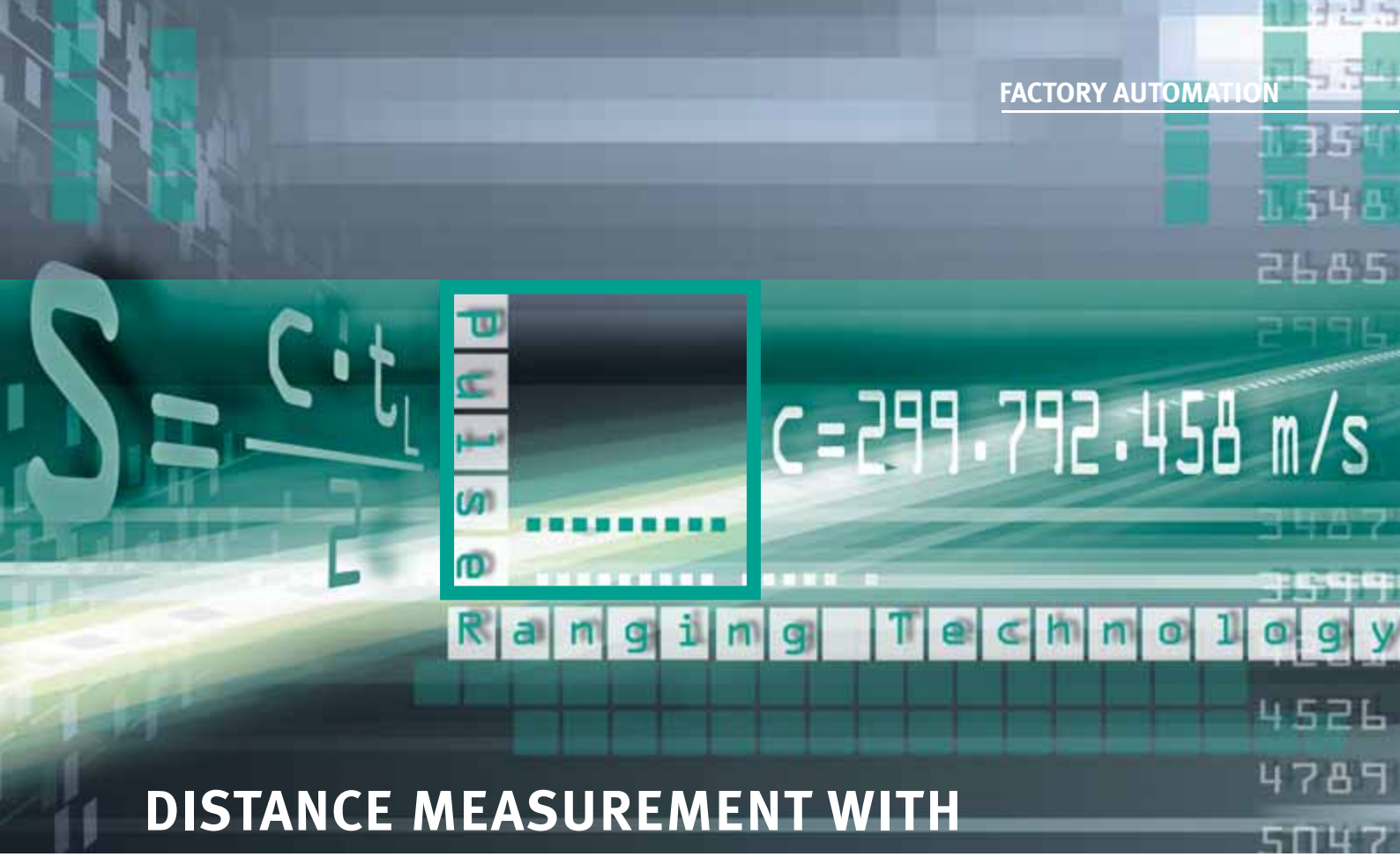


DISTANCE MEASUREMENT WITH PULSE RANGING TECHNOLOGY

PEPPERL+FUCHS
SENSING YOUR NEEDS

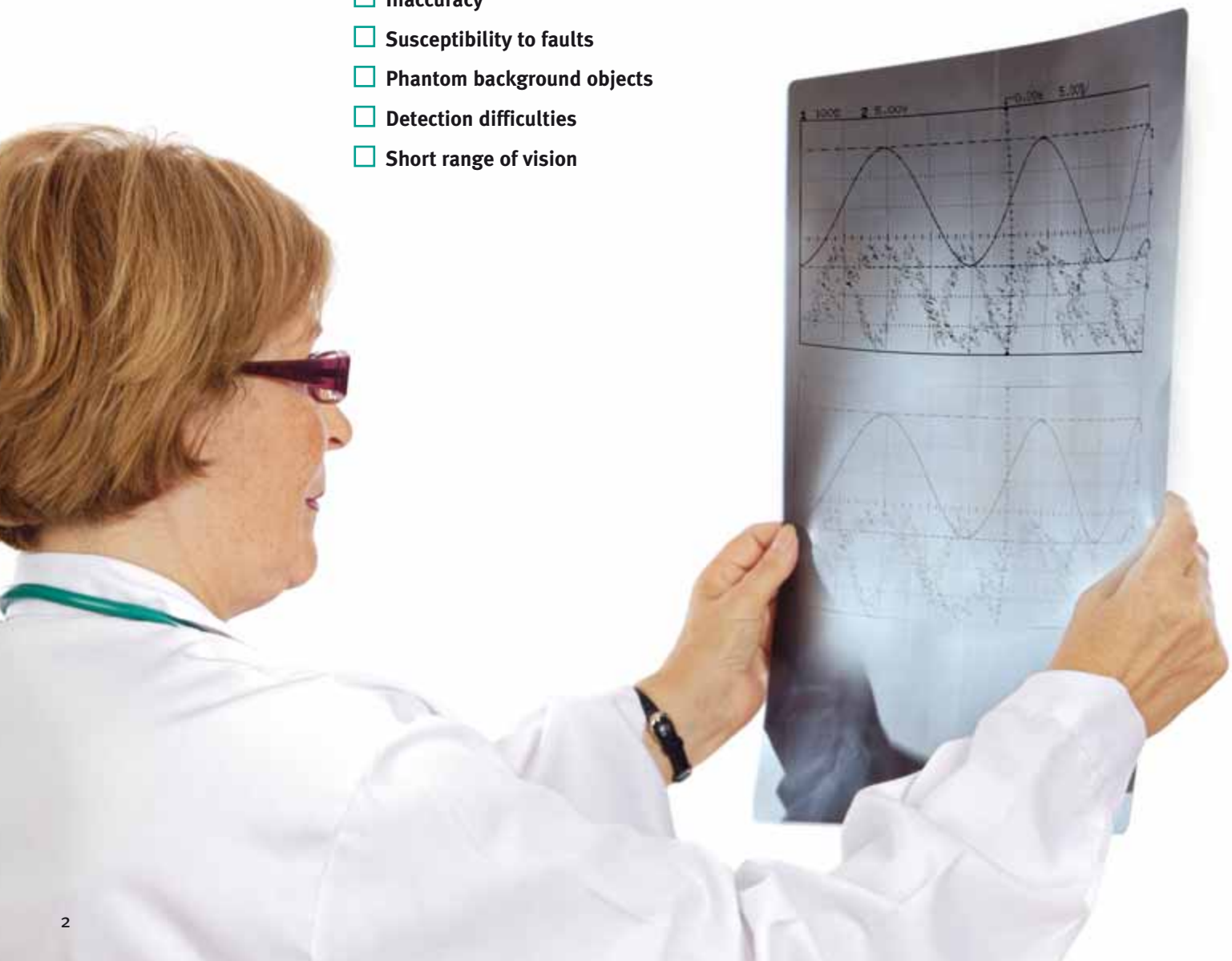
PROBLEMS WITH DISTANCE MEASUREMENT?

There is a complete range of sensors with different principles for measuring distances. Many measuring methods are often unsuitable because the ambient conditions, measured objects or the distance are simply not “conventional”.

