

autoneum

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Autoneum Measurement Systems Alpha Cabin

Autoneum. Mastering sound and heat.

Automotive Acoustics Absorption Measurements

Absorption is an important function in automotive acoustics. It is thus very important to be able to measure the sound absorption characteristics of the materials and parts used in vehicle noise control.

- For the vehicle manufacturer to:
 - develop optimised sound packages,
 - specify the absorption properties of absorbing trim parts, linings, treatments and of acoustic materials
 - control the quality of the parts supplied.

- For the supplier of noise control parts and materials to:
 - develop optimised sound packages,
 - develop new materials and parts,
 - control the quality of the parts produced,

Such measurements should be performed under realistic conditions and must be reliable, consistent and reproducible.

Two standardised methods exist for the measurement of absorption of acoustic materials, the impedance tube and the reverberation chamber. The impedance tube has the disadvantages that it requires a disc to be cut from the sample and that it measures under normal incidence. The ISO standard reverberation chamber is impractical because it requires a sample size of 10 to 12 m² surface area.

The Autoneum solution:

- **A small-size reverberation room, where frequency range and sample size is adapted to the requirements of the automotive acoustics.**
- **The Autoneum Alpha Cabin is used by most OEMs and suppliers, in the automotive industry, as the standard for absorption measurements.**
- **Standardised chamber. All Autoneum Alpha Cabins worldwide are produced in the same way and gives comparable results.**
- **Thanks to the reduced size the Alpha Cabin can, easily be moved to another room or building.**

The Alpha Cabin

New version with reduced measurement duration by 50%

The Alpha Cabin is a reverberation chamber having linear dimensions one-third of those of an international standard reverberation room. Its volume is 6.44 m³ and no two walls are parallel. As a result of the size reduction of the room, the sample surface area is reduced to 1.2 m², an area that corresponds to that of typical hood- and roof-liners. The measurement frequencies are also increased proportionally, so that the useful range lies between 400 and 10'000 Hz, which corresponds particularly well to the needs of the automotive industry.

The acoustic absorption of the Alpha Cabin itself is very low and the design ensures a high level of sound insulation to keep the background noise level very low in the frequency range of interest. The enclosure consists of a separate floor mounted on casters on which the upper part rests. Normal access to the cabin is through a door in one of the sides. Wall-mounted reflectors assure the sound field diffusivity necessary for the measurements.

The excitation is provided by three loudspeakers located in the corners. The excitation is done by one loudspeaker at the time. 5 microphones measure the sound pressure decay simultaneously. The microphones are folded like an umbrella when the measurement is finalized, so it becomes easy to work in the cabin.



Main advantages with the new Autoneum Alpha Cabin:

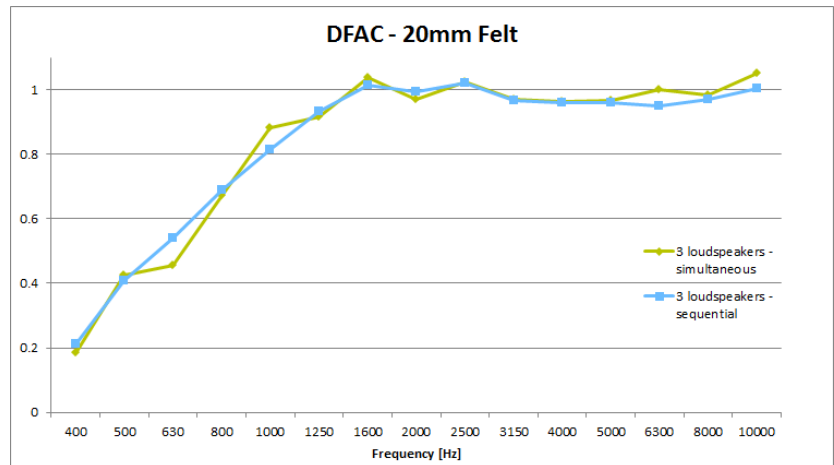
- Effective measurement duration **reduced by about 50%**
- Improved data Quality** – mainly due to increased number of measurements
- Increased efficiency** - 5 microphones
- Easier to work** inside the cabin thanks to a new microphone folding system
- New user friendly **software with several improvements**.
- Latest** data acquisition and control **technology** and electronics
- Improved light inside the cabin thanks to **environmentally friendly LED** lights
- Well documented measurements - **Integrated camera – saves time!** [Option]

Alpha Cabin

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Comparison example between the new Alpha Cabin with 3 loudspeakers sequential and the previous version (3 loudspeakers simultaneous).

