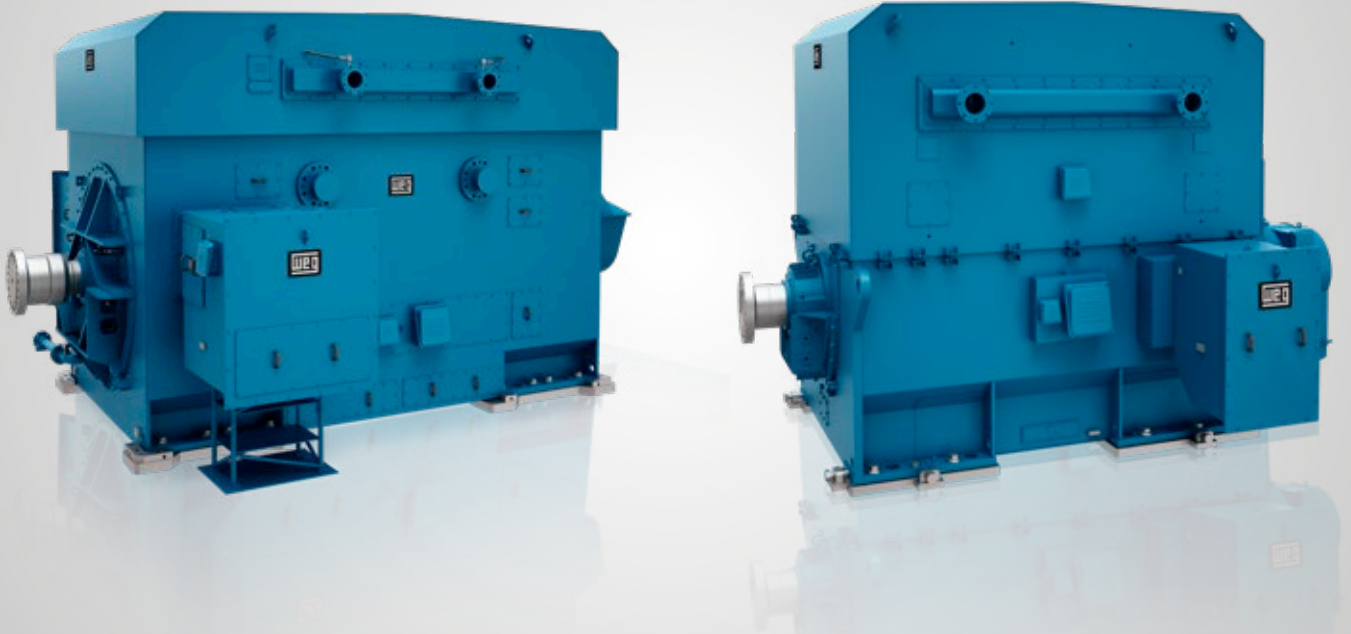


TURBOGENERATORS

Technological innovation
applied to power generation



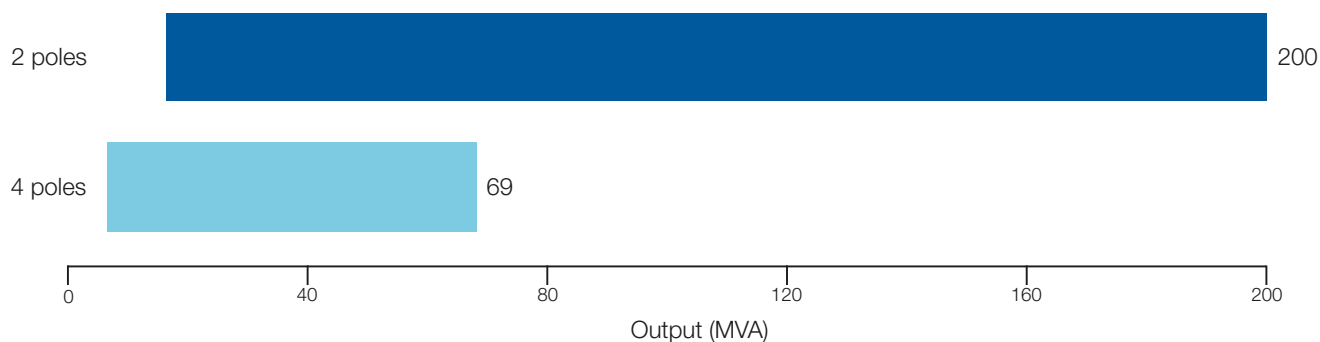
Motors | Automation | Energy | Transmission & Distribution | Coatings

