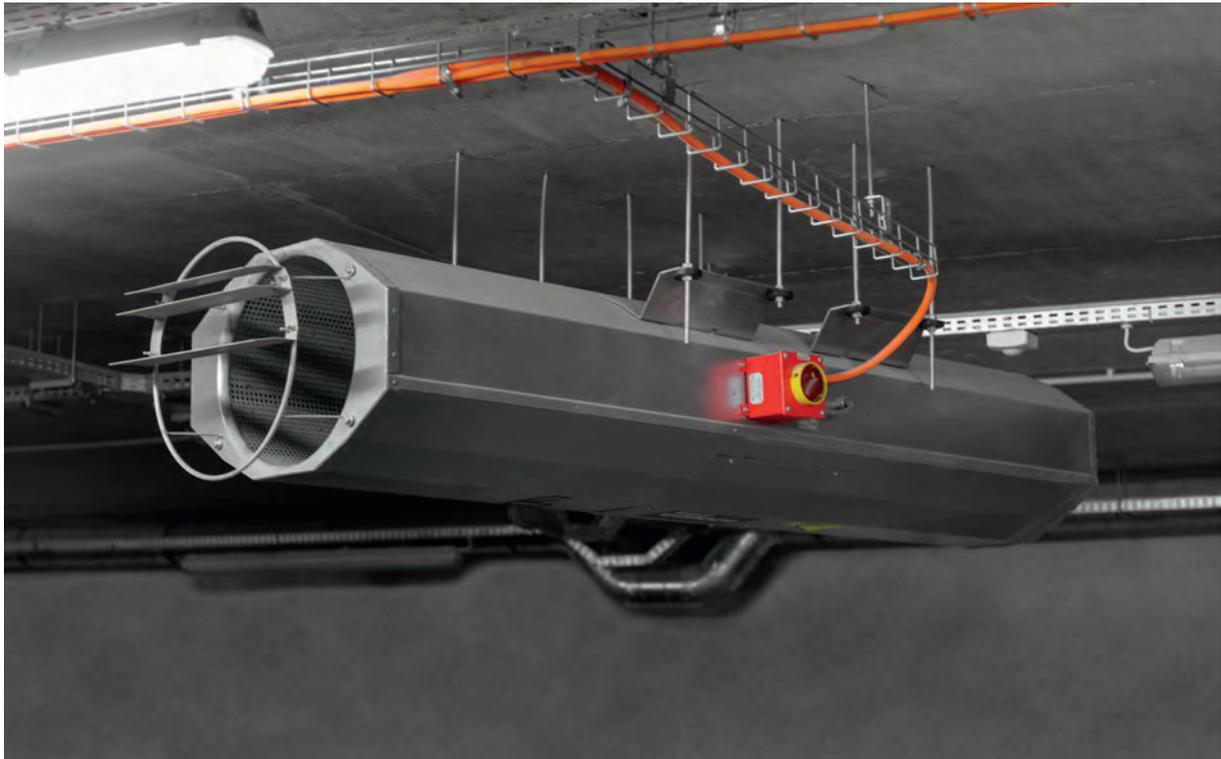




mcr j-FLO

complex jet fan system
for garages



Jet fan systems are used for smoke exhausting from underground garages as a solution alternative to conventional duct systems. When detecting smoke or excessive concentrations of CO and LPG gases, the system devices are activated on receiving a signal from the power supply and control unit and, using a piston effect in their operation, they circulate smoke and gases in the entire cross-section of the garage respectively to the air inlet (aeration dampers and supply air fans) into the exhaust/smoke exhaust opening (smoke exhaust dampers and exhaust fans). Not allowing for excessive smoke accumulation and temperature rise, they provide a safe and effective escape and facilitate the operation of rescue teams.

The jet fan systems may also be used for comfort ventilation, aerating garage under their normal use. They operate with the CO and LPG detection systems, monitor the acceptable level of pollutants and dilute and remove gases harmful to people's health.

The **mcr j-FLO jet fan system** is designed for mechanical ventilation of single and multi-floor garages where in accordance with applicable regulations automatic smoke exhaust devices (smoke exhaust mechanical ventilation) are to be used.

