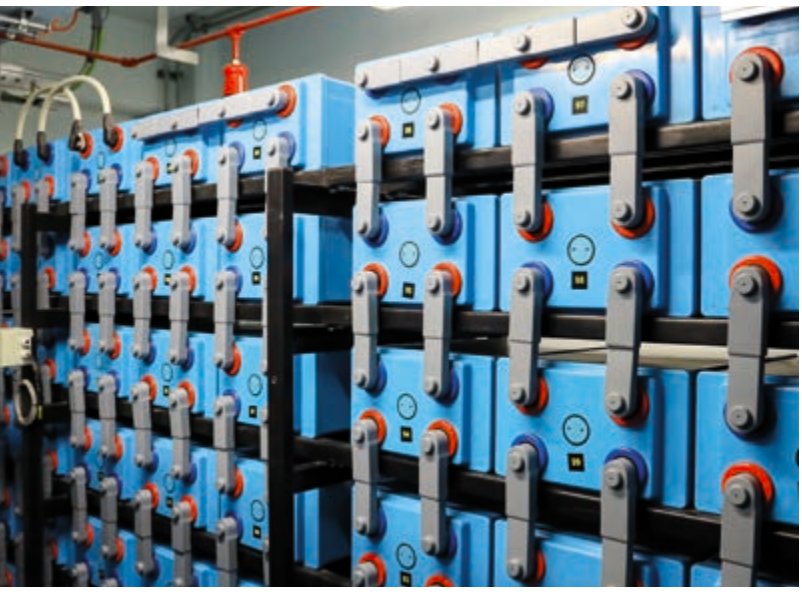
Railway Energy System

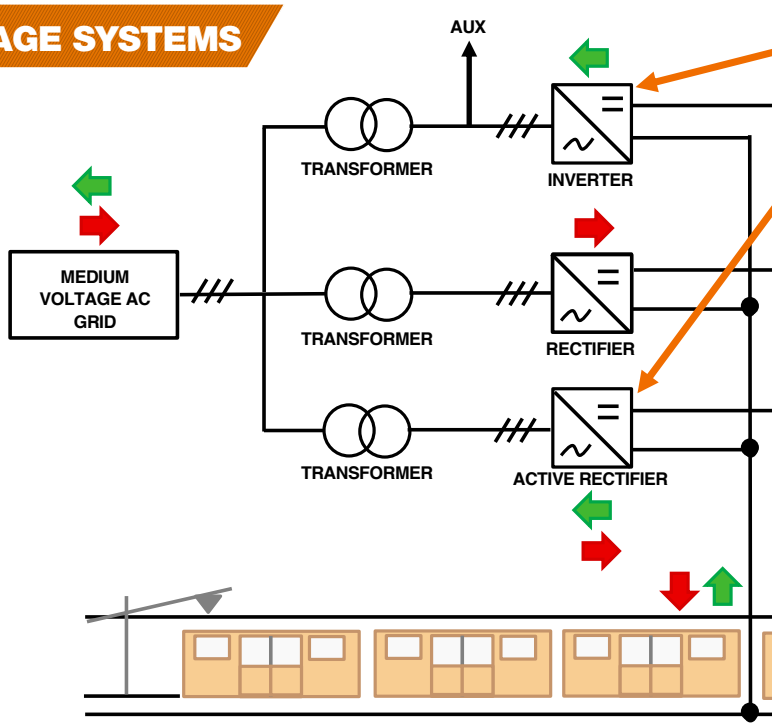
Energy recovery & storage systems



MONT-ELE
power conversion division

MONT-ELE ENERGY RECOVERY & STORAGE SYSTEMS

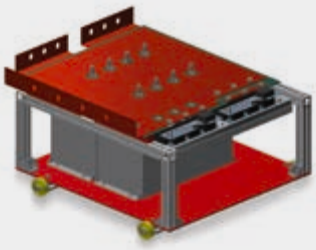
The MONT-ELE Power Conversion Division can satisfy any power conversion need in the market sectors relating to transport, industry, energy, and the environment, satisfying the most restrictive requirements of quality, reliability and safety in accordance with the standards of international reference. In recent years, the concept of a smart grid that allows the inversion of energy flows has been strengthened more and more to obtain a distributed and sustainable generation system. Every day, thousands of metro, trains, and trolleybus, dissipate an enormous amount of energy in the form of heat on the braking resistors. To prevent this, we developed and built different type of recovery systems that allow energy to be reintroduced directly to the AC network or to accumulate it in special supercapacitor banks or batteries.



