R&S®SFE
Broadcast Tester
Specifications

ROHDE&SCHWARZ

Data Sheet | Version 06.00

CONTENTS

Specifications

Specifications apply under the following conditions: 60 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and all internal automatic adjustments performed. “Typical values” are designated with the abbreviation “typ.”. These values are verified during the final test but are not assured by Rohde & Schwarz. “Nominal values” are design parameters that are not assured by Rohde & Schwarz. These values are verified during product development but are not specifically tested during production.

Rohde & Schwarz equipment is designed for reliable operation up to an altitude of 2000 m above sea level, and for transport up to an altitude of 4500 m above sea level.

RF characteristics

Frequency

Frequency range		100 kHz to 2.7 GHz
Uncertainty	internal reference	see “Reference frequency”
	external reference [1]	$< 0.5 \times 10^{-9}$, typ. $< 1.0 \times 10^{-10}$
Setting resolution		1 Hz
Setting time	to within $< 1 \times 10^{-7}$, with GUI update stopped	20 ms

Frequency sweep

Operating mode		digital sweep in discrete steps
Trigger mode	free run	auto
Sweep range		full frequency range
Sweep shape		sawtooth
Step size	linear	full frequency range
Dwell time setting range		100 ms to 1 s
Dwell time setting resolution		1 ms

Reference frequency

Uncertainty		$< 1.6 \times 10^{-7}$
Aging	after 10 days of uninterrupted operation	$< 1.0 \times 10^{-9}$/day
Temperature effect	in operating temperature range 0 °C to +50 °C	$< 5 \times 10^{-8}$
Input for external reference signal	frequency (sine wave)	10 MHz
	maximum deviation	3×10^{-6}
	input level	≥ –5 dBm to ≤ 19 dBm
	recommended limits	0 dBm to 19 dBm
	input impedance	50 Ω
	connector	BNC female, rear
Output for internal reference signal	frequency (sine wave)	10 MHz
	level	typ. +6 dBm ± 3 dB
	input impedance	> 200 Ω
	connector	9-pin D-Sub, rear, alternatively to trigger out

[1] Averaged over 10 minutes measurement time, 10 minutes after switching to external reference.

Level

RF output	connector	N female, front
	output impedance	50 Ω
Maximum level	f ≤ 1.0 GHz	+15 dBm (PEP) [2]
	1.0 GHz < f ≤ 2.0 GHz	+12 dBm (PEP)
	2.0 GHz < f ≤ 2.5 GHz	+10 dBm (PEP)
	2.5 GHz < f	+7 dBm (PEP)
Setting range	level	–110 dBm to +20 dBm
	resolution	0.1 dB
Dynamic range of attenuator		110 dB
Level uncertainty	attenuator mode: auto, temperature range +18 °C to +33 °C	< ±1.0 dB
Output VSWR in 50 Ω system	at maximum level	< 1.8, typ. < 1.5
	at maximum level – 15 dB	< 1.5, typ. < 1.3
Setting time	to < 0.1 dB deviation from final value, with GUI update stopped	10 ms
Uninterruptible level setting	attenuator mode: fixed, setting range	18 dB
Back-feed (from ≥ 50 Ω source)	maximum permissible RF power in output frequency range of RF path	+30 dBm, permanent
	permissible DC voltage	±20 V

Spectral purity

Harmonics	level ≤ 12 dBm, CW	< –30 dBc
Nonharmonics	level ≥ –20 dBm, CW, carrier frequency, carrier offset > 10 kHz	reference: signal power
	100 kHz to 87 MHz	< –50 dBc
	> 87 MHz to 1 GHz	< –60 dBc
	> 1 GHz to 2.5 GHz	< –50 dBc
Broadband noise	carrier offset > 10 MHz, measurement bandwidth 1 Hz	
	f > 87 MHz	< –135 dBc
	f ≤ 87 MHz	< –115 dBc
SSB phase noise	carrier offset 20 kHz, measurement bandwidth 1 Hz	
	f ≤ 87 MHz	< –100 dBc
	87 MHz < f < 375 MHz	< –110 dBc
	375 MHz ≤ f < 750 MHz	< –100 dBc
	750 MHz ≤ f < 1 GHz	< –100 dBc
	f > 1 GHz	< –95 dBc
	carrier offset 500 kHz, measurement bandwidth 1 Hz	
	f ≤ 87 MHz	< –100 dBc
	87 MHz < f < 375 MHz	< –130 dBc
	375 MHz ≤ f < 750 MHz	< –130 dBc
	750 MHz ≤ f < 1 GHz	< –120 dBc
	f > 1 GHz	< –115 dBc

[2] PEP = peak envelope power (CW); for other modulation modes, depending on back-off.

I/Q modulation

I/Q modulator

Modulation frequency range		DC to 35 MHz
Modulation frequency response [3]	up to 35 MHz	< ±2 dB
	up to 5 MHz	< ±0.4 dB
Carrier leakage	without input signal, referenced to full-scale input [4]	< –55 dBc, typ. < –65 dBc after local adjustment
Sideband suppression	modulation frequency ≤ 100 kHz, referenced to signal power	< –50 dBc, typ. < –60 dBc after local adjustment
I/Q swap	I and Q signals swapped	on/off

Internal baseband I/Q

Signal characteristics		see “Digital modulation systems”
D/A converter	sample rate	100 MHz
	resolution	16 bit
	sampling rate	400 MHz (internal interpolation × 4)
Aliasing filter	with amplitudes, group delay, and Si correction	
	bandwidth 0.1 dB	35 MHz

Extended I/Q input (R&S®SFE-K80 option)

The R&S®SFE-K80 option allows external digital signals to be fed into the baseband signal processing unit of the R&S®SFE. Noise signals can be superimposed on input signals if the noise option has been installed.

Digital I/Q input	connector	Mini D Ribbon, 26 pins, rear
	level	LVDS
	word width	16 bit
	analog bandwidth	0 Hz to 35 MHz
	symbol rate	3 ksymbol/s to 100 Msymbol/s

[3] This frequency response is superimposed on all frequency responses of this specification.

[4] Value applies after 1 h warm-up time and recalibration for 4 h of operation as well as temperature variations of less than ±5 °C.