The use of indirect measuring procedures frequently results in incorrect or inaccurate measurements. Dealing with reflective or dark objects, an influx of extraneous light, several objects in a beam or the use of several sensors within an application are just some examples where this can occur.

TAKE THE DISTANCE MEASUREMENT SYMPTOM CHECK!
EVER SUFFERED FROM THE FOLLOWING SYMPTOMS?

- ☐ **Inaccuracy**
- ☐ **Susceptibility to faults**
- ☐ **Phantom background objects**
- ☐ **Detection difficulties**
- ☐ **Short range of vision**



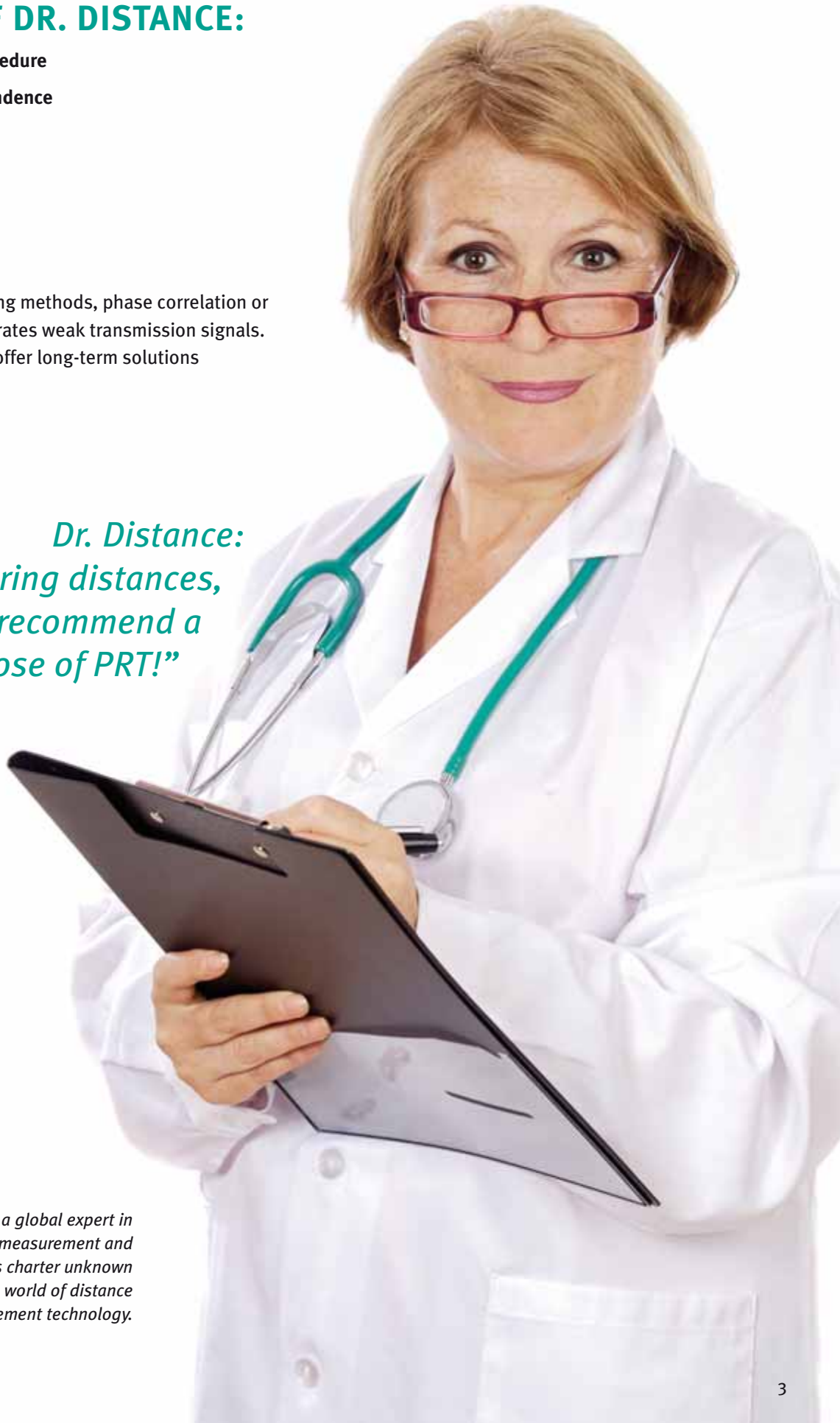
DIAGNOSIS OF DR. DISTANCE:

