

# R&S®TSME30DC, R&S®TSME44DC ULTRACOMPACT DOWNCONVERTERS

R&S®TSMx6 upgrade for  
5G NR mmWave measurements



Product Brochure  
Version 04.00

**ROHDE & SCHWARZ**

Make ideas real



# AT A GLANCE

The R&S®TSME30DC and R&S®TSME44DC are designed to easily upgrade the R&S®TSMx6 scanners to measure 5G NR signals in the mmWave frequency range. They perfectly extend the latest generation mobile network scanner family and provide all features for easy drive and walk testing. They are fully controlled by the R&S®TSMx6 and the corresponding software layers, which allows seamless, unattended operation.

With their broadband downconversion frequency ranges, the downconverters cover a huge part of the new mmWave frequency bands allocated for 5G NR networks. These new frequency bands show completely different behavior in terms of propagation and phase noise, which puts demanding requirements on measurement tools' hardware. Using mmWave frequencies necessitates beamforming for sufficient propagation.

To provide best sensitivity, image frequency rejection and lowest phase noise, the R&S®TSME30DC and R&S®TSME44DC adjust internal parameters such as the intermediate frequency (IF) and the local oscillator (LO) to the measurement task. This takes place in the background and is unnoticeable by the user. It ensures that every single parameter is optimized for best system performance. The R&S®TSME30DC and R&S®TSME44DC are also future-proof. Both support up to five scanners for future 5G NR measurements tasks and ultra high performance measurement modes.



Typical setup for walk testing with a tablet controlling the R&S®TSMx6 autonomous mobile network scanner with battery pack and an R&S®TSME30DC or R&S®TSME44DC ultracompact downconverter on top

### Key facts

- ▶ Ultra broadband RF frequency range for downconversion
  - R&S®TSME30DC: 24 GHz to 30 GHz
  - R&S®TSME44DC: 24 GHz to 44 GHz
- ▶ Fully controlled by R&S®TSMx6 scanners to simplify operation and maximize performance
- ▶ Simultaneous mmWave and sub 6 GHz measurements with a single scanner
- ▶ Customized mechanical concept, fully compatible with the latest R&S®TSMx6 network scanner generation
- ▶ Future-proof concept (supports up to five scanners)
- ▶ Low power consumption

# BENEFITS

### Fully controlled by the latest network scanner generation

- ▶ [page 4](#)

### Self-optimization in the background

- ▶ [page 5](#)

### Simplifies multiple technology measurements

- ▶ [page 6](#)

### Mechanically compatible with click-in system

- ▶ [page 8](#)

### Future-proof hardware concept

- ▶ Ready for future measurement tasks by supporting up to five network scanners
- ▶ New 5G NR measurement features via software updates
- ▶ [page 7](#)

### Optimized for backpack operation and walk testing

- ▶ Low power consumption, small form factor, low weight
- ▶ Large portfolio of accessories for easy operation
- ▶ [page 9](#)



