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Sitras REC

Diode rectifier for DC traction power supply

Sitras® REC type rectifiers are designed to supply traction power to DC-operated mass transit systems and main-line railways.

The special demands of these rail services are met by the use of aircooled disc-type diodes with a high blocking voltage.

Features

- Modular design allows cost effective adaptation to customer requirements
- Compact design
- High capacity, high overload capability
- Type-tested to IEC 60146-1-1 and EN 50328
- Reliable, low maintenance requirements as a result of robust mechanical and electrical design
- Earthquake tested rectifiers available

Technical data

Nominal voltage U_n	[V]	600 / 750	1,500	3,000
Peak inverse voltage of diodes U_{RRM}^* (Option)	[V]	2,200	4,000 (4,600)	4,000 (4,600)
Maximum rated current I_{dN}^* (depending on load class and number of parallel diodes)	[A]	5,220	3,780	3,230
Maximum weight	[kg]	850	850	2x 850
Width	[mm]	800	800	2x 900
Height	[mm]	2,200	2,200	2,200
Depth* (Option)	[mm]	1,400 (1,200)	1,400 (1,200)	1,400 (1,200)
Max. ambient temperature**	[°C]	+40	+40	+40
Maximum installation height above sea level**	[m]	1,000	1,000	1,000
Degree of protection acc. to IEC 60529 (Option)		IP20 (IP40)	IP20 (IP40)	IP20 (IP40)

* other values on request ** without current decrease

Design

The diode rectifier is designed as a sheet-steel cubicle suitable for indoor installation. The diode sets, busbars and the combined RC and base-load elements are modules bolted in the cubicle.

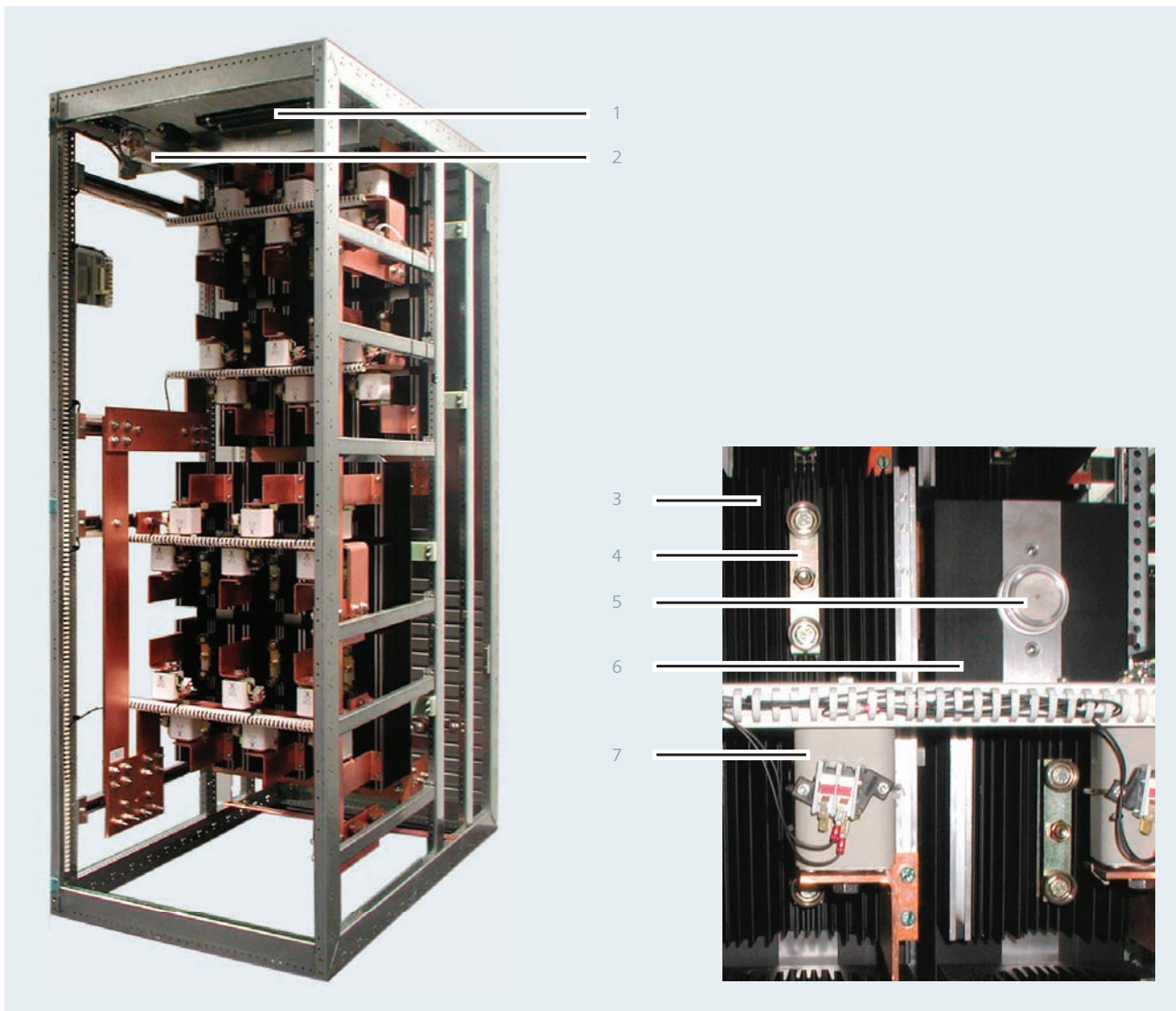
For flexibility, various versions are available for connection of AC and DC power cables from all directions – from top, from bottom, as well as from top and bottom.

