

FX100 Audio Analyzer

Technical Specifications

Analog Generator	
Number of channels	2 or 4 (<i>optional</i>); independent signal amplitude frequency control
Output connectors	XLR BNC Binding post (ground)
Test signals	Sinusoidal StepSweep (2 to 500 points) GlideSweep (0.1 s to 40 s) White noise
Level range balanced unbalanced	-100 dBV to +21.9 dBV (10 μ V to 12.45 V) -100 dBV to +15.9 dBV (10 μ V to 6.22 V)
Level accuracy ¹⁾ balanced unbalanced grounded	< ± 0.04 dB @ 1 kHz, output load > 2 k Ω < +0.02 / -0.06 dB @ 1 kHz, output load > 2 k Ω
Level flatness	± 0.01 dB @ (-80 dBV to +21.9 dBV), (10 Hz to 20 kHz) ± 0.08 dB @ (-80 dBV to +21.9 dBV), (10 Hz to 80 kHz)
Level setting resolution -40 dBV to +24.9 dBV < -40 dBV	± 0.01 dB ± 0.05 dB
Frequency range	5 Hz to 80 kHz
Frequency resolution	< 0.1 Hz
Frequency accuracy	± 25 ppm
Residual THD+N ²⁾ fundamental 20 Hz to 20 kHz fundamental 10 Hz to 80 kHz	typical ≤ -104 dB @ 1 kHz, 0 dBV $\leq (-101$ dB + 0.8 μ V) @ 22 kHz BW $\leq (-92$ dB + 1.6 μ V) @ 80 kHz BW
Maximum differential DC at output	± 1.0 mV
S/N ratio (noise in presence of signal) 20 Hz to 20 kHz 10 Hz to 80 kHz	$\leq (-107$ dB + 0.8 μ V) $\leq (-97$ dB + 1.6 μ V)
Output hum noise rejection ratio balanced unbalanced	> 100 dB @ output load 10 k Ω > 80 dB @ output load 10 k Ω
Output common mode rejection ratio	> 80 dB @ BW 80 kHz
Output related XTalk ³⁾ 10 Hz to 20 kHz 20 kHz to 80 kHz	$\leq (-125$ dB + 1 μ V) $\leq (-105$ dB + 1 μ V)
Output impedance	< 0.8 Ω (servo loop) + 1 Ω shunt (overload detection)
Output current limitation	typical 35 mA _p
Maximum protection against external voltage	42.4 V _p (according to IEC61010)

¹⁾ For loads < 2 k Ω , the FX100 inward resistance (approx. 1.8 Ω) degrades the output level accuracy.

²⁾ System specification includes contribution from both generator and analyzer; generator only and analyzer only contributions are typically less.

³⁾ System specification includes contribution from both generator and analyzer; one generator channel muted.

