

Project Documentation | UMRR Traffic Management Sensor Data Sheet

Project Number:

SMS Project Number:

Project Title:

Traffic Management Sensor

Keyword(s):

UMRR Traffic Management Sensor Data Sheet

Date:

January 22, 2016

Document:

UMRR Traffic Sensor Type 32 Data Sheet

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

1 Content

1	Content	2
2	Sensor Data Sheet	3
2.1	Sensor Photograph.....	4
2.2	Function Description.....	6
2.3	Applications	7
2.3.1	Intersection Management.....	7
2.4	General Performance Data.....	9
2.4.1	General Data	9
2.4.2	Start-up time	10
2.4.3	On-board diagnostics (BIT).....	10
2.4.4	Compliance.....	10
2.4.5	Corrosion resistance / UV resistance	10
2.5	Sensor Description and Hardware ID.....	11
2.6	Sensor Dimensions.....	12
2.7	Connector.....	14
3	Important Legal Disclaimer Notice.....	15
4	Contact	16

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2 Sensor Data Sheet

Smartmicro offers a family of traffic Radar sensors called UMRR – Universal Medium Range Radar. Within this family, three different Radar generations exist: UMRR-0A, UMRR-0F and UMRR-0C.

For each Radar generation, a number of different antennas are available - so the permanent fixed field of view and max. range can be selected by the customer.

This data sheet describes the UMRR-0A Type 32 antenna model (all model specific values are highlighted).

Type 32 Antenna aims at very long range with narrow horizontal angular coverage.

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2.1 Sensor Photograph



Figure 1: Traffic Sensor Type 32 - front.

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.



Figure 2: Traffic sensor **Type 32** - rear.

Also available:

- Other versions of the housing for OEM integration.
- Other physical interface options.

For more details please [contact us](#).

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2.2 Function Description

The sensor is a very robust low cost 24GHz Radar for traffic management applications.

It works in adverse conditions, almost unaffected by weather, and independent of sunlight, in a wide temperature interval.

The customer can select from a number of antenna and housing models which determine the permanent fixed field of view and range. **Type 32 Antenna aims at very long range with narrow horizontal angular coverage.**

One individual sensor measures range, radial speed, angle, reflectivity and other parameters of multiple stationary and moving reflectors (**targets**) simultaneously. The following detection principle is integrated:

Doppler based radial motion detection (> 0.1m/s), including:

- a) Direct Doppler measurement
- b) Direct Range measurement
- c) Direct Angle measurement

Reflectors having a radial speed component of typ. abs. >0.1m/s are detected. Having multi target capability, the sensor may report many reflectors at a time being within the field of view.

Additionally filter algorithms are implemented for the tracking of all detected reflectors over time, those tracking algorithms are integrated in the sensor. Multiple objects are tracked simultaneously; the individual reflectors are separated in the detection algorithms by having a different radial speed value (difference > 0.25m/s) and also by the tracking algorithms and data base.

The result of the tracking is an **object** list with the following parameters:

- x position
- y position
- x component of the velocity
- y component of the velocity
- other...

Hence the sensor reports such a list of all tracked objects inside its field of view in every measurement cycle of typ. 50ms length. Stationary reflectors are not reported. Stopped objects are reported, as they remain valid in the tracking data base until they start moving again, for example at a stop bar. **The field of view typically covers up to four lanes.**

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2.3 Applications

2.3.1 Intersection Management

At intersections, the sensor is typically used for advance detection.

