R&S®UPV
Audio Analyzer
Specifications

ROHDE&SCHWARZ

CONTENTS

Definitions **4**

Analog analyzers **5**

Dual-channel inputs 5

Dual-channel analog analyzer measurement functions 5

Eight-channel analog inputs (R&S®UPV-B48 option) 7

Analog generators **8**

Outputs 8

Signals 8

Digital analyzers **11**

Digital audio inputs (R&S®UPV-B2 option) 11

I^2S input (R&S®UPV-B41 option) 11

Universal serial interface input (R&S®UPV-B42 option) 11

PDM bitstream analyzer (R&S®UPV-K421 option) 13

Digital audio analyzer measurement functions 14

Digital generators **15**

Digital audio outputs (R&S®UPV-B2 option) 15

I^2S output (R&S®UPV-B41 option) 15

Universal serial interface output (R&S®UPV-B42 option) 16

Signals 18

FFT analyzer **19**

Filter **20**

Sweep **21**

Display of results **21**

Audio monitor **22**

150 Ω modification (R&S®UPV-U1 option) **22**

BNC phone out (R&S®UPV-U2 option) **22**

Digital audio protocol (R&S®UPV-K21 option) **22**

Jitter and interface test (R&S®UPV-K22 option) **23**

Generator 23

Analyzer 23

Remote control (R&S®UPV-K4 option) **24**

Extended analysis functions (R&S®UPV-K6 option) **24**

PESQ® measurement (R&S®UPV-K61 option) [16] **24**

PEAQ® measurement (R&S®UPV-K62 option) **24**

POLQA® measurement (R&S®UPV-K63 option) [16] **24**

Hearing aid measurements (R&S®UPV-K7 option) **25**

Hearing aid speech tests (R&S®UPV-K71 option) **25**

UMTS/GSM mobile phone tests (R&S®UPV-K91 option) **25**

R&S®UPV-K91 upgrade 01 (R&S®UPV-K9101 option) **25**

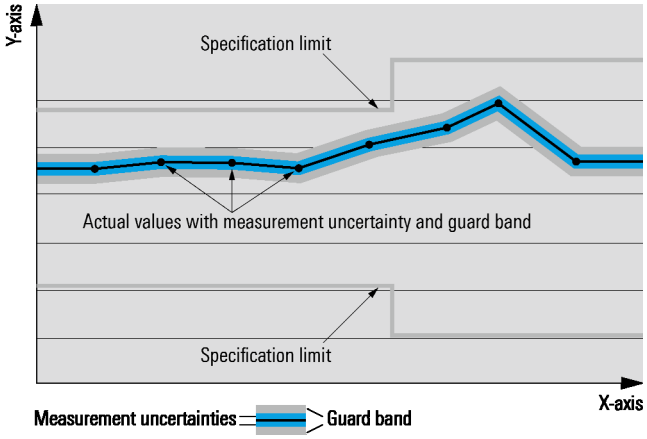
CDMA2000® mobile phone tests (R&S®UPV-K92 option) 25
Cable for R&S®UPV-B48 (R&S®UPV-Z48 option) 25
General data 26
Ordering information 27
System components 27

Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

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

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

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Analog analyzers

Analog measurements are available with different bandwidths, specifications and measurement functions.

Dual-channel inputs

Analyzer		
Bandwidth 22 kHz		DC/10 Hz to 21.76 kHz [1]
Bandwidth 40/80 kHz		DC/10 Hz to 40/80 kHz [1]
Bandwidth 250 kHz		DC/10 Hz to 250 kHz [1]

Level measurements (RMS)		
Level error	at 1 kHz	±0.05 dB, typ. ±0.025 dB
Frequency response (referenced to 1 kHz)	20 Hz to 20 kHz	±0.01 dB, typ. 0.003 dB, V_{in} < 3 V [2]
	20 kHz to 50 kHz	±0.03 dB, V_{in} < 3 V [2]
	50 kHz to 100 kHz	±0.1 dB
	100 kHz to 250 kHz	±0.3 dB

XLR connectors	2 channels, balanced (unbalanced measurements possible with the R&S®UP-Z1MF XLR/BNC adapter set), XLR pin 1 floating/grounded selectable, AC/DC coupling selectable	
Voltage range	RMS, sine	0.1 µV to 110 V
Measurement ranges		18 mV to 100 V, in steps of 5 dB
Input impedance		100 kΩ ±1 % shunted by 120 pF (230 pF for ranges ≥ 6 V), each pin against ground
		300 Ω ±0.5 %, P_{max} 2 W
		600 Ω ±0.5 %, P_{max} 1 W
Crosstalk attenuation	frequency < 22 kHz, 600 Ω	> 120 dB
Common-mode rejection (V_{in} < 3 V)	at 50 Hz	> 90 dB
	at 1 kHz	> 86 dB
	at 20 kHz	> 80 dB
Generator output	each input channel switchable to any output channel	
	input impedance	200 kΩ balanced
		100 kΩ unbalanced

Dual-channel analog analyzer measurement functions

RMS, wideband		
Level error	measurement speed AUTO	±0.05 dB, typ. ±0.025 dB, at 1 kHz, sine
	measurement speed AUTO FAST	±0.1 dB additional error
Integration time	AUTO FAST/AUTO	min. 200/4000 sample, at least 1 cycle
	GEN TRACK	min. 100 sample, at least 1 cycle
	VALUE	0.1 ms to 100 s
Noise (input shorted)	22/40/80 kHz bandwidth	
	A weighted	< 1 µV, typ. 0.7 µV
	CCIR unweighted	< 1.4 µV, typ. 1 µV
	80 kHz bandwidth	< 2.8 µV
	250 kHz bandwidth	< 7 µV
Spectrum		post FFT

DC voltage		
Voltage range		0 V to ±110 V
Level error [3]		±(1 % of measured value + 0.1 % of measurement range)
Measurement ranges		100 mV to 100 V, in steps of 10 dB

FFT analysis		see FFT analyzer section

[1] DC/AC coupling.

[2] Additionally ± 0.02 dB from 5 kHz to 50 kHz when V_{in} ≥ 3 V.

[3] Not valid for bandwidth 250 kHz.

