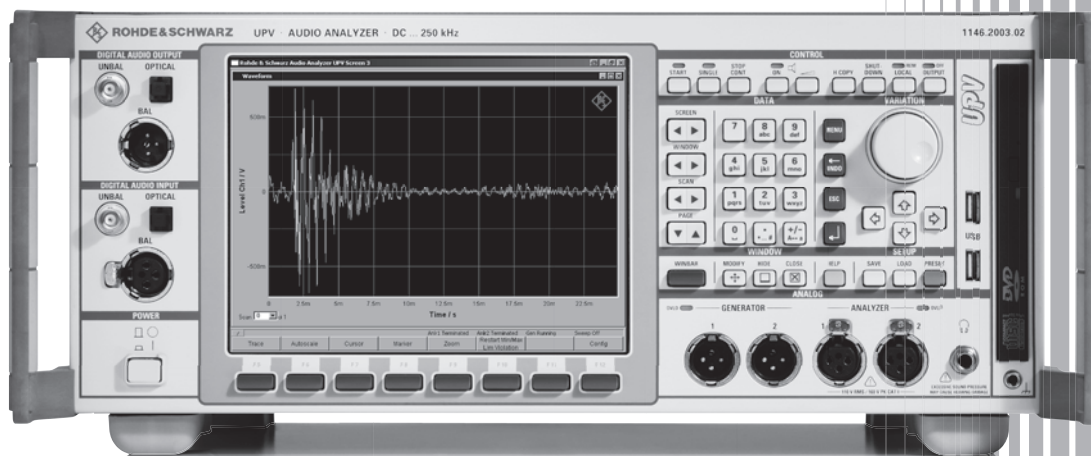


R&S® UPV Audio Analyzer Specifications



75 Years of
Driving
Innovation

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Specifications apply under the following conditions: 30 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.

In line with the 3GPP standard, chip rates are specified in Mcps (million chips per second), whereas bit rates and symbol rates are specified in kbps (thousand bits per second) or ksps (thousand symbols per second). Mcps, kbps, and ksps are not SI units.

Data without tolerance limits is not binding.

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)		
Accuracy	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®UPL-Z1 XLR/BNC adapter set), floating/grounded and AC/DC coupling selectable	
Voltage range	0.1 µV to 110 V (rms, sine)	
Measurement range	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

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

This option can be built in twice to provide 16-channel analog inputs.

For specifications, see the R&S®UPV-B48 data sheet (PD 5213.9805.22).

¹ DC/AC coupling.

² For $V_{in} \geq 3 V$ additionally ± 0.02 dB from 5 kHz to 50 kHz.

Measurement functions

RMS value, wideband		
Accuracy	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 GEN TRACK VALUE	min. 200/4000 sample, at least 1 cycle min. 100 sample, at least 1 cycle 0.1 ms to 100 s
Noise (input shorted)	22/40/80 kHz bandwidth A weighted CCIR unweighted 80 kHz bandwidth 250 kHz bandwidth	$< 1 \mu\text{V}$, typ. $0.7 \mu\text{V}$ $< 1.4 \mu\text{V}$, typ. $1 \mu\text{V}$ $< 2.8 \mu\text{V}$ $< 7 \mu\text{V}$
Spectrum		post-FFT

DC voltage		
Voltage range		0 V to ± 110 V
Accuracy ³		$\pm(1\%$ 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
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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
Accuracy	harmonics < 50 kHz harmonics < 100 kHz harmonics < 250 kHz	± 0.5 dB ± 0.7 dB ± 1 dB
Inherent distortion Bandwidth 22 kHz ^{4 5}	fundamental 20 Hz to 10.95 kHz fundamental 10 Hz to 20 Hz	< -110 dB, typ. -115 dB < -100 dB
Inherent distortion Bandwidth 40/80/250 kHz ^{4 5}	fundamental 50 Hz to 20 kHz fundamental 20 kHz to 110 kHz	< -100 dB, typ. -105 dB < -90 dB, typ. -95 dB
Spectrum		bar chart showing signal and distortion post-FFT

³ Not valid for bandwidth 250 kHz.

