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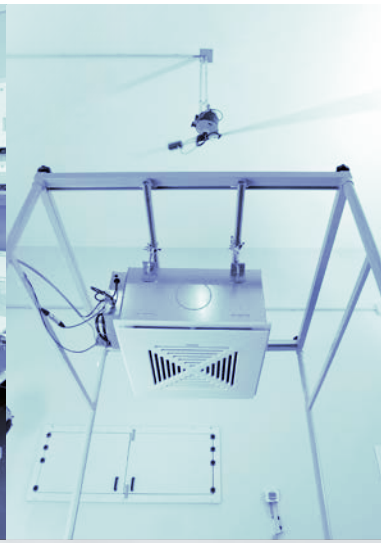
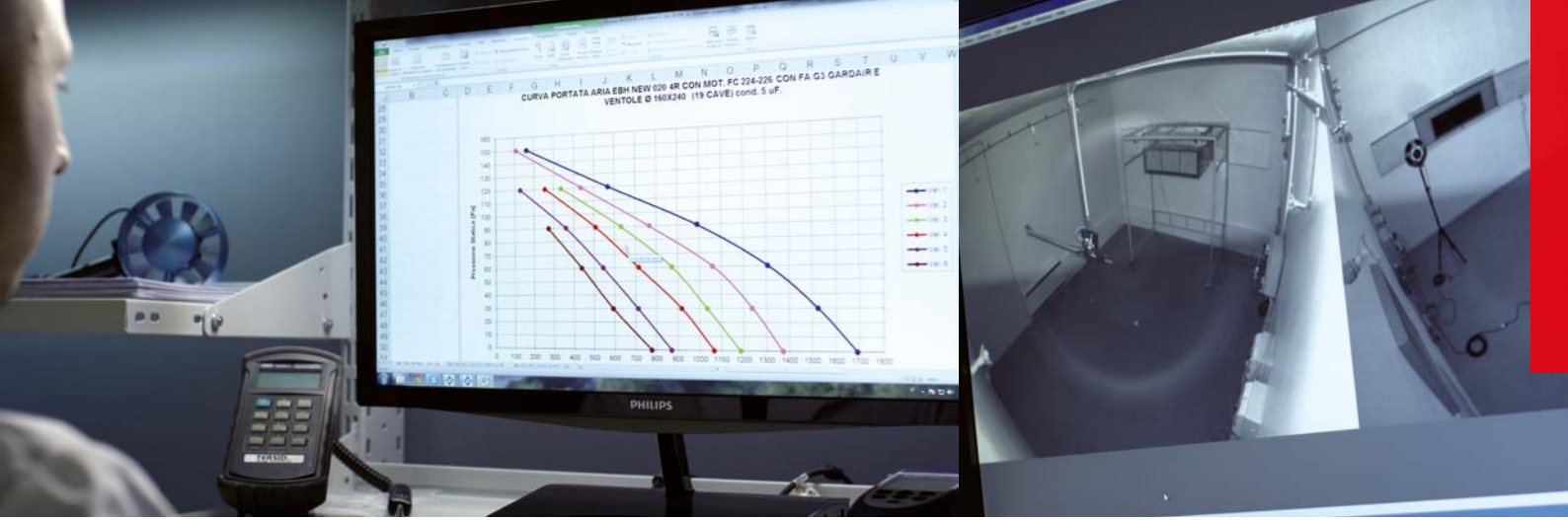


EUROPO

INTEGRATED
COMFORT
SYSTEMS

Innovation has always been
a key factor for competitiveness:
in the current global economy,
it allows companies to diversify strategies
and products to size new opportunities
and to face diversities and peculiarities,
which distinguish every single market.



In 2013, Eurapo decided to take a very important step in terms of investments, by building, in co-operation with Padua University, brand new technical laboratories, in strict compliance with the applicable regulations and Eurovent standards, in order to pursue ever-higher performance standards and to achieve the following goals:

- differentiate the offered products through the continuous and constant research of innovative technical and technological solutions, which follow or anticipate global markets' dynamics;
- improve products' quality, efficiency, performances, security and reliability;
- ensure performances of the offered products by running periodic tests and making analysis on the results;
- improve the technical support offered to their customers, by providing accurate, reliable and customized solutions with a very short response time;
- consolidate their presence in an increasingly competitive market;
- strengthen the engineering and technical relationships with their industrial and business partners.

The laboratories, which cover an area of over 400 square meters, represent the highest evolution in terms of technological solutions that make them unique in Italy.

