

Computerized Micro Jet Engine Test Facility

Flexible test bed for experiments

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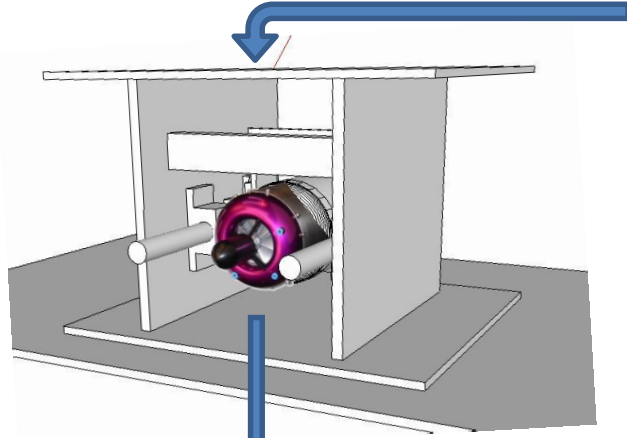
Turbo and Jet Engine Laboratory
Technion

- Basic physics similar to full scale engines
 - Education
 - UAVs
 - Fun



- Measurements of engine performance
- Integrated control of operation and data acquisition
- Easy expandability with additional equipment

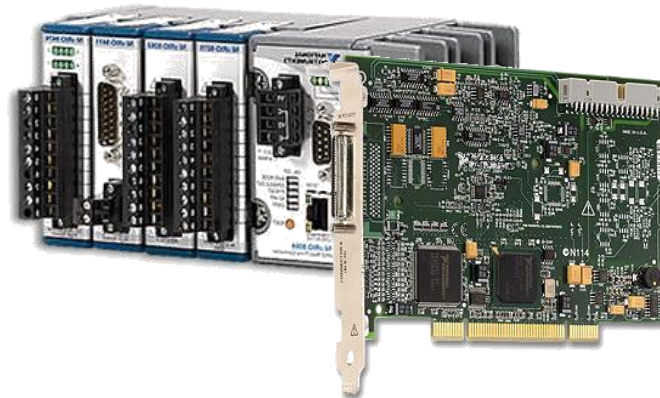
Engine on test stand



Control devices



Sensors

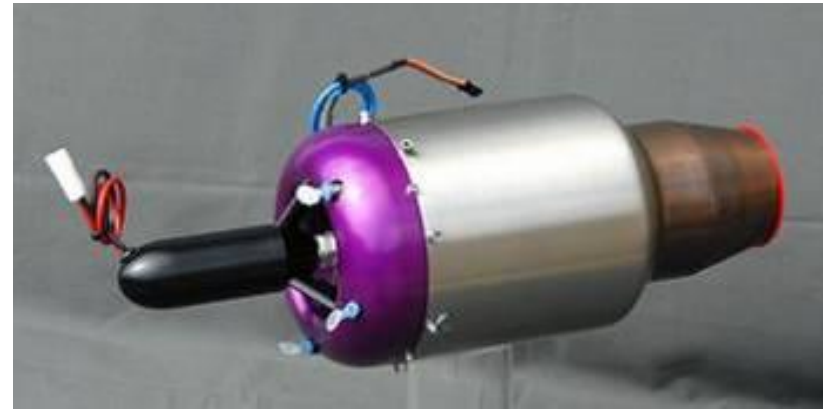


Data acquisition
and control
hardware



PC running
LabVIEW
software

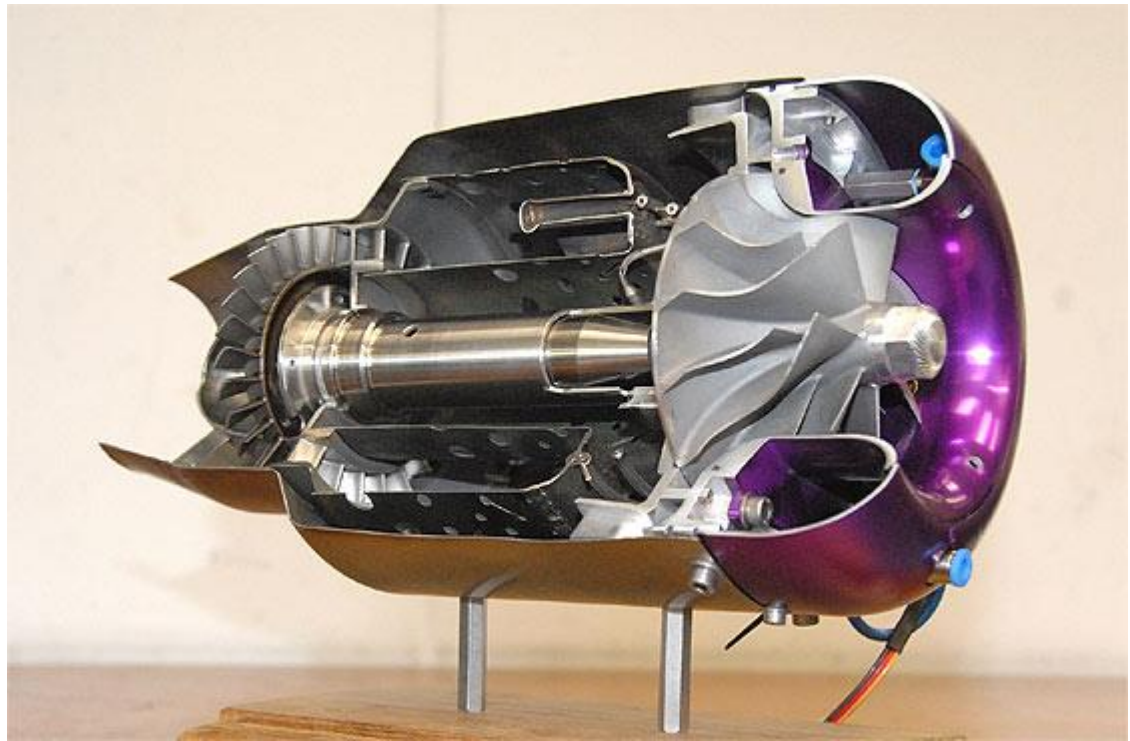
- Representative of the whole category of micro-jets
- Used in scale models, as well as in some less conventional applications



- Diameter: 130mm
- Length: 267mm
- Max. Thrust: 230N

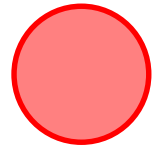
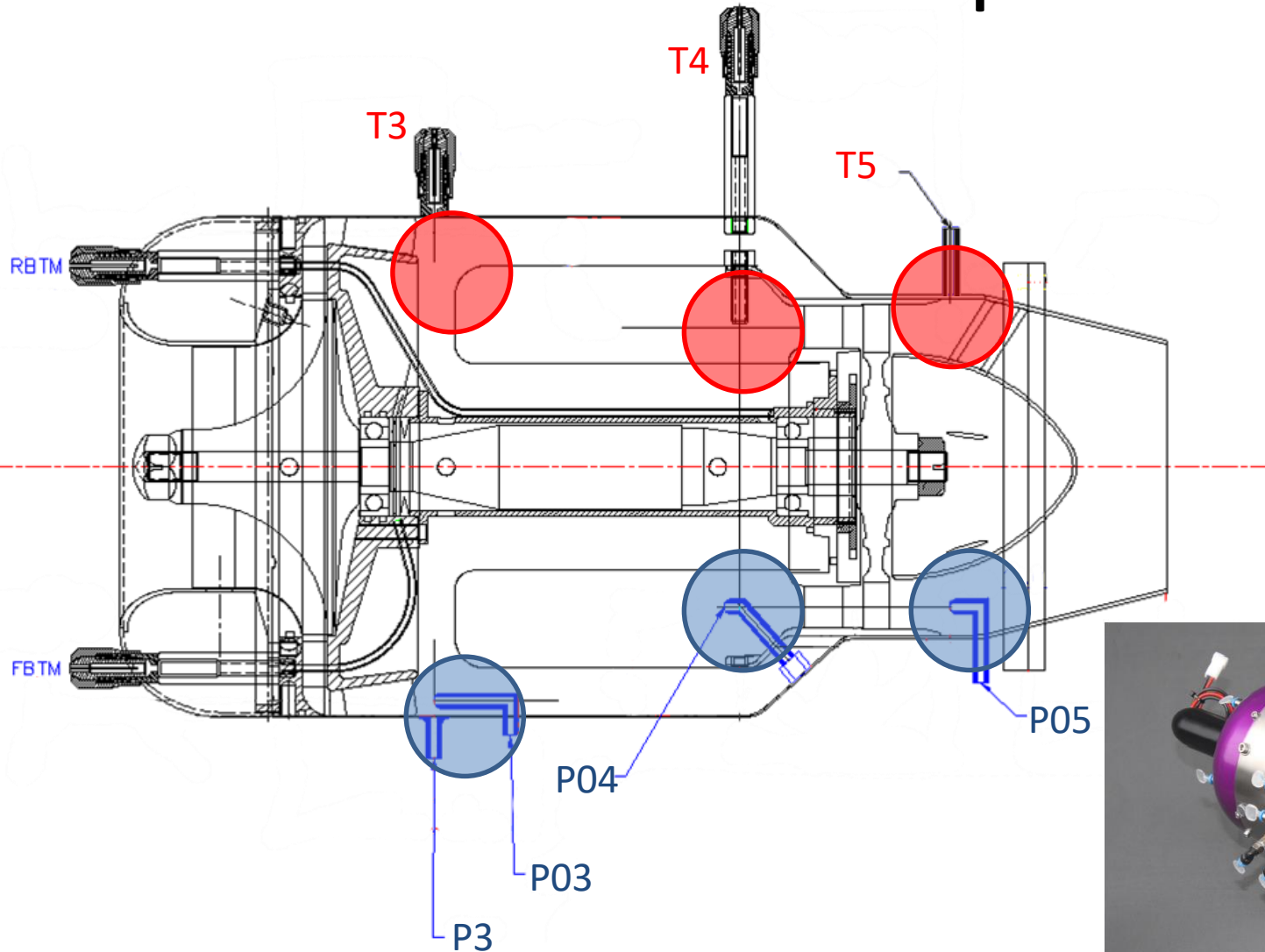


