

Radar sensors

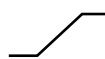
Object detection and collision avoidance	RAD51C	Analog + 3 switching outputs
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Simple. Robust. Flexible.

The compact RAD51C radar sensor is suitable for the tightest installation situations and the harshest environmental conditions. With an opening angle of $\pm 8^\circ$ (16°), the sensor offers maximum reliability for object detection.

Thanks to a measuring rate of 100 Hz and measuring ranges between 0.15 m ... 20 m or 0.3 ... 30 m, countless applications can be realized with the latest radar technology. Simple tools not only help with implementation, but also create transparency during operation.



Analog
Output

PNP NPN

Features and benefits

- **Wide measuring range**
 - Measuring range 0.15 m to 20 m or 0.30 m to 30 m
 - Small blind area of only 0.15 or 0.3 m
- **Fast and precise**
 - Measurement rate up to 100 Hz
 - Repeatability up to ± 2 mm
- **Wide range of applications for collision avoidance, obstacle detection, object detection and positioning**
 - Wide opening angle $\pm 8^\circ$ (16°) for reliable object detection
 - Different data output options: In addition to the analog output of 4 ... 20 mA, 3 switching outputs are available for a wide range of applications.
 - For flexible and reliable monitoring of safety areas, up to 4 sensor zones can be set via the switching outputs
- **Compact and easy to install**
 - 92,65 mm total length incl. M12 connector
 - Standardized mounting due to M30 mounting thread
 - Matching mounting accessories for easy mounting and alignment on the application
- **Maximum robustness**
 - Latest radar technology for reliable measurement even under the most adverse environmental conditions such as dust, fog, rain, smoke, wind or unfavorable light conditions.
- **Simple commissioning and setting of parameters**
 - Connection of the radar sensor to the PC using a configuration box (ConfigBox). Communication via the RS485 interface
 - "See what the sensor sees" through real-time visualization of the echo curve using appropriate software tools. This also enables simple and intuitive commissioning, as the measurement can be tracked live during installation.
 - Numerous setting options, such as setting the measuring range, setting switching points, filters or other features, to customize the sensor system to the respective application requirements.

Order code

RAD51C . XXX . 11111 . 1118

Type

^a

Opening angle : $\pm 8^\circ$ (16°)
 Linearity : up to ± 10 mm
 Interface : 4 ... 20 mA + 3 x switching output PNP/NPN
 RS485 as communication interface

^a Measuring range
 020 = 0.15 m ... 20 m
 030 = 0.30 m ... 30 m

Stock types
 RAD51C.020.11111.1118
 RAD51C.030.11111.1118

Radar sensors

Object detection and collision avoidance		RAD51C	Analog + 3 switching outputs
Accessories			Order no.
M30 - Mounting bracket  	For easy mounting and correct alignment of the RAD5x sensors on the measurement object.		
	Material: galvanized steel 1.4301 Weight: 81 g Dimensions: 60 x 55 x 42 mm	for vertical adjustment $\pm 30^\circ$	8.0000.7000.0083 ¹⁾
	Material: galvanized steel 1.4301 Weight: 223 g Dimensions: 70 x 65 x 65 mm	for vertical adjustment $\pm 30^\circ$ and horizontal adjustment $\pm 15^\circ$	8.0000.7000.0084 ¹⁾
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⁾
Configuration box 	For transferring the sensor data to a PC/laptop Scope of delivery: - Configuration box „ConfigBox“ - Connection cable M12, 8-pin with plug and socket - Connection element - LAN cable for connection to the PC - Power connection		8.0010.9000.0023 ¹⁾
Cables and connectors			Order no.
Preassembled cables	M12 female connector with coupling nut, 8-pin, A coded, straight single ended 2 m [6.56'] PVC cable		05.00.6041.8211.002M
	M12 female connector with coupling nut, 8-pin, A coded, straight single ended 2 m [6.56'] PUR cable		05.00.6051.8211.002M
Connectors	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.

Radar sensors

Object detection and collision avoidance	RAD51C	Analog + 3 switching outputs
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Technical data

General data

Radar frequency (FMCW)	122.25 - 123 GHz
Radiation power	EIRP < 100 mW
MTTF	> 125 years
Measuring range	0.15 m ... 20 m 0.30 m ... 30 m
Opening angle	±8° (16°)
Measurement rate	100 Hz 300 Hz on request
Linearity	up to ±10 mm
Repeatability	±2 mm

Mechanical characteristics

Material	housing lens	stainless steel 1.4404 PTFE
Weight		205 g (170 g sensor / 35 g M30 nuts)
Protection acc. to EN 60529		IP67 / IP69k
Working temperature range		-40 °C ... +70 °C [-40 °F ... +158 °F]
Storage temperature range		-40 °C ... +85 °C [-40 °F ... +185 °F]
Shock resistance (EN 60068-2-27)		100 g; 11 ms
Electrical connection		M12 connector, 8-pin, A-coded
Dimensions		l = 92,65 mm [3.65"] ø = 30 mm [1.18"]

Electrical characteristics

Power supply	12 ... 30 V DC
Current consumption	80 mA (at 24 V DC)
Power consumption	2.4 W
Reverse polarity protection	yes
Communication	RS485 (half-duplex mode)
Analog output	4 ... 20 mA
Switching outputs	3 x PNP/NPN

Approvals

CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

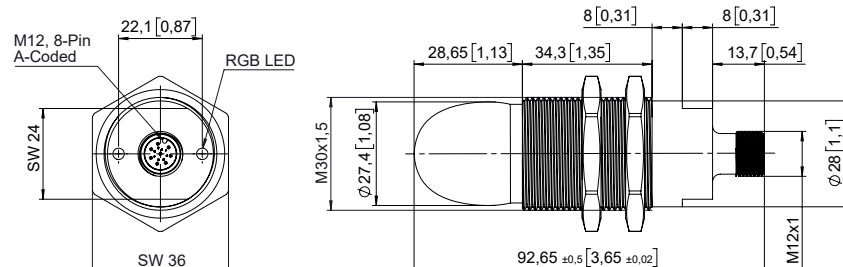
Terminal assignment

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

+V:	supply voltage sensor +V DC
0 V:	Ground sensor GND (0V)
A, B:	RS485 Communication
CL:	analog output (4 ... 20 mA)
OUT 1, 2, 3:	switching outputs
PH ⊥:	connector housing (Shield)

Dimensions

Dimensions in mm [inch]



