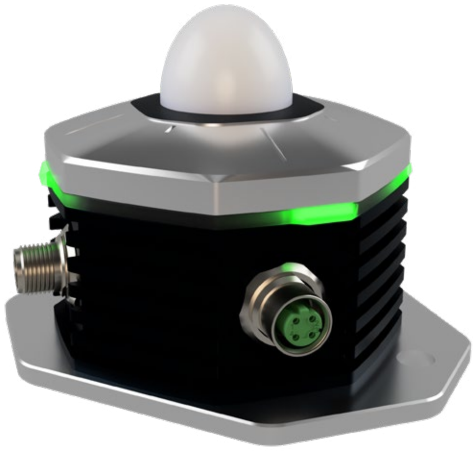
Distance change measurement | RAD78P | PROFINET IO



Ultra-precise up to ±1 µm
The RAD78P radar sensor with PROFINET interface and integrated web server is perfectly suited for ultra-precise distance change measurements in the µm range, from the monitoring of bridge structures to measurements of concentricity or surface properties, completely new concepts can be realized, especially in the field of condition monitoring. An extremely narrow opening angle of just ±1.5° (3°) offers maximum focusing up to a measuring range of 40 m. With a measuring rate of 500 Hz, measurements can be taken not only precisely but also quickly with a linearity of up to ±1 µm.

Features and benefits

- **Versatile in use**
  - Measurement of position/distance changes in the µm-range
  - Precise recording of concentricity data, surface structures, etc.
  - Condition monitoring: condition monitoring of bridges, critical infrastructure and buildings

- **Fast and precise with maximum focus**
  - Real-time measurement rate up to 500 Hz
  - Repeatability up to ±1 µm
  - Extremely small opening angle of ±1.5° (3°)

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- **Wide measuring range**
  Measuring ranges from 0.1 to 6 m or 0.3 to 40 m with an extremely small blind range at the start of the measuring range

- **Maximum precision in the harshest environmental conditions**
  - Latest radar technology in a robust metal housing
  - Air-cooled protective housing for extreme radiant heat
  - Even with dust, ash, water vapor and heat, the radar sensor measures the level of liquid metal reliably and accurately

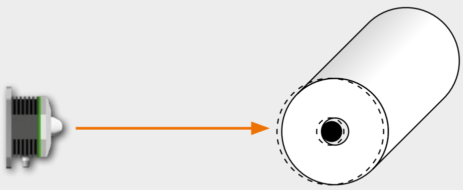
- **Simple installation and commissioning**
  - High level of integration into the application thanks to compact design
  - Suitable accessories for easy connection and alignment to the application
  - Visual feedback on the alignment of the sensor to the measurement object or visualization of the signal strength via LEDs.

- **PROFINET interface**
  - Industrie 4.0 ready
  - Integrated web server

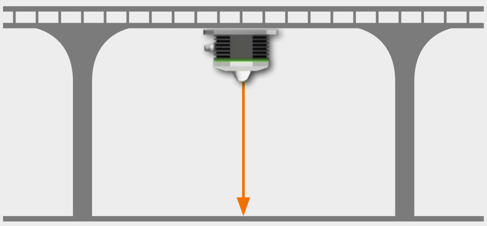
- **Intuitive operation**
  - Graphical user interface for easy handling
  - Browser-based configuration software
  - Visualization of the echo curve (see what the sensor sees)
  - Numerous setting options and features for ideal adaptation to and increased performance in the application

Condition Monitoring

Example: Detection of the smallest inaccuracies in the concentricity of rollers, which can indicate bearing damage or damage to the surface.



Example: Detection of the smallest distance changes in structures such as bridges.



