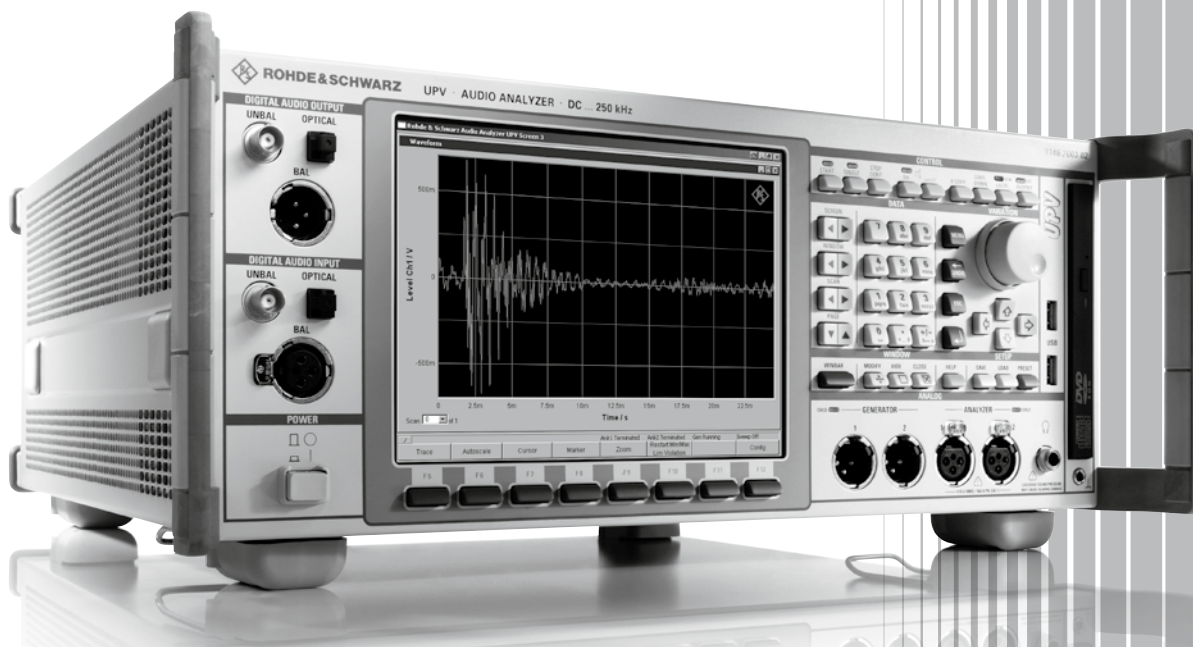


# R&S® UPV Audio Analyzer Specifications



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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 <sup>1</sup>
Bandwidth 40/80 kHz		DC/10 Hz to 40/80 kHz <sup>1</sup>
Bandwidth 250 kHz		DC/10 Hz to 250 kHz <sup>1</sup>

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

<b>XLR connectors</b>	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
<b>Generator output</b>	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).

<sup>1</sup> DC/AC coupling.

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

## Measurement functions

<b>RMS value, wideband</b>		
Accuracy	measurement speed AUTO	$\pm 0.05$ dB, typ. $\pm 0.025$ dB, at 1 kHz, sine
	measurement speed AUTO FAST	$\pm 0.1$ 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	$< 1$ $\mu$ V, typ. 0.7 $\mu$ V
	CCIR unweighted	$< 1.4$ $\mu$ V, typ. 1 $\mu$ V
	80 kHz bandwidth	$< 2.8$ $\mu$ V
Spectrum	250 kHz bandwidth	$< 7$ $\mu$ V
		post-FFT

<b>DC voltage</b>		
Voltage range		0 V to $\pm 110$ V
Accuracy <sup>3</sup>		$\pm(1$ % of measured value + 0.1 % of measurement range)
Measurement ranges		100 mV to 100 V, in steps of 10 dB

<b>FFT analysis</b>		see FFT analyzer section
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<b>Total harmonic distortion (THD)</b>		
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	$\pm 0.5$ dB
	harmonics $< 100$ kHz	$\pm 0.7$ dB
	harmonics $< 250$ kHz	$\pm 1$ dB
Inherent distortion Bandwidth 22 kHz <sup>4 5</sup>	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 <sup>4 5</sup>	fundamental 50 Hz to 20 kHz	$< -100$ dB, typ. $-105$ dB
	fundamental 20 kHz to 110 kHz	$< -90$ dB, typ. $-95$ dB
Spectrum		bar chart showing signal and distortion post-FFT

<sup>3</sup> Not valid for bandwidth 250 kHz.