Total harmonic distortion (THD)		
Fundamental		10 Hz to 110 kHz
Frequency tuning		automatic to input or generator signal or fixed through entered value
Weighted harmonics		any combination of d_2 to d_9, up to 250 kHz
Error limit	harmonics < 50 kHz	±0.5 dB
	harmonics < 100 kHz	±0.7 dB
	harmonics < 250 kHz	±1 dB
Inherent distortion (bandwidth 22 kHz) [4] [5]	fundamental 20 Hz to 10.95 kHz	< –110 dB, typ. –115 dB
	fundamental 10 Hz to 20 Hz	< –100 dB
Inherent distortion (bandwidth 40/80/250 kHz) [4] [5]	fundamental 50 Hz to 20 kHz	< –100 dB, typ. –105 dB
	fundamental 20 kHz to 50 kHz	< –90 dB, typ. –95 dB
	fundamental 50 kHz to 110 kHz	< –80 dB, typ. –85 dB
Spectrum		bargraph showing signal and distortion post FFT

THD+N and SINAD			
Fundamental			10 Hz to 110 kHz
Frequency tuning			automatic to input or generator signal or fixed through entered value
Input voltage			typ. > 100 µV with automatic tuning
Bandwidth			upper and lower frequency limit selectable, one weighting filter in addition
Error limit	bandwidth		
	< 50 kHz		±0.5 dB
	< 100 kHz		±0.7 dB
	< 250 kHz		±1 dB
Inherent distortion (analyzer bandwidth 22 kHz) [4]	fundamental	meas. Bandwidth	
	to 22 kHz	20 Hz to 22 kHz	typ. –110 dB at 1 kHz, 2.5 V < –105 dB + 2 µV [6] typ. –108 dB + 1.5 µV
Inherent distortion (analyzer bandwidth 40/80/250 kHz) [4]	fundamental	meas. bandwidth	
	to 20kHz	20 Hz to 22 kHz	< –95 dB + 2.5 µV, typ. –100 dB + 1.75 µV
	to 20 kHz	20 Hz to 80 kHz	< –90 dB + 5 µV, typ. –95 dB + 3.5 µV
	to 50 kHz	20 Hz to 250 kHz	< –84 dB + 10 µV, typ. –90 dB + 7 µV
Spectrum			post FFT

Time domain display (WAVEFORM)		
Trigger		rising/falling
Trigger level		–100 V to +100 V
Trace length		max. 480 ksample per channel
Pretrigger		max. 19200 sample
Standard mode		each sample recorded
Compressed mode		peak value of up to 1024 sample recorded (envelope)
Undersample mode		undersampling factor up to 1024

Frequency		
Frequency range		20 Hz to 250 kHz
Frequency error		±10 ppm

Phase		
Frequency range		20 Hz to 250 kHz
Phase error	20 Hz to 22 kHz	±0.4°
	22 kHz to 50 kHz	±0.6°
	50 kHz to 100 kHz	±1.0°
	100 kHz to 250 kHz	±1.5°

[4] Total inherent distortion of analyzer and generator (with R&S®UPV-B1 option), analyzer with dynamic mode precision.

[5] Typ. 3 dB less when > 3.5 V; sensitivity reduced by inherent noise when < 0.5 V.

[6] At full-scale level of measurement range (< –100 dB + 2 µV with autoranging), < –100 dB for input voltage > 3.5 V.

Eight-channel analog inputs (R&S®UPV-B48 option)

Two R&S®UPV-B48 options can be installed to provide 16-channel analog inputs.

8 analog input channels		25-pin D-Sub, balanced, TASCAM pinning
Bandwidth		DC, 20 Hz to 40 kHz
Level range	RMS, sine	1 µV to 50 V
Measurement ranges		200 mV to 50 V in steps of 12 dB autoranging or fixed, selectable for each channel, or coupled
Input impedance	each pin to ground	100 kΩ ±1 % ‖ 220 pF
AC/DC coupling		selectable for each channel, or coupled

Level error (RMS)	at 1 kHz	±0.05 dB, typ. ±0.025 dB
Frequency response (referenced to 1 kHz)	20 Hz to 20 kHz	±0.1 dB
	20 Hz to 40 kHz	±0.2 dB
Noise (RMS, input shorted)	A weighted	< 1.5 µV
	CCIR unweighted	< 2.0 µV
THD+N [7]	20 Hz to 20 kHz	typ. –100 dB at 1 kHz, 2.5 V <–94 dB + 2 µV
Frequency error	20 Hz to 40 kHz	±10 ppm
Phase error	20 Hz to 20 kHz	±0.5°
	20 kHz to 40 kHz	±1.0°
Level error (DC)		±(1 % of measured value + 0.2 % of measurement range)
Crosstalk attenuation	up to 20 kHz	> 100 dB (100 Ω)
Common-mode rejection (V_{in} < 3 V, DC coupling)	up to 20 kHz	> 50 dB

Measurement functions		RMS wideband, RMS selective, peak, S/N, DC, FFT, THD, THD+N, Mod Dist, DFD, DIM, polarity
Audio monitor		not available

[7] Total inherent distortion of analyzer and generator (with R&S®UPV-B1 option).

Analog generators

Outputs

XLR connectors (pin 1 not connected), 2 channels, floating/grounded selectable, balanced/unbalanced selectable, short-circuit-proof; max. current < 120 mA with external feed.

Balanced			
Voltage	RMS, sine, open circuit		0.1 mV to 20 V
Crosstalk attenuation	frequency < 20 kHz		> 115 dB
Source impedance			typ. 10 Ω
			200 Ω (150 Ω with R&S®UPV-U1) ± 0.5 %
			600 Ω ± 0.5 %
Load impedance	incl. source impedance		> 400 Ω
Output balance	at 1 kHz		> 75 dB
	at 20 kHz		> 60 dB

Unbalanced			
Voltage	RMS, sine, open circuit		0.1 mV to 10 V
Crosstalk attenuation	frequency < 20 kHz		> 115 dB
Source impedance			typ. 5 Ω
Load impedance			> 200 Ω

Signals

Sine			
Frequency range			0.1 Hz to 80 kHz
Frequency error			±10 ppm
Level error	at 1 kHz		±0.05 dB
Frequency response (referenced to 1 kHz)	20 Hz to 20/70/80 kHz		±0.01 dB/±0.05dB/±0.1 dB
Inherent distortion (THD+N)	level < 3 V		
	fundamental	meas. bandwidth	
	20 Hz to 20 kHz	22 kHz	< –103 dB + 2.5 µ V, typ. –107 dB
	20 Hz to 20 kHz	80 kHz	< –90 dB + 5 µ V
Sweep parameters			frequency, level

