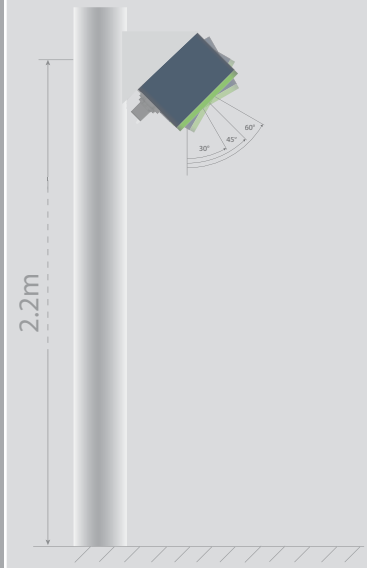
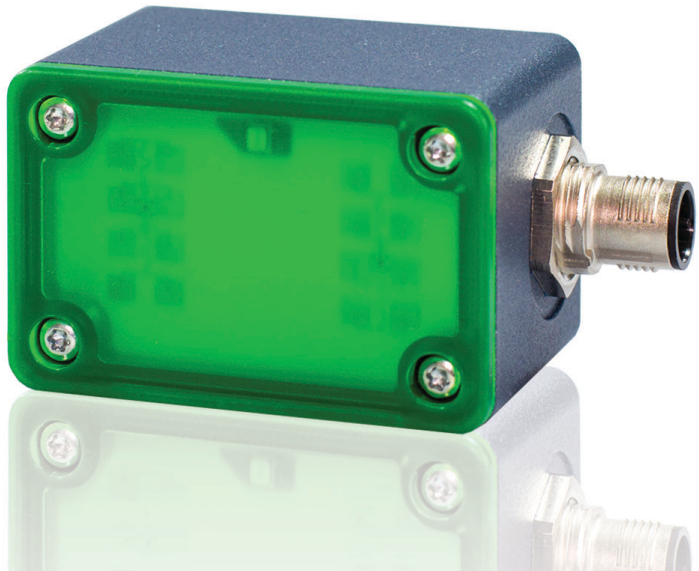
iSYS
www.InnoSenT.de

iSYS-4001
iSYS-4002
iSYS-4003

iSYS-4010
iSYS-4013

quick-start guide V2.2

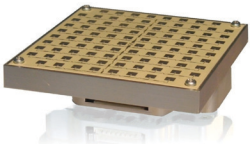
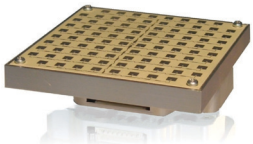




content

iSYS-400x

quick-start guide

iSYS-4001	iSYS-4002	iSYS-4003	iSYS-4010	iSYS-4013
				
RS232 -250...250 km/h	RS485 -250...250 km/h	RS485 -45...45 km/h „low speed“	RS485 -250...250 km/h	RS485 -45...45 km/h „low speed“

Install the iSYS-GUI software as described in the document „iSYS-400x GUI Interface“ and connect the sensor to your computer. If you use the iSYS-400x 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 „Short Range“ configuration. The following configuration files are available within Software-Package: iSYS-4001_iSYS-4002_iSYS-4003_iSYS_4010_iSYS-4013\GUI

- Short Range.ipf (for short range applications up to 50m)
- Long Range.ipf (for long range applications up to 150m)
- Demonstrator.ipf (for testing the sensor in house)

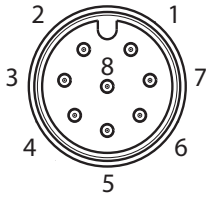
Examples how to mount the sensor and the expected detection fields are given on the next pages.

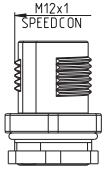
interface connection

RS-485 Interface (iSYS-4002; iSYS-4003) and RS-232 Interface (iSYS-4001)

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).

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	RS485_A	in/output	RS232_Rx for iSYS-4001 (in)
8	RX485_B	in/output	RX232_Tx for iSYS-4001 (out)

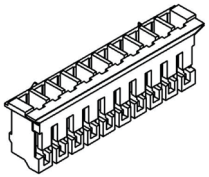




RS-485 Interface (iSYS-4013)

The sensor provides a Würth 620 108 131 822 connector mates with Würth 620 008 113 322

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	RS485_A	in/output	
8	RX485_B	in/output	



configuration settings

The following settings apply for the different configuration sets:

	Short Range.ipf	Long Range.ipf	Demonstrator ipf
output1	approaching & receding active low, if object exist open drain, if NO object exist	approaching & receding active low, if object exist open drain, if NO object exist	approaching & receding active low, if object exist open drain, if NO object exist
output 2	approaching open drain, if object exist active low, if NO object exist	approaching open drain, if object exist active low, if NO object exist	approaching open drain, if object exist active low, if NO object exist
output 3	receding open drain, if object exist active low, if NO object exist	receding open drain, if object exist active low, if NO object exist	receding open drain if object exist active low, if NO object exist
rising delay	375ms	375ms	75ms
falling delay	75ms	75ms	75ms
filter type	highest amplitude	highest amplitude	highest amplitude
single target filter	20% for all outputs	20% for all outputs	20% for all outputs
amplification	20dB	20dB	20dB
distance range	0....50m	0....150m	0....50m
detection level	0dB	0dB	25dB

short-range configuration

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

- mounting height: 2.2m
- mounting angle: 30° - 45° - 60° (depending on your application)

In the short Range configuration the ambiguity range is set to 50m.
Typical detection fields for a person are shown next page.

