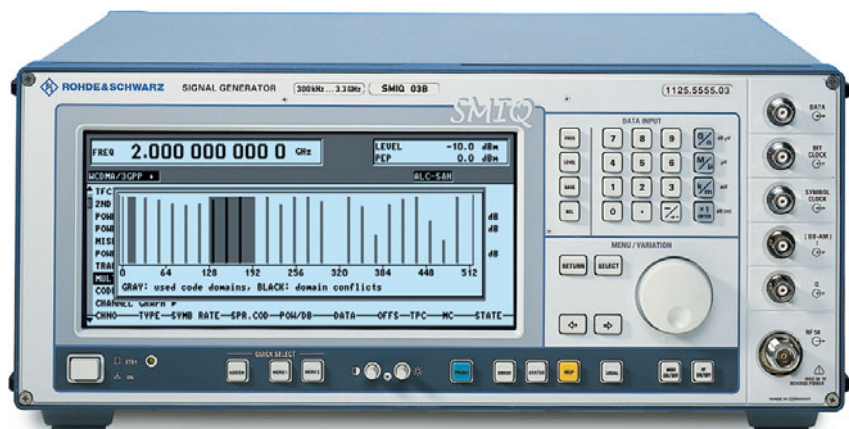


Signal Generation

Vector Signal Generator R&S® SMIQ

R&S® SMIQ02B/03B/04B/06B:
300 kHz to 2.2/3.3/4.4/6.4 GHz
Digital signals of your choice

Vector Signal Generator R&S® SMIQ03B



Brief description

The B series of Signal Generator Family R&S® SMIQ for analog and digital modulation is offering solutions for today and tomorrow. This series particularly takes into account future developments in the field of 3rd-generation digital mobile radio.

The R&S® SMIQ family comprises four models which differ in their upper frequency limits. These feature a hitherto unrivalled versatility regarding signal generation and signal quality and are therefore ideal for use in development and type-approval testing.

With their outstanding price/performance ratio, these signal generators are also economically attractive for applications in production. The wide frequency range from 300 kHz to 6.4 GHz covers all main radio bands including their IF ranges.

The high-grade I/Q modulator fitted as standard ensures minimum error vector magnitude and high intermodulation suppression. Using modern digital signal processor (DSP) technology, the versatile concept allows the generation of high-precision digital modulation signals with

high bit rates without any limitations on modulation modes or standards.

In addition to digital modulation, the signal generators provide the full range of analog modulation modes as well as simultaneous modulation capability.

Applications

- ◆ Type-approval testing of digital base and mobile stations
- ◆ Base-station transmitter test
- ◆ Sensitivity measurements on digital receivers
- ◆ Selectivity measurements on digital receivers
- ◆ Testing of equalizers
- ◆ Tolerance tests on digital systems
- ◆ Components tests
- ◆ Development of new digital communication systems

Main features

- ◆ Frequency range 300 kHz to 2.2/3.3/4.4/6.4 GHz
- ◆ Analog and digital modulation
- ◆ Versatile and broadband generation of digitally modulated signals up to 18 Msymbol/s
- ◆ Generation of TDMA, CDMA, WCDMA and cdma2000 standard signals to all main mobile radio standards

- ◆ Broadband I/Q modulator with outstanding vector accuracy
- ◆ Optional internal fading simulator to test specifications of mobile radio standards
- ◆ Optional internal noise generator and distortion simulator
- ◆ Optional BER measurement
- ◆ Optional arbitrary waveform generator
- ◆ Low ACP for IS-95 CDMA and WCDMA (option)
- ◆ Low cost of ownership due to three-year calibration intervals
- ◆ Future-oriented platform concept
- ◆ Unrivalled price/performance ratio

Characteristics

Digital modulation

Any digital modulation modes (with option R&S® SMIQB20)

- ◆ Free choice of modulation mode from ASK through to 256QAM
- ◆ Any kind of baseband filtering with variable filter parameters
- ◆ Symbol rate adjustable up to 18 Msymbol/s
- ◆ Realtime coding of internal and external data
- ◆ Internal PRBS generators

USED4TEST

Телефон: +7 (499) 685-7744
used@used4test.ru
www.used4test.ru

Signal Generation

Vector Signal Generator R&S®SMIQ

Convenient burst generation for TDMA standards (with option R&S®SMIQB20/R&S®SMIQB11)

