SGT-A05 (Industrial 501) Aeroderivative Gas Turbine
More than 1,675 SGT-A05 gas turbines have been sold for industrial use to more than 500 customers in 53 countries, accumulating an impressive 120 million operating hours since its introduction in 1963.

Today, these engines are delivered to our customers through a network of distributors who incorporate the engine into complete generator sets, both stationary and mobile.

All Siemens distributors are carefully chosen for their engineering and manufacturing capabilities and commitment to adhere to Siemens standards for quality and delivery.

**Industrialized Aeroderivative Gas Turbine**

Fast start-up and flexible generation including multiple starts, fast ramp-up and down, virtually no limit on number of start-ups.

Originally developed for use in aviation, SGT-A05 gas turbines are flexible, compact and lightweight designs that are ideally suited for decentralized power generation offering high efficiency and fast start up capabilities.

Designed for use in power generation and oil & gas applications, features of the SGT-A05 gas turbine include:

- Lightweight modular construction
- Ease of field repair
- Virtually unlimited cycle capability
  - black start capability
  - hot start capability
  - full power available within 60 seconds
- load following
- Wide range of fuels in any environmental condition
- High electrical efficiency

Siemens acquired the Rolls-Royce aeroderivative gas turbine and compressor business effective December 1, 2014. References to Siemens and products are intended to refer to such business as acquired and incorporated into Siemens as from such effective date.
At Siemens we understand the rapidly-changing nature of today’s industrial and commercial environment, in which market requirements and operating conditions can vary significantly – and often unpredictably. So we design and shape our products and services to help ensure Siemens customers maintain and increase performance and profitability throughout the life of their power generation project.

**SGT-A05 Aeroderivate Gas Turbine variants**

The SGT-A05 gas turbine variants produce electrical power output between 4 and 6 MW for applications such as base load, co-generation, combined heat and power, mobile power and emergency power.

SGT-A05 variants are fulfilling the requirements of a wide spectrum of applications in terms of efficiency, reliability, flexibility and environmental compatibility.

SGT-A05 gas turbine variants offer low life-cycle costs and an excellent return on investment.

**Low emissions as a gateway to our customers**

Advanced lean-burn combustion technology: The well-proven and reliable Dry Low Emissions (DLE) system offers clean combustion for gas turbines in power generation applications. It achieves emission levels better than 25 vppm NOx and 50 vppm CO.

The Wet Low Emissions (WLE) system utilizes nozzle steam or water injection for gas and liquid fuel operation in order to meet the most stringent environmental requirements.

More than 75 DLE systems have entered service since its introduction in 1994. This system is also available for upgrade during routine overhaul of the SGT-A05.

SGT-A05 gas turbine variants produce low emission levels that meet and exceed customers requirements as well as emission standards around the world.

The SGT-A05 is suitable for the following applications and industries:

**Operation mode**

- **Intermediate load**
- **Peak load**
- **Grid support**
- **Base load**

**Application**

- CHP (Combined heat and power)
- Simple cycle
- Combined cycle

**Industrial power generation**

- Oil & gas industries
- Metals / Ceramics & Glass
- Pulp & Paper
- Chemical / Rubber & Plastics
- Buildings & Infrastructure
- Manufacturing industries / Industrial parks

**Industries & users**

- Power producers
- Oil & gas industries
- Refining / Petrochemical
- Onshore production
- Offshore fixed

**Power producers**

- Utility
- Municipality
- Independent power producers
SGT-A05 Gas Turbine Variants
Now even stronger with SGT-A05 KB7HE

Our current offering includes variants of the proven KB5 and KB7 engines:

**SGT-A05 KB5S, SGT-A05 KB7S and KB7HE**
- Added value to our customers – Leveraging proven technology and reputation
- Improved electrical efficiency reduces fuel usage
- Increased power output increases revenue from the sale of electricity or reduce cost of buying additional electricity off of the grid
- Increased exhaust temperature and flow increases usable exhaust for steam production or direct heat processes