Radar sensors

Object detection and collision avoidance

RAD51C

Analog + 3 switching outputs

Technology in detail

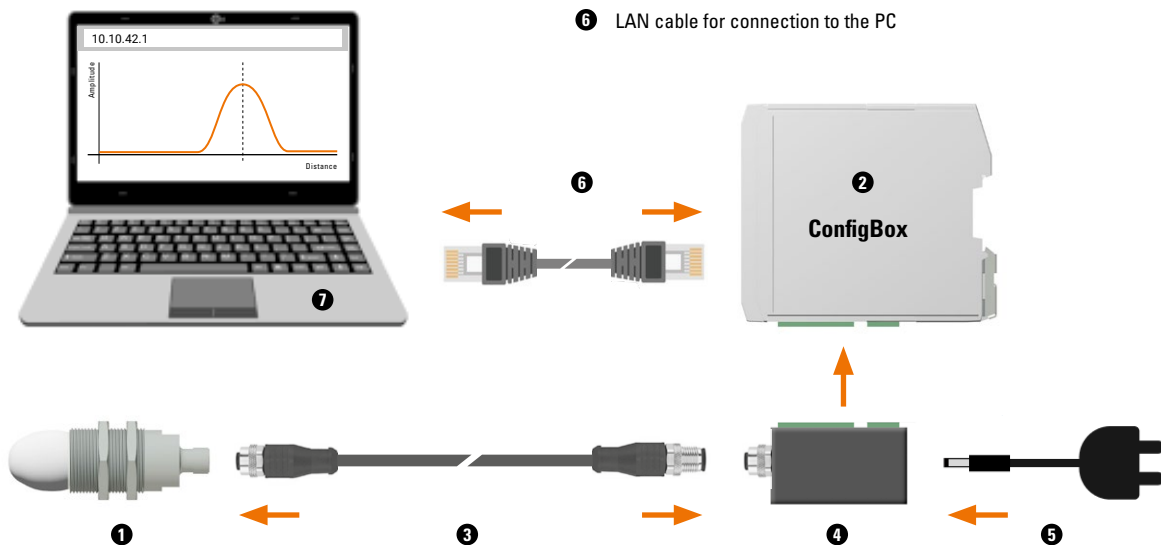
Individual setting options via the configuration box and configuration software

Connection

The radar sensor **1** is first connected to the PC **7** via the configuration box **2**.

All necessary connecting elements are included in the scope of delivery of the configuration box **2** :

- 3** M12 connecting cable, 8-pin with male and female contacts
- 4** Connection module
- 5** Power connection
- 6** LAN cable for connection to the PC



Commissioning / diagnosis

After connection, as shown above, the configuration software is opened via the browser - **URL = 10.10.42.1** (no "www").

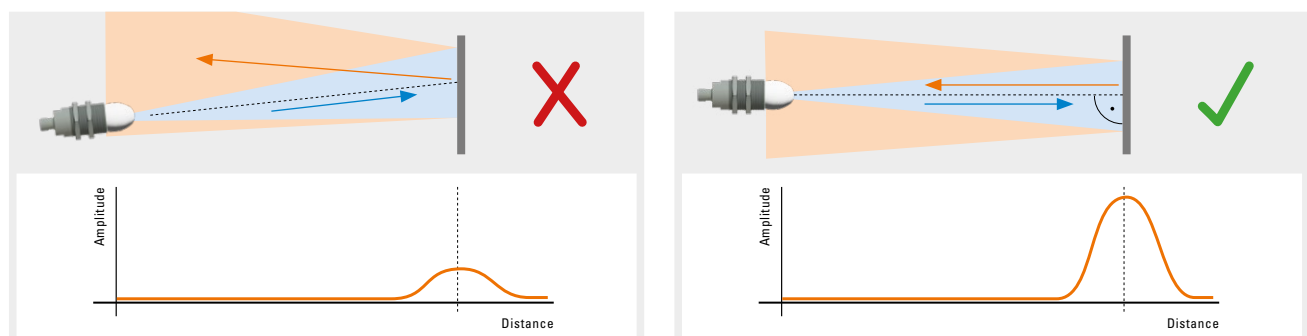
The software can be used to configure the sensor to the respective application requirements or to check its status during operation.

In addition to the visualization of the echo curve (radar signal), the following settings can be configured, for example:

- Configuration of the analog interface
- Setting the switching points for the switching outputs
- Setting the measuring range
- Setting the signal threshold value
- 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



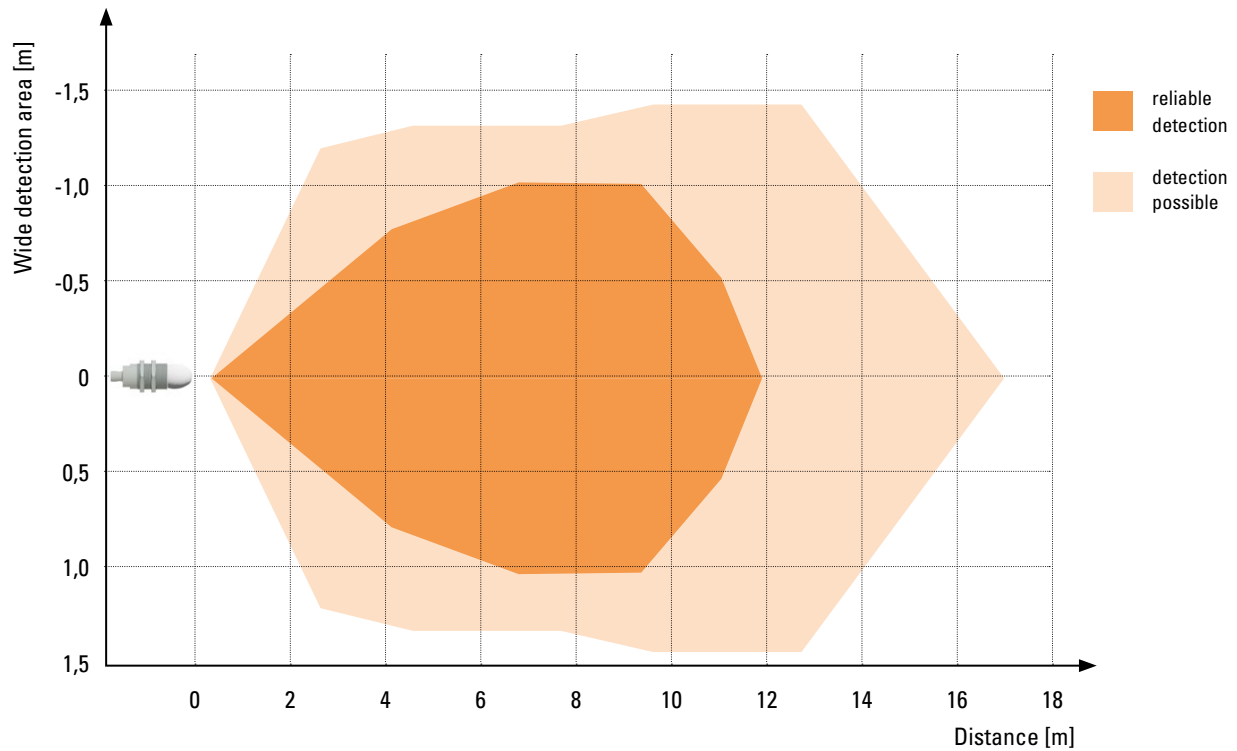
Radar sensors

Object detection and collision avoidance	RAD51C	Analog + 3 switching outputs
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Technology in detail