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

⁵ > 3.5 V: typ. 3 dB less; < 0.5 V: sensitivity reduced by inherent noise.

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 μ V with automatic tuning
Bandwidth		upper and lower frequency limit selectable, one weighting filter in addition
Accuracy	bandwidth < 50 kHz < 100 kHz < 250 kHz	± 0.5 dB ± 0.7 dB ± 1 dB
Inherent distortion Analyzer bandwidth 22 kHz ⁶	bandwidth 20 Hz to 22 kHz	typ. -110 dB at 1 kHz, 2.5 V < -105 dB + 2 μ V ⁷ typ. -108 dB + 1.5 μ V
Inherent distortion Analyzer bandwidth 40/80 kHz ⁶	bandwidth 20 Hz to 22 kHz 20 Hz to 80 kHz	< -95 dB + 2.5 μ V, typ. -100 dB + 1.75 μ V < -88 dB + 5 μ V, typ. -95 dB + 3.5 μ V
Inherent distortion Analyzer bandwidth 250 kHz ⁶	bandwidth 20 Hz to 22 kHz 20 Hz to 110 kHz	< -95 dB + 2.5 μ V, typ. -100 dB + 1.75 μ V < -88 dB + 5 μ V, typ. -95 dB + 3.5 μ V
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 samples recorded (envelope)
Undersample mode		undersampling factor up to 1024

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

Phase		
Frequency range		20 Hz to 250 kHz
Accuracy	20 Hz to 22 kHz 22 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 250 kHz	$\pm 0.4^\circ$ $\pm 0.6^\circ$ $\pm 1.0^\circ$ $\pm 1.5^\circ$

⁶ Total inherent distortion of analyzer and generator (with R&S®UPV-B1 option), analyzer with dynamic mode precision.

⁷ At full-scale level of measurement range (< -100 dB + 2 μ V with autoranging), < -100 dB for input voltage > 3.5 V.

Analog generators

24-bit $\Delta\Sigma$ D/A converters are used for analog signal generation. The characteristics of the basic generator can be improved and extended by a low-distortion RC oscillator (R&S®UPV-B1 low distortion generator option):

- Sine with reduced distortion
- Frequency range up to 185 kHz

Outputs

XLR connectors, 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) \pm 0.5 %
		600 Ω \pm 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 accuracy		\pm 10 ppm	
Level accuracy	at 1 kHz	\pm 0.05 dB	
Frequency response (referenced to 1 kHz)	20 Hz to 20/70/80 kHz	\pm 0.01 dB/ \pm 0.05dB/ \pm 0.1 dB	
Inherent distortion (THD+N)	level < 3 V		
	fundamental	meas. bandwidth	
	20 Hz to 20 kHz	22 kHz	< -103 dB, typ. -107 dB
	20 Hz to 20 kHz	80 kHz	< -90 dB
Sweep parameters		frequency, level	

Sine (with R&S®UPV-B1 low distortion generator option)		
Frequency range		10 Hz to 185 kHz
Frequency accuracy	10 Hz to 100 kHz	\pm 0.5 %
	100 kHz to 185 kHz	\pm 0.75 %
Level accuracy	at 1 kHz	\pm 0.05 dB
Frequency response (referenced to 1 kHz)	20 Hz to 20 kHz	\pm 0.01 dB
	10 Hz to 100 kHz	\pm 0.05 dB
	100 kHz to 150 kHz	\pm 0.15 dB
	150 kHz to 185 kHz	\pm 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	< -105 dB
	7 kHz to 20 kHz	< -100 dB
	20 kHz to 50 kHz	< -90 dB
	50 kHz to 100 kHz	< -80 dB