**SGT-A05 Gas turbine variants specification***
Simple cycle power generation

<table>
<thead>
<tr>
<th></th>
<th>SGT-A05 KB5S</th>
<th>SGT-A05 KB7S</th>
<th>SGT-A05 KB7HE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Output</strong></td>
<td>4.0 MW(e)</td>
<td>5.4 MW(e)</td>
<td>5.8 MW(e)</td>
</tr>
<tr>
<td><strong>Fuel</strong></td>
<td>Natural gas, liquid fuel, dual fuel; other fuels on request; automatic changeover from primary to secondary fuel at any load</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td><strong>Gross Efficiency</strong></td>
<td>29.7%</td>
<td>32.3%</td>
<td>33.2%</td>
</tr>
<tr>
<td><strong>Heat Rate</strong></td>
<td>12,137 kJ/kWh</td>
<td>11,152 kJ/kWh</td>
<td>10,848 kJ/kWh</td>
</tr>
<tr>
<td><strong>Turbine Speed</strong></td>
<td>14,200 rpm</td>
<td>14,600 rpm</td>
<td>14,600 rpm</td>
</tr>
<tr>
<td><strong>Pressure Ratio</strong></td>
<td>10.3 : 1</td>
<td>13.9 : 1</td>
<td>14.0 : 1</td>
</tr>
<tr>
<td><strong>Exhaust mass flow</strong></td>
<td>15.4 kg/s</td>
<td>21.3 kg/s</td>
<td>21.4 kg/s</td>
</tr>
<tr>
<td><strong>Exhaust Temperature</strong></td>
<td>560 °C (1,040 °F)</td>
<td>494 °C (921 °F)</td>
<td>522 °C (972 °F)</td>
</tr>
<tr>
<td><strong>NOx emissions</strong></td>
<td>≤ 25 ppmvd at 15% O2 on fuel gas (with DLE)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Nominal engine performance, ISO, No losses, gaseous fuel 20,400 BTU/lb

**New High Efficiency (HE) Compressor Hardware Upgrades Provide Opportunity to Increase Power and Fuel Economy:**
- Vanes – abradable inner bands
- Case – blade track radius for reduced tip clearance
- Improved interstage sealing
- Includes new generation DLE liners
**SGT-A05 Gas Turbine Variants**

**SGT-A05 KB7S**

A single stage boost compressor, improved vane cooling, higher strength turbine blades and many other enhancements have been incorporated for improved performance, durability and operating cost.

The aeroderivative design of the SGT-A05 series engine provides a lightweight, modular product that helps lower operating costs through improved fuel consumption, extended hot section life and ease of maintenance.

Siemens knows there is more to customer satisfaction than manufacturing a quality gas turbine. Beginning with the finest designs, the most advanced manufacturing techniques and rigid verification testing, our team continues to serve our customers with a global network of support.

- Effusion cooled combustion liners
- Core engine commonality with SGT-A05 family
- Addition of single stage compressor boost module
- Natural gas, mid-BTU gas options, liquid and dual fuel configurations
- 5 MW power class
- Competitive operating cost

The aeroderivative SGT-A05 KB7S engine has an overall improvement in fuel consumption **32.3%** electrical efficiency
**SGT-A05 KB7HE**

Taking advantage of the already proven and trusted SGT-A05 KB7S gas turbine, the SGT-A05 KB7HE provides performance enhancements using a High Efficiency Compressor upgrade.

Based on the proven aeroderivative gas turbine technology, the SGT-A05 KB7HE is an outstanding solution for power generation application.

Existing SGT-A05 KB7S easily retrofits to SGT-A05 KB7HE at a cost competitive investment.

SGT-A05 KB7HE is the highest horsepower version (simple cycle) of the SGT-A05 series of engines.

- Higher Power – 8% power increase (8000 SHP) at ISO conditions
- Lower Fuel Burn – 34% Fuel Efficiency (Uninstalled)
- Fuel Flexibility – Same fuel options as current SGT-A05 KB7S Model Specification
- Proven Dual fuel configuration and combustion system
- Heat Rate – 2.6 % improvement

**The aeroderivative SGT-A05 KB7HE engine has an overall improvement in fuel consumption 33.2% electrical efficiency**

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**Engine Power and Heat Rate vs. Amb. Temp**

**Exhaust Flow and Temp vs. Amb. Temp**
SGT-A05 Gas Turbine Variants

SGT-A05 KB5S

The current engine design is the evolutionary result of continuous improvements since the first release in 1963. This continued product enhancement concept has improved the reliability, performance, power, and efficiency of the SGT-A05 to better serve the needs of our customers. The aeroderivative design of the SGT-A05 engine provides a lightweight, modular product that helps lower operating costs through improved fuel consumption, extended hot section life and ease of maintenance.

Siemens knows there is more to customer satisfaction than manufacturing a quality gas turbine engine. Beginning with the finest designs, the most advanced manufacturing techniques and rigid verification testing, our team continues to serve our customers with a global network of support.

The SGT-A05 KB5S has millions of hours of service in thousands of installations worldwide.