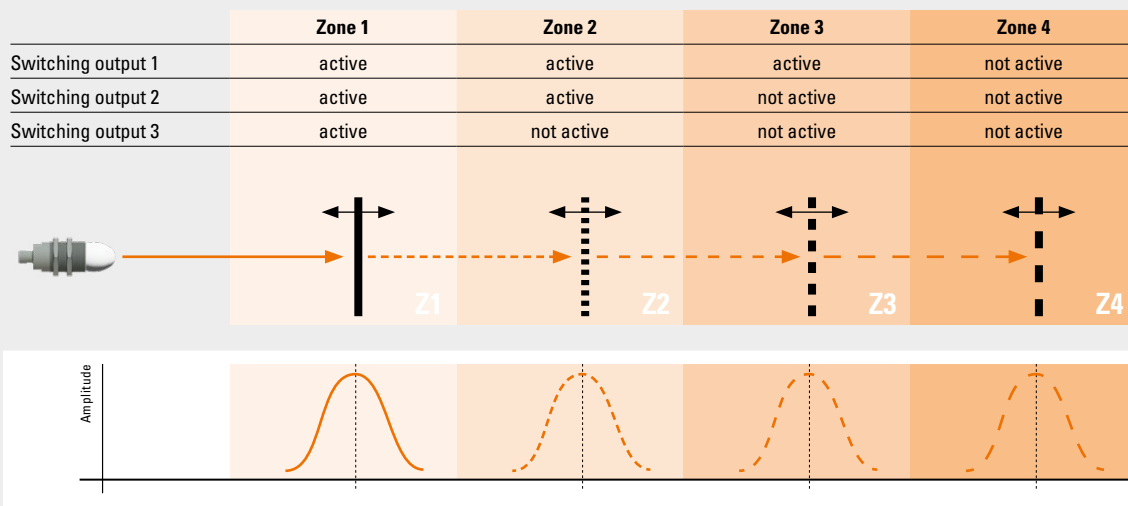
Radar detection area

The detection pattern shows the extent to which a 25 mm diameter round metal rod illuminated by the radar sensor is detected.



Setting safety areas via the switching outputs

Up to 4 safety ranges can be defined by specifying measuring ranges for the activation of the three switching outputs. Depending on the range in which an object is detected, different actions can be triggered.



Radar sensors

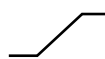
Distance measurement and positioning	RAD51D	Analog + 3 switching outputs
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Simple. Robust. Precise.

The compact RAD51D radar sensor is suitable for the tightest installation situations and the harshest environmental conditions. With a narrow opening angle of $\pm 3^\circ$ (6°), the sensor offers maximum focusing for positioning tasks.

Thanks to a measuring rate of 100 Hz and measuring ranges between 0.15 m ... 20 m or 0.3 ... 40 m, countless applications can be realized with the latest radar technology. The simplest tools not only help with implementation, but also create transparency in operation.



Analog
Output

PNP NPN

Features and benefits

- **Wide measuring range**
 - Measuring range 0.15 m to 20 m or 0.30 m to 40 m
 - Small blind area of only 0.15 or 0.3 m
- **Fast and precise**
 - Measurement rate up to 100 Hz
 - Repeatability up to ± 1 mm
- **Wide range of applications**
 - Small opening angle $\pm 3^\circ$ (6°) for precise distance and position detection
 - Different data output options: In addition to the analog output of 4 ... 20 mA, 3 switching outputs are available for a wide range of applications.
- **Compact and easy to install**
 - 95 mm total length incl. M12 connector
 - Standardized mounting due to M30 mounting thread
 - Matching mounting accessories for easy mounting and alignment on the application
- **Maximum robustness**
 - Latest radar technology for reliable measurement even under the most adverse environmental conditions such as dust, fog, rain, smoke, wind or unfavorable light conditions.
- **Simple commissioning and setting of parameters**
 - Connection of the radar sensor to the PC using a configuration box (ConfigBox). Communication via the RS485 interface
 - "See what the sensor sees" through real-time visualization of the echo curve using appropriate software tools. This also enables simple and intuitive commissioning, as the measurement can be tracked live during installation.
 - Numerous setting options, such as setting the measuring range, setting switching points, filters or other features, to customize the sensor system to the respective application requirements.

Order code

RAD51D . XXX . 11111 . 1118

Type

a

Opening angle : $\pm 3^\circ$ (6°)
 Linearity : up to ± 5 mm
 Interface : 4 ... 20 mA + 3 x switching output PNP/NPN
 RS485 as communication interface

a Measuring range
 020 = 0.15 m ... 20 m
 040 = 0.30 m ... 40 m

Stock types
 RAD51D.020.11111.1118
 RAD51D.040.11111.1118

Radar sensors

Distance measurement and positioning		RAD51D	Analog + 3 switching outputs
Accessories			Order no.
M30 - Mounting bracket  	For easy mounting and correct alignment of the RAD5x sensors on the measurement object.		
	Material: galvanized steel 1.4301 Weight: 81 g Dimensions: 60 x 55 x 42 mm	for vertical adjustment $\pm 30^\circ$	8.0000.7000.0083 ¹⁾
	Material: galvanized steel 1.4301 Weight: 223 g Dimensions: 70 x 65 x 65 mm	for vertical adjustment $\pm 30^\circ$ and horizontal adjustment $\pm 15^\circ$	8.0000.7000.0084 ¹⁾
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⁾
Configuration box 	For transferring the sensor data to a PC/laptop Scope of delivery: - Configuration box „ConfigBox“ - Connection cable M12, 8-pin with plug and socket - Connection element - LAN cable for connection to the PC - Power connection		8.0010.9000.0023 ¹⁾
Cables and connectors			Order no.
Preassembled cables	M12 female connector with coupling nut, 8-pin, A coded, straight single ended 2 m [6.56'] PVC cable		05.00.6041.8211.002M
	M12 female connector with coupling nut, 8-pin, A coded, straight single ended 2 m [6.56'] PUR cable		05.00.6051.8211.002M
Connectors	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.

