TRAFFIC RADAR | INTERSECTION MANAGEMENT

- **MULTI-LANE**
- **REPLACES LOOPS, OUTPERFORMS VIDEO DETECTORS**
- **DETECTS MOVING AND STOPPED TRAFFIC**
- **RELAYS, SDLC, RS485, ETHERNET**
- **WORKS UNDER ALL CONDITIONS**
- **FIELD PROVEN** In Service Since 2009, Many Thousands Deployed Worldwide
- **MAINTENANCE FREE**
FLEXIBLE INSTALLATION
Because of flexible mounting options, Smartmicro Radars are easy to integrate with existing infrastructure like street lights or traffic light poles. Usually no lanes need to be blocked, since the sensor is typically installed on a pole at the roadside or at the corner of an intersection. This makes things simple.

EASY SETUP
The Traffic Management Configurator (TMC) Easy Mode software can control every aspect of the Radar sensor and allows for intuitive configuration and alignment of the sensor. TMC Easy Mode is available on the Smartmicro website.

POWERFUL COMMUNICATION
Smartmicro traffic sensors use RS458 communication by default. Ethernet, CAN and wireless options are available. Usually all sensors of an intersection are remotely accessible over the internet, for convenient re-configuration of loops or real-time traffic data streaming.

WORKS UNDER ALL WEATHER CONDITIONS
The Radar performance is not affected by dirt, smog, fog, sunlight, wind, sandstorms or extreme temperatures (-40...+85°C). Even rain and snow have only small impact on sensor performance and usually their influence is not noticeable due to detection margins and advanced tracking algorithms. Because of its IP67 water tight housing, the sensor can be mounted in any environments.

WIDE FIELD OF VIEW
There are sensor models available which can cover up to 8 lanes (wide beam +50 ... -50deg), as well as narrow beam models for detection ranges of up to 450m (1476ft).

MAINTENANCE FREE
Smartmicro Radar sensors undergo a sophisticated end-of-line test and calibration procedure, as well as a burn-in stage after production. The sensors maintain high accuracy by means of innovative built-in self-calibration functions throughout the entire design life.
UMRR | INTERSECTION MANAGEMENT RADAR

- Multi-Lane Object Tracking Radar • Installs on Road Side or Overhead
- Easy Setup & Configuration • Remote Internet Access for Real Time Monitoring
- Traffic Statistics Data • NEMA Compliant • Field Proven since 2009

STOP BAR +
Replaces loops in 6 lanes. Excellent stop bar detection performance.

STOP + ADVANCE
One single Radar for Stop Bar and Advance Detection. Saves cost and installation effort.

ADVANCE +
Lane specific advance detection. 300m range. For adaptive intersection control.
This multi-lane 3D object tracking sensor reliably detects and tracks up to 256 stopped and moving vehicles in up to eight lanes. At intersections, it is used for stop bar detection and advance detection.

UMRR-0C is the highest performance traffic radar available today, it provides a wide field of view of up to 100 degree and at the same time a range of up to 320m, or 450m (long range version). The 3DHD capability provides high resolution (good vehicle separation) capability in scenarios where many vehicles are closely spaced, i.e. in many lanes, dense traffic, traffic jams, stop-and-go situations. Smartmicro is the only company who has this new 3DHD technology available in production, it outperforms any other traffic radar.

**3DHD**
- Separation in Speed
- Separation in Range
- Separation in Angle

**2DHD**
- Separation in Speed
- Separation in Range

**STANDARD TECHNOLOGY**
- Separation in Speed
This multi-lane 3D object tracking radar sensor reliably detects and tracks up to 64 stopped and moving vehicles in up to six lanes. At intersections, it is used for stop bar detection and advance detection.

UMRR-0F complements UMRR-0A, a field proven product with a large installation base of more than 20,000 sites worldwide. UMRR-0F is now especially easy to deploy and to set up, as it features a built-in attitude sensor and compass, to measure and to check the installation angles. It also has direct Ethernet interface, in addition to CAN and RS485 interface. For traffic counting, it has 256MB data storage and a buffered real-time clock on board.
Stop + Advance 2DHD

Stop + Advance 2DHD combines stop bar detection for up to 6 individual lanes with advance detection up to 350m (1148ft) for passenger cars, with 450m (1476ft) max. detection range for larger reflectors.