Digital baseband

Internal test signals

MPEG-2 TS packet	header + 184 byte payload PID = 1FFF (hex)	payload: PRBS
MPEG-specific TS packet	sync byte + 187 byte payload	payload: PRBS
DIRECTV TS packet	header + 127 byte payload	payload: PRBS
DIRECTV TS packet without header	130 byte payload	payload: PRBS
PRBS	PRBS in line with ITU-T O.151	$2^{23} – 1$, $2^{15} – 1$ (selectable)

MPEG-2 inputs

ASI/SMPTE310M/ETI serial input	connector	BNC female, 2 × rear
	ASI input level	200 mV to 880 mV
	SMPTE310M input level	400 mV to 880 mV
	ETI input level	0 V to ±2.37 V (HDB3)
	input impedance	75 Ω
	ASI data rate	270 Mbit/s
	SMPTE310M data rate	19.392658 Mbit/s
	ETI data rate	2048 kbit/s
Stuffing	ASI, SMPTE310M	on/off
	stuffing packets	see MPEG-2 TS packet under “Internal test signals”
Display	measured values	packet length, input data rate, useful data rate

TS generator (R&S®SFE-K20 option)

Transport stream	files	Rohde & Schwarz data streams
	file format	generated transport streams (GTS) format
	length of transport stream packets	ATSC: 188
		DVB: 188
	sequence length	generation of endless and seamless transport streams with repetition of video, audio and data content
	data rate	100 kbit/s to 214 Mbit/s (including null packets)
	net data rate	max. 90 Mbit/s
	data volume	max. 80 Mbyte payload
Signal set		moving picture sequences and test patterns with test tones, for 625 and 525 lines; DVB/ATSC systems, additional signals via options

TRP player (R&S®SFE-K22 option)

Replay	file format	TRP, T10, BIN, ETI (any recorded data streams)
	length of transport stream packets	corresponding to externally applied/recorded transport stream
	replay time/sequence length	endless (but not seamless) replay with cut at transition from end of file to beginning of file; seamless in case of TRP file
	data rate	corresponding to recording data rate and setting (100 kbit/s to max. 90 Mbit/s) from hard disk
	data volume	corresponding to recorded data volume, limited only by hard disk size

Analog baseband

Analog video/audio input

Video input	connector	BNC female, rear
	CCVS input level	V_{pp} = 1 V
	input impedance	75 Ω
	level clamping	back-porch clamping
Audio inputs 1/2	connector	D-Sub, 9-pin female, rear
	input level	100 mV to 1.55 V RMS
	input impedance	600 Ω, balanced
BTSC	connector	D-Sub, 9-pin female, rear
	input level	0.25 V to 2 V RMS
	input impedance	75 Ω

Audio player for analog TV

Waveform memory	sequence duration	80 s
	resolution	16 bit for AF1 and 16 bit for AF2
Audio	number of signals	2 channels, AF1 and AF2
	bandwidth	DC to 15 kHz
	level	16 bit full scale in each channel corresponds to standard deviation
	frequency response	< ±0.3 dB
Clock generation	clock rate	50 kHz
Marker	position	restart waveform

Internal audio signal generator

Audio signals	number of signals	2, can be set separately
	frequency	30 Hz to 15 kHz, in 1 Hz steps
	level	–60 dBu to +12 dBu, in 0.01 dB steps, 6 dBu corresponds to standard deviation
Audio frequency sweep	operating mode	digital sweep in discrete steps
	trigger mode	auto
	sweep range	settable within full frequency range
	step size	1 Hz to 7 kHz in 1 Hz steps
	dwell time setting range	1 ms to 10 s
	dwell time setting resolution	1 ms

Internal NICAM audio signal generator

Audio signals	number of signals	2, can be set separately
	frequency	30 Hz to 15 kHz, in 1 Hz steps
	level	–60 dBu to +12 dBu, in 0.01 dB steps, 6 dBu corresponds to standard headroom

Internal video signal generator (R&S®SFE-K23 option)

Internal video generator		
Video signals	ATV video basic test signals	COLORBARS_75 (PAL)
		COLORBARS_75 (PAL M)
		COLORBARS_75 (PAL N)
		COLORBARS_75 (NTSC)
		COLORBARS_75 (SECAM)
		PAL FuBK
Insertion test signal structure	in line with country-specific standards	
PAL color bar 75 %	first field	
	line 16	2T pulse
	line 17	CCIR17
	line 18	CCIR18/1
	line 19	CCIR18/2
	line 20	data line
	line 21	teletext insertion test signal
	second field	
	line 319	ramp
	line 329	modulated ramp
	line 330	CCIR330/5
	line 331	CCIR331/1
	line 332	red line
	line 333	sin x/x
	line 334	15 kHz, 200 ns
	line 335	250 kHz, 100 ns
PAL M color bar 75 %	first field	
	line 16	2T pulse
	line 17	NTC7 composite
	line 18	FCC composite
	second field	
	line 11	ramp
	line 12	modulated ramp
	line 13	red line
	line 14	15 kHz, 250 ns
	line 15	250 kHz, 125 ns
	line 16	FCC multiburst
	line 17	NTC7 combined
	line 18	sin x/x
PAL N color bar 75 %	first field	
	line 16	2T pulse
	line 17	CCIR17
	line 18	CCIR18/1
	line 19	CCIR18/2
	line 20	data line
	line 21	teletext insertion test signal
	second field	
	line 319	ramp
	line 329	modulated ramp
	line 330	CCIR330/5
	line 331	CCIR331/1
	line 332	red line
	line 333	sin x/x
	line 334	15 kHz, 200 ns
	line 335	250 kHz, 100 ns

NTSC color bar 75 %	first field	
	line 16	2T pulse
	line 17	NTC7 composite
	line 18	FCC composite
	second field	
	line 11	ramp
	line 12	modulated ramp
	line 13	red line
	line 14	15 kHz, 250 ns
	line 15	250 kHz, 125 ns
	line 16	FCC multiburst
	line 17	NTC7 combined
	line 18	sin x/x
SECAM color bar 75 %	first field	
	line 7 to 15	discriminating signal
	line 16	2T pulse
	line 17	CCIR17
	line 18	CCIR18/1
	line 19	CCIR18/2
	line 20	data line
	line 21	teletext insertion test signal
	second field	
	line 319	ramp
	lines 320 to 328	discriminating signal
	line 329	modulated ramp
	line 330	CCIR330/5
	line 331	CCIR331/1
	line 332	red line
	line 333	sin x/x
	line 334	15 kHz, 200 ns
	line 335	250 kHz, 100 ns
PAL FuBK	first field	
	line 16	2T pulse
	line 17	CCIR17
	line 18	CCIR18/1
	line 19	CCIR18/2
	line 20	data line
	line 21	teletext insertion test signal
	second field	
	line 319	ramp
	line 329	modulated ramp
	line 330	CCIR330/5
	line 331	CCIR331/1
	line 332	red line
	line 333	sin x/x
	line 334	15 kHz, 200 ns
	line 335	250 kHz, 100 ns
Other video signals		see R&S®ATV Video

Digital modulation systems

Terrestrial standards

DVB-T2 (R&S®SFE100-K16 option)

DVB-T2	in line with EN 302755 and TS 102773	v1.1.1, v1.2.1 [5] and v1.3.1 [6], incl. Annex I
	single PLP and multi PLP	v1.1.1, v1.2.1 [5]
	T2-Base single profile transmission	v1.3.1 [6]
	T2-Lite single profile transmission	v1.3.1 [6] in line with Annex I
Input	transport stream	
	interface	ASI
	format	T2-MI (single PLP and multi PLP) or MPEG-2 TS (single PLP only)
	T2-MI	
	interface	on/off
	PID filter	settable [7]
	SID filter	settable [7]
	analyzer	T2 specification check and logging
Modulation	modulation	COFDM
	PLP number	1 (single PLP) to 16 (multi PLP)
	single PLP	
	T2-MI interface	off
	PLP number	1
	single PLP and multi PLP	
	T2-MI interface	on
	PLP number	1 to 16
Coding	bandwidth	1.7/5/6/7/8 MHz
	MER	> 40 dB [8]
	modulation frequency response	< ±0.2 dB
	shoulder attenuation	> 45 dB
	PLP type	common, data type 1, data type 2 [7]
	baseband mode	normal (NM), high efficiency (HEM)
	ISSY	off, short, long [7]
	null packet deletion	on/off [7]
	FEC frame	normal (64k), short (16k)
	code rate	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3 [6, 7], 2/5 [6, 7]
	constellation	QPSK, 16QAM, 64QAM, 256QAM
	rotation	on/off
	time interleaver	settable [9]
	frame interval (I_{jump})	≥ 1 [7]
	FFT size	1k, 2k, 4k, 8k, 16k and 32k COFDM
	extended carrier mode	on/off
	pilot pattern	PP1, PP2, PP3, PP4, PP5, PP6, PP7, PP8
	guard interval	1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128

[5] Bias balancing cells and unoccupied cell filling between PLP cells not supported.
[6] Features in line with T2 v1.3.1, including Annex I (T2-Lite).
[7] With T2-MI interface switched on.
[8] With internal test signals.
[9] With T2-MI interface switched off.

