



High efficiency  
and performance



# BITRAC

LOCOMOTIVE CATALOGUE

# THE ANSWER TO YOUR NEEDS

Backed by years of experience in the railway sector, CAF has designed the **Bitrac** locomotive platform, a range of electric and diesel-electric powered locomotives that meet the most demanding requirements as regards performance, reliability and availability. Their flexibility

and interoperability make them the optimum solution for passenger and freight transport operators.

Bitrac includes the latest advances in terms of comfort for drivers. The locomotive can be equipped with air conditioning systems,

bathrooms and even beds for personnel who work in these vehicles.



SRO Locomotive



Bitrac Locomotive



# BITRAC

Passenger and freight railway transport networks have become strategically important for the competitiveness of the regions. For this, operators require fleets of efficient and very reliable trains that minimise the costs of the rolling stock life cycle.

CAF has an extensive experience in supplying locomotives for passenger and freight transport services. Major operators such as the Spanish RENFE or Euskotren, relied on CAF for their locomotive fleets. CAF has also manufactured locomotives for Saudi

Railways Organization (SRO), Saudi Railway Company (SAR) and RATP in France.



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# LOCOMOTIVES THAT **CROSS BORDERS**

One of the major advantages of Bitrac is the use of specific technology for full interoperability between tracks with different gauges, signalling systems and electrical power supply.

The integration of the different railway networks makes it necessary to have a fleet of trains capable of running on different networks in the most efficient way.



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# BITRAC IS FLEXIBILITY

Bitrac is synonymous with flexibility. The standardisation of its components means these locomotives can be adapted to the specific needs of each customer. Its modularity enables a wide range of locomotives to be produced with different characteristics and based on the following parameters:

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## Type of locomotive

Bitrac covers both single-cab and twin-cab locomotives.

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## Power supply

Bitrac covers electric, diesel-electric and dual-mode (electric/diesel-electric) powered locomotives. Within diesel-electric, CAF is developing single-engine and dual-engine locomotives with one and two diesel engines respectively.

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## Different service types

Designed not only for passenger trains, Bitrac is also the optimum solution for freight operators. The locomotive can also be adapted throughout its life, from a freight locomotive into a passenger locomotive and vice versa.

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## Track gauge

The Bitrac locomotive can run in different track gauges: international (1,435 mm) and other specific gauges (1,520 mm, 1,524 mm, 1,600 mm and 1,668 mm).

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## Supply voltage

Bitrac is designed for different power supply voltages: 15 kV DC, 3 kV DC, 15 kV AC and 25 kV AC.

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## Axle layout

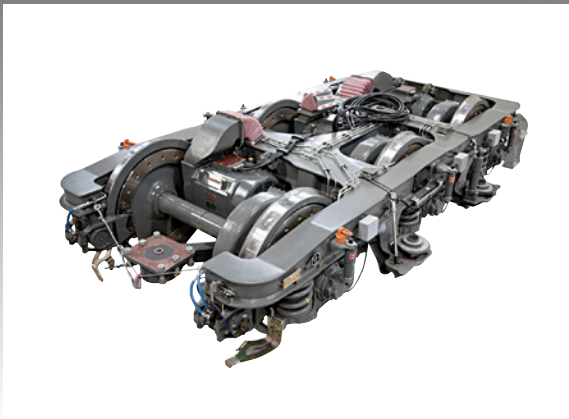
Bitrac has provision for 2 axles (Bo'-Bo') and 3 axles (Co'-Co').

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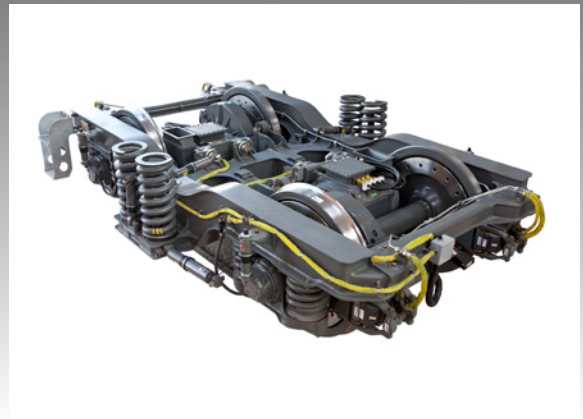
## Different geographical markets

This locomotive can be adapted to the characteristics of the market in which it is going to operate as regards climate conditions.





Bogie with 3 axes



Bogie with 2 axes

## Benefits of Bitrac

- Modular design, adaptable to the specific needs of each customer.
- High levels of reliability and availability.
- High level of performance.
- Maximum energy efficiency during operation.
- Interoperability between infrastructures of different countries.
- Minimised maintenance costs, thanks to the standardisation of its components and to centralised maintenance management.