This configuration is supposed to use in applications like:

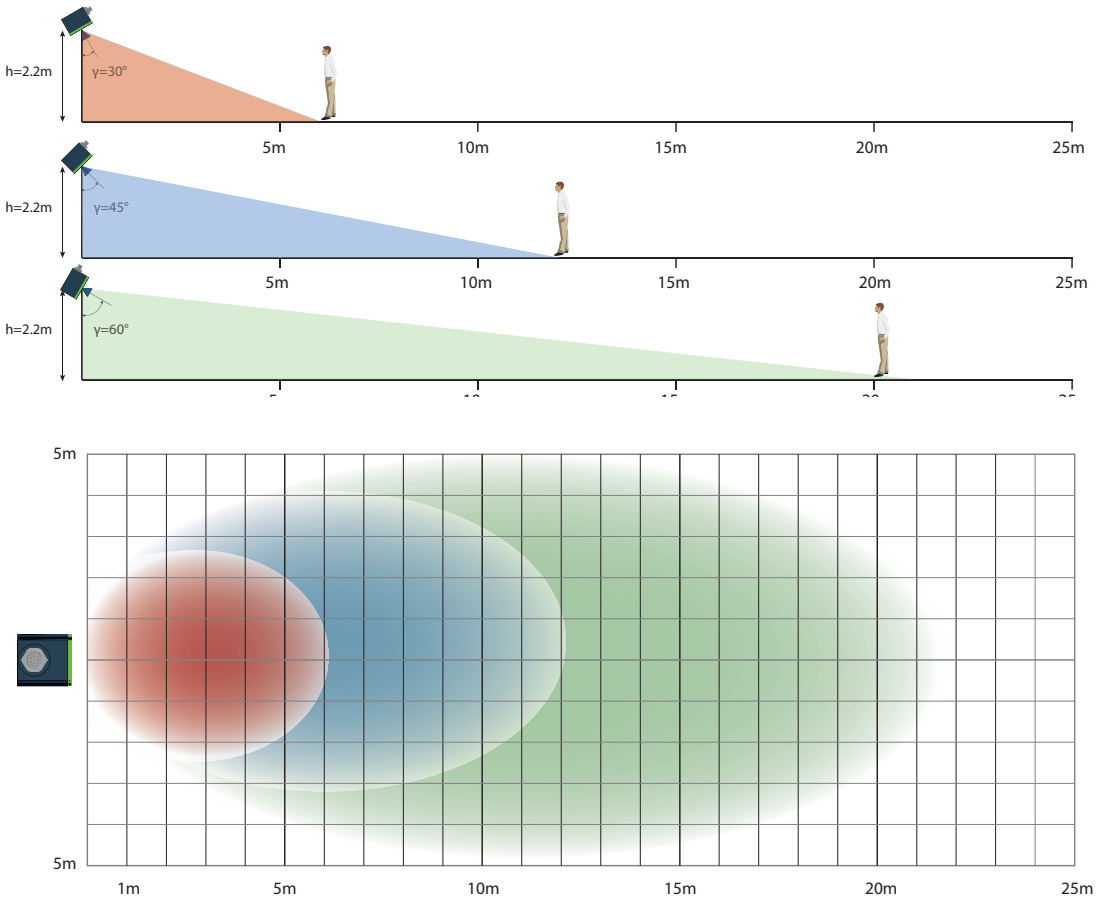
- door openers
- mobile traffic lights
- security applications

If detection ranges are necessary use the „Long Range“ configuration.

short-range configuration - detection fields

The schematic below shows typical detection areas for the iSYS-4001 for persons.

The detection areas are based on real measurements but can differ for objects with different RCS.



long-range configuration

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

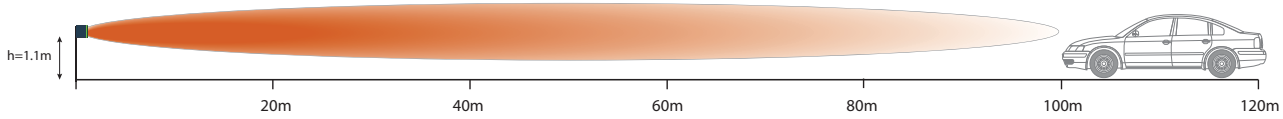
- mounting height: 1.1m
- mounting angle: 90°

In the „Long Range“ configuratoin the ambiguity range is set to 150m.

