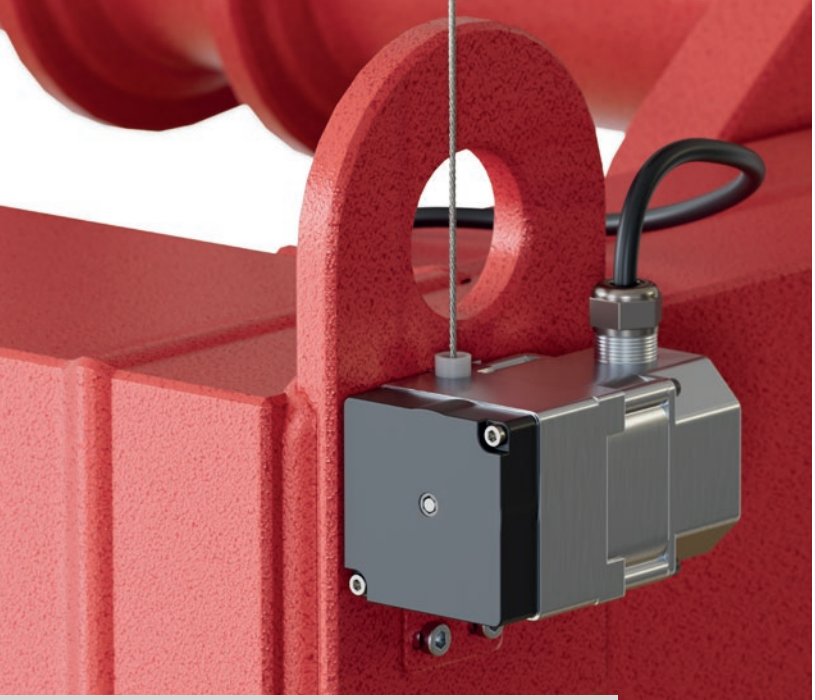
HIGHLIGHTS:

- ☑ Travel measurement, display of travel distance or travel speed
- ☑ Wear-free and slip-free optical system
- ☑ High sampling rate of 0.9 milliseconds
- ☑ Software-based parameterization with many additional functions
- ☑ Suitable for many different material surfaces
- ☑ Configurable zero point for a predefined distance
- ☑ High process reliability thanks to configurable alarm output
- ☑ Rotary encoder output

APPLICATION EXAMPLES:

- *I* Distance measurements of objects with different material surfaces (e.g. in coating systems)
- *I* Control of a PLC for automated cutting of strip materials
- *I* Length measurements of thin materials such as films, paper, etc.

...and what about your application?



Simple position measurement on a lift table

CABLE ACTUATED SENSOR

IT COULDN'T BE EASIER, FASTER OR MORE HASSLE-FREE.

The easiest technologies to use are usually those whose functionality is immediately apparent. One such solution is undoubtedly the cable pull sensor from ipf electronic, which allows distance measurements to be taken in an extremely straightforward manner.

Cable actuated sensor: VS98C572

Operating principle: The sensor consists of a housing containing a cable with spring return. The eyelet at the end of the cable is simply attached to an object. When the object moves, the cable is pulled out of the housing (cable pull body). The distance traveled by the object is then determined by the length of the unwound cable using a potentiometer and output as an analog signal. This also works “indirectly,” for example, by guiding the cable over a deflection pulley.

HIGHLIGHTS:

- ☑ Very simple absolute distance measurements
- ☑ Even indirect distance measurements possible
- ☑ Extremely simple installation and commissioning
- ☑ Reliable distance measurements up to 1,500mm
- ☑ Absolute accuracy of 0.15mm
- ☑ Travel speed 1 m/s
- ☑ Robust zinc die-cast housing
- ☑ Analog output (4...20mA)

APPLICATION EXAMPLES:

- / Monitoring the fork lift height of forklift trucks
- / Measurement of lift height on many means of transport with lifting devices
- / Stroke measurement in telescopic and hydraulic cylinders
- / Position measurement on cranes, lift trucks, scissor lifts or lifting platforms
- / General monitoring of movement processes

...and what about your application?

