

IMD-2000 Data Sheet

Version 1.10 - 2024-09-16

PRODUCT FAMILY

InnoSent Motion Detector

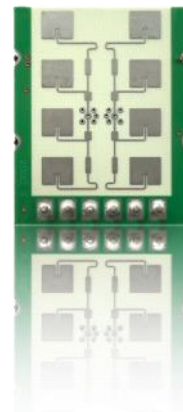
APPLICATIONS

- Industrial Applications
- Security Applications



FEATURES

- FSK-radar working in the 24 GHz ISM band
- ETSI and UKCA compliance, FCC certification
- Worldwide certification possible
- Incorporates 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 -28 km/h to 28 km/h
- Small outline dimensions (25 x 20 x 13 mm)
- Evaluation Kit available



DESCRIPTION

The IMD-1800 is a customized Radar sensor featuring one transmit and two receive antennas for monopulse operation.

The Fast-Chirp modulation scheme is configurable regarding center frequency, RF bandwidth and sweep time.

The sensor provides raw data for each channel via 100 Mbit Ethernet 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. More information on our quality standards:

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

RoHS-INFO

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

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	TYPICAL VALUE ¹	UNIT
Regulatory		
Transmit Frequency	24.15 .. 24.25	GHz
Output Power (EIRP)	12.7	dBm
Available Frequency Channels	4	
Range		
Standard Detection Range	0.5 .. 50 1.6 .. 164	m ft
Typ. Detection Range: Pedestrian ²	30 98.4	m ft
Speed		
Min. Radial Speed	0.2 0.1	km/h mph
Speed Range	-28.4 .. +28.4 -17.6 .. +17.6	km/h mph
Angle		
Field of View: Azimuth ³	98	°
Field of View: Elevation ³	48	°
Operational		
Update Rate ⁴	100	ms
Maximum Amount of Targets	20	
Power supply		
Operating Voltage	3.8 .. 7.2	V
Supply Current ⁵	74	mA
Power Consumption ⁵	0.29	W
Environment		
Temperature (Operating and Storage)	-30 .. +80	°C
Mechanical		
Dimensions (with connectors) ⁶ : H/W/D	25.0 x 20.0 x 3.9 (12.7) 1 x 0.8 x 0.15 (0.5)	mm in
Weight	4 0.14	g oz

¹ typical specifications are for general understanding and may vary

² This value is derived from measurements 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.

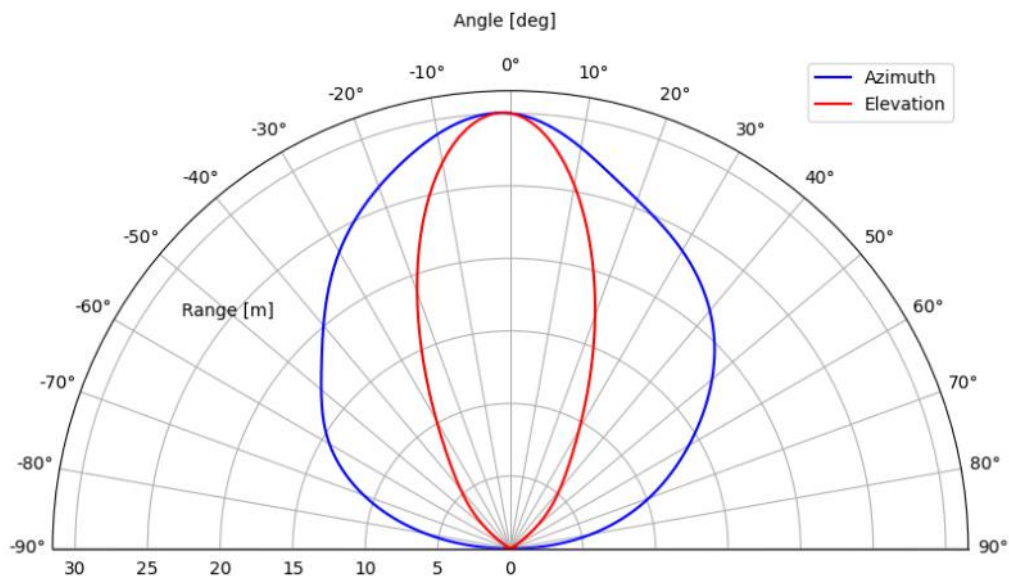
³ standard detection field @-10dB beam width

⁴ If false alarm suppression is activated, a filtering algorithm is applied to the point cloud. In this case, the point cloud is output with a latency of additional 200ms.

