



FX100 Audio Analyzer

Technical Specifications

Analog Generator	
Number of channels	2 or 4 (<i>optional</i>); channel independent signal level, frequency control
Connectors Types Configurations	XLR BNC Binding post (ground) Balanced unbalanced unbalanced grounded common signal test
Test signals	Sinusoidal StepSweep (2 to 500 points; frequency level time sweep) GlideSweep (0.1 s to 40 s) White noise (cf = 3.646), Pink noise (cf = 3.846) IMD (acc. IEC60268/3)
Level Range Balanced Unbalanced Accuracy ¹⁾ Balanced, unbalanced GND, CMST Unbalanced (if grounded externally) Flatness 10 Hz to 20 kHz 10 Hz to 80 kHz Setting resolution -40 dBV to +24.9 dBV < -40 dBV	-100 dBV to +21.9 dBV (10 μV to 12.45 V) for 600 Ω load @ 24 dBu -100 dBV to +15.9 dBV (10 μV to 6.22 V) < ±0.04 dB @ 1 kHz, output load > 2 kΩ < +0.02 / -0.06 dB @ 1 kHz, output load > 2 kΩ ±0.01 dB @ (-80 dBV to +21.9 dBV) ±0.08 dB @ (-80 dBV to +21.9 dBV) ±0.01 dB ±0.05 dB
Frequency Range Resolution Accuracy ²⁾	5 Hz to 80 kHz < 2 ppm ±25 ppm (standard version) ±2.5 ppm (with AES option installed)
Residual THD+N ¹⁾ 1 kHz, 0 dBV Fundamental 20 Hz to 20 kHz Fundamental 10 Hz to 80 kHz	≤ -104 dB typical ≤ (-101 dB + 0.8 μV) @ 22 kHz BW ³⁾ ≤ (-92 dB + 1.6 μV) @ 80 kHz BW ³⁾
IMD MOD Low frequency tone range f ₁ High frequency tone range f ₂ Amplitude ratio Residual IMD MOD d2+d3 1:1 amplitude ratio 4:1 amplitude ratio 10:1 amplitude ratio	60 Hz to 1 kHz 2 kHz to 20 kHz, f ₂ ≥ 6.1 * f ₁ 1:1, 4:1 and 10:1 typ. -101 dB @ 0 dBV, f ₁ = 60 Hz, f ₂ = 20 kHz, amplitude ratio 1:1 ≤ -95 dB ^{3), 4)} @ output level > -20 dBV ≤ -90 dB ^{3), 4)} @ output level > -20 dBV ≤ -85 dB ^{3), 4)} @ output level > -20 dBV
IMD DFD Mean frequency range f _m Difference frequency range f _d Residual IMD DFD d2+d3	2.5 kHz to 20 kHz 80 Hz to 2 kHz typ. -108 dB @ 0 dBV, f _m = 80 Hz, f _d = 20 kHz ≤ -100 dB ^{3), 4)} @ output level > -20 dBV
IMD DIM Square frequency Sine frequency Amplitude ratio Residual IMD DIM	3.15 kHz (DIM 30 or DIM 100) 15 kHz 4:1, square to sine peak-peak typ. -103 dB @ 0 dBV ≤ -95 dB ^{3), 4)} @ output level > -20 dBV

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

²⁾ Temperature range +20 to +45 °C; ±1 ppm ageing p.a.

³⁾ System specification includes contribution from both generator and analyzer; generator only and analyzer only contributions are typically less.

⁴⁾ Applies for all FX100 units with serial number ≥ 11221; for instruments with a lower serial number, +5 dB have to be added.

Wave file playback Format Sampling rate Data format Word length Channels Mono Stereo Max. file size Max. play time 24 bit 16 bit Level flatness 10 Hz to 20 kHz Reconstruction filter Filter type -0.005 dB point -3 dB point Stopband attenuation Group delay Max. filter overshoot (step -1 to +1)	Microsoft RIFF wave (16 bit and 24 bit), extensible RIFF wave (24 bit only) 48 kHz Signed integer linear PCM 16 bit or 24 bit Wave data is assigned to all FX100 channels Wave data chn1 is assigned to FX100 chn1&3; wave data chn2 is assigned to chn2&4 16 MByte mono 116 sec.; stereo 58 sec. mono 174 sec.; stereo 87 sec. ± 0.015 dB FIR 20.0 kHz 21.18 kHz > 140 dB @ 24 kHz 150.5 samples @ 192 kHz sample rate ± 1.25
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	$\leq (-107 \text{ dB} + 0.8 \mu\text{V})$ $\leq (-97 \text{ dB} + 1.6 \mu\text{V})$
Output Hum noise rejection ratio Balanced Unbalanced Common mode rejection ratio Related XTalk ⁵⁾ 10 Hz to 20 kHz 20 kHz to 80 kHz Impedance Current limitation Maximum protection against external voltage	$> 100 \text{ dB @ output load } 10 \text{ k}\Omega$ $> 80 \text{ dB @ output load } 10 \text{ k}\Omega$ $> 80 \text{ dB @ BW } 80 \text{ kHz}$ $\leq (-125 \text{ dB} + 1 \mu\text{V})$ $\leq (-105 \text{ dB} + 1 \mu\text{V})$ $< 0.8 \Omega$ (servo loop) + 1Ω shunt (overload detection) typical 35 mA _p 42.4 V _p (according to IEC61011)

