

# RAILWAY TRACTION POWER SUPPLY



## CONVERTER STATION BÜTZOW AND SCHWERIN

### System overview

Each station consists of two independent blocks operating fully redundantly. They connect to the 110 kV 3-phase grid through an oil-immersed transformer (ONAN cooling system) and feed the 15kV 16.7 Hz overhead catenary system directly.

For maximum efficiency, each block employs air-core reactors on the 15 kV rail electrification side (transformer-less design). Connection of a 50 Hz filter is not necessary thanks to the innovative converter concept and control algorithm. On the 15 kV rail side, only a small passive filter is required to meet the strict harmonics requirements of DB.

### Converter system

Each block employs three converters based on the proven MV 7000 type, with the main components being:

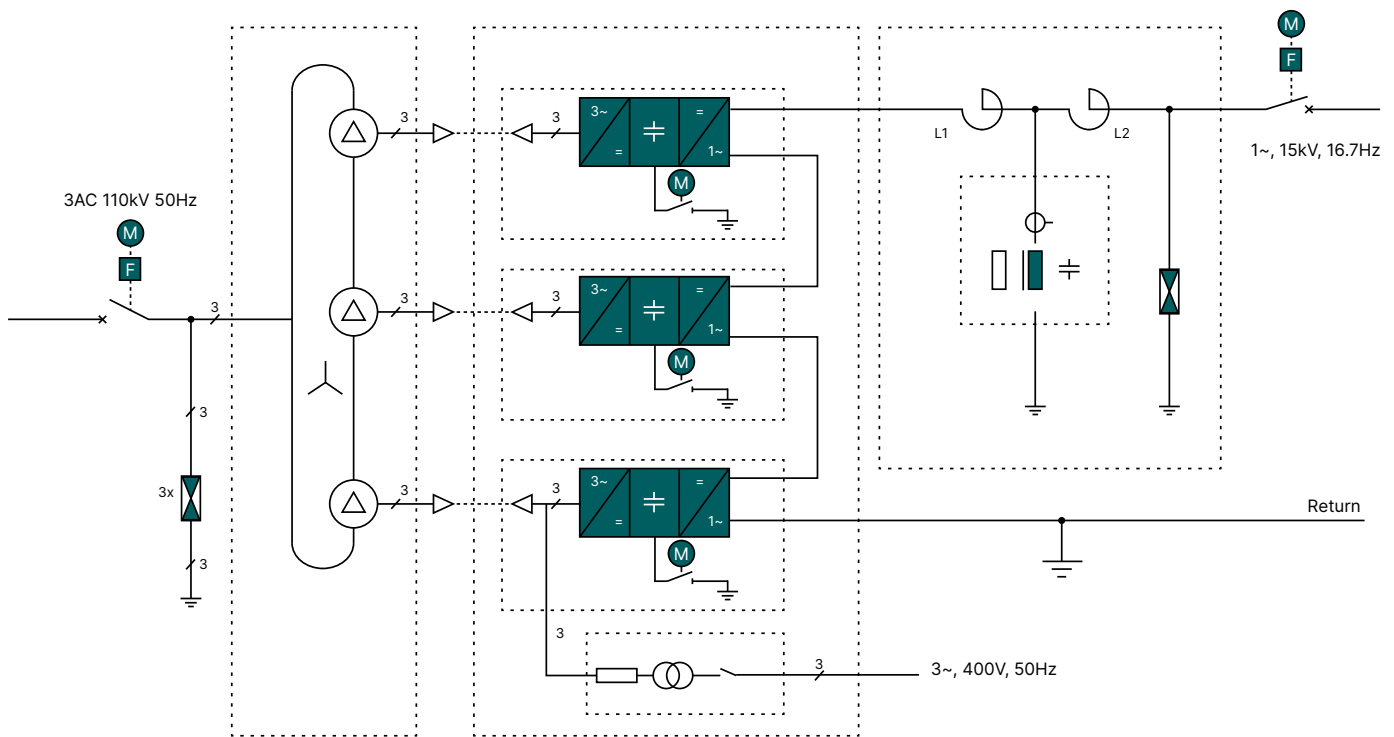
- An input 3-phase pulse controlled sub-inverter
- A DC link with an integrated 33.4 Hz filter and a fast discharge/earthing device
- An output 1-phase 4QS sub-inverter

Each sub-inverter contains press-pack IGBT modules organised in phase-segments and fitted with a patented pull-out mechanism including the IGBT control amplifiers.

