R&S®TSME6
Ultracompact Drive Test Scanner
User Manual

4900003302
Version 08

ROHDE & SCHWARZ

Make ideas real

This manual applies to the following R&S®TSME6 models and options:

- R&S®TSME6 (4900.0004.02)
- Block I/Q data R&S®TSME6-K10 (4900.2459.02)
- P25 scanning R&S®TSME6-K19 (4900.2720.02)
- WCDMA scanning R&S®TSME6-K21 (4900.2188.02)
- CDMA2000® scanning R&S®TSME6-K22 (4900.2165.02)
- GSM scanning R&S®TSME6-K23 (4900.2194.02)
- 1xEV-DO Rev. A scanning R&S®TSME6-K24 (4900.2142.02)
- CW scanning R&S®TSME6-K25 (4900.2242.02)
- TETRA scanning R&S®TSME6-K26 (4900.2142.02)
- RF power scan R&S®TSME6-K27 (4900.2120.02)
- WiMAX™ scanning R&S®TSME6-K28 (4900.2136.02)
- LTE scanning R&S®TSME6-K29 (4900.2171.02)
- LTE 2x2, 4x2, 4x4 MIMO®TSME6-K30 (4900.2113.02)
- LTE eMBMS scanning R&S®TSME6-K32 (4900.2288.02)
- NB-IoT/Cat NB1 scanning R&S®TSME6-K34 (4900.2207.02)
- LTE-M scanning R&S®TSME6-K35 (4900.2465.02)
- C-V2X LTE scanning R&S®TSME6-K36 (4900.2707.02)
- Automatic Channel Detection R&S®TSME6-K40 (4900.2259.02)
- 5G NR scanning R&S®TSME6-K50 (4900.2436.02)
- 5G NR scanning add-on R&S®TSME6-K51 (4900.2488.02)
- BTS PE Enabler R&S®TSME6-K80 (4900.2442.02)

Contents

1 Safety and regulatory information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the following chapters.

Intended use

The R&S TSME6 is intended for efficient drive and walk tests with a maximum degree of freedom and upgradeability. With the ultracompact design and multiband and multi-technology support for simultaneous measurements, the scanner fulfills all requirements for a state-of-the-art measurement tool.

Where do I find safety information?

Safety information is part of the product documentation. It warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

● In Chapter 1.1, "Safety instructions", on page 7. The same information is provided in many languages in printed format. The printed "Safety Instructions" for "DC-Powered Products for Mobile Use" (document number 1171.2049.99) are delivered with the product.

● Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Safety instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the specifications document, manuals and the printed "Safety Instructions" document. If you are unsure about the appropriate use, contact Rohde & Schwarz customer support.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

Reconfigure or adjust the product only as described in the product documentation or the specifications document. Any other modifications can affect safety and are not permitted.

Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. If any part of the product is damaged or broken, stop using the product. Contact Rohde & Schwarz customer support at https://www.rohde-schwarz.com/support.

Connecting the product

Before connecting the interfaces and measuring inputs of the product to other products or electrical circuits, make sure that the other products or electrical circuits provide special protection against electric shock. This protection principle is referred to as SELV (safety extra-low voltage) and is based on a low voltage level and increased insulation. Exceptions are indicated by a measurement category on the product and given in the specifications document.

Operating the product

The product is intended for mobile use. The maximum weight of the product is provided in the specifications document. If the product casing is not waterproof, use an adequate weather protection to carry the product outdoors with you.

When operating the product on a mobile platform, such as a vehicle, aircraft or drone, make sure that the product is properly secured. Refer to the instructions provided by the manufacturer of the mobile platform. If stacking is possible, secure the whole stack of products so that they cannot fall over and cause injury.

Observe the ambient conditions such as altitude, operating temperature and climatic loads; see the specifications document.

Due to their exposed location, mobile communications systems are at risk of damage from lightning. This also poses a risk to persons nearby. When the risk of lightning is present, remove antennas from exposed locations, e.g. vehicle roofs. Do not operate the product until the lightning risk has passed.

Connecting to power

The product runs on DC voltage. For the specifications of the supply voltage for the product, refer to the specifications document. Only connect the product to a power source that provides a protection against electric shock.

Take the following measures for your safety:

* If you connect the product to an external power supply, use one recommended in the product documentation.
* If you connect the product to a battery, observe the safety information delivered with the battery.
* Before switching on the product, ensure that the voltage and polarity indicated on the product matches the available power source.
* Only use intact cables and route them carefully so that they cannot be damaged. Also ensure that nobody can trip over loose cables.

Meaning of safety labels

Safety labels on the product warn against potential hazards.

⚠	Potential hazard
	Read the product documentation to avoid personal injury or product damage.

	DC - direct current
⚍	Connect to a DC power supply of the specified voltage range.

1.2　Labels on the product

Labels on the casing inform about:

- Personal safety, see "Meaning of safety labels" on page 8
- Product and environment safety, see Table 1-1
- Identification of the product, see bottom label of the R&S TSME6.

Table 1-1: Labels regarding product and environment safety

	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. For more information, see "Disposing of electrical and electronic equipment" on page 73.

1.3　Warning messages in the documentation

A warning message points out a risk or danger that you need to be aware of. The signal word indicates the severity of the safety hazard and how likely it will occur if you do not follow the safety precautions.

CAUTION

Potentially hazardous situation. Could result in minor or moderate injury if not avoided.

NOTICE

Potential risks of damage. Could result in damage to the supported product or to other property.

1.4　Korea certification class B

이 기기는 가정용(B급) 전자파 적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

2 Welcome

2.1 Documentation overview

This section provides an overview of the R&S TSME6 user documentation. Unless specified otherwise, you find the documents at:

www.rohde-schwarz.com/manual/tsmx

2.1.1 Getting started manual

Introduces the R&S TSME6 and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc. A printed version is delivered with the instrument.

2.1.2 User manuals and help

The user manual contains the description of all instrument modes and functions. It also provides information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.

The user manual is also available for download or for immediate display on the Internet.

2.1.3 Videos

Find various videos on Rohde & Schwarz products and test and measurement topics on YouTube: https://www.youtube.com/@RohdeundSchwarz

2.1.4 Printed safety instructions

Provides safety information in many languages. The printed document is delivered with the product.

2.1.5 Product brochures

The brochure provides an overview of the instrument and deals with the specific characteristics and contains the technical specifications of the R&S TSME6. It also lists the firmware applications and their order numbers, and optional accessories.

See www.rohde-schwarz.com/brochure-datasheet/tsmx

2.1.6 Open source acknowledgment (OSA)

The R&S TSME Device Manager is part of the R&S TSME Tools and uses several valuable open source software packages. An open source acknowledgment document provides verbatim license texts of the used open source software.

After the installation of the R&S TSME Tools, the OSA is available in the directory `C:\Program Files\Rohde-Schwarz\TSME Tools\doc`.

2.1.7 Application notes, application cards, white papers, etc.

These documents deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/tsmx

2.2 Key features

The R&S TSME6 sets standards in RF performance and usability. Outstanding key features are:

- Support of frequency range 350 MHz to 6.0 GHz, integrated multi GNSS
- Support of the following technologies: GSM, WCDMA, CDMA2000, EVDO, WiMAX, LTE FDD/TDD, TETRA, P25, RF power scan, CW, NB-IoT/Cat NB1, C-V2X LTE, LTE-M, 5G NR (incl. RedCap, FrMCS)
- Scan of all technologies in all bands at the same time at highest rates including SIB/Layer 3 demodulation
- Easy software upgrade for new features or technologies and backward compatibility to R&S TSME
- Compact and lightweight design with customized mechanical concept for cascading
- Low power consumption
- Support of LTE 2x2 MIMO and 4x4 MIMO
- Network synchronization measurements in 5G NR
- Support of 5G NR millimeterwave measurements with additional downconverter R&S TSME30DC / 44DC and R&S TSMS53DC (17 GHz to 53 GHz)

For a detailed specification, refer to the specifications document.

3 Getting started

3.1 Preparing for use

Here, you can find basic information about setting up the product for the first time.

3.1.1 Unpacking and checking

1. Unpack the product carefully.

2. Retain the original packing material. Use it when transporting or shipping the product later.

3. Using the delivery notes, check the equipment for completeness.

4. Check the equipment for damage.

   If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

Accessory list

The R&S TSME6 comes with the following accessories:

- Printed getting started manual
- LAN cable
- GPS antenna
- 12 V DC power supply cable (cigarette lighter cable)
- 4 connecting screws

3.1.2 Setting up indoors

3.1.2.1 Placing the product on a bench top

If you want to set up the R&S TSME6 on a benchtop or prepare the R&S TSME6 for mobile use, proceed as follows.

To place the product on a bench top

1. Place the R&S TSME6 on a stable, flat and level surface.

2. If you want to stack R&S TSMx products, proceed as described in

3. If you want to stack the R&S TSME6 together with other products:

   a) Follow the instructions given for the other products.

b) Place the R&S TSME6 on top.

3.1.2.2 Mounting the product in a rack

To mount the product in a rack

1. Use an adapter kit to prepare the product for rack mounting.

   a) Order the rack adapter kit designed for the product. For the order number, see specifications document.
   b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.

2. Lift the product to shelf height. If the rack is high, use a safe climbing aid when placing on upper shelves.

3. Grip the product by the handles. Slide the product onto the shelf until the rack brackets fit closely to the rack.

4. Tighten all screws on the rack brackets with a tightening torque of 1.2 Nm to secure the product in the rack.

Rackmounting

The R&S TSME6 can be installed in a 19-inch rack using a rack adapter kit for one to four R&S TSME6s (option R&S TSME6-Z2, order number 4900.1030.02). The installation instructions are part of the adapter kit.

Figure 3-1: Rackmounting of 2 R&S TSME6s

Figure 3-2: Rackmounting of 2 R&S TSME6s (reverse orientation of R&S TSME6s)

Figure 3-3: Rackmounting of 4 R&S TSME6s

Figure 3-4: Rackmounting of 4 R&S TSME6s (reverse orientation of R&S TSME6s)

3.1.3 Considerations for test setup

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

- Use high-quality shielded cables, for example, double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

Signal input and output levels

Information on signal levels is provided in the specifications document. Keep the signal levels within the specified ranges to avoid damage to the product and connected devices.

Electromagnetic compatibility classes

The electromagnetic compatibility (EMC) class indicates where you can operate the product. The EMC class of the product is given in the specifications document.

- Class B equipment is suitable for use in:
  - Residential environments
  - Environments that are directly connected to a low-voltage supply network that supplies residential buildings
- Class A equipment is intended for use in industrial environments. It can cause radio disturbances in residential environments due to possible conducted and radiated disturbances. It is therefore not suitable for class B environments.
  If class A equipment causes radio disturbances, take appropriate measures to eliminate them.

3.1.4 Connecting to power

This section describes how to connect the R&S TSME6 to a power supply unit.

3.1.4.1 Connecting to a vehicle DC power supply via a cigarette lighter

The R&S TSME6 is delivered with a 12 V DC power supply cable with a cigarette lighter connector.

1. Check the rating of the vehicle DC power supply.

2. Connect the 4-pin connector to DC IN.

3. Connect the cigarette lighter adapter to the 12 V outlet of the vehicle.

3.1.4.2 Connecting to the vehicle power supply via a terminal

1. Demount the cigarette lighter adapter from the cable.

2. Connect the open ends of the cable to the DC power supply.
   Ensure that the polarity is correct (see Figure 3-5).
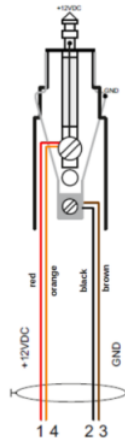
Figure 3-5: Supplied power cable with cigarette lighter adapter

+12 V DC = red/orange cabling
GND   = black/brown cabling

3.1.4.3 Connecting to an AC power supply

If you operate the product with an external power supply, you can use it indoors only in pollution degree 2 environments where nonconductive contamination can occur. Suitable AC power supplies are listed in the specifications document. They differ in the output power:

● R&S TSMA6-Z1 has an output power of 105 W and is suitable for multiple R&S TSMx products.

1. Ensure that the required ratings listed in the specifications document are matched.

2. Connect the round connector to DC IN.

3. Insert the AC power plug into a power outlet with ground contact.

3.1.5 Putting into operation

This section describes the basic steps to be taken when setting up the R&S TSME6 for the first time.

> ⓘ **EMI suppression**
>
> Electromagnetic interference (EMI) may affect the measurement results.
>
> To suppress generated electromagnetic interference (EMI):
> * Use only double-shielded cables for RF and GPS connection when not using the standard accessory.
> * Always terminate open cable ends.
> * DC-based lab networks are not allowed to be used for power supply.
> * LAN cable length to the next PC or switch must be < 30m.
> * Note the EMC classification in the specifications document.

3.1.5.1 Setting up the LAN connection to the host PC

To control and run measurements with the R&S TSME6, a host PC or notebook with LAN interface is required.

The R&S TSME6 is equipped with a network interface and can be connected to an Ethernet LAN (local area network). The interface can be used to connect the R&S TSME6 to a host PC.

The following scenarios are possible.

* Connection between PC and R&S TSME6(s) using static IP addresses.
* Connection between PC and R&S TSME6(s) using dynamical generated IP addresses (**Auto-IP**).

Modes

* **"Full auto-IP" mode**
  IP addresses are automatically generated on PC and R&S TSME6(s) if the following conditions are met:
    – A PC network interface is configured to obtain an IP address automatically
    – The IP address stored in R&S TSME6(s) is not in the range 169.254.0.1 – 169.254.255.254 (inclusive).
      Note: It is the IP address set by the R&S TSME Device Manager.
* **"Partial auto-IP" mode**
  An IP address is automatically generated on a PC and a static IP address is used on R&S TSME6 if the following conditions are met:
    – A PC network interface is configured to obtain an IP address automatically
    – The IP address stored in R&S TSME6 is in the range 169.254.0.1 – 169.254.255.254 (inclusive).
      Note: It is the IP address set by the R&S TSME Device Manager.
* **"Static IP" mode**
  The IP address is manually set on the PC and a static IP is used on R&S TSME6 if the following conditions are met:
    – PC LAN interface is configured to use a user-defined IP address, not in the range 169.254.0.1 – 169.254.255.254 (inclusive).

Recommendations/Limitations of modes

- **"Full auto-IP" mode**
  - Only 1 PC and 1 or more R&S TSME6 devices per LAN interface, either connected directly or via a L2 switch. (Do not use this mode when more than 1 PC is physically connected to the same subnetwork, e.g. via the switch.)
  - The PC's LAN interface must not receive an IP from a DHCP server. (The IP address generated for PC must match the following pattern: `169.254.X.Y.`)
  - Configure all R&S TSME6 devices on the same LAN interface with stored IP addresses not in the range 169.254.1.0 – 169.254.254.255 (inclusive) to prevent conflicts.
    Note: R&S TSME6 devices with stored IP addresses in ranges 169.254.0.1 – 169.254.0.255 (inclusive) or 169.254.255.0 – 169.254.255.254 (inclusive) are effectively operating in "partial auto-IP" mode.
  - Depending on the software accessing the R&S TSME6 devices, it is mandatory to configure the stored IP addresses in all R&S TSME6 devices to be unique.
    Example: R&S TSME Device Manager does not have this requirement, ROMES / R&S NESTOR have such requirements depending on the use made internally of the stored IP address as unique identifier.

- **"Partial auto-IP" mode**
  Use this mode only for specific cases. The preferred modes are "full auto-IP" or "static IP".
  - 1 or more PCs and 1 or more R&S TSME6 devices per LAN interface, either connected directly or via a L2 switch
  - Each of the PC's LAN interface physically connected to the subnetwork must not receive an IP from a DHCP server. (The IP address generated for PC must match the following pattern: `169.254.X.Y.`)
  - Configure all R&S TSME6 devices on the same LAN interface with stored IP addresses in the ranges 169.254.0.1 – 169.254.0.255 (inclusive) or 169.254.255.0 – 169.254.255.254 (inclusive), and use unique IP addresses. These ranges are important to prevent conflicts with IP addresses dynamically generated for the PC LAN interfaces.
    Note: If a R&S TSME6 is shared with 2 or more PCs, and its stored IP address is not in the defined range above, it leads in rare cases to IP conflicts. It is therefore recommended to respect this rule.

- **"Static IP" mode**
  - 1 or more PCs and 1 or more R&S TSME6(s), either connected directly or via a L2 switch.
  - Other network devices are permitted, as long as all IP addresses used are unique.

This section describes how to configure the LAN interface for a single R&S TSME6. It includes the following topics:

Configuring the LAN interface on the host PC

Each R&S TSME6 has the default IP address **192.168.0.2**. It is recommended that you define the fixed IP address **192.168.0.1** to the host PC or configure the host PC to obtain an IP address automatically ("Auto-IP").

To control the R&S TSME6 from the host PC, the LAN interface of the host PC must be configured as follows:

1. Press the "Windows" key or the [CTRL + ESC] key combination on your keyboard to access the Windows "Start" menu.

2. Type "Control Panel" and select this application.

3. Select "Control Panel > Network and Internet > Network and Sharing Center".

4. Select "Change adapter settings".

5. Double-click the LAN interface with which the R&S TSME6 is connected.

   The items used by the LAN connection are displayed.

