



CUTTING-EDGE TECHNOLOGY

Product Portfolio

**SIEMAG
TECBERG**

WWW.SIEMAG-TECBERG.COM

SIEMAG TECBERG GROUP HEADQUARTERS
HAIGER (NORTH OF FRANKFURT), GERMANY



GLOBAL NETWORKING SIEMAG TECBERG GROUP



SIEMAG TECBERG

- Haiger / Germany
- Katowice / Poland
- Milwaukee / USA
- Moscow / Russia
- Tianjin / China

WINDER CONTROLS

- Johannesburg / South Africa
- Rugby / UK
- Sydney / Australia

DEUTSCHE KÜHLTECHNIK

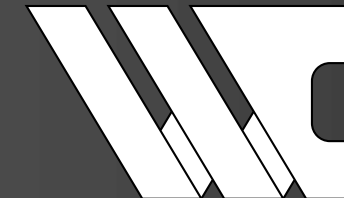
- Haiger / Germany

COOPERATION PARTNER

- Belo Horizonte / Brasil
- Hanoi / Vietnam
- Istanbul / Turkey
- Madrid / Spain
- Santiago de Chile / Chile
- Seongnam City / Korea
- Tehran / Iran
- Ulan Bator / Mongolia

HIGH-PERFORMANCE SOLUTIONS INFRASTRUCTURE ▪ MINING ▪ ENERGY

SIEMAG TECBERG



Winder Controls



The SIEMAG TECBERG group, which includes Winder Controls and Deutsche Kühltechnik, has been providing knowledge-based solutions for 150 years, specialising in the following fields:

- Hoisting Systems
- Underground Cooling
- Brake Control Systems
- Automation & Drive Technology
- Mobile Winches

The industrial park at Haiger-Kalteiche (Cold Oak) in Germany is the location of SIEMAG TECBERG group headquarters, the backbone of its network of expertise.

The group's capabilities are complemented by its affiliated companies Winder Controls, experts in electrical solutions, and Deutsche Kühltechnik, professional provider of underground cooling systems.

This worldwide network enables SIEMAG TECBERG group to provide close customer relations and long lasting customer-oriented support combined with the appropriate quality of service and maintenance for systems that are in operation.

HOISTING SYSTEMS

THE WORLDS LEADING SYSTEM PROVIDER



Ship Lift (under construction)
Niederfinow (Brandenburg), Germany

As a system provider of mechanical and plant engineering for hoisting and lifting technology, SIEMAG TECBERG is a global market leader. SIEMAG TECBERG builds its systems based on expertise that it has gathered during the development and construction of over 200 complete systems and more than 1,000 hoists worldwide.

For hoisting systems, the constantly growing global demand for resources is being met by the development of raw material mines at ever increasing loads and depths. This requires efficient shaft and inclined hoisting systems with challenging technical dimensions. These developments go hand in hand with extremely strict safety and quality requirements.

SIEMAG TECBERG recognised these trends at an early stage and has therefore been able to prepare for the challenges of the markets. We are applying our engineering expertise into developments for innovative applications, for example in the field of heavy-duty hoisting technology.

These include public infrastructure projects, for example the construction of the Gotthard Base Tunnel in Switzerland, or the special tasks and work that we have taken on in the field of civil engineering, for example in connection with the installation of a ship lifting system in Niederfinow, Germany.



HOISTING SYSTEMS

HEAVY MATERIAL HANDLING

Ship Lift (under construction)
Niederfinow (Brandenburg), Germany

THE NEW NIEDERFINOW SHIP LIFT

Modern, effective and good for the environment

The hoisting technology of the new Niederfinow ship lifting system functions on the counterweight principle. SIEMAG TECBERG brings to this project its decades of experience with counterbalanced systems in the area of mining. By using the counterweight principle, the installed capacity of the drive for the lifting and lowering of the approximately 10,000 t ship chamber can be kept low.

