Mecanum
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Impedance & Transmission Tube

ISO 10534-2, ASTM E1050 and ASTM E2611

(2, 3 or 4 microphone method)

Mecanum's impedance and transmission tubes are designed to measure key acoustic indicators of a wide range of materials from simple foams to complex multilayers including resistive screens and fabrics.

They can be used for acoustic material characterization and quality control.

*** Please note that the technical aspects of our equipment may be subject to change without notice.**

Mecanum Inc.
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Measuring System

Test Bench

- Impedance tube for 2, 3 or 4 microphones methods
- IEPE Microphones (up to 4)
- 24-bits acquisition system (DAQ) with embedded Low distortion audio amplifier
- Verification sample
- Mounting rings and grids
- 'End' anechoic Termination
- Piston with integrated numeric thickness gage

All Mecanum Impedance Tubes come with their ruggedized transportation case

Property	2 mics	3 & 4 mics
Sound absorption coefficient	X	X
Complex reflection coefficient	X	X
Surface acoustic impedance	X	X
Sound transmission loss		X
Transfer matrix coefficients		X
Characteristics impedance		X
Unwrapped complex wave number		X
Eq. fluid dynamic density		X
Eq. fluid dynamic bulk modulus		X

Software TUBE-X

- Fully controls the procedure (from calibration to measurement).
- Corrects errors due to weather conditions, internal tube dissipation, mounting rings, mounting grids and automatically controls the sound level pressure inside the tube.
- Additional features: microphone acoustic center measurement, compare project and merging tool, averaging module, air cavity simulation, acoustic penetration depth tool & report generation.

Optional Complements

- Porous material slicers & circular cutter
- Resistive screen and fabrics sample holder
- ENVIRO weather station
- Custom diameter tubes
- Square section for transmission measurement

Technical Data

Tubes

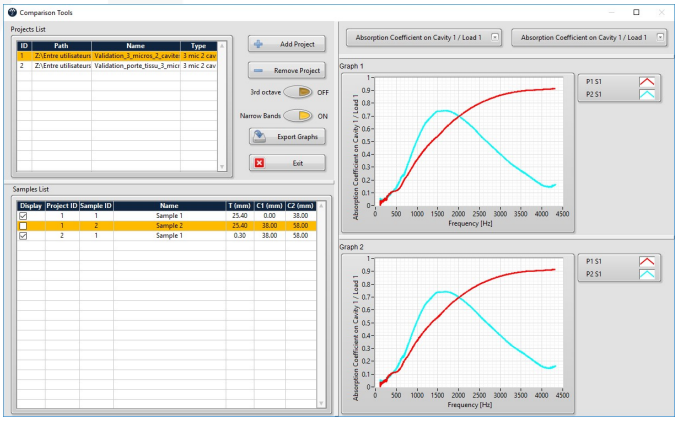
- Nominal dimensions:
  - 29 mm Ø tube: 80 (L) x 20 (W) x 20 (H) cm
  - 44.44 mm Ø tube: 80 (L) x 20 (W) x 20 (H) cm
  - 100 mm Ø tube: 120 (L) x 20 (W) x 20 (H) cm
- Max Sample Thickness:
  - 2 microphones absorption: 250 mm
  - 3 microphones transmission : 220 mm
  - 4 microphones transmission: 125 mm
- Neodymium speaker with RCA connector

Instrumentation

- Power supply: 100-240 VAC 50/60 Hz 60 W
- Communication: USB 2.0 Type A
- Dimensions: 234 (W) x 223 (D) x 141 (H) mm
- Input: 4 channels 102.4 kHz / 24-bits channel
- Output: 1 channel 96 kHz / channel 24-bits
- 15 W low distortion audio amplifier
- IEPE ¼ " TEDs microphones

Measurement Range

- 29 mm : 50 Hz to 6600 Hz
- 44.44 mm : 45 Hz to 4300 Hz
- 100 mm tube : 35 Hz to 1800 Hz
- Hard wall Measurement (zero Absorption)
  - All 1/3 Octave until 4 kHz. < 4 %
  - Third Octave 5 kHz and Above < 10 %



Warranty and Support

All Mecanum characterization systems are covered by a one-year limited warranty and technical support.

The Mecanum warranty is valid only on manufacturing defects and does not cover damage due to abuse or improper use of the equipment.

