Rotating Machines Manufacturing Capability
Campinas, Brazil
ggepowerconversion.com
The Site

GE Values
- Extensive manufacturing flexibility
- Integrated engineering capabilities
- Comprehensive range of high efficiency and high power density machines for all general industries, oil & gas and special applications
- ISO 9001 certified since 1988

Overview

GE Power Conversion Campinas

<table>
<thead>
<tr>
<th>Site Area</th>
<th>367,000 m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Area</td>
<td>37,400 m²</td>
</tr>
<tr>
<td>Office Area</td>
<td>57,300 m²</td>
</tr>
<tr>
<td>Engineering 60+ Employees</td>
<td></td>
</tr>
</tbody>
</table>

End-markets
- Oil & Gas
- Marine
- Industry
- Power & Water
- Renewables
- Mining, Cement & Metals
- Automotive
- Paper
- Biomass

Manufacturing Lifting Capacity
- Max Lifting Load: 150 ton
- Max Crane Load: 150 ton
- Max Forklift Load: 25 ton

Manufacturing Capacity
- 140 Production Equipments

Located 100 km from São Paulo
- 160 km from Santos (largest port in Brazil)
- 30 km from Viracopos (largest cargo airport in Brazil)

Center of Excellence for medium and large induction machines and synchronous electric machines

Established since 1962
- 12,000+ Induction Machines
- 500+ Synchronous Machines
Quality System and Product Certification

- GE Plant Foundation
- CSA Z.299 Quality System Initiation
- CCQ
- ISO 9001 (First GE Plant Certified)
- Joint Venture GE + Villares + Safra Bank (GEVISA)
- GE + Safra Bank
- ISO 9001:2000 Industrial Services
- ISO 9001:2018
- Converteam Integration
Our Products and Services

Product Portfolio

MEDIUM AC INDUCTION MOTORS
- C7
- Custom 8000 Horizontal and Vertical
- Pegasus Horizontal and Vertical

SYNCHRONOUS MOTORS
- HS9000
- LS9000
- Quadramatic

WIND GENERATORS
- Doubly-Fed Induction Generator (DFIG)

HIGH SPEED GENERATORS
- Laminated rotors
- Integral solid pole rotors

SMALL HYDRO GENERATORS
- Horizontal & Vertical

LARGE DC MOTORS
- Horizontal & Vertical
Induction Motors
MEDIUM & HIGH POWER INDUCTION MOTORS

BEST IN CLASS MACHINES

• Reduced opex with longer durability & lower vibration
• Reduced capex with lighter machines that enable less foundations and associated costs
• Machines with reduced that reduce energy consumption

MAXIMIZING CUSTOMER OUTCOMES

BUILT FOR DURABILITY
• For over 100 years, GE has produced countless medium voltage induction machines for the petrochemical, power generation, mining and minerals, water and wastewater industries.

GE offers a full range of horizontal and vertical synchronous machines, ranging from direct-drive high torque (at speeds as low as 20 rpm) to high-speed-type motors for compressor & turbine applications.

SYNCHRONOUS MACHINE ROTOR PLATFORMS

• Salient pole rotors (both laminated and integral solid pole versions available dependent upon starting requirements or duty cycle)

• We can rapidly adapt our standard product platforms to cater for many applications or any proposed starting methods, including:
  • Fixed-speed started by asynchronous means, e.g. direct-on-line, series reactor, capacitor, reactor/capacitor, auto-transformer (single or multi-stage)
  • Fixed-speed started by pony motor, electronic soft starter or mechanical gear system (i.e. variable speed planetary gear)
  • Variable speed drive system controlled (MV7000) Industries

APPLICATIONS
Motors: Fans, pumps, compressors, grinding mills, metal rolling, mine hoists, refiners, propulsion and many others.

INDUSTRIES
Oil & Gas, Mining & Metals, Power & Energy, Marine, Pulp & Paper, Water & Wastewater, Other Process Industries

NMP/NHP MACHINE DATA

| Frame Size | IEC: 400 to 1120 / NEMA: 580 and above |
| Poles     | 2 to 24 |
| Frequency | 50 & 60 Hz (or VFD) |
| Cooling   | IEC: IC411, IC01, IC611, IC81W NEMA: WP I – II, TEAAC, TECWAC |
| Power     | 1MW to 20MW |
| Voltage   | 3300 to 13800V |

DRIVEN MACHINES: Reciprocating Compressors, Centrifugal Compressors, Pumps, Blowers, Fans, Extruders, Crushers, Conveyors, Mills.