Analog Analyzer	
Connectors	XLR BNC Binding post (ground)
Input impedance Balanced Unbalanced	100 k Ω 65 pF (differential) 50 k Ω 130 pF
Maximum rated input (overload protected) DC to 20 kHz 20 Hz to 80 kHz	200 V _p (DC + AC) total symmetrical and asymmetrical 60 V _p (DC + AC) total symmetrical and asymmetrical
Input Range Bandwidth Coupling	$-6.7 \text{ dBVp to } +46 \text{ dBVp}$ DC 5 Hz to 80 kHz AC (< 3 Hz) or DC (selectable)
CMRR @ 10 Hz to 20 kHz ⁶⁾ Input range < 0 dBV _p Input range 0 dBV _p to 10 dBV _p Input range 10 dBV _p to 20 dBV _p Input range 20 dBV _p to 40 dBV _p Input range 40 dBV _p to 46 dBV _p	<i>(CMRR performance below 50 Hz degrades substantially with AC coupling)</i> $\geq 88 \text{ dB}$ $\geq 80 \text{ dB}$ $\geq 72 \text{ dB}$ $\geq 60 \text{ dB}$ $\geq 56 \text{ dB}$
Bias supplies	48 V microphone Phantom power 2 V microphone power ICP [®] microphone power ⁷⁾ DCR measurement current 100 μA (100 k Ω range) 1.6 mA (5 k Ω range)

⁶⁾ CMRR performance below 50 Hz degrades substantially with AC coupling ON.

⁷⁾ ICP[®] is a registered trademark of PCB Piezotronics.

⁵⁾ System specification includes contribution from both generator and analyzer; one generator channel muted.

Measurement functions	<p>Frequency [Hz ; ppmr] Level [V ; dBV ; dBu ; dB SPL ; dBPa ; dBr ; W] Selective level [V ; dBV ; dBu ; dB SPL ; dBPa ; dBr ; W] Input level [V ; dBV ; dBu ; dB SPL ; dBPa ; dBr ; W] THD+N [% ; dB ; dBV ; dBu ; dB SPL ; dBPa ; dBr ; W] THD [% ; dB ; dBV ; dBu ; dB SPL ; dBPa ; dBr ; W] Harmonic distortion k2 to k35 [% ; dB ; dBV ; dBu ; dB SPL ; dBPa ; dBr ; W] IMD (acc. IEC60268/3) [% ; dB] FFT [V ; dBV ; dBu ; dB SPL ; dBPa ; dBr ; W] Gain [% ; dB] Inter-channel phase [Deg ; Rad] XTalk [% ; dB] Signal latency [s] PureSound™ steepness [Pa/s ; V/s] (optional) DCV differential [V] DCV common high (XLR pin 2-1); low (XLR pin 3-1) [V] DCR [Ω] Impedance [Ω] (requires SIP, SIL or SIH option)</p>
Sweep modes	<p>StepSweep: Frequency ; Amplitude ; Time ; Table sweep GlideSweep: Frequency sweep</p>
Level measurement Range Resolution Accuracy Flatness (AC coupling OFF) ⁸⁾ 20 Hz to 20 kHz ⁹⁾ 10 Hz to 80 kHz ⁹⁾ Generator + analyzer 20 Hz to 20 kHz Generator + analyzer 10 Hz to 80 kHz Additional tolerance with AC coupling ON Residual noise A-weighted 20 kHz BW 80 kHz BW	<p>< 1 μV to 200 Vp ±0.01 dB ±0.04 dB @ 1 kHz ±0.015 dB ±0.1 dB ±0.025 dB ±0.2 dB -0.01 dB @ 20 Hz typical ; -0.065 dB @ 10 Hz ; -0.3 dB @ 5 Hz ≤ 1.2 μV (-118.4 dBV) ≤ 1.6 μV (-116.0 dBV) ≤ 3 μV (-110.5 dBV) ; 2.5 μV (-112 dBV) typical</p>
Frequency measurement Range Resolution Accuracy 5 Hz to 10 Hz 10 Hz to 80 kHz	<p>5 Hz to 80 kHz < 0.1 ppm ≤ ±25 ppm (standard) ; ±2.5 ppm (with AES board) absolute + measurement error ±50 ppm ≤ ±25 ppm (standard) ; ±2.5 ppm (with AES board) absolute + measurement error ±1 ppm</p>
THD ; THD+N ; harmonics measurement Range Accuracy THD fundamental measurement range Source internal generator Source external generator Minimum input level for fundamental frequency detection Analyzer residual THD / harmonics (22 kHz BW) Fundamental 0 dBV @ 1 kHz Fundamental 20 Hz to 20 kHz ¹⁰⁾ Generator + analyzer residual THD+N ¹¹⁾ Fundamental 20 Hz to 20 kHz Fundamental 10 Hz to 80 kHz Fundamental 5 Hz to 10 Hz	<p>0 % to 100 % ≤ ±0.5 dB (10 Hz to 80 kHz) 5 Hz to 80 kHz 10 Hz to 80 kHz ≤ 0.1 mV ≤ -107 dB typical ≤ (-104 dB + 0.5 μV) ≤ (-104 dB + 1.7 μV) @ 1 kHz, 0 dBV, 22 kHz BW typical ≤ (-101 dB + 1.7 μV) @ 22 kHz BW ≤ (-92 dB + 3.4 μV) @ 80 kHz BW ≤ (-90 dB + 3.4 μV) @ 80 kHz BW (source internal generator)</p>
IMD MOD Low frequency acceptance range f ₁ High frequency acceptance range f ₂ MOD component analysis Residual IMD MOD d2+d3 1:1 amplitude ratio 4:1 amplitude ratio 10:1 amplitude ratio	<p>60 Hz to 1 kHz 2 kHz to 20 kHz, f₂ ≥ 6.1 * f₁ d2, d3, d2+d3, or d2 ... d5 typ. -101 dB @ 0 dBV, f₁ = 60 Hz, f₂ = 20 kHz, amplitude ratio 1:1 ≤ -95 dB ^{3), 4)} @ output level > -20 dBV ≤ -90 dB ^{3), 4)} @ output level > -20 dBV ≤ -85 dB ^{3), 4)} @ output level > -20 dBV</p>

