Toshiba Locomotives: Aiming to Meet Your Needs

Toshiba Locomotives

Independent-control main circuit of Electric Locomotive

High Availability with Water-Cooled Power Converter

Independent control is applied for high availability and performance.

Low-emission Transformer

Nitrogen gas sealed transformer technology reduces need for insulation oil exchange.

Toshiba Locomotives

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Toshiba Locomotives

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High Availability with Water-Cooled Power Converter

Independent control is applied for high availability and performance.

Low-emission Transformer

Nitrogen gas sealed transformer technology reduces need for insulation oil exchange.

Toshiba Locomotives
Diesel Electric Locomotive

### Specifications

- **DE45**
  - **Maximum Power**
    - Engine Output: 4,500 BHP
    - Total at Tread: 5,500 BHP
  - **Fuel**
    - Standard
  - **Weight**
    - 120 – 150 tons
  - **Length**
    - 100 – 120 meters
  - **Maximum Speed**
    - 120 km/h

- **DE43S**
  - **Maximum Power**
    - Engine Output: 3,500 BHP
    - Total at Tread: 4,500 BHP
  - **Fuel**
    - Standard or Non-Radioactive
  - **Weight**
    - 90 – 110 tons
  - **Length**
    - 90 – 110 meters
  - **Maximum Speed**
    - 120 km/h

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Hybrid Locomotive

### Specifications

- **HBR700**
  - **Maximum Power**
    - Locomotive Total at Tread: 700 kW
    - (Battery Output): 330 kW
    - (Diesel Engine Output): 800 kW
  - **Length**
    - 15.0 m
  - **Weight**
    - 80 – 100 tons
  - **Bogie Arrangement**
    - Bo - Bo
  - **Maximum Speed**
    - 60 km/h

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### Features of SCiB™

- **Safety**
- **Long Life**
- **Performance**

SCiB™ Toshiba’s lithium-ion battery realizes safety, long life and good performance, even in low-temperature environments.

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**Efficient Traction Motor**

PMSM (Permanent Magnet Synchronous Motor) technology realizes high efficiency of up to 97%.*

* The efficiency of PMSM was calculated with loss measurement based on IEC 60349-2 at the temperature below 40˚C from 8/25/2009 to 9/25/2009.

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**Find out more on**

http://toshiba-railway.com
History

Toshiba’s first electric locomotive

Toshiba’s glorious locomotive business began with supplying electric components for the 40-ton electric locomotive built by Ishikawajima Shipbuilding & Engineering Co in 1923. The first locomotive Toshiba manufactured was the 73-ton locomotive in 1926. This locomotive was used for coal transportation. Since then, Toshiba has supplied 600 complete locomotives or electric components for locomotives for Japanese customers.

Overseas business in early times

Toshiba locomotive business has entered into the global market by supplying electric locomotives to Indian Railways. This was followed by supplying 5 electric locomotives to New Zealand in 1968. Since then, more than 2,000 locomotives or their components had been supplied to customers outside Japan.

Diesel electric locomotive

Toshiba’s first diesel electric locomotive was built in 1934, equipping a 750 HP diesel engine. Since 1969, Toshiba had manufactured 26 locomotives (500 HP/1050 HP) for Zambia and Brazil. Since 1981, 24 locomotives with two 500 HP engines had been shipped to New Zealand. In 1987, 24 locomotives with 2400 HP were delivered to Malaysia in collaboration with Kawasaki Heavy Industry, Ltd. The locomotives for steelworks with radio remote control were manufactured in 1991 and some were delivered to various locations in Japan.

Key Technologies for Locomotives

Power Converters

Modular design power converter cubicle for locomotive – The optimum configuration can be realized.

Main Power Unit up to 1,200 kW and convertible to APU (up to 500 kVA)

Auxiliary Power Unit (230 kVA)

Cooling Unit

3-MPU (1,200 kW), 1-APU (230 kVA) configuration

Other existing IGBT power converters

Power Converters for Electric Locomotives – Wide range of tractive power can be covered

<table>
<thead>
<tr>
<th>Power</th>
<th>500 kW / axle</th>
<th>750 kW / axle</th>
<th>1,200 kW / axle</th>
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Power Converter for DEL

Power Converter for Hybrid
**Recent Products**

**Electric Locomotive**
- **Application:** Freight
- **Number of locomotives:** 1,090
- **Catenary:** 25k Vac-50 Hz
- **Rated power:** 7,200 kW (continuous) at tread
- **Axle arrangement:** Co-Co
- **Locomotive weight:** 138 tons, 150 tons
- **Maximum speed:** 120 km/h
- Toshiba supplied electrical equipment

**Class 19E Electric Locomotive**
- **Application:** Freight (heavy ion)
- **Number of locomotives:** 44+32
- **Catenary:** 50k Vac-50Hz
- **Rated power:** 4,500 kW (continuous) at tread
- **Axle arrangement:** Co-Co
- **Locomotive weight:** 180 tons
- **Maximum speed:** 90 km/h
- Manufactured in collaboration with a local locomotive builder

**Class 29 Diesel Electric Locomotive**
- **Application:** Freight (coal)
- **Number of locomotives:** 110
- **Line Voltage:** 25k Vac-50 Hz / 3,000 Vdc
- **Rated power:** 3,000 kW (continuous) at tread
- **Axle arrangement:** Bo-Bo
- **Locomotive weight:** 100 tons
- **Maximum speed:** 120 km/h
- Manufactured in collaboration with a local locomotive builder

**Freight**
- **Engine power:** 2,580 kW
- **Axle arrangement:** Co-Co
- **Maximum speed:** 120 km/h
- Toshiba supplied electrical equipment

**Shunting**
- **Number of locomotives:** 2
- **Maximum power:** 500 kW at tread
- **Axle arrangement:** Bo-Bo
- **Locomotive weight:** 60 tons
- **Maximum speed:** 45 km/h
- Toshiba supplied electrical equipment

**Traction Motors**

**PMSM (Permanent Magnet Synchronous Motor)**
- PMSM technology with reduced energy loss realizes high efficiency up to 97%.*
- This high efficiency also realizes smaller size or higher power compared with our conventional products.
- *The efficiency of PMSM was calculated with loss measurement based on IEC 60349-2 at the temperature below 40˚C from 8/25/2009 to 9/25/2009.

**AC Induction Motor**
- 500 kW class
- 750 kW class
- 1,200 kW Class

**Main Transformers**

**Main Battery**

SCB™- anode material LTO (Lithium Titanium Oxide) makes the battery good performance, versatility and durability.

**Main Alternator**

**TCMS**

Distribution of Powering/Regenerative braking command to other locomotives in the same train set with wired/wireless communication.

**Wireless Communication**

**Driving screen examples**

**PMSM technology with reduced energy loss realizes high efficiency up to 97%.***

**Main alternator**

**for diesel electric locomotive**