Data Sheet IMD-2000

Version 1.8 — 31.03.2022

PRODUCT FAMILY

InnoSenT Motion Detector

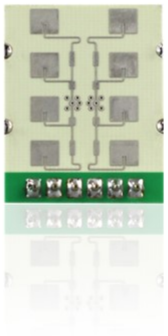
APPLICATIONS

- Industrial Applications
- Security Applications

- Movement
- Velocity
- Direction
- Presence
- Distance
- Angle

FEATURES:

- FSK-radar working in the 24 GHz—ISM—band
- Worldwide certification possible
- FCC certified
- RED DoC available
- Including digital signal processing to output a filtered target list via UART
- Detection of direction, range and velocity of moving objects
- Configurable distance up to 50m
- Velocity range from 0.2 to 28 km/h
- Small outline dimensions (25 x 20 x 13 mm)



DESCRIPTION

The IMD-2000 radar system with an intelligent µC pre-processing unit detects moving targets and measures their speed, direction and range. This information is provided in a target list that can be used to implement individual security, door opener or proximity applications. The sensor detects targets in a speed range from 0.2 to 28 km/h.
Individual programming and adjustment is easily done via the included GUI which is also available at www.innosent.de.

CERTIFICATES

InnoSenT GmbH has established and applies a quality system for: development, production and sales of radar sensors for industrial and automotive sensors. See more information on our quality standards:

https://www.innosent.de/en/company/certifications/

ADDITIONAL INFORMATION

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

RoHS-INFO

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

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PARAMETERS

The IMD-2000 consists of a 24 GHz Radar front end (RFE) with FSK-modulation and a DSP-board for measurement of distance, velocity and direction of radial movement. The sensor outputs a target list.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Radar					
transmit frequencies (see p. 6)	f_t	24.150		24.250	GHz
output power (EIRP)	P_{out}			12.7	dBm
Sensor					
unambiguous detection range	d_r	0.5 | 1.6		50 | 164	m | ft
typical detection range for human being *	$d_{r\_human\_boresight}$		30 | 98.4		m | ft
* This value is derived from measurements (see p. 3) which have been performed outdoors and with dry weather conditions. Please consider, that the detection range is highly dependent on the radome, object's RCS, surroundings, environmental and weather conditions.					
standard detection field	azimuth		98		°
	elevation		48		°
velocity range		0.2 | 0.1		28.4 | 17.6	km/h | mph
velocity resolution	v_{res}		0.2 | 0.1		km/h | mph
update rate			100		ms
latency for false alarm suppression			additional 200 ms		
maximum number of targets	$nr_{targets}$			20	
Power supply					
supply voltage	V_{CC}	3.8		7.2	V
supply current @4V	I_{CC}		74		mA
Environment					
operating temperature	T_{OP}	-30		+80	°C
storage temperature	T_{STG}	-30		+80	°C
Mechanical Outlines					
outline dimensions	height length width		25.0 20.0 12.7		mm

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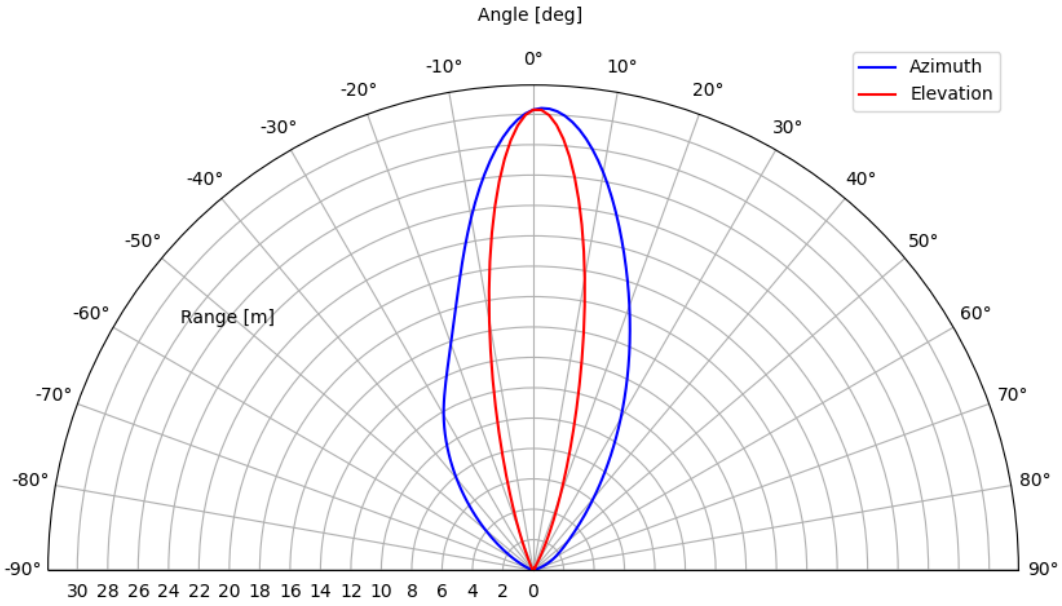
DETECTION RANGE FOR HUMAN BEING



Note: In order to acquire the data for elevation, the sensor module has been turned by 90° clockwise with perspective from the sensor to the FoV.