T2 system	T2 frames per superframe	settable [9]
	data symbols per T2 frame	settable [9]
	subslices per T2 frame	≥ 1 [7]
	in-band signaling	in line with T2 version [7]
	transmission system	SISO, MISO, T2-Lite SISO [7], T2-Lite MISO [7]
	MISO group	settable
	PAPR reduction	off, tone reservation (TR) [10]
	future extension frames (FEF)	off, null, noise [7, 11]
	T2 version	settable [9]
	L1 post modulation	BPSK, QPSK, 16QAM, 64QAM
	L1 repetition	on/off
	L1 post scrambled	settable, in line with T2 version
	T2 base lite	on/off [7]
	cell ID	settable [9]
	network ID	settable [9]
	T2 system ID	settable [9]
Single-frequency network	network mode	SFN [7], MFN
	control	T2-MI [7], manual
Test signals		TS test packet with settable payload (PRBS, 0x00, 0xFF) (see “Internal test signals”)

DVB-T/DVB-H (R&S®SFE-K1 option)

DVB-T/DVB-H	in line with EN 300744/EN 302304	Europe
Modulation	modulation	COFDM
	bandwidth	5 MHz, 6 MHz, 7 MHz, 8 MHz
	MER	> 40 dB [12]
	modulation frequency response	< ±0.2 dB
	shoulder distance	> 48 dB
	back-off	13.5 dB
Coding	constellation	QPSK, 16QAM, 64QAM, hierarchical coding
	code rate	1/2, 2/3, 3/4, 5/6, 7/8
	guard interval	1/4, 1/8, 1/16, 1/32
	FFT mode	2k, 4k, and 8k COFDM
	interleaver	native and in-depth
	TPS	in line with DVB-T/DVB-H
Special functions	Reed-Solomon encoder	can be switched off
Test signals		TS test packet (see “Internal test signals”), PRBS after convolutional encoder

T-DMB/DAB (R&S®SFE-K11 option)

T-DMB/DAB	in line with T-DMB/EN 300401	Korea/Europe
Modulation	modulation	COFDM
	mode	I, II, III, IV
	bandwidth	1.536 MHz
	modulation frequency response	< 0.2 dB
	shoulder distance	> 45 dB
	back-off	13 dB
Single-frequency network	network mode	MFN
	control	MID, manual
Special function	PRBS	can be inserted into a subchannel [13]

[10] PAPR reduction in line with T2 version > v1.1.1 not supported yet. Reserved carriers are modulated with 0+j0 only.

[11] Special feature to add noise to the FEF payload instead of Null-FEF payload.

[12] With internal test signals.

[13] Can be inserted into an existing, user-selectable subchannel of an incoming, valid ETI data stream.

DRM/DRM+ (R&S®SFE-K19 option)

DRM/DRM+		in line with ETSI ES 201980
Input signal		MDI/DCP IP interface or DCP file
Transmission	mode	A, B, C, D, E
	modulation	OFDM
	bandwidth	
	mode A to D	4.5 kHz to 20 kHz
	mode E	100 kHz
	MER	> 40 dB
	modulation frequency response	< 0.2 dB
	shoulder attenuation	> 55 dB

ISDB-T/ISDB-T_{SB}/ISDB-T_B (R&S®SFE-K6 option)

ISDB-T	in line with ARIB STD-B31 version 1.5	
ISDB-T_{SB}	in line with ARIB STD-B29 ISDB-T_{SB}	
ISDB-T_B	Brazil	
Modulation	modulation	OFDM
	bandwidth	6 MHz (variable: ±1000 ppm)
	number of segments	
	STD-B31	13
	STD-B29	1, 3
	MER	> 40 dB
	modulation frequency response	< 0.2 dB
	shoulder distance	> 48 dB
	back-off	13 dB
Coding	FFT mode	2k, 4k and 8k
	number of layers	1 to 3 (1 or 2 in the case of ISDB-T_{SB})
	constellation	QPSK, DQPSK, 16QAM, 64QAM
	code rate	1/2, 2/3, 3/4, 5/6, 7/8
	guard interval	1/4, 1/8, 1/16, 1/32
	time interleaver	0, 1, 2, 4, 8, 16 (additionally 32 with ISDB-T_{SB})
Early earthquake warning (EEW)	ISDB-T	on/off
	signal type	warning with area, warning without area, test with area, test without area
	area information	bit 56 to bit 111
	epicenter	apply, number of epicenters
	information type	issued, cancelled
	warning ID	0 to 511
	geographic co-ordinates	latitude (south/north), longitude (west/east)
	depth	0 km to 1023 km
	occurrence time	0 s to 1023 s
Special functions	residual carrier shift, alert broadcasting flag	on/off
	AC data (AC1, AC2)	All1, PRBS
	TX parameter switching indicator	normal, 1 to 15
	TMCC next	unused, current
Test signals		TS test packet (see “Internal test signals”)

ISDB-T_{MM} (R&S®SFE-K106 option)

ISDB-T_{MM}		in line with ARIB STD-B46
Modulation	mode	OFDM
	bandwidth	14.143 MHz at 6 MHz reference channel
	number of segments	33
	number of super segments	3, 4, 5
	types of super segments	A, B
	MER	> 40 dB
	modulation frequency response	< 0.2 dB
	shoulder attenuation	> 48 dB
Coding	ISDB-T mode	mode 1, mode 2, mode 3
	number of layers (type A coder)	1 to 3
	constellation	DQPSK, QPSK, 16QAM, 64QAM
	code rate	1/2, 2/3, 3/4, 5/6, 7/8
	guard interval	1/4, 1/8, 1/16, 1/32
	time interleaver	
	ISDB-T mode 1	0, 4, 8, 16, 32 [14]
	ISDB-T mode 2	0, 2, 4, 8, 16 [14]
	ISDB-T mode 3	0, 1, 2, 4, 8 [14]
	reference channel	6 MHz, 7 MHz, 8 MHz
Early earthquake warning (EEW)	ISDB-T	on/off
	signal type	warning with area, warning without area, test with area, test without area
	area information	bit 56 to bit 111
	epicenter	apply, number of epicenters
	information type	issued, cancelled
	warning ID	0 to 511
	geographic coordinates	latitude (south/north), longitude (west/east)
	depth	0 km to 1023 km
	occurrence time	0 s to 1023 s
Special functions	scrambler, Reed-Solomon encoder, byte interleaver, bit interleaver, frequency interleaver	on/off
	TX parameter switching indicator	normal, 1 to 15
	TMCC next	unused, current
Test signals		TS test packet (see “Internal test signals”)

DTMB (R&S®SFE-K12 option)

DTMB	in line with GB 20600-2006	
Modulation	modulation	COFDM/single carrier
	bandwidth	6 MHz, 7 MHz, 8 MHz
	modulation frequency response	< 0.2 dB
	shoulder distance	> 50 dB
	back-off	12 dB
Coding	constellation	4QAM(QPSK), 4QAM-NR, 16QAM, 32QAM, 64QAM
	code rate	0.4, 0.6, 0.8
	guard interval	420, 595, 945 symbols
	guard interval PN	variable/constant
	time interleaver	0, 240, 720 symbols
	FFT mode	4k COFDM/single carrier
	dual pilot tone	on/off (single carrier)
Network mode		MFN
Test signals		TS test packet (see “Internal test signals”)

[14] Type B coder only.

