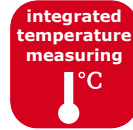


# Radarcont® RP4IR

Electronic Radar filling level sensor  
with freely radiating 122GHz FMCW signal



Technical Information TIO4.25



## Application

- Non-contact level and volume measurement
- Flow measurement at open channels and measuring weirs
- Water and waste water sector
- Process industry
- Environmental technology
- Storage tanks, storage bunkers, silos

## Main features

- Measuring ranges up to 10m
- Connector plug M12
- High protection class IIP65/IP67 (EN/IEC 60529)
- Process temperature range -20...+70°C (-4°F... +158°F)
- Characteristic deviation  $\leq \pm 0.1\%$ FSI (linearity + repeatability + hysteresis)
- Integrated overvoltage protection
- Temperature compensation



## Description

The device is an electronic radar filling level sensor for continuous measurement of filling levels in liquid media.

The device operates with a pulsed FMCW radar (Frequency Modulated Continuous Wave) and detects contactless the distance to motionless objects.

The sensor outputs a periodic radar signal with linear frequency which varies upwards and downwards. The rate of change of frequency over time remains constant. Objects in the detection range reflect the transmitted signal. The change in the signal delay and frequency of the reflected signal are used to determine the distance to the object.

The device is suitable for applications in virtually all industries, optimally for use within container up to 10m.

Due to the small opening angle especially disturbances by foreign objects or internals will be reduced.

It is advisable for applications, where optical or ultrasonic sensors are unsuitable because of disruptive factors like temperature, gas or dust stratification, under or overpressure resp. vacuum, dust, wind or incidence of light.

The Radar technology allows depending on the application:

- Measurement of liquids, also at gas stratification (e.g. ammonia) or foaming
- Measurement through the container wall, e.g. IPC container or through a protection window, e.g. PTFE or PP



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# TECHNICAL DATA

## Distance input

Sensor type FMCW radar, pulsed  
Frequency 122...123 GHz  
Radiated power EIRP  $\leq 10\text{dBm}$   
Beam angle  $10^\circ$   
Pulse rate  $\geq 10\text{Hz} / \leq 100\text{ms}$   
Measuring range 0 ... 10m (FSI)  
Blind zone  $\leq 30\text{cm}$   
Resolution  $\leq 1\text{mm}$   
Characteristic deviation  $\leq \pm 0.1\%\text{FSI}$  (linearity + repeatability + hysteresis)  
Linearity  $\leq \pm 0.1\%\text{FSI}$   
Repeat accuracy  $\leq \pm 2\text{mm}$   
Hysteresis negligible  
Influence of auxiliary energy  $\leq \pm 0.002\%\text{FSI/V}$   
Influence of temperature  $\leq \pm 0.005\%\text{FSI/K}$   
Long-term drift  $\leq \pm 0.02\%\text{FSI/year}$   
Influence of installation position without

## Electronics output IO-Link

### Interface - Co

Specification IO-Link V1.1 / Port Class A / Com2 (38.4 kBaud), Com3 (230.4 kBaud)  
Cycle time  $\geq 2.3\text{ms}$   
Time response  $t_{90-\text{min}} \leq 100\text{ms}$  ( $t_d = 0\text{s}$ )  
Switching output - So  
Specification 2x PP (push-pull), switching to +L/-L  
Output signal  $U_o \leq 0.2\text{V} \dots \geq (U_s - 2\text{V}) / I_o = 0 \dots 200\text{mA}$  (current-limited  $\leq 450\text{mA}$ , short-circuit proof)  
Switching delay time  $\leq 30\mu\text{s}$  ( $R_L \leq 3\text{k}\Omega / I_o \geq 4.5\text{mA}$ )  
Switching cycles  $\geq 100,000,000$

### Analog output - Io

Signal range 4...20mA: Signal range 3.8...20.5mA, error  $\leq 3.6\text{mA} / \geq 21\text{mA}$  (22mA)  
0...20mA: Signal range 0...20.5mA, error  $\leq 0.05\text{mA} / \geq 21\text{mA}$  (22mA)  
Resolution  $\leq 1\mu\text{A}$   
Permissible load  $R_L \leq (U_s - 8\text{V}) / 22\text{mA}$   
Influence of auxiliary energy  $\leq \pm 0.5\mu\text{A/V}$   
Influence of temperature  $T_a \leq \pm 0.5\mu\text{A/K}$

### Power supply

Supply voltage  $U_s$  IO-Link inactive: 9...35VDC reverse polarity protected / residual ripple  $\leq 2\text{Vpp}$   
IO-Link active: 18...30VDC reverse polarity protected / residual ripple  $\leq 2\text{Vpp}$   
Input current  $I_s \leq 20\text{mA}$  ( $I_{Co} / I_{So} / I_o = 0\text{mA}$ )  
Switch-on delay time  $\leq 0.5\text{s}$  ( $t_d = 0\text{s}$ )

## Electronics output RS485 Modbus-RTU

### Interface - Co

Specification RS485, bidirectional / Modbus-RTU / 4.8...38.4 kBaud  
Input resistance  $112\text{k}\Omega$   
Time response  $t_{90-\text{min}} \leq 100\text{ms}$  ( $t_d = 0\text{s}$ )