Improved data quality mainly due to increased number of measurements.



All the Alpha Cabin systems are constructed to the same high standards, are subjected to careful acoustic checks both before leaving our plant and after installation and are matched to one another. This means that you can rely on the consistency of the results obtained, independently of where in the world they are measured.



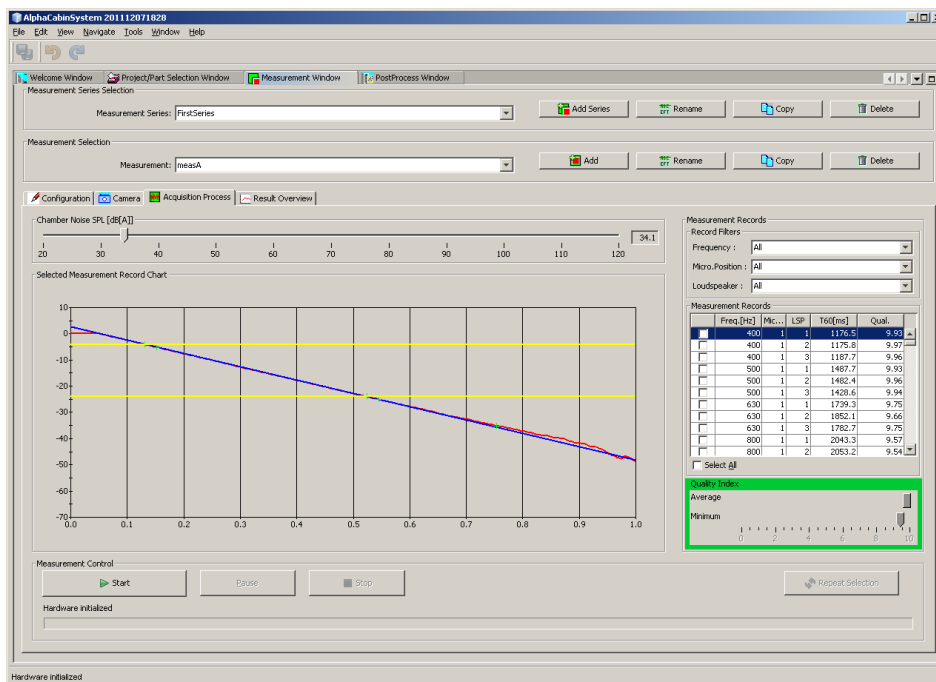
To summarise: The Alpha Cabin is a standardised reverberation chamber adapted to the requirements of automotive acoustics and is

- **practical in use**
- **consistent**
- **reliable**

The equipment required for the measurement of the reverberation times in the Alpha Cabin comprises electronics and software. The complete reverberation time measurement system is controlled by a PC running under "Windows". The reverberation times are determined by the integrated impulse response method. The control electronics are integrated into a 19" rack.