This configuration is supposed to use in applications like:

- traffic monitoring
- collision avoidance systems

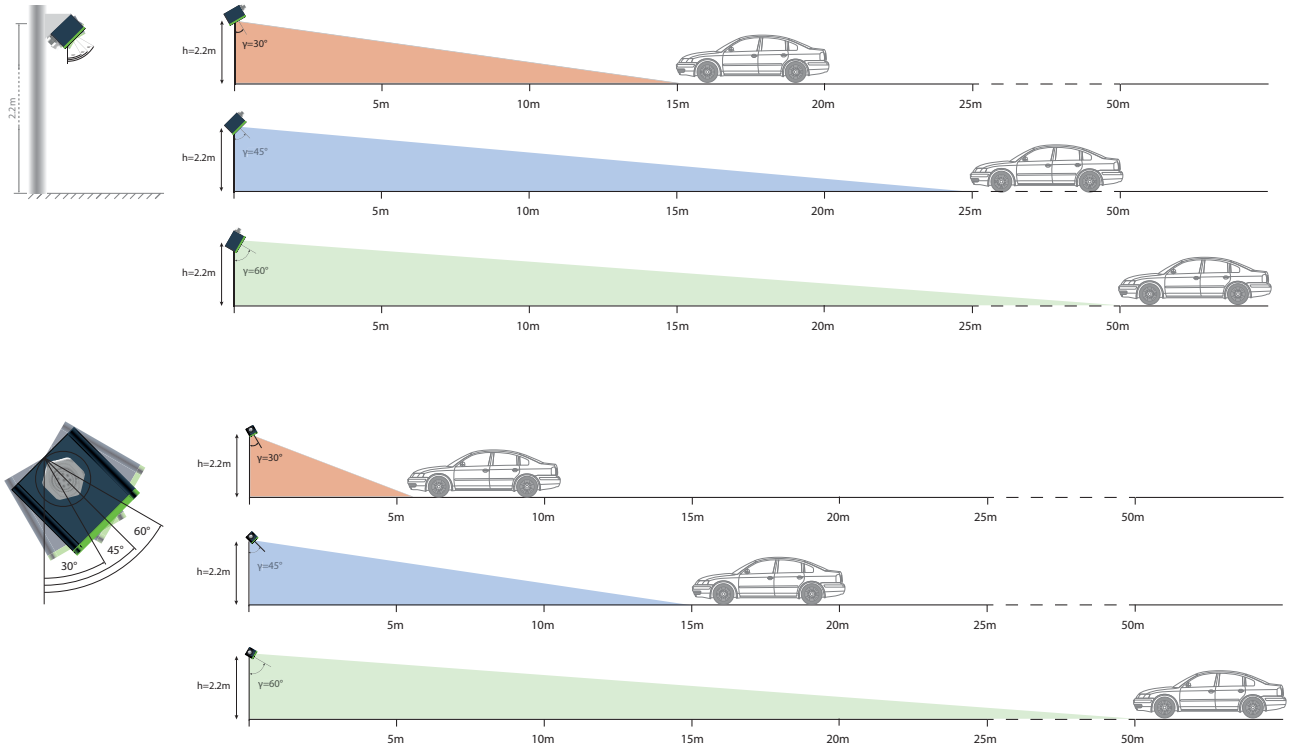
The typical detection distance for cars is shown below.



The maximum detection distance is depending on the size of the car, typically a detection distance of 100m with an medium size car can be achieved. For bigger vehicles even larger distances are possible.

long-range configuration - typical detection distances for cars

To get an impression about the typical detection range of the iSYS-4001 real measurements were performed. The pictures below shows the typical detection areas for cars for different mounting situations (mounting height 2.2m - mounting angle 30° - 45° - 60°) of the sensor. To achieve similar results use config file „Long Range.ipf“ available @ www.innosent.de.



individual configuration - flow chart

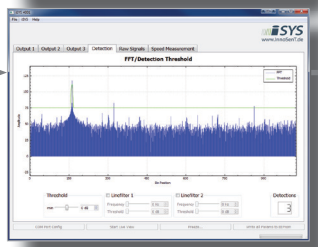
iSYS-400x QUICK-START

install the iSYS-4001 in your environment

connect sensor with your PC and supply voltage

start iSYS-GUI and connect to sensor

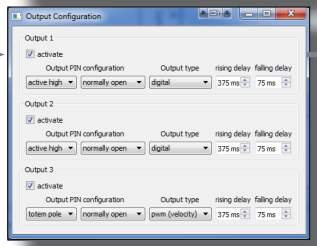
open Tab „Detection“



adjust „Threshold“ in that way that the FFT peaks are above the threshold

select the „Line Filter“ option if there are fixed frequency disturbing sources around