SIEMAG TECBERG is one of four consortium partners, responsible for the share of mechanical engineering with the following parts in this project:

- Counterweight system
- Ship chamber safety system
- Ship chamber guidance (longitudinal and lateral)
- Ship chamber holding device
- Ship chamber drive

As a service provider for the consortium SIEMAG TECBERG has assumed the following tasks:

- Engineering
- Purchasing / Procurement
- Production monitoring
- Installation Planning
- Installation supervision

SHIP CHAMBER Technical Information	
Length	125.5 m
Width	12.5 m
Depth	4.0 m
Capacity	~10,000 t
Pylon Height	56.0 m

TWIN ROPE PULLEY Technical Information	
Diameter	4.0 m
Number	112
Rope Diameter	60 mm

HOISTING SYSTEMS

SHAFT HOISTING RESOURCES



Shaft Hoisting System
AlpTransit Gotthard Tunnel, Switzerland

© AlpTransit Gotthard AG

SHAFT HOISTING RESOURCES

Complete hoisting solutions

The planning, design and construction of complete systems in the area of shaft hoisting for customers all over the world is a core competence at SIEMAG TECBERG.

Because SIEMAG TECBERG engineers all the component assemblies it supplies for shaft hoisting systems itself, the company is also competent in the planning and construction of complete systems.

SIEMAG TECBERG is able to coordinate and optimise all the component assemblies of a system within the framework conditions specified by the customer, SIEMAG TECBERG achieves the best economic efficiency and availability of a shaft hoisting system.

Moreover, its engineers and specialists provide collaborative support right from the planning stage to develop tailor-made concepts. Thanks to this cooperation, SIEMAG TECBERG is the right partner for the integration of all the component assemblies.

SIEMAG TECBERG's feasibility studies are conducted on the basis of focused, effective planning and execution with sound engineering disciplines, technology and service capability. The result is maximum planning reliability and short realisation times which deliver assured advantages to the customers.

PRODUCTS AND SERVICES

Complete Hoisting Solutions

- Shaft and inclined hoisting systems
- Cages and Skips
- Loading and Unloading
- Rope Attachments
- Signalling Systems
- Safety Arrestors
- Headgears and Sheaves
- Guide Rope Applications
- Winches and rope changing equipment



6-Rope Koepe Hoist and Brake System
Shilawusu, China

HOISTING SYSTEMS

DISPOSAL TECHNIQUE

DISPOSAL TECHNIQUE

Safety for future generations

In the storage of radioactive and toxic waste the safety aspect is the utmost importance. Because such waste is extremely harmful and cannot be completely disposed of, it has to be removed permanently and safely from all contact with human life. The long half-life values of some radionuclides require their safe storage for thousands of years.

In addition to the planning and construction of mining facilities, SIEMAG TECBERG has been active in the field of nuclear toxic-waste deposit technology for more than 30 years. To date, the company has designed and delivered a large variety of systems and products for the handling of nuclear containers or cylindrical drums designed for underground storage or deposit.

The current orders on hand of SIEMAG TECBERG reflect the design and construction for the refurbishment of the original shaft-hoisting installations of the former Konrad iron ore mine shaft near Salzgitter, Germany. The two upgraded shafts will be converted to suit the demands for disposal of radioactive waste.

The SIEMAG TECBERG's design and products with all applicable safety standards is maintained through its close contacts with nuclear research institutes, operators of nuclear plants, and with the respective licensing authorities.

