DATA SHEET

AIRBORNE RADAR SENSOR

MICRO RADAR ALTIMETER



s.m.s, smart microwave sensors GmbH
In den Waashainen 1
38108 Braunschweig
Germany

Phone: +49 531 39023-0
Fax: +49 531 39023-599
info@smartmicro.de
www.smartmicro.com

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

CONTENT

1 User Safety Warning 3
2 Sensor Specifications 5
2.1 Sensor Dimensions 5
2.2 Sensor Connector 6
2.3 Sensor and Hardware Identification 7
3 General Performance Data 8
3.1 Pitch and Roll 9
3.2 On-Board Diagnostics (BIT) 9
4 Compliances 10
5 Legal Disclaimer Notice 12

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

1 USER SAFETY WARNING

Please read the entire document carefully before using the sensor.

INSTALLATION

Please pay attention to the details below before installing and connecting the sensor:

- Only use provided or approved equipment for the installation.
- Only skilled and instructed persons shall install and connect the sensor. Proper experience in working with mains voltage, electrical and electronic devices is required.
- Do not connect the sensor directly to the mains voltage; instead use the voltage specified for the product.
- Do not wire any connections when power is applied to the device.
- Ground devices carefully to prevent electrical shock.
- All connectors are pin-coded and fit in only one position. Also note the arrow indicating the top side of the sensor.
- Only use fully functional equipment (ladders, aerial work platform, etc.) when working above ground. Staff shall be capable of working at heights.
- Be cautious when installing the sensor on or around active roadways and pay attention to moving traffic.
- Mount the sensor carefully to prevent it from shifting or dropping.
- The sensor must be mounted to a stiff bracket on the vehicle. Vibration, oscillation or other movement will reduce the sensor performance.
- Make sure that installation methods are in accordance with local safety policies and procedures as well as company practices.

OPERATION

Do not operate the sensor if the device itself or any cables are damaged.

Transmission of radio frequency waves starts after the sensor is powered up and stops when it is disconnected from power.

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

For testing purposes, the sensor may be laid on its face when it is powered up, given that the surface or connectors will not be damaged this way. Please note that this position is not intended for permanent use.



The sensor may become hot during operation. Proper hand protection is recommended for maintenance work.



Do not dispose electrical and electronic equipment in household trash.

TECHNICAL SERVICE

Only use provided or approved equipment for operation. People other than authorized and approved electrical technicians shall NOT attempt to connect the device to a power supply or other controllers, as there is a risk of electrical shock by unsafe handling of the power source.

Do not attempt to service or repair this device:

- No user-maintainable parts are contained in the device.
- To avoid electrical shock, do not remove or open the cover.
- Unauthorized opening will void all warranties.
- smartmicro is not liable for any damages or harms caused by unauthorized attempts to open or repair the device.

RADIATION

Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This device generates radio frequency energy. There are strict limits on continuous emission power levels to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

- Human exposure to transmitted waves from this device is generally considered as safe. Still, it is considered good practice that humans are not subject to higher radiation levels than necessary.

This device may interfere with other devices using the same frequency band.

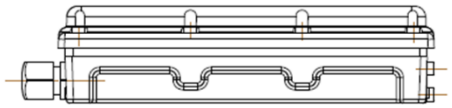
Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

2 SENSOR SPECIFICATIONS

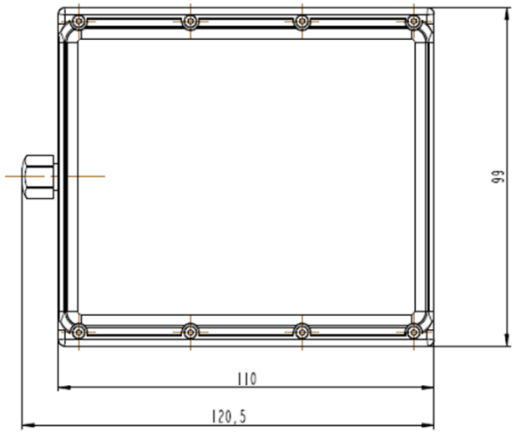
Micro Radar Altimeter is one of the most advanced radar altimeters on the market today. This technologically leading product is a 24GHz radar sensor for standard Unmanned Aerial Vehicles (UAVs), small UAVs (sUAV), micro UAVs (MAV), fixed and rotary winged aircraft, Vertical Take-Off and Landing (VTOL) aircrafts, Terrain Awareness and Warning Systems (TAWS) and similar applications.

