

The background image shows a large outdoor parking lot filled with cars, with a fenced-in industrial area in the foreground. Inside the fence, there are several large, green, modular units, which are the Sitras RAB plus rail active balancers. The sky is clear and blue.

# SIEMENS

*Ingenuity for life*

## Sitras RAB plus

Rail active balancer for AC traction power supply

[siemens.com/rail-electrification](https://www.siemens.com/rail-electrification)

The rail active balancer Sitras® RAB plus turns a high one phase railway load into a symmetric load for the three phase grid.

It also compensates the reactive power of the traction system.

### Features

- Innovative modular multilevel technology enables:
  - Compact containerized design
  - Low space requirement
  - Low noise emission
  - Low losses over the whole operating range due to low switching frequency
  - High EMC
- Minimized engineering efforts due to standardized component design
- Can be used for 1-phase 25 kV systems and for autotransformer systems

# Function

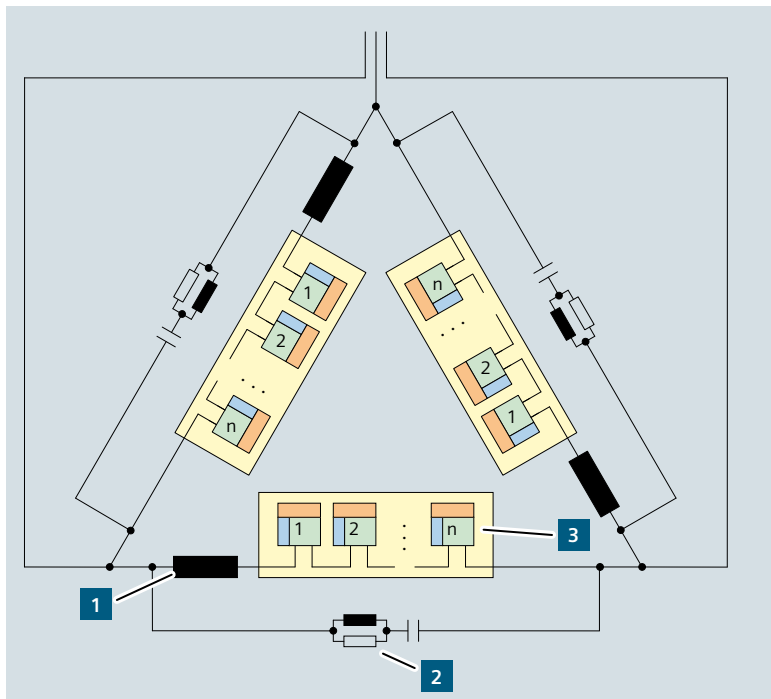
The rail active balancer is based on three multilevel converter phases. Each phase can provide independently from the other phases (delta connection) capacitive reactive or inductive reactive power to the rail grid.

Compared to a standard SVC the rail RAB plus doesn't measure the line voltage but the load current of the railway

lines and feeds its reactive current in to the net in such a way, that the resulting load of the net is symmetrically.

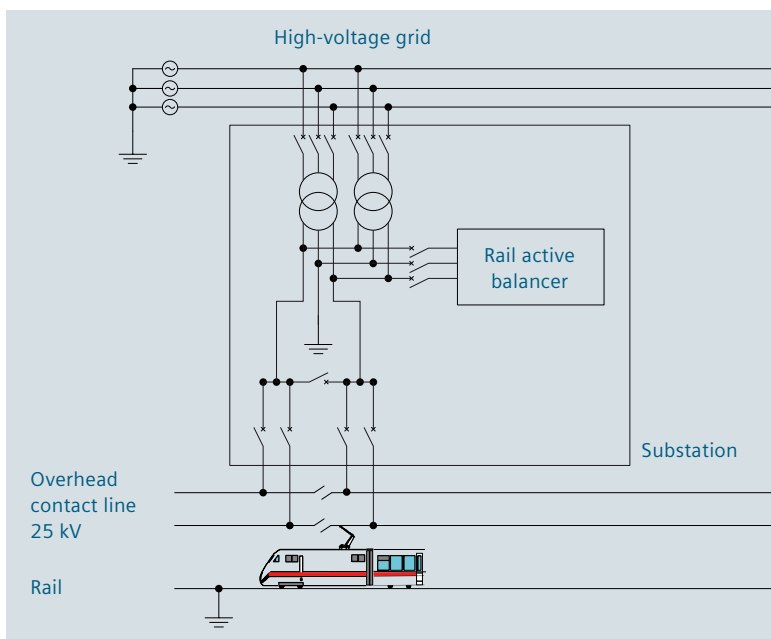
Also reactive power on the railway line will be compensated by the RAB plus.

The RAB plus can be connected to the HV grid but also to the 25 kV busbar.



- 1 Branch reactor
- 2 HFB Filter
- 3 Submodule

Design of rail active balancer Sitras RAB plus



System integration of rail active balancer Sitras RAB plus

# Features

## Power rating

- Containerized solutions are available with  $\pm 25$ ,  $\pm 35$  and  $\pm 50$  MVar.
- Up to four of these units can be configured as a fully parallel operating system.
- On request an open rack modular system configuration enables transformerless grid connection up to 36 kV and  $\pm 100$  MVar.

## Electrical properties

Due to the MMC technology, the degree of harmonic generation emission is quite small. High frequency noise is absorbed by small standardized high-frequency blocking filters (if necessary), resulting in a design which is practically independent from individual network impedances.

## Redundancy

A very high level of system availability is achieved thanks to the redundancy of power modules.

## Design

- Compact and adaptable, thanks to MMC technology.
- The layout of RAB plus is fully flexible.
- Both containerized and conventional building solutions are available.
- Low space requirements due to the reduced size of converter and fewer passive components.
- A small physical footprint reduces the turnkey costs.

# Main components

## Transformer

A standard three phase transformer is used if the balancer is connected to the HV grid. If the balancer is connected to the 25 kV level, autotransformer or coupling reactors (depending on the power rating) can be used.

## Multilevel converter

The three phases of the converter are delta connected. A phase consists of power modules connected in series with attached module capacitor. The number of power modules connected in series determines the power rating of the converter.

## Reactors

Air core reactors are used in each phase.

## Filters

Small standardized high-frequency blocking filters are installed if necessary.

## Cooling system

Simple single-circuit cooling system for semiconductor cooling.

## Open loop control

Standard WinCC and Simatic TDC control and protection hardware and software are fully proven in practice in a wide range of applications worldwide.

# Technical data

## Sitras RAB plus

Nominal power	[MVar]	+/-25, +/- 35, +/-50
3-Phase connection		
• Input voltage	[kV]	7 / 9 / 13.9
• Input frequency	[Hz]	50 / 60

## References

Siemens has always been a leader in the reactive power compensation business, both in conventional and innovative technologies. Reactive power compensation based on thyristor controlled technology started in the mid 1970s and has achieved a high degree of maturity in many applications, worldwide. Based on Siemens' vast experience in shunt and series compensation, active filtering, and HVDC PLUS, SVC PLUS® was developed.

The newest generation of balancing equipment Sitras RAB plus featuring modular multilevel technology can be found at locations such as Blackwater and Adelaide in Australia.

### Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

For more information about industrial security, please visit:  
<http://www.siemens.com/industrialsecurity>.

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