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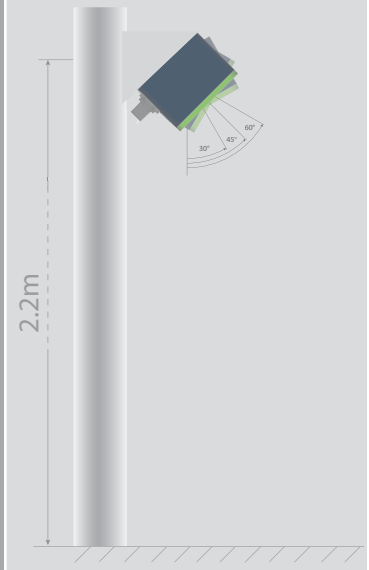
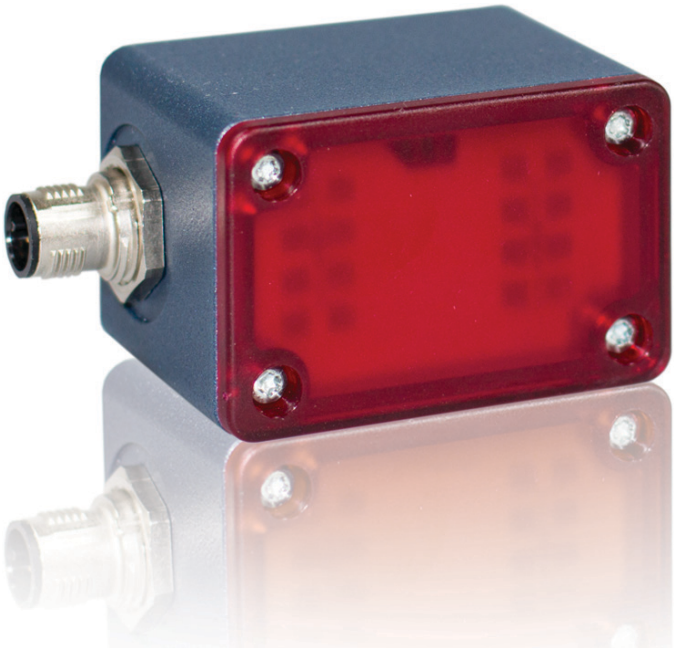
iSYS-4004

quick-start guide V2.2





content

iSYS-4004

quick-start guide

iSYS-4004

RS232

Install the iSYS-GUI software as described in the document „iSYS-GUI Interface“ and connect the sensor to your computer. If you use the iSYS-4004 the first time InnoSenT recommends to use one of the available configuration files to set up the sensor.

The DEFAULT setting of the sensor when powered up for the first time is the „fill level“ configuration. The following configuration files are available within Software-Package: iSYS-4004\GUI

- Fill level.ipf (distance measurement with full range)
- Presence detection.ipf (object detection in specific range)

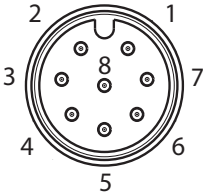
Examples how to mount the sensor and the expected detection fields are given on the next pages.

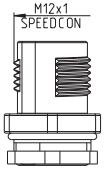
interface connection

The sensor provides an M12x8 Conec type SAL - 12 - FSH8 - P5,5 - 9 (PN: 43-01071) with SAL - 12 - FKH8 - P5,5 - 9 PLUG (PN: 43-01063).