MAIN EMPHASIS

Special Application

- Project business in the field of civil engineering
- Toxic waste disposal and heavy-duty materials handling technology
- Delivery of complete heavy-material & storage technology systems for private or state-owned infrastructure developers





UNDERGROUND COOLING SYSTEMS FOR TUNNELING AND MINING

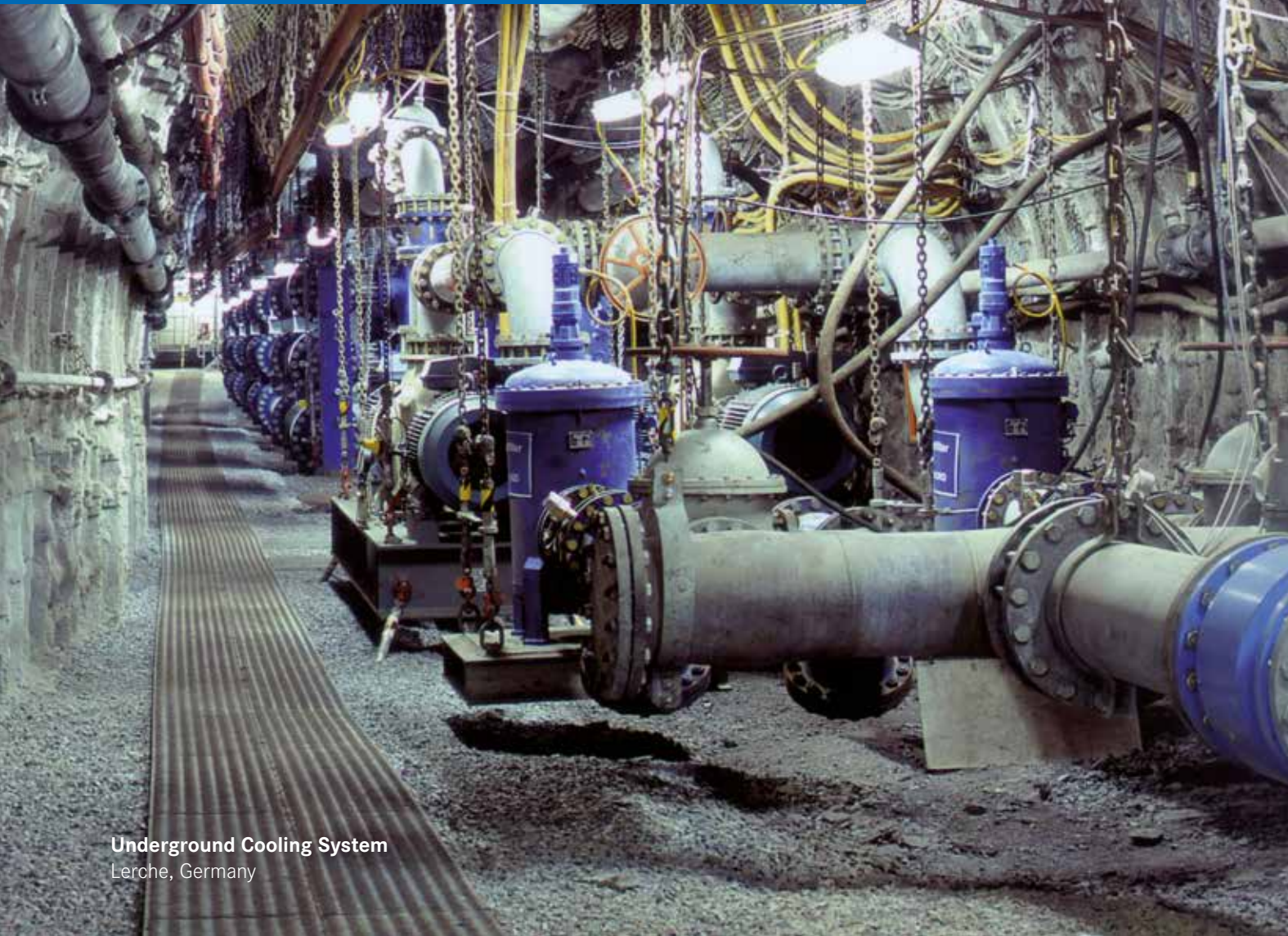
Penetration into greater depths and the growing amount of waste heat resulting from the advancing mechanisation of high-performance mines are placing increasingly high demands on underground climate conditions and ventilation equipment. Similar requirements make SIEMAG TECBERG's technology also perfectly applicable for tunnel cooling with.

