R&S®TSME
Ultracompact
Drive Test Scanner

All bands, all technologies, simultaneously

ROHDE&SCHWARZ
Mobile Network Testing

Product Brochure | Version 18.00

R&S®TSME Ultracompact Drive Test Scanner

At a glance

The extremely compact R&S®TSME offers all that is required for mobile use. Multitechnology measurements and multiband support provide full flexibility and an optimal price/performance ratio for both drive tests and walk tests.

The scanner measures all supported technologies simultaneously and seamlessly in wireless communications bands from 350 MHz to 4.4 GHz. It is possible to cascade multiple scanners. For LTE applications, four R&S®TSME scanners can be combined for 4x4 MIMO measurements.

With its light weight of only 650 g and low power consumption of max. 15 W, the R&S®TSME meets all the requirements placed on a drive test scanner.

Key facts

- Multiband support from 350 MHz to 4.4 GHz
- More than ten technologies simultaneously in one scanner
- Compact, lightweight design
- Low power consumption
- Internal GPS/GLONASS receiver

R&S®TSME Ultracompact Drive Test Scanner

Benefits and key features

Maximum flexibility and future readiness

- Simultaneous measurement of multiple technologies and multiple bands using one device
  - Cascading
  - In-field upgrades
  - SIB/L3 decoding
  - Flexible band selection

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Wide range of applications

- Ultracompact design
- Minimal noise
- Low power consumption
- Integrated GPS
- Fast setup with automatic channel detection
- LTE uplink and downlink allocation analyzer
- NB-IoT/Cat NB1 measurements
- LTE-M measurements

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R&S®TSME-Z3 backpack system

- Maximum autonomy
- Flexible measurement configuration
- Rugged and lightweight

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Supported by a wide variety of software products

- Network optimization with scanner and test UE
- Improvement of LTE quality of service (QoS)
- Position estimation of base stations
- Scanner application in benchmarking and optimization solution
- Open interface and use as OEM

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Maximum flexibility and future readiness

Simultaneous measurement of multiple technologies and multiple bands using one device

The R&S®TSME not only boasts very fast signal processing, it also incorporates the RF core competency of Rohde&Schwarz in an ultracompact RF receiver. As a result, this extremely compact scanner can perform measurements in a user-configurable frequency range between 350 MHz and 4.4 GHz, making it possible to measure all current and future bands of any supported technology in this range. The LTE standard, in particular, specifies a large number of bands. The multitechnology, multiband R&S®TSME provides excellent investment protection.

Its measurement bandwidth of 20 MHz allows all wireless communications standards to be measured, including LTE, LTE-Advanced and WiMAX™. Since the R&S®TSME can simultaneously measure any combination of bands, it supports measurements in networks with LTE-Advanced carrier aggregation.

It is possible to use multiple bands in parallel and to measure multiple technologies simultaneously. At present, the R&S®TSME can handle more than ten technologies at the same time. For each technology, it is possible to define multiple frequencies in different bands.

Cascading

The adaptable hardware allows several R&S®TSME scanners to be cascaded using one synchronization interface and one power supply. As a result, measurement applications such as for 4x4 MIMO can be implemented.

In-field upgrades

The supported technologies can be installed via software as desired. Since no hardware is needed for upgrading, users are able to upgrade the scanner in the field and add more technologies.

Examples of simultaneous use of multiple frequencies in different bands for each technology

	North America				Europe		
GSM	850 MHz	1900 MHz			900 MHz	1800 MHz	–
WCDMA	850 MHz	1900 MHz	2100 MHz/AWS		900 MHz	2100 MHz	–
LTE-FDD, LTE-M	700 MHz	850 MHz	1900 MHz	2100 MHz/AWS	800 MHz	1800 MHz	2600 MHz
LTE-TDD	2500 MHz	3400 MHz			2500 MHz	3400 MHz	–
NB-IoT/Cat NB1	700/800/900/1800/1900/2100 MHz				700/800/900/1800/1900/2100 MHz		
Spectrum	UL and DL frequencies				UL and DL frequencies		

SIB/L3 decoding

The R&S®TSME performs RF measurements on the individual wireless communications technologies and also decodes the layer 3 information of the SIB broadcast messages from base stations. This feature makes it possible to determine the configuration of the wireless communications network in detail and to easily detect errors.

Flexible band selection

The R&S®TSME hardware simultaneously measures in all wireless communications bands from 350 MHz to 4.4 GHz. A more cost-efficient version is available for applications where only a limited number of bands need to be measured simultaneously. This version limits the number of bands that can be measured in parallel. Users can reconfigure the bands for each measurement as desired.

The R&S®TSME-K2B option allows, for example, simultaneous measurement of any two wireless communications bands. Any licensed technology (e.g. GSM, WCDMA, LTE, LTE-M, NB-IoT/Cat NB1) can be measured in any of the configured bands. This enables the user, for example, to perform simultaneous measurements in the GSM900 and GSM1800 bands and, after changing the configuration, in the UMTS 2100 MHz and the LTE 2600 MHz bands.

Should other bands be required in the future, users can order additional options to increase the number of bands in the field. This reduces investments to only those functionalities that are actually required.