- Single spool
- Radial compressor
- Axial turbine
- Pressure ratio: 4:1
- Max. RPM: 108,000

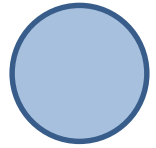


- Compressed air start-up
- Propane gas pre-heating
- Evaporators

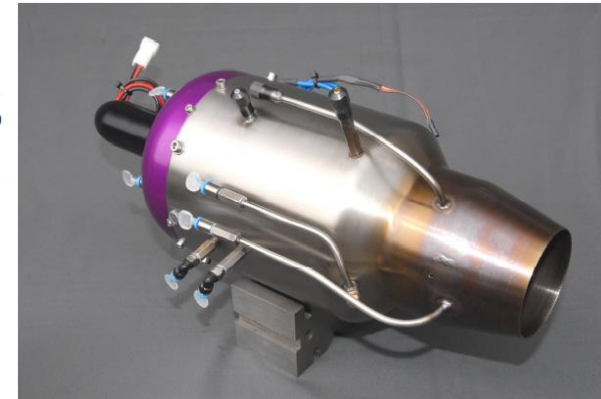
Measurement points



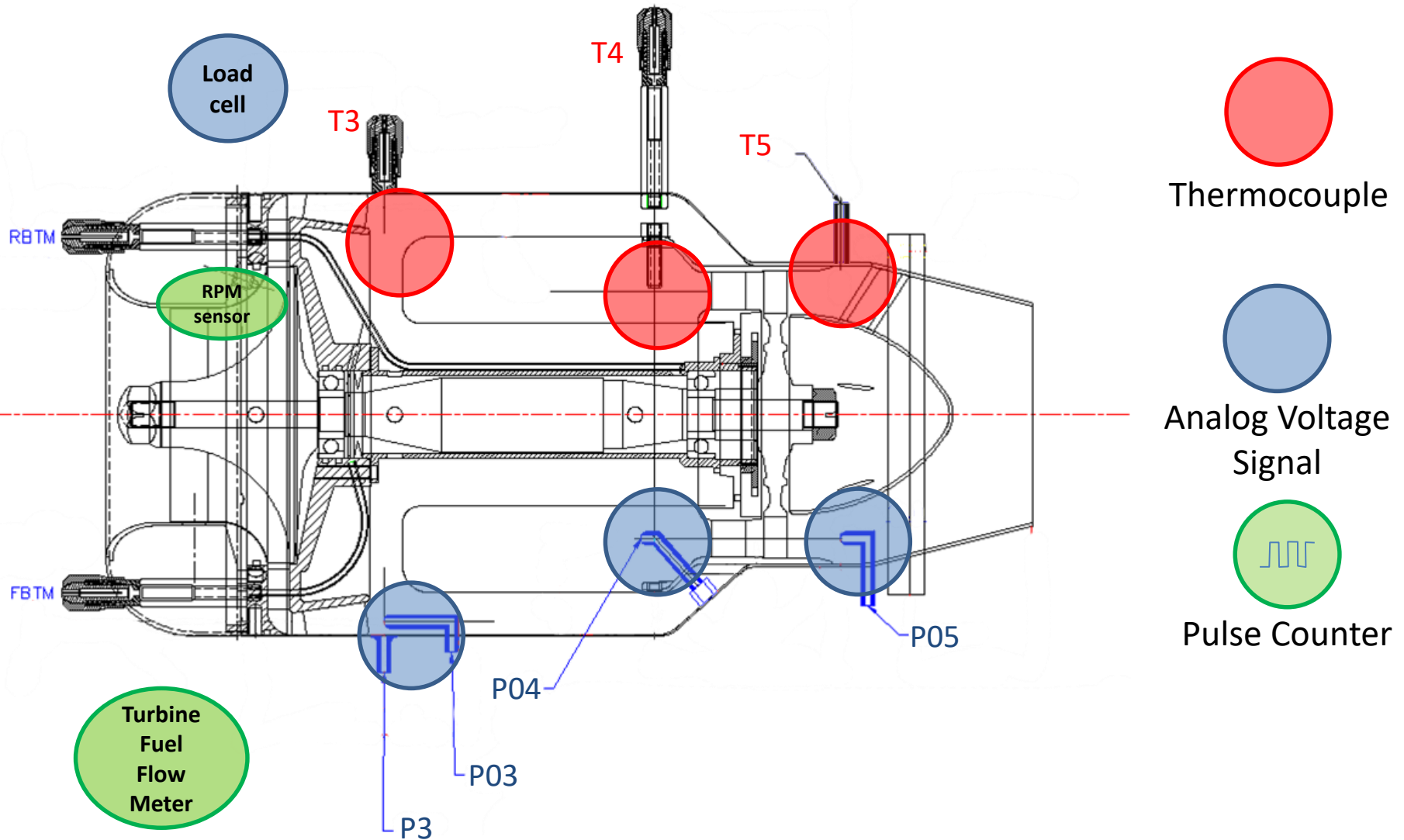
Temperature
Measurement



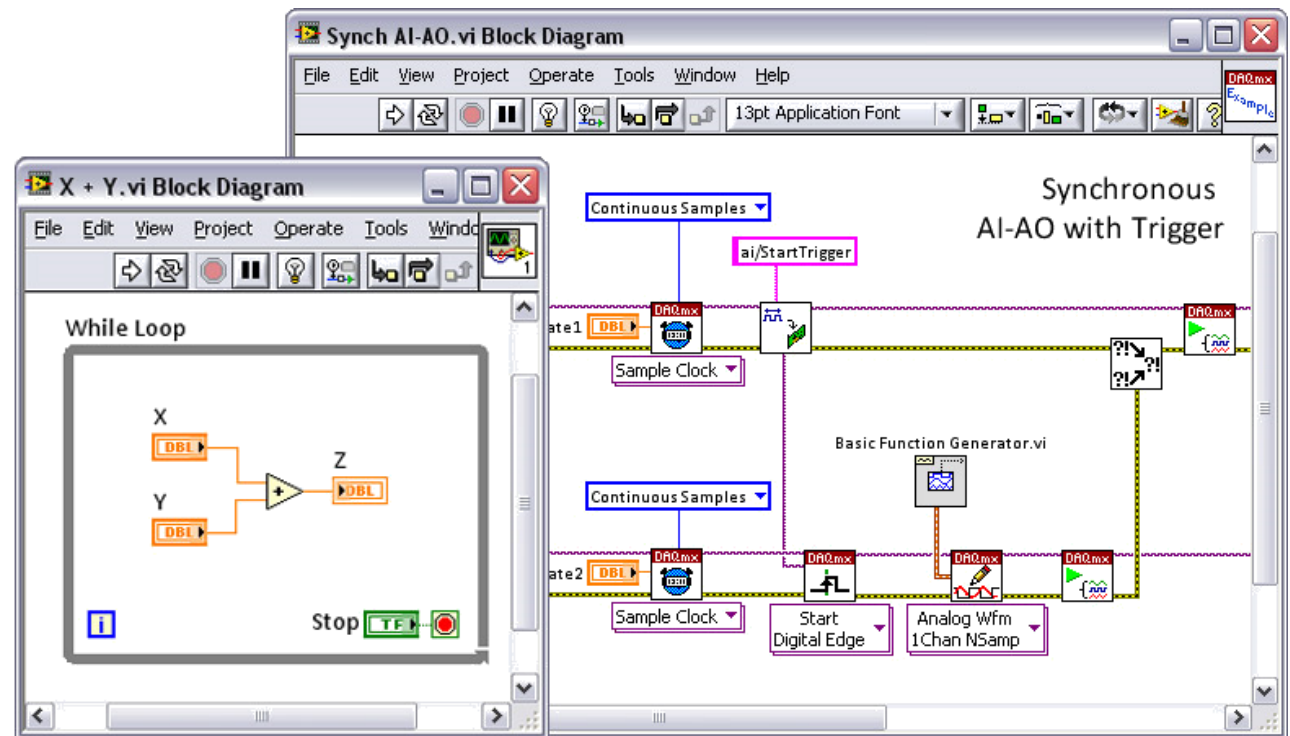