RS-232 Interface (iSYS-4004)

PIN#	DESCRIPTION	IN / OUT	COMMENT
1	OUT1	output	open drain
2	OUT2	output	open drain
3	OUT3	output	open drain
4	Boot Mode	input	do not connect in operation
5	VCC	input	supply voltage (DC 10...30V)
6	GND	input	
7	RS232_Rx	input	
8	RX232_Tx	output	





configuration settings

The following settings apply for the different configuration sets:

	Fill level.ipf	Presence detection.ipf
output1	if object exist low, else high impedance	if object in selected range high impedance else low
output 2	if object exist high impedance, else low	if object in selected range high impedance else low
output 3	if object exist high impedance, else low	if object in selected range high impedance else low
rising delay	375ms	375ms
falling delay	75ms	75ms
filter type	highest amplitude	highest amplitude
single target filter	20% for all outputs	off
distance range	0....35m	4....6m
detection level	0dB	0dB

fill level configuration

Load the file „Fill level.ipf“ in the iSYS-GUI and mount the sensor as described in the following:

- mounting at the top of the tank
- mounting vertical to the fluid

In the fill level configuration the all filter parameters opened to see the fill level of the tank. The iSYS-4004 measures the distance between the fluid and the sensors front side.

This configuration is supposed to use in applications like:

- fill level
- contactless distance measurements

presence-detection configuration

Load the file „Presence Detection.ipf“ in the iSYS-GUI and mount the sensor as described in the following:

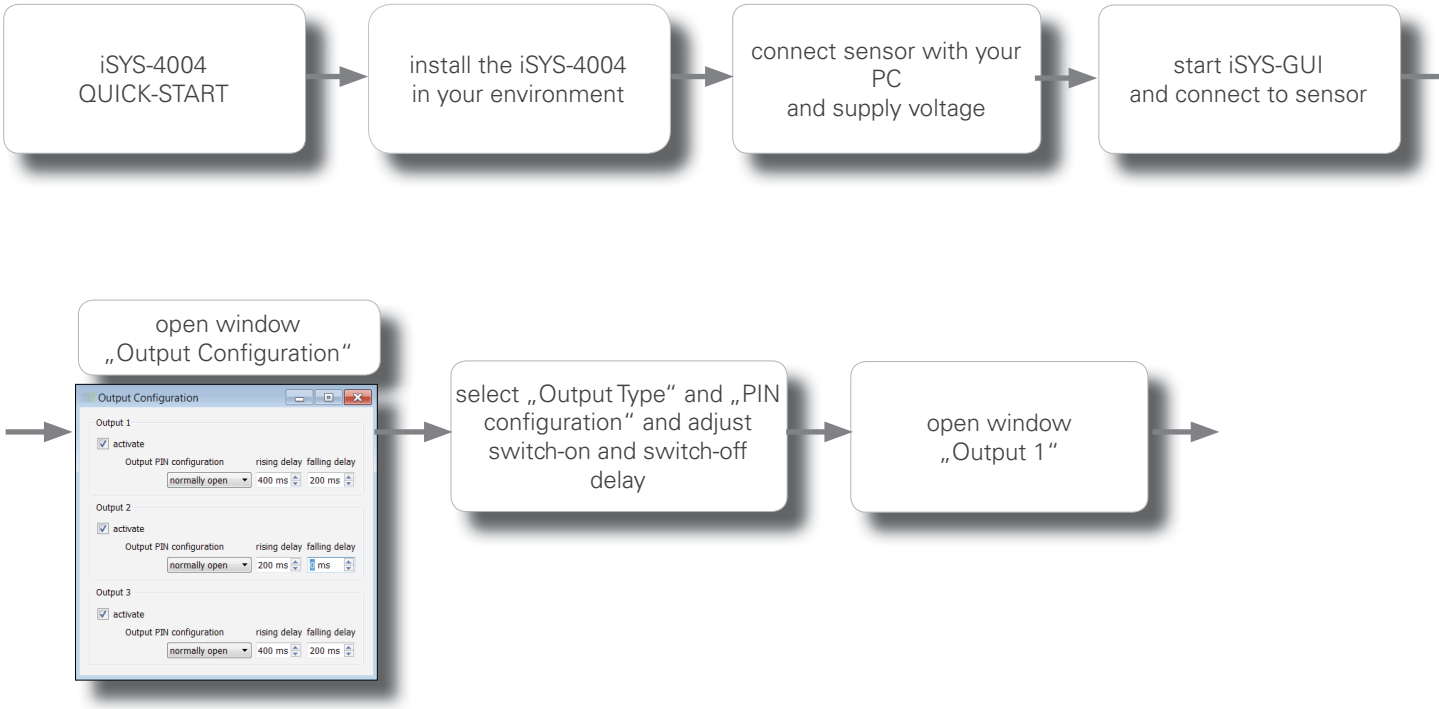
- mounting height: 1.1m
- mounting angle: 90°