6. Select the entry named "Internet Protocol Version 4 (TCP/IPv4)".
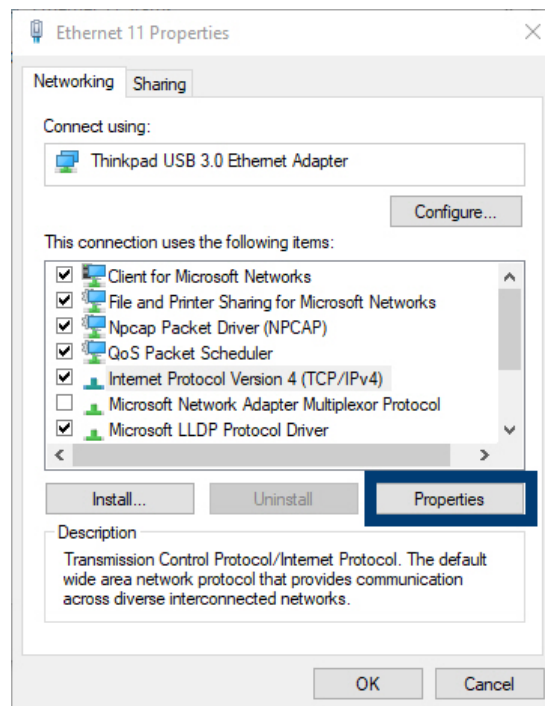
7. Select the "Properties" button.

8. Configure the following TCP/IP settings:

   a) Use any "Auto-IP" mode.
      Select "Obtain an IP address automatically".

b) Use "Static IP" mode.

- Select "Use the following IP address" (fixed IP, no dynamic range)
- IP address: **192.168.0.1** (recommended)
- Subnet mask: 255.255.255.0
- No Default Gateway
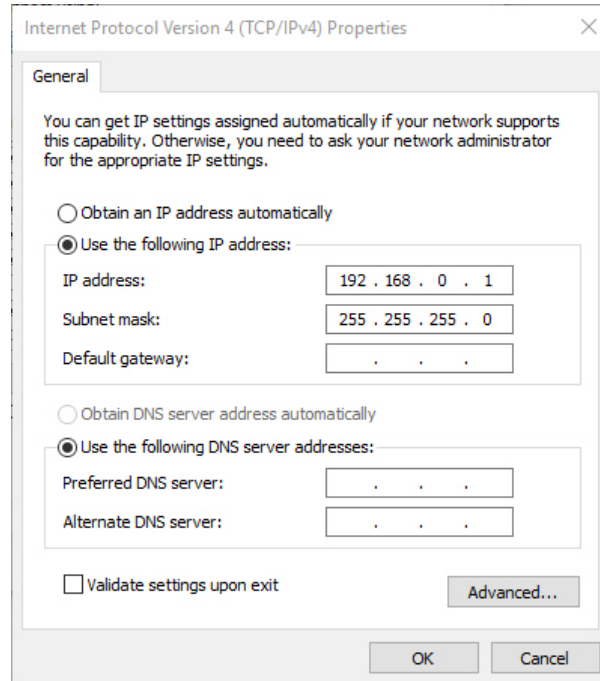
9. Enable the use of 9-kB-jumbo frames:

   a) Return to the "Local Area Connection Properties" dialog box.
   b) Select the entry for the LAN adapter and then "Properties".
   c) Switch to the "Advanced" tab.
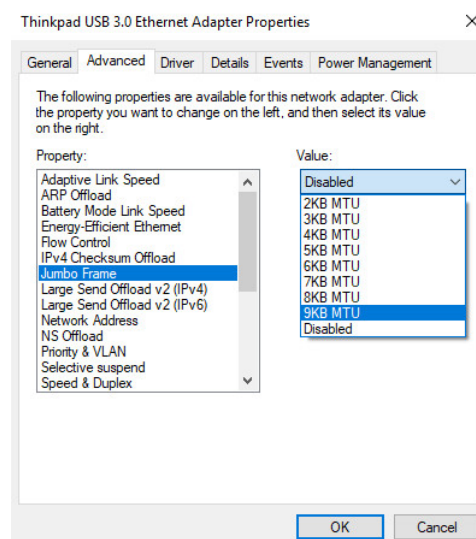
d) Select the "Jumbo Frames" property and the "Value":"9014 Bytes".
   Note: Sometimes, this setting causes problems in Windows, but it is an important prerequisite for correct operation of the R&S TSME6.
   See "Does the host provide a Gbit LAN connector and support 9k jumbo frames?" on page 65.

10. Close the control panel, reboot the host PC and check if you can establish the connection (see Chapter 7.1, "Guide to solve instrument connection problems", on page 64).

ⓘ If your firewall is active, make sure that it is configured as described in "Firewall configuration" on page 21.

Firewall configuration

The firewall can be turned off on the LAN interface or on with all the mandatory configurations.

If your firewall is active, make sure that your program is allowed to communicate through the firewall. The following ports must be available:

- RxPort (R&S TSME6->PC): Port 17476
- TxPort (PC->R&S TSME6): Port 5140 and 16962

Also, the following parameters must be configured to decide if a specific program is allowed to pass the firewall.

- Multicast IP address for R&S TSME: *224.17.4.76*
- Multicast Address for R&S TSME6: *239.192.1.7*
- IP-Address of R&S TSME6 has to be allowed as well: *192.168.0.2* (example)
  Note: In "full auto-IP" mode, the IP address generated for the R&S TSME6 has to be allowed.
- Allow UDP Protocol
- Allow Multicast Protocol
- Allow executed application (ROMES, R&S NESTOR, R&S TSME Device Manager as examples)
- Allow Network-Interface R&S TSME are connected to
- Allow network profile active on Network-IF R&S TSME is connected to

Even if all these parameters are set properly, this rule can be overwritten in Windows Firewall by a blocking rule. Furthermore on the first execution of a program, windows ask the user to decide on which network profiles communication through the firewall shall be allowed. If it is set correctly by the user, the firewall is in a good state.

Connecting the R&S TSME6 to the host PC

The R&S TSME6 has a built-in 1000BASE-T (802.3ab), 1 Gbit/s Ethernet interface. The host PC must have a separate 1 Gbit network interface card with an independent LAN connection.

Dedicated LAN adapter and IP address for host PC

It is important for the host PC to have its own dedicated LAN adapter for the connection to one or more R&S TSME6s (or a switch), rather than being integrated in a regular office network.

If multiple R&S TSME6s are connected to one host PC, the following rules are valid.

● Using "static IP" or "partial auto-IP" mode, it is important to define unique IP addresses for each instrument using the R&S TSME Device Manager (see R&S TSME6 user manual, chapter Configuring the R&S TSME6).

● Using "full auto-IP" mode, it is recommended to define unique IP addresses for each instrument, but depending on the software run, it may not be mandatory.

► Connect the supplied LAN cable to the LAN connector on the rear panel of the R&S TSME6, and to the host PC.

Windows 10 automatically detects the network connection and all devices in the same subnet when the R&S TSME6 is switched on.

3.1.5.2 Connecting external devices

The SMA connector is sensitive to mechanical stress. Use the following handling precautions.

● Always use a torque wrench and mount the cable end with 60 Ncm to 90 Ncm.

● Do not stack adapters directly at the SMA connector. If you need to use adapters (e.g: SMA to N), then always use a specific adapter cable (order no. 4900.1700.00).

The following external devices are required for standard operation.

● Connect the instrument to the power supply as described in Chapter 3.1.4, "Connecting to power", on page 15.

● Connect the PC or notebook LAN port to the LAN port of the R&S TSME6 as described in Chapter 3.1.5.1, "Setting up the LAN connection to the host PC", on page 17.

● Connect the (optional) antenna's SMA connector to the RF IN connector.
NOTE: Do not overload the input power at the RF input connector, otherwise the input stage could be severely damaged. For maximum allowed values, see the specifications document.

● Connect the GPS antenna to the GPS ANT connector of the instrument for time synchronization to a GPS signal (3 V, max. 25 mA for active antenna). To ensure time synchronization of the R&S TSME6, it is required to have a GPS antenna connected.
NOTE: A missing GPS antenna will lead over time to the point that signals cannot be detected anymore. We recommend connecting a GPS antenna at least once per month.

- Connect the R&S TSME30DC / R&S TSME44DC / R&S TSMS53DC according to the measurement setup description in R&S TSME30DC / R&S TSME44DC / R&S TSMS53DC Ultracompact Downconverters manual.

ⓘ Depending on the intended use, the respective valid regulations regarding lightning protection of the antennas and regarding vehicle installation must be observed during installation.

3.1.5.3 Connecting a Kensington lock

The R&S TSME6 provides a connector for a Kensington lock, which can be used to secure a mobile device against theft. The connector is on the side panel of the instrument.

Figure 3-6: Connector for a Kensington lock on theR&S TSME6

3.1.5.4 Enabling untethered dead reckoning

The following steps are necessary to enable untethered dead reckoning with the integrated receiver (see "GPS antenna connector" on page 36) of the R&S TSME6.

1. Mount the R&S TSME6 device fixed to the frame of a car.
   The rear panel of the R&S TSME6 must point in the driving direction. Ensure fixed attachment of the R&S TSME6.Place the antenna near by the R&S TSME6. If you place the GNSS antenna at a significant distance from the receiver, introduced position offsets affect the accuracy of the navigation solution.

Figure 3-7: Orientation of the R&S TSME6

2. Power on the R&S TSME6 device.

3. Activate "Dead Reckoning" in the used software (see ROMES, R&S NESTOR or R&S ViCom documentation).

4. Wait until the used software reports a "3D fix" (time vary depending on the configured GNSS).

5. To calibrate the instrument, perform the following driving procedures in a safe environment.

   a) 720 degrees right turn.
   b) 720 degrees left turn.
   c) Drive a straight line with a velocity exceeding 40 km/h.

   Note: Whenever the device is switched off, the calibration procedure must be repeated for the next usage of dead reckoning.

After finishing the calibration, the used software reports a fix state "GPS+DR" or "3D +DR", in case satellite reception is lost the fix state changes to "DR only".

(i) If using "DR only", the accuracy of the reported position will decrease over time, if it falls below a certain threshold the receiver will report the state "No Fix".

3.1.6 Connecting multiple R&S TSME6s to one host PC

(i) Due to the compatibility of R&S TSME and R&S TSME6, the combined usage of R&S TSME and R&S TSME6 devices in an LTE-MIMO setup is possible.

Using multiple R&S TSME6 devices requires sufficient capacity of the used network link.

A single R&S TSME6 can fully utilize a Gigabit Ethernet connection. If the network link reaches its maximum capacity, the measurement system decreases the network

throughput to avoid network overload. The result is a reduced performance of the R&S TSME6.

In a MIMO scenario or when using multiple R&S TSME6 devices for load balancing applications, a network link can be shared by several R&S TSME6 devices. In a multi-technology setup, we recommend using several network ports on your PC. It applies also for the measurement of multiple technologies on the used R&S TSME6 device.

3.1.6.1 Using two R&S TSME6s in parallel

Using two R&S TSME6s in parallel enhances the measurement capability compared to a single R&S TSME6, and can increase measurement speed.

> Synchronized devices are time-synchronous, not phase-synchronous.
>
> We recommend connecting every R&S TSME6s with a dedicated network connection to the used PC.

A R&S TSME6 intelligently captures signals of multiple technologies at the same time, if they fall within its 20 MHz frontend.

If two R&S TSME6s are connected, and a technology option is installed on at least one of the R&S TSME6s, the measurement software can measure on both R&S TSME6 frontends. Thus you can create a virtual 40 MHz frontend.

Therefore, measurements on combined R&S TSME6s are faster than measurements on separate R&S TSME6s in shared spectrum networks.

Using two R&S TSME6s in parallel requires the following options:

- A band option (R&S TSME6-KxB) on each R&S TSME6
- Identical technology options on both R&S TSME6 devices for measurements on both R&S TSME6 frontends simultaneously

The following table demonstrates some sample configurations and applications for parallel usage.

Table 3-1: Sample configurations and applications for parallel usage

Configuration		R&S TSME6 1	R&S TSME6 2	Application
Config 1	Options	GSM, KAB	KAB	Increase measurement speed
	Measurements	GSM	GSM	
Config 2	Options	LTE, KAB	WCDMA, GSM, KAB	Use scanners separately; join for increased speed
	Measurements	GSM, WCDMA, LTE	GSM, WCDMA, LTE	
Config 3	Options	LTE, MIMO, KAB	LTE, KAB	Use scanners separately; join for LTE MIMO measurement
	Measurements	LTE, MIMO	LTE, MIMO	

3.1.6.2 LTE MIMO setup with two R&S TSME6s

Basic LTE MIMO measurements are possible with a single R&S TSME6, which can analyze two different transmission paths of a signal from two different transmit anten-nas. A single R&S TSME6 can determine the RSRP/Q and RS SINR results for both paths (see documentation of the measurement software for details).

If two R&S TSME6s are connected to one host PC, multiple signals can be received by two receive antennas and processed in one application. It is useful, for example, to analyze a MIMO matrix, condition numbers, or ranks, or generally to optimize the LTE MIMO setup.

Table 3-2: Required options for sample (minimum) configuration for LTE MIMO measurements with 2 R&S TSME6s

R&S TSME6	Option
1	KxB, LTE (K29), LTE MIMO (K30)
2	None (MIMO extension option R&S TSME6-K300 installed by default)

Required connections

1. Connect the SYNC-cable (R&S TSME6-ZC2, order number 4900.1800.02) to the Aux. connectors of all R&S TSME6 devices in this setup.

Figure 3-8: SYNC-cable connected to Aux. connectors of 2 R&S TSME6 devices

2. Connect the power cable (R&S TSME-ZYC, order number 1514.7290.02) to the DC IN connectors of all R&S TSME6 devices in this setup.
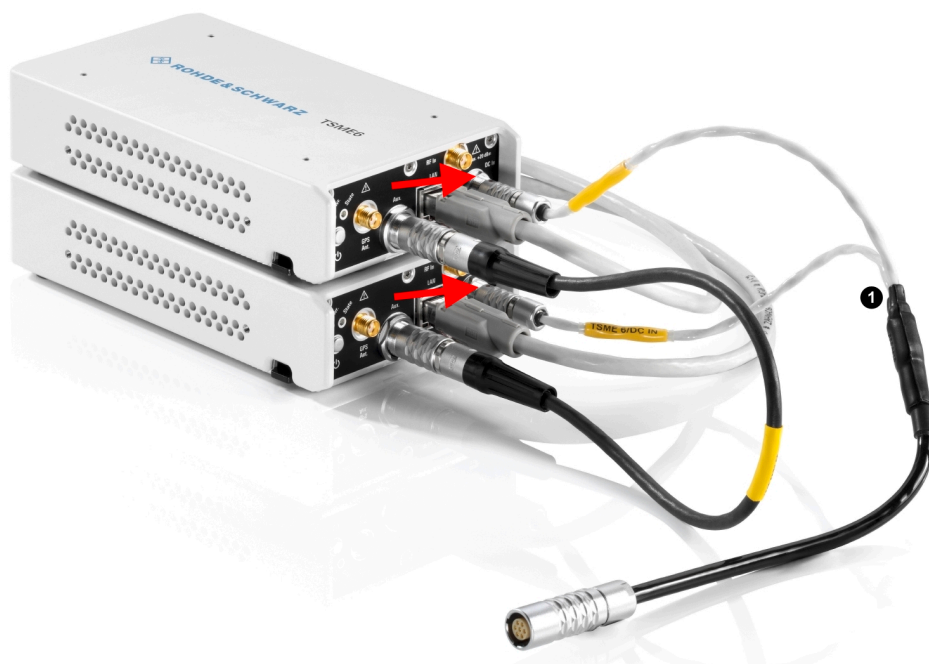
Figure 3-9: Power cable connected to DC IN connectors of 2 R&S TSME6 devices

1 = Power cable (connecting 2 R&S TSME6 devices)

For configurations with two R&S TSME6 devices, use the power supply R&S TSME-Z1 (order number 1514.6913.02).