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Order code
Measuring range 0.10 m ... 6 m

RAD78P	.	006	.	11	1	5	3	.	CC12
Type					a				

Opening angle : ±1.5° (3°)
Interface : PROFINET
4 ... 20 mA + 3 x switching output PNP/NPN
RS485 as communication interface
Radar frequency : 119 ... 125 GHz (selectable 122 ... 123 Hz)

a *Linearity*
1 = 0.1 % of the measuring section

Order code
Measuring range 0.30 m ... 40 m

RAD78P	.	040	.	11	1	5	2	.	CC12
Type					a				

Opening angle : ±1.5° (3°)
Interface : PROFINET
4 ... 20 mA + 3 x switching output PNP/NPN
RS485 as communication interface
Radar frequency : 122 ... 123 Hz

a *Linearity*
1 = 0.1 % of the measuring section

Accessories

Accessories		Order no.
AirChill protective housing 	Air-cooled housing for extreme radiant heat, e.g. from molten metal Resistance up to 1600°C Short-term load tolerance up to 700°C Suitable for ambient temperatures up to 120°C	**on request**
Corner Cube 	• Increasing the signal strength received from a target. • Increasing the possible angle between sensor and target. • Increasing the measurement accuracy by increasing the signal strength.	
	Material: 1.401 Weight: 120 g Dimensions: 104 x 82 x 91 mm — **side length 100 mm**	**8.0000.7000.0081** 1)
	Material: 1.401 Weight: 690 g Dimensions: 254 x 170 x 221 mm — **side length 250 mm**	**8.0000.7000.0082** 1)

Cables and connectors

Cables and connectors		Order no.
Preassembled cables	M12 male connector with external thread, 4-pin, D-coded, straight M12 female connector with coupling nut, 4-pin, D-coded, straight 2 m [6.56'] PUR cable	**05.00.6031.4444.002M**
	M12 male connector with external thread, 4-pin, D-coded, angled M12 female connector with coupling nut, 4-pin, D-coded, straight 2 m [6.56'] PUR cable	**05.00.6031.4542.002M**
	M12 male connector with external thread, 4-pin, D-coded, straight RJ45 connector 2 m [6.56'] PUR cable	**05.00.6031.7444.002M**
	M12 female connector with coupling nut, 8-pin, A-coded, straight M12 male connector with external thread, 8-pin, A-coded, straight 2 m [6.56'] PUR cable	**05.00.6051.8284.002M**
Connectors	M12 male connector with external thread, 4-pin, D-coded, straight (metal)	**05.WASCSY4S**
	M12 male connector with external thread, 4-pin, D-coded, angled (metal)	**8.0000.5128.0000**
	M12 female connector with coupling nut, 8-pin, A-coded, straight (metal)	**05.CMB 8181-0**

Further Kübler accessories can be found at: kuebler.com/accessories
Further Kübler cables and connectors can be found at: kuebler.com/connection-technology

1) Stock types.

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Technical data

General data

Radar frequency (FMCW)	119 - 125 GHz 122 - 123 GHz (selectable)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measuring ranges	0.1 m ... 6 m 0.3 m ... 40 m
Opening angle	±1.5° (3°)
Measurement rate	500 Hz
Linearity – distance change	±0,1 % des Messabschnittes (bis zu ±1 µm)
Linearity – absolute position measuring range 0,1 m ... 6 m measuring range 0,3 m ... 40 m	 bis zu ±0,7 mm bis zu ±2,0 mm
Repeatability distance change	±1 µm
Repeatability absolute position measuring range 0,1 m ... 6 m measuring range 0,3 m ... 40 m	 ±0,1 mm ±0,5 mm

Electrical characteristics

Power supply	24 V DC
Current consumption	125 mA
Power consumption	3 W
Reverse polarity protection	yes

Approvals

CE compliant in accordance with

EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

Mechanical characteristics

Material housing lens	die-cast aluminum, coated PTFE
Weight	740 g
Protection acc. to EN 60529	IP67
Working temperature range	-40 °C ... +70 °C [-40 °F ... +185 °F]
Storage temperature range	-40 °C ... +85 °C [-40 °F ... +158 °F]
Shock resistance (EN 60068-2-27)	100 g; 11 ms
Electrical connection	1 x M12 connector, 4-pin, D-coded 1 x M12 connector, 8-pin, A-coded

