

# FX100

## Professional Audio Analyzer

 Made in Switzerland



FOR LABORATORY AND PRODUCTION  
ANALOG & DIGITAL AUDIO  
FAST & ACCURATE MEASUREMENTS  
SCALABLE ARCHITECTURE  
SUPERIOR SPECIFICATIONS

# FX100 – Fast. Precise. Reliable.

The FX100 is a unique professional audio analyzer that adapts to your application. The instrument offers comprehensive measurements including Pass/Fail tests in under 1 second. You may customize the system for two or four parallel channel operation, speaker impedance testing and digital audio measurements. Switcher modules provide additional outputs and inputs.



FX100 Audio Analyzer

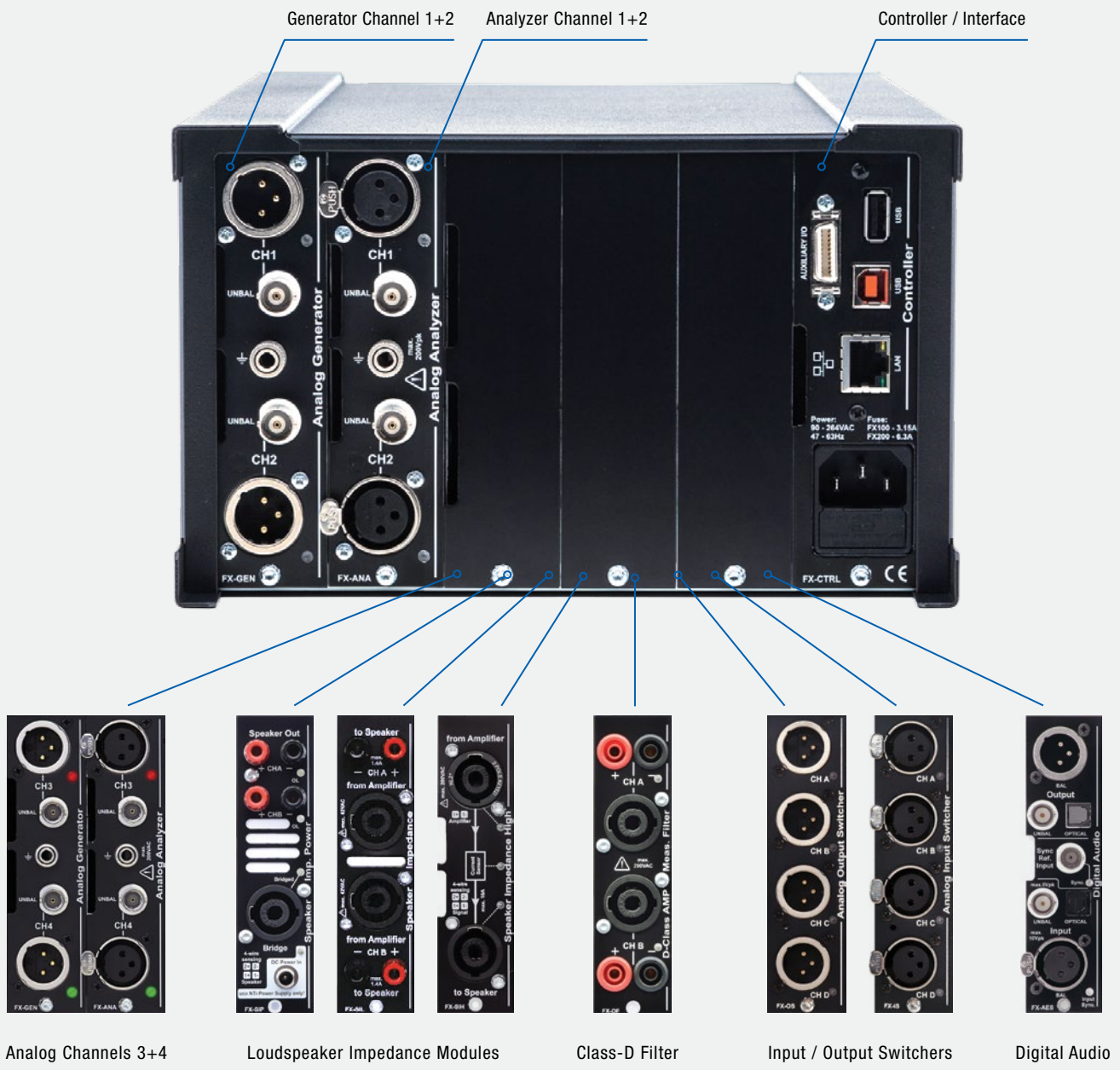
## Outstanding Features

The FX100 Audio Analyzer with the FX-Control software are expertly suited to a variety of audio measurement applications. The system offers a number of outstanding features and benefits:

- Comprehensive functionality
- Incredible measurement speed
- High-precision results
- Ease-of-use and automation
- Extensive documentation
- Modular hardware concept
- Robust and reliable
- First-class worldwide support

# Scalable Architecture

The FX100 Base Unit consists of a 2-channel analog generator, as well as a 2-channel analog analyzer. The remaining three slots can be filled with modules appropriate to the desired application.



# Fast Setup



## Research & Development

The wide range of available standard test signals, measurements and auxiliary functions as well as the intuitive FX-Control software are ideal for use in research and development laboratories.

## Acoustic Measurements

Besides the typical requirements, in acoustic applications, of frequency response measurements and the analysis of audible defects, the FX100 is also able to produce quasi-free-field results within a reverberant space.

## Manufacturing

The FX100 excels in the quality control of mass-production because of its ease of integration as well as the extremely rapid and comprehensive verification of test samples.