CMMB (R&S®SFE-K15 option)

CMMB	in line with GY/T 220.1-2006	
Modulation	modulation	COFDM
	bandwidth	2 MHz, 8 MHz
	modulation frequency response	< 0.2 dB
	shoulder attenuation	> 50 dB
Coding	FFT mode	1k, 4k
	scrambling mode	0 to 7
	number of timeslots	40
	services	
	Reed-Solomon	(240, 240)
		(240, 224)
		(240, 192)
		(240, 176)
	byte interleaver	1 to 3
	LDPC	1/2, 3/4
	constellation	BPSK, QPSK, 16QAM

ATSC/8VSB (R&S®SFE-K4 option)

ATSC/8VSB	in line with ATSC Doc. A/53 (8VSB)	
Modulation	modulation	8VSB
	bandwidth	6 MHz
	symbol rate	10.762 Msymbol/s
	range	settable ±5 %
	pilot	1.25
	pulse filtering	root raised cosine rolloff, α = 0.115
	MER	> 40 dB
	modulation frequency response	< ±0.25 dB
	shoulder distance	> 45 dB
	back-off	9 dB
Coding	input data rate	19.392658 Mbit/s
	range	±5 % (depending on symbol rate)
Test signals		TS test packet (see “Internal test signals”)

ATSC-M/H (R&S®SFE-K18 option)

ATSC Mobile DTV, ATSC-M/H	in line with ATSC Doc. A/153	mobile TV USA
Modulation	mode	8VSB
	bandwidth	6 MHz
	symbol rate	10.762 Msymbol/s
	range	settable ±5 %
	pilot	1.25 (can be switched off)
	range	settable (from 0 to 5 in steps of 0.001)
	pulse filtering	root raised cosine rolloff, α = 0.115
	MER	> 40 dB [15]
	modulation frequency response	< ±0.25 dB
	shoulder attenuation	> 45 dB
Coding	input data rate	19.392658 Mbit/s
	range	±5 % (depending on symbol rate)
Special functions	randomizer, Reed-Solomon, interleaver, Trellis initialization	can be switched off
Test signals		TS test packet (see “Internal test signals”)

[15] With internal test signals.

Cable standards

DVB-C2 (R&S®SFE-K17 option)

DVB-C2	in line with EN 302 769	
Input	transport stream	
	interface	ASI, SPI
	format	MPEG-2 TS
	PLP	
	number	1 to 4 PLPs
	payload	one live and 3 PRBS
	ID	settable
	type	normal data PLP
Modulation	modulation	OFDM
	mode	16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM
	channel raster bandwidth	6 MHz, 8 MHz
	bundled channels [16]	
	number	1 and 2 channels
	bandwidth	5.71 MHz, 7.61 MHz and 11.42 MHz 15.22 MHz
	MER	> 40 dB [17]
	modulation frequency response	< ±0.2 dB
	shoulder attenuation	> 45 dB
Coding	baseband mode	normal (NM), high efficiency (HEM)
	guard interval	1/64, 1/128
	BICM	
	FEC frame	normal (64k), short (16k)
	code rate (concatenated BCH/LDPC)	2/3, 3/4, 4/5, 5/6, 8/9 (short FEC frame), 9/10 (normal FEC frame)
	data slice	
	number	1 to 4 data slices
	ID	settable
	packets	type 1, type 2, stuffing
	tune position	settable
	tune offset	left, right, settable
	FEC frame header type	robust, high efficiency (DSlice packets type 2)
	XFEC frame number	1 and 2 (DSlice packets type 2)
	PLP number	1 to 4 PLP
	time interleaving	none, 4 symbols, 8 symbols, 16 symbols
	notch types	narrowband, broadband
C2 system	C2 system ID	settable
	network ID	settable
	layer 1 part 2 signaling	
	time interleaving	none, best fit, 4 symbols, 8 symbols
	code rate (concatenated BCH/LDPC)	1/2 (16k LDPC)
	mode	16QAM
Test signals		TS test packet with settable payload (PRBS ITU-T O.151, 0x00, 0xFF) (see “Internal test signals”)

[16] In preparation.

[17] With internal test signals.

DVB-C/ISDB-C (R&S®SFE-K2 option)

DVB-C	in line with EN 300429	
ISDB-C	in line with ITU-T J.83/C	
Modulation	modulation	16QAM, 32QAM, 64QAM, 128QAM, 256QAM
	symbol rate	0.75 Msymbol/s to 8 Msymbol/s, settable
	pulse filtering	root raised cosine rolloff, α = 0.13, 0.15
	MER	> 40 dB
	modulation frequency response	±0.25 dB
	shoulder distance	> 48 dB
	back-off	9 dB
Special functions	Reed-Solomon encoder	can be switched off
Test signals		TS test packet (see “Internal test signals”), PRBS before mapper

J.83/B (R&S®SFE-K5 option)

J.83/B	in line with ITU-T J.83/B	
Modulation	modulation	64QAM, 256QAM, 1024QAM
	bandwidth	6 MHz
	symbol rate	
	64QAM	5.0569 Msymbol/s
	256QAM	5.3605 Msymbol/s
	1024QAM	5.3605 Msymbol/s
	pulse filtering	root raised cosine rolloff, α = 0.18 (64QAM), 0.12 (256/1024QAM)
	MER	> 40 dB
	modulation frequency response	±0.25 dB
	shoulder distance	
	64QAM	> 50 dB
	256QAM	> 45 dB
	1024QAM	> 45 dB
	back-off	9 dB
Coding	input data rate	
	64QAM	26.97035 Mbit/s
	256QAM	38.81070 Mbit/s
	1024QAM	49.02525 Mbit/s
	data interleaver	level 1 and level 2
Special functions	Reed-Solomon encoder	can be switched off
Test signals		TS test packet (see “Internal test signals”), PRBS before mapper

Satellite standards

DVB-S/DVB-DSNG (R&S®SFE-K3 option)