In the „Presence detection“ configuratoin the detection range is set 4…6m. So the iSYS-4004 detects only objects within this range.

This configuration is supposed to use in applications like:

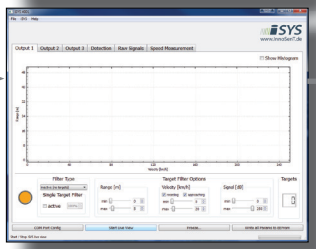
- security applications
- collision avoidance systems
- object detection

individual configuration - flow chart

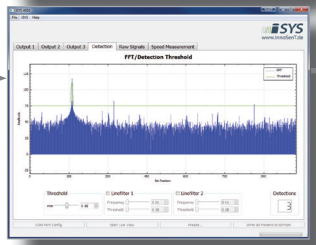


Set country specific channel

open Tab "Raw Signals" and start „Live View"

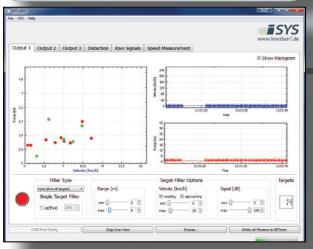


open Tab „Detection"



adjust „Threshold" in that way that the FFT peaks of the targets are above the threshold

activate „Show Histogram" to watch signals over time



select distance area and signal power

now you are ready to start

detection fields

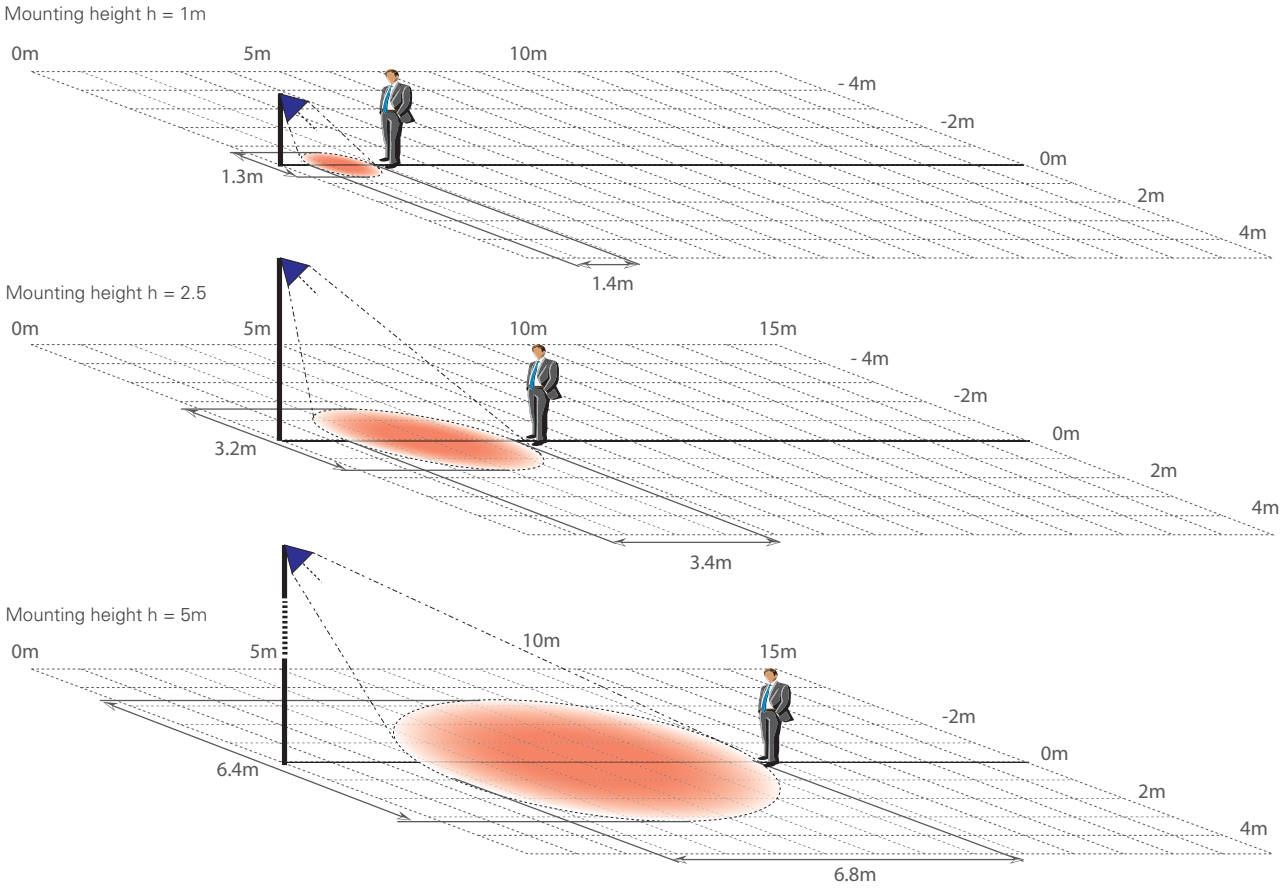
Providing the width of the antenna in degrees just says, that the transmitted or received energy has dropped at this point down to 50 percent of the maximum value (3dB-beamwidth). It does definitely not mean that beyond that point no transmission or reception is possible.

