SIPOREC
Siemens Power Rectifiers – powering your industrial copper and zinc electrolysis
Your challenge: success depends on reliable Direct Current

In industrial electrolyzer applications, every kiloampere DC counts. The production output of copper, zinc, nickel, aluminum, chlorine, hydrogen, and other substances depends almost proportionally on the Direct Current’s value and production time.

As a result, production managers must be able to count on a heavy-duty rectifier system with best-in-class efficiency and the highest reliability.

“What makes industrial operations challenging today?”
With decentral and renewable power on the rise, grid providers as well as industrial clients are facing new challenges. The result is stricter regulations regarding the power quality of the rectifier systems that major power consumers have to comply with. At the same time, it is essential to reduce a plant’s ecological footprint and respect the carbon dioxide balance.

How much can you get back?
When making an investment decision, you expect to get a lot back: a fast return on investment and minimized production costs based on easy maintenance and long maintenance intervals – without compromising system and staff safety.

Another aspect is longevity. You want to be sure that you can rely on your system every day for an expected lifetime of up to 30 years, even under extreme environmental conditions and with challenging infrastructures. That’s where the promise of “best-in-class availability” really gets put to the test.

What features do you expect to meet the challenge?
• Highest efficiency, availability, and cost-effectiveness in operation
• Optimal customized system design with maximum standardization number of high-quality components
• Greatest safety for both staff and equipment
• Fast diagnosis of system conditions, minimized planned downtimes, and the best worldwide service
• The least possible grid distortion
• Fast installation and commissioning
• Long-term upgradability, spare parts availability, and strong technical support

In nonferrous metals as well as chemical production plants, reliable DC supply is mission-critical. Siporec puts you on the safe side, including our severe Factory Acceptance Test (FAT) for reliable quality.
Siporec rectifiers embody the most advanced electrical and mechanical engineering available, with features that include:

- Most compact, customized design of the rectifier unit, in closest proximity to the rectifier transformer – for high efficiency and optimal power factor per IEC 60146 recommendations
- High unit ratings – resulting in a small footprint and minimal civil engineering
- Excellent system safety thanks to extra-long creepage paths on all insulation materials (minimum 4× the value of IEC recommendations) and wide air clearances between parts with different voltage potentials
- Careful separation of the phases due to insulating shields made of flame-resistant material with high tracking index per IEC
- Fail-safe design with no earthed parts other than the base frame; isolation from ground by using at minimum 10 kV post insulators
- Test voltages applied between busbars at different potentials and between busbars and baseframe up to 10 kV rms, 50 Hz
- Easy and fast maintenance as a result of readily accessible vital components like thyristors/diodes and fuses
- Efficient and virtually wear-and-tear-free cooling system with high overload capacity
- Use of long-life Siemens standard components for industry – like the DC Master Control Sinamics DCM and the world’s leading PLC system, Simatic, ensuring high reliability, long-term compatibility, and availability – and giving you all the required system information “at your fingertips” in situ or exchanged with the DCS
- Several operating, control, monitoring, and protection functions are available and displayed in an easily understandable way
- Long maintenance-free intervals for the entire system
- Nickel plating on all contact surfaces of the water-cooled aluminum busbars and heat sinks for semiconductors and fuses – for low and stable long-term ohmic resistance across the contact surface
- Robust ironless current transformers installed on the incoming AC terminals that feed their signals to the Siporec CC digital control system, providing fast processing of:
  - DC measurement with high accuracy
  - Constant current control
  - Reverse current detection
  - Overcurrent protection
An additional DC measurement system is often not necessary.

“Count on the most advanced electrical and mechanical engineering available – and meet your budget requirements today and tomorrow”
Your benefit: highest availability beyond 98% efficiency

Siporec powers your production – reliably and 24/7/365. However, dependable operation is just one aspect you benefit from.

Get exactly the performance you need
Choose from three scalable Siporec platforms in vertical, horizontal, or compact design and you will always get the highest cost-effectiveness in terms of Direct Current capacity and space requirements. The customized system design fully matches the current and power requirements of your electrolysis at different operating points – with perfect interaction of the tap-changer, thyristor firing angle, and – for diode-based systems – saturable core reactor.

98 percent speaks for itself
Siporec features very high efficiency,* with values exceeding 98 percent, an optimal power factor, and minimized grid distortion thanks to minimal harmonics.

Engineered to perform under all conditions
In your industry, costly downtimes are not an option. Wherever possible, Siemens engineers use robust industrial-standard components from our broad product range. This includes Simatic – optionally available in fail-safe design and Sinamics DCM – Direct Current Master. The result: high performance, continuous innovation, long-term spare part availability around the globe, and compatibility with all main standards.

What’s more, our engineering is not limited to the rectifier group. If you need to extend or modernize your plant, Siemens is the right partner for electrification, automation, and digitalization.

New revenues thanks to energy stock markets
As an operator of a power-intensive electrolyzer or smelter plant, you should think about getting access to the electrical energy stock markets. To stabilize grid conditions, grid operators even reward standby mode or temporary reductions in power consumption. Ask our engineers to implement a remote power management system that will make you an electro winner.

Reliable support for continuous operation
With Siemens’ world-class services in virtually every country, you’ll never walk alone. Whether you need quick remote help or on-site support – we’re at your side to enable your operation to move forward as quickly as possible. Our service offerings include:

- Siemens Remote Services via telephone or Internet/VPN
- On-site services in case of emergency
- Planned services during scheduled maintenance phases
- Service contracts.

*According to IEC 60146
Odda, Norway: For the zinc smelting plant, Siporec has been designed for a 30-year service life – running around the clock.

Successful in practice: More zinc from the high north
In 2003, the Swedish metal company Boliden acquired the traditional zinc smelting plant in Odda (Norway). To boost production from 143,000 tons in 2013 to 200,000 tons in 2016, Boliden initiated a major modernization project. Siemens implemented a heavy-duty rectifier group with a 44 MVA rating as well as the associated rectifier control and cooling system. The solution is based on the proven platform Siporec H, designed with diodes forming a 12-pulse system with 110 kA DC at 345 V.

The project execution was an excellent example of international and cross-divisional teamwork between Siemens Norway and different Siemens units. With the successful completion, Boliden was able to increase productivity, flexibility, and energy efficiency.

“It doesn’t matter whether you’re planning a new greenfield plant or the replacement of an existing system”

Five decades, 100 percent commitment
With over 50 years of experience and nearly 1,000 installed rectifier systems, our specialists bring all their expertise to your project to engineer the most appropriate system design for all types of electrolysis plants. The ongoing development and improvement of rectifier technology, based on quality standards ISO 9001, 14001, and 18001, has always been our goal – resulting in solutions that balance technical innovation with safety and maintenance aspects.

Your benefits with Siporec – at a glance:
• Most suitable system design – with three scalable platforms
• Minimized footprint, but never pushed to the limits
• Maximized efficiency – enabled by the compact and proven system design
• Always informed about the entire status of your rectifier group through autonomous information and “at your fingertips”
• Minimized maintenance costs – thanks to rugged, maintenance-friendly components
• The option to participate in energy stock markets – with a remote power management system