

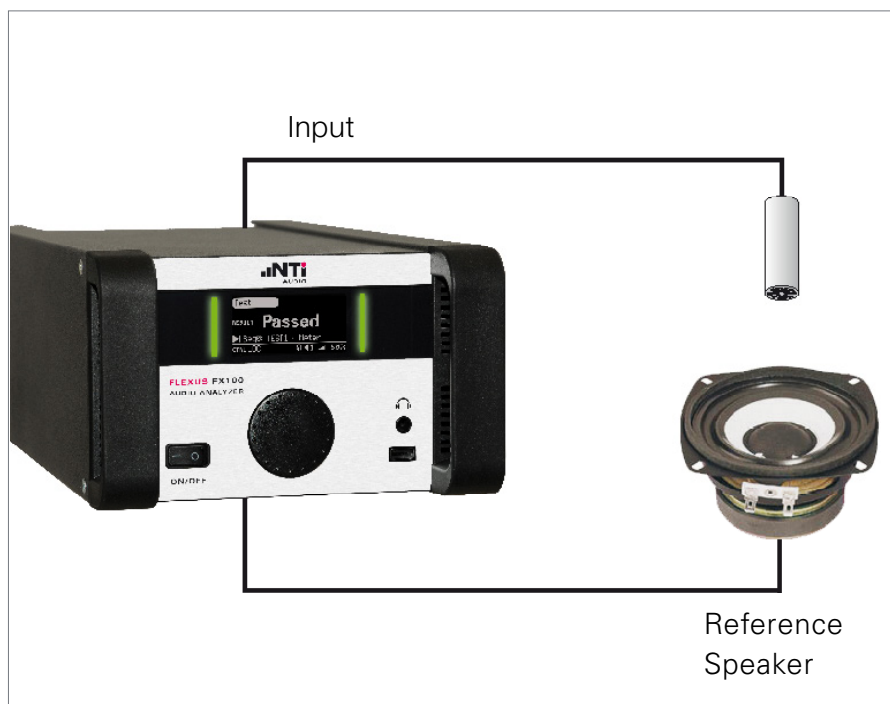
# Microphone Test System



The NTi Audio microphone test system is a powerful solution with short test cycle times. The turnkey system is based on the high-speed FX100 Audio Analyzer and the dedicated production test software “RT-Microphone”. It provides a comprehensive set of measurements for the complete quality control of microphone components or final assembled products, such as mobile phones, vocal microphones or headsets.

## Key Parameters:

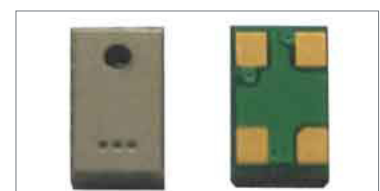
- Accurate and repeatable measurements
- Turnkey solution with flexible user interface
- Short test cycle time, typically < 2 seconds
- Dedicated for R&D and automated production lines
- Scalable test architecture with dual channel measurements and optional switchers for sequential testing of one or more microphones
- Built-in phantom power supply



