

# T & M solutions for production

## Automatic functional testing of roof antennas

### TEST & MEASUREMENT

Today's automobiles contain a wide variety of radio reception equipment. Roof antennas therefore usually house multiple reception modules in one unit, e.g. for radio, GPS, telephone, and DAB. These antenna systems – which are often referred to as "shark fins" and vary in size and functionality depending on the equipment configuration in the vehicle – are now found on almost every vehicle. For example, vehicles with a navigation system have an antenna with an additional GPS reception system. The antenna equipment can be combined

in various ways to yield many different configurations. In order to produce such roof antennas by means of automated processes, manufacturers require flexible solutions that they can adapt to their individual needs. Conventional production methods often do not meet the quality requirements that automobile manufacturers place on process stability. Automated production must ensure process stability and traceability, and it must do so while lowering production costs.

### T&M solution



The implementation of the system described here is based on a rotary table with integrated automatic functional testing. The system not only performs the electrical functional tests in the DC and RF range. It also fastens the electronic module on the base with the housing parts while applying torque control to the screws. Mechanical and visual aspects of the housing and of the various mounting screws are checked during the production process by means of a camera system.



The test system also controls the rotary table and manages and monitors all electrical and mechanical parameters. Every step of production from the setup of the individual jobs to the management of the transport containers is monitored and documented. A sensor-controlled gate detects and labels defective (FAIL) parts and separates them from the good (PASS) parts. The result is minimum cycle time at maximum process stability.

The system is based on the R&S® CompactTSVP production test platform and a network analyzer from Rohde & Schwarz with a customized RF switching matrix (including automatic calibration) for performing RF measurements and functional testing. The GTS-PA production test software from GEDIS supports the user in every task from the administration of test equipment and test programs up to monitoring the production sequence. A quality analysis software application (which can be used online or offline) enables Production Management and Quality Assurance to access all key production data at any time.

Customer-configurable statistical analyses – with reference to the unit under test (UUT) and the production processes – complement the test system. Parameterization as well as the analyses can be performed from any location via a LAN. The system cycle time, which may vary greatly depending on the test specification but is nevertheless automatically minimized, and the high level of process stability provided through the continuous online monitoring help to ensure cost-effective production.



## Technical information

<b>Product designation</b>	Automatic standalone production solution for roof antennas
<b>System components</b> (standard configuration)	<ul style="list-style-type: none"> <li>• Rotary table with five stations for operation with UUT holders</li> <li>• TS-P-T-Line test system from GEDIS, network analyzer from Rohde &amp; Schwarz</li> <li>• RF switching matrix up to 4 GHz</li> <li>• SPC interface</li> </ul>
Sensors	Camera system for visual inspection, UUT holder coding, sensor-controlled screw torque and insertion depth, color coding of connectors, monitoring for proper cabling
Application	<ul style="list-style-type: none"> <li>• Characteristics: power consumption (standby operation, normal operation), characteristic impedance, matching/transmission function 150 kHz to 3 GHz</li> <li>• Import of production data from SAP, customer-specific logging of all key production data</li> <li>• Sensor-controlled separation of FAIL parts from PASS parts</li> <li>• Sensor-controlled routing of PASS parts to customer-specific UUT holders</li> </ul>



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