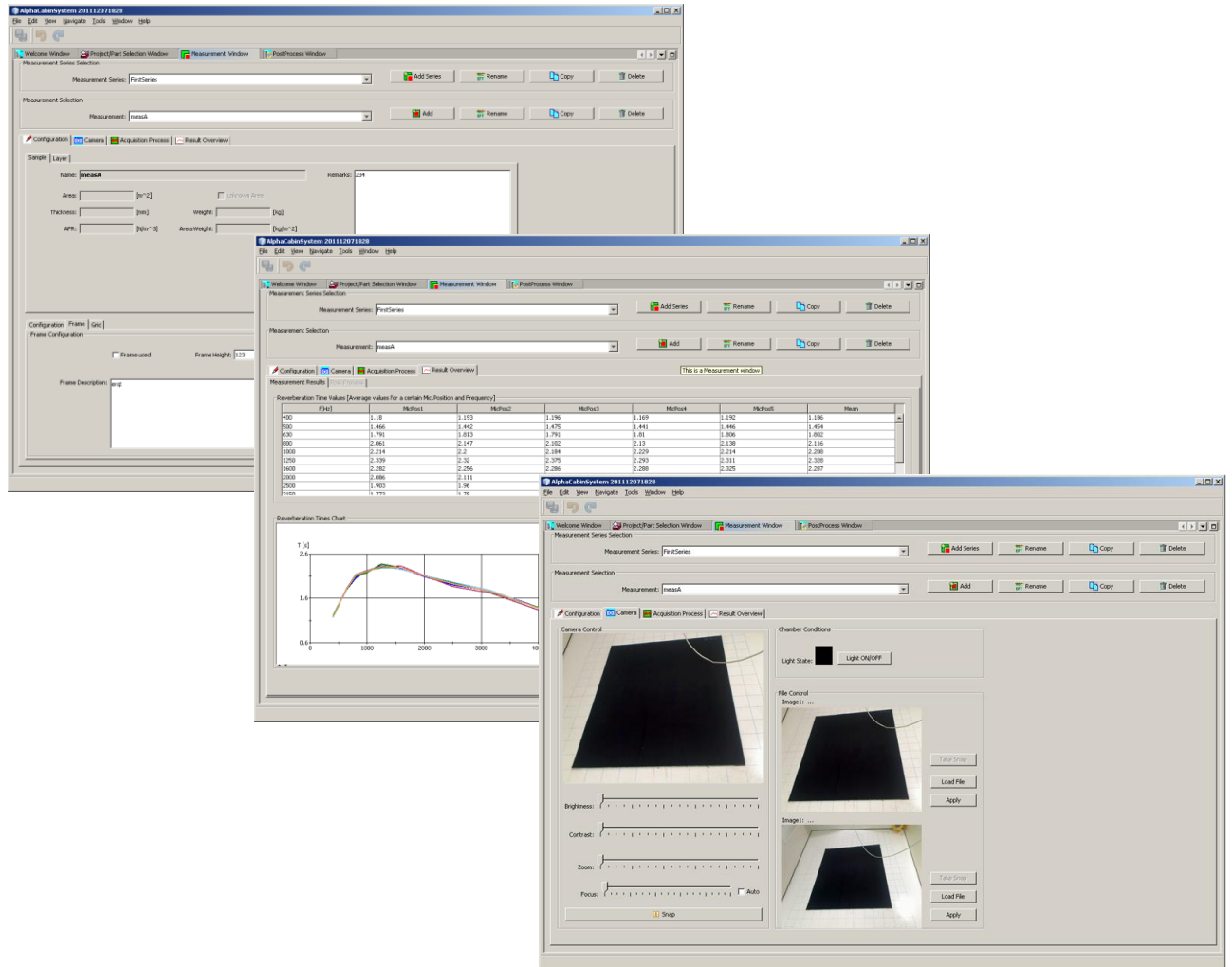


The bandwidth of the excitation pulses (and thus of the measurement) is freely selectable between 1/1 and 1/3 octave bandwidth.



The software package that controls the sound absorption measurement and data evaluation is a user-friendly program using a modern Windows-based graphical user interface. The operator is guided in his own language* through the measurement and data evaluation processes. The fully documented results may be viewed on the screen within the software or exported to Excel.

*At the moment English and German is available



The procedure chosen and the digital measurement methods used guarantee that the system is:

- accurate
- stable
- widely applicable
- flexible
- easy to use

The samples which may be measured in the Alpha Cabin

The Alpha Cabin can be used for measuring the acoustic absorption of a large range of materials and objects including flat samples of standard dimensions, moulded parts and absorbing objects such as seats or baffles without a need for cutting, i.e. non-destructively.



