Sitras® TCR controlled thyristor rectifiers are used to supply power to DC railways for mass transit systems and main line railways. Up to a maximum loading current, they are capable of keeping the supply voltage of a substation to an almost constant level.

Features
- Greater distances between the substations of new DC traction supply systems
- Correction of voltage distortions and asymmetry in the medium-voltage system by controlled thyristor bridges
- Robust, reliable thyristor technology
- Restriction of short-circuit currents by controllable thyristors
- Remote parameterization, control and diagnosis possible via standardized communication interface

<table>
<thead>
<tr>
<th>Technical data</th>
<th>750</th>
<th>1,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage [V DC]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated current [A]</td>
<td>1,650...6,600</td>
<td>1,300...5,200</td>
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<tr>
<td>Overload category acc. to IEC 60146-1-1</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td>Efficiency</td>
<td>0.995</td>
<td>0.995</td>
</tr>
<tr>
<td>Auxiliary voltage [V AC]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or [V DC]</td>
<td>110...230</td>
<td>110...230</td>
</tr>
<tr>
<td>or [V DC]</td>
<td>60...230</td>
<td>60...230</td>
</tr>
<tr>
<td>Width [mm]</td>
<td>600...2,400</td>
<td>600...2,400</td>
</tr>
<tr>
<td>Height [mm]</td>
<td>2,300</td>
<td>2,300</td>
</tr>
<tr>
<td>Depth [mm]</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Weight [kg]</td>
<td>450...1,900</td>
<td>450...1,900</td>
</tr>
<tr>
<td>Maximum ambient temperature [°C]</td>
<td>+40</td>
<td>+40</td>
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<tr>
<td>Max. site altitude above sea level [m]</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Degree of protection acc. to IEC 60529</td>
<td>IP20</td>
<td>IP20</td>
</tr>
<tr>
<td>Color</td>
<td>RAL 7047</td>
<td>RAL 7047</td>
</tr>
</tbody>
</table>

1) depending on rated current and number of cubicles
2) without power derating
Design of primary equipment

The controlled rectifiers are installed in steel cubicles and are designed for indoor installation.

All the main components are easily accessible from the front and can therefore be easily replaced. This type of construction is suitable for mounting against a wall.

Configuration

The different ratings (rated currents) of the Sitras TCR family of products depend on the number of B6 bridges connected in parallel.

12-pulse controlled thyristor rectifiers are created by the use of two B6 thyristor bridges which are connected to two secondary windings of a transformer connected in star and connected in delta.

Terminals

In the case of the DC power terminals, the L+ and L- terminals are arranged in the downward direction. The AC power terminals are arranged in the upward direction. All power terminals are prepared for cable connections.

Controlled rectifier

The 6-pulse thyristor controlled rectifier consists of:
- B6 thyristor bridge, connected in circuit with
  - Thyristors with heatsinks
  - RC circuit
  - Fuse and fuse monitoring
- Busbars
- Control electronics, consisting of
  - Current controller
  - Overall programmable logic control
- Ventilator module

Design of primary equipment

Example: Design Sitras TCR, 750 V

1 Ventilator module
2 Thyristor firing unit
3 B6 thyristor bridge
4 Current controller (microprocessor)
5 Overall programmable logic control
6 Auxiliary power supply
Design of secondary equipment

Closed looped control
The closed looped control has been designed such that the system meets all the requirements with regard to the power supply system of DC railways in a highly dynamic manner.

Operator control and visualization
The ergonomically designed Simatic® Touch-Panel and the conventional operating controls for the most important functions provide the operating staff with a quick and reliable overview of the operating state of the system.

Function
The use of controlled rectifiers enables the busbar voltage to be kept to an almost constant level. Compared to diode rectifiers, controlled rectifiers significantly improve the voltage stability and, at the same time, enable the distances between substations to be increased.

Communication
Thanks to the standardized communication interfaces modular design, all the standard media such as WAN, ISDN or modem can be used for remote link-up to the central control room.

Sitrac TCR uses the PROFIBUS protocol. Additional protocols can be implemented on request.

Voltage characteristic along the feeder section with diode rectifier (red line) and with controlled rectifier (green line)
Scope of application

The controlled rectifiers are integrated into the DC substations in the same manner as the uncontrolled diode rectifiers. The three-phase side of the controlled rectifier is connected to the secondary winding of the rectifier transformer.

The auxiliaries (ventilation, closed-loop control supply, switches, contactors, watchdogs) are supplied by means of a single-phase auxiliary voltage available in the DC substation.

Schematic diagram:
Example for the integration of the Sitras TCR (12-pulse) into a DC substation