



over **1260** Employees

5 Departments

2 Subsidiary Enterprises

8 Locations

Infrastructure Systems

Appplied Research

System Competence

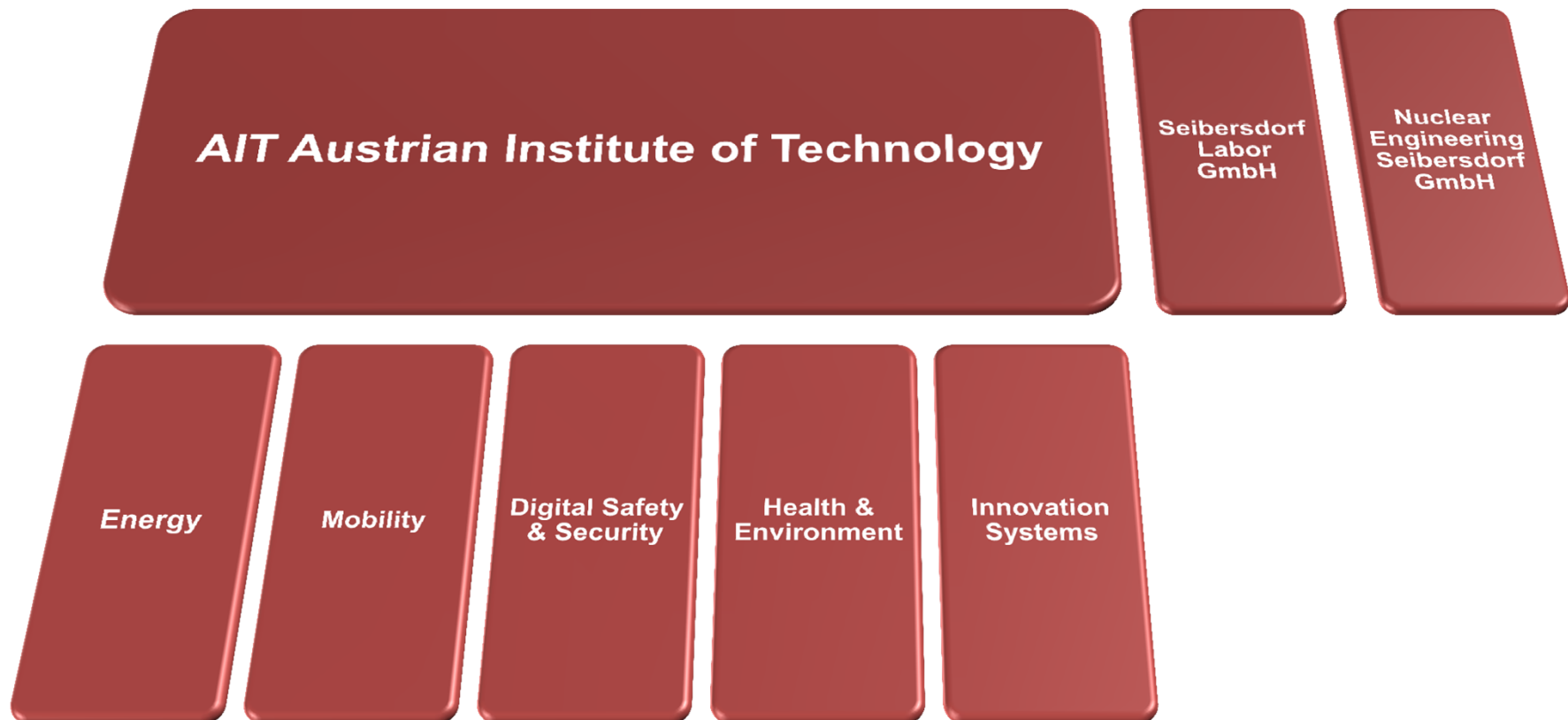
NG Solutions

VFFI

BMVIT INDUSTRY

131 MIO TOTAL REVENUE

AIT Austrian Institute of Technology



AIT Energy Department

The AIT Energy Department develops solutions for a sustainable energy system of tomorrow.