MECHANICAL SENSOR

SOMETIMES TACTILE IS SIMPLY BETTER

There are a variety of applications in which only mechanical systems with tactile detection of an object ultimately lead to the expected results for reliable distance measurement. The **YM12** mechanical sensor from ipf electronic is a robust and highly precise solution that is ideal for a whole range of such tasks.

Mechanical distance measurement: YM120020

Funktionsweise: The **YM12** operates on the principle of a differential transformer (a special type of transformer). A spring-mounted measuring rod serves as the movable core of the excitation coil, which is arranged symmetrically between two secondary coils. As soon as the rod is no longer in its center position (0 mm), a voltage is induced in one of the two adjacent secondary coils, enabling distance measurement via the output of an analog signal (0–10 V).

HIGHLIGHTS:

- ☑ High-precision mechanical distance measurement (accuracy <0.1 mm)
- ☑ Extremely robust: stainless steel housing, plunger with hardened tip, shock resistanc up to 200g
- ☑ Measuring range ±5mm
- ☑ Also ideal for harsh environments (moisture, aggressive chemicals, elevated temperatures)
- ☑ Analog output (0...10V)

APPLICATION EXAMPLES:

- / Positioning of glass plates with very high accuracy
- / Presence check of seals, e.g. on housing covers
- / Query and positioning of components

...and what about your application?

Reliable assembly inspection of transmission components

INCLINATION SENSORS

QUICKLY READY FOR USE THANKS TO PARTICULARLY EASY INSTALLATION

Impressive inner values: The YN58 inclination sensors measure the angle of inclination in the X and Y directions. During installation, the angle of inclination is visualized via an integrated LED display. Four additional crosshair LEDs arranged around the display also indicate the direction in which the device is tilted. Inclination sensors from ipf electronic: save time, ready for use quickly!

Inclination sensors: YN58002x

Operating principle: The sensors in the **YN58**-series use Earth's gravity to measure the angle of inclination. The inclination sensors integrate an acceleration measuring cell (MEMS: micro-electromechanical system) and output angles according to the respective measuring axis or measuring axes. If the angle to Earth's gravity changes, this is detected by the acceleration measuring cell, the signal is processed, linearized and output as a value for the angles.
Die Auflösung des Ausgangssignals beträgt 0,02°. Die Wiederholgenauigkeit des Sensors liegt bei typ. 0,03° bzw. 0,1%.

HIGHLIGHTS:

- ☑ Highly accurate measurement of the angle of inclination in the X and Y directions
- ☑ High absolute repeatability of 0.03°
- ☑ Various angle ranges (-10° to +10°,-45° to +45°,-85° to +85°)
- ☑ Two analog outputs (4...20mA)
- ☑ Particularly easy installation: visualization of the angle of inclination via LED display plus indi cation of the direction of inclination via crosshair LEDs.☑ Robustes Gehäuse aus Aluminium (degree of protection IP67)

APPLICATION EXAMPLE:

- KContinuous inclination control on mobile machines, e.g., excavators, cranes, lifting platforms, tractors, various construction machines, etc..
- Monitoring the angle of crane jibs
- Safe alignment or leveling of vehicles and machines in the field
- Monitoring and alignment of PV systems and wind turbines
- Optimization of agricultural machinery, e.g. for precise plowing and sowing
- Monitoring the movement and alignment of industrial robots
- Position control of turning stations, e.g., for heavy wire coils
- Inspection of tilting devices in metalworking
- Monitoring of pressure devices, e.g. for steel coils

...and what about your application?

Precise monitoring of the angle of attack of a crane jib and the alignment of the crane vehicle

MAGNETIC ANGLE SENSORS

COMPACT, ROBUST AND EXTREMELY VERSATILE IN INSTALLATION

Ideal for integration into existing machine assemblies, among other things: The absolute magnetic angle sensors from ipf electronic cover the entire angle range of 360° and, as particularly compact solutions, can be used even under the most adverse environmental conditions. The separate mounting of the encoder and sensor opens up a wide range of variable mounting options.

Magnetic angle sensors: MD42002x

Operating principle: The magnetic angle sensors consist of a movable transmitter (magnet) and a stationary sensor. Depending on the rotation of the transmitter, the direction of its magnetic field lines changes in relation to the sensor. The stationary sensor detects the changes in direction in the field lines. This allows the exact position of the transmitter relative to the sensor to be determined and converted into angle information (from 0° to 360°), which is output as an analog current or voltage signal (4...20mA, 1...10V).