Sine (with R&S®UPV-B1 low distortion generator option)			
Frequency range			10 Hz to 185 kHz
Frequency error	10 Hz to 100 kHz		±0.5 %
	100 kHz to 185 kHz		±0.75 %
Level error	at 1 kHz		±0.05 dB
Frequency response (referenced to 1 kHz)	20 Hz to 20 kHz		±0.01 dB
	10 Hz to 100 kHz		±0.05 dB
	100 kHz to 150 kHz		±0.15 dB
	150 kHz to 185 kHz		±0.25 dB
Harmonics	measurement bandwidth 20 Hz to 20 kHz, voltage 1 V to 5 V		typ. < –115 dB (< –120 dB at 1 kHz)
Inherent distortion (THD)	fundamental		
	1 kHz, 1 V to 10 V		typ. < –120 dB
	20 Hz to 7 kHz		< –110 dB, typ. –115 dB
	7 kHz to 20 kHz		< –105 dB, typ. –110 dB
	20 kHz to 50 kHz		< –88 dB
	50 kHz to 100 kHz		< –80 dB
Inherent distortion (THD+N) [8]	fundamental	meas. bandwidth	
	1 kHz, 2.5 V	22 kHz	typ. –110 dB
	20 Hz to 20 kHz	22 kHz	< –100 dB + 2 µV
	20 Hz to 20 kHz	100 kHz	< –88 dB + 5 µV
Sweep parameters			frequency, level

[8] Total inherent distortion of analyzer and generator, analyzer with dynamic mode precision.

Stereo sine (only with R&S®UPV-B3 second analog generator option)		
Frequency range		0.1 Hz to 80 kHz
Frequency		adjustable for each channel
Phase	same frequency in both channels	–360° to +360°
Level		adjustable for each channel or channel ratio 2/1
Sweep parameters		frequency, level of channel 1

MOD DIST	for measuring the modulation distortion in line with IEC 60268-3	
Frequency range	lower frequency (LF)	30 Hz to 2700 Hz
	upper frequency (UF)	8 × LF to 21.75 kHz
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Level error		±0.5 dB
Inherent distortion	level ratio LF:UF = 4:1	
	at 7 kHz, 60 Hz	< –96 dB, typ. –108 dB
		< –90 dB, typ. –103 dB
Sweep parameters		upper frequency, level

DFD	for measuring the difference frequency distortion in line with IEC 60268-3 or IEC 60118	
Frequency range	difference frequency	80 Hz to 2 kHz
	mean frequency	200 Hz to 20.75 kHz
Level error		±0.5 dB
Inherent distortion [9]	DFD d_2	< –115 dB, typ. –120 dB
	DFD d_3	< –94 dB, typ. –103 dB
Sweep parameters		mean frequency, level

DIM (only with R&S®UPV-B3 second analog generator option)		
For DIM measurements in line with DIN IEC 60268-3 (dynamic intermodulation distortion).		
Waveform	square/sine frequency	3.15/15 kHz or 2.96/14 kHz or 2.96/8 kHz
	square/sine amplitude ratio	4:1
	bandwidth (3 dB)	30/100 kHz selectable
Max. level (peak-peak)		50 V (25 V unbalanced)
Level error		±0.5 dB
Inherent distortion [10]	level < 3 V (RMS)	< –95 dB, typ. –105 dB
	level > 3 V (RMS)	< –90 dB, typ. –100 dB
Sweep parameters		level

Sine burst, sine² burst		
Burst time		1 sample up to 60 s, 1 sample resolution
Interval		burst time up to 3600 s, 1 sample resolution
Low level		0 to burst level, absolute or relative to burst level (0 for sine² burst)
Bandwidth		80 kHz
Sweep parameters		burst frequency, level, time, interval

Noise		
Distribution		Gaussian, triangular, rectangular

Arbitrary waveform		
Memory depth		max. 256 ksample
Clock rate	with bandwidth setting to 22 kHz/40 kHz/80 kHz	48 kHz/96 kHz/192 kHz
File format		*.arb

[9] Mean frequency > 5 kHz, difference frequency < 1 kHz, DFD d_2 typ. –100 dB with DC offset.

[10] Level > 0.5 V, typ. values apply from 0.5 V to 6 V.

Polarity test signal		asymmetrical two-tone signal (fundamental + 2nd harmonic)
Fundamental frequency		0.1 Hz to 32 kHz

FM signal		
Carrier frequency		0.1 Hz to 80 kHz
Modulation frequency		1 µHz to 80 kHz
Modulation		0 % to 100 %

AM signal		
Carrier frequency		0.1 Hz to 80 kHz
Modulation frequency		1 µHz to 80 kHz
Modulation		0 % to 100 %

DC voltage		
Level range	balanced	0 V to ±10 V
	unbalanced	0 V to ±5 V
Level error		±2 %
Sweep parameters		level

DC offset [11]		
Level range	balanced	0 V to ±10 V
	unbalanced	0 V to ±5 V
Level error		±2 %
Residual offset		±1 % of RMS value of AC signal

[11] No DC offset for DIM signal or sine with Low Dist ON. With DC offset, the AC voltage swing will be reduced; specified inherent distortion values valid for DC offset = 0.

Digital analyzers

Digital audio inputs (R&S®UPV-B2 option)

Balanced input		XLR connector, transformer coupling
Impedance		110 Ω
Level	peak-peak	200 mV to 12 V
Unbalanced input		BNC, grounded
Impedance		75 Ω
Level	peak-peak	100 mV to 5 V
Optical input		TOSLINK
Channels		1, 2 or both
Audio bits		8 to 24
Clock rate		30 kHz to 200 kHz
Format		professional and consumer format in line with AES3 or IEC 60958
Reclocking		input signal sampled with low-jitter clock signal and available at AUX output (XLR connector on rear panel)

I^2S input (R&S®UPV-B41 option)

Input		25-pin D-Sub connector (male)
Level	low	< 0.8 V (min. –5 V)
	high	> 2 V (max. 10 V)
Impedance	level –0.5 V to +5.5 V	10 kΩ
	level –5 V to –0.5 V and +5 V to +10 V	100 Ω
Channels		1, 2 or both multiplexed
Word length		16 bit/24 bit/32 bit per channel
Audio bits		8 to 32
Word clock rate		6.75 kHz to 400 kHz

Universal serial interface input (R&S®UPV-B42 option)