Radar sensors

Distance measurement and positioning	RAD51D	Analog + 3 switching outputs
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Technical data

General data	
Radar frequency (FMCW)	122.25 - 123 GHz
Radiation power	EIRP < 100 mW
MTTF	> 125 years
Measuring range	0.15 m ... 20 m 0.30 m ... 40 m
Opening angle	±3° (6°)
Measurement rate	100 Hz 300 Hz on request
Linearity	up to ±5 mm
Repeatability	±1 mm

Mechanical characteristics	
Material	housing stainless steel 1.4404 lens PTFE
Weight	205 g (170 g sensor / 35 g M30 nuts)
Protection acc. to ISO 20653	IP67 / IP69k
Working temperature range	-40 °C ... +70 °C [-40 °F ... +158 °F]
Storage temperature range	-40 °C ... +85 °C [-40 °F ... +185 °F]
Electrical connection	M12 connector, 8-pin, A-coded
Dimensions	l = 95 mm [3.74"] ø = 30 mm [1.18"]

Electrical characteristics	
Power supply	12 ... 30 V DC
Current consumption	75 mA (at 24 V DC)
Power consumption	1.8 W
Reverse polarity protection	yes
Communication	RS485 (half-duplex mode)
Analog output	4 ... 20 mA
Switching outputs	3 x PNP/NPN

Approvals	
CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

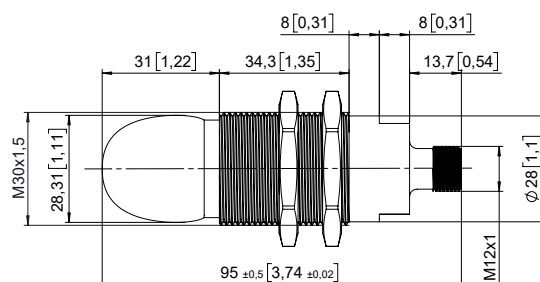
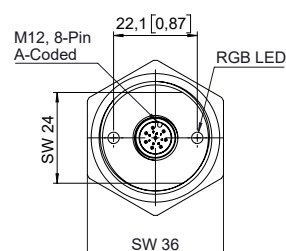
Terminal assignment

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

+V: supply voltage sensor +V DC
 0 V: Ground sensor GND (0V)
 A, B: RS485 Communication
 CL: analog output (4 ... 20 mA)
 OUT 1, 2, 3: switching outputs
 PH ⊥: connector housing (Shield)

Dimensions

Dimensions in mm [inch]



Technology in detail

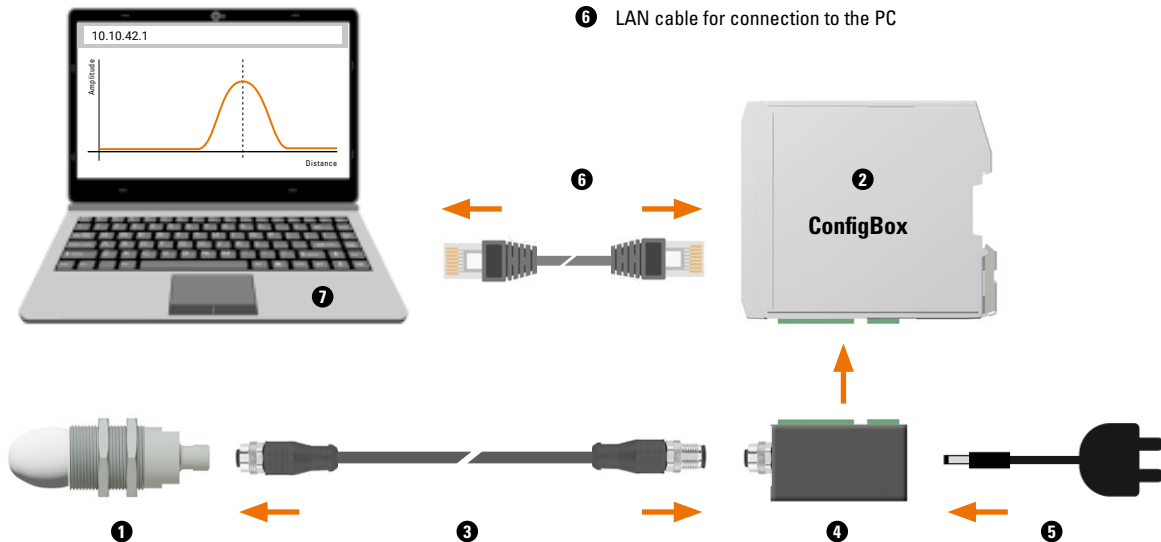
Individual setting options via the configuration box and configuration software

Connection

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All necessary connecting elements are included in the scope of delivery of the configuration box **2**:

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Commissioning / diagnosis

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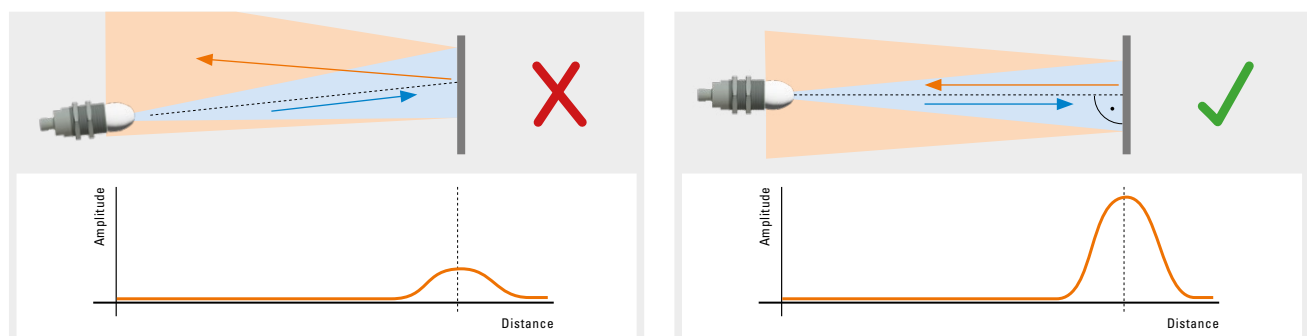
The software can be used to configure the sensor to the respective application requirements or to check its status during operation.

In addition to the visualization of the echo curve (radar signal), the following settings can be configured, for example:

- Configuration of the analog interface
- Setting the switching points for the switching outputs
- Setting the measuring range
- Setting the signal threshold value
- 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