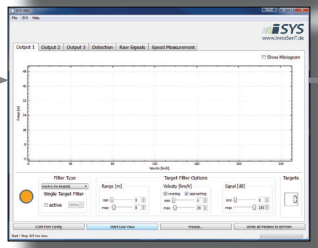
open window „Output Configuration“



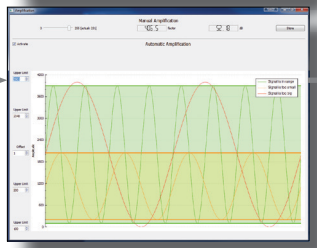
select distance- and speed area, as well as the direction of speed

now you are ready to start

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



open window „Amplification Settings“



signal has continous and constant amplitude

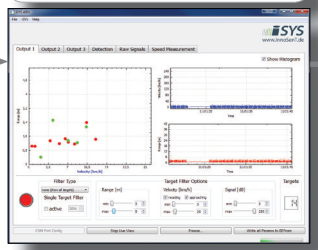
NO

activate automatic gain control and adjust the parameters to your application

YES

adjust amplification manually using the slider

activate „Show Histogram“ to watch signals over time



open window „Output 1“

select „Output Type“ and „PIN configuration“ and adjust switch-on and switch-off delay

detection fields

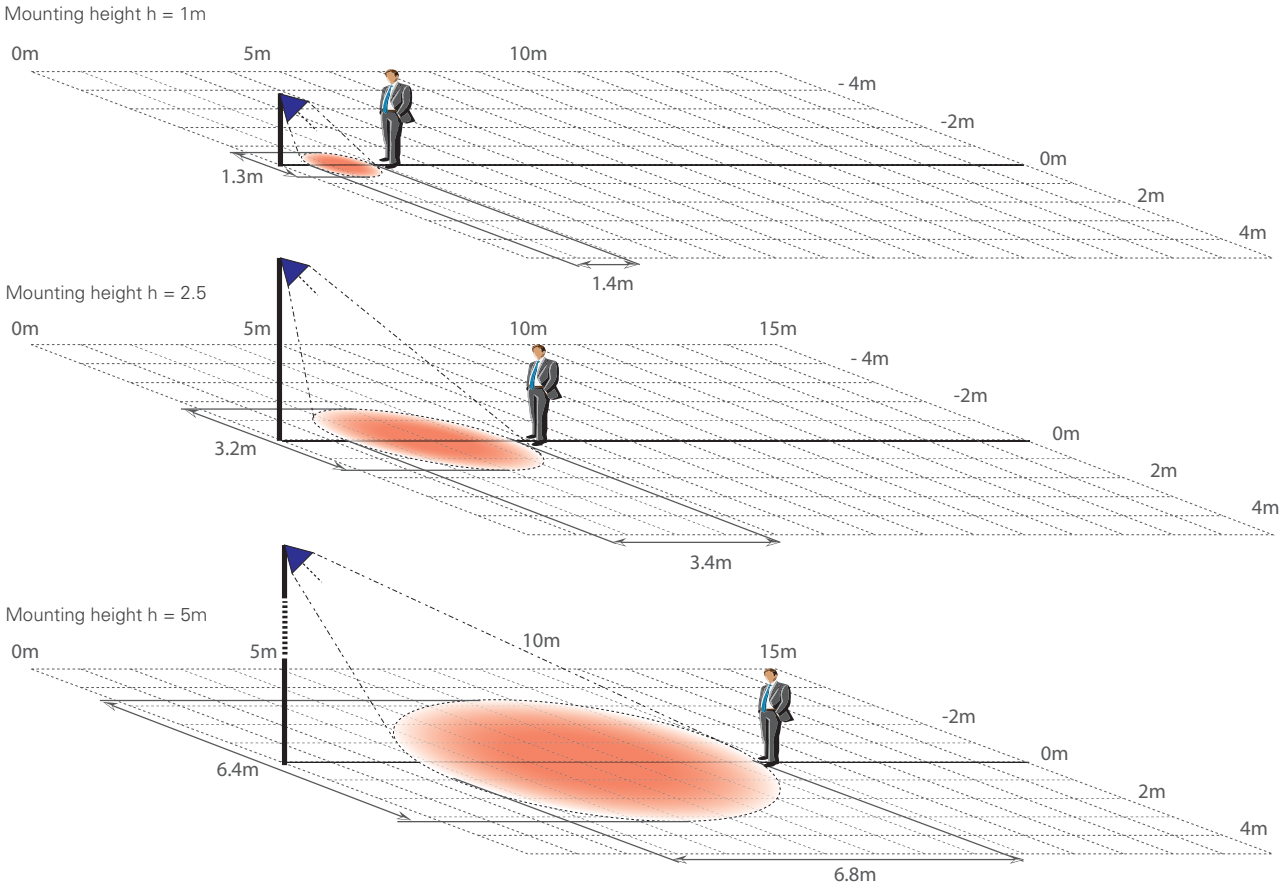
Providing the width of the antenna in degrees just says, that the transmitted or received energy has dropped at this point down to 50 percent of the maximum value (3dB-beamwidth). It does definitely not mean that beyond that point no transmission or reception is possible.

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-4001.

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.