Interface format		
Connector		26-pin connector strip, 2.54 mm (female)
Input data lines		4
Data routing		any input data line to any measurement channel
Input measurement channels	dual-channel analyzer mode	1 or 2
	eight-channel analyzer mode	1 to 8
Samples per frame	single-sample format	1
	multisample format	2 to 32
Number of slots	single-sample format	1 to 256
	multisample format	up to 32
Slot length		8 bit to 256 bit
Frame length	slot length × number of slots	8 bit to 2048 bit
Lead bits		0 to (slot length – audio bits)
Audio bits		8 to 32
Audio bit order		MSB or LSB first
Audio bit decoding mode		linear PCM, A-law, µ-law
Clock mode		continuous clock, gated clock
Synchronization	internal	internal clock source
	external	frame sync, frame sync and bit clock, master clock

Clocks		
Sampling frequency		0.84375 kHz to 400 kHz
Mixed sampling frequencies ratio	with multisample format only	2, 3, 4, 5, 6
Frame sync	frequency	0.84375 kHz to 400 kHz
	width	1 to (slot length × number of slots) – 1
	slope	rising, falling
	offset (relative to frame)	–(number of slots × slot length) to (number of slots × slot length) – 1
Bit clock	frequency	6.75 kHz to 55.296 MHz
	slope	rising, falling
Master clock	frequency	13.5 kHz to 110.592 MHz
	ratio to frame sync	16 to 768
Timing		
Sampling delay	sync mode: frame sync and bit clock	–9 ns to +8 ns
	other sync modes	–12 ns to +5 ns
Data and frame sync to bit clock (relative to bit clock)	setup time	–1.3 ns
	hold time	4.6 ns
Measurement functions	dual-channel analyzer mode	same as for digital audio analyzer
	eight-channel analyzer mode	RMS wideband, RMS selective, peak, S/N, DC, FFT, THD, THD+N, Mod Dist, DFD, DIM, polarity

Outputs		
Logic voltage	CMOS	0.9 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V
	LVTTL	3.3 V
Impedance	short-circuit-proof	50 Ω
Maximum reverse voltage		–3 V to selected logic voltage + 3 V

Inputs		
Logic voltage	CMOS	0.9 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V
	LVTTL	3.3 V
Impedance	–0.3 V to selected logic voltage + 0.3 V	10 kΩ
	–4 V to –0.3 V or selected logic voltage + 0.3 V to selected logic voltage + 4 V	100 Ω
Maximum input voltage		–4 V to selected logic voltage + 4 V

Clock I/O configuration					
Synchronization	Internal clock	External master clock	External rame sync	External frame sync (audio monitor)	External frame sync and bit clock
Master clock output	X		X		
Master clock input		X			
Bit clock output	X	X	X	X	
Bit clock input					X
Frame sync output	X	X	X	X	
Frame sync input			X	X	X

Unused outputs are tristated.

PDM bitstream analyzer (R&S®UPV-K421 option)

Universal serial interface (R&S®UPV-B42 option) required.

Interface format		
Connector		26-pin connector strip, 2.54 mm (female)
Input data lines		4
Input measurement channels	channel mode: mono	1 to 4 mono channels (data lines 1 to 4)
	channel mode: stereo	1 to 2 stereo channels (data lines 1 and 2)
Data alignment (relative to bitstream clock)	channel mode: mono	rising, falling
	channel mode: stereo	ch1 rising/ch2 falling ch1 falling/ch2 rising ch1 high/ch2 low ch1 low/ch2 high
Downsampling factor		16/32/64/128/256
Audio bits		8 to 32
Clock source	internal	channel mode mono or stereo
	external	channel mode mono only

Clocks		
Bitstream clock frequency	internal, external	512 kHz to 12.800 MHz
Bitstream clock duty cycle	internal clock	40 % to 60 % adjustable
	external clock	40 % to 60 %
Sampling frequency	depends on bitstream clock frequency and downsampling factor	2 kHz to 200 kHz

Timing		
Sampling delay		–9.323 ns to +9.323 ns
Data to bitstream clock (relative to bitstream clock)	setup time	–1.3 ns
	hold time	4.6 ns

Measurement functions		same as for digital audio analyzer

Output (clock)		
Logic voltage	CMOS	0.9 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V
	LVTTL	3.3 V
Impedance	short-circuit-proof	50 Ω
Maximum reverse voltage		–3 V to selected logic voltage + 3 V

Inputs (data and clock)		
Logic voltage	CMOS	0.9 V/1.2 V/1.5 V/1.8 V/2.5 V
	LVTTL	3.3 V
Impedance	–0.3 V to selected logic voltage + 0.3 V	10 kΩ
	–4 V to –0.3 V or selected logic voltage + 0.3 V to selected logic voltage + 4 V	100 Ω
Maximum input voltage		–4 V to selected logic voltage + 4 V

Digital audio analyzer measurement functions

All measurements at 24 bit, full scale.

RMS, wideband		
Measurement bandwidth		up to 50 % of sampling rate
Level error	AUTO FAST	±0.1 dB
	AUTO	±0.01 dB
	GEN TRACK	±0.001dB
Integration time	AUTO FAST/AUTO	min. 200/4000 sample, at least 1 cycle
	GEN TRACK	min. 100 sample, at least 1 cycle
	VALUE	0.1 ms to 100 s
Spectrum		post FFT

DC voltage		
Measurement range		0 to ±1 FS
Level error		±1 %

FFT analysis		see FFT analyzer section

Total harmonic distortion (THD)		
Fundamental		10 Hz to 23.9 % of sampling rate
Frequency tuning		automatic to input or generator signal or fixed through entered value
Weighted harmonics		any combination of d_2 to d_9, up to 21.90 kHz
Error limit		±0.3 dB
Inherent distortion [12]		< –155 dB
Spectrum		bargraph showing signal and distortion post-FFT

THD+N and SINAD		
Fundamental		10 Hz to 47.9 % of sampling rate
Frequency tuning		automatic to input or generator signal or fixed through entered value
Stopband range		fundamental ± 28 Hz, max. up to 2nd harmonic
Bandwidth		upper and lower frequency limit selectable, one weighting filter in addition
Error limit		±0.3 dB
Inherent distortion [12]	bandwidth 20 Hz to 21.90 kHz	< –142 dB
Spectrum		post FFT

Time domain display (WAVEFORM)		
Trigger		rising/falling
Trigger level		–1 FS to +1 FS
Trace length		max. 480 ksample per channel
Pretrigger		max. 19200 sample
Standard mode		each sample recorded
Compressed mode		peak value of up to 1024 sample recorded (envelope)
Undersample mode		undersampling factor up to 1024

Frequency		
Frequency range		20 Hz to 47.9 % of sampling rate
Frequency error		±10 ppm

Phase		
Frequency range		20 Hz to 47.9 % of sampling rate
Phase error		±0.4°

[12] Total inherent distortion of analyzer and generator.