# FULLY CONTROLLED BY THE LATEST NETWORK SCANNER GENERATION

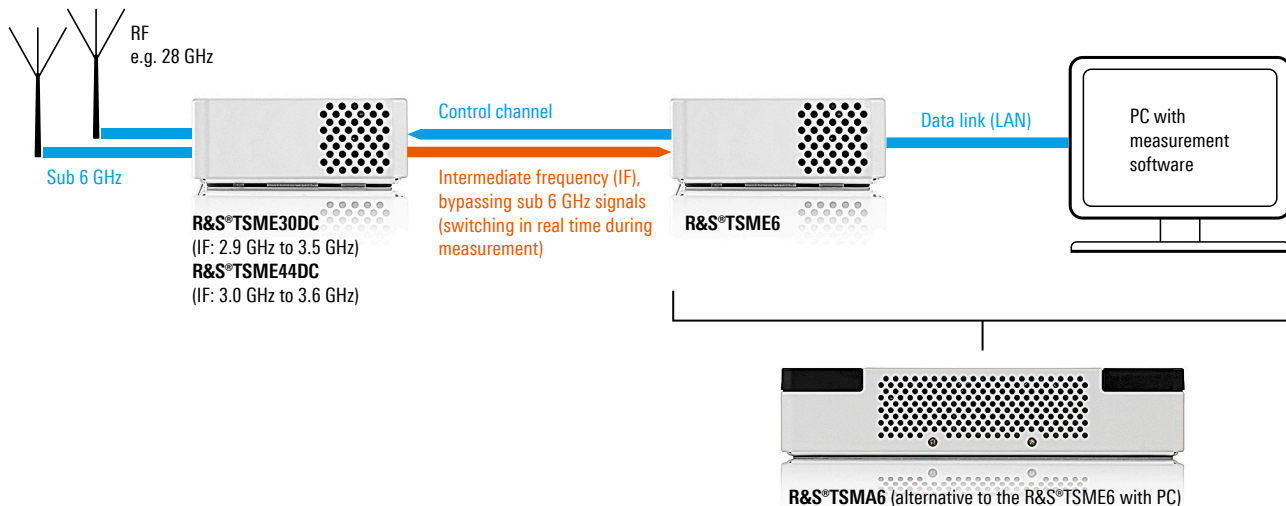
The R&S®TSME30DC and R&S®TSME44DC enable the latest network scanner generation (R&S®TSME6, R&S®TSMA6) to measure in the mmWave frequency bands. Each mmWave frequency (e.g. RF = 28 GHz) is downconverted to an intermediate frequency that can be natively measured by the latest scanner generation (R&S®TSME30DC: IF = 2.9 GHz to 3.5 GHz, R&S®TSME44DC: IF = 3.0 GHz to 3.6 GHz).

Measurement campaigns are typically very expensive. Saving money means significantly reducing the setup time and spending more time on the main task of collecting measurement data. It is therefore very important to streamline the instrument setup by eliminating as many user inputs as possible to achieve the best system performance. All internal RF parameters are automatically set based on the frequency configured in the measurement software.