⁵ the typical value is given for 4V at 25°C

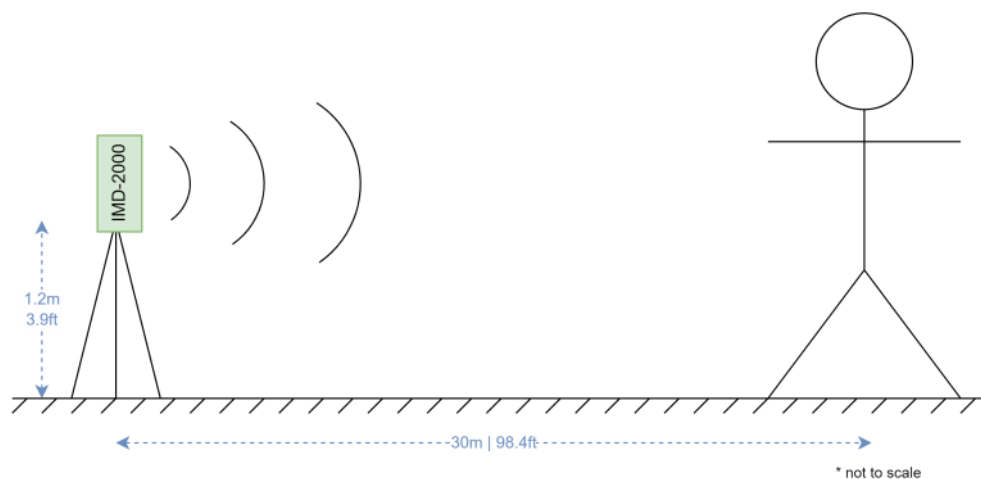
⁶ see drawings for tolerances

DETECTION RANGE FOR HUMAN BEING



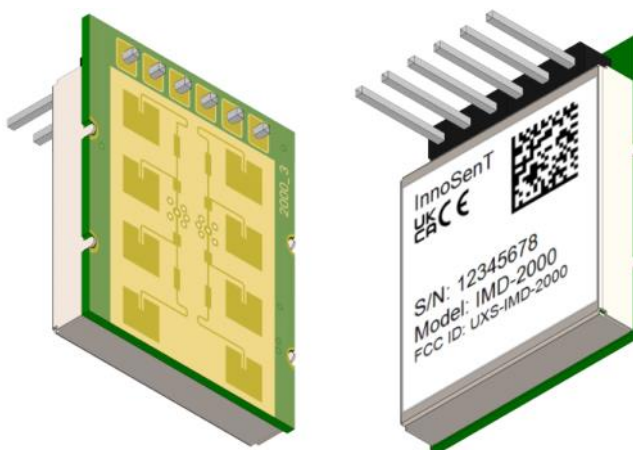
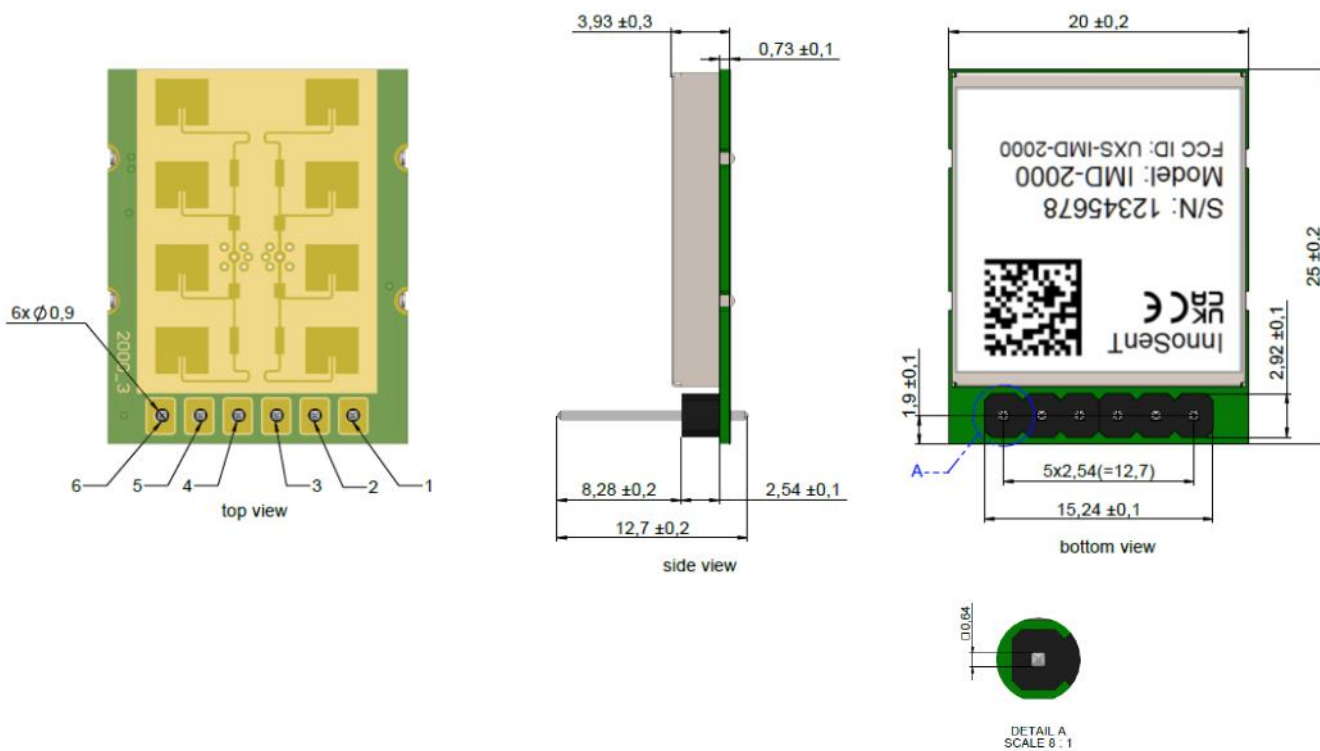
Note: In order to acquire the data for elevation, the sensor module has been turned by 90° clockwise with perspective from the sensor to the FoV.