Interface characteristics PROFINET

General information

Communication interface	Profinet RT
Cycle time	1 ms
Data transfer	100 MBit/s
Line length	100 m
Classifications	RT Class 1 Conformance Class B Netload Class III

Adjustable parameters

- IP address
- Device name
- I&M 0…3 Parameter

PROFINET characteristics

- I&M 0 ... 3
- MRP
- LLDP
- PDEV
- SNMP

Process data

- Distance
- Peak
- Ramp Count

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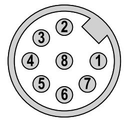
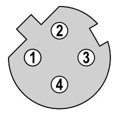
Terminal assignment

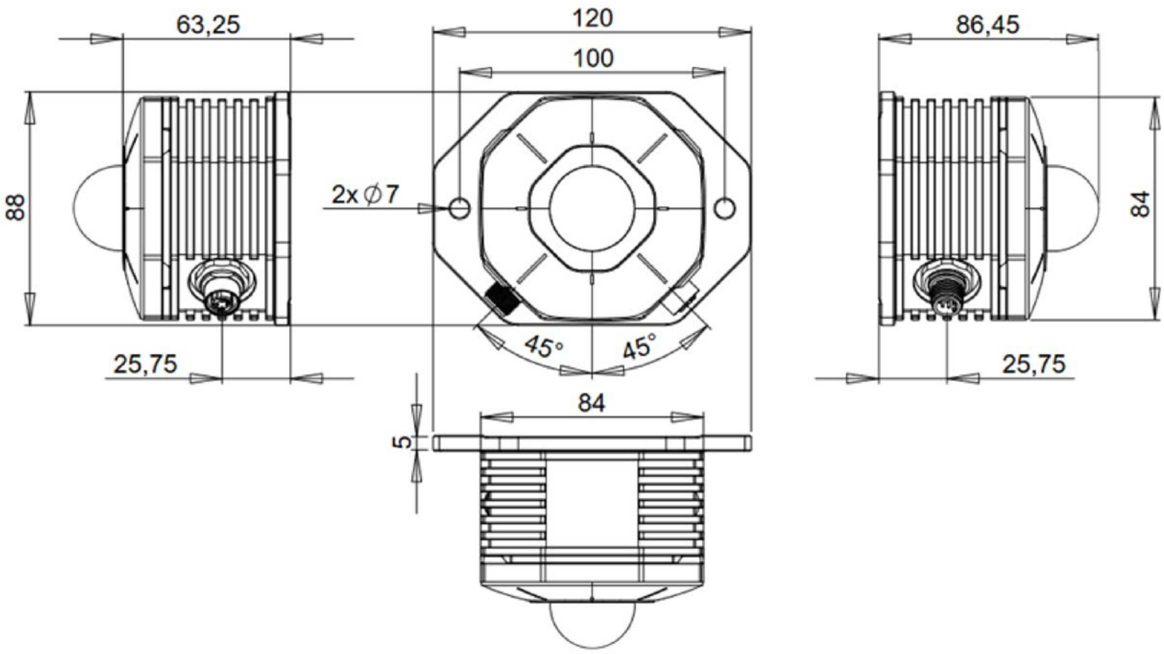
Function	M12 connector, 8-pin, A-coded										
Power supply Analog output Switching outputs	Signal:	A	+V	–	–	–	B	0 V	–	⏚	
	Pin:	1	2	3	4	5	6	7	8	PH	

Funktion	M12 connector, 4-pin, D-coded					
Profinet communication	Signal:	RxD+	RxD-	TxD+	TxD+	
	Abbreviation:	Transmit data+	Transmit data-	Transmit data+	Transmit data-	
	Pin:	1	2	3	4	

+V:	supply voltage sensor +V DC
0 V:	Ground sensor GND (0V)
A, B:	RS485 Communication
PH ⏚:	connector housing (Shield)