MEASUREMENT SETUP

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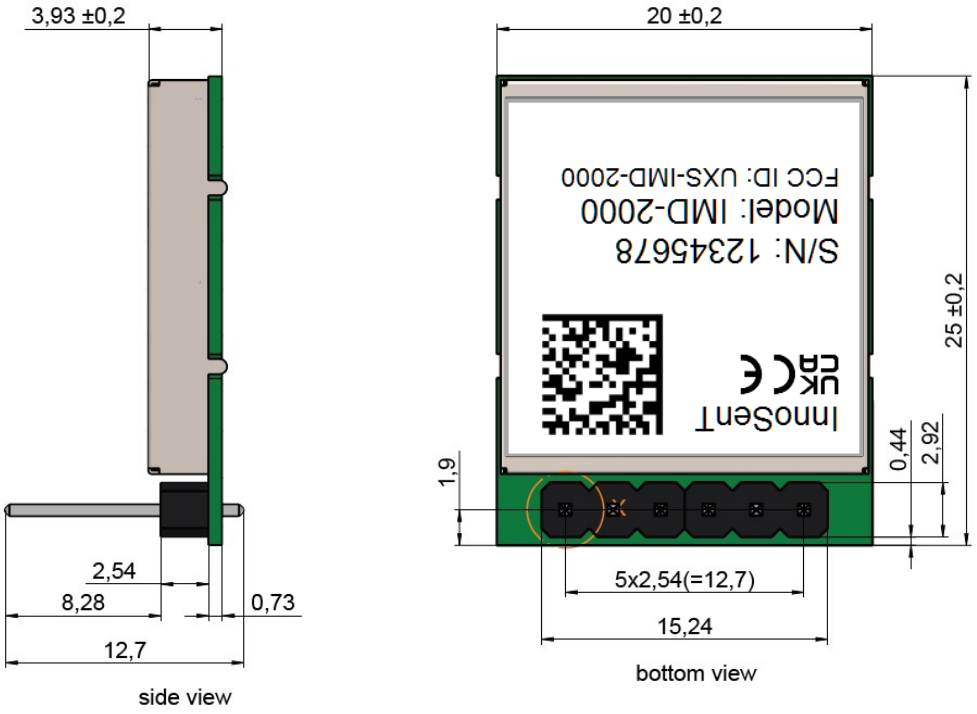
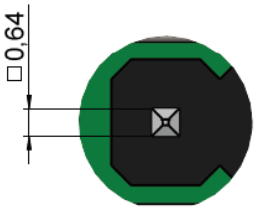
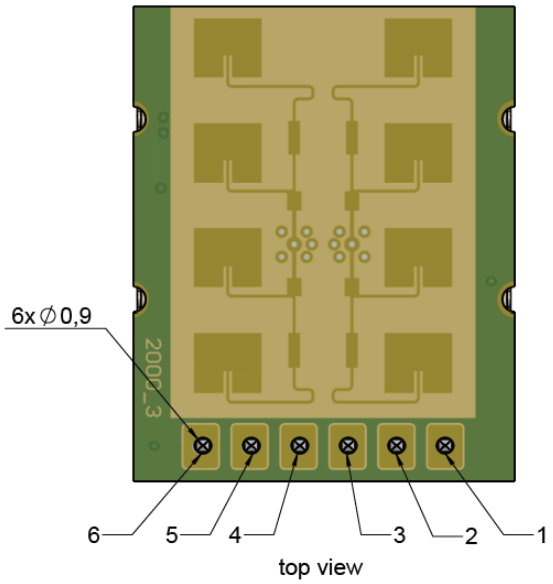
MECHANICAL DRAWING





DETAIL X
SCALE 8 : 1



All dimensions in mm

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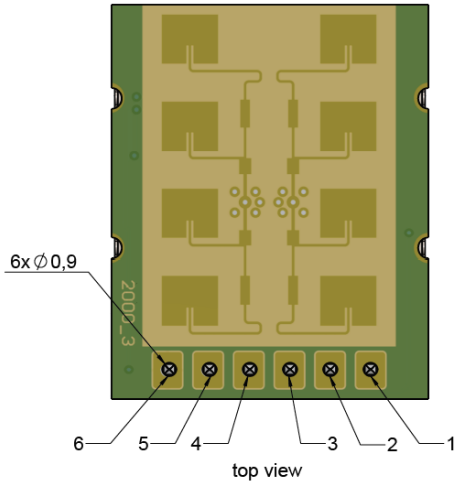
INTERFACE

The IMD-2000 provides a 6x1, 2.54mm pitch Pin header. The connector (W+P 943-18,3-006-00) is mounted on the module facing backwards. InnoSenT uses a gold plated connector. A compatible female pin header is W+P 153-006-1-50-00.