With the new technical laboratories, **research**, **development** and **innovation** become, strongly and increasingly an integral part of the Eurapo corporate mission, to pursue the goal of continuous improvement.

climate chamb

The climate chamber of Eurapo Laboratories allows to run tests mainly for the following products:

- hydronic air-terminal units in heating and cooling mode
- hydronic air handling units in heating and cooling mode
- dehumidifiers

The climate room measures both the thermodynamic and the electrical characteristics of the units such as temperatures, pressures, flow rates and absorptions, in order to calculate the following values:

- Heating and cooling capacities (total and sensible)

- Energy Efficiency Ratio (EER) in cooling mode
- Coefficient Of Performance (COP) in heating mode
- Partial loads in cooling and heating mode (SEER and SCOP).

The system is able to test units with heating capacities from 0,5kW to 40kW (standard conditions: 20°C / 50% RH) and cooling capacities from 0,5kW to 30kW (standard conditions: 27°C / 48% RH), in compliance with EN 1397:2001 standards, Eurovent 6/3 standards (Thermal test method for Fan Coil units) and Eurovent 6/11 standards (Thermal test method for Ducted Fan Coil units).

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The working conditions range can go from inlet water temperature of 5°C (for district cooling applications) up to 70°C (for high temperature heating tests).
The test chamber has been designed and manufactured with very high quality components, ensuring deviations of ± 0.2°C on dry bulb temperature and deviations of ± 2% on relative humidity.


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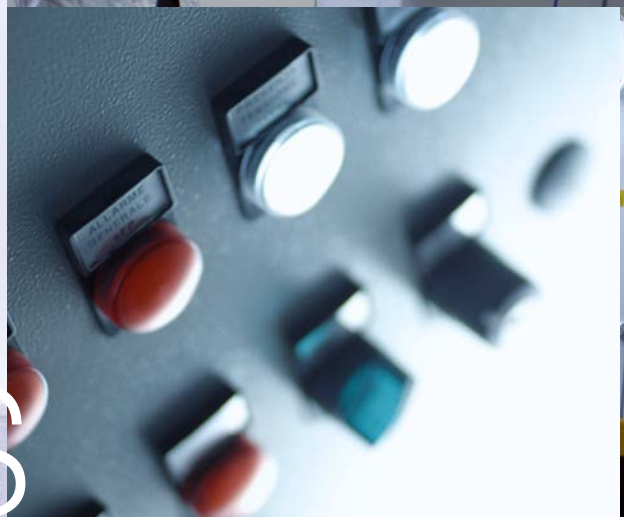
aeraulic tunnels

The enthalpy tunnel and the aeraulic tunnel in Eurapo Laboratories are used to measure the air flow generated by:

- fans (axial, centrifugal, industrial and domestic)
- air-terminal units (ducted and non-ducted)
- air handling units
- dehumidifiers.

The scope is to calculate the characteristic fan curves of the unit, which describe the flow rate in combination with the fan pressure (external static pressure), the absorbed power and the performance. These curves are generally measured for



different rotation speeds or for different configurations of the unit.

As required by the current regulations, both tunnels ensure to run tests with an overall accuracy in the order of ± 5%, which varies depending on the device chosen for flow measurement.

Enthalpy tunnel

Although UNI EN 1397 standard requires that, during the test, the unit should not be fed with any liquid for heating or cooling and the coil must be clean and dry, it may be of considerable interest to measure the air flow in a concrete

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working operation, in presence of heat exchange between air and heating or cooling water. It allows to make useful considerations on different possible experiences, such as the measurement of the air flow with wet coil.
In addition to measuring the airflow of the tested units as a classic aeraulic tunnel, at standard conditions prescribed by the regulations, the enthalpy tunnel may be coupled to the climate chamber in order to carry out tests on units (standard and ducted) under actual operating conditions. In this way, the enthalpy tunnel allows to carry out additional research and development activities and not only the basic ones, complying with the regulations' requirements.
The enthalpy tunnel has been manufactured according to ISO 5801:2007 (and former UNI 10531), ISO 5221 standards, Eurovent 6/3 standards (Thermal test method for Fan Coil units) and Eurovent 6/10 standards

(Air Flow test method for Ducted Fan Coil units).
The tunnel has been sized to ensure a correct measurement of the airflow from 120 m³/h to 6000 m³/h.