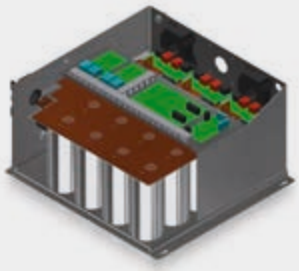
INVERTER ENERGY RECOVERY SYSTEM

The inverter recovery system operates in two different ways. The recovered energy finally available on the AC side can be returned by a transformer to the MT grid or given to the auxiliary system net. Reusing braking energy means being able to achieve considerable economic savings and determines a lower environmental impact in terms of pollution and climate change. Service continuity is guaranteed in all cases by a static switch which allows loads to be supplied from the public distribution network. Otherwise, through the use of a different type of transformer, the inverter can be used to return the recovered braking energy into the main distribution grid. MONT-ELE recovery inverters can operate with all the typical voltage values for traction systems from 600 Vdc up to 3000 Vdc.

The modularity of this system combined with the possibility to connect in parallel more power converters, makes the DC/AC recovery system suitable for a power range from 500 kW up to 2.5 MW peak depending on the needs.



Single phase leg of 2,5 MVA recovery energy inverter



500 kVA recovery energy inverter, design phase

500 kVA recovery energy inverter, prototype

500 kVA recovery energy inverter, installation

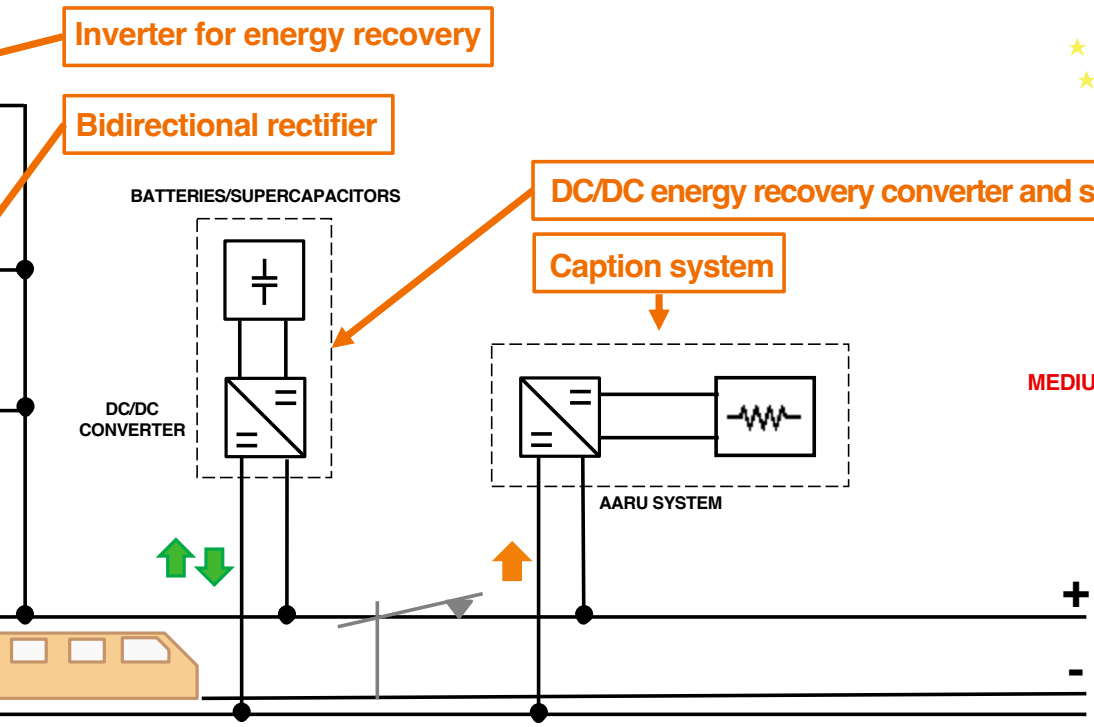
ADVANTAGES

- The system can be complementary to the existing structure and the installation takes place in parallel with the power supply substation of the traction line.
- Energy recovery increases thanks to the reduction of energy conversion stages.
- The reliability of the existing traction line power supply system is not affected.
- The system is designed to minimize the required maintenance.
- The system can also work as an active harmonic filter or compensate reactive power, making the substation more efficient.
- No additional short-circuit current is added to the catenary thanks to the fast current limitation system.
- The system can also power the catenary and can be used as a backup during peak times or when main traction power system fails.

EVOLUTION TO BIDIRECTIONAL CONVERTER

The inverter recovery system can work both as inverter and as rectifier.
Mont-Ele can build and supply bidirectional converter with the following advantages:

- The rectifier can regulate the output DC voltage
- The rectifier can regulate the input power factor
- Only one converter with two functions
- Energy losses reduced thanks to the double use of the system



MONT-ELE
power conversion division

MEDIUM VOLTAGE FROM DISTRIBUTION GRID
RECOVERED ENERGY
ENERGY TO DISSIPATION SYSTEM

DC/DC ENERGY RECOVERY SYSTEM

The DC/DC energy recovery system made by the Power Conversion Division allows, through a DC/DC conversion, to accumulate the energy produced during regenerative braking, inside batteries or supercapacitors banks and to supply the same energy to the traction line when request. The energy storage system is equipped with a bidirectional DC/DC converter that regulates the voltage and the charge/discharge current flow of the batteries or supercapacitor banks.