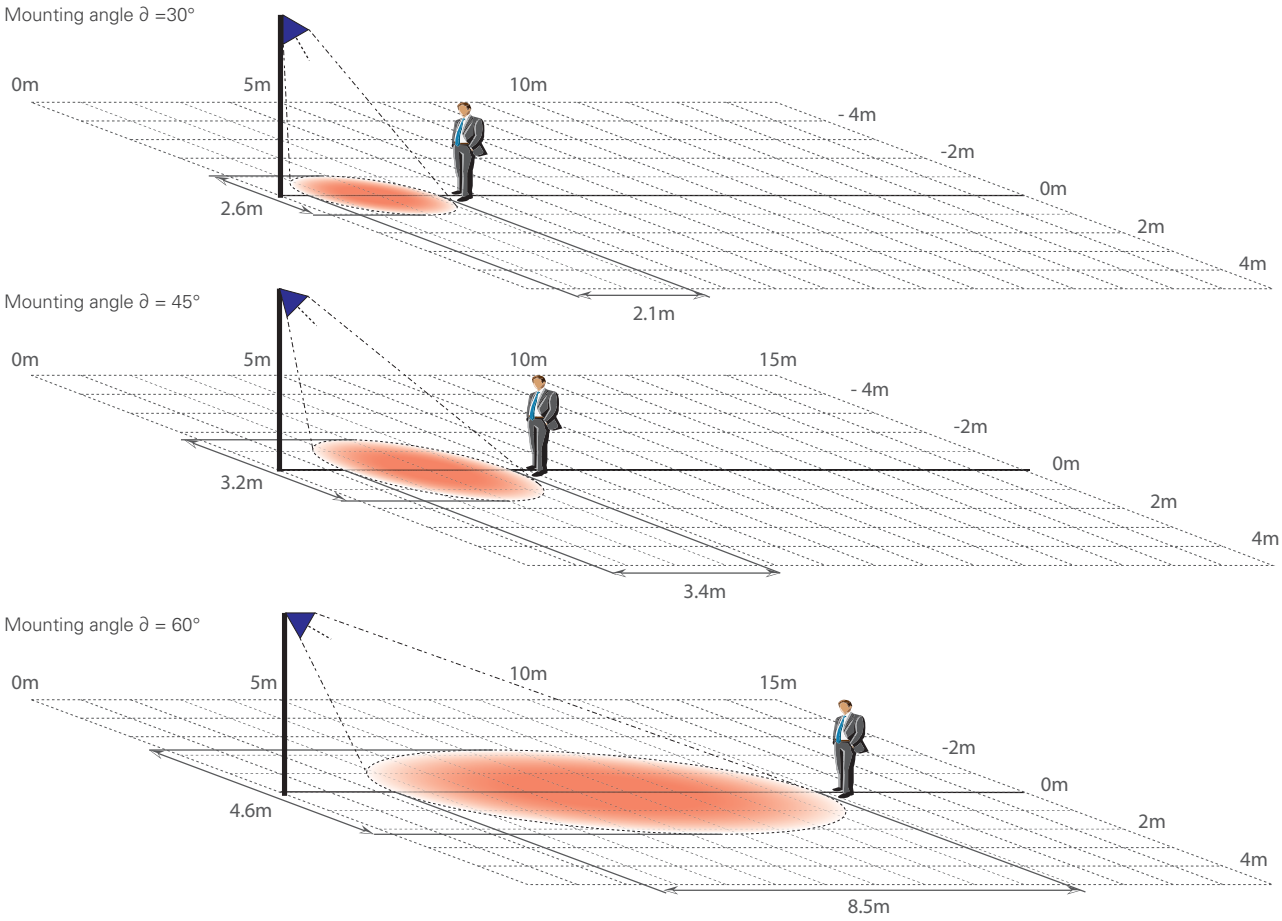
detection fields - depending on mounting height (examples)

The coverage area of the iSYS-4001 is depending on the distance to the object as well as to the mounting situation.



detection fields - depending on mounting angle (examples)

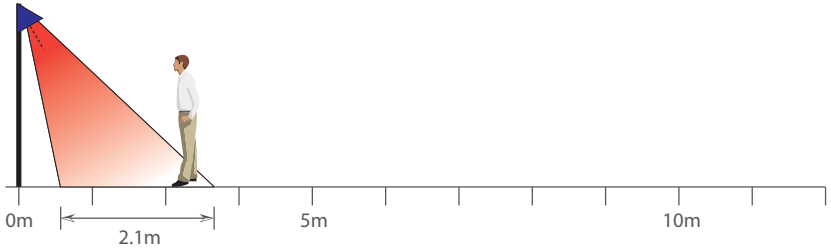
The coverage area of the iSYS-4001 is also depending on the mounting angle of the sensor.