## Service & Repair

Service technicians appreciate the outstanding flexibility of the system and its effortless operation. At the same time, the system can be adapted quickly to changing requirements.

# FX-Control Software



## Intuitive Operation



The Windows-based FX-Control software is standard issue with the FX100. It provides a comprehensive interface for robust control of the FX100 including many useful functions. Fully-configurable charts display the details of the measurement results. Test parameters and measurement functions can be defined in multiple windows. It is this outstanding ease-of-use and flexibility that makes even the most complex measurement processes quick and simple to manage. Extensive integrated help functions complement the simple operation.

## Customized Computation Elements

A particular advantage of the FX-Control software is that you can extend the standard range of measurement functions with customized computation elements and regulators. For instance, arithmetic basic functions such as addition or multiplication, boolean operators, interpolation or smoothing etc. are supported.

Thus, you may create separated analysis of selected portions of a trace, determine outcomes by linking several obtained results, automatically derive and dynamically adjust tolerance limits, and much more.

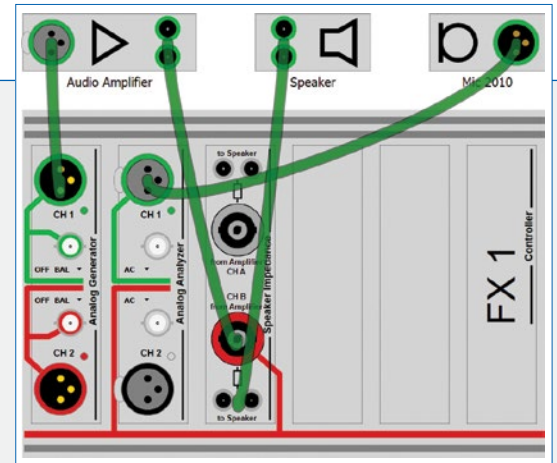
## Fully-documented Results

Measurement results and calculations can be saved in various data formats. For fast manual documentation, graphic and numeric measurement data can be transferred using the Windows clipboard.

Reports are produced as part of the automated measurement sequence, and can be individually designed using a Microsoft Word template.

# Wiring Assistant

FX-Control allows you to show graphically how the FX100 is physically connected to external components. Use this wiring assistant to give you a clear overview of the process and ensure that the selected input and output channels and the associated settings match the real signal path.



