

LIGHT SECTION SENSORS

FLEXIBILITY ACROSS THE BOARD



FEWER VERSIONS BUT MORE FLEXIBILITY

Which sensor is suitable for my specific application? You have most likely asked yourself this same question. The answer is usually not easy because the huge number of different and sometimes highly automated manufacturing processes in all conceivable branches of industry means that the tasks and therefore the functionality that sensor solutions are expected to fulfill are correspondingly diverse.

ipf electronic now makes your decision easier – with a new series of multifunctional light section sensors, which are sure to impress across the board.

The special feature: The contactless laser sensors are extraordinarily versatile and therefore extremely flexible with regard to their potential applications.

And there's more: All multifunctional light section sensors are identical in design (easy to install for different applications), are based on the same measurement principle (simple start up) and operate without soiling-sensitive reflectors (simple installation and high reliability even in harsh environments).

This saves you having to install and start up many different sensors for a wide variety of different applications. Benefit from just four device versions with as yet unrivalled application flexibility. Fewer device versions but more flexibility – and often much more than you'd expect.

See for yourself.

OPERATING PRINCIPLE

A SINGLE PRINCIPLE PERFECT FOR MANY DIFFERENT TASKS

The multifunctional device solutions from ipf electronic are all based on the same operating principle – the light section method.

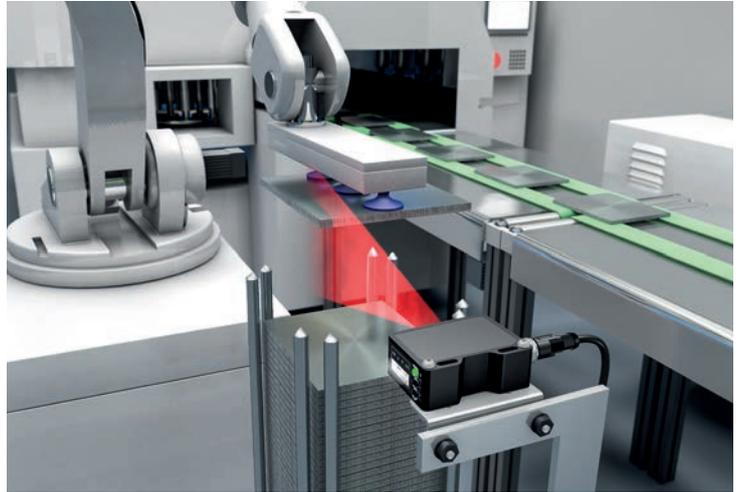
Here, the sensors project a laser line (laser class 1 and 2) onto an object. This laser line is reflected by the surface of the object and, following the triangulation method, reaches a two-dimensional optical receiver with a special multiple-lens system which enables precise mapping in high optical quality.

For subsequent calculation of the respective output values, based on up to 600 measured values per measurement, the light section sensors feature an intelligent algorithm combined with powerful coordinate transformation which allows, for example, measurements to be performed without time-consuming alignment of the sensor.



