DIFFUSE REFLECTION LASER SENSORS
WITH TRIANGULATION

New visions in distance measurement and positioning

IPF ELECTRONIC

YOU MAKE THE BEST DECISION BY SOME DISTANCE …

…when you invest in a **PT64** series diffuse reflection laser sensor with triangulation from ipf electronic. With it, you are opting for an acutely efficient solution in terms of distance measurement and positioning, with extreme flexibility in applications. When two device series for distance measurement which have been proven for a long time such as the **PT65** and **PT66** are replaced by a new series for the almost color-independent detection of object surfaces, this can only mean one thing: a significant technological advancement with considerable added value for the user.

Loosely based on the idea of turning two into one, the mechanically identical **PT64** sensors with only slightly larger installation depth, not only replace the previous diffuse reflection laser sensors of the **PT65** and **PT66** model ranges, but actually combine three devices into a single robust industrial solution: an analog sensor, a switching sensor and a diffuse reflection contrast sensor.

An additional advantage: Thanks to the free software included in the scope of delivery, the range of performance of the **PT64** is enhanced much further. Many new perspectives for the exceedingly flexible use of these diffuse reflection laser sensors with triangulation from ipf electronic in your applications. Prepare to be impressed!

DOWN THE LINE TO THE TARGET
DISTANCE MEASUREMENT AND POSITIONING WITH TRIANGULATION

Devices from **PT64** series are based on the triangulation method. In this process, the distance to an object is measured indirectly via the angle of incidence of the light signal reflected from the object.

In order to determine this angle of incidence, the receiver of the diffuse reflection laser sensor with triangulation has what is referred to as a line detector, which consists of a large number of individual receiving elements and which, when brought together, form a kind of receiver line. The position inside the receiver line, at which a laser beam reflected from an object strikes a receiving element or several receiving elements, depends on the angle of incidence of the laser beam. The space from and thus the distance to an object can be determined by means of this angle of incidence.

Intelligent control circuit for nearly all surfaces
The **PT64** diffuse reflection laser sensors with triangulation feature an intelligent control circuit which regulates the power of the transmission signal depending on the reflection properties of an object's surface and the quality of the receiver signal. To put it simply: The power of the transmitting diode increases for dark surfaces, while decreasing for lighter objects.

Alarm function instead of guesswork
The **PT64** diffuse reflection laser sensors with triangulation contain a special alarm function. This is triggered if the limits of transmitting power, and thus of the control circuit, are reached when surfaces are too light or too dark, or if the sensor optics are too heavily soiled. The sensor also triggers an alarm when the permissible measuring range is exceeded.

INSTANTLY IN THE IMAGE – INTEGRATED STATUS INDICATORS

The **PT64** sensors include two LEDs as status indicators, whereby one indicator as a tricolor LED (red, green and white) can deliver three different pieces of information simultaneously.

LEFT LED

The left LED indicates, where the measured value is in relation to the teached tolerance range.

/ LED GREEN

If the status indicator is green, the measured value of the **PT64** is in the pre-defined tolerance window.

/ LED RED

If the left LED lights up red, the measured value of the **PT64** is out of the pre-defined tolerance window.

/ LED WHITE

A white status indicator indicates to the user that the measured value detected by the diffuse reflection sensor is outside the device measuring range or the transmitting power has reached its maximum (alarm).

RIGHT LED

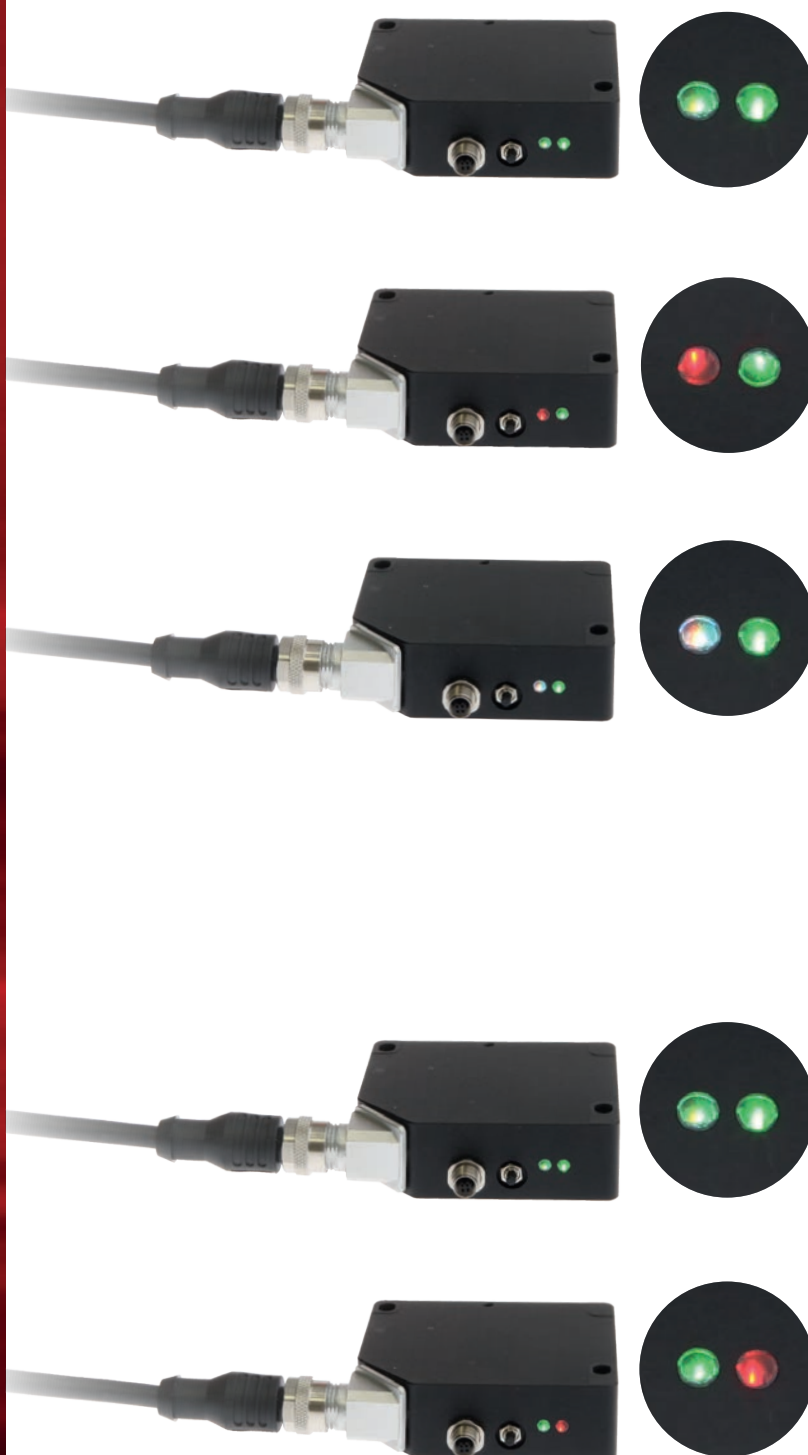The right LED indicates the sensor's operational state.

