



# High Power Rectifiers for primary aluminum smelting

Excellence in rectifiers

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## ABB High Power Rectifiers boost your aluminum production

The primary aluminum smelter process requires reliable, highly efficient DC power supplies. Continuous availability is essential for a successful smelter operation.

ABB, a worldwide leading supplier of rectifiers, has the experience and technical expertise to fulfill your requirements and to come up with the optimum solution. This outstanding reliability has been proven in over 100 aluminum smelters worldwide.

Our technology offers you a technical solution that minimizes risk, provides total system integration and ensures a high return on investment.

### **DC power from ABB – reliable, efficient and safe**

Having a reliable power supply implemented by highly efficient rectifiers minimizes operational costs. The safety of personnel is a high priority for all of our systems.

At ABB we supply equipment you can absolutely trust. Although the cost of the power supply is minor compared to the total investment, a loss of power can result in a tremendous production loss.

### **Overall system supply**

We take care of all aspects of planning, designing, manufacturing, testing, shipping, installing, site testing, and starting up the rectifier system.

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Isal aluminum plant in Iceland



# ABB – the No. 1 for reliable DC power

State-of-the-art technologies like well-proven diode and thyristor rectifiers, current compensation loops and booster rectifiers, in combination with increased voltage levels and robust and reliable design, demonstrate our market-leading position and our thorough understanding of the aluminum smelting process.

ABB’s success derives from the ability to develop highly customized integrated solutions that can match our customers’ most demanding specifications.

### Enhance production

ABB designs and builds rectifiers to the highest quality standards. Our extensive industry experience enables us to understand your specific requirements. By combining uninterrupted power, early warnings, equipment and process safety, we provide a DC power supply that keeps your potlines running and enhances productivity.