HIGHLIGHTS:

- ☑ Extremely simple, variable installation and commissioning
- ☑ Absolute system: no calibration or referencing required before commissioning
- ☑ Insensitive to contamination (e.g., moisture, oils, dust, etc.)
- ☑ Extremely compact and robust design
- ☑ Complete coverage of the entire angle range from 0° to 360°
- ☑ Analog output (4...20mA or 1...10V)
- ☑ Ideal for use in existing applications
- ☑ High protection class IP67

APPLICATION EXAMPLES:

- Diverse industrial control and regulation tasks
- Position control of turning stations, e.g., for heavy wire coils
- Inspection of tilting devices in metalworking

Space-saving monitoring of the angle of attack of a coil tilting station

EFFICIENT ADVICE ON ALL QUESTIONS

PERSONALISED SERVICE AND ON-SITE PROBLEM SOLVING

Every call is important! On our technical hotline, you will speak to experienced staff who will answer your questions competently and conscientiously. We aim to provide you with comprehensive and personalised advice at all times. Our experienced and specially trained team is on hand to help you. You can also contact your personal application consultant in Sales. We coordinate closely internally so that we can respond to your enquiry in a targeted manner- quickly, competently and reliably.

Problems are becoming increasingly complex and diverse in almost all industrial application areas. External expertise is often required to find the right solutions. And this is what you will find at ipf electronic, together with a high level of expertise and problem-solving skills. We come to you on request. No distance is too far for us to talk to you personally, even if the task is seemingly simple. Our more than 20 application consultants are also in your neighbourhood. So don‘t hesitate to give us a call.

You know us as a renowned supplier of industrial sensor technology or will get to know get to know ipf electronic as a reliable partner. No customer enquiry will be neglected, no customer appointment on site will be missed. Our extremely wide-ranging product portfolio will convince you.

Variety, expertise, advice, flexibility:
This is ipf electronic‘s recipe for success.

MAGNETIC MEASURING SYSTEMS

HIGH DYNAMICS, SPEEDS, PRECISION AND WEAR-FREE

Magnetic measuring systems are particularly versatile when it comes to contactless, precise displacement and angle measurements, even in environments with high levels of contamination and humidity. These robust systems are valued for their high dynamics and travel speeds. Sensors such as the MW09 from ipf electronic can also be used anywhere thanks to their battery-powered mobile display. Absolute or incremental displacement and angle sensors from ipf electronic are therefore ideal for all conceivable industrial sectors in which precise measurement results for displacement or rotational movements are always required.