Analog Analyzer	
Input connectors	XLR BNC Binding post (ground)
Input impedance balanced unbalanced	100 k Ω 65 pF (differential) 50 k Ω 130 pF
Max. rated input (overload protected) DC to 20 kHz 20 Hz to 80 kHz	200 Vp (DC + AC) total symmetrical and asymmetrical 60 Vp (DC + AC) total symmetrical and asymmetrical
Input ranges	-6.7 dBVp to +46 dBVp
Input bandwidth	DC 5 Hz to 80 kHz
Input coupling	AC (< 3 Hz) or DC (selectable)
CMRR (10 Hz to 20 kHz) ⁴⁾ input range < 0 dBVp input range 0 dBVp to 10 dBVp input range 10 dBVp to 20 dBVp input range 20 dBVp to 40 dBVp input range 40 dBVp to 46 dBVp	(<i>CMRR performance below 50 Hz degrades substantially with AC coupling</i>) ≥ 88 dB ≥ 80 dB ≥ 72 dB ≥ 60 dB ≥ 56 dB
Bias supplies	48 V microphone Phantom power 2 V microphone power ICP [®] microphone power ⁵⁾ DCR measurement current 100 μ A (100 k Ω range) 1.6 mA (5 k Ω range)
Measurement functions	Frequency [Hz] Level [V dBV dBu dBSPL dBPa dBr] Selective level [V dBV dBu dBSPL dBPa dBr] Input level [V dBV dBu dBSPL dBPa dBr] THD+N [% dB dBV dBu dBSPL dBPa dBr] THD [% dB dBV dBu dBSPL dBPa dBr] Harmonic distortion k2 to k35 [% dB dBV dBu dBSPL dBPa dBr] FFT [V dBV dBu] with window selection Gain [% dB] Inter-channel phase [Deg Rad] XTalk [% dB] PureSound steepness [Pa/s V/s] (<i>optional</i>) DCV differential [V] DCV common high (XLR pin 2-1); low (XLR pin 3-1) [V] DCR [Ω] Impedance [Ω] (<i>requires SIL or SIH option</i>)
Sweep modes	StepSweep: Frequency Amplitude Time Table sweep GlideSweep: Frequency sweep
Level measurement range	< 1 μ V to 200 Vp
Level measurement resolution	± 0.01 dB
Level measurement accuracy	± 0.04 dB @ 1 kHz
Level measurement flatness (AC coupling OFF) ⁶⁾ 20 Hz to 20 kHz ⁷⁾ 10 Hz to 80 kHz ⁷⁾ generator + analyzer 20 Hz to 20 kHz generator + analyzer 10 Hz to 80 kHz additional tolerance with AC coupling ON	± 0.015 dB ± 0.1 dB ± 0.025 dB ± 0.2 dB -0.01 dB @ 20 Hz -0.065 dB @ 10 Hz -0.3 dB @ 5 Hz
Level measurement residual noise A-weighted 20 kHz BW 80 kHz BW	≤ 1.2 μ V (-118.4 dBV) ≤ 1.5 μ V (-116.5 dBV) typical 2.5 μ V (-112 dBV) ≤ 3 μ V (-110.5 dBV)
Frequency measurement range	5 Hz to 80 kHz
Frequency measurement resolution	< 0.1 ppm
Frequency measurement accuracy 20 Hz to 80 kHz 10.5 Hz to 20 Hz 5 Hz to 10.5 Hz	absolute error $\leq \pm 25$ ppm + measurement deviation error $\leq \pm 2$ ppm absolute error $\leq \pm 25$ ppm + measurement deviation error $\leq \pm 25$ ppm < 1 %

⁴⁾ CMRR performance below 50 Hz degrades substantially with AC coupling ON.

⁵⁾ ICP[®] is a registered trademark of PCB Piezotronics.

⁶⁾ Specified for Meter and StepSweep. For GlideSweep ± 0.01 dB ripple has to be added.

⁷⁾ Specified by design and characterization; not production tested.