Our Research Fields

- Smart Grids
- Photovoltaics
- Thermal Energy Systems
- Smart Buildings
- Smart Cities
- Complex Energy Systems
- Environmental Resources & Technologies



AIT Energy – Research Fields

Smart Grids



- Network Planning & Operation
- Smart Grid Controllers & ICT
- Power Electronics & Network Components

Smart Cities & Regions



- Urban & Regional Energy Strategies
- Energy Concepts for Urban Neighbourhoods

Photovoltaics



- Performance & Reliability
- Building integrated PV
- Emerging Technologies

Smart Buildings



- Building Management
- Building Optimization

Thermal Energy Systems



- District Heating & Cooling
- Energy in Industries
- Renewable Heating & Cooling

Complex Energy Systems



- Modeling & Simulation
Cyber-Physical Systems
- High Performance Computing

Thermal Energy Systems

Component Manufacturers

- Accredited thermophysical analysis
- Support in the development of innovative heat exchangers (evaporator, thermal storages)



Technology Providers

- Evaluation of optimisation measures on heat pumps, solar collectors and thermal storages for use in buildings, thermal networks and industrial processes
- (Accredited) performance & functional tests on heat pumps, solar collectors and thermal storages



Plant Engineers, Installers

- Planning support in the integration of heat pumps, solar systems and thermal storages in industrial processes and district heating and cooling networks
- Certified training courses for planners and installers



Industry & District Heating Network Operators

- Independent development and assessment of concepts to increase energy efficiency and the share of renewable energies
- Independent assessment of concepts for optimised thermal network operation
- Scientific implementation support



Heat Pump Laboratory

Services and expertise

- Measurements for EHPA quality label, NF PAC certification, MCS certification, EU EcoLabel, heat pump keymark
- Classification according to the Energy Labelling Directive (811/2013)
- Efficiency measurements according to the EcoDesign Directive (813/2013).
- Electro Magnetic Compatibility (EMC) and acoustic measurements.

Accredited performance and functional tests for the following heat pump technologies

- Air/water heat pumps (up to 75 kW)
- Brine/water heat pumps (up to 100 kW)
- Direct expansion/water heat pumps (up to 35 kW)

13.04.2016

Independent accredited testing:

- EN 14511
- EN 15879
- EN 14825
- EN 12102



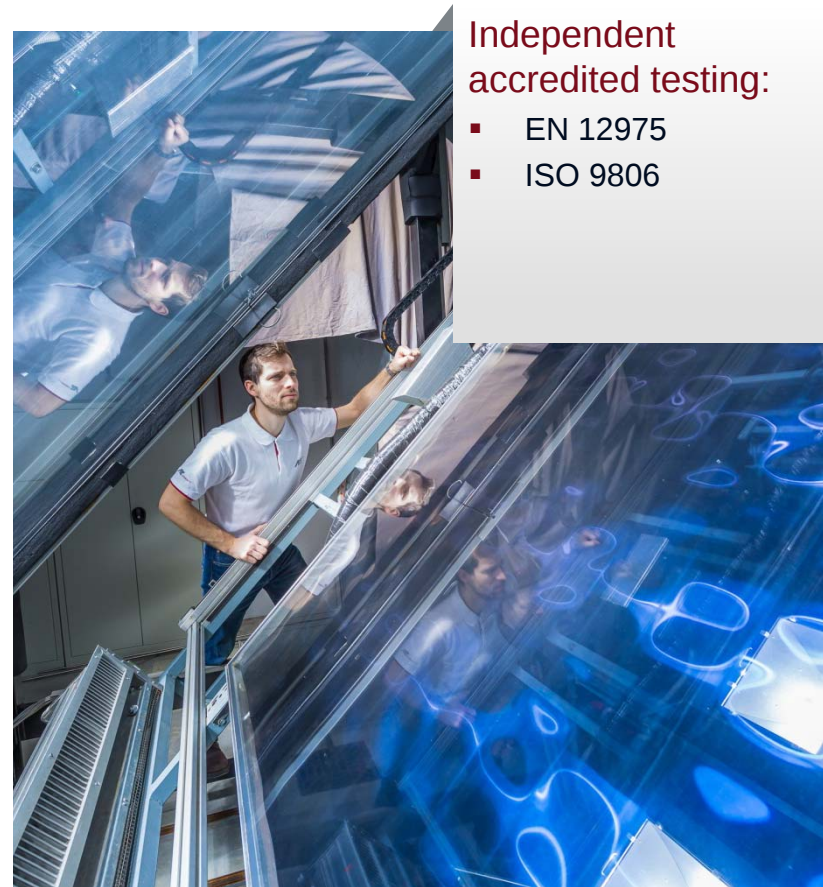
Solar Thermal Laboratory

Accredited performance and reliability testing of standard solar collectors (up to 100°C)

- Efficiency and resistance to environmental impacts such as ice, snow, wind, hail, etc.
- Testing of large-size collectors up to 18 m².
- Solar Keymark certification.