- **Indirect measuring procedure**
- **Strong amplitude dependence**
- **Drift conditions**

CAUSE

The use of indirect measuring methods, phase correlation or chip-based processes generates weak transmission signals. These technologies do not offer long-term solutions to problems.

Dr. Distance:
“When measuring distances, I always recommend a healthy dose of PRT!”



Dr. Distance is a global expert in industrial distance measurement and helps Pepperl+Fuchs charter unknown territory in the world of distance measurement technology.

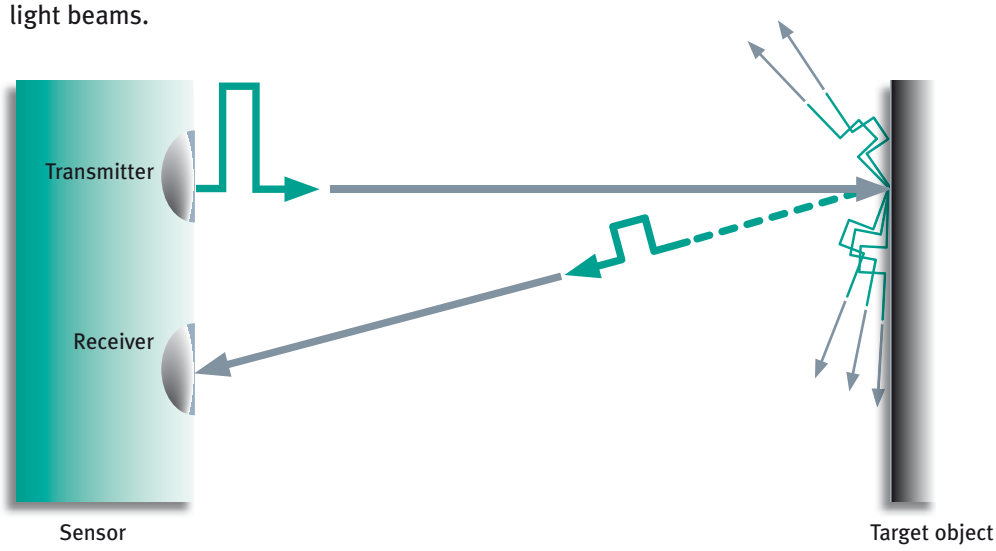
HIGHLY ACCURATE DISTANCE MEASUREMENT USING PRT

WHAT IS PRT?

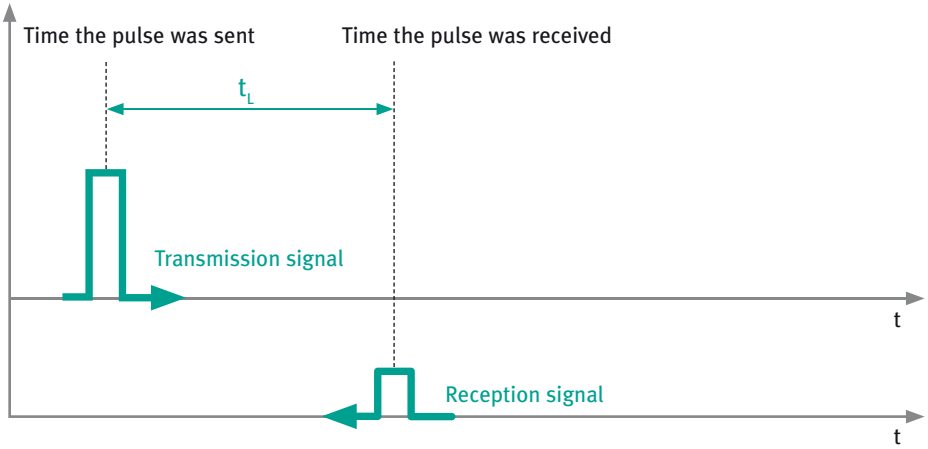
PRT is an abbreviation for **Pulse Ranging Technology**, a direct measuring method for measuring distance. PRT is the most accurate industry-grade distance measuring process.

