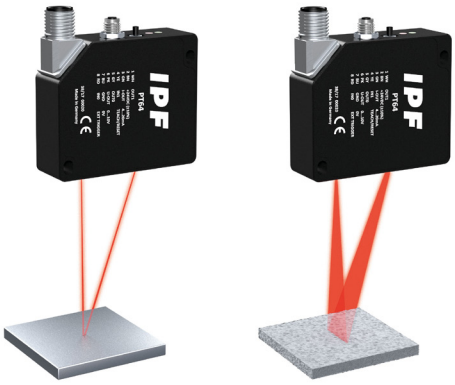
NO FEAR OF DIFFICULT SURFACES

WITH LASER POINT OR LASER LINE TO THE OBJECT

For distance measurement or positioning, there is a wide range of tasks in a wide variety of industrial sectors, which can be mastered above all with equally intelligent and flexible sensor technology. With the **PT64**, ipf electronic presents a new series of diffuse reflection laser sensors with triangulation for an almost color-independent detection of object surfaces. The potential that these devices offer in practice will be illustrated using concrete application examples. Within their device-specific measuring ranges, the diffuse reflection laser sensors with triangulation are available in two versions with laser dot or laser line, which differ only in the transmission optics.



The diffuse reflection laser sensors with triangulation are available with a laser dot (left) as well as with a laser line as transmission signal to reliably detect a wide variety of objects even with inhomogeneous or rough surfaces (right).

With a very small, precise laser beam as transmission signal, extremely accurate, pinpoint measurements can be made. The diffuse-reflection laser sensors with laser dot therefore allow, for example, distance measurement and positioning of even very small objects. In addition, these devices can be used, for example, to carry out highly accurate measurements at specific positions of components with complex geometries.

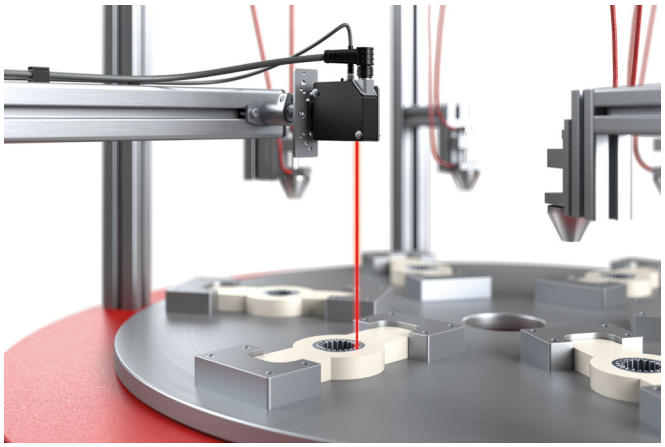
COMPENSATION OF „UNFAVOURABLE“ REFLECTION PROPERTIES

However, in applications where rough or inhomogeneous surfaces are to be measured (e.g. milled or roughened metal parts, castings, etc.), a point-shaped laser beam would sometimes be very strongly scattered and therefore hardly usable reflection signals or results would be obtained. For this reason, solutions with linear laser light beams are available within the **PT64** series. If such a laser beam reaches a rough or inhomogeneous surface, a large area is hit by the beam, which improves the reflection of the light towards the receiving optics of the sensor accordingly. The reflection properties of such object surfaces, which are rather „unfavorable“ for a point-shaped laser beam, are thus basically compensated by the devices with laser line. The many possibilities offered by the two technologies described are to be demonstrated by concrete application examples from practice.

PRECISE QUERY OF THE PRESS-IN DEPTH OF COMPONENTS

An automotive supplier presses a specific part into a vehicle component on a production line. The correct press-in depth of the components is to be checked, taking into account a previously defined tolerance range. From a cost perspective, vehicle components with incorrectly pressed-in parts should also be reworked if possible. To avoid costly processing of analog measurement signals, the control sensor system should ideally only provide switching signals. In order to realize the described task, the automotive supplier opts for a **PT64** with a laser dot, which precisely measures the distance of the pressed-in components from above.

To compensate for mounting inaccuracies, the sensor is taught via the integrated probe using a dimensionally accurate reference part in the production line. Thus, the reference dimension for the press-in depth of the components is quasi taken over into the current mounting situation of the sensor.



Precise inspection of the press-in depth of components via a **PT64** with a point-shaped laser beam.

CONSIDERATION OF TOLERANCES

With the help of a parameterization software, which is available free of charge for the **PT64**, a tolerance band is then laid around the teached reference value according to the tolerance specifications. The sensor has two digital switching outputs for evaluation, whereby output 1 carries a signal if the measured distance to the press-fit component is within the defined tolerance range.

The second switching output (alarm output ex works) has been set via the software so that it gives a signal if the offset is too small or if the tolerance range is exceeded. For a simple quality statement there are therefore three possibilities via the signal outputs:

/ Output 1 signal yes, output 2 signal no: press-in depth accurate
/ Output 1 signal no, output 2 signal yes: press-in depth not reached
/ Output 1 and 2 signal yes: press-in depth too high

ONE SOLUTION - MANY OPTIONS

With only one device of the **PT64** series, the automotive supplier can now check the press-in depth of a component and additionally evaluate, in terms of cost-efficient post-processing, whether the distance of an NIO component is above or below a defined tolerance band. While a diffuse-reflection laser sensor with triangulation with a laser dot has proven itself for simple processing of switching signals in the described application, another application from a metal processing company shows why the use of a **PT64** with laser line is recommended for very specific tasks.