Radar sensors

Distance measurement and positioning

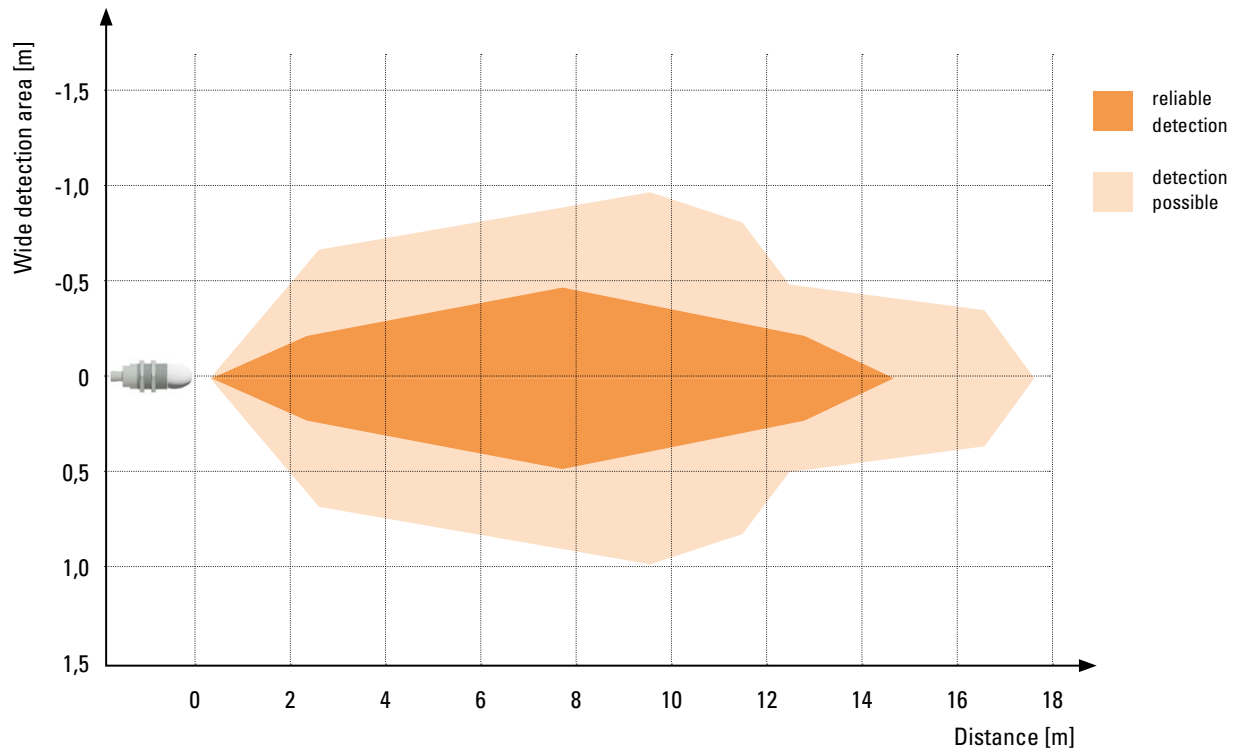
RAD51D

Analog + 3 switching outputs

Technology in detail

Radar detection area

The detection pattern shows the extent to which a 25 mm diameter round metal rod illuminated by the radar sensor is detected.



Radar sensors

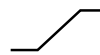
For demanding measurement tasks with maximum precision

RAD78D

PROFINET IO



For distance measurement, positioning, and object detection.



Analog
Output

PNP NPN

Order code

Measuring range 0.10 m ... 6 m

RAD78D . 006 . 11 X 5 3 . 3C12

Type

a

Opening angle : $\pm 1.5^\circ$ (3°)

Measurement rate : 500 Hz

Interfaces : PROFINET

4 ... 20 mA + 3 x switching output PNP/NPN

RS485 as communication interface

Radar frequency : 119 ... 125 GHz (selectable 122 ... 123 GHz)

a Linearity

1 = up to ± 1.0 mm

3 = up to ± 0.3 mm

7 = up to ± 0.7 mm

Order code

Measuring range 0.3 m ... 50 m

RAD78D . 050 . 11 2 1 2 . 3C12

Type

a

Opening angle : $\pm 1.5^\circ$ (3°)

Measurement rate : 100 Hz

Interfaces : PROFINET

4 ... 20 mA + 3 x switching output PNP/NPN

RS485 as communication interface

Radar frequency : 119.6 ... 123 GHz (selectable 122 ... 123 GHz)

a Linearity

2 = up to ± 2.0 mm

Radar sensors

For demanding measurement tasks with maximum precision		RAD78D	PROFINET IO																								
Accessories		Order no.																									
Starter Kit RAD78x PROFINET Preconfigured router and power kit for immediate access to the sensor and the integrated web interface—without changing the PC's IP address or admin rights. The kit consists of a mini router and a 24 V sensor power supply.		8.0010.9000.0025																									
Radar 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. <table> <tr> <td>For the measuring range:</td><td>0.5 m ... 20 m</td><td>side length 100 mm</td><td>8.0000.7000.0081 ¹⁾</td></tr> <tr> <td>Dimensions:</td><td>100 x 82 x 91 mm</td><td></td><td></td></tr> <tr> <td>For the measuring range:</td><td>10 m ... 30 m</td><td>side length 250 mm</td><td>8.0000.7000.0082 ¹⁾</td></tr> <tr> <td>Dimensions:</td><td>250 x 171 x 221 mm</td><td></td><td></td></tr> <tr> <td>For the measuring range:</td><td>20 m ... 70 m</td><td>side length 350 mm</td><td>8.0000.7000.0091 ¹⁾</td></tr> <tr> <td>Dimensions:</td><td>350 x 210 x 307 mm</td><td></td><td></td></tr> </table>		For the measuring range:	0.5 m ... 20 m	side length 100 mm	8.0000.7000.0081 ¹⁾	Dimensions:	100 x 82 x 91 mm			For the measuring range:	10 m ... 30 m	side length 250 mm	8.0000.7000.0082 ¹⁾	Dimensions:	250 x 171 x 221 mm			For the measuring range:	20 m ... 70 m	side length 350 mm	8.0000.7000.0091 ¹⁾	Dimensions:	350 x 210 x 307 mm				
For the measuring range:	0.5 m ... 20 m	side length 100 mm	8.0000.7000.0081 ¹⁾																								
Dimensions:	100 x 82 x 91 mm																										
For the measuring range:	10 m ... 30 m	side length 250 mm	8.0000.7000.0082 ¹⁾																								
Dimensions:	250 x 171 x 221 mm																										
For the measuring range:	20 m ... 70 m	side length 350 mm	8.0000.7000.0091 ¹⁾																								
Dimensions:	350 x 210 x 307 mm																										
Mounting plate for precise angle adjustment  To ensure that the sensor is correctly aligned perpendicular to the intended target Horizontal angle adjustment $\pm 2^\circ$ Vertical angle adjustment $\pm 1.5^\circ$ Dimensions: 288 x 175 x 88 mm		8.0000.7000.0088																									
Heat protection 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		8.0000.7000.0085																									
Heat protection housing with deflection  With a connection for air cooling.		on request																									
Heat protection housing for closed furnaces and containers  For enclosed furnaces and containers with high process temperatures. With a connection for air cooling		on request																									

¹⁾ Stock types

Radar sensors

For demanding measurement tasks with maximum precision		RAD78D	PROFINET IO
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

Radar sensors

For demanding measurement tasks with maximum precision

RAD78D

PROFINET IO

Technical data

General data – Order code **a** = 3

Measuring range	0.1 ... 6 m
Linearity	up to 2 m ±0.3 mm > 2 m ±0.015 % of the measurement section
Repeatability	up to 2 m ±0.03 mm > 2 m ±0.0015 % of the measurement section
Radar frequency (FMCW)	119 ... 125 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	500 Hz
Opening angle	±1.5° (3°)