⁸⁾ Specified for Meter and StepSweep. For GlideSweep, the length must be ≥ 0.2 s and ±0.01 dB ripple has to be added.

⁹⁾ Specified by design and characterization; not production tested.

IMD DFD Mean frequency acceptance range f_m Difference frequency acceptance range f_d DFD component analysis Residual IMD DFD d2+d3	2.5 kHz to 20 kHz 80 Hz to 2 kHz d2, d3, d2+d3, or d2 ... d5 typ. -108 dB @ 0 dBV, $f_m = 80$ Hz, $f_d = 20$ kHz ≤ -100 dB ^{3), 4)} @ output level > -20 dBV
IMD DIM Square frequency Sine frequency DIM component analysis Residual IMD DIM	3.15 kHz (DIM 30 or DIM 100) 15 kHz u1 ... u9 or u4+u5 typ. -103 dB @ 0 dBV ≤ -95 dB ^{3), 4)} @ output level > -20 dBV
Interchannel phase measurement Range Accuracy ¹²⁾ 10 Hz to 20 kHz 20 kHz to 80 kHz	-180° to 180° $\leq \pm 1^\circ$ $\leq \pm 3^\circ$
XTalk measurement Frequency range Residual XTalk ¹³⁾ 10 Hz to 20 kHz 20 kHz to 80 kHz	10 Hz to 80 kHz < (-125 dB + 1 μ V) < (-105 dB + 1 μ V)
Signal latency measurement Range GlideSweep sync source internal GlideSweep sync source external Residual signal latency Resolution Accuracy ¹⁴⁾ DUT bandwidth ≥ 100 Hz to 20 kHz DUT bandwidth ≥ 100 Hz to 15 kHz DUT bandwidth ≥ 300 Hz to 8 kHz DUT bandwidth ≥ 300 Hz to 3.4 kHz Speaker measurements ¹⁵⁾ Max. allowed interchannel latency difference	0 s to 95 ms 0 s to 19 s ≤ 0.05 ms 0.005 ms ≤ 0.05 ms ≤ 0.1 ms ≤ 0.2 ms ≤ 0.5 ms ≤ 0.1 ms ≤ 40 ms
Filters LowPass (real time; only one filter can be active at a time) HighPass (real time; only one filter can be active at a time) Weighting (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) 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) A-weighting, compliant to IEC 179 ; ANSI S1.4 ; IEC 61672-1 C-message weighting, compliant to ANSI/IEEE 743-1995 ; BSTM 41004
Input coupling	DC ; AC (-3 dB point < 3 Hz)
FFT Analysis Transform length Sampling rate Windows Averaging (only in frequency domain) Waveform display modes	Fully channel-independent and independent of other simultaneous measurements 512 ; 1024 ; 2048 ; ... 1048576 ; 2097152 samples 192 kHz 4-term Blackman-Harris ; Hann (Hanning) ; none Exponential ; arithmetical Frequency domain ; time domain

¹⁰⁾ Input level has to be ≤ 19.5 dBV

¹¹⁾ System specification includes contribution from both generator and analyzer; generator only and analyzer only contributions are typically less.