THD ; THD+N ; harmonics measurement range	0 % to 100 %
THD ; THD+N ; harmonics measurement accuracy	±0.5 dB (10 Hz to 80 kHz)
THD fundamental measurement range signal source internal generator signal source external device	5 Hz to 80 kHz 10 Hz to 80 kHz
Minimum input level for fundamental frequency detection	≤ 0.1 mV
Analyzer residual THD / harmonics (22 kHz BW) fundamental 1 kHz fundamental 20 Hz to 20 kHz ⁸⁾	typical ≤ (-108 dB + 0.5 μV) ≤ (-104 dB + 0.5 μV)
Generator + analyzer residual THD+N ⁹⁾ fundamental 20 Hz to 20 kHz fundamental 10 Hz to 80 kHz fundamental 5 Hz to 10 Hz	typical ≤ (-104 dB + 1.7 μV) @ 1 kHz, 0 dBV, 22 kHz BW ≤ (-101 dB + 1.7 μV) @ 22 kHz BW ≤ (-92 dB + 3.4 μV) @ 80 kHz BW ≤ (-90 dB + 3.4 μV) @ 80 kHz BW
Inter-channel phase measurement range	-360° to +360°
Inter-channel phase measurement accuracy 10 Hz to 20 kHz 20 kHz to 80 kHz	±1° ±3°
XTalk frequency range	10 Hz to 80 kHz
Residual XTalk ¹⁰⁾ 10 Hz to 20 kHz 20 kHz to 80 kHz	< (-125 dB + 1 μV) < (-105 dB + 1 μV)
LowPass filters (real time; only one filter can be active at a time)	3.4 kHz, 12 th order (passband ripple ±0.01 dB, 3-dB-point 3.484 kHz, stopband attenuation > 97 dB @ 4.08 kHz) 8 kHz, 12 th order (passband ripple ±0.01 dB, 3-dB-point 8.196 kHz, stopband attenuation > 97 dB @ 9.6 kHz) 15 kHz, 12 th order (passband ripple ±0.01 dB, 3-dB-point 15.364 kHz, stopband attenuation > 99 dB @ 18 kHz) 20 kHz Brickwall, compliant to AES17 (10 Hz to 20 kHz passband ripple ±0.1 dB, stopband attenuation > 60 dB @ 24 kHz) 22.4 kHz, 4-pole, compliant to DIN45405 40 kHz, 12 th order (passband ripple ±0.01 dB, 3-dB-point 40.86 kHz, stopband attenuation > 100 dB @ 48 kHz)
HighPass filters (real time; only one filter can be active at a time)	10 Hz, 3 rd order Butterworth (3-dB-point 10 Hz, stopband attenuation > 60 dB @ 1 Hz) 22.4 Hz, 4 th order, compliant to DIN 45405 100 Hz, 4 th order Butterworth (3-dB-point 100 Hz, stopband attenuation > 80 dB @ 10 Hz) 300 Hz, 4 th order Butterworth (3-dB-point 300 Hz, stopband attenuation > 90 dB @ 20 Hz) 400 Hz, 4 th order Butterworth (3-dB-point 400 Hz, stopband attenuation > 100 dB @ 20 Hz)
Weighting filters	A-weighting, compliant to IEC 179 ; ANSI S1.4 ; IEC 61672-1 C-message, compliant to ANSI/IEEE 743-1995 ; BSTM 41004
FFT analysis	Fully independent of other simultaneous measurements
FFT analysis transform length	512 ; 1024 ; 2048 ; 4096 ; 8192 ; 16384 ; 32768 ; 65536 samples
FFT analysis windows	Blackman-Harris Hann none
FFT analysis averaging (only in frequency domain)	exponential arithmetical
FFT analysis waveform display modes	frequency domain time domain
DCV differential measurement (XLR pin 2-3) range accuracy	460 mV to 200 V ±0.5 % of input range
DCV common measurement (XLR pin 2-1/3-1) range accuracy	200 V (fixed) ±50 mV
DCR measurement range	4 Ω to 5 kΩ ; 5 kΩ to 100 kΩ
DCR measurement accuracy 30 Ω to 100 kΩ 4 Ω to 30 Ω	< 0.6 % < 3 %

⁸⁾ Input level has to be ≤ 19.5 dBV

⁹⁾ System specification includes contribution from both generator and analyzer; generator only and analyzer only contributions are typically less.

¹⁰⁾ System specification includes contribution from both generator and analyzer; one generator channel muted.

Communication I/O	
USB host	2*USB mass-storage device (rear and front), A-plug, protocol version 2.0
USB device	Remote control USB-TMC, B-plug, protocol version 2.0
LAN	(for future use)
Interfaces	
Monitor output connector signals max. output	6.3 mm (¼") Jack input signal after the filter stage after the PureSound™ bandpass 65 mW @ 32 Ω, software-controlled volume -80 dB to +40 dB
Auxiliary I/O configuration max. protection against external Voltage	8 programmable general purpose digital inputs & outputs 42.4 Vp (according to IEC61010)
Output V_{OHmin} (@ +3 mA I_{OH}) V_{OLmax} (@ -3 mA I_{OL}) impedance	3.3 V _{TTL} 2.4 V 0.4 V typ. 50 Ω
Input level range V_{IH} V_{IL} impedance	5 V _{TTL} max. -0.5 to +5.5 V 2.0 V 0.8 V 10 kΩ
General data	
Power supply	100 120 230 VAC 50 60 Hz
Temperature range operating conditions storage	+5° to +45°C (+41° to +113°F) -20° to +80°C (-20° to +176°F)
Humidity	≤ 90% R.H. (non condensing)
Mechanical dimensions	width 215 mm (8.5" i.e. half-rack) height 132 mm (5.25" i.e. 3 RU) length 429 mm (16.9")
Weight (2-channel base unit w/o options)	5.12 kg (11.3 lbs)

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