2.1 SENSOR DIMENSIONS

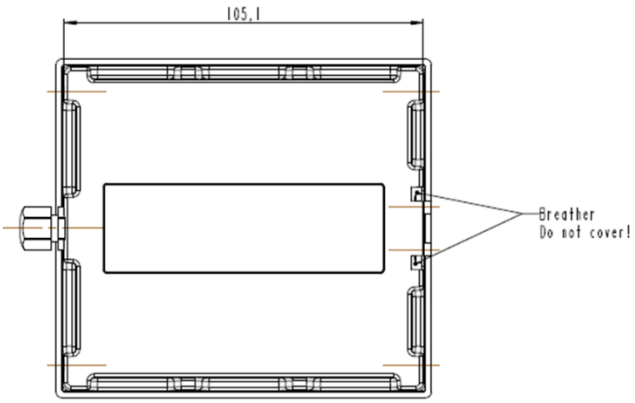
All values are given in mm.



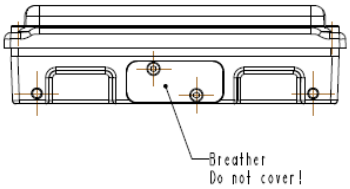
Sensor Top Side



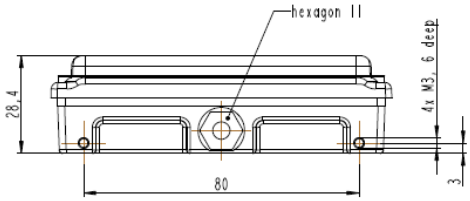
Sensor Front Side



Sensor Rear Side



Sensor Left Side

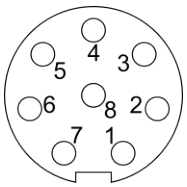


Sensor Right Side

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

2.2 SENSOR CONNECTOR

The sensor connector is an 8-pin male (plug) circular connector (waterproof IP67, series 712, manufacturer Binder GmbH, Germany). A female counterpart (socket) must be used to connect with the sensor.



View on solder cup side of socket showing the pin numbering
(rear view of female counterpart to be connected to sensor)

Sensor connector pin out:

Pin No.	Cable Connector	Wire Color
1	RS485 L	Pink
2	Ground (GND)	Blue
3	RS485 H	Grey
4	CAN_L	Yellow
5	CAN_H	Green
6	not connected	Brown
7	Vcc (+7V…+32V)	Red
8	not connected	White

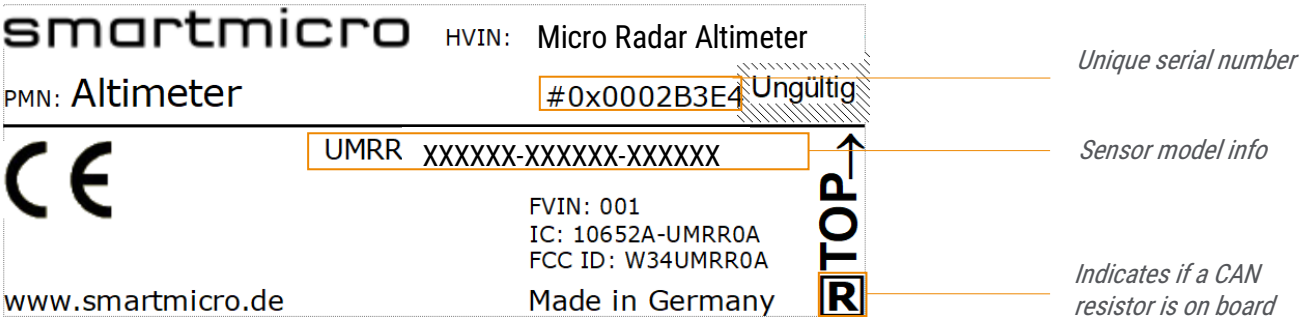
Please note that in the standard configuration the sensor has no 120Ohms resistor on board (CAN bus termination between CAN L and CAN H). However, the resistor is possible at either end of a CAN bus and is in most cases integrated in the cable delivered along with the sensor (cable manufactured by smartmicro).