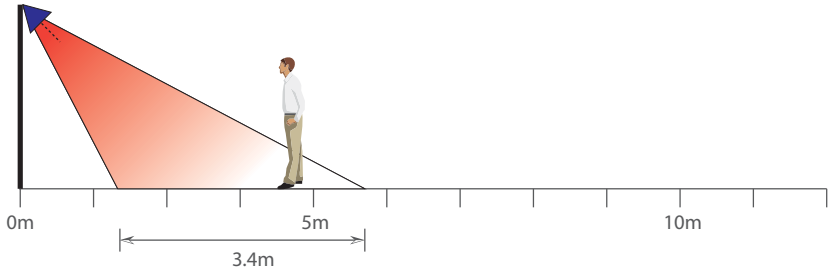
iSYS-4001_4002_4003_4010_4013 | quick start guide

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°.

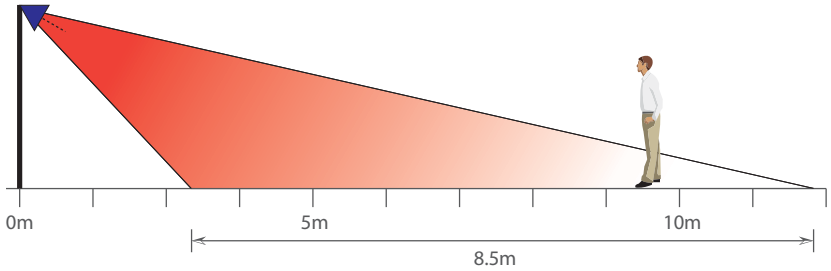
Mounting angle ∂ =30°



Mounting angle ∂ = 45°



Mounting angle ∂ = 60°



detection range depending on RCS

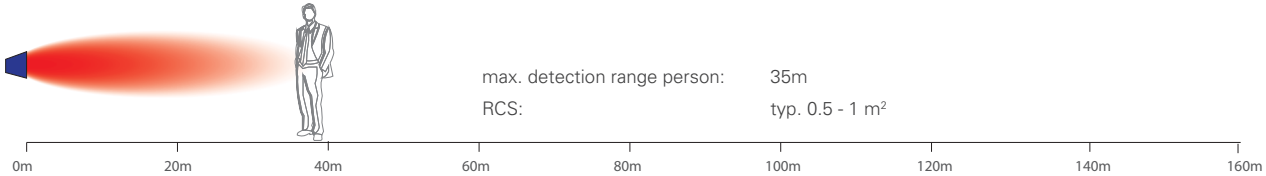
The amount of power that is reflected back to the radar depends largely on a quantity called the radar cross section (RCS). The power reflected by the target can be much stronger in some directions than in others. As a result, that reflected power will be much greater or much smaller than the isotropic 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).

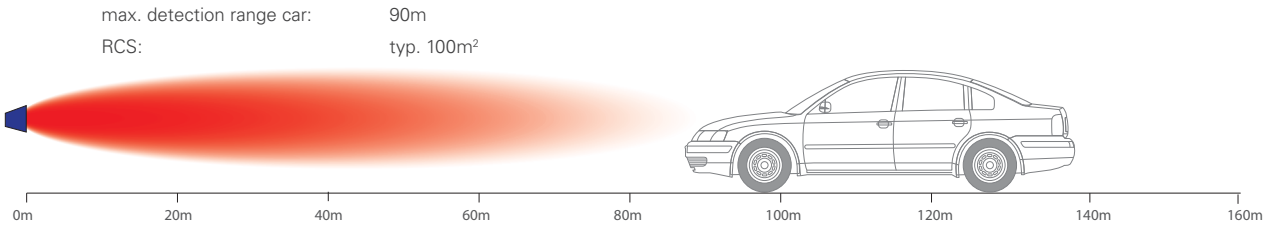
The RCS of an object is depending on its geometric cross section (the geometric cross section refers to the area the target presents to the radar, or its projected area); Reflectivity (Reflectivity refers to the fraction of the intercepted power that is reflected by the target, regardless of direction)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

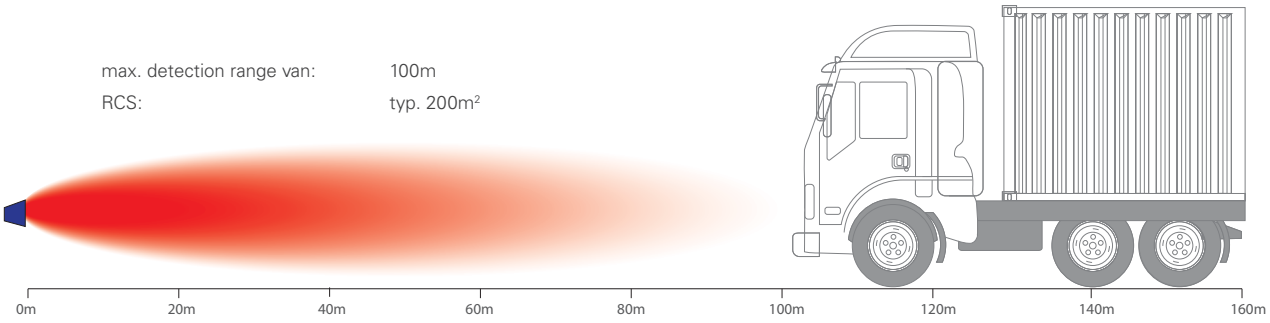
Therfore the maximum detection distance of different objects is strongly depending on its RCS as well as on their orientation to the sensor and can strongly differ for different objects.