## Downconverter building blocks

Mixer	Local oscillator
Filters	LNAs
Controller/interface	

## Setup 1: Downconverter cabling for standard performance measurements



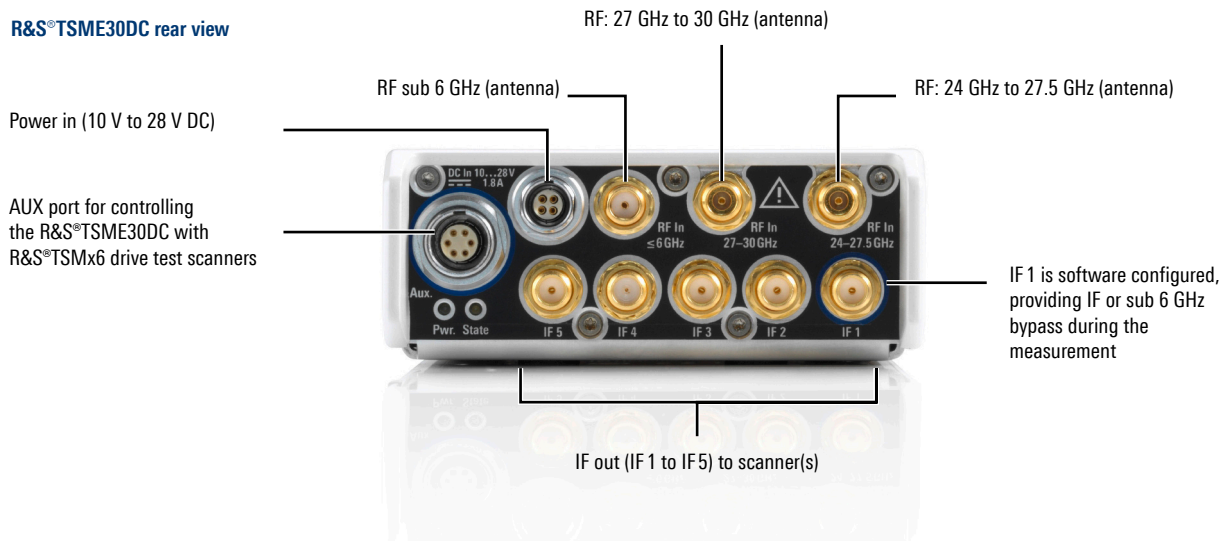
# SELF-OPTIMIZATION IN THE BACKGROUND

Downconversion sounds simple, but it is actually a complex process that involves a lot of trade-offs and hardware components. Each downconverter requires a high-precision local oscillator that has to be set according to the measured frequency to ensure best sensitivity and lowest phase noise in the entire measurement system. The objective is a downconverted, distortion-free signal that does not influence the measurement results. Downconversion unavoidably leads to image frequencies that have to be filtered out to prevent collisions in the frequency domain. The downconverter optimizes all internal parameters for the configured measurement task and the connected scanners' RF parameters for best system performance in all supported frequency bands.

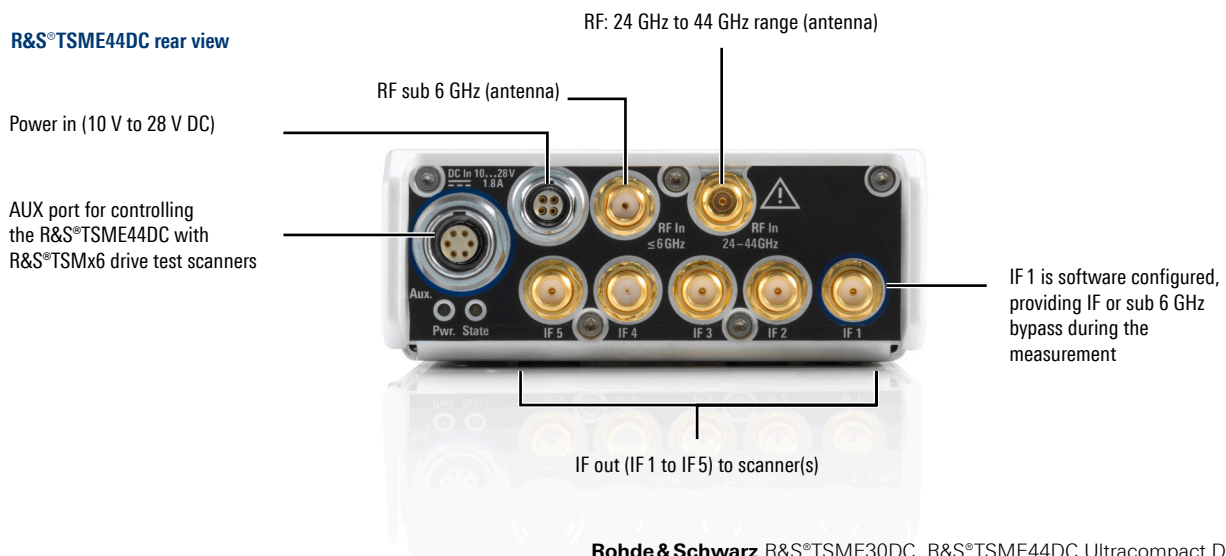
In general, bandwidth affects the degree of freedom for RF performance optimization. The supported frequency range is one of the main differences between the downconverters. The R&S®TSME30DC supports 24 GHz to 30 GHz and focuses on the best achievable performance across a 6 GHz bandwidth, while the R&S®TSME44DC focuses on reaching a maximum bandwidth of 20 MHz. A comparison of both products can be found in the specifications on page 10.