Combining more DC/DC conversion units allows you to build a smart system which can directly supply a DC network when there is a demanding or accumulate the recovered energy inside banks if there isn't any request.

Supercapacitor panel and user interface

Supercapacitor bank

DC/DC converter panel

ADVANTAGES

- The system is independent so it can be positioned at any point on the line to optimize the energy recovery.
- The reliability of the existing traction line power supply system is not affected in any way.
- The system is designed to minimize the maintenance required.
- The system allows voltage stabilization in the weak points of the line by compensating for voltage drops.
- The system is easy to implement: no special requirements or adjustments needed because the system is separated from the network.
- The system saves costs by being able to obtain a low peak power energy supply contract.
- SiC MOSFETs technology allows to minimize losses and component's dimensions increasing the overall efficiency of the system, which is one of the primary objectives for recovery systems.
- The product is modular and thanks to the possibility of connecting several units in parallel, maximum flexibility of use is guaranteed. It is suitable for installations both stationary and directly on board the vehicle with all typical voltage values for traction systems from 600 Vdc up to 3000 Vdc. Thanks to this system the power range covered is from a minimum of 115 kW to a maximum of 1 MW.

AARU SYSTEM

To absorb the energy excess on the line, due to a braking event, Mont-Ele can supply Automatic Assured Receptivity Unit (AARU). The system is composed by a controller unit and a resistor bank.

ADVANTAGES

- Low cost of maintenance due to the high reliability and the easy access
- No braking resistors needed on boards of the rolling stocks and no heat to manage inside the tunnels
- Overvoltage protection for the equipment connected to the catenary line

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The information in this document contains general description of the technical options which do not always have to be present in individual cases.
Therefore, the required performance characteristics must be defined in individual cases during conclusion of the contract.
In view of the constant evolution in standards and design, and due to the continuous development, the characteristics of the elements contained in this catalogue are subject to changes without prior notification.
These characteristics, as weel as the availability of components, are subject to confirmation by Mont-Ele's Technical Sales Department.
Not valid as a contractual item.

Cod. ERS-002

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