DVB-S/DVB-DSNG	in line with EN 300421/EN 301210	
Modulation	modulation	QPSK, 8PSK, 16QAM
	symbol rate	100 ksymbol/s to 45 Msymbol/s, settable
	pulse filtering	root raised cosine rolloff, α = 0.35, 0.25
	MER	38 dB (27.5 Msymbol/s)
	modulation frequency response	±0.25 dB
	shoulder distance	> 45 dB
	back-off	9 dB
Coding	code rate	QPSK: 1/2, 2/3, 3/4, 5/6, 7/8
		8PSK: 2/3, 5/6, 8/9
		16QAM: 3/4, 7/8
Special functions	Reed-Solomon encoder	can be switched off
Test signals		TS test packet (see “Internal test signals”), PRBS before convolutional encoder

DVB-S2 (R&S®SFE-K8 option)

DVB-S2	in line with EN 302307, broadcast services	
Modulation	modulation	QPSK, 8PSK, 16APSK, 32APSK
	symbol rate	
	QPSK	1 Msymbol/s to 47 Msymbol/s (overrange 53 Msymbol/s)
	8PSK	1 Msymbol/s to 40 Msymbol/s (overrange 45 Msymbol/s)
	16APSK	2 Msymbol/s to 39 Msymbol/s
	32APSK	2 Msymbol/s to 32 Msymbol/s
	pulse filtering	root raised cosine rolloff, α = 0.20 variable rolloff (0.15, 0.20, 0.25, 0.35)
	MER	38 dB (20 Msymbol/s)
	modulation frequency response	±0.25 dB
	shoulder distance	45 dB
	back-off	12 dB
Coding	code rate	QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
	FEC frame	8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
		16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
		32APSK: 3/4, 4/5, 5/6, 8/9, 9/10
	pilot insertion	normal (64800 bit)/short (16200 bit) can be switched off
Special function	error insertion	after CRC-8, BCH or LDPC
Test signals		TS test packet (see “Internal test signals”)

DIRECTV legacy modulation (R&S®SFE-K9 option)

DIRECTV legacy modulation	in line with DIRECTV transmission specifications	
Modulation	modulation	QPSK
	symbol rate	20 Msymbol/s
	overrange	1 Msymbol/s to 30 Msymbol/s
	pulse filtering	root raised cosine rolloff, α = 0.20 variable rolloff (0.15, 0.20, 0.25, 0.35)
	MER	38 dB (20 Msymbol/s)
	modulation frequency response	< ±0.25 dB
	shoulder distance	45 dB
	back-off	11.5 dB
Coding	code rate	1/2, 2/3, 6/7
Special functions	customer-specific DIRECTV streams	can be replayed in 188 byte format, requires R&S®SFE-K22 option
	error insertion	after convolutional encoder
Test signals		TS test packet (see “Internal test signals”)

Analog modulation systems

AM/FM/RDS (R&S®SFE-K170 option)

FM	FM operating modes	stereo, mono
	audio signals	
	internal audio signal generator	see ”Internal audio signal generator”
	external audio input	see “Analog video/audio input”
	AF frequency range	30 Hz to 15 kHz
	AF frequency response	< 0.2 dB
	attenuation at 19 kHz	> 70 dB
	preemphasis	off, 50 µs, 75 µs
	residual AM	< 0.1 % (at AF = 1 kHz, deviation ±50 kHz)
FM stereo	stereo operating modes	L, R, L = R, L = –R, L ≠ R internal generation of RDS signal, simultaneous generation of MPX and RDS signals possible
	MPX frequency deviation	
	deviation	0 Hz to ±100 kHz
	resolution	10 Hz
	stereo crosstalk attenuation	> 50 dB (at AF = 30 Hz to 15 kHz)
	total harmonic distortion [18]	< 0.1 % (at 60 kHz audio frequency deviation, AF = 1 kHz)
	SNR (stereo/RDS signal) [18]	at ±40 kHz audio frequency deviation
	ITU-R weighted (quasi-peak)	> 64 dB
	ITU-R unweighted (RMS)	> 70 dB
	pilot tone	
	frequency	19 kHz ± 1 Hz
	deviation	0 Hz to ±15 kHz
	resolution	10 Hz
	phase	0° to ±180°
	resolution	0.1°
	RDS	
	subcarrier frequency	57 kHz ± 3 Hz
	deviation	0 Hz to ±10 kHz
	resolution	10 Hz
FM mono	mono frequency deviation	
	deviation	0 Hz to ±100 kHz
	resolution	10 Hz
	total harmonic distortion [19]	< 0.1 % (at ±67.5 kHz audio frequency deviation, AF = 1 kHz)
AM	audio signals	
	internal audio signal generator	see “Internal audio signal generator”
	external audio input	see “Analog video/audio input”
	AF frequency range	30 Hz to 15 kHz
	AF frequency response	< 0.2 dB
	modulation	
	modulation depth	0 % to 100 %
	resolution	1 %
	AM total harmonic distortion	at AF = 1 kHz
	m = 30 %	< 0.2 %
	m = 80 %	< 0.2 %

[18] Generator without preemphasis, receiver with deemphasis.

[19] Generator and receiver without preemphasis/deemphasis.

Standard B/G (R&S®SFE-K190 option)

Standard B/G	in line with country-specific standard	
Vision modulation	modulation	B/G
	group delay	
	precorrection	CCIR – B/G general half (can be switched off)
	frequency response	< 20 ns (with/without vestigial sideband filtering)
	vestigial sideband	
	filtering	B/G, can be switched off
	amplitude frequency response	< 0.5 dB (–0.6 MHz to +4.8 MHz) (with/without vestigial sideband filtering)
	residual carrier	0 % to 30 %, settable in 0.1 % steps
	signal-to-noise ratio	
	video [20]	> 60 dB, weighted
	back-off	6 dB
Sound modulation	operating mode	mono, stereo, dual tone, NICAM, mono/NICAM
	modulation of sound carrier 1, 2	
	modulation mode	FM
	frequency deviation	30 kHz (settable)
	preemphasis	50 µs/75 µs (can be switched off)
	vision/sound intercarrier frequency	5.5 MHz/5.742 MHz (settable)
	vision/sound carrier power ratio	13 dB/20 dB (settable)
	pilot tone	in sound carrier 2 (can be switched off)
	signal-to-noise ratio	
	sound	> 60 dB, weighted (CCIR)
Video signals	internal video signal generator	see R&S®SFE-K23
	external video input	see “Analog video/audio input”
Audio signals	internal audio generator	see “Internal audio signal generator” see “Internal NICAM audio signal generator”
	external audio input	see “Analog video/audio input”
	audio player	see “Audio player”

[20] For RF > 87.0 MHz.

Standard D/K (R&S®SFE-K191 option)

Standard D/K	in line with country-specific standard	
Vision modulation	modulation	D/K
	group delay	
	precorrection	OIRT – D/K half (can be switched off)
	frequency response	< 20 ns (with/without vestigial sideband filtering)
	vestigial sideband	
	filtering	DK, DK-FM2, DK-NICAM, can be switched off
	amplitude frequency response	< 0.5 dB (–1 MHz to +5.8 MHz) (with/without vestigial sideband filtering)
	residual carrier	0 % to 30 %, settable in 0.1 % steps
	signal-to-noise ratio	
	video [21]	> 60 dB, weighted
	back-off	6 dB
Sound modulation	operating mode	mono, stereo, dual tone, NICAM, mono/NICAM
	modulation of sound carrier 1, 2	
	modulation mode	FM
	frequency deviation	30 kHz (settable)
	preemphasis	50 µs/75 µs (can be switched off)
	vision/sound intercarrier frequency	6.5 MHz/6.742 MHz (settable)
	vision/sound carrier power ratio	13 dB/20 dB (settable)
	pilot tone	in sound carrier 2 (can be switched off)
	signal-to-noise ratio	
	sound	> 60 dB, weighted (CCIR)
Video signals	internal video signal generator	see R&S®SFE-K23
	external video input	see “Analog video/audio input”
Audio signals	internal audio generator	see “Internal audio signal generator”, see “Internal NICAM audio signal generator”
	external audio input	see “Analog video/audio input”
	audio player	see “Audio player”

[21] For RF > 87.0 MHz.