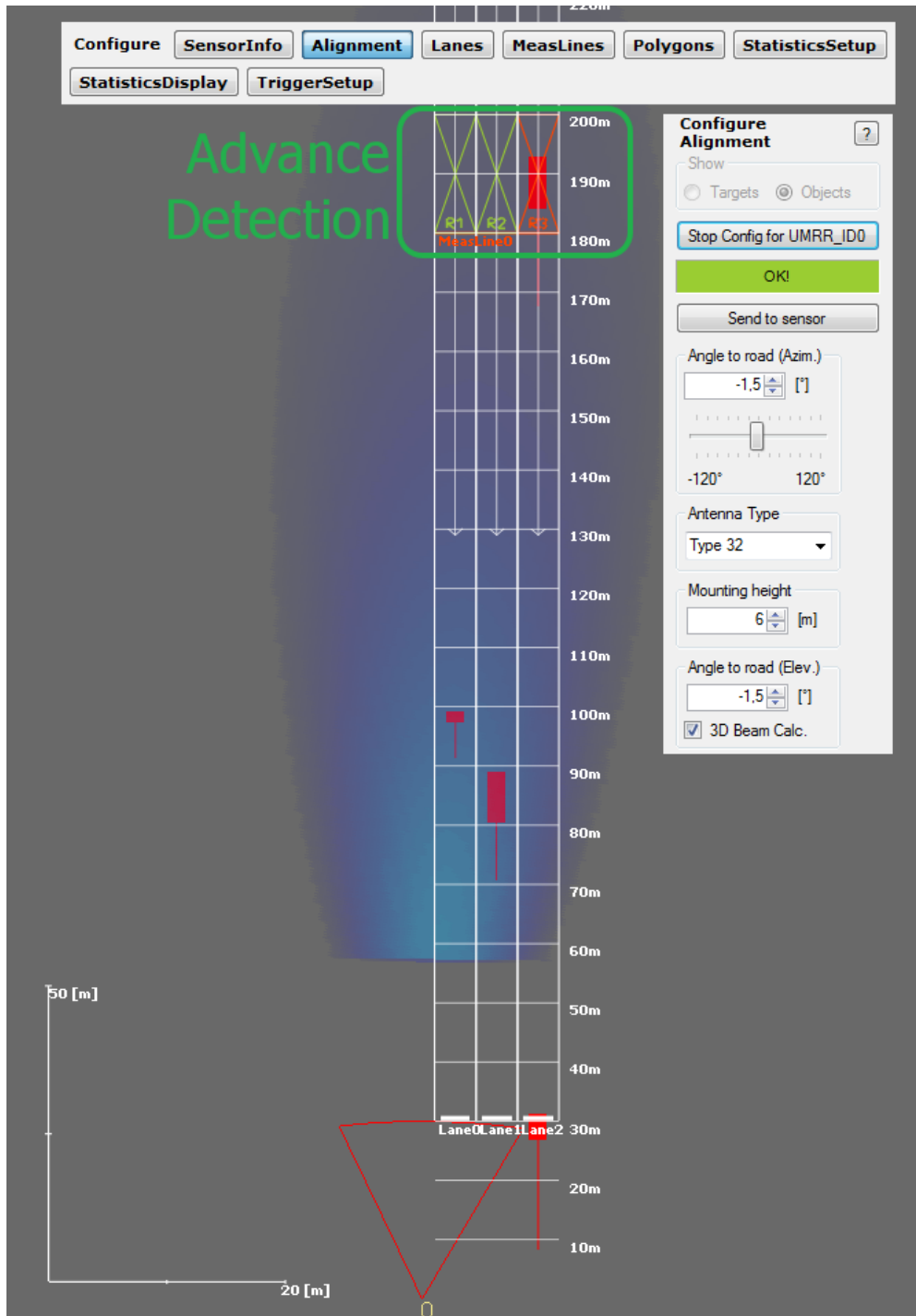


Figure 3: Advance Detection Type 32

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

The sensor is usually mounted at the corner of an intersection on a vertical pole. Other mounting positions (gantry, mast arm, luminaire) may be possible. The **standard configuration** for type 32 sensor for intersection applications is shown in Figure 3 and its parameters are given in Table 1.