Microphone Test Configuration



Mobile Phone Microphones



MEMS Microphones



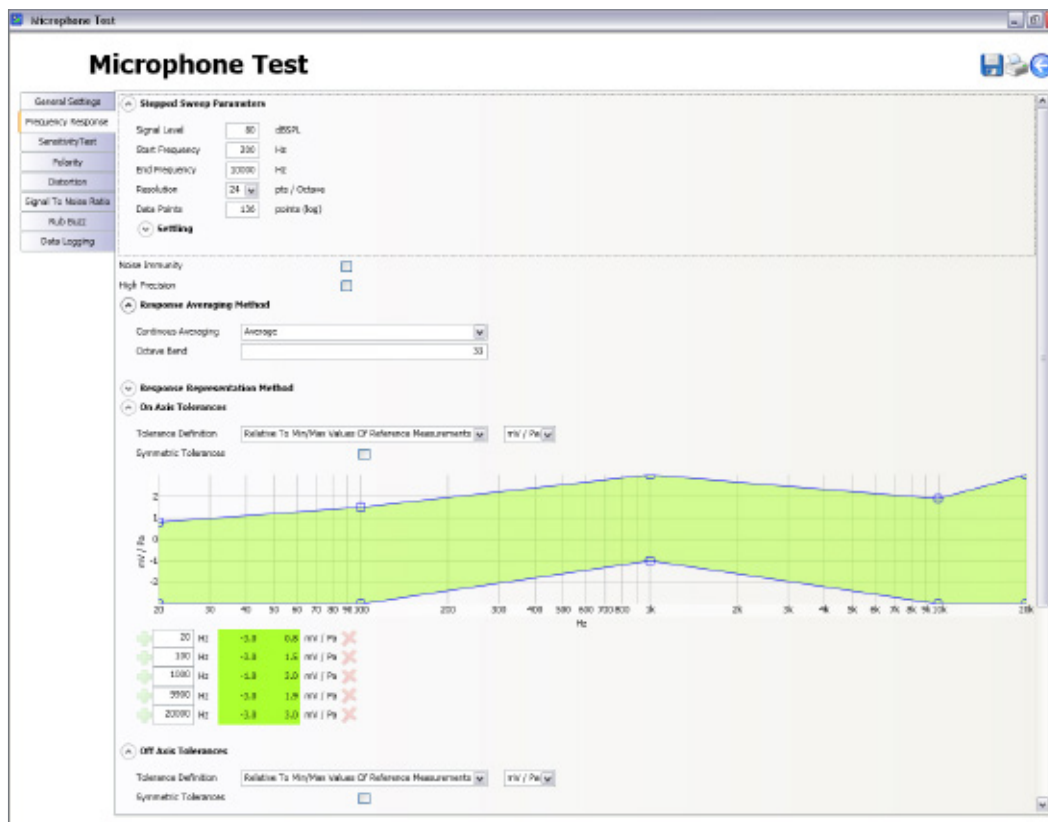
Vocal Microphone

## FLEXIBLE PARAMETER AND TOLERANCE SETTING

Microphone production has a natural error rate. Sorting out faulty devices in an early production stage is important in that it increases the overall yield, reduces waste material and optimizes the quality of the manufactured goods. Important for a state-of-the-art microphone test system are reproducibility, automation, speed and simplicity. The FX100 Audio Analyzer provides such a microphone test system.

### Measurement Functions:

- Frequency response on-axis, off-axis
- Sensitivity
- Distortion
- Polarity
- Signal-to-noise ratio S/N
- Idle Channel Noise
- Detection of audible imperfections
- Linearity
- Directivity, polar plot

