Gas-insulated medium-voltage switchgear

For the mining industry

Answers for energy.
Working and environmental conditions in the mining industry are equally difficult for people, machines and electric equipment. Therefore, it is absolutely necessary for the technology in use to be safe and reliable, in open-pit as well as in underground mining. Safe operation demands a reliable and consistent energy supply. This is where the gas-insulated, medium-voltage switchgear from Siemens points the way. Our switchgear is designed to perform reliably even under extreme conditions. This makes it ideally suited for mining applications, as operational safety and maximum performance are essential in this sector.

All over the world, the demand for mineral resources is increasing. In newly industrialized countries, demand is continually rising due to rapid economic development. Still the mining industry can only be economically successful if it reduces costs and produces as efficiently as possible.

The challenge: maximum performance around the clock
Mining is an industry that requires enormous amounts of energy. In open-pit mining, for example, approximately 60 MW to 80 MW of electrical power is needed. Energy supply must operate reliably around the clock, as every outage has dramatic consequences. Conveying bridges, excavators and other conveying systems are constantly in motion. Each breakdown in the supply can mean production stoppage and production losses. This is why reliability is essential in medium-voltage switchgear in the mining industry.

The Siemens solution: reliable, proven technology
With Siemens you benefit from over 25 years of experience with gas-insulated medium-voltage switchgear and a degree of expertise only the market leader can provide. Siemens’ gas-insulated switchgear is designed for high reliability and availability.
The challenge: reliable operation despite extreme environmental conditions

Deposits are often located either underground or in regions with extraordinarily harsh climatic conditions, for example in the tropics, in deserts or in permafrost regions of the Arctic and Antarctic. This means that operating conditions for the switchgear are often very tough: dust, sand, extreme temperatures, high-humidity levels or aggressive gases. Medium-voltage switchgear in the mining industry must withstand these continuous stresses for a long time and without difficulty.

The Siemens solution: protection from damaging environmental influences

Reliable protection of the medium-voltage part of our gas-insulated medium-voltage switchgear is provided by a hermetically sealed primary enclosure and by insulation consisting of inert sulfur hexafluoride (SF₆) gas. This makes the switchgear resistant to environmental effects such as humidity, saline air and dust, and also prevents ingress of small animals. Live parts of the primary circuit – busbar, three-position switch, vacuum circuit breaker, connecting bars, bushings and cable connection – fulfill the IP65 degree of protection.

Robust

The challenge: maximum operational safety, even under vibration and impacts

Switchgear in open-pit mining equipment is constantly exposed to frequent vibrations and steep jolts. This means the dielectric strength of the switchgear, the solidity of the gas enclosure and all mechanical components – operating mechanisms, bolted joints and logical interlocks – are put to severe tests. The switchgear must be able to cope with these challenges in order to function reliably.

The Siemens solution: intelligent engineering and comprehensive testing

Siemens uses only hermetically welded, stainless steel vessels or single-pole, enclosed, cast-alloy housings for our medium-voltage switchgear. A computer-controlled, three-dimensional, copper bending technique minimizes the number of bolted connections. The use of three-position switches as busbar disconnectors, as well as of feeder earthing (grounding) switches, additionally contributes to the reduction of moving parts. To provide the highest degree of safety, all of our switchgear is thoroughly and comprehensively tested before delivery.

Stress resistant

The challenge: individual adjustment to all space requirements

Both in open-pit and underground mining, there are severe space restrictions. Switchgear is often installed in corners and nooks, and it must adjust flexibly to given conditions. Space-saving installations provide compact construction and minimum dimensions, without compromising the safety of the switchgear.

The Siemens solution: modular and compact construction

Medium-voltage switchgear from Siemens provides the ideal solution for installations in confined spaces. Thanks to its modular design and small dimensions, our switchgear can be flexibly adapted to situations where space is limited.

Compact
The challenge: particularly high switching rates
The power supply for processes in the mining industry is extremely demanding. For example, the daily switching rate for generators or pumps, drives and transport systems is very high and requires maximum safety. Medium-voltage switchgear used in the mining industry must be capable of a high number of operating cycles to ensure trouble-free and cost-efficient continuous operation.

The Siemens solution: vacuum switching technology
Circuit breakers and contactors from Siemens are exclusively equipped with vacuum interrupters. These extremely durable devices allow for up to 500,000 (contactors) or up to 30,000 (circuit breakers) making and breaking operations. The operating mechanisms of the switching devices are located outside the medium-voltage area of the equipment. They are accessible from outside without reaching into the medium-voltage enclosure, and they can be inspected without interfering with operation.

The challenge: integration of control and automation systems
Medium-voltage switchgear units are decisive network nodes in the power distribution network, which, in the mining industry, often has to supply widely scattered areas. Therefore, they must be fully integratable in the control and automation environment of the complete system. The generator sets, for example, are started up or shut down by a power management system (PMS), which allows for load control of critical and non-critical consumers. Seamless interaction between the switchgear and the PMS is therefore indispensable.

The Siemens solution: remote control and central monitoring
Siemens medium-voltage switchgear with Siemens protective relays can be fully controlled remotely – from the control room, as well as by the PMS. In connection with the combined protection and control devices, the switchgear panels can be integrated into power management systems and process control systems from different manufacturers.

The challenge: maximum availability, minimum operating costs
Conveying systems in the mining industry need to operate continuously in order to achieve maximum efficiency. Each stoppage costs money. This is why maximum availability and a minimum need for maintenance are decisive quality criteria for medium-voltage switchgear used in mining applications.