## Downconverter interfaces

### R&S®TSME30DC rear view



### R&S®TSME44DC rear view

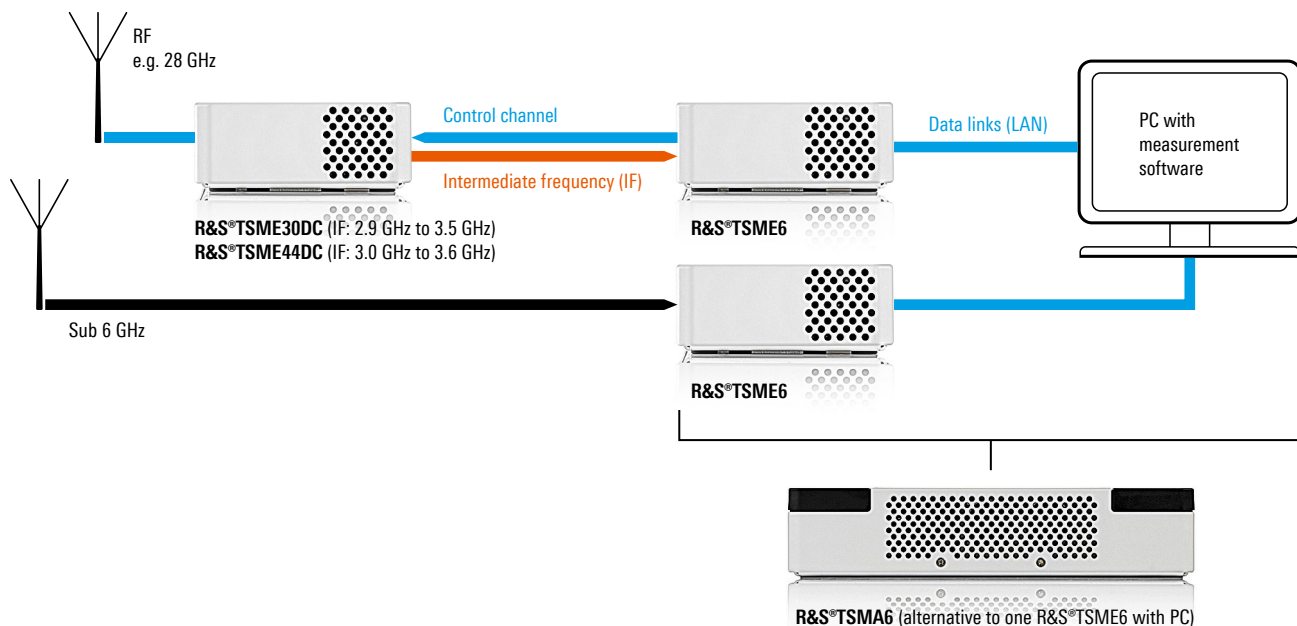


# SIMPLIFIES MULTIPLE TECHNOLOGY MEASUREMENTS

Rohde & Schwarz network scanners are designed for measuring all major 3GPP technologies. 5G NR will initially be deployed in the non-standalone mode, which requires an LTE carrier as an anchor for the control channel and 5G NR carriers for major data transmission. The standard measurement setup (setup 1 on page 4) includes one downconverter and one R&S®TSME6. One network scanner can be used for simultaneous 5G NR mmWave and LTE/sub 6 GHz standard performance measurements. An alternative setup would be to use two network scanners for high-speed 5G NR and LTE/sub 6 GHz measurements (setup 2).

The user has maximum degree of freedom to use less hardware for standard performance (setup 1) or invest in more hardware for high speed (setup 2). In both cases, the setup is fully software-controlled. Operating the setup becomes very simple since the software can configure one IF port (IF 1) of the downconverter to bypass the sub 6 GHz signal (350 MHz to 6 GHz) coming directly from the antenna or to provide the downconverted IF signal. The switch between bypassing sub 6 GHz and IF signals can be performed in real time during the measurement for maximum measurement setup flexibility (setup 1).