PRINCIPLE OF OPERATION PRT

In this most advanced of all optical measuring methods, a laser diode transmits short pulses of light that are reflected by the target object and then recaptured by a light-sensitive receiver element. The power of a single pulse is up to one thousand times more intense than the power of pulses generated by sensors that emit permanent light beams.



The times when the pulse was sent and received are measured extremely accurately.



The exact distance (s) from the object is calculated using the measured values (t_L) and the speed of light (c).
In modern sensors, this procedure is repeated up to 250,000 times per second.

ADVANTAGES OF PRT

The advantages of Pulse Ranging Technology (PRT) lie in the direct nature of the measurement methods, which achieve accurate, reliable and unambiguous measurements; accurate repeatability; as well as short response times.

Only sensors with PRT achieve accurate, reliable, unambiguous and reproducible results regardless of ambient and object conditions such as surface condition, dark color or extraneous light.

Take advantage of the benefits offered by PRT!

ACCURACY

Thanks to its short high-intensity light pulses, PRT measures over larger distances with greater accuracy than indirect measuring methods, such as phase correlation or chip-based processes. There is no drift of the measured value, even after prolonged periods of operation.

NOISE IMMUNITY

Compared with devices with light sources that are transmitting all the time, PRT provides a high degree of immunity to extraneous light by emitting discrete light pulses. As a direct consequence of this pulsing technology, the device is highly resistant to changes in the measurement path caused by environmental influences, such as mist, dust, etc. Several devices can be used without mutual interference.

UNIQUENESS

PRT is immune to interference from multiple targets in the measurement field. Objects in the far distance, outside the measuring range, are reliably suppressed. This guarantees that so-called phantom objects are not detected.

TARGET INDEPENDENCE

Thanks to time determination, the hallmark of Pulse Ranging Technology, the surface of the object has a negligible effect on the accuracy of the measurement. “Black-white difference” is not an issue for PRT.

FARSIGHTED

As opposed to triangulation, the measurement range of PRT is not reliant on the geometrical layout of the optics. Sensors with PRT, despite the relatively small housing, can be used for substantially larger measurement ranges and complement sensors with background suppression perfectly.

FORMULA FOR ACCURATE REMOTE MEASUREMENTS

Information for the use of distance measurement devices with PRT:

