TOSHIBA

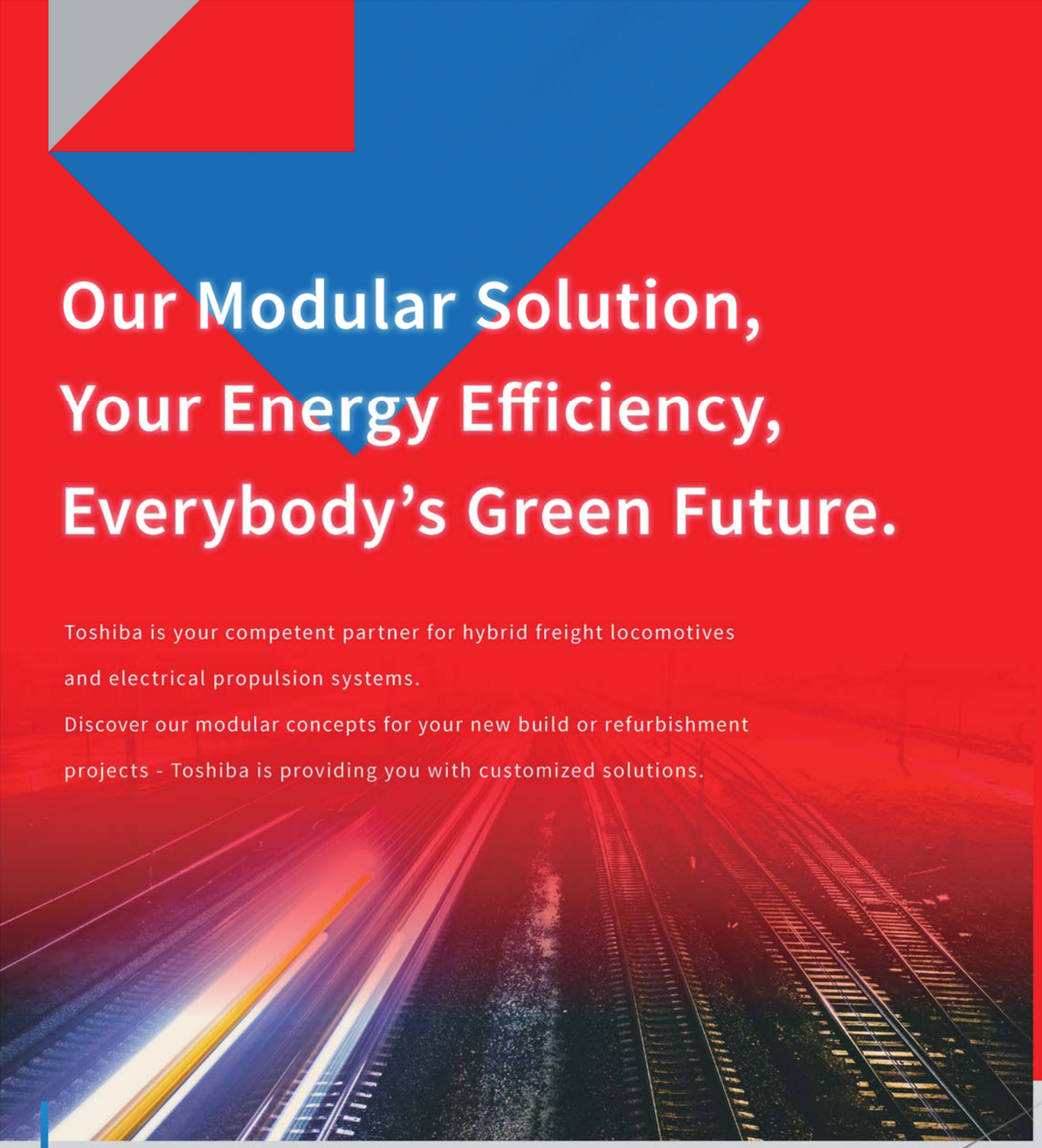
Hybrid locomotives and propulsion systems