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

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

<b>THD+N and SINAD</b>		
Fundamental		10 Hz to 110 kHz
Frequency tuning		automatic to input or generator signal or fixed through entered value
Input voltage		typ. > 100 $\mu$ V with automatic tuning
Bandwidth		upper and lower frequency limit selectable, one weighting filter in addition
Accuracy	bandwidth	
	< 50 kHz	$\pm 0.5$ dB
	< 100 kHz	$\pm 0.7$ dB
Inherent distortion Analyzer bandwidth 22 kHz <sup>6</sup>	bandwidth	
	20 Hz to 22 kHz	typ. $-110$ dB at 1 kHz, 2.5 V < $-105$ dB + 2 $\mu$ V <sup>7</sup>
		typ. $-108$ dB + 1.5 $\mu$ V
Inherent distortion Analyzer bandwidth 40/80 kHz <sup>6</sup>	bandwidth	
	20 Hz to 22 kHz	< $-95$ dB + 2.5 $\mu$ V, typ. $-100$ dB + 1.75 $\mu$ V
	20 Hz to 80 kHz	< $-88$ dB + 5 $\mu$ V, typ. $-95$ dB + 3.5 $\mu$ V
Inherent distortion Analyzer bandwidth 250 kHz <sup>6</sup>	bandwidth	
	20 Hz to 22 kHz	< $-95$ dB + 2.5 $\mu$ V, typ. $-100$ dB + 1.75 $\mu$ V
	20 Hz to 110 kHz	< $-88$ dB + 5 $\mu$ V, typ. $-95$ dB + 3.5 $\mu$ V
Spectrum		post-FFT

<b>Time domain display (WAVEFORM)</b>		
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

<b>Frequency</b>		
Frequency range		20 Hz to 250 kHz
Accuracy		$\pm 10$ ppm

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

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

<sup>7</sup> At full-scale level of measurement range (<  $-100$  dB + 2  $\mu$ 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.

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

<b>Unbalanced</b>		
Voltage	rms, sine, open circuit	0.1 mV to 10 V
Crosstalk attenuation	frequency < 20 kHz	> 115 dB
Source impedance		typ. 5 $\Omega$
Load impedance		> 200 $\Omega$

## Signals

<b>Sine</b>			
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	

<b>Sine (with R&amp;S®UPV-B1 low distortion generator option)</b>		
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	< -88 dB
	50 kHz to 100 kHz	< -80 dB

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

<b>Stereo sine (only with R&amp;S®UPV-B3 second analog generator option)</b>			
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

<b>MOD DIST</b>			
	for measuring the modulation distortion		
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 accuracy			± 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

<b>DFD</b>			
	for measuring the difference frequency distortion		
Frequency range	difference frequency		80 Hz to 2 kHz
	center frequency		200 Hz to 20.75 kHz
Level accuracy			± 0.5 dB
Inherent distortion <sup>9</sup>	DFD d <sub>2</sub>		< -115 dB, typ. -120 dB
	DFD d <sub>3</sub>		< -94 dB, typ. -103 dB
Sweep parameters			center frequency, level

<b>DIM (only with R&amp;S®UPV-B3 second analog generator option)</b>			
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 <sup>10</sup>	level < 3 V (rms)		< -95 dB, typ. -105 dB
	level > 3 V (rms)		< -90 dB, typ. -100 dB
Sweep parameters			level

<b>Sine burst, sine<sup>2</sup> burst</b>			
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 <sup>2</sup> burst)
Bandwidth			80 kHz
Sweep parameters			burst frequency, level, time, interval

<b>Noise</b>			
Distribution			Gaussian, triangular, rectangular

<sup>8</sup> Total inherent distortion of analyzer and generator, analyzer with dynamic mode precision.

<sup>9</sup> Center frequency > 5 kHz, difference frequency < 1 kHz; DFD d<sub>2</sub> typ. -100 dB with DC offset.

<sup>10</sup> Level > 0.5 V, typ. values apply from 0.5 V to 6 V.