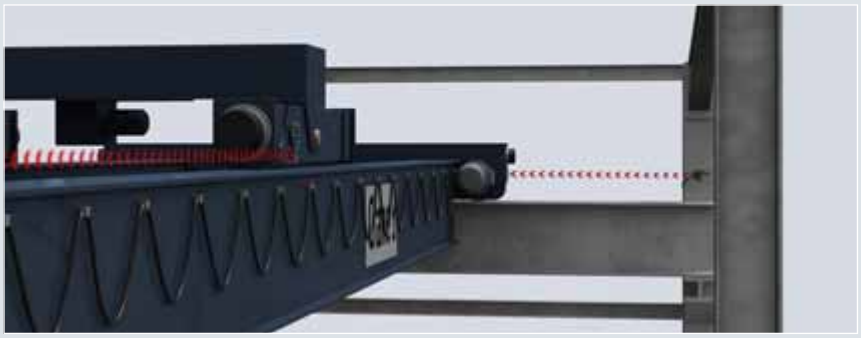
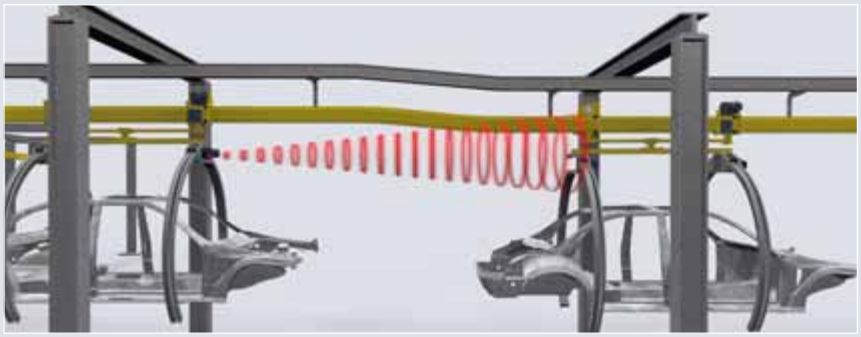
SERIES	TYPE	POSSIBLE APPLICATIONS
VDM28 	Distance measurement device with PRT	Universal device for measuring and monitoring, e.g. ■ Positioning ■ Fill level measurement ■ Collision prevention/separation distance measurement ■ Rack occupancy checks ■ Rack fine positioning ■ Stacking height checks ■ Coil measurement ■ Dip monitoring ■ Lift height checks ■ …
VDM70 	Distance measurement device with PRT	■ Simple positioning on gantry cranes, lifters, elevator cars/cages ■ Measuring coils made from paper, plastic or metal ■ Small object and part detection in manufacturing
VDM100 	Distance measurement device with PRT	Precise, rapid positioning of ■ Stock feeders ■ Moving vehicles ■ Gantry cranes and lifters
VDM54 	Distance measurement device with PRT	■ Optimized for measuring the separation distance on electronic suspended rails

	DESCRIPTION	SPECIFICATIONS
	■ Smallest measuring sensor with PRT ■ Impressive performance data in a compact standard photoelectric sensor housing ■ Small, clearly visible red light spot ■ High degree of repeatability irrespective of the surface ■ Minimal black-white difference ■ Two switching points per output ■ Immune to extraneous light ■ No mutual interference ■ IO-Link interface	■ Measurement range: 0.2 m … 8 m ■ Temperature range: –30 °C … 50 °C ■ Resolution: 1 mm ■ Repeat accuracy: < 10 mm ■ Absolute accuracy: < 35 mm
	■ High accuracy and independence from measuring environment ■ Adjustable analog output throughout the entire measurement range ■ Accurately limited light spot ■ High sampling rate for consistent measurement ■ Measurement to reflector or object ■ Adjustable switching outputs ■ Immune to extraneous light	■ Measurement range: 0.5 m … 10 m / … 250 m ■ Temperature range: –10 °C … 50 °C ■ Resolution: 0.1 mm ■ Repeat accuracy: ± 2 mm / ± 4 mm ■ Absolute accuracy: ± 8 mm / ± 12 mm
	■ High accuracy and independence from measuring environment ■ Extremely rapid measured value acquisition ■ High sampling rate for consistent measurement ■ Active dynamic control ■ Fast response time for extremely dynamic processes ■ Laser class 1 measuring method with no danger to eyesight ■ Modern lightweight design and extremely robust ■ Immune to extraneous light	■ Measurement range: 0.3 m … 50 m /… 150 m /… ■ Temperature range: –30 °C … 50 °C ■ Resolution: 0.1 mm ■ Repeat accuracy: < 0.5 mm ■ Absolute accuracy: ± 2.5 mm (< 3 m)
	■ Large horizontal and vertical sensing range ■ Adjustable distance values for switching points throughout the entire measurement range ■ Simple integration in existing systems ■ Fast response time permits use in extremely dynamic processes ■ Laser class 1 measuring method with no danger to eyesight ■ Immune to extraneous light	■ Measurement range: 0 m … 4 m / … 6 m ■ Horizontal beam angle: Typ. ± 7.5° ■ Vertical beam angle: Typ. ± 3.5° ■ Temperature range: 0 °C … 50 °C ■ Resolution: 1 mm ■ Repeat accuracy: ± 100 mm