- ◆ TDMA mobile radio standards provided as standard GSM, GSM/EDGE, DECT, NADC (IS-54C/IS-136), PDC, PHS
- ◆ Versatile external synchronization capabilities
- ◆ Realtime processing of external and internal data
- ◆ Generation of TDMA frames with versatile timeslot configuration
- ◆ Continuous PRBS sequences
- ◆ Optimization of burst shaping to reduce spectra due to switching
- ◆ Realtime processing with external data for BER tests
- ◆ Fast Slot-by-slot modulation change at GSM/EDGE

Analog modulation

- ◆ Broadband AM with up to 30 MHz modulation frequency
- ◆ I/Q modulation with 30 MHz modulation bandwidth (3 dB), 60 MHz RF bandwidth
- ◆ Unprecedented vector accuracy and high intermodulation suppression
- ◆ Amplitude modulation
- ◆ Pulse modulation
- ◆ Optional frequency and phase modulation (R&S®SM-B5)

RF characteristics

- ◆ Wide output frequency range from 300 kHz to 6.4 GHz
- ◆ High (up to 16 dBm) and precise output level (<0.5 dB)
- ◆ Fast setting time for frequency (<3 ms) and level (<2.5 ms)¹⁾
- ◆ Frequency hopping (500 μs)

- ◆ High spectral purity (typ. -130 dBc (1 Hz) at 1 GHz and 20 kHz carrier offset)
- ◆ Calibrated RF level in range from -140 dBm to -5 dBm
- ◆ RF, AF and level sweep (user-programmable)

Special options

Fading Simulation R&S®SMIQB14/B15

- ◆ Fading of internal or external I/Q signals conforming to mobile radio standards
- ◆ 6-path simulation can be enhanced to 12-path simulation (2-channel fading also possible with second vector signal generator)
- ◆ Rayleigh, Rice and Lognormal fading profiles independently for each path selectable
- ◆ Selectable path attenuation and delay
- ◆ Simulation of high speeds
- ◆ Preprogrammed fading profiles for mobile radio standards GSM, NADC, IS-95 CDMA and TETRA
- ◆ Frequency range of basic unit can be fully utilized

Noise Generator and Distortion

Simulator R&S®SMIQB17

- ◆ Simulation of amplitude and phase distortion (AM/AM and AM/φM characteristics)
- ◆ Distortion characteristics programmable from up to 30 input values
- ◆ Superimposed noise signals (AWGN)
- ◆ C/N ratio variable with high resolution over a wide range
- ◆ Broad noise bandwidth (10 kHz to 10 MHz)

Bit Error Rate Measurements

R&S®SMIQB21

- ◆ Up to 30 MHz clock rate

WCDMA for 3GPP/FDD R&S®SMIQB45

Software option R&S®SMIQB45 supports the generation of downlink and uplink signals in line with the 3GPP standard (FDD mode). As the standardization process is not yet completed, the functionality of this option will continuously be adapted to the relevant standard modifications and expansions (for functionality see specifications).

Low ACP for IS-95 CDMA and WCDMA R&S®SMIQB47

- ◆ Specially designed for 1.2288 Mcps, 4.096 Mcps and 8.192 Mcps as well as 3.840 Mcps according to 3GPP
- ◆ Can be used with internal (option R&S®SMIQB42/43/45/48) or external CDMA/WCDMA signals
- ◆ Typical WCDMA adjacent-channel power ratio (5 MHz offset, 3.84 Mcps): -67 dBc (1 DPCH)
- ◆ Typical IS-95 CDMA adjacent-channel power ratio (885 kHz offset): -78 dBc (9 code channels)

Enhanced Functions for WCDMA 3GPP (FDD) Digital Standard R&S®SMIQB48

This option expands the functionality of option R&S®SMIQB45 WCDMA 3GPP. It allows the generation of up to four enhanced channels that can be combined with the standard channels.

- ◆ Very long signal sequences and continuous PRBS sequences (e.g. PN9) often required for BER measurements can be implemented for the channel under test

¹⁾ Without switching the mechanical attenuators.