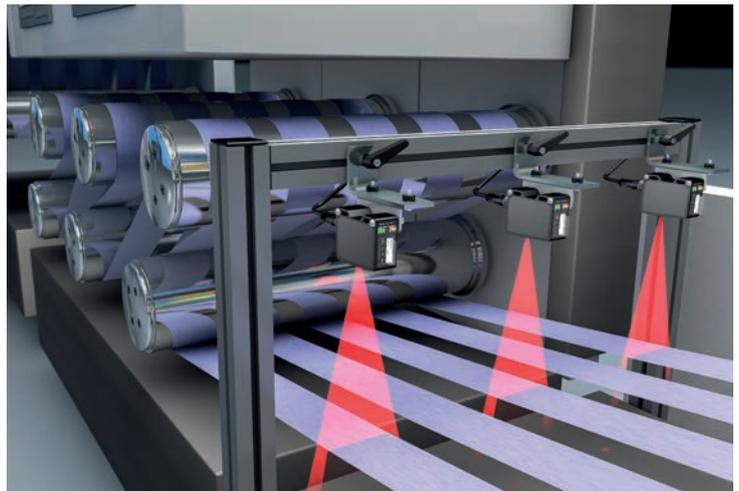
DOUBLE SHEET CONTROL

in metal processing



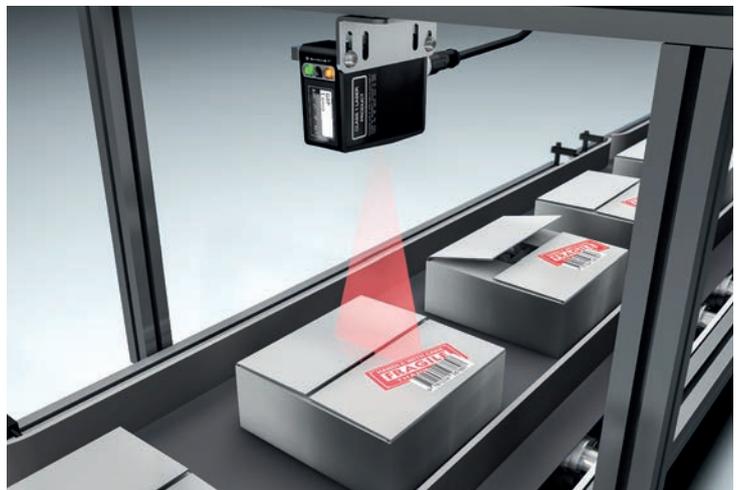
EDGE CONTROL

e.g. in the production of bitumen sheets



GAP CONTROL

e.g. on cardboard boxes (correct sealing)



PY740020 / PY740021**THE OBJECT EDGE VIEWED FROM MANY ANGLES****ADVANTAGES AND HIGHLIGHTS**

- Measurement of the object width irrespective of surface and color
- Simple alignment using a visible laser line
- Edge position measurement with a resolution of up to 40µm
- Up to 200 measurements per second
- No soiling-sensitive reflector necessary
- Measurements can be performed irrespective of distance
- Reliable measurements under different light conditions, even with a changing background and varying light conditions
- Measurement without complicated and time-consuming device alignment
- Lateral sensor positioning above the object is possible
- Degree of protection IP67

**3-DIMENSIONAL EDGE MEASUREMENT**

The PY740020 and PY740021 (operating distance 100mm to 150mm and 150mm to 250mm respectively) determine the position of object edges irrespective of the distance. Although these sensors provide features which until now only complex laser measurement systems could offer, they are just as easy to use as diffuse reflection sensors.

The PY740020 and PY740021 measure the precise distance to the object surface along the laser line and use their integrated intelligence to calculate the results: the position of an edge or the width/gap of an object. Measurement by the device can be interrupted by a hold function which is active for as long as a high signal is present at the input. In addition, the sensor reduces the laser power during the “hold time”. If the high signal at the input disappears, the measurement continues. This function allows, for example, triggering at a defined object measurement point.

Owing to the integrated coordinate transformation, the devices can, like almost all of the sensors of this series, also be positioned laterally above an object at an angle of $\pm 30^\circ$.

OVERVIEW OF MEASURING FUNCTIONS

- Edge: determination of a right or left object edge
- Width: determination of an object width
- Center: determination of the center point of an object
- Gap: determination of the gap width or the gap center of an object

AND THERE'S MORE

- Restriction of the measurement field to suppress interfering edges and objects
- Measurement of extremely dark objects
- No evaluation devices or external software necessary
- Integrated soiling alarm

MEASUREMENT AND TESTING APPLICATIONS

e.g. measurement of the maximum object height irrespective of position



PRODUCTION PROCESSES

e.g. inspection of weld seams of plastic tubes



DEMANDING CHECK AND SORT APPLICATIONS

e.g. checking the lid curvature on yoghurt pots



PY740025 / PY740026**QUALITY ASSURANCE FLYING HIGH****ADVANTAGES AND HIGHLIGHTS**

- Height measurements irrespective of the object position
- High resolution up to 2 μm
- Absolutely calibrated prior to shipping
- Instant evaluation for check and sort applications
- 5 integrated measuring modes
- Measured value indication in millimeters
- High measuring accuracy under changing ambient light conditions
- Degree of protection IP67

**HEIGHT MEASUREMENT WITH
MAXIMUM PRECISION**

The PY740025 and PY740026 (operating distance 100mm to 150mm and 100mm to 500mm respectively) determine the heights of objects at a high resolution of up to 2 μm based on the following five parameters: maximum, minimum and mean height, delta height value (e.g. to identify non-conforming products on the basis of a non-standard shape) and standard deviation across all determined height information.

The intelligent combination of the parameters enables the PY740025 and PY740026 to perform instant evaluation in applications where objects need to be checked and NOK products immediately rejected. The devices are therefore ideal for a wide variety of quality assurance applications.