	ADDITIONAL INFORMATION	MECHANICAL SPECIFICATIONS
	■ Dual push-pull output ■ Teach-in ■ IO-Link interface for servicing and process data ■ Also suitable for extremely cold applications	■ Compact plastic housing in standard photoelectric sensor size ■ Dimensions (WxHxD): 88 mm x 26 mm x 54 mm ■ Weight: 90 g ■ Connection: M12 plug, 4-pin or 2 m fixed cable ■ Degree of protection: IP65
	■ 2 PNP outputs ■ Analog output ■ Service output ■ Interface output ■ Teach-in ■ RS422, SSI interface	■ Compact plastic housing ■ Dimensions (WxHxD): 93 mm x 93 mm x 42 mm ■ Weight: 230 g ■ Connection: M16 plug, 12-pin ■ Degree of protection: IP67
. 300 m	■ 2 PNP inputs/outputs, independent configuration ■ Maximum travel speed: 15 m/s ■ Interfaces: Interbus, Profibus, SSI ■ Also suitable for deep-freeze applications	■ Weight-optimized plastic housing ■ Dimensions (WxHxD): 100 mm x 140 mm x 170 mm ■ Weight: 700 g ■ Connection: M12 plug, 4-pin (power supply); 2 x M12 plugs, 5-pin, B-coded (bus in/bus out) ■ Degree of protection: IP65
	■ ConfigBox with PC for easy teach-in ■ Adjustable switching outputs ■ RS422 interface	■ Application-optimized plastic housing ■ Dimensions (WxHxD): 85 mm x 145 mm x 80 mm ■ Weight: 200 g ■ Connection: M12 plug, 5-pin ■ Degree of protection: IP54

ALL PRT SENSORS AT A GLANCE

Are you searching for a powerful distance measurement sensor that provides accurate measurements?
Sensors with PRT deliver accurate results without unwanted “side effects”

SERIES	POSSIBLE APPLICATIONS
VDM28 Distance measurement device with PRT 	Universal device for measuring and monitoring 
VDM70 Distance measurement device with PRT 	Simple measurement and positioning tasks 
VDM100 Distance measurement device with PRT 	Positioning tasks accurate to the millimeter 
VDM54 Distance measurement device with PRT 	Separation distance measurement on overhead conveyors 

DISTANCE MEASUREMENT GLOSSARY

DR. DISTANCE EXPLAINS THE TECHNICAL TERMS

ABSOLUTE ACCURACY
Absolute accuracy is the difference between the measured value and the actual distance.

ACTIVE DYNAMIC CONTROL
The optical signal from a distance measurement device is subject to sharp fluctuations, depending on the measuring objectives and the distance. Active optical elements can be used to compensate this dynamic.

AMPLITUDE DEPENDENCE
Independence of the distance measurement value from the received signal level. The sharp fluctuation of the signal level during distance measurement is normal. Causes may include changes in distance or different targets (see black-white difference).

RESOLUTION
Smallest possible change in a measured value from a distance measurement device. The resolution is not an indicator of the accuracy of a sensor.

IO-LINK
Modern sensor interface for transferring process data (such as measured values) and service data (parameters, diagnostic information). Extremely convenient parameterization of the sensor system via the IO-Link serial interface.

MAXIMUM TRAVEL SPEED
Maximum speed at which the measurement object can travel without causing the measured values to change.

MEASUREMENT RANGE
Smallest and largest measured value that the sensor can detect.

MEASURED VALUE DRIFT
Offset of the measured value resulting from drift conditions in a distance measurement device.

OFFSET
Measured value offset by a constant value, which is particularly important for transfers between 2 devices. If the offset value is low, position values do not need to be taught in again.

REPEAT ACCURACY
The measurement is repeated at the same distance to the same objective. The deviation is the repeat accuracy value.

BLACK-WHITE DIFFERENCE
Measured value difference between a white target (90% remission) and a black target (6% remission) based on the detection range to white. The black-white difference is specified in percent.

TEMPERATURE EFFECT
Measured value modified due to a change in temperature. This effect results from temperature drift in the measuring electronics and fluctuations in the light speed following a change in temperature.

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