Signal Generation

Vector Signal Generator R&S®SMIQ

- ◆ Use of externally precoded data or the generation of long power control profiles for the DUT
- ◆ Testing the closed-loop power control function of a mobile station
- ◆ Receiver and performance tests to TS 25.101, TS 25.104, TS25.141 and TS25.944
- ◆ Realistic simulation of WCDMA scenarios
- ◆ Creation and insertion of bit errors into the data of enhanced channels
- ◆ Insertion of block errors (BLERs) into the channel-coded data
- ◆ Generation of WCDMA signals of up to 2 minutes repetition rate

Enhanced Fading Functions for W-CDMA 3GPP R&S®SMIQB49

Option R&S®SMIQB49 extends the functionality of fading options R&S®SMIQB14 /B15 to include WCDMA 3GPP channel simulation. It adds three new modes to the fading simulator so that all scenarios defined in 3GPP Release 99 can be simulated:

- ◆ In fine delay mode, fading simulator resolution is increased to 1 ns with up to four paths being available
- ◆ In moving delay mode, two paths are simulated: for one path the delay remains constant, whereas for the other path the delay varies continuously
- ◆ In birth-death mode, there are two paths changing delay in steps in accordance with the 3GPP channel model

Digital Standard GPS R&S®SMIQB51

This option allows the static signal of a GPS satellite to be simulated. This enables the user to carry out basic GPS receiver testing. The most important

settings according to GPS standard can be activated on the R&S®SMIQ by a keystroke.

The data sources available are bit patterns of up to 16 bits in length and data lists. It is also possible to use navigation data. Several navigation data lists (i.e. 25 frames of GPS navigation data) can be generated by means of the free external "Almanac Uploader" PC software.

TETRA T1 Simulator R&S®SMIQ-K8

R&S®SMIQ-K8 is a PC-based software package for generating TETRA T1, T2, T3, T1&T2 or T1&T3 test signals to ETS300-392/ETS300-394. It is designed for putting RF components into operation and supporting ETS300394-1 tests. R&S®SMIQ-K8 generates all the data sequences including all the control sequences required to operate the signal generator.

Characteristics:

- ◆ The TETRA frame (bit stream) is generated according to the selected burst type, i.e. control burst (CB), normal burst (NB) or synchronizing burst (SB)
- ◆ The frames are generated for the uplink (mobile station [MS] transmitting) and the downlink (base station [BS] transmitting)
- ◆ The channel types ACH, BSCH, BNCH, TCH, STCH and SCH are generated
- ◆ Channel coding is performed for all channels; scrambling with system code, base colour code, mobile country code and mobile network code can be set separately for each channel
- ◆ Frame repetition of 1 to 180 multi-frames can be selected via sequence length

- ◆ The T1 test signal is generated for the V + D (voice and data) test on MS and BS DUTs
- ◆ Channel types 1 to 4, 15 and 17 can be set for the downlink and channel types 7 to 11, 16 and 18 for the uplink
- ◆ The bit stream can be generated either from pseudo-random sequences (CCITT 0.153) or from user-selectable sequences
- ◆ The R&S®SMIQ-K8 software package calculates the appropriate TETRA T1 signal and transfers it to the R&S®SMIQ via the GPIB or RS-232-C interface; all the R&S®SMIQ settings that are needed are included. Additionally the R&S®SMIQ-K8 can operate a second R&S®SMIQ simultaneously for generating a TETRA T2 or T3 signal (TETRA T1, T2, T3, T1&T2 or T1&T3).

Arbitrary Waveform Generator R&S®SMIQB60

To further enhance the versatility of the modulation coder, a dual-channel arbitrary waveform generator (ARB) with a maximum clock rate of 40 MHz is available as an option. It can store up to 512 ksamples of externally computed I/Q values.

The supplied R&S®WinIQSIM™ software (see page 263) allows the calculation of arbitrary modulation signals, for example COFDM, multicarrier and noise, and downloading them into R&S®SMIQ. Together with a convenient data editor, R&S®WinIQSIM™ can calculate any kind of TDMA frame configuration, simulate impairments by superimposed interference signals, etc.

