

The background image shows a large, light-colored metal container used as a substation, situated outdoors. In the background, there are green trees and high-voltage power lines with pylons under a clear blue sky. The Siemens logo is positioned in the top left corner of the image area.

SIEMENS

Ingenuity for life

Compact digital substation container solutions

for DC traction power supply

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

Traction power supply requires powerful, reliable, low-maintenance, compact substations. An intelligent solution for obtaining direct current quickly and economically is provided by container substations.

By integrating the equipment in a modular housing and undertaking rigorous testing off site, Siemens is able to supply fully built and tested modular traction power substations to a consistent and high level of quality. The state-of-the-art equipment and connectivity allows optimal operations and transparency.

Input voltages: up to AC 24 kV

Output voltages: DC 600 / 750 V, 1500 V, 3000 V

Highlights

- Compact transportable Traction Power Substation
- Easy mounting of power cables, setup and installation
- Setup, connect, switch on ready
- All necessary equipment (medium-voltage switchgear, rectifier transformer unit, DC switchgear, station controller and connectivity) in one container
- State-of-the-art DC protection device Sitras MDC
- Communication protocol IEC 61850 follows latest industrial standards (optional PROFINET)
- Sitras iEMS intelligent energy management System enables energy sensitive operations
- AssetMonitoring giving insights in status and use of equipment
- Cloud connectivity provides opportunity to access data individually

Compact transportable traction power substation solutions

All traction power and switching equipment in one container

The three-phase AC supply is fed in and distributed via the medium-voltage switchgear. The rectifier transformer unit (rectifier transformer and rectifier Sitras REC) transforms the voltage and frequency of the power supply.

DC switchgear Sitras DSG or Sitras CSG distributes the power to the track sections.

The Sitras SCS station control system performs all the control functions as well as protection and communication tasks in the AC and DC traction power supply.

The low-voltage distribution board is used for the substation auxiliary supply.

Medium-voltage switchgear

The three-phase AC supply is fed in and distributed via a compact gas-insulated medium-voltage switchgear.



Technical features medium-voltage switchgear 8DJH

- Up to 17.5 kV, 25 kA or 24 kV, 20 kA
- Busbar 630 A, feeders up to 630 A
- Factory assembled, type-tested switchgear acc. to IEC 62271-200
- Metal-enclosed
- Single busbar
- Gas-insulated, sealed for life
- Flexible due to extension option and block formation
- Individual panels and block versions

Rectifier transformer unit

The rectifier transformer unit (rectifier transformer and rectifier Sitras REC) transforms the AC-power and frequency to DC traction power.

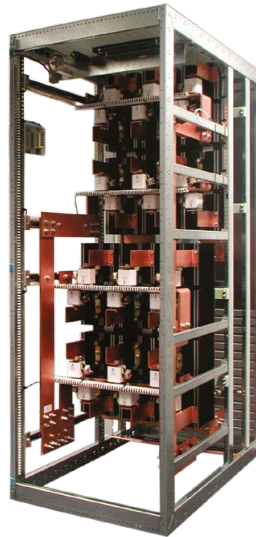
Technical features rectifier transformer

- Power range from 50 kVA to 20 MVA with operating voltages up to 36 kV
- High power-frequency voltage and impulse voltage strength
- No insulating liquid
- Low-noise
- Small footprint
- Maintenance free



Technical features rectifier Sitras REC

- Rectifier for supply of traction power DC operated mass transit systems
- 600 / 750 V, 1500 V, 3000 V DC
- Rated current up to 5220A per unit
- 6 pulse / 12 pulse
- Type-tested



DC switchgear

DC switchgear Sitras DSG or the compact Sitras CSG distribute the current to the track sections.

DC switchgear Sitras DSG

- Switchgear for use in DC traction power supply systems 600 / 750 V, 1500 V, 3000 V DC
- Rated current busbar 4,7...10 kA
- With truck for DC high speed circuit-breaker
- DC protection unit Sitras MDC
- Type-tested

Compact DC switchgear Sitras CSG

- For power supply of DC operated mass transit systems
- Optimized solution for DC substations with performance range up to 2.5 MVA (750 V) and 3.5 MVA (1,500 V)
- Integrated diode rectifier
- DC protection unit Sitras MDC
- Type-tested



Setup, connect, switch on – ready

In contrast to conventional substations, the local assembly and construction works for container substations are reduced to a minimum. They are supplied completely prefabricated and only need be set up and connected to an external supply.