If the R&S®TSME is equipped with the R&S®TSME-KAB option, there are no band restrictions.

Technology support at a glance

	Technologies supported	MIB, SIB decoding
GSM	•	•
WCDMA	•	•
CDMA2000®	•	•
1xEV-DO (Rel. 0/Rev. A/Rev. B)	•	•
WiMAX™ IEEE 802.16e	•	•
TD-LTE	•	•
LTE-FDD	•	•
LTE-M	•	•
NB-IoT/Cat NB1	•	•
TETRA, TETRA DMO	•	•
TD-SCDMA	•	•
RF power scan	•	–
CW channel power RSSI scan	•	–

Cascaded R&S®TSME scanners in original size

Wide range of applications

Ultracompact design

With dimensions of approx. 5 cm × 9 cm × 15 cm and a weight of only 650 g, the R&S®TSME is the most compact scanner in its class.

Minimal noise

Its small size makes the R&S®TSME ideal for use in mobile solutions, especially for walk tests and indoor tests. The scanner is equipped with a virtually silent, temperature-controlled fan, allowing unobtrusive measurements in a backpack.

Low power consumption

Thanks to the large-scale integration of all components, the scanner is lightweight and handy and boasts low power consumption. The R&S®TSME consumes max. 15 W and is therefore ideal for long-term battery operation.

Integrated GPS

The built-in GPS and GLONASS chip can be addressed via the common LAN interface, which reduces the amount of cabling required.

Fast setup with automatic channel detection

In combination with the R&S®ROMES4ACD automatic channel detection option, the R&S®TSME automatically detects active channels in a specified band. NB-IoT, LTE, LTE-M, UMTS and CDMA2000®/1xEV-DO networks are supported. The feature can be optionally enhanced by a spectrum scan that significantly speeds up the detection process.

With this feature, channel lists no longer have to be set up before a measurement campaign; the measurement system dynamically identifies new channels and adds them to the workspace during the drive. This is particularly relevant in networks deployed in a shared spectrum with other cellular standards, where frequent channel frequency and channel bandwidth changes can occur. Without R&S®ROMES4ACD, the automatic channel detection feature is provided by the R&S®TSME-K40 option via the ViCom interface.

LTE uplink and downlink allocation analyzer

The R&S®TSME offers a unique feature that allows analysis of the UL and DL allocations (up to Rel. 12) of the strongest eNodeBs during measurement. The information includes the following: the number of RNTIs (UEs) that have been scheduled data by the eNodeB, the MCS and throughput for each detected UE, and the occupation of the cell. Information is provided per TTI and per resource block. The data can be statistically evaluated to assess the overall load of the cell in terms of throughput and number of users. This information is important during network optimization and troubleshooting, for it helps users acquire network data without accessing O&M network information such as base station counters. Uplink and downlink allocation analyzer can be run simultaneously; the balance of uplink and downlink allocation can be analyzed. LTE allocation analysis requires the R&S®TSME-K31 option for downlink analysis and the R&S®TSME-K33 option for uplink analysis.

For example, the LTE uplink and downlink allocation analysis result can explain a limited UE throughput if the scanner shows that the cell load is already high and therefore not enough resources are available for the test UE. In a benchmarking environment, the feature provides deep insight into networks, allowing comparison of traffic and available capacity between different operators. The tool can also be used as a network probe to measure the cell load in a stationary situation, for example when a site owner wants to know the importance of a site before renewing the lease with the network operator.

NB-IoT/Cat NB1 measurements

The R&S®TSME-K34 option makes it possible for the R&S®TSME to measure in NB-IoT/Cat NB1 networks. NB-IoT/Cat NB1 is a 3GPP standard for connecting a huge number of devices, such as smart meters, to the internet (IoT). While traditional LTE standards mainly enhance throughput and network capacity, the focus of NB-IoT/Cat NB1 is on low power consumption for IoT devices and highest availability of the connection, especially indoors.

Indoor measurements require lightweight and ultra-compact scanners with low power consumption. For coverage validation, troubleshooting and optimization, the R&S®TSME measures signal power, quality and power to interference and noise ratio on each available physical cell ID based on synchronization and reference signals. During NB-IoT/Cat NB1 measurements, it is possible to demodulate the layer 3 broadcast information to check the network configuration.

The standard allows three operating modes to integrate the NB-IoT carrier efficiently into the available spectrum. The R&S®TSME supports all three modes. The most spectrum efficient mode is the LTE in-band operatig mode where the NB-IoT carrier uses the spectrum of one LTE PRB. The guard band and standalone operating modes allow NB-IoT deployments independently of the LTE spectrum.

NB-IoT measurements can be run simultaneously with measurements on other technologies such as GSM, LTE, (W)CDMA (with the appropriate R&S®TSME option). For optimization or in case of troubleshooting, the impact of NB-IoT spectrum on adjacent GSM/LTE/(W)CDMA spectrum and vice versa can be validated.