With its patented pressure exchange system (P.E.S.), SIEMAG TECBERG provides state-of-the-art mining and tunnel cooling systems on the market.

For more than 30 years, SIEMAG TECBERG has been working in the field of mine and tunnel cooling. In cooperation with end users and appropriate experienced companies, concepts for underground cooling were designed and realised.

SIEMAG TECBERG has repeatedly proven its competence in engineering, programming, supply, installation, and commissioning in a variety of mine and tunnel cooling projects worldwide.

UNDERGROUND COOLING PRESSURE EXCHANGE SYSTEM (P.E.S.)



Underground Cooling System
Lerche, Germany

PRESSURE EXCHANGE SYSTEM (P.E.S.)

Motivation for effective systems

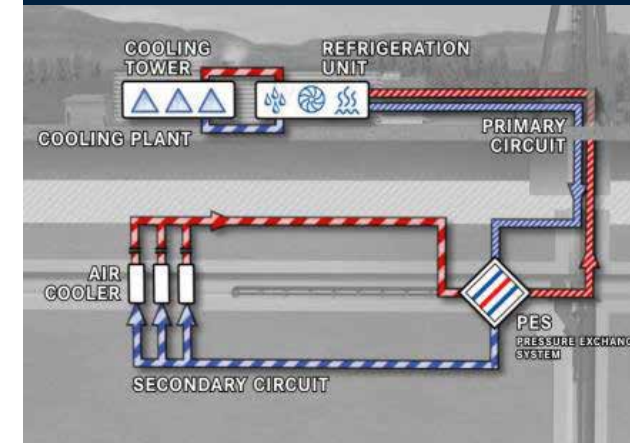
High-performance mines and modern infrastructure projects are often characterised by penetration into greater depths. As a consequence the climatic conditions in the underground require increasing demands on ventilation and cooling. Considering the vertical height between the surface and the underground the pressure exchange system (P.E.S.) is to be recommended as an effective element of an efficient operating tunnel- and mine cooling system.

Meanwhile water already held in another chamber is pumped through the pipework to the chillers at the workplaces and the chamber is simultaneously filled by the reflow of the warm water (low pressure circuit).

Exchange of pressure saves material of pipes and valves in the low pressure circuit. Exchange of the medium by the P.E.S. enables less temperature loss than exchange of temperature as in alternative concepts. Transport of warm water to the surface by the hydrostatic pressure of the inflow reduces power demand of pumps.

PROCESS SCHEME

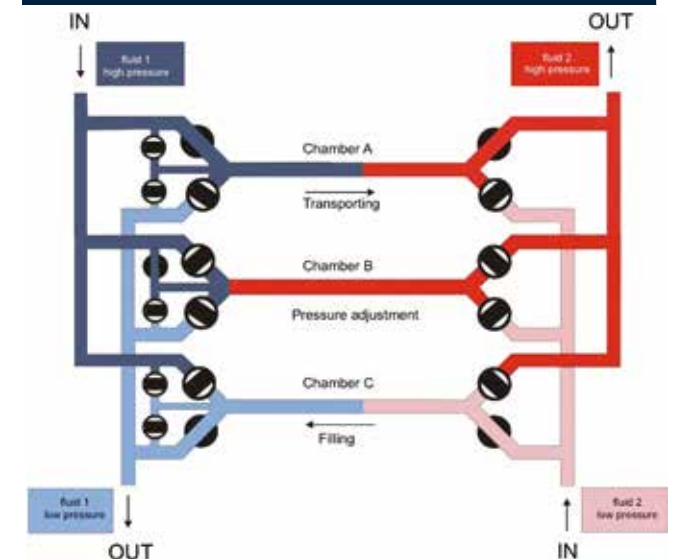
Underground Cooling System



Effectiveness and efficiency of the P.E.S. are based on the hydrostatic principle of communicating vessels. With this system the inflow of the cold water from the cooling plant on the surface forces out the warm water from one of the chambers of the P.E.S. and transports it to the cooling plant at the surface (high pressure circuit).

