

HIGH PRECISION MEASUREMENT ROOM – NANOMETROLOGY LABORATORY

The science of high precision metrology is an indispensable part of the scientific research as well as industrial applications. However, to meet the requirements of high precision metrology, high accuracy in the sub micrometer and nanometer range is mandatory for International recognition of the results under guidance of the international standards. Only the conveniently designed laboratory with consistent and reproducible environmental conditions may ensure measurements with high accuracy fulfilling the tasks with the smallest measurement uncertainties.

The most important environmental measurement influences are:

- temperature (thermal conduction, convection and radiation)
- vibrations
- humidity
- pollution

The structural organization of a precision measurement room ensures that these disturbing influences will be reduced and kept constant. The High Precision Measurement Room – Nanometrology Laboratory of the Vienna University of Technology demonstrates the demands for such a building and features of technical realization.

NANOMETROLOGY LABORATORY – ROOM-IN-ROOM CONCEPT

The HIGH PRECISION MEASUREMENT ROOM – NANOMETROLOGY LABORATORY, which is located in the basement of the main building of the Vienna University of Technology, is separated from the surrounding buildings by a mechanical and structural concept (room-in-room) and has solid walls and a concrete slab, that provide vibration isolation from the environment also preventing the transfer of building oscillations.

Through a powerful air conditioning system in the High Precision Measurement Room – Nanometrology Laboratory, there exists an environmental condition of temperature, humidity, air pressure, air speed and particles with defined values. The climate in the Nanometrology-Laboratory is controlled and monitored continuously to hold these constant values. This slightly overpressure of about 10 Pa in the measurement Laboratory is performed to prevent the irruption of unfiltered and unconditioned air while the doors are opened.

The system consists of the "High Precision Measurement Room – Nanometrology Laboratory", control room, sluice, entrance hall and machine room.

The technical characteristics of the Nanometrology-Laboratory is represented in the Table 1.

Table 1: Technical characteristics of the “Nanometrology-Laboratory”:

Dimensions „Nanometrology-Labor“: Length in m Width in m Height in m Floor area in m ²	L= 12 m B= 5,8 m H= 2,8 m 70 m ²
Space volume in m ³	195
Air circulation ratio per hour	28 changes per hour
Percentage of fresh air	18 %
Reference temperature	20°C ± 0,1 °C
relative humidity	45 % ± 5
Air filtration	99,97 % of all particles larger than 0.3 µm
Vibration isolation Maximum ground amplitudes at frequencies greater than 5 Hz	0,05 µm

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