

**TOSHIBA**

Hybrid locomotives and propulsion systems

# Solutions for Modern Freight Transportation

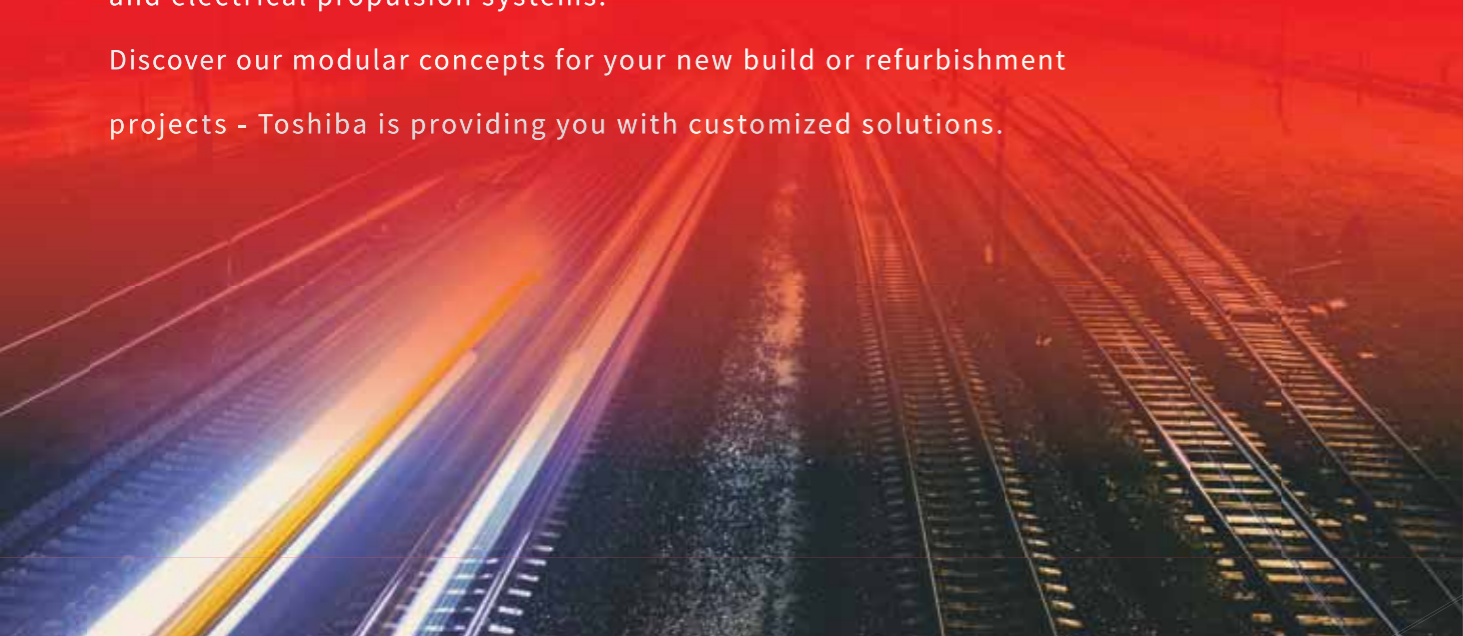


**Advanced Rail  
Technologies**

# Our Modular Solution, Your Energy Efficiency, Everybody's Green Future.

Toshiba is your competent partner for hybrid freight locomotives and electrical propulsion systems.

Discover our modular concepts for your new build or refurbishment projects - Toshiba is providing you with customized solutions.



## High Flexibility

Easier maintenance and adaptation to other power sources

3

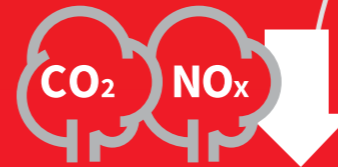
### Features

Toshiba combines its experience in railway systems with its innovative technology. In designing next generation products we promote a more safe, reliable and sustainable railway system