/ LED GREEN

If the status indicator is green, the **PT64** is in the regular operational mode.
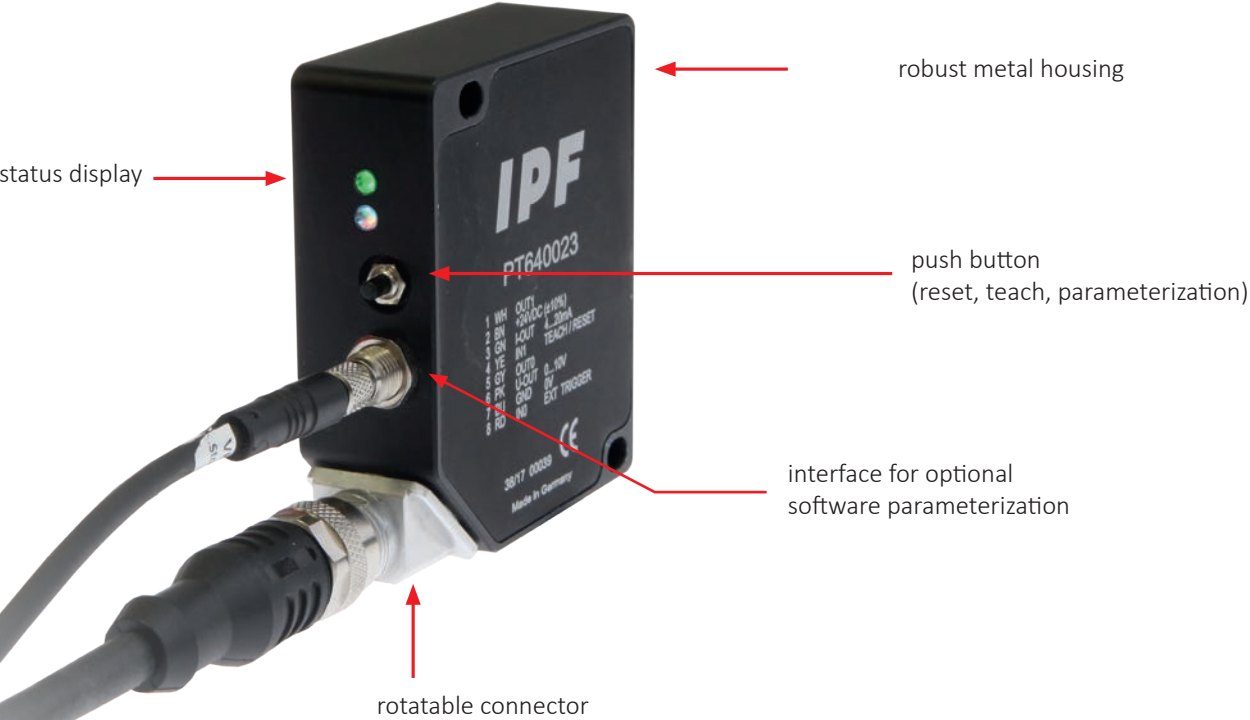

/ LED RED

If the right LED is red, the sensor is in the teach-mode.

ADVANTAGES FROM ALL PERSPECTIVES
### OUTER VALUES THAT IMPRESS ALL-ROUND

Regardless from which angle you consider a **PT64**, the devices with laser class 1 or 2 and with protection class IP67 impress from every viewpoint, even from the outer values. These include the integrated LED status indicators, 2 digital inputs, 2 analog outputs (0–10V / 4–20mA) and 2 digital outputs, which, with the software for the **PT64**, offer interesting options. Particularly striking is the rotatable angle plug.

robust metal housing

status display

push button
(reset, teach, parameterization)

interface for optional
software parameterization

rotatable connector

No greater flexibility exists: The connector of the **PT64** can be rotated up to 180°.

ROTATABLE CONNECTOR
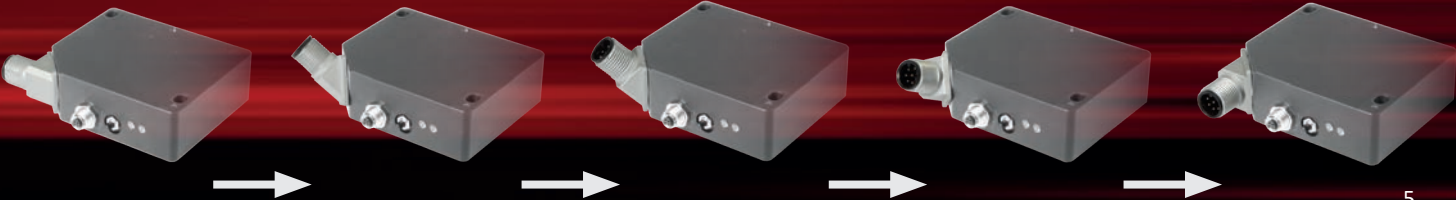
TO THE OBJECT WITH A SPOT OR A LINE?
## THE REFLECTION PROPERTIES DECIDE

Within their device-specific measuring ranges, the **PT64** series of diffuse reflection laser triangulation sensors offer two solutions for selection – one version with laser spot and one with laser line – which differ solely in terms of the transmission optics.

The laser technology delivers a key advantage, because with a very small, precise laser beam as a transmission signal, extremely exact, pinpoint measurements can be performed. We have conceived the device series with a point-shaped transmission signal for such applications. The diffuse reflection sensors of this series enable distance measurement and positioning, for example, even with very small objects. Furthermore, highly precise measurements of components with complex geometries in specific positions, for example, can be achieved with these devices.

There are of course more and more applications in which rough and uneven surfaces are to be measured (e.g. milled or scrubbed metal parts, cast parts or layers of metal wire on coils, etc.). From time to time, a point-shaped laser beam would be heavily scattered on such object surfaces, or those of a similar nature, thus delivering results which can barely be used.

For this reason, in addition to the **PT64** with laser spot, we are offering a separate series with laser line. When a line-shaped laser beam hits a rough and uneven surface, a larger area is scanned by the beam, which improves the reflection of light toward the sensor and therefore the receive signal of the diffuse reflection sensor. The reflection properties of such object surfaces which have until now been unfavorable for a point-shaped laser beam, are thus somewhat compensated for with the devices with laser line.