Digital generators

Digital audio outputs (R&S®UPV-B2 option)

Balanced output		XLR connector, transformer coupling
Impedance		110 Ω, short-circuit-proof
Level (peak-peak)	into 110 Ω	0 V to 8 V, in 240 steps
Level error	RMS	±1 dB
Unbalanced output		BNC, transformer coupling
Impedance		75 Ω, short-circuit-proof
Level (peak-peak)	into 75 Ω	0 V to 2 V, in 240 steps
Level error	RMS	±1 dB
Optical output		TOSLINK
Channels		1, 2 or both
Audio bits		8 to 24
Clock rate	internal: generator clock or synchronization to analyzer external: synchronization to word clock input, DARS	30 kHz to 200 kHz
Format		professional and consumer format in line with AES3 or IEC 60958 as well as user-definable formats at all outputs
Phase (output to reference)		adjustable between –64 UI and +64 UI
Cable simulator		100 m typical audio cable

I²S output (R&S®UPV-B41 option)

Output		25-pin D-Sub connector (male)
Impedance		50 Ω , short-circuit-proof
Level		3.3 V
Channels		1, 2 or both multiplexed
Word length		16 bit/24 bit/32 bit per channel
Audio bits		8 to 32
Word clock rate	word length 16 bit/32 bit	6.75 kHz to 400 kHz
	word length 24 bit	6.75 kHz to 200 kHz
Synchronization		internal clock external word clock or master clock
Master/word clock ratio [13]	sync to internal clock, external word clock	
	word length 16 bit	64, 128, 256, 512
	word length 24 bit	96, 192, 384
	word length 32 bit	128, 256, 512
	sync to external master clock	
	word length 16 bit/32 bit	128, 256, 512
	word length 24 bit	192, 384
Master clock rate		432 kHz to 51.2 MHz
Clock input (TX CLK IN)		BNC
Level	low	< 0.8 V (min. –5 V)
	high	> 2 V (max. +10 V)
Impedance	level –0.5 V to +5.5 V	10 kΩ
	level –5 V to –0.5 V or +5 V to +10 V	100 Ω

[13] Master clock max. 51.2 MHz.

Universal serial interface output (R&S®UPV-B42 option)

Interface format		
Connector		26-pin connector strip, 2.54 mm (female)
Output data lines		4
Data routing	to any slot in any data line	signal from generator channel 1 or 2, zero, tristate
Samples per frame	single-sample format	1
	multisample format	up to 32
Number of slots	single-sample format	1 to 256
	multisample format	2 to 32
Slot length		8 bit to 256 bit
Frame length		8 bit to 2048 bit (slot length × number of slots)
Lead bits		0 to (slot length – audio bits)
Audio bits		8 to 32
Audio bit order		MSB or LSB first
Audio bit coding mode		linear PCM, A-law, µ-law
Clock mode		continuous clock, gated clock
Synchronization	internal	internal clock source
	external	frame sync, frame sync and bit clock, master clock

Clocks		
Sampling frequency		0.84375 kHz to 400 kHz
Mixed sampling frequencies ratio	with multisample format only	2, 3, 4, 5, 6
Frame sync	frequency	0.84375 kHz to 400 kHz
	width	1 to (slot length × number of slots) – 1
	slope	rising, falling
	offset (relative to frame)	–(number of slots × slot length) to (number of slots × slot length) – 1
Bit clock	frequency	6.75 kHz to 55.296 MHz
	slope	rising, falling
	jitter frequency (depends on amplitude)	0 MHz to 110 MHz
	jitter amplitude (depends on frequency)	0 UI to 2.5 UI
Master clock	frequency	13.5 kHz to 110.592 MHz
	ratio to frame sync	16 to 768
	jitter frequency (depends on amplitude)	0 MHz to 110 MHz
	jitter amplitude (depends on frequency)	0 UI to 2.5 UI
Slot clock	frequency	0.84375 kHz to 400 kHz
	width	1 to slot length – 1
	slope	rising, falling
	offset (relative to frame)	–(slot length – 1) to (slot length – 1)

Timing		
Skew (relative to bit clock)	data line 1/2/3/4	–0.5 ns/–0.7 ns/–0.2 ns/–0.5 ns
	frame sync	–0.3 ns
	slot clock	–0.1 ns
TCO (slave mode)	data line 1/2/3/4	7.3 ns/7.1 ns/7.6 ns/7.3 ns
	frame sync	7.7 ns
	slot clock	7.8 ns

Outputs		
Logic voltage	CMOS	0.9 V/1.2 V/1.5 V/1.8 V/2.5 V
	LVTTL	3.3 V
Impedance	short-circuit-proof	50 Ω
Maximum reverse voltage		–3 V to selected logic voltage + 3 V

Inputs		
Logic voltage	CMOS	0.9 V/1.2 V/1.5 V/1.8 V/2.5 V
	LVTTL	3.3 V
Impedance	–0.3 V to selected logic voltage + 0.3 V	10 kΩ
	–4 V to –0.3 V or selected logic voltage + 0.3 V to selected logic voltage + 4 V	100 Ω
Maximum input voltage		–4 V to selected logic voltage + 4 V

Clock I/O configuration						
Synchronization	Internal clock	Ext. master clock	Ext. frame sync	Ext. frame sync (audio monitor)	Ext. frame sync and bit clock	Ext. frame sync and bit clock (gated)
Master clock output	X		X		X	
Master clock input		X				
Bit clock output	X	X	X	X		
Bit clock input					X	X
Frame sync output	X	X	X	X		
Frame sync input			X	X	X	X
Slot clock output	X	X	X	X	X	X

Unused outputs are tristated.

Signals

All signals 24 bit, full scale.