They can be easily adapted to their urban environment and do not have to be incorporated into any building plans. The substation's location can be easily changed.

Also, approval procedures are simpler since the containers are of a standard type. In a container concept, the complete substation comes from a single source: Planning, manufacturing, equipping and assembly of the electrical system are performed entirely by the manufacturer. Auxiliaries such as lighting, air-conditioning and ventilation systems come from a standard program. Completion is speeded up considerably due to rationalized manufacture, smart fitting out and function tests at the works.



Substation prefabricated in the form of a steel-enclosed container



Highway substation in prefabricated steel-enclosed container – exterior wood facing

There is no need for the components to be packed and crated and they are not kept in store until installed. Prefabricated, flexible and complete container substations are the fast and economical solution for providing traction power supplies.

Depending on requirements, the container is divided into one or more switchgear or transformer compartments.

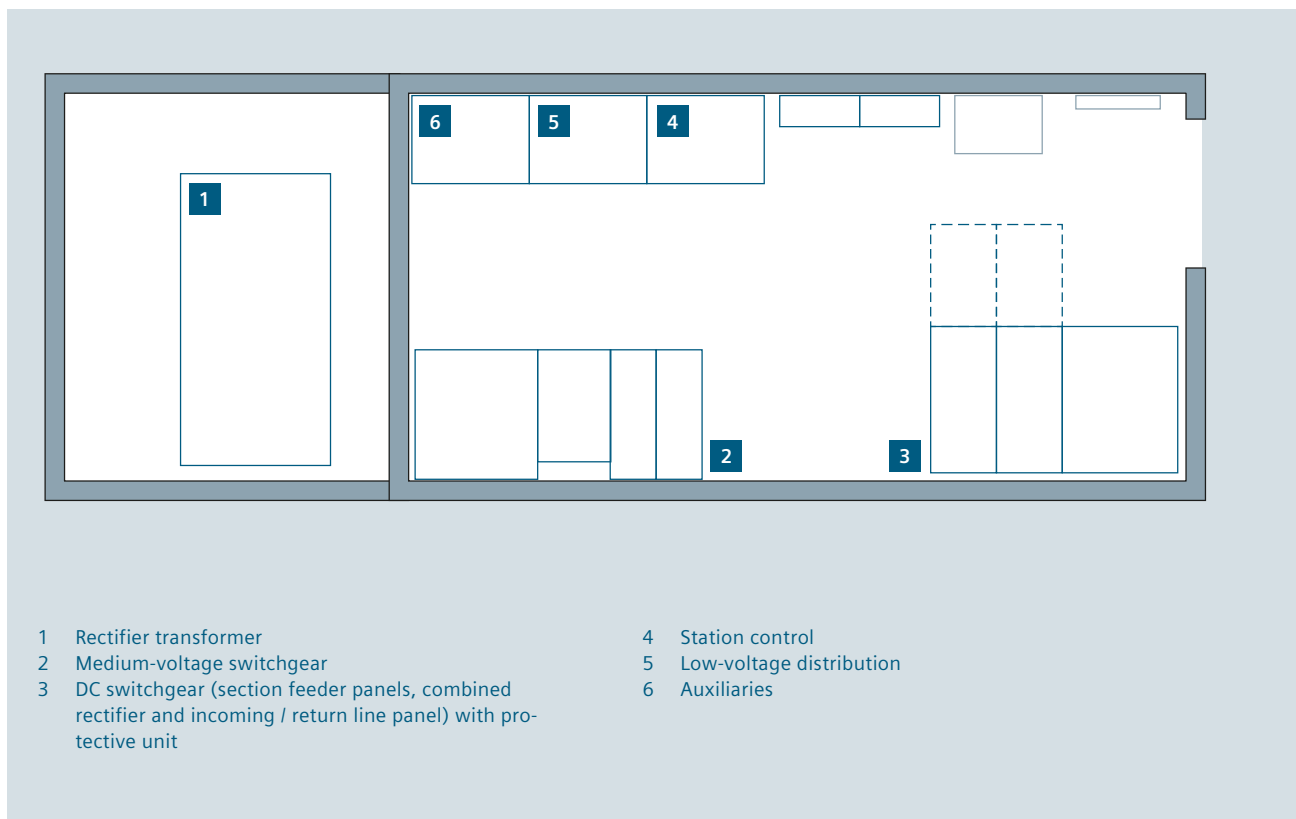
When used under extreme climatic conditions (heat, dust, vapours, etc.), air-conditioning equipment is used for cooling, renewing and moving the air and to lower

air humidity. For this kind of special solutions the compact air-conditioning equipment is housed in two sections (split version) and has an air-cooled condenser outside located.