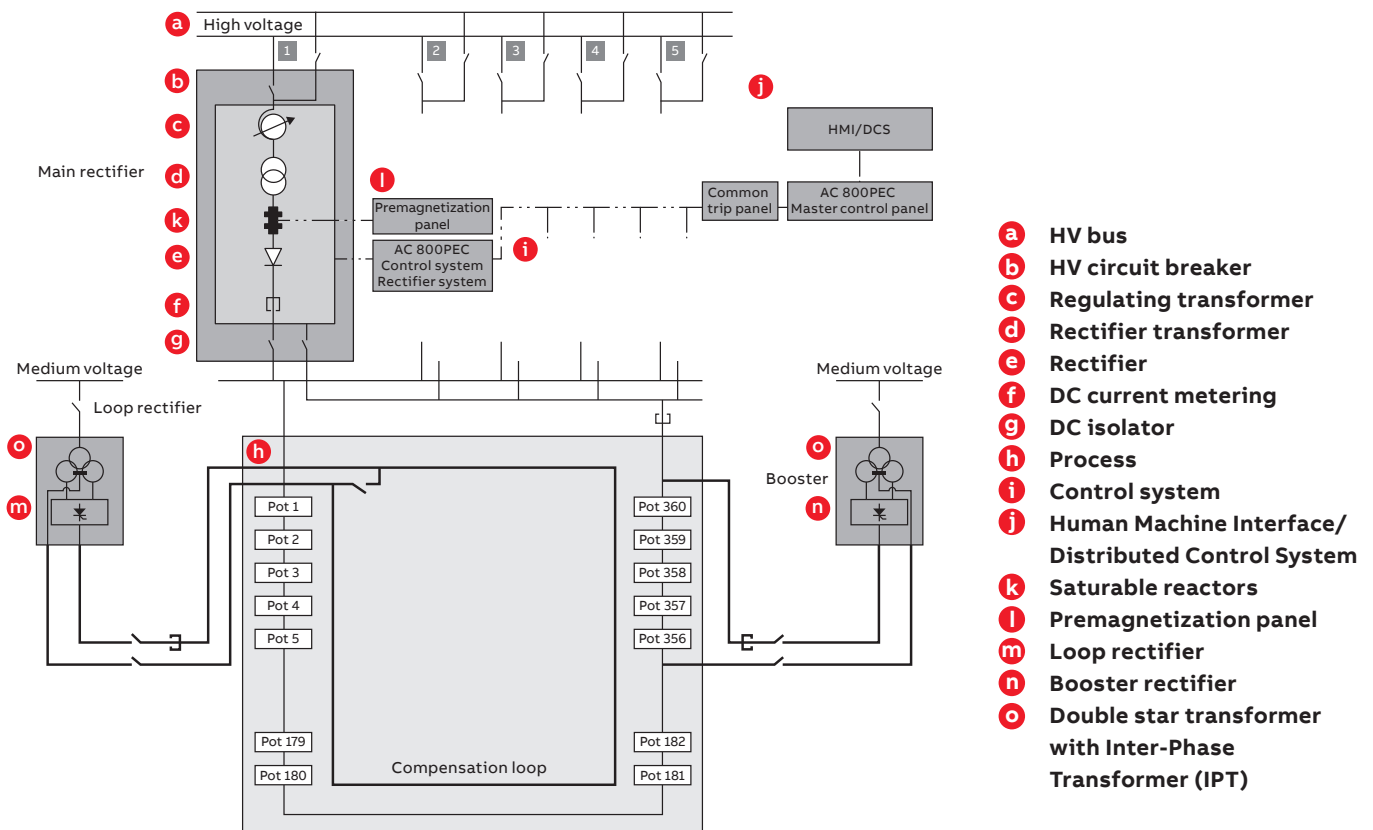
### Lowest cost of ownership

In an economic calculation of the operational cost of a rectifier system, various direct and indirect costs throughout the system’s entire lifetime should be considered. Savings on operational and energy cost will compensate for the initial investment.

With ABB rectifiers you achieve the lowest total cost of ownership and boost your production through

- maximized availability
- minimized losses
- minimized maintenance
- highest personnel safety
- longest lifetime
- global presence for service
- 24h support line

ABB high power rectifier solutions, a perfect match for any plant



# High performance equipment – the base for your productivity

ABB's advanced technological solutions provide decisive operational advantages. In order to achieve the most efficient, economic and service-friendly solution, we take the entire plant into consideration when drafting the equipment arrangement.

This attention to detail and consideration of the particular needs of each individual customer and project is just one example how ABB looks beyond the product to the system solution.

## ABB's state-of-the-art diode rectifiers

Our rectifiers are built in a compact design where minimum coupling impedances reduce the inductive voltage drop.

The coordinated selection of rectifier frame, semiconductors, fuses, and other protective devices result in a robust, safe, low loss system.

## Proven thyristor technology for smooth and economic operation

Although diode rectifiers are currently the most common, our thyristor rectifier systems provide many advantages:

- Fast response for most stable operation, even in weak grids
- Fast load shedding to support AC grid stability
- Easy start of the potline with fast and smooth control to reduce inrush currents and network distortions
- Absence of regulation transformer increases rectifier efficiency
- No need for on-load tap changers in the transformer reduces maintenance
- Simple transformer design without saturable reactor
- Reduced civil engineering, installation and commissioning efforts

ABB thyristor rectifiers have proven high reliability and performance in trouble-free operation for more than 25 years.

## Current loop rectifiers to compensate magnetic fields for stable and balanced pot operation

Current loop rectifiers up to 150kA enable equal distribution of the aluminum melt around the anodes for enhanced melting. Their design considers special requirements in terms of voltage stress and overload capabilities. ABB performs mutual coupling studies to allow the proper design of current loop rectifiers.

## Booster rectifiers for pot technology improvements

ABB offers booster rectifiers to provide you with an efficient tool for further development of your pot technology and integrates into the main rectifier metering, control and protection concepts. The thyristor booster rectifiers are designed while taking voltage stress requirement into account to ensure high reliability and safe operation.

## Swing units

Swing units are designed to meet process requirement of two potlines with different operating points, restoring rectifier redundancy in case the potline current has been increased or to allow maintenance on a unit.

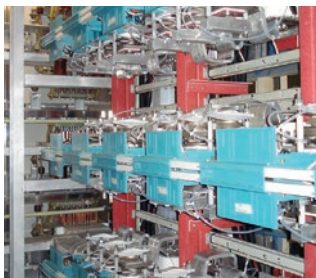
ABB supplies fully containerized outdoor solutions comprising a diode or thyristor rectifier, cooling system, controls, two sets of DC isolators (one set per potline), fully interlocked and automated busbar transfer and auxiliary distribution for the full rectifier bay.

— 01 Thyristor rectifier

— 02 Diode Rectifier with efficient cooling circuits

— 03 Containerized compensation loop rectifier

— 04 Swing unit



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02



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# Smart control with immunity to interferences

## High-performance control for the toughest conditions

ABB's high-speed AC 800PEC provides high processing power with very short cycle times. It has been specially designed for power electronic applications in harsh industrial environments such as aluminum smelters.

The AC 800PEC provides a number of predictive diagnostic functions like trending, transient recording and full-text alarm messages all intended to prevent unscheduled shutdowns and allow efficient production planning.