LTE-M measurements

LTE-M is another 3GPP standard for connecting things to the internet. LTE-M addresses different use cases than NB-IoT, for instance voice (VoLTE) and mobility. It also provides higher data rates. LTE-M is based on legacy LTE and reuses some of the cell-specific signals. Like NB-IoT, LTE-M uses smart mechanisms to enlarge the link budget. One of those mechanisms is frequency hopping to overcome fading and areas of bad SINR (resulting from LTE traffic and other interference) across the LTE spectrum. This is achieved by dividing the LTE carrier into several LTE-M narrowbands that are allowed to handle LTE-M traffic depending on the RF environment. The R&S®TSME supports LTE-M measurements that deliver RF parameters (SINR, RSRP, RSRQ and RSSI) on each of those LTE-M narrowbands per PCI to identify, for example, the best narrowband for LTE-M data transmission. In R&S®ROMES4, it is also possible to compare all narrowbands at a glance to evaluate the RF environment in the surrounding narrowbands. With fading and interference from LTE traffic and other pilot signals, the RF parameter differences between the narrowbands can be quite remarkable. It is also possible to compare scanner based and module based results to verify if the LTE-M module uses the best narrowband for data transmission.

Supported by a wide variety of software products

The R&S®ROMES4 drive test software platform supports the R&S®TSME and mobile devices for signaling information and quality of service measurements. In this combination the system achieves maximum performance, permitting interference analysis for operating the mobile devices in the wireless communications network.

Network optimization with scanner and test UE

The R&S®ROMES4 drive test software collects data from Rohde&Schwarz scanners and also controls special mobile devices, i.e. test user equipment (UE). The test UEs function according to specific requirements, enable conversations and transmit data. They are used to measure the voice quality of calls and generate statistics on the number of dropped calls in certain measurement scenarios.

It is important to analyze the data throughput and stability of data transmissions, for example by simulating FTP downloads.

Improvement of LTE quality of service (QoS)

During an FTP download, the UE shows the currently achieved data throughput. If the data throughput is lower than expected, the channel quality indicator (CQI) can be used to determine the reason for the reduced data throughput.

A low CQI indicates, for example, that the received signal is too weak or that the signal to interference and noise ratio (SINR) is too low. In this case, LTE user equipment usually cannot use higher-order modulation modes such as 64QAM. The R&S®TSME measures and analyzes interference or insufficient coverage completely independently of the user equipment. It finds out whether the neighboring cells can be received with sufficient strength and quality. It also allows in-depth analysis of the situation at the cell borders. This situation is decisive for correct handover. Automatic neighbor relation (ANR) algorithms in self-optimizing networks (SON) can also be verified in this way.

LTE eMBMS measurements

The LTE evolved multimedia broadcast multicast service (eMBMS) uses several base stations to broadcast the same content at the same time to all users. This poses new challenges for RAN engineers, such as base station synchronization and managing the coverage and quality of the multimedia single frequency network. eMBMS scanner measurements provide the needed insight to the SFN's RF performance, such as eMBMS reference signal power, quality and SINR. The channel impulse response

R&S®TSME measurement configuration with TETRA mobile

provided by the scanner allows detection of intersymbol interference as well as the interfering base station. The complete MBSFN configuration is decoded from SIB messages 2 and 13 from the broadcast channel. eMBMS measurements are enabled by the R&S®TSME-K32 option.

Position estimation of base stations

During a drive test, R&S®ROMES4 can use the measurement and GPS data delivered by the R&S®TSME to estimate the geographic position of the base stations. This calculation is fast and accurate. GSM, WCDMA, LTE, NB-IoT, CDMA2000®/1xEVDO and TETRA networks are supported in parallel. This unique feature enables users to quickly generate a base station list for export or graphic display.

Automatic channel detection

In combination with the R&S®ROMES4ACD automatic channel detection feature, the R&S®TSME detects active channels in a specified band. LTE, LTE-M, NB-IoT, UMTS and CDMA2000®/1xEV-DO networks are supported. This feature can be optionally enhanced by a spectrum scan that significantly speeds up the detection process. In this mode, channel lists no longer have to be set up before a measurement campaign. The measurement system dynamically identifies new channels and adds them to the workspace during the drive. This is particularly relevant in LTE networks that are deployed in a shared spectrum with other cellular standards where frequent channel frequency and channel bandwidth changes can occur.

Without R&S®ROMES4ACD, the automatic channel detection is provided by the R&S®TSME-K40 option via the ViCom interface.

Scanner application in benchmarking and optimization solution

SmartBenchmarker is a modular and rugged drive test system with up to eight individual PC modules, supporting e.g. two scanners for MIMO measurements and 24 mobile phones for a true benchmarking approach. It is a high-productivity measurement system that meets all requirements for efficient and error-free operation in large-scale deployments.

For evaluating the benchmarking results, Rohde&Schwarz offers various data management tools that provide scalable data analysis, flexible interfaces and reporting for the data captured during the benchmarking campaigns.

Open interface and use as OEM

Many manufacturers have firmly integrated Rohde&Schwarz scanners into their drive test tool chain. The outstanding signal processing capabilities and the easy-to-use Windows API virtual communications (ViCom) interface with sample code make it very easy for users to get the maximum out of every Rohde&Schwarz drive test scanner.