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Square
Impedance & Transmission Tube

ISO 10534-2, ASTM E1050 and ASTM E2611 2 & 4 microphones method

Mecanum's square Impedance tube is the perfect tool for measuring the acoustic properties of square samples. Ideal for acoustics meta-material development and verification

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Measuring System

Test Bench

- Impedance tube for 2 or 4 microphones methods
- IEPE Microphones (up to 4)
- 24-bits acquisition system (DAQ) with embedded Low distortion audio amplifier
- Verification sample
- Mounting rings and grids
- 'End' anechoic Termination
- Piston with integrated numeric thickness gage

All Mecanum Impedance Tubes come with their ruggedized transportation case

Property	2 mics	3 & 4 mics
Sound absorption coefficient	X	X
Complex reflection coefficient	X	X
Surface acoustic impedance	X	X
Sound transmission loss		X
Transfer matrix coefficients		X
Characteristics impedance		X
Unwrapped complex wave number		X
Eq. fluid dynamic density		X
Eq. fluid dynamic bulk modulus		X

Software Tube-X

- Fully controls the procedure (from calibration to measurement).
- Corrects errors due to weather conditions, internal tube dissipation, mounting rings, mounting grids and automatically controls the sound level inside the tube.
- Additional features: microphone acoustic center measurement, compare project and merging tool, averaging module, air cavity simulation, acoustic penetration depth tool & report generation.

Optional Complements

- Porous material slicers
- Circular cutter
- ENVIRO weather station
- Custom side section tubes

Technical Data

Tube

- Nominal dimensions:
  - 1373 (L) x 110 (W) x 234 (H) mm (4 mics)
  - Mass: 9 kg (4 mics)
  - **XXX** (L) x 110 (W) x 234 (H) mm (2 mics)
  - Mass: 6 kg (2 mics)
- Interior square section width: 38.1 mm
- Neodymium speaker with RCA connector
- Sample thickness: up to 200 mm (both 2 & 4 mics)

Instrumentation

- Power supply: 100-240 VAC 50/60 Hz 60 W
- Communication: USB 2.0 Type A
- Dimensions: 234 (W) x 223 (D) x 141 (H) mm
- Input: 4 channels 102.4 kHz / 24-bits channel
- Output: 1 channel 96 kHz / channel 24-bits
- 15 W low distortion audio amplifier
- IEPE ¼ " TEDs microphones

Measurement Range

- Frequency range: 45 to 4300 Hz
- Hard wall Measurement (zero Absorption)
  - All 1/3 Octave until 4 kHz. < 4 %
  - Third Octave 5 kHz and Above < 10 %

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Road Sound Absorption Tube

Impedance tube for Road Sound Absorption (RSA) Measurements

ISO 13492-2

Mecanum RSA Impedance Tube is specially designed for measuring the sound absorption coefficient of pavements in third octave bands from 250 to 1600 Hz.

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Measuring System

Test Bench

- 100-mm tube complying with ISO 13492-2
- 2 IEPE Microphones
- 24-bits acquisition system (DAQ) with embedded Low distortion audio amplifier
- Calibration plate
- Special adapter for sealing impedance tube base

All Mecanum Impedance Tubes come with their ruggedized transportation case

Normal Incidence Properties	2 mics
Absorption coefficient	X
Complex reflection coefficient	X
Normalized surface impedance	X

Software TUBE-X

- Fully controls the procedure from calibration to measurement.
- Special ISO 13492-2 Module:
  - Third Octave Band Computation in 250-1600 Hz frequency range
  - Zero Absorption Correction calculation from measurement with the calibration plate
- Corrects errors due to weather conditions, internal tube dissipation, mounting rings, mounting grids and automatically controls the sound level inside the tube.
- Additional features: microphone acoustic center measurement, compare project and merging tool, averaging module, air cavity simulation, acoustic penetration depth tool & report generation.

Optional Complements

- Verification and calibration sample
- ENVIRO weather station
- Special wax for sealing the adapter to the soil