In the case of a fire/smoke, the mcr j-FLO complex jet fan system for garages:

- ensures temperature allowing safe escape of the garage users (below 60°C up to 1.80m above the floor),
- ensures enough visibility for the garage users to escape the garage (less than 10m up to 1.80m above the floor),
- facilitates operation of rescue teams by not allowing the temperature to rise above 100°C at a distance above 10m from the fire source,
- contributes to the building structure protection by maintaining temperatures below 200°C at a height above 2.50 m from the floor (in the space under the ceiling).

SYSTEM COMPONENTS

All devices included in the mcr j-FLO system are approved for use in building industry, in fire protection.

The mcr j-FLO complex jet fan system for garages consists of:

main supply and exhaust fans, unidirectional or reversible

These fans (installed inside or outside the rooms) are designed to transport the amount of air required to ensure adequate aeration or smoke removal from the garage space.

► mcr Monsun

- fire resistances F200, F300, F400
- available in ten sizes
- capacity up to 102 000 m³/h
- compression up to 1800 Pa
- unidirectional motor
- single or two speed motors

CE certificate of conformity with EN 12101-3:2002



► mcr Pasat

- fire resistances F200, F300, F400
- available in six sizes
- capacity up to 52 000 m³/h
- compression up to 1800 Pa
- unidirectional motor
- single or two speed motors

CE certificate of conformity with EN 12101-3:2002



► mcr Monsun S / mcr Monsun R

- fire resistances F200, F300, F400
- available in four sizes
- capacity up to 200 000 m³/h
- compression up to 950 Pa
- motors: unidirectional (mcr Monsun S) and reversible (mcr Monsun R)
- single or two speed motors

CE certificate of conformity with EN 12101-3:2002



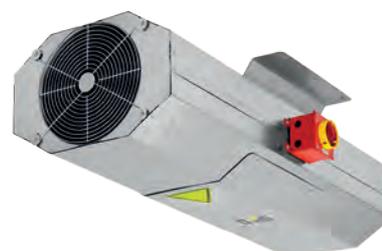
jet fans, unidirectional or reversible

The function of the jet fans is to ensure proper direction and speed of the ventilation air or smoke flow in the direction of exhaust fans.

► mcr Bora

- fire resistances F200, F300, F400
- available in seven sizes
- thrust up to 165 N
- unidirectional or reversible motor operation
- single or two speed motors

