Welcome to Toshiba South America.

Committed to People,
Committed to the Future. TOSHIBA
Toshiba is a world reference concerning technology development and equipment production for the Electronics industry. Founded in Tokyo in 1875, Toshiba Group is comprised by 550 companies and employs more than 188,000 people around the globe.

Present in Brazil for 50 years, based in Sao Paulo (SP), with offices in Curitiba (PR) and plants in Contagem and Betim (MG), Toshiba offers a complete portfolio of products with power up to 800 kV, solutions and high technology services for energy Transmission and Distribution, and has a proven history of Full Turnkey installations in big projects of infrastructure, transportation, industries and Smart Grid solutions projects.

Toshiba establishes, documents and maintains a Management System seeking its effectiveness and continuous improvement in accordance with the requirements established by ISO 9001 (Quality), ISO 14001 (Environment) and OHSAS 18001 (Health and Safety at Work) standards to perform the processes described in the scope of Toshiba Units.

TOSHIBA MEANS TECHNOLOGY AND PEOPLE WORKING WITH PASSION AND DEDICATION, BLENDING JAPANESE INNOVATIONS AND TRADITION WITH THE BRAZILIAN TALENT. TOSHIBA IS RELIABILITY THROUGH ENERGY.
Solutions in energy, technology and know-how on a wide variety of applications all over Brazil.

Toshiba has global experience in supplying Full Turnkey (FTK) substations with transmission voltage reaching 800 kV.

The company develops energy transmission and distribution projects, interconnection of power generation plants, expansion and retrofits, customized solutions with qualified engineering, equipment and cutting-edge technology, and excellence in the management of engineering projects, combining Japanese know-how, quality and tradition.

Toshiba provides to its customers technical and economical engineering solutions, including basic and executive designs, engineering studies, civil works, electromechanical assembly, supplying of materials and equipment, testing and commissioning for substations, as well as contract management in the EPC model (Engineering, Procurement and Construction).
AIR INSULATED SWITCHGEAR
SF6 GAS INSULATED SWITCHGEAR
TRANSPORTATION
MAILING AUTOMATION SYSTEM
SUBSTATIONS

Curitiba Leste Substation 525/230 kV.

**CHARACTERISTICS**

- Conventional air insulated substations (AIS - Air Insulated Switchgear)
- SF6 Gas insulated substations (GIS - SF6 Gas Insulated Switchgear)
- Voltages up to 550 kV

Management of Full Turnkey Projects according to EPC model (Engineering, Procurement and Construction).

Toshiba is specialized in Full Turnkey projects which include civil works, planning, design, engineering, equipment supply, supplying, delivery, installation, testing, commissioning, post-delivery, service and maintenance of the complete power transmission and distribution systems. Other Full Turnkey projects involving renewable solar power generation systems are also part of its broad capacity.

Toshiba’s effort in providing its experience is supported by skilled professionals and experienced Electrical Engineers, who are specialized in Project Management, Production, Commissioning, Maintenance and Services.
CURITIBA LESTE SUBSTATION

Curitiba Leste substation was built in 2015 as part of a master plan to strengthen the electric service for the Curitiba city and its metropolitan region, contributing to the increase of the reliability of the region’s electrical system. The substation is composed of 525/230 kV - 672 MVA autotransformers bank, and two sectors, 525 kV and 230 kV.

SÃO GOTARDO 2 SWITCHGEAR

The project was built in 2014 and consisted of the expansion of the São Gotardo 2 substation, composed by the installation of a 345/138/13.8 kV - 300 MVA autotransformers bank, a 138/138 kV – 300 MVA Phase Shifting Transformer (PST) and a new 138 kV sector. This project aimed to reinforce the electrical system of the Patos de Minas region, providing a better control of the power flow to the region, thus improving the efficiency of the region’s electrical system.

