## Traction Converters (Inverters) for 25 kV AC / 3000 V DC

| Description | 25 kV AC | 3000 V DC |
|---|---|---|
| Control method | PWM controlled voltage type Converter<br>PWM controlled voltage type VVVF Inverter | PWM controlled voltage type VVVF Inverter |
| Cooling method | Natural cooling | Forced air cooling |
| Output capacity | 200 kW × 4 | 210 kW × 4 |
| Converter unit | IGBT rating 1,700 V - 2,400 A | – |
| Inverter unit | IGBT rating 3,300 V - 1,200 A | IGBT rating 6,500 V - 600 A |
| Dimensions (width x depth x height) | 4,200 × 1,241 × 650 mm | 2,900 × 1,660 × 650 mm |
| Mass | 1,120 kg | 1,355 kg |

## Traction Motor for 25 kV AC / 3000 V DC

| Description | 25 kV AC | 3000 V DC |
|---|---|---|
| Rating | 200 kW (Continuous) | 210 kW (Continuous) |
| Insulation class | Class H | Class 200 |
| Cooling method | Self-ventilation | Self-ventilation |
| Mass | 630 kg | 750 kg |

## Auxiliary Power Supply Inverters for 25 kV AC / 3000 V DC

| Description | 25 kV AC | 3000 V DC |
|---|---|---|
| Control method | PWM controlled voltage type Converter<br>PWM controlled voltage type CVCF Inverter | PWM controlled voltage type CVCF Inverter |
| Cooling method | Natural cooling | Forced air cooling |
| Input voltage | AC 469 V | DC 3,000 V |
| Capacity | 185 kVA | 206 kVA |
| Efficiency | Exceeding 92% | Exceeding 92% |
| Dimensions (width x depth x height) | 3,500 × 970 × 650 mm | 3,160 × 1,780 × 650 mm |
| Mass | 1,220 kg | 2,625 kg |

## Main Transformer for 25 kV AC

| Description | 25 kV AC |
|---|---|
| Type | Shell type, constant pressure type |
| Cooling method | Forced oil/forced air cooled (KDAF) |
| Insulation fluid | Silicone oil |
| Rated voltage and capacity | Primary : 26,125 V - 1,980 kVA<br>Secondary : 2 × 1,087 V - 1,590 kVA<br>Tertiary : 2 × 469 V - 390 kVA |
| Dimensions (width x depth x height) | 2,325 × 3,175 × 720 mm |
| Mass | 3,520 kg |

The products described in this document may include products subject to the foreign exchange and foreign trade laws.

**Find out more on** http://toshiba-railway.com


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TOSHIBA

Leading Innovation

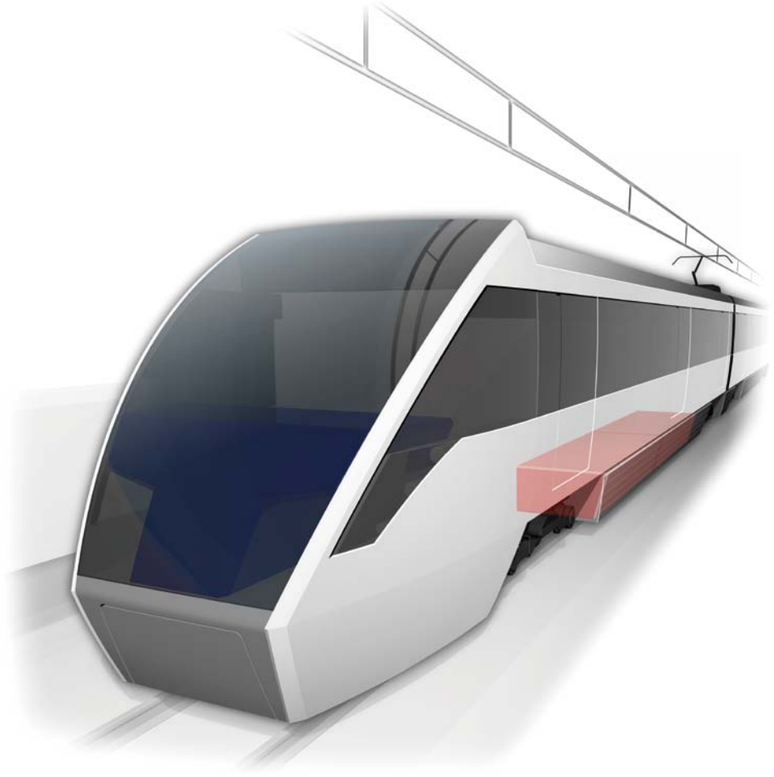
25 kV AC / 3000 V DC

# Electrical Equipment and Systems for Rolling Stock

High reliability

High performance

Energy saving



# Toshiba's field-proven technologies and top-quality equipment realize highly economical, comfortable and safe railway systems.