On the right side you see some examples of different detection fields depending on the mounting height and based on the 3dB-antenna-parameters of the iSYS-4004.

The color gradient shows the energy density of the antenna field. The darker the red the higher is the energy density of the antenna. That means that a small object (e.g. a cat) will be detected later than the border of the ellipse shows, whereas big objects (e.g. a car) are detected sooner. This is depending on the RCS of the object and is described in the next section.

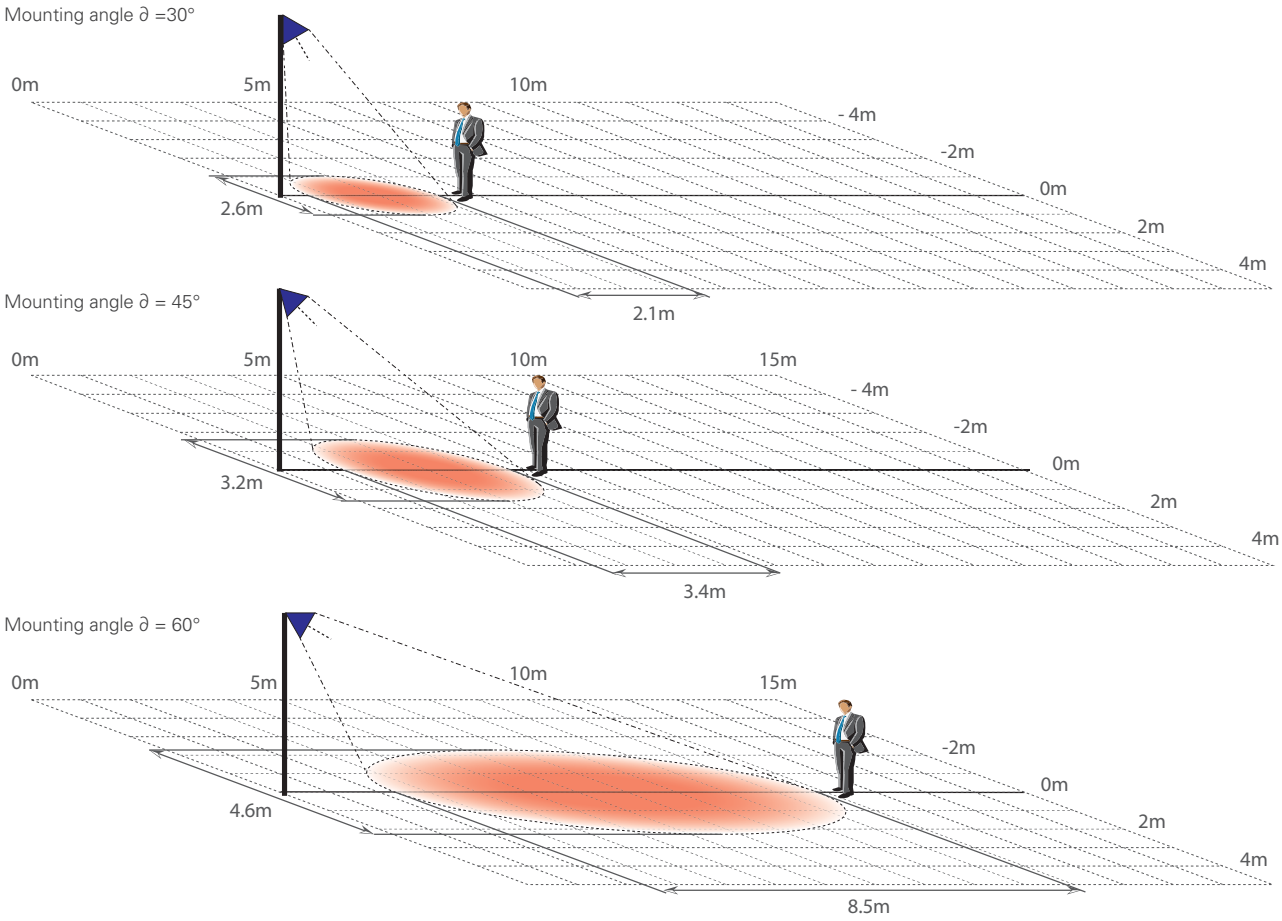
detection fields - depending on mounting height (examples)