Table 1: Standard Configuration for Stop Bar Detection Type 32

Parameter	Value
Traffic Direction	Typ. Approaching
Mounting Height	Typ. 6m (1...10m) ^I
Sensor Azimuth angle	Typ. -1.5° (-15 ...+15 deg.) ^{II}
Sensor Elevation angle	Typ. -1.5° (-9...0 deg.) ^{II, III}
Advance Detection Distance	Typ. 180m (20m ... 220m ^{IV} /285 ^V)

^I May affect max. detection range. The best performance is typically achieved for mounting heights between 2-8m. Occlusion needs to be considered.

^{II} Smaller absolute angles allow longer detection range along a road.

^{III} Application specific. Gantry mount: steeper e. angle possible, with limitations of maximum range. Negative elevation angle means sensor pointing towards road.

^{IV} Typical value for stop bar applications; may be different for other applications.

^V Only applicable in regions which comply to FCC15.245. Certification is done for USA and Canada and can be obtained for other regions if required.

The sensor is typically used standalone. Multiple sensors may however be used at an intersection. While usually four approaches need to be covered, up to seven sensors can usually be mounted at or around an intersection using separate configurable frequency channels, avoiding mutual interference.

Sensor Variants and Features

UMRR-0A Type 32 Advance+	<ul style="list-style-type: none"> • Advance detection (exploiting the long detection range) • Loop replacement (non-intrusive detection) • Custom trigger conditions (e.g. location, vehicle speed and class condition) • ETA measurement • Speed measurement
---------------------------------	--

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2.4 General Performance Data

2.4.1 General Data

Parameter	Value	Unit
Sensor Performance		
Max. Range on Pedestrian	90 ^I	m
Max. Range on Passenger Car	240 ^I / 305 ^{II}	m
Minimum Range	1.5	m
Range accuracy	Typ. < ±2.5% or < ±0.25m (bigger of)	%, m
Radial Speed Interval	-68.3 ... +68.3 (±88.8 available)	m/s
Minimum abs. Radial Speed	0.1	m/s
Speed accuracy	Typ. < ±0.28 or ±1% (bigger of) ^{III}	m/s
Angle Interval (total field of view)	-4 ... +4 (El.); -12 ... +12 (Az.) ^{IV}	degree
Update time	≤ 50	ms
Environmental		
Ambient Temperature	-40 ... +85	degree C
Shock	100	g _{rms}
Vibration	14	g _{rms}
IP	67 ^V	
Pressure / Transport altitude	0...10.000	m
Mechanical		
Weight	1276	g
Dimensions	See 2.6	
Model No.		
DSP Board – Antenna Identification	0A0301-200300	
Housing Identification	070601	
General		
Power Supply	7 ... 32 ^{VI} 3.7	V DC W
Frequency Band	24.0...24.25	GHz
Bandwidth	< 100	MHz
Max. Transmit Power (EIRP)	20 / 30 ^{II}	dBm
Interfaces	CAN V2.0b (passive) ^{VII} RS485 half-duplex	
Connector	8 Pin plug Binder Series 712	CAN, Power, RS485

^I Typical values; may vary to higher or lower values depending on clutter environment. All values given for bore sight. Please note that the Radar system – like any other sensor system – although being well optimized and providing excellent performance, will not achieve a 100% detection probability and will not achieve a false alarm rate equal to zero.

^{II} Only applicable in regions which comply to FCC15.245.

^{III} Measured on object having const. radial speed, at bore sight.

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

^{IV} Total field of view is angle interval where reflectors can be detected; 3dB field of view is narrower.

^V IP 67 only when connector or cap attached.

^{VI} measured at connector; min. voltage slew rate 500V/s or max. voltage rise time 15ms; supply source impedance 0.5Ohms.

^{VII} Also available: Ethernet, Relay contacts. It is recommended to use an external surge protection for power, CAN, RS485 and other interface ports.

2.4.2 Start-up time

After power up or reset, the sensor readings are within specified performance within typ. <30 seconds.