## 25 kV AC Electrical Equipment and Systems

## Propulsion system

Light and compact traction converter and traction motor contribute to energy saving and longer life of bogies and tracks.

### Traction Converter

**High reliability / Reduced maintenance**

#### Natural cooling

The propulsion inverter consists of one three-level converter and one two-level inverter. The cooling method used for both the converter and inverter units is natural cooling. This means that no blower is necessary and eliminates the need for filter maintenance. As a result, a high-efficiency system with low energy consumption and easy maintenance can be achieved.

### Main Transformer

**Reduced maintenance**

#### No need for oil replacement

The main transformer employs forced oil/forced air cooling (KDAF), allowing a more compact design. And the oil tank is sealed without any air to prevent oil degradation, thus ensuring easy maintenance.

### Traction Motor

**High reliability**

#### Maintenance-free filter

A maintenance-free filter is used that separates dust by centrifugal force.

## Auxiliary power supply system

The auxiliary power supply contributes to improv reliability and customer service.

**Reduced maintenance**

#### Natural cooling

The APU consists of one two-level converter and one two-level inverter, both of which are cooled by the natural cooling method. Therefore, no blower is necessary and there is no need for filter maintenance. This makes it possible to achieve a high-efficiency, low-energy-consumption and easy maintenance system.

**High reliability**

#### Redundancy

There are two APUs in one train. In the event of a failure in one unit, the remaining unit will supply power to maintain normal train services.

**High reliability**

#### High-speed response

High reliability is assured thanks to real-time control, amplification of signal voltage and improved electro-magnetic noise performance.

**Extendability**

#### 10/100 Mbps High-speed signaling

In-car displays, television reception and mixed transmission of multi-media information are available with high-speed communication.

**Redundancy**

#### High network redundancy

Even if a terminal fails, the double-ladder type configuration makes it possible to bypass the system to maintain communication.

## 3000 V DC Electrical Equipment and Systems

## Propulsion system

Field-proven traction inverter and traction motor

### Traction Inverter

**High reliability / High performance**

#### Simple inverter circuit

A two-level inverter circuit is adopted using 6.5 kV insulated IGBTs, which reduces the number of IGBTs and other parts while improving efficiency and reliability

### Traction Motor

**Reduced maintenance**

#### 3000 V DC Traction Motor

Incorporates insulated bearings to prevent electric corrosion, realizing high-voltage insulation for 3000 V DC catenary power.

**Reduced maintenance**

#### Maintenance-free filter

The maintenance-free filter separates dust by centrifugal force.

## Auxiliary power supply system

Auxiliary power supply ensures high-grade customer services

### APU

(Auxiliary Power Unit)

**Energy saving**

#### High efficiency

Efficiency exceeding 92% contributes to energy saving.

**High reliability**

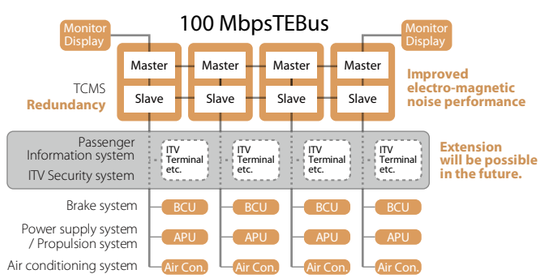
#### Redundancy

One train has two APUs. In the event that one unit fails, the remaining unit will supply power to maintain normal train services.

**Common spare parts**

#### Common power unit module

Traction inverter and the auxiliary power supply inverter incorporates 6.5 kV insulated IGBTs and the power unit module is compatible between traction inverter and APU. This concept minimizes the number of spare parts and reduces running costs.




## TCMS

### Train Control and Managing System

TEBus (Train Ethernet Bus) is adopted to exceed specification requirements, provides high capacity communications, real time control, improved electro-magnetic noise performance and rich media capabilities, while also easily accommodating redundancy.