- Competitive operating cost
- 4 MW power class
- Single shaft cold end drive
- Standard effusion cooled combustion liners
- Core engine commonality with SGT-A05 family
- Natural gas, mid-BTU gas options, liquid and dual fuel configurations

SGT-A05 KB5S based on proven technology

29.7% electrical efficiency

Engine Power and Heat Rate vs. Amb. Temp

Exhaust Flow and Temp vs. Amb. Temp

<table>
<thead>
<tr>
<th>Amb. Temp, °C (°F)</th>
<th>Engine Power, kW (hp)</th>
<th>Heat Rate, kW/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30 (-22)</td>
<td>5000 (6705)</td>
<td>13500</td>
</tr>
<tr>
<td>-15 (5)</td>
<td>4500 (6035)</td>
<td>13000</td>
</tr>
<tr>
<td>0 (32)</td>
<td>4000 (5364)</td>
<td>12500</td>
</tr>
<tr>
<td>15 (59)</td>
<td>3500 (4694)</td>
<td>12000</td>
</tr>
<tr>
<td>30 (86)</td>
<td>3000 (4023)</td>
<td>11500</td>
</tr>
<tr>
<td>45 (113)</td>
<td>-30 (-22)</td>
<td>3000 (4023)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amb. Temp, °C (°F)</th>
<th>Exh Flow, kg/sec (lb/sec)</th>
<th>Exh Temp, °C (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30 (-22)</td>
<td>19 (41.9)</td>
<td>-30 (-22)</td>
</tr>
<tr>
<td>-15 (5)</td>
<td>18 (39.7)</td>
<td>-15 (5)</td>
</tr>
<tr>
<td>0 (32)</td>
<td>17 (37.5)</td>
<td>0 (32)</td>
</tr>
<tr>
<td>15 (59)</td>
<td>16 (35.2)</td>
<td>15 (59)</td>
</tr>
<tr>
<td>30 (86)</td>
<td>15 (33.1)</td>
<td>30 (86)</td>
</tr>
<tr>
<td>45 (113)</td>
<td>14 (30.9)</td>
<td>45 (113)</td>
</tr>
</tbody>
</table>

Heat Rate kJ/Kw-hr

<table>
<thead>
<tr>
<th>Amb. Temp, °C (°F)</th>
<th>Engine Power, kW (hp)</th>
<th>Heat Rate, kW/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30 (-22)</td>
<td>5600 (1040)</td>
<td>13500</td>
</tr>
<tr>
<td>-15 (5)</td>
<td>5700 (1058)</td>
<td>13000</td>
</tr>
<tr>
<td>0 (32)</td>
<td>5800 (1076)</td>
<td>12500</td>
</tr>
<tr>
<td>15 (59)</td>
<td>5900 (1094)</td>
<td>12000</td>
</tr>
<tr>
<td>30 (86)</td>
<td>6000 (1112)</td>
<td>11500</td>
</tr>
<tr>
<td>45 (113)</td>
<td>6100 (1130)</td>
<td>11000</td>
</tr>
</tbody>
</table>

Heat Rate kJ/Kw-hr
Reference Case: HERA Cogeneration Plant in Bologna

**Location**
Bologna, Italy

**Commissioning Date**
Autumn 2017

**Packager**
Centrax Gas Turbines, Ltd.

**Application**
Cogeneration

**Gas Turbine Model**
2 x SGT-A05 KB5S

**Electricity Generated**
7.8 MW

**Customer Benefits**
The new equipment helps to achieve an annual reduction of around 21,000 kg of NOx and 2500 tonnes of CO₂.
The SGT-A05 is known for its high fuel flexibility, which will accommodate a wide variety of possible application scenarios and requirements.

Fuels include, but are not limited to natural gas, liquid fuel (or both) and mid to low BTU gas fuels. Fuel system options include dual fuel, steam and water injection.

Dry Low Emissions (DLE) technology is also available.

In addition to the fuel flexibility, SGT-A05 accommodates a wide variety of customer requirements. The compact design of the engine permits application versatility and ease of removal and replacement. The SGT-A05 measures less than 2.7 meters (8 feet) long and weighs less than 766 Kg (1,690 pounds).

The SGT-A05 is proven to operate in various challenging conditions and locations around the world including the North Sea, West Africa, Siberia, Brazil, Alaska, South East Asia and the desert regions of the Middle East.

The SGT-A05 engine has been shock qualified to Mil-S-901C, which makes it particularly suitable for areas with frequent or severe seismic activity.

Advanced Engineering

Core engine commonality of all SGT-A05 variants

• Highest power density in weight class
• Advanced materials including leading edge additive manufacturing.
  • All SGT-A05 engines are built to meet stringent industry standards including ISO 9001 and AS9100
  • Full power available within 60 seconds from all conditions, including hot restarts, with no need to go to an idle condition
  • Black Start capability
  • Modular gas turbine configuration optimizes spares requirements, minimizes cost of ownership and simplifies engine maintenance

Low Emissions Options

Three combustion systems are available, based on customer need:

• Standard combustion system can operate on liquid or gas fuel
• Wet Low Emissions combustion system utilizes nozzle steam or water
• Dry Low Emissions combustion system achieves better than 25vppm NOx and 50vppm CO (gas fuel only)

Reliable, Easy Installation and Maintenance

Our comprehensive portfolio of services provides low life cycle cost and optimum performance throughout the turbine’s life cycle: Long Term Programs (LTP), Overhaul service, field service, spare parts, service exchange, remote diagnostic service and modernization and upgrades.

