TRACTION
POWER
SYSTEMS

Sécheron

DIODE RECTIFIERS

EFFICIENT-**REC-D**

EFFICIENT

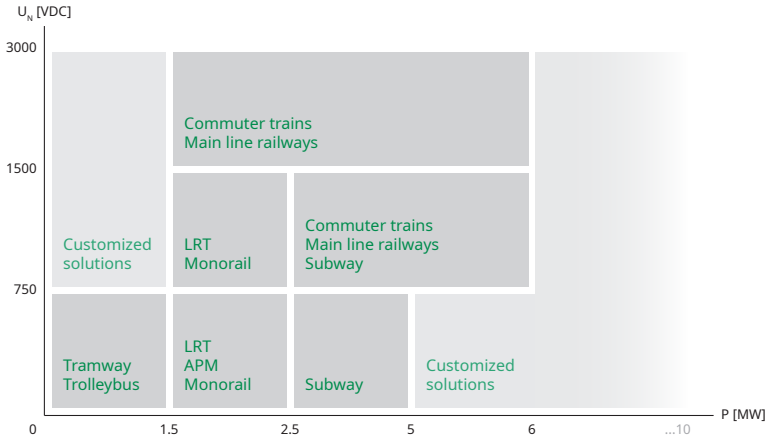
POWER CONVERSION

Using experience accumulated over more than 50 years working in the field of traction power substations, Sécheron has designed the EFFICIENT product category from the ground up to cover all the customer needs for DC supplies.

All the EFFICIENT products are built specifically to comply with the most stringent requirements of usability, maintainability and durability in traction power application environments, maximizing the return of investment for our customers. These reliable and field-proven building blocks are also the basis for custom applications upon specific requests.

GENERAL INFORMATION

APPLICATIONS



Thanks to its complete range of rated voltages, Sécheron is able to cover all types of traction networks.

With many years of experience in the field, Sécheron is able to propose a reliable and suitable range of diode rectifiers for DC traction power supply. Our natural air cooled rectifiers are equipped with diode blocks with high overload capability and high blocking voltage.

The design of the rectifiers is based on ideally sized and proven semi-conductors (silicon diodes) offering particularly high performances and reliability. All components are fully interchangeable.

Rectifiers are designed in accordance with customers' specifications and with the relevant standards.

MAIN BENEFITS

- Compact design
- Adaptability: Power connection from either the top or the bottom of the cubicle
- Ease of access for easy maintenance of components
- Reliable, robust and high quality solution
- Natural air cooling
- High efficiency
- Safe and reliable

MAIN CHARACTERISTICS

	Unit	Values		
Standard rectifier range		**750 V**	**1500 V**	**3000 V**
Rated DC voltage	[V]	750	1500	3000
Rated current	[A]	Up to 6000	Up to 4000	Up to 3000
Overload	-	Class VI per EN 50328 / IEC 60146 (others on demand) Extra Heavy Duty per NEMA RI9 (others on demand)		
Maximum ambient temperature	[°C]	40 (without derating)		
Peak reverse voltage of diode	[V]	2200	4500	4500
Maximum altitude	[m]	1000 (without derating)		
IP degree	-	IP2x to IP32		
Width	[mm / in]	800-3200 / 31.5”-126”		1200-2400 / 47.25”-94.5”
Depth	[mm / in]	1400 / 55”		
Height	[mm / in]	2200 / 86.5”		

Other ratings and dimensions upon request.

STANDARDS

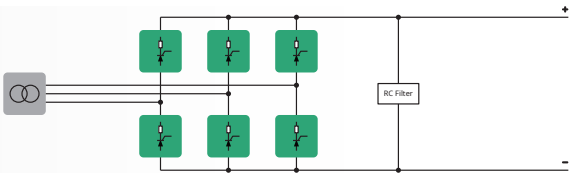
Our rectifiers are fully compliant and type tested according to the following standards:

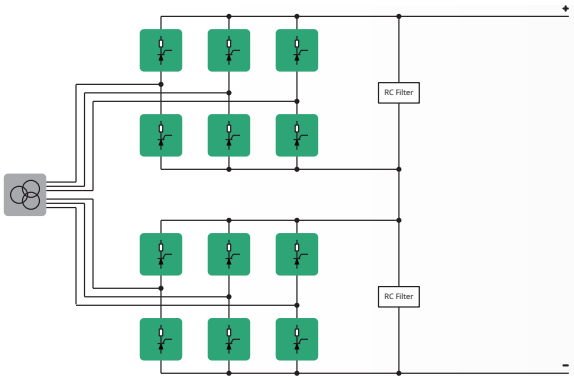
- **IEC 60146-1-1 (EN 60146-1-1)** | Semiconductor converters – General requirements and line commutated converters - Specification of basic requirements
- **IEC 60747** | Semiconductor devices
- **IEC 62590 (EN 50328)** | Railway applications – Fixed installations – Electronic power converters for substations
- **IEEE/ANSI C34.2** | Practices and Requirements for Semiconductor Power Rectifiers
- **IEEE 1653.2** | Uncontrolled Traction Power Rectifiers for Substation Applications Up to 1500 V DC Nominal Output

CONNECTIONS

6-pulse – *Up to 1500 VDC*

- Connection n°8 according to IEC 60146-1-2
- Connection n°25/26 according to IEEE 1653.2



