



# Gas-insulated medium-voltage switchgear

for the mining industry

Answers for energy.

**SIEMENS**





8DH10 switchgear  
up to 24 kV, up to 20 kA, up to 1,250 A  
up to 17.5 kV, up to 25 kA, up to 1,250 A

## Full power even under extreme conditions

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

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-cast as well as in underground mining. Safe operation is secured by a reliable and consistent energy supply. This is where the gas-insulated medium-voltage switchgear from Siemens points the way. Our switchgear performs reliably even under extreme conditions. This makes it ideally suited for mining applications, as absolute operational safety and maximum performance are essential in this sector.



NXPLUS C switchgear  
up to 24 kV, up to 25 kA, up to 2,500 A  
up to 15 kV, up to 31.5 kA, up to 2,500 A



8DA10 switchgear  
up to 40.5 kV, up to 40 kA, up to 5,000 A

## Superior technology for demanding tasks

Highly available, maintenance-free, compact, robust: Gas-insulated medium-voltage switchgear from Siemens provides a convincing solution, even under the most extreme conditions. A worldwide unique, hermetically welded pressure system in a stainless-steel vessel, vacuum switching technology, and a digital protection system make it independent from environmental conditions, and provide maintenance-free operation for life. On top of that, the SF<sub>6</sub> insulation enables an extremely compact construction.

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

### Reliability

- Type and routine tests in accordance with IEC 62271-200
- Standardized, NC production processes
- Experience from more than 100,000 installed panels
- Quality assurance in accordance with DIN EN ISO 9001

### Operational safety

- Hermetically welded switchgear vessels
- Permanently maintenance-free 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, logical mechanical interlocks and capacitive voltage detecting system
- IP65 degree of protection for the primary part



## Reliable

**The challenge: maximum performance around the clock**

Mining is an industry which requires enormous amounts of energy. In open-cast mining, for example, approximately 60 to 80 MW of electrical power is needed. Energy supply must operate with absolute reliability around the clock, as every outage has dramatic consequences. Conveying bridges, excavators, and conveying systems are constantly in motion. Each breakdown in the supply would mean production stoppage and production losses. Therefore, absolute reliability is the first and foremost requirement for switchgear in the mining industry, in non-stop operation, 365 days a year.

**The Siemens solution: extremely reliable technology**

With gas-insulated medium-voltage switchgear from Siemens you benefit from 25 years of experience and a degree of expertise only the market leader can provide. The probability of an outage is reduced to the absolute minimum, which means maximum reliability and availability.

## Robust

**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 the permafrost regions of the Arctic and the 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 such permanent stress for a long time and without difficulty.

**The Siemens solution: consistent exclusion of damaging environmental influences**

Reliable protection of the high-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. This makes the switchgear resistant to environmental effects such as humidity, saline air, and dust, but 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.



## Stress-resistant

**The challenge: maximum operational safety, even under oscillations and impacts**

Switchgear in open-cast mining equipment is constantly exposed to frequent oscillations and steep jolts. This means that the dielectric strength of the switchgear, the solidity of the SF<sub>6</sub> enclosure, and all mechanical components – operating mechanisms, screwed joints, and logical interlocks – are put to severe tests. The switchgear must be able to cope with such challenges, in order to function reliably at all times.

**The Siemens solution: intelligent engineering and consistent testing**

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

## Compact

**The challenge: individual adjustment to all space requirements**

Both in open-cast and underground mining, there are severe spatial restrictions. The space available for the switchgear is frequently limited. Switchgear is often installed in corners and nooks, and it must adjust flexibly to given conditions. Space-saving installations ask for a compact construction and minimum dimensions, without compromising on 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.



## Integratable

### The challenge: perfect integration in control and automation systems

Medium-voltage switchgear units are decisive nodes in the power distribution network, which, in the mining industry, often has to supply widely ramified 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 important and unimportant consumers. Seamless interaction between the switchgear and the PMS is therefore indispensable.

### The Siemens solution: remote control and central monitoring

Siemens medium-voltage switchgear can be fully controlled from remote – from the control room as well as by the power management system. 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.

## Durable

### The challenge: particularly high switching rates

The power supply for processes in the mining industry has to meet quite specific demands. For example, the switching rate of drives and transport systems, generators or pumps is very high and requires maximum safety. Medium-voltage switchgear used in the mining industry must feature 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 failure-free making and breaking operations. The operating mechanisms of the switching devices are located outside the high-voltage part. They can be accessed from outside without having to reach into the enclosure, and thus be inspected without interfering with operation. 8DA10 switchgear allows even circuit-breakers for 40 kA to reach up to 30,000 operating cycles.

## Efficient

### The challenge: maximum availability, minimum operating costs

Conveying systems in the mining industry need to operate non-stop in order to achieve maximum efficiency – 24 hours a day, 7 days a week. Each stoppage implies losses. That's why maximum availability and a minimum need for maintenance are decisive quality criteria for medium-voltage switchgear used in the mining industry.

### The Siemens solution: highest reliability and availability

Medium-voltage switchgear from Siemens features a sealed pressure system, which makes the equipment maintenance-free, even under the toughest possible operating conditions. This allows for reduced operating costs and a higher return on investment.



## Earthquake-proof

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

Mining activities often take place 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 used in those plants. Despite severe jolts and vibrations, the switchgear must operate continuously, reliably, and with a maximum degree of safety.

**The Siemens solution: constructional 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 screwed connections. The use of three-position switches as busbar disconnectors, as well as of feeder earthing switches, additionally contributes to the reduction of moving parts. These constructional measures provide the utmost reliability, even in case of vibrations and earthquakes.

## Independent of altitude

**The challenge: reliable operation at high altitudes**

The exploitation of mineral resources occasionally takes place 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 its decline, 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 is installed.

**The Siemens solution: independence thanks to gas insulation**

The gas insulation of medium-voltage switchgear from Siemens at a relative gas pressure of 50 kPa 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 the 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 with its sealed pressure system does not release any insulating gas into 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.

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