## High Comfort

Provided by larger driver's cabin



## High Efficiency

Energy savings and emission free operation



## Our Goal



improve  
life cycle cost



reduce  
maintenance effort



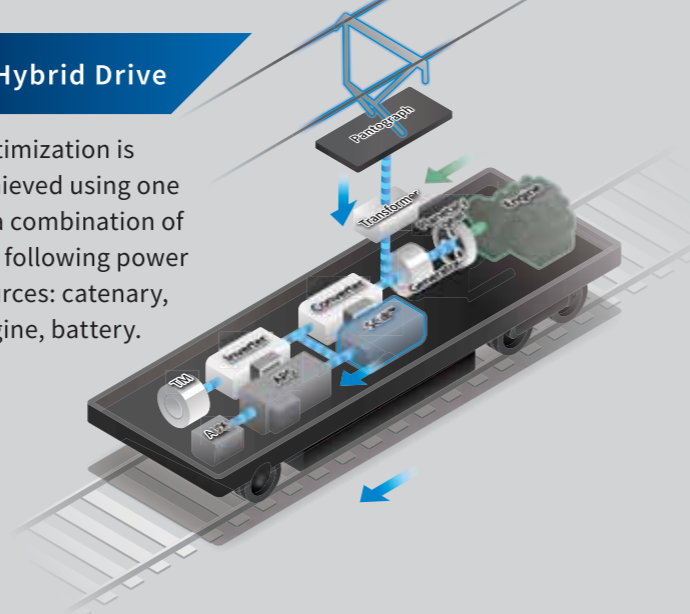
improve  
operational reliability

## Hybrid System

The hybrid system combines Toshiba's long experience in propulsion systems and its innovative SCiB™ battery technology (SIL 4 compliant). Choose the perfect type of hybrid system adjusted to your demand.

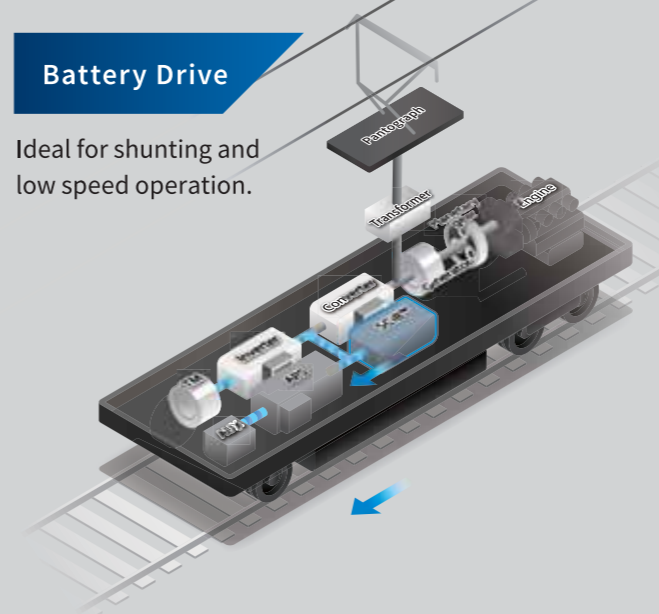
### Hybrid Drive

Optimization is achieved using one or a combination of the following power sources: catenary, engine, battery.



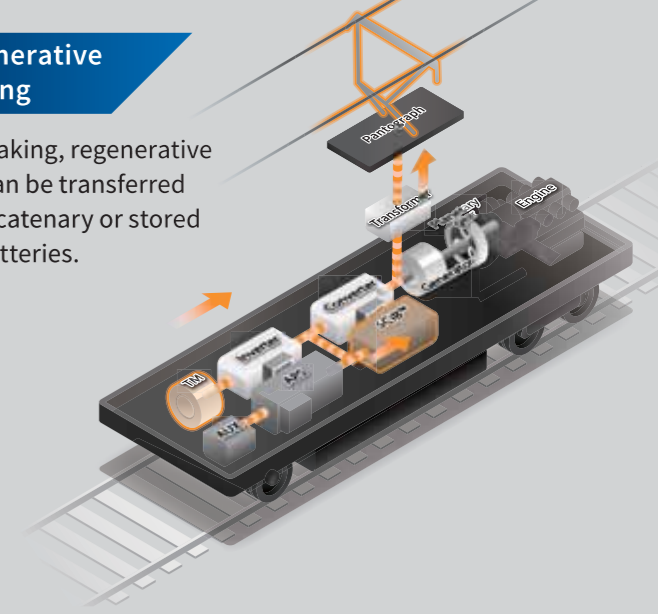
### Battery Drive

Ideal for shunting and low speed operation.



### Regenerative Braking

When braking, regenerative power can be transferred into the catenary or stored in the batteries.



Hybrid System  
Component

**SCiB™**

## SCiB™ is suitable for Railway Applications

### Safety

Battery system consisting of TypeS-20 SCiB™ and SSU components fulfils the qualitative and quantitative safety requirements according to EN 50129 for SIL 4\* applications. This confirms SCiB™'s excellent safety characteristics including low risk of fire and explosion.