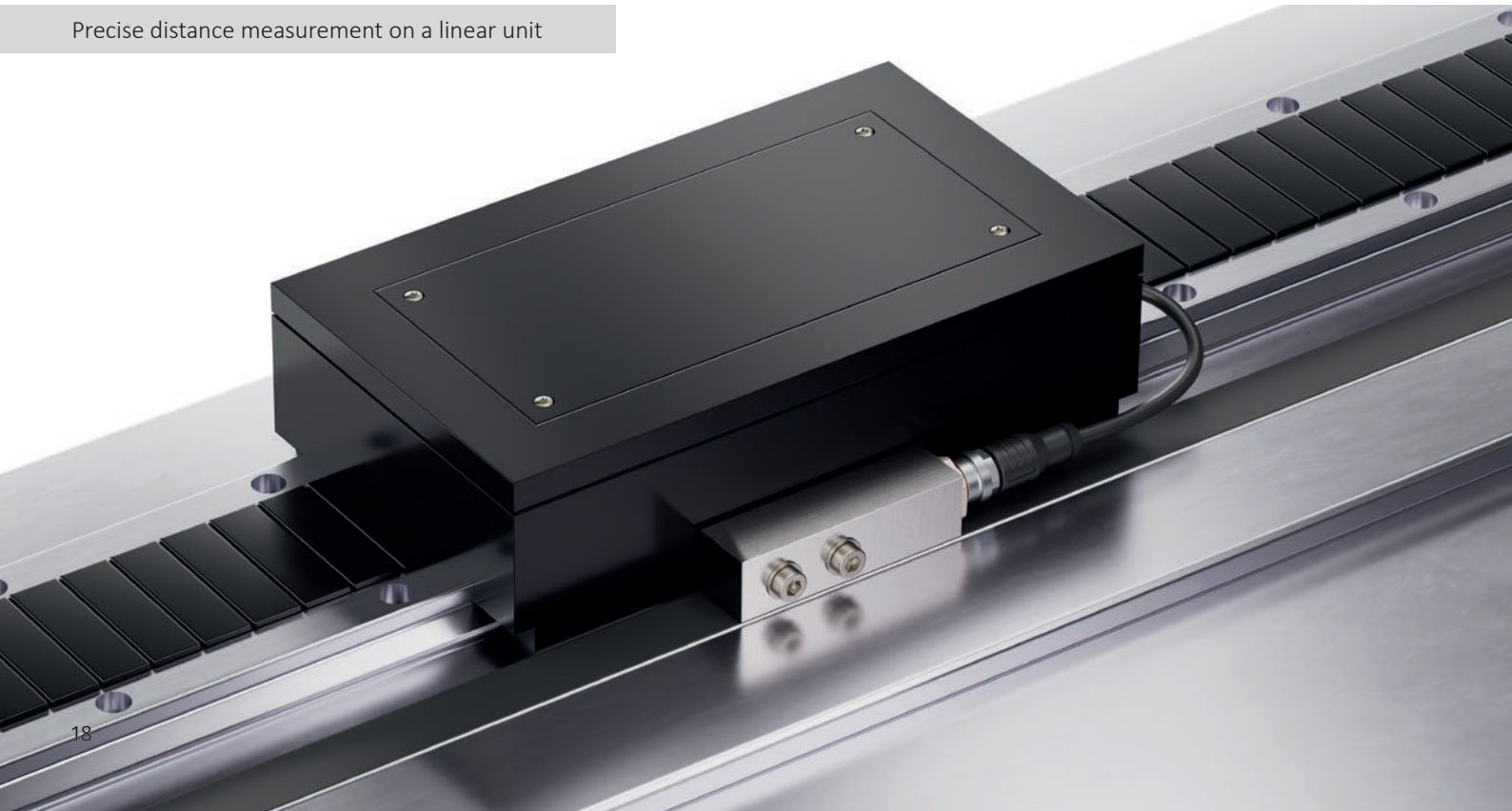
Magnetic measurement systems: MW10, **MW11**, **MW20** and **MW09**

Operating principle: Magnetic measuring systems consist of a combination of magnetic tape or magnetized measuring wheel and probe (sensor). On the magnetic tape or the circumference of the measuring wheel, north and south poles alternate in exact pole width. The sensor detects the magnetic fields (field lines) of the north and south poles without contact and uses this information to generate a high-resolution signal similar to that of a rotary encoder for accurate distance measurements or, via the angle of rotation, for precise angle measurements. Incremental systems must be referenced in order to specify a position. This is not necessary for absolute encoders with a unique sequence of north and south poles.

HIGHLIGHTS:

- ☑ Wear- and slip-free distance and angle measurements
- ☑ Resistant to dirt and moisture
- ☑ Simple solution for measuring the length of strip materials
- ☑ High travel speed of up to 25 m/s
- ☑ Optionally as an absolute encoder or incremental encoder
- ☑ Verschiedene Auflösungen (von 1mm bis max. 0,01mm)
- ☑ Ortsunabhängig einsetzbar (MW09 mit mobiler, batteriebetriebener Anzeige)

