



Two Shaft Gas Turbine Power Plant (SMT-HT-48)

The SMT-HT-48 trainer helps to study the behaviour of Two shaft Gas Turbine Power Plan. In this system one turbine (the high-pressure turbine) drives the compressor and the other turbine (the power turbine) supplies the effective power. The trainer includes the following components: compressor, tubular combustion chamber and high-pressure turbine; fuel system; starter and ignition system; lubrication system; power turbine; generator; and measuring and control equipment. The complete unit is called gas turbine.

The gas turbine works as an open cyclic process, with the ambient air being drawn out and fed back in. The high-pressure turbine together with the compressor and the combustion chamber are called gas generator as they produce the required gas for the power turbine. To do so, the ambient air drawn in is brought to a higher pressure in the single-stage radial compressor. When the air enters the combustion chamber, only part of it is used for combustion. This air is decelerated with the aid of a turbulence generator such that the added fuel is able to burn with a stable flame. The greater portion of the air is used to cool the combustion chamber components, and is mixed into the combustion gases at the end of the combustion chamber. This reduces the gas temperature to the permissible inlet temperature of the high-pressure turbine.



The gas flows out of the combustion chamber into the single-stage radial high-pressure turbine and discharges a portion of its energy to the turbine. This energy drives the compressor.

In the power turbine, the gas discharges the remaining portion of its energy, which is converted into mechanical energy and drives a generator. The electrical energy generated is dissipated using braking resistors. The gas turbine is started with the aid of a start-up fan. The speed, temperatures, and pressures and the mass flow rates of the air and fuel are recorded and displayed using sensors.

The unit has Touch LCD display for visualization of process and the measurements. The Unit is also connected to Software for computer connectivity and data analysis. The Touch screen and computer software is included in the package.

TECHNICAL SPECIFICATIONS

Specifications:

- Touch LCD with GUI Interface for better monitoring and accurate measurement of Plant variables.
- Experiments relating to the function and behaviour during operating of a gas turbine in a two-shaft arrangement.
- Operation with power turbine and generator.
- Asynchronous motor with frequency converter as generator.
- Start-up fan to start the high-pressure turbine.
- Conversion of generated electrical energy into heat using four 600W braking resistors.
- Effective silencing at intake and exhaust for laboratory operation.
- Sensors record all relevant data visualised on displays in the process schematic.
- Uses industrial parts, powered by kerosene for realistic tests and results
- ESOLS DAQ Software for monitoring and control.

Technical Data:

- Gas generator (compressor and high-pressure turbine):
 - Speed range 60000 to 125000min⁻¹
 - Max. Pressure ratio: 1:2.0.
 - Max. Mass flow rate (air): 115g/sec.
 - Max. Fuel consumption: 120g/min.

- Power turbine:
 - Speed range: 10000 to 40000min⁻¹.
 - Mechanical power: 0 to 1.5kW.
 - Electrical power: 0 to 1kW.
 - Sound level at 1m distance: max. 80dB (A).
 - Temperature exhaust gas 700°C.
- Measuring ranges:
 - Temperature: 5x 0 to 180°C / 2x 0 to 1200°C.
 - Speed: 0 to 199.999min⁻¹.
 - Electric power: 0 to 1999W.
 - Air inlet velocity: 0 to 25m/s.
 - Fuel mass flow rate: 1.5 to 10.5kg/h.
 - Fuel supply pressure: 0 to 25bar.
 - Fuel nozzle pressure: 0 to 4bar.
 - Combustion chamber pressure loss: 0 to 20mbar.
 - High-pressure turbine inlet pressure: 0 to 2.5bar.
 - Power turbine inlet pressure: 0 to 250mbar.
- Touch LCD with GUI Interface for better monitoring and accurate measurement of Plant variables.
- ESOLS DAQ Software for monitoring and control.
 - Graphical visualization.
 - Security mechanism for login.
 - USB Connected
 - Compatible with Windows 7,8.1,10.
- Digital Instrumentation
- Capability to modify according to end user.
- Can be used in Research Purposes.

- Dimensions and weight:
 - LxWxH: 1500x650x1800mm.
 - Weight: approx. 300kg.

Experiments:

- Determining the shaft power.
- Determining specific fuel consumption.
- Recording the characteristics of the power turbine.
- Thermal, isentropic and mechanical efficiencies