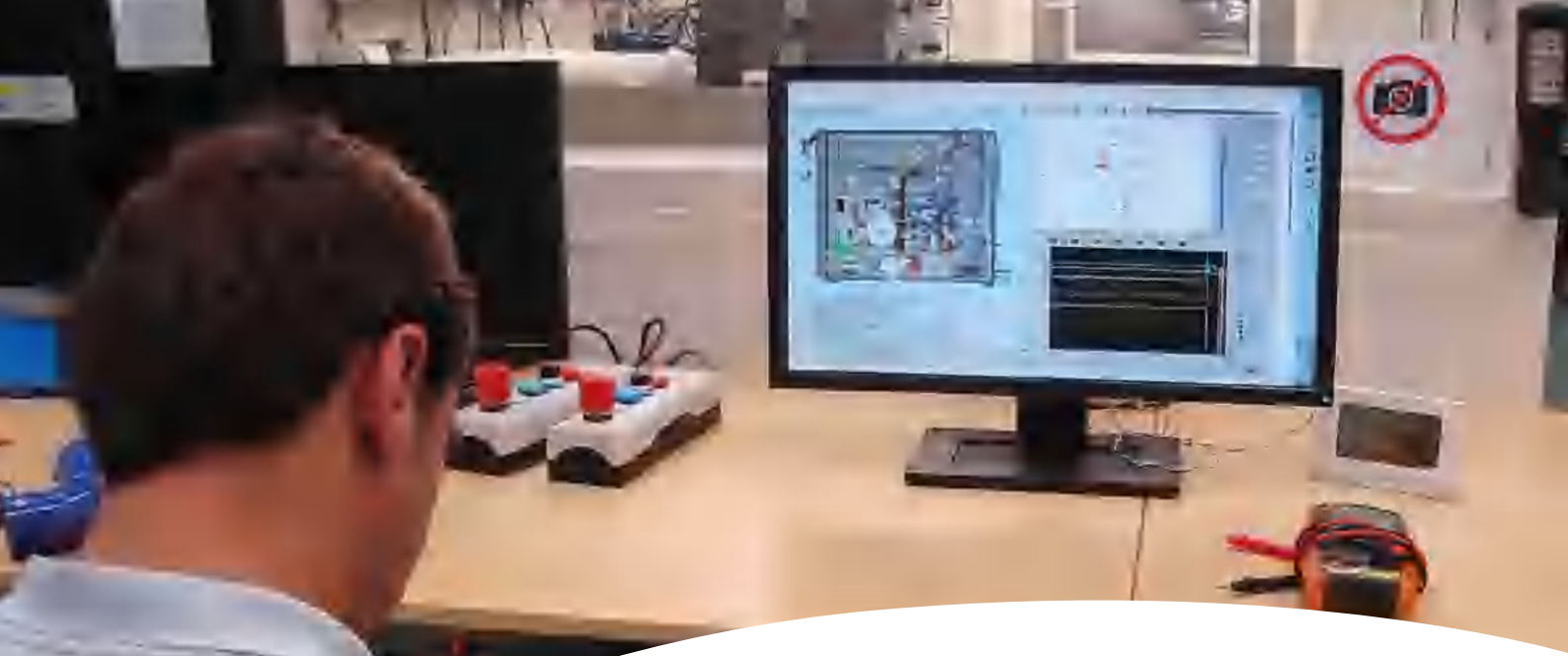
Micro Turbine LAB

Platform for research & development

MTT
micro turbine technology bv



Plug and play platform for research & education

R&D institutes and universities have a strong need for platforms to do experiments and the validation of research results. Especially in the gas turbine community this forms a problem as gas turbines are in general large, expensive, require a substantial infrastructure and are costly to operate. To overcome this problem, MTT has developed a very small and flexible micro turbine. This recuperated micro gas turbine has now been integrated in the MTT Micro Turbine LAB, which is especially suitable for gas turbine research, for example on the fields of turbomachinery, components, cycle studies, combustion- and application research. In addition, it can also be used for educational- and training purposes at universities and other institutes allowing practical exercises and analyses for staff and students.

The Micro Turbine LAB is an integrated plug and play research and education platform that comes as a completely integrated setup, including all auxiliaries, power electronics and control. This enables an easy and fast start of new R&D projects as well as practical exercises with a safe and controlled micro turbine system.

One of the main benefits of the Micro Turbine LAB is its relatively small footprint. In addition, its flexible operating requirements and very low operating cost (fuel and infrastructure) are important advantages. Component changes are far easier and more cost efficient when compared to larger gas turbines or even other micro turbines currently available in the market.