Inherent distortion (THD+N) ⁸	fundamental	meas. bandwidth	typ. -110 dB < -100 dB + 2 μ V < -88 dB + 5 μ V
	1 kHz, 2.5 V	22 kHz	
	20 Hz to 20 kHz	22 kHz	
	20 Hz to 20 kHz	100 kHz	
Sweep parameters			frequency, level

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 and level of channel 1	

MOD DIST

for measuring the modulation distortion

Frequency range	lower frequency (LF) upper frequency (UF)	30 Hz to 2700 Hz 8 × LF to 21.75 kHz
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Level accuracy		± 0.5 dB
Inherent distortion	level ratio LF:UF = 4:1 at 7 kHz, 60 Hz	< -90 dB, typ. -103 dB < -96 dB, typ. -108 dB
Sweep parameters	upper frequency, level	

DFD

for measuring the difference frequency distortion

Frequency range	difference frequency center frequency	80 Hz to 2 kHz 200 Hz to 20.75 kHz
Level accuracy		± 0.5 dB
Inherent distortion ⁹	DFD d ₂ DFD d ₃	< -115 dB, typ. -120 dB < -94 dB, typ. -103 dB
Sweep parameters	center 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 accuracy	± 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 60 s, 1-sample resolution	
Low level	0 to burst level, absolute or relative to burst level (0 for sine ² burst)	
Bandwidth	80 kHz	
Sweep parameters	burst frequency, level, time, interval	

Noise

Distribution	Gaussian, triangular, rectangular
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⁸ Total inherent distortion of analyzer and generator, analyzer with dynamic mode precision.⁹ Center frequency > 5 kHz, difference frequency < 1 kHz; DFD d₂ typ. -100 dB with DC offset.¹⁰ Level > 200 mV, typ. values apply from 0.5 V to 6 V.

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

Polarity test signal		
		asymmetrical two-tone signal (fundamental + 2nd harmonic)
Fundamental frequency		0.1 Hz to 8 kHz

FM signal		
Carrier frequency		2 Hz to 21.75 kHz
Modulation frequency		1 mHz to 21.75 kHz
Modulation		0 % to 100 %

AM signal		
Carrier frequency		2 Hz to 21.75 kHz
Modulation frequency		1 mHz to 21.75 kHz
Modulation		0 % to 100 %

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

DC offset ¹¹		
Level range	balanced	0 V to ± 10 V
	unbalanced	0 V to ± 5 V
Accuracy		± 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

Frequency limits specified for measurement functions are valid at a sampling rate of 48 kHz. For other sampling rates, limits are calculated in accordance with the formula: $f_{new} = f_{48\text{ kHz}} \times \text{sampling rate}/48\text{ kHz}$.

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)

I²S input (R&S®UPV-B41 option)

Input		25-contact 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		16/24/32 bits 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)

For specifications, see the R&S®UPV-B42 data sheet (PD 5214.1350.22).

Measurement functions

All measurements at 24 bits, full scale.

RMS value, wideband		
Measurement bandwidth	up to 0.5 times the clock rate	
Accuracy	AUTO FAST	± 0.1 dB
	AUTO	± 0.01 dB
	FIX	± 0.001 dB
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 ± FS	
Accuracy	± 1 %	

FFT analysis	see FFT analyzer section	
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Total harmonic distortion (THD)		
Fundamental		10 Hz to 21.90 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 21.90 kHz
Accuracy		± 0.3 dB
Inherent distortion ¹²		< -155 dB
Spectrum		bar chart showing signal and distortion post-FFT

THD+N and SINAD		
Fundamental		10 Hz to 21.90 kHz
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
Accuracy		± 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 samples recorded (envelope)
Undersample mode		undersampling factor up to 1024

Frequency		
Frequency range		20 Hz to 20 kHz
Accuracy		± 10 ppm

Phase		
Frequency range		20 Hz to 20 kHz
Accuracy		$\pm 0.4^\circ$

¹² Total inherent distortion of analyzer and generator.

