

MITRAC 1000

Driven by Reliability



Propulsion & Controls

BOMBARDIER

◁ MITRAC – Medium Power exceeding your expectations ▷



The **BOMBARDIER* MITRAC* 1000** product portfolio is a family of propulsion systems for a wide range of vehicle applications. It also includes the Train Control and Management System (TCMS) for doors, brakes, heating or air conditioning as well as for passenger information and security systems.

MITRAC 1000 supports all line voltages and diesel electric applications including multi and hybrid systems (750 / 1500 / 3000 V DC, 15 / 25 kV AC, diesel electric). The modular architecture allows customized applications, based on standard and field proven building blocks, to meet customer requirements. The synergy of high modularity, efficiency, reliability and excellent maintainability provides low life cycle costs and dependable revenue service. Innovative designs, modern simulation tools and intensive product testing ensure maximum performance and reliable operation from day one, even under the toughest environmental conditions.

Bombardier offers stand-alone products as well as integrated system solutions for propulsion, auxiliary and controls. Based on comprehensive experience from all over the world, Bombardier can, in close cooperation with the customer, develop the optimal solution and exceed expectations.

MITRAC 1000 Applications

For the following vehicle types:

- Very High Speed Trains
- High Speed Trains
- Intercity Trains
- Regional Trains
- Commuter Trains
- Metros

Reliable – and
Competitive Worldwide

■ Countries with
MITRAC 1000
applications

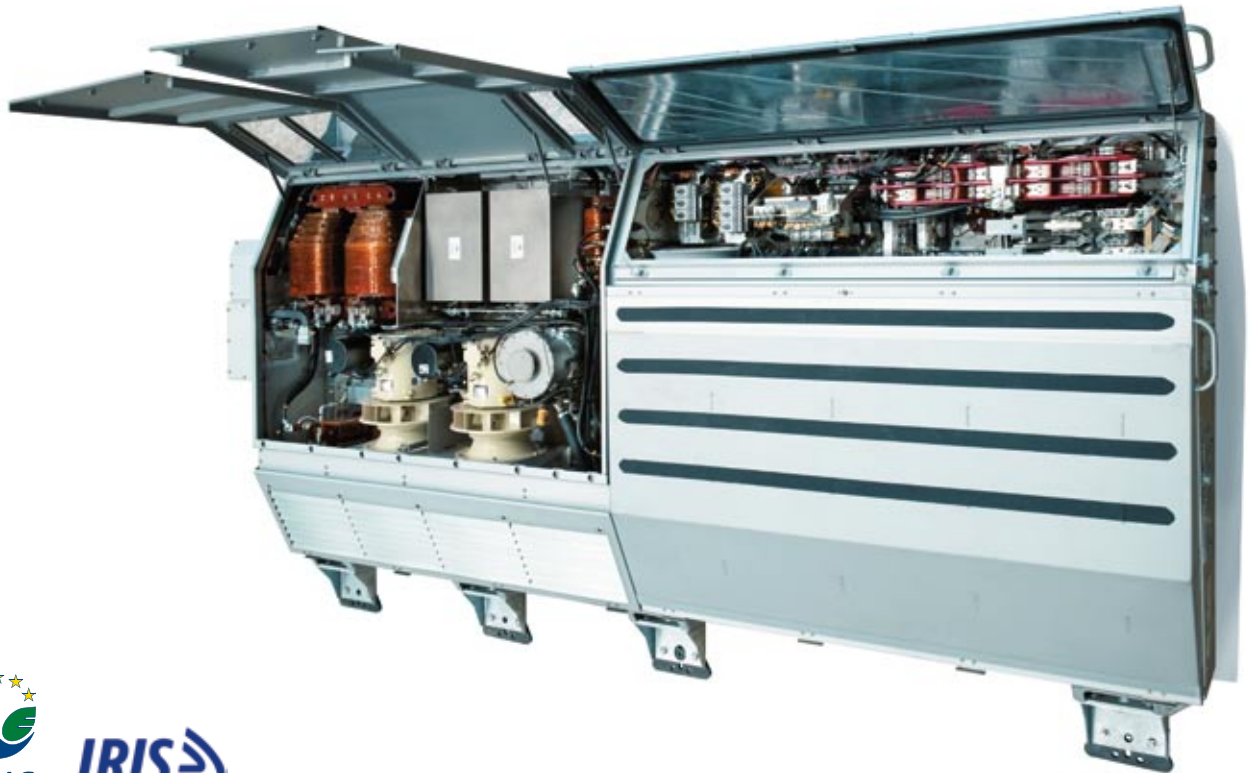
● Cities with
MITRAC 1000
Metro applications

MITRAC 1000 meets customer requirements as well as increasingly demanding industry standards and regulations. Receiving the IRIS (International Railway Industry Standard) award reflects the excellent quality of both, products and management over the entire supply chain.