¹²⁾ Both analyzer inputs must have the same coupling (AC ; DC), and the automatic input range is switched OFF.

¹³⁾ System specification includes contribution from both generator and analyzer; one generator channel muted.

¹⁴⁾ Accuracy can degrade due to impulse response band limitation; Brickwall filter assumed for the specified accuracy; listed cutoff frequency @ -3 dB point

¹⁵⁾ With sample rate adjustment turned OFF

DCV measurement Differential (XLR pin 2-3) Input range setting Accuracy Common (XLR pin 2-1/3-1) Range Accuracy	460 mV to 200 V $\leq \pm 0.6\%$ of input range setting 200 V (fixed) $\leq \pm 50$ mV
DCR measurement Range Accuracy 4 Ω to 30 Ω 30 Ω to 100 k Ω	4 Ω to 5 k Ω ; 5 k Ω to 100 k Ω (manual Bias selection) $< 4\%$ $< 0.8\%$
Interfaces	
Communication USB host USB device LAN	2*USB mass-storage device (rear and front), A-plug, protocol version 2.0 Remote control USB-TMC, B-plug, protocol version 2.0 <i>(for future use)</i>
Monitor output Connector Signals Maximum output power	6.3 mm (¼") Jack after the input filter stage ; after the PureSound™ bandpass 65 mW @ 32 Ω , software-controlled volume -80 dB to +40 dB
Auxiliary I/O Configuration Output V_{OHmin} (@ $I_{OH} = +3$ mA) V_{OLmax} (@ $I_{OL} = -3$ mA) Impedance Input Level range V_{IH} V_{IL} Impedance Min. input pulse width Max. protection against external Voltage	8 programmable general purpose digital inputs & outputs 3.3 V _{TTL} 2.4 V 0.4 V 50 Ω typical 5 V _{TTL} max. -0.5 to +5.5 V 2.0 V 0.8 V 10 k Ω ≥ 200 μ s 42.4 Vp (according to IEC61011)
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	$\leq 90\%$ 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)

FX-SIP Option

Output Bandwidth Power (BW 22 kHz) ¹⁶⁾ Dual operation Bridged operation	5 Hz to 80 kHz (± 0.1 dB relative to 1 kHz without load) 2*10 W into 2 Ω / 4 Ω or 2*5 W into 8 Ω THD < -80 dB / 0.01% 1*30 W into 2 Ω / 4 Ω or 1*20 W into 8 Ω THD < -86 dB / 0.005%
Amplifier gain	0 dB
Output level Overall Accuracy ¹⁷⁾ Added error due to amplifier inward resistance Dual Mode (R _i = 50 m Ω) Bridge Mode (R _i = 80 m Ω) Flatness ¹⁷⁾ 10 Hz to 20 kHz, load \geq 2 Ω 10 Hz to 80 kHz, load \geq 8 Ω 10 Hz to 80 kHz, load \geq 2 Ω	± 0.1 dB (no load) Loss = dB (R _{Load} / (R _{Load} + R _i)) +0 / -0.21 dB @ 2 Ω load ; +0 / -0.11 dB @ 4 Ω load ; +0 / -0.05 dB @ 8 Ω load +0 / -0.34 dB @ 2 Ω load ; +0 / -0.17 dB @ 4 Ω load ; +0 / -0.09 dB @ 8 Ω load ± 0.06 dB +0.1 / -0.2 dB +0.1 / -0.4 dB
Inward resistance R_i Dual mode (per channel) Bridge mode	\leq 50 m Ω (20 m Ω typical) \leq 80 m Ω (40 m Ω typical)
Damping factor Dual mode Bridge mode	> 80 @ 10 Hz to 10 kHz, load \geq 4 Ω > 50 @ 10 Hz to 10 kHz, load \geq 4 Ω
THD ¹⁸⁾ Dual mode (BW 22 kHz) fundamental 1 kHz fundamental 10 Hz to 20 kHz Bridge mode (BW 22 kHz) fundamental 1 kHz fundamental 10 Hz to 20 kHz	-101 dB typical (with 1 W @ 4 Ω) \leq -80 dB + 15 μ V (power 0 to 10 W, load 2 to 250 Ω) -105 dB typical (with 5 W @ 4 Ω) \leq -86 dB + 15 μ V (power 0 to 30 W, load 2 to 250 Ω)
S/N ratio A-weighted BW 22.4 kHz BW 80 kHz	> 109 dB below rated power @ 4 / 8 Ω > 106 dB below rated power @ 4 / 8 Ω > 103 dB below rated power @ 4 / 8 Ω
XTalk	< -60 dB, BW 10 Hz to 20 kHz
Slew rate	> 50 V/ μ s
Interchannel phase accuracy ^{12) 110)}	± 1.3 deg
Amplifier protection	Short circuit ; overcurrent shutdown and automatic retry ; thermal
Maximum output Level Dual mode Bridge mode Current	16.2 dBV 21.9 dBV 4.2 A (Bridge mode, 2 Ω load)
Impedance measurement ²⁰⁾ Nominal speaker impedance range Measurement range Nominal shunt resistance Measurement accuracy ^{20) 21)} General accuracy Meter, StepSweep 5 Hz to 1 kHz, GlideSweep 20 Hz to 1 kHz Meter, StepSweep 5 Hz to 10 kHz, GlideSweep 20 Hz to 10 kHz Bridge mode 4-wire (sense pins used) Bridge mode 2-wire, Dual mode Additional impedance measurement error with GlideSweep < 20 Hz, 10 Hz to 10 kHz	2 Ω to 250 Ω 0 Ω to > 1 k Ω 0.2 Ω / 0.1 % (in front of amplifier feedback \Rightarrow no impact on FX-SIP output level) ± 5 % with Z = 2 Ω to 150 Ω ²²⁾ ; ± 7 % with Z = 150 Ω to 250 Ω ²²⁾ ± 10 % with Z = 2 Ω to 150 Ω ²²⁾ ; ± 15 % with Z = 150 Ω to 250 Ω ²²⁾ ± 2 % with Z = 2 Ω to 16 Ω ²²⁾ ± 5 % with Z = 2 Ω to 64 Ω ²²⁾ +1 %