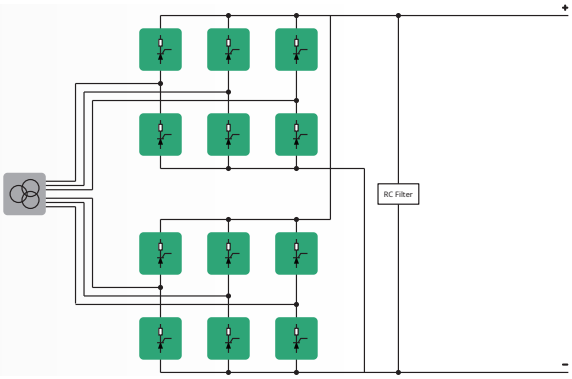


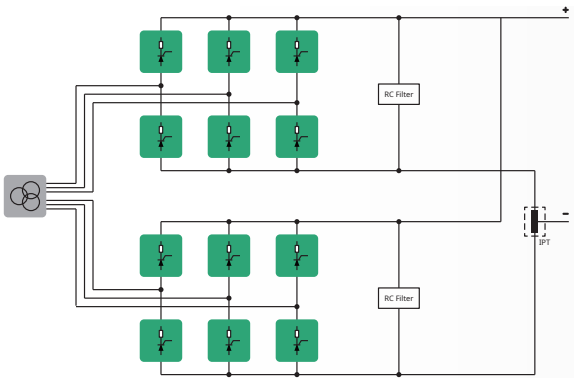
12-pulse series
Up to 3000 VDC

- Connection n°12 according to IEC 60146-1-2
- Connection n°31B according to IEEE 1653.2

12-pulse parallel, without IPT
Up to 1500 VDC

- Connection n°9 according to IEC 60146-1-2
- Connection n°29 according to IEEE 1653.2





12-pulse parallel, with IPT
Up to 1500 VDC

- Connection n°9 according to IEC 60146-1-2
- Connection n°31 according to IEEE 1653.2

24-pulse

Two transformer-rectifier groups each 12 pulses and with adequate phase shift ±7.5° on primary can be provided to achieve 24 pulses rectification.

Special connection (upon request)

- Connection n°5 according to IEC 60146-1-2
- Connection n°45 according to IEEE 1653.2

PROTECTIONS

OVERVOLTAGE PROTECTION

Internal overvoltage

During turn-off, the load current of the diode does not stop flowing immediately but continues briefly in reverse direction as reverse recovery current. This peak reverse recovery current causes a voltage peak which is eliminated by an individual snubber circuit mounted in parallel with each diode.

External overvoltage

Essentially due to lightning strikes, AC circuit breaker operation at no-load or short-circuits, external overvoltage can occur. The rectifier is equipped on the DC side with a RC filter capable of absorbing significant surges. A surge arrester can optionally be installed directly between the output terminals of the rectifier.

SHORT-CIRCUIT PROTECTION & IMMUNITY LEVELS

All traction rectifiers are designed to withstand external short circuit without damage until the MV circuit breaker opens.

Fuseless rectifiers (Damage)
According to EN 50328 standard

Each branch has one diode only and the diode failure detection is ensured by the reverse current detector (CR10).

Rectifiers with fuses (Np) (Tripping+)
According to EN 50328 standard

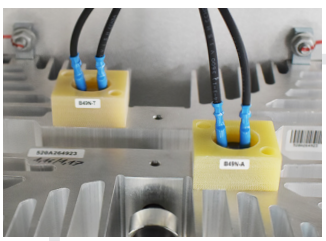
Composed of several parallel diodes in each branch, the failed diode will be isolated from the circuit by melting the associated fuse, witnessed by the fuses own micro-contact. After melting of the fuse, the rectifier is withdrawn from operation.

Rectifier in Np+1 configuration (Redundancy) – *According to EN 50328 standard*

Additional diode in each branch in order to provide full performance after failure of one diode in each branch.

Rectifier in Np-1 configuration (Functional) – *According to EN 50328 standard*

The rectifier continues providing service with reduced performance after losing up to one diode in each branch; the performance is guaranteed for rated power and some reduced overload.



OVERLOAD PROTECTION

Rectifier diodes are protected against over-temperatures by thermostats mounted on heatsinks (alarm and trip thresholds).

CUSTOMIZED DESIGN

In order to cover all customer requirements, Sécheron can provide different designs of rectifiers.

FIXED RECTIFIER

- Compact & robust.

DRAWOUT RECTIFIER

- Interchangeable & easy maintenance.

RECTIFIER WITH INSULATING SWITCH

Sécheron also offers a cubicle which integrates both functions of rectifier (up to 1200 kW) and isolating switch for special applications for light rail systems (compact solution for tramway and trolley-bus).

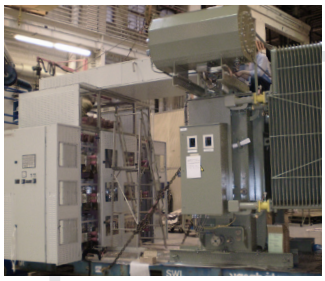
Power diode blocks
Diodes fitted in heatsinks combined with snubbers and optional fuses

SWS / SWG
Bipolar off-load motorized disconnecting switch with optional earthing connection

TRANSFORMER-RECTIFIER GROUP

Based on a strong experience, Sécheron provides an engineering and consulting support service for the transformers according to standards IEC 62695 (EN 50329) and IEEE 1653.1:

- Technical specification
- Monitoring during the manufacturing process with the supplier
- Assistance during factory acceptance test
- Assistance during the combined tests of the complete transformer-rectifier group



To ensure the compatibility of rectifier and transformer, Sécheron is able to provide the complete transformer-rectifier group.

RELATED PRODUCTS

REC-T

THYRISTOR CONTROLLED RECTIFIERS

Customer benefits:

- Regulation of the voltage in order to compensate voltage drops of the line
- External DC short-circuit limitation
- Optimization of the functioning in case of double converter (controlled rectifier coupled with inverter)

Refer to **Brochure REC-T** · SG841750BEN

BDUCT

AC/DC BUS DUCTS

Refer to **Brochure BDUCT** · SG859912BEN

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