## Setup 2: Multiple technology measurements in high-speed mode





# FUTURE-PROOF HARDWARE CONCEPT

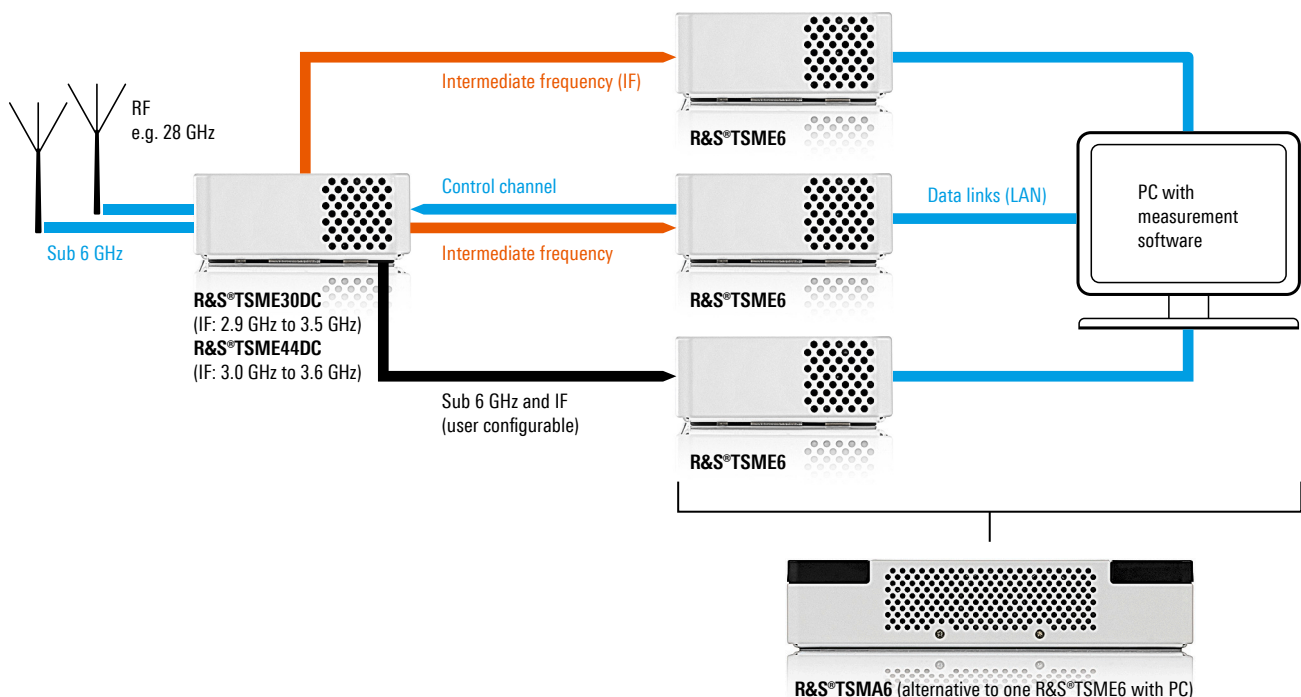
## Ready for future measurement tasks by supporting up to five network scanners

Every investment in measurement tools is a long-term investment. It is expected that future features for 5G NR mmWave measurements will be added via a simple software upgrade since changing the hardware is cost-intensive. That is why both downconverters are equipped with five IF ports to support the connection of up to five network scanners, each measuring in its individual 20 MHz band within the 600 MHz IF range (software controlled). A standard setup (setup 1) consists of one downconverter and one R&S®TSMx6 network scanner. For broadband 5G NR carriers, additional scanners can be used for high-performance measurements with increased system speed and dynamic range (setup 3). Other future use cases for multiple 5G NR scanner measurements include advanced demodulation and channel detection tasks.

## New 5G NR measurement features via software updates

Rohde&Schwarz network scanners are in-field software upgradeable. The R&S®TSMx6 5G NR measurements will be extended by adding different features with every new release. New features are enabled via a simple software upgrade on the R&S®TSMx6, R&S®TSME30DC and R&S®TSME44DC.

## Setup 3: Multiple measurements with up to five network scanners for increased dynamic range



# MECHANICALLY COMPATIBLE WITH CLICK-IN SYSTEM

R&S®TSMA6, R&S®TSME6, R&S®TSME30DC, R&S®TSME44DC and R&S®TSMA6-BP are also mechanically compatible. All these devices feature the click-in system to create a vibration-safe stack. This makes it possible to quickly arrange different measurement setups based on the measurement task.



Two R&S®TSME6 with R&S®TSMA6-BP battery pack and a downconverter on top



# OPTIMIZED FOR BACKPACK OPERATION AND WALK TESTING

## Low power consumption, small form factor, low weight

5G NR using mmWave spectrum will mainly be deployed for small cell applications. It is expected that cell sizes will range from 20 m to 200 m with highly directive antennas. Consequently, 5G NR mmWave measurements will mainly be performed during walk tests.