OVERVIEW OF MEASURING FUNCTIONS

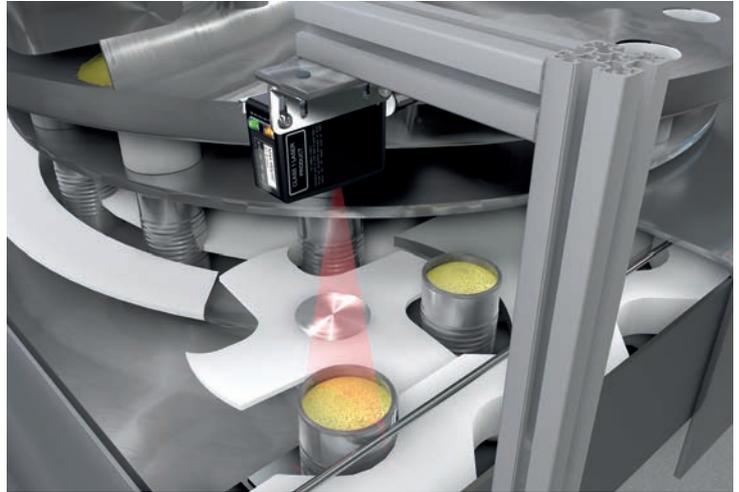
- Minimum, maximum, mean: minimum, maximum or average height of an object relative to the reference surface
- Delta height: difference between the maximum and minimum height
- Standard deviation: determination of the height value scatter around the mean value

AND THERE'S MORE

- Exact positioning of the objects is not necessary for reliable measurements
- High measuring accuracy even under changing ambient light conditions
- Calibrated sensor for fast installation and start up
- No evaluation devices or external software necessary

PRODUCTION MONITORING

e.g. precise level measurement of
solid material



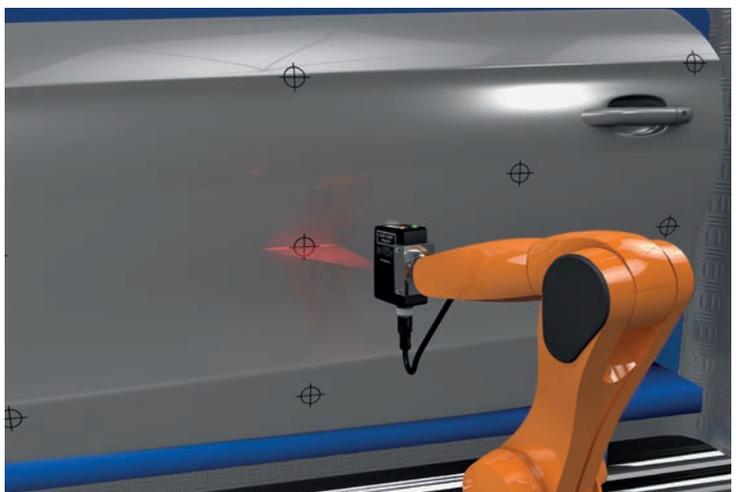
WEAR CONTROL OF TOOLS

e.g. saw blade, grinding disc, etc.



MEASUREMENT OF GLOSSY MOLDED PARTS

e.g. in the automotive industry



PT740020 / PT740021

GLOSSY OR EXTREMELY ROUGH

ADVANTAGES AND HIGHLIGHTS

- Stable, repeatable measurements also on unevenly glossy and extremely rough surfaces
- 3 integrated measuring modes: mean, minimum, maximum
- High resolution up to 2µm
- Ideal for demanding measuring and inspection tasks
- Measured value indication in millimeters
- Mean value of up to 600 measured values per measurement at a measurement frequency of up to 1540Hz



DISTANCE MEASUREMENTS WITH REAL ADDED VALUE

The PT740020 and PT740021 (operating distance 100mm to 150mm and 100mm to 500mm respectively) measure distances even in the case of extremely demanding surfaces, e.g. unevenly glossy, non-reflective metals or extremely rough surfaces, such as grinding disks.

Based on the light section method, the sensors determine up to 600 measured values per measurement on each object and use these measured values together with the integrated intelligent evaluation functionality to calculate the distance. Owing to the high resolution of up to 2µm and measurement frequencies up to 1540Hz, the laser distance sensors deliver extremely precise and consistently repeatable measurement results. And all this without having to use external software or perform complex conversions.

These true innovations in optical laser distance measurement are therefore ideal for a broad range of measuring and testing applications.

OVERVIEW OF MEASURING FUNCTIONS

- Distance minimum: distance to the nearest measurement point
- Distance maximum: distance to the furthest measurement point
- Distance mean: average distance to all measurement points

AND THERE'S MORE

- High measuring accuracy even under changing ambient light conditions
- Calibrated prior to shipping – fast installation and start up
- Compact solution without complex external software