CHECK WINDING DIAMETER OF COPPER WIRE

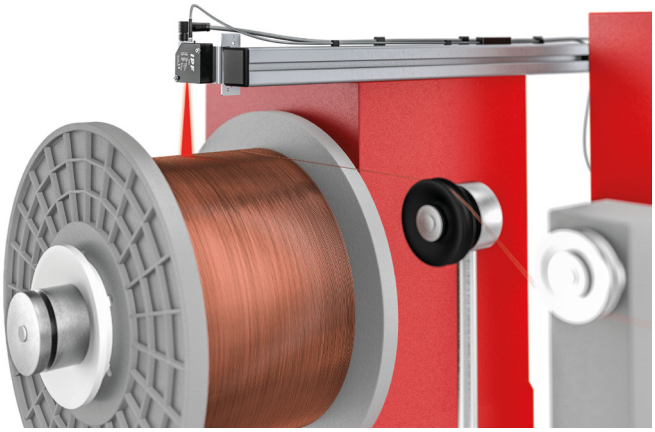
A pipe production plant produces copper wires with different diameters for the electronics industry. To obtain the required wire diameters, the copper wire on a spool is drawn on a machine through a so-called draw plate and then wound onto a second spool for shipping.

CHALLENGE GLOSSY, INHOMOGENEOUS SURFACE

In order to detect an idling of the spool with the raw material during wire drawing, the speed of the drawing machine must be throttled or the machine must be stopped completely when a specific winding diameter is reached on the raw material spool. For this purpose, it is necessary to measure the winding diameter on the respective spool. Not an easy task, given the usually very shiny material copper, which also does not produce a smooth surface on the raw material coil for problem-free measurement.

EXACT SIGNALS FOR THE PLC

For this reason, the pipe production plant uses a **PT64** with laser line to continuously determine the winding diameter of the copper wire coils in question. Due to its linear laser beam, the sensor is able to detect even the inhomogeneous surface of the copper wire on the coil and thus permanently check the winding diameter. The distance information recorded by the device is transmitted via the analog signal of 4 to 20mA to the machine control system, which controls the throttling of the drawing speed or the stop of the system depending on the respective sensor signal.



Even shiny, inhomogeneous surfaces such as a copper wire on a spool can be reliably detected with a **PT64** with laser line. In this application, the distance information is transmitted via the analog signal to a PLC in order to reduce the drawing speed of a machine or to stop the machine depending on the respective sensor signal.

ⓘ Via the line to the destination

The devices of the **PT64** series operate according to the triangulation method, whereby the distance to an object is measured indirectly via the angle of incidence of the light signal reflected from the object's surface. To determine the angle of incidence, the receiver (in the figure on the right) has a line detector consisting of a number of individual receiving elements which together form a receiver line. The position within this receiver line at which the light beam reflected from an object strikes a receiving element or several receiving elements depends on the angle of incidence of the laser beam. The distance and thus the distance to an object can be determined via this angle of incidence.

ALWAYS OPTIMUM TRANSMISSION POWER

Thanks to the integrated, intelligent control circuit for power tracking, the sensor also flexibly adjusts its transmission power during the detection depending on the reflection behavior of the copper wire. If the reflection of the line-shaped transmission signal on the wire becomes weaker, the power of the transmitting light source increases. If the reflection is stronger, the signal power is reduced accordingly. By using the **PT64**, the pipe production plant can now reliably check the winding diameters of its raw material coils and flexibly adjust the speed of the drawing machine via a PLC signal or stop the plant even before a copper wire coil is completely unwound.

METROLOGICAL SPECIALITY

A metrological speciality of the diffuse-reflection laser sensor with triangulation **PT64** from ipf electronic is the so-called drag pointer function, which is available with the help of the software via the analog outputs of the devices. What this special function is all about is illustrated by a concrete application example of a pipe drawing factory that wants to check the ovality of pipes with a specific diameter.

The drag pointer function can be used to check the ovality of pipes with a specific diameter.

To prepare the ovality check, the drag pointer function „MIN-MAX“ is activated via the parameterization software. For the test, the inserted pipe is rotated 360° under the sensor, which is communicated to the **PT64** via a digital switching signal on signal input 1. During the time this control signal is present, i.e. for one complete rotation of the test part or pipe, the laser sensor continuously collects measured values. From the recorded series of measurements, a maximum and minimum value is determined after the control signal at input 1 has ceased to be present and the difference between the minimum and maximum value is then output via the analog output. The difference determined for the test part is quasi the measure for the ovality.

The analog or differential signal is transmitted to the higher-level control system and evaluated there. If the signal is so large that it exceeds the range for the permissible maximum ovality, the pipe in question is rejected. Before the next pipe is evaluated, the **PT64** receives a switching signal via the second digital control input, which deletes the last difference value formed. Using the special drag pointer function of the **PT64**, the pipe production plant is now able to control the ovality of all pipes with a uniform diameter very easily, conveniently and above all consistently.

VERSATILITY THANKS TO SENSOR TECHNOLOGY PLUS SOFTWARE

The application examples give an impression of the versatility of the new series of diffuse-reflection laser sensors with triangulation (Fig. 5). The free, powerful parameterization software for the **PT64**s significantly expands the performance spectrum of the sensors. The devices of the series (protection class IP67) cover measuring ranges from 21mm to 1000mm and have resolutions from 6µm to 250µm.