Dimensions

Dimensions in mm



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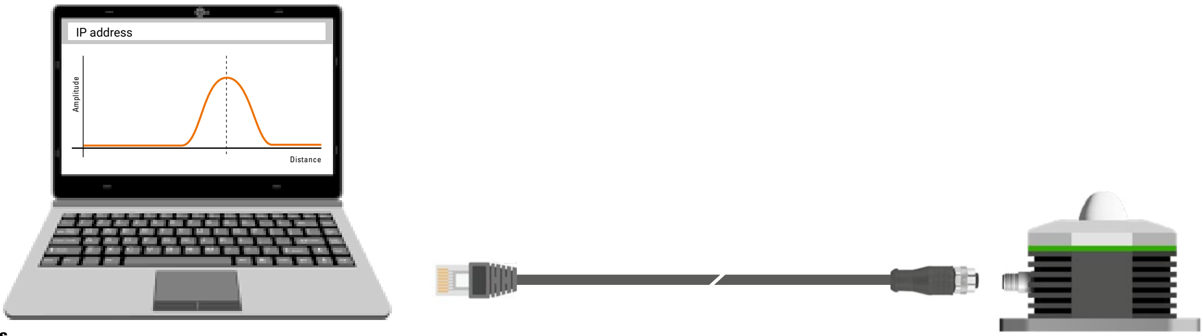
Technology in detail

Individual setting options via "Graphical User Interface"

Connection

The radar sensor with integrated web server can be connected directly to a PC or integrated into a PROFNET network. The sensor is accessed via the original IP address of the sensor (as delivered) or via the IP address assigned by a PLC after integration into the PROFINET network.



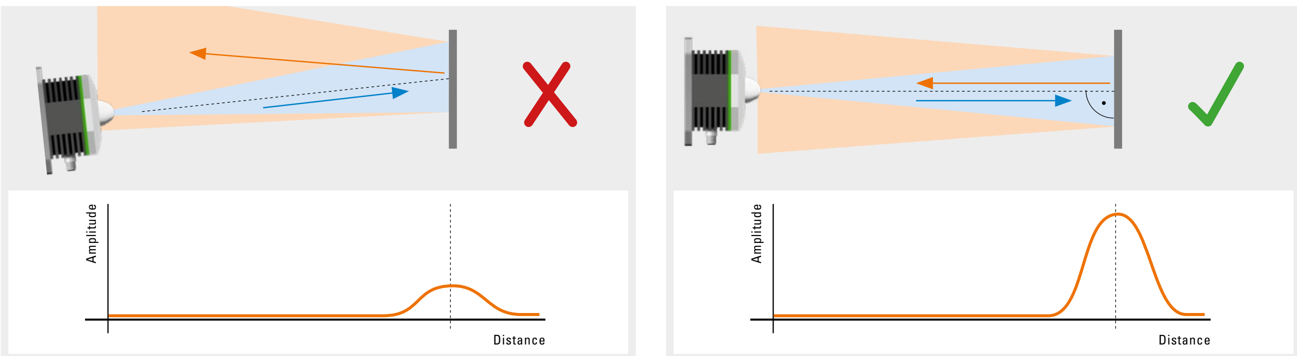
Settings

The sensor can be accessed via the respective IP address, the measurements can be displayed and parameters can be set individually for the application requirements.

- Setting the measuring range
- Setting the signal threshold value
- Setting the switching points for the switching outputs
- Setting the distance values for the analog output
- Selecting the desired signal for multiple peaks
- and much more

Simple start-up and analysis

Optimal alignment of the sensor to the measurement object by visualizing the measurement result during installation