With unfavorable reflection properties, the laser line shows its strengths.
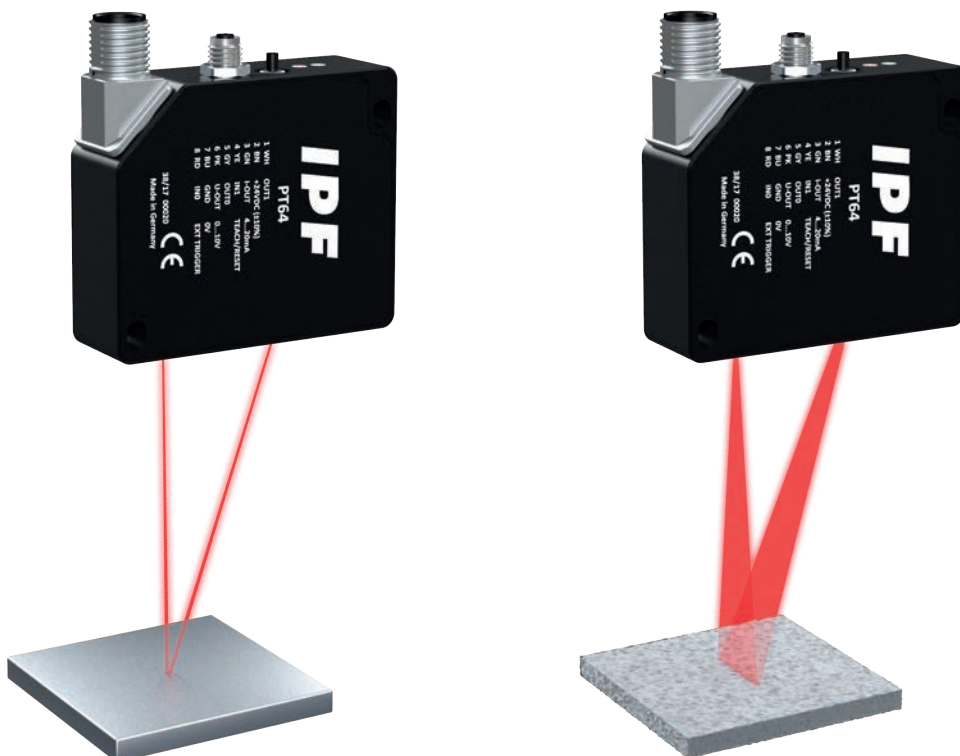
A LOT OF FUNCTIONALITY FROM THE VERY BEGINNING
CONNECTION AND START UP MADE EASY

ADVANTAGES AND HIGHLIGHTS

| Almost color-independent detection of object surfaces
| All device types optionally with laser spot or laser line
| Three devices in one solution: an analog sensor, a switching sensor, a diffuse reflection contrast sensor
| Two analog signals 0–10V / 4–20mA
| Measuring range of 21mm to 1.000mm
| Resolutions from 6µm to 250µm
| Tolerance band and measuring range monitoring
| Status indication through two integrated LEDs

GET STARTED INSTANTLY WITH LASER SPOT OR LASER LINE

Straight upon delivery, the devices of the **PT64** series provide a large number of basic functions, so that the diffuse reflection laser sensors with triangulation are ready for operation in no time. As a factory default, all **PT64**s supply a distance signal based on the entire measuring range of the respective device type.

The diffuse reflection sensors provide two analog signals 0–10V and 4–20mA and various measuring ranges, whereby the shortest measuring range is 21mm to 45mm, and the largest spans from 150mm to 1,000mm. Moreover, depending on the device type and therefore the measuring range, the diffuse reflection sensors achieve resolutions of 6µm to 250µm with laser spot and laser line.

Determine start and end simply with the push of a button
With the integrated teach button, the user is able to set as new the start and end point of the measuring range within the measuring range limits specified by the corresponding device. For shifting the measuring range limits, there is a time window of 5 minutes from the point of connecting the diffuse reflection sensor to the supply voltage. This time window is intended to protect the device from unauthorized or unintended tampering.

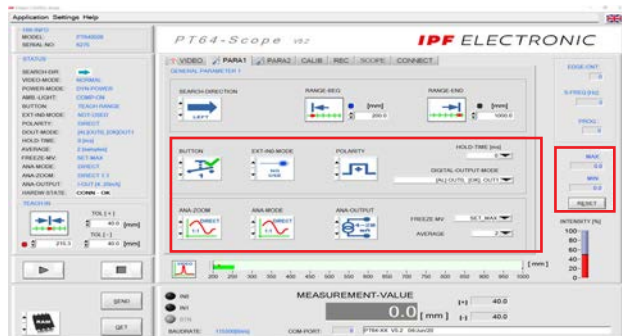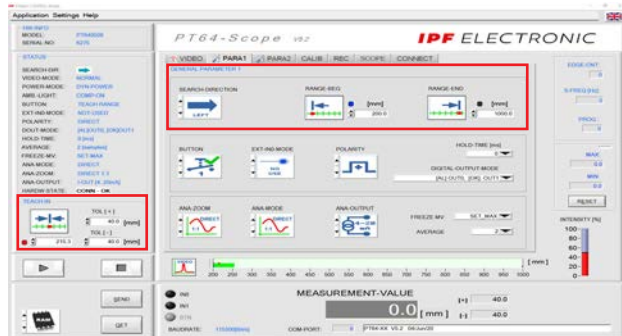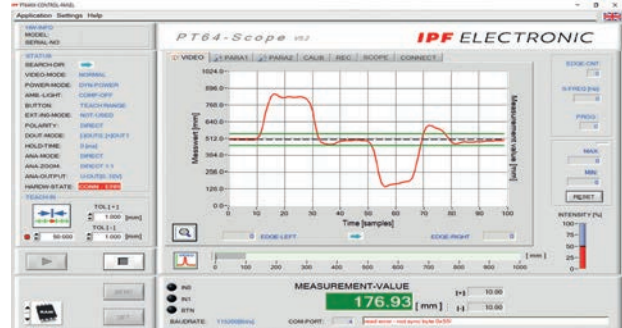## *SIGNIFICANT*
ADVANTAGES
IN PRACTICE
Diverse benefits due to intelligent software

SEEING WHAT
HAPPENS

DETERMINING WHAT
HAPPENS

KNOWING WHAT
## *HAPPENED*

SENSOR FUNCTIONS
THROUGH SOFTWARE

SEEING WHAT HAPPENS

In some applications, it is beneficial to see precisely how strong or weak the reflectivity of an object surface is in order to be able to assess more precisely the signal quality of a diffuse reflection laser triangulation sensor for distance measurement or positioning.

