



Model Series: SEGT-500

Function:

The Steam Power Generation / Thermodynamics Trainer is purpose designed and built for hands-on education and training on topics related to steam generation, power generation and control. This Trainer demonstrates the conversion of stored chemical energy to electricity; the primary method of generating electricity used today. The trainer uses a natural gas boiler to generate steam which is then expanded in a steam turbine, converting the heat energy of the steam into electrical energy via the turbo-generator.

This steam electrical generator unit is mounted complete on a single skid (except for the remotely installed resistive load bank), allowing for compact installation. Industrial type process components, process measurement and control devices have been used throughout the trainer to provide the student with a realistic training experience using equipment common to industry. This trainer is a real system that generates electricity from a natural gas fuel on a small scale. In every other respect the system is designed, operated, controlled, and maintained in the same way as the full-scale industrial electrical generating facilities.

Two Available Options:

- Complete electrical power generation unit
- Electrical Power Generation unit with enhancements for combustion analysis and overall system efficiency. Fuel flow, air flow, steam mass flow and flue-gas analyser plus connection to and configuration of DCS to display process variables

System Capacity:

- Nominal electrical output of up to 12 kW 208 VAC 3 phase

Intended Training Topics:

- Pressure boilers
- Steam turbine / alternators and controls
- Thermodynamics
- Power System Operation and Control

Sub Topics:

- Boiler operation and controls
- Turbine/alternator operation
- Alternator and power switching controls
- Combustion reaction stoichiometry
- Efficiency calculations

Equipment Specification Highlights:

- Boiler (25 Hp nominal) Natural gas (liquid fuel options available), 863 lbs of saturated steam at 150 psi
- Full automatic control via integrated PLC and communication with DCS
- Turbine
- Single stage, integrated speed governor and over-speed trip device
- Centrifugal type condensate return and boiler feed water pumps
- Electrical generation equipment
- Alternator developing up to 10-15 kW 3-phase electrical power (voltage and frequency determined by installation country)
- Power dissipated in a resistive load bank with variable load controls - variable in 14 steps up to 15 kW
- Integrated switchgear and safety controls (synchronize power to grid like a real power system)
- All industrial indications and controls
- Optional Analytical controls
- Combustion reaction reactant and product flow measurement and gas analysis equipment
- Fuel and air flow meters
- Steam flow meter
- Flue gas analyser (O₂, CO₂, and CO)
- Operator controls
- Industrial standard distributed control system that operates in parallel to the local control systems provided as integrated with the component parts steam system components. The DCS will provide overall alarming and control functions in parallel and in cooperation with the local control systems integrated with the steam components.
- Skid Approximate Dimensions; custom dimensions available to fit available space 2.3 x 5.5 x 3.0 m high, allowing for access to the equipment for teaching purposes as well as the ability to insulate the system to prevent excessive heat loss

Codes and Standards:

- Steam system components comply with or exceed sound engineering practices and all standards and codes applicable to operation at the installation site, including but not limited to the relevant ASTM and ASME. Components will be clearly marked with the applicable designations.
- Electrical components shall comply with or exceed CSA and/or UL standards and approvals. Components are clearly marked with the applicable designations.
- Engineering Standards. The design and fabrication shall conform to normal industry practices

Control Component Protocol:

- Hart 4-20 mA standard

Utility Supply Requirements:

- 120 VAC, 60 Hz single-phase power (240 VAC, 50 Hz available)
- 440 VAC 60 Hz three-phase power (415 VAC 50 Hz available)
- Clean, Dry instrument air to 35 psig minimum
- Natural gas supply
- Cooling Water Supply
- Draft air supply
- Appropriate flue gas exhausts