



Identification of the installation/facility :

Country: Austria

Location (city): A-8010 Graz

Name of the facility: Institute for Thermal Turbomachinery and Machine Dynamics

Date of construction or of acquisition or of main refurbishment: Ongoing since 1990

Owner: Graz University of Technology

Contact point: Dr. Emil Göttlich;

Internet site: <http://www.ttm.tugraz.at>

Technical characteristics:

1 - Type of infrastructure

Wind tunnel	<input checked="" type="checkbox"/>
Propulsion bench	<input checked="" type="checkbox"/>
Structures facility	<input type="checkbox"/>
Material facility	<input type="checkbox"/>
Simulator (ex. Flight simulator, tower, ...)	<input type="checkbox"/>
Flight test bed (aircraft, embedded facilities, ...)	<input type="checkbox"/>
Supercomputers	<input type="checkbox"/>
Other	<input checked="" type="checkbox"/>

2 - Main technical characteristics

For wind tunnels : max velocity (or Mach number), test section area, max Rey/m, special features (power if continuous, pressure and temperature if blow down, ...)

For aeroby propulsion bench: air mass flow, temperature, pressure, type of fuel,...

For solid combustion bench : max force,...

The Institute works experimentally in the fields of:

Aero engines - overall system; Turbine aerodynamics (numeric and experiment);

Aero engine acoustics.; Interaction between high pressure Turbine and low pressure turbine (Mid Turbine Frame); Noise propagation within the engine; Analytical and experimental investigation of combustion chambers; Emission analysis;

The following test facilities are available:

1) Transsonic Turbine Test Facility, 5 bar, up to 20 kg/s mass flow. (2-shafts for high and low pressure turbine)

2) Subsonic Test facility, Combustion Chamber Test facility, 8 bar, 700 K, 1,5 kg/s (in the future: 20 bar, 700 K; 3 kg/s).

3) Acoustic Laboratory

4) Laboratory for Optical Measurement (3D-PIV; LDA; Raman; LV)

5) Laboratory for Machine Dynamics

Detailed descriptions are available on request.

3 - Research domains which can be addressed (refer to ACARE taxonomy

<http://www.acare4europe.com/docs/ASD-Annex-final-211004-out-asd.pdf>)

Aero engines - overall system; Turbine aerodynamics (numeric and experiment);

New aero engine concepts.; Aero engine acoustics.; Interaction between high pressure Turbine and low pressure turbine (Mid Turbine Frame); Noise propagation



within the engine; Analytical and experimental investigation of combustion chambers; Emission analysis;

Our research topics are on

- gas turbine combustion,
- machine dynamics
- and on the fluid mechanics and aerodynamics in turbines and there especially
 - Unsteady flow
 - Turbulence (optical measurement and numerical calculation)
 - Cooling systems (steam cooling, slit cooling)
 - aero-acoustics in the flow field
 - transonic flow fields and effects in the stage
 - clocking (stator)
 - Flow visualisation (Schlieren, Oil)

4 - *Main (or specific) associated measurement techniques*

The whole range of conventional Measurement equipment. In addition Fast Response pressure Probes (FRAP) and a great variety of optical measurement techniques such as LDA, PIV, Raman/CARS, Laser vibrometry for density fluctuation, Schlieren.

See attached file

5 - *Operational status*

- Fully operational (hours available in 2010)

The test facilities are all fully operational and in use

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6 - *picture*

see the website: <http://ttm.tugraz.at/>

Financial elements:

Replacement cost (M€uros)

- | | |
|---------------|-------------------------------------|
| Less than 10 | <input type="checkbox"/> |
| 10 to 30 | <input type="checkbox"/> |
| 30 to 60 | <input checked="" type="checkbox"/> |
| 60 to 100 | <input type="checkbox"/> |
| More than 100 | <input type="checkbox"/> |

Practices concerning:

Access policy (contract, voucher, free access for research, etc...)



AirTN
Air Transport Net



Support (regional, national, European, private, ...)

Investigations are performed in cooperation within European research programmes or in direct cooperation with industry partners.

Comments:

More Information about the test facilities are available on request.

Origin of information ('signature'): author and date

Graz, 19.12.2010

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