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

2.3 SENSOR AND HARDWARE IDENTIFICATION

The sensor housing is tagged with a type sticker containing the product description and the serial number. It also indicates which side of the sensor is the top side.

Sticker example:



Additionally, the DSP board and the RF board have their own unique serial numbers.

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

3 GENERAL PERFORMANCE DATA

Parameter	Value
Operating Frequency	24.0…24.25GHz
Minimum Height[1]	0.5m | 1.64ft
Maximum Height[2]	500m | 1640.42ft
Supported Pitch and Roll Angles[3]	-20...+20°
Maximum Speed Vertical	50m/s
Maximum Speed Forward[4]	75 or 100m/s
Height Accuracy	3% or 0.5m (maximum of) | 3% or 1.64ft (maximum of)
Mechanical Details	
Weight	350g (incl. 0.5m cable and connector) | 12.35oz
Dimensions (H/W/D)	99 x 110 x 29mm | 3.9 x 4.3 x 1.1in
Further Information	
Initialization Time	< 1s (lower accuracy altitude available) < 5s (altitude result in spec.)
Update Cycle Time	≤ 17ms
Operating Voltage[5]	7…32V DC
Power Consumption[6]	3.7W
Bandwidth	< 200MHz
Max. Transmit Power (EIRP)	17dBm
Ambient Temperature	-40…+85°C | -40…+185°F
Interfaces[7]	CAN V2.0b (passive), RS485
Connector	8 Pin plug Binder Series 712 on 0.5m cable CAN, RS485, Power
Shock / Vibration	$100g_{rms}$ / $14g_{rms}$
IP	67
Pressure or Transport Altitude	0…10000m | 0…32800ft

[1] Below minimum height, presence detection is available.
[2] Please note that the radar system can neither achieve a detection probability of 100% nor a false alarm rate equal to zero.
[3] Combined pitch and roll angle shall not exceed the given value. If exceeded, the max. altitude and accuracy will be reduced.
[4] Depending on the firmware
[5] Measured at the connector; min. voltage slew rate 500V/s or max. voltage rise time 15ms; supply source impedance 0.5Ohms.
[6] Depending on supply voltage and temperature; Power consumption decreases with lower voltage and lower temperature.
[7] It is recommended to use an external surge protection for power, CAN, RS485 and other interface ports.

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

START-UP TIME

After powering up or resetting, the altitude readings meet the specified performance in 5 seconds.

3.1 PITCH AND ROLL

Up to 20-degree pitch and 20-degree roll are supported. The beam shape is circular, the sum of pitch plus roll must not exceed 20-degree in any direction.[8]

3.2 ON-BOARD DIAGNOSTICS (BIT)

The sensor cyclically reports a status message providing the following information (continuous BIT):

- Sensor run time
- Sensor cycle time
- Sensor mode
- Hardware failure status bit
- Height output reliable bit

Initiated BIT is available. The sensor will send BIT results when it receives a command to do so.

[8] Above forest terrain, the maximum supported combined pitch and roll is reduced to 10 degrees for altitudes between 400m and 500m.