Pressure
Measurement



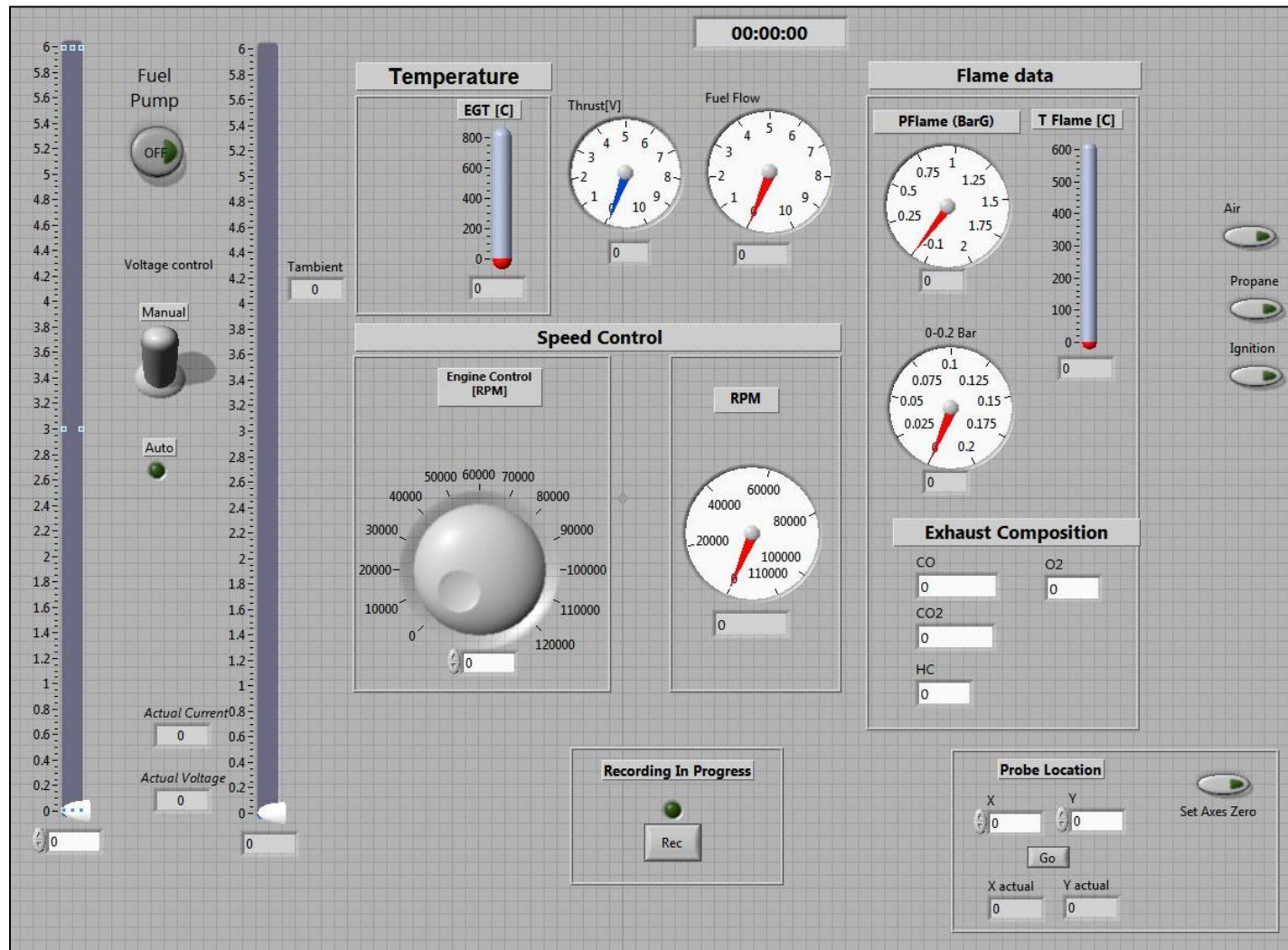
Sensors



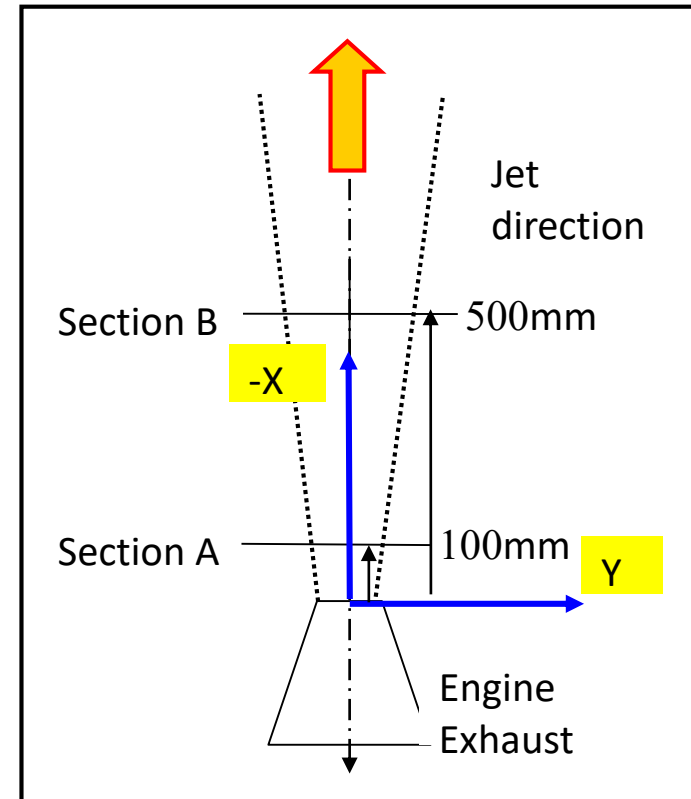
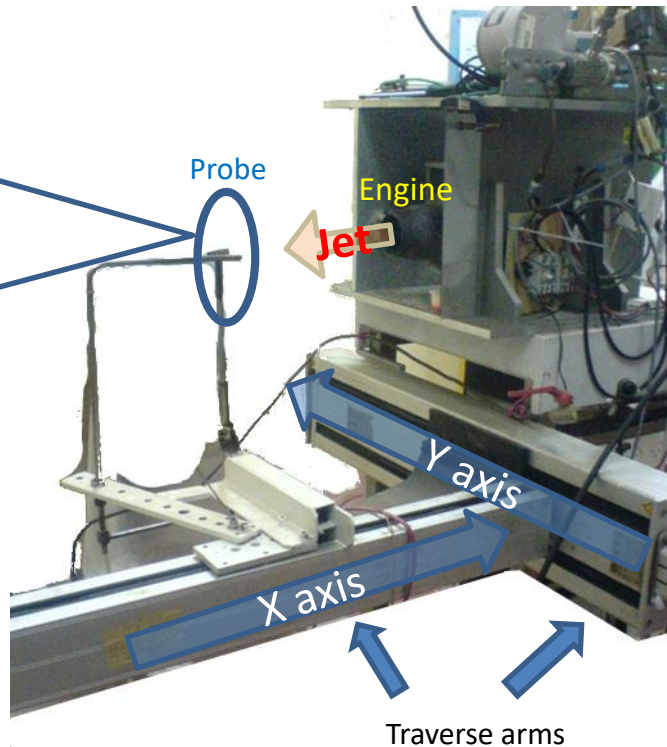
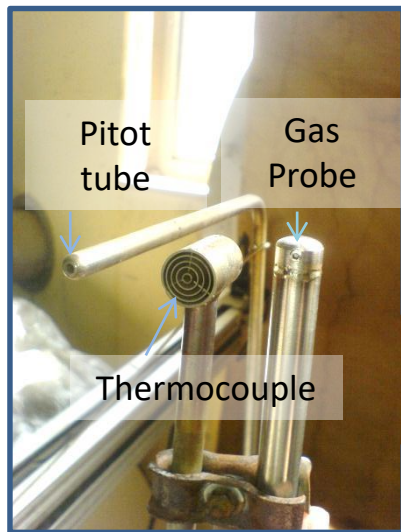
- Graphical programming language
- Evolved specifically for measurement and control
- Rapid software development
- GUI inherent in program