The coverage area of the iSYS-4004 is depending on the distance to the object as well as to the mounting situation.



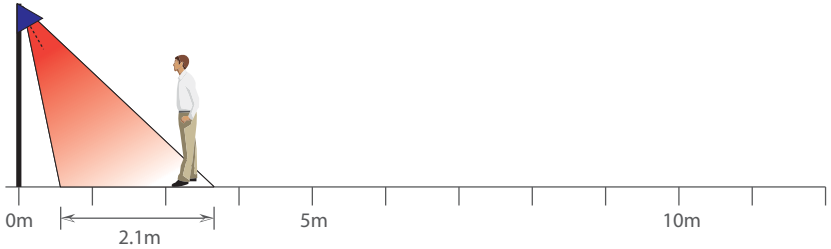
detection fields - depending on mounting angle (examples)

The coverage area of the iSYS-4004 is also depending on the mounting angle of the sensor.

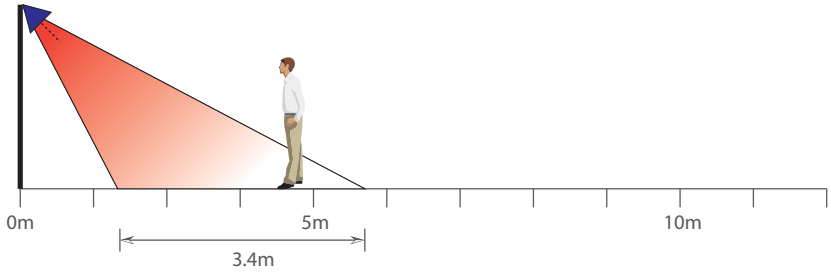


In the side view you see, that the energy density in the right area of the antenna beams decreases if the mounting angle of the module rises. Therefore the detection field gets broader, but because of the lower energy the same object has to move further into the beam @60° mounting angle as @30°.