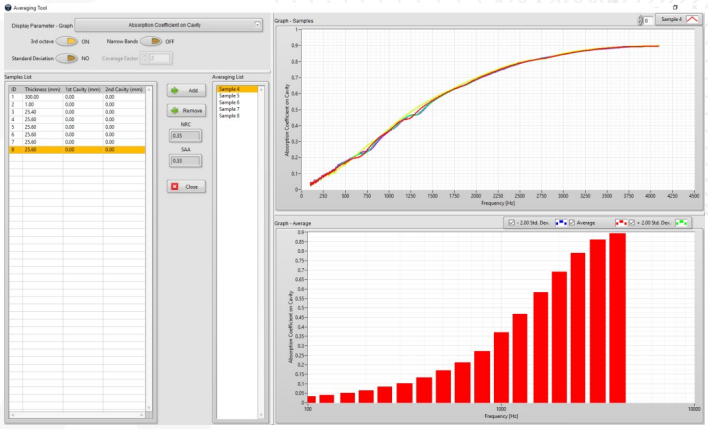
Technical Data

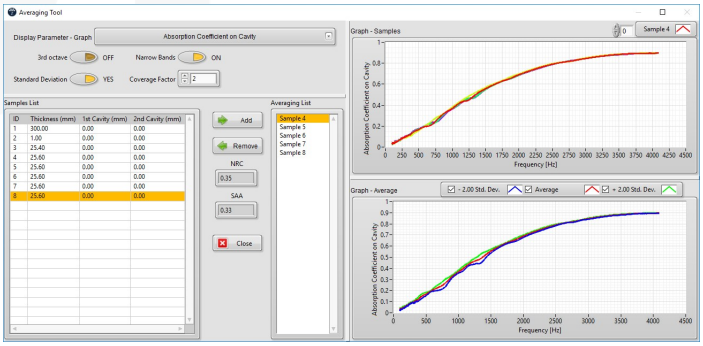
Tube

- Dimension: 750 (L) x 280 (W) x 294 (H)
- Mass: 10 kg
- Material: CNC machined aluminum, clear anodized

Instrumentation

- Power supply: 100-240 VAC 50/60 Hz 60 W
- Communication: USB 2.0 Type A
- Dimensions: 234 (W) x 223 (D) x 141 (H) mm
- Input: 4 channels 102.4 kHz / 24-bits channel
- Output: 1 channel 96 kHz / channel 24-bits
- 15 W low distortion audio amplifier
- IEPE ¼ " TEDs microphones





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High Level Impedance Tube

Impedance tube operating up to 155 dB

The high sound level impedance tube is specially designed to measure the acoustic properties in transmission or absorption of materials or devices under high level excitation.

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Measuring System

Bench Test

- 29-mm impedance tube
- High performance compression driver
- High sound pressure level microphones
- Flat square flange for in-situ measurements
- Large ergonomics handles for in-situ measurements
- Available for 2 microphone absorption method or 3 and 4 microphones transmission loss method.

All Mecanum Impedance Tubes come with their ruggedized transportation case

Property	2 mics	3 & 4 mics
Sound absorption coefficient	X	X
Complex reflection coefficient	X	X
Surface acoustic impedance	X	X
Sound transmission loss		X
Transfer matrix coefficients		X
Characteristics impedance		X
Unwrapped complex wave number		X
Eq. fluid dynamic density		X
Eq. fluid dynamic bulk modulus		X

Tube-X Software

- Fully controls the procedure (from calibration to measurement).
- Corrects errors due to weather conditions, internal tube dissipation, mounting rings, mounting grids and automatically controls the sound level pressure inside the tube.
- Additional features: microphone acoustic center measurement, compare project and merging tool, averaging module, air cavity simulation, acoustic penetration depth tool & report generation.

Optional Complements

- Customized curved flange for aircraft engine liners
- Customized IC engine silencers adapters
- Porous material slicer
- Circular cutter
- ENVIRO weather station

Technical Data

Tube

- 29 mm tube in-situ 2 mics: 345 (L) x 165 (W) x 186 (H) mm
- 29 mm tube 3 mics: 887 (L) x 165 (W) x 186 (H) mm
- 29 mm tube 4 mics: 1137 (L) x 165 (W) x 186 (H) mm
- Maximum length of samples:
  - Absorption with 2 microphones: 250 mm
  - Transmission with 3 microphones: 250 mm
  - Transmission with 4 microphones: 125 mm
- Material: CNC machined aluminum, black anodized
- High performance 150W compression driver

Instrumentation

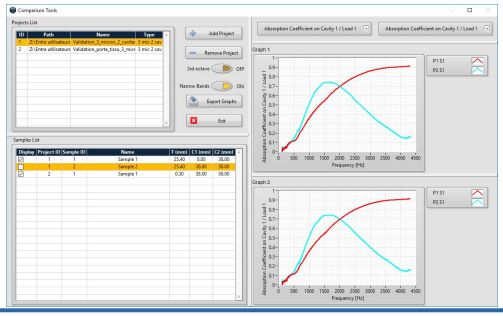
- Power supply: 100-240 VAC 50/60 Hz
- Communication: USB 2.0 Type A
- Dimensions: 234 (L) x 223 (W) x 141 (H) mm
- Input: 4 channels 102.4 kHz / channel 24 bit
- Output: 1 channel 96 kHz / channel 24 bit
- Integrated 100 W Class D Audio Amplifier
- ¼ "IEPE high Sound Pressure Level microphones

Measurement Range

- Frequency Range: 300 Hz to 6.3 kHz
- Excitation Level up to 155 dB
- Hard wall Measurement (zero Absorption)
  - All 1/3 Octave until 4 kHz. < 4%
  - Third Octave 5 kHz and Above < 10%

Typical Application

- Aircraft Engine Liners
- Non Linear meta materials
- IC Engine Silencers & air intake
- Non linear resistive screens and perforated plates



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