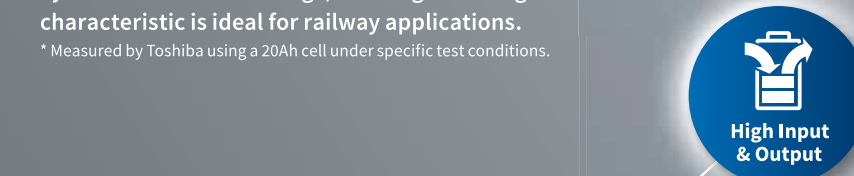
\* Safety Integrity Level 4



### Long Life

Type test confirmed that SCiB™ cell has minimal capacity degradation even after more than 20,000 cycles\* of 0%-100% charge/discharge. Its long life characteristic is ideal for railway applications.

\* Measured by Toshiba using a 20Ah cell under specific test conditions.



### High Input & Output

SCiB™ has high input and output characteristics making it suitable for railway application which demands high power to support various customer benefits such as hybrid rolling stock, as well as battery post for alternative power supply source.



Features realized by the use of lithium-titanate oxide (LTO)



## Toshiba Hybrid Locomotives

Combine various options for your needs

Type(s)	Heavy Shunting and Mainline Locomotive
Hybrid type	Series Hybrid
Maximum output (at wheel rim)	up to 3000 kW
Maximum operation speed	up to 120 km/h
Catenary operation	Option
Diesel engine power	up to 2 x 500 kW
Generator	Asynchronous/Synchronous type
Traction motor	PMSM/ASM
Traction inverter	IGBT-type
Traction battery	SCiB™

## T-HDB 800 for DB Cargo and RAILPOOL (under development)

Name	T-HDB 800
Type	Heavy Shunting and Shortline Locomotive
Hybrid type	Series Hybrid
Maximum output (at wheel rim)	750 kW
Maximum operation speed	100 km/h
Diesel engine power	2 x 471 kW
Generator (x2)	Asynchronous type
Traction motor (x4)	Permanent Magnet Synchronous Motor
Traction converter (x2)	IGBT-type, single-axis control
Traction battery	SCiB™ 2 x 61,8 kWh



## DB Cargo BR1094 HELMS

Two prototypes currently on the validation phase

Name	BR1094
Type	Heavy Shunting Locomotive
Hybrid type	Series Parallel Hybrid
Maximum output (at wheel rim)	780 kW
Maximum operation speed	80 km/h
Diesel engine power	1000 kW
Generator (x1)	Asynchronous type
Traction motor (x2)	Asynchronous type
Traction converter (x1)	IGBT-type
Traction battery	SCiB™ 92 kWh



## JR Freight HD300

Toshiba's first hybrid locomotive in collaboration with Japan's largest freight rail company, JR Freight