Precise distance measurement on a linear unit

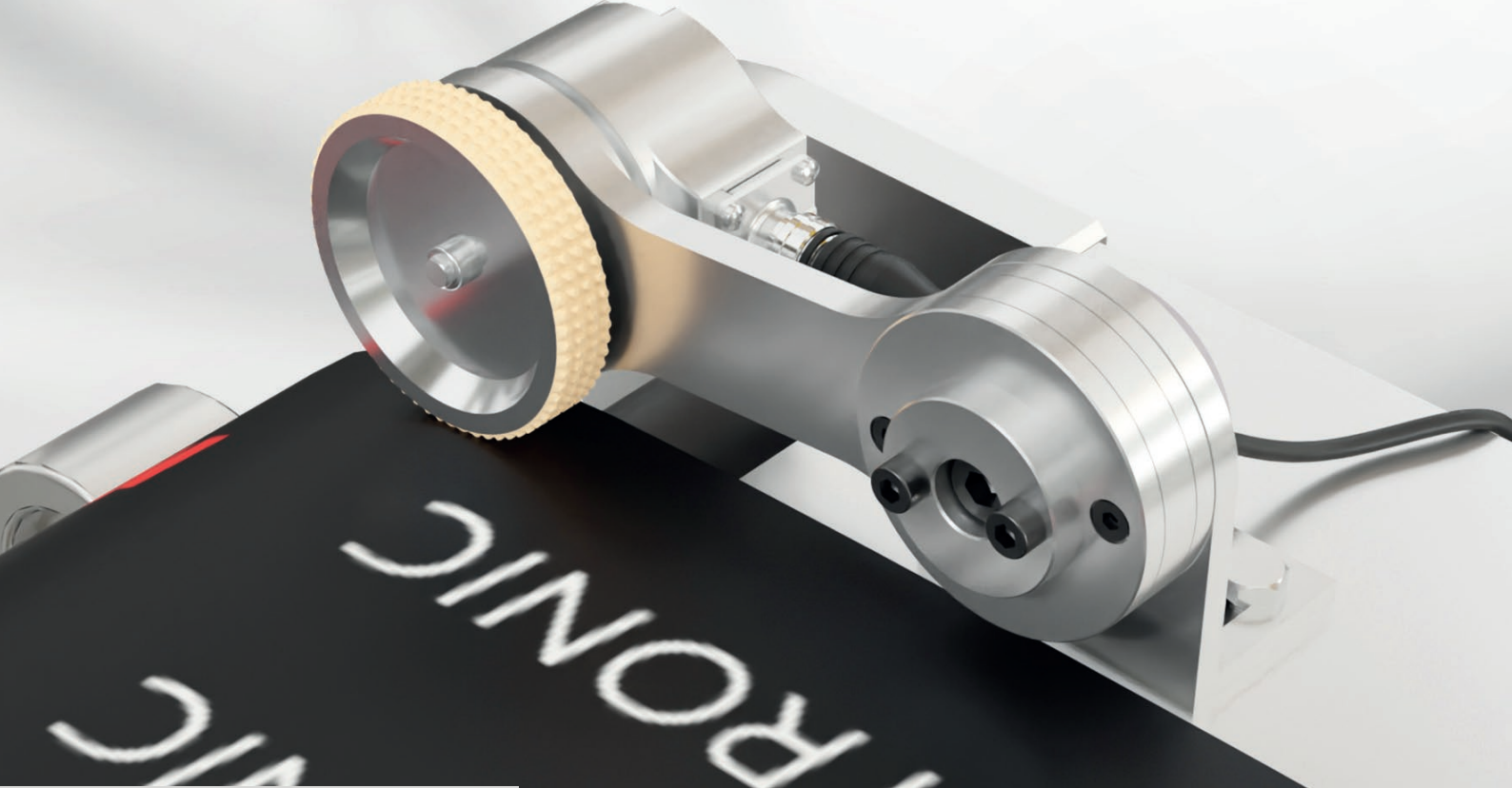


High-precision measurement of length stop and miter angle

APPLICATION EXAMPLES:

- Use in plants and systems in the wood and metal industry
- Integration into fastening systems
- Distance measurements on linear axes
- Setting and adjusting tools on machines
- Determination of the angles of rotation on rotationally symmetrical or curved shafts

...and what about your application?



Precise length measurement of a film

CONFIGURABLE ROTARY ENCODERS

EXTREMELY FAST RESPONSES AT HIGH SPEEDS AND FLEXIBLE AT ALL TIMES

Rotary encoders from ipf electronic can be set on site to the required number of pulses per revolution (between 1 and 65,536 pulses). This opens up an immense range of possible uses in a wide variety of applications.

For length measurements, the rotary encoder shaft is connected directly to a deflection roller or mounted on a measuring wheel. The devices, which are available with hollow or solid shafts, are perfect for applications with fast-running processes and high speeds.