The wiring assistant diagram is also stored with the project data as an invaluable guide for reproducing the physical environment of the test at a later date.

## Application Programming

The complimentary Microsoft® .NET API can be integrated into all Microsoft .NET programming languages. Sample programs in C#.NET and Visual Basic.NET are available. In addition, a complete LabVIEW™ driver library exists for the integration of the FX100 into an existing quality control system.

## Individual Test Sequences

Recurrent tasks can be easily translated into automated sequences with the FX-Control software. To this end, there is a structured set of self-explanatory commands available. Processes that include, for example, data input from the operator, calling external procedures, or producing customized reports can be created without the user needing special programming skills.



Example of an automated test sequence including operator input

# Manufacturing System Integration

## Quick Measurements

Our quest for maximum measurement speed makes the FX100 Audio Analyzer the optimal solution for all applications in which accurate results are required in the shortest possible measurement time.

## Favorable Flexibility

The modular design of the FX100 Audio Analyzer provides a decisive advantage in adapting to changing requirements. Thus, the 2-channel base unit may at any time and easily be upgraded to either 4 channels, up to 12 internal switchable inputs or outputs, or up to 80 external switchable input or output channels. Other useful plug-in modules for speaker impedance measurement and digital audio signals are available.

## Effortless Automation

RT-Speaker and RT-MicFX are two other sophisticated software packages that combine with the FX100 Audio Analyzer for the testing of loudspeakers and microphones respectively. Through the interfaces of these software packages, test systems can be progressively and practically fine-tuned. The packages further provide the facility to integrate peripheral devices, manage projects, store data, and customize reports of the measurement results. Also, frequent change-overs in a modern production plant can be accomplished quickly and safely.

The Microsoft .NET or LabVIEW™ driver libraries allow the direct integration of the FX100 into higher-level systems, communicating through the integrated controller module available in the FX100 base unit.

# Analog and Digital Signal Analysis



The 2-channel analog FX100 base unit supports a wide range of test signals and audio measurements in a variety of modes.

## Meter Mode

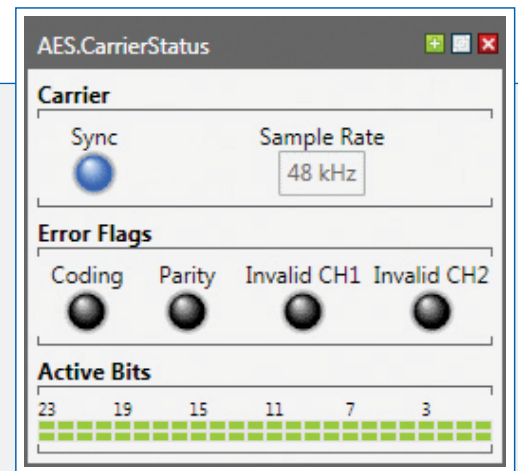
Generate test signals with specific levels and/or frequencies and continuously analyze the response of the device under test. The Meter Mode also includes high-resolution FFT spectral analysis with a block length of up to 2 MSamples.

## StepSweep

The StepSweep is suitable for applications where, for example, the test signal is required to switch amongst specified frequencies and/or amplitudes at pre-determined intervals. The flexibility in defining these frequency and amplitude transitions allows a quick determination of the linearity of a device under test simply by examining the relationship between the input and output signals. By displaying the THD value against the input level, the effects of overload (clipping, distortion) are represented graphically within seconds.



The FX-AES module contains two complete channels of digital audio in standard AES3 format with sample rates up to 192 kHz. This adds digital signal generator and analyzer capabilities to the FX100, allowing for the complete analysis of a device under test in a pure D-D and mixed A-D or D-A mode. The interface includes two XLR and BNC connectors with selectable input impedance as well as optical TosLink connectors. The sync-input allows the generator clock to be synchronized to an external clock reference.



AES Audio Carrier Status

## GlideSweep

Fast and comprehensive audio analysis is a central requirement for laboratory as well as manufacturing applications. Quick GlideSweeps (chirps) allow you to simultaneously measure frequency response, distortion, audible defects, phase, latency and more.