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 due to modular design

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 Efficiency

CO_2 NO_x

Energy savings and emission free operation

High Comfort

Provided by larger driver's cabin

Our Goal

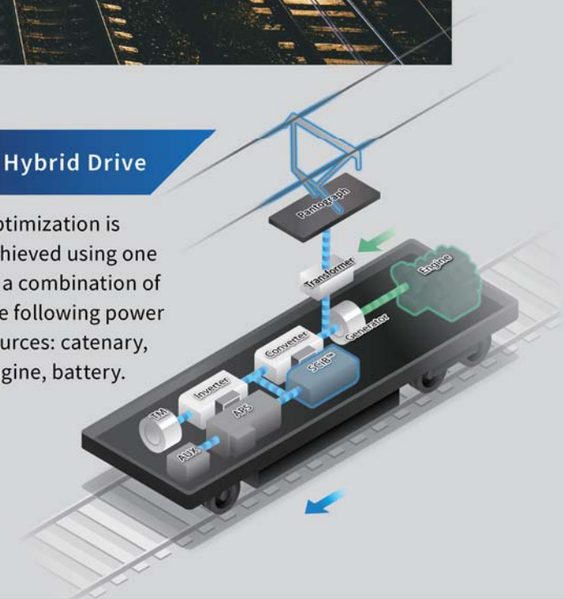
- improve life cycle cost
- reduce maintenance effort
- improve operational reliability

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.

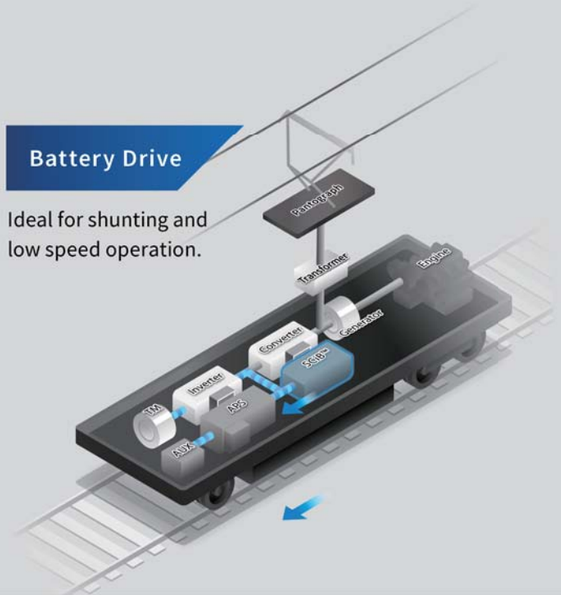
Hybrid Drive

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



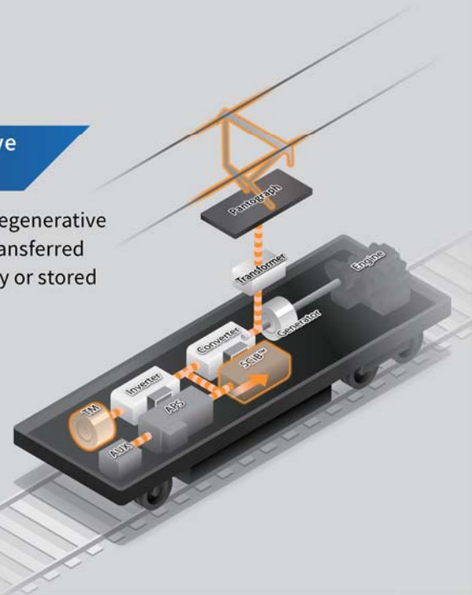
Battery Drive

Ideal for shunting and low speed operation.



Regenerative Braking

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



Hybrid System Component

SCiB™

SCiB™ is suitable for Railway Applications

Safety

Battery system consisting of TypeS-20 SCiB™ and monitoring units fulfills the qualitative and quantitative safety requirements according to EN 50129 for SIL 4* applications. In addition, SCiB™ has excellent safety characteristics including low risk of fire and explosion.

TÜVRheinland CERTIFIED — Functional Safety — www.tuv.com ID 0000064268

*Safety Integrity Level 4 based on the assessment according to EN 50126 and EN 50129.

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.

Safety · Low Temperature Operation · Long Life · High Input & Output · Rapid Charging · Wide Effective SOC Range

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

Toshiba Hybrid Locomotives

Combine various options for your needs

Type(s)	Shunting and Universal Locomotive
Hybrid type	Series Hybrid
Maximum output (at wheel rim)	up to 2000 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™

Toshiba HDB 800 for DB Cargo

(under development)

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

DB Cargo BR1094 HELMS

Two prototypes currently in 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
Tracion 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
Tracion converter (x1)	IGBT-type
Traction battery	Lithium-Ion 67,4kWh

Hybrid System Component

PMSM

Permanent Magnet Synchronous Motor

New Generation of Traction Motors

Smarter · Reliable · Efficient · Quieter

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

Smarter

Smarter maintenance operations, thanks to a unique structure.

