

LABORATORY OF AIR HANDLING TECHNOLOGY AND ACOUSTICS

PERFORMANCE AND ACOUSTICS OF AIR HANDLING EQUIPMENT ACOUSTIC AND VIBRATION CHARACTERISTICS OF BUILDING ELEMENTS

Large spaces and generic research facilities make it possible to carry out measurements according to various standards. The know how of the experienced staff ensures versatile, quick and advantageous service for the customers.

The Acoustics laboratory of research hall 1 at Eurofins Expert Services Oy (formerly part of VTT Technical Research Centre of Finland) comprises the acoustics research hall (800 m²) with six reverberation rooms, silencer space (150 m²) and a machine room (350 m²).

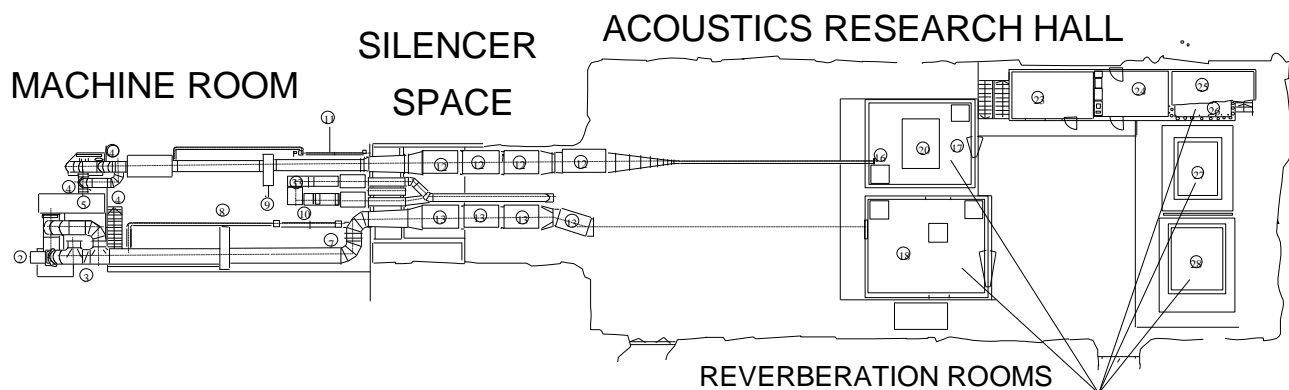
The efficient silencers in the silencer space separate the acoustics research hall from the machine room. Fans, air volume flow measurement equipment and air flow control devices as well as heating and cooling equipment are installed in the machine room due to their noise.

Noise from air handling equipment to be tested can be measured in the reverberation rooms or in ducts. The measured characteristics are flow noise, sound attenuation and sound insulation. In conjunction with the acoustical measurements, other performance characteristics (aerodynamic and thermal) of the equipment to be studied can also be measured.

Acoustic and vibration characteristics of building elements and equipment can be measured in the reverberation rooms. Measurable characteristics are airborne sound insulation of building elements, impact sound insulation of floors, sound absorption, sound power, dynamic stiffness and noise classification of sanitary equipment. Vibration of building elements can be measured parallel to noise measurements.

Typical air handling equipment and building elements to be studied

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| <ul style="list-style-type: none"> - fans - silencers - dampers and valves - ducts - air terminal devices - outdoor air intakes | <ul style="list-style-type: none"> - heat exchangers - air handling units - residential ventilation equipment - industrial process equipment - special equipment | <ul style="list-style-type: none"> - floors - walls - windows - doors - floor coverings - absorption materials | <ul style="list-style-type: none"> - floating elements - sanitary equipment - noise barriers - noise producing equipment |
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Lay-out of the laboratory

QUANTITIES TO BE MEASURED

ACOUSTICS	AERODYNAMICS	THERMODYNAMICS	OTHERS
- sound pressure level	- volume flow	- temperature	- rotational speed
- sound power level	- mass flow	- humidity	- electric power
- insertion loss	- pressure	- heat effect	- shaft power
- sound insulation	- velocity		- efficiencies
- vibration			
- sound absorption			
- dynamic stiffness			

PERFORMANCE OF THE TEST FACILITIES

ACOUSTICS		OTHER TECHNIQUES	
- reverberation rooms	51,6 m ³ , 55,9 m ³ , 102 m ³ , 131 m ³ , 201 m ³ , 298 m ³ ,	- rotational speed	<30 000 rpm
- background noise level	<3dB(A)	- electric power	0 - 315 kW, 380 V
- one-third octave bands	25 Hz - 20 kHz	- frequency controller	0 - 280 kW
- octave bands	31,5 Hz - 8 kHz		380 V, 0.5 - 100 Hz
- vibration	1 Hz-		
		MAXIMUM DIMENSIONS	
		- doors of the hall (height • width)	5,0 m • 3,3 m
		- crane	150 kN
		- openings of the reverb. rooms	3 m • 4 m
		- connection duct to the reverb.room	1,5 m • 2 m
		- length of the studied device	12 m
		- size of the building element studied	
		wall	3 m • 4 m
		floor	3,05 m • 3,90 m
AERODYNAMICS			
- attenuated air flow	0 - 20 m ³ /s		
- pressures	20 m ³ /s, 1 kPa 1 m ³ /s, 8 kPa		
- compressed air	0,1 m ³ /s, 600 kPa		
THERMODYNAMICS			
- heating water flow	5 dm ³ /s, 225 kW, 90 °C		
- cooling water flow	5 dm ³ /s, 100 kW, +7 °C		
- steam flow (air humidifier)	170 kg/h		

ACCREDITATIONS FINAS T001, (www.finas.fi)

ISO 7235:2003. Acoustics - Measurement procedures for ducted silencers and air terminal units - Insertion loss, flow noise and total pressure loss.

ISO 11691:1995. Acoustics - Measurement of insertion loss of ducted silencers without flow

ISO 3741:2010. Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms.

ISO 5135:1997 Acoustics - Determination of sound power levels of noise from air terminal devices, air terminal units, dampers and valves by measurement in a reverberation room

ISO 5167-1 and 2:2003. Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full.

ISO 5801:2007. Industrial fans - Performance testing using standardized airways.

EN 1751:2014. Ventilation for buildings - Air terminal devices - Aerodynamic testing of damper and valves.

EN 12238:2001. Ventilation for buildings – Air terminal devices – Aerodynamic testing and rating for mixed flow application

EN 13141-7:2010 ventilation for buildings. performance testing of components/products for residential ventilation. part 7: performance testing of a mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single family dwellings

ISO 10140-1,2,4,5:1995. Acoustics - Measurement of sound insulation in buildings and building elements.

EN ISO 717-1:1996. Acoustics - Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation.

EN 1793-1,2,3:2003 Road traffic noise reducing devices. Test method for determining the acoustic performance.

EN ISO 354 Acoustics-Measurement of absorption in reverberation rooms.

ISO 11654:1997 Acoustics-Sound absorbers for use in buildings-Rating of sound absorption

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