The GlideSweep duration is defined by the user, while the frequency continuously increases. The FX100 Audio Analyzer supports this process with a number of unique, helpful additional functions. For example, GlideSweeps in an Open Loop configuration are ideal for testing intelligent devices, such as mobile phones, tablet computers, intercoms or surveillance cameras.

## PureSound Loudspeaker Testing (optional)

Our unique PureSound technology reliably detects electromechanical defects in loudspeakers. Typically faults are caused by, for example, particles in the magnetic gap, wires touching the cone, or incorrectly-centered coils. This type of defect is known as Rub & Buzz.

PureSound analyzes the transient response of the acoustic signal in six frequency bands. This analysis simulates the response of human hearing and thus correlates to human pass/fail decisions. The PureSound analysis has a distinct advantage; it always produces the same result and is not subject to biases caused by familiarity or fatigue.

# The Leading Loudspeaker Test System

Verifying electro-acoustic transducers in a harsh manufacturing environment requires a sensitive, yet rugged and fast test system. The FX100 Audio Analyzer with the PureSound option for detecting audible defects provides a trusted and proven solution. The system supports all kinds of acoustic measurements such as level, distortion, T/S parameters, etc. as well as statistical analysis such as trend analysis, histograms and Cpk/Ppk process control.

## Overview of the Results



## Simple Operation

A big advantage is the practical and obvious structure of the software. It leads the user intuitively through the parameterization process.

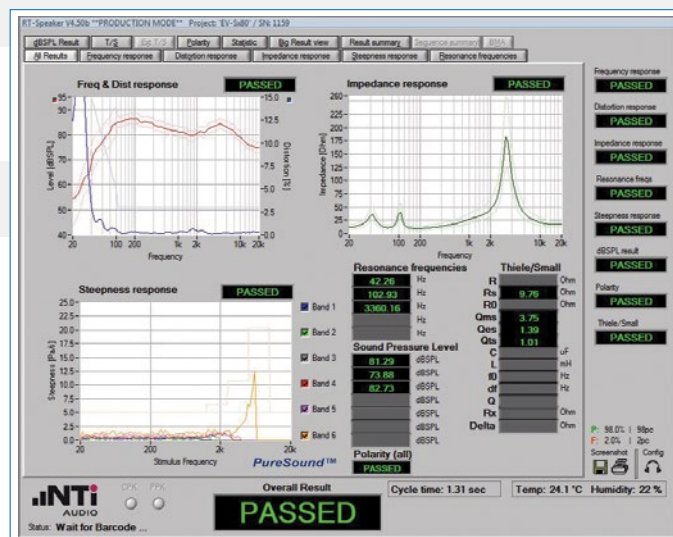
There is also a strict separation of administrator and user modes, allowing the user rights to be adjusted as the process becomes more familiar.

## Easy Integration

A variety of interfaces allow the RT speaker software to be integrated into your specific test environment. These include a digital I/O connection and complete remote control via TCP/IP commands from the PLC.

## Data Management

A convenient data logging process ensures complete traceability of the production data. In addition to the actual measurement data, various metadata such as serial number, date and time, temperature and humidity and much more are also recorded.



RT-Speaker overview of the measurement results



## Smooth Setup of Pass/Fail Criteria

As soon as a new product goes into production, the significance of the Pass/Fail criteria must be considered. This adjustment is critical because both the relevance of measurements as well as the level of the yield depends directly on optimizing these tolerance limits.