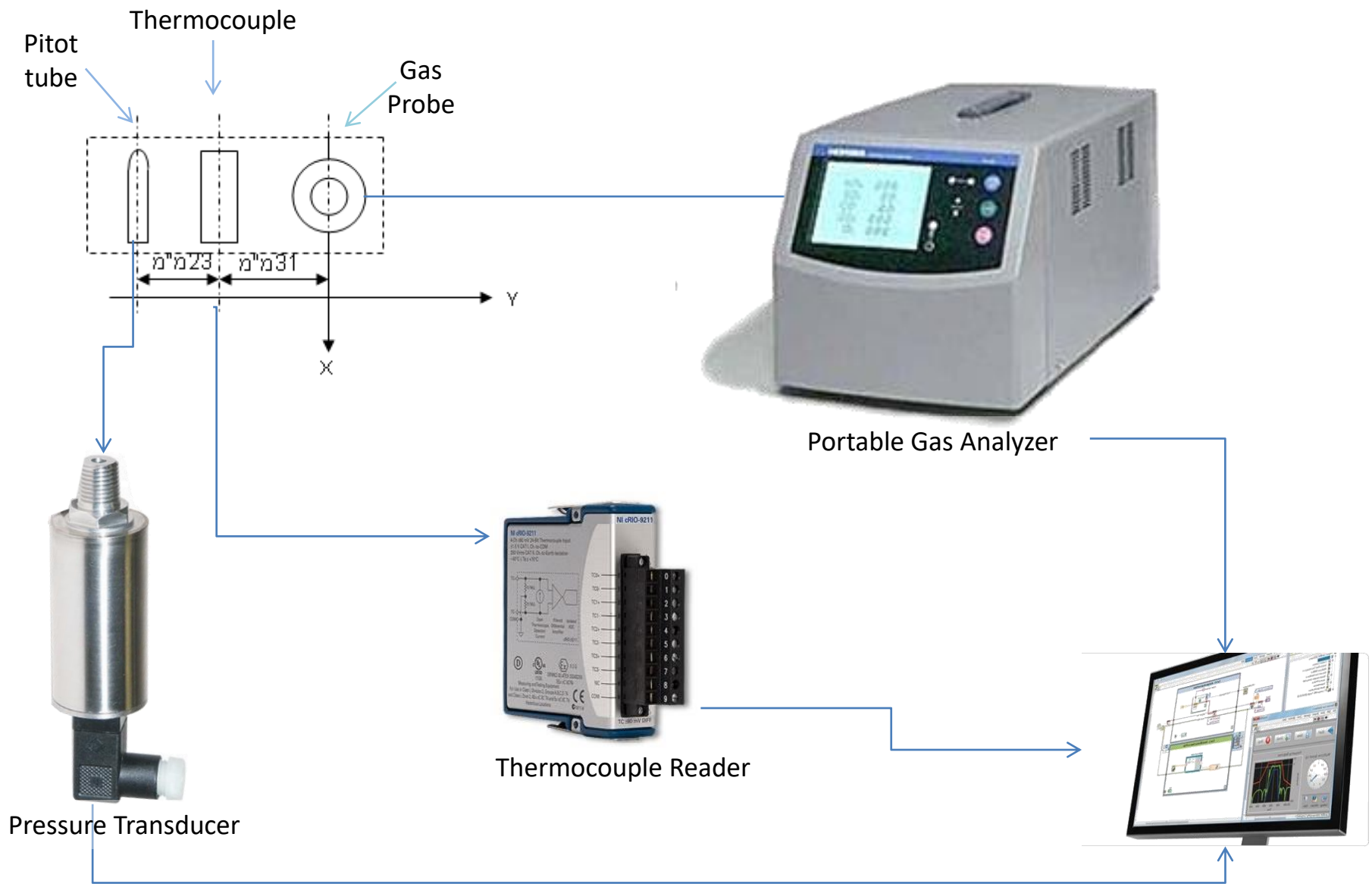


Program Front Panel



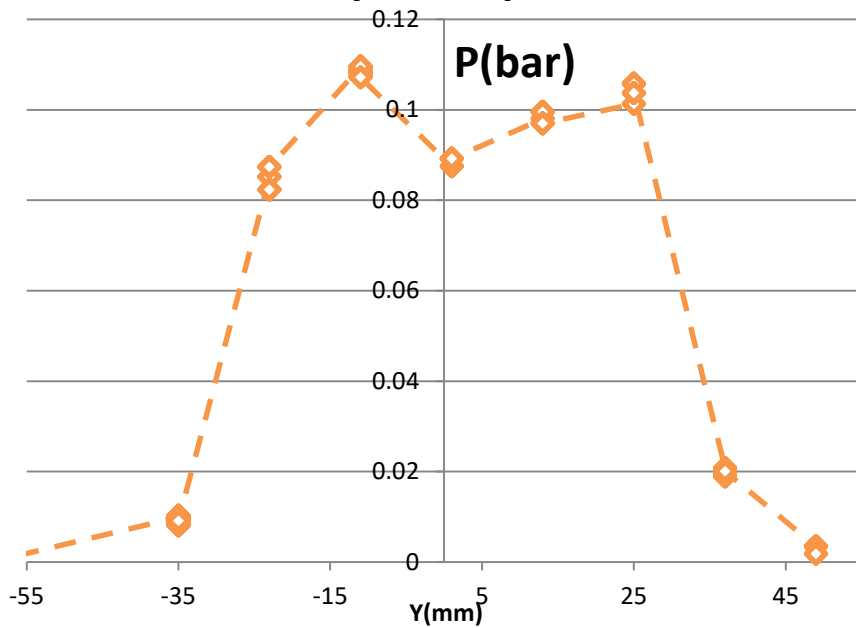
Measurement of exhaust jet flow parameters



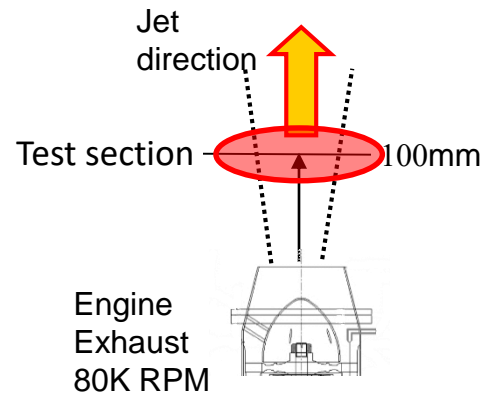
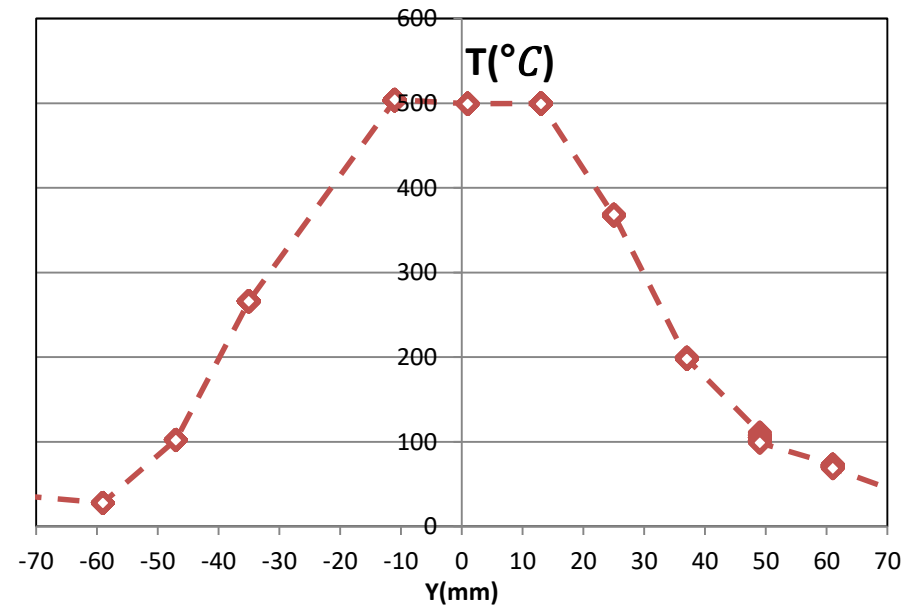