Signal Generation

Vector Signal Generator R&S®SMIQ

Specifications in brief

You will find detailed and binding data on the enclosed CD (./DATASHEET/SMIQ.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: **SMIQ**

Frequency

Range	R&S®SMIQ02B/03B/04B/06B	300 kHz to 2.2/3.3/4.4 GHz/6.4 GHz
Level		
Range	R&S®SMIQ02B/03B R&S®SMIQ04B/06B	-144 dBm to +13 dBm (PEP) -144 dBm to +10 dBm (PEP)
Overranging without warranty of specs		up to 16 dBm
Total level uncertainty	>-127 dBm	typ. ± 0.5 dB ($f \leq 2$ GHz)
Frequency response at 0 dBm		typ. < -0.3 dB ($f \leq 3.3$ GHz)
Spectral purity		
Spurious, harmonics at levels ≤ 10 dBm		< -30 dBc (R&S®SMIQ02B/03B)
Spurious, harmonics at levels ≤ 7 dBm		< -30 dBc (R&S®SMIQ04B/06B)
Broadband noise, carrier offset		
>5 MHz, $f > 450$ MHz to 3040 MHz, CW		typ. -144 dBc
Broadband noise, vector modulation, ($f > 20$ MHz) carrier offset >5 MHz		typ. -137 dBc
SSB phase noise, carrier offset 20 MHz, 1 Hz bandwidth	CW	Vector modulation (dig. modulation)
$f = 1$ GHz		< -126 dBc
Sweep		
RF sweep, AF sweep		digital sweep in discrete steps
Modes		automatic, single shot, manual or external trigger, linear or logarithmic

Modulation

Internal modulation generator		
Frequency range		0.1 Hz to 1 MHz
Vector modulation		2 inputs (I and Q)
Amplitude modulation ⁴⁾		internal, external AC/DC
Broadband amplitude modulation		external DC
Pulse modulation		external
Frequency modulation	Option R&S®SM-B5	
		int., external AC/DC, two-tone with two modulation channels FM1 and FM2
Max. deviation		0.5/1/2/4 MHz depending on frequency
Phase modulation	Option R&S®SM-B5	
		int., external AC/DC, two-tone with two modulation channels $\phi M1$ and $\phi M2$
Max. deviation		5/10/20/40 rad depend. on frequency
Digital modulation	Option R&S®SMIQB20	
		internal, external, serial, ext. parallel
Predefined modulation settings		
APCO C4FM, APCO QPSK, CDPD, CT2, DECT, GSM, IRIDIUM, NADC, PDC, PHS, TETRA, TETS, PWT, ICO BPSK, ICO GMSK, ICO QPSK, GSM/EDGE, CDMA IS-95, WCDMA, QPSK		
Envelope control		internal or external
Range of function		1 ksymbol/s to 2.5 Msymbol/s
Modulation modes		ASK, FSK, GMSK, PSK, QAM
ASK, symbol rate		100 symbol/s to 18 Msymbol/s
FSK, modulation modes		2FSK, 4FSK, 4FSK APCO, GFSK
GMSK, bit rate		100 bit/s to 7.5 Mbit/s ¹⁾
PSK, modulation modes		BPSK, QPSK, OQPSK, QPSK (IS-95), OQPSK (IS-95), QPSK (ICO), QPSK (INMARSAT), $\pi/4$ DQPSK, $\pi/4$ QPSK, 8PSK, 8PSK EDGE
QAM, modulation modes		16QAM, 32QAM, 64QAM, 256QAM

Data generator	Option R&S®SMIQB11
	Programmable data memory for modulation data, envelope-control and trigger signals. The data generator can be operated only in conjunction with the optional modulation coder
Max. symbol rate	8.5 Msymbol/s
Operating modes	automatically repeating, single shot, manually or externally triggered
Memory extension	Option R&S®SMIQB12
	The data generator memory can be extended to max. 79 Mbit by fitting up to two options R&S®SMIQB12.
Memory capacity	32 Mbit
Digital standards	Options R&S®SMIQB20/SMIQB11
GSM/EDGE	according to GSM standard
DECT	according to ETS300175-2 and ETS300176-1
NADC	according to IS-54 and IS-136
PDC	according to RCR STD-27
PHS	according to RCR STD-28
Digital standard IS-95 CDMA	Option R&S®SMIQB42
	According to TIA standard IS-95A and J-STD-008
Digital standard WCDMA	Option R&S®SMIQB43
Modulation	QPSK, OQPSK
Digital standard WCDMA 3GPP (FDD)	Option R&S®SMIQB45³⁾
	according to 3GPP standard 3.4.0 (FDD)
3GPP (FDD) version	optional 3.4.0, according to technical specifications 3GPP TS25.211 and TS25.213
Simultaneous modulation	
	Any combination is possible with the following exceptions:
	- Simultaneous FM and ϕM
	- Simultaneous digital modulation and vector modulation
	Pulse modulation cannot be used together with level attenuation function LEV ATT (option R&S®SMIQB20)