During walk test campaigns, the handling of the T&M equipment directly affects the time needed for the campaigns. Hardware with a small form factor and low weight is mandatory for efficient walk testing.

Walk test equipment typically runs on a battery, making low power consumption imperative for the entire measurement system, even including the extra hardware for mmWave measurements. Recharging interrupts the measurement campaign and significantly increases the costs. The combination of the R&S®TSME6 and a downconverter is optimized for maximum performance and low power consumption of approx. 16 W in total.

## Large portfolio of accessories for easy operation

All advantages of low weight, small form factor and low power consumption are used efficiently during backpack operation. The large portfolio of accessories includes a backpack solution that accommodates all types of measurement setups (standard and high performance), including the required cables, antennas and batteries. The location of the mmWave antenna is critical during walk testing. Near-field objects significantly affect the measurement result. Therefore, the backpack solution includes a special antenna holder to carry the antenna above the head of the person using the backpack.



Rear view of the setup above with interfaces. The battery pack can be used as a rechargeable power source for the two R&S®TSME6 devices and one downconverter.

# SPECIFICATIONS

## R&S®TSME30DC, R&S®TSME44DC ultracompact downconverters

### RF characteristics

Frequency range downconverter	input 1	
	R&S®TSME30DC	24 GHz to 27.5 GHz
	R&S®TSME44DC	24 GHz to 44 GHz
	input 2 (R&S®TSME30DC only)	27 GHz to 30 GHz
Frequency range RF bypass input		350 MHz to 6 GHz
IF (downconverted spectrum frequency range)	R&S®TSME30DC	2.9 GHz to 3.5 GHz
	R&S®TSME44DC	3.0 GHz to 3.6 GHz
Level measurement uncertainty	outputs IF 1 to IF3	±1.5 dB
	outputs IF 4 and IF5	-2 dB to +1 dB
Bandwidth		600 MHz
Maximum operating measurement range input level	R&S®TSME30DC	-10 dBm (nom.)
	R&S®TSME44DC	-15 dBm (nom.)
Maximum safe permissible input level		0 dBm/0 V (DC)
Image rejection	R&S®TSME30DC	> 50 dBc (meas.)
	R&S®TSME44DC	> 40 dBc (meas.)
Spurious responses at -30 dBm input level	R&S®TSME30DC	< -45 dBc (meas.)
	R&S®TSME44DC	< -25 dBc (meas.)
Third order intercept (TOI)	R&S®TSME30DC	> 0 dBm
	R&S®TSME44DC	> -3 dBm (meas.)
Second order intercept (SOI)	R&S®TSME30DC	> 70 dBm (meas.)
	R&S®TSME44DC	> 0 dBm (meas.)
Noise figure	R&S®TSME30DC	6 dB
	R&S®TSME44DC	7 dB
VSWR	input 1	
	R&S®TSME30DC (24 GHz to 27.5 GHz)	< 2.4 (meas.)
	R&S®TSME44DC (24 GHz to 27 GHz)	< 2.4 (meas.)
	R&S®TSME44DC (27 GHz to 44 GHz)	< 1.6 (meas.)
	input 2 (R&S®TSME30DC only)	
	27 GHz to 30 GHz	< 2.0 (meas.)
Switching time between frequencies		real-time during measurement
<b>Connectors</b>		
RF mmWave inputs	R&S®TSME30DC	2 × K connectors, 50 Ω
	R&S®TSME44DC	1 × K connector, 50 Ω
RF bypass input		1 × SMA connector, 50 Ω
IF outputs	IF 1 to IF5	5 × SMA connectors, 50 Ω
AUX control interface		6-pin Lemo connector
DC In		4-pin Lemo connector
<b>General data</b>		
Environmental conditions		
Temperature range	operating	0°C to +50°C
	storage	-40°C to +70°C
Damp heat		+25°C/+55°C, 95% relative humidity, cyclic, in line with EN 60068-2-30
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), 300 Hz to 500 Hz, acceleration 1.2 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