The API delivers all the data that the scanner can measure. The performance and quality parameters of the cells are measured at high speed, and the GSM, WCDMA, LTE (FDD/TDD), LTE-M, NB-IoT, TD-SCDMA, CDMA2000®, 1xEV-DO and WiMAX™ system information transmitted via the air interface is collected. TETRA networks are exclusively measured using R&S®ROMES4.

In addition to cell measurements, it is possible to simultaneously perform in-depth spectrum analysis in all bands.

GPS information and scanner status are also transmitted via the interface. The built-in GPS and GLONASS chip is addressed via the common LAN interface, which reduces the amount of cabling required.

For ViCom details, please contact your local Rohde&Schwarz sales office.

R&S®TSME-Z3 backpack system

Maximum autonomy

To ensure maximum autonomy, the R&S®TSME-Z3 backpack system is equipped with an intelligent voltage supply with one or two batteries, enabling hot swapping during operation.

A battery set (not included in the product portfolio) ensures eight hours of operation when one R&S®TSME is used. As an alternative, the system can be operated without batteries from an external power supply. The batteries must be removed and charged outside the scanner.

Flexible measurement configuration

The backpack system includes a central unit with USB hub and 1 Gbit/s Ethernet switch. It supports a wide variety of measurement tasks. The backpack accommodates up to four R&S®TSME scanners or one R&S®TSME and two mobile devices.

Measurement antennas can be placed inside the backpack. They can also be used outside the backpack by passing the connecting cable through the opening provided.

The backpack system can be optionally equipped with a compact PC that runs R&S®ROMES4. Windows remote desktop can be used by any suitable device over LAN, Wi-Fi or Bluetooth®.

Rugged and lightweight

The R&S®TSME-Z3 backpack system has been developed for everyday use. The rugged hard shell protects the electronics inside and can be easily carried thanks to the ergonomic straps and soft padding.

R&S®TSME-Z3 backpack system

Specifications

Specifications of the R&S®TSME ultracompact drive test scanner		
System requirements		PC, 2 Gbyte RAM, Gigabit Ethernet, 9k jumbo frames
RF characteristics		
Frequency range		350 MHz to 4.4 GHz
Level measurement uncertainty	350 MHz to 3 GHz	< 1 dB
	3 GHz to 4.4 GHz	< 1.5 dB
Maximum operating measurement range input level		nom. –10 dBm
Maximum extended measurement range input level	in extended range mode: not 100% compliant to measured values	nom. +10 dBm
Maximum safe permissible input level		20 dBm/10 V DC
Noise figure	900 MHz	5 dB (meas.)
	2100 MHz	6 dB (meas.)
	3500 MHz	7 dB (meas.)
Intermodulation-free dynamic range (TOI)	900 MHz	–2 dBm (meas.)
	2100 MHz	–1 dBm (meas.)
	3500 MHz	–9 dBm (meas.)
RF receive paths		1
VSWR	350 MHz ≤ f ≤ 650 MHz	< 3.5 (meas.)
	650 MHz ≤ f ≤ 1.95 GHz	< 2.0 (meas.)
	1.95 GHz ≤ f ≤ 3.0 GHz	< 2.25 (meas.)
	3.0 GHz ≤ f ≤ 4.4 GHz	< 1.9 (meas.)
LTE/LTE-M characteristics		
Frequency bands supported		no restrictions
Measurement modes	automatic detection of carrier bandwidth	LTE-FDD, LTE-TDD, LTE-M
Measurement speed (LTE/LTE-M)	automatic detection of all 504 physical cell IDs with SIB decoding active/two adjacent channels	max. 330 Hz/25 Hz (meas.)
Physical decoding accuracy		
Sensitivity for initial physical cell ID decoding	SYNC signal power (LTE)	–128 dBm (meas.)
	SYNC signal RE power (LTE)	–145.9 dBm (meas.)
	RSRP (LTE/LTE-M)	–147 dBm/–132 dBm (meas.)
Sensitivity after successful physical cell ID decoding	SYNC signal power (LTE)	–130 dBm (meas.)
	SYNC signal RE power (LTE)	–147.9 dBm (meas.)
	RSRP (LTE/LTE-M)	–149 dBm/–132 dBm (meas.)
RS SINR dynamic range		–20 dB to +42 dB (meas.)
SYNC SINR dynamic range		–20 dB to +42 dB (meas.)
PCI false detection (ghost code)		$< 10^{-8}$
NB-IoT/Cat NB1 characteristics		
Frequency bands supported		no restrictions
NB-IoT/Cat NB1 measurement modes		standalone
		guard band
		in-band
Sensitivity for initial physical cell ID decoding	sync signal power (NSSS power)	–132 dBm (meas.)
	reference signals power (NRSRP)	–143 dBm (meas.)
Sensitivity after successful physical cell ID decoding	sync signal power (NSSS power)	–135 dBm (meas.)
	reference signals power (NRSRP)	–146 dBm (meas.)
CINR dynamic range	sync signals (NSSS CINR)	–15 dB to +30 dB (meas.)
	reference signals (NRS CINR)	–15 dB to +30 dB (meas.)
Measurement speed		5 Hz (single channel) (meas.)

