

Fail safe actuators aid fire safety in Swiss road tunnel

Tunnel Visp, Switzerland



INDUSTRY

APPLICATION

Tunnel

AUMA SOLUTION

- > SQ part-turn actuators with intelligent AC 01.2 actuator controls
- > FQM fail safe unit

CUSTOMER BENEFITS

- > Maximum safety for people in the tunnel

Fire safety in tunnels is a prime concern for the highway authority in Switzerland. In the new Visp motorway tunnel, AUMA fail safe actuators help to keep an escape route free from smoke.

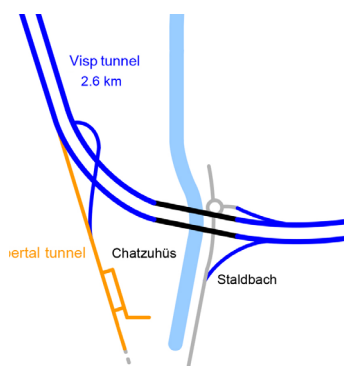
IMPROVED FIRE SAFETY

Switzerland is extending its A9 motorway to create a high-speed route from Lake Geneva in the west of the country to the town of Brig in the east, via the Rhone valley.

The project includes construction of the Visp tunnel that forms part of a new bypass for the town of Visp. The Visp tunnel consists of two tubes: The north tube is new and is currently under construction. The south tube uses the existing Vispental tunnel.

The operator, Switzerland's Federal Roads Office (FEDRO), wanted to bring the Vispental tunnel up to modern safety standards, especially in terms of fire protection. This has meant adapting and partly replacing the operating and safety equipment in this tunnel.

A series of linking passages now allows drivers to escape from the north to the south tube – or vice versa – in the event of a fire. However, part of the old Vispental tunnel is used as an exit road for the motorway, leaving a single-lane section. To provide an escape route from this section, a new 300 m-long pedestrian safety tunnel was built that links to the main tunnel via several emergency exit sliding doors. In the event of a fire, people can exit the main tunnel through the safety tunnel.



Project responsibility:
AUMA Austria

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AUMA SOLUTION SECURES FRESH AIR SUPPLY

A key safety requirement is a supply of fresh air, so that during a fire the safety tunnel contains enough oxygen and does not fill with smoke. Accordingly, the exit from the safety tunnel is protected by a double door flanked by two large fans.

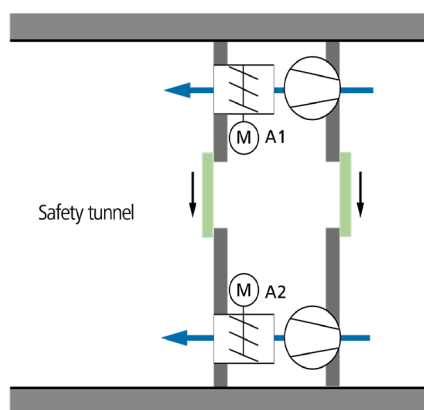
In the event of a fire, the fans turn on, pumping fresh air into the tunnel and creating an overpressure that keeps out smoke.

The safety design also had to take into consideration what happens if the mains power fails during a fire and the fans stop. The chosen solution was to install a damper in front of each fan that closes in the event of a power failure, preserving the overpressure in the safety tunnel for as long as possible.

Operating the dampers clearly required a fail safe solution that will work without electric power.

In cooperation with Sirocco, an Austrian company specialising in tunnel ventilation, AUMA supplied an actuation solution consisting of SQ 07.2 part-turn actuators combined with FQM 07.1 fail safe units. The fail safe units are equipped with a purely mechanical energy buffer which provides the torque required to close the dampers without electric power. The AUMA solution thus plays a key role in enhancing safety for the people in the tunnel in the event of a fire.

During normal tunnel operation, the fans are switched off and the dampers are closed. If an emergency door is opened, the fans start and the electric actuators open the dampers. Should the mains power fail, the fail safe function of the FQM units closes the dampers.



Schematic representation of the fresh air supply in the safety tunnel.

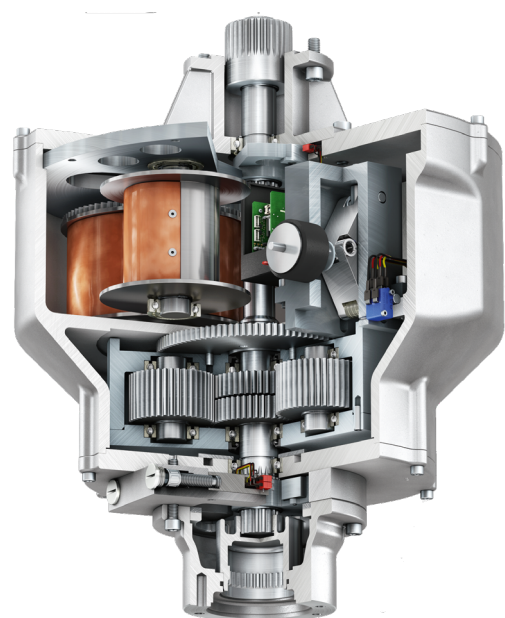
BENEFITS OF THE FQM FAIL SAFE UNIT

The AUMA FQM fail safe unit is equipped with a constant-force spring motor that stores the mechanical energy needed to open or close the valve or damper in an emergency.

When power is first applied to the actuator, an integrated electric motor winds the constant-force spring and a solenoid keeps it in the fully wound position. If there is a power failure or an emergency signal is issued, the solenoid releases the spring and initiates the fail safe operation.

Conventional fail safe actuators using simple return springs have to be oversized, because the torque they supply falls considerably towards the end of the travel. The AUMA solution has the advantage that the spring supplies an almost constant torque across the full valve travel, so the actuator can be smaller.

A further advantage of the AUMA FQM unit is its planetary gearing, which in normal operation transmits the movement of the drive shaft directly to the valve, bypassing the fail safe spring. Since the spring does not move, it avoids the fatigue that can be a problem for springs subject to repeated cycling. Disengaging the spring during normal operation also means the actuator does not have to work against the force of the spring. This also allows a smaller actuator to be used and protects the valve against excessive torque.



During fail safe operation, a mechanical constant-force spring motor within the FQM fail safe unit supplies the torque required to operate the damper.