R&S® TSM-DVB DVB-T/H Diversity Test Receiver

Compact drive test receiver for DVB-T and DVB-H

- Fast DVB-T and DVB-H measurements for drive test applications
- Indoor and outdoor coverage measurements possible
- Fully software-supported application via R&S® ROMES
- VHF (channels 5 to 12; 177.5 MHz to 226.5 MHz)
- UHF (channels 21 to 69; 474 MHz to 858 MHz)
- User-selectable IF bandwidths of 5 MHz, 6 MHz, 7 MHz, and 8 MHz
- RS-232-C interface
- High-quality stable aluminum case, compact
- Low power consumption
  12 V DC/12 W
- Secured measurements due to antenna diversity
- Two ASI outputs for two MPEG transport streams
At a glance

For survey tests within DVB-T/H networks, operators usually perform measurements in line with the ETSI DVB-T and DVB-H standards:

◆ ETSI EN 50083-9
◆ ETSI EN 300 744 including annex F

Stationary measurements are performed with directional antennas raised to 10 m above the surface. These measurements require tremendous investments in specialized measurement vehicles. Furthermore, these kind of coverage measurements take a lot of time. Finally, the coverage information is collected only for smaller areas, not in the broad field.

Emerging technologies (such as DVB-T/H) are generating a demand for new coverage measurement methods that do more than the traditional procedure mentioned above. These new methods must work in mobile scenarios, i.e. during driving.

The R&S®TSM-DVB DVB-T/H diversity test receiver has been designed for mobile measurements in DVB-T/H networks, even at very high driving speed (up to 100 km/h). Its concept helps ensure reliable and fast measurements.

The R&S®TSM-DVB DVB-T/H diversity test receiver complies with the standard DVB-T/H receiver specifications. It also complies with the equipment environment at the following levels:

◆ Mechanical
◆ Electrical
◆ Control

The receiver supports all DVB-T/H modes (2K, 4K, 8K), including hierarchical modes, and does so in all available bandwidths (5 MHz, 6 MHz, 7 MHz, and 8 MHz) with the same hardware.

The receiver is equipped with two antenna inputs (for diversity reception) and two demodulation channels.

Front view of the R&S®TSM-DVB
Applications

The R&S®TSM-DVB DVB-T/H diversity test receiver can be used for mobile coverage measurements. The R&S®ROMES drive test measurement software provides an effective driver to support the DVB-T/H receiver.

The R&S®TSM-DVB DVB-T/H diversity test receiver together with the R&S®ROMES software make mobile measurements possible in a DVB-T/H network. The system performance allows driving speeds up to 100 km/h.

The R&S®TSM-DVB DVB-T/H diversity test receiver provides the following measurement parameters:

- RF level
- MER (modulation error ratio)
- PER (packet error ratio)
- BER (bit error ratio after Reed-Solomon)
- TPS bits b16 to b55
- DVB-H signaling performed/not performed
- Time slicing used/not used on HP/LP stream
- MPE FEC used/not used on HP/LP stream
- Constellation diagram view

The R&S®ROMES application software displays all of these parameters online and stores all data together with time and positioning information.
Configuration examples

**DVB-H test application**
The R&S® ROMES drive test software controls the R&S®TSM-DVB receiver and an optional GPS. DVB-H mobile is used for visual picture quality control.

**R&S®TSMU-Z3 backpack drive test system**
The R&S®TSM-DVB receiver is used for parallel DVB-H measurements, and GSM, WCDMA measurements are performed with test mobile phones. Control via pen PC (not shown) and R&S® ROMES drive test software (indoor/outdoor application).

**R&S®TS51GA drive test aluminum case**
Fix mounted notebook (with R&S®ROMES drive test software installed), R&S®TSM-DVB receiver, test mobile phones and GPS for parallel coverage tests in radio networks (outdoor application).
Technology

The R&S®TSM-DVB DVB-T/H diversity test receiver is equipped with two RF receivers, two DVB-T/H demodulators, and thus two ASI outputs, as well as a complex programmable logic device (CPLD). All are controlled by a state-of-the-art microcontroller.

Mode of operation

<table>
<thead>
<tr>
<th>Operating modes</th>
<th>ASI outputs</th>
<th>Active RF inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual input</td>
<td>ASI 1 ↔ ASI 2</td>
<td>RF IN 1 ↔ RF IN 2</td>
</tr>
<tr>
<td>Redundant</td>
<td>ASI 1 = ASI 2</td>
<td>RF IN 1 or RF IN 2</td>
</tr>
<tr>
<td>Hierarchical</td>
<td>ASI 1 (HP) ↔ ASI 2 (LP)</td>
<td>RF IN 1 ↔ RF IN 2</td>
</tr>
<tr>
<td>Diversity</td>
<td>ASI 1 = ASI 2</td>
<td>RF IN 1 = antenna 1, RF IN 2 = antenna 2</td>
</tr>
</tbody>
</table>

Features

- Modern chipset and microprocessor design → fast DVB-T/H measurements possible
- High-tech Rohde & Schwarz design and production process → stable aluminum case, compact size, low weight, low power consumption (12 V DC)
- Online display of all measurement data; data evaluation in replay mode; layer concept supports maps; more than 30 different drivers available (Rohde & Schwarz receivers, test mobile phones, GPS) → fully supported by the R&S®ROMES measurement software
- Double-receiver concept with four user-selectable modes: dual input, redundant, hierarchical, diversity → secured measurements due to antenna diversity, two ASI outputs for two MPEG transport streams
- Modular hardware and software concept → easy expandability with test mobile phones and R&S®TSMx radio network analyzer for mobile network application