Specifications of the R&S®TSME ultracompact drive test scanner		
Minimum layer 3 demodulation threshold	sync signal power (NSSS power)	–124 dBm (meas.)
	sync signal CINR (NSSS CINR)	–7 dB (meas.)
PCI false detection (ghost code)		< 10^{-8}
WCDMA characteristics		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed	high speed/high dynamic mode automatic detection of all 512 scrambling codes	300 Hz/80 Hz with BCH demodulation (meas.)
Scrambling code detection sensitivity (RSCP)		
Sensitivity for initial SC detection	high speed/high dynamic range	–119 dBm/–127 dBm (meas.)
Sensitivity after successful SC detection	high speed/high dynamic range	–124 dBm/–132 dBm (meas.)
Scrambling code false detection (ghost code)		< 10^{-9}
Dynamic range E_c/I_0 for initial detection	high speed/high dynamic mode	–20 dB/–26 dB (meas.)
Dynamic range E_c/I_0 after successful detection	high speed/high dynamic mode	–23 dB/–31 dB (meas.)
Min. BCH demodulation threshold E_c/I_0	high speed/high dynamic mode	> –14 dB/–20 dB (meas.)
GSM characteristics		
Frequency bands supported		no restrictions
Measurement modes	in parallel	DB/TCH/SCH code power, TCH total in-band power, timeslot power, GSM spectrum, BCH demodulation for all system information types
Measurement speed	with SI decoding active	800 channels/s (meas.)
Sensitivity	detection/BSIC decoding/BCH decoding	–124 dBm/–122 dBm/–117 dBm (meas.)
BSIC decoding dynamic range		
Sensitivity for initial BSIC detection		C/I > –2 dB (meas.)
Sensitivity after successful BSIC detection		C/I > –24 dB (meas.)
BCCH decoding dynamic range		C/I > 0 dB (meas.)
CDMA2000® characteristics		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed	automatic detection of all 512 PN codes	70 Hz, with BCH demodulation (meas.)
PN detection sensitivity		–125 dBm (meas.)
1xEV-DO characteristics (Rel. 0/Rev. A/Rev. B)		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed		20 Hz, with BCH demodulation (meas.)
PN detection sensitivity		–122 dBm (meas.)
TD-SCDMA characteristics		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed	high speed	80 Hz, with BCH demodulation (meas.)
	high sensitivity	20 Hz, with BCH demodulation (meas.)
Automatic detection of all 128 scrambling codes		
Scrambling code detection sensitivity		
Sensitivity for initial BTS detection (DwPTS)	high speed/high sensitivity	–119 dBm/–118 dBm RSCP (meas.)
Sensitivity for initial SC detection (midamble)	high speed/high sensitivity	–119 dBm/–119 dBm RSCP (meas.)
Sensitivity after successful BTS detection	high speed/high sensitivity	–120 dBm/–121 dBm (meas.)
TETRA characteristics		
TETRA bands supported		350 MHz to 4.4 GHz
Number of RF carrier frequencies	within a 10 MHz downlink band	max. 400
Channel resolution		25 kHz (QPSK)
Measurement speed		max. 8000 channels/s, 20/s for a 10 MHz block (meas.)
Sensitivity (RSSI)	RSSI measurements	–128 dBm (meas.)
	TETRA BSCH decoding (BSCH decoding for channels with SNR > 8 dB)	–123 dBm (meas.)
	BER measurements	–128 dBm (meas.)

Specifications of the R&S®TSME ultracompact drive test scanner		
WiMAX™ characteristics		
Frequency bands supported		no restrictions
Measurement speed	automatic detection of all 114 preamble indices	9 channels/s (meas.)
Preamble decoding accuracy	frame duration: 5 ms; FFT size: 1024; bandwidth: 10 MHz; 2.657 GHz	±1 dB (–20 dBm to –110 dBm) (meas.)
Sensitivity for initial preamble decoding (10 MHz bandwidth)	RSSI	–103 dBm (meas.)
Sensitivity after successful preamble decoding (10 MHz bandwidth)	RSSI	–129 dBm (meas.)
SINR dynamic range		–23 dB to +26 dB (meas.)
RF power scan		
Frequency range		350 MHz to 4.4 GHz
Frequency resolution		140 Hz to 1.438 MHz
Sensitivity	22.46 kHz (RMS) frequency resolution, at 900 MHz	–126 dBm (meas.)
	140 Hz resolution bandwidth, RMS, at 900 MHz	–145 dBm (meas.)
Scan speed	180 kHz resolution, 100 MHz span, 20 MHz bandwidth/FFT size: 128	135 Hz (meas.)
	11.23 kHz resolution, 10 MHz span, 10 MHz bandwidth/FFT size: 1024	800 Hz (meas.)
	140 Hz resolution, 1 MHz span, 1 MHz bandwidth/FFT size: 8192	70 Hz (meas.)
RSSI scan speed	20 MHz span, 20 MHz bandwidth/FFT size: 1024	99 GSM channels: max. 950 Hz (meas.) (94 050 channels/s)
	20 MHz span, 20 MHz bandwidth/FFT size: 256	4 WCDMA channels: max. 970 Hz (meas.) (38 800 channels/s)
	20 MHz span, 20 MHz bandwidth/FFT size: 256	1 LTE channel (100 RB): max. 975 Hz (meas.) (975 channels/s)
Max. number of frequency ranges		20
Detectors		max., min., RMS, auto
CW scanning		
Sensitivity channel power RSSI scan	200 kHz channel (GSM)	–119 dBm (meas.)
	5 MHz channel (UMTS)	–104 dBm (meas.)
	20 MHz channel (LTE)	–98 dBm (meas.)
Scan rate	200 kHz channel (GSM)	1900 Hz (190 000 channels/s) (meas.)
	5 MHz channel (UMTS)	12 995 Hz (51 980 channels/s) (meas.)
	20 MHz channel (LTE)	13 000 Hz (13 000 channels/s) (meas.)
Interfaces	LAN	Gigabit Ethernet
	GPS_{in}	SMA female
	RF_{in}	SMA female
GPS/GLONASS receiver		
Sensitivity	cold start	–148 dBm
	tracking	–162 dBm
Acquisition	cold start	26 s
	hot start	< 1 s
Channels		50
General data		
Environmental conditions		
Temperature range	operating	0 °C to +50 °C
	permissible	–10 °C to +55 °C
	storage	–40 °C to +70 °C
Damp heat		+25 °C/+55 °C, 95 % relative humidity, cyclic, in line with EN 60068-2-30