## CHALLENGE

To increase availability and reduce maintenance efforts while maintaining the traction power supply service level at the lowest possible cost, DB wished to replace its existing rotating equipment in Bützow and Schwerin (Germany). For both locations, two static converter stations of 2×15 MW each to feed the 16.7 Hz 15 kV overhead catenaries were contracted as a turn-key project to a consortium with Power Conversion as the key participant. The systems are currently in commissioning phase.

# PROVIDING THE INTERFACE TO THE DISTRIBUTION GRID



Circuit diagram of one converter block

## Cooling system

Each converter block has its own dedicated closed-loop cooling system with a mix of glycol and water. The power electronics is directly cooled with this fluid, to achieve compact design and small space requirements. The heat is then dissipated in a water-air heat exchanger. A high-availability canned motor pump is installed to provide continuous circulation. All systems are monitored automatically. Additional secondary air-cooling is provided for the E-house in each block.

## Control system

Internal converter control enables the following operation modes:

- Standard control in all 4 quadrants (according to the P/f, Q/U characteristic)
- Reactive Compensation/ STATCOM (supply of reactive power to the railway grid only)
- Parallel operation with other generation units integrated on the 15kV line
- Isolated mode (creating independent rail grid), with automatic synchronization to three-phase grid before reconnection
- Remote control by sinusoidal reference signal (Pilot Mode) or Autonomous Mode based on asynchronous telemetry reference signal can be provided as well.
- Black Start-Up of rail grid

Remote short circuits are handled reliably by the control algorithms. The control system allows for either local or remote operation via a user-friendly HDM interface and integration to SCADA according to IEC 61850 (IEC 60870-105-4 can be provided as well).



# OUR SFC TECHNOLOGY BRINGS MULTIPLE ADVANTAGES TO THE OPERATOR

## BENEFITS

High efficiency and low operating costs

High availability owing to modular design and a high degree of standardization

New cost-optimized design

Transformer-less rail-side output

IGBT design optimized for highly dynamic loads

Maintenance-optimized design

Short commissioning time

Scalable concept

## Project key data

Customer

DB Energie

Location

Bützow and Schwerin, both Germany

Project Structure

Consortium with Rail Power Systems

Scope of Supply

Engineering  
Delivery of technology  
Installation (consortial partner)  
Commissioning

Schedule

Contract awarded: 04/2015  
Start of installation: 09/2016  
In Commissioning



# STATIC FREQUENCY CONVERTER FOR RAILWAY APPLICATION

Application	Static frequency converter for railway application
Temperature range	-30...40 °C
Public Grid	3-phase AC 110 kV; 50 Hz
Railway Grid	1-phase AC 15 kV; 16.7 Hz
Number Blocks	2 per site
Apparent Power Active Power	18.75 MVA per block 15 MW per block (cos $\varphi$ = 0.8)
Availability	99.3%
Efficiency	97%
Cooling converter	Ambient air and mix glycol/ water
Cooling transformer	ONAN

About Power Conversion, a GE Vernova business

**GE Vernova's Power Conversion business provides energy conversion technologies, systems, and services across the power and energy intensive industries, driving the electric transformation of the world's energy and industrial infrastructure.**

GEA33527\_Industry\_Rail\_CS\_Bützow\_Schwerin\_Rev1 – ©2024 GE Vernova. All rights reserved. Confidential. Not to be copied, distributed, or reproduced without prior approval. GE Vernova reserves the right to make changes in specifications shown herein, or discontinue the product described at any time without notice or obligation.