General characteristics		
Dither	for sine, stereo sine, DFD and MOD DIST	
	distribution	Gaussian, triangular, rectangular
	level	0.5 LSB to 1 FS
Frequency error	internal clock	±10 ppm
	relative to clock rate	±1 ppm
DC offset		0 to ±1 FS adjustable

Sine		
Frequency range		0.1 Hz to 49.9 % of sampling rate
Inherent distortion (THD) [14]		< –155 dB
Sweep parameters		frequency, level

Stereo sine		
Frequency range		0.1 Hz to 47.9 % of sampling rate
Frequency		adjustable for each channel
Phase	same frequency in both channels	–360° to +360°
Level		adjustable for each channel or channel ratio 2/1
Sweep parameters		frequency and level of channel 1

MOD DIST	for measuring the modulation distortion	
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 × LF to 47.9 % of sampling rate
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Inherent distortion [14]	level LF:UF = 4:1 with 1 LSB triangular dither	< –142 dB
Sweep parameters		upper frequency, level

DFD	for measuring the difference frequency distortion	
Frequency range	difference frequency	80 Hz to 2 kHz
	mean frequency	200 Hz to 20.90 kHz
Inherent distortion [14]	DFD d_2, DFD d_3 with 1 LSB triangular dither	< –155 dB
Sweep parameters		mean frequency, level

Sine burst, sine^2 burst		
Burst time		1 sample up to 60 s, 1-sample-resolution
Interval		burst time up to 3600 s, 1-sample-resolution
Low level		0 to burst level, absolute or referenced to burst level (0 for sine^2 burst)
Sweep parameters		burst frequency, level, time, interval

Noise		
Distribution		Gaussian, triangular, rectangular

Arbitrary waveform		
Memory depth		max. 256 ksample
Clock rate		sampling rate of generator
File format		*.arb

[14] Total inherent distortion of analyzer and generator.

Polarity test signal		asymmetrical two-tone signal (fundamental + 2nd harmonic)
Fundamental frequency		0.1 Hz to 16.6 % of sampling rate

FM signal		
Carrier frequency		0.1 Hz to 49.9 % of sampling rate
Modulation frequency		1 µHz to 49.9 % of sampling rate
Modulation		0 % to 100 %

AM signal		
Carrier frequency		0.1 Hz to 49.9 % of sampling rate
Modulation frequency		1 µHz to 49.9 % of sampling rate
Modulation		0 % to 100 %

DC voltage		
Level range		0 to ±1 FS
Sweep parameters		level

FFT analyzer

Frequency range	digital	DC to 50 % of sampling rate
	analog bandwidth 22 kHz /40 kHz /80 kHz/ 250 kHz	DC to 22.5 kHz/43.5 kHz/87 kHz/250 kHz
Dynamic range	digital 24 bit/32 bit	170 dBFS/220 dBFS
	analog bandwidth 22 kHz/40 kHz/80 kHz	120 dB [15]
	analog bandwidth 250 kHz	100 dB [15]
Noise floor	digital 24 bit/32 bit	–170 dBFS/–220 dBFS
	analog bandwidth 22 kHz/40 kHz/80 kHz	–140 dB [15]
	analog bandwidth 250 kHz	–120 dB [15]
FFT size		512, 1k, 2k, 4k, 8k, 16k, 32k, 64k, 128k, 256k points
Window functions		rectangular, Hann, Blackman-Harris, Rife-Vincent 1-3, Hamming, flat top

[15] Relative to the nominal value of the measurement range in V. Valid for measurement ranges ≥ 300 mV and an FFT resolution of 2.93 Hz.

Filter

For all analog and digital analyzers and generators. All filters are digital filters.

Analyzer	prefilter	1 weighting or user-definable filter
	function filter	up to 3 weighting or user-definable filters
Generator		1 weighting or user-definable filter

Weighting filters		A weighting
		C weighting
		CCIR 1k weighted
		CCIR 2k weighted
		CCIR unweighted
		CCITT
		C message
		DC noise highpass
		deemphasis J.17, 50/15, 50, 75
		preemphasis 50/15, 50, 75
		IEC tuner
		jitter weighted
		rumble weighted

Highpass and lowpass filters		highpass 22 Hz
		highpass 400 Hz
		lowpass 22 kHz
		lowpass 30 kHz
		lowpass 80 kHz

User-definable filters		
Design parameters		8th order elliptical, type C (for highpass and lowpass filters also 4th order), passband ripple +0 dB/–0.1 dB, stopband attenuation approx. 20 dB to 120 dB selectable in steps of approx. 10 dB (highpass and lowpass filters: stopband attenuation 40 dB to 120 dB)
Highpass, lowpass filters		passband (–0.1 dB) selectable, stopband indicated
Bandpass, bandstop filters		passband (–0.1 dB) selectable, stopband indicated
Notch		center frequency and width (–0.1 dB) selectable, stopband indicated
Third octave and octave filters		center frequency selectable, bandwidth (–0.1 dB) indicated
File-defined filters		any 8th order filter cascaded from 4 biquads, defined in the z plane by poles/zeroes or coefficients

Analog notch filter		for measurements on signals with high S/N ratio, this filter improves the dynamic range of the analyzer by up to 30 dB to 140 dB for an analyzer bandwidth of 22/40/80 kHz, or 120 dB for an analyzer bandwidth of 250 kHz (typical noise floor of FFT); the filter is also used for measuring THD, THD+N and MOD DIST with dynamic mode precision
Characteristics	available in dual channel analog analyzer with measurement functions	RMS (wideband)
		RMS (selective)
		quasi-peak
		FFT analysis
Frequency range	center frequency (f_c)	10 Hz to 110 kHz
Frequency tuning		automatic to input signal
		coupled to generator
		fixed through entered value
Stopband	f_c ± 0.5 %	typ. > 30 dB
Passband	at 0.77 × f_c and 1.3 × f_c	typ. –3 dB
	outside 0.5 × f_c to 2 × f_c	typ. +0 dB/–1 dB

Sweep

Generator sweep		
Parameters		frequency, level, with bursts also interval and duration, one- or two-dimensional
Sweep		linear, logarithmic, single, continuous
Stepping		automatic after end of measurement
		time delay (fixed or loaded table)

Sweep speed		
Two-channel RMS measurement 20 Hz to 20 kHz, 30-point generator sweep logarithmic (frequency measurement switched off, Low Dist OFF)	GEN TRACK	1.0 s
	AUTO FAST	1.2 s
	AUTO	2.0 s