Standard I (R&S®SFE-K192 option)

Standard I	in line with country-specific standard	
Vision modulation	modulation	I
	group delay	
	precorrection	UK – I (can be switched off)
	frequency response	< 20 ns (with/without vestigial sideband filtering)
	vestigial sideband	
	filtering	I, I1 (can be switched off)
	amplitude frequency response	< 0.5 dB (–1 MHz to +4.8 MHz) (with/without vestigial sideband filtering)
	residual carrier	0 % to 30 %, settable in 0.1 % steps
	signal-to-noise ratio	
	video [22]	> 60 dB, weighted
	back-off	6 dB
Sound modulation	operating mode	mono, NICAM, mono/NICAM
	modulation of sound carrier 1	
	modulation mode	FM
	frequency deviation	30 kHz (settable)
	preemphasis	50 µs/75 µs (can be switched off)
	vision/sound intercarrier frequency	6 MHz (settable)
	vision/sound carrier power ratio	13 dB (settable)
	modulation of sound carrier 2	
	modulation mode	NICAM
	vision/sound intercarrier frequency	6.552 MHz (settable)
	vision/sound carrier power ratio	20 dB (settable)
	signal-to-noise ratio	
	sound	> 60 dB, weighted (CCIR)
Video signals	internal video signal generator	see R&S®SFE-K23
	external video input	see “Analog video/audio input”
Audio signals	internal audio generator	see “Internal audio signal generator” see “Internal NICAM audio signal generator”
	external audio input	see “Analog video/audio input”
	audio player	see “Audio player”

[22] For RF > 87.0 MHz.

Standard M/N (R&S®SFE-K193 option)

Standard M/N	in line with country-specific standard	
Vision modulation	modulation	M/N
	group delay	
	precorrection	FCC – M/N (can be switched off)
	frequency response	< 20 ns (with/without vestigial sideband filtering)
	vestigial sideband	
	filtering	M, N (can be switched off)
	amplitude frequency response	< 0.5 dB (–0.6 MHz to +4 MHz) (with/without vestigial sideband filtering)
	residual carrier	0 % to 30 %, settable in 0.1 % steps
	signal-to-noise ratio	
	video [23]	> 60 dB, weighted
	back-off	6 dB
Sound modulation	operating mode	BTSC mono, stereo Korea, dual Korea
	modulation of sound carrier 1, 2	
	modulation mode	FM
	frequency deviation	25 kHz (settable)
	preemphasis	50 µs/75 µs (can be switched off)
	vision/sound intercarrier frequency	4.5 MHz/4.742 MHz (settable)
	vision/sound carrier power ratio	13 dB/20 dB (settable)
	pilot tone	in sound carrier 2 (can be switched off)
	signal-to-noise ratio	
	sound	> 60 dB, weighted (CCIR)
Video signals	internal video signal generator	see R&S®SFE-K23
	external video input	see “Analog video/audio input”
Audio signals	internal audio generator	see ”Internal audio signal generator”
	external audio input	see “Analog video/audio input”
	audio player	see “Audio player”

[23] For RF > 87.0 MHz.

Standard L (R&S®SFE-K194 option)

Standard L	in line with country-specific standard	
Vision modulation	modulation	L
	group delay	
	precorrection	TDF – L (can be switched off)
	frequency response	< 20 ns (with/without vestigial sideband filtering)
	vestigial sideband	
	filtering	L, L NICAM (can be switched off)
	amplitude frequency response	< 0.5 dB (–1 MHz to +5.8 MHz) (with/without vestigial sideband filtering)
	residual carrier	0 % to 30 %, settable in 0.1 % steps
	signal-to-noise ratio	
	video [24]	> 60 dB, weighted
	back-off	6 dB
Sound modulation	operating mode	AM mono, NICAM, AM mono/NICAM
	modulation of sound carrier 1	
	modulation mode	mono/NICAM
	vision/sound intercarrier frequency	5.85 MHz (settable)
	vision/sound carrier power ratio	27 dB (settable)
	modulation of sound carrier 2	
	modulation mode	AM
	frequency deviation	modulation depth 54 % (settable)
	vision/sound intercarrier frequency	6.5 MHz (settable)
	vision/sound carrier power ratio	10 dB (settable)
Video signals	internal video signal generator	see R&S®SFE-K23
	external video input	see “Analog video/audio input”
Audio signals	internal audio generator	see ”Internal audio signal generator” see ”Internal NICAM audio signal generator”
	external audio input	see “Analog video/audio input”
	audio player	see “Audio player”

ATV multistandard (R&S®SFE-K195 option)

Standard B/G		see R&S®SFE-K190
Standard D/K		see R&S®SFE-K191
Standard I		see R&S®SFE-K192
Standard M/N		see R&S®SFE-K193
Standard L		see R&S®SFE-K194

Internal NICAM encoder

Included in the following options: R&S®SFE-K190, R&S®SFE-K191, R&S®SFE-K192, R&S®SFE-K194 and R&S®SFE-K195.

Audio coding	internal audio generator	see ”Internal NICAM audio signal generator”
	external audio input	see “Analog video/audio input”
	operating mode	mono, stereo, dual tone
	preemphasis	J.17, can be switched off
	headroom (400 Hz)	–6 dB to +6 dB, can be set different from standard
Encoder	data	audio coding, NICAM728 data input, PRBS, NICAM audio generator
	pulse filtering	root raised cosine rolloff, α = 0.40 (B/G, D/K, L standards), α = 1.00 (I standard)
NICAM728 data input	connector	D-Sub, 9-pin female, rear
	input level	1 V to 10 V (V_{pp})
	input impedance	50 Ω

[24] For RF > 87.0 MHz.