PROCESS SCHEME

3-Chamber Pipe Feeder



UNDERGROUND COOLING COOLING AND VENTILATION

COOLING AND VENTILATION SYSTEMS

Systems for tunneling and mining

For more than 25 years now, the pressure exchange system (P.E.S.) developed by SIEMAG TECBERG, has been applied in underground cooling systems all over the world. In cooperation with end users and appropriately experienced companies concepts for mine and tunnel cooling were designed and have realised best optimised with regard to operating costs and climate efficiency. Nowadays modern high-performance mines very often need cooling capacities exceeding 10 MW. Therefore, it is very important to generate this energy as efficient as possible.

The patented P.E.S. allows the alternate inflow or outflow, respectively, of water from a high pressure to a low pressure piping system and vice versa. In underground mine or tunnel cooling applications the P.E.S. system represents the interface between the cooling system on surface - which produces and supplies the cold water via the shaft pipes at high pressure - and the underground piping network, which supplies the cold water at low pressure to the roadway coolers.

MAIN EMPHASIS Special Application

- Temperature increase $<0.5^{\circ}\text{C}$
- Cooling capacity up to 20 MW with one P.E.S.
- Pressure exchange up to 150 bar with one P.E.S.
- Stepwise expandable
- Constant lifelong efficiency
- Low maintenance downtime
- Low space demand underground

SIEMAG TECBERG also builds, installs and commissions control and monitoring systems for ventilation fans. By leveraging current technology with proven best practices, SIEMAG TECBERG optimizes its fan control systems to perform reliably and efficiently, while minimizing project costs. The standard fan control package can be modified as needed to suit specific application requirements and maintain the high level of performance the customers expect.

The SIEMAG TECBERG standard ventilation fan control and monitoring system is universal and works with fans of various sizes. The standard package is a base-level system with several control and feedback options to meet system and customer requirements. The components combine to control and monitor ventilation fans to maximize efficiency and uptime. Feedback options give valuable information that can indicate issues in their infancy so they can be corrected before they cause major downtime.



Ventilation Fan System

Alliance Resources River View Mine, Kentucky

BRAKE CONTROL SYSTEMS

DISC BRAKE ELEMENTS AND CONTROL SYSTEMS

SIEMAG TECBERG disc brake systems for winders, winches and other appliances are built to a modular design. They are suited for various applications and can be upgraded to improve customised characteristics.

The brake system consists of the following components:

- Brake stands with brake elements
- Hydraulic system
- Electrical brake control

The brake components, which are adapted to suit the particular winder, guarantee safe braking during normal operation as well as during emergency braking, always taking into consideration the relevant regulations. The initiation of the braking force is monitored in order to preserve the hoisting equipment and to avoid rope slip by use with friction winders. All elements related to safety are installed in duplicate, which means that the hydraulic safety circuit is redundant.

BRAKE CONTROL SYSTEMS

CONTROL SYSTEMS



Modernised Brake Control System
Mataihao, Inner Mongolia

CONTROL SYSTEMS

Constant brake force and retardation

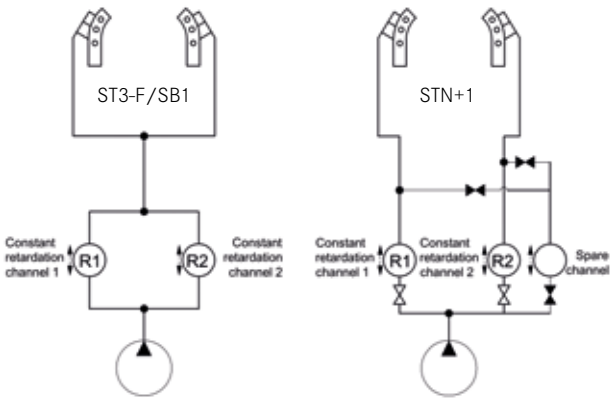
To perform in the different applications in hoisting for example, SIEMAG TECBERG has various types of hydraulic brake systems to match the requirements of the specific hoist with the safety of the brake system.