3. Connect one LAN cable per LAN connector of all R&S TSME6 devices in this setup.
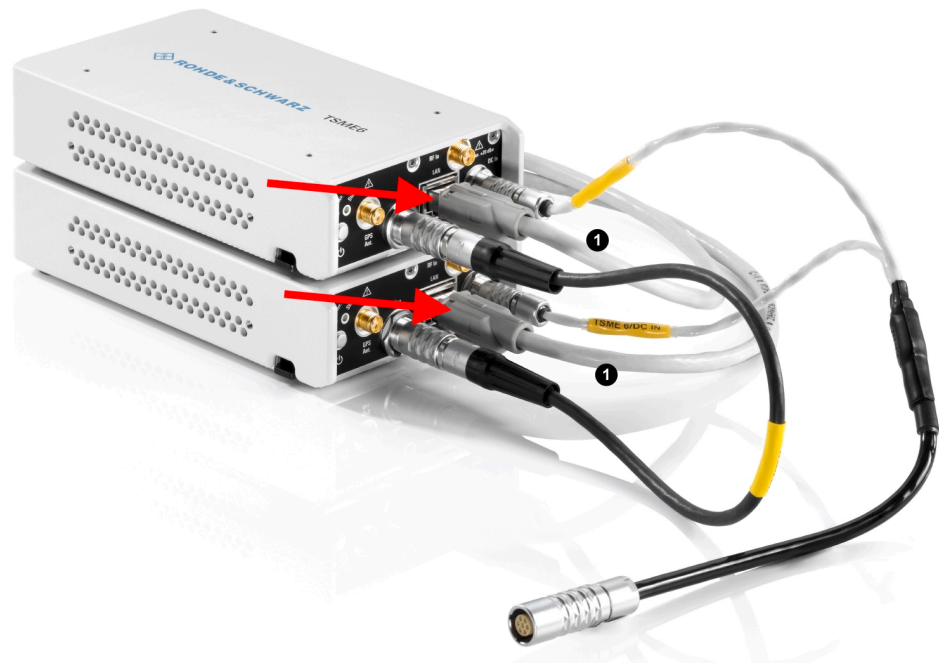
Figure 3-10: LAN cable connected to LAN connectors of 2 R&S TSME6 devices

1 = LAN cable

3.1.6.3   LTE MIMO setup with four R&S TSME6s

If four R&S TSME6s are connected to one host PC, multiple signals can be received by four receive antennas and processed in one application. It is useful, for example, to perform LTE MIMO path measurements or throughput/CQI estimations (in addition to the results using two R&S TSME6s).

Table 3-3: Required options for sample (minimum) configuration for LTE MIMO measurements with 4 R&S TSME6s

R&S TSME6	Option
1	KxB, LTE (K29), LTE MIMO (K30)
2	None (MIMO extension option R&S TSME6-K300 installed by default)
3	None (MIMO extension option R&S TSME6-K300 installed by default)
4	None (MIMO extension option R&S TSME6-K300 installed by default)

Required connections

1. Connect the SYNC-cable to the Aux. connectors of all R&S TSME6 devices in this setup.

Figure 3-11: SYNC-cable connected to Aux. connectors of 4 R&S TSME6 devices

2. Connect the power cable R&S TSME6-ZYC4, order number 4900.1846.02) to the DC IN connectors of all R&S TSME6 devices in this setup.

Figure 3-12: Power cable connected to DC IN connectors of 4 R&S TSME6 devices

1 = Power cable (connecting 4 R&S TSME6 devices)

For configurations with four R&S TSME6 devices, use the following power supply (R&S TSMA6-Z1, order number 1523.8450.02).

Figure 3-13: AC Power Supply (four R&S TSME6s)

3. Connect a LAN cable to the LAN connectors of all R&S TSME6 devices in this setup.

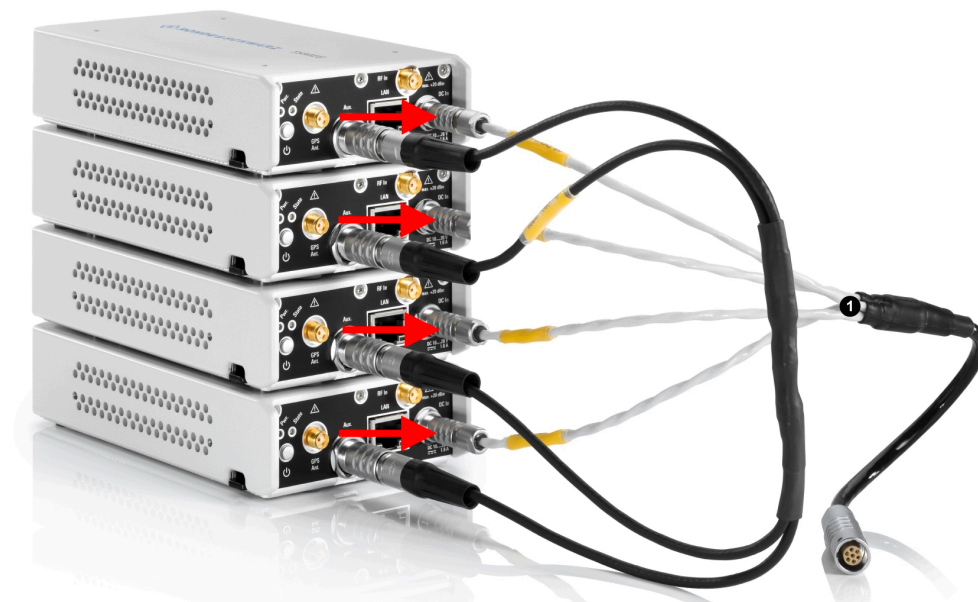*Figure 3-14: LAN cable connected to LAN connectors of 4 R&S TSME6 devices*

1 = LAN cable

3.1.7 Connecting R&S TSME6 with R&S TSMA6/6B-BP

To power R&S TSMEx devices (scanner, downconverter), the following accessory cables are necessary.

● R&S TSMA6-BPPT (single R&S TSMETSMEx power cable, order no. 4900.1730.02)

● R&S TSMA6-BP2T (dual R&S TSMETSMEx power cable, order no. 4901.0566.02)

3.1.8 Switching on or off R&S TSME6

To switch on the device

1. Use the supplied power cable to connect the power supply to the instrument.

2. After you have connected the power cable, the R&S TSME6 is powered on.

After booting, the instrument switches to the idle mode and is ready to be accessed by an application.

To shut down the device

When you press the On/Off key on the rear panel of the R&S TSME6 to switch it off, the instrument changes to standby mode. In standby mode, the program execution on the instrument is stopped immediately, but the instrument is still under power connection.

ⓘ Do not switch off the instrument while a connection to the application is being established, otherwise the application does not close properly. As a result, the software could crash and must be shut down from the Windows Task manager.

Removing the power supply

If you remove the power supply and reconnect it later, the instrument automatically boots when power returns.

3.1.9 Connecting the R&S TSME6 to a software application for the first time

The following procedure describes the steps performed when you connect the R&S TSME6 to a software application (ROMES, R&S NESTOR, or R&S ViCom) for the first time. Note that this process takes a few minutes initially.

1. Switch on the R&S TSME6 and the host PC.

2. Start the ROMES / R&S NESTOR / R&S ViCom application on the host PC.

   The application searches for R&S TSME6s connected to the host PC.

If the R&S TSME6 is detected by the software for the first time, the software down-loads the calibration files from the R&S TSME6 to the host PC. This procedure takes a few minutes.

3. If you have defined the firewall settings not to include the R&S TSME6 applications, a Windows Security Alert may appear. Change the firewall settings to permit access to the R&S TSME6 applications:

   a) In the Windows Control Panel, select "System and Security > Windows Firewall > Allow apps to communicate through Windows Defender Firewall".
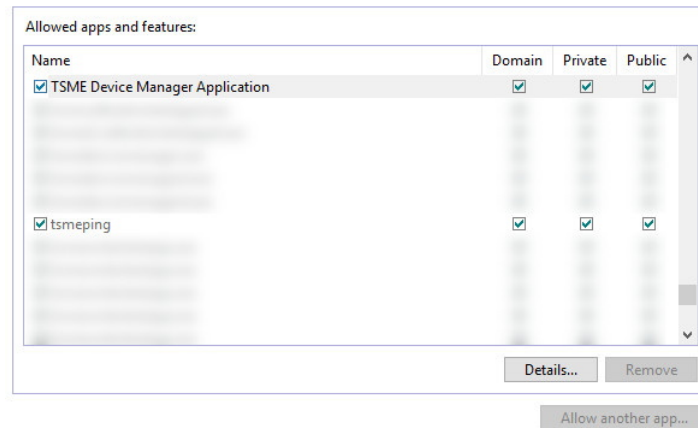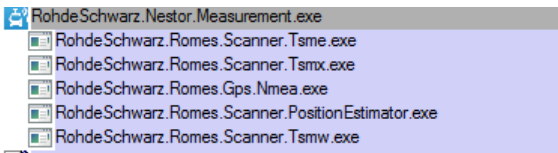
Figure 3-15: Firewall settings to permit application access

   b) Allow one or more specified application modules to communicate **on all network types** (domain, private, public).

   In particular, select:
   - "TSME Device Manager" Application
   - "tsmeping"

   c) Depending on the application used, also select the following items:
   - **ROMES**:
     – `ROMES.exe`
     – `Dll Loader for PHYLIS Modules` (in the ROMES application folder)
   - **R&S NESTOR**:
     – `RohdeSchwarz.Nestor.exe`
     –
   - **R&S ViCom**:
     DLL Loader for PHYLIS Modules (`RuSProcessPhysicalLayer.exe`)

4. The application checks the installed firmware versions on the R&S TSME6 and which version was used to boot the R&S TSME6. You can store up to four firmware versions on the R&S TSME6.
The following procedure depends on the detected versions.
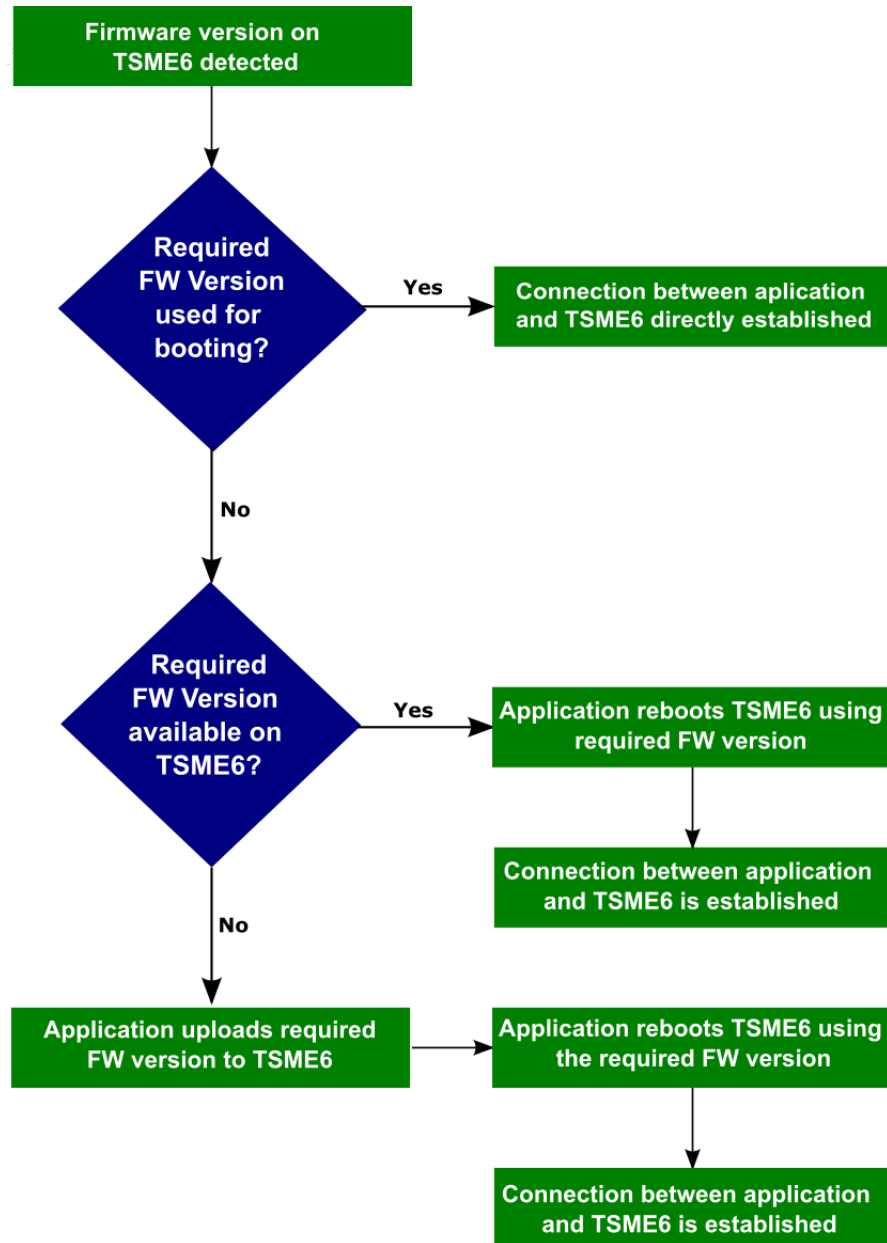
- If you use the firmware version required by the application for booting, the application establishes a connection to the R&S TSME6 directly.
- If the firmware version required by the application is available on the R&S TSME6, but was not used for booting, the application reboots the R&S TSME6 using the required firmware version. Then the application establishes a connection to the R&S TSME6.

- If the firmware version required by the application is not yet available on the R&S TSME6, the application uploads the required firmware version to the R&S TSME6 (this step takes about one minute). The application reboots the R&S TSME6 using the required firmware version, then establishes a connection to the R&S TSME6.
- If the firmware version required by the application is not yet available on the R&S TSME6, and other versions occupy all three storage spaces for firmware, the application must do the following:

a) Clear all storage space for firmware versions on the R&S TSME6 (this step takes about one minute).
b) Upload the required firmware version to the R&S TSME6 (this step takes about one minute).
c) Reboot the R&S TSME6 using the required firmware version.
d) Establish a connection to the R&S TSME6.

3.2 Instrument tour

3.2.1 Front panel view

The front panel of the R&S TSME6 does not provide any connectors or control elements for operation.

Behind the right side of the rear panel (with the ventilation openings), 4 status LEDs are located. These LEDs display the following states:

- LEDs ON: R&S TSME6 ready for operation, RF-PLLs initialized correctly
- LEDs OFF: R&S TSME6 is off or RF-PLLs initialized not correctly

If the fans are off (temperature on the controller board < 60° C), the LEDs are partially covered by the fan blades.
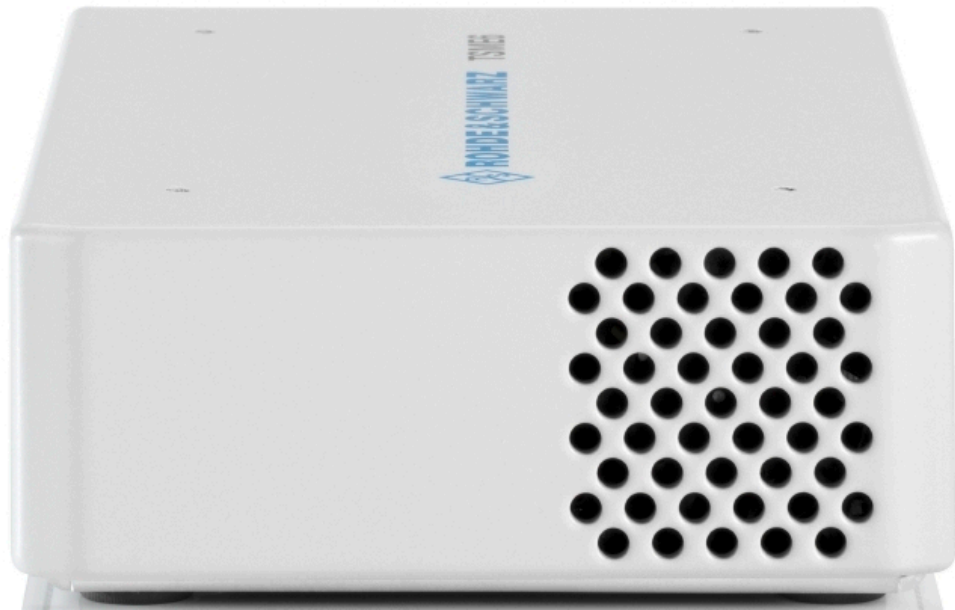
Figure 3-16: R&S TSME6 - front panel

3.2.2 Rear panel view

This figure shows the rear panel view of the R&S TSME6. The individual elements are described in more detail in the subsequent sections.
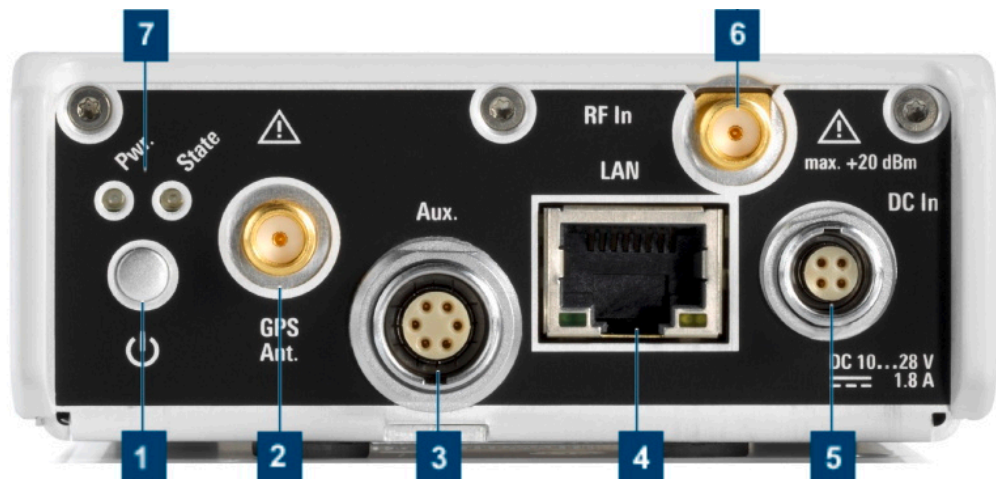
Figure 3-17: R&S TSME6 - rear panel

1 = "Power ON/OFF" on page 36
2 = "GPS antenna connector" on page 36
3 = "AUX connector" on page 36
4 = "LAN connector with LEDs" on page 36

Power ON/OFF

The On/Off key switches the device on and off if power is supplied via the DC IN connector. For details, see Chapter 3.1.8, "Switching on or off R&S TSME6", on page 31.