These outstanding performance figures enable this sensor to be used for very large and demanding intersections, where radar detection was not possible before. At the same time, the 2DHD measurement principle, combined with the capability to track up to 256 objects at a time, ensures that even dense traffic does not significantly affect the detection performance.

Stop + Advance 2DHD is the longest range traffic detection Radar available on the market.

Stop + Advance 3DHD

Stop + Advance 3DHD is designed to cover a very wide field of view (100degree) which allows stop bar detection in 8 lanes. The advance detection range for passenger cars is 180m, with a max. range of 320m.

3DHD measurement allows to separate objects in range, speed and angle, it uses digitally controlled Radar beams which scan the (azimuth) field of view. This principle supports objects separation in dense, congested traffic scenarios at intersections. 256 objects can be detected and tracked at a time.

Stop + Advance 3DHD represents the highest performance traffic Radar made by smartmicro.

1. Smartmicro is the only company to offer combined Stop Bar and Advance Detection using one single sensor.
Advance+ sets the standard for non-intrusive advance detection. It offers up to 300m (1000ft) range for detecting passenger cars, on up to four lanes and lane-specific measurement. Approach, advance and system loops can effectively be replaced with one sensor. Advance+ and the lane specific detection works on straight roads as well as on curved roads.
Stop Bar +

Smartmicro Stop Bar+ sensors offer reliable presence detection for the stop bar and are used to replace loops. Up to six lanes are covered by one Radar, which is usually installed on a traffic light pole at the corner of the intersection. Smartmicro Stop Bar+ sensors are field proven since 2009. Being installed at thousands of intersections worldwide, they keep showing best performance in many benchmark tests. Highest detection rates, a very low number of false or stuck calls and robust function under adverse weather conditions are typical. Stop Bar+ sensors also detect bicycles.

Stop + Advance

The Stop+ Advance sensor combines stop bar detection for up to four lanes with coverage of the advance zones up to 160m (525 ft). Replacing both stop bar loops and advance presence-, ETA- or other loops, it allows advanced control strategies like dilemma zone protection or green light extension with one single Radar per approach, even on curved approaches.

This combination of advance and stop bar detection is a unique feature, saving hardware cost and installation time, where competitors need two separate sensors for the two functions.

The advance detection feature works lane specific, i.e. advance loops can be assigned to individual lanes.

Smartmicro is the only company to offer this technology.

In addition to simple presence detection, the integrated Event Trigger Module can be used to conveniently realize dilemma zone protection, signal priority, signal phase extension and other concepts for modern actuated intersections.
ACCURATE. RELIABLE.

ILLINOIS CENTER FOR TRANSPORTATION TEST REPORT

The Illinois Center for Transportation performed a “Field Evaluation of Smart Sensor Vehicle Detectors at Intersections and Railroad Crossings” in October 2012. In this report, the Smartmicro radar, integrated in an OEM system, was compared to inductive loops (used as a reference).

<table>
<thead>
<tr>
<th>ACCURACY</th>
<th>FALSE CALLS</th>
<th>MISSED CALLS</th>
<th>STUCK-ON</th>
<th>DROPPED CALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop Bar</td>
<td>96%</td>
<td>1.4% - 3.6%</td>
<td>0.1% - 0.3%</td>
<td>0.9% - 2.8%</td>
</tr>
<tr>
<td>Advance</td>
<td>99%</td>
<td>0.7%</td>
<td>0.8%</td>
<td>0.04%</td>
</tr>
</tbody>
</table>

In a second report, the performance was re-evaluated under adverse weather conditions. The Smartmicro radar performed significantly better than all competitor products.

6 LANE APPROACH AT INTERSECTION

Smartmicro Stop+Advance was compared against loops in this test. No Classification data was provided by the reference. The test duration was 28 days, the summarized results are shown below. More detailed results can be obtained upon request.

