

APPLICATION NOTE

# Smoke extraction motors in West Metro

## A new extension to Helsinki's metro system



Smoke extraction systems play an important part in the overall safety of road and rail tunnels. The electric motors that drive smoke extraction fans have to meet tough requirements for operation at high temperatures. ABB supplied 32 specialized smoke extraction motors for the West Metro, a new extension to Helsinki's metro system.

— 01 A total of 3.2 million cubic meters of rock had to be dug out to make the tunnels.

Finland's capital city is home to the most northerly metro system in the world. First opened in 1982, the Helsinki Metro currently has 17 stations on 21 kilometers of track and it carries 50 million passengers per year. The new West Metro, which entered service in late 2017, adds almost 14 kilometers of track and eight stations. Construction of the West Metro is presently Finland's largest infrastructure project.

### Focus on safety in tunnels

Serious incidents like the fire in the St. Gotthard Road Tunnel have prompted the authorities to focus increasing attention on passenger safety, especially in long metro, rail and road tunnels.

In Europe the EU has introduced Directives and standards covering smoke extraction fans for use in tunnels. These include requirements on how long and at what temperature the fans must be capable of operating in a fire. The most rigorous classification requires that the motor / fan combination will continue to operate at 400 °C for 2 hours.

ABB has got a type approval certification according to the EN 12101-3 norm for M3BPW range of smoke extraction motors ten years ago. Since then ABB has supplied the IEC Low voltage M3BPW 160 to 400 frame size motors for a large number of tunnel projects in Europe and elsewhere.

### Three-way collaboration

The ABB motors for the West Metro project drive smoke extraction fans manufactured by ZITRON, a leading producer of tunnel ventilation equipment, which is based in Spain. ABB won the West Metro order in close collaboration with ZITRON and Suomen TPP, the company which represents ZITRON in Finland.

The motors are 315 and 355 frame size smoke extraction M3BPW models rated at 200 and 315 kW and they are certified for 400 °C/2h.

### Tunneling completed

Construction of the West Metro track is divided into four projects, and the individual stations are also separate projects. Tunneling work was completed in early 2014, and the construction phase then began. A total of 3.2 million cubic meters of rock had to be dug out to make the tunnels, and this was tipped into the sea to reclaim land that will be used for new housing.

The West Metro consists of two separate parallel tunnels which are linked by cross-connecting tunnels at intervals of 150 to 200 meters. In all there are 15 vertical shafts around 600 to 700 meters apart. The shafts have been designed to provide emergency escape routes, pressure equalization, ventilation and smoke removal.



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01 Around 10,000 cubic metres of concrete has been cast at each station.

02 The Zitron smoke extraction fan weigh around 6,000 kgs.



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### Six-tonne smoke extraction fan-motor combination

The ZITRON smoke extraction fans – which incorporate the ABB motors - weigh around 6,000 kilograms. The first fan to be installed is built into a wall, with the inlet side in a space that is connected to both metro tunnels. The two parallel tunnels are individual fire compartments, and the crossconnections between them will have fire doors at both sides.

If a fire breaks out the smoke will be extracted using two shafts. The smoke will be removed through one shaft – in this case exiting through a hatch some 40 meters above the floor of the tunnel - while fresh air

is fed in through the other shaft. Smoke extraction can begin five minutes after a fire is detected. An over-pressure is maintained in the crossconnecting tunnels to ensure that the escape routes are practically smoke-free while they are in use.

### Putting passenger safety first

Unlike the existing Helsinki Metro, the new West Metro will be completely underground. This naturally places special demands on the network's safety systems. The smoke extraction team at ABB Motors and Generators is pleased that its certified smoke extraction products will play their own significant part in ensuring the safety of the estimated 100,000 passengers who will use the West Metro every day.

### West Metro in brief

- total length 13.9 kilometers
- 2 parallel underground tunnels
- 8 stations
- 15 vertical shafts
- 12 access tunnels for construction and service
- 3 million cubic meters of rock removed
- 1,500 passenger parking spaces
- 1,800 passenger bike stands
- 2.5 to 5 minute service interval
- Total budget EUR 1,186 million ([www.lansimetro.fi](http://www.lansimetro.fi))
- passenger traffic started autumn 2017