detection range depending on RCS

The picture below shows the typical detection ranges of the iSYS-4001 for different objects. The maximum detection range is limited to 150m.







ambiguity range

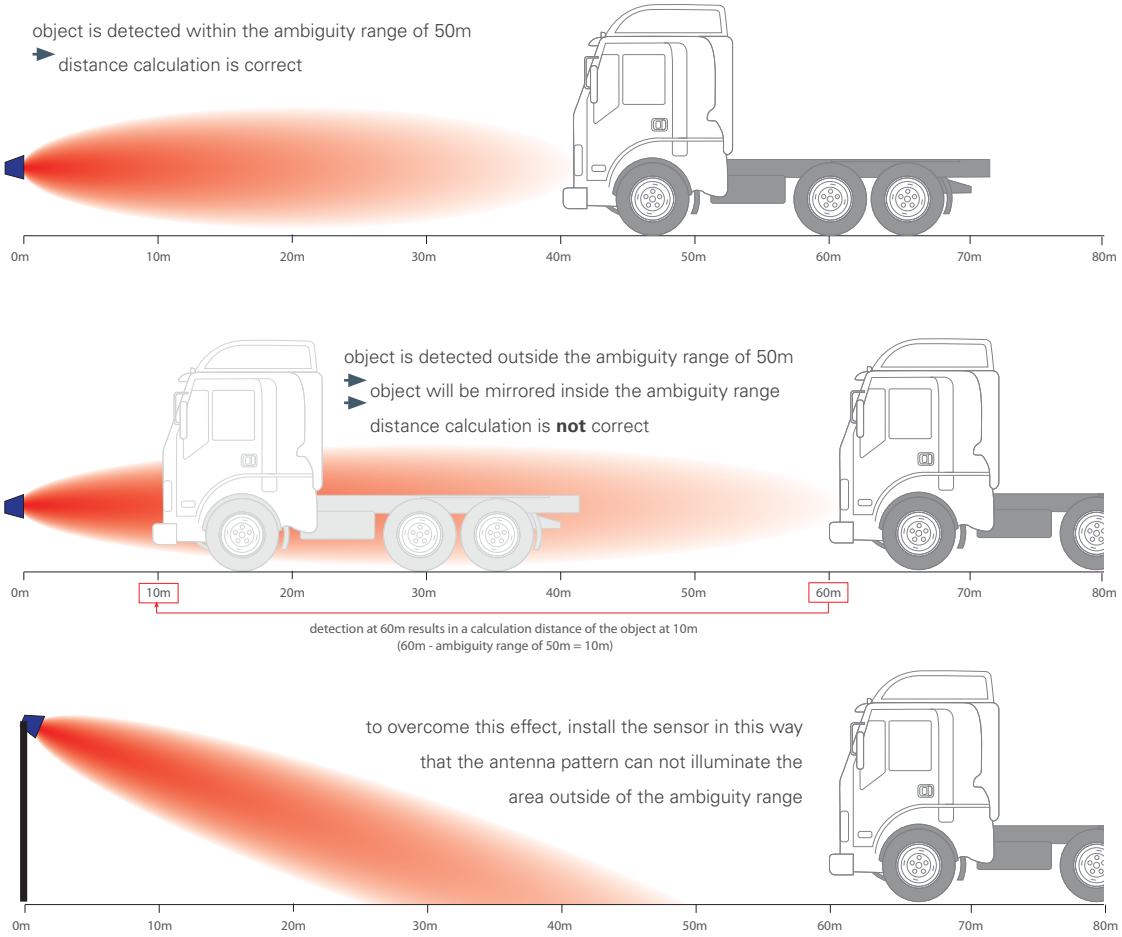
If you install the iSYS-4001 in your application you have to think about the ambiguity range of the sensor. The ambiguity range is the distance within the sensor provides correct measurements. In case of the iSYS-4001 the ambiguity range can be selected. Two distance ranges are available: 0m to 50m and 0m to 150m. Select the proper distance range depending on your application. The ambiguity range is the distance within the object will be calculated correctly. If an object is detected outside of the selected ambiguity range (e.g. a large truck), this object will be mirrored back into the ambiguity range.

Example: ambiguity range 50m
object in a distance of 25m will be calculated at 25m
object in a distance of 52m will be calculated at 2m
object in a distance of 132m will be calculated at 32m

Finally you can only avoid this effect by installing the sensor in this way, that no reflections of objects outside of the selected ambiguity range can occur.

ambiguity range

The picture below shows an example of what will happen if the ambiguity range of the sensor will exceed.