Configurable rotary encoders: VD58982x

Operating principle: The incremental encoders from ipf electronic operate on the principle of optical scanning. They feature a pulse disc with a repeating (incremental) scale. This is scanned by an optical system and converted into encoder-specific output signals (A, B, 90°) by integrated electronics.

HIGHLIGHTS:

- ☑ Flexible length measuring system that can be parameterized on site via PC
- ☑ Needs-based selection of resolution, signal level, and direction of rotation, for example
- ☑ Ideal for high speeds (max. speed 6,000rpm)
- ☑ High precision
- ☑ High resolution, variable parameterization
- ☑ Robust, wear-free industrial design (high shock and vibration resistance)
- ☑ Ideal for industrial sectors with high demand for encoders for various applications

ANWENDUNGSBEISPIELE:

- High-precision monitoring and control of travel paths in automation and logistics
- Precise positioning of tools on machines and systems
- Precise length measurement on conveyor belt systems
- High-precision angle measurement on bending machines
- Monitoring of press brakes during bending processes
- Position detection and control in automated processes
- Speed measurement, e.g. on winding machines
- Variable speed measurement in a wide range of applications

…and what about your application?

"MIDGET" FOR SPECIAL TASKS

PRECISE LEVEL CONTROL THROUGH THE SMALLEST OPENINGS

A chemical company fills small glass bottles with very small openings at an automatic dosing station. The bottles are transported to a dosing unit, where they are filled with a precise amount of a clear, transparent liquid. The amount of product per bottle must be absolutely identical. Therefore, each container must be checked for the correct fill level. In addition, the presence of a glass bottle must be monitored at the dosing station.

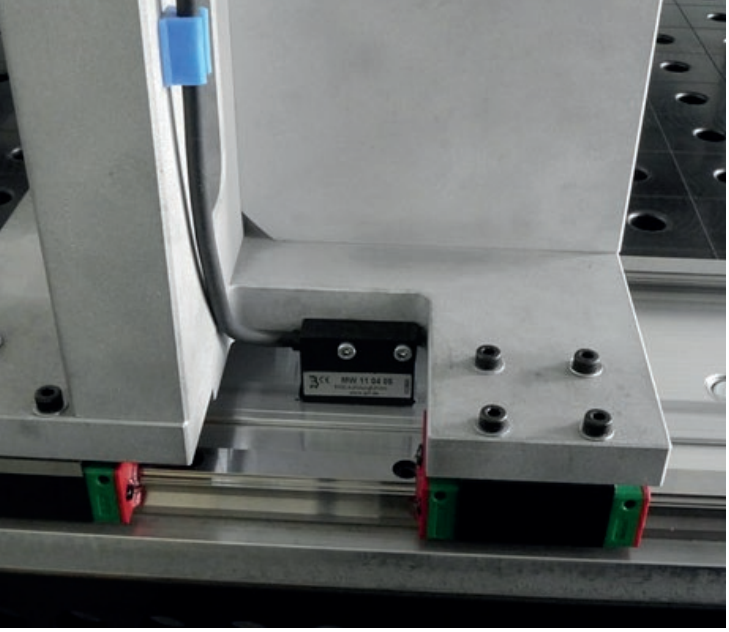
Initially, a cover-proportional light barrier (transmitter/receiver system) with a linear light beam was tested to detect the fill level laterally through the glass wall of the bottles. However, due to its high transparency, the liquid contained in the bottles did not provide sufficient attenuation of the sensor system and did not deliver a clear signal. Refractions of light on the glass bottle also made it difficult to reliably check the fill level.