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

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

<b>FM signal</b>		
Carrier frequency		2 Hz to 21.75 kHz
Modulation frequency		1 mHz to 21.75 kHz
Modulation		0 % to 100 %

<b>AM signal</b>		
Carrier frequency		2 Hz to 21.75 kHz
Modulation frequency		1 mHz to 21.75 kHz
Modulation		0 % to 100 %

<b>DC voltage</b>		
Level range	balanced	0 V to $\pm 10$ V
	unbalanced	0 V to $\pm 5$ V
Accuracy		$\pm 2$ %
Sweep parameters		level

<b>DC offset <sup>11</sup></b>		
Level range	balanced	0 V to $\pm 10$ V
	unbalanced	0 V to $\pm 5$ V
Accuracy		$\pm 2$ %
Residual offset		$\pm 1$ % of RMS value of AC signal

<sup>11</sup> 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:  $f_{\text{new}} = f_{48 \text{ kHz}} \times \text{sampling rate}/48 \text{ kHz}$ .

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

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

### I<sup>2</sup>S input (R&S®UPV-B41 option)

<b>Input</b>		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
<b>Channels</b>		1, 2 or both multiplexed
<b>Word length</b>		16/24/32 bits per channel
<b>Audio bits</b>		8 to 32
<b>Word clock rate</b>		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.

<b>RMS value, wideband</b>		
Measurement bandwidth	up to 0.5 times the clock rate	
Accuracy	AUTO FAST	± 0.1 dB
	AUTO	± 0.01 dB
	FIX	± 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

<b>DC voltage</b>		
Measurement range	0 to ± FS	
Accuracy	± 1 %	

<b>FFT analysis</b>	see FFT analyzer section	
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<b>Total harmonic distortion (THD)</b>		
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		$\pm 0.3$ dB
Inherent distortion <sup>12</sup>		$< -155$ dB
Spectrum		bar chart showing signal and distortion post-FFT

<b>THD+N and SINAD</b>		
Fundamental		10 Hz to 21.90 kHz
Frequency tuning		automatic to input or generator signal or fixed through entered value
Stopband range		fundamental $\pm 28$ Hz, max. up to 2nd harmonic
Bandwidth		upper and lower frequency limit selectable, one weighting filter in addition
Accuracy		$\pm 0.3$ dB
Inherent distortion <sup>12</sup>	bandwidth 20 Hz to 21.90 kHz	$< -142$ dB
Spectrum		post-FFT

<b>Time domain display (WAVEFORM)</b>		
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

<b>Frequency</b>		
Frequency range		20 Hz to 20 kHz
Accuracy		$\pm 10$ ppm

<b>Phase</b>		
Frequency range		20 Hz to 20 kHz
Accuracy		$\pm 0.4^\circ$

<sup>12</sup> 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)

<b>Balanced output</b>		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)
<b>Unbalanced output</b>		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)
<b>Optical output</b>		TOSLINK
<b>Channels</b>		1, 2 or both
<b>Audio bits</b>		8 to 24
<b>Clock rate</b>	internal: generator clock or synchronization to analyzer external: synchronization to word clock input, DARS	30 kHz to 200 kHz
<b>Format</b>		professional and consumer format in line with AES3 or IEC 60958 as well as user-definable formats at all outputs
<b>Phase (output to reference)</b>		adjustable between -64 UI and +64 UI
<b>Cable simulator</b>		100 m typical audio cable

### I<sup>2</sup>S output (R&S® UPV-B41 option)

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

<sup>13</sup> 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	Gaussian, triangular, rectangular
	level	0.5 LSB to 1 FS
Frequency accuracy	internal clock	$\pm 10$ ppm
	relative to clock rate	$\pm 1$ ppm
DC offset		0 to $\pm 1$ FS adjustable

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

Stereo sine		
Frequency range		0.1 Hz <sup>14</sup> 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)	30 Hz <sup>14</sup> to UF/8
	upper frequency (UF)	8 × LF to 21.90 kHz
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Inherent distortion <sup>15</sup>	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 <sup>14</sup>
	center frequency	200 Hz <sup>14</sup> to 20.90 kHz
Inherent distortion <sup>15</sup>	DFD d <sub>2</sub> , DFD d <sub>3</sub> with 1 LSB triangular dither	< -155 dB
Sweep parameters		center frequency, level

Sine burst, sine <sup>2</sup> 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 <sup>2</sup> 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

<sup>14</sup> Fixed frequency independent of clock rate.

<sup>15</sup> Total inherent distortion of analyzer and generator.