<table>
<thead>
<tr>
<th>Total</th>
<th>LOOP</th>
<th>RADAR</th>
<th>LOOP</th>
<th>RADAR</th>
<th>LOOP</th>
<th>RADAR</th>
<th>LOOP</th>
<th>RADAR</th>
<th>LOOP</th>
<th>RADAR</th>
<th>LOOP</th>
<th>RADAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>27930</td>
<td>27819</td>
<td>119389</td>
<td>116244</td>
<td>160657</td>
<td>161346</td>
<td>94769</td>
<td>99665</td>
<td>200126</td>
<td>196207</td>
<td>167921</td>
<td>164836</td>
</tr>
<tr>
<td>Accuracy Count</td>
<td>99,60%</td>
<td>97,37%</td>
<td>100,43%</td>
<td>105,17%</td>
<td>98,04%</td>
<td>98,16%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TMIB - DETECTOR CARD

The Traffic Management Interface Board (TMIB) connects up to four Smartmicro traffic Radars of an intersection and interfaces those to all common intersection controllers. For the US market, there is NEMA TS1/TS2 compliance and SDLC interface. For other markets and controller types, there are 16 opto-isolated contacts available. The data of all four Radars are available at one Ethernet interface. The configuration of the complete intersection, virtual loops, ETA triggers and more has become very convenient through this Ethernet port, using the TMC EASY MODE software. TMIB also provides surge and overvoltage protection for all connected sensors.
JUNCTION BOX

The Smartmicro Junction Box (JBOX) offers a convenient and reliable way to connect any UMRR sensor to the home run cable, which connects the sensor to the cabinet. It can accommodate a wide range of customer cables, which are run through a water tight sealing, then connected to a terminal block. The JBOX directly attaches to the sensor, IP67 protection level is retained. No soldering and no external connection box is required.
In addition to providing ease of installation, the JBOX also protects the radar from voltage surges and overvoltage.

BRACKETS

Straight brackets and advanced brackets are available for every sensor model. The straight bracket is intended for poles, while the advanced bracket supports adjustment in two axes.
TRAFFIC RADAR ACCESSORIES

SENSOR RELAY OPTION

The Sensor Relay Option (SRO) module supports any application which requires contact closures attached to the sensor. It features 8 configurable solid state relays which can be chosen as either normally-open (NO) or normally-closed (NC).

TARGET SIMULATOR

The Elektronic K-Band Target Simulator/ Doppler Generator (EKTSDG) is a battery powered handheld portable target simulator.

It can be used for:
- alignment of sensors in the field at installation time
- field or lab calibration and year-by-year inspection
- general functional testing.

This device was specifically developed to work with Smartmicro 24GHz sensors. It is capable of simulating a moving target (1...200km/h) up to distances of 100m and can for instance be placed close to a stop line to check the alignment of a Radar sensor.
Smartmicro offers a demo kit which can be used to test the Radar performance under real world conditions and to get hands-on experience.

The demo kit typically consists of:
- UMRR-0A radar sensor T29 or T30
- RS485 serial to USB adaptor
- Test cable
- Mounting bracket for poles or tripods
- Upon request, UMRR-0C and UMRR-0F demo kits are available as well.

The kit comes ready-to run, just a power supply is required, as well as the installation of the TMC software, which can be loaded from the Smartmicro website. After connecting all parts and with power on, Radar data will immediately be displayed. Connecting to video cameras is optionally supported. A quick guide document is available, and the Smartmicro team is always available for questions and support.
INSTALLATION OPTIONS

INTERFACE TO NEMA TS1 TRAFFIC CONTROLLER

UMRR Sensor

1 RS485
2 RS485
3 RS485
4 RS485

PC with TMC Easy Mode Software

NEMA TS1 Traffic Controller
Replaces 16 Loops
Loop Detector Output on Cabinet Card

INTERFACE TO NEMA TS1 OR ANY OTHER TRAFFIC CONTROLLER

UMRR | SRO

1 8 opto isolated contact pairs / RS485
2 8 opto isolated contact pairs / RS485
3 8 opto isolated contact pairs / RS485
4 8 opto isolated contact pairs / RS485

