Sitras® TCI thyristor controlled inverters are used in the power supply system of DC railways. Through the parallel connection of such an inverter, DC substations equipped with diode rectifiers can acquire the capability to return surplus energy to the system.

Features
- Braking energy can be transmitted via the medium-voltage power system to loads that are even further away
- The medium-voltage power system is usually receptive to an unlimited amount of energy
- The number of brake resistors on the vehicles can be kept to a minimum
- Robust, reliable thyristor technology
- Substations can subsequently acquire the capability to return surplus energy to the system with an additional inverter.
- Remote parameterization, control and diagnosis possible via standardized communication interface

Technical data

<table>
<thead>
<tr>
<th></th>
<th>[V DC]</th>
<th>750</th>
<th>1,500</th>
</tr>
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<tbody>
<tr>
<td>Nominal voltage</td>
<td></td>
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<tr>
<td>Rated recovery current</td>
<td>[A]</td>
<td>3,000</td>
<td>1,000</td>
</tr>
<tr>
<td>– for 30 s</td>
<td></td>
<td></td>
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<tr>
<td>– for 70 s</td>
<td>[A]</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Efficiency</td>
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<td>0.96</td>
<td>0.96</td>
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<tr>
<td>Auxiliary voltage</td>
<td>[V AC]</td>
<td>110..230</td>
<td>110..230</td>
</tr>
<tr>
<td>or [V DC]</td>
<td></td>
<td>60..230</td>
<td>60..230</td>
</tr>
<tr>
<td>Width</td>
<td>[mm]</td>
<td>2,400</td>
<td>1,800</td>
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<tr>
<td>Height</td>
<td>[mm]</td>
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<tr>
<td>Depth</td>
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</tr>
<tr>
<td>Weight</td>
<td>[kg]</td>
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<td>5,000</td>
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<td>Maximum ambient temperature</td>
<td>[°C]</td>
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<td>+40</td>
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<tr>
<td>Maximum site altitude above sea level</td>
<td>[m]</td>
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<td>1,000</td>
</tr>
<tr>
<td>Degree of protection acc. to IEC 60529</td>
<td></td>
<td>IP20</td>
<td>IP20</td>
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<tr>
<td>Color</td>
<td>RAL</td>
<td>7047</td>
<td>RAL 7047</td>
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</tbody>
</table>

1) other values on request
2) the autotransformer will be installed separately
3) without power derating

Sitras TCI
Thyristor controlled inverter for DC traction power supply

siemens.com/mobility
Design of primary equipment

The inverters 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.

Cubicle design
The inverter components are housed in a panel group of three or four cubicles. The system can therefore be easily integrated into existing substations. With the 750 V version, the autotransformer is already integrated in the cubicles. With the 1,500 V version or the 750 V version with more power, the autotransformer is installed separately.

Main components
The line-commutated inverter comprises:
- B6 thyristor bridge with fuses for converting direct current into alternating current,
- Autotransformer for matching the secondary voltage of the rectifier transformer to the B6 thyristor bridge,
- DC choking coil for limiting the circuit currents between diode rectifiers and the thyristor inverter,
- AC circuit-breaker and DC disconnector for protection purposes and for isolation of the Sitras TCI.

Terminals
In the case of the DC power terminals, the L+ and L- terminals are arranged as cable connections in the downward direction. The AC power terminals are arranged also in the downward direction.

Example: Layout of the Sitras TCI, 1,500 V (autotransformer is installed separately)
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.

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.

Sitra TCI uses the PROFIBUS protocol. Additional protocols can be implemented on request.

Function

Inverters are for the most part used at those points at which the transfer of energy between vehicles is frequently incomplete. The braking energy of the vehicle can be transferred at any time via the inverter to the constantly receptive medium voltage power system. Therefore the energy can also be transmitted over greater distances.

Flow of energy from the vehicle via the inverter to the medium voltage power grid
Scope of application

The AC side of the inverter is connected to the substation at the rectifier transformer, the DC side at the DC switchgear.

Sitar TCI is thus directly connected in parallel with a diode rectifier. This additional inverter concept not only represents a big space-saving solution, it is also especially suitable for retrofitting in existing substations.

With the integrated AC circuit-breaker and DC disconnector, Sitar TCI can be isolated separately.

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

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Schematic diagram: Example for the integration of the Sitar TCI into an existing DC substation with diode rectifier