Data Sheet iSYS-4004

Version 1.5 - 19.07.2016

designed
and manufactured
in Germany

| PRODUCT FAMILY | K-Band Distance Measurement System |

☐ Movement
☐ Velocity
☐ Direction
☑ Presence
☑ Distance
☐ Angle

APPLICATIONS	
	• Level Measurement
	• Industrial Applications

FEATURES:

» Radar-based distance measurement system working in the 24GHz - ISM - Band

» Distance measurement of stationary objects

» Measuring distance from 1.1 to 35m with an accuracy of ±3cm for EU (available Bandwidth 250MHz)

» Measuring distance from 2.7 to 35m with an accuracy of ±7.5cm for US, UK, France (available Bandwidth 100MHz)

» Detection range configurable

» Robust metal housing designed for outdoor use

DESCRIPTION

K-Band distance measurement system with intelligent µC decision unit. The system is based on modern MMIC technology, therefore best measurement stability over temperature and aging is given. Depending on the available bandwidth the system can detect stationary objects in a distance between 1.1m (3.6ft) / 2.7m (8.9ft) to 35m (115ft) (depending on the RCS of the object). The sensor provides 3 programmable output pins that offers a wide area of individual configurations, to be sure that the sensor fits to your individual requirements. The programming can be easily done by a GUI (Graphical User Interface).

ADDITIONAL INFORMATION

InnoSenT Standard Product. Changes will not be notified as long as there is no influence on form, fit and within this data sheet specified function of the product.

CERTIFICATES

InnoSenT GmbH has established and applies a quality system for development, production and sales of radar sensors for industrial and automotive sensors.

Qualitätsmanagement ISO/TS 16949 ▶ Regelmäßige freiwillige Überwachung — DEKRA zertifiziert

Qualitätsmanagement ISO 9001:2008 ▶ Regelmäßige freiwillige Überwachung — DEKRA zertifiziert

Umweltmanagement ISO 14001 ▶ Regelmäßige freiwillige Überwachung — DEKRA zertifiziert

RoHS-INFO

This product is compliant to the restriction of hazardous substances (RoHS - European Union directive 2011/65/EU).

PARAMETERS

The iSYS-4004 consists of a 24GHz MMIC based Radarfrontend (RFE) with DSP-Board for measuring the distance to stationary objects. Due to the used MMIC technology there is nearly no influence on measurement accuracy over temperature and aging. The sensor offers 3 outputs that can be configured within the specified ranges:

distance area (EU): 1.1....35m (reachable distance depending on RCS of detected object)
distance area (US, UK, F): 2.7....35m (reachable distance depending on RCS of detected object)

The communication is be done by RS232 interface in case of PWM output signals or as digital output (open drain). The configuration of the sensor can be done by an GUI.
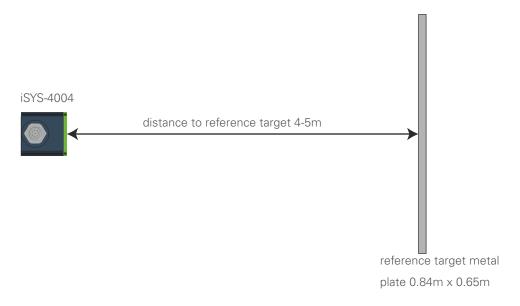
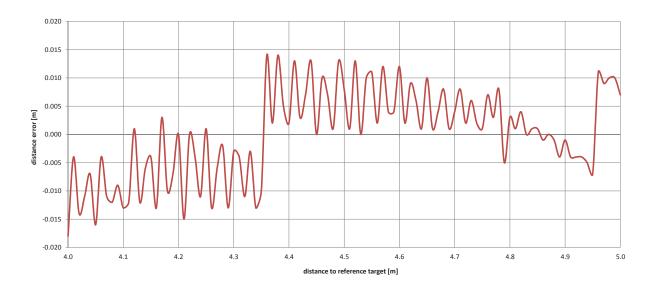| PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
Radar						
transmit frequency		f	24.000		24.250	GHz
occupied bandwidth	EU-version	B_{EU}			250	MHz
	US/UK/France - version	B_{US}			100	MHz
output power (EIRP)	@ 25°C	P_{out}			20	dBm
Sensor						
detection distance	EU-version	d_{r_EU}	1.1		35	m
	US/UK/F - version	d_{r_US}	2.7		35	m
accuracy @ 250MHz bandwidth	compare test conditions on page 3	A_{EU}		±3		cm
accuracy @ 100MHz bandwidth		A_{US}		±7.5		cm
update rate				75		ms
resolution	@ 250MHz	r_{EU}			60	cm
	@ 100MHz	r_{US}			150	cm
standard detection field	compare with plot on page 4	horizontal		34		°
		vertical		49		°
Power supply						
supply voltage		V_{CC}	10		30	V
supply current	@ 12V without digital out current	I_{CC_12V}		135	150	mA
supply current	@ 24V without digital out current	I_{CC_24V}		76	85	mA
Digital Output Current						
OUT1	open drain	I_{Out}			-400	mA
OUT2	open drain	I_{Out}			-400	mA
OUT3	open drain	I_{Out}			-400	mA
digital total current		I_{Out}			-800	mA
Environment						
operating temperature		T_{OP}	-25		+60	°C
storage temperature		T_{STG}	-25		+60	°C
Mechanical Outlines						
outline dimensions	compare to schematic on page 5	height length width		43.4 75.6 40.0		mm