EVALUATION CONNECTION

For evaluation, you can connect the sensor via FTDI TTL-232R-3V3 cable to a PC's USB port.

Note: In order to achieve best performance for data transmission when using this cable, an additional configuration has to be made in its device settings. Please see the application note "Measurement of data transmission latency".



PIN #	DESCRIPTION	COMMENT
1	D.N.C.	Do Not Connect
2	UART_RX	UART -> command interface (module side view)
3	UART_TX	UART -> command interface (module side view)
4	V_{CC}	3.8 V—7.2 V supply voltage
5	D.N.C.	Do Not Connect
6	GND	Ground

COMMUNICATION

The sensor outputs a list of 20 targets via UART protocol with a baudrate of 256000 Baud.

It can easily be configured with the supplied Target Viewer software or the IMD-2000_radarAPI.dll.

The dll is pre-compiled for different compilers and comes with an example project for easy integration.

Available commands can be found in the accompanying IMD-2000_RadarAPI_readMe.pdf.

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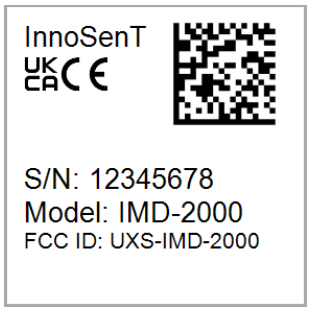
FREQUENCY INFORMATION

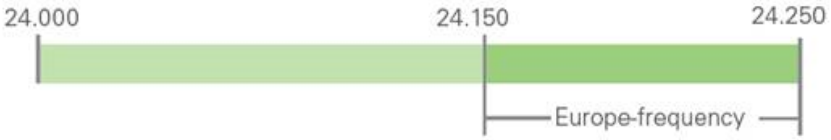
The information that will be given below is only a rough overview; for details please contact the local approval agencies. An overview over the frequency bands in Europe can also be found in the REC 70-03 (Annex B) which is available under www.cept.org.

ID LABEL



FREQUENCY BANDS IN EUROPE

In general, the IMD-2000 can be used in all European countries.



FREQUENCY BANDS IN US FCC 15.249

The IMD-2000 is admitted by FCC for usage in USA.

CONFIGURABLE FREQUENCY BANDS

The IMD-2000 provides a configurable set of transmit frequency channels. These can be used to achieve interference mitigation.
All channels provided in this set apply to regulatory limitations according to RED (EU) and FCC (USA).

CHANNEL #	TYP	UNIT
channel f_1	24.166	GHz
channel f_2 *	24.189	GHz
channel f_3	24.214	GHz
channel f_4	24.232	GHz

* channel f_2 is preconfigured

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FCC APPROVAL

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) this device may not cause harmful interference and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications made to this equipment not expressly approved by InnoSenT GmbH may void the FCC authorization to operate this equipment.

Manufacturers of mobile or fixed devices incorporating IMD-2000 modules are authorized to use the FCC Grants for their own final products according to the conditions referenced in these documents. In this case, the FCC label of the module shall be visible from the outside, or the host device shall bear a second label stating “Contains FCC ID: UXS-IMD-2000”.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.
However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

DISPOSAL

The device is to be disposed of according to the European Community Directive 2012/19/EU on waste electrical and electronic equipment.
Devices must not be disposed of with consumer waste.
For environmentally compatible recycling and disposal of the device, please contact a certified waste management company or send the device back to InnoSenT GmbH.

ESD-INFORMATION

This InnoSenT sensor is sensitive to damage from ESD. Normal precautions as usually applied to CMOS devices are sufficient when handling the device. Touching the signal output pins has to be avoided at any time before soldering or plugging the device into a motherboard.

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REVISION HISTORY

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
1.7	28.01.2022	Updated - increased typical detection range for human being from 15 to 20m - updated plot with new detection range - mechanical drawings (no parameter change) Added - product picture
1.8	31.03.2022	Updates - increased unambiguous detection range for human being from 20 to 30m - updated plot with new detection range - updated mechanical drawing in connection description (no technical change) - removed version entries up to 1.6 to clear history - module label with FCC ID: UXS-IMD-2000 Added - FCC approval - RED DoC - module label information - maximum number of targets - conversion from metric to imperial - description of unambiguous detection range for human being - measurement sketch - definition of channel preconfiguration - RoHS-info

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