SUBSTATION GIS VILA OLÍMPICA

High voltage gas insulated switchgear in 138 kV (Gas Insulated Switchgear - GIS), built in 2015. It has three three-phase transformers (138/13.8 kV of 40 MVA each), in insulated vegetable oil, totaling 120 MVA of installed power. The 13.8 kV sector was designed with 51 medium voltage switchgear, containing advanced digital protection system, automation and equipment monitoring. This high technology and reliability substation is responsible for providing power to the entire Olympic Park complex.
GAS INSULATED SWITCHGEAR (GIS)

CHARACTERISTICS

Through the equipment for the SF6 Gas Insulated Substation (GIS), Toshiba offers the solution for power supply in small spaces such as industries, hospitals, shopping malls and other diverse applications.

Gas Insulated Substation (GIS) easily fit in small urban spaces, requiring a simplified construction, thus dispensing fire walls, oil secondary containment and boxes to collect oil.

A GIS+GIT substation occupies 16% of the area (m²) and less than 10% of the volume (m³) when compared to an equivalent conventional AIS substation.

AIS X GIS COMPARISON (145 KV): ADVANTAGE IN AREA REDUCTION

<table>
<thead>
<tr>
<th>COMPARISON CHART</th>
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<tbody>
<tr>
<td>SE 145 kV</td>
</tr>
<tr>
<td>AREA (m²)</td>
</tr>
<tr>
<td>VOLUME (m³)</td>
</tr>
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AIS + OIT

HIGH RELIABILITY AND SAFETY
Toshiba has extensive know-how in the development of this technology, as well as supply background offering compact gas insulated systems and equipment for energy transmission and distribution with high safety and efficiency, providing greater reliability to the electrical system. Toshiba’s GITs and GISs have low maintenance rates and long service life.

**SF6 GAS INSULATED TRANSFORMERS (GIT)**

**CHARACTERISTICS**

- **Non-flammable:** Because it’s not fuel, SF6 gas is used as insulation and allows the exclusion of fire-fighting equipment and fire walls in the transformer installation area;

- **Non-explosive:** The elevation of the internal pressure of the tank during the electrical fault is small due to the characteristics of the SF6 gas, eliminating the risk of tank explosion.

- **Compaction:** Through direct coupling with the GIS Substation, the substation space can be reduced;

- **Easy installation:** Does not require oil treatment;

- **Maintenance:** Only SF6 gas pressure must be monitored during routine inspections;

- **Reduced installation cost:** The GIT solution provides reduction on civil construction cost since it does not require the construction of oil secondary containment and fire walls.

First SF6 gas insulated power transformer manufactured in Brazil. 12.5 MVA - 138x88 kV/ 13.8 kV.
Toshiba supplies high performance and quality systems and equipment to the railway market. Using advanced control and information techniques, the urban transport electrification projects implemented by Toshiba in several countries result in a highly safe, efficient and sustainable operation.

<table>
<thead>
<tr>
<th>ELECTRIFICATION</th>
<th>ROLLING STOCK SYSTEM</th>
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<tbody>
<tr>
<td>AC ELECTRIFICATION</td>
<td>DC ELECTRIFICATION</td>
</tr>
<tr>
<td>Single-phase AC power system for feeding high- and medium-speed train lines</td>
<td>DC power system for feeding suburban trains, metros, monorails and light rail vehicles (LRV)</td>
</tr>
<tr>
<td>DC power system for feeding suburban trains, metros, monorails and light rail vehicles (LRV)</td>
<td>Traction power storage system using LTO SCiBTM batteries</td>
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<tr>
<td>Traction Auxiliary Power Supply</td>
<td></td>
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<tr>
<td>Information/Safety</td>
<td></td>
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<tr>
<td>Air Conditioning</td>
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<tr>
<td>Driving Assistance</td>
<td></td>
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<tr>
<td>Operation Planning</td>
<td></td>
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</tbody>
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### REFERENCES OF PROJECTS BUILT IN SOUTH AMERICA