The free software for the **PT64** series is extremely useful in this regard, since it displays the surface reflection signal impinging on the line detector of the diffuse reflection sensor, amongst other things. Due to this exact ''optical feedback'' to the receiver side of the device, the user always instantly recognizes how good or bad the signals to be processed are, and the user can strategically respond to this, if necessary. Since the software for the **PT64** series in practical use also displays the control reserve which is still available, the diffuse reflection sensor can always be optimally configured for the specific application in hand.
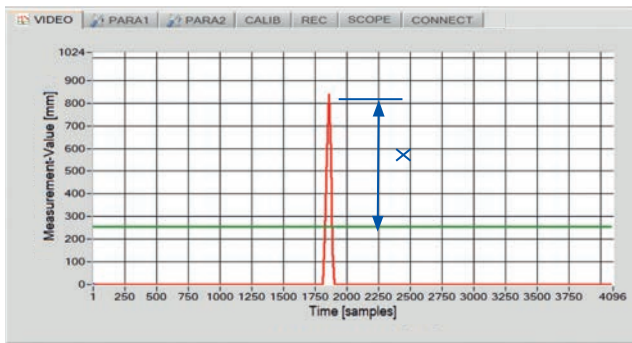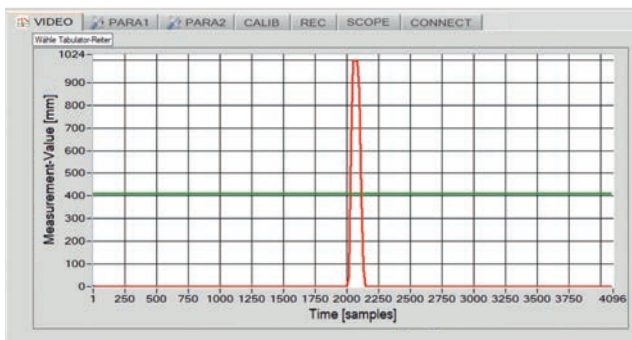
SIGNAL STRENGTH
OPTIMAL
Transmission power and exposure time are optimally adapted to the reflectivity of the object surface. X indicates the existing control or soiling reserve.
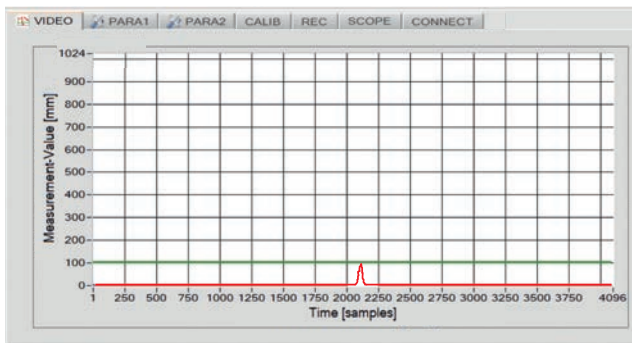
SIGNAL STRENGTH
TOO LOW
The strength of the received signal is too low due to the poor reflection behavior of the object surface. For an evaluation, the transmitting power or the exposure time must be increased.

SIGNAL STRENGTH
TOO HIGH
The received signal strength is too high. For an evaluation, the transmitting power or exposure time must be reduced.

DETERMINING WHAT HAPPENS –
DIGITAL INPUTS

Do you want to determine precisely what happens during measurement detection and evaluation? The software for the **PT64** series keeps extremely useful functions ready for the application-specific configuration of the device inputs and outputs.

DIGITAL INPUT 1 –
ONE INPUT, FOUR FUNCTIONS:

/ **NO-USE:** By selecting this function, the input is deactivated. The sensor continuously detects measured values once it is connected to the voltage supply.

/ **TRIGG – IN0 L/H:** This option enables an external, edge-controlled triggering of measured value detection and evaluation through the digital input in order to perform event-controlled measurements, for example. A new measured value is generated with every low/high edge.

/ **TRIGG – IN0 HIGH:** If the setting is activated, the external triggering of the measured value evaluation occurs through a high level. The **PT64** measures for as long as the 24V signal is present at the input.
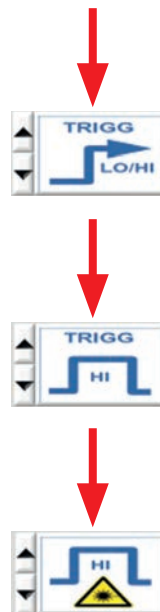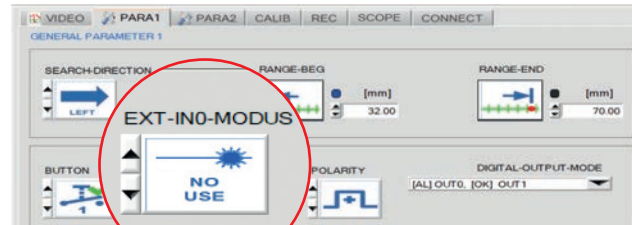
/ **LASER ON – IN0 HIGH:** Through this function, the laser transmitting diode of the diffuse reflection sensor can be activated/deactivated, in order to switch off the laser beam of the transmitter during maintenance work, for example.

DIGITAL INPUT 2 –
## YOU HAVE A CHOICE:

/ **Teach function:** The **PT64** is teached directly through the input without having to press the integrated device teach button.

/ **Reset function:** The current measured value is reset. This function is useful for using the slave pointer function, for example. More on this on page 11.

In addition to the two digital inputs, all **PT64** devices have two anaolg and two digital outputs, which can also be specifically configured via the software.
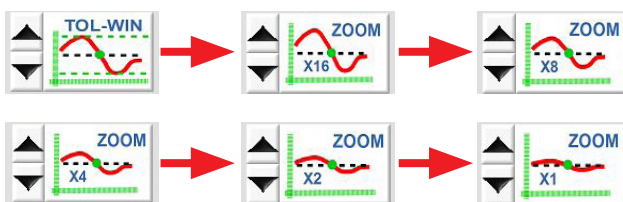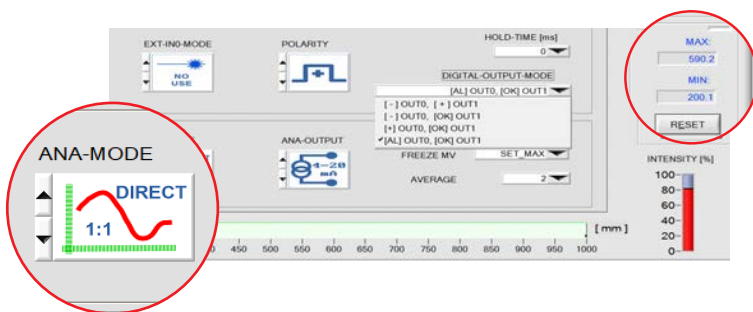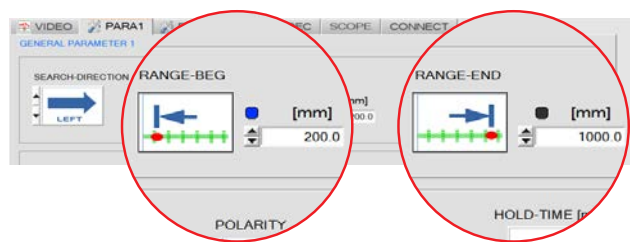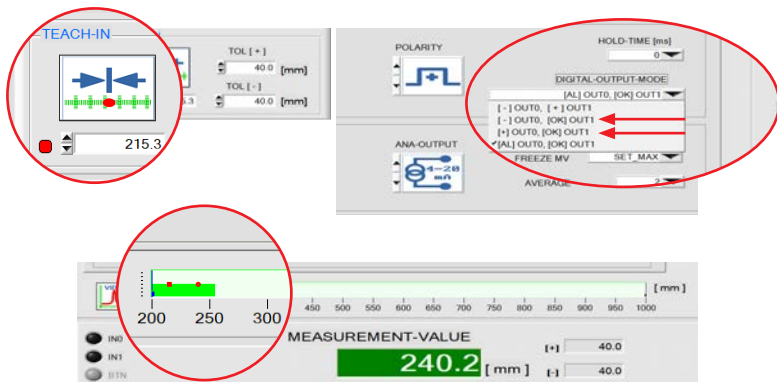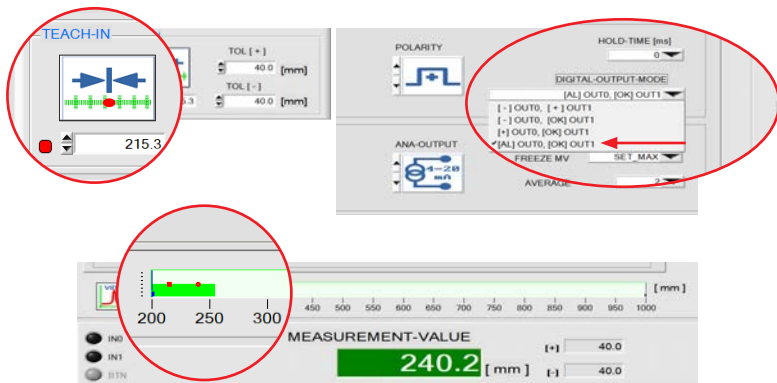
DETERMINING WHAT HAPPENS –
ANALOG AND SWITCHING OUTPUTS