2.4.3 On-board diagnostics (BIT)

The UMRR sensor cyclically reports a status message providing the following information (Continuous BIT)

- Sensor run time
- Sensor cycle time
- Sensor mode
- Other status bits

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

2.4.4 Compliance

ETSI EN 300-440, FCC part 15, RSS-310, RSS-210, SRRC, KCC, NCC

NEMA TS2-2003

- Voltage and Transients
- Temperature and Humidity
- Shock
- Vibration
- Detector Unit Modes of Operation¹

2.4.5 Corrosion resistance / UV resistance

- Plastic Radome: UV resistance compliant to UL 746C
- Aluminum enclosure: Trivalent chromium passivation (RoHS compatible)

¹ Minimally conforms to NEMA TS2-2003 6.5.2.17

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2.5 Sensor Description and Hardware ID

Every UMRR sensor housing is tagged with a type sticker containing the product description and the serial number. It also contains a mark which side of the sensor is top.

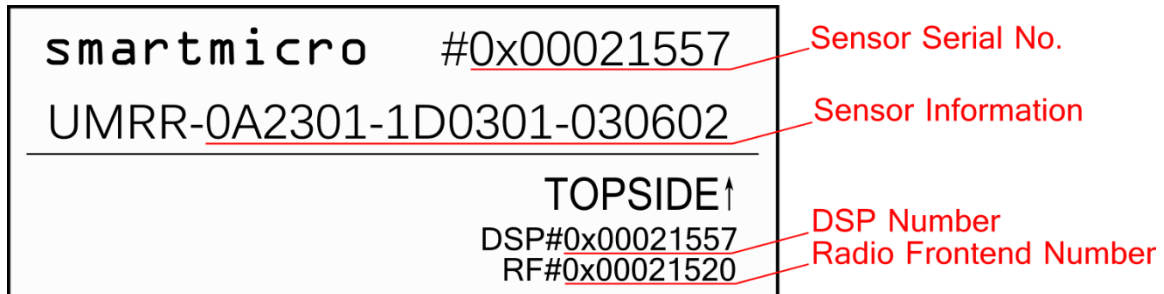


Figure 4: Type sticker example

The individual sensors are referred to as **UMRR-xxyyzz-aabbcc-ddeeff**

- xx** (DSP Board Generation xx)
- yy** (DSP Board Derivative/Version yy)
- zz** (DSP Board Revision zz)

- aa** (RF Board (Antenna) aa)
- bb** (RF Board Derivative/Version bb)
- cc** (RF Board Revision cc)

- dd** (Housing type dd)
- ee** (Housing Version ee)
- ff** (Housing Revision ff)

UMRR means Universal Medium Range Radar platform developed by Smartmicro.

The number in the top right corner is the unique serial number of the sensor. In addition to that the used DSP board and the RF board got their own unique serial numbers.

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2.6 Sensor Dimensions

All values given in mm.