The function of ST1 and ST2 is purely hydraulic. The SB1-2 is equipped with a dual-valve blank and motor pump system (1x operation / 1x standby) on one tank. Safety braking is redundant. In case of failure of one hydraulic line the second line will be activated automatically. Regardless of load and load direction, the preset braking retardation will be maintained. The required braking force is electronically controlled by means of a pressure servo-valve.

On the STN+1 this is done by at least two independent closed-loop controls. As an option, one additional closed-loop control may be integrated as a reserve. The ST3-D comes with a constant brake force function as backup, in case of malfunction of the main brake function.

The ST3-F and SB1 have an active closed-loop control and a passive one as backup, which is activated if a fault is detected in the active one. Because the STN+1 and ST3-F work only with constant retardation, they can bring the hoist to a safe standstill under all circumstances by full compliance with the relevant regulations. SIEMAG TECBERG offers the ST3-D and ST3-F as double single stations (full redundancy of the hydraulic station) or as compact station for smaller applications.

Brake Type	Hoisting Speed m/s	Brake function	Backup Brake function
ST1	< 4 m/s	Constant brake force	-
ST2	> 4 m/s	Constant brake force	-
ST3	> 4 m/s	Constant retardation	Constant brake force
ST3-D	> 4 m/s	Constant retardation	Constant brake force
ST3-F	> 4 m/s	Constant retardation	Constant retardation
STN+1	> 4 m/s	Constant retardation	Constant retardation
SB1	> 4 m/s	Constant retardation	Constant retardation
SB1-2	> 4 m/s	Constant retardation	Constant retardation



BRAKE CONTROL SYSTEMS

BRAKE STANDS AND ELEMENTS



Assembly and Quality Control Stands
SIEMAG TECBERG Workshop, Germany

BRAKE STANDS AND ELEMENTS

Safe and reliable

The brake supports, which are adapted to suit the applications, are fitted with brake elements of own design to specifically meet hoisting applications. The braking force is generated by pre-tensioned cup springs and hydraulically lifted. Spring pressure and air gap are easily re-adjusted. Brake lining wear as well as spring breakage are monitored and signaled. The brake stands are placed on sole plates, which itself are fixed to the foundation by strong anchor bolts. Further, the BE 100 and BE 125 brake units are interchangeable with comparable brake units to offer better reliability with higher braking force.

BRAKE ELEMENTS

Technical Information

- High braking forces
- Infinite lifetime – rated for more than two million load changes for standard working strokes
- Low brake surface pressure
- Fine adjustment, infinitely variable and clearance-free
- Fully encapsulated against dirt and aggressive media
- Monitored by linear transducers
- Low maintenance required, brake unit inspection without disassembly