Testing of medium-temperature solar collectors (up to 220°C)

- Performance and reliability tests of innovative concentrating collector systems.
- Temperature and pressure resistance tests.
- Mobile infrastructure with pressurised water up to 23 bar, operating temperatures up to 220°C and flexible mass flow rate up to 2000 kg/h.



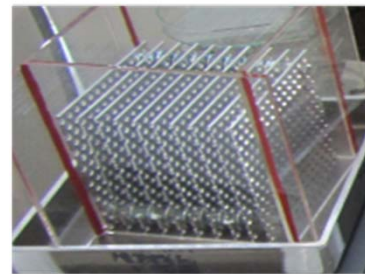
Independent accredited testing:

- EN 12975
- ISO 9806

Thermal storages and water heaters

Measurement and classification of thermal storages / water heaters

- Determination of heat loss rate and heat loss analysis using thermography and heat flow plate.
- Efficiency measurements on water heaters for different tapping cycles.
- Classification according to the Energy Labelling Directive (811/2013 and 812/2013)
- Efficiency measurements according to the EcoDesign Directive (813/2013 and 814/2013).



Independent accredited testing:

- EN 12897
- EN 12977
- EN 16147



Heat pumps and thermal storages for industrial processes

Services and expertise

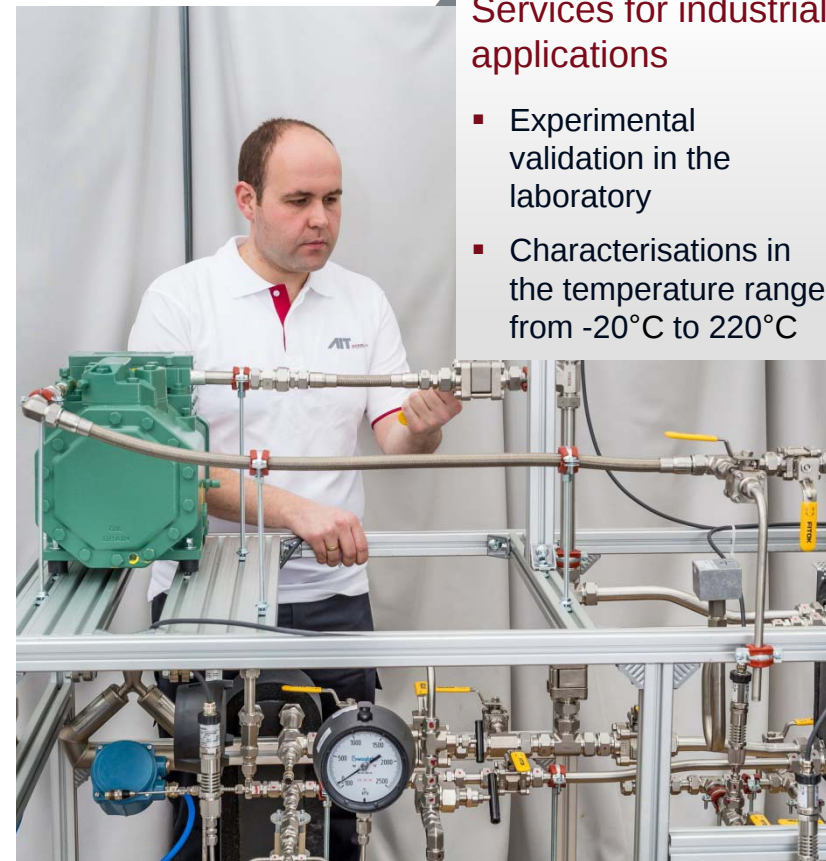
- Investigation and assessment of novel refrigerants (up to ASHRAE classes A1-A3, B1-B2) for high-temperature heat pump applications.
- Investigation and assessment of novel storage materials (PCM, thermochemical) for use in industrial processes.
- Development and assessment of innovative heat exchanger concepts for thermal storages and heat pumps.
- Characterisation and development of innovative thermal storages.

Infrastructure

Heat sources and sinks:

- Thermal oil: max. 350°C, 50kW.
- Pressurised water: max. 220°C, 15kW.
- From beginning 2017: pressurised water max. 170°C, 1.3 MW

13.04.2016



Services for industrial applications

- Experimental validation in the laboratory
- Characterisations in the temperature range from -20°C to 220°C

Thermophysics Laboratory

Services and expertise

- Thermophysical characterisation of solids, powders, pastes, liquids and melts for operating temperatures from -180°C to 1600°C .
- Thermokinetic modelling and simulation of processes.