¹⁶⁾ Duty cycle (signal ON : OFF) must not exceed 1:2

¹⁷⁾ Including FX100 generator output level tolerance

¹⁸⁾ The generator Chn1 and Chn2 frequencies have to be the same

¹¹⁰⁾ Tolerances contain all FX100 errors including generator output phase and analyzer input phase

²⁰⁾ Tolerances include all errors of FX100 generator output level, analyzer input level and FX-SIP shunt & inward resistance

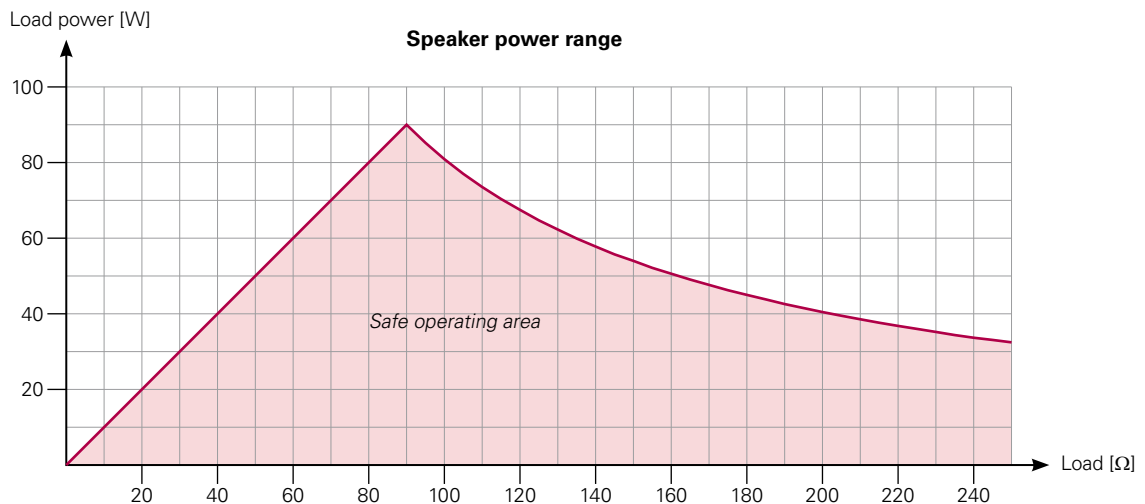
²¹⁾ Frequency range: Meter, StepSweep 5 Hz to 10 kHz ; GlideSweep 20 Hz to 10 kHz

²²⁾ AC coupling OFF

DCR measurement	
Current source (DCR 250 Ω range)	24.925 mA / ±1 %
Range	
Dual mode	0 Ω to 500 Ω
Bridge mode	0 Ω to 1 k Ω
Accuracy resistance DCR (auto range active)	
R = 2 Ω to 4 Ω	±2.5 %
R = 4 Ω to 250 Ω	±1.2 %