The modular, compact design of the SGT-A05 facilitates onsite maintenance, since the modules can be quickly replaced. A direct core engine exchange is possible and can be executed in as little as 12 hours. The proven lightweight industrial design allows an easy and economical transport.

• Simple, inexpensive to maintain
• Rugged, reliable performance with up to seven years baseload duty between full overhaul
• Over 98% demonstrated availability/reliability
• Lightweight, aeroderivative, industrial design is easy
Packaged for Success

Package features for industrial power generation applications

The SGT-A05 packages are designed with noise suppression, access doorway, as well as safety interlocks supporting the health and safety of the operation and maintenance staff. The packages are compact and easily transported, installed and maintained.

**Lubricating Oil System**
- Common synthetic lube oil system for both engine and package
- Main "engine" lube and scavenge oil pump is driven off the engine accessory gearbox for normal operation and shutdown
- Oil system components are skid-mounted and designed to industry standards
- Optional heaters/coolers to meet the climate needs of the application

**Fuel System**
- On-skid fuel system includes all components needed to control fuel during start up and operation
- Operates on natural gas, liquid, dual fuel, and low BTU gas with steam and water injection

**Low Emissions**
Dry Low Emissions (DLE) system available on: SGT-A05 KB7S and SGT-A05 KB7HE / SGT-A05 KB5S

**Baseplate**
- Sturdy, but small, lightweight footprint
- Design allows easy access for maintenance
- Jib boom provides easy installation or removal of gas turbine

**Electrical**
Available to meet local standards as needed

**Air Intake System**
- Provides clean, uniform airflow to the gas turbine
- Includes filter assembly, silencer and flow direction geometry
- Site-specific design minimizes disruption of inlet air
- Filtration systems are available to handle extreme environments – arctic cold, salt water spray, severe heat and dust
- Single to multiple stages handle offshore, coastal and inland sites

**Gas Turbine Enclosure**
- Acoustic enclosures meet a wide range of requirements and environments
- Factory-completed enclosure can house all auxiliary equipment on engine skid, with piping and wiring completed and tested at the factory
- Completed enclosures shipped with connections intact for simplified installation and commissioning

**Water Wash System**
- Maintains performance by preventing build-up of contaminants in the engine compressor
- Pump or compressed air system includes storage tanks, pressure gauges, valves and piping

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"All Siemens distributors are carefully chosen for their engineering and manufacturing capabilities and commitment to adhere to Siemens standards for quality and delivery."
Complete Customer Care for the SGT-A05 Gas Turbine

Customer support throughout the life of the engine

The global infrastructure of Siemens and its distributors provides customers with the support they need at any time, anywhere in the world. Service centers in every region of the world, combined with a responsive spares program and expert field service representatives, all unite to provide a comprehensive system of service to keep our customers’ equipment running reliably.

Engine Lease

Engine lease programs are as varied as our customers’ needs. Whether for routine maintenance, or in an emergency, engines can be made available to minimize disruptions to daily operations.

Spares

A worldwide spares inventory allows parts to be delivered anywhere in the world, and as the original equipment manufacturer, Siemens is committed to supplying only the highest quality parts, whether new or refurbished.

Field Service

Twenty-four hours a day, seven days a week, expert field service engineers work to install, maintain and service customer equipment. Their high level of skill allows them to respond rapidly and effectively to a range of situations that may arise. They also provide training and equipment monitoring. Field service is provided by the distributor network or Siemens.

Modernizations and Upgrades

Upgrades to existing equipment are an attractive option for many customers, and a dedicated team of engineers and project managers work to ensure that the customer’s equipment is providing the most power, efficiency and reliability possible. There are currently more than ten different upgrades available for the SGT-A05 gas turbine. Upgrades include SGT-A05 KB7HE upgrade, a conversion to Dry Low Emissions (DLE), dual fuel conversion and more.
Complete Customer Care for the SGT-A05 Gas Turbine

Customer support throughout the life of the engine

Core Compressor

Accessory Drive Housing

Combustion Section

Turbine Section

SGT-A05 Aeroderivative Gas Turbine
Our customers may be located in diverse regions around the world, but they all have one thing in common. They all require timely and accurate support to purchase, install and maintain their SGT-A05 gas turbines and equipment. That’s why we continually invest in our global infrastructure from distributors to repair and overhaul facilities.

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