GPS antenna connector

An SMA connector is provided for the supplied external active GPS antenna (antenna power: 3 V, max. 25 mA).

The behavior of the integrated multi-GNSS (GPS / BeiDou / Galileo / GLONASS) receiver depends on "Product Change Index" of the controller board of the device (see Figure 6-1).

- PCI of controller board < 06.00 (u-blox NEO-M8U): R&S TSMA6, R&S TSMA6B, R&S TSME6
  The integrated multi-GNSS receiver uses three satellite systems in parallel. It offers an accuracy improvement of 30 % to 50 % by using a second constellation of satellites.
  The following combinations are allowed:
    – GPS only
    – GPS / GLONASS / Galileo
    – GPS / BeiDou
- PCI of controller board ≥ 06.00 (u-blox NEO-M9V): R&S TSME6 (new), R&S TSMA6B (new)
  The integrated multi-GNSS receiver uses all four satellite systems in parallel.

The R&S TSME6 can perform untethered dead reckoning in tunnels to provide position information even if no satellites are available. The untethered dead reckoning is performed in the device itself by built-in electronic gyroscopes.

For enabling untethered dead reckoning, see Chapter 3.1.5.4, "Enabling untethered dead reckoning", on page 23.

AUX connector

The AUX connector can be used to connect additional devices. It can be a signal generator that provides an external reference frequency for the R&S TSME6, or a synchronization cable for multiple R&S TSME6 connected to one host PC.

LAN connector with LEDs

The LAN connector provides a high-speed Gigabit Ethernet interface with an RJ-45 connector using IPv4. It is required to connect the R&S TSME6 to a host PC.

The LEDs on the LAN connector indicate the status of the connection to the host PC. LED 1 is on the left side of the connector, LED 2 is on the right.

Table 3-4: LAN LED 1 states and their meaning

LED state	Description
Green, blinking	LAN sending or receiving, or identifying connected device

Table 3-5: LAN LED 2 states and their meaning

LED state	Description
Off	No connection
Yellow	Physical connection established
Yellow, blinking	Identifying connected device

DC IN connector

The DC IN connector is required for the DC power supply (10-28 V, max. 1.8 A). For details, see Chapter 3.1.4, "Connecting to power", on page 15.

RF IN connector (50 Ω)

The optional multi-band RF antenna (700 MHz to 2.6 GHz) or the device providing the RF signal is connected to the instrument's RF input. The used cable needs an appropriate connector (SMA female, 50 Ω input impedance).

Do not overload the allowed maximum input of 20 dBm. Non-compliance destroys the input mixer.

Pwr./State LEDs

Table 3-6: POWER and STATE LED states and their meaning

STATE LED	POWER LED	Meaning
Off	Off	No power supply connected at DC IN Power supply is off Power supply < 10 V
Off	Yellow	Standby
Off	Green, blinking (2 Hz)	FGPA configuration in progress
Red (up to 5 seconds during startup)	Green	FPGA configuration finished, preparing for start
Off	Green	R&S TSME6 ready, not connected
Green	Green	Connected
Green, blinking rapidly	Green	Measuring
Green, blinking 2 Hz	Green	Instrument is identified by the software

STATE LED	POWER LED	Meaning
Red, blinking 2 Hz	Green	Temperature warning (controller board temperature = 75° C ... 80° C)
Red (continuous)	Green	Temperature error (controller board temperature above 80° C)

*The fans are temperature-controlled and below a temperature of 60° C on the controller board, the fans are in status OFF.

4 Option concept

The R&S TSME6 scanner consists of the R&S TSME6 hardware and a set of (specified) technology and band options when it comes from the factory.

4.1 Technology options

Technology options allow the R&S TSME6 to scan the input based on a specific technology, for example, LTE. All technology options can be installed on the same instrument; the R&S TSME6 can measure various technologies simultaneously.

The following technology options are available (for current availabilities see http://www.rohde-schwarz.com/product/TSMx.html):

Table 4-1: Available R&S TSME6 technology options

Options	Order number	Description
R&S TSME6-K10	4900.2459.02	R&S TSME6 scanner option: Block I/Q
R&S TSME6-K19	4900.2720.02	R&S TSME6 scanner option: P25
R&S TSME6-K21	4900.2188.02	R&S TSME6 scanner option: WCDMA
R&S TSME6-K22	4900.2165.02	R&S TSME6 scanner option: CDMA2000
R&S TSME6-K23	4900.2194.02	R&S TSME6 scanner option: GSM
R&S TSME6-K24	4900.1242.02	R&S TSME6 scanner option: 1xEV-DO Rev. A
R&S TSME6-K25	4900.2242.02	R&S TSME6 scanner option: CW
R&S TSME6-K26	4900.2142.02	R&S TSME6 scanner option: TETRA
R&S TSME6-K27	4900.2120.02	R&S TSME6 scanner option: RF power Scan
R&S TSME6-K28	4900.2136.02	R&S TSME6 scanner option: WiMAX™
R&S TSME6-K29	4900.2171.02	R&S TSME6 scanner option: LTE
R&S TSME6-K30	4900.2113.02	R&S TSME6 scanner option: LTE 2x2, 4x2, 4x4 MIMO
R&S TSME6-K32	4900.2288.02	R&S TSME6 scanner option: LTE eMBMS
R&S TSME6-K34	4900.2207.02	R&S TSME6 scanner option: NB-IoT/Cat NB1-scanning
R&S TSME6-K35	4900.2465.02	R&S TSME6 scanner option: LTE M
R&S TSME6-K36	4900.2707.02	R&S TSME6 scanner option: C-V2X LTE scanning
R&S TSME6-K40	4900.2259.02	R&S TSME6 Automatic Channel Detection (R&S ViCom only, not for ROMES)
R&S TSME6-K50	4900.2436.02	R&S TSME6 scanner option: 5G NR scanning

Options	Order number	Description
R&S TSME6-K51	4900.2488.02	R&S TSME6 scanner option: 5G NR add-on scanning
R&S TSME6-K80	4900.2442.02	pR&S TSME6 scanner option: BTS PE Enabler

4.2 Band options

The R&S TSME6 hardware simultaneously measures in all wireless communications bands from 350 MHz to 6 GHz. Using band licenses, more cost-efficient configurations are available for applications where only a limited number of bands need to be measured simultaneously.

These configurations limit the number of bands that can be measured in parallel. You can reconfigure the bands for each measurement as desired. Upgrade options are available to increase the bandwidth of the R&S TSME6 from a limited number of bands to full bandwidth. The following band options are available:

Table 4-2: Available R&S TSME6 band options

Options	Order number	Description
R&S TSME6-KAB	4900.2107.02	Measure all bands measured simultaneously
R&S TSME6-K1B	4900.2094.02	Measure 1 band simultaneously
R&S TSME6-K2B	4900.2088.02	Measure 2 bands simultaneously
R&S TSME6-K3B	4900.2071.02	Measure 3 bands simultaneously
R&S TSME6-K4B	4900.2065.02	Measure 4 bands simultaneously
R&S TSME6-K5B	4900.2059.02	Measure bands simultaneously
R&S TSME6-KUB	4900.2307.02	Upgrade: Measure 1 additional band simultaneously

For measurements with R&S TSME30DC/TSME44DC and R&S TSMS53DC downconverters, the option R&S TSME6-KAB is mandatory.

The R&S TSME6 band assignment can be reconfigured by the user (see Chapter 6.1.4, "Configuring measurement bands - "Band Configuration"", on page 53).

For an overview of available cellular bands and their characteristics see Chapter A, "Available cellular bands", on page 74.

4.3 Licensing

All options are available with registered or unregistered licenses.

- Registered licenses (variant .02)
  Registered licenses are permanent licenses which are fixed to a serial device number.

- Unregistered licenses (variant .03)
  Unregistered licenses are permanent licenses without serial number fixation.

Also, the options K2x, K3x, K40, K5x and KAB are available with timed licenses.

- Timed licenses
  Timed licenses are unregistered licenses limited to a defined time period.
  - 1 months (variant .11)
  - 3 months (variant .13)
  - 6 months (variant .16)
  - 12 months (variant .12)

4.4 Option sharing concept

Definition TSME group

A group of TSMEs are all R&S TSME or R&S TSME6 receivers, which are loaded by a TSME admin (independent of their synchronization).

Technology options

When a technology option is valid on at least one R&S TSME or R&S TSME6 of the group, you can measure on all connected receivers for this technology in the allowed frequency bands of the respective receiver.

Allowed frequency bands

With an "All Band Option" (KAB), you can measure the complete frequency band supported by the hardware. On a R&S TSME6, the complete frequency band is slightly larger than on an R&S TSME.

If there is no "All Band Option" (KAB) in a receiver, but only a non-empty set of band options for 1 to 5 bands (K1B, ... K5B) each, then the upper limited number of bands can be selected from a table for this receiver, which are then allowed for all measurements.

The number of bands to be measured simultaneously is the sum of all activation numbers x from valid KxB options with a maximum of 5.

Example:

If two K1B and one K2B are installed on a R&S TSME6, then it is permitted to measure in 4 bands simultaneously for this R&S TSME6.

Special scenario: MIMO

If a K300 is installed on an R&S TSME or R&S TSME6, then a measurement for technology option index 130 (LTE MIMO) can be made on this R&S TSME or R&S TSME6 on all frequencies supported by the hardware.

The 5G NR FR2 demodulation with several R&S TSME6 is also supported.

5 Vibration-proofed stacking

5.1 Cascading R&S TSMA6/6B and R&S TSME6

To connect R&S TSMA6/6B and R&S TSME6

1. Screw the connecting elements (order no. 4900.0804.00) on the top of the R&S TSMA6/6B.

   - Torque: 0.66 Nm ± 0.05 Nm
   - Secure with liquid plastic
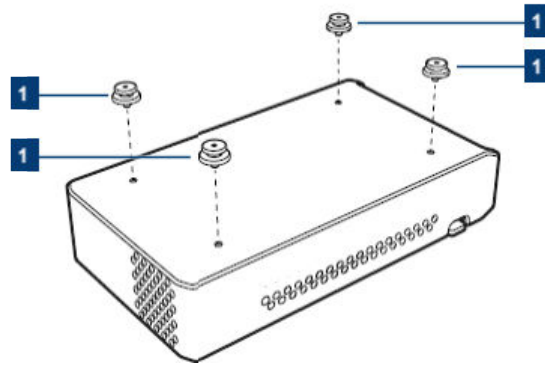
Figure 5-1: Connecting elements

1 = Connecting elements (order no.4900.0804.00)

2. **Notice**: An insufficient airflow can cause the instrument to overheat, which disturbs the operation and even cause damage. Make sure that all fan openings are unobstructed and that the airflow perforations are unimpeded, particularly when you install the instrument in a rack or packed in a backpack. Keep clear the following surrounding spaces to the instrument:

   - Front pane: minimum 2 cm
   - Left/right panes: minimum 1 cm

   Align the connecting elements with the holes on the bottom of an R&S TSME6 and press the R&S TSME6 down.
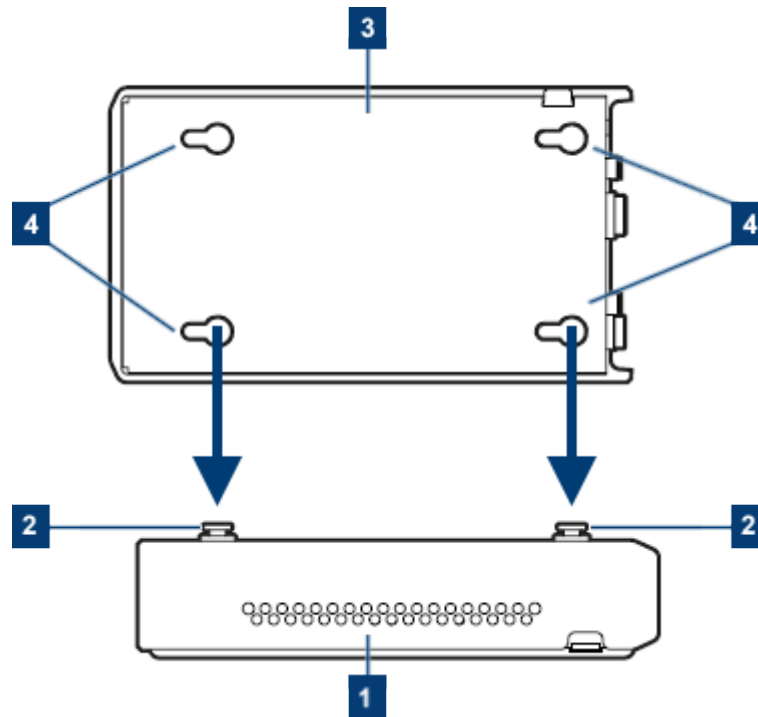
Figure 5-2: Aligning R&S TSMA6/6B and R&S TSME6

1 = R&S TSMA6/6B
2 = Connecting screws
3 = R&S TSME6
4 = Holes on the bottom pane of R&S TSME6

5.2 Connecting R&S TSMA6/6B-BP with R&S TSME6 and R&S TSMExxDC/TSMS53DC

ⓘ The following steps are valid for R&S TSME6 and downconverter R&S TSMExxDC/R&S TSMS53DC.

For the cabling of the devices, the accessory cables R&S TSMA6-BPPT or R&S TSMA6-BP2T are necessary.

1. Screw the collar screws (1) on the top of the R&S TSMA6/6B-BP with a Torx 8 screw driver.

   ● Torque: 0.66 Nm ± 0.05 Nm
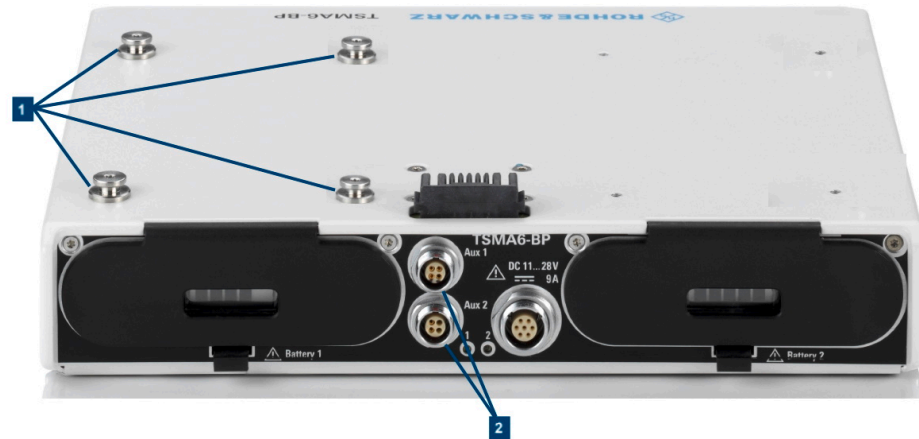
1 = Collar screws for connecting R&S TSME6
2 = Aux 1 / Aux 2 (auxiliary power out for connecting R&S TSME6/TSMExxDC/TSMS53DC via power
    cable R&S TSME-ZYC)

2. Align the collar screws with the snap-in holes on the bottom of an R&S TSME6/
   TSMExxDC/TSMS53DC and press the device down.
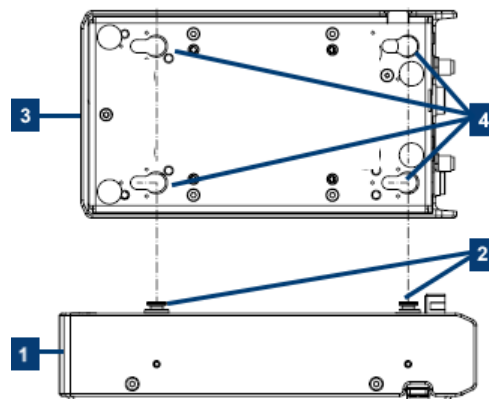
Figure 5-3: Example: Aligning R&S TSMA6/6B-BP and R&S TSME6

1 = R&S TSMA6/6B-BP
2 = Collar screws
3 = R&S TSME6/TSMExxDC/TSMS53DC
4 = Snap-in holes on the bottom pane of R&S TSME6/TSMExxDC/TSMS53DC

3. Move the R&S TSME6/TSMExxDC/TSMS53DC to the back side, until you hear a
   click when the collar screws are locked in.