The diode sets consist of disc-type diodes cooled from both sides. The disc is cooled on one side by a heatsink

and on the other side by the cooling busbar.

The massive cooling busbars extend over a number of diode locations and give the structure a high stability. Both, the heatsink and the cooling busbar are made of the same thermally optimized extruded aluminium profile.

All main components are easy accessible from the front (the cubicle is suitable for mounting against a wall) and can be easily replaced.



1 Base load resistors
2 RC elements

3 Individual heatsinks
4 Clamping strip

5 Disc-type diode
6 Cooling busbars

7 Semiconductor fuse with
microswitch

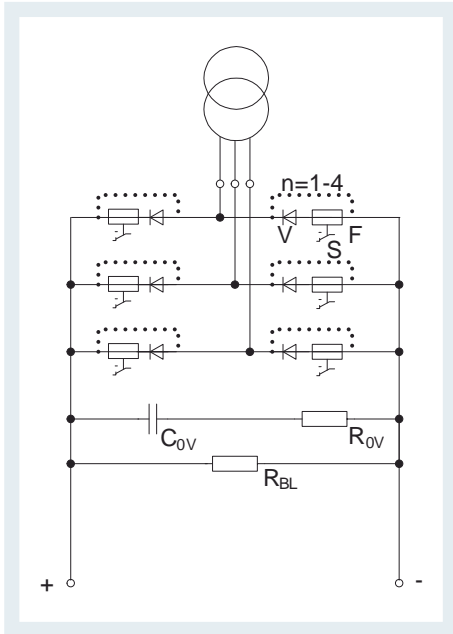
Layout of cubicle and diode mounting

Circuit variants

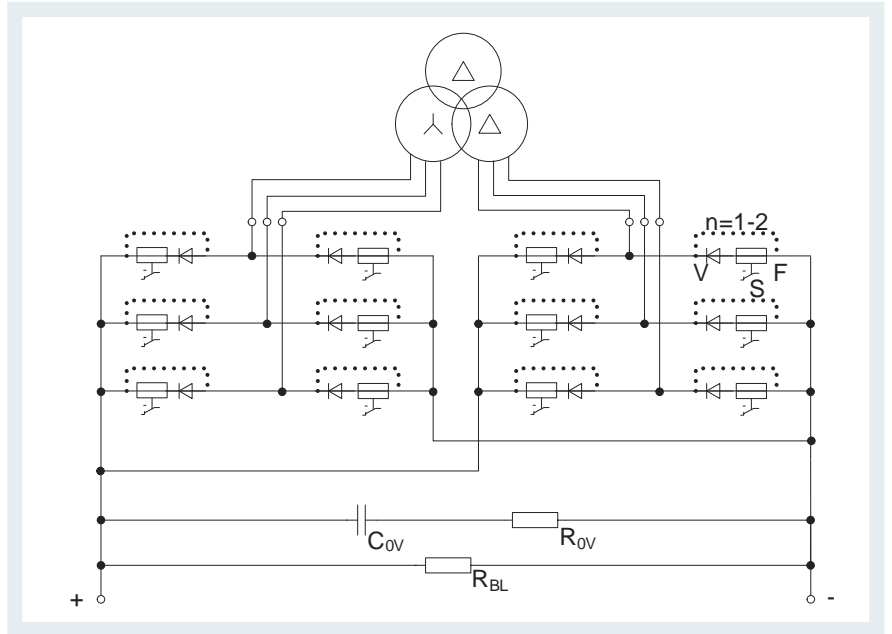
The diode rectifiers are based on diode sets connected as three-phase, 6-pulse, uncontrolled bridge circuits (B6U). A multiple of the pulse number can be obtained by series or parallel connection of three-phase bridge circuits.