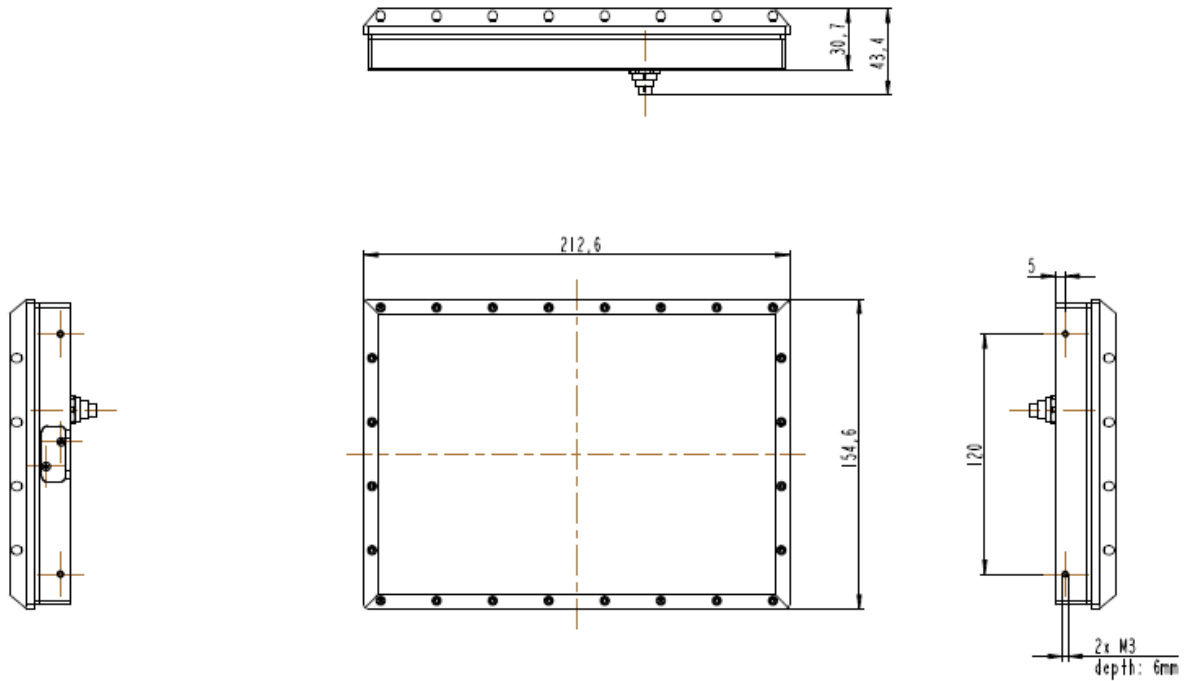


Figure 5: Sensor Front and side views.

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

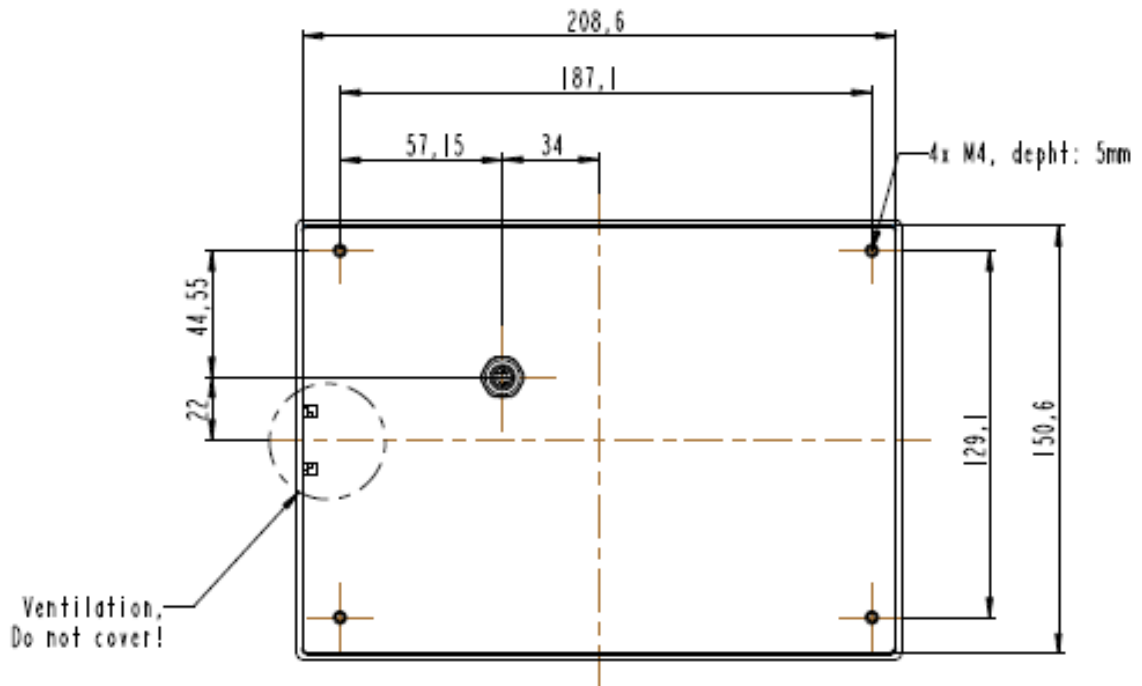


Figure 6: Sensor Rear Side.