Digital generators

Frequency limits specified for the signals are valid at a sampling rate of 48 kHz. For other sampling rates, limits are calculated in accordance with the formula: $f_{\text{new}} = f_{48 \text{ kHz}} \times \text{sampling rate}/48 \text{ kHz}$.

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

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

For specifications, see the R&S® UPV-B42 data sheet (PD 5214.1350.22).

¹³ Master clock max. 51.2 MHz.

Signals

All signals with 24 bits, full scale.

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

Sine		
Frequency range		0.1 Hz ¹⁴ to 21.90 kHz
Inherent distortion (THD) ¹⁵		< -155 dB
Sweep parameters		frequency, level

Stereo sine		
Frequency range		0.1 Hz ¹⁴ to 21.9 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 and level of channel 1

MOD DIST		
for measuring the modulation distortion		
Frequency range	lower frequency (LF) upper frequency (UF)	30 Hz ¹⁴ to UF/8 8 × LF to 21.90 kHz
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Inherent distortion ¹⁵	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 center frequency	80 Hz to 2 kHz ¹⁴ 200 Hz ¹⁴ to 20.90 kHz
Inherent distortion ¹⁵	DFD d_2 DFD d_3 with 1 LSB triangular dither	< -155 dB < -155 dB
Sweep parameters		center frequency, level

Sine burst, sine ² burst		
Burst time		1 sample up to 60 s, 1-sample resolution
Interval		burst time up to 60 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 Fixed frequency independent of clock rate.

¹⁵ Total inherent distortion of analyzer and generator.

Polarity test signal		asymmetrical two-tone signal (fundamental + 2nd harmonic)
Fundamental frequency		0.1 Hz ¹⁶ to 8 kHz

FM signal		
Carrier frequency		2 Hz ¹⁶ to 21.9 kHz
Modulation frequency		1 mHz ¹⁶ to 21.9 kHz
Modulation		0 % to 100 %

AM signal		
Carrier frequency		2 Hz ¹⁶ to 21.9 kHz
Modulation frequency		1 mHz ¹⁶ to 21.9 kHz
Modulation		0 % to 100 %

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

FFT analyzer

Frequency range	digital analog bandwidth 22/40/80/250 kHz	DC to 0.5 × sampling rate DC to 22.5/43.5/87/250 kHz
Dynamic range	digital 24/32 bit analog bandwidth 22/40/80 kHz analog bandwidth 250 kHz	170/220 dB 120 dB 100 dB
Noise floor	digital 24/32 bit analog bandwidth 22/40/80 kHz analog bandwidth 250 kHz	-170/-220 dB -140 dB -120 dB
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

¹⁶ Fixed frequency independent of clock rate.

Filter

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

Analyzer	prefilter function filter	1 weighting or user-definable 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 rumble unweighted
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Highpass and lowpass filters		highpass 22 Hz highpass 400 Hz lowpass 22 kHz lowpass 30 kHz lowpass 80 kHz AES 17 lowpass
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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		limit frequencies (-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/zeros 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	$f_c \pm 0.5 \%$	typ. > 30 dB
Passband	at $0.77 \times f_c$ and $1.3 \times f_c$ outside $0.5 \times f_c$ to $2 \times f_c$	typ. -3 dB 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

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 AUTO FAST AUTO	0.5 s 1 s 2.5 s

Display of results

Units		
Level (analog)		V, dBu, dBV, W, dBm, difference (Δ), deviation ($\Delta\%$) and ratio (without dimension, %, dBr) to reference value
Level (digital)		FS, %FS, dBFS, LSBs, deviation ($\Delta\%$) 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 ($\Delta\%$) and ratio (as quotient f/f_{ref} , 1/3 octave, octave or decade) to reference value (entered or stored, current generator frequency)
Phase		$^\circ$, rad, difference (Δ) to reference value (entered or stored)
Reference value (level)		fixed value (entered or stored)