The Siemens solution: high reliability and availability
Medium-voltage switchgear from Siemens features a sealed pressure system that minimizes the maintenance needed, even under the toughest possible operating conditions. Types 8DA10 and 8DB10 equipment require opening gas enclosures only at 20-year intervals under usual conditions, for very low maintenance frequency. This allows for reduced operating costs and a higher return on investment.
Earthquake resistant

The challenge: maximum reliability and availability in regions prone to earthquakes

Mining activities often occur in regions that have an above-average earthquake risk. In certain parts of the globe, several minor earthquakes a day are not unusual. Exploitation and extraction work can cause notable vibrations too. This places high demands on the medium-voltage switchgear. Despite severe jolts and vibrations, the switchgear must operate continuously, reliably and with a maximum degree of safety.

The Siemens solution: construction solutions and comprehensive tests

Our medium-voltage switchgear meets the highest safety requirements. Furthermore, a computer-controlled, three-dimensional copper bending technique minimizes the number of bolted connections. The use of three-position switches as busbar disconnectors, as well as of feeder earthing (grounding) switches, additionally contributes to the reduction of moving parts. These construction measures provide high reliability, even in case of vibrations and earthquakes.

Independent of altitude

The challenge: reliable operation at high altitudes

The extraction of mineral resources occasionally occurs at very high altitudes. In this case, an altitude correction of the switchgear's dielectric strength must be made in the planning stage, to account for the reduced dielectric strength as the air becomes thinner with increasing altitude above sea level. This can imply larger dimensions for the switchgear, and therefore, higher costs. Furthermore, it could mean restrictions in terms of where the delivered switchgear can be installed.

The Siemens solution: independence thanks to gas insulation

The gas insulation of medium-voltage switchgear from Siemens permits switchgear installation at any desired altitude above sea level without the dielectric strength being adversely affected. This applies both to the busbar and the cable connection. A decrease in the dielectric strength with increasing site altitude must only be considered for panels with high-voltage, high-rupturing capacity fuses. Siemens medium-voltage switchgear operates reliably at any altitude, so its application range is extremely diverse.

Environmentally compatible

The challenge: minimum environmental impact throughout entire life cycle

For consumers, it is increasingly important that electrical equipment is environmentally friendly. This also applies to the mining industry. High efficiency and emission-free operation, as well as the best option for recycling the equipment at the end of its lifespan, are decisive factors that influence a consumer’s decision.

The Siemens solution: intelligent technology and sustainable concepts

Medium-voltage switchgear from Siemens does not release any insulating gas to the atmosphere, even under the toughest possible operating conditions. Its compact construction and short conducting paths inside the switchgear minimize electric heat losses, thus providing maximum power efficiency. Furthermore, Siemens is committed to environmental protection. That is why all synthetic materials are clearly labeled for recycling at the end of their service life, and a comprehensive recycling concept makes possible the recovery of the materials and substances used.
Type NXPLUS C - Superior technology for demanding tasks

High availability, low-maintenance, compact, robust: gas-insulated medium-voltage switchgear type NXPLUS C from Siemens provides a reliable solution, even under extreme conditions. A unique, hermetically welded stainless steel switch enclosure, vacuum switching technology and a digital protection system make it independent from environmental conditions and result in low maintenance and long life. On top of that, the SF$_6$ insulation enables an extremely compact construction.

The result: minimum operating costs, high performance and highest safety in every respect.

Reliability:
- Type and routine tests in accordance with IEC 62271-200
- Standardized, numerically controlled production processes
- Experience from more than 100,000 installed panels of all types
- Quality assurance in accordance with DIN EN ISO 9001.

Operational safety:
- Hermetically welded switch enclosures
- Low-maintenance operating mechanisms
- Optimum accessibility of current and voltage transformers
- Complete logical mechanical interlocks
- Minimum fire load.

Personal safety:
- Safe-to-touch and hermetically welded primary enclosure
- Design tested for resistance to internal faults
- Metallic partitions between switching device, cable termination area and main bus area
- Logical mechanical interlocks and capacitive voltage detecting system
- IP65 degree of protection for the high-voltage element.
Type 8DA10 - Superior technology for demanding tasks

High availability, low-maintenance, compact, robust: gas-insulated medium-voltage switchgear type 8DA10 from Siemens provides a reliable solution, even under extreme conditions. A unique, hermetically sealed pressure system in a corrosion-resistant aluminum alloy vessel, vacuum switching technology and a digital protection system make the high-voltage elements independent from environmental conditions and provide low maintenance operation for life. On top of that, the SF₆ insulation enables an extremely compact construction.

The result: minimum operating costs, high performance and highest safety in every respect.

Reliability:
- Type and routine tests in accordance with IEC 62271-200
- Standardized, CNC production processes
- Experience from more than 55,000 installed panels globally
- Quality assurance in accordance with DIN EN ISO 9001.

Operational safety:
- Hermetically sealed switchgear housings
- Permanently low-maintenance operating mechanisms
- Optimum accessibility of current and voltage transformers
- Complete logical mechanical interlocks
- Minimum fire load.

Personal safety:
- Safe-to-touch and hermetically sealed primary enclosure
- Design tested for resistance to internal faults
- Single-phase (isolated-phase) construction eliminates phase-to-phase faults inside switchgear
- Logical mechanical interlocks and capacitive voltage detecting system
- IP65 degree of protection for the primary part.