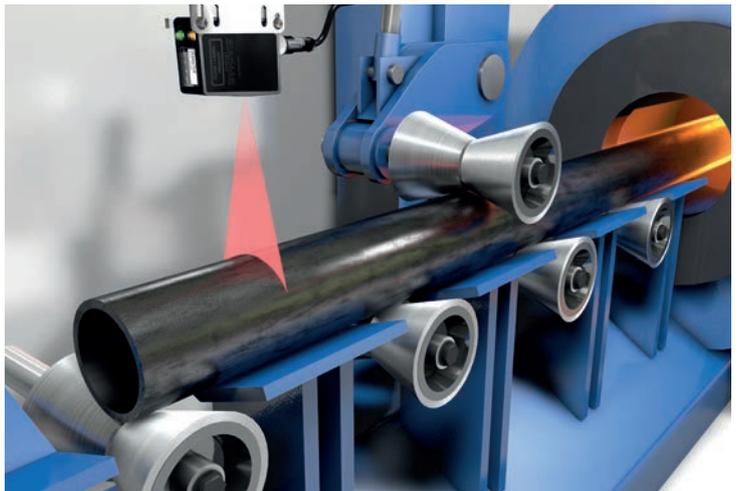
OPTIMUM POSITIONING

e.g. of yoghurt pots during filling



MEASUREMENT OF THE DIAMETER

e.g. of metal tubes



CENTER POINT DETERMINATION

e.g. as position check with insertion tasks



PY74002A**A WELL-ROUNDED CONCEPT FOR A VARIETY OF REQUIREMENTS****ADVANTAGES AND HIGHLIGHTS**

- Measurement of center point, diameter and outer position on round objects
- Suitable for outer diameters of 30mm to 130mm
- Degree of protection IP67
- 5 measuring modes in one device
- Automatic display of the measured values in millimeters
- Broad operating temperature range: -10°C to +50°C

**MEASUREMENT OF ROUND OBJECTS WITH A HIGH LEVEL OF FUNCTIONAL FLEXIBILITY**

The PY74002A measures round objects with an outer diameter of 30mm to 130mm and for this purpose provides five different measuring modes to ensure maximum versatility: center point, diameter, highest measurement point of an object (vertex), right outer position and left outer position.

The PY74002A also offers a high degree of flexibility with regard to installation – no reflector is needed, which means that the sensor can be installed at any position without automated production processes being obstructed.

Due to its broad operating temperature range from -10°C to +50°C, the light section sensor is also predestined for a wide variety of different applications in all conceivable branches and sectors of industry.

OVERVIEW OF MEASURING FUNCTIONS

- Center point: determination of an object's center point
- Diameter: measurement of an object's diameter
- Vertex: determination of the highest point of a round object
- Outer position: determination of the outer right or left position of an object

AND THERE'S MORE

- Measurement field restriction to suppress interfering objects
- Automatic object detection
- High measuring accuracy even under changing ambient light conditions
- Selectable precision mode

A LARGE NUMBER OF TASKS COVERED BY JUST FOUR SOLUTIONS

PY740020 / PY740021

Determination of the position of object edges irrespective of distance (edge position, width/gap of an object) without time-consuming sensor alignment. Up to 200 measurements per second. Operating distance 100mm – 150mm (PY740020) or 150mm – 250mm (PY740021). Ideal for position control and edge control and for checking object gaps.

PY740025 / PY740026

Height measurements irrespective of the object position with a total of five parameters. Instant evaluation in a wide range of applications. High flexibility with regard to the output of measured values.

Operating distance 100mm – 150mm (PY740025) or 100mm – 500mm (PY740026). Particularly suitable for „check and sort“ applications as well as many other quality assurance tasks.

PT740020 / PT740021

Reliable distance measurement even with demanding surfaces which are unevenly glossy (non-reflective) or extremely rough.

High resolution of up to 2µm and measurement frequencies up to 1540Hz. Operating distance 100mm – 150mm (PT740020) or 100mm – 500mm (PT740021). Ideal for measuring and testing applications, e.g. with glossy molded parts or objects with extremely rough surfaces.

PY74002A

Measurement of round objects with outer diameters of 30mm to 130mm with a total of five flexible measuring modes: center point, diameter, vertex of an object, right and left outer position. Operating distance 150mm – 250mm.

Specially developed for the flexible measurement of round objects. Also ideal for positioning and for determining the center point as a reference for surface treatment and inspection.





Lateral positioning of a light section sensor above an object at an angle of $\pm 30^\circ$.

GREATER POTENTIAL WITH MORE FEATURES

In addition to the described, device-specific functions, the multifunctional light section sensors also have a range of impressive features to provide even greater flexibility. All devices, with the exception of the PT740020 and PT740021, can also be positioned laterally above an object at an angle of $\pm 30^\circ$. This means more space when installing and during operation, e.g. if obstacles get in the way or if, for some other reason, it is not possible to position a sensor above a measurement object.

Furthermore, the measurement field can be restricted in order to suppress interfering edges or objects during measurement. In addition, all sensors are extremely robust (IP67), have a broad operating temperature range from -10°C to $+50^\circ\text{C}$ and are immune to changing ambient light conditions during operation.