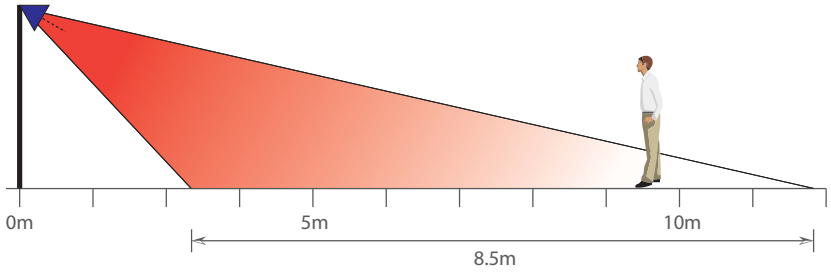
Mounting angle ∂ =30°



Mounting angle ∂ = 45°



Mounting angle ∂ = 60°



detection range depending on RCS

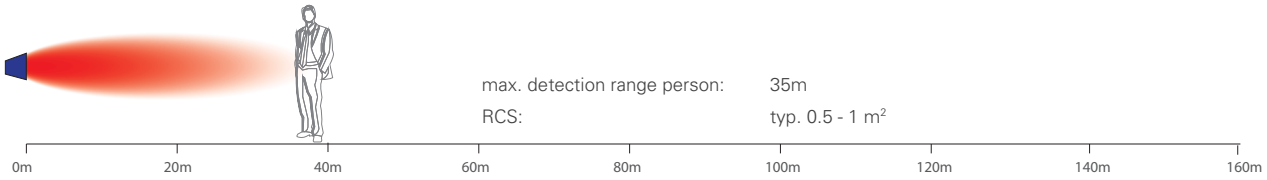
The amount of power that is reflected back to the radar depends largely on a quantity called the radar cross section (RCS). The power reflected by the target can be much stronger in some directions than in others. As a result, that reflected power will be much greater or much smaller than the isotropic power depending on how the target is oriented to the transmitting radar. Although RCS is technically an area and typically expressed in square meters (m^2).

The RCS of an object is depending on its geometric cross section (the geometric cross section refers to the area the target presents to the radar, or its projected area); Reflectivity (Reflectivity refers to the fraction of the intercepted power that is reflected by the target, regardless of direction) and its Directivity (Directivity is related to reflectivity but refers to the power scattered back in the direction of the transmitting radar).

Therefore the maximum detection distance of different objects is strongly depending on its RCS as well as on their orientation to the sensor and can strongly differ for different objects.

detection range depending on RCS

The picture below shows the typical detection ranges of the iSYS-4004 for different objects. The maximum detection range is limited to 35m.



FMCW modulation

The FMCW modulation enables the user to detect distance to **stationary objects**.

IMPORTANT: - objects standing close to each other can appear as one object.

Several examples are shown on the left side. If a bandwidth of 100 MHz (Channel #2 or #3) is used, two objects can be detected as soon as they are not closer together than 3m. If the objects get closer to each other they appear as one object. In this case the optical and the radar view are different. This fact is amongst others important if you want to monitor areas with a lot of moving of objects close to each other.

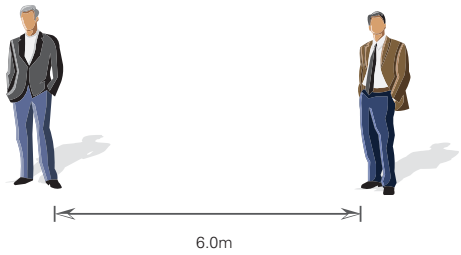
A bandwidth > 250MHz is unfortunately not allowed because of regulation reasons in Europe (ETSI 300-440) and US (FCC 15.245). Therefore the best achievable resolution for the iSYS-4004 is limited to 60cm.