MEASUREMENT SETUP



MECHANICAL DRAWING

Note: All dimensions in mm



INTERFACE

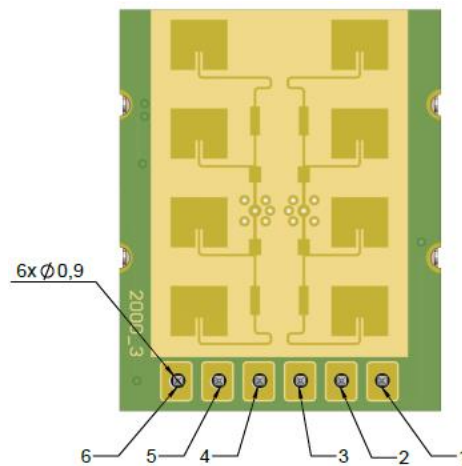
The IMD-2000 provides a 6x1, 2.54mm pitch Pin header. The connector (W+P 943-18,3-006-00) is mounted on the module facing backwards. InnoSenT uses a gold plated connector. A compatible female pin header is W+P 153-006-1-50-00.

EVALUATION CONNECTION

For evaluation, you can connect the sensor via FTDI TTL-232R-3V3 cable to a PC's USB port.⁷

DATA INTERFACE

Data interface is UART +3.3V TTL level with a baud rate of 256000 bd.



PIN #	DESCRIPTION	COMMENT
1	D.N.C.	do not connect
2	UART_TX ⁸	UART -> command interface 256000 Baud
3	UART_RX ⁸	UART -> command interface 256000 Baud
4	V _{CC}	operating voltage
5	D.N.C.	do not connect
6	GND	ground

COMMUNICATION

The sensor outputs a list with a maximum 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.

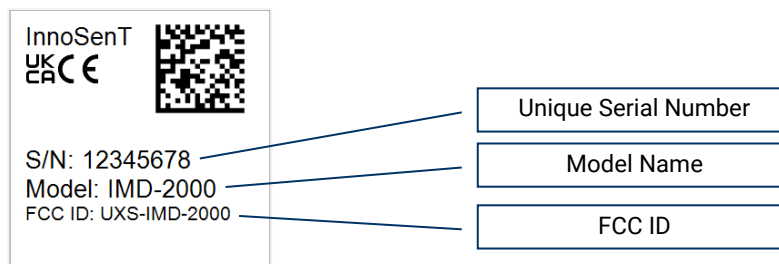
⁷ In order to achieve best performance for data transmission when using this cable, an additional configuration has to be made in its device settings. Please see the application note "Measurement of data transmission latency".