The container has internal lighting and power sockets in the vicinity of the doors.

Point or strip foundations have to be prepared where the container is to be set up.

The container can be transported by road, rail or water and crane attachment provisions are fitted for loading and unloading.



Schematic layout for container substation

Digital components, connectivity and digital solutions

Siemens Mobility continuously improves its components and takes on trends from other industries to bring linked benefits to the rail infrastructure industry. Entering the digital age the development of our equipment is focused on highest standards for networking and communication. We ensure efficient and flexible communication under highest data security standards.

Protection device



Technical features DC protection device Sitras MDC

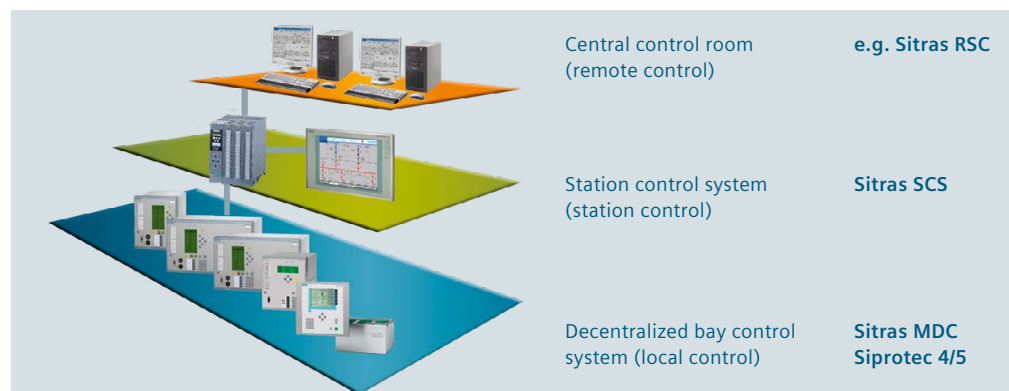
- Over 20 years of experience in digital protection relays
- Reliable protection functions
- Autonomic circuit-breaker control
- Extensive analysis
- Digital networking
- Remote access via Chrome browser
- Wide range of power supplies, inputs and outputs,
- Flexible assembly

Station control

The Sitras SCS station control system performs all the control functions as well as protection and communication tasks in the AC and DC traction power supply. Thus it provides the operating staff with a quick and reliable overview of the operating state of the system.

Technical features station control system Sitras SCS

- Remote link-up to central control room
- Open-loop and closed-loop control of the transformer tap changer
- Coordination of automated switching operations and interlocks (e.g. automatic testing and reclosing) throughout substations
- Monitoring of auxiliary power requirement distribution
- Operator control and visualization of the current status of switching devices, transformers, rectifiers and connections
- Display and archiving of fault and status events
- Transfer tripping of the circuit-breaker in the adjacent substation Sitras SCS-TTU (optional)
- Parameterization and diagnosis of fault records of the numerical protection units (optional)
- Remote diagnosis (optional)
- Full transparency of energy flow and consumption with the Sitras iEMS intelligent energy management (optional)
- AssetMonitoring application allows detailed information of status and use of equipment, e.g. high-speed circuit-breakers (optional)



Communication Protocol IEC 61850

Key features and benefits:

- Interoperability
 - standardized Data Model
 - standardized Communication Protocol
 - standardized Engineering Process
- Standardized in IEC
 - worldwide since 2005
- Real-time communication supported
- One configuration data base
 - standardized Configuration Language
 - extendable for future
- Conformance testing
 - independent third party
 - certification with standardized tests