Specifications of the R&S®TSME ultracompact drive test scanner		
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.9 g RMS, in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E, method 516.4, procedure I
Power rating		
Supply voltage		10 V to 27 V DC
Power consumption during operation		typ. 13 W
Max. inrush current		2 A at 10 V
Product conformity		
Electromagnetic compatibility	EU	applied harmonized standards: EN 61326-1 (industrial environment), EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3, EN 50498, in line with EMC directive 2004/108/EC
	Korea	KC mark
Electrical safety	EU	EN 61010-1, in line with directive 2014/35/EU
	USA	UL 61010-1
	Canada	CAN/CSA-C22.2 No. 61010-1
International safety approvals	VDE – Association for Electrical, Electronic and Information Technologies	VDE-GS mark, certificate no. 40039189
	CSA – Canadian Standards Association	$_{c}$CSA$_{us}$ mark, certificate no. 70002782
Calibration interval		24 months
Dimensions	W × H × D	151 mm × 47 mm × 93 mm (5.95 in × 1.85 in × 3.66 in)
Weight		650 g (1.43 lb)

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Specifications of the R&S®TSME-Z3 backpack system		
Power rating	input voltage range	10 V to 18 V DC (0%/+ 10%)
	nominal input current	max. 8 A at 10 V (4 × R&S®TSME plus one mobile device)
Autonomy	1 × R&S®TSME with 2 batteries	8 h
	1 × R&S®TSME with 1 battery	4 h
	4 × R&S®TSME with 2 batteries	2 h
	time to fully charge one battery	4 h
User interface		on/off switch, LED interface (STATE and PWR), acoustic error alarm
Connectors	LAN uplink/downlink	RJ-45
	USB uplink	USB type B (female)
	USB downlink	6 × USB type A (female), min. 1 A
	DC IN	D-Sub power
	FAN OUT	2-pin Molex
	BAT IN	4-pin Kycon
	DC OUT	3-pin Kycon
Environmental conditions (R&S®TSME-Z3 with R&S®TSME and Anton Bauer Dionic HC battery)		
Temperature range	operating	+5 °C to +40 °C
	permissible	0 °C to +45 °C
	storage	–20 °C to +50 °C
Damp heat		+40 °C, 95 % relative humidity, cyclic, in line with EN 60068-2-30
Mechanical resistance (R&S®TSME-Z3 with R&S®TSME and Anton Bauer Dionic HC battery)		
Vibration	sinusoidal	in line with EN 60068-2-6
	random	in line with EN 60068-2-64
Shock		in line with MIL-STD-810E, method no. 516.4, procedure I
Product conformity (R&S®TSME-Z3 with R&S®TSME)		
Electromagnetic compatibility	EU	applied harmonized standards: EN 61326-1 (industrial environment) EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3, EN 50498, in line with EMC directive 2004/108/EC
Electrical safety	EU	EN 61010-1, in line with directive 2014/35/EU
Dimensions	W × H × D	370 mm × 500 mm × 185 mm (14.6 in × 19.7 in × 7.28 in)
Weight	complete system (R&S®TSME-Z3, two batteries, one R&S®TSME, RF antenna, GPS antenna)	8.4 kg (18.5 lb)
	one rechargeable battery (Anton Bauer Dionic HC)	0.8 kg (1.76 lb)
	R&S®TSME-Z3 backpack system	5.9 kg (13.0 lb)