Aeraulic tunnel

The aeraulic tunnel, smaller than the enthalpy one, is manufactured according to ISO 5801:2007 (and former UNI 10531), ISO 5221 standards, Eurovent 6/3 standards (Thermal test method for Fan Coil units) and Eurovent 6/10 standards (Air Flow test method for Ducted Fan Coil units) and it is designed to measure an airflow range starting from 100 m³/h up to 2500 m³/h.

double reverbe

The double reverberation room for acoustic measurements is designed to measure sound power levels of air conditioning units and relevant components, fans and other similar products.

In the two reverberation rooms it is possible to measure very low sound power levels, with range of frequency between 100Hz and 10000Hz, in accordance with the methods of measurements described in UNI EN ISO 3740:2002, UNI EN ISO 3741:2010 and UNI EN ISO 5135:2003 standards. Each room complies with Eurovent 8/2 standards (Acoustical testing of Fan Coil Units).

eration room

The two reverberating rooms have different dimensions: 84 and 127 m³ respectively and are connected each other by an air duct.

The purpose of the smaller reverberation room is to provide support to the second one, in order to carry out sound test for ducted aeraulic systems, in compliance with 8/12 Eurovent standards (Sound test method for Ducted Fan Coil Units).

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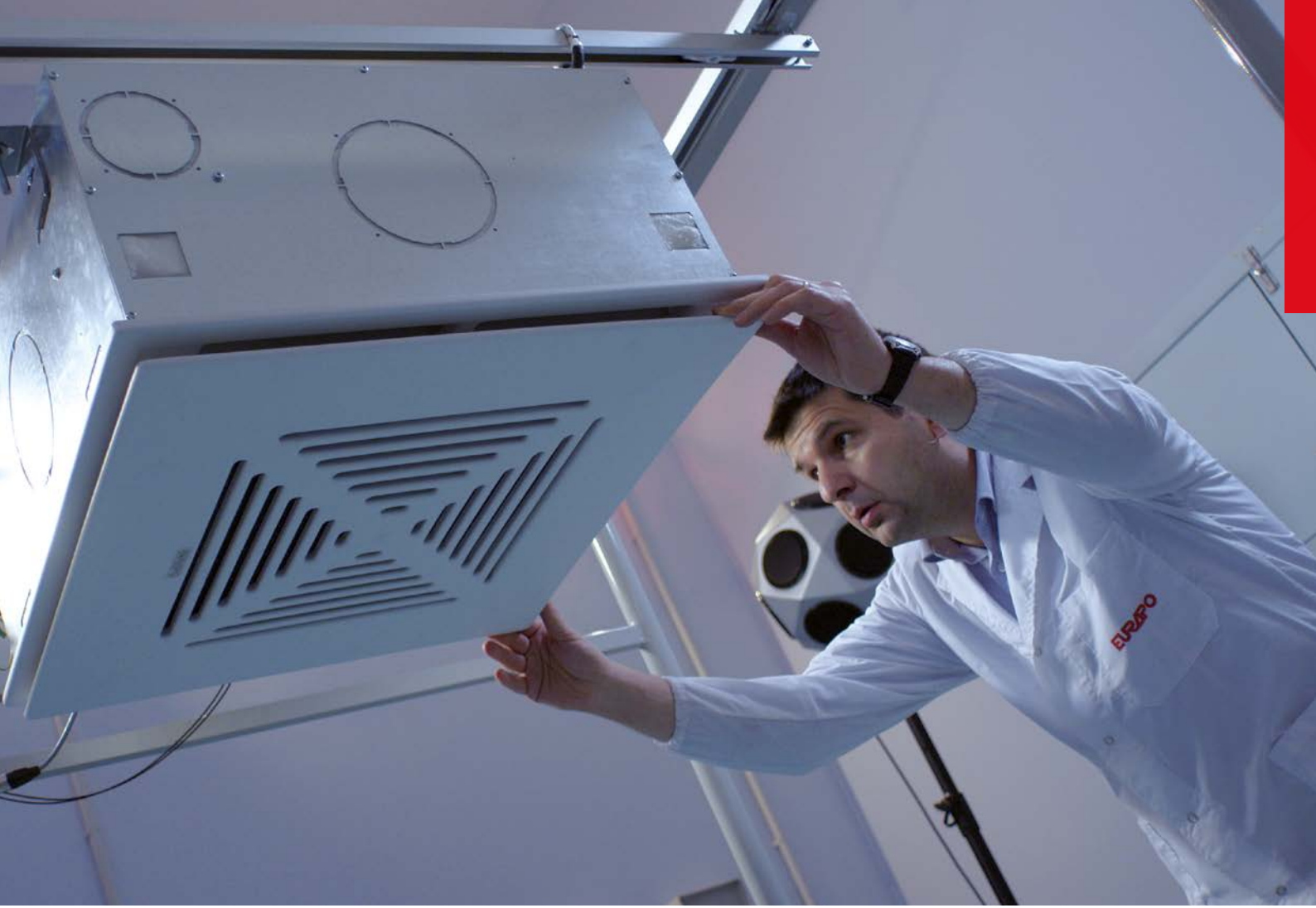
The purpose of the larger reverberation room is to perform acoustic tests in order to measure the sound power level of sources operating either in the same environment (for example fan coil units) or in a separate room (the smaller reverberation room), but having direct acoustic input in the measuring environment (ducted units).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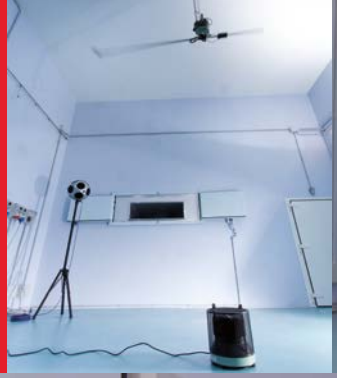