KEY FEATURES & BENEFITS
• Best in class Noise level
• Best in class Design
• High Reliability
• Energy savings
• Robust design optimized footprint and weight
• Reduced vibration & maintenance
• Reduced energy consumption for lower OPEX

High Reliability
High Efficiency
Reduced OPEX
Reduced Maintenance
Smooth Start Up

HIGH SPEED LOW SPEED

| Poles  | 4, 6 | 8 to 40 |
| Power  | 1 MW to 100 MW | 1 MW to 30 MW |
| Voltage| 3300 to 16000V |
| Cooling| IEC: IC01, IC611, IC81W, IC91W, NEMA: TEAAC, TEWAC, ODIP, WP1-II, DUCT-VENTILATED |
**INDUCTION GENERATORS**

**Technical Data**

<table>
<thead>
<tr>
<th><strong>DOUBLY FED INDUCTION GENERATOR</strong></th>
<th><strong>CAGE INDUCTION GENERATOR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Power range: up to 4 MW</td>
<td>• Power range: up to 6 MW</td>
</tr>
<tr>
<td>• Voltages: up to 13.8 kV</td>
<td>• Voltages: 0.69 kV, 3.3 kV</td>
</tr>
<tr>
<td>• Network Frequency: 50 &amp; 60 Hz</td>
<td>• Rated operating speed: up to 1800 RPM</td>
</tr>
<tr>
<td>• Rated operating speed: up to 2200 RPM</td>
<td>• Efficiency: &gt;96%</td>
</tr>
<tr>
<td>• Efficiency: &gt;96%</td>
<td></td>
</tr>
</tbody>
</table>

Our generators are designed and manufactured to operate efficiently and reliably in challenging applications and severe environments.

We help to reduce levelized cost of electricity with:

- High electrical efficiency across a broad generating power range
- Optimized systems solutions incorporating our range of full and partial power converters
- Using components proven in diverse industries
- Ease maintenance enabling lower operation & maintenance cost
- Noise levels as low as 77dBA* can be met to help reduce cost for the overall system whilst reducing environmental impact. [*Achievable in closed type machines with operating speeds up to 1200 rpm]
HIGH EFFICIENCY MACHINES

HIGH PERFORMANCE

- GE synchronous generators are legendary for their efficiency and reliability.
- Modular construction concept, using the latest design and manufacturing techniques, including Vacuum Pressure Impregnation (VPI) insulation System and the GE Pin Vent stator technology.
- Large high speed generators are designed with a single forged shaft for maximum strength and stiffness to provide a long life.
- Laminated rotor construction available up to 10MW with star punching design (salient poles and magnetic ring punched out in one single piece).

HIGH SPEED GENERATOR MACHINE DATA

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>630 and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poles</td>
<td>4&amp;6</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 or 60Hz</td>
</tr>
<tr>
<td>Cooling</td>
<td>IEC: IC01, IC611, IC81W, IC9W, NEMA: WPI - II, TEAAC, TEWAC</td>
</tr>
<tr>
<td>Power</td>
<td>2MW to 100 MW</td>
</tr>
<tr>
<td>Voltage</td>
<td>3300 to 16000 V</td>
</tr>
</tbody>
</table>

MECHANICAL MACHINES: STEAM OR GAS TURBINES

KEY FEATURES & BENEFITS

- High efficiency
- High thermal capacity
- Reduced mechanical stress
- Low vibration levels
- Easy rotor maintenance
- Fewer components (integral pole design)

TECHNICAL DATA

<table>
<thead>
<tr>
<th>Power</th>
<th>2 to 25 MW</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2 to 25 MW</td>
</tr>
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</table>
DC Motors

Direct Current Machines

INDUSTRIAL APPLICATION – PRODUCT RANGE

- 100 HP to 3000 HP
- 300 RPM to 1500 RPM
- 250 V to 700 V
- Paper, Ventilation, Rubber, Excavator, Hoist, Etc

METAL MILL APPLICATION – PRODUCT RANGE

- 100 HP to 8000 HP
- 30 RPM to 900 RPM
- 500 V to 1000 V
- Rougher, Finishing, Edger, Rolls, Etc
Certification & Testing

**CERTIFICATIONS**
- OFF SHORE (ABS, DNV, BV, LLOYD’S)
- HAZARDOUS LOCATIONS (NEMA / NEC & IEC STANDARDS)
- COUNTRY-SPECIFIC CERTIFICATIONS (GOST for Russia, CSA for Canada, RETIE for Colombia, etc.)

