INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai 400076.

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Technical Specifications of Gas Turbine Engine

(Detailed technical specifications of Gas Turbine Engine)

Section-A:

1. Product specification:

Number	Specification	Specification in Details	QTY
1	**Gas turbine engine**	• Engine Type: Turbojet turbine • Diameter (Maximum): 135 mm • Turbine weight (Maximum): 3000 g • Compressor: Single-stage radial compressor • Combustion chamber: Annular combustion chamber • Turbine: Single-stage axial flow turbine • Thrust at max. RPM: At least 225 N • Thrust at min. RPM: At least 12 N • Exhaust gas temperature (Maximum): 750 Deg. Celsius	1
2	**Sensor measurements**	• Temperature measurement at intake • Temperature measurement behind the diffusor stage • Temperature measurement before nozzle guide vanes • Temperature measurement after turbine wheel • Temperature measurement at exhaust nozzle • Fuel flow rate • Thrust • Engine Shaft speed	1 each

3	**Engine control unit (ECU)**	• One or Two-channel operation • Output for fuel solenoid valve • Output for igniter solenoid valve • Output for igniter • Output for E-starter • Programmable failsafe timer • Logfile of engine run • Software for fast throttle response • All high-quality cables with gold plated connectors • Standard "K type" EGT probe connector **A) ECU Outputs** • Engine status • Exhaust gas temperature (EGT) • Rotation speed (RPM) • Throttle channel (receiver) Voltage out **B) Buzzer beeps** • The ECU should have a built-in buzzer that functions as an indicator of the actual status of the system	1
4	**Analog control box**	• Analog ECU facilitating control inputs with DC signals between 0 and 5 v. • Analog ECU to be operated with an analog control box containing a throttle knob 0-100% and a switch to operate the ECU. • Analog control box cable of a minimum length of 2 meters.	1
5	**RS-232 serial protocol**	Standard ECU to have control inputs (throttle and switch) that work with PWM signals or with an RS-232 serial protocol. Shall provide reliable and effective communications over a serial link.	1
6	**Software interface**	For a running engine, the following information is to be logged: • RPM of the shaft • Exhaust gas temperature • Throttle channel • Switch channel, or throttle trim @ single-channel operation • Fail-safe condition if occurred • Number of fail-safes during the last engine run • Supply voltage of ECU • Pump voltage • Status of ECU (e.g., start up, max RPM set, error messages)	1

		• Reason for last stop • For each engine run, all engine settings & sensor measurements are to be stored • Each run with its unique engine number and time • Total running time and run time of the last run	
7	**Engine data terminal (ETD) tab**	• The EDT is to be microprocessor controlled and shall display all the engine data in real-time mode on LCD display. • The EDT must be connected to the serial communication/Telemetry port of the ECU, which provides the data output.	1

B) Installation & Commissioning: The GTE facility shall be installed in full functionality and handed over in fully functional condition to IITB at the location designated for delivery.

C) Maintenance: IITB Unit will nominate a few people for thorough training by the vendor/manufacturer to carry out necessary maintenance and troubleshooting. They will also work with the vendor/manufacturer as a point of contact for remote diagnostics using the internet and minor fixes and repair activities.

D) Warranty: A minimum of Three-year warranty on-site from the date of commissioning. During the warranty period, any un-serviceability in the GTE facility has to be attended to and rectified by the seller at the installation site. All Repair/Replacement/Spares cost during the warranty period will be fully borne by the seller. Original equipment manufacturer (OEM) should bear to and fro freight charges during the warranty period.

E) Integration of hardware plus software:

Kindly specify:

a. The time required for installation and commissioning
b. The requirement of civil, electrical, plumbing work, etc. to be carried out by IIT for the GTE facility
c. Manufacturer to guarantee spares availability and provide technical support services for the entire engine setup
d. Training to laboratory personnel after installation and commissioning at IIT Bombay
e. Power requirements
f. The provided software interface (that is provided by default) compatible with MATLAB or LabView in real-time (preferably MATLAB)
g. Real-time software/connector for display and control of all variables on its own customized Laptop/PC.
h. Consider providing details regarding the data communication channels Telemetry software, and ECU. Clarify they are bi-directional. Installation and commissioning by the supplier at no cost.

F) G. Installation and commissioning by the supplier at no cost.

G) Detailed manuals of hardware and software (in English) along with electronic copies.

H) Upgradation of software should be free for the first 5 years, which shall be compatible with any higher version of the MS-Windows operating system.

I) Additional requirements:

a. Protective casing for the entire system with Lock and Key.
b. Pressure sensors for the following positions:
    i. Static pressure at "extended intake" (static pressure)
    ii. Pressures measurement at compressor (total and static)
    iii. Pressure measurement after combustion chamber (total and static pressure)
    iv. Pressure measurement after turbine wheel (total and static pressure)
    v. Pressure measurement at exhaust nozzle (total and static pressure)
c. Sensors (at least 3) for multiple measuring points at
    i. Compressor exit temperature and pressure
    ii. Combustion chamber exit temperature (TIT) and pressure
    iii. Turbine exit temperature (TIT) and pressure
    iv. Exhaust gas temperature (EGT) and pressure

The party to provide the following in the quote:

a) The vendor/manufacturer should have a direct presence in India or should be an exclusive agent of an International equipment manufacturer for minimum of 5 years in India. Proof of this relationship should be included along with the technical bid.

b) Support of hardware and spares for a minimum period of 10 years after installation and commissioning.

c) To provide details of installed GTE facilities over the last 10 years of at least 02 users of similar or higher capabilities in India (specifically in reputed institutions/organizations like IIT's, IISc, NIT's and reputed national labs like DRDO, NAL, ISRO, HAL, etc.) or abroad from reputed institutions/organizations for getting first-hand feedback from them about the product and service experience.

d) The firm should be equipped with well-trained engineers to offer post-warranty maintenance and service support. The number of service engineers employed in this region by the manufacturer should be mentioned, along with their qualifications and experience.

e) Details of service support in India that the firm can offer should be given along with the NABL calibration facility.

f) The nearest service center to Mumbai, India is to be mentioned.

g) A well-trained engineer should install the complete setup and it should not be carried out by the agent.

Safety: -

At all times, the setup should ensure the operator's safety. Please specify in the technical bid the safety features, precautions, and capabilities of the experimental setup.