Benefits

- Reduction of measurement time; cost-saving measurements
- Ideal for mobile applications (indoor and outdoor); easy integration into backpack or suitcase; low expenditure for system design
- High-performance R&S®ROMES drive test software with intuitive, easy-to-use user interface
- Very flexible applications due to diversity receiver concept
- Future-proof modular and expandable R&S®ROMES software; hardware add-ons for high-quality DVB-T tests (R&S®EFA, R&S®DVMD, R&S®DVQ) available
### Specifications

**RF inputs**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF</td>
<td>channels 5 to 12; 177.5 MHz to 226.5 MHz with IF bandwidth of 7 MHz</td>
</tr>
<tr>
<td>UHF</td>
<td>channels 21 to 69; 474 MHz to 858 MHz with IF bandwidth of 8 MHz</td>
</tr>
<tr>
<td>IF bandwidths</td>
<td>user-selectable IF bandwidths of 5 MHz, 6 MHz, 7 MHz, and 8 MHz for all VHF, UHF bands</td>
</tr>
<tr>
<td>Frequency step</td>
<td>166.667 kHz</td>
</tr>
<tr>
<td>Frequency offset</td>
<td>±167 kHz or ±125 kHz, supported without configuration</td>
</tr>
<tr>
<td>Input sensitivity</td>
<td>-92 dBm to -20 dBm (depends on DVB-T/-H mode, low values: QPSK only)</td>
</tr>
<tr>
<td>Level accuracy</td>
<td>±2 dB (level ≤ -30 dBm, +15 °C to +50 °C)</td>
</tr>
<tr>
<td></td>
<td>±3 dB (level ≤ -30 dBm, 0 °C to +15 °C)</td>
</tr>
<tr>
<td>Input impedance</td>
<td>75 Ω, on female N connector</td>
</tr>
</tbody>
</table>

**DVB-T demodulation**

- fully compliant with ETS 300744:
  - includes hierarchical modes (selection of stream priority)
  - DVB-H signaling performed/not performed
  - MPE FEC used/not used on HP/LP stream
  - automatic mode detection from TPS information (even at 0 dB C/N), TPS bits b16 to b55
  - dual-stream demodulation in hierarchical mode
  - in-depth deinterleaver
  - dual-stream demodulation in redundant mode with automatic or manual switching
  - diversity mode
  - DVB-H signaling (time slicing and MPE FEC) in TPS field (no power reduction and no MPE FEC decoding)
  - (time slicing used/not used on HP/LP stream)

**Constellation diagram**

![Constellation Diagram](image)

**ASI output**

- fully compliant with EN 50083-9
- 188 bytes per packet in data burst format (continuous mode)
- dual outputs

**Control of module**

- RS-232-C interface with standard ±12 V level in slave mode
- two 5 V TTL status lines

**MPEG TS outputs**

- serial interfaces

**Output impedance**

- 75 Ω

**Output connector**

- BNC

**General data**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>single +12 V power supply</td>
</tr>
<tr>
<td></td>
<td>max. 1 A (12 W)</td>
</tr>
<tr>
<td>Dimensions (H × W × D)</td>
<td>83 mm × 154 mm × 224 mm (3.3 in × 6.1 in × 8.8 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 1.4 kg (3.1 lb)</td>
</tr>
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</table>
## Ordering information

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVB-T/H Diversity Test Receiver</td>
<td>R&amp;S*TSM-DVB</td>
<td>1503.7007.10</td>
</tr>
<tr>
<td><strong>Options and accessories</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DVB-T/H Antenna Fixed Mount</td>
<td>R&amp;S*TSM-DVB-Z1</td>
<td>1503.4008.02</td>
</tr>
<tr>
<td>DVB-T/H Antenna Magnet Mount</td>
<td>R&amp;S*TSM-DVB-Z2</td>
<td>1503.4014.02</td>
</tr>
<tr>
<td>DVB-ASI Decoder (PCI) for R&amp;S*TSM-DVB</td>
<td>R&amp;S*TSM-DVB-Z3</td>
<td>1503.4020.02</td>
</tr>
<tr>
<td>DVB-ASI Decoder (USB) for R&amp;S*TSM-DVB</td>
<td>R&amp;S*TSM-DVB-Z4</td>
<td>1503.4037.02</td>
</tr>
<tr>
<td>Power Supply 230 V AC, 12 V DC/6 A</td>
<td>R&amp;S*TSMU-Z1</td>
<td>1166.3786.02</td>
</tr>
<tr>
<td>19&quot; Rack Adapter</td>
<td>R&amp;S*TSMU-Z2</td>
<td>1153.6700.02</td>
</tr>
<tr>
<td>Indoor Backpack System</td>
<td>R&amp;S*TSMU-Z3</td>
<td>1153.6900.02</td>
</tr>
<tr>
<td>Drive Test System Software</td>
<td>R&amp;S*ROMES3NG</td>
<td>1143.7991.40</td>
</tr>
<tr>
<td>R&amp;S<em>ROMES Driver for R&amp;S</em>TSM-DVB</td>
<td>R&amp;S*ROMES3DVB</td>
<td>1502.5652.40</td>
</tr>
<tr>
<td>DVB-T/H Drive Test Bundle consisting of: R&amp;S<em>TSM-DVB Receiver, GPS, R&amp;S</em>ROMES3NG Drive Test System Software, R&amp;S<em>ROMES3DVB Driver Software for R&amp;S</em>TSM-DVB, R&amp;S*ROMES3IND Indoor Driver Software</td>
<td>R&amp;S*TS-DVB-T/H</td>
<td>1508.1742.02</td>
</tr>
</tbody>
</table>

(Please note: The R&S*ROMES software is not upgradeable.)

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**Rear view of the R&S*TSM-DVB**

![Rear view of the R&S*TSM-DVB](image-url)
More information at
www.rohde-schwarz.com
(search term: TSM-DVB)