Brake Type	Nominal application force	Brake force with friction coefficient $\mu = 0,4$	Recommended air gap	Wear allowance (standard)	Hydraulic operating pressure	Max. surface pressure on brake lining	Air Gap range L=	Weight/ Dimension in mm L x B x H
BE 50 (callipers=2x)	2 x 50 kN (3 mm air gap)	40 kN	2.0 mm	1.0 mm	140 MPa	1.79 MPa	2.0...5.0 mm	2 x 60 kg 325 x 225 x 288
BE 65 (callipers=2x)	2 x 65 kN (3 mm air gap)	52 kN	2.0 mm	1.0 mm	170 MPa	2.33 MPa	2.0...5.0 mm fatigue resistant 2.0...3.0 mm	2 x 60 kg 325 x 225 x 288
BE 100 (callipers=2x)	2 x 100 kN (3 mm air gap)	80 kN	2.0 mm	1.0 mm	140 MPa	1.43 MPa	2.0...5.5 mm	2 x 175 kg 460 x 360 x 340
BE 125 (callipers=2x)	2 x 125 kN (3 mm air gap)	100 kN	2.0 mm	1.0 mm	175 MPa	1.79 MPa	2.0...5.0 mm fatigue resistant 2.0...3.0 mm	2 x 175 kg 460 x 360 x 340
BE 200 (callipers=2x)	2 x 200 kN (4 mm air gap)	160 kN	3.0 mm	1.0 mm	140 MPa	1.45 MPa	3.0...5.5 mm	2 x 560 kg 673 x 440 x 520
BE 250 (callipers=2x)	2 x 250 kN (4 mm air gap)	200 kN	3.0 mm	1.0 mm	180 MPa	1.82 MPa	3.0...5.5 mm	2 x 560 kg 673 x 440 x 520
BE 300 (callipers=2x)	2 x 300 kN (4 mm air gap)	240 kN	3.0 mm	1.0 mm	175 MPa	1.56 MPa	3.0...5.5 mm	2 x 643 kg 728 x 520 x 492
BE 350 (callipers=2x)	2 x 350 kN (4 mm air gap)	280 kN	3.0 mm	1.0 mm	200 MPa	1.82 MPa	3.0...5.5 mm	2 x 643 kg 728 x 520 x 492

AUTOMATION AND DRIVE TECHNOLOGY

CONTROLLING AND OPTIMISING PROCESSES

Based on long tradition and experience in the mining business SIEMAG TECBERG and its subsidiaries to Winder Controls operate as skilled suppliers and system integrators for the mining and infrastructure industries.

Hence, SIEMAG TECBERG is an one-stop shop for mechanical and electrical equipment. This philosophy adapted both at the headquarters and at in its subsidiaries in the UK, Poland, Russia, China, Australia, South Africa, and USA, where SIEMAG TECBERG delivers mechanical and automation solutions for all types of winders.

With the knowledge and expertise of our skilled engineers SIEMAG TECBERG is able to adapt solutions to the standards and regulations to meet customer needs worldwide.

In addition, SIEMAG TECBERG also has a strong tradition in refurbishments, upgrades and revamps of existing systems to extend the life and provide the latest features.

Control Cubicle Brake Control System
Rio Tinto Northparkes, Australia

AUTOMATION AND DRIVE TECHNOLOGY

HOISTING CONTROLLER



Control Desk Shaft Hoisting System
Silesia, Poland

HOISTING CONTROLLER

Does more than just control

The hoisting controller does more than just control the speed of the winder: it's the heart of the system.

It is connected to all shaft-related mine installations and can collect any information to show the operator the status on large screens. To ensure safe operation the HMI-language is provided in the native language of the operators.

After the successful installation of a speed controller at the Schacht Marie mine in Germany, SIEMAG TECBERG in 2008 implemented the hoisting controller at the Draa Lasfar 3 shaft in Morocco. This controller type, based on major brands of controllers, can be used for drum or friction winders in several operating modes.

Programming and engineering of the hoisting controller is all done by SIEMAG TECBERG specialists and with the know-how gained from the plant operation at Gotthard. STB-SC0x controllers are TAS certified and the STB-SC02 is also WUG-certified (Polish mining regulation). This controller type has already an installed base in Germany, Switzerland, Poland, Morocco, and Turkey.

Following customer demands and to supply state-of-the-art equipment, SIEMAG TECBERG has developed a new hoisting controller STB-HC06. This hoisting controller can be set up as fully redundant system to operate even if one controller has a malfunction.



The need for hoisting systems to be available 24/7 is supported by the remote control functionality of SIEMAG TECBERG hoisting controllers, which allows our specialists access to the system on dedicated VPN connections to support our customers with troubleshooting.

AUTOMATION AND DRIVE TECHNOLOGY

SHAFT SIGNALLING AND SAFETY MONITORING

SHAFT SIGNALLING SYSTEM

Efficiency and safety for shaft hoisting

To give customers every help in running an efficient shaft hoisting system, SIEMAG TECBERG also supplies shaft signalling systems adapted to the hoisting controller and the mechanical equipment. In non-explosive areas SIEMAG TECBERG provides its own hardware and software engineering and has supplied shaft signaling systems to mines in Germany, Morocco, Turkey, Switzerland and South Korea.