SWITCHING OUTPUTS:

LIMIT VALUE FUNCTION
A limit value or switching point can be monitored for transgressions (over/under) through a digital output with this function. An alarm signal is also available through the second digital output.

LIMIT RANGE MONITORING
A classic application for this function is checking a component height within a pre-defined tolerance range, for example. In such instances, you could check whether the current distance measured value is in the pre-defined tolerance window/ range through a digital output. If this is not the case, the signal of the second output permits a message on the measured value deviation (extent of excess or insufficiency). The advantage? The dimensional accuracy of a component can be assessed using two digital signals (see application example on page 16).

ANALOG OUTPUTS:

CONSISTENTLY REPRODU-CIBLE MEASURING RANGE VALUES
By entering specific final values for the measuring range limits for the analog outputs, the sensor can be ideally adjusted to the requirements.

SLAVE POINTER FUNCTION
A measurement-related feature is the so-called slave pointer function, which can be activated for the analog outputs. In this function, the analog outputs output the highest (max.) and lowest (min.) distance measured value across a measuring cycle. A difference value can be determined from both results in order to obtain a limit value, for example. Why this function might be of benefit in practice is exemplified in the application example on page 18.

KNOWING WHAT HAPPENED

If you do not just want to see and determine what is happening, but also know what happened, you get a simple and convenient solution for this with the free software, with which you can save a lot of time and even more work.

ALL PARAMETERS ALWAYS AVAILABLE

All function-related parameters of a **PT64** can be read and saved to a PC or external data medium application-specifically as a data record using the software. As a result, all relevant parameters are always reproducible and available at any time.

NO TIME-CONSUMING RECONFIGURATION

If a diffuse reflection sensor needs to be replaced, the saved parameters of a specific measurement task can be transmitted to the new device simply via the software. Complex reconfigurations when replacing devices, and thus essentially unnecessary production standstills, are therefore a thing of the past. At the same time, the availability of machines and systems increases – Costs fall, productivity grows.
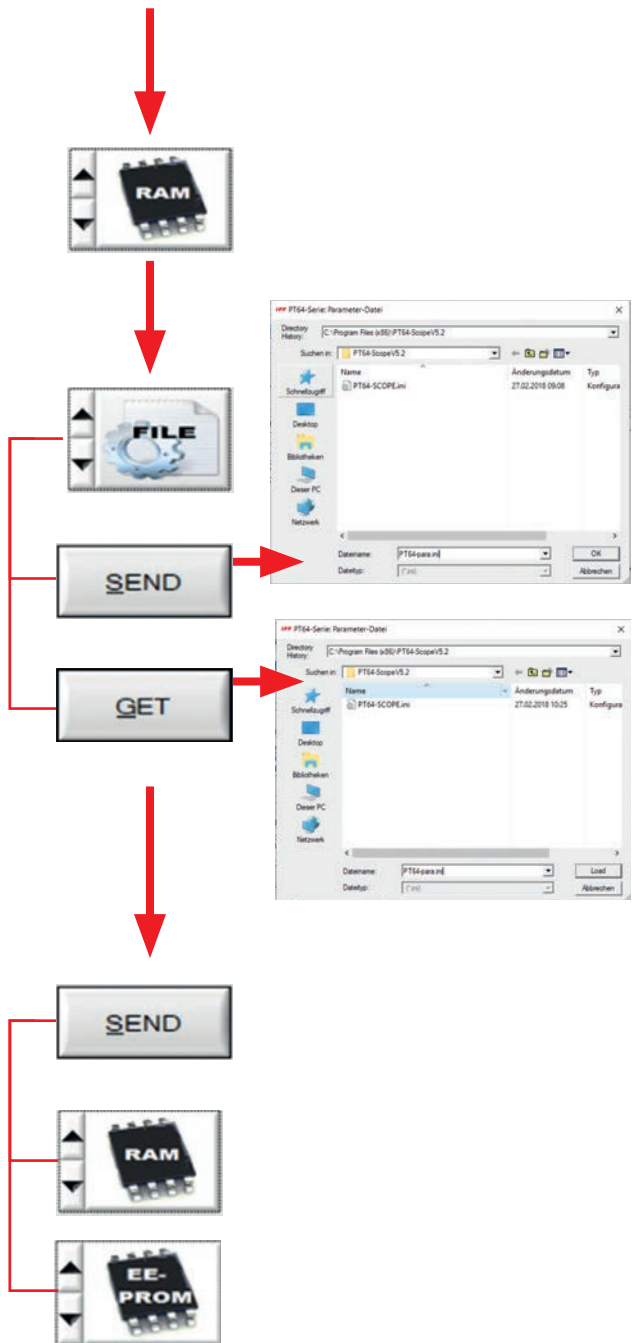
www.ipf-electronic.com
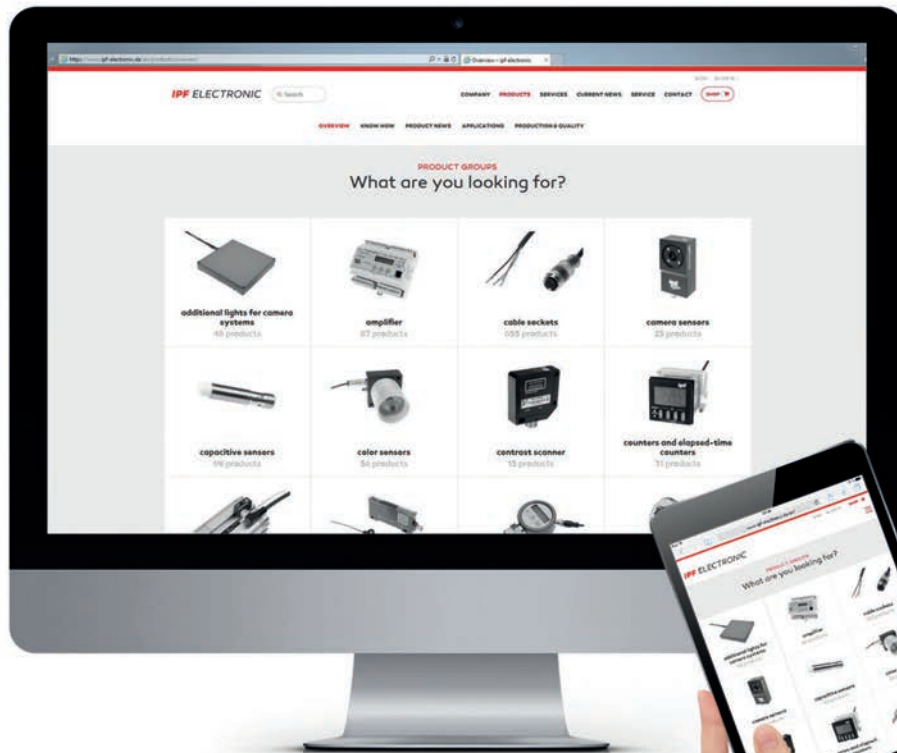
WITHOUT CHANGE THERE IS NO DEVELOPMENT