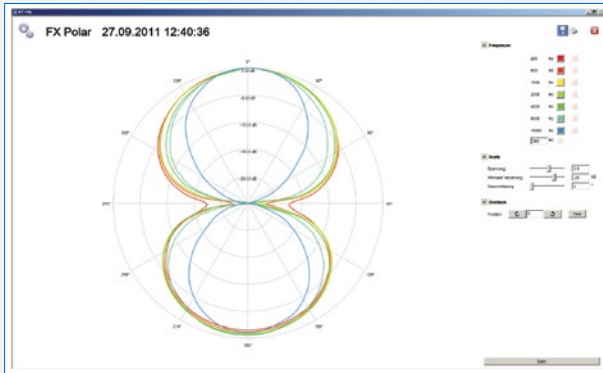
The FX100 + RT-Speaker test system facilitates this process considerably, thanks to its informative user interface and several practical functions. As examples, the concept of nested classes and the reference recording mode simplifies the rapid identification of clearly-intact or defective parts. The desired Pass/Fail criteria can thus be quickly and reliably established.

## The Right Solution for You

The RT-Speaker software is available in various editions, covering all types of loudspeaker testing processes from manual to fully automated.

# Microphone Test System

## Polar plot



Frequency response, sensitivity and distortion

## Wide Range of Applications

The FX100 Analyzer + RT-MicFX software are excellent for comprehensive quality control of microphones, be they capsules (electret, condenser or dynamic), digital MEMS microphones, or contained in complete products such as studio microphones, headsets or mobile phones.

The test system captures frequency response, distortion (THD), sensitivity and signal-to-noise ratio (SNR) in the shortest possible time.

## Reliable Results in all Environments

In a microphone test measurement jig, a loudspeaker serves as the source for the test signal. Since the performance of loudspeakers, compared to microphones, can vary over time and with change of temperature, a reference measurement microphone is integrated into the test setup. This monitors and compensates for any variations in the loudspeaker.

## Polar Diagrams

In combination with the optional turntable, the system can determine the directional characteristic of microphones through the recording of polar plots.

## Other Options

If required the system can be expanded, with an ampere meter or ambient sensors, to capture additional parameters such as the microphone power consumption, ambient temperature, altitude and barometric pressure.

# Modular Extensions

The three empty slots in the FX100 base unit can be used, for example, to expand the FX100 from 2 to 4 analog channels, to add a loudspeaker impedance module, or a digital module.

For multi-channel measurements the FX100 can be expanded by internal and/or external switchers, thus handling up to 80 input or output channels. The FX-Control software also supports the parallel control of multiple FX100 devices.



FX100 with Channel Extension and Input Switcher

## MODULAR EXTENSIONS

<p>Channel Extension 2 CH -&gt; 4 CH # 600 060 010</p>	<p>Output Switcher FX-OS # 600 060 016</p>	<p>Input Switcher FX-IS # 600 060 013</p>	<p>Impedance Module FX-SIH (25mA–10A) # 600 060 021</p>	<p>Impedance Module+ Amplifier FX-SIP # 600 060 022</p>	<p>Filter for Class-D Am- plifier Testing FX-DF # 600 060 026</p>	<p>Digital Audio FX-AES # 600 060 024</p>

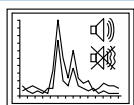
# Modules and Accessories

NTi Audio provides two high-quality measurement microphone models for use in research, development, manufacturing and service. Their compact design provides flexibility, especially in tight spaces. Both models have omni-directional characteristics and require 48V phantom power.

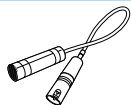
MODEL	DESCRIPTION
M2010	Measurement Microphone with class 1 frequency response and metal diaphragm
M2015	Measurement Microphone for high acoustic levels (155 dB) with class 1 frequency response and metal diaphragm



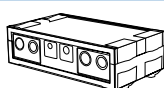
## MODULES AND ACCESSORIES



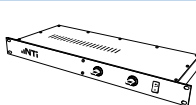
PureSound™  
Rub & Buzz  
# 830 000 200



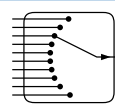
Measurement Mic.  
M2010: # 600 040 010  
M2015: # 600 040 015



