Sitras® RVC plus mobile rail VAR compensators are used to stabilize the voltage in single-phase railway networks.

Features

- The innovative multilevel converter concept ensures
  - Compact design in 40-foot high cube standard container
  - Connection of the converter to the contact line without a heavy transformer
  - High availability due to redundancy in the converter power section
  - Low losses over the entire operating range
- An alternative auxiliary power supply via the contact line or an external 400 V 3-phase AC network
- Automatic operation or remote control operation possible
- Control of contact line voltage by means of capacitive and inductive reactive power within the performance limits

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Function and features

Power
- One container has an output of 15 MVAr (inductive or capacitive)
- Paralleling of several units is possible

Electrical properties
- Power supply friendliness:
  - Implementation of the output voltage in small voltage steps enables the generation of an output voltage that is comparable to that of a generator
  - In order to meet high demands and be capable of use at any location in the traction power supply, a compact filter has been provided
- No complementary energy storage units and therefore no uncontrolled oscillation of series resonant circuits in the event of line disruptions
- Stored energy is distributed among numerous power modules (any fault will remain limited to the easily replaceable power module)
- Redundancy in the power section (operation is not interrupted by failure of power modules)

Design
- Compact 40-foot high cube standard container solution (L x W x H: 12.2 m x 2.4 m x 2.9 m), weight approx. 28 t
- Suitable for use in ambient conditions with high levels of pollution (external air only passes through the heat exchanger area).
- Simple single-circuit cooling system for cooling reactor and converter
- Use of proven components and materials offers a high level of reliability and robustness
- Use under the following climatic conditions:
  - Snow-load on roof surface of up to 150 kg/m²
  - Crosswind speeds up to 160 km/h
  - Temperature range -20 °C to +40 °C
  - Site altitude up to 1,000 m above sea level
  - Earthquake-proof for earthquake zone Z3b, earth class E and structure class III (in accordance with SIA 261)

Operating modes
- Can be operated on power supplies with elastic or rigid frequencies
- 24 hours in standby mode without contact line voltage or auxiliary power supply

![Diagram of a VAR compensator system](image-url)
Main components

Multilevel converter
The converter consists of 18 series-connected power modules with a connected module capacitor. Service-proven power modules are also used in the Sitras SFC plus static frequency converter and for SVC and HVDC systems.

Output reactor
A compact water-cooled, iron-cored reactor is used for decoupling the converter and traction power supply.

Filter
A compact RLC high-pass filter ensures the reduction of system perturbation, especially in the frequency range of the track circuits, even in case of different power supply configurations.

Switchgear
The compact and maintenance-free gas-insulated traction supply switchgear 8DA11 is equipped with Connex plug-connectors for connection of the compensator to the overhead contact line.

Protection
The components such as reactor, cables, filters and auxiliary power transformer are protected against overcurrent by means of a standard protection device. The converter’s own controller protects against over- and undervoltage, as well as highly dynamic overcurrents. Moreover, the thermal overload protection is also implemented here.

In the event of short-circuits on the traction power supply side the converter does not contribute to the short-circuit current, but instead reduces the current to zero. After a programmable break for the short-circuit test (e.g. 500 ms), operation is automatically resumed when the voltage returns.

Open and closed-loop control
The proven Siemens Simatic® TDC multiprocessor system with a subordinate PLUSCONTROL system is used as an open and closed-loop control system. These systems control all components that are assigned to the compensator. The closed-loop control converts the setpoints for the compensator into the switching commands of the semiconductor valves. The compensator is operated using the proven Simatic WinCC system.
Technical data

<table>
<thead>
<tr>
<th>Sitras RVC plus</th>
<th></th>
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<tbody>
<tr>
<td>Nominal power [MVar]</td>
<td>15</td>
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<tr>
<td>Nominal voltage [kV]</td>
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<tr>
<td>Nominal frequency [Hz]</td>
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<td>Voltage range [kV]</td>
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<td>Auxiliary power [kW]</td>
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References

Sites that are using the new Sitras RVC plus mobile rail VAR compensators in modular multilevel technology are:

• Domodosola / Italy
• Neuhausen / Switzerland.

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.