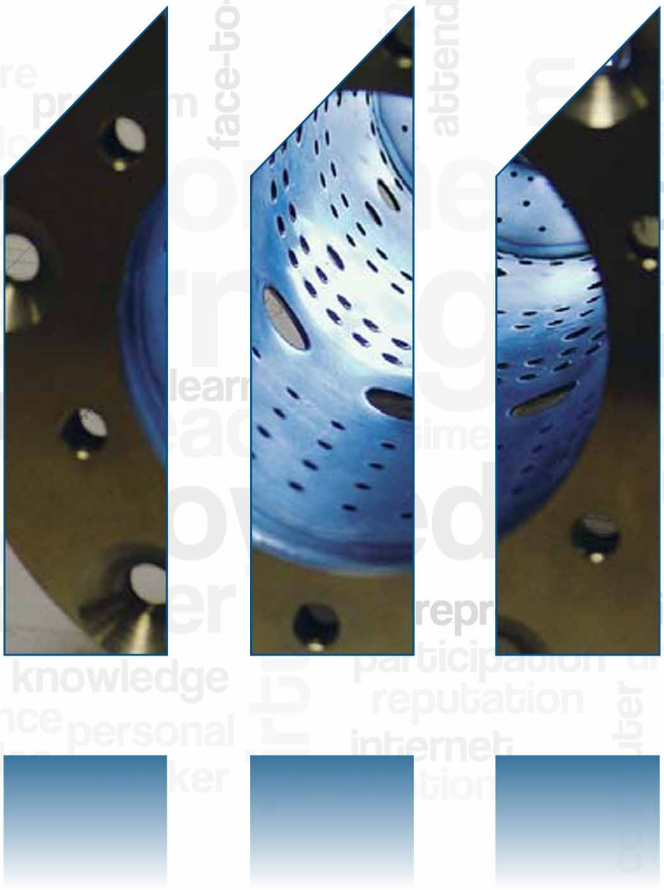


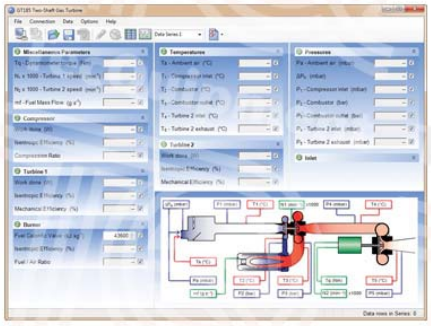
Thermodynamics

infoWERK
medien & technik

GT185

Two-Shaft Gas Turbine

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



Screenshot from the GT185 ADA 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)
- Direct-coupled (no belts) eddy current dynamometer for accurate loading, speed control and true shaft power measurement
- Supplied with 'Gas Turbine Theory' textbook
- Full schematic 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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TecQuipment

GT185 Two-Shaft Gas Turbine

Description

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

This product helps students to understand the use of this 'engine' with a secondary power turbine, on practical applications such as helicopters or electrical power generators.

A steel frame holds a gas generator, power turbine, 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 through a calibrated nozzle and 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 a gas generator turbine. 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.

Hot gas from the gas generator turbine passes through a short duct to the power turbine. The short duct reduces heat losses to atmosphere. The exhaust gases then discharge to a suitable exhaust system.

The power turbine couples direct to an eddy current dynamometer, so there are no belts to adjust. A load cell on the dynamometer measures torque and a sensor measures the dynamometer speed, to allow calculation of true shaft power. A control on the instrumentation and control panel adjusts the load of the dynamometer (and therefore speed of the power 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 specialist, user-friendly data acquisition software. This allows students to display, graph and analyse all relevant variables, and save their results for later analysis. Supplied on a CD-ROM, the data acquisition system includes a connection cable.

TecQuipment supply a detailed textbook with the equipment. The textbook covers the theory and use of gas turbines.

Experiments

Turbine tests to find key performance information such as:

- Specific fuel consumption
- Pressure losses and ratios
- Thermal, isentropic and mechanical efficiencies
- Work and power

Standard Features

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

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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GT185 Two-Shaft Gas Turbine

Specification

Nett dimensions and weight:
1385 mm (width) x 825 mm (depth) x 1721 mm (height) and 360 kg (with no fuel or oil)

Approximate packed dimensions and weight:
4.12 m^3 and 460 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 90000 $rev.min^{-1}$

Power turbine (and dynamometer):
Maximum continuous speed: 40 000 $rev.min^{-1}$

Instruments:
- Shaft speeds
- Pressures
- Temperatures
- Torque
- Fuel flow, level and pressure
- Oil temperature and pressure
- Dynamometer brake load
- Total hours run

Automatic shut down conditions:
- Ignition failure
- Incorrect turbine speeds
- Oil pressure failure
- Water supply failure
- Incorrect temperatures

Exhaust emissions (typical):
- Carbon dioxide (CO_2): 1.8 – 2.9%
- Carbon monoxide, (CO): 240 – 900 ppm
- Nitric oxide, (NO): 11 – 26 ppm
- Nitrogen dioxide, (NO_2): 0 – 1 ppm
- Combination of NO and NO_2, (NOX): 12 – 26 ppm
- Sulphur dioxide, (SO_2): 5 – 6 ppm

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 100 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.

*The GT185 includes a length of metal flexible hose to help with your exhaust.

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 +35°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 recommends that you wear ear defenders when you work with or near to this equipment.

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infoWERK is a leading expert in the development of eLearning courseware, learning system solutions, teaching and AV equipment.

Furthermore infoWERK is the representative and system integrator of "TecQuipment".

TecQuipment is one of the global leaders in technical teaching equipment for engineering. If you are interested in one of TecQuipment's products feel free to contact us at:

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