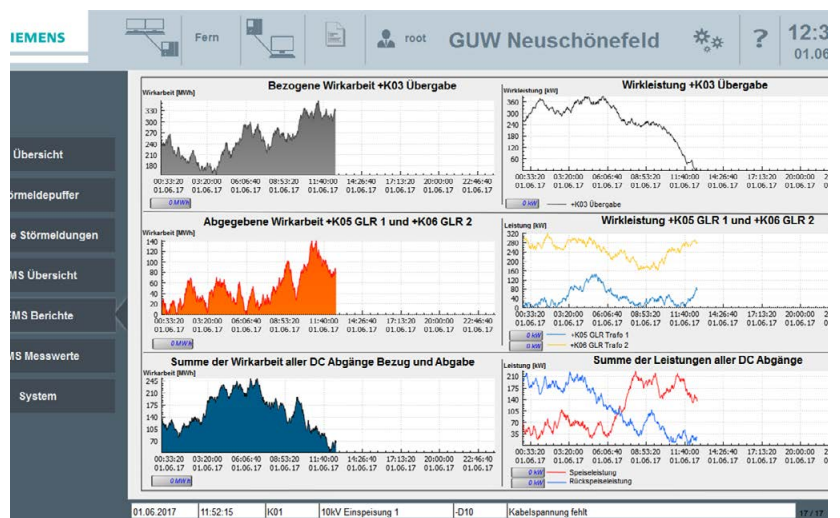
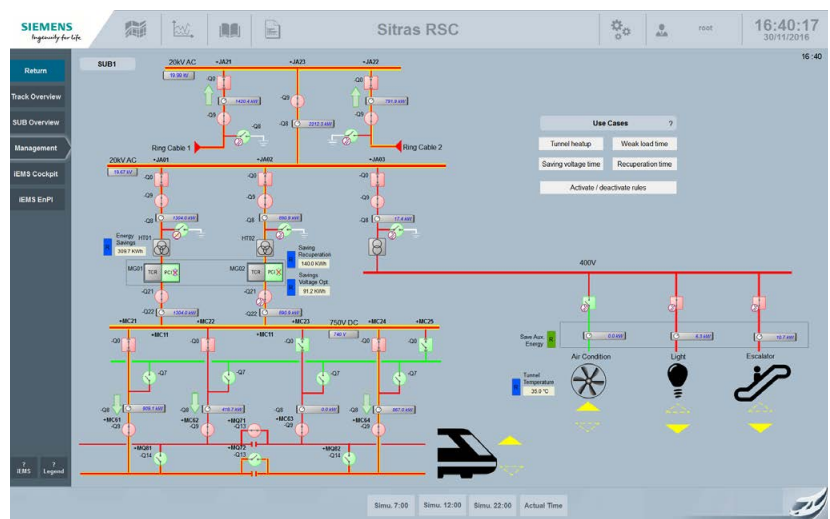
Energy management system

The intelligent energy management system Sitras iEMS is our solution for optimizing energy supply and improving the overall energy efficiency within traction power and rail infrastructure system.

Benefits

Full transparency of energy flow & consumption for:

- Energy-conscious operation
- Prevention of load peaks
- Forecast and optimization
- Realization of customer internal efficiency targets and requirements on sustainable installations & designs
- Realization of governmental regulations e.g. for reduction of carbon dioxide emissions



Asset Monitoring

Transparency of the status and conditions of assets is the key for optimal operations meaning high-est availability and lowest lifecycle costs. Our Asset Monitoring solution provides such insights and allows optimizing operational processes. It com-

bines information from design, installation and actual use in an innovative way and thus enables better decision-making. For instance, since all necessary information is available predictive maintenance becomes possible.

		Schaltgeräte				
		Doku	Doku	Doku		
Übersicht		+K01/-QA1	+K02/-QA1	+K05/-QA1		
	Typ		
	Seriennummer		
	Einbaudatum	01.01.2000	01.01.2000	01.01.2000	erste für alle übernehmen	Grundmodul
Störmeldepufer	Ablauf Lebenszeit in [Tage]	9	9	9		
	Schaltspielzähler [Anzahl]	9	9	9		
aktuelle Störmeldungen	Auslösungen [Anzahl]	3	3	3		
	Pt [A²s]	3	3	3		
iEMS	Grenzwerte: Schaltspielzähler	Offset	0	0	0	erste für alle übernehmen
		Warnung	10	9	0	erste für alle übernehmen
		Alarm	0	0	9	erste für alle übernehmen
Asset Monitoring	Grenzwerte: Pt	Offset	0	0	0	erste für alle übernehmen
		Warnung	10	9	0	erste für alle übernehmen
		Alarm	0	0	9	erste für alle übernehmen
Option 2		Reset	Reset	Reset		
System						

Cloud Connectivity

In the digital age we expect information to be available always and anywhere. For personal and proprietary data cloud technologies make this possible. We are convinced that this has benefits for managers and operators in the rail infrastructure sector as well. As an example one could see the service technician analyzing which circuit-breaker needs most attention before

starting maintenance at a substation. Another case could be an energy procurement manager who can access all information about energy use and peak loads during negotiations with the energy supplier.

Hence, Siemens Mobility offers cloud connectivity for all its traction power equipment.

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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