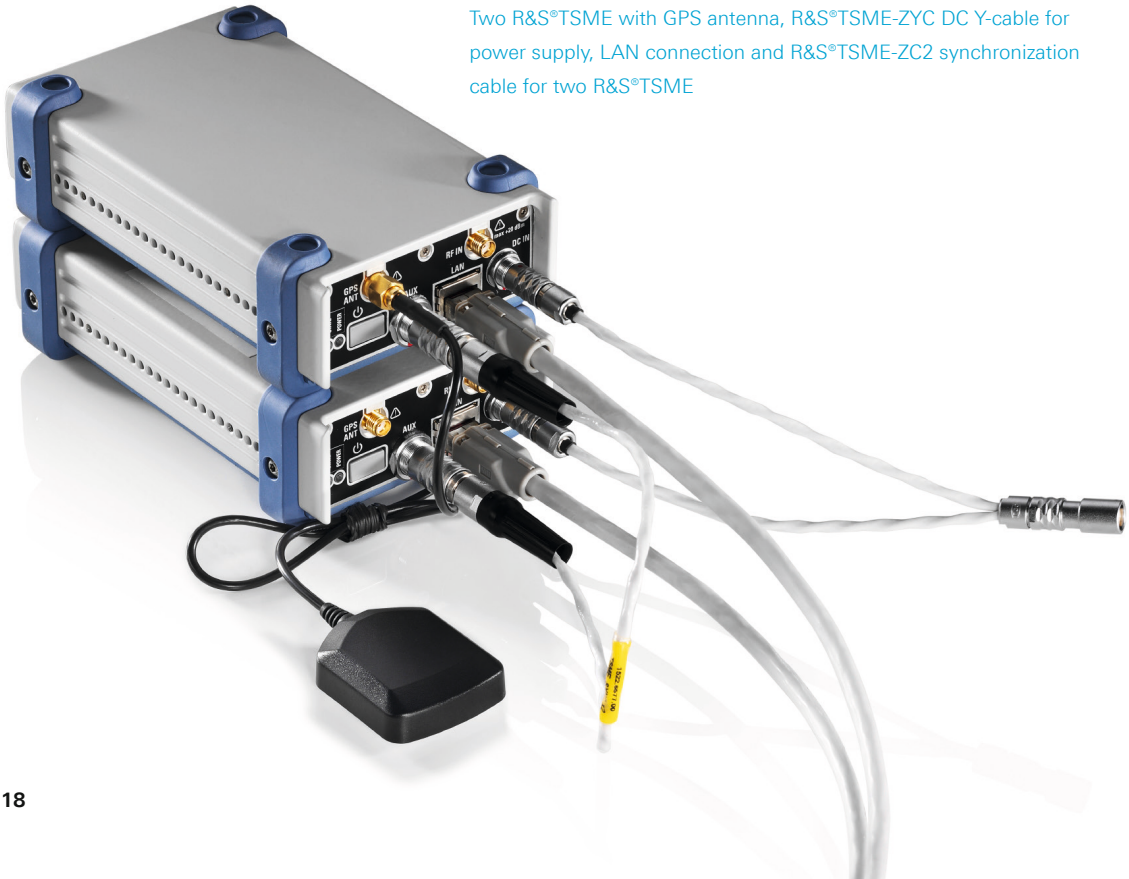
Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Ordering information

Designation	Type	Order No.
Base unit		
Ultracompact drive test scanner	R&S®TSME	1514.6520.02
Scope of delivery: R&S®TSME, LAN cable, GPS antenna, 12 V DC power supply cable (cigarette lighter cable), CD		
Options		
TD-SCDMA scanning	R&S®TSME-K20	1510.0079.02
WCDMA scanning	R&S®TSME-K21	1514.6820.02
CDMA2000® scanning	R&S®TSME-K22	1514.6836.02
GSM scanning	R&S®TSME-K23	1510.0085.02
1xEV-DO Rev. A scanning	R&S®TSME-K24	1510.0010.02
CW scanning	R&S®TSME-K25	1522.6954.02
TETRA scanning	R&S®TSME-K26	1514.6920.02
RF power scan	R&S®TSME-K27	1514.6813.02
WiMAX™ scanning	R&S®TSME-K28	1514.6842.02
LTE scanning	R&S®TSME-K29	1514.6859.02
LTE MIMO 2x2, 4x2, 4x4	R&S®TSME-K30	1514.6871.02
LTE DL allocation analyzer (up to Rel. 12)	R&S®TSME-K31	1522.6990.02
LTE eMBMS scanning	R&S®TSME-K32	1522.6960.02
LTE UL allocation analyzer (up to Rel. 12)	R&S®TSME-K33	4900.5112.02
NB-IoT/Cat NB1 scanning	R&S®TSME-K34	1522.6731.02
LTE-M scanning	R&S®TSME-K35	4900.7473.02
Automatic channel detection (ViCom only, not for R&S®ROMES4)	R&S®TSME-K40	1514.7232.02
Simultaneous measurement in all bands	R&S®TSME-KAB	1514.7384.02
Simultaneous measurement in 1 band	R&S®TSME-K1B	1514.7403.02
Simultaneous measurement in 2 bands	R&S®TSME-K2B	1514.7410.02
Simultaneous measurement in 3 bands	R&S®TSME-K3B	1514.7426.02
Simultaneous measurement in 4 bands	R&S®TSME-K4B	1514.7432.02
Simultaneous measurement in 5 bands	R&S®TSME-K5B	1514.7449.02
Upgrade by one additional band (in field)	R&S®TSME-KUB	1514.7390.02
External accessories		
Power supply	R&S®TSME-Z1	1514.7310.00
19" rack adapter, for one or two R&S®TSME	R&S®TSME-Z2	1522.6502.02
Mounting kit, for R&S®TSME	R&S®TSME-Z4	1522.6590.02
R&S®TSME DC Y-cable	R&S®TSME-ZYC	1514.7290.02
R&S®TSME 4 x DC Y-cable (for R&S®TSMW-Z1 AC power supply only)	R&S®TSME-ZYC4	1522.6825.02
R&S®TSMW-Z1 AC power supply (for R&S®TSME-ZYC4 only)	R&S®TSMW-Z1	1503.4608.02
Synchronization cable for two R&S®TSME	R&S®TSME-ZC2	1522.6560.02
Synchronization cable for up to four R&S®TSME and mounting material for four R&S®TSME	R&S®TSME-ZC4	1522.6831.02
USB 3.0 to LAN adapter	R&S®TSPC-U2L	3593.8430.02
5-port USB or AC powered LAN switch	R&S®TSPC-LS	3624.8364.02
Carrier box, for R&S®TSME	R&S®TSME-Z5	1514.6942.02
Additional software		
Drive test software	R&S®ROMES4	1117.6885.04
R&S®TSME driver, for R&S®ROMES4 drive test software	R&S®ROMES4T1E	1117.6885.82
R&S®ROMES4 option, base station position estimation	R&S®ROMES4LOC	1117.6885.32
R&S®ROMES4 driver, automatic channel detection	R&S®ROMES4ACD	1506.9869.02
ViCom R&S®TSMx scanner interface/API	R&S®VICOM	4900.7309.02