### Power supply

Supply voltage  $U_s$  6...35VDC reverse polarity protected / residual ripple  $\leq 2\text{Vpp}$   
Input current  $I_s \leq 20\text{mA}$  ( $I_{Co} = 0\text{mA}$ )  
Switch-on delay time  $\leq 0.5\text{s}$  ( $t_d = 0\text{s}$ )

## Materials

not in contact with the process PE-HD, POM, PA, FPM

### Process conditions

Process temperature  $T_p$  -20...+70°C (-4°F...+158°F)

Process pressure -0.2...+0.5bar

### Ambient conditions

Ambient temperature  $T_a$  -20...+70°C (-4°F... +158°F)

Protection class IP65/IP67 (EN/IEC 60529)

Climate class 4K4H (EN/IEC 60721-3-4)

Shock resistance 50g [1ms] (EN/IEC 60068-2-27)

Vibration resistance 20g [10...2000 Hz] (EN/IEC 60068-2-6)

EM compatibility Equipment class B / industrial area (EN/IEC 61326)

Overvoltage protection Integrated overvoltage protection (EN/IEC 61000-4-5)

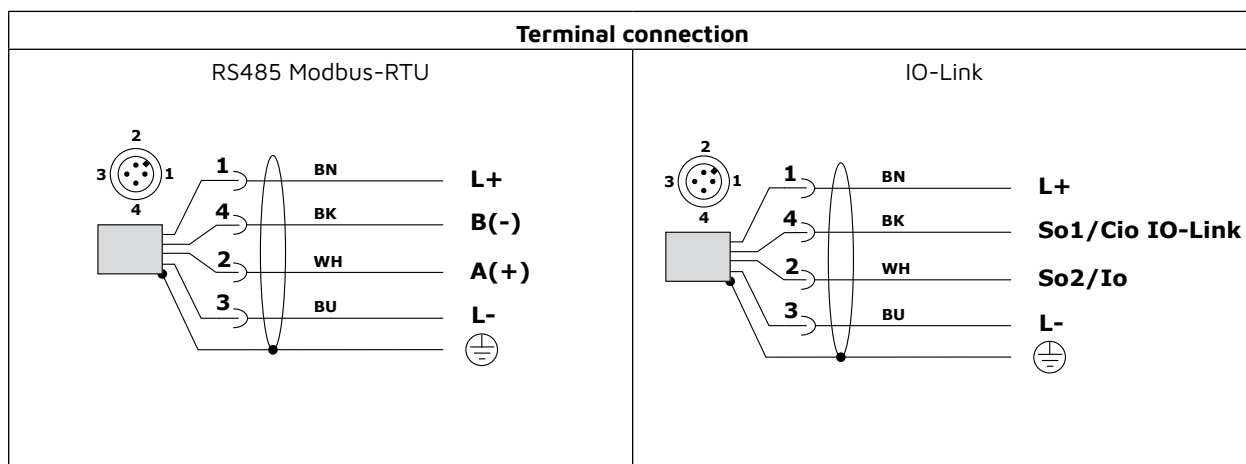
Insulation voltage  $\geq$  50VDC / rated leakage current 10kA (8/20 $\mu$ s)

Protection class III

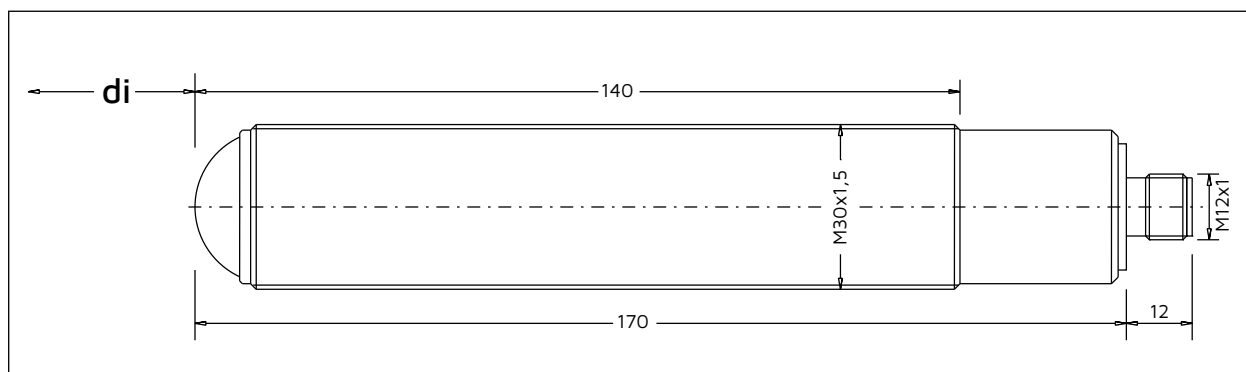
Pollution degree 4

Operating altitude 2000m above sea level

## ELECTRICAL CONNECTION



## DIMENSIONS (MM)



Type

<b>Approval</b>	
S	Without
<b>Process connection</b>	
U	Thread DIN 13 – M30x1,5
<b>Electronics output</b>	
V	RS485 Modbus-RTU, 4-wire
L	IO-Link, current 0/4...20mA / 1x/2x switch PP, 3-/4-wire
<b>Electronics function</b>	
0	Without
3	Temperature $\leq \pm 0,5K$
<b>Electrical connection</b>	
S	Plug M12-A-4P

Radarcont® RP4IR	S	U				S
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