A 6-pulse bridge circuit with $n = 1-4$ parallel diodes per bridge arm, i.e. a maximum of 24 diode locations can be fitted in a cubicle.

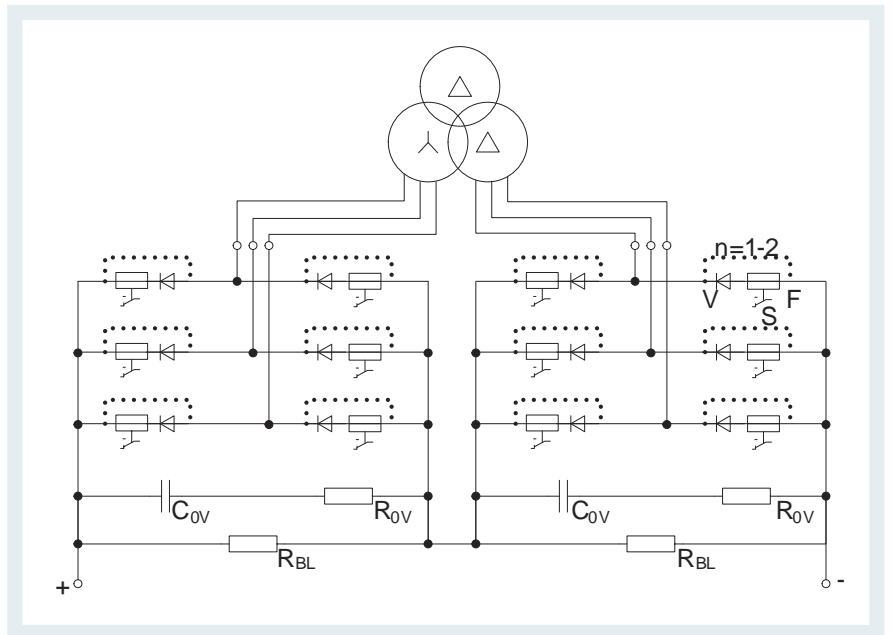
12-pulse versions in series connection (B6U2S) or in parallel connection (B6U2P) with $n = 1-2$ parallel diodes per bridge arm can also be fitted in one cubicle.



6-pulse version,
DC 600 / 750 V and DC 1,500 V
 Types: B6U 750P1, B6U 1500P1
 B6U 750P2, B6U 1500P2
 B6U 750P3, B6U 1500P3
 B6U 750P4, B6U 1500P4



Parallel connection 6-pulse and 12-pulse version,
DC 600 / 750 V and DC 1,500 V
 Types: B6U2P 750P1, B6U2P 1500P1, B6U2P 750P2, B6U2P 1500P2