regulations

Eurapo laboratories (provided with climatic chamber, two aeraulic tunnels and two reverberation rooms), are equipped to perform and comply with all performance tests required by the market, in compliance with applicable regulations, in particular:

- EN 1397:2001 - Test procedures for establishing the performance of heat exchangers and hydronic fan coil units
- EUROVENT 6/3 – Thermal test method for fan coil units
- EUROVENT 6/11 – Thermal test method for ducted fan coil units
- ISO 5801:2009 (and former UNI 10531) - Performance testing of industrial fans using standardized airways
- ISO 5221 - Methods of measuring air flow rates in an air duct

- EUROVENT 6/10 – Airflow test method for ducted fan coil units
- UNI EN ISO 3740:2002 - Guidelines for determination of sound power levels of noise sources
- UNI EN ISO 3741 - Precision methods for reverberation test rooms for determining sound power levels of noise sources
- UNI EN ISO 5135 - Determination of sound power levels of noise from air-terminal devices, air-terminal units, dampers and valves by measurement in a reverberation room
- EUROVENT 8/2 – Acoustical testing of fan coil units in reverberation room
- EUROVENT 8/12 – Sound test method for ducted fan coil units

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- Commission Regulations EU No. 327/2011 and EU No. 206/2012 implementing the Directive 2099/125/CE with regard to ecodesign requirements for air conditioners and comfort fans
- Commission Regulation EU No 626/2011 supplementing Directive 2010/30/EU with regard to energy labelling of residential ventilation units

Running tests involves the use of experimental devices that need to comply with some basic requirements:

- offer a precise standard for running tests methods to ensure comparability between tests results performed by different laboratories
- ensure the absence of serious procedural errors (wrong positioning of the measurement points, use of correct formulations and acceptable assumptions)
- allow a proper evaluation of experimental uncertainties
- comply with the correct application field of the tested unit and compensate, if necessary, deviations coming from the measurement system
- ensure an operating mode of the tested unit in accordance with its designed specifications