**ARGENTINA**

- **Sarmiento/Mitre - Buenos Aires**
  - 800 VDC Traction Systems (405 cars)
- **Urquiza**
  - 600 VDC Traction Systems (128 cars)
  - 600 VDC Traction Substations (03)
- **Roca**
  - 25 kVAC Traction Substations (04)

**VENEZUELA**

- **IAFE Caracas**
  - 25 kVAC Traction Systems
  - Auxiliary Inverters
  - Monitoring Systems
  - Air Conditioning (104 cars)

**CHILE**

- **EFE**
  - Air Conditioning (60 cars)

- **BRASIL**
  - **Trensurb**
    - 3 kVDC Traction Motors (100 cars)
    - 34.5 kV Distribution Network
  - **CBTU/EFS – São Paulo**
    - 3 kVDC Traction Motors (196/30 cars)
  - **RFFSA/CBTU – Rio de Janeiro**
    - 3 kVDC Rectifier Substations (17)
  - **Salvador Metro**
    - 3 kVDC Traction Systems
    - Auxiliary Inverters (24 cars)
  - **São Paulo Metro – Line 1**
    - 750 VDC Traction Motors (156 cars)
  - **Central**
    - 3 kVDC Traction Systems.
    - Auxiliary Inverters (480 cars)
    - Monitoring Systems (400 cars)
  - **Rio de Janeiro Metro - Line 4**
    - Primary GIS Substation (01)
    - Auxiliary Substations (14)
    - Conventional Catenary (~18 km)
    - Escape Route Signaling System
  - **São Paulo Metro – Line 5**
    - Primary Substation (01)
    - 1.5 kVDC Rectifier substations (14)
    - Auxiliary Substations (14)
    - Rigid Catenary (~22 km)

**METRO**

- **Metrô São Paulo – Linha 5**
  - Primary GIS Substation (01)
  - Auxiliary Substations (14)
  - Rigid Catenary (~22 km)
  - Conventional Catenary (~18 km)
  - Escape Route Signaling System
- **Rio de Janeiro Metro - Line 4**
  - Primary GIS Substation (01)
  - Auxiliary Substations (14)
- **São Paulo Metro – Line 6**
  - Primary Substations (02)
  - Rectifier Substations (09)
  - Auxiliary Substations (18)
- **CPTM - Line 13**
  - Rectifier Substations (03)
  - Sectioning Cabin (01)
  - Telecontrol System
  - 34.5 kV Distribution Network
An important construction for the city of Rio de Janeiro, the Metro line 4 started operating in 2016 and was designed to transport more than 300 thousand people a day, removing from the streets about 2 thousand vehicles per hour/peak in each direction of the axis Barra da Tijuca-Zona Sul. The line has approximately 16 kilometers of tracks and 6 passenger stations.

Toshiba implemented São Conrado Primary Substation and the 12 Auxiliary Substations responsible for power supplying to the new line and the various auxiliary equipment located in the Tunnels, Passenger Stations and Maintenance and Maneuvering Yards, with special emphasis on the gas insulation technology (GIS: Gas Insulated Switchgear) of São Conrado Primary Substation, ensuring economy, safety and reliability to the Metro operations.

### TECHNICAL CHARACTERISTICS

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<tbody>
<tr>
<td><strong>Number of Stations</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>Maximum Speed</strong></td>
<td>80 km/h</td>
</tr>
<tr>
<td><strong>Headway</strong></td>
<td>4 min</td>
</tr>
<tr>
<td><strong>Primary Energy</strong></td>
<td>Gas Insulated Switchgear (GIS) 138 kV / 22 kV / 90 MVA</td>
</tr>
<tr>
<td><strong>Auxiliary Energy</strong></td>
<td>440 / 220 / 127 Vca Between 112.5 and 750 kVA per substation</td>
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</tbody>
</table>
The project connects Largo Treze, in the neighborhood of Santo Amaro, to Chácara Klabin, totaling an extension of 19.9 km, 17 stations and 02 depots.