Figure 5-4: Connected R&S TSME6/TSMExxDC/TSMS53DC and R&S TSMA6/6B-BP

1 = R&S TSMA6/6B-BP
2 = R&S TSME6/TSMExxDC/TSMS53DC

4. Connect the power cable R&S TSMA6-BPPT resp. R&S TSMA6-BP2T from AUX1 resp. AUX2 to DC IN of R&S TSME6/xxDC/TSMS53DC.

6 Configuring the R&S TSME6

Measurements are performed on the R&S TSME6 via the ROMES, R&S NESTOR or R&S ViCom interface. Depending on the installed software options, the network is either scanned for individual standards, or globally over all frequency bands. Details on scanning networks are described in the ROMES, R&S NESTOR and R&S ViCom manuals.

Basic device configuration tasks can be performed directly on the R&S TSME6, via the host PC, using the "R&S TSME Device Manager".

6.1 Using the R&S TSME device manager

The "R&S TSME Device Manager" is a configuration software tool for scanners of the R&S TSME and R&S TSMA family. This utility is part of the R&S®TSME installation package. It can also be installed together with ROMES, R&S NESTOR and R&S ViCom, and is available for download from the Rohde & Schwarz product website http://www.rohde-schwarz.com/product/TSMx.html.

To start the R&S TSME Device Manager

► To start the R&S TSME Device Manager, double-click the desktop icon or select the "R&S®TsmeTools" program entry in the Windows "Start" menu.

When you start the R&S TSME Device Manager, a dialog box with different tabs is displayed (see Figure 6-1).

- **Selecting the device**
  The R&S TSME Device Manager can configure any connected R&S TSME6 that the software detects in the LAN. The individual devices are identified uniquely by their serial number. By selecting one of the "Available Devices" by its serial number in the R&S TSME Device Manager dialog box, you determine which R&S TSME6 the current configuration applies to.
- **Updating the device selection list**
  If additional R&S TSME6s become available after the R&S TSME Device Manager has started, you must select the "Refresh Device List" button so the new devices are included in the "Available Devices" list.
- **Updating the displayed device data**
  If the current configuration or device information has changed and is not yet displayed correctly in the R&S TSME Device Manager, select the "Refresh Device Data" button to update the display.

ⓘ If a connection to a R&S TSME6 is not possible (for example due to mismatch of subnetmask configuration), only limited information is displayed. For example, no information about installed options is available in this case.

6.1.1 Obtaining device information - "Device Info"

The most important configuration settings for each available R&S TSME6 are displayed in the "Device Info" tab of the "R&S TSME Device Manager".

Figure 6-1: Tab "Device Info"

This tab includes the following information:

ⓘ If an R&S TSME30DC/TSME44DC or R&S TSMS53DC downconverter is correctly connected, a second table with the relevant data for the downconverter is displayed.

Table 6-1: R&S TSME6 device information

Label	Description
Device	
The device can be a receiver R&S TSME6 or a downconverter, e.g. R&S TSME30DC/TSME44DC or R&S TSMS53DC. For the R&S TSME30DC/TSME44DC and R&S TSMS53DC, only a reduced set of data is displayed.	
"Device Type"	Type of device (TSME family, TSMA family)
"Material Number"	Order number of the device
"Variant Number"	Precise device type (variant)
"Serial Number"	Unique ID of the device
"Product Change Index"	Version of the device
"MAC Address"	Network address of the device
FPGA	
"Available FPGA Bit File Versions"	Previous firmware version backups stored on the device (see also Chapter 6.1.5, "Obtaining firmware and correction data updates - "Updates"", on page 55)
"Current FPGA Bit File Version"	Currently used firmware version
"Power Board"	
"Serial Number"	Unique ID of the power board
"Product Change Index"	Version of the power board
"Controller Board"	
"Serial Number"	Unique ID of the controller board
"Product Change Index"	Version of the controller board
"Temperature"	Current temperature of the hardware in [°]C
"RF Board"	
"Serial Number"	Unique ID of the RF board
"Product Change Index"	Version of the RF board
"Temperature"	Current temperature of the hardware in [°]C
"Correction Data"	
"Version"	Current version of the calibration data saved on the device
"Type"	- Factory The original factory calibration data are saved on the device. - Update An improved set of calibration data is available and saved on the device. (See Figure 6-5.)
"Date"	Timestamp of creating and saving the calibration data on the device
"TCXO Date"	Date of correction data for the internal reference

Device Analysis Output

Furthermore, any warnings, errors or information concerning the device status are displayed in the "Device Analysis Output" table. This table is available on all tabs, at the bottom of the R&S TSME Device Manager window.

Depending on their relevance, the messages are assigned to the following categories:

- **Info**: information for the user, no action required
- **Warning**: warning on behalf of the instrument - solution recommended
- **Error**: error on behalf of the instrument - must be solved before further operation

In case measurement problems occur with the R&S TSME6, check the "Device Analysis Output" table for any detected errors. If available, a repair function is provided.

6.1.2 Changing IP addresses - "Network Configuration"

By default, each R&S TSME6 is delivered with the pre-configured IP address **192.168.0.2**. However, if multiple R&S TSME6s are connected to the same host PC, each device must have a unique IP address.

You can change the IP address for the connected R&S TSME6s directly via the R&S TSME Device Manager.

If necessary, the LAN adapter settings on the host PC must also be adapted accordingly to reconnect with the R&S TSME6 (see also Chapter 3.1.5.1, "Setting up the LAN connection to the host PC", on page 17). In particular, the host PC (LAN adapters) must use the subnet in which the IP addresses of the R&S TSME6s are located.

Define the IP address in the "Network Configuration" tab of the R&S TSME Device Manager. The currently active IP address for the selected R&S TSME6 is displayed for reference. It remains active until you select the "Accept Network Changes" button.

Auto IP Address

If "full auto-IP" mode is used, the "R&S TSME Device Manager" shows an extra field indicating the automatically generated IP address used for the connection to the host (see Figure 6-2 with example IP address: `169.254.233.79`).

In this case, the IP address stored in R&S TSME6 (here 192.168.0.2) is still used as an identifier for the connection by the software applications, i.e. a kind of virtual IP address.

If partial auto-IP mode or static IP mode is used, the "R&S TSME Device Manager" does not show this extra field and the IP address stored in the R&S TSME6 is also the IP address used for the physical connection (in this example: `192.168.0.2`)

Advanced settings

The "Advanced Settings" are only visible for devices with a PCI of the controller board < 06.00 (R&S TSMA6 and older versions of R&S TSME6). Use this functionality only if

you have connection problems or after consulting the R&S support, in all other cases use the default configuration.

Figure 6-2: Tab "Network Configuration"

Applying changes to the LAN configuration

Changes to the IP address configuration in the R&S TSME Device Manager are only applied when you select the "Accept Network Changes" button. The reconfigured R&S TSME6 is then accessible only via the new IP address.

6.1.3 Installing and managing software license keys - "Options"

All new devices are preconfigured and specified technology and band options are already installed. Only if you obtain additional software options later, you have to enable the options with the corresponding software license keys.

License keys are shipped as a printed "License Keys List". Advance deliveries consist of a PDF file. Unregistered software licenses can be downloaded from the Rohde & Schwarz website (https://extranet.rohde-schwarz.com/service). For details, see the "Installation instructions for options".

(Note: previously, license keys were shipped as .xml files.)

Prerequisites to install software license keys

To install a software license key, the following conditions must apply:

- PC/notebook is connected via Gbit LAN adapter, with "Jumbo Frames" (9 kB) enabled
- The (registered) software license key must be available

Software license keys are installed using the "R&S TSME Device Manager" ("Options" tab).
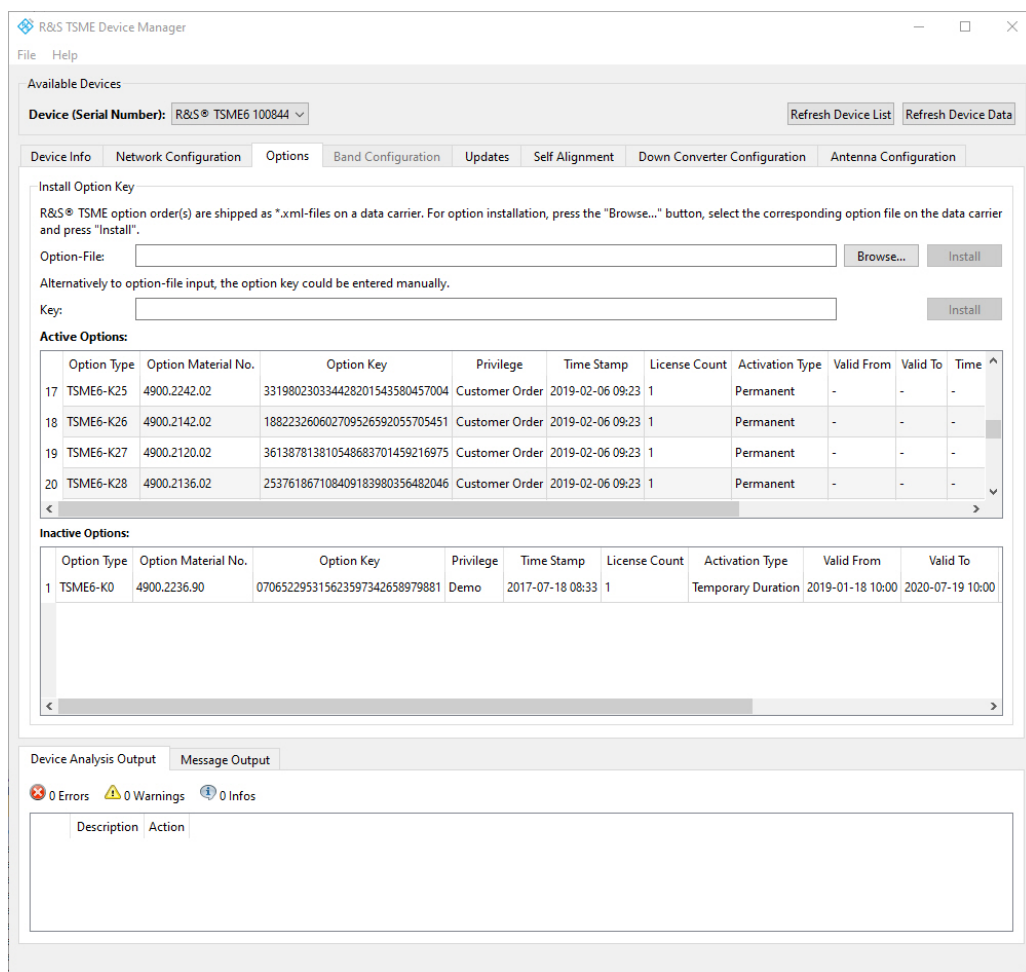
Figure 6-3: Tab "Options"

For each option, the following information is displayed:

ⓘ Information for options that are no longer valid because their expiry date has passed are listed as "Inactive Options".

To replace temporary by permanent software license keys, contact your Rohde & Schwarz sales representative.

Table 6-2: Software license key information

Label	Description
"Option Type"	Band or technology option name
"Option Material No."	Order number of the option
"Option key"	Software license key number
"Privilege"	Usage type (customer, services, demo)
"Time Stamp"	Time the software license key was installed
"License Count"	Number of times the (band upgrade) option is installed

Label	Description
"Activation Type"	Activation can be permanent or temporary
"Valid From"	Start of validity for temporary license
"Valid To"	End of validity for temporary license
"Time to Expiration"	Time left until license expires
"Option Index"	For internal use only
"Format ID"	For internal use only

Finding the software license key files

Previously, license keys were shipped as `.xml` files. This function is only available for compatibility reasons.

If you do not know the precise path and filename of the required software license key, you can browse through the host PC's file system directly from the "R&S TSME Device Manager", by selecting the "Browse" button in the "Options" tab.

Entering key codes

Enter the 30-digit keycode from the "License Keys List" in the "Key" field.

Alternatively, if available, copy the keycode from the supplied PDF license key file and paste it in the "Key" field.

To install the software license key on the currently selected R&S TSME6, select the "Install" button (see Figure 6-3).

Installing a software license key

The software license key for which you have entered the keycode in the R&S TSME Device Manager is installed on the currently selected R&S TSME6 when you select the "Install" button. It then appears in the "Active Options" list with its validity dates and other information (see Figure 6-3).

6.1.4 Configuring measurement bands - "Band Configuration"

Depending on which options are installed, various different bands and technologies can be scanned by the R&S TSME6.

ⓘ Before you can configure the measurement bands you must install all required software license keys, see Chapter 6.1.3, "Installing and managing software license keys - "Options"", on page 51.

The band configuration is stored permanently on the R&S TSME6.

ⓘ When using a R&S TSME6 with a limited number of measurement bands, you must consider the band configuration of the scanner when planning a measurement task.

The scanner provides only measurement results for those bands that are currently configured on the scanner.

Example:

An R&S TSME6 is configured with band option TSME-K2B (2 bands measured simultaneously). During the last measurement, the R&S TSME6 was used for measurements in 900 MHz and 1800 MHz bands. For the next measurement, the R&S TSME6 can still only be used in 900 MHz and 1800 MHz bands, unless you change the band configuration using the "R&S TSME Device Manager".

The band configuration is defined in the "Band Configuration" tab of the "R&S TSME Device Manager".

Select the bands that are to be scanned by the R&S TSME6 in the "Band Table". Which bands are available is independent of the installed *technology* options; all installed technologies can be scanned in all configured bands at the same time.

The *number* of bands available for selection depends on the installed band options.
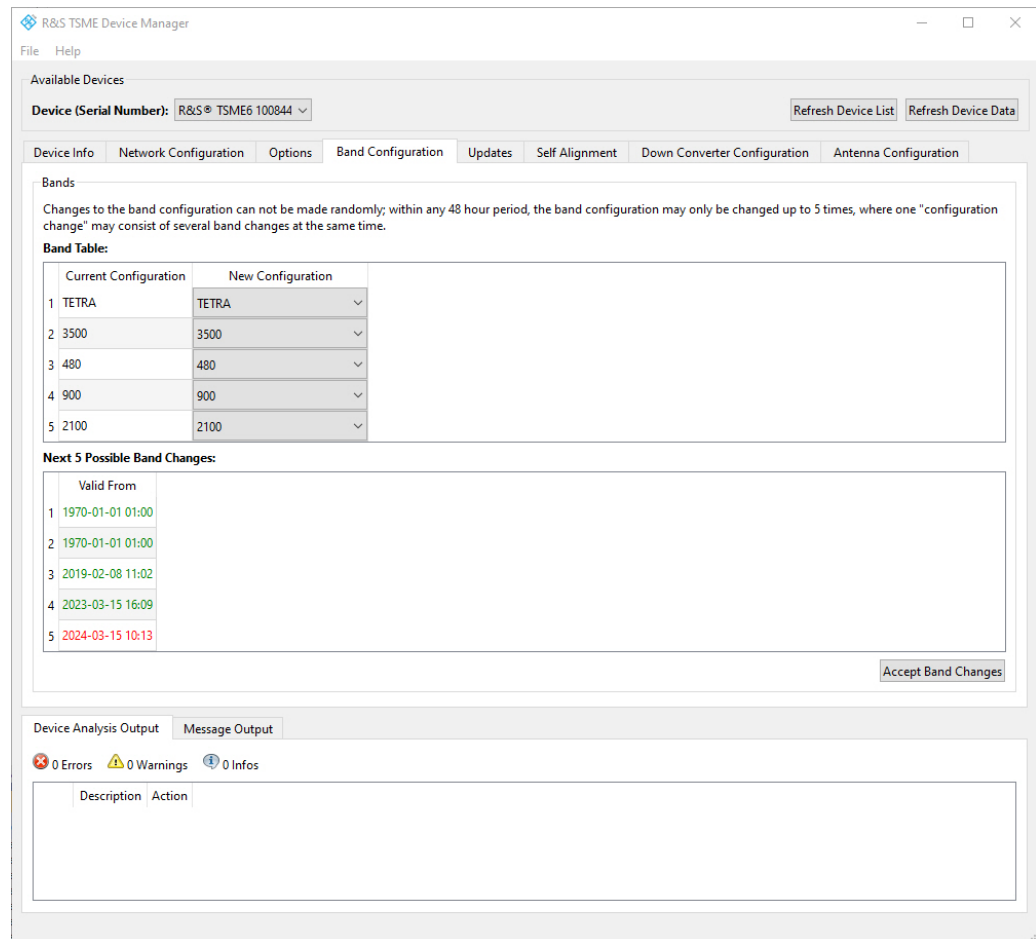
Figure 6-4: Tab "Band Configuration"

The current band configuration for the selected R&S TSME6 is displayed for reference. It remains active until you select the "Accept Band Changes" button.

Band configuration changes

Changes to the band configuration cannot be made randomly. Within any 48-hour period, you can change the band configuration only up to 5 times (where one "configuration change" may consist of several band changes at the same time, see "Applying band configuration changes" on page 55).