FX-SIL Option

Nominal shunt resistance	1 Ω ±0.1 %
Recommended current range	50 μA to 1 A
Overcurrent detection	1.4 A ±10 %
Speaker power range	
Minimum power	<< 1 mW
Maximum power @ 2 Ω	2 W
Maximum power @ 4 Ω	4 W
Maximum power @ 8 Ω	8 W
Maximum power @ 32 Ω	32 W
Maximum power @ 250 Ω	32 W
Impedance measurement	
Nominal speaker impedance range	2 to 250 Ω
Accuracy @ AC coupling OFF ^{23), 24)}	
5 Hz to 20 kHz	≤ ±1 %
Accuracy @ AC coupling ON ^{23), 24)}	
20 Hz to 20 kHz	≤ ±1 %
10 Hz to 20 kHz	≤ ±3 %
5 Hz to 20 kHz	≤ ±5 %
DCR measurement	
DC current source (DCR 250 Ω range)	5 mA ±1 %
Range	2 to 250 Ω
Accuracy	
R = 2 to 8 Ω	≤ ±2.5 %
R = 8 to 250 Ω	≤ ±1 %

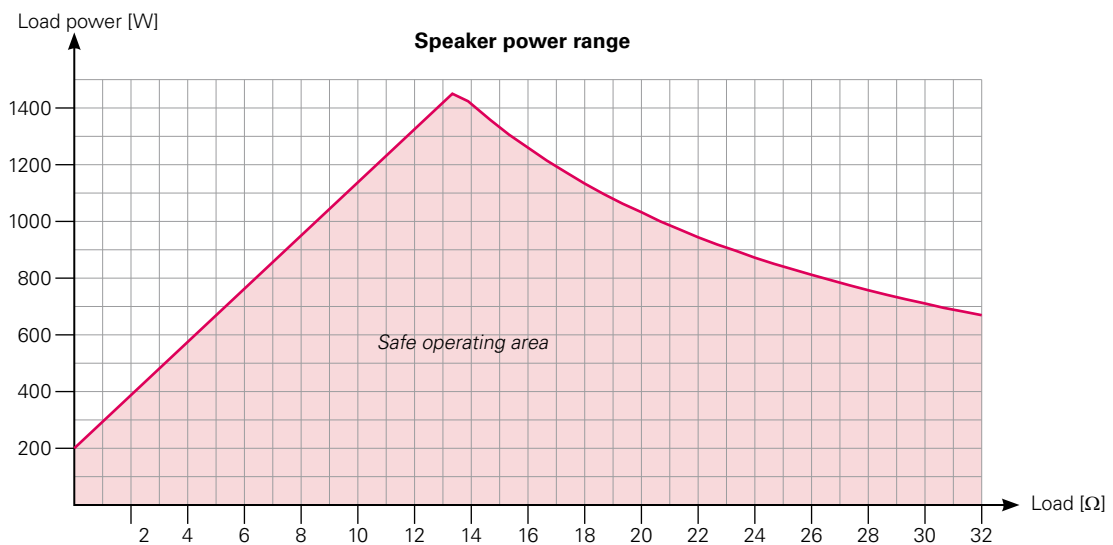


²³⁾ Cabling from amplifier to SIL, SIH in accordance to IEC 60268-12

²⁴⁾ Add 1% to tolerance if loudspeaker impedance is measured with 2 channels (i.e. reference @ amplifier terminal + shunt measurement)