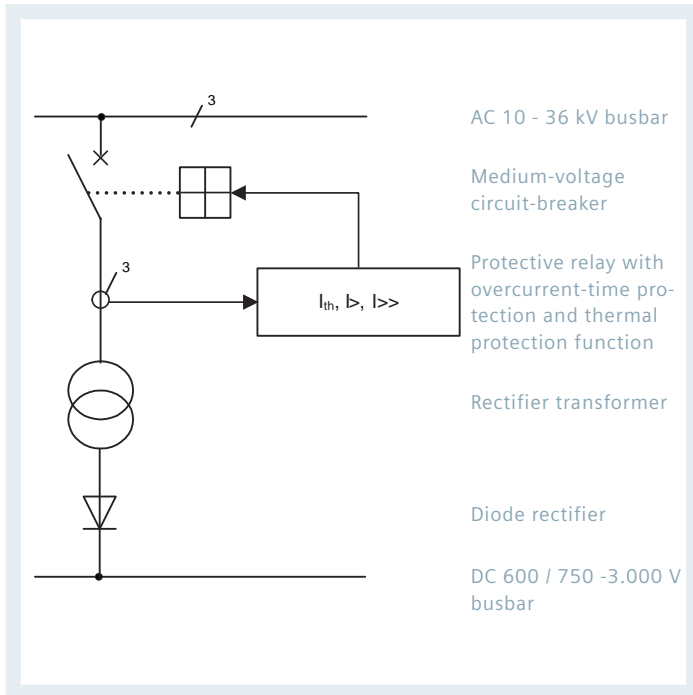


Series connection 6-pulse and 12-pulse version, DC 3000 V
 Types: B6U2S 3000P1, B6U2S 3000P2
 (Option: DC 600 / 750 V and DC 1,500 V)

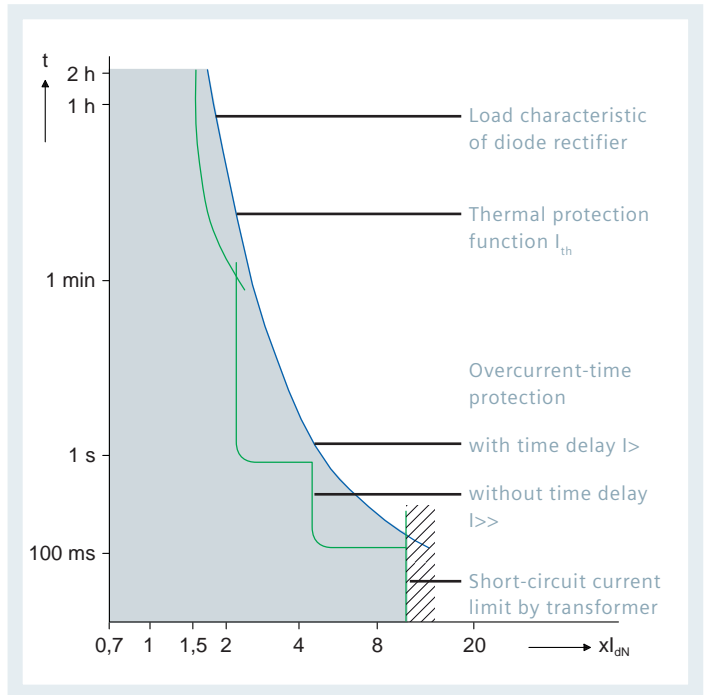
Legend of block diagrams:

- C_{0V} Condensator, RC circuit
- F Semiconductor fuse
- n Number of parallel diodes per arm
- R_{0V} Resistor RC circuit
- R_{BL} Base-load resistor
- S Microswitch
- V Disc-type diode

Protection



Schematic diagram: Protection against overload



Schematic diagram: Protection against external short-circuit

Protection against internal short-circuit

The diode rectifier is protected by fuses in series with each diode. The failed diode is thus selectively disconnected by its fuse. The operation of the fuse is signaled by its potential-free contact.

Protection against internal and external switching overvoltages

The RC circuit of the diode rectifier damps transient overvoltages, which come through the input or output or which occur as a result of commutation between the diodes. The RC circuit thus protects the diodes.

Protection against overload and external short-circuit

This protection is provided by external protective relays. The diode rectifier is designed to conduct the DC short-circuit current until operation of the protective element. This is usually the relevant medium-voltage circuit-breaker with its protective relay. Typically, the protective relay with overcurrent-time protection and thermal protection function monitors the diode rectifier and the rectifier transformer.

Protection against atmospheric overvoltages

The diode rectifier is protected against external overvoltages by external surge arresters on the contact wire or in the outgoing feeder panels of the DC switchgear. Surge arresters can optionally be installed also directly in the rectifier cubicle.

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The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. If not stated otherwise, we reserve the right to include modifications, especially regarding the stated values and dimensions.