



# Service Package 4 upgrade for SGT5-4000F Gas Turbines

Over the last years the worldwide demand for power has been growing continuously. Siemens Energy anticipated and reacted to the needs of the market by further developing its combined cycle power plant technologies and providing a full range of energy products and services. Siemens gas turbines are renowned for their high availability and reliability as well as high power output and low emissions.

One of the innovative solutions offered by Siemens Energy Service to help you improve the performance of your gas turbine and your competitiveness is the Service Package 4 upgrade.

## Our product

The Service Package 4 upgrade combines upgrades of proven technology among which improved blade design and enhanced combustion technology. It has been developed utilizing extensive field experience and advances in design technologies to help maximize the benefits to be offered to you.

The Service Package 4 includes following measures:

- **Compressor Mass Flow Increase** with modified 3D airfoils of the inlet guide vane and the first two stages of compressor blades and vanes. For the operation with increased mass flow several instrumentation and control improvements are included in the upgrade scope
- **Turn Down** upgrade intended to increase the operational range of the plant in part load operation while maintaining plant carbon monoxide emissions limit

- **Hydraulic Clearance Optimization** shifting the rotor against flow direction to minimize the turbine clearances during baseload operation
- **Cooling Air Reduced (CAR)** combustion chamber to minimize cooling air consumption
- **Burner Upgrade** designed to improve combustion stability during partload and baseload operation in combination with CAR and to lower the nitrogen oxide emissions during baseload operation
- **Fuel Gas Preheating** upgrade enabling more efficient fuel gas usage due to increased combined cycle efficiency.

## Your benefits

The Service Package 4 upgrade can be a cost-effective way to improve the overall performance of your gas turbine and combined cycle power plant integrating various technical solutions.



Advanced compressor blades

Performance Enhancement – Gas Turbine

Answers for energy.

**SIEMENS**



Implementing the compressor modifications



Hydraulic Clearance Optimization bearing

**Benefits may include:**

- increased gas turbine power output of up to 3 % in simple-cycle operation<sup>\*)</sup>
- higher combined cycle power output
- increased gas turbine efficiency of up to 0.5 %-pts. in simple-cycle operation<sup>\*)</sup>
- lower fuel consumption costs
- lower carbon monoxide emissions during partload and baseload operation at constant turbine inlet temperatures
- reduction of sulfur deposits inside the burner fuel gas system which can occur at fuel gas temperatures higher than 60°C.

The Service Package 4 measures are state-of-the-art for new Siemens Gas Turbines of the frame type SGT5-4000F (V94.3A) manufactured since July 2005. The Service Package 4 upgrade is able for retrofit your SGT5-4000F (V94.3A) power plant.

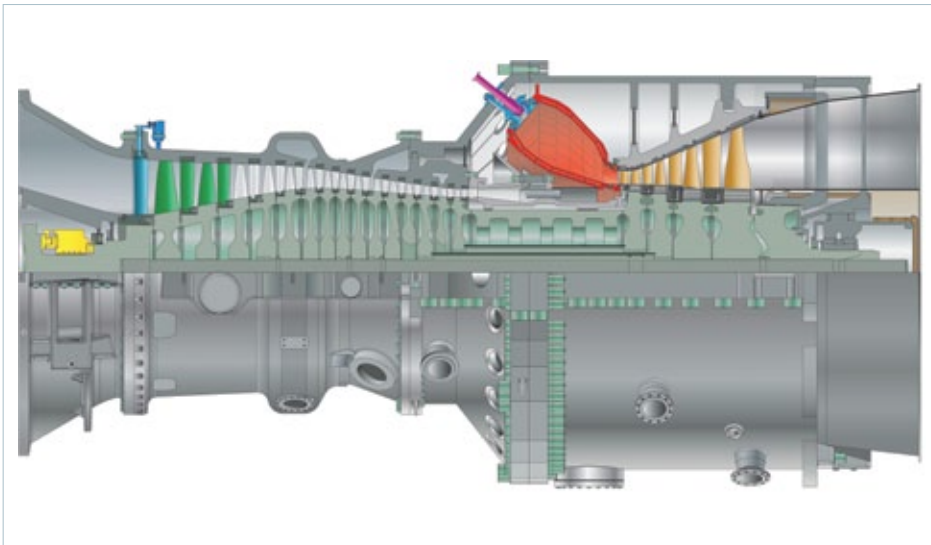
**Scope of supply**

The Service Package 4 upgrade from Siemens is just one of the many innovative modernization packages available.

The scope of this upgrade includes:

- new inlet guide vane and the first two stages of compressor blades and vanes
- new hydraulic inlet guide vane actuator and position sensor
- new combined axial and radial compressor bearing with hydraulic axial shifting device and required hydraulic pump skid
- CAR combustion chamber with improved cooling air pattern, new impingement cooled tile holders and optimized ceramic heat shields
- Premix-Pilot burner with reduced swirl
- auxiliary systems for modified inlet guide vane adjusting device, hydraulic clearance optimization, two stage burner operation, and the fuel gas preheating equipment
- instrumentation and control modifications.

We recommend that the installation of this upgrade be performed at a major outage. Siemens Energy Service offers a full range of field service capabilities to help you manage your maintenance and outage schedules. The Service Package 4 upgrade with the above mentioned scope of supply is applicable for the SGT5-4000F (V94.3A) frame and can be combined with other modernizations.



Cross section of the SGT5-4000F (V94.3A) gas turbine

**References**

Siemens Energy has successfully retrofitted Service Package 4 measures and features in more than 25 units worldwide that have accumulated more than 1,400,000 equivalent operating hours (EOH). Since their first time application in 2005, more than 100 new units equipped with these technical features have been delivered by Siemens Energy which have accumulated more than 1,600,000 equivalent operating hours (EOH).<sup>\*\*)</sup>

<sup>\*)</sup> Actual results may vary, <sup>\*\*)</sup> As of March 2012

**For more information please contact your local Siemens sales representative.**

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Siemens AG  
Energy Sector  
Freyeslebenstrasse 1  
91058 Erlangen, Germany

Siemens Energy, Inc.  
4400 Alafaya Trail  
Orlando, FL 32826-2399, USA

For more information, please contact our Customer Support Center.  
Phone: +49 180/524 70 00  
Fax: +49 180/524 24 71  
(Charges depending on provider)  
E-mail: support.energy@siemens.com

Energy Service Division  
Order No. E50001-G520-A447-X-7600  
Printed in Germany  
Dispo 34805, c4bs No. 7816, 7821  
TH 258-120516 BR 460867 DB 05122.0

Printed on elementary chlorine-free bleached paper.

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