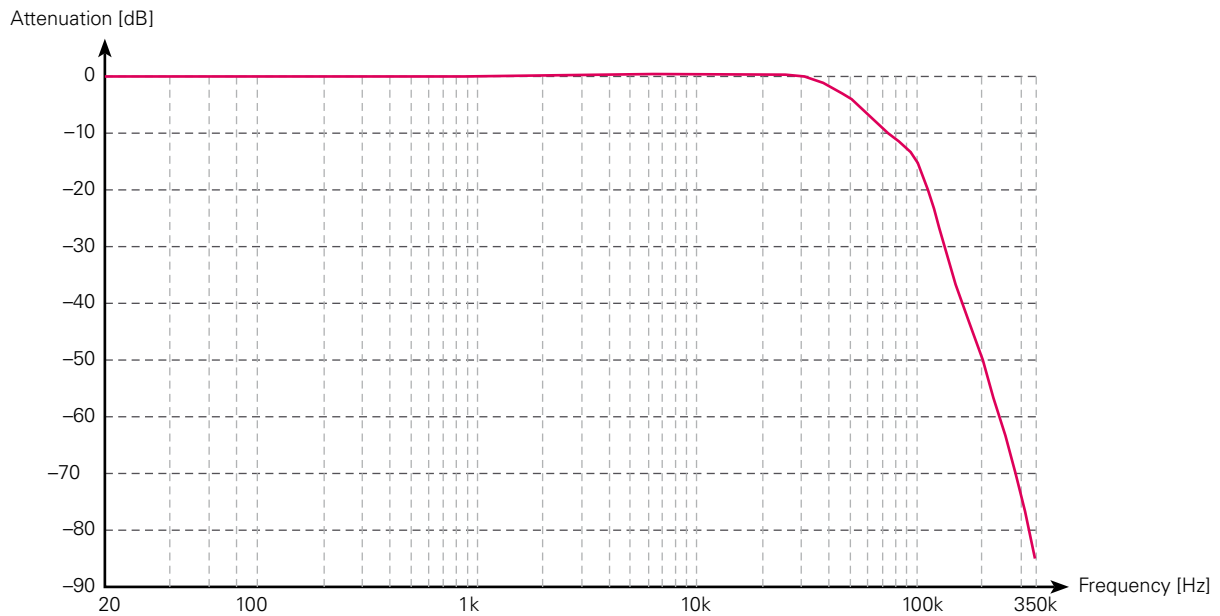
FX-SIH Option

Nominal shunt resistance	0.1 Ω \pm 0.1 %
Recommended current range	25 mA to 10 A
Overcurrent detection	12 A \pm 10 %
Speaker power range Minimum power Maximum power @ 2 Ω Maximum power @ 4 Ω Maximum power @ 8 Ω Maximum power @ 16 Ω Maximum power @ 32 Ω	< 1 W 200 W 400 W 800 W 1300 W 670 W
Impedance measurement Nominal speaker impedance range Accuracy @ AC coupling OFF ^{23), 24)} 5 Hz to 20 kHz Accuracy @ AC coupling ON ^{23), 24)} 20 Hz to 20 kHz 10 Hz to 20 kHz 5 Hz to 20 kHz	2 to 32 Ω $\leq \pm 1$ % $\leq \pm 1$ % $\leq \pm 3$ % $\leq \pm 5$ %
DCR measurement DC current source (DCE 100 Ω range) Range Accuracy @ R = 2 to 100 Ω	100 mA \pm 1 % 2 Ω to 100 Ω $\leq \pm 2$ %



FX-DF Option ²⁵⁾

Operation range	D-class amplifier testing of up to 2 kW @ 8 Ω
Maximum input voltage	±200 Vp, 140 Vrms
Level measurement Accuracy Flatness 20 Hz to 20 kHz	±0.06 dB @ 1 kHz ±0.1 dB
High-frequency rejection	> 70 dB @ 300 kHz
Residual DFD acc. to IEC60268 ²⁶⁾ Input Level ≤ 60 Vpp Input Level ≤ 100 Vpp	< -100 dB < -96 dB
Residual THD @ input level 60 Vpp Typical Maximum	< -105 dB < -100 dB @ fundamental input frequency 20 Hz to 10 kHz
Residual crosstalk	< -100 dB
Residual noise ²⁷⁾	≤ 10 μV (-100 dBV), BW 20 kHz



²⁵⁾ FX-DF specifications include FX100 Analyzer & Generator specifications whenever applicable

²⁶⁾ Test Frequencies 18 kHz + 20 kHz, DFD products 2nd order (@ 2 kHz) / 3rd order (@ 16 and 22 kHz)

