



### **PRODUCT INFORMATION**

# Sitras RCC Rail Charging Converter for battery-powered vehicles siemens.com/rail-electrification



Sitras RCC is an innovative charging converter and the heart of a modern charging station. Its main task is to create a single-phase traction power system from the local three-phase medium-voltage grid. The 3AC network is loaded symmetrically without any disruptive effects on the traction power network.

### Application

The Sitras RCC charging converter converts a three-phase medium-voltage connection into a singlephase voltage, typically 25 kV at 50 Hz / 60 Hz or 15 kV at 16.7 Hz. The conversion is carried out via a full-scale power converter with a rated output of up to 2.5 MVA. The rated output can be increased by connecting up to three charging converters in parallel. To limit harmonic grid feedback, 3AC and 1AC filter can be provided for each system or site.

## Function

- Charging of stationary and moving<sup>1</sup> battery-powered rail vehicles
- Power supply of depots
- Power supply of test tracks and laboratory environments
- Operation in combination with other energy input sources<sup>1</sup>

## **Benefits**

- High voltage quality on 3AC side due to shifted pulsing of semiconductors and optional filter
- Symmetrical loading of the 3AC network regardless of the load on the 1AC side
- **3AC reactive power compensation** (mains support according to U/Q characteristic<sup>2</sup> possible)
- **High voltage quality on 1AC side** due to shifted pulsing of semiconductors and filter, according to the needs of the vehicle
- Protection functions for converter and system protection by standard relays
- Control of short circuits and mains faults on the 1AC side
- Controled 1AC voltage
- Power limitation on the 1AC side by means of voltage reduction
- No influence from 1AC to 3AC network due to separation via DC link

2) within the defined P/Q characteristic

# Design

### Basic design of a charging station

A charging station can have a modular design, as shown in the following image. It consists of a station infrastructure (marked in gray) and at least one charging converter (marked in yellow). To increase the output, up to three3 charging converters can be connected in parallel. Each charging converter requires its own circuit breaker on both the 3AC and 1AC sides.



Exemplary view: Design of a charging station

#### Station infrastructure

The station infrastructure includes all necessary components to turn the charging converter into a complete charging station. It is developed on a project-specific basis and contains the following power components:

- 3AC and 1AC medium voltage switchgear including current and voltage transformers.
- Auxiliary power and auxiliary equipment: The auxiliary power is covered via a separate power supply.
- **Auxiliary voltage:** Provision of one non-protected and one UPS-protected auxiliary voltage to supply all system-relevant components (e.g. control and IT systems).
- Station control technology: For higher-level process control.

# Design

#### Basic design of a charging converter

Sitras RCC contains all necessary components to generate the required 1AC traction power from an existing 3AC medium-voltage grid. The following figure shows the basic design of a charging converter, consisting of the following main components:

- **3AC filter** (optional) and 3AC transformer<sup>4</sup>
- 1AC filter and 1AC transformer
- Two converter units, each with a compact cooling unit
- A control cabinet



Exemplary view: Design of the Sitras RCC charging converter

#### Main Components

The standardized main components of the charging converter offer flexible options for installation and accommodation. These components can be integrated into a steel container, a concrete building, or an existing infrastructure.

Below are two possible concepts for installation in steel containers.



Example: Sitras RCC charging converter unit



Example: charging station with switchgear

1	3AC filter (optional)	4	1AC transformer	7	Control cabinet
2	3AC transformer	5	Converter unit	8	1AC switchgear
3	1AC filter	6	Cooling unit	9	3AC switchgear

# Secondary equipment

#### IT security

The Sitras RCC charging converters are implemented with a modern IT protection concept. This concept is subdivided into different zones and is secured by various protective elements.

#### Open- and closed-loop control

Sitras RCC includes components for measuring grid parameters such as voltage and current. The control electronics of the converter are equipped with control and protection software that initiates the necessary protective measures based on the preset control parameters under defined operating conditions. Optionally, the charging converter can be equipped with a permanently installed real-time measuring system with fault recorder function, which provides additional information and data and facilitates error analysis.

### Operator control and visualization

The Simatic touch panel, the installed S7 controller 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

Remote control via common interfaces and protocols is possible.

### **Technical data**

Electrical data	Unit	Value	
Input voltage range 3AC	[kV]	6 30	
Input Frequency 3AC	[Hz]	50 or 60	
Output voltage range 1AC	[kV]	15 25, other <sup>1</sup>	
		Variant 1	Variant 2
Output voltage 1AC to traction power system	[kV]	27.5	16.5
Output frequency 1AC to traction power system	[Hz]	50	16.7
Continuous output 1AC side (cos phi 1)	[MW]	<= 2.5	
1AC / 3AC auxiliary power supply	[V]	230/400	
Tolerance 1AC / 3AC auxiliary power supply	[%]	± 10	
Current requirements / Power requirements		16 A	per phase / 8 kW
DC auxiliary power supply	[V]	60 220	
Tolerance DC auxiliary power supply	[%]	± 10	
Power requirements			2 kW
<sup>1</sup> on request			

Mechanical data	Weight in kg	Dimensions in mm		
Converter cabinet	1200	1200 x 1400x 2200		
Control cabinet	400	1200 x 600 x 2200		
Cooling unit	200	630 x 730 x 2000		
1AC transformer (50 Hz)	8800	2400 x 1600 x 2850		
1AC transformer (16.7 Hz)	12000	2450 x 1450 x 2850		
1AC filter	70	2000 x 1000 x 1200		
3AC transformer <sup>₄</sup>	7400	2500 x 1400 x 2850		
3AC filter <sup>4</sup>	150	2500 x 1200 x 2300		
<sup>4</sup> Project-specific adaptations required				

Environmental conditio	ns	Unit	
Installation location			Indoors in container or building
Degree of protection			IP20
Cooling 3AC and 1AC transformer / filter			Natural air cooling
Cooling converter unit			Liquid-cooled
Outside temperature range		[°C]	-30 to +40
Inside temperature range		[°C]	-5 to +40
Max. humidity		[%]	85
Pollution degree	according to EN 50124-1		PD2
Overvoltage category	according to EN 50124-1		OV3
Maximum operating altitude <sup>4</sup>		[m]	Standard up to 1000
<sup>4</sup> Project-specific adaptations re	quired		

### References

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