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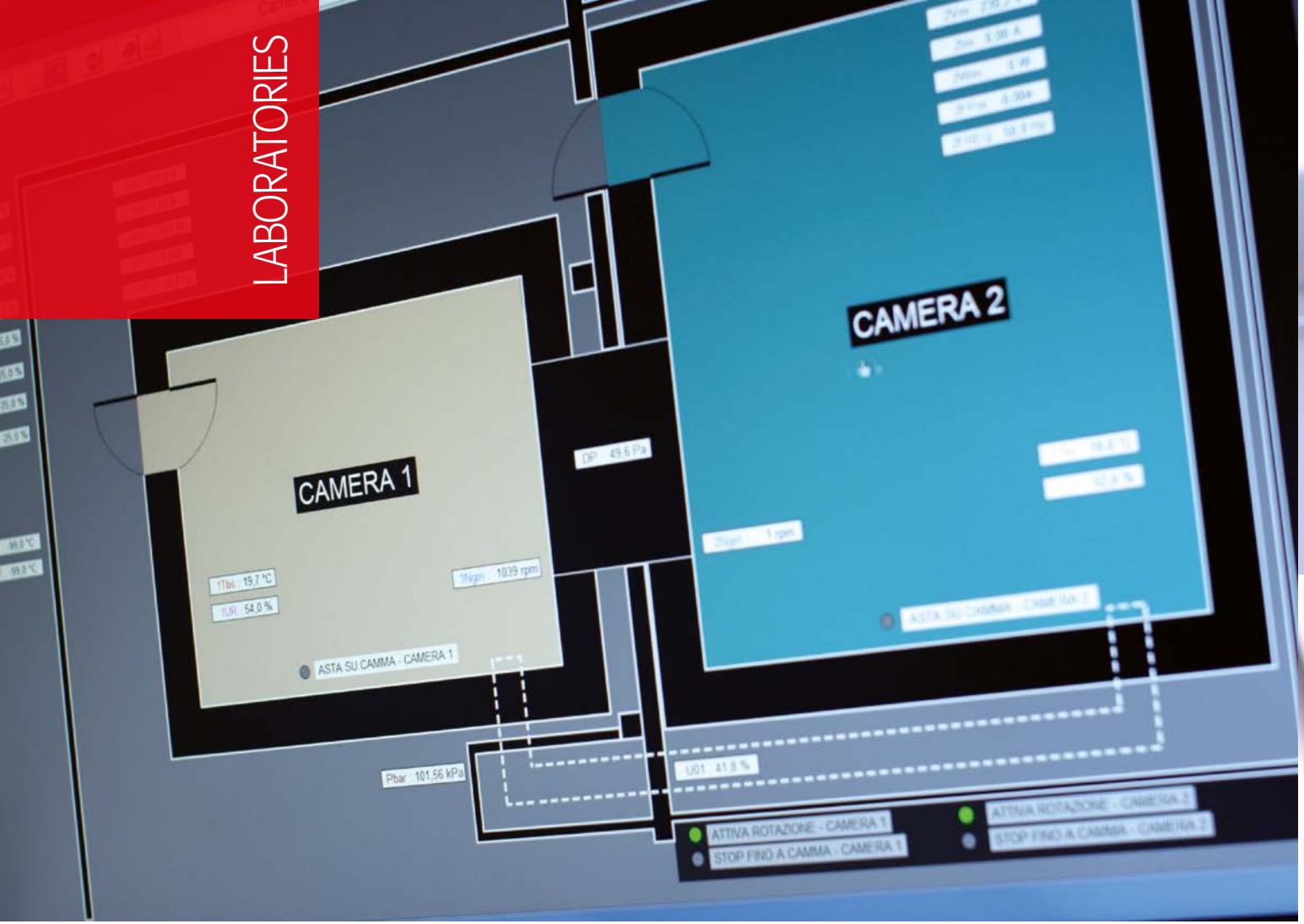

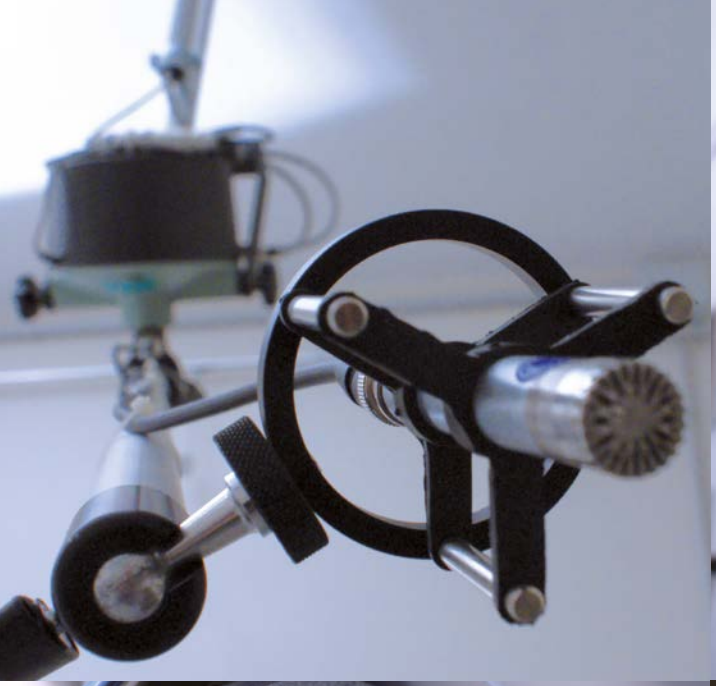


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