ARB/waveforms

Arbitrary waveform generator (R&S®SFE-K35 option)

Waveform memory	length	up to 1 Gsample in 1-sample steps
	size	4 Gbyte
	resolution	2 × 16 bit
	loading time for 10 Msample	3 s
	memory location for data	hard disk
Clock generation	clock rate	400 Hz to 100 MHz
	uncertainty	0.001 Hz
	operating mode	internal
	frequency accuracy (internal)	accuracy of reference frequency
Interpolation	bandwidth	
	with clock rate = 100 MHz (no interpolation), bandwidth 0.1 dB	40 MHz
	with clock rate < 100 MHz, bandwidth −0.1 dB	0.31 × clock rate
	sampling rate	automatically interpolated to internal 100 MHz data rate
Triggering	operating modes	auto, retrigger, armed auto, armed retrigger
	source	internal, external
	delay	0 to 2^{32} – 1 sample, settable
	inhibit	0 to 2^{32} – 1 sample, settable
Markers	position	restart waveform
	delay	0 to waveform length, settable in samples
Special function	software support	R&S®WinIQSIM™ (R&S®SFE-K350 option)

Terrestrial standards with I/Q waveforms

Transmission standard	Option	For specifications, see separate data sheet.
DVB-T2 waveforms	R&S®SFU-K359	PD 5214.2662.22
DVB-H waveforms	R&S®SFU-K352	PD 5214.3900.22
T-DMB/DAB waveforms	R&S®SFU-K351	PD 5214.3898.22
DRM waveforms	R&S®SFU-K353	PD 5214.1020.22
DRM+ waveforms	R&S®SFU-K361	PD 3607.3439.22
HD Radio™ waveforms [25]	R&S®SFU-K357	PD 5214.2691.22
ISDB-T_{mm} waveforms	R&S®SFU-K365	PD 2115.3091.02
CMMB waveforms	R&S®SFU-K358	PD 5214.2656.22
DTV waveforms	R&S®SFU-K354	PD 5214.3546.22
Analog signals	R&S®SFU-K360	PD 5214.3146.22
China Digital Radio Waveforms	R&S®WV-K807	PD 5215.1676.22

Cable standards with I/Q waveforms

Transmission standard	Option	For specifications, see separate data sheet.
DVB-C2 waveforms	R&S®WV-K817	
MoCA® waveforms	R&S®SFU-K364	PD 2115.3004.02
Cable interferers	R&S®SFU-K356	PD 5214.3930.22

Satellite standards with I/Q waveforms

Transmission standard	Option	For specifications, see separate data sheet.
XM Radio™ playback of waveforms [26]	R&S®SFEK256	
ISDB-S waveforms	R&S®SFU-K362	PD 5214.5349.22
Satellite interferers	R&S®SFU-K363	PD 5214.4888.22
DVB-CID Waveforms	R&S®WV-K810	2116.9870.02

[25] Requires license from DTS, Inc.

[26] Signal generation requires waveforms from XM Radio™.

Simulation

AWGN generator (R&S®SFE-K40 option)

RF bandwidth	3 dB spectrum (AWGN)	96 MHz
Noise	density distribution function	Gaussian, statistical, separate for I and Q
	crest factor	18 dB
C/N	setting range	–30 dB to +60 dB
	resolution	0.01 dB
	uncertainty for system bandwidth = symbol rate and C/N < 20 dB	< 0.2 dB
System bandwidth	(bandwidth for calculating noise power) range	100 kHz to 80 MHz

Fading simulator (R&S®SFE-K30 option)

Number of paths		12
Number of delay groups		2
Path loss	range	0 dB to 50 dB
	resolution	0.01 dB
	accuracy	< 0.01 dB
Path delay	range	
	within each group	0 s to 40 µs
	between group 1 and group 2	0 s to 5.242 ms
	resolution	10 ns
Speed range	range	0 m/h to 1726.8 km/h for 1 GHz
Doppler frequency	limit	±1600 Hz
	frequency ratio	(–1 to +1) × current Doppler frequency
	resolution	0.01 × current Doppler frequency
Phase	range	0° to 359.9°
	resolution	0.1°
Fading profiles		
Pure Doppler	frequency ratio	(–1 to +1) × current Doppler frequency
	resolution	0.01 × current Doppler frequency
Static and constant phase	path loss	
	phase	0° to 360°
	resolution	0.1°
Rayleigh fading	pseudo noise interval	> 93 h
Rice fading	combination of Rayleigh fading and pure Doppler	
	pseudo noise interval	> 93 h
	power ratio [27]	–30 dB to +30 dB

[27] Ratio of discrete component to distributed component.

Analysis

BER measurements (R&S®SFE-K60 option)

BER measurements	for all digital modulation modes	
Display	measured value	BER
		error counter
		measurement time
Start/restart		manual
Serial PRBS measurements (serial BER measurement is not possible with DVB-S2, DIRECTV, DTMB, and MediaFLO™)		
Inputs for BER clock, BER data, BER enable	connector	BNC female, rear
	input impedance	50 Ω
	input level	TTL/LVTTL
BER data	input data rate	up to 90 Mbit/s
	PRBS	$2^{23} – 1$, $2^{15} – 1$ (in line with ITU-T O.151)
BER clock, BER data	polarity	normal, inverted
BER enable	polarity	always, active high, active low
Output for BER error	connector	BNC female, rear
	output impedance	50 Ω
	output level	LVTTL
MPEG-2 TS measurements		
Input	input interfaces	ASI, SMPTE310M (see “MPEG-2 inputs”) TS packet (see “Internal test signals”)
	input signal	
	payload (PRBS in line with ITU-T O.151)	$2^{23} – 1$, $2^{15} – 1$
	PID	NULL (1FFF (hex))/variable

Trigger inputs/outputs

Trigger out	connector	9-pin D-Sub female, rear, alternative to reference out
	load impedance	> 200 Ω
	output level	LVTTL
1PPS input/Trigger in	connector	BNC female, rear
	input impedance	high impedance
	input level	LVTTL

General data

System data

System	operating system	PC platform
		Windows XP Embedded
		min. 160 Gbyte internal hard disk
Local control	display	VGA 640 × 480 pixel
	control	rotary knob, hardkeys, softkeys
External control	control	external mouse and keyboard via USB
Remote control	command set	SCPI 1999.5
	Ethernet	10/100BaseT
Connectors	Ethernet	RJ-45, rear
	USB	USB 2.0, front and rear
	AC supply input	IEC 60320 C14, rear

Operating data

Power supply	AC input voltage range	100 V to 240 V ± 10 %
	supply frequency	50 Hz to 60 Hz ± 5 %
	input current	1.8 A to 0.8 A
	power consumption	
	standby	5 W
	operational	65 W
Electromagnetic compatibility		in line with EN 55011 class A, EN 61326-1
Immunity against RF fields		up to 10 V/m
Environmental conditions	operating temperature range	+5 °C to +45 °C [28]
	permissible temperature range	0 °C to +50 °C
	storage temperature range	–20 °C to +60 °C
	climatic resistance, cyclic test at +25 °C/+40 °C	85 % rel. humidity
Mechanical resistance	vibration, sinusoidal	5 Hz to 150 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g constant, in line with EN 60068-2-6
	vibration, random	10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
	shock	40 g shock spectrum, in line with MIL-STD-810E, method 516.4, procedure I
Electrical safety		in line with IEC 61010-1, EN 61010-1 and UL 61010-1, CSA C22.2 No. 61010-1
Dimensions	W × H × D	235 mm × 155 mm × 465 mm (3 HU) (9.25 in × 6.11 in × 18.3 in)
Weight		6 kg (13.28 lb)
Recommended calibration interval		3 years

[28] Reduced LCD brightness at higher operating temperatures.

Ordering information

Option identification: R&S®SFE-Bxy = hardware option, R&S®SFE-Kxy = software option.
Delivery of R&S®SFE base unit only with at least one modulation system.