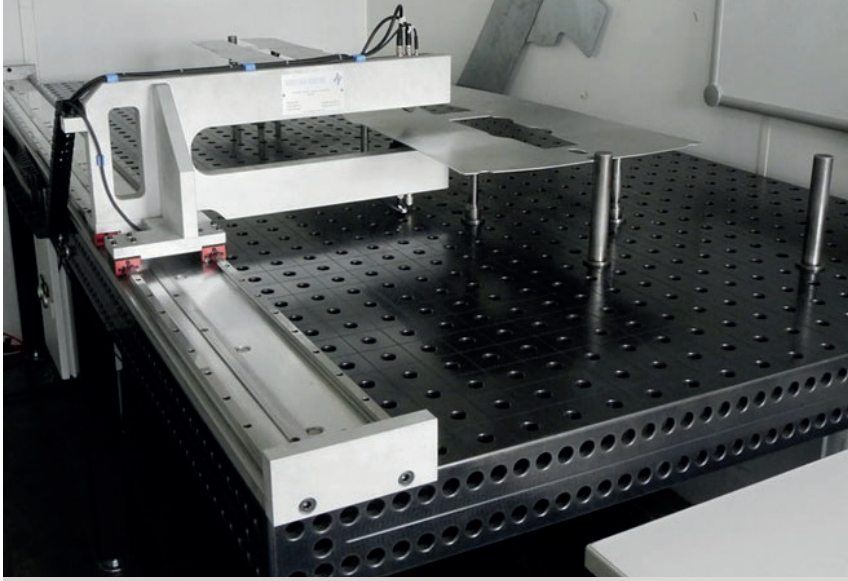
The next test was carried out with an ultrasonic sensor positioned above the bottle opening, which has a diameter of only 10mm. This was also unsuccessful. The reasons: the special mode of operation of ultrasonic sensors (see page 6) and, in this context, the surface area of the transducer and the opening angle of the sound beam generated by the sensor.

Since standard ultrasonic sensors have a comparatively large surface area in relation to their size due to their transducers, the sound beam in this application also detected the edge of the narrow bottle opening due to its large opening angle and used this as the first evaluable signal for distance and thus level measurement. The **UT12**-series ultrasonic sensors have a diameter of only 12mm and are available with an analog output (**UT129021**), e.g. for precise level queries.

In the filling system, the **UT129021** was mounted directly behind the dosing unit with a sound nozzle attached to the sensor head to detect the fill level. The acoustic nozzle additionally focuses the ultrasound, enabling the detection of liquids in containers with very small openings. The dosing unit itself also features a **UT129520** with a digital switching output for presence monitoring to ensure that a bottle is in the desired position before the filling process begins.

Level control and position detection at a dosing station





Combined thickness/distance measurement of sheet metal blanks

DIFFERENT SIGNALS, ONE RESULT

COMPLETE INSPECTION OF SHEET METAL BLANKS WITH COMBINED THICKNESS/ DISPLACEMENT MEASUREMENT SYSTEM

If flexibly rolled or welded sheet metal blanks do not meet the specified requirements and this is detected too late, it can be costly. An automotive supplier therefore uses a special solution to check complete sheet metal blanks as soon as they arrive.

Flexibly rolled blanks used in hot forming or press hardening have different material thicknesses in different segments. If the material thicknesses specified for a sheet metal blank are outside the permissible tolerances and this is only noticed during the forming process, non-conforming parts are produced and, in the worst case, tool breakage occurs.

In the past, individual sheet metal blanks from different delivery batches were checked using hand-held measuring devices. However, this only allowed individual measured values from different sheet metal segments to be determined on a random basis. The company was therefore looking for a device that would enable continuous inspection of individual sheet metal blanks at the goods receiving stage based on a combined thickness and displacement measurement.

The solution was implemented by a special machine manufacturer using a testing device consisting of a base table for holding the sheet metal blanks and various support points, some of which also serve as stops. The measuring system is mounted on the base table and can be moved manually along the entire length of the table. The thickness measurement is performed depending on the distance traveled by the measuring system, which is measured using the **MW100405** from ipf electronic. For non-contact distance measurement, the **MW100405** sensor is moved at a distance of 0.1 to 2mm above a magnetic tape, whereby the system achieves a high repeat accuracy of ±0.1mm.

A master-slave system (**PTSI0292 / PTSI0274**) from ipf electronic is used to measure the thickness of the sheets. The master is connected to a host computer running QA software for analyzing the combined thickness and distance measurements. The software converts the analog signals from the master-slave system as well as the incremental TTL signals from the displacement measurement system and synchronizes them to produce uniform output results.

Deviations from the permissible tolerances are now immediately apparent thanks to the meaningful results, allowing for an immediate response to prevent faulty sheet metal from entering production.

ipf electronic gmbh
Rosmarter Allee 14 • 58762 Altena
Germany
www.ipf-electronic.com

Headquarters
Tel +49 2351 9365-0
info@ipf-electronic.com

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