Options for special applications

Fading simulation	Options R&S®SMIQB14/SMIQB15
paths and channels with option R&S®SMIQB14	6 paths, 1 channel
with options R&S®SMIQB14/-B15	12 paths, 1 channel or 6 + 6 paths, 2 channels with second R&S®SMIQ through simple retrofit
Path attenuation	
Simulation types	Rayleigh fading, Rice fading, Lognormal fading, Suzuki fading
Correlation	paths 1 to 6 with paths 7 to 12
Enhanced fading functions for WCDMA 3GPP	Option R&S®SMIQB49
	The following data deviate from the specifications for R&S®SMIQB14/ R&S®SMIQB15
Fine delay mode	
Number of paths	2 (with R&S®SMIQB14), 4 (with R&S®SMIQB14 + R&S®SMIQB15)
Profiles	Rayleigh, pure Doppler
Moving delay mode	
Number of paths	2
Birth-death mode	
Number of paths	2
Profiles	pure Doppler
Noise and distortion simulation	Option R&S®SMIQB17
Distortion simulator	AM/AM and AM/ ϕM distortion of modulation signal
Distortion characteristic	each characteristic programmable by entering up to 30 input values via IEC/IEEE bus or by entering up to five polynomial coefficients
Noise generator (AWGN)	
Distribution density	Gaussian, statistically indep. for I and Q

Signal Generation

Vector Signal Generator R&S®SMIQ

Bit error rate measurement	Option R&S®SMIQB21
Measurement time	selectable through maximum number of data bits or bit errors (max. 2 ³¹ bits each), continuous measurement
Measurement result	BER in ppm, % or decade values (if selected number of data bits or bit errors is attained) status displays: not synchronized, no clock, no data
Improved adjacent-channel power ratio for WCDMA and CDMA IS-95	Option R&S®SMIQB47
Selectable baseband filters to improve ACP values (values see at Digital Standards CDMA/WCDMA)	
Enhanced functions for digital standard WCDMA 3GPP (FDD)	Option R&S®SMIQB48
3GPP (FDD) version	3.4.0 to 3GPP technical specifications TS25.101, TS25.104, TS25.141, TS25.211 and TS25.213
Enhanced Channels	
Channels of W-CDMA system in R&S®SMIQ that offer enhanced functionality compared with standard channels of option R&S®SMIQB45. Can be used in downlink for max. four DPCHs and in uplink for one DPCCCH and max. three DPDCCHs. All DPCHs or DPDCCHs have the same symbol rate.	
Enhanced functions at a glance: Sequences of up to 1042 frames; data lists for data fields and TPC field; external power control; channel coding; bit error insertion; block error insertion; simulation of realistic noise scenarios; orthogonal channel noise simulation (OCNS); additional mobile stations	
Digital Standard GPS	Option R&S®SMIQB51
Channels	1, simulation of one GPS satellite
Function:	
Simulation of static signal of GPS satellite using option SMIQB51; prerequisites: SMIQB11 (data generator) and SMIQB20 (modulation coder), SMIQ firmware version 5.65 or higher	
Navigation data:	
user-selectable bit patterns of up to 16 bit, user-definable data lists of any length, length only limited by memory capacity (SMIQB11, SMIQB12), simple generation of several navigation data lists of 37500 bits each, i.e. 25 frames of GPS navigation data, for example by means of free external PC software "AlmanacUploader", Application Note 1GP46	
Arbitrary waveform generator	Option R&S®SMIQB60
Length of waveform	1 to 524216 in steps of one sample
Resolution	12 bit
Downloading time for 512k I/Q samples	4 s
Nonvolatile memory	
Number of blocks	22
Block size	24 from firmware version 5.30
Interpolation	65527
Signal output, channels	2 (I and Q)
Trigger modes	auto, retrigger, armed auto, armed retrigger
Trigger source	internal or external
Trigger outputs	2
Delay	0 to 524216 samples
On time, off time	1 to 524215 samples
General data	
Memory for instrument settings	50 storable settings
List Mode: Frequency and level values can be stored in a list and set in an extremely short time; permissible level variation: 90 dB	
Max. number of channels	2000
Remote control	IEC 625 (IEEE 488)
Power supply	90 V to 265 V (AC), 50 Hz to 400 Hz, autoselecting to AC supply, max. 300 VA
Dimensions (W × H × D)	435 mm × 192 mm × 460 mm
Weight	25 kg when fully equipped