Graphical display of results		
Monitor		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 (V_p)		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 sample rate 256 ksample (max.)
Amplitude (peak)		0 to 2.5 UI
Common mode injection		
Signals	sine	0.1 Hz to 80 kHz
	random	12 Hz to 80 kHz
	arbitrary	80 kHz bandwidth 192 kHz sample 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 sample rate	typ. 0.75 UI to 80 kHz, decreasing to 25 kHz at 2.5 UI
	96 kHz sample rate	typ. 1.25 UI to 80 kHz, decreasing to 40 kHz at 2.5 UI
	192 kHz sample rate	typ. 1.5 UI to 80 kHz, decreasing to 50 kHz at 2.5 UI
Level error		$\pm(10\% + 1 \text{ ns})$
Flatness	300 Hz to 50 kHz	$\pm 10\%$
	50 kHz to 80 kHz	$\pm 20\%$
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		
Analyzer functions	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
Sample rate		30 kHz to 200 kHz

Remote control (R&S® UPV-K4 option)

Enables remote control via IEC 625-2 (IEEE 488), LAN, USB and RS-232-C.

Commands largely compliant with SCPI.

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

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

1/n octave analysis		
Frequency range		20 Hz to 20 kHz
Level accuracy	at center frequency 20 Hz to 20 kHz	$\pm 0.2 \text{ dB}$ $\pm 1.0 \text{ dB}$ (EN 61260, class 0)

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

PESQ® measurement (R&S® UPV-K61 option) ¹⁷

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

¹⁷ PESQ® is a registered trademark of OPTICOM Dipl.-Ing. M. Keyhl GmbH, Germany, and of Psytechnics Ltd., UK.

PEAQ[®] measurement (R&S[®]UPV-K62 option) ¹⁸

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

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

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

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.

CDMA2000[®] ¹⁹ 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.

General data

Operating temperature range		+5 °C to +45 °C; in line with EN 60068 2-1, EN 60068 2-2
Storage temperature range		-20 °C to +60 °C
Humidity		max. 80 % at +45 °C (no condensation) in line with EN 60068-2-3
EMC	EMC Directive 2004/108/EC	
	emission	EN 55011 class B
	immunity	EN 61326
Mechanical resistance		
	vibration, sinusoidal	5 Hz to 55 Hz, max. 1.8 g at 55 Hz; 55 Hz to 150 Hz, 0.5 g const.; in line with EN 60068-2-6, EN 61010-1
	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 EN 60068-2-27, MIL-STD-810E
Power supply	AC voltage range	100/120/220/230 V ± 10 %,
	AC frequency range	50 Hz to 60 Hz
	power consumption	300 VA
Safety		in line with EN 61010-1, CAN/CSA-C22.2 No. 1010.1, UL Std. No. 61010B-1
Conformity marks		VDE-GS, cCSAus
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 PEAQ[®] is a registered trademark of OPTICOM Dipl.-Ing. M. Keyhl GmbH, Germany.

¹⁹ CDMA2000[®] is a registered trademark of the Telecommunications Industry -Association (TIA -USA).

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 I/O 192 kHz	R&S®UPV-B2	1146.4306.02
Second Analog Generator	R&S®UPV-B3	1146.4806.02
I ² S 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
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 Hearing Aid Measurements	R&S®UPV-K7	1401.9301.02
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
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
XLR/BNC Adapter Set	R&S®UPL-Z1	1078.3704.02
19" Rack Adapter	R&S®ZZA-411	1096.3283.00
Operating and service manual (German version)		1146.2084.31
Operating and service manual (English version)		1146.2084.32
Audio Switcher (Input)	R&S®UPZ	1120.8004.02
Audio Switcher (Output)	R&S®UPZ	1120.8004.03

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