And this is why we completely redesigned our website for you. Our product search, for example, provides a quicker and easier orientation now, either via the quick search function or via the product overview that is ordered alphabetically by product group.

By clicking on a product group, you have the possibility to further narrow your product search using various filter functions. Besides, you can systematically compare products to find your solution with just a few clicks. Moreover, you receive valuable additional information in form of white papers, application examples or product news, in which our developers present new products based on specific customer requirements and applications.

LASER POINT
ø 0.3mm

- Max. measuring frequency (normal mode) 2kHz
- Max. measuring frequency (fast mode) 3.3kHz

PT640020

Measuring range 21 to 45mm
Laser class 1
Resolution 6µm

PT640021

Measuring range 32 to 70mm
Laser class 1
Resolution 10µm

PT640022

Measuring range 42 to 120mm
Laser class 1
Resolution 20µm

PT640023

Measuring range 50 to 200mm
Laser class 1
Resolution 40µm

PT640024

Measuring range 60 to 300mm
Laser class 1
Resolution 60µm

PT640025

Measuring range 100 bis 600m
Laser class 2
Resolution 150µm

PT640026

Measuring range 200 to 1.000mm
Laser class 2
Resolution 250µm

PT643020

Measuring range 21 to 45mm
Laser class 1
Resolution 6µm

PT643021

Measuring range 32 to 70mm
Laser class 1
Resolution 10µm

PT643022

Measuring range 42 to 120mm
Laser class 1
Resolution 20µm

PT643023

Measuring range 50 to 200mm
Resolution 40µm

PT643024

Measuring range 60 to 300mm
Laser class 2
Resolution 60µm

PT643025

Measuring range 100 to 600mm
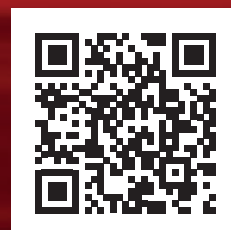Laser class 2
Resolution 150µm

PT643026

Measuring range 200 to 1.000mm
Laser class 2
Resolution 250µm

LASER LINE
0.3 x 3mm

- **I** Max. measuring frequency (normal mode) 2kHz
- **I** Max. measuring frequency (fast mode) 3.3kHz

QUERY THE PRESS-IN DEPTH OF A COMPONENT

A supplier presses a component into a vehicle component. During production, the correct press-in depth of the components must be checked in accordance with a defined tolerance range. From a cost perspective, the components with incorrectly pressed-in components should also be reworked. For the prevention of complex processing of analog measurement signals, the monitoring sensor technology should only supply switching signals.

To this end, a device of the **PT64** series is used with laser spot, which detects the distance of the pressed-in components from above. To compensate for installation inaccuracies, the sensor is taught in through the integrated button using a dimensionally stable reference part in the system. As a result, the reference dimension is effectively adopted for the press-in depth of the components in the current installation situation of the sensor. With the help of the configuration software, a tolerance band is subsequently placed around the taught reference value in accordance with the tolerance specifications. For evaluation purposes, the sensor has two digital switching outputs, whereby output 1 carries a signal if the detected measuring distance to the press-in component is within the defined tolerance range.

The second switching output (alarm output as factory default) has been set up with the software so that it carries a signal if the press-in depth is too short or if the tolerance range is not reached. This results in three possibilities for a simple quality message via the signal outputs.