Designation	Type	Order No.
Broadcast Tester Including power cable, quick start guide	R&S®SFE	2112.4300.02
Options		
Digital modulation systems		
DVB-T/DVB-H Coder	R&S®SFE-K1	2113.4010.02
DVB-C/ISDB-C Coder	R&S®SFE-K2	2113.4032.02
DVB-S/DVB-DSNG Coder	R&S®SFE-K3	2113.4055.02
DVB-S2 Coder	R&S®SFE-K8	2113.4132.02
ATSC/8VSB Coder	R&S®SFE-K4	2113.4078.02
J.83/B Coder	R&S®SFE-K5	2113.4090.02
ISDB-T/ISDB-T_{SB}/ISDB-T_B Coder	R&S®SFE-K6	2113.4110.02
ISDB-T_{MM} Coder	R&S®SFE-K106	2113.4455.02
T-DMB/DAB Coder	R&S®SFE-K11	2113.4190.02
DTMB/DMB-TH Coder	R&S®SFE-K12	2113.4210.02
DIRECTV Legacy Modulation Coder	R&S®SFE-K9	2113.4155.02
CMMB Coder	R&S®SFE-K15	2113.4278.02
DVB-T2 Coder, requires an installed R&S®SFE-B15 option	R&S®SFE-K16	2113.4290.02
DVB-C2 Coder requires an installed R&S®SFE-B15 option	R&S®SFE-K17	2113.4310.02
ATSC-M/H Coder	R&S®SFE-K18	2113.4332.02
Analog modulation systems		
AM/FM/RDS Coder	R&S®SFE-K170	2113.4432.02
ATV Standard B/G Coder	R&S®SFE-K190	2113.4655.02
ATV Standard D/K Coder	R&S®SFE-K191	2113.4678.02
ATV Standard I Coder	R&S®SFE-K192	2113.4690.02
ATV Standard M/N Coder	R&S®SFE-K193	2113.4710.02
ATV Standard L Coder	R&S®SFE-K194	2113.4732.02
ATV Multistandard	R&S®SFE-K195	2113.4755.02
ARB/waveforms		
ARB Waveform Generator, requires an installed R&S®SFE-B3 option	R&S®SFE-K35	2113.4932.02
Memory Expansion	R&S®SFE-B3	2112.4500.04
R&S®WinIQSIM™ Support	R&S®SFE-K350	2113.4955.02
The following options can be used with the R&S®SFE-K35 option:		
T-DMB/DAB Waveforms	R&S®SFU-K351	2110.4277.04
DVB-H Waveforms	R&S®SFU-K352	2110.4425.02
DRM Waveforms	R&S®SFU-K353	2110.4554.02
DRM+ Waveforms	R&S®SFU-K361	2110.8366.02
HD Radio™ Waveforms [29] (DTS license required)	R&S®SFU-K357	2110.5573.02
Playback of XM Radio™ Waveforms (SiriusXM license required)	R&S®SFE-K256	2113.6087.02
CDR Waveforms	R&S®WV-K807	2116.9841.02
CMMB Waveforms	R&S®SFU-K358	2112.3726.02
DVB-T2 Waveforms	R&S®SFU-K359	2112.3803.02
ISDB-Tmm Waveforms	R&S®SFU-K365	2115.3010.02
DTV Interferers	R&S®SFU-K354	2110.4690.02
Cable Interferers	R&S®SFU-K356	2110.3212.02
MoCA® Waveforms	R&S®SFU-K364	2115.2920.02
ISDB-S Waveforms	R&S®SFU-K362	2115.2450.02
Satellite Interferers	R&S®SFU-K363	2115.2537.02
DVB-CID Waveforms	R&S®WV-K810	2116.9870.02
Analog Signals	R&S®SFU-K360	2110.3941.02

[29] HD Radio™ is a proprietary trademark of iBiquity Digital Corp. HD Radio™ waveforms require a license agreement with iBiquity Digital Corporation.

Designation	Type	Order No.
Simulation		
Fading Simulator, requires an installed R&S®SFE-B15 option	R&S®SFE-K30	2113.5047.02
AWGN Generator	R&S®SFE-K40	2113.4910.02
Baseband inputs/outputs		
Extended I/Q Input	R&S®SFE-K80	2113.5251.02
Digital baseband		
TS Generator including SDTV streams	R&S®SFE-K20	2113.4878.02
The following options require the R&S®SFE-K20 option:		
DVB-H Stream Library	R&S®DV-DVBH	2085.8704.02
Test Card M Streams	R&S®DV-TCM	2085.7708.02
HDTV Sequences	R&S®DV-HDTV	2085.7650.02
H.264 Stream Library	R&S®DV-H264	2085.9052.02
ISDB-T Stream Library	R&S®DV-ISDBT	2085.9146.02
TRP Player	R&S®SFE-K22	2113.5274.02
TS Generator/Player	R&S®SFE-PK20	2113.6035.02
The following options require the R&S®SFE-K22 option:		
T-DMB/DAB Streams	R&S®SFU-K221	2110.4348.02
DAB+ Streams	R&S®SFU-K223	2110.4760.02
DRM/DRM+ MDI Stream Library	R&S®LIB-K60	2116.9458.02
Brazilian ISDB-T Transport Streams	R&S®SFU-K224	2110.4777.02
CMMB Transport Streams	R&S®SFU-K225	2112.3649.02
ATSC and ATSC Mobile DTV Streams	R&S®SFU-K226	2110.3812.02
DVB-T2 MI Streams	R&S®SFU-K227	2115.2120.02
EMC Streams	R&S®SFU-K228	2115.2520.02
French DMB	R&S®SFU-K229	2115.2543.02
Basic Stream Library	R&S®LIB-K70	2116.9558.02
Extended SDTV Library	R&S®LIB-K71	2116.9564.02
Extended HDTV Library	R&S®LIB-K72	2116.9570.02
3D Library	R&S®LIB-K73	2116.9587.02
HEVC Stream Library	R&S®LIB-K78	2116.9641.02
Customer-Specific Transport Streams	R&S®DV-SCA	on request
Analog baseband		
Video Generator	R&S®SFE-K23	2113.4890.02
ATV Video Signals	R&S®ATV Video	2110.4831.02
Measurement and analysis		
BER Measurement (for DVB-S2, DIRECTV, DTMB only possible to a limited extent or not at all)	R&S®SFE-K60	2113.5151.02
Other extras		
Coder Extension Board	R&S®SFE-B15	2112.4200.02
Recommended extras		
Operating manuals; include quick start guide (English)		2112.4322.12
Documentation of R&S®SFE Calibration Values	R&S®SFE-DCV	2082.0490.32
Keyboard with USB Interface (US layout)	R&S®PSL-Z2	1157.6870.03
Mouse with USB Interface, optical	R&S®PSL-Z10	1157.7060.02
External USB CD-RW Drive	R&S®PSP-B6	1134.8201.12
19" Rackmount Kit for R&S®SFE and second instrument	R&S®ZZA-T33	1109.4458.00
19" Rackmount Kit for R&S®SFE and cover	R&S®ZZA-T34	1109.4464.00
LVDS cable for digital I/Q interface, length: 2 m		1130.1302.00

Service options

Warranty		
Base unit		3 years
All other items [30]		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [31]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [31] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For product brochure, see PD 5213.8596.12 and www.rohde-schwarz.com

[30] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.
[31] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

Service that adds value

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

Rohde&Schwarz

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

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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R&S®SFE Broadcast Tester

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