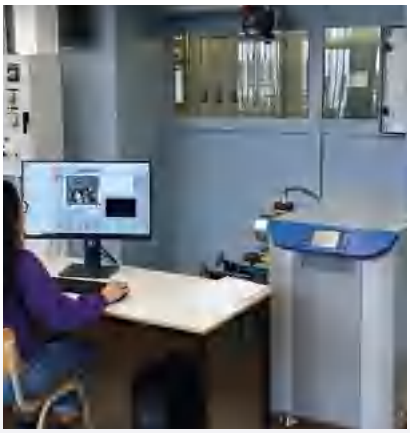
Technology Description

Micro Turbine LAB system operates on the same thermodynamic cycle (Brayton Cycle) as larger gas turbines and it shares many similar basic components.

The Micro Turbine LAB is a recuperated Brayton cycle, which includes:

- The turbogenerator which comprises a compressor, turbine and high-speed generator.
- A combustor, developed for natural gas, biogas and LPG. The combustor and fuel system can be adapted for other fuel types.
- A recuperator, high temperature air-to-air heat exchanger, for improved cycle efficiency.
- Integrated power electronics and control hardware.
- All auxiliary components required for safe operation, including an oil system, fuel compressor, water pump, etc.
- Air to water heat exchanger, allowing easy integration in a lab environment to remove exhaust heat. Could alternatively be removed to generate high temperature flue gas for other research topics and cycles.
- LabVIEW control and monitoring software.
- Basic sensor set sufficient for control. Optionally an extended sensor package can be ordered allowing detailed cycle- and component analysis as well as validation of modelling and simulation results.

Compact & efficient



Umons, Belgium: MGT wet cycle research and MGT hydrogen combustion

Fields of Application

Micro Turbine LAB units in the context of research & development can be utilized to study:

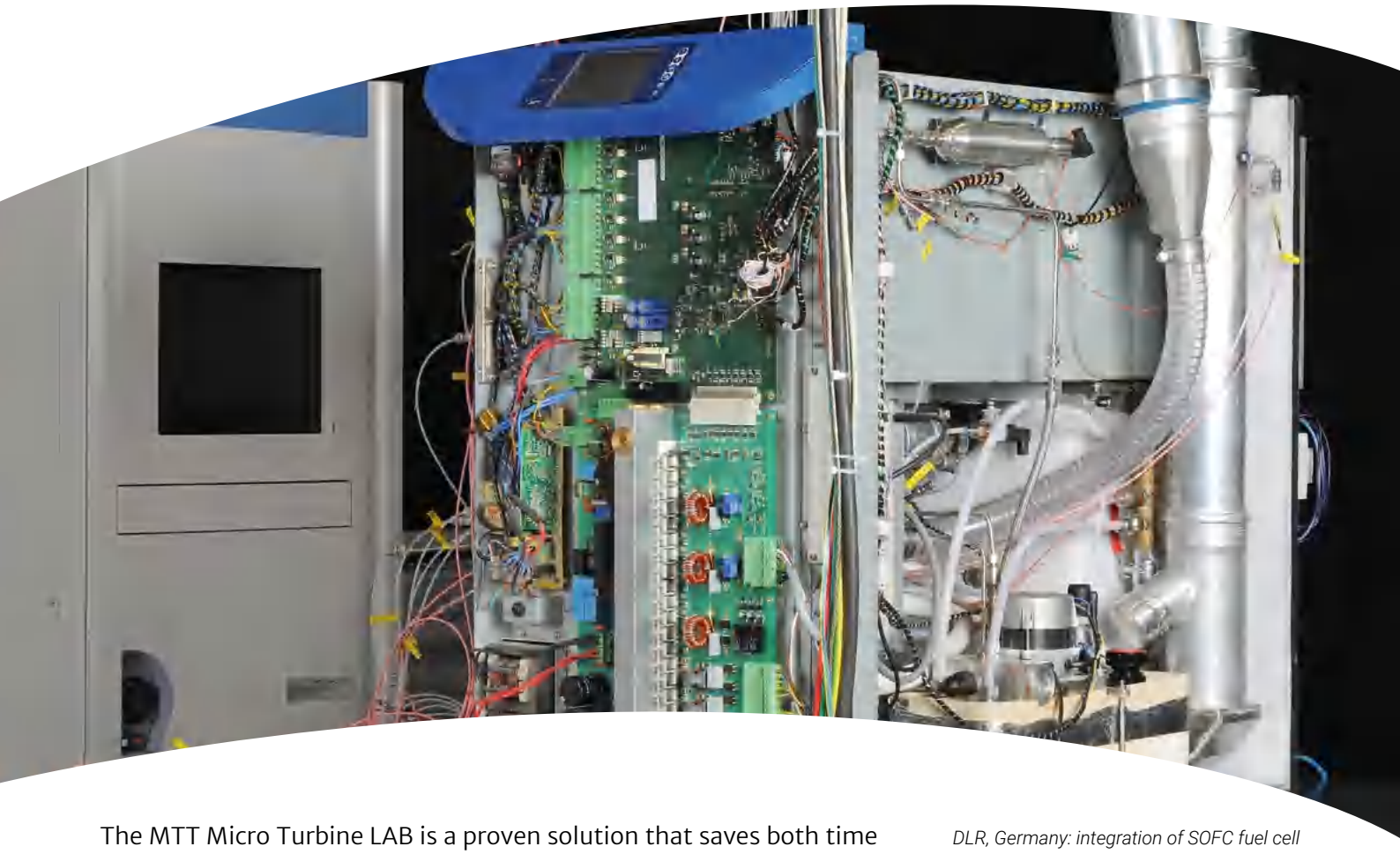
- Recuperated Bryton cycle
- Turbomachinery optimization
- Novel combustion concepts
- Innovative and sustainable fuels such as Hydrogen and NH3
- Smart microgrid concepts
- Advanced CHP and poly-generation concepts
- Integrated cycles, such as CCHP