TEST CONDITIONS FOR DISTANCE MEASUREMENT

To verify the accuracy of the iSYS-4004 the following test condition apply:

iSYS-4004

distance to reference target 4-5m
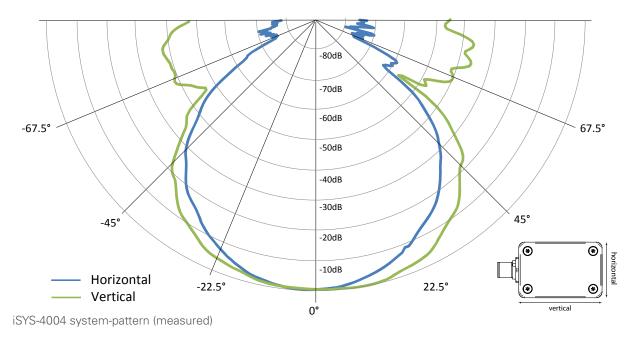
reference target metal

plate 0.84m x 0.65m

Measurement results (Bandwidth: 250MHz):
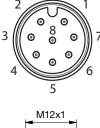
DETECTION FIELDS

Something about 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 - beam width). It does definitely not mean that beyond that point no transmission or reception is possible anymore. An object for instance with huge radar cross section (truck, metallic door) might very well compensate the loss of the antenna pattern and provide a significant radar signal. Due to this fact the detection range of the sensor can vary depending on the RCS (radar cross section) of the detected object. The shown schematics below are theoretical detection fields for a person (typ. RCS 0.5 - 1 m² @24GHz) walking towards the sensor and should only be a guidance for first installations.

iSYS-4004 system-pattern (measured)

INTERFACE

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	RS232_Rx	input	
8	RS232_Tx	output	

M12x1

MECHANICAL OUTLINES

For mounting the module we recommend to use standard M4 screws.

40.3

43.4

13

60

40

M12x1

75.6

M4-6H (4x)

30

50

START-UP SEQUENCE

The integrated LED indicates the status of the sensor on power up.

```
           ┌─────────────────┐
           │    Power up     │
           └────────┬────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │ Initialize Peripheral │
        └───────────┬───────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │    Start Measure-     │
        │      ment Mode        │
        └───────────┬───────────┘
                    │
                    ▼
              ╱─────────╲          YES   ┌──────────────────┐
             ╱  Object   ╲──────────────▶│ LED flashes red  │────┐
             ╲ available ╱               └──────────────────┘    │
              ╲─────────╱                                        │
                    │ NO                                         │
                    ▼                                            │
        ┌───────────────────────┐                                │
        │     LED blinking      │                                │
        └───────────┬───────────┘                                │
                    │                                            │
                    └────────────────────────────────────────────┘
```
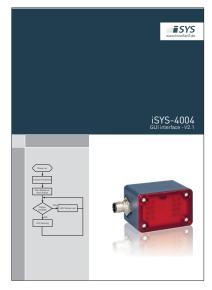
QUICK-START-GUIDE

For an easy start with the iSYS-4004 a quick-start-guide is available at www.innosent.de

GUI - Graphical User Interface

The iSYS-4004 can be configured by using the corresponding GUI. The actual Software can be downloaded under www.innosent.de.

APPROVAL

This Data Sheet contains the technical specifications of the described product. Changes of the specification must be in written form. All previous versions of this Data Sheet are no longer valid.

VERSION	DATE	COMMENT
0.9	14.10.2013	preliminary release
1.0	14.11.2013	initial release
1.1	25.04.2014	measuring distance
1.2	27.11.2014	changes in RoHS-Info
1.3	03.03.2015	changes in supply current
1.4	12.03.2015	changes in digital current
1.5	19.07.2016	outputs changed to open drain; adding start-up sequence

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