## Pre-magnetization panel for accurate current control

ABB's well proven pre-magnetization panel controls the current by pre-magnetizing saturable core reactors located at the secondary winding outlet inside the rectifier transformer. It drives separate bias- and control windings for the most accurate current control. In order to minimize reverse voltages, the bias and control circuits contain only two windings.

## Effective process earth resistance monitoring

ABB's unique monitoring system PERMS (Process Earth Resistance Monitoring System) enables continuous monitoring of the resistance between the electrolysis process and earth. Earth fault currents, no matter where, will be detected at an early stage to ensure a safe working area at your plant and to protect personnel and installed equipment.

## Potline Open Circuit Protection

The Potline Open Circuit Monitoring is a unique monitoring system from ABB to measure the potential open circuit or actual open circuit in Aluminium Smelters.

The system is continuously checking the condition of the Potline circuit, using the actual current and actual voltage values.

## Intelligent diagnostic tool

ABB's Power Asset Monitor (PAM) is a tool for continuous condition monitoring and system analysis in power electronics systems. It features a secure remote connection option.

The access and support levels are configurable and range from basic local monitoring to full remote access.

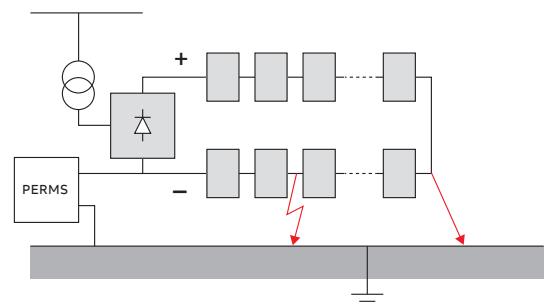
01 AC 800PEC high-speed controller

02 PERMS (Process Earth Resistance Monitoring System)

03 PAM (Power Asset Monitor)



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# ABB engineering – bringing your plant to excellence

## No compromise on safety!

We never design to the limits. No matter how demanding your project requirements are, you can be sure our solution will provide high reliability and maximum safety to protect personnel and equipment.

## Total system design

The focus of our expertise and experience is on designing and engineering complete rectiformers. Our overall approach covers utility requirements, high voltage switchgear, cables, transformers and rectifiers, DC bus bar systems and process requirements.

## Enclosure design with burst disc

Arc flash explosion burst disk is a failsafe safety device with a defined breaking point, which responds to a specific pressure and are used for pressure relief to protect against an overpressure for the protection of people, environment and assets.

## We provide system engineering – you enjoy the benefit

Every plant is different and so are your needs. We design your DC power supply and provide you with a tailor-made solution. Our market-leading engineering capabilities cover:

- Network system and power quality studies
- Insulation coordination studies
- Harmonic filter and Static Var Compensator engineering
- Transformer and rectifier system engineering
- DC ripple, EMC and magnetic-field analysis
- DC busbar engineering studies

## Continuous improvements

ABB is committed to providing a rectifier design that fulfills the requirements of future potline technologies such as increasing DC voltage and current, energy efficiency, redundancy and reliability.

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Alouette Aluminium  
Plant in Canada



## Life cycle service – for customer satisfaction

ABB rectifier systems are designed for a service life of 25 years or more. A key objective is to maximize your process uptime by providing low-cost guarantees of an extended service life for all ABB products.

- Throughout the entire lifetime of a product, ABB will provide training and technical support and arrange service contracts – all backed by a world-class global sales and service network.
- ABB's preventive maintenance programs increase active life, minimize replacement costs and lower investment. At the same time, the right service plan will extend the service life of ABB equipment by several years.
- Thanks to a long life, low maintenance costs and very low spare parts consumption, ABB equipment will soon pay for itself. An extended service life is also achieved through control add-ons and power components that operate well below their design limits.

### A local presence – worldwide

With offices around in 100 countries, ABB is well placed to offer the best technical advice and local support around the clock.

ABB's global presence is built on strong local companies. We offer local sourcing while drawing on our worldwide experience. By combining the experience and know-how gained in both local and global markets, we ensure that our customers will get the most out of our product solutions.

- We guarantee fast and flexible support with our remote access platform via the 24/7 support line on a global level.
- We offer condition monitoring service across the whole system starting from HV switchgear downstream to the DC output or process.

For further details about all our services, please contact your nearest ABB office or visit us on [www.abb.com/rectifiers](http://www.abb.com/rectifiers).

A properly maintained ABB rectifier system can last more than 25 years.





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