A counter is decremented after each (applied) change. How many changes have already been performed and how many are still possible within the current timeframe is displayed at the bottom of the "Band Configuration" tab of the "R&S TSME Device Manager".

Red dates indicate the changes recently made, while green dates indicate possible changes left.

Applying band configuration changes
Changes to the band configuration are only applied to the R&S TSME6 when you select the "Accept Band Changes" button in the "Band Configuration" tab of the "R&S TSME Device Manager".

Only then the counter for possible band changes (within 48 hours) is decremented.

6.1.5 Obtaining firmware and correction data updates - "Updates"

The "R&S TSME Device Manager" is always provided with the most recent basic FPGA (section 0). If a newer one becomes available due to security or functional issues, a message is indicated in the "Device Analysis Output" at the bottom of the "R&S TSME Device Manager" window. In this case, and only in this case, it is recommended that you install this update on your R&S TSME6.

Keep the correction data on your R&S TSME6 always up to date. Available updates are also indicated in the "Device Analysis Output" and it is recommended that you install them.

If an R&S TSME30DC/TSME44DC or an R&S TSMS53DC downconverter is correctly connected, the basic FPGA and correction data for the downconverter are also displayed in a second line.

Risk of inoperability of device due to FPGA update
Before performing an update, make sure that you have a stable power supply and a stable (no interruption) LAN connection. Both updates take a few minutes.

If the LAN connection is interrupted during an FPGA update, the device may become inoperable. Thus, only install such an update if it is explicitly recommended by a message in the "Device Analysis Output" of the "R&S TSME Device Manager" or by the Rohde & Schwarz support center.

You can update the basic FPGA or the correction data on your R&S TSME6 directly from the "R&S TSME Device Manager", in the "Update" tab. The currently installed versions and the newest supported version (of the FPGA) or the minimum recommended version (of the correction data) are indicated.
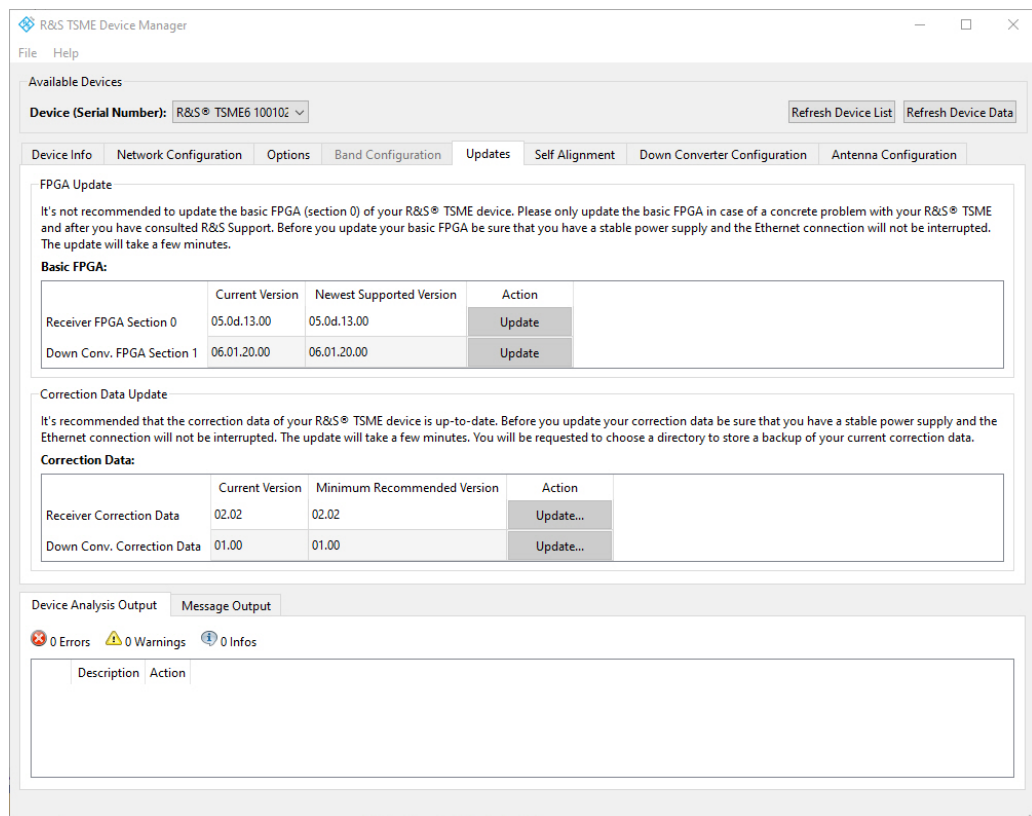
Figure 6-5: Tab "Updates"

To perform an update

1. In the "R&S TSME Device Manager", select the serial number of the R&S TSME6 which you want to update.

2. In the "Updates" tab, select the "Update" button for either the "Basic FPGA" or the "Correction Data".

   When updating the correction data, you are asked to select a directory to store a backup of your current correction data.

6.1.6 Aligning R&S TSME6 manually - "Self Alignment"

During self-alignment, the R&S TSME6 determines alignment values for the I/Q filter and the I/Q imbalance.
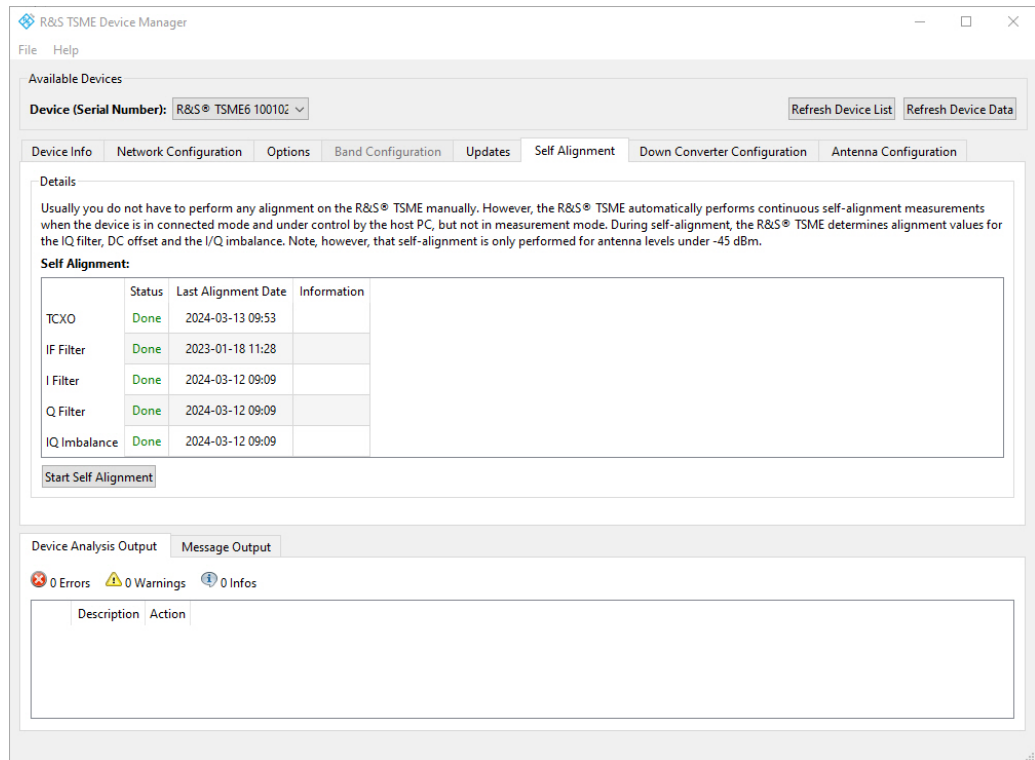
Figure 6-6: Tab "Self Alignment"

Start Self Alignment

To start the self-alignment manually, select the "Start Self Alignment" button in the "Self Alignment" tab of the "R&S TSME Device Manager".

6.1.7 Configuring downconverter R&S TSMExxDC/TSMS53DC - "Downconverter Configuration"

In this tab, you can configure the IF output receiver and the RF input antenna of the R&S TSMExxDC/TSMS53DC downconverter. For details, refer to the related downconverter manual.
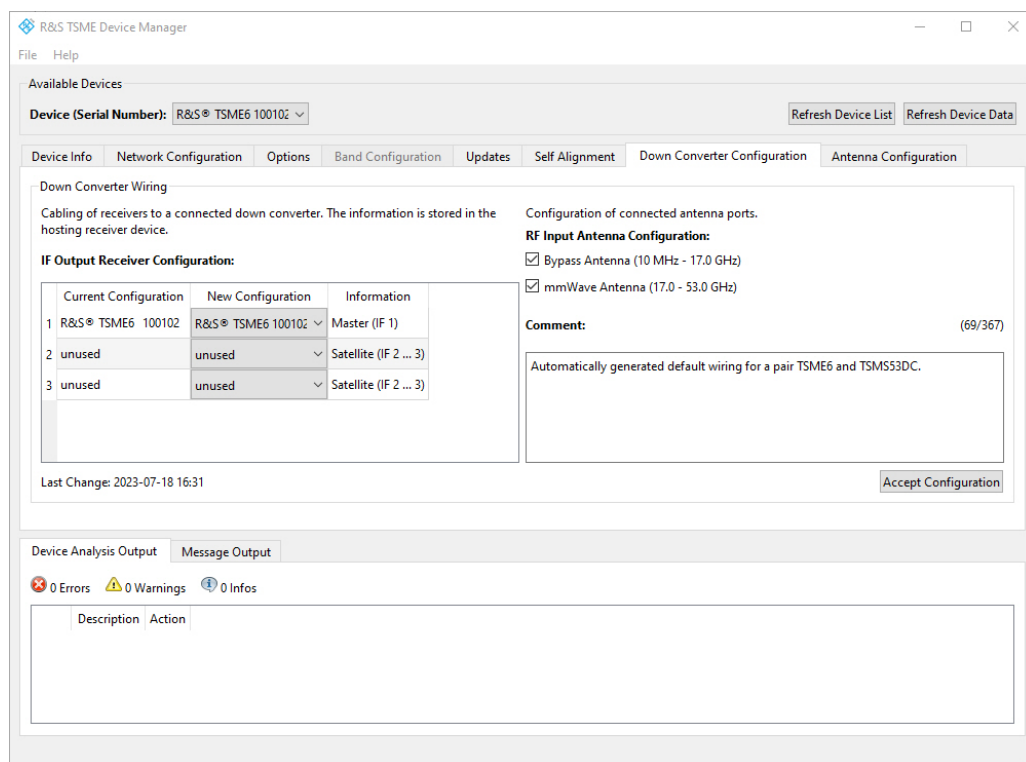
Figure 6-7: Tab "Downconverter Configuration"

IF Output Receiver Configuration
Specify the configuration of the IF output connectors of the R&S TSMExxDC/
TSMS53DC.

RF Input Antenna Configuration
- Specify the configuration of the RF input antenna connectors of the R&S
  TSME30DC.
    - "Bypass Antenna (< 6 GHz)"
    - "mmWave Antenna 1 (24 GHz to 27.5 GHz)"
    - "mmWave Antenna 2 (27 GHz to 30 GHz)"

  For R&S ViCom and ROMES, the API allows only the configuration of frequencies
  of activated antenna ports.
  NOTE: For the overlapping frequency range 27 GHz to 27.5 GHz, the "mmWave
  Antenna 1" is used by default.
- Specify the configuration of the RF input antenna connectors of the R&S
  TSME44DC.
    - "Bypass Antenna (< 6 GHz)"
    - "mmWave Antenna 1 (24 GHz to 44 GHz)"

  ForR&S ViCom and ROMES, the API allows only the configuration of frequencies
  of activated antenna ports.
- Specify the configuration of the RF input antenna connectors of the R&S
  TSMS53DCDC.
    - "Bypass Antenna (10 MHz to 17 GHz)"
    - "mmWave Antenna 1 (17 GHz to 53 GHz)"

ForR&S ViCom and ROMES, the API allows only the configuration of frequencies of activated antenna ports.

Accept Configuration
To confirm the current configuration settings, select the "Accept Configuration" button.

6.1.8 Configuring antenna properties - "Antenna Configuration"

In this tab, you can configure the individual antenna properties. These configuration values are saved in the measurement files and can be displayed in the related application user interfaces.
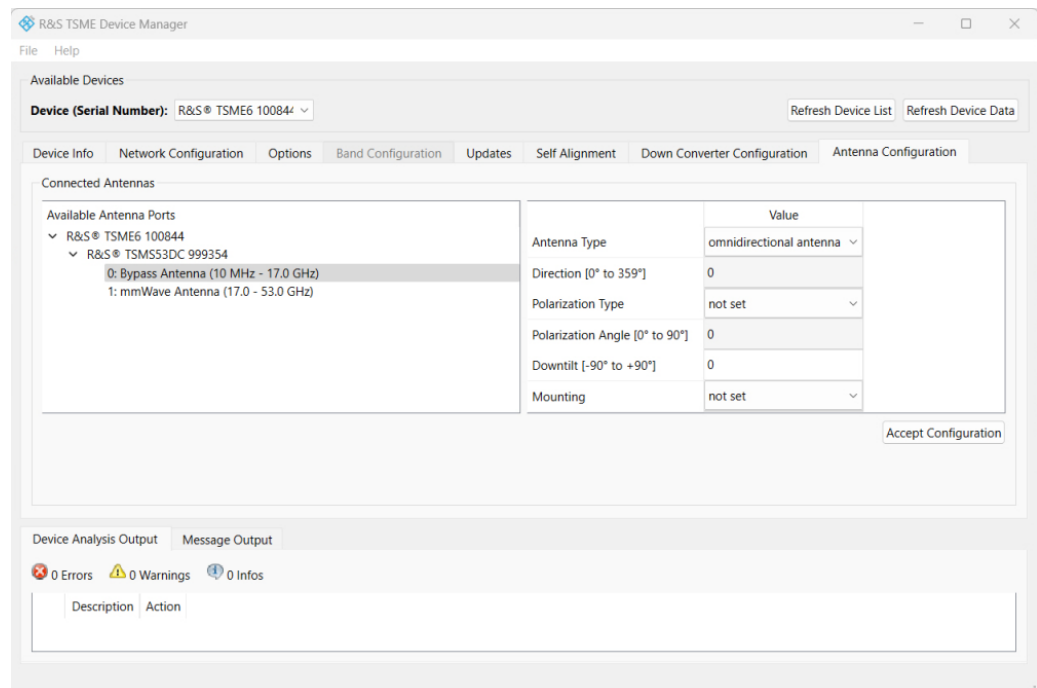
Available Antenna Ports
Displays the available antenna ports of the device.

Antenna Type
This setting defines the antenna type.

"not set"	The antenna type is not specified.
"omnidirectional antenna"	Specifies an omnidirectional antenna.
"directed antenna"	Specifies a directed antenna. For downtilt, see "Downtilt [-90° to +90°]" on page 60.

Direction [0° to 359°]
This setting defines the antenna direction.

If the antenna mounting is fixed, the direction is absolute defined as follows.

"0°"	North
"90°"	East
"180°"	South
"270°"	West

If the antenna mounting is motion direction, the direction is clockwise defined as follows.

"0°"	in driving direction (heading)
"90°"	to the right side
"180°"	backwards
"270°"	to the left side

Polarization Type
Displays the antenna polarization type.

"not set"	The polarization type is not specified.
"linear polarized"	The antenna polarization is linear.
"circular polarized"	The antenna polarization is circular.
"elliptical polarized"	The antenna polarization is elliptical.

Polarization Angle [0° to 90°]
This setting is used for linear polarized antennas.

"0°"	Horizontal
"90°"	Vertical

Downtilt [-90° to +90°]
This setting is used for directed antennas.

"0°"	The antenna is not tilted and looks horizontal.
">0°"	The antenna is tilted to the ground.
"<0°"	The antenna is directed to heaven.

Mounting
This setting describes the antenna mounting.

"not set"	The antenna mounting is not specified.
"fixed"	The antenna is fixed for the measurement. The direction is measured from True North (0°) towards East (90 °).
"motion direction"	The antenna is mounted in motion direction. For horizontal motion, add the motion angle in the horizontal plane on the ground, measured from True North (0°) towards East (90 °) with the antenna direction to get the current antenna direction in the horizontal plane.

6.2   Interacting with ROMES, R&S NESTOR, and R&S ViCom

Measurements are performed on the R&S TSME6 via theROMES, R&S NESTOR, or R&S ViCom interface. Depending on the installed technology options, the network is either scanned for individual standards, or globally over all frequency bands.

The following sections briefly describe the basic requirements for interaction between the R&S TSME6 and the ROMES, R&S NESTOR, or R&S ViCom interface. For details on using these interfaces see the ROMES, R&S NESTOR, and R&S ViCom manuals.

6.2.1   Interacting with ROMES

Prerequisites

For measurements with the ROMES application, the following prerequisites apply:

ⓘ   For details on ROMES, see the manual provided on the software DVD.

