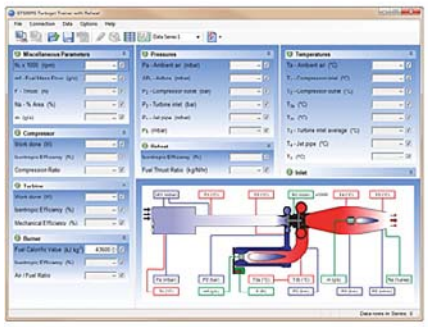
TURBOJET TRAINER WITH REHEAT

GT100RS

Trolley-mounted, mobile apparatus that allows detailed experiments on how a single-shaft gas turbojet with reheat (afterburner) works, and tests its performance.



SCREENSHOT OF THE GT100RS SOFTWARE (INCLUDED)

KEY FEATURES

- Uses industrial parts, powered by kerosene for realistic tests and results
- Includes reheat (afterburner) section
- 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, examples installed in universities, technical colleges and military training establishments in 30 countries worldwide

TECQUIPMENT LTD, BONSALL STREET, LONG EATON, NOTTINGHAM NG10 2AN, UK
TECQUIPMENT.COM +44 115 972 2611 SALES@TECQUIPMENT.COM

TECQUIPMENT

TURBOJET TRAINER WITH REHEAT

GT100RS

DESCRIPTION

A self-contained, fully instrumented, educational single-shaft gas turbine with reheat. 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 with reheat.

This product helps students to understand the use of this 'engine' with additional exhaust nozzle control, on practical applications such as jet aircraft.

A steel frame 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 control panel with mimic diagram includes the instrument displays, controls and warning lights.

Air passes into an air box, through a calibrated nozzle 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 a radial flow turbine, then to the reheat section. This increases the temperature and velocity of the gas. It then passes through 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 turbine speed. This design reduces the possibility of overspeed. A separate control adjusts the fuel flow to the reheat section. A second high-energy spark in the reheat section ignites the reheat fuel. This creates a secondary burn (or afterburn), using some of the remaining oxygen in the hot exhaust gases leaving the turbine.

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

A PLC (programmable logic controller) controls the turbine start up and shut down. For protection of the equipment and user, it shuts down the turbines if the user makes an error. It also switches on cooling fans after running.

Digital and analogue indicators show all the important readings from the sensors around the equipment, such as pressures, temperatures, fuel flow and level.

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.

LEARNING OUTCOMES

Turbine, reheat and nozzle tests to find key performance information such as:

- Specific thrust and fuel consumption
- Pressure losses and ratios
- Thermal, propulsive, isentropic and mechanical efficiencies
- Work and power
- Thrust with and without reheat
- How the variable area nozzle affects thrust

STANDARD FEATURES

- Supplied with a comprehensive user guide and textbook
- Five-year warranty
- Manufactured in accordance with the latest European Union directives
- ISO9001 certified manufacturer

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

TURBOJET TRAINER WITH REHEAT

GTI00RS

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 +35vC

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 100 dB(A)

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

SPECIFICATIONS

TecQuipment is committed to a programme of continuous improvement; hence we reserve the right to alter the design and product specification without prior notice.

NETT DIMENSIONS AND WEIGHT:

1385 mm (wide) x 1200 mm (depth) x 1721 mm (height) and 260 kg (with no fuel or oil)

APPROXIMATE PACKED DIMENSIONS AND WEIGHT:

3.8 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

GAS GENERATOR TURBINE:

Maximum continuous speed:
Approximately 100000 $rev.min^{-1}$

APPROXIMATE MAXIMUM THRUST:

50 N

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

INSTRUMENTS:

- Shaft speed
- Pressures
- Temperatures
- Thrust
- Fuel flow, level and pressure
- Oil temperature and pressure
- Nozzle area
- Total hours run

AUTOMATIC SHUT DOWN CONDITIONS:

- Ignition failure
- Incorrect turbine speed
- Oil pressure failure
- Water supply failure
- Incorrect temperatures

EXHAUST EMISSIONS (TYPICAL):

- Carbon dioxide (CO2): 1.8 – 2.9%
- Carbon monoxide, (CO): 240 – 900 ppm*
- Nitric oxide, (NO): 11 – 26 ppm
- Nitrogen dioxide, (NO2): 0 – 1 ppm
- Combination of NO and NO2, (NOX): 12 – 26 ppm
- Sulphur dioxide, (SO2): 5 – 6 ppm

***NOTE:** with reheat on, the CO levels can increase to 1700 ppm at a low engine speed.

TECQUIPMENT LTD, BONSALL STREET, LONG EATON, NOTTINGHAM NG10 2AN, UK
TECQUIPMENT.COM +44 115 972 2611 SALES@TECQUIPMENT.COM

TECQUIPMENT