Experiment: probe setup

Dynamic pressure

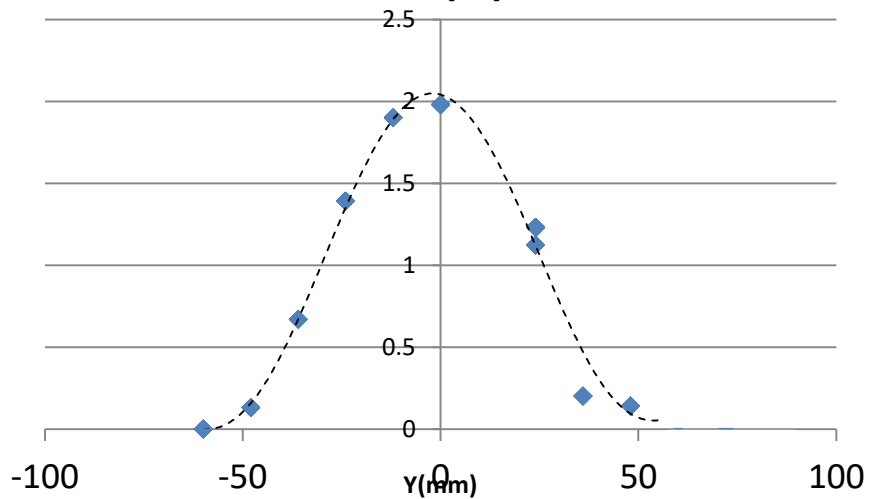


Temperature

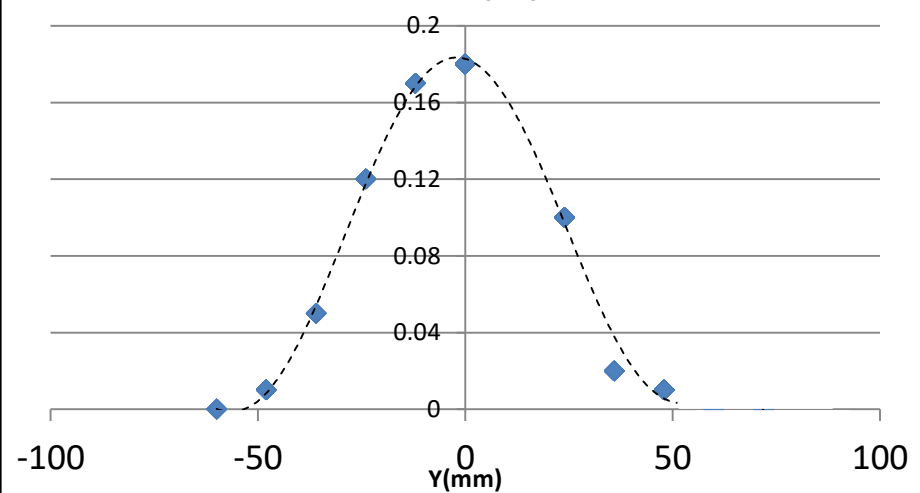


Jet profile, 100mm downstream

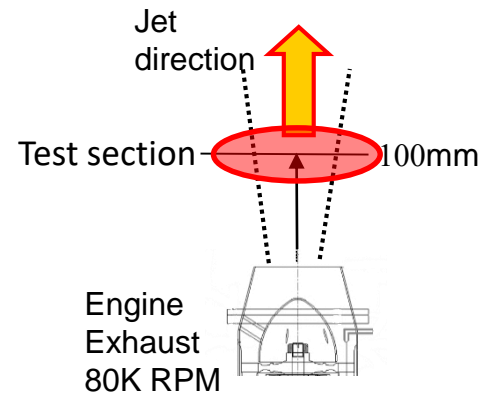
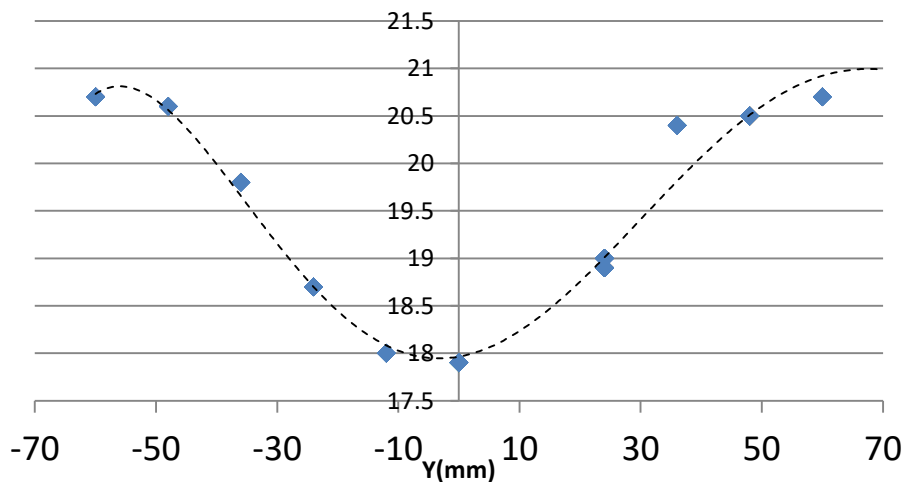
CO₂ (%)

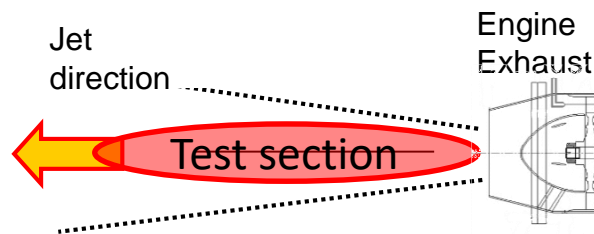
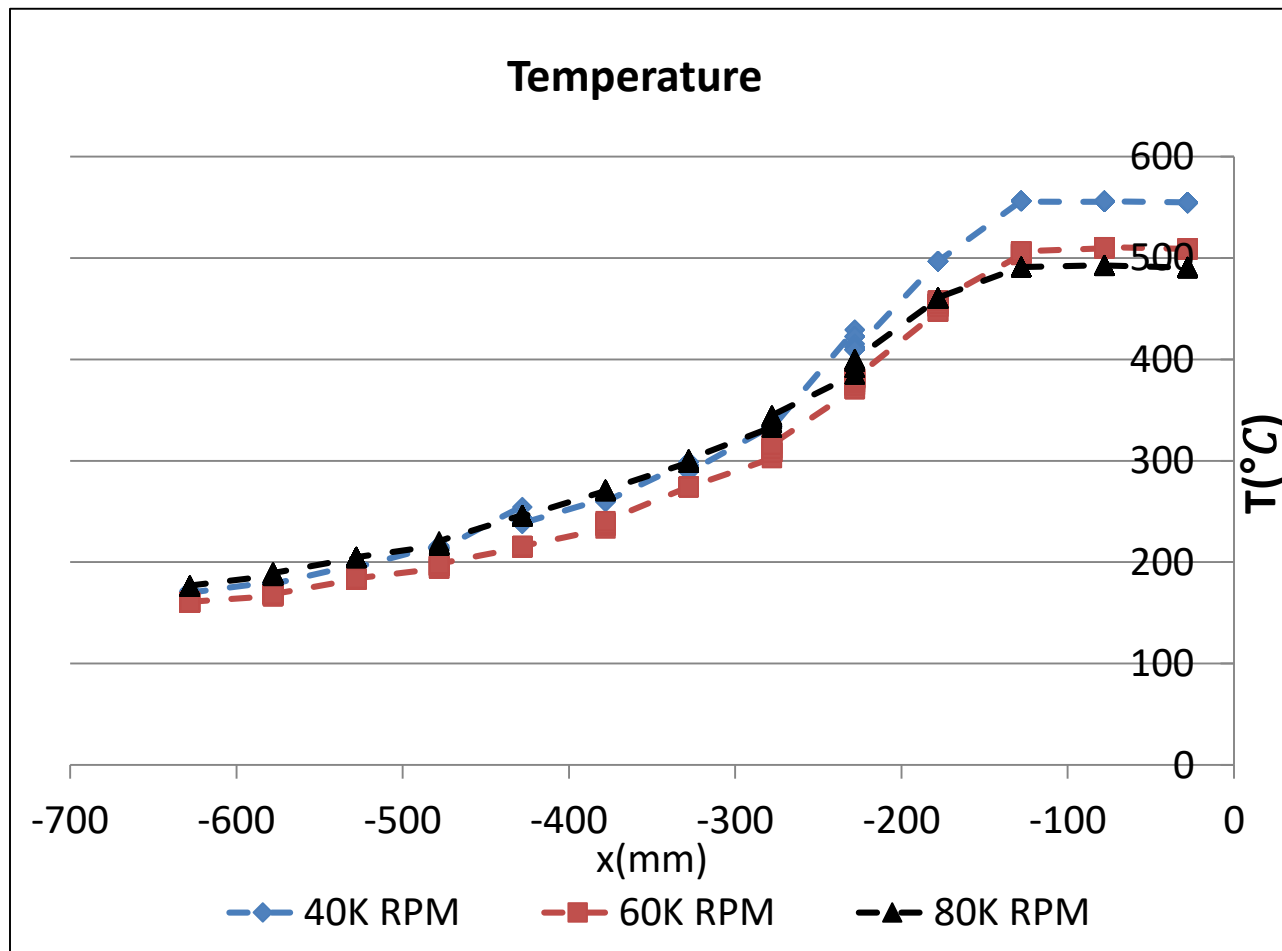