Turbogenerators

Developed for power generation applications, turbogenerators have a wide power range, defined based on WEG's experience in supplying and sizing turbogenerators, which can be applied to steam, and gas turbines.

Technical Data

- Output up to 200,000 kVA - 13,800 V - 60 Hz - 3,600 and 1,800 rpm
- Output up to 160,000 kVA - 11,000 V - 50 Hz - 3,000 and 1,500 rpm
- Degree of protection: IP23 to IP56W/IP65W
- Mounting: IM1001 or IM1005 (B3), IM7311 (D5), IM7315 (D6)
- Other characteristics on request



Design

WEG products are designed with modern software applications, developed in conjunction with universities from Europe, USA and Brazil, ensuring optimized projects and maximum product efficiency.

Certifications

WEG quality system complies with the requirements of ISO 9001 and ISO 14001.

The quality system is audited and certified by the Bureau Veritas Quality Institute. In order to meet the most demanding markets requirements, WEG turbogenerators are certified by the most important certification entities worldwide, such as: CSA, BVQI, NBR, ABS and DNV.



Manufacturing Process

Insulation System

WEG MICATHERM insulation system is based on the Vacuum Pressure Impregnation process (VPI), which was developed together with the world's most renowned suppliers of insulating materials.

This system ensures perfect insulation for the turbogenerator winding using special epoxy resins and its process is totally free from gases harmful to the environment. The VPI process has shown its efficiency and reliability in electrical rotating machines in many different applications. The insulation system is used in low and high voltage machines that use form wound coils from 380 to 15,000 V.

Winding

The winding process adopted by WEG is especially developed and specified for the turbogenerators according to their voltage and application. The windings are manufactured with preformed rectangular cooper bars and are completely insulated with mica tape. The winding process also uses conductor and semiconductor tapes in the coils ensuring the suitable characteristics for the required insulating level.

Balancing

All the rotors are dynamically balanced in two symmetry planes at the turbogenerator operating speeds. The process is computer-controlled and it may have three degrees of balancing: regular, reduced or special. Increased bearing lifetime and lower vibration levels are some of the benefits of a good balancing, thus increasing the service life of the turbogenerators.



Plasma cutting



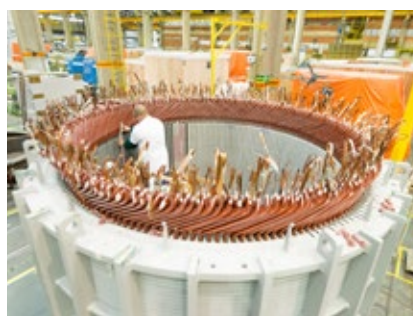
Laser cutting



Vertical lathe



2-pole rotor



Winding



Impregnation system

Turbogenerators

ST20 Line

The ST20 line turbogenerators are manufactured with state-of-the-art technology, providing high quality, reliability and low maintenance ensuring long lifetime.

Special characteristics and accessories can be supplied in order to meet specification requirements.