Also available:

- Other versions of the housing for OEM integration.
- Other solution for connector and cable stump.
- Other physical interface options.

For more details please [contact us](#).

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

2.7 Connector

The used sensor connector is an 8-pin male (plug) circular connector (water proof IP67, series 712, manufacturer Binder GmbH, Germany). A female counterpart (socket) has to be used to connect to the sensor. The pin numbering of the socket is shown in Figure 7 the pin description is given in Table 2.

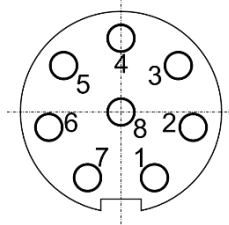


Figure 7: View on solder cup side of socket (rear view of female counterpart to be connected to sensor)

Pin	Function	Wire color
1	Sensor RS485 TX/RX L	Pink
2	Sensor_GND	Blue
3	Sensor RS485 TX/RX H	Grey
4	CAN L	Yellow
5	CAN H	Green
6	not connected	Brown
7	Sensor_VCC (+7V to +32V)	Red
8	not connected	White

Table 2: Sensor connector pin out Model UMRR-0Axxxx

Please note that in the standard configuration for a CAN data interfaced UMRR the sensor has no 120 Ohms resistor on board (CAN bus termination between CAN L and CAN H). The resistor is nevertheless required at either end of a CAN bus and is in most cases integrated in the cable delivered along with the sensor (if cable is manufactured by Smartmicro).

For the RS485 data interface there is a 120 Ohms resistor on board of the sensor.

A number of cable sets for initial operation and test purposes are offered by Smartmicro, to deliver a fast set-up of a sensor system. Among those preconfigured ready-to-run cables as well as cable stumps (pig tail cables or various lengths) which carry the connector on one side and open wires on the other.

Additionally a special junction box to be directly attached to the sensor is available. This IP67 proof sensor + junction box assembly eliminates the need to use the specific sensor connector and provides connectivity for almost any kind of field installation cables using a terminal block (see [junction box data sheet](#)). It also provides additional surge and lightning protection.

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

3 Important Legal Disclaimer Notice

All Product, Product specifications and data in this Product / project documentation or data sheet are subject to change without notice to improve reliability, function, design 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.

The statements, technical information and recommendations contained herein are believed to be accurate as of the date hereof. Smartmicro disclaims any and all liability for any errors, inaccuracies or incompleteness contained in this datasheet 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 suitability of the Product for a particular purpose.

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

The information provided herein, relates only to the specific Product designated and may not be applicable when such 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 customer application by the customer/user's technical experts. Customers using or selling Smartmicro products not expressly indicated for use in such applications do so at their own risk.

This Product specification or data sheet does not expand or otherwise modify Smartmicro terms and conditions of purchase, including but not limited to the warranty expressed therein. 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, express 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/user's responsibility to ensure that the use and incorporation of Products complies with the regulatory requirements of their markets.

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

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.

4 Contact

Address:

smart microwave sensors GmbH
In den Waashainen 1
38108 Braunschweig
Germany

Phone / Fax numbers:

Phone: +49-531-39023-0
Fax: +49-531-39023-599

Web / Email address:

Web: www.smartmicro.de
Email: info@smartmicro.de

PROPRIETARY

The information contained in this document may be subject to change without notice.

The information contained in this document shall remain the sole exclusive property of s.m.s smart microwave sensors GmbH.