The devices also provide added flexibility when it comes to the output of measured values: The results can be compared with the preconfigured values in the respective measuring mode and defined as the switching threshold or switching window. At the same time, the measurement results can be queried via the analog output and immediately shown in millimeters in the display.

PRECISE EDGE CONTROL IN HARSH ENVIRONMENTS

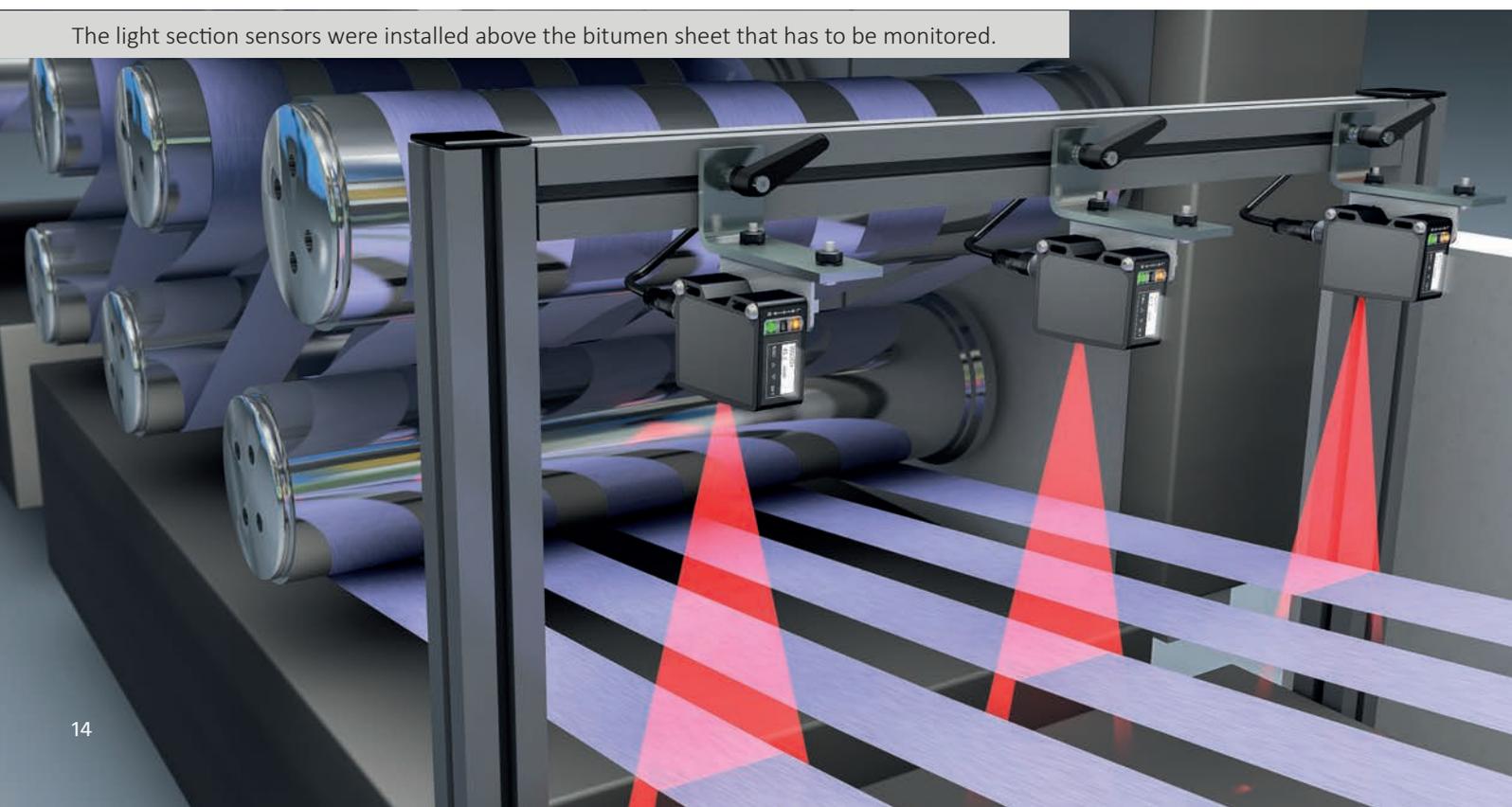
Bitumen sheets for roof coverings are being produced on a company's production line. Each sheet consists of a carrier layer which is first impregnated with bitumen, then given a bitumen coating on both sides and sprinkled with granulate. Before the sheets pass through a cooling zone, a film is applied so that the sheet does not stick together when rolled up during packing. As the production line has several guide rollers and drums, the edge of the sheet must be checked at various positions in order to ensure that the final product has a uniform coating.