## R&S®TSME30DC, R&S®TSME44DC ultracompact downconverters

Power rating		
Supply voltage	DC-In	10 V to 28 V DC
Power consumption during operation	R&S®TSME30DC	5 W (typ.)
	R&S®TSME44DC	6 W (typ.)
Maximum inrush current	at 10 V	1.5 A
Product conformity		
Electromagnetic compatibility	EU: in line with Radio Equipment Directive 2014/53/EU	applied harmonized standards: ETSI EN301489-1, ETSI EN301489-17, ETSI EN301489-19, ETSI EN300328, ETSI EN301893, ETSI EN303413, EN55032, EN300339, EN50498
	Korea	KC mark
Electrical safety	EU: in line with Low Voltage Directive 2014/35/EU	EN61010-1, EN61326-1
Restriction of the use of hazardous substances	EU: in line with 2011/65/EU (RoHS)	applied harmonized standard: EN50581
Calibration interval		24 months
Dimensions	W × H × D	154 mm × 34 mm × 85 mm (6.06 in × 1.34 in × 3.35 in)
Weight	R&S®TSME30DC	approx. 540 g (1.19 lb)
	R&S®TSME44DC	approx. 550 g (1.21 lb)

## R&S®TSME-Z1 AC power supply

Power rating		
Input voltage		100 V to 240 V AC ± 10%
Input frequency		47 Hz to 63 Hz
Input current	230 V to 100 V AC	0.4 A to 0.8 A
Efficiency		CEC V
Output voltage		12 V DC
Output current		2.5 A
Standard output cable length		180 cm (5.9 ft)
Temperature range	operating	0°C to +60°C
	derating	derated linearly from 40°C at 100% load to 60°C at 60% load
Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2014/30/EU	applied harmonized standards: EN61204-3 (class A), EN61000-3-2, EN61000-3-3
	international	CISPR/FCC (class A)
Electrical safety	EU: in line with Low Voltage Directive 2014/35/EU	applied harmonized standard: EN60950-1
	international	IEC 60950-1, UL 60950-1, PSE J60950-1
Restriction of the use of hazardous substances	EU: in line with 2011/65/EU (RoHS)	applied harmonized standard: EN50581
Dimensions and weight		
Dimensions	W × H × D	57.6 mm × 33.5 mm × 107.7 mm (2.27 in × 1.32 in × 4.23 in)
Weight		400 g (0.88 lb)

