

Acoustic characteristics of Porous Materials

The SCS-902A suite general overview

Foreword

The knowledge of material poro-elastic properties for Noise and Vibration applications is a common request of N&V Materials Manufacturers and Users in the domain of automotive and building acoustic, and SCS-902A represent an ideal solution to perform such testing rapidly and in a reliable and scientific way.

One of the main reasons for developing SCS-902A materials suite was to satisfy the demand of users of simulation softwares packages for « inputs » of materials characteristics, in order to properly run applications like FEM-BEM-SEA, typical companions tools for fast development of new products and to predict potential noise and vibration problems.

Despite the fact that it is possible to measure just one or two parameters by means of a single device, for instance sound absorption coefficient and Impedance (typical Kundt tube device), and then derive the other parameters by inverse matrix method on theoretical models from Allard, Johnson, Bolton, Biot, etc. the independent measure of each single parameter it is a much better approach.

SCS902A can actually offer both possibilities: few parameters from a single device (Kundt tube) with derivation of the others, or a set of independent devices (suite).

Poro-acoustic properties

Standing wave tube ISO 1053-ASTM E-1050 standards

- ▶ Tubes sizes: $\varnothing 28\text{mm}$, $\varnothing 100\text{mm}$ and $\varnothing 45\text{mm}$
- ▶ Samples length up to more than 40 cm
- ▶ Kundt tubes pair upgradeable for TL measurement
- ▶ Optional measurement of: Transmission Loss, Surface Impedance, Transfer Complex Impedance, Propagation constant



SCS9020B: Kundt tube

Flow Resistance ISO 9053

- ▶ Diam.100mm chamber with piston and geared motor
- ▶ Electronic Speed Controller
- ▶ Calibration Cup
- ▶ Adjustable Sample Holder
- ▶ Four Interchangeable Cams



SCS9023: Flow Resistance

Tortuosity

- ▶ Method using electrical impedance in water
- ▶ Includes n.2 cylindrical tanks for measurement
- ▶ Electronic Speed Controller
- ▶ Holding elements, electrodes, pipes and connectors.



SCS9025: Tortuosity

Reverberant room for α_{ST} coefficient

- ▶ Transportable mini reverberant room with NOT/parallel walls
- ▶ Includes internal Diffusers and reference material samples, rotating microphone holder (manual)
- ▶ Steel cage around the ABS-CAB for transportation purposes



SCS9031: ABS-CAB

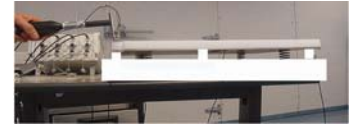
Determination of acoustic parameters for Porous Materials, Multi-layers, etc. in the fields of:

- ▶ Automotive
- ▶ Aeronautics
- ▶ Railway
- ▶ Ships
- ▶ Construction Machines
- ▶ Building construction

Poro-elastic properties

Damping Loss Factor SAE method

- Method is based on a reference stainless steel plate suspended on a bearing slab by means of four elastic suspensions
- Method suitable for ASTM and BS requirements
- Plate excitation using instrumented impact hammer
- Response measured with a light accelerometer
- The damping material sample is adhered to the plate surface



SCS9022: SAE Plate

Damping Loss Factor and Elastic Modulus

- Oberst Device Frame including:
 - High temperature, non contact inductive displacement transducer (
 - S-5026 Displacement transducer conditioner
 - M-PS124 Power Supply / Mains Adapter
 - Two Adjustable Arms
 - Electromagnetic Exciter



SCS9021: Oberst method

Bulk Modulus

- Measurement device for dynamic elastic modulus on porous materials
- Steel & Aluminum structure with mechanical parts and 200N shaker
- Sinusoidal generator (stepped sine) and close-loop controller
- Option: static measurement of E (young modulus) and Poisson ratio
- Material compression is measured using a load cell, lateral deformation is measured using double laser multi-beams, resolution down to 10 micron.
- Option: Vacuum chamber and vacuum pump (100 mBA)
- Option: seismic table in painted steel



SCS9026: Bulk Modulus

DAQ Systems and Software

Together with a Windows-based dedicated software, PRO-series of SCS-902A allows easy and reliable measurement of all poro-acoustic and elastic properties

Easy to operate and flexible

- User friendly software interface leading up to completion of the measurement
- Typical application for Laboratory use; also portable and battery operable

Modelling software

- Software package applying theoretical models from Allard, Delany-Bazley, Johnson, Bolton, Biot, etc. to derive parameters using inverse matrix method

Ex-2 Prediction software

- Prediction software for Absorption, Impedance and Transmission loss of Acoustic Trims package using materials data-base



Pro-515



Pro-517



Pro-518

Supported Hardware Platforms



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