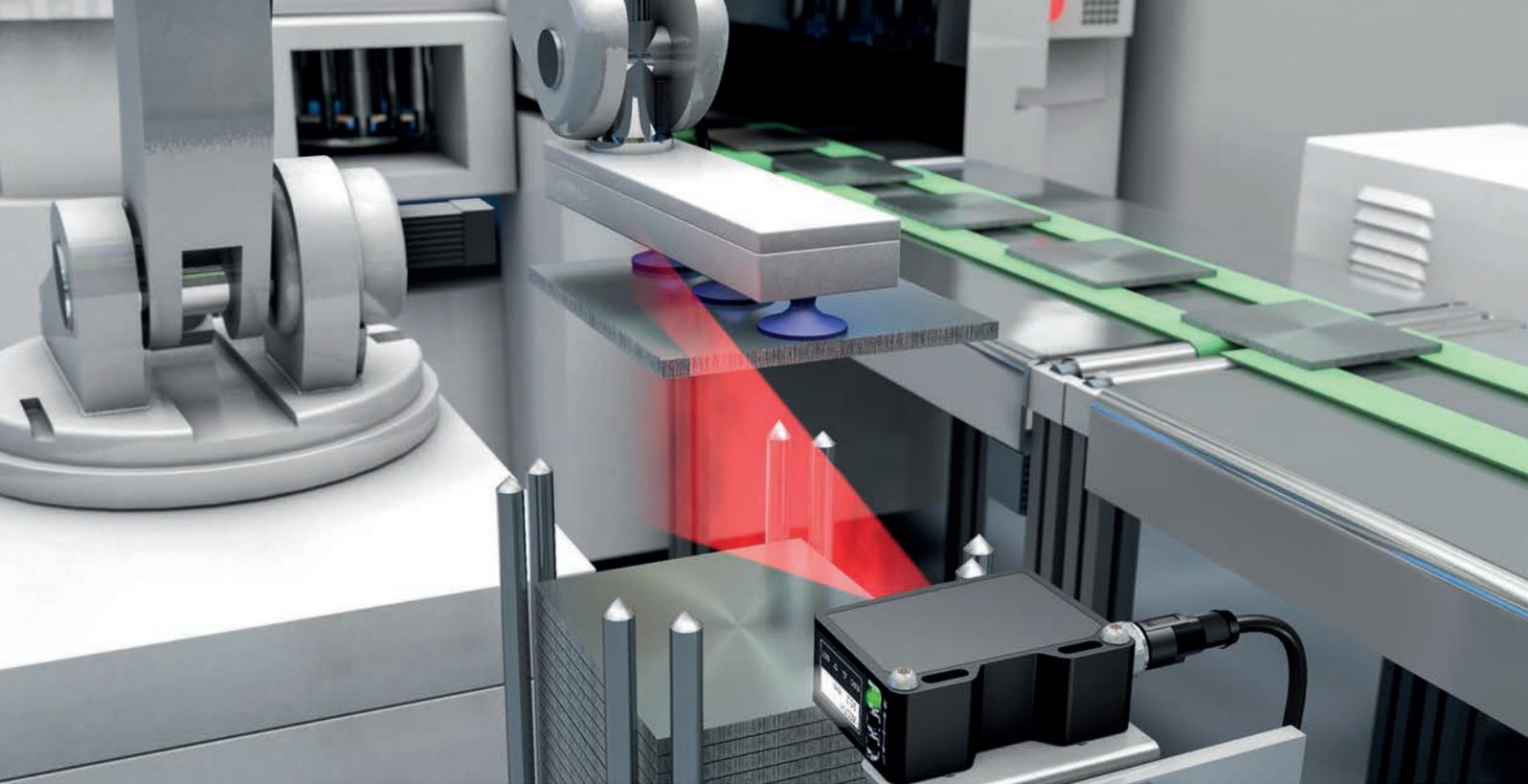
Previously, a number of line sensors with reflectors were used to perform this task. However, in the impregnation, coating and cooling zones, the reflectors located underneath the edge of the sheet were often soiled with liquid bitumen residue as well as granulate, and this repeatedly resulted in fault messages.

This problem was solved by replacing the line sensors with multifunctional light section sensors. The light section sensors with protection class IP67 and an operating temperature range up to max. +50 °C were installed above the guide rollers and drums to be monitored. The device's laser line is reflected by the bitumen sheet and reaches a two-dimensional optical receiver which enables precise mapping of the edge position. The position value is converted by the sensor into a so-called position-proportional analog signal and processed by the PLC (programmable logic controller) of the system for edge control. In this way, it was possible to implement an easy-to-use, cost-effective and above all highly precise edge control system on the bitumen sheet production line without the need for soiling-prone reflectors.



The light section sensors were installed above the bitumen sheet that has to be monitored.