NEMA TS1 Traffic Controller
Replaces 32 Loops
Loop Detector Output on Cabinet Card
INSTALLING UMRR RADARS

In order to integrate Smartmicro traffic radars with any intersection controller, several interface options exist. For NEMA TS1 or TS2 compliant controllers, Smartmicro offers its TMIB interface cards, which can be installed in any T-170 detector rack. Vehicle detections are either signaled through the back-plane (TS1 mode) or through an SDLC link to the controller (TS2 mode).

In addition, Smartmicro also offers a general purpose relay module (Sensor Relay Option, SRO), which is directly attached to the back of the sensor. Its 8 output channels can be wired to any controller which accepts relay or Loop Detector outputs.

INTERFACE TO NEMA TS2 TRAFFIC CONTROLLER
The new TMC (Traffic Management Configurator) Easy Mode Installation Wizard makes planning and field installation of sensors simple, as an intuitive step-by-step guide starting with site planning over sensor selection and configuration to physically installing the radar at an intersection. Just one simple window for settings, and a map for the visualization, TMC Easy Mode helps and explains all settings. Remarkable features are "local awareness" and "guided alignment", meaning that the sensor itself provides feedback to the installer about where it is mounted and how well it is physically aligned/pointed towards the area of an intersection which shall be covered.

In order to further simplify the installation process, the TMC Easy Mode software now contains help videos for every relevant setup step. By clicking “Show Video”, explanations on the current step can be directly accessed from the user interface.
7-STEP SETUP PROCESS

After a location was selected from a map (1), a satellite image is automatically fetched from a number of map providers and scaled to the correct dimensions (2). Lanes and stop bar position may also be loaded from the (high resolution) map if available. Detection zones are configured by drag & drop (3). When basic setup is complete, the mounting positions for one or more radar sensors are proposed/selected (4). Next detection zones are assigned to the appropriate radars (5). The radar is then connected using the Interface Wizard (6). In the field, at an intersection, the guided alignment feature will help to physically adjust the radar correctly (7).

CHANGING & SHARING SETTINGS

All installation settings are stored in one container file, including location data, so they can easily be archived, reviewed and/or shared via email.
ABOUT SMARTMICRO

Smartmicro is a specialist in Radar technology and has been working with automotive customers since the company’s founding. Today not only automotive Radars are being developed, but since 2007 the business has very successfully been extended to Traffic Management Radar products. Today Smartmicro is among the largest manufacturers of Traffic Management Radar sensors. Worldwide market presence, a strong engineering team and an excellent support team is backing the growth of Smartmicro in the ITS business.
COMPANY
The company was founded in November 1997 by Prof. Dr. rer. nat. Hermann Rohling and Dr.-Ing. Ralph Mende as a spin-off of the Institute for Communications Engineering at the Technical University of Braunschweig. Prof. Rohling recently retired from being Vice President of the Technical University of Hamburg-Harburg (TUHH) and head of the Communications Department at this University, while Dr. Mende is the Managing Director of Smartmicro.

FACTS
Over 90 employees, most of them scientists, Ph.D. graded or highly specialized engineers form the outstanding staff of the company. We work in over 1400m² offices and labs, and another 1000m² test field and production labs in a brand new company building in Braunschweig, located in Northern Germany close to Hanover.
DISCLAIMER
All Product, Product specifications and data in this brochure 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 in this brochure 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 presentation or in any other disclosures related 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 in this brochure, (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’s knowledge of typical requirements that are often placed on Smartmicro’s 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’s products not expressly indicated for use in such applications do so at their own risk.
This brochure does not expand or otherwise modify Smartmicro’s 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. Smartmicro GmbH is the sole owner of the information collected in this brochure. The information contained in it shall remain the sole exclusive property of Smartmicro and shall not be copied or otherwise used without prior consent of Smartmicro in writing.
All information in this brochure is copyrighted 2014 by s.m.s. microwave sensors GmbH (Smartmicro).