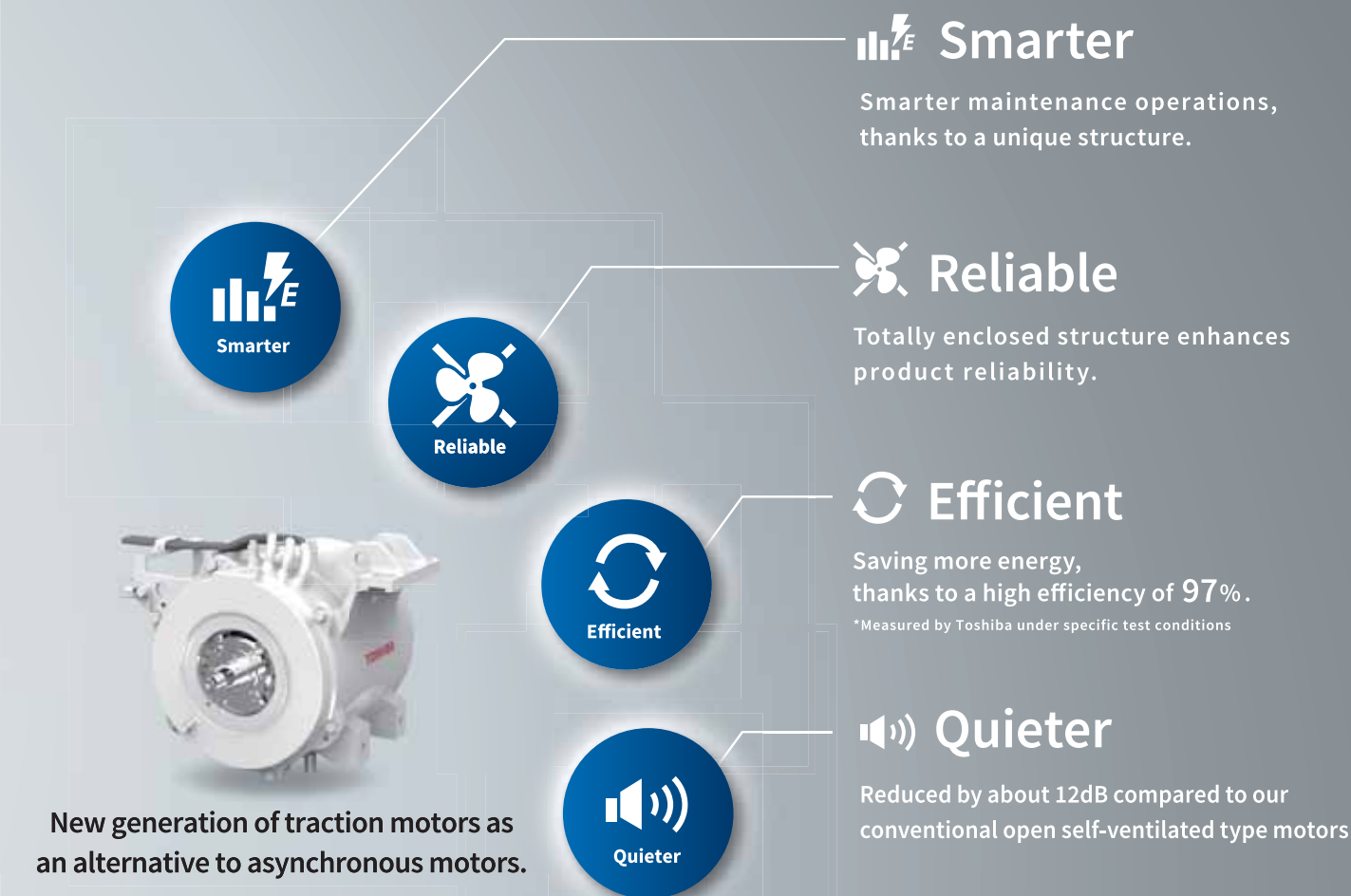
Name	HD300
Type	Shunting Locomotive
Hybrid type	Series Hybrid
Maximum output (at wheel rim)	500 kW
Maximum operation speed	45 km/h
Diesel engine power	242kW
Generator (x1)	Asynchronous type
Traction motor (x4)	Permanent Magnet Synchronous Motor
Traction converter (x1)	IGBT-type
Traction battery	Lithium-Ion 67,4kWh

Hybrid System  
Component

**PMSM**

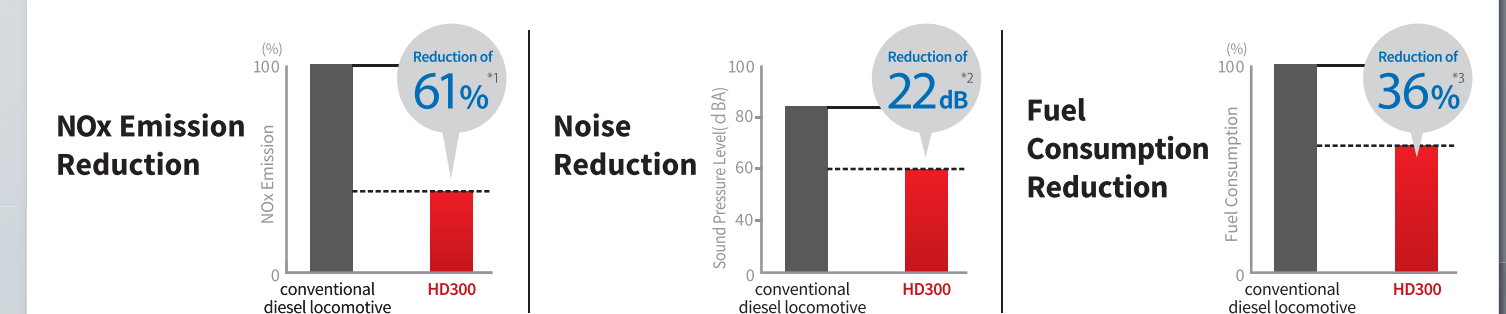
Permanent Magnet Synchronous Motor

## New Generation of Traction Motors



New generation of traction motors as an alternative to asynchronous motors.