## GENERAL CHARACTERISTICS

• Vehicle type	Electric Diesel electric Dual-mode locomotive (electric/diesel-electric)
• Axle arrangement	Bo'Bo' // Co'Co'
• Track gauge	1,435 mm 1,520 mm 1,524 mm 1,600 mm 1,668 mm
• Gauge	UIC 505-1 / EN 15273
• Cabs	1 or 2 with air conditioning
• Maximum speed	200 km/h (Bo'-Bo') 120 km/h (Co'-Co')
• Starting effort	300kN (Bo'-Bo') 445kN (Co'-Co')

## DIMENSIONS

• Length	22,410 mm (depending on the final configuration)
• Height	4,230 mm
• Wheel base	12,450 mm
• Wheel diameter	1,250 mm

## DIESEL ENGINE

• Number of engines	1 or 2
• Power	Up to 2 x 1,800 kW Up to 1 x 2,800 kW
• Fuel tank	1 x 4,000 l (Bo'-Bo') 2 x 3,500 l 1 x 7,000 l (Co'-Co')
• Smoke emissions	EU26/2004 Stage IIIb

## ELECTRIC TRACTION

• Alternator	2 x 1,800 kVAs 1 x 2,800 kVAs
• Number of inverters	4 (Bo'-Bo') 6 (Co'-Co')
• Type of inverter	VVVF IGBT
• Type of motor	Asynchronous AC
• Maximum motor power	4/6 x 1,200 kW
• Power at wheel-rim	Up to 2,900 kW as a diesel electric (dual engine for freight) 4,800 kW (Bo'-Bo') as electric 7,200 kW (Co'-Co') as electric
• Rheostatic dynamic brake power	1,800 kW
• Regenerative dynamic brake power	5,000 kW (Bo'-Bo') 7,500 kW (Co'-Co')

## OTHER EQUIPMENT

• Compressed air	2 x 1,250 lN/min 1 x 2,400 lN/min
• Wheel slide protection	UIC
• Auxiliary converter	2 x 115 kVA for freight 2 x 350 kVA for passengers
• Batteries	2 x 170 Ah

## BOGIE

• Bogie wheelbase	2,700 mm (Bo'-Bo') 2 x 1,800 mm (Co'-Co')
• Wheel diameter	1,250 mm