General data – Order code **a** = 1

Measuring range	0.1 ... 6 m
Linearity	up to 2 m ±1 mm > 2 m ±0.05 % of the measurement section
Repeatability	up to 2 m ±0.1 mm > 2 m ±0.005 % of the measurement section
Radar frequency (FMCW)	119 ... 125 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	500 Hz
Opening angle	±1.5° (3°)

Electrical characteristics

Power supply	24 V DC
Current consumption	125 mA
Power consumption	3 W
Reverse polarity protection	yes
Analog output	4 ... 20 mA power supply 8 ... 40 V
Switching outputs	3 x PNP/NPN power supply 10 ... 40 V

General data – Order code **a** = 7

Measuring range	0.1 ... 6 m
Linearity	up to 2 m ±0.7 mm > 2 m ±0.035 % of the measurement section
Repeatability	up to 2 m ±0.07 mm > 2 m ±0.0035 % of the measurement section
Radar frequency (FMCW)	119 ... 125 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	500 Hz
Opening angle	±1.5° (3°)

General data – Order code **a** = 2

Measuring range	0.3 ... 50 m
Linearity	up to 4 m ±2 mm > 4 m ±0.05 % of the measurement section
Repeatability	up to 4 m ±0.5 mm > 4 m ±0.005 % of the measurement section
Radar frequency (FMCW)	119.6 ... 123 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	100 Hz
Opening angle	±1.5° (3°)

Mechanical characteristics

Material	housing lens	die-cast aluminum, coated PTFE
Weight	800 g [28,22 oz]	
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	

Approvals

CE compliant in accordance with	EMC Directive RoHS Directive	2014/30/EU 2011/65/EU
Approvals/Certificates	FCC / CFR-47 part 15 (USA) RSS-210 Issue 10 (Canada) EN 305 550-1 V.1.2.1 (European Union) EN 305 550-2 V.1.2.1 (European Union)	

Radar sensors

For demanding measurement tasks with maximum precision

RAD78D

PROFINET IO

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

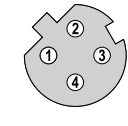
PROFINET characteristics

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

Process data

- Distance
- Peak
- Ramp Count

Terminal assignment

Function	M12 connector, 8-pin, A-coded										
Power supply	Signal:	A	+V	CL	OUT 2	OUT 1	B	0 V	OUT 3	±	
Analog output Switching outputs	Pin:	1	2	3	4	5	6	7	8	PH	
Function	M12 connector, 4-pin, D-coded										
Profinet communication	Signal:	RxD+		RxD-		TxD+		TxD+			
	Abbreviation:	Receive data+		Receive data-		Transmit data+		Transmit data-			
	Pin:	2		4		1		3			

+V: supply voltage sensor +V DC
 0 V: ground sensor GND (0V)
 A, B: RS485 communication
 CL: analog output (4 ... 20 mA)
 OUT 1, 2, 3: switching outputs
 PH ±: connector housing (shield)

Radar sensors

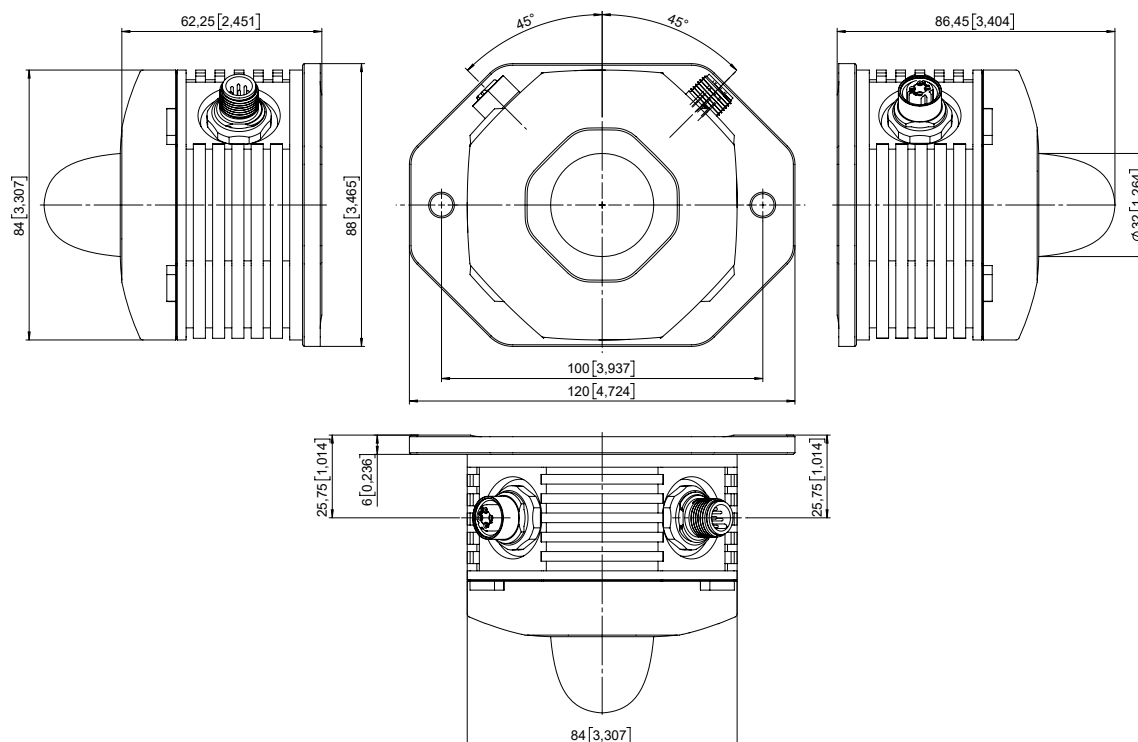
For demanding measurement tasks with
maximum precision

RAD78D

PROFINET IO

Dimensions

Dimensions in mm



Radar sensors

**For demanding measurement tasks
with liquid metal**

RAD78L

PROFINET IO



For measuring the level of molten metal.