**R&S®TSMA6-Z1 AC power supply (with R&S®TSMA6-Z174 adapter cable)**

Power rating		
Input voltage	at +25°C (1.6 A charge/1.6 A discharge)	100 V to 240 V AC ± 10%
Input frequency		50/60 Hz ± 5%
Input current	230 V to 115 V AC	0.7 A to 1.4 A
Efficiency		CEC VI
Output voltage		15 V DC
Output current		7.0 A
Standard output cable length		120 cm (3.9 ft)
Temperature range	operating	-10°C to +70°C
	derating 230 V AC	derated linearly from +45°C at 100% load to +70°C at 50% load
	derating 110 V AC	derated linearly from +40°C at 100% load to +60°C at 50% load
Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2014/30/EU	applied harmonized standards: EN 55032 (Class B), EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11
	international	CISPR 32
Electrical safety	EU: in line with Low Voltage Directive 2014/53/EU	applied harmonized standard: EN 60950
	international	IEC 60950, CCC GB4943.1, PSE J60950-1, KC K60950-1
Restriction of the use of hazardous substances	EU: in line with 2011/65/EU (RoHS)	applied harmonized standard: EN 50581
Dimensions and weight		
Dimensions	W × H × D	67 mm × 35 mm × 167 mm (2.64 in × 1.38 in × 6.57 in)
Weight		583 g (1.29 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.
<b>Base unit (includes accessories such as power cable, manual)</b>		
Ultracompact downconverter, 24 GHz to 30 GHz	R&S®TSME30DC	4901.1004.02
Ultracompact downconverter, 24 GHz to 44 GHz	R&S®TSME44DC	4901.2600.02
Scope of delivery: R&S®TSMExxDC, synchronization cable for two devices, 4 matching resistors, 5 SMA cables for IF transmission (from down-converter to scanner), power splitter cable to power the R&S®TSMExDC from an R&S®TSME-Z1 power supply, tools for cabling the downconverter		
<b>Compatible scanner hardware and battery pack</b>		
Ultracompact drive test scanner	R&S®TSME6	4900.0004.02
Autonomous mobile network scanner	R&S®TSMA6	4900.8005.02
Battery pack for R&S®TSMA6	R&S®TSMA6-BP	4900.9001.02
<b>Hardware and software options (for compatible R&amp;S®TSMx6 scanner hardware)</b>		
5G NR scanning for R&S®TSME6	R&S®TSME6-K50	4900.2436.02
5G NR scanning for R&S®TSMA6	R&S®TSMA6-K50	4901.0966.02
Simultaneous measurement in all bands	R&S®TSME6-KAB	4900.2107.02
Simultaneous measurement in all bands	R&S®TSMA6-KAB	4901.0708.02
RF power scan for R&S®TSME6	R&S®TSME6-K27	4900.2120.02
RF power scan for R&S®TSMA6	R&S®TSMA6-K27	4901.0720.02
CW scanning for R&S®TSME6	R&S®TSME6-K25	4900.2242.02
CW scanning for R&S®TSMA6	R&S®TSMA6-K25	4901.0814.02
Downconverter hardware driver for R&S®ROMES4	R&S®ROMES4T30D	4900.5293.02
Drive test software	R&S®ROMES4	1117.6885.04
ViCom interface/API for R&S®TSMx scanner	R&S®VICOM	4900.7309.02
<b>External accessories</b>		
Omnidirectional mmWave antenna (26 GHz to 40 GHz)	R&S®TSME-Z20	3636.7151.02
AC power supply	R&S®TSME-Z1	1514.7310.00
AC power supply	R&S®TSMA6-Z1	4901.0550.02
Adapter cable, for connection of R&S®TSMA6-Z1 with R&S®TSMExxDC	R&S®TSMA6-Z174	4901.0120.02
Synchronization cable for up to four devices (R&S®TSMx6 and R&S®TSMExxDC)	R&S®TSME6-ZC4	4900.1817.02
Synchronization cable for five scanners and one downconverter	R&S®TSME6-ZC6	4900.1830.02
Power cable for R&S®TSMA6 battery pack	R&S®TSMA6-BPPT	4900.1730.02
R&S®TSME6/TSMExxDC dual power cable for R&S®TSMA6 battery pack	R&S®TSMA6-BP2T	4901.0566.02
K cable (K male to K male)	R&S®TSME-ZKC	3640.5350.02
Port saver, 2.92 mm (K female to K male)	R&S®TDC292JACK	3637.8397.02
19" rack adapter, for four R&S®TSME6/TSMExxDC	R&S®TSME6-Z2	4900.1030.02
Mounting kit	R&S®TSME6-Z4	4900.1100.02
Carrying box	R&S®TSME6-Z5	4900.1875.02
R&S®FR4 Freerider 4 backpack system (contact your local Rohde & Schwarz sales office for backpack configuration)	R&S®FR4-CORE	1900.6403.10

<b>Warranty</b>		
Base unit		3 years
All other items <sup>1)</sup>		1 year
<b>Options</b>		
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	

<sup>1)</sup> 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.rohde-schwarz.com](http://www.rohde-schwarz.com)

## Service that adds value

- ▶ Worldwide
- ▶ Local und personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

## Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

## Mobile network testing

The company's broad and diverse product portfolio for mobile network testing addresses every test scenario in the network lifecycle – from base station installation to network acceptance and network benchmarking, from optimization and troubleshooting to interference hunting and spectrum analysis, from IP application awareness to QoS and QoE of voice, data, video and app based services.

[www.rohde-schwarz.com/mnt](http://www.rohde-schwarz.com/mnt)

## Rohde & Schwarz customer support

[www.rohde-schwarz.com/support](http://www.rohde-schwarz.com/support)