Toshiba’s project is composed of 01 Primary High Voltage Substation, 14 4MW Rectifier Substations, 12 Low Voltage Auxiliary Substations, 11.5 km of 1500 VDC rigid catenaries, conventional catenaries, and also the Escape Route Signaling System. Toshiba’s scope encompasses the development of the executive design, equipment supply, electromechanical assembly, factory tests, training, commissioning tests, spares and assisted operation.

With the commercial start-up of the Adolfo Pinheiro - Chácara Klabin section, Line 5 - Lilac has an estimated demand forecast of 781,300 passengers/day with 34 trains operating at peak hours.

**SÃO PAULO METRO, EXTENSION OF LINE 5**

Bandeirantes Primary Substation: air insulated 138-88 kV / 22 kV / 100 MVA

Auxiliary Substations: 460/220 VAC - Between 2000 and 4000 kVA per substation

### TECHNICAL CHARACTERISTICS

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</tr>
<tr>
<td><strong>Primary Energy</strong></td>
<td>01 Air Insulated Substation (AIS) 138-88 kV / 22 kV / 100 MVA</td>
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Toshiba offers Smart Community solutions that seek to create intelligent resources for the whole society through information and communication technologies. Smart Communities also promote the use of renewable energy, integrated management and optimized controls for infrastructure. These solutions include electrical power, heating, mobility, health care and useful information to the daily life. Toshiba seeks to create a balanced society, in which comfort and social-environmental responsibility go hand in hand.

### RENEWABLE ENERGY

**Solar energy in Full Turnkey Modality of Contract**

Toshiba supplies large-scale photovoltaic power generation plants in Full Turnkey Modality of Contract and substation solutions to connect wind power plants to the national interconnected system.

- Global experience in solar power generation projects (mini and mega) with installed capacity superior to 100 MW;
- Ability and know-how in regional technical requirements for photovoltaic plants;
- Solid supplier network ensuring the best options for the investor.

### MAILING AUTOMATION SYSTEM

With over 40 years of experience in providing Automatic Mailing Triage Machines with high speed processing and high address reading rates, including Optical Character Recognition (OCR).

Toshiba began its participation in the national market in 2013, supplying machines installed in several plants, distributed among the cities of Cuiabá, Florianópolis, Fortaleza and Rio de Janeiro.

### TOSHIBA SCiB™ RECHARGEABLE BATTERY

Wide range of solutions aiming at efficiency, quality of supply and better integration of renewable energy resources. Toshiba’s rechargeable lithium-ion SCiB™ batteries have been developed with superior performance, safety and long service life.
More than 120 years have passed since Toshiba manufactured its first transformer in Tokyo, Japan, and even with all the dramatic social and technological changes since then, some principles remain unchanged in this long history: quality, reliability, innovation and respect to customers.

Important milestones have defined this long history of achievements, among them: transformers of 220 kV in 1939, of 330 kV in 1961, of 550 kV in 1967, GIT (SF6 gas insulated transformer) of 66 kV - 3MVA in 1967, of 765 kV in 1983 and of 1050 kV in 1993.

Toshiba began manufacturing transformers in Brazil in 1968, in Contagem, state of Minas Gerais. Through successive investments, the plant has been expanded, improved and has been producing 220 kV transformers since 1979 and 550 kV transformers since 2001.

In 2013, a new and ultramodern power transformers and shunt reactors factory was inaugurated in the city of Betim, 25 kilometers away from from the unit located in Contagem. The two plants work closely together and stand out by reaching a combined total capacity above 60 GVA per year.

- Solutions tailored to your needs
- Equipment for the most diverse applications
Power Transformers and Autotransformers for generation, transmission and distribution of energy and for the most diverse industrial applications.

**TRANSFORMERS AND AUTOTRANSFORMERS**

**CHARACTERISTICS**

Quality, reliability and durability.

Manufactured under the highest international quality standards, with special design, manufacturing and testing technologies that ensure a reliable performance.

Produced to attend a wide range of demands from the markets of generation, transmission and distribution of energy, steel industries, metal casting, mining and the most diverse branches of activity.