MITRAC 1000 powers the world's most reliable rail vehicles – a result of uncompromisingly optimizing the reliability of all our products. Bombardier designs for reliability from the start, and also achieves excellent performance. For passengers it means punctual departures, comfortable trips, and on-time arrivals. For fleet carrier it means lowest maintenance efforts and downtimes of the whole vehicle.

The consistent energy efficient design of each propulsion unit and control component contributes strongly to more sustainable mobility. The first EPD (Environmental Product Declaration) for a *MITRAC* product was verified in accordance with EMAS (Eco Management and Audit Scheme) confirming Bombardier's commitment to preserving the environment.

Heart – Energy Transformed Into Power



MITRAC TC 1210

Over 35,000 MITRAC traction and auxiliary converters sold worldwide.

World-leading Converters

Bombardier offers the world's most innovative, efficient and reliable solution based on industry standard IGBT modules, combining the best power-to-weight-ratio with an environment friendly cooling system. It's one of the reasons why more than 35,000 MITRAC medium power traction and auxiliary converters have been sold to date.

Solutions for every Medium Power Propulsion Application

The world has many different systems for public transport. The MITRAC 1000 traction converter product family can be applied to any power system in any country. This allows flexible use not only within cities, but also in the suburban and regional areas.

Higher Reliability through Modularity

MITRAC 1000 traction converters are based on a unique concept that enables extensive standardization. It consists of modular and scalable designs that can be adapted to a wide variety of applications and power ranges.

The converters are based on stand-alone units or modules that can be used for a range of applications including line converters, motor converters for asynchronous and permanent magnet motors, choppers and auxiliary converters.

The stand-alone units (*MITRAC* TC1410 / TC1420 family) are forced air cooled or natural convection cooled. They can provide outputs for up to four motors, two brake resistors or alternatively two energy storage systems.

The module (CM-C family) is forced air or water cooled, contains up to eight IGBTs, and is able to provide outputs for up to four AC motors and two brake resistors. The modular compartments allow a customer specific arrangement of the converter system and its functionality.

One of the features of TC1410 / TC1420 converters and CM-C modules is a high degree of maintainability combined with easy and rapid parts removal and replacement.

Auxiliary Converters

Bombardier provides stand alone auxiliary converters (*MITRAC* AU 1410 family) and integrated auxiliary converters using CM-C modules, with output power of up to 300 kVA AC output and up to 25 kW DC output for the 24 - 110 V DC vehicle supply system as well as for the vehicle battery charging.

Different power ratings allow the vehicle builder to optimize the auxiliary supply to the needs of the vehicle and its application. In regions with high ambient temperature and the need for air conditioning, an advanced solution is possible.

MITRAC Energy Saver

The *MITRAC* Energy Saver, based on high performance double layer capacitor technology (ultracapacitors), provides vehicles with an energy source that has a considerably longer service life than energy storage based on conventional batteries. The system works by charging the ultracapacitors during vehicle braking, and releasing it when it is needed, such as when accelerating the vehicle.



MITRAC TC 1410

◁ Muscles — Providing Traction Effort ▷



MITRAC DR 1200

Over 45,000 Bombardier **MITRAC 1000** drives are sold worldwide.

Pace-setting Drives

This success is based on Bombardier's exacting requirements on the reliability, safety, energy efficiency and low life cycle costs in the entire product range. The drives optimally exploit the converters' characteristics and are designed to fit within a bogie's limited space. Bombardier has also launched a robust series of permanent magnet motors optimized for rail applications.

Drives for every Medium Power Application

The **MITRAC DR 1000** family offers the right drive solution for every high speed-, intercity-, regional- and commuter train as well as for metro applications. The selection of the right configuration of traction motor and gear is essential for a powerful, high performing and reliable drive. An optimized design according to the fundamental requirements of available space, axle load and speed result in a highly reliable solution with low maintenance effort during the whole lifetime of the product.



MITRAC DR 1200



MITRAC DR 1500

◁ Brain – Managing the Vehicle and Propulsion System ▷

Control

- Vehicle Control Unit (VCU)
- Drive Control Unit (DCU)

Networking

- Ethernet Switches
- TCN & IP Gateways
- Mobile Communication Gateway (MCG)

Interfacing

- Input / Output Units
- Driver's Desk I/O

Visualization

- Human Machine Interface (HMI)



Bombardier Transportation introduced the world's first integrated IP-based TCMS for rail vehicles.