/ Output 1, signal yes; output 2, no: Press-in depth dimensionally stable

/ Output 1, signal no; output 2, yes: Press-in depth not reached

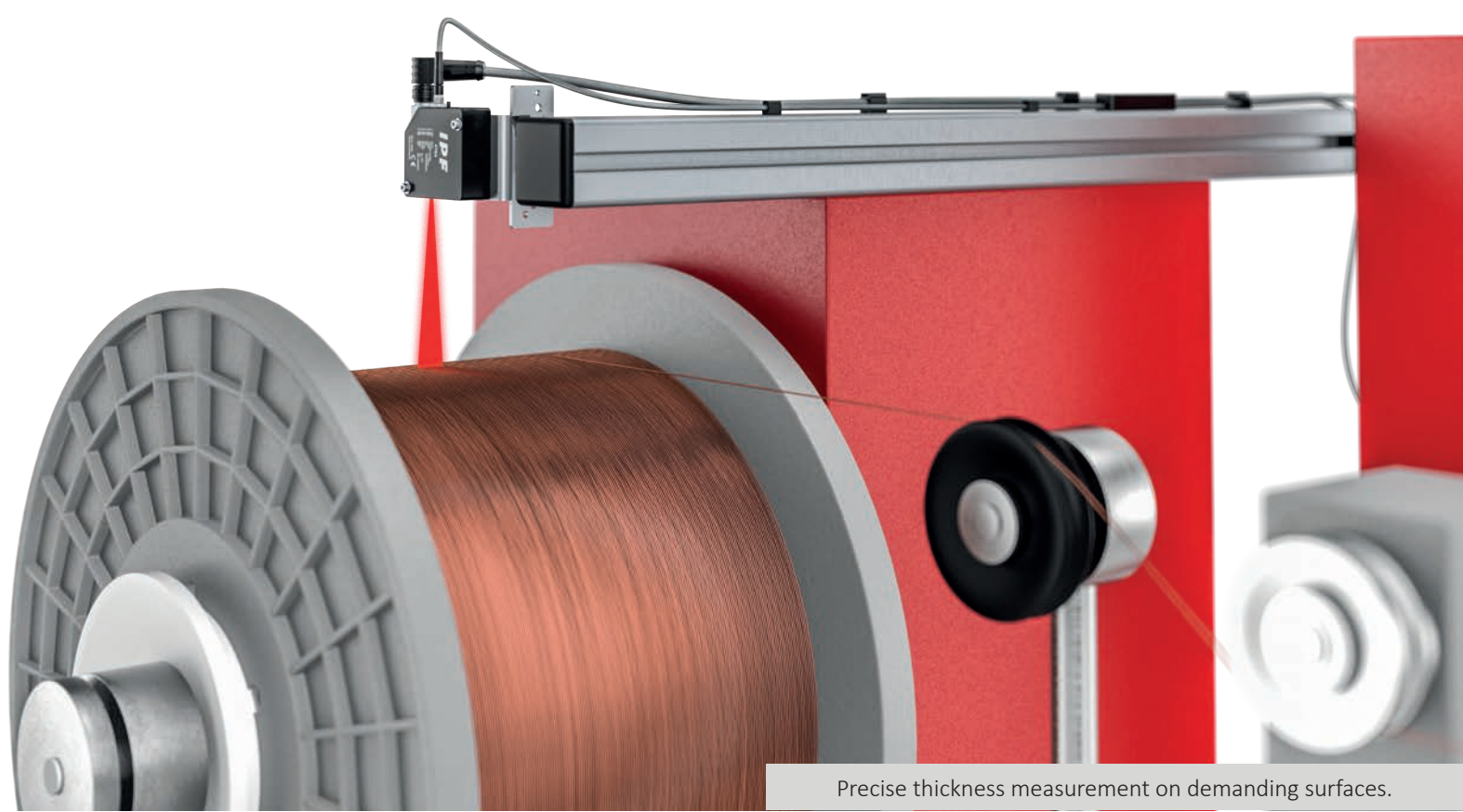**/** Outputs 1 and 2, signal yes: Press-in depth too large

The supplier can now check the press-in depth of a component with just one device and also assess in terms of reworking whether or not the distance of a NOK component is above or below a defined tolerance band.

Exact determination of the press-in depth of a component.
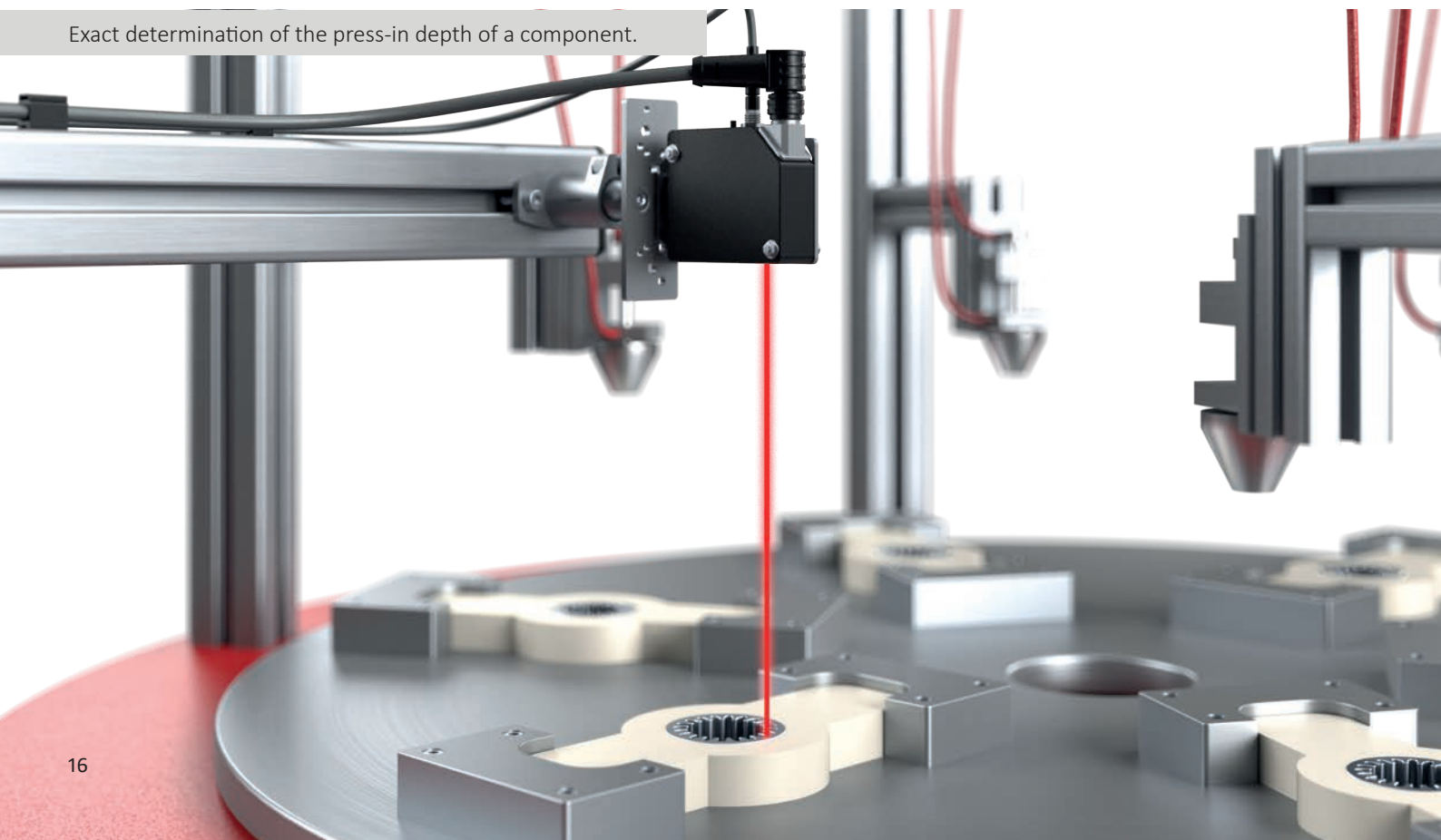
Precise thickness measurement on demanding surfaces.

CHECKING THE REEL DIAMETER OF COPPER WIRE COILS

In a wire-drawing plant, copper wires with different diameters are produced for the electronics industry. In order to obtain the required wire diameter, a copper wire on a coil on a machine is pulled through a so-called drawing die and then wound onto a second coil for dispatch

For the coil with the raw material not to run empty during wire drawing, the speed of the drawing machine must be throttled or the system must be stopped once a specific reel diameter is reached on the raw material coil. This reel diameter should therefore be measured on the relevant coil. No easy task, when you consider that copper is generally a material that glistens considerably and, furthermore, the wire on the raw material coil does not produce a smooth surface which can be measured seamlessly.