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

<b>FM signal</b>		
Carrier frequency		2 Hz <sup>16</sup> to 21.9 kHz
Modulation frequency		1 mHz <sup>16</sup> to 21.9 kHz
Modulation		0 % to 100 %

<b>AM signal</b>		
Carrier frequency		2 Hz <sup>16</sup> to 21.9 kHz
Modulation frequency		1 mHz <sup>16</sup> to 21.9 kHz
Modulation		0 % to 100 %

<b>DC voltage</b>		
Level range		0 to $\pm 1$ FS
Sweep parameters		level

## FFT analyzer

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

<sup>16</sup> Fixed frequency independent of clock rate.

# Filter

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

<b>Analyzer</b>	prefilter function filter	1 weighting or user-definable filter up to 3 weighting or user-definable filters
<b>Generator</b>		1 weighting or user-definable filter

<b>Weighting filters</b>		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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<b>Highpass and lowpass filters</b>		highpass 22 Hz highpass 400 Hz lowpass 22 kHz lowpass 30 kHz lowpass 80 kHz AES 17 lowpass
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<b>User-definable filters</b>		
Design parameters		8th order elliptical, type C (for highpass and lowpass filters also 4th order), pass-band 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

<b>Analog notch filter</b>		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 $1.3 \times f_c$	typ. -3 dB
	outside $0.5 \times f_c$ to $2 \times f_c$	typ. +0 dB/-1 dB

## Sweep

<b>Generator sweep</b>		
Parameters		frequency, level, with bursts also interval and duration, one- or two-dimensional
Sweep		linear, logarithmic, single, continuous
Stepping		automatic after end of measurement

<b>Sweep speed</b>		
Two-channel RMS measurement 20 Hz to 20 kHz, 30-point generator sweep logarithmic (frequency measurement switched off, Low Dist OFF)	GEN TRACK	0.5 s
	AUTO FAST	1 s
	AUTO	2.5 s

## Display of results

<b>Units</b>		
Level (analog)		V, dBu, dBV, W, dBm, difference ( $\Delta$ ), 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 ( $\Delta$ ), 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 ( $\Delta$ ) to reference value (entered or stored)
Reference value (level)		fixed value (entered or stored)

<b>Graphical display of results</b>		
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

<b>Test reports</b>		
Functions		screen copy to clipboard, file or printer

## Audio monitor

<b>Loudspeaker</b>		built in
<b>Headphone connector</b>		6.3 mm jack
Output voltage ( $V_p$ )		max. 7 V
Source impedance		100 $\Omega$ , short-circuit-proof
Recommended headphone impedance		600 $\Omega$

## 150 $\Omega$ modification (R&S®UPV-U1 option)

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

## 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.

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

<b>Analyzer</b>		
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

<b>Jitter injection</b>		
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
<b>Common mode injection</b>		
Signals	at balanced output	
	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)	



## Analyzer

<b>Jitter measurement</b>		
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
<b>Common mode test</b>		
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
<b>Input signal</b>		
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)

<b>Rub &amp; buzz measurement</b>		
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

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

<b>Undersample FFT</b>		
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) <sup>17</sup>

<b>Perceptual evaluation of speech quality</b>		
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

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

## PEAQ<sup>®</sup> measurement (R&S<sup>®</sup>UPV-K62 option) <sup>18</sup>

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<sup>®</sup>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<sup>®</sup>UPV-K91 option)

In line with 3GPP TS 26.131 and TS 26.132.

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

## CDMA2000<sup>®</sup> <sup>19</sup> mobile phone tests (R&S<sup>®</sup>UPV-K92 option)

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

Base software for mobile phone tests (R&S<sup>®</sup>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)

<sup>18</sup> PEAQ<sup>®</sup> is a registered trademark of OPTICOM Dipl.-Ing. M. Keyhl GmbH, Germany.

<sup>19</sup> CDMA2000<sup>®</sup> is a registered trademark of the Telecommunications Industry -Association (TIA -USA).

## Ordering information

Designation	Type	Order No.
<b>Base unit</b>		
Audio Analyzer	R&S®UPV	1146.2003.02
Audio Analyzer without Display	R&S®UPV66	1146.2003.66
<b>Accessories supplied</b>		
Power cable		
Compact manual		
CD with operating manual/service manual		
<b>Hardware options</b>		
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 <sup>2</sup> 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
<b>Software options</b>		
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

For product brochure, see PD 0758.1306.12 and [www.rohde-schwarz.com](http://www.rohde-schwarz.com)

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PD 0758.1306.22 | Version 02.01 | March 2010 | R&S®UPV  
Subject to change  
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