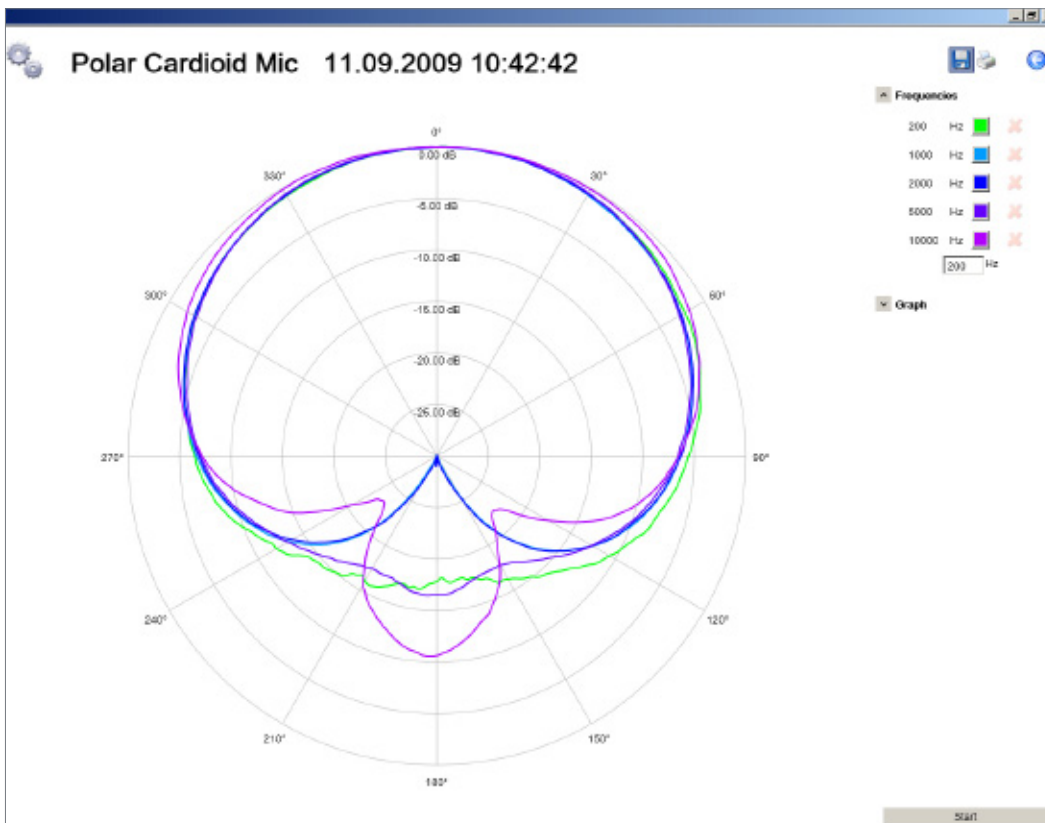


Screenshot: Test parameter and tolerance setting

## HIGH-RESOLUTION POLAR PLOT MEASUREMENT

A polar plot analysis, using the NTi Audio precision turntable, complements the microphone measurement system as an all-in-one solution. The polar diagram displays the directional characteristic related to the measurement frequency of the microphone. For detailed analysis, the measurement angles may be configured in resolutions down to less than 1°.

The high-speed FX100 Audio Analyzer generates a series of fast sweep signals, covering the complete audio band from 20 Hz – 20 kHz, and turns the microphone to the required angles between the sweeps. The measurement time is halved by choosing the 180° mode, which mirrors the polar image. The polar plot graphics can be adjusted after the completed measurement, thus offering full flexibility for post processing.