Analog
Output

PNP NPN

Order code

Measuring range 0.10 m ... 6 m

RAD78L . 006 . 11 X 5 3 . 3C12

Type

a

Opening angle : $\pm 1.5^\circ$ (3°)

Measurement rate : 500 Hz

Interfaces : PROFINET

4 ... 20 mA + 3 x switching output PNP/NPN

RS485 as communication interface

Radar frequency : 119 ... 125 GHz (selectable 122 ... 123 GHz)

a *Linearity*

1 = up to ± 1.0 mm

3 = up to ± 0.3 mm

7 = up to ± 0.7 mm

Order code

Measuring range 0.3 m ... 30 m

RAD78L . 030 . 11 2 1 2 . 3C12

Type

a

Opening angle : $\pm 1.5^\circ$ (3°)

Measurement rate : 100 Hz

Interfaces : PROFINET

4 ... 20 mA + 3 x switching output PNP/NPN

RS485 as communication interface

Radar frequency : 119.6 ... 123 GHz (selectable 122 ... 123 GHz)

a *Linearity*

2 = up to ± 2.0 mm

Radar sensors

For demanding measurement tasks with liquid metal		RAD78L	PROFINET IO																								
Accessories			Order no.																								
Starter Kit RAD78x PROFINET Preconfigured router and power kit for immediate access to the sensor and the integrated web interface—without changing the PC's IP address or admin rights. The kit consists of a mini router and a 24 V sensor power supply.			8.0010.9000.0025																								
Radar 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. <table> <tr> <td>For the measuring range:</td><td>0.5 m ... 20 m</td><td>side length 100 mm</td><td>8.0000.7000.0081 ¹⁾</td></tr> <tr> <td>Dimensions:</td><td>100 x 82 x 91 mm</td><td></td><td></td></tr> <tr> <td>For the measuring range:</td><td>10 m ... 30 m</td><td>side length 250 mm</td><td>8.0000.7000.0082 ¹⁾</td></tr> <tr> <td>Dimensions:</td><td>250 x 171 x 221 mm</td><td></td><td></td></tr> <tr> <td>For the measuring range:</td><td>20 m ... 70 m</td><td>side length 350 mm</td><td>8.0000.7000.0091 ¹⁾</td></tr> <tr> <td>Dimensions:</td><td>350 x 210 x 307 mm</td><td></td><td></td></tr> </table>		For the measuring range:	0.5 m ... 20 m	side length 100 mm	8.0000.7000.0081 ¹⁾	Dimensions:	100 x 82 x 91 mm			For the measuring range:	10 m ... 30 m	side length 250 mm	8.0000.7000.0082 ¹⁾	Dimensions:	250 x 171 x 221 mm			For the measuring range:	20 m ... 70 m	side length 350 mm	8.0000.7000.0091 ¹⁾	Dimensions:	350 x 210 x 307 mm				
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Mounting plate for precise angle adjustment  To ensure that the sensor is correctly aligned perpendicular to the intended target Horizontal angle adjustment $\pm 2^\circ$ Vertical angle adjustment $\pm 1.5^\circ$ Dimensions: 288 x 175 x 88 mm			8.0000.7000.0088																								
Heat protection 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			8.0000.7000.0085																								
Heat protection housing with deflection  With a connection for air cooling.			on request																								
Heat protection housing for closed furnaces and containers  For enclosed furnaces and containers with high process temperatures. With a connection for air cooling			on request																								

¹⁾ Stock types

Radar sensors

For demanding measurement tasks with liquid metal		RAD78L	PROFINET IO
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

Radar sensors

For demanding measurement tasks with liquid metal

RAD78L
PROFINET IO

Technical data

General data – Order code **a** = 3

Measuring range	0.1 ... 6 m
Linearity	up to 2 m ±0.3 mm > 2 m ±0.015 % of the measurement section
Repeatability	up to 2 m ±0.03 mm > 2 m ±0.0015 % of the measurement section
Radar frequency (FMCW)	119 ... 125 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	500 Hz
Opening angle	±1.5° (3°)

General data – Order code **a** = 1

Measuring range	0.1 ... 6 m
Linearity	up to 2 m ±1 mm > 2 m ±0.05 % of the measurement section
Repeatability	up to 2 m ±0.1 mm > 2 m ±0.005 % of the measurement section
Radar frequency (FMCW)	119 ... 125 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	500 Hz
Opening angle	±1.5° (3°)

Electrical characteristics

Power supply	24 V DC
Current consumption	125 mA
Power consumption	3 W
Reverse polarity protection	yes
Analog output	4 ... 20 mA
power supply	8 ... 40 V
Switching outputs	3 x PNP/NPN
power supply	10 ... 40 V

General data – Order code **a** = 7

Measuring range	0.1 ... 6 m
Linearity	up to 2 m ±0.7 mm > 2 m ±0.035 % of the measurement section
Repeatability	up to 2 m ±0.07 mm > 2 m ±0.0035 % of the measurement section
Radar frequency (FMCW)	119 ... 125 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	500 Hz
Opening angle	±1.5° (3°)

General data – Order code **a** = 2

Measuring range	0.3 ... 30 m
Linearity	up to 4 m ±2 mm > 4 m ±0.05 % of the measurement section
Repeatability	up to 4 m ±0.5 mm > 4 m ±0.005 % of the measurement section
Radar frequency (FMCW)	119.6 ... 123 GHz (selectable 122 ... 123 GHz)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	100 Hz
Opening angle	±1.5° (3°)

Mechanical characteristics

Material	housing lens	die-cast aluminum, coated PTFE
Weight	800 g [28,22 oz]	
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	

Approvals

CE compliant in accordance with	EMC Directive RoHS Directive	2014/30/EU 2011/65/EU
Approvals/Certificates	FCC / CFR-47 part 15 (USA) RSS-210 Issue 10 (Canada) EN 305 550-1 V.1.2.1 (European Union) EN 305 550-2 V.1.2.1 (European Union)	

Radar sensors

**For demanding measurement tasks
with liquid metal**

RAD78L

PROFINET IO

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

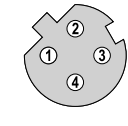
PROFINET characteristics

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

Process data

- Distance
- Peak
- Ramp Count

Terminal assignment

Function	M12 connector, 8-pin, A-coded										
Power supply	Signal:	A	+V	CL	OUT 2	OUT 1	B	0 V	OUT 3	±	
Analog output Switching outputs	Pin:	1	2	3	4	5	6	7	8	PH	
Function	M12 connector, 4-pin, D-coded										
Profinet communication	Signal:	RxD+		RxD-		TxD+		TxD+			
	Abbreviation:	Receive data+		Receive data-		Transmit data+		Transmit data-			
	Pin:	2		4		1		3			

+V: supply voltage sensor +V DC
 0 V: ground sensor GND (0V)
 A, B: RS485 communication
 CL: analog output (4 ... 20 mA)
 OUT 1, 2, 3: switching outputs
 PH ±: connector housing (shield)

