

Power Converters for **Traction** Application



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Thanks to the experience matured in Power Conversion for Electrochemical application, in 1974 FRIEM started the production of Air Cooled Diode Rectifiers for:

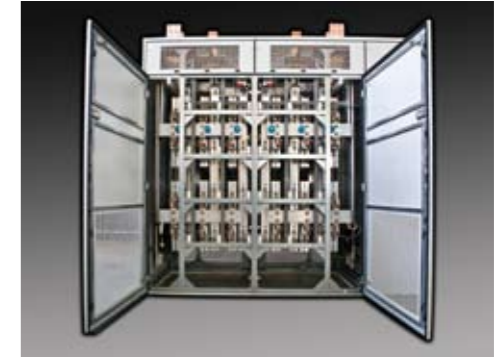
- Train Lines
- Metro Lines
- Tram Lines

Today FRIEM also provides a complete line of inverters and bidirectional converters, using thyristor, IGBT or GTO, to comply with the recent requests of braking energy recovery.

FRIEM's Traction Converters fully comply with IEC or ANSI/IEEE standards and the most severe standards for heavy traction service. FRIEM designs compact and modern Converters maintaining an extremely high level of efficiency, reliability and service continuity. Low losses, low operating temperatures, reduced maintenance and noise are granted by the specific design of the Power Section.

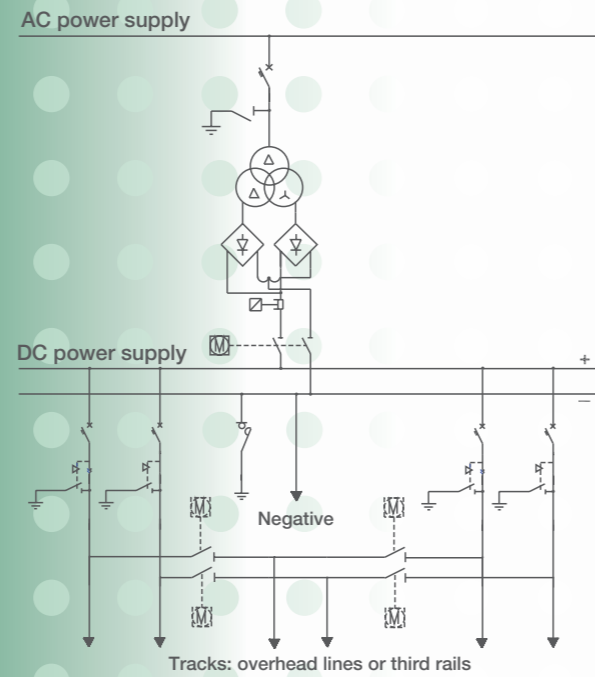
Protection Features

- O/C, O/V, U/V, Phase Sequence Protection
- N+1 Semiconductors redundancy with alarm output
- Extra fast fuse protection for each diode and relevant alarm panel
- Thermal probes for semiconductor holder bars temperature monitoring
- Thermal probes for air temperature monitoring inside the converter cubicle
- Transformer Alarm and trip signals recording



FRIEM is capable of providing to the customer a complete package, including:

- MV Switchgear
- Traction Converter Transformer
- Power Converter (AC/DC – DC/AC)
- DC Isolators
- Negative Cubicles/Voltage Limiting Devices
- Disconnectors Cubicles
- Feeders Cubicles
- Outdoor Disconnecting Units



Operating Characteristics

- Connection: Bridge - Double Bridge (Series or Parallel)
- Type: Diode, Thyristor, IGBT, GTO
- Cooling: Natural Air, Forced Air, Water-to-Air
- DC Output Voltage: Up to 3300V
- DC Output Current: Up to 5000A
- Pulses: 6, 12
- Standards: IEC 60146 – EN 50328 - ANSI/IEE
- Duty Class: up to IX
- Protection Degree: up to NEMA 4X (standard IP40)
- Control: Local and/or Remote control section

FRIEM Converter Advantages

Reliability and reduced maintenance

- N+1 Semiconductors Redundancy
- Control System Self Diagnostic
- Short circuit high withstand capacity thanks to the Robust Structure
- Production continuity and long operation life achieved with the low operating temperature

High Efficiency

- Proprietary internal Busbar design with reduced losses
- Simplified design

Fast Operation

- Reduced delivery time thanks to MODULAR DESIGN
- Reduced installation and commissioning time

Safety

- Latest IEC and ANSI/IEEE
- FRIEM design protection devices
- Self-extinguishing and reduced gas emission materials



Design and Manufacturing Characteristics

Power Section

- Exclusive aluminium extruded Busbars
- High efficiency and High Dynamic Stress Withstand
- Non-Magnetic Material Rectifier Cubicle
- Metal enclosed fixed or withdrawable Power Section
- Interphase Reactor for 12 Pulses Double Bridge in Parallel

Control Section

- High Accuracy Current Metering Systems by CTs or Shunts
- High Accuracy DC Voltage Metering System by voltage transducer
- Automatic control combined with PLC and electronic boards
- Serial Communication for interface with DCS (Modbus, Profibus DP, Ethernet, FMS or Datahighway Plus protocols)
- Alarm and trip messages history
- Temperature monitoring system
- DC Reverse Current monitoring system
- Earth Fault monitoring system
- Transformer control