In order to measure the reel diameters of the relevant copper wire coils consistently, the wire-drawing plant uses a **PT64** with laser line. Due to the linear characteristic of the generated laser beam, the diffuse reflection sensor is able to detect even the uneven surface of the copper wire on the coil and check the diameter of the reel. The distance information of the sensor is transmitted to the machine control unit by means of the analog signal from 4 to 20mA. The control unit controls the throttling of the drawing speed or triggers a system stop based on the sensor signal. Due to the integrated, intelligent control circuit, the diffuse reflection sensor also flexibly adjusts its transmitting power during the query depending on the reflectivity of the copper wire. If the reflectivity becomes weaker, the power of the transmission signal increases. Alternatively, if it becomes weaker, the power of the transmission signal weakens accordingly.

By using a **PT64** sensor, the supplier can now reliably check the reel diameter of its raw material coils, throttle the speed of the drawing machine through a PLC signal and stop the machine before the copper wire coil is completely unreeled.

CHECKING THE OVALITY OF PIPES (SLAVE POINTER FUNCTION)

A measurement-related feature of the **PT64** diffuse reflection laser triangulation sensors from ipf electronic is the so-called slave pointer function, which is available through the analog outputs of the device using the software. The utility of this special function is illustrated using the specific application example of a pipe-drawing plant, which needs to check the ovality of pipes with a specific diameter.

The „MIN-MAX" slave pointer function is activated using the free configuration software for preparing the ovality check. For the check, the pipe placed under the sensor is rotated 360°, which is reported to the **PT64** through a digital switching signal at signal input 1. During the time period in which this control signal is present, or for one complete revolution of the test part or pipe, the diffuse reflection laser sensor continuously gathers measured values. A maximum and minimum value is determined from the detected measuring range after the disappearance of the control signal at input 1, and then the difference between the minimum and maximum value is output through the analog output. The difference determined for the test part effectively represents the measurement of the ovality.

The analog/difference signal is transmitted to the higher-level control unit and evaluated there. If the signal is so big that it exceeds the range for the permitted maximum ovality, the pipe in question is rejected as scrap. Before the next pipe is evaluated, the **PT64** receives a switching signal through the second digital control input which deletes the last generated difference value.

Thanks to the special slave pointer function for the **PT64**, the pipe-drawing plant is now able to check the ovality of all pipes with an uniform diameter very easily, conveniently and above all consistently.

Easiest monitoring of the ovality of pipes.
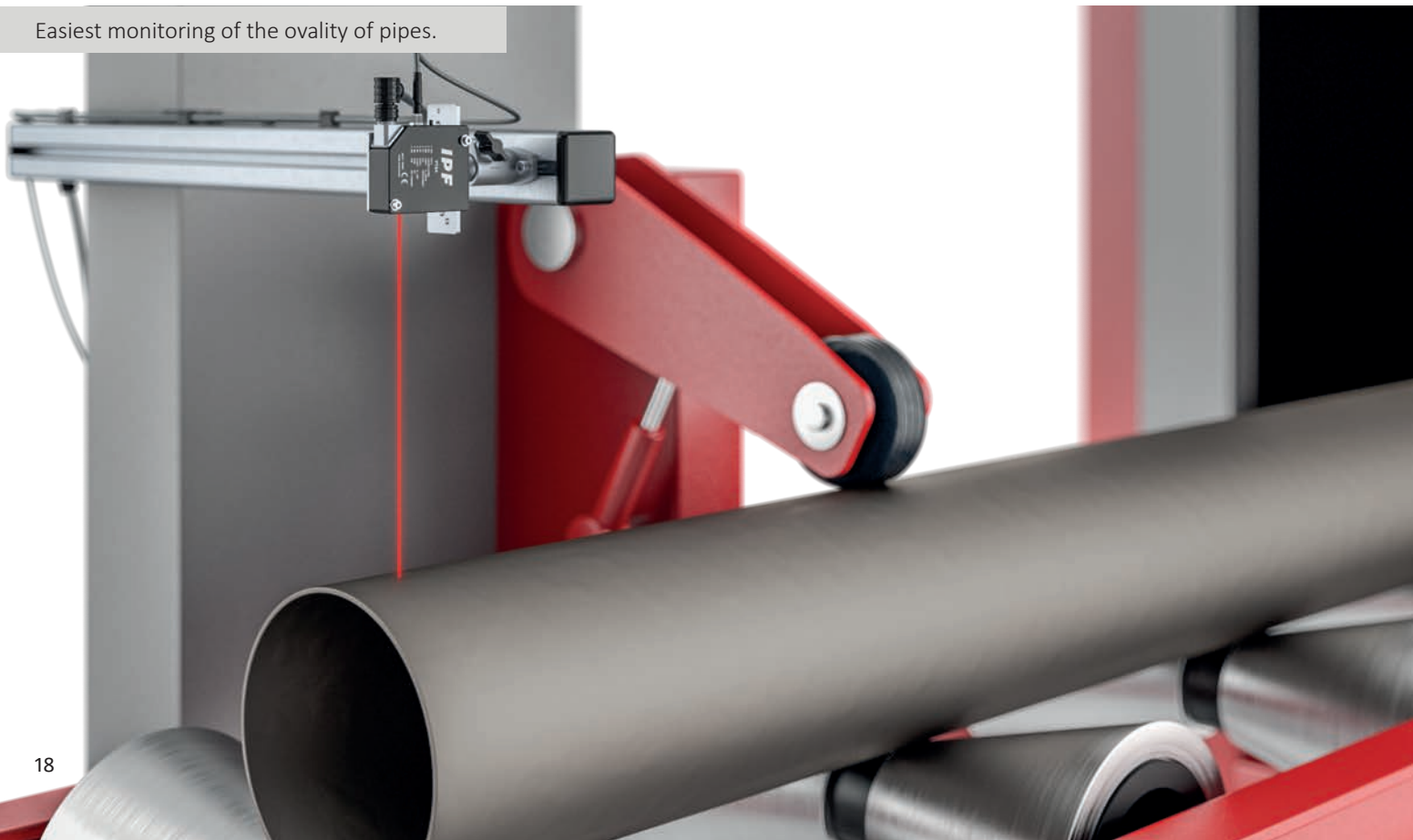
EFFICIENT CONSULTING IN ALL MATTERS
PERSONAL SERVICE AND RAPID SOLUTIONS FOR YOUR PROBLEMS

Every call is important! When you contact our technical hotline, you contact experienced employees who will answer your questions competently and conscientiously. Our goal is to provide you with comprehensive and individual advice around the clock. Our expert team of in-house trained personnel is here to support you.

In almost all industrial applications, problems are becoming ever more complex and varied. Solutions to these problems often require external expertise. You will find this expertise together with a high level of specialist and problem-solving competence at ipf electronic. We are happy to discuss tasks which may seem small with you. For us, this is a matter of course!

ipf electronic is a renowned supplier of industrial sensor technology and a reliable partner. No customer query is ignored and no on-site customer appointment is missed. Our extremely broad range of products will convince you.

Diversity, expertise, consultation and flexibility:
This is ipf electronic's recipe for success.