The Micro Turbine LAB will be a valuable asset for research & development teams when studying and validating novel theoretical and experimental concepts. In addition, this system can also be utilized by various industries to train their engineers, operators and maintenance staff in the fundamental working principals of gas turbines, auxiliary power systems (APUs), turbomachinery and propulsion systems.

Validation of novel concepts

Furthermore, universities and other technical education institutes can rely on the Micro Turbine LAB for demonstration purposes and education of undergraduate and graduate students, or as a research platform for doctorate programs.

HySa, South Africa: performance of hydrogen combustion in various H2/CH4/CO2 mixes



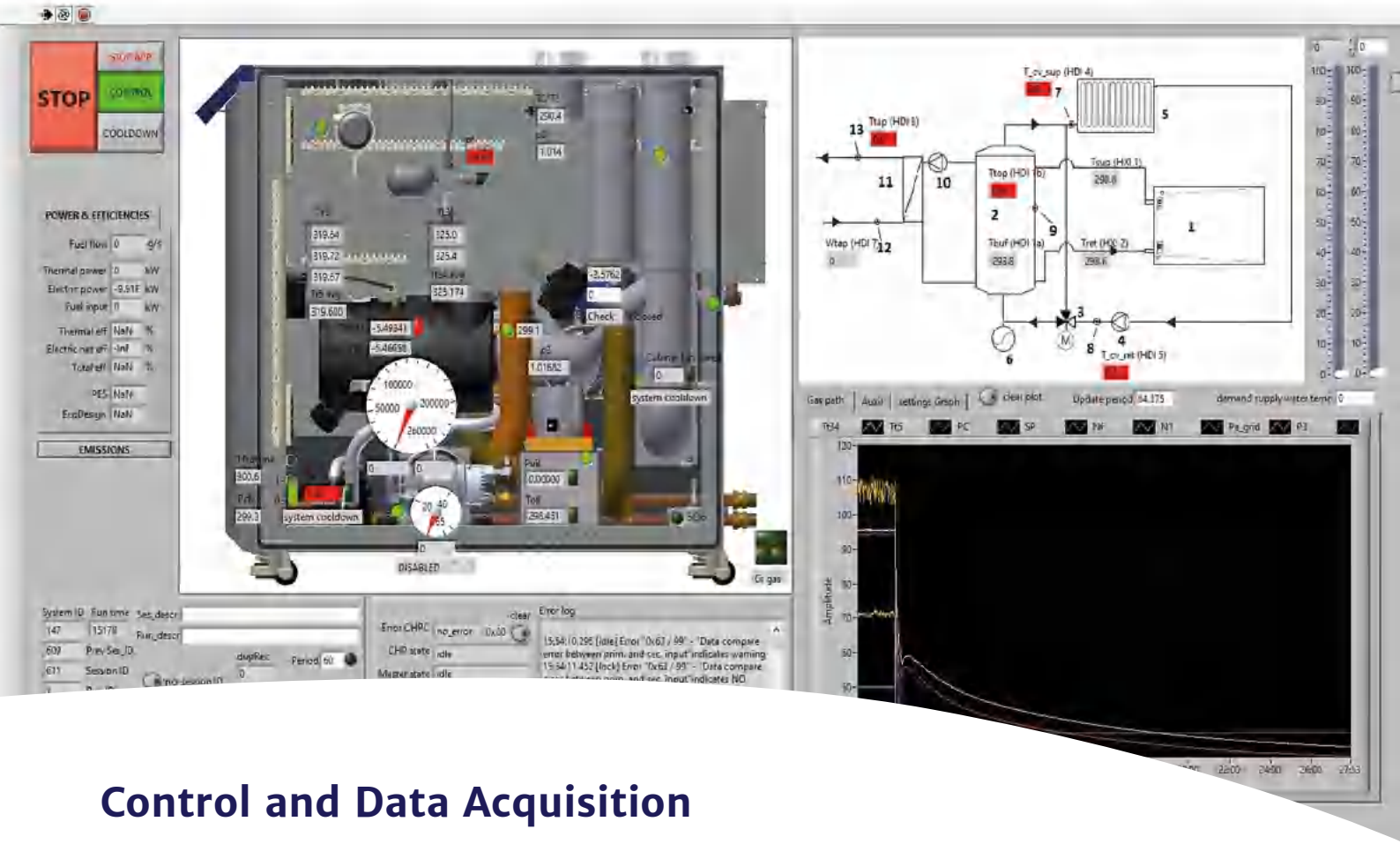
DLR, Germany: integration of SOFC fuel cell with micro gas turbine