Technical Data

- Output up to 200,000 kVA - 13,800 V - 60 Hz - 3,600 rpm
- Output up to 160,000 kVA - 11,000 V - 50 Hz - 3,000 rpm
- Degree of protection: IP23 to IP56W/IP65W
- Mounting: IM1001 or IM1005 (B3), IM7311 (D5), IM7315 (D6)
- Other characteristics on request

Main Features

- Compliance with local content requirements
- Customized engineering in order to meet the application mechanical, electrical and structure requirements
- Cooling system by means of air-air or air-water heat exchanger
- Robust design combined with state-of-the-art technology for dynamic balancing at rated speed provides low vibration levels, which results in longer lifetime and smooth operation
- The terminal boxes can be mounted on top, bottom or side of the turbogenerator so as to meet the installation requirements
- Mounted on its own bearings and tested at rated speed and voltage to comply with the application requirements
- All projects include the necessary characteristics to comply with the strict requirements of the different operational regimes, load variations and peak load
- Different mounting types to meet the turbine set requirements

Main Components Features

Stator Core

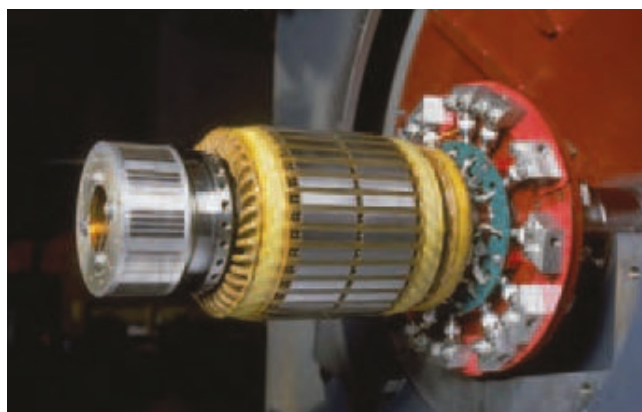
The frame is designed, welded and machined to withstand the forces produced by the mechanical stresses on the lamination core. The core lamination is punched in low loss silicon steel with electrical insulation film. The lamination segments are stacked on circular studs, which extend lengthwise within the stator frame. As the stator core laminations are stacked, vent duct spacers are inserted at specific intervals to provide cooling passages in the stator core for uniform cooling. The stator coils are preformed and vacuum impregnated (VPI) in order to meet the insulation class F requirements. This system provides excellent dielectric properties, greater resistance to moist and chemicals, excellent mechanical integrity and longer lifetime.

Rotor

The rotor forging is a special alloy steel containing nickel, chromium, molybdenum, and vanadium. The forging material is produced from an electric furnace vacuum degassed ingot. The forging manufacturer performs ductility, tensile strength and chemical tests. In addition, ultrasonic tests are made to assure that the forging is sound. Ventilating slots are punched in the straight portion of the coils to allow for radial discharge of cooling air.

Brushless Excitation System

The shaft mounted brushless exciter is provided with permanent magnet generators, redundant fused diodes, and ground detector system to provide maintenance-free, reliable operation.



Turbogenerators

ST40 Line

The ST40 turbogenerator line was developed based on WEG's extensive experience in the biomass, oil and gas, and geothermal power generation segment. This translates into increased safety and reliability in generation system operation.

Technical Data

- Output up to 62,500 kVA - 13,800 V - 60 Hz - 1,800 rpm
- Output up to 50,000 kVA - 11,000 V - 50 Hz - 1,500 rpm
- Degree of protection: IP44, IP54 and IP55
- Mounting: IM1001 or IM1005 (B3), IM7311 (D5), IM7315 (D6)
- Other characteristics on request

Main Features

- Increasing robustness of generator excitation system by integrating the exciter and rectifier
- New efficient and optimized cooling system the generator excitation system
- New bearing designs, optimizing the internal space
- Rotating rectifier redundancy available as optional for brushless excitation system

Main Components Features

Stator

It is the active magnetic static part of the turbogenerator. It consists of high silicon electrical steel laminations with slots that fit the coils to form the stator winding. The stator core is mounted directly on the frame.