Ordering information

Vector Signal Generator		
300 kHz to 2.2 GHz	R&S®SMIQ02B	1125.5555.02
300 kHz to 3.3 GHz	R&S®SMIQ03B	1125.5555.03
300 kHz to 4.4 GHz	R&S®SMIQ04B	1125.5555.04
300 kHz to 6.4 GHz	R&S®SMIQ06B	1125.5555.06
Accessories supplied		
power cable, operating manual		
Options		
Reference Oscillator OCXO	R&S®SM-B1	1036.7599.02
FM/φM Modulator	R&S®SM-B5	1036.8489.02
Data Generator	R&S®SMIQB11	1085.4502.04
Memory Extension, 32 Mbit	R&S®SMIQB12	1085.2800.04
Fading Simulator, 6 paths	R&S®SMIQB14	1085.4002.02
Second Fading Simulator for 12 paths or 2 channels	R&S®SMIQB15	1085.4402.02
Noise Generator & Distortion Simulator	R&S®SMIQB17	1104.9000.02
RF and AF Rear Connectors	R&S®SMIQB19	1085.2997.02
Modulation Coder	R&S®SMIQB20	1125.5190.02
BER Measurement	R&S®SMIQB21	1125.5490.02
Digital Standard IS-95 CDMA	R&S®SMIQB42	1104.7936.02
Digital Standard WCDMA acc. to NTT DoCoMo 1.0, ARIB 0.0 standard	R&S®SMIQB43 ²⁾	1104.8032.02
Digital Std. WCDMA acc. to 3GPP (FDD)	R&S®SMIQB45 ³⁾	1104.8232.02
Low ACP for IS-95 CDMA and W-CDMA	R&S®SMIQB47	1125.5090.02
Extended Functions for WCDMA (3GPP)	R&S®SMIQB48	1105.0587.02
Ext. Fading Funct. for WCDMA (3GPP)	R&S®SMIQB49	1105.1083.02
Digital Standard GPS	R&S®SMIQB51	1105.1683.02
Arbitrary Waveform Generator incl. R&S®WinIQSIM™	R&S®SMIQB60	1136.4390.02
TETRA T1 Simulator	R&S®SMIQ-K8	1136.4290.02
Software for R&S®SMIQB60		
Digital Standard IS-95 CDMA	R&S®SMIQK11	1105.0287.02
Digital Standard cdma2000	R&S®SMIQK12	1105.0435.02
Dig. Std. WCDMA TDD mode (3GPP)	R&S®SMIQK13	1105.1231.02
Digital Standard TD-SCDMA	R&S®SMIQK14	1105.1338.02
OFDM Signal Generation, HIPER LAN/2	R&S®SMIQK15	1105.1531.02
Digital Standard 1xEV-DO	R&S®SMIQK17	1154.7800.02
Digital Standard IEEE 802.11	R&S®SMIQK19	1154.8307.02
Digital Std. 3GPP FDDA incl. HSDPA	R&S®SMIQK20	on request

Additional hint: R&S®SMIQ02B/03B (R&S®SMIQ04B/06B) can be equipped with up to three (two) of the following options: R&S®SM-B5, R&S®SMIQB14, R&S®SMIQB15, R&S®SMIQB17

Application software

Generation of Data and Control Lists	R&S®SMIQ-K1	1)
Bluetooth signals for R&S®SMIQ	R&S®SMIQ-K5	1)
User mappings and user filters for R&S®SMIQ	User Mod	1)
IQWizard 1)		1)

1) available on www.rohde-schwarz.com

Extras

19" Adapter	R&S®ZZA-94	0396.4905.00
Service Kit	R&S®SM-Z3	1085.2500.02
BNC Adapter for rear panel, D type connector PAR DATA	R&S®SMIQ-Z5	1104.8555.02
90° Power Splitter	R&S®SMIQ-Z9	1104.9580.02
Trolley for Transit Case	R&S®ZZK-1	1014.0510.00
Transit Case	R&S®ZZK-944	1013.9366.00
Service Manual R&S®SMIQ		1085.2445.24