**MAIN TEST FACILITY**
- Area: 19K+ sq ft
- Lifting Capacity: 150 ton
- Online Data Acquisition System
- Electronic Database & Reports

**INDUCTION MOTORS**
- All power, voltage and polarity range
- Dual-frequency load test on all range
- Direct Load – 2000hp (2-pole) / 5,000hp (≥4-pole)

**SYNCHRONOUS MACHINES**
- Temperature rise determination – IEEE 115 Method 4 or Method 3 limited to 10MVA @ 13kV
- Back to Back

**CARING FOR YOUR NEEDS**
At GE, we understand that the goals of your organization are demanding, and evolving. To help you meet these goals here at GE Power Conversion we provide a service that goes beyond just waiting for your call.

We offer a comprehensive range of aftermarket services including replacement units, field services, spares, in-shop repairs, service agreements, unit upgrades and technical support. Our mission is to satisfy our customers needs in the aftermarket of power generation.

**INSTALLATION & COMMISSIONING**
Installing with confidence. Our team of field service engineers are on hand to ensure your assets go into active service functioning efficiently.

**INSPECTION & REPAIR**
We offer a broad array of generator, excitation and protection relaying inspection and repairs services, supported through our international network of GE specialists and service shops.

Our team of project management experts are available to support and schedule your overhaul requirements, working with you to ensure that you are provided regular project updates and work is completed to your satisfaction on time.
Services

Reducing risks, optimize productivity
WIND GENERATORS REPAIR

- GE Power Conversion Campinas has developed specific solutions for Wind market in order to reduce maintenance cycle time and guarantee equipment reliability.

- GE counts with specialized and experienced Engineering and Field Services for this market to perform Field Services (Uptower and Downtower), shop repair, long term agreement, spare generators as well Spare parts (e.g. brushes, brush holders, bearings, slip rings).

- This portfolio covers any type of Wind Generators such as DFIG or permanent magnet design manufactured by GE or any other equipment manufacturer.

- Campinas Site is one of GE Center of Excellence for new Wind Generators and all technology applied in the repairs follows most recent process and innovation used for new equipment.

FIELD SERVICES – UPTOWER
(for GE or Non-GE Equipment)

- Rotor Wye Ring retrofit*
- Electrical tests
- Partial winding repair
- Generator cleaning and overhaul
- Shaft machining
- Stator or rotor cables exchange
- Slip ring and bearings replacement

SHOP REPAIR
(for GE or Non-GE Equipment)

- Rotor rewinding
- Stator rewinding
- Rotor / Stator overhaul
- Motor / Generator power upgrade
- Parts replacement
- Electrical / Rotating tests
- Engineering Studies

* GE PC patent
PREVENTIVE & CORRECTIVE SERVICES

GE Power Conversion - Campinas as Motors and Generators manufacturing center has a complete structure and Services offering to repair Induction, Synchronous, Wound Rotors, Direct Current motors, turbogenerators & Synchronous Generators applicable in all Industry Segments such as Oil & Gas, Hydro, Biomass, Metals, Mining & Wind. Our services portfolio is applicable for third party equipment.

GE counts with specialized and experienced Engineering and Field team to perform Field and shop repair and all technology applied in the repairs follows most recent process and innovation used for new equipment.

SHOP REPAIR OFFERING
(for GE or Non-GE Equipment)

• Rotor rewinding
• Stator rewinding
• Rotor / Stator overhaul
• Parts replacement
• Electrical tests
• Engineering studies and evaluation of installed base for uprate opportunities
• Improvement in efficiency through re-winds or replacement components
• Retrofits, uprates and replacement stators, rotors and Renewal Parts
• Providing coil design for direct re-winds in the service shops
• Mechanical components for repairs and refurbishments

FIELD SERVICES OFFERING
(for GE or Non-GE Equipment)

• Assembly, Installation & Commissioning
• Electrical tests
• Complete rewind – resin rich coils
• Partial winding repair
• Cleaning and overhaul
• Bearing, Conduit box and/or Accessories replacement
• Vibration measurement and analysis
• On site machining

CONTACT US
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• Phone: +55 19 21028533
About GE Power Conversion

GE’s Power Conversion business, a business unit of GE Power, applies the science and systems of power conversion to help drive the electric transformation of the world’s energy infrastructure. It does so by designing and delivering advanced motor, drive and control technologies that evolve today’s industrial processes for a cleaner, more productive future. Serving specialized sectors such as energy, marine, renewables and industry, through customized solutions and advanced technologies, GE Power Conversion partners with customers to maximize efficiency. For more information, please visit www.gepowerconversion.com

About GE

GE (NYSE: GE) is the world’s Digital Industrial Company, transforming industry with software defined machines and solutions that are connected, responsive, and predictive. GE is organized around a global exchange of knowledge, the “GE Store,” through which each business shares and accesses the same technology, markets, structure, and intellect. Each invention further fuels innovation and application across our industrial sectors.

With people, services, technology and scale, GE delivers better outcomes for customers by speaking the language of industry.

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