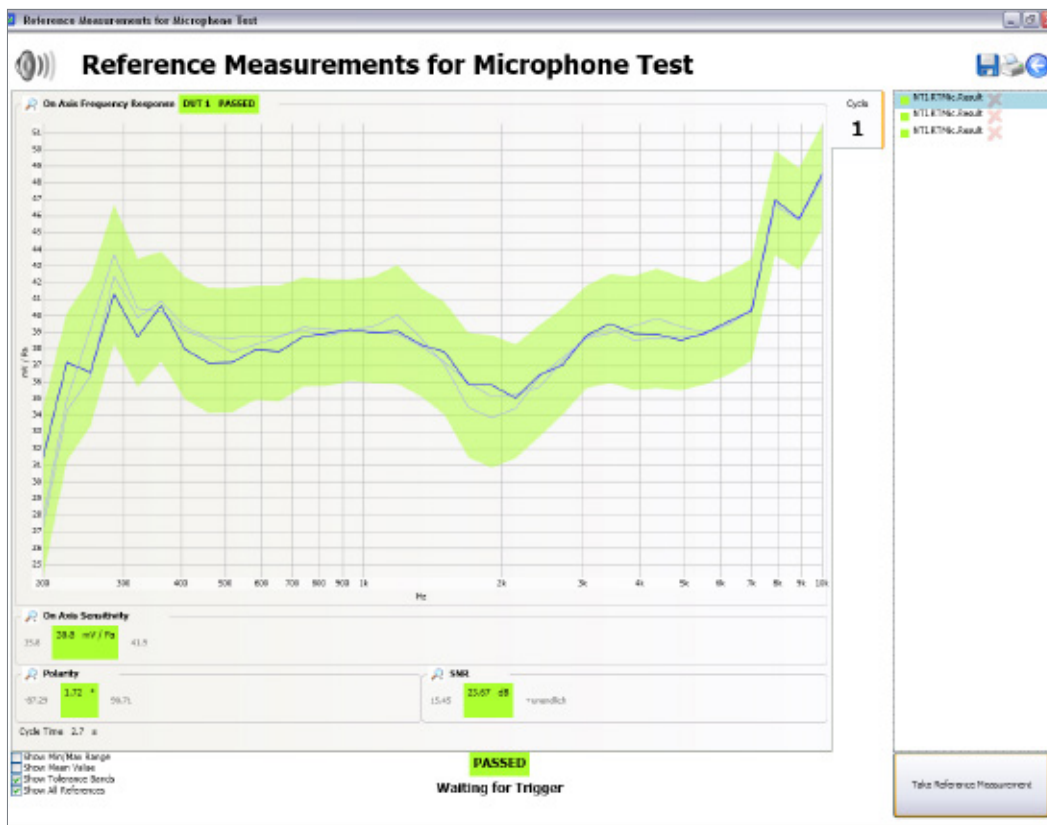


Screenshot: Polar Plot

## CALIBRATION AND RECORDING OF REFERENCE DATA

The automated calibration (i.e. equalization of the reference speaker) is carried out with the M2010 measurement microphone. Thereafter the smart “learn-mode” simplifies tolerance definition by feeding the system with a representative set of one or more “Golden Samples”. The flexible tolerance management automatically derives its tolerance Pass/Fail criteria. The system also supports up to five different quality clusters, which may be user-defined, such as “Excellent”, “OK”, “Acceptable”, “Class 3” and “Reject”. This allows the manufacturer to distinguish between quality classes.

System integration into existing production lines and the connection to host controllers is very simple. The extremely short test cycle time enables the microphone test system to easily cope with high volume production lines.



Screenshot: Recording of reference data

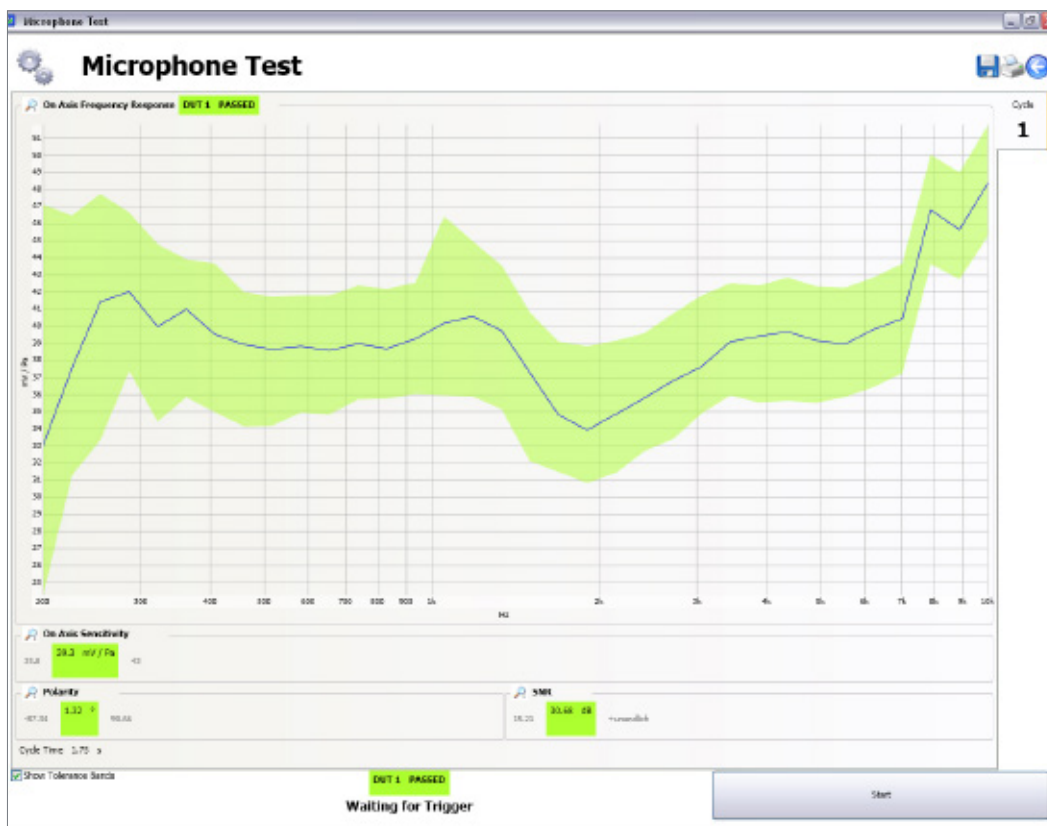
## MICROPHONE TEST PRODUCTION MODE

The patented measurement algorithms have been optimized for factory noise immunity. This maximizes production line yield and allows the same measurements to be conducted in R&D and on the production floor. In the production mode the measurement results are compared with the defined tolerances. The individual results of each measured parameter are summarized into a class result. (e.g. Passed/Failed).

