

ABB components for the Gotthard Base Tunnel Reliable and safe energy supply and ventilation



Picture courtesy from AlpTransit Gotthard AG

ABB provides essential electrical components for the 50-Hz energy supply of the Gotthard base tunnel infrastructure and its energy-efficient ventilation system.

With a length of roughly 57 kilometers, the Gotthard base tunnel will be the longest tunnel of its kind for decades to come. Its builder, AlpTransit Gotthard AG, commissioned Transtec Gotthard as general contractor for railroad 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.

Alp Transit Gotthard AG contracted a consortium of ABB and Germany based TLT Turbo GmbH to build one of the most vital partial lots – the tunnel's ventilation system – 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 during construction 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 clean air at the emergency stops and having an effective smoke vent in place.

The ABB solution

ABB employs a gas insulated medium voltage ZX0 switchgear in its approach 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.

The ventilation system also meets the tunnel's high safety exigencies and ensures an energy efficient operation. ABB delivers the medium-voltage and low-voltage distribution systems, including drive transformers and converters (ACS1000) for some 30 ventilators as well as the low-voltage components (switches and soft starters). Also included in the delivery is the controller (AC800M), communication, instrumentation of the ventilation system and its sensors.

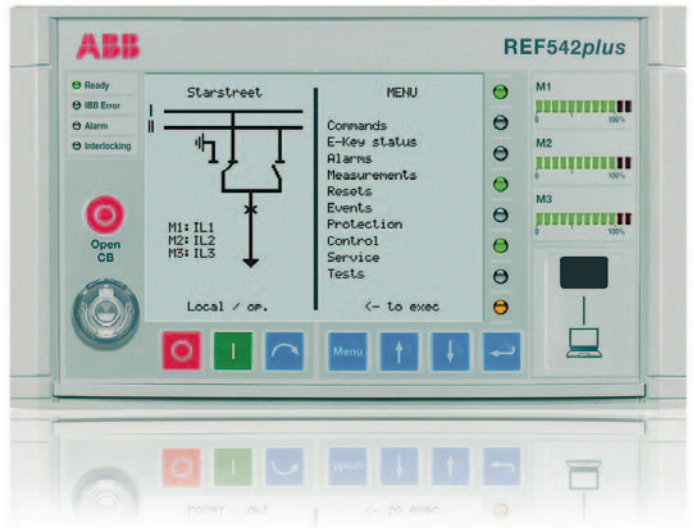
Contributing to the work of a century

ABB previously supplied the drive system with an ACS6000 and synchronous motor for the elevator in the Sedrun access tunnel, which moves rocks, construction material, machinery and people. ABB also installed a pump system with electrical setup and automation technology to pump accumulated water from the Sedrun construction site to the surface located 850 meters above the site.

In approximately 2017 — when the tunnel is scheduled to open — 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: Multi-functional REF542plus safety and control unit.

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