Installing a Sample in the Cabin

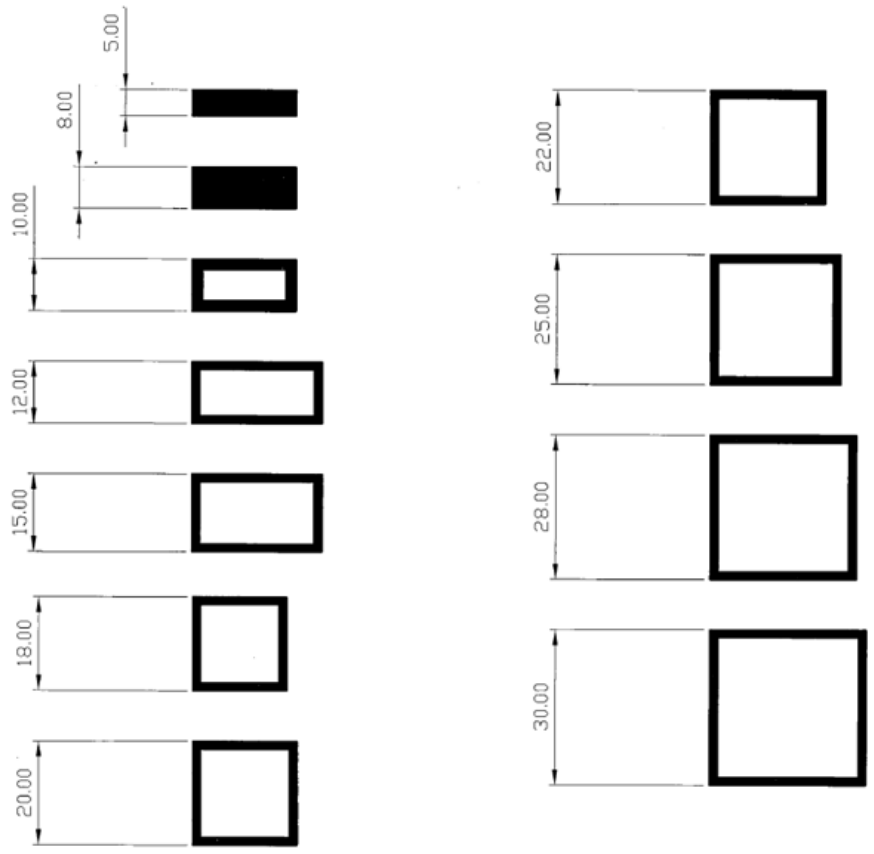
Integrated Webcam (OPTION)

This option includes:

- Webcam
- Cables
- Software integrated into the standard Alpha Cabin software.

Additional steel frames (OPTION)

The Alpha Cabin is delivered with a 20 mm high steel frame. Following optional steel frames are available. Height in mm:



Temperature and humidity

Temperature and humidity have an influence on the measurement results at high frequency and possibly also on the sample characteristics, depending on its material. The latest Alpha Cabin software (v 2.01 or newer) has a correction for temperature and humidity. Note that this correction is only correcting the difference in temperature and humidity between the reference measurement and the sample measurement.

It is recommended to have a temperature between 20 and 28 degrees and a relative humidity between 50 and 65%.

System Specifications

a) Alpha Cabin

Acoustical Parameters

Dimensions of standard sample:	1.0 x 1.2 m
Surface area of absorbent part to be measured:	0.6 to 2.4 m ²
Measurement frequency range:	0.4 to 10 kHz
Acoustic excitation:	3 Loudspeakers, 8 ω , 50 W
Number of microphone positions:	5

Microphone

Microphone type:	ICP with BNC connector, e.g. PCB 130E20
A-filter:	e.g. PCB 426B02

Physical dimensions

Volume of cabin:	6.44 m ³
Interior surface area:	22.6 m ²
Overall dimensions of cabin (L x W x H):	3.22 x 2.37 x 2.03 m
Weight of complete Alpha Cabin:	1680 kg
Weight of the cabin without floor:	1070 kg

Power Requirements

230V, 50Hz, 110V, 60Hz, (Other mains voltages and frequencies are available on request)
400 W Power consumption (complete system including PC and screen)

b) Reverberation time measurement system Type 1950

Mounted in a 19" rack.

- Data acquisition and control electronics.
- 4-channels Power amplifier
- Signal Cable Junction Box
- Measurement system control software
- PC with Windows 7

Standard Measurement frequency range:

1/1 octave bands:	0.5 to 8 kHz
1/3 octave bands:	0.4 to 10 kHz