Reliable

Totally enclosed structure enhances product reliability.

Efficient

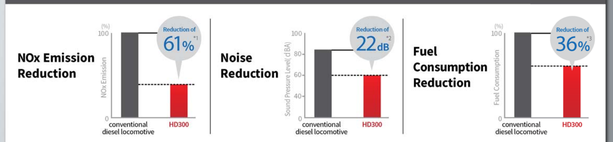
Saving more energy, thanks to a high efficiency of 97%.

*Measured by Toshiba under specific test conditions

Quieter

Reduced by about 12dB compared to our conventional open self-ventilated type 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's advanced railway and locomotive technologies situated at the "Heart of Europe"

Toshiba Railway Europe GmbH

Site Kiel

Locomotives & Mechanical Engineering

Address: Bunsenstrasse 29, 24145 Kiel

Site Duesseldorf

Propulsion Systems & Electrical Engineering

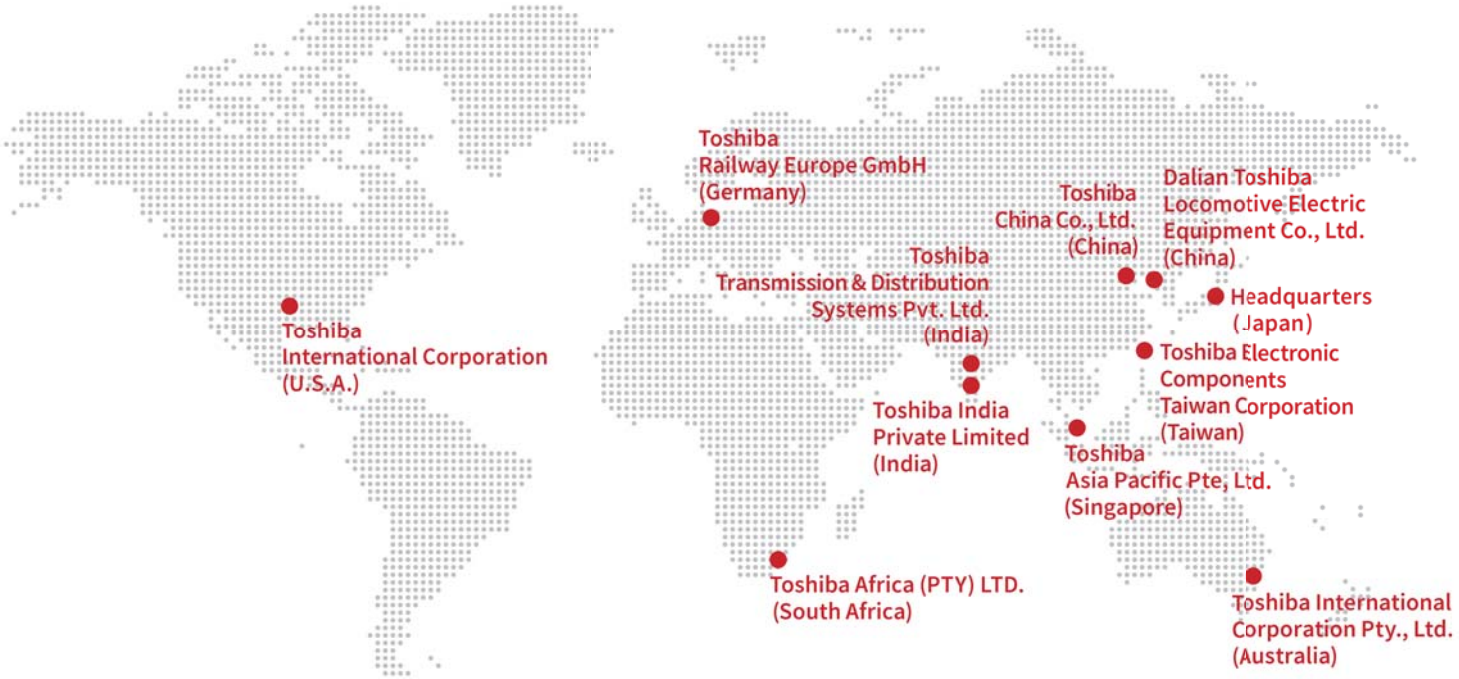
Address: Marienstrasse 8, 40212 Duesseldorf

Contact: sales@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

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