Designation	Type	Order No.
Backpack system		
Backpack system	R&S®TSME-Z3	1514.6936.02
Lithium-ion rechargeable battery, 91 Wh, 14.4 V, 138.8 mm × 103.1 mm × 59.4 mm (5.46 in × 4.06 in × 2.34 in)	Anton Bauer Dionic HC (Product Code 86750074)	Not included, must be purchased locally.
Twin battery charger for Anton Bauer Dionic HC rechargeable battery	R&S®TSME-Z3BC2	1519.0920.02
Mounting kit, for two R&S®TSME	R&S®TSME-Z3T2	1519.1003.02
Mounting kit, for one mobile device	R&S®TSME-Z3M1	1519.1010.02
Intel NUC i5 system PC	R&S®TSPC-NUC	3590.8374.02
R&S®TSPC-NUC PC mounting kit for R&S®TSME-Z3	R&S®TSME-Z3N1	1519.1032.02
Antennas		
Antenna mount, magnetic	R&S®TSME-ZA1	1506.9817.02
Antenna mount, fixed	R&S®TSME-ZA2	1506.9823.02
Antenna mount, fixed, with integrated GPS antenna	R&S®TSME-ZA4	1506.9846.02
Antenna emitter, 406 MHz to 440 MHz	R&S®TSMW-ZE2	1117.8165.00
Antenna emitter, 380 MHz to 430 MHz	R&S®TSMW-ZE7	1519.5709.02
Antenna emitter, 698 MHz to 2700 MHz	R&S®TSMW-ZE8	1506.9852.02
Antenna emitter, 430 MHz to 470 MHz	R&S®TSMW-ZE9	1519.5709.03
Dipole paddle multiband antenna for backpack, 698 MHz to 2700 MHz	R&S®TSME-Z7	3591.2870.02
Ultrawideband antenna, 350 MHz to 6000 MHz	R&S®TSME-Z9	3590.8039.02
Single-port ultrawideband antenna, 698 MHz to 6000 MHz	R&S®TSME-Z10	4900.1917.02
Three-port antenna, 698 MHz to 2690 MHz (MIMO) + GPS	R&S®TSME-Z11	4900.1923.02
Two-port MIMO reference antenna, 698 MHz to 2700 MHz	R&S®TSME-Z12	4900.1930.02
Three-port MIMO antenna, 698 MHz to 3800 MHz (MIMO) + GPS/GNSS for drive testing	R&S®TSME-Z13	4900.1946.02
Four-port MIMO antenna, 698 MHz to 3500 MHz (MIMO 2x2) + 5150 MHz to 5850 MHz (MIMO 2x2) for drive testing	R&S®TSME-Z14	4900.1952.02
Single-port ultrawideband, antenna 698 MHz to 3800 MHz with magnetic mount	R&S®TSME-Z15	3652.7281.02



Two R&S®TSME with GPS antenna, R&S®TSME-ZYC DC Y-cable for power supply, LAN connection and R&S®TSME-ZC2 synchronization cable for two R&S®TSME

Warranty		
Base unit		3 years
All other items [1]		1 year
Options		
Extended warranty, one year	R&S®WE1	Please contact your local Rohde&Schwarz sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	

[1] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

Your local Rohde&Schwarz expert will help you determine the optimum solution for your requirements.
To find your nearest Rohde&Schwarz representative, visit www.sales.rohde-schwarz.com