For indoor and outdoor applications.

**MODELS**

Single-phase and three-phase up to 800 kV.

**SHUNT REACTORS**

**CHARACTERISTICS**

Developed based on innovative design.

They produce lower noise and vibration levels.

They ensure balance and stability for the network.

**MODEL**

Single-phase up to 800 kV.
VEGETABLE OIL INSULATED TRANSFORMERS

**CHARACTERISTICS**

Toshiba uses vegetable oil as an insulation for environmental needs. Vegetable oil has the following advantages: it is biodegradable, increases the life expectancy of insulation materials, has greater fire safety, provides greater stability to oxidation and does not require the use of fire walls and fire extinguishing systems.

VOLTAGE REGULATOR

**MODELS**

- Single-phased up to 36.2 kV.
- Three-phased up to 69 kV.

**CHARACTERISTICS**

Provides stability and voltage quality in the load on distribution lines in the power substations.

Controls with cutting-edge processors, programmable 8-channel mass memory, ensuring efficient accuracy and communication.

Widely diffused and proven solution in the correction and adequacy of voltage level required in the power distribution lines.

Equipment with cutting-edge technology for stable power generation, transmission and distribution always constant.
PHASE-SHIFTING TRANSFORMERS

CHARACTERISTICS

Used to control the power flow between the transmission branches of the electrical system, the phase-shifting transformers allow the interconnection of the transmission systems with phase displacement angle between the lines. They are manufactured according to the specific requirements of each application.

FIELD REFORM, REPOTENTIATION, REVITALIZATION SERVICES

CHARACTERISTICS

Quality and reliability services

Toshiba offers solutions and technical support for various technical assistance services in transformers above 34 kV, voltage regulators and shunt reactors.

Renovation, repowering and revitalization services:

These services can be run on the customer’s locations or at Toshiba’s factories. After technical evaluation, it is also possible to carry out technological update services of the protection, control and supervision equipment from transformers and shunt reactors.

Field services:

Toshiba performs assembly supervision, oil treatment, commissioning, transformer energization and shunt reactors in the field, with or without associated equipment and services to perform these activities.
Toshiba is applying its knowledge and expertise to create economic, efficient and reliable systems, offering solutions in Protection Systems, Control, Supervision, Measurement and Automatization of the Substations and Power Network for all levels of automation regarding power generation, transmission, distribution and transportation sectors.

SPCS – Protection and Control Systems & Service also includes TELECOM / Smart Communications (SDH - Synchronous Digital Hierarchy, PDH - Plesiochronous Digital Hierarchy, OPLAT / PLC - Power Line Carrier, WiMax - Worldwide Interoperability for Microwave Access, CFTV - Closed-Circuit Television) solutions in several market segments, such as industry, automation, metro and road systems, and mainly energy system (generation, transmission and distribution) for small, medium or large size projects.

**STEP-UP SUBSTATION (TYPICAL) OF A WIND FARM**

**CHARACTERISTICS**

Aligned with the Brazilian Market requirements, Toshiba has a team prepared to integrate several multibrand control and protection systems, including supervisors (SCADA), oscillography and measurement systems. The company has a large experience concerning several manufacturers of relays, meters, oscillographs and supervisors.

Toshiba’s Protection and Control Systems have:

- High Reliability;
- Team with great expertise in Critical and Complex Systems (such as: Phase-shifting Transformer, SVC, GIS Substations, etc);
- Projects with Japanese technologic innovation.

**SERVICE**

Services for retrofit, maintenance, modernization, expansion and scanning of the Protection, Control Supervision and Measurement, systems of energy substations, industrial and generation plants.
For the distribution sector Toshiba offers the GRE relay line, with application on Transmission line protection, transformers (with 2 windings), feeders, motors and capacitor banks.

Toshiba has the GR-200 relay line, with application on transmission line protection, transformers, reactors, capacitor banks, bars and gap control, worldwide used.
TOSHIBA SOUTH AMERICA

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