Radar sensors

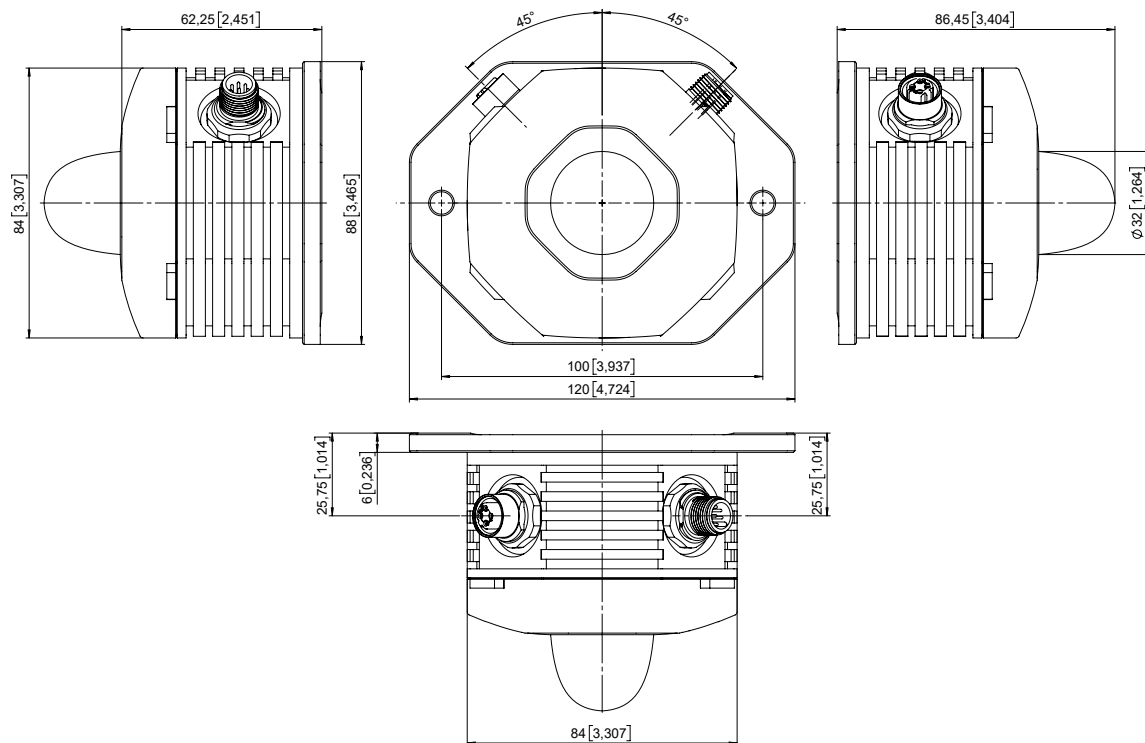
**For demanding measurement tasks
with liquid metal**

RAD78L

PROFINET IO

Dimensions

Dimensions in mm

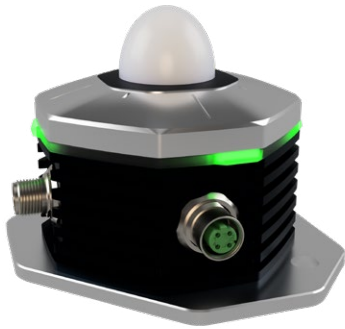


Radar sensors

For high-precision distance measurement

RAD78P

PROFINET IO



Distance measurements in the μm range.



Order code

Measuring range 0.10 m ... 6 m

RAD78P . 006 . 11 1 5 3 . CC12
Type

Opening angle : $\pm 1.5^\circ$ (3°)
Measurement rate : 500 Hz
Interface : PROFINET
Radar frequency : 119 ... 125 GHz (auswählbar 122 ... 123 GHz)

a Linearity
1 = $\pm 0.1\%$ of the change in distance relative to the specified zero point

Order code

Measuring range 0.3 m ... 40 m

RAD78P . 040 . 11 1 5 2 . CC12
Type

Opening angle : $\pm 1.5^\circ$ (3°)
Measurement rate : 500 Hz
Interface : PROFINET
Radar frequency : 122 ... 123 GHz

a Linearity
1 = $\pm 0.1\%$ of the change in distance relative to the specified zero point

Accessories

Order no.

Starter Kit RAD78x PROFINET

Preconfigured router and power kit for immediate access to the sensor and the integrated web interface—without changing the PC's IP address or admin rights.
The kit consists of a mini router and a 24 V sensor power supply.

8.0010.9000.0025

Mounting plate for precise angle adjustment

To ensure that the sensor is correctly aligned perpendicular to the intended target
Horizontal angle adjustment $\pm 2^\circ$
Vertical angle adjustment $\pm 1.5^\circ$
Dimensions: 288 x 175 x 88 mm

8.0000.7000.0088



Radar sensors

For high-precision distance measurement		RAD78P	PROFINET IO
Cables and connectors			Order no.
Preassembled cables	M12 male connector with external thread, 4-pin, D-coded, straight		05.00.6031.4444.002M
	M12 female connector with coupling nut, 4-pin, D-coded, straight 2 m [6.56'] PUR cable		
	M12 male connector with external thread, 4-pin, D-coded, angled		05.00.6031.4542.002M
	M12 female connector with coupling nut, 4-pin, D-coded, straight 2 m [6.56'] PUR cable		
	M12 male connector with external thread, 4-pin, D-coded, straight RJ45 connector 2 m [6.56'] PUR cable		05.00.6031.7444.002M
Connectors	M12 female connector with coupling nut, 8-pin, A-coded, straight		05.00.6051.8284.002M
	M12 male connector with external thread, 8-pin, A-coded, straight 2 m [6.56'] PUR cable		
	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

Radar sensors

For high-precision distance measurement

RAD78P

PROFINET IO

Technical data

General data

Measuring range	0.1 ... 6 m 0.3 ... 40 m
Linearity	±0.1 % of the measurement section
Repeatability	±1 µm
Radar frequency (FMCW)	119 ... 125 GHz (selectable 122 ... 123 GHz for measuring range 0.3 ... 40 m)
Radiation power	EIRP < 100 mW
MTTF	> 105 years
Measurement rate	500 Hz
Opening angle	±1.5° (3°)

Electrical characteristics

Power supply	24 V DC
Current consumption	125 mA
Power consumption	3 W
Reverse polarity protection	yes
Analog output	4 ... 20 mA power supply 8 ... 40 V
Switching outputs	3 x PNP/NPN power supply 10 ... 40 V

Mechanical characteristics

Material	housing lens	die-cast aluminum, coated PTFE
Weight	800 g [28,22 oz]	
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Storage temperature range	-40 °C ... +85 °C [-40 °F ... +158 °F]	
Shock resistance (EN 60068-2-27)	100 g; 11 ms	

Approvals

CE compliant in accordance with	EMC Directive RoHS Directive	2014/30/EU 2011/65/EU
Approvals/Certificates	FCC / CFR-47 part 15 (USA) RSS-210 Issue 10 (Canada) EN 305 550-1 V.1.2.1 (European Union) EN 305 550-2 V.1.2.1 (European Union)	

Interface characteristics PROFINET

General information

Communication interface	Profinet RT
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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

Radar sensors

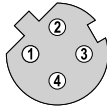
For high-precision distance measurement

RAD78P

PROFINET IO

Anschlussbelegung

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

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

+V: supply voltage sensor +V DC
 0 V: ground sensor GND (0V)
 A, B: RS485 communication
 CL: analog output (4 ... 20 mA)
 OUT 1, 2, 3: switching outputs
 PH ±: connector housing (shield)

Dimensions

Dimensions in mm