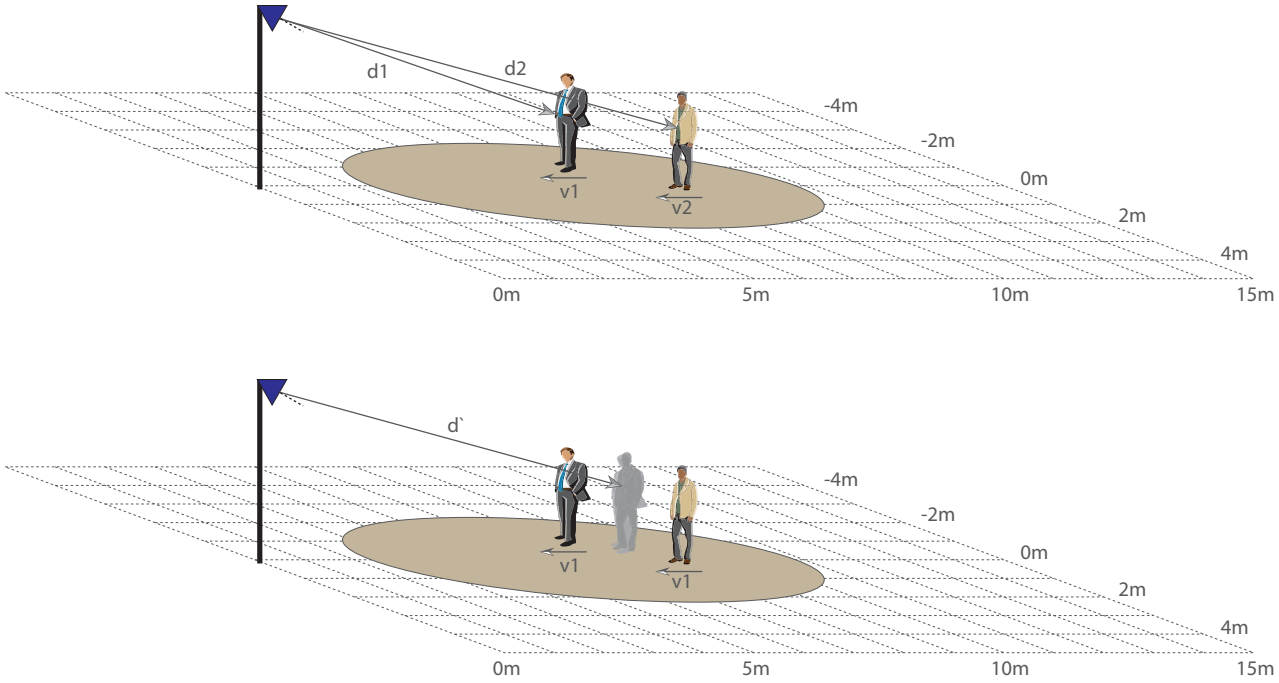
FSK modulation

The FSK modulation enables the possibility to detect speed and distance of moving objects. The FSK modulation is used for the iSYS-4001, iSYS-4002, iSYS-4003 and iSYS-4013. Within this mode different speed and distance limits can be set.

IMPORTANT:
- with the FSK modulation there is no possibility to detect stationary objects.
- the distance to more than one object can only be determined if the objects differs in speed. If not a distance that is between the detected objects will given back by the system.

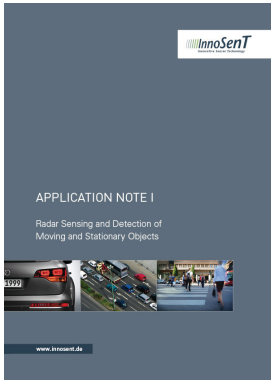
FSK modulation

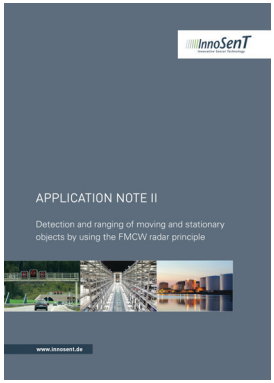
The distance to more than one object can only be determined if the speed of the two objects is different. If not a distance that is between the detected objects will be given back by the system

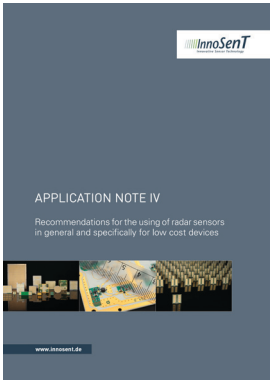


more details...

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

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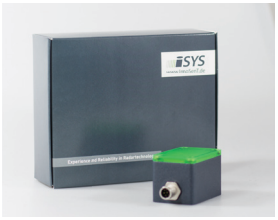
part numbers



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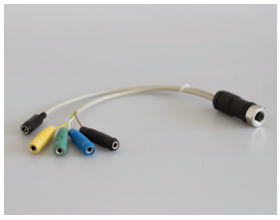
P/N: iSYS-prog_adap



P/N: iSYS-pow_adap

P/N: iSYS-pow_sup

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