²⁷⁾ FX-SIP power supply disconnected

FX-AES Option

Digital Signal Generator	
Interface	
Balanced	
Format	AES-EBU per AES3-2003
Connector	XLR
Carrier amplitude	2.2 Vpp ±10 % into 110 Ω
Output impedance	110 Ω
Unbalanced	
Format	S/PDIF-EIAJ per IEC60958-3 or AES3-id
Connector	BNC (S/PDIF with BNC to RCA adapter)
Carrier amplitude	0.5 Vpp (S/PDIF) 1.0 Vpp (AES3-id) ±20 % into 75 Ω
Output impedance	75 Ω
Optical ²⁸⁾	Toslink®, fs ≤ 192 kHz
Output sample rate	
Source selection	internal digital input signal recovered sync input
Range	22 to 220 kHz
Resolution	≤ ±0.0001 % (±1 ppm)
Accuracy ²⁹⁾	≤ ±0.00025 % (±2.5 ppm) using internal reference
Audio data word length	16 18 20 24 bit (TPDF Dither added for < 24 bit)
Channel status bit setting	Consumer format: channel independent selection, full implementation per IEC60958 (english language decoded) Professional format: channel independant selection of bit #0 to #21, bit #32 to #39 per IEC 60958 (english language decoded)
User bits	set to 0
Validity bit	channel independent toggling between Valid – Invalid
Signals	<i>same as analog output</i>
Level	
Range	-142 dBFS to 0 dBFS (0.0707 μFFS to 1 FFS, channel independent)
Resolution	±0.001 dB
Flatness	±0.006 dB
Anti-Aliasing cut-off ³⁰⁾	
-0.01 dB point	0.453 ±0.5 % * fs, typical 21.75 kHz with fs = 48 kHz
-3 dB point	0.478 ±0.5 % * fs, typical 22.98 kHz with fs = 48 kHz
Attenuation ≥ 120 dB	0.55 * fs, typical 26.2 kHz with fs = 48 kHz
Frequency range	5 Hz to 80 kHz
Residual	
Noise	≤ -128 dBFS (20 kHz BW)
Jitter ³¹⁾	≤ 2 ns peak (700 Hz to 100 kHz jitter BW)
Digital Signal Analyzer	
Interface	
Balanced	
Format	AES-EBU per AES3-2003
Connector	XLR
Unbalanced	
Format	S/PDIF-EIAJ per IEC60958-3 or AES3-id, symmetrical input
Connector	BNC (S/PDIF with RCA to BNC adapter)
Input impedance Bal/Unbal	110 Ω 75 Ω Hi-Z (> 2k Ω)
Carrier signal range	200 mVpp to 10 Vpp (covers AES3-2003 S/PDIF IEC 60958-3 AES3-id)
Optical ²⁷⁾	Toslink®, fs ≤ 192 kHz
AES recovered input carrier sample rate	22 to 220 kHz
Measurement	
Range	22 to 220 kHz
Resolution	≤ ±0.00005 % (±0.5 ppm)
Accuracy ²⁹⁾	≤ 0.00025 % (±2.5 ppm) internal reference accuracy ±0.00015 % (±1.5 ppm) frequency measurement accuracy
Detection range of standard sample rate	±5000 ppm
(32 44.1 48 64 88.1 96 128 176.4 192 kHz)	

²⁸⁾ Sampling rate fs ≤ 192 kHz for AES option installed after July 2014; otherwise fs ≤ 110 kHz

²⁹⁾ Specification valid for temperature range +20° to +45°C, excluding the aging (±1 ppm/year)

³⁰⁾ Specification valid for fs = 26 to 220 kHz

³¹⁾ Specification valid for fs = 32 to 220 kHz, output source internal or SyncIn

Embedded data display	24 bit activity indicators of each channel
Channel status bit indicators	Consumer format: channel independent selection, full implementation per IEC60958 (english language decoded) Professional format: channel independant selection of bit #0 to #21, bit #32 to #39 per IEC 60958 (english language decoded) Warning highlight mode if channel status differs from received data stream (e.g. audio word length, audio data mode, sample rate etc.)
User bits	not displayed
Validity flag	displayed for each channel
Carrier condition indicator	parity † coding error † receiver synchronized
Level Range Resolution Flatness Anti-Aliasing cut-off ²⁷⁾ -0.01 dB point -3 dB point Attenuation ≥ 120 dB	-144 to 0 dBFS ±0.001 dB ±0.007 dB 0.453 ±0.5 % * fs, typical 21.75 kHz with fs = 48 kHz 0.478 ±0.5 % * fs, typical 22.98 kHz with fs = 48 kHz 0.55 * fs, typical 26.2 kHz with fs = 48 kHz
Frequency range Meter, StepSweep GlideSweep	5 Hz to 0.4986 * fs 5 Hz to 0.465 * fs
Residual noise	< -135 dBFS, BW 20 kHz
Measurements	same as in analog input mode, except of PureSound † DCV common † DCR Impedance
Sync Input Characteristics	
Interface Format Connector Input impedance Frequency range Input amplifier range Rise / fall time	Squarewave or Video (PAL † NTSC) BNC 75 Ω † Hi-Z (> 1 k Ω) 22 to 220 kHz, 15.625 kHz (PAL) † 15.734 kHz (NTSC) 200 mVpp to 5 Vpp < 500 ns
Sample rate measurement Range Resolution Accuracy ²⁷⁾	22 to 220 kHz, 15.625 kHz (PAL) † 15.734 kHz (NTSC) ≤ ±0000.5 % (±0.5 ppm) ≤ 0.00025 % (±2.5 ppm) internal reference accuracy ±0.00015 % (±1.5 ppm) frequency measurement accuracy
Detection range of standard sample rate Video (15.625 kHz PAL † 15.734 kHz NTSC) Audio (32 † 44.1 † 48 † 64 † 88.1 † 96 † 128 † 176.4 † 192 kHz)	±1500 ppm ±5000 ppm
Residual jitter ²⁹⁾	≤ 2 ns peak (700 Hz to 100 kHz jitter BW)
PLL loop filter	5 kHz