## Reduction of Life Cycle Costs and Emissions for HD300



\*1: Hauling test with load 700t at Tokyo Freight Terminal (June 2010) \*2: Running engine with high speed rotation (June 2010) \*3: Hauling test with load 700t at Tokyo Freight Terminal (June 2010)

# Toshiba advanced railway and locomotive technologies situated at the “Heart of Europe”

## Toshiba Railway Europe GmbH



### Site Kiel

Locomotives & Mechanical Engineering

Address: Diedrichstrasse 9, 24143 Kiel

### Site Duesseldorf

Propulsion Systems & Electrical Engineering

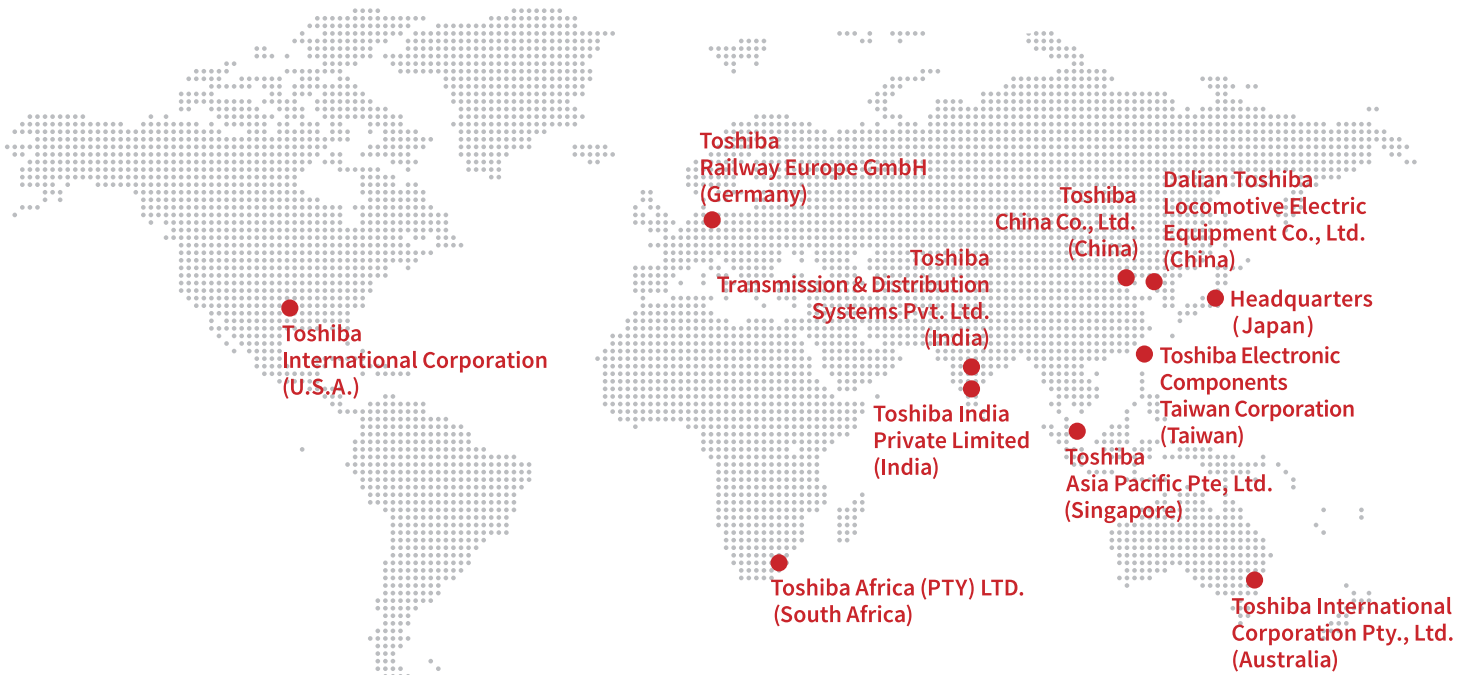
Address: Marienstrasse 8, 40212 Duesseldorf

Contact: [transport@toshiba-trg.eu](mailto:transport@toshiba-trg.eu)

## Working together with a global network

Toshiba Railway Europe GmbH is a part of an expansive global network with operations in Japan, China, India, Taiwan, Singapore, Australia, South Africa and the United States.

- Main global offices of the Toshiba Group cooperation for Railway System Business



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

## Toshiba Infrastructure Systems & Solutions Corporation

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