The light section sensor was installed in such a way that it could laterally detect the lifted metal blank.

RELIABLE DOUBLE-SHEET CONTROL IN METAL PROCESSING

A supplier to the automotive industry processes (e.g. shapes) metal blanks for vehicle body components. For this purpose, a robot lifts a metal blank from a stack using a vacuum sucker and feeds the blank into a shaping press. As the metal sheets are coated with oil on both sides, several blanks can stick to each other when lifted from the stack of sheets. If this is the case, transport of the metal blanks must be stopped immediately in order to prevent major damage to the shaping die of the press.

When looking for a reliable sensor solution which would ensure safe processing during this phase of automated production, the supplier finally decided on a multifunctional light section sensor for double-sheet control.

The light section sensor was installed in the system in such a way that the sensor's laser line can scan the side of the metal blanks lifted by the robot. For technical reasons, however, the sensor had to be mounted at an angle of 20°. By measuring the edge width of the sheet, it is now possible to reliably determine whether, instead of one metal blank, the robot's vacuum sucker has picked up two or more sheets. If required, the sensor can also determine the exact number of sheets that have been picked up by the robot. Double sheet control can be performed either by outputting an analog signal which is evaluated by the PLC (programmable logic controller) of the system, or alternatively by defining switching thresholds which are within the tolerances required for control.



RELIABLE SEAL CHECKING: GAP DETECTION ON CARDBOARD BOX FLAPS

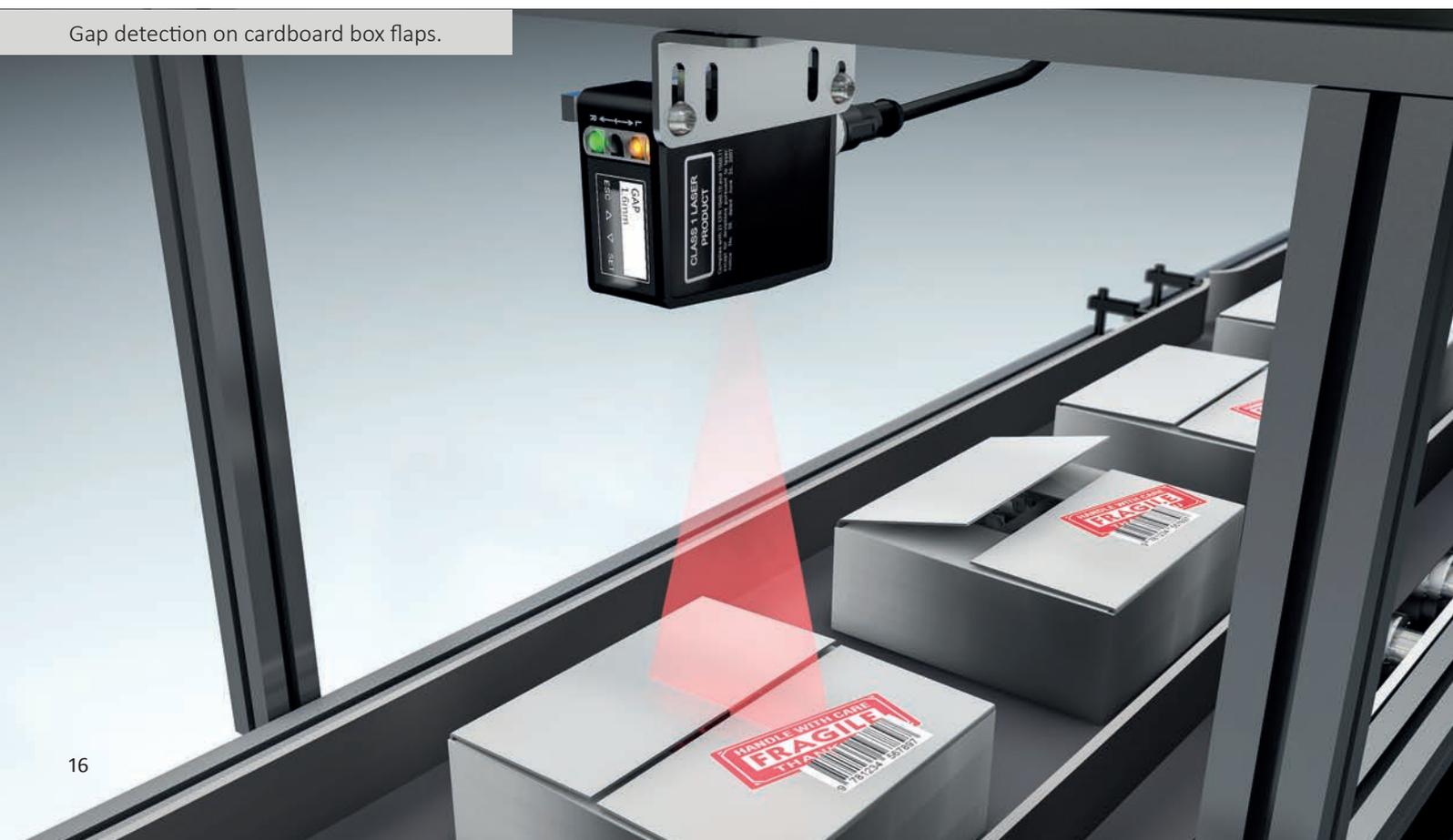
At a company, cardboard boxes in different sizes and heights are filled with products and then transported on a conveyor belt to the dispatch department. Each box needs to be checked to ensure that it is correctly sealed. The company previously used diffuse reflection laser sensors which determined the height of both box flaps in order to check whether they had been correctly sealed.

