

ABB components for the Gotthard Base Tunnel

Reliable and safe energy supply and ventilation



ABB provided essential electrical components for the 50 Hz power supply of the Gotthard Base Tunnel infrastructure and for its energy-efficient ventilation system.

The Gotthard Base Tunnel is roughly 57 kilometers in length, making it the longest railway tunnel in the world. Its builder, AlpTransit Gotthard AG, commissioned Transtec Gotthard as general contractor for the railway applications. ABB was hired as sub-contractor to provide the medium-voltage supply for the tunnel's infrastructure in addition to delivering transformers that provide the power needed to maintain the 50-Hz grid.

The builder contracted a consortium consisting of ABB and the German-based TLT Turbo GmbH to construct one of the most vital lots in the tunnel project: the largest tunnel ventilation system ever built.

Challenges faced by the client

The challenges faced at the Gotthard are its harsh climatic conditions and rough terrain. The 50-Hz energy supply in the tunnel's tube is exposed to aggressive salts, brake dust, soot particles, as well as track and wire particles while at the same requiring only minimal maintenance. Enormous pressure

fluctuations between ± 10 kPa, caused by trains traversing the cross passages at speeds of up to 250 kph, complicate matters even more.

In addition the energy supply needs to continue safely and without interruptions to ensure continued railroad traffic. The ventilation also needs to ensure maximum safety for individuals in case of fire. This is achieved by providing sufficient fresh air at the emergency stops and by efficiently extracting smoke.

The ABB solution

ABB installed a gas-insulated medium voltage ZX0 switchgear to power the 50 Hz tunnel infrastructure. These 16 kV switchgear units are designed to be very compact. By connecting these in groups of up to six units, a fully functional control unit can be built, allowing for quick and easy total replacements during a disruption or emergency, if necessary. Aside from providing the standard-welded gas insulated high voltage element, an additional control cabinet with protection level IP65 was included, which prevents ingress of dust or water jets.

More than five hundred REF542plus safety and control units, with multi-stage distance protection, ensure optimal security across the entire tunnel. To allow for optimal selectivity, while providing stable uninterrupted energy supply, any fault and its location need to be quickly identified and the information

immediately transmitted to the tunnel control system. Special remote services enable access to stored programs and protective data via Ethernet-LAN.

Several hundred ABB vacuum-impregnated dry type transformers ensure the 50-Hz energy supply in the tunnel as well as the energy supply for the emergency backup system. The transformers distinguish themselves through low energy loss, high efficiency, high overload protection and short circuit strength and their low maintenance needs over years of active operation. In addition, ABB delivered all dry-type and oil-immersed transformers that are required in the buildings at the tunnel entrances and that serve the 50-Hz energy supply.

The lighting system in the tunnel consists of more than 10,000 orientation lights and 450 escape route lighting systems. ABB installed PMA cable protection systems more than 21 kilometers in length for the electrical lines powering this lighting. The systems have excellent fire protection properties and are impervious to water and dust.

The ventilation system also meets the tunnel's high safety exigencies and ensures an energy efficient operation. ABB delivered the medium-voltage and low-voltage distribution systems, including drive transformers and converters (ACS1000) for tunnel ventilation as well as the low-voltage components (switches and soft starters) for the 24 jet fans at the tunnel portals. Also included in the delivery is the controller (AC800M), communication, instrumentation of the ventilation system and its sensors.

SBB built two maintenance and intervention centers in Biasca and Erstfeld to handle tunnel maintenance. The energy supply must be highly reliable for the operation of these facilities, so that employees can take the necessary actions if incidents occur. ABB installed an uninterruptible power supply system (UPS) at both locations. Each one has a Conceptpower DPA 250 UPS with output power of 90 kVA to protect critical loads against short-term power outages and fluctuations.

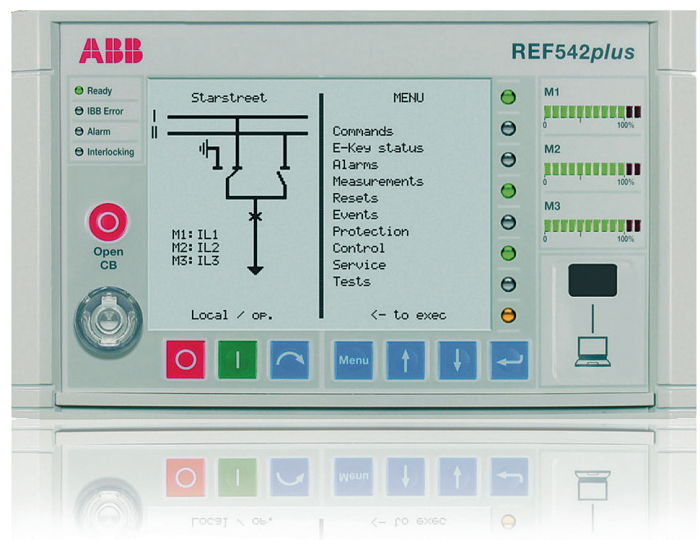
Contributing to the work of a century

ABB previously supplied the drive system with an ACS 6000 and a synchronous motor for the elevator in the Sedrun access tunnel, which moves excavated rocks, construction material, machinery and people. In Sedrun, ABB also installed a pump system with electrical setup and automation technology to pump water that accumulates at the construction site to the surface 850 meters above the site.

In 2016 – when the tunnel opens – ABB's units will start contributing to the safe passage of millions of passengers through this work of the century over decades to come.



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Top picture: Vacuum-impregnated dry-type transformers supplied by ABB ensure the 50-hz energy supply in the tunnel.
Bottom picture: Multifunctional REF542plus safety and control unit.

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