Measurement methods

- *Dilatometry* (-160°C to 1600°C): thermal expansion, density, melting and solidification processes
- *Calorimetry* - DSC (-160°C to 1600°C): thermal analysis, specific heat, conversion processes
- *Laser flash analysis* (-120°C to 1600°C): thermal and heat conductivity
- *Thermobalance* (-160°C to 1600°C): simultaneous calorimetry & gas analysis (QMS & FT-IR)
- *Transient hot bridge* (-15°C to 200°C): thermal conductivity

Thermophysics

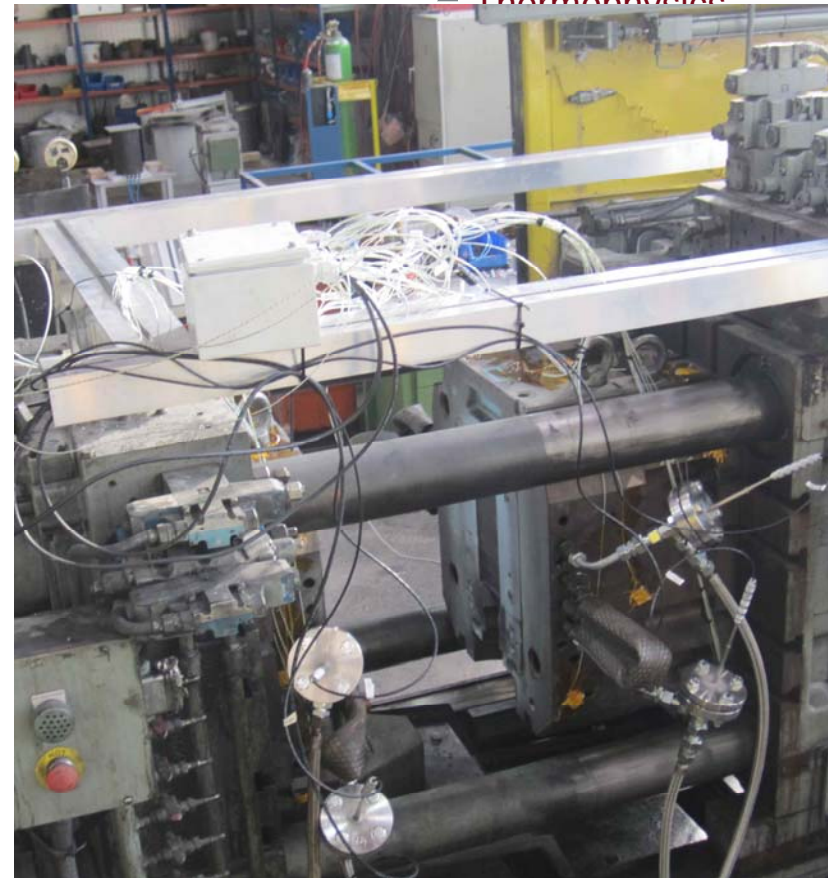
- Independent accredited test lab
- Characterisations in the temperature range from -180°C to 1600°C



Support in planning and integrating innovative efficiency technologies in trade & industry

Services and expertise

- Measurement and analysis of energy data at different process levels
- Support in the integration of heat pumps and thermal storages in industrial processes and development of optimised operating and control strategies
- Development of detailed process models for use in process design and optimisation
- Improving transparency of operation based on energy management systems and simulation-based process monitoring
- Prototype development and experimental testing at pilot scale using realistic infrastructure and industrial control technology



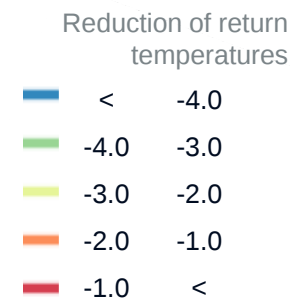
District heating and cooling simulation

Services and expertise

- Optimization of (distributed) supply controls and network supply temperatures
- Assessment of demand side measures (e.g. load shifting, reduction of return temperatures)
- central/ distributed storage management strategies, utilization of the network as storage

Models and functionalities available

- supply: CHP, heat pumps, solar thermal ...
- demand: load profile data base, one note model, detailed hydraulic substation schemes
- storage: water based, PCM, TCM ...
- GIS Interface (data import/export, visualization)
- algorithms for customers/ network topology aggregation → modelling of very large networks
- co-simulation interface (electricity networks, building simulations, external controllers ...)



Modelica/ Dymola

- open source language
- multi-engineering
- Bi-directional flow
- instationary/ dynamic effects