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

4 COMPLIANCES

The sensor model complies with the following EU directives:

- RED 2014/53/EU
- RoHS 2011/65/EU
- EC 1907/2006 REACH

Applied Standards:

- Spectrum Usage:
  - EN 300 440 V2.1.1
- EMC:
  - EN 301 489-1 V2.2.3
  - EN 301 489-3 V2.1.2
- Health and Safety:
  - EN 62311: 2008
  - EN 62368-1: 2014 + AC: 2015

Regarding spectrum usage, this sensor model was tested and certified by independent test labs (formally approved by a test lab or notified body):

- EU RED directive
- FCC part 15C §245 and
- RSS-210, Annex F
- ICES-003

This sensor model is also generally compliant with the following regional regulations (but may not be formally tested/approved):

- SRRC
- KCC
- MIIT
- NCC

Note: This statement of compliance means that the sensor allows operation compliant to the listed standards. However, not all standards are certified through test labs. Formal frequency approval or registration is not accomplished for all countries. In certain countries or regions, a customer-specific local frequency approval is reasonable. smartmicro supports customers throughout this process.

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

This device is NOT compliant to ISO IEC62443, to the EU CRA or similar international regulations. This device features an Ethernet port and/or WIFI connectivity. It is explicitly NOT INTENDED to be connected to the Internet or any other, unprotected network. The built-in connectivity is intended to be used exclusively for on-site use, or for use in a protected, proprietary user network. The user remains in charge to comply with any cyber-security and related regulations to protect the device from misuse on-site and in the user's network.

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.

5 LEGAL DISCLAIMER NOTICE

All products, product specifications and data in this document may be subject to change without notice to improve reliability, function or otherwise.

Not all products and/or product features may be available in all countries and regions. For legal reasons features may be deleted from products or smartmicro may refuse to offer products. Statements, technical information and recommendations contained herein are believed to be accurate as of the stated date. smartmicro disclaims any and all liability for any errors, inaccuracies or incompleteness contained in this document or in any other disclosure relating to the product.

To the extent permitted by applicable law, smartmicro disclaims (i) any and all liability arising out of the application or use of the product or the data contained herein, (ii) any and all liability of damages exceeding direct damages, including - without limitation - indirect, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of the suitability of the product for particular purposes.

Statements regarding the suitability of products for certain types of applications are based on smartmicro's knowledge of typical requirements that are often placed on smartmicro products in generic/general applications. Statements about the suitability of products for a particular/specific application, however, are not binding. It is the customer's/user's responsibility to validate that the product with the specifications described is suitable for use in the particular/specific application. Parameters and the performance of products may deviate from statements made herein due to particular/specific applications and/or surroundings. Therefore, it is important that the customer/user has thoroughly tested the products and has understood the performance and limitations of the products before installing them for final applications or before their commercialization. Although products are well optimized to be used for the intended applications stated, it must also be understood by the customer/user that the detection probability may not be 100% and that the false alarm rate may not be zero.

The information provided, relates only to the specifically designated product and may not be applicable when the product is used in combination with other materials or in any process not defined herein. All operating parameters, including typical parameters, must be validated for each application by the customer's/user's technical experts. Customers using or selling smartmicro products for use in an application which is not expressly indicated do so at their own risk.

This document does not expand or otherwise modify smartmicro's terms and conditions of purchase, including but not being limited to the warranty. Except as expressly indicated in writing by smartmicro, the products are not designed for use in medical, life-saving or life-sustaining applications or for any other application in which the failure of the product could result in personal injury or death.

No license, expressed or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of smartmicro. Product names and markings noted herein may be trademarks of their respective owners.

Please note that the application of the product may be subject to standards or other regulations that may vary from country to country. smartmicro does not guarantee that the use of products in the applications described herein will comply with such regulations in any country. It is the customer's/user's responsibility to ensure that the use and incorporation of products comply with regulatory requirements of their markets.

If any provision of this disclaimer is, or is found to be, void or unenforceable under applicable law, it will not affect the validity or enforceability of the other provisions of this disclaimer.

Proprietary - This document may be subject to change without notice. The information shall remain the exclusive property of s.m.s, smart microwave sensors GmbH.