The signalling system can also operate as loading and unloading controller, if needed. Where explosion proof

equipment is needed we still do the basic engineering and clearance with third parties for the signalling system and integrate components from trusted and reliable suppliers, as was done for the coal mines in Poland and Vietnam.

Related to the shaft signaling system, SIEMAG TECBERG also supplies wireless cage and skip communication devices to support the shaft inspection and self-controlled men riding on the conveyance.

HOIST SAFETY MONITOR

Watchdog of the hoist control system

Hoist systems are a mine's lifeline, so they need the best protection device to keep your personnel safe and production levels high.

SIEMAG TECBERG's hoist monitoring device, acts as an independent watchdog of the primary hoist control system. It provides constant, accurate measurement of speed and position to help ensure safe, efficient operation.

SPEED & POSITION MONITORING

The software precisely monitors speed and position during the complete hoisting cycle. Each ramp-up and ramp-down is fully monitored for constant protection.

CUSTOMIZATION

The system can be customized to match your specific hoist conditions and operating requirements. Core functions provide required protection, but hardware and software can be changed to meet the mine's application needs.

FLEXIBILITY

It doesn't matter if you operate a double-drum, single-drum, friction or winder – the system can be adapted to all system types and has been installed on many hoists, including production, service, chippy, slope and escape. It can also be set-up to control brake dump valves, buzzers and horns.

MOBILE WINCHES

RELIABLE CUSTOM-BUILT SOLUTIONS

One of SIEMAG TECBERG's state-of-the-art products is the mobile shaft winch. It is especially designed as an autonomous hoisting system for emergency rescue of personnel out of shafts or rescue chambers as well as for the inspection of vertical mine shafts in compliance with the relevant rules and regulations of the mining and vehicle construction industries of the customer's country.

Mobile Shaft Winch
Xinwen, China

MOBILE WINCHES

MOBILE SHAFT WINCH



Mobile Shaft Winch

CSRG, Poland

MOBILE SHAFT WINCH

Inspection, service, auxiliary and rescue operations

The mobile shaft winch was designed as an inspection facility for hoisting shafts and as an emergency transport facility for the rescue of personnel in compliance with the relevant rules and regulations applied in the mining and vehicle construction industries of the customer’s country. It is approved by both the mining authorities and motor vehicle regulations.

The mobile winch is equipped with rescue cages for any application. The cages, which come in different diameters, also fit into small drill holes or ventilation shafts and are approved for the transport of one to ten persons on max. two decks. The cages for the rescue of personnel and for the transport of smaller devices are fastened to the end of the hoisting rope.

Depending on the specific site conditions, the movements of the jib assembly and the winch itself may be operated by an electrical pump unit or – independently from external power supply – by a five-cylinder diesel pump unit; furthermore, the two drive systems ensure operational redundancy.

Each mobile shaft winch is always individually designed to meet the customer’s specific requirements. As a mining specialist with highly efficient structure, SIEMAG TECBERG is in a position to transform individual customers needs into technical solutions.

Application examples	XINWEN, China	CSRG, Poland
Shaft depth	max. 1,300 m	max. 1,400 m
Rope load	max. 50 kN	max. 50 kN
Load suspended (cage incl. payload) depending on depth	2.0 to 3.5 t	1.8 to 3.1 t
Rope diameter	24 mm	24 mm
No. of rope windings on drum	max. 14	max. 15
Hoisting speed (adjustable)	0 – 1 m/s	0 – 1 m/s
Jib radius (from slewing ring center)	9.65 m	-
Max. working area behind vehicle rear end	max. 6 m	10-25° max. 10 m
Jib height working position	max. 12.6 m	max. 14 m
Vehicle	Truck (4-axle)	Truck (4-axle)

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