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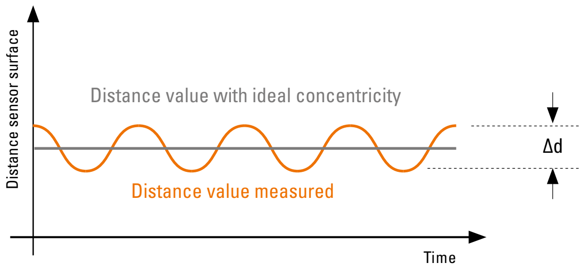
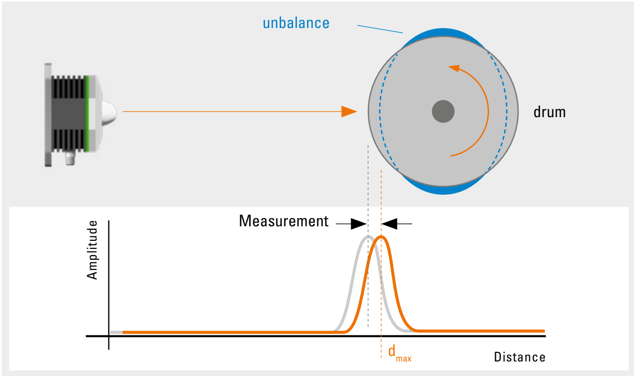
Application examples

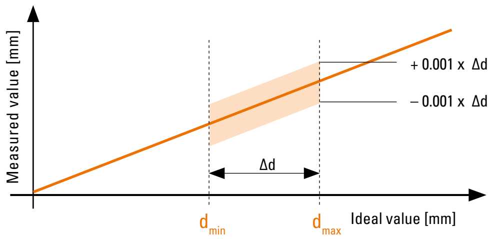
Monitoring the roundness of drums

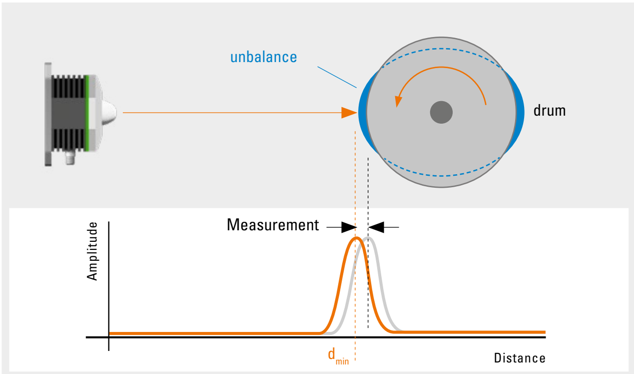
By detecting the change in distance between the drum and the radar sensor in the µm range, the smallest deviations - caused by imbalances or bearing damage - can be detected in the concentricity.





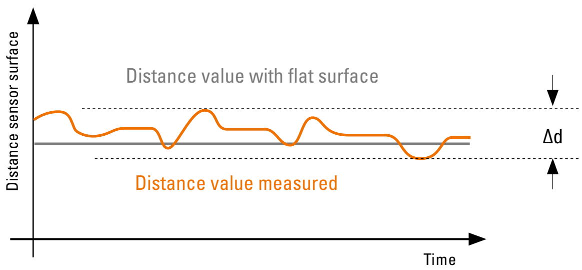
Linearity of the measurement (±0.1 % of the measurement section Δd)

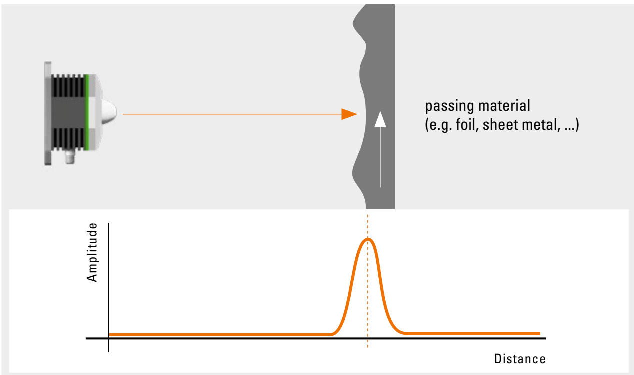




Monitoring of surface structures

By detecting the change in distance from the radar sensor to the surface of materials that are moved past the radar sensor.





Linearity of the measurement (±0.1 % of the measurement section Δd)