Display of results

Units		
Level (analog)		V, dBu, dBV, W, dBm, difference (Δ), deviation (Δ%) and ratio (without dimension, %, dBr) to reference value
Level (digital)		FS, %FS, dBFS, LSBs, deviation (Δ%) or ratio (dBr) to reference value
Distortion		% or dB, referenced to signal amplitude, THD and THD+N in all available level units (absolute or relative to selectable reference value)
Frequency		Hz, difference (Δ), deviation (Δ%) and ratio (as quotient f/f_{ref}, 1/3 octave, octave or decade) to reference value (entered or stored, current generator frequency)
Phase		°, rad, difference (Δ) to reference value (entered or stored)
Reference value (level)		fixed value (entered or stored)

Graphical display of results		
Monitor (not R&S®UPV66)		8.4" LCD, color
Display of results		numeric display
		combi display with numeric value, bargraph, min./max. and limits (for each numeric result)
		sweep trace
		spectrum
		waveform
		list of results
		bargraph for THD and intermodulation measurements
Display functions		autoscale
		X- and Y-axis zoom
		2 vertical and 2 horizontal cursor lines
		search function for max. values
		marker for harmonics (spectrum)
		change of unit and scale also possible for loaded traces

Test reports		
Functions		screen copy to clipboard, file or printer

Audio monitor

Loudspeaker		built in
Headphone connector		6.3 mm jack
Output voltage	peak	max. 7 V
Source impedance		100 Ω, short-circuit-proof
Recommended headphone impedance		600 Ω

150 Ω modification (R&S®UPV-U1 option)

Change of source impedance of analog generator to 150 Ω (instead of factory-set value of 200 Ω).

BNC phone out (R&S®UPV-U2 option)

Two BNC connectors at the rear panel in parallel to the left and right channels of the headphone output.

Digital audio protocol (R&S®UPV-K21 option)

Digital audio I/O 192 kHz (R&S®UPV-B2 option) required.

Generator		
Validity bit		NONE, L+R
Channel status data		mnemonic entry for professional and consumer format in line with AES3 or IEC 60958

Analyzer		
Error flags		PCM, parity, lock, CRC, validity
Channel status display		binary and mnemonic display of data fields in line with AES3 or IEC 60958

Jitter and interface test (R&S®UPV-K22 option)

Digital audio I/O 192 kHz (R&S®UPV-B2 option) required.

Generator

Jitter injection		
Signals	sine	0.1 Hz to 80 kHz
	random	12 Hz to 80 kHz
	arbitrary	80 kHz bandwidth, 192 kHz sampling rate, 256 ksample (max.)
Amplitude (peak)		0 to 2.5 UI
Common mode injection	at balanced output	
Signals	sine	0.1 Hz to 80 kHz
	random	12 Hz to 80 kHz
	arbitrary	80 kHz bandwidth, 192 kHz sampling rate, 256 ksample (max.)
Amplitude (peak)		0 V to +10 V

Analyzer

Jitter measurement		
Analyzer functions	RMS, RMS selective, peak, frequency, FFT, waveform	10 Hz to 250 kHz
3 dB bandwidth		> 150 kHz
Measuring range	48 kHz sampling rate	typ. 0.75 UI to 80 kHz, decreasing to 25 kHz at 2.5 UI
	96 kHz sampling rate	typ. 1.25 UI to 80 kHz, decreasing to 40 kHz at 2.5 UI
	192 kHz sampling rate	typ. 1.5 UI to 80 kHz, decreasing to 50 kHz at 2.5 UI
Level error		±(10 % + 1 ns)
Flatness	300 Hz to 50 kHz	±10 %
	50 kHz to 80 kHz	±20 %
Inherent jitter	700 Hz to 80 kHz	< 0.01 UI (peak)
Spurious jitter	700 Hz to 80 kHz	< –35 dBc or < –50 dBUI, whichever is larger
Common mode test	at balanced input	
Analyzer functions		RMS, RMS selective, peak, frequency, FFT, waveform
Frequency range		10 Hz to 250 kHz
Amplitude range		0 V to 30 V
Input signal		
Amplitude (peak-peak)		0 V to 10 V
Sampling rate		30 kHz to 200 kHz

Remote control (R&S®UPV-K4 option)

Enables remote control via IEC 625-2 (IEEE 488), LAN and USB.

Commands largely compliant with SCPI.

Extended analysis functions (R&S®UPV-K6 option)

Rub & buzz measurement		simultaneous measurement of frequency response, rub & buzz and polarity
Frequency range		20 Hz to 80 kHz
Tracking highpass filter		2 to 20 times fundamental frequency
Lower/upper frequency limit		selectable

1/n octave analysis		
Frequency range		20 Hz to 20 kHz
Level error	at center frequency	±0.2 dB
	20 Hz to 20 kHz	±1.0 dB (EN 61260, class 0)

Undersample FFT		FFT resolution is improved while reducing the measurement bandwidth
Undersampling factor		up to 1024
Highest resolution	bandwidth 0 Hz to 23 Hz	0.18 mHz

PESQ® measurement (R&S®UPV-K61 option) [16]

Perceptual evaluation of speech quality		in line with ITU-T recommendation P.862, 862.1 and 862.2
Numeric results		PESQ score, MOS-LQO narrowband and wideband, average delay
Graphic displays (versus time)		PESQ score, MOS-LQO, delay, dropouts, reference signal and degraded signal

PEAQ® measurement (R&S®UPV-K62 option) [16]

Perceptual evaluation of audio quality		in line with ITU-R recommendation BS.1387
Numeric results		ODG (objective difference grade), DI (distortion index), average delay

R&S®UPV-B3 option required for dual channel analog signals.

POLQA® measurement (R&S®UPV-K63 option) [16]

Perceptual objective listening quality analysis		in line with ITU-T recommendation P.863
Numeric results	narrowband or super-wideband	MOS-LQO, level, attenuation, SNR (signal to noise ratio), ASR (active speech ratio), delay (average, minimum, maximum)
Graphic displays (versus time)		MOS-LQO, delay, reference signal and degraded signal

[16] PESQ®, PEAQ® and POLQA® are registered trademarks of OPTICOM Dipl.-Ing. M. Keyhl GmbH, Germany.

Hearing aid measurements (R&S®UPV-K7 option)

In line with IEC 60118, parts 0, 1, 2 and 7 and ANSI S3.22.

Hearing aid speech tests (R&S®UPV-K71 option)

In line with IEC 60118-15.

R&S®UPV-K7 option is required for R&S®UPV-K71 hearing aid speech tests.