- ROMES installation (refer to ROMES manual)
- ROMES option on dongle inserted (refer to ROMES manual)
- Required technology options installed on the R&S TSME6 (see Chapter 6.1.3, "Installing and managing software license keys - "Options"", on page 51).
- Software options installed on the host PC (see information on the ROMES product page on the Rohde & Schwarz website: https://www.rohde-schwarz.com/product/ROMES > "Options")

After the R&S TSME6 has finished booting, start the ROMES software application.

Automatic firmware updates

Each time ROMES is started, the software automatically compares the firmware version of the connected R&S TSME6 with the version currently available on the host PC. If a newer version is available, it is copied to and installed on the R&S TSME6.

Up to three previously installed firmware versions are stored as backups and maintained on the R&S TSME6 (see also Chapter 6.1.1, "Obtaining device information - "Device Info"", on page 47). Thus, it is not necessary to perform firmware updates on the R&S TSME6 manually.

6.2.2 Interacting with R&S NESTOR

Prerequisites

For measurements with the R&S NESTOR application, the following prerequisites apply:

ⓘ For details on R&S NESTOR, see the user manual.

- R&S NESTOR installation on the host PC (refer to the R&S NESTOR manual)
- R&S NESTOR option on dongle inserted in host PC (refer to the R&S NESTOR manual)
- LAN connection between the R&S TSME6 and the host PC (note the special LAN adapter requirements specified in "Configuring the LAN interface on the host PC" on page 19)
- Required technology options installed on the R&S TSME6 (see Chapter 6.1.3, "Installing and managing software license keys - "Options"", on page 51)
- Software options installed on the host PC (see information on the R&S NESTOR product page on the Rohde & Schwarz website: https://www.rohde-schwarz.com/product/NESTOR > "Options")
  In particular, R&S NESTOR-SCN 1521.5031.xx (R&S scanner driver) is always required to operate the R&S TSME6.

After the R&S TSME6 has finished booting, start the R&S NESTOR software application.

Automatic firmware updates

Each time R&S NESTOR is started, the software automatically compares the firmware version of the connected R&S TSME6 with the version currently available on the host PC. If a newer version is available, it is copied to and installed on the R&S TSME6.

Up to three previously installed firmware versions are stored as backups and maintained on the R&S TSME6 (see also Chapter 6.1.1, "Obtaining device information - "Device Info"", on page 47). Thus, it is not necessary to perform firmware updates on the R&S TSME6 manually.

6.2.3 Interacting with R&S ViCom

R&S ViCom interface is a software package to develop software applications, which integrate the R&S TSME6 as an OEM product into customer software.

ⓘ The R&S ViCom package is not part of the shipment.
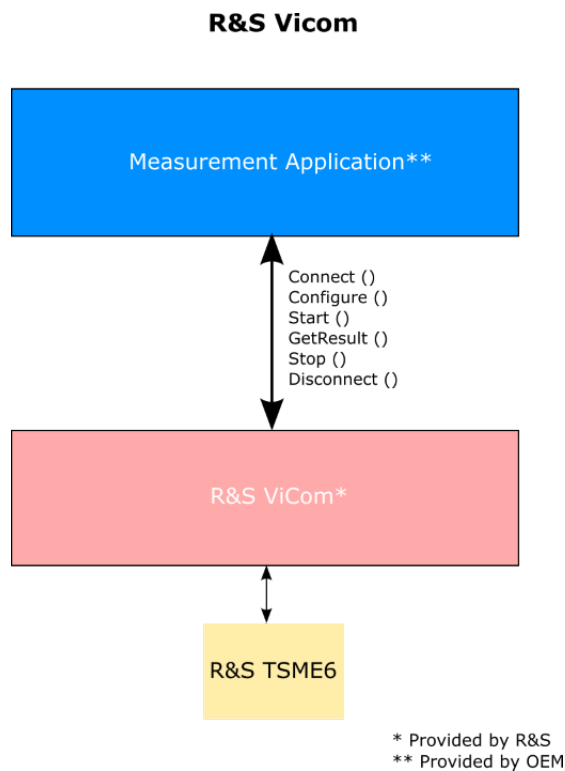
R&S Vicom

Figure 6-8: R&S ViCom architecture

Install the R&S ViCom package on the host PC. It includes documentation and sample applications.

ⓘ **Scanner options**

To interact with the R&S TSME6 via the R&S ViCom interface, the corresponding scanner options must be installed on the device.

Open the R&S TSME Device Manager to see which scanner options are installed on the device (see Chapter 6.1.3, "Installing and managing software license keys - "Options"", on page 51).

For details and information on how to configure the R&S ViCom interface and carry out measurements with the R&S TSME6, refer to the R&S ViCom manual.

7 Troubleshooting

If errors occur during operation or connection of the R&S TSME6, the following information helps you solve the issue.

ⓘ Most errors occurring during measurements with the R&S TSME6 are indicated in the host PC software (e.g. ROMES, R&S NESTOR, or the R&S ViCom application). Solve these errors within the software. This chapter refers only to errors that occur directly on the R&S TSME6.

In case measurement problems occur with the R&S TSME6, check the "Device Analysis Output" table in the R&S TSME Device Manager for any errors that have been detected at a first measure (see "Device Analysis Output" on page 50). If available, a repair function is provided.

7.1 Guide to solve instrument connection problems

The following section describes the steps how to check the LAN connection to the instrument.

Hardware check

Check the LEDs of the LAN connector.

If LAN LED1 (left side) is blinking green and LAN LED2 (right side) is permanently yellow, the physical connection is established.

In this case, continue with the software check (see "Software check" on page 64), otherwise run the following checks.

● R&S TSME6 powered and switched on (power LED must be green)?
● The ends of the LAN cable are plugged into R&S TSME6 and host PC or LAN switch?
● If a LAN switch is used: LAN switch powered?
● LAN adapter enabled at the host PC? Check the device manager of the host PC.

If the R&S TSME6 does not show normal function after these measures, contact R&S support.

Software check

If the hardware check was successful, run the following checks.

● Is a fixed IP address used? *
● Application using R&S TSME6 is running as administrator? **
● Is the IP address of the host PC in the same subnet as the R&S TSME6?
● Is the IP address of the R&S TSME6 unique?

- Jumbo Frames (9 kB) supported (see "Does the host provide a Gbit LAN connector and support 9k jumbo frames?" on page 65)?
- Max. 5 R&S TSME6 devices connected to one adapter?
- USB2LAN realized via USB3.0 (see "Are you using a USB2LAN adapter?" on page 66)?
- Firewall settings: Application permitted access?

If the R&S TSME6 does not show normal function after these measures, contact R&S support.

(i) **Remarks to the software checks**

For "full auto-IP" and "partial auto-IP" mode, the following hints are valid:

- R&S TSME6 IP addresses are unique and physically in the network range (169.254.0.0 netmask 255.255.0.0).
- In "full auto-IP" mode, the user has no control on the IP addresses physically used.

** If the application using R&S TSME6 is not running as administrator, the following problems are possible:

- The static ARP table conflicts with the dynamic configuration of R&S TSME6. Clean up the ARP table or run the application as administrator to verify if the configuration is working.
- The host (respectively R&S TSME6) is not able to send and receive a multicast frame to IP address 239.192.1.5 port 16962.

The following information provides further solutions to frequent connection problems.

Does the host provide a Gbit LAN connector and support 9k jumbo frames?

Sometimes the Windows network adapter properties show that 9k is enabled, but in fact the adapter does not support the setting. You can check this using this command:

```
netsh interface ipv4 show interfaces
```

The "MTU" value in each line indicates the maximum transmission unit. Make sure the LAN adapter connected to the R&S TSME6 supports an MTU larger than 9000.

If the 9k jumbo frames cannot be enabled in the Windows dialog box, try the following command:

```
netsh interface ipv4 set subinterface [Idx] mtu=9000
store=persistent
```

`[Idx]` is the network ID of the LAN adapter.

For more information on the required settings, see step 9.

Some drivers use the minimum MTU value set between IPv4 and IPv6, even if only IPv4 is used. It is possible when some third-party tools are installed on the PC (e.g. proxy, firewall). In this case, verify and apply the MTU setting for IPv6 too.

The commands to check and fix the MTU values for IPv6 are respectively:

```
netsh interface ipv6 show interfaces
```

```
netsh interface ipv6 set subinterface [Idx] mtu=9000
store=persistent
```

`[Idx]` is the network ID of the LAN adapter.

Are you using a USB2LAN adapter?

Consider using an R&S TSPC-U2L adapter, order no. 3593.8430.02.

Is the R&S TSME6 connected to the host PC properly?

Currently the R&S TSME6 does not answer to ICMP echo requests (PING). However, for ViCom users, the "TsmePing" tool is available after installation of R&S ViCom (`C:\RuS\ViCom_19.3\tools\TSME\TsmePing.exe`). This tool is part of the "R&S TsmeTools".

Is the PC configured to use the subnet 192.168.0.0 with a different IP address to the R&S TSME6 (default 192.168.0.2)?

(See also "Configuring the LAN interface on the host PC" on page 19.)

Are other applications trying to access the R&S TSME6 at the same time (e.g. ROMES, R&S NESTOR, R&S ViCom, R&S TSME Device Manager)?

Check the Windows Task manager and look for associated processes. If necessary, stop the processes.

Is the host using other network connections at the same time, such as VPN?

R&S TSME6 does not work when the PC is connected to VPN.

Is the connecting cable between the host and the R&S TSME6 the one provided with the R&S TSME6?

Make sure you are using a quality CAT5e or better Gigabit Ethernet conform cable. Use shielded RJ-45 connectors, not plastic.

After switching the R&S TSME6 off and back on, is the power LED on the R&S TSME6 blinking while the state LED is off?

It indicates that the R&S TSME6 cannot boot. Contact Rohde & Schwarz support center.

7.2 Solving other miscellaneous problems

In case measurement problems occur with the R&S TSME6, check the "Device Analysis Output" table in the "R&S TSME Device Manager" for any errors that have been detected as a first measure (see Chapter 6.1.1, "Obtaining device information - "Device Info"", on page 47).

Problem: ROMES does not detect the R&S TSME6
Possible solutions:
● Restart ROMES, while the R&S TSME6 is connected and switched on.
● Restart the PC and then start ROMES, while the R&S TSME6 is connected and switched on.
● If there is no success, try to connect with "R&S TSME Device Manager" to see details.

If you switch the instruments off and on again, be sure to switch on the R&S TSME6 before you start ROMES.

Problem: The R&S TSME Device Manager does not detect the R&S TSME6
Solution:

Be sure you have administrator rights on the host PC running the "R&S TSME Device Manager".

Problem: The options in the R&S TSME Device Manager are lost
Solution:

Contact the Rohde & Schwarz support center.

Problem: Error message: "No calibration data"
Solution:

Delete the `TSME6_ID_4900.0004K02-XXXXXX.cal` file in the application directory (e.g.
`C:\Program Files (x86)\Rohde-Schwarz\ROMES4.78 or C:\RuS\`
`ViCom_19.3\bin`) where `XXXXXX` is the serial number of the R&S TSME6.

Problem: R&S TSME6 does not provide measurement data
Solution:

Delete the `TSME6_ID_4900.0004K02-XXXXXX.cal` file in the application directory (e.g. `C:\Program Files (x86)\Rohde-Schwarz\ROMES4.78` or `C:\RuS\ViCom_19.3\bin`) where `XXXXXX` is the serial number of the R&S TSME6.

Problem: Instrument shuts down at lower temperature than expected
By default, the instrument is set to shut down when it reaches a temperature of 85° C to prevent damage.

In rare occasions, it shut down at a lower temperature. Check the "Device Analysis Output" in the "R&S TSME Device Manager" for a message and a repair function, if available.

Problem: Ethernet negotiation between PC and TSME/TSME6 is not successful with an Intel network chip
If PC and R&S TSME6 / R&S TSME are both powered on and physically connected with a LAN cable, and the LAN LED 2 of the device (see Table 3-5) does not reach its yellow state after a few seconds, and/or no connection is visible on the PC side, this may be due to the following setting enabled in Intel's Ethernet driver:

"Ultra Low Power Mode"
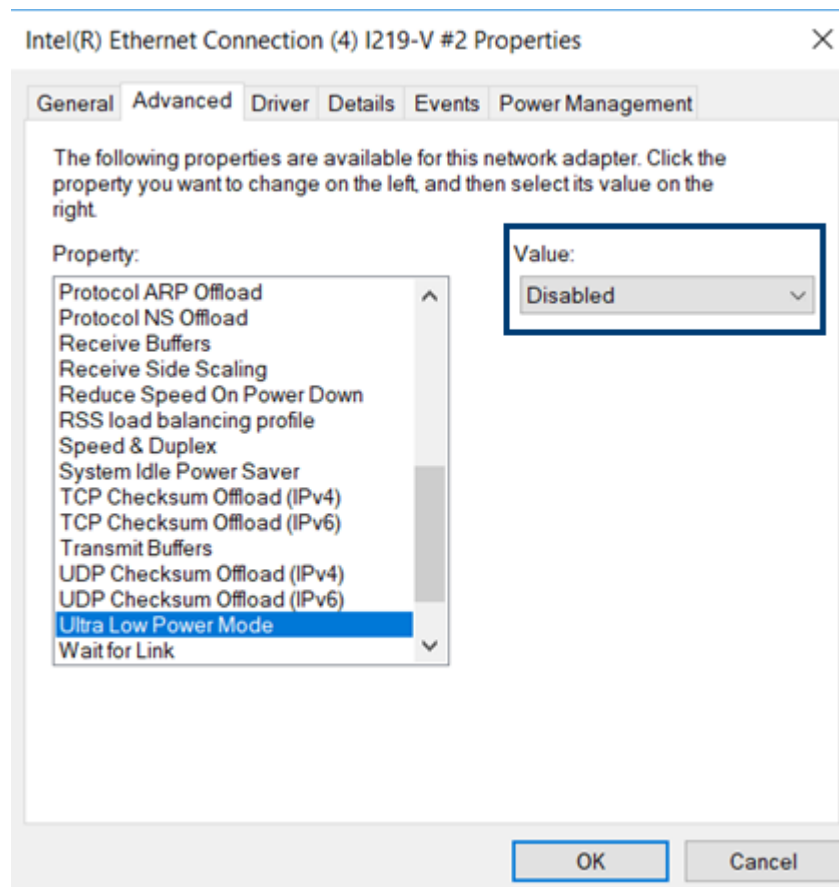
Disabling this setting resolves the issue.

Problem: Sporadic issues during Ethernet negotiation between PC and R&S TSME6 with some USB-LAN adapters using a Realtek RTL8153 network chip
If PC and R&S TSME6 are both powered on and physically connected with a LAN cable, and the LAN LED 2 of the device (see Table 3-5) does not reach its yellow state after a few seconds, and/or no connection is visible on the PC side, and this event occurs sporadically, this may be due to an issue with the USB-LAN adapter not always completing Ethernet negotiation successfully.

Usually, forcing a new Ethernet negotiation is enough to solve the issue (e.g. by unplugging and plugging again the Ethernet cable). A workaround for this issue is implemented in R&S TSME6's firmware since version 05.06.10.00, it is recommended to use this version or a newer one.

Problem: Sporadic issues with R&S TSME6 not responding to connect attempts from PC after Ethernet negotiation is completed when using a USB LAN adapter based on a microchip LAN7800 network chip
If the PC and R&S TSME6 are both powered on and physically connected with a LAN cable, and the LAN LED 2 of the device (see Table 3-5) has reached its yellow state after a few seconds, and no connection to R&S TSME6 is possible, and this event occurs sporadically, this may be due to an issue with the sending path from the USB-LAN adapter to R&S TSME6.

Usually, forcing a new Ethernet negotiation is enough to solve the issue (e.g. by unplugging and plugging again the Ethernet cable). A workaround for this issue is implemented in R&S TSME6s firmware since version 05.08.10.00. This workaround also requires an up-to-date software release (R&S ViCom 21.0 or newer, ROMES or newer).

Problem: Unable to connect to R&S TSME6 when using a PCIe Network card using a network chip from Realtek

Sometimes a PC is properly configured to communicate with R&S TSME6 and no connection is possible. A possible reason is an issue with default drivers available in Windows 10 for the network card not setting the MTU value correctly. Updating the driver solves the issue.

Problem: Sporadic connection issues when using firmware 05.08.10.00 or newer version

Sometimes the PC is not able to connect to R&S TSME6 (firmware 05.08.10.00). A possible reason is an old software release which is not compatible with the implemented workaround starting from this firmware version. The workaround is available starting from R&S ViCom 21.0 or ROMES 21.1.

This issue rarely happens on a system, the worst case to trigger it is to use a single R&S TSME6 connected to PC using an unmanaged network switch. If compatibility with an older software stack is mandatory, try one of the following solutions:

● Connect PC directly to R&S TSME6. It drastically reduces the probability to trigger this issue.
● Connect a second active R&S TSME/TSME6 to the network switch.