CO (%)

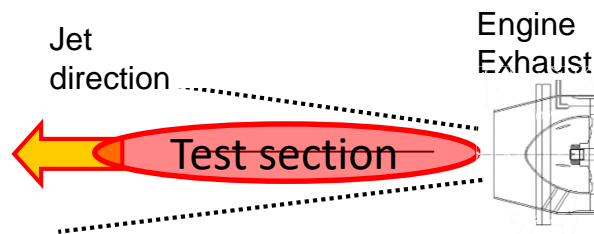
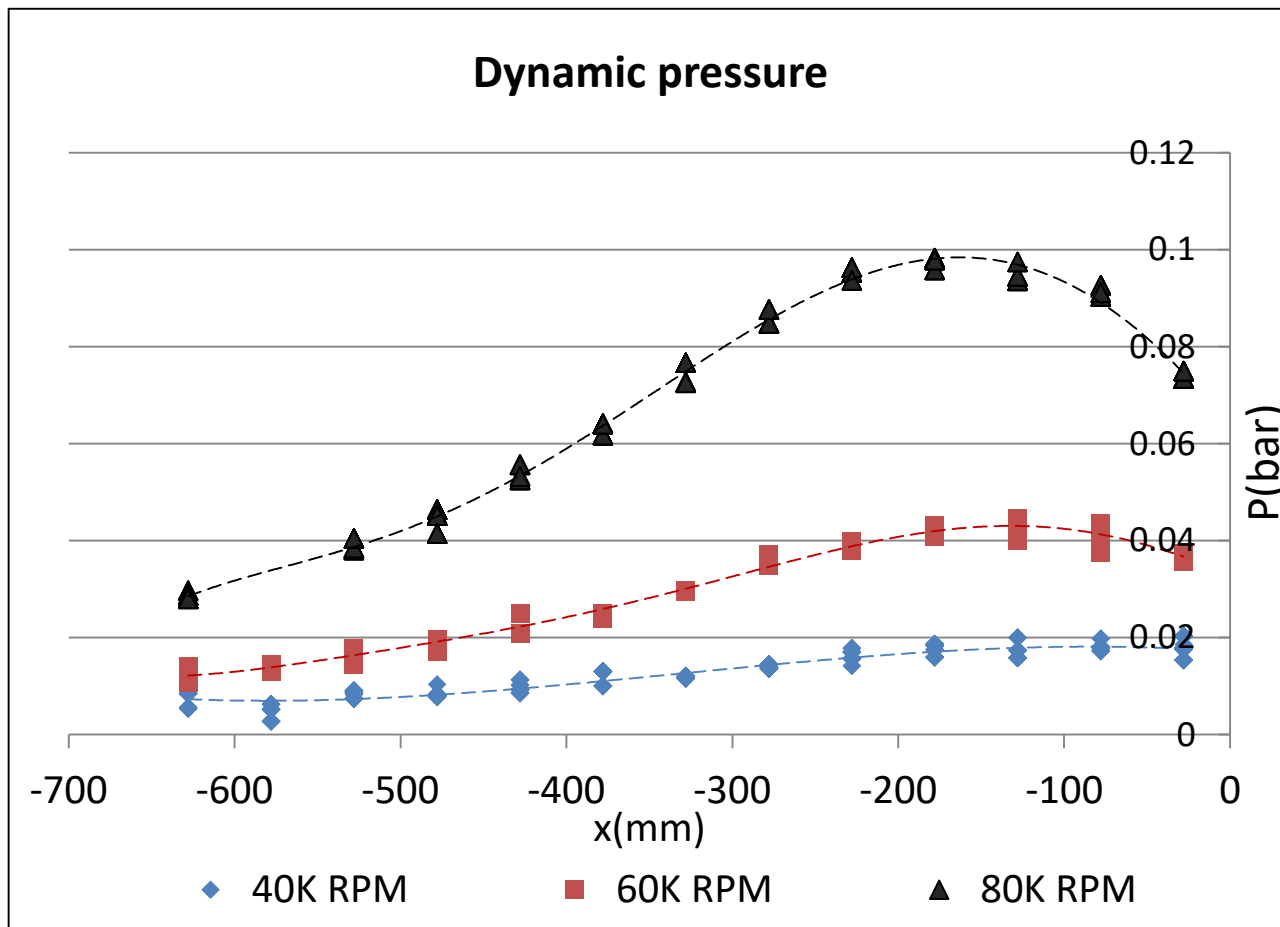


O₂ (%)