UMTS/GSM mobile phone tests (R&S®UPV-K91 option)

In line with 3GPP TS 26.131 and TS 26.132.

Base software for mobile phone tests (R&S®UPV-K9 option) required.

R&S®UPV-K91 upgrade 01 (R&S®UPV-K9101 option)

Upgrade of UMTS/GSM mobile phone tests to version 2.2.1 of R&S®UPV-K91 option.

CDMA2000® [17] mobile phone tests (R&S®UPV-K92 option)

In line with TIA-1042 and 3GPP2 C.S0056-0.

Base software for mobile phone tests (R&S®UPV-K9 option) required.

Cable for R&S®UPV-B48 (R&S®UPV-Z48 option)

25-pin D-Sub to 8 XLR female connectors		
	25-pin D-Sub	TASCAM pinning
	XLR female connectors	pin 1 not connected

[17] CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

General data

Environmental conditions		
Temperature	operating temperature range	+5 °C to +45 °C
	storage temperature range	–20 °C to +60 °C
Humidity		in line with EN 60068-2-30 +25°C/+40°C, 95% rel. humidity, cyclic

Mechanical resistance		
Vibration	sinusoidal	in line with EN 60068-2-6 5 Hz to 55 Hz, 0,15mm amplitude const. 55 Hz to 150 Hz, 0.5 g const.
	random	in line with EN 60068-2-64 10 Hz to 300 Hz, acceleration 1.2 g RMS
Shock		in line with MIL-STD-810E, method no. 516.4, procedure I, 40 g shock spectrum

Power supply		
Nominal voltage		AC 100/120/220/230 V
Nominal frequency		50 Hz to 60 Hz
Nominal power		300 VA

Product conformity		
Electromagnetic compatibility	complies with EMC Directive 2004/108/EC	applied harmonized standards: EN 61326-1 (industrial environment) EN 61326-2-1 EN 55011 (class B) [18] EN 61000-3-2 EN 61000-3-3
Electrical safety	complies with Low Voltage Directive 2006/95/EC	applied harmonized standard: EN 61010-1
	USA Canada	UL 61010-1 CAN/CSA-C22.2 no. 61010-1
International safety approvals	VDE – Association for Electrical, Electronic and Information Technologies	GS certificate no. 40009394
	CSA – Canadian Standard Association	CSA_{US} certificate no. 1499441

Dimensions	W × H × D	465 mm × 197 mm × 495 mm (18.31 in × 7.76 in × 19.49 in)
Weight	fully equipped	15.0 kg (33.07 lb)

[18] With installed R&S®UPV-B42 option, the instrument complies with EN 55011 class A.

Ordering information

Designation	Type	Order No.
Base unit		
Audio Analyzer	R&S®UPV	1146.2003.02
Audio Analyzer, without display	R&S®UPV66	1146.2003.66
Accessories supplied		
Power cable, Compact manual, CD with operating manual/service manual		
Hardware options		
Low Distortion Generator	R&S®UPV-B1	1146.5202.02
Digital Audio	R&S®UPV-B2	1146.4306.02
Second Analog Generator	R&S®UPV-B3	1146.4806.02
I²S Interface	R&S®UPV-B41	1146.5402.02
Universal Serial Interface	R&S®UPV-B42	1146.5802.02
Eight-Channel Analog Inputs	R&S®UPV-B48	1402.2200.02
Modification 150 Ω	R&S®UPV-U1	1146.1507.02
BNC Phone Out	R&S®UPV-U2	1402.1704.02
Software options		
Universal Sequence Controller	R&S®UPV-K1	1401.7009.02
Digital Audio Protocol	R&S®UPV-K21	1401.7809.02
Jitter and Interface Test	R&S®UPV-K22	1401.7909.02
Remote Control	R&S®UPV-K4	1401.9001.02
PDM Bitstream Analysis	R&S®UPV-K421	1402.1104.02
Extended Analysis Functions	R&S®UPV-K6	1401.9201.02
Software for PESQ® Measurement	R&S®UPV-K61	1401.7309.02
Software for PEAQ® Measurement	R&S®UPV-K62	1401.7750.02
Software for POLQA® Measurement	R&S®UPV-K63	1402.1156.02
Software for Hearing Aid Measurements	R&S®UPV-K7	1401.9301.02
Hearing Aid Speech Tests	R&S®UPV-K71	1402.1004.02
Base Software for Mobile Phone Tests	R&S®UPV-K9	1402.0008.02
UMTS/GSM Mobile Phone Tests	R&S®UPV-K91	1402.0108.02
R&S®UPV-K91 Upgrade 01	R&S®UPV-K9101	1402.2517.02
CDMA2000® Mobile Phone Tests	R&S®UPV-K92	1402.0608.02

System components

Designation	Type	Order No.
Cable Set for R&S®UPV-K7	R&S®UPV-Z7	1401.7609.02
Cable for R&S®UPV-B48	R&S®UPV-Z48	1401.7709.02
Cable for R&S®UPV-B41	R&S®UP-Z3	1411.3458.02
XLR/BNC Adapter Set, 2 male, 2 female	R&S®UP-Z1MF	1411.3306.02
19" Rack Adapter	R&S®ZZA-411	1096.3283.00
Audio Switcher (input)	R&S®UPZ	1120.8004.12
Audio Switcher (output)	R&S®UPZ	1120.8004.13

For product brochure, see PD 0758.1306.12 and www.rohde-schwarz.com

Service you can rely on

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

About Rohde&Schwarz

Rohde&Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde&Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

Rohde&Schwarz GmbH&Co. KG
www.rohde-schwarz.com

Regional contact

- Europe, Africa, Middle East
  +49 89 4129 12345
  customersupport@rohde-schwarz.com
- North America
  1 888 TEST RSA (1 888 837 87 72)
  customer.support@rsa.rohde-schwarz.com
- Latin America
  +1 410 910 79 88
  customersupport.la@rohde-schwarz.com
- Asia/Pacific
  +65 65 13 04 88
  customersupport.asia@rohde-schwarz.com
- China
  +86 800 810 8228/+86 400 650 5896
  customersupport.china@rohde-schwarz.com

R&S® is a registered trademark of Rohde&Schwarz GmbH&Co. KG
Trade names are trademarks of the owners | Printed in Germany (sv)

PD 0758.1306.22 | Version 03.00 | August 2011 | R&S®UPV

Subject to change
© 2004 - 2011 Rohde&Schwarz GmbH&Co. KG | 81671 München, Germany

0758130622