FMCW modulation (optical vs. radar view)

Depending on the bandwidth the optical view differs from the radar view

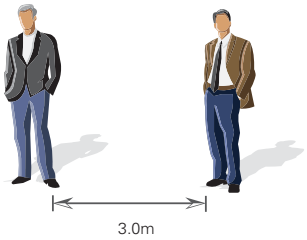
Bandwidth = 50MHz

two objects with the same RCS are closer than 6.0m, they appear as one target



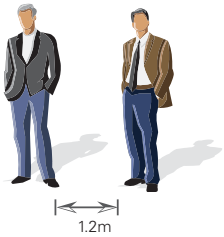
Bandwidth = 100MHz

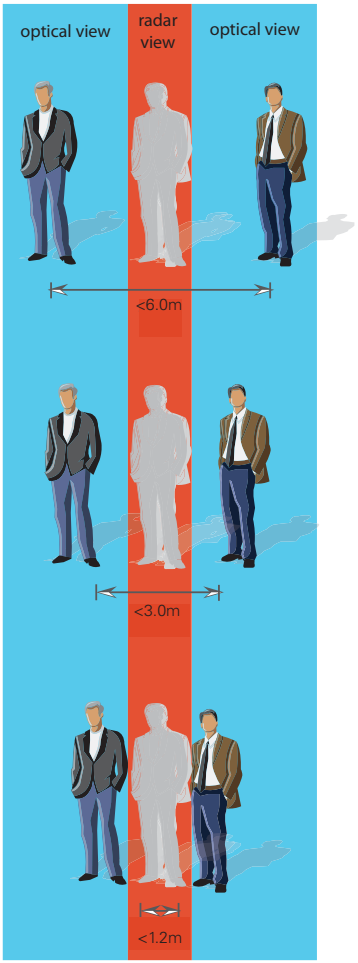
two objects with the same RCS are closer than 3.0m, they appear as one target



Bandwidth = 250MHz

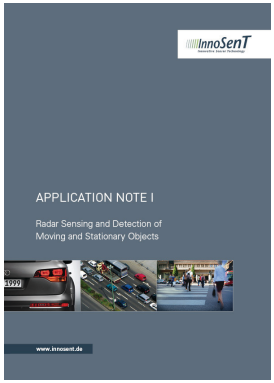
two objects with the same RCS are closer than 1.2m, they appear as one target

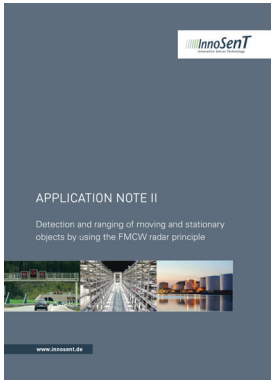


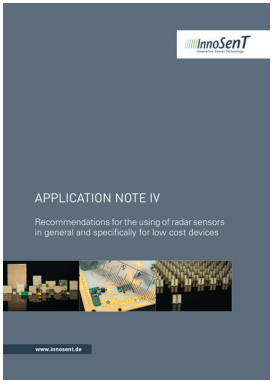


more details...

This quick start guide gives you only a short overview over the physical characteristics of radar. If you want to know more we recommend to have a look on our application notes (available @ www.innosent.de) or contact us directly.







contact information

If you have any questions please contact us!

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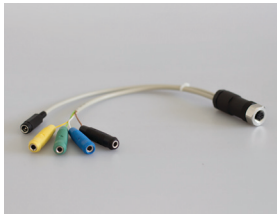
part numbers

P/N: iSYS-4004

P/N: iSYS-prog_adap



P/N: iSYS-pow_adap

P/N: iSYS-pow_sup

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