The MTT Micro Turbine LAB is a proven solution that saves both time and costs for research projects since it offers:

- A small scale, fully instrumented solution
- Adaptable control for specific projects
- Low cost, light weight, small size
- Low infrastructure required
- Low operating cost due to its low fuel consumption
- Low maintenance requirements
- Full support by experienced MTT engineers

KIT, Germany: real time simulation and grid integration of a micro gas turbine

Support by experienced MTT engineers

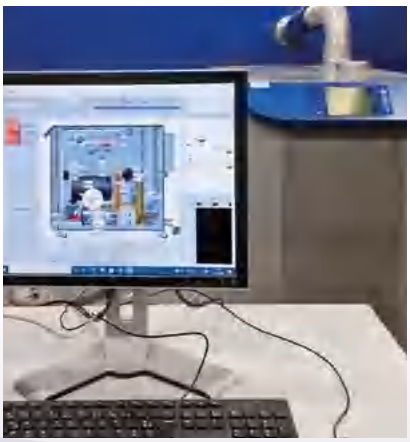


Control and Data Acquisition

An award-winning control and monitoring program designed in LabVIEW, gives a clear overview of the micro turbine performance and the thermodynamic process. Using this program, the Micro Turbine LAB can be controlled in both automatic mode as well in manual mode to set the desired test parameters such as rotor speed, peak cycle temperatures, power settings and other gas turbine boundary conditions. The program gives the possibility to control both rotor speed and turbine exit temperature separately. Sensors located at critical points offer accurate and precise measurement of pressures and temperatures at the different thermodynamic stations within the gas path as well as the status and operating conditions of the sub systems.

Access to the LabVIEW source code is optional, if adaptation of the Micro Turbine LAB for your specific requirements is desired. Any optional sensors can be integrated into the LabVIEW software, including optional measurements of for example air and fuel flow, allowing full cycle and performance monitoring and advanced combustor research & development.

