Cover photo:
All measurement instruments in the TestLab Heat Pumps and Chillers undergo continuous inspection and are calibrated in-house.

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TestLab
Heat Pumps and Chillers

Measurement of Heat Pumps and Chillers

Measurement of Heat Pumps and Chillers

Heat pumps and chillers are key technologies for reducing carbon dioxide emissions in the building sector. Reliable and independent third-party characterization of these units is of central importance for their sustainable marketing. The increasing system complexity and high demands from the industry require state-of-the-art measurement technology and excellent technical know-how to perform the required measurements.

In the TestLab Heat Pumps and Chillers at Fraunhofer ISE, we carry out extensive measurements in the field of heating, cooling and ventilation technology. Our engineers and scientists have many years of experience and apply their cutting edge knowledge gained through participation in national and international standardization committees and research projects into their daily work.

Technical Equipment

Our technical center, built in 2015, has testing facilities for electrically driven appliances, thermally driven systems operated with gas or heat as well as hybrid systems. The center is equipped with state-of-the-art measuring and conditioning technologies. In a calorimetric double climatic chamber, we can measure equipment with a heating or cooling power of up to 100 kW, at temperatures from -25 °C to +50 °C, and at relative humidities from 25 % to 95 %. In addition to the climatic chamber, air-cooling devices and components can be tested in one of the three air channels at air flow rates up to 5000 m³/h, at temperatures from -15 °C to +50 °C, and relative humidities from 15 % to 95 %. For the heat transfer media water or brine, several systems are available. These can condition the media at temperatures from -25 °C to +95 °C in the power range up to 75 kW_{th} and at volume flows up to 9 m³/h.

The measurement data is protected at the highest data security level. Among other measures, this includes a protected subnet in the laboratory, which can only be accessed by our test engineers. Secure interface computers for embedded hardware-in-the-loop measurements, as well as remote access to devices under test or locally installed in-house computers, enable fast and secure data exchange in real time.

In addition to performance measurements and functional tests, acoustic measurements can also be carried out in the TestLab. These can be complemented by structural dynamic characterizations upon request.

Additionally, modern analysis methods are available. These can either be combined with performance measurements or offered as a separate service: particle image velocimetry, laser shadowgraphy, laser Doppler anemometry, gas chromatography and 3D scanning vibrometry.

Customized Processes

Beyond the standardized methods, we develop individual measurement procedures together with our customers to support the time saving and cost efficient development and optimization of devices and complex systems with dynamic test sequences that closely approximate real conditions. In our laboratory, the data acquisition and conditioning technology can be connected either to an in-house or external computer, e.g. to perform hardware-in-the-loop measurements. The signals are transmitted and synchronized in encrypted form between the external simulator and the laboratory infrastructure.

In addition to testing heat pumps and chillers, the TestLab also offer testing services for many other products and components, such as gas or hydrogen-powered heaters, ventilation units, humidifiers and dehumidifiers, compressors, heat exchangers or control valves.

Safety Concept

Due to the increasingly tight regulations in the use and handling of refrigerants with high global warming potential, refrigeration technology is currently facing new challenges and seeking new refrigerants. Therefore, the TestLab Heat Pumps and Chillers has established an integral safety concept that allows components and systems with flammable (e.g. propane and isobutane) or toxic (e.g. ammonia) refrigerants to be set up and measured. The test center is also equipped for measurements of transcritical carbon dioxide processes. The staff is certified according to the F-Gas Regulation, Class I.

Accredited Tests

The TestLab Heat Pumps and Chillers is accredited according to ISO/IEC 17025 for measurements on various types of heat pumps and chillers. Accredited tests are performed according to the following standards:

- EN 14511, EN 14825, EN 16147, EN 13203-5 for electrically driven systems and hybrid heat pumps
- EN 12309, EN 13203-6 for sorption devices
- sound power level according to EN 12102-1

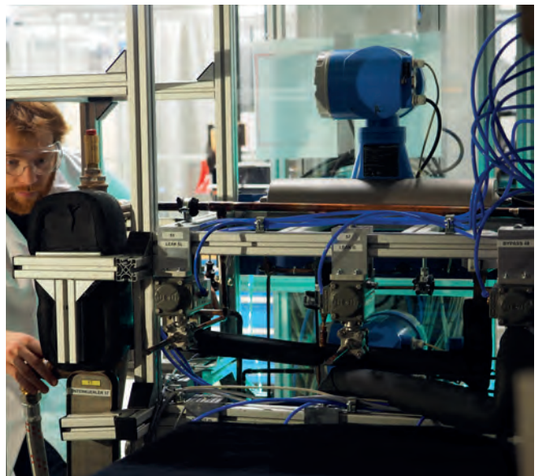
The TestLab Heat Pumps and Chillers has a flexible accreditation category III according to DAkkS. This allows accredited testing according to different issues of the above mentioned standards.

We are a DIN CERTCO and BRE approved test laboratory for conducting tests for the Heat Pump Keymark certificate.

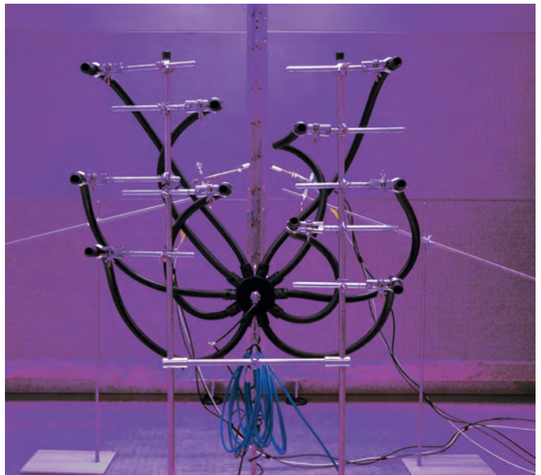
DAkkS
Deutsche
Akkreditierungsstelle
D-PL-11140-34-00

The TestLab is equipped to handle flammable and toxic refrigerants.

Investigation of specific issues with state-of-the-art analytical technology.



Measurement of air temperature and humidity in the climatic chamber.



Calorimetric double climatic chamber up to 100 kW_{th}.