⁸ sensor is point of view for transmission direction

LABEL LOCATION



LABEL DESCRIPTION



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.

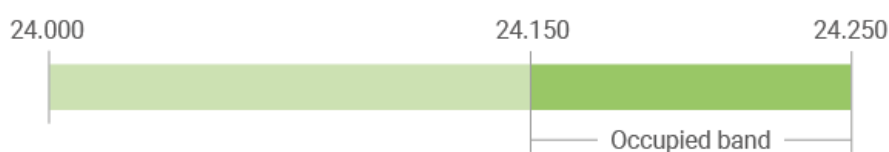
For environmentally compatible recycling and disposal of the device, please contact a certified waste management company or send the device back to InnoSenT GmbH.

FREQUENCY INFORMATION

The information that will be given below is only a broad overview; for details please contact the regional approval agency. An overview over the frequency bands in Europe can also be found in the REC 70-03 which is available under www.cept.org.

ISM FREQUENCY BAND

In general, the IMD-2000 can be used in EU, USA, Canada and UK, as well as other regions which apply to those regulations.



CONFIGURABLE FREQUENCY BANDS

The IMD-2000 provides a configurable set of transmit frequency channels. These can be used to achieve interference mitigation.

All channels can legally be used in markets, which are regulated by RED (EU), FCC (USA) andISED (Canada)⁹.

CHANNEL #	TYPICAL VALUE ¹	UNIT
channel f_1	24.166	GHz
channel f_2 ¹⁰	24.189	GHz
channel f_3	24.214	GHz
channel f_4	24.232	GHz

⁹ this list is not exhaustive

¹⁰ channel f_2 is preconfigured

COMPLIANCES

Declarations of conformity, certificates and test reports can be provided upon request.

STANDARD	COMMENT
Conformity / Certificates	
CE	Declaration of Conformity
UKCA	Declaration of Conformity
FCC Part 15.245	Tested by external TCB and applies to relevant regulatory limitations.
ISED	Product is conform, but not registered in ISED list.
RF / Electrical / Other	
EN 300 440 V2.1.1	
EN 301 489-1 V2.2.3	
EN 301 489-3 V2.3.2	

IDs

AGENCY	ID
FCC	UXS-IMD-2000

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.

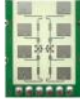


Manufacturers of mobile or fixed devices incorporating IMD-2000 modules are authorized to use the FCC Grants for their own final products according to the conditions referenced in these documents. In this case, the FCC label of the module shall be visible from the outside, or the host device shall bear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

EVALUATION KIT

Order number: 80.00000576

ACCESSORY	ORDER NUMBER	PICTURE	DESCRIPTION
IMD-2000	80.00000451		IMD-2000 Motion Detector
TTL-232R-3V3 cable	29.00000313		UART connection USB to PIN header
Software Package	download at InnoSenT download portal		Software Package: <ul style="list-style-type: none"> -TargetViewer - Radar API - Firmware Update - Documentation

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.

CO-APPLICABLE DOCUMENTS

REFERENCE	DOCUMENT
[1]	IMD-2000 Quick Start Guide
[2]	IMD-2000 RadarAPI readMe
[3]	IMD-2000 User Manual
[4]	IMD-2000 Interface Protocol

REVISION HISTORY

This Data Sheet contains the technical specifications of the described product. Changes to specifications will be in written form. All previous versions of this Data Sheet are invalid. Previous versions are removed from this table

VERSION	DATE	COMMENT
1.10	16.09.2024	<p>Updates</p> <ul style="list-style-type: none">- new layout- change UART-pin allocation perspective from backend-connector's to sensor view- new drawings with extended tolerance information and better quality- improved frequency information- improved label location and description <p>Added</p> <ul style="list-style-type: none">- footnote 6- compliance table- evaluation kit <p>Note: No functional change has occurred in this release.</p>
1.9	12.04.2023	<p>Updates</p> <ul style="list-style-type: none">- Updated product picture- Corrected plot for detection range- Change to standard InnoSenT datasheet form <p>Note: No functional changes have occurred in this release</p>