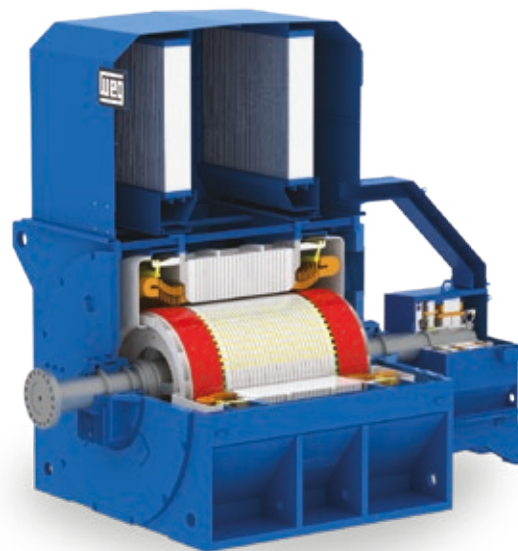
Rotor

The rotor consists of the active rotating parts, and it is composed of a pressed steel lamination core, field winding and damper winding. The rotors of WEG turbogenerators are cylindrical (non-salient poles) and feature slots where the field winding and damper winding are fitted. The shafts are made of forged or rolled steel and machined according to the specifications. The shaft end is normally cylindrical or flanged.

Brushless Exciter

The turbogenerators with the brushless excitation system have a main rotating exciter installed in a compartment in the back of the turbogenerator.

The voltage regulator feeds the stator of the main exciter with DC current and the rotor of the main exciter feeds the field winding of the turbogenerator through a rotating, three-phase rectifier bridge.



Brushless Excitation with Auxiliary Exciter (PMG)

The auxiliary exciter or PMG (Permanent Magnet Generator) is a small generator built in WEG brushless turbogenerators intended to supply power to the voltage regulator.

The PMG rotor, installed on the shaft of the turbogenerator, is composed of a lamination core where the permanent magnets are mounted.

The PMG stator is normally mounted external compartment frame, where the main exciter stator is also installed.

Brushless Excitation without Auxiliary Exciter

This type of excitation is optional for WEG turbogenerators. The turbogenerator does not have auxiliary exciter (PMG) and the power to the voltage regulator supplied by an excitation transformer, connected to the main terminals of the turbogenerator. The excitation transformer can be installed in the terminal box of the turbogenerator (on request) or in the customer's excitation panel.

Turbogenerators

ST41 Line

ST41 line turbo generators are designed to operate in the power generation segment through biomass, oil and gas, and geothermal. Used together with steam or gas turbines, its concept allows a great flexibility of electromagnetic designs to meet the most diverse applications, maximizing the weight to power ratio.

Technical Data

- Output up to 69,000 kVA - 13,800 V - 60 Hz - 1,800 rpm
- Output up to 60,000 kVA - 11,000 V - 50 Hz - 1,500 rpm
- Degree of protection: IP54 and IP55
- Mounting: IM1001 or IM1005 (B3)
- Other characteristics on request

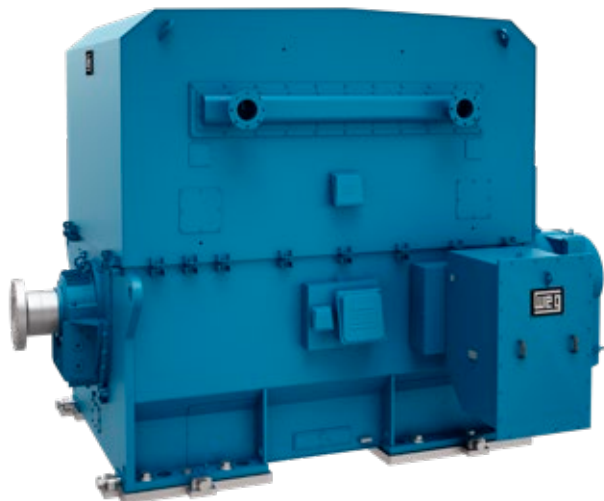
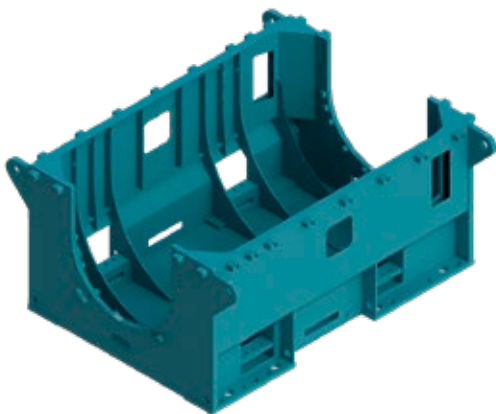
Main Features