To be able to measure the height of the two flaps of a cardboard box for the sealing check, it was necessary to use two diffuse reflection laser sensors with which the measured values first had to be collected and then various measurement windows had to be defined for boxes of different heights. However, owing to the different box sizes, it was frequently the case that individual boxes were not at the center of the conveyor belt and their flaps were therefore outside the measuring range of the diffuse reflection sensors. When looking for a reliable solution which also had the necessary degree of flexibility to cope with the different cardboard box heights, the company decided on a multifunctional light section sensor.

Irrespective of the box height, this sensor allows a value including tolerances to be defined for the gap between the flaps. If this value deviates from the specifications, the incorrectly sealed box is regarded as NOK and automatically removed from the conveyor belt. The cardboard boxes can therefore be checked using just one light section sensor which can detect the object gap reliably even if the position of individual boxes on the conveyor belt varies. This solution has many advantages compared to the previously used diffuse reflection laser sensors: simpler both with regard to configuration and signal evaluation, and also more flexible and reliable in operation.



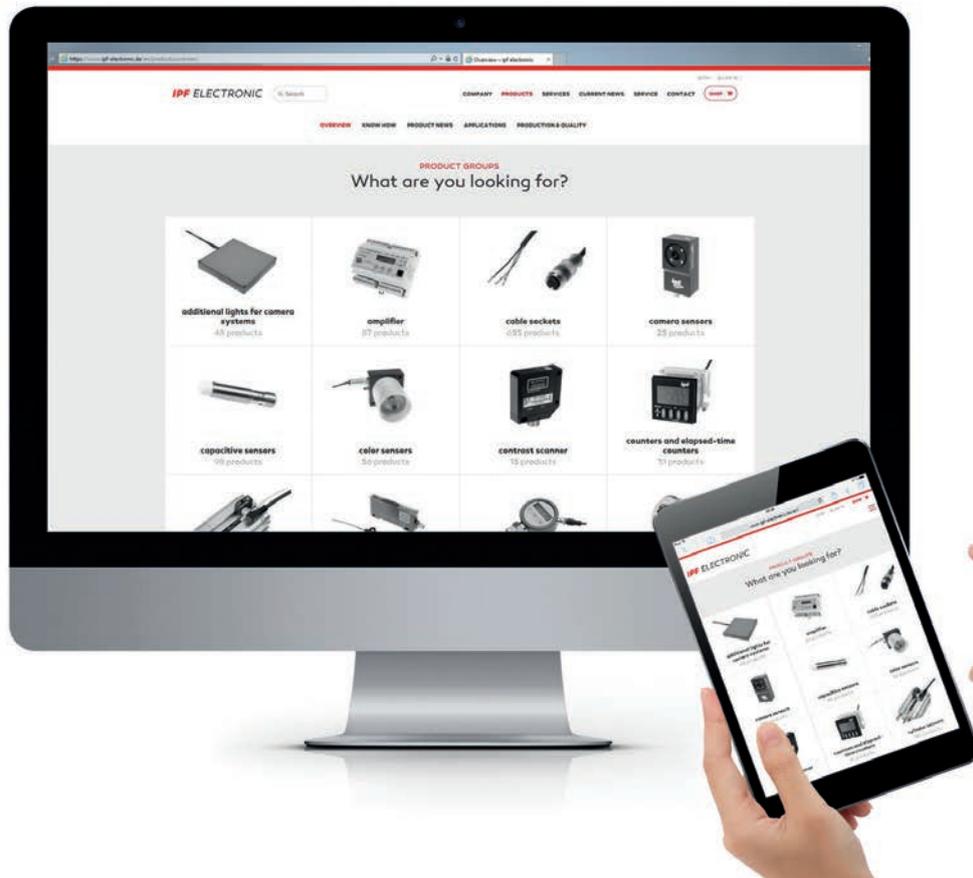
Gap detection on cardboard box flaps.



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