Game-changing Electronics

MITRAC TCMS (Train Control and Management System) provides train, vehicle and drive control functions such as those for operating, comfort and diagnostics. The latter facilitates increased efficiency in operation and maintenance, resulting in greater competitiveness for vehicle builders, maintainers and operators. The backbone of the TCMS is the TCN (Train Communication Network), which consists of the MVB (Multifunctional Vehicle Bus) for intra-vehicle communication, and the WTB (Wire Train Bus) for train-wide information exchange. The *MITRAC* TCMS is also available in industry-standard IP technology using Ethernet – the latest and most widely used communication technology. The 100 Mbit/s bandwidth creates opportunities for increased functionality such as on-board video surveillance, extended passenger information systems and voice communication.

Vehicle Control

The TCMS provides all the management and control functions that bring life to the vehicle. The TCMS also collects, processes and visualizes diagnostic information.

Drive Control

The drive control units (e.g. the DCU2) are integrated in the traction and auxiliary converters. They control and supervise all functions in the converter, including high performance adhesion control for traction motors and effective power management such as energy recuperation.

Wireless Communication

The *MITRAC* CC TWCS (Train to Wayside Communication System) extends TCMS by providing seamless wireless communication between train and wayside. It supports upcoming requirements of railway operators, such as remote access to diagnostic data and real-time monitoring, passenger information systems, updating seat reservations, retrieving trip databases and more. The heart of the TWCS is the MCG (Mobile Communication Gateway).

Major References

Metros for Chicago (CTA), USA

| | |
|------------------------|---------------------------|
| Vehicle Class: Chicago | Maximum speed: 70 mph |
| Line voltage: 600 V DC | Number of cars: Up to 706 |
| First order date: 2006 | First in service: 2008 |

Metros for London Underground, UK

| | |
|-----------------------------------|-------------------------|
| Vehicle Class: VLU & SSL | Maximum speed: 100 km/h |
| Line voltage: 420 V DC & 210 V DC | Number of cars: 1778 |
| First order date: 2003 | First in service: 2008 |

Metros for Guangzhou/ Shenzhen/ Shanghai: China

| | |
|-------------------------|-----------------------------|
| Vehicle Class: China A | Maximum speed: 80 km/h |
| Line voltage: 1500 V DC | Number of cars: So far 1128 |
| First order date: 2005 | First in service: 2006 |

Metros for Delhi Metro (DMRC), India

| | |
|---------------------------|------------------------|
| Vehicle Class: Movia, RS2 | Maximum speed: 85 km/h |
| Line voltage: 25 kV AC | Number of cars: 424 |
| First order date: 2007 | First in service: 2009 |

Regional trains & Commuter for DfT, UK

| | |
|-------------------------------------|-----------------------------|
| Vehicle Class: Electrostar | Maximum speed: 160 km/h |
| Line voltage: 675 V DC and 25 kV AC | Number of cars: So far 1862 |
| First order date: 1997 | First in service: 2000 |

Regional trains for SNCF, France

| | |
|---|-----------------------------|
| Vehicle Class: AGC | Maximum speed: 160 km/h |
| Line voltage: Diesel, 1.5 kV & 25 kV AC | Number of cars: So far 2392 |
| First order date: 2001 | First in service: 2004 |

Commuter trains for SNCF, France

| | |
|---------------------------------|-------------------------|
| Vehicle Class: Spacium | Maximum speed: 140 km/h |
| Line voltage: 1.5 kV & 25 kV AC | Number of cars: 2791 |
| First order date: 2006 | First in service: 2009 |

Regional & Commuter trains for DB, Germany

| | |
|--------------------------|----------------------------|
| Vehicle Class: Talent II | Maximum speed: 160 km/h |
| Line voltage: 15 kV AC | Number of cars: Up to 1200 |
| First order date: 2007 | First in service: 2009 |

Regional trains for DB, Germany

| | |
|---------------------------|---------------------------|
| Vehicle Class: DOSTO 2010 | Maximum speed: 160 km/h |
| Line voltage: 15 kV AC | Number of cars: Up to 800 |
| First order date: 2009 | First in service: 2001 |

High Speed trains for MOR, China

| | |
|-----------------------------|----------------------------|
| Vehicle Class: CHE and CRH1 | Maximum speed: 250 km/h |
| Line voltage: 25 kV AC | Number of cars: So far 960 |
| First order date: 2005 | First in service: 2007 |

For further technical details see *MITRAC* specification sheets.

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