### The measurement may be triggered by

- Operator, using the keyboard
- Serial number barcode reader
- DIO Input (e.g. PLC trigger signal or foot switch)

The measurement results are shown on the PC-screen, indicated at the digital I/O Output (e.g. driving red/green lamps or bin-sorter) and directly logged in Microsoft Excel xlsx-format.



Screenshot: Production testing result overview

## ORDERING INFORMATION

### Basic Configuration:

- FX100 Audio Analyzer
- RT-Microphone measurement software
- Reference Measurement Microphone M2010, class 1 frequency response
- Reference Loudspeaker

### Accessories:

- FX-SIP amplifier module
- Precision Turntable TT01 with microphone holder
- PureSound Rub & Buzz for testing audible manufacturing imperfections
- 1/2 Cycle PDM Interface for Digital MEMS Microphones
- Input Switcher IS-1002
- Output Switcher OS-0210
- Environmental Sensor
- Sound Calibrator 1/2"
- Class 1 Sound Calibrator

### Automation Accessories:

- Digital I/O Adapter for FX100
- Foot Switch for FX100
- Stack Light for FX100
- Barcode Reader

## FX100 AUDIO ANALYZER SPECIFICATION

Analog Generator	
Test signals	Sine, StepSweep, GlideSweep, Pink or White noise
Level range	10 $\mu$ V to 12.45 V (–100 dBV to 21.9 dBV)
Level accuracy	$\pm$ 0.05 dB
Level flatness	< $\pm$ 0.01 dB (10 Hz to 20 kHz)
Frequency range	5 Hz to 80 kHz
THD+N	<ul style="list-style-type: none"> <li>• –104 dB @ 1 kHz, 0 dBV (typical)</li> <li>• <math>\leq</math> –101 dB + 1.3 <math>\mu</math>V (20 Hz to 20 kHz fundamental, low-pass 22 kHz)</li> </ul>

Analog Analyzer	
Measurement functions	<ul style="list-style-type: none"> <li>Level (selective &amp; wideband), frequency, FFT, gain, THD, THD+N, harmonics k2 to k35, phase, crosstalk, polarity, DC-level, DC-impedance</li> <li>Optional: PureSound™ Rub&amp;Buzz</li> </ul>
Sweeps	Frequency sweep, time sweep, level sweep, table sweep
Speed	Frequency response down to 200 ms from 20 Hz to 20 kHz (GlideSweep)
Level range	< 1.0 $\mu$ V to 141 V (max 200 Vp), channel independent auto ranging
Level accuracy	$\pm$ 0.1 dB @ 1 kHz
Level flatness	< $\pm$ 0.02 dB (20 Hz to 20 kHz)
Frequency range	DC, 5 Hz to 80 kHz
THD+N	<ul style="list-style-type: none"> <li>-104 dB @ 1 kHz, 0 dBV (typical)</li> <li><math>\leq</math> -104 dB + 1.5 <math>\mu</math>V (20 Hz to 20 kHz fundamental, low-pass 22 kHz)</li> </ul>
Residual noise	$\leq$ 1.5 $\mu$ V (20 Hz to 20 kHz bandwidth)

General	
Channels	<ul style="list-style-type: none"> <li>2 or 4 parallel independent inputs/outputs analog</li> <li>XLR and BNC connectors</li> </ul>
Extension slots	3 empty slots @ base unit FX100 for modular extensions
Interfaces	<ul style="list-style-type: none"> <li>USB 2.0 Communication to PC</li> <li>Headphone connector for audio out, 1/4" jack stereo</li> <li>LAN (prepared for later firmware extension)</li> </ul>
Pass/Fail result	<ul style="list-style-type: none"> <li>Built-in DIO Interface controls external peripherals</li> <li>Dual color display with green/red indication</li> </ul>
FX-Control suite	<ul style="list-style-type: none"> <li>PC Software with full access to all audio analyzer features</li> <li>Parallel measurements with internal/external triggering</li> <li>Calculation panels for mathematical processing of measurement data</li> <li>Result reporting: txt-files, csv-files or xlsx-files</li> <li>Full tolerance handling and hardware wiring diagram</li> </ul>
Programming	Supports .NET Assembly (e.g. C#.NET, Visual Basic.NET)
Design	Desktop use or 1/2 size 19" rack mount (3 rack units high)