Problem: Sporadic network issues

If there are sporadic network issues, disable the "Flow Control" in the network adapter settings.
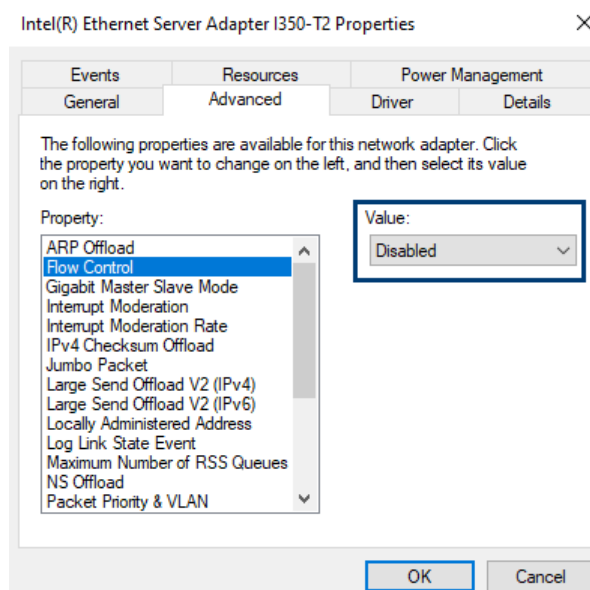
7.3 Contacting customer support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:

Figure 7-1: QR code to the Rohde & Schwarz support page

8 Transporting

Packing

Use the original packaging material. It consists of antistatic wrap for electrostatic protection and packing material designed for the product.

If you do not have the original packaging, use similar materials that provide the same level of protection. You can also contact your local Rohde & Schwarz service center for advice.

Securing

When moving the product in a vehicle or using transporting equipment, make sure that the product is properly secured. Only use items intended for securing objects.

Transport altitude

The maximum transport altitude without pressure compensation is 4500 m above sea level.

9 Maintenance, storage and disposal

The product does not require regular maintenance. It only requires occasional cleaning. It is however advisable to check the nominal data from time to time.

9.1 Cleaning

Do not use any liquids for cleaning. Cleaning agents, solvents (thinners, acetone), acids and bases can damage the front panel labeling, plastic parts and display.

9.2 Storage

Protect the product against dust. Ensure that the environmental conditions, e.g. temperature range and climatic load, meet the values specified in the specifications document.

9.3 Disposal

Rohde & Schwarz is committed to making careful, ecologically sound use of natural resources and minimizing the environmental footprint of our products. Help us by disposing of waste in a way that causes minimum environmental impact.

Disposing of electrical and electronic equipment

A product that is labeled as follows cannot be disposed of in normal household waste after it has come to the end of its life. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Figure 9-1: Labeling in line with EU directive WEEE

Rohde & Schwarz has developed a disposal concept for the eco-friendly disposal or recycling of waste material. As a manufacturer, Rohde & Schwarz completely fulfills its obligation to take back and dispose of electrical and electronic waste. Contact your local service representative to dispose of the product.

Annex

A Available cellular bands

The following cellular bands are available for selection for R&S TSME6s with a limited band option (see Chapter 4, "Option concept", on page 39).

Table A-1: Available cellular bands for the R&S TSME6

ID	TSME band	Span	Start [MHz]	Stop [MHz]
1	"TETRA"	span 1	375	435
		span 2	445	475
		span 3	865	881
		span 4	910	926
2	"CDMA 400"	span 1	410	493
3	"480"	span 1	478	486
		span 2	488	496
4	"700"	span 1	698	862
5	"810"	span 1	806	821
		span 2	851	866
6	"850"	span 1	806	940
7	"900"	span 1	917	960
		span 2	872	915
8	"1400"	span 1	1427	1496
9	"PDC Japan"	span 1	1447	1463
		span 2	1495	1511
10	"1500/1600"	span 1	1626	1661
		span 2	1525	1559
11	"AWS"	span 1	1710	1780
		span 2	2110	2200
12	"1700"	span 1	1749	1785
		span 2	1840	1880
		span 3	1695	1710
		span 4	1995	2020
13	"1800"	span 1	1710	1785
		span 2	1805	1880
14	"1900"	span 1	1850	1915

ID	TSME band	Span	Start [MHz]	Stop [MHz]
		span 2	1930	1995
15	"2100"	span 1	1920	2010
		span 2	2110	2200
16	"S-Band"	span 1	2000	2020
		span 2	2180	2200
17	"2600"	span 1	2496	2690
18	"3500"	span 1	3410	3490
		span 2	3510	3590
19	"WiMAX 7.x"	span 1	730	770
		span 2	890	903
		span 3	915	950
20	"WiMAX 8.A/TDD 1900/2000"	span 1	1785	1805
		span 2	1880	1930
		span 3	2010	2025
21	"TDD 1800"	span 1	1800	1830
22	"TDD 1930"	span 1	1930	1990
23	"TDD 2300"	span 1	2300	2400
24	"TDD 3300"	span 1	3300	3400
25	"TDD 3400"	span 1	3400	3600
26	"TDD 3600"	span 1	3600	3800
27	"5000"	span 1	5150	5925
28	"ISM-Band"	span 1	433	435
		span 2	2400	2500
29	"600"	span 1	617	698

Table A-2: Additional information on cellular bands

ID	Band name	Included standardized bands	UL low	UL high	DL low	DL high	Duplex
1	**"TETRA"**	T-GSM 380	380.2	389.8	390.2	399.8	FDD
		T-GSM 410	410.2	419.8	420.2	429.8	FDD
		GSM 450	450.4	457.6	460.4	467.6	FDD
		TETRA 380 to 400	380	390	390	400	FDD
		TETRA 410 to 430	410	420	420	430	FDD
		TETRA 450 to 470	450	460	460	470	FDD
		TETRA 900	870	876	915	921	FDD

ID	Band name	Included standardized bands	UL low	UL high	DL low	DL high	Duplex
		LTE band 31	452.5	457.5	462.5	467.5	FDD
2	"CDMA 400"	CDMA2000/EV-DO band class 11 (400 MHz European PAMR Band)	410	483	420	493	FDD
		CDMA2000/EV-DO band class 5 (450 MHz band)	410	483	420	493	FDD
3	"480"	GSM 480	478.8	486	488.8	496	FDD
4	"700"	WiMAX 7.A	698	862	698	862	TDD
		CDMA2000/EV-DO band class 19 (Lower 700 MHz band)	698	716	728	746	FDD
		LTE band 12 (lower 700 A/B/C)	699	716	729	746	FDD
		3GPP WCDMA XII	699	716	729	746	FDD
		LTE band 17 (lower 700 B)	704	716	734	746	FDD
		GSM 710	698	716	728	746	FDD
		LTE band 44 TDD	703	803	703	803	TDD
		CDMA2000/EV-DO band class 7 (Upper 700 MHz band)	776	788	746	758	FDD
		Band 13 (upper 700 C)	777	787	746	756	FDD
		WiMAX 7.B	776	787	746	757	FDD
		3GPP WCDMA XIII	777	787	746	756	FDD
		CDMA2000/EV-DO band class 18 (700 MHz Public Safety Band)	787	799	757	769	FDD
		LTE band 14 (upper 700 D)	788	798	758	768	FDD
		3GPP WCDMA XIV	788	798	758	768	FDD
		WiMAX 7.C	788	798	758	768	FDD
		WiMAX 7.D	788	798	758	768	FDD
		GSM 750	777	793	747	763	FDD
		LTE band 28 (700 APT)	703	748	758	803	FDD
		LTE band 20	832	862	791	821	FDD
		3GPP WCDMA XX	832	862	791	821	FDD
		LTE band 29	N/A	N/A	717	728	FDD
		LTE band 68	698	728	753	783	FDD
		LTE band 67	N/A	N/A	738	758	FDD
5	"810"	T-GSM 810	806	821	851	866	FDD
6	"850"	GSM 850	824	849	869	894	FDD
		3GPP WCDMA V	824	849	869	894	FDD
		LTE band 5	824	849	869	894	FDD

ID	Band name	Included standardized bands	UL low	UL high	DL low	DL high	Duplex
		LTE band 26	814	849	859	894	FDD
		LTE band 18	815	830	860	875	FDD
		CDMA2000/EV-DO band class 0 (800 MHz band)	815	849	860	894	FDD
		CDMA2000/EV-DO band class 10 (Secondary 800 MHz band)	806	901	851	940	FDD
		CDMA2000/EV-DO band class 12 (800 MHz PAMR band)	870	876	915	921	FDD
		3GPP WCDMA VI	830	840	875	885	FDD
		3GPP WCDMA XIX	830	845	875	890	FDD
		3GPP WCDMA XXVI	814	849	859	894	FDD
		LTE band 27	807	824	852	869	FDD
		LTE band 6	830	840	875	885	FDD
		LTE band 19	830	845	875	890	FDD
		TETRA 900	870	876	915	921	FDD
		CDMA2000/EV-DO band class 3 (JTACS band)	887	925	832	870	FDD
7	"900"	P-GSM 900	890	915	935	960	FDD
		E-GSM 900 (includes P-GSM 900)	880	915	925	960	FDD
		R-GSM 900 (includes E-GSM 900)	876	915	921	960	FDD
		3GPP WCDMA VIII	880	915	925	960	FDD
		LTE band 8	880	915	925	960	FDD
		WiMAX 7.G	880	915	925	960	FDD
		CDMA2000/EV-DO band class 9 (900 MHz band)	880	915	925	960	FDD
		CDMA2000/EV-DO band class 2 (TACS band)	872	915	917	960	FDD
8	"1400"	3GPP WCDMA XI	1427.9	1447.9	1475.9	1495.9	FDD
		LTE band 11	1427.9	1447.9	1475.9	1495.9	FDD
		LTE band 32	N/A	N/A	1452	1496	FDD
		LTE band 45	1447	1467	1447	1467	TDD
		3GPP WCDMA band XXXII	N/A	N/A	1452	1496	FDD
9	"PDC Japan"	3GPP WCDMA XXI	1447.9	1462.9	1495.9	1510.9	FDD
		LTE band 21	1447.9	1462.9	1495.9	1510.9	FDD
10	"1500/1600"	CDMA2000/EV-DO band class 20 (L-band)	1626	1660	1525	1559	FDD

ID	Band name	Included standardized bands	UL low	UL high	DL low	DL high	Duplex
		LTE band 24	1626.5	1660.5	1525	1559	FDD
11	"AWS"	3GPP WCDMA IV	1710	1755	2110	2155	FDD
		3GPP WCDMA X	1710	1770	2110	2170	FDD
		LTE band 4	1710	1755	2110	2155	FDD
		LTE band 10	1710	1770	2110	2170	FDD
		CDMA2000/EV-DO band class 15 (AWS band)	1710	1755	2110	2155	FDD
		WiMAX 6.A	1710	1770	2110	2170	FDD
		LTE band 66	1710	1780	2110	2200	FDD
12	"1700"	3GPP WCDMA IX	1749.9	1784.9	1844.9	1879.9	FDD
		LTE band 9 (UMTS1700)	1749.9	1784.9	1844.9	1879.9	FDD
		CDMA2000/EV-DO band class 4 (Korean PCS band)	1750	1780	1840	1870	FDD
		LTE band 70	1695	1710	1995	2020	FDD
13	"1800"	DCS 1800	1710	1785	1805	1880	FDD
		3GPP WCDMA III	1710	1785	1805	1880	FDD
		LTE band 3	1710	1785	1805	1880	FDD
		CDMA2000/EV-DO band class 8 (1800 MHz band)	1710	1785	1805	1880	FDD
		WiMAX 6.C	1710	1785	1805	1880	FDD
14	"1900"	PCS 1900	1850	1910	1930	1990	FDD
		3GPP WCDMA II	1850	1910	1930	1990	FDD
		3GPP WCDMA XXV	1850	1915	1930	1995	FDD
		3GPP TDD incl. TD-SCDMA b	1850	1910	1930	1990	TDD
		LTE band 2	1850	1910	1930	1990	FDD
		LTE band 35 TDD	1850	1910	1850	1910	TDD
		CDMA2000/EV-DO band class 1 (1900 MHz band)	1850	1910	1930	1990	FDD
		CDMA2000/EV-DO band class 14 (US PCS 1.9 GHz band)	1850	1915	1930	1995	FDD
		LTE band 25 (PCS A-G superset of band 2)	1850	1915	1930	1995	FDD
15	"2100"	3GPP WCDMA I	1920	1980	2110	2170	FDD
		LTE band 1	1920	1980	2110	2170	FDD
		CDMA2000/EV-DO band class 6 (2 GHz IMT2000 band)	1920	1980	2110	2170	FDD

ID	Band name	Included standardized bands	UL low	UL high	DL low	DL high	Duplex
		WiMAX 6.B	1920	1980	2110	2170	FDD
		LTE band 65	1920	2010	2110	2200	FDD
16	"S-Band"	LTE band 23	2000	2020	2180	2200	FDD
		CDMA2000/EV-DO band class 21 (S-band)	2000	2020	2180	2200	FDD
17	"2600"	LTE band 7	2500	2570	2620	2690	FDD
		CDMA2000/EV-DO band class 13 (25 GHz IMT-2000 Extension band)	2500	2570	2620	2690	FDD
		3GPP WCDMA VII	2500	2570	2620	2690	FDD
		CDMA2000/EV-DO band class 16 (US 2.5 GHz band)	2502	2568	2624	2690	FDD
		CDMA2000/EV-DO band class 17 (US 2.5 GHz Forward Link Only band)			2624	2690	FDD (DL only)
		LTE band 41 TDD	2496	2690	2496	2690	TDD
		WiMAX 3.A	2496	2690	2496	2690	TDD
		WiMAX 3.B	2496	2572	2614	2690	FDD
		LTE band 38 TDD	2570	2620	2570	2620	TDD
		3GPP TDD incl. TD-SCDMA d	2570	2620	2570	2620	TDD
		LTE band 69	N/A	N/A	2570	2620	FDD
18	"3500"	3GPP WCDMA XXII	3410	3490	3510	3590	FDD
		LTE band 22	3410	3490	3510	3590	FDD
19	"WiMAX 7.x"	7.x* lower	730	770	730	770	TDD
		7.x* mid	890	903	890	903	TDD
		7.x* higher	915	950	915	950	TDD
20	"WiMAX 8.A/TDD 1900/2000"	WiMAX 8.A lower	1785	1805	1785	1805	TDD
		WiMAX 8.A mid	1880	1930	1880	1930	TDD
		WiMAX 8.A upper	2010	2025	2010	2025	TDD
		3GPP TDD incl. TD-SCDMA a (lower)	1900	1920	1900	1920	TDD
		LTE band 33 TDD	1900	1920	1900	1920	TDD
		3GPP TDD incl. TD-SCDMA c	1910	1930	1910	1930	TDD
		LTE band 37 TDD	1910	1930	1910	1930	TDD
		3GPP TDD incl. TD-SCDMA f	1880	1920	1880	1920	TDD
		LTE band 39 TDD	1880	1920	1880	1920	TDD
		3GPP TDD incl. TD-SCDMA a (upper)	2010	2025	2010	2025	TDD

ID	Band name	Included standardized bands	UL low	UL high	DL low	DL high	Duplex
		LTE band 34 TDD	2010	2025	2010	2025	TDD
21	"TDD 1800"	WiMAX 8.G	1800	1830	1800	1830	TDD
22	"TDD 1930"	LTE band 36 TDD	1930	1990	1930	1990	TDD
23	"TDD 2300"	LTE band 40 TDD	2300	2400	2300	2400	TDD
		3GPP TDD incl. TD-SCDMA e	2300	2400	2300	2400	TDD
		WiMAX 1.A	2300	2400	2300	2400	TDD
		WiMAX 1.B	2300	2400	2300	2400	TDD
		WiMAX 2.D (lower)	2305	2320	2305	2320	TDD
		WiMAX 2.D (upper)	2345	2360	2345	2360	TDD
		WiMAX 2.E	2345	2360	2305	2320	FDD
		WiMAX 2.F	2345	2360	2305	2320	FDD
		LTE band 30	2305	2315	2350	2360	FDD
24	"TDD 3300"	WiMAX 4.A	3300	3400	3300	3400	TDD
		WiMAX 4.B	3300	3400	3300	3400	TDD
		WiMAX 4.C	3300	3400	3300	3400	TDD
25	"TDD 3400"	LTE band 42 TDD	3400	3600	3400	3600	TDD
		WiMAX 5L.A	3400	3600	3400	3600	TDD
		WiMAX 5L.B	3400	3600	3400	3600	TDD
		WiMAX 5L.C	3400	3600	3400	3600	TDD
		WiMAX 5L.D	3400	3500	3500	3600	FDD
26	"TDD 3600"	LTE band 43 TDD	3600	3800	3600	3800	TDD
		WiMAX 5H.A	3600	3800	3600	3800	TDD
		WiMAX 5H.B	3600	3800	3600	3800	TDD
		WiMAX 5H.C	3600	3800	3600	3800	TDD
27	"5000"	LTE band 46 TDD	5150	5925	5150	5925	TDD
		LTE band 47 TDD	5855	5925	5855	5925	TDD
		ISM 5000	5725	5875	5725	5875	TDD
28	"ISM-Band"	ISM 433	433	435	433	435	TDD
		ISM 2400	2400	2500	2400	2500	TDD
29	"600"	LTE band 71 - US Digital Dividend	663	698	617	652	TDD

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