Control designed in LabVIEW

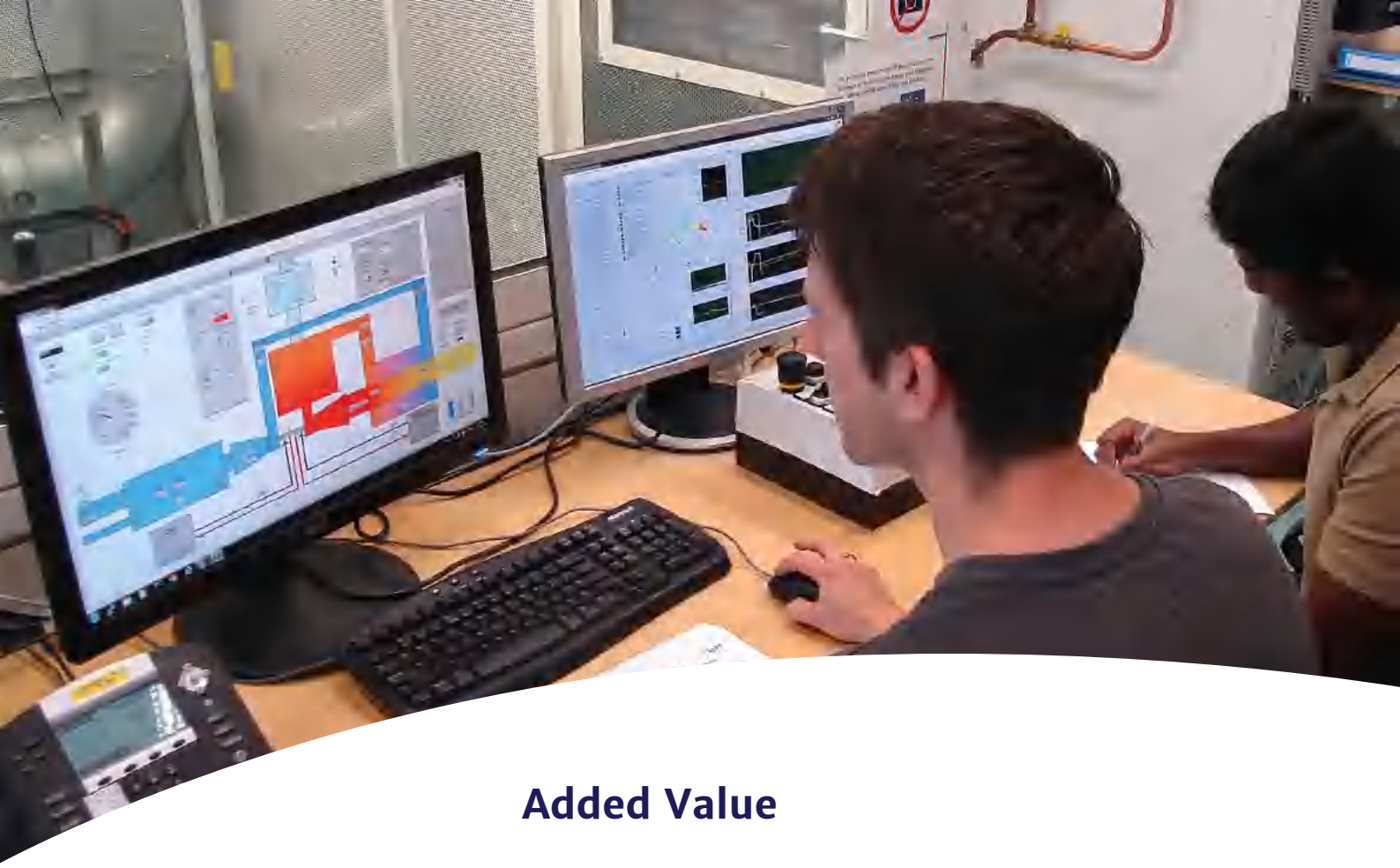


Mines ParisTech, France: research on turbo machinery components

Micro Turbine LAB specifications

		Max.	Min.	
Performance at ISA *	Net electric power	> 3,0	1,0	kW
	Net thermal power	15,0 **	7,2	kW
	Power to heat ratio at max power	20		%
	Net grid output efficiency (electrical)	16		%
	CHP efficiency	> 94 **		%
	Rotor speed	240.000	180.000	rpm
Fuel	Renewable gas / biomethane / natural gas / hydrogen (H_2 mixes) / LNG / CNG / LPG			
Operating conditions	Ambient air pressure	0,8 - 1,1		bar
	Inlet air temperature	20 - 40		°C
	System room temperature	5 - 40		°C
Water cycle	Water flow rate	3 - 21		l/min
	Return water temperature	5 - 60		°C
	Supply water temperature	5 - 80		°C
	Water pressure	0,7 - 3		bar
Support	Helpdesk / remote assistance / advice / training / software updates (LabVIEW) / spare parts			
Emissions	NO_x	< 27		ppm @ 15% O_2
	CO	< 50		ppm @ 15% O_2
	Noise	58		dB(A) 1m
Control	RS-485 Modbus remote control interface			
	0-10V system interface			
	MTT proprietary control interface			
	LabVIEW executable (optional source code)			
Installation	Dimensions (h x w x d)	995 x 600 x 1170		mm
	Weight (empty/with water and oil)	215		kg
	Gas connector	¾"		
	Water connector	¾"		
	Inlet air and flue gas pipes	DN 100 (parallel)		
	Grid connection	230 / 50		VAC / Hz

* *ISA conditions are 15 °C and 1.01325 bar dry air.*
** *Depending on system operating conditions such as water return temperature.*



Added Value

- Small footprint
- Low fuel consumption
- Low installation costs
- Low maintenance and operating costs
- Easy installation
- Single phase simple connection to power grid
- Fuel flexibility
- Wide operating envelope
- Separate control of both rotor speed and turbine exit temperature
- Remote control and data acquisition
- Excellent availability of spare parts
- Technology support by MTT engineers
- In use by multiple renowned research institutions in the gas turbine community

Contact us

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