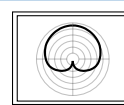
Bluetooth Box  
# 600 061 021



0100V RT-IB  
Impedance Box  
# 600 010 395



IS-1002  
Input Switcher  
# 600 010 425



Turntable TT01  
# 600 061 020



Digital MEMS Mic  
Interface  
# 600 090 000

# Specifications

ANALOG AUDIO GENERATOR	
Test Signals	Sine, StepSweep, GlideSweep, White Noise, Pink Noise, wav files
Level Range	10 $\mu$ V bis 12.45 V (–100 dBV to 21.9 dBV)
Level Accuracy	$\pm 0.04$ dB
Level Flatness	$< \pm 0.01$ dB (10 Hz to 20 kHz)
Frequency Range	5 Hz bis 80 kHz
THD+N, Harmonic Distortion	–104 dB @ 1 kHz, 0 dBV (typical)

ANALOG AUDIO ANALYZER	
Measurement Functions	<ul style="list-style-type: none"> <li>• Level (selective &amp; wideband)</li> <li>• Gain</li> <li>• FFT</li> <li>• Frequency</li> <li>• THD, THD+N, Harmonics k2-k35</li> <li>• Phase</li> <li>• Crosstalk</li> <li>• Polarity</li> <li>• Signal latency</li> <li>• DC-Level, DC-Impedance,</li> <li>• optional: PureSound Rub&amp;Buzz</li> <li>• optional: AC-Impedance</li> </ul>
StepSweep	Frequency Sweep, Time Sweep, Level Sweep, Table Sweep
GlideSweep	100 ms to 40 s for internal/external sweeps
Level Range	<ul style="list-style-type: none"> <li>• <math>&lt; 1.0</math> <math>\mu</math>V to 141 V (max 200 Vp)</li> <li>• Channel-independent auto ranging</li> </ul>
Level Accuracy	$\pm 0.04$ dB @ 1 kHz
Level Flatness	$< \pm 0.015$ dB (20 Hz to 20 kHz)
Frequency Range	DC, 5 Hz to 80 kHz
THD+N	–107 dB @ 1 kHz, 0 dBV (typical)
Crosstalk	$\leq -125$ dB + 1 $\mu$ V (10 Hz to 20 kHz)
Signal Latency	0 to 19 seconds
Input Bias Supply	2 VDC, 48 VDC Phantom Power, ICP®

DIGITAL AUDIO GENERATOR	
Formats	AES3, S/PDIF & TosLink (XLR, BNC, optical)
Test Signals	Sinus, StepSweep, GlideSweep, Noise
Channel Status	Adjustable key parameters
Sampling Rate	22 kHz to 220 kHz

DIGITAL AUDIO ANALYZER	
Formats	AES3, S/PDIF & TosLink (XLR, BNC, optical)
Measurements	<ul style="list-style-type: none"> <li>• Same as analog analyzer (if applicable)</li> <li>• Channel Status, Input Sampling Rate</li> </ul>
Sampling Rate	22 kHz to 220 kHz
External Sync.	Wordclock, Video PAL/NTSC, AES3

GENERAL	
Analog Audio Input / Output	<ul style="list-style-type: none"> <li>• 2 or optional 4</li> <li>• Independent signal / level / frequency selection</li> <li>• XLR and BNC connections</li> </ul>
Extensions	3 empty slots in the base unit for modular extension
Interfaces	<ul style="list-style-type: none"> <li>• USB 2.0 communication with the PC</li> <li>• Headphone audio output, 6.3 mm stereo jack</li> </ul>
Pass / Fail Display	<ul style="list-style-type: none"> <li>• Digital I/O interface</li> <li>• Two-color LED with Green/Red distinction</li> </ul>
FX-Control Software	<ul style="list-style-type: none"> <li>• PC software application with access to all functions of the instrument</li> <li>• Parallel measurement with internal / external triggering</li> <li>• Calculation function for further processing of results</li> <li>• Measurement reports in the following formats: txt, csv or xlsx</li> <li>• Extensive tolerance functions and display of the measurement setup</li> </ul>
Programming	Supports Microsoft.NET Framework 3.5 (e.g. C#.NET, Visual Basic.NET), LabVIEW™, MATLAB®
Design	Desktop or ½*19" rack chassis, 3 units high
Order Information	# 600 060 000 (2-channel base unit)

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**FX100**



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