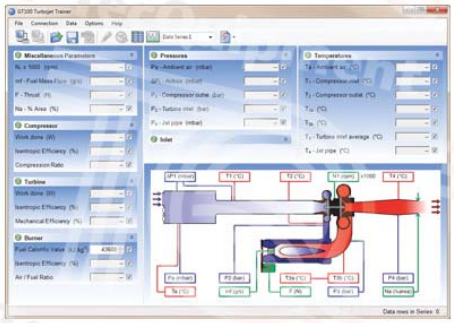
GT100

Turbojet Trainer

Allows detailed experiments that show how a single-shaft gas turbojet works, and tests its performance



Screenshot of the GT100 software (included)

- Uses industrial parts, powered by kerosene for realistic tests and results
- Fully interlocked starting procedure and automatic shut-down
- Automatic data acquisition (ADA) included (supplied with software)
- Supplied with 'Gas Turbine Theory' textbook
- Full schematic coloured instrumentation panel diagram shows students what each part does
- Well proven design – versions installed in universities, technical colleges and military training establishments in 30 countries worldwide

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● An ISO 9001 certified company

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Description

A self-contained, fully instrumented, educational single-shaft gas turbine. Powered by kerosene, the experimental abilities of this high-quality apparatus enable comprehensive practical investigations into the principles, and performance of single-shaft gas turbines.

It is a steel frame that holds a gas generator, combustion chamber, oil and fuel tanks, pumps, ancillaries and guards. Above these is an instrumentation and control panel with schematic diagram. The clearly labelled front panel with mimic diagram includes the instrument displays, controls and warning lights.

Air passes into an air box, into a compressor, then into the combustion chamber. A pump transfers fuel from the fuel tank to spray through a special nozzle into the combustion chamber. A high-energy spark ignites the air and fuel mixture, that flows to radial flow turbine, then a variable area propelling nozzle. The exhaust gases then discharge to a suitable exhaust system. The combustion chamber gives excellent combustion, low pressure loss and good flame stability over a wide range of conditions. A fuel flow control valve on the instrumentation and control panel regulates the speed. This design reduces the possibility of overspeed.

The equipment has an oiling system including filters and water-cooled oil.

Starting is semi-automatic and fully interlocked, controlled by a start up and shut down logic system. For protection of the equipment and user, it shuts down the turbine if the user makes an error.

Digital indicators show shaft speed, pressures, temperatures and fuel flow. Analogue indicators show fuel level, fuel pressure, oil temperature, oil pressure and hours run.

This equipment connects to your computer (computer not supplied) and includes dedicated, user-friendly data acquisition software. This allows students to display, graph and analyse all relevant variables, and save their results for later analysis. The data acquisition system includes adaptors and leads, and the software is supplied on CD-ROM.

Supplied with the equipment is a detailed textbook that covers the theory and use of gas turbines.

Standard Features

- Supplied with a comprehensive user guide and textbook
- Five-year warranty
- Manufactured in accordance with the latest European Union directives

Experiments

Various investigations into single-shaft turbine thrust jet performance, including:

- Effect on thrust generation by variation in rotational speed and propelling nozzle area
- Isentropic, polytropic and mechanical efficiencies of compressor, combustion chamber and turbine
- Pressure ratios of turbine, compressor and non-dimensional characteristics
- Combustion chamber pressure losses and combustion efficiencies
- Specific fuel consumption, thermal efficiency, air standard cycle, work ratio and heat balance

Recommended Ancillary

A computer with:

- Intel® Pentium® 4 or equivalent processor operating at 2 GHz
- 512 MB of RAM
- SVGA monitor that works with 16-bit colour, 1024 x 768 resolution
- CD-ROM drive
- RS232 D-type serial COM port or USB (RS232 to USB Adaptor supplied)
- 500 MB of hard disc space
- Standard two-button mouse (three-button mouse with scroll wheel is better)

Recommended operating systems:

- Microsoft® Windows XP, Vista, 7 and 8

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Specification

Note: All performance specifications are nominal and determined by local conditions.

Nett dimensions and weight:
1350 mm x 1700 mm x 750 mm and 260 kg (with no fuel or oil)

Approximate packed dimensions and weight:
3.6 m^3 and 450 kg

Fuel:
High-quality aviation kerosene: ASTM D 1655 Jet A or similar

Lubricating oil:
SAE 10W-40 multigrade turbo diesel oil

Speed range:
50 000 to 90 000 $rev.min^{-1}$

Approximate maximum thrust:
44 N

Note: Local operating conditions, such as air and fuel quality will affect maximum thrust.

Digital instruments:
Shaft speed, Pressures, Temperatures, Fuel flow, Thrust and Nozzle area

Analogue instruments:
Fuel level and pressure, Oil temperature and pressure, Filter condition and Total hours run

Essential Services

Floor space needed:
For the product - roughly 1500 mm x 1500 mm of solid, level floor, adjacent to an outside wall with exhaust duct.

For refuelling and maintenance access - an additional 500 mm to the rear and 1000 mm each side of the product.

Electrical supply:
230 VAC, 50 Hz a.c. single-phase 17 A

or

220 VAC, 60 Hz a.c. phase-phase 17 A

Water supply and drain:
At least 18 litres per minute, assuming a cold water supply at less than 10°C

Exhaust duct system:
At least 200 mm diameter heat-resistant material, vented directly to atmosphere.

Note: your local conditions affect how you direct your exhaust to atmosphere, so TecQuipment does not supply a complete exhaust system.

Oil breather vent:
19 mm diameter, direct to atmosphere

Room ventilation:
Roughly 4000 m^3/h assuming standard 20°C room temperature

Operating Conditions

Operating environment:
Dry and well-ventilated engine test laboratories

Storage temperature range:
–25°C to +55°C (when packed for transport)

Operating temperature range:
+5°C to +40°C

Note: the flash point of kerosene can be as low as 37°C, so keep your working environment below 35°C.

Operating relative humidity range:
30% to 95% (non-condensing)

Sound Levels

This equipment emits sound levels greater than 90 dB(A).

TecQuipment recommend that you wear ear defenders when you work with or near to this equipment.

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