- Compact machine
- Low noise level
- High efficiency
- VPI with epoxy resin
- Low maintenance
- Integrated exciter and rectifier, increasing robustness and harmony of excitation assembly
- Efficient and optimized cooling system through ducts for excitation assembly
- Option to use redundant diode wheel excitation assembly

Main Components Features

Frame

Its housing uses a 75% height housing concept, where its top is open, allowing the stator to be mounted from the top.



Full Rotor

ST41 line rotors consist of: shaft, winded rotor, internal and external fans, and complete excitation system, i.e. main exciter, auxiliary exciter and diode wheel.

As with other systems, rotors in the line were validated in virtual and real prototyping environments, where in the virtual one they were submitted to structural and dynamic numerical calculations, such as: rotordynamic analysis of the assembly, which evaluates unbalance response, stiffness map, full rotor static deflection, and Campbell diagram.

Each component was individually assessed in structural terms according to submitted loads.

For this analysis, the commercial finite element software Ansys® was used to evaluate the stress and strain state experienced by the rotating components of the generator.



Test Laboratory

WEG turbogenerators are tested according to the NBR, IEC and IEEE standards in a modern laboratory capable of testing generators with output up to 20,000 kVA and voltages up to 15,000 V, with fully computerized monitoring and highly accurate controls. The tests are divided into three categories: routine, type and special tests.



Technical Assistance

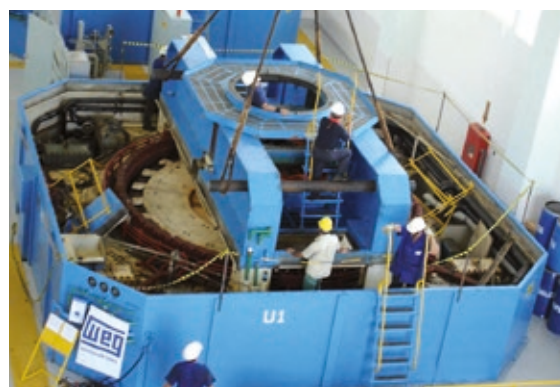
WEG technical team provides the customers with full after sale support. The services include support to general questions and service in the field, such as diagnosis, commissioning of machines and on duty service 24/7. The technical assistance team is well qualified and experienced, able to handle many different field situations and provides remote support using state-of-the-art equipment, ensuring reliability to the results. WEG also provides worldwide network of authorized repair shops.

Services

The customers can count on WEG Service Team to restore medium and large electrical machines. The same technology used to manufacture motors, generators and turbines is used for inspection and restoration. The services are executed in the field (at the customer's premises) or in the installations: Jaraguá do Sul/SC, Sertãozinho/SP, and São Bernardo do Campo/SP, which is also homologated to execute services on equipment for application in explosive atmospheres. Those plants, both in Brazil, count on the full structure and support of the engineering, industrial process and quality control departments, enabling fast, reliable and top quality service.

Scope of supply:

- DC generators and motors
- Three-phase induction motors (squirrel cage or slip ring; medium and high voltage)
- Synchronous motors (with or without brushes; medium and high voltage)
- Synchronous condensers
- Turbogenerators
- Hydrogenerators
- Wind Turbines
- Water and Steam turbines
- Gearboxes
- Scope valid to all brands



WEG services: flexibility, agility and experience to optimize your time and productivity.

Parts and Components

After years in operation, the generators need maintenance to continue working properly.

We recommend that you use original spare parts supplied by the manufacturer. WEG team is willing to promptly assist you in the correct identification of the required parts.

For WEG's worldwide
operations visit our website




www.weg.net



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The values shown are subject to change without prior notice.
The information contained is reference values.