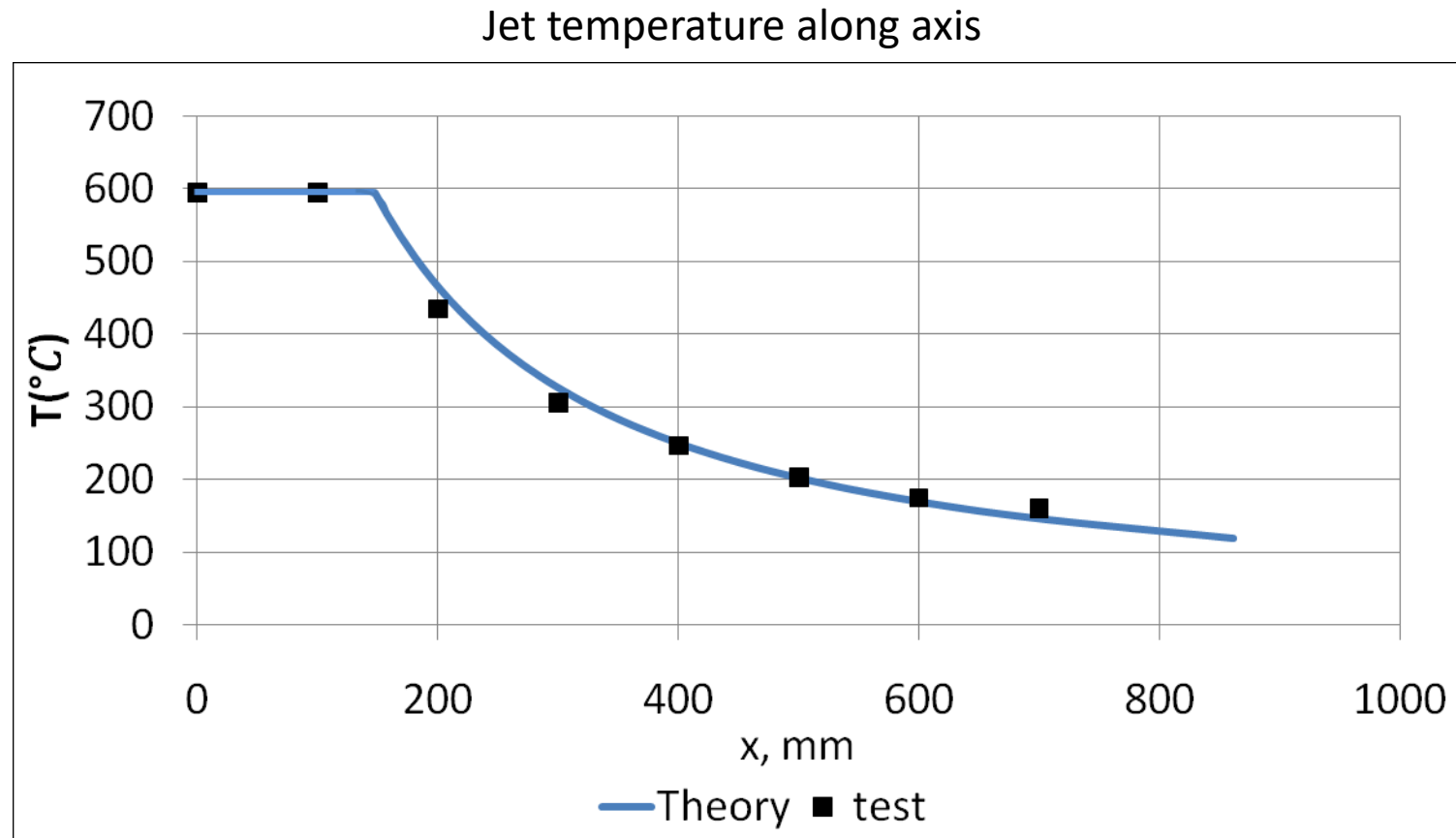


Jet temperature along axis ,
various RPM



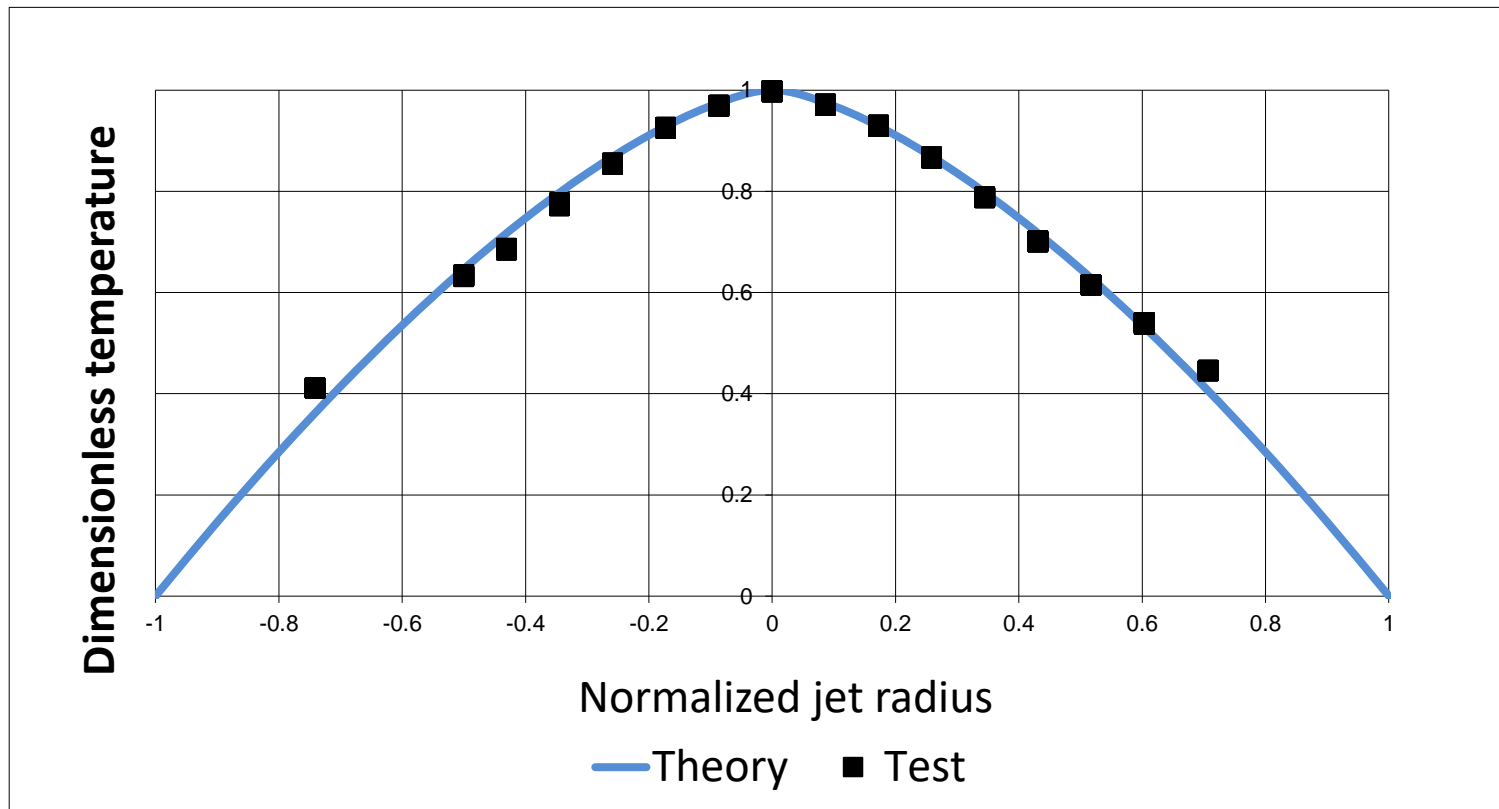
Jet pressure along axis,
various RPM

Comparison of theory and test result

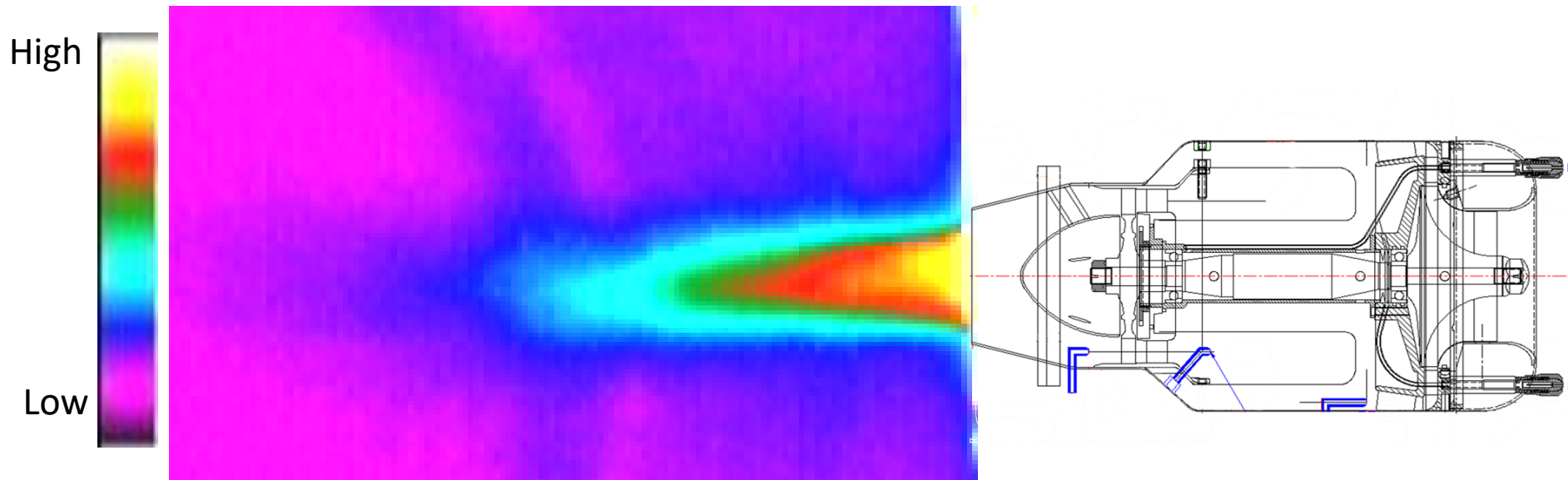


Comparison of theory and test result

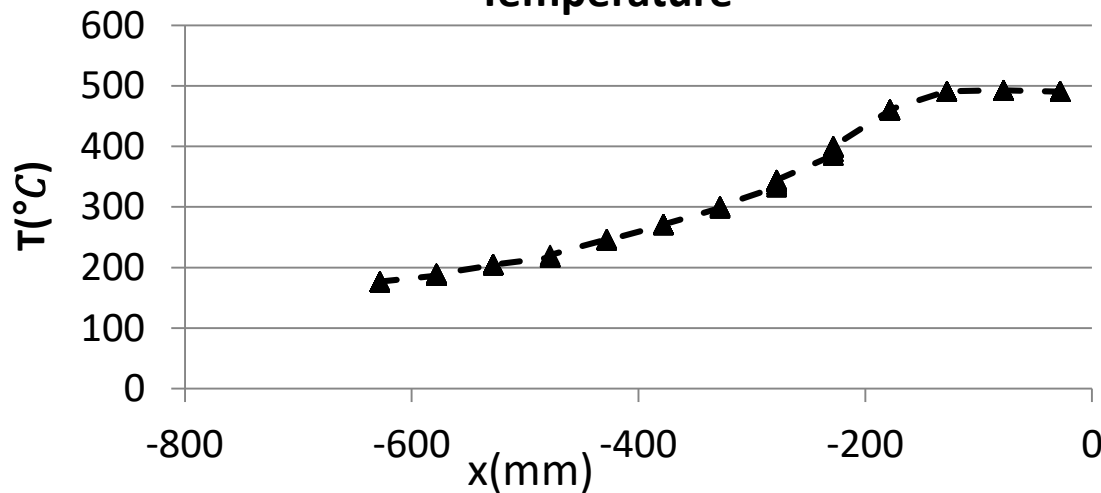
Jet temperature – 500mm downstream



Intensity of IR radiation level

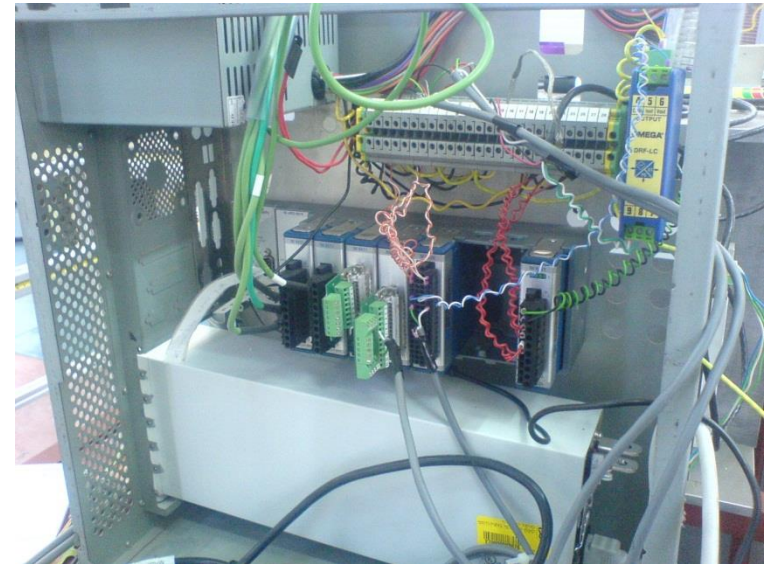
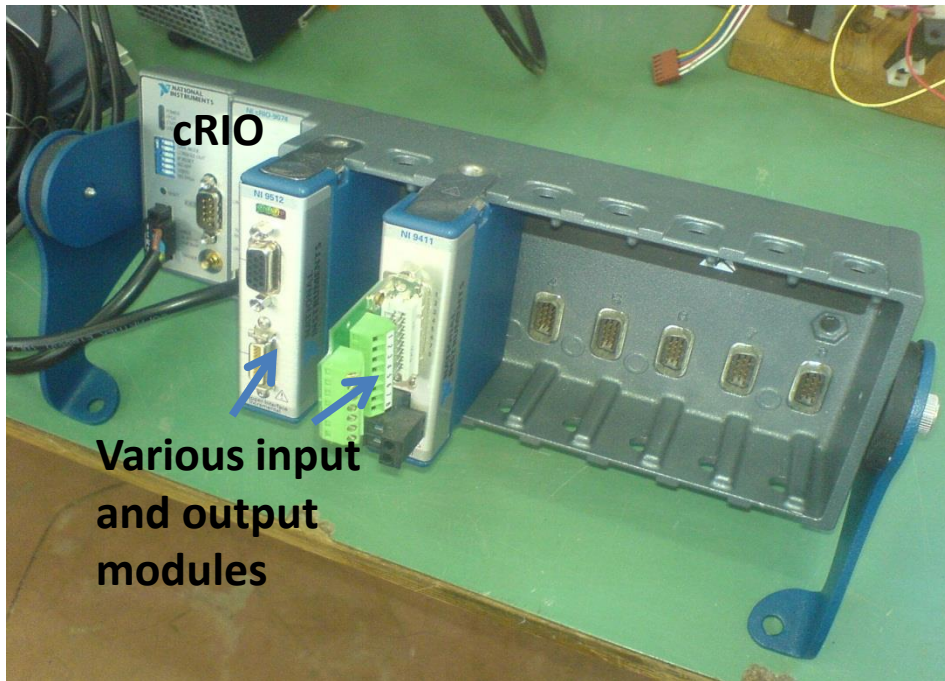


Temperature



Thermal imaging of jet

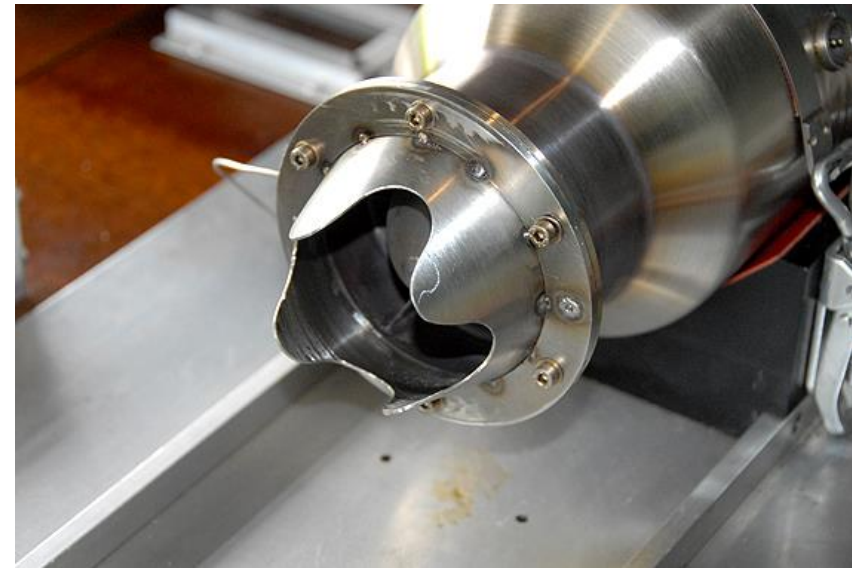
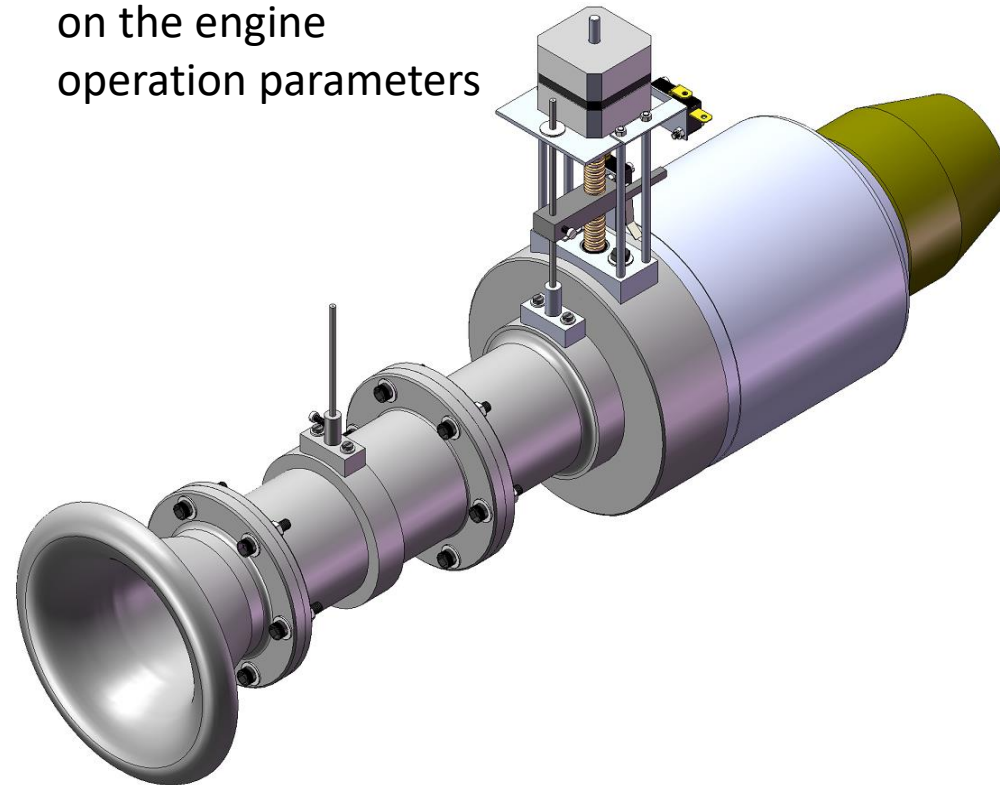
cRIO – reconfigurable input/output system
Includes a real time capable controller, with
interchangeable I/O modules:
analog and digital input and output
thermocouple input
step motor controller etc.



2nd generation test stand
electronics box:
Integrating power supplies,
connection routing,
data acquisition device (cRIO)

Inlet Obstruction testing

A custom made inlet with attachable flow disruption rings. Examination of flow inside the inlet is made via pitot tube. Aim of project is to examine effect of inlet obstructions on the engine operation parameters



Exhaust options

The Olympus engine allows for different exhaust options, such as noise reduction devices (above) or a reheat section.

- A test bench was built with the capability to study the characteristics of various micro-turbine engines
- The system built is highly modular and flexible
- Useful experiments have already been performed
- Much is yet to be done, and we'll be glad to cooperate on this matter

Questions?