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# SAFETY FIRST

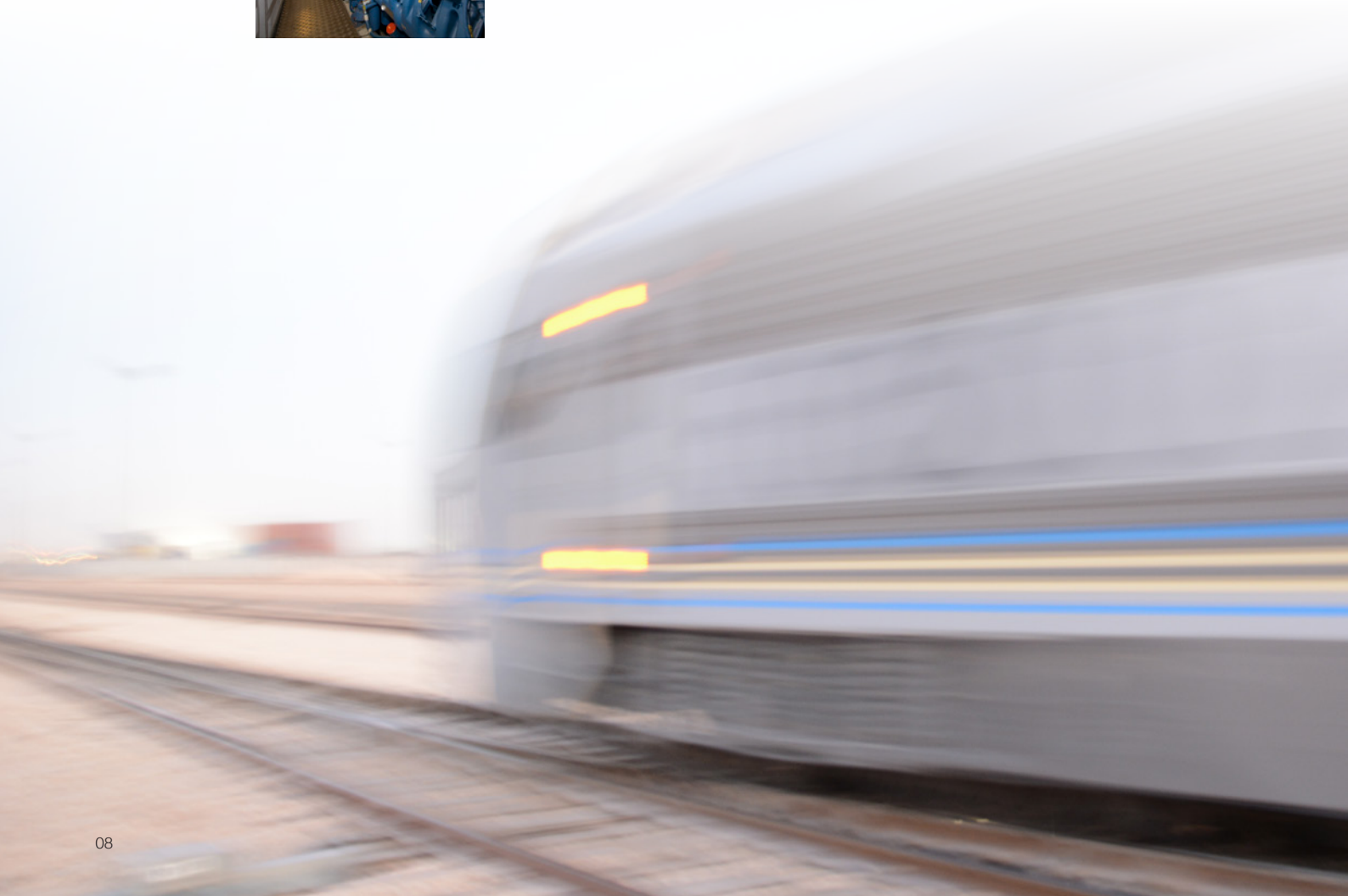
## Active safety

Bitrac is created to accommodate the most comprehensive signalling systems to ensure a high level of safety in daily operation, such as ERTMS levels 1, 2 and 3. Furthermore, the platform is designed to integrate all the existing national signalling systems such as ATB, AWS/TPWS, ASFA, EBICAB, INDUSI, LZB, SCMT, etc.

Bitrac locomotives are equipped with additional safety systems such as radio (GSM-R and/or any other type of local radio), dead man, event recorder, etc.

## Passive safety

Bitrac meets the EN15227 crashworthiness regulations which provide good protection for the vehicle and the driver in the event of a crash.





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## OPTIMISED LIFE CYCLE COSTS

The Bitrac platform has been developed with the aim of minimising the life cycle cost. The main benefits include:

- Reduced energy consumption through optimised aerodynamic design, high performance traction equipment, reduced weight, efficient driving strategy definition and regenerative braking.
- Maintenance cost saving, thanks to a design and a maintenance strategy focused on vehicle reliability and maintainability.

To achieve optimum unit maintenance, CAF makes a wide range of after-sales services available to its customers, which includes the supply of spares, warranty services, maintenance of varying scope and refurbishment of the fleet. For this, flexible technical support teams are implemented where the units are operating.

The CAF after-sales engineering department is dedicated to analysing and maximising the fleet service quality parameters, and will design and implement

improvement actions to this end. This is possible as the fault data for all the locomotives in the warranty phase and the locomotives maintained by CAF is available in a centralised maintenance management system, so the maintenance plan is optimised based on improvements implemented in previous projects.



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BITRAC,  
**ENERGY EFFICIENCY**



The Bitrac design ensures maximum energy efficiency. Its traction units minimise energy losses and optimise consumption. Furthermore, the mass of the carbody structure as well as that of the equipment and supplementary parts has been reduced.

At the same time, CAF carefully chooses all those materials that are used in the manufacture, putting a special emphasis on recyclability. Not allowing

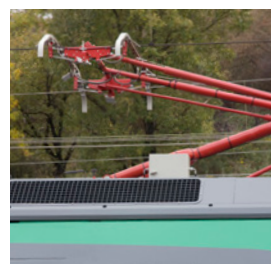
irreversible joins between parts of different materials aids not only maintenance but dismantling at the end of the train's service life, and thus their subsequent re-use.

The Bitrac locomotive has been specifically developed so that the regenerative braking has priority over rheostatic and friction braking. In this way, the energy recovered during the braking process is returned to the catenary, and can be used for another train

or returned to the electric grid in accordance with the infrastructure characteristics.

Energy recovery during braking is an essential element in the operation of railway networks, as it contributes to optimising operations and achieving high efficiencies.

Lastly, the optimised Bitrac design also reduces noise emissions considerably when the units are in operation.



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