



# TUNNEL SYSTEMS

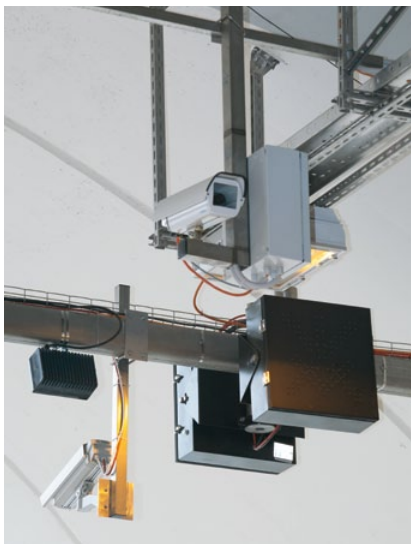
- Global technological tunnel system
- Traffic violation identification
- Direct communication of control centre with drivers
- Maximum situation survey in the tunnel
- High safety degree

### General Description

Tunnel systems are used for safety of traffic and travellers during ordinary operation and also during unexpected events and emergency situations at the tunnel roads.

Global solution includes:

- Control system,
- Tunnel information system,
- Camera systems for measuring of section speed, check of the trucks weight limits, detection of exceeding the permitted vehicle height, identification of vehicles hauling



- dangerous cargo according to ADR agreement and comparison of passing vehicle licence plates with central police register of stolen vehicles,
- Measuring of physical values for a maximum situation survey in the tunnel by the control centre,
- Traffic data measuring system,
- Radio communication in a tunnel,
- Power back up systems in tunnels
- Tunnel SOS safety,
- Equipment of pre-gantry sections,
- Additional systems according to a specific implementation.

Tunnel systems are suitable for small tunnels with a short tube and also for long highway tunnels several kilometres long.

### Basic Technical Description

Control system provides a complete check of all processes of the tunnel entire technological equipment and forms a functional, well organised and ergonomic man-system interface. It includes well arranged diagnostics and measured data archiving

system. Central dispatcher post is equipped by visualisation system and overview video large screen.

For direct communication of tunnel dispatchers with drivers in the real time a tunnel information system is used. It includes a set of various traffic signs, vehicle signals and light traffic signs coupled with the control centre.

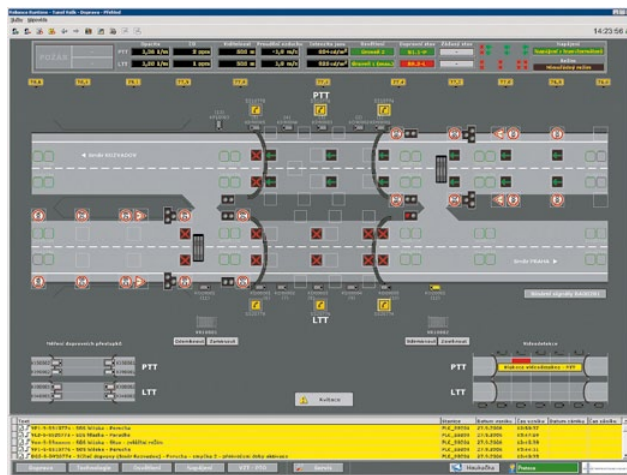
The stationary MUR-07 system is used to measure the vehicle section speed. More details are at the catalogue page describing this product.

Weight control of trucks is based on principal of scanning of separate half-axis weight by piezo-electrical sensors and video image analyses recorded by cameras. The result is used to select vehicles suspected





Dispatcher's workplace



System graphic interface

of exceeding permitted limits in the traffic flow.

Video-detection system is also applied for recognition of orange tables of vehicles hauling a dangerous cargo according to ADR agreement. Video image data are converted to the text form, based on which the type of danger and character of transported substance can be identified. In case of accident this information can significantly help to control

centre employees and rescue units to re-arrange their decision making.

To ensure maximum safety and timely reactions to impending danger the key physical values testifying of current situation in tunnel are continuously monitored. For instance concentration of carbon monoxide (CO), speed and direction of air circulation, opacity, air temperature at tunnel gantries and also in tunnel internal space, fog occurrence in gantry vicinity, pressure difference at ventilators and other relevant factors are monitored.

available continuously. Power supply system must cover required outputs and also short-time consumption increase.

SOS cabinets are used for public and operators to call for help in case of emergency. Cabinets with special fire resistant construction include communication equipment for connection with the dispatcher centre, basic first aid, fire and rescue outfitting and other necessary technological equipment.



Variable traffic signs

For measuring of traffic data a system evaluating traffic by induction loops built-in a roadway is used.

Tunnel radio communication is provided by signal transmission from outdoor antennas and its transmission is ensured via diplex and amplifying circuit system allowing simultaneous operation of all networks without mutual interference and difference in a communication quality.

Installation of the tunnel systems includes also realization of the equipment at pre-gantry road sections. It especially includes variable traffic signs and informative boards, system of dynamic detection of vehicle height before its entry into the tunnel and its timely diverting in case the set height limits are exceeded and other technologies according to the specific project.

All systems are designed and supplied according to standards in force and according to technological conditions of the Board of Highways and Expressways of the Czech Republic.



SOS phone

During ordinary operation the power supply of the tunnel technological equipment is provided from public distribution network. In case of power supply drop out a second back-up source from distribution network and additional power supply source (usually a diesel-aggregate) are