CE certificate of conformity with EN 12101-3:2002



power supply and control units for the system components

► mcr Omega

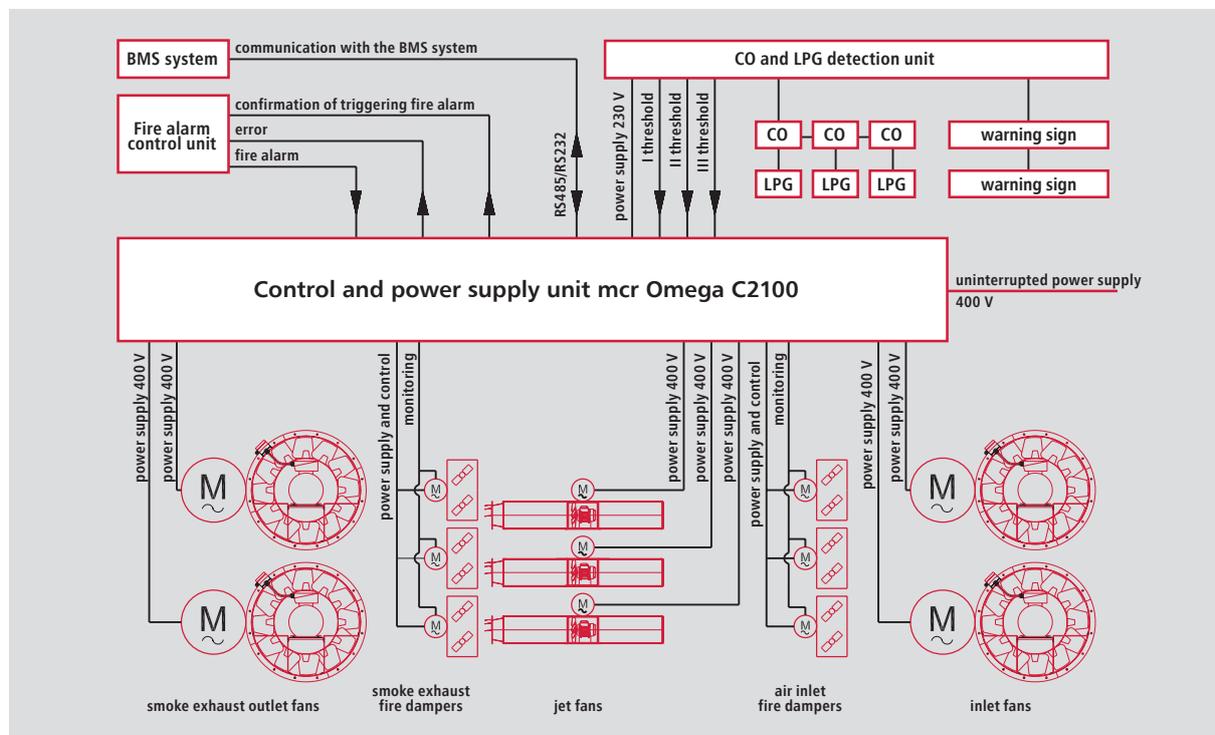
The mcr Omega C2100C control units allow power supply, control, monitoring and visualization of the operating status of devices within the system, both for the comfort and smoke exhaust functions. They run jet ventilation devices with the required capacity and in the right direction after receiving an alarm signal from the fire alarm control unit, the BMS system or CO and LPG detection units.

The control units should be installed in a separate room (separate fire zone). The most common systems consist of a single control unit per each air supply and exhaust shaft and separately for max 30 jet fans.

certificate of approval
technical approval



Fig. 1 A typical configuration of the electrical control system using the mcr Omega control unit



Configuration and the number of individual components of the system depend on the surface area, height, requirements, construction and location of the garage to be protected.

cut-off dampers for fire ventilation systems

► mcr FID S, mcr WIP

The cut-off dampers can be installed in the walls and ducts. Their task is to cut-off smoke-free zones from that in which the jet ventilation is running, preventing the spread of smoke from the danger zone to other zones of fire. During comfort ventilation, the dampers are open as a standard. After detecting fire, and after receiving a signal from the mcr Omega control unit, the dampers in safe areas close to prevent the penetration of harmful gases and heat to safe zones and ensure adequate airflow in the hazardous area.

CE certificate of conformity with EN 12101-8:2011



SYSTEM COMPONENTS

power cords, cable supports and electrical installation equipment

In order to ensure uninterrupted electricity supply for the mcr j-FLO system devices during a fire, cable route assemblies are used (cables and cable trays) of fire resistance class E90. This resistance is confirmed by the certificates for the continuity of electricity supply or signal transmission for the time required to start and operate the device, which is designed to enable the safe escape of people from the garage protected space and ensure the safety of rescue teams.

CO, LPG and smoke detection system components

The CO and LPG detection system is designed for detection of carbon monoxide (CO) and propane-butane (LPG) in air. The CO and LPG detectors are the basis of the garage comfort ventilation control system. In case of exceeding the permissible concentrations of the gases, the CO and LPG detection system communicates with the mcr Omega control unit, which launches the jet fans and supply and exhaust fans in order to dilute and remove contaminated air. Additionally, the system is equipped with optoacoustic warning signs as devices to warn the users of the resulting hazard.

OPERATION

The smoke exhausting system function is to stop the smoke, only in the smoke area where the fire occurred, so that rescue teams can easily locate and extinguish the resulting fire.

Depending on the geometry of the garage and of the requirements, unidirectional or reversible ventilation systems are designed. The following example shows a reversible system diagram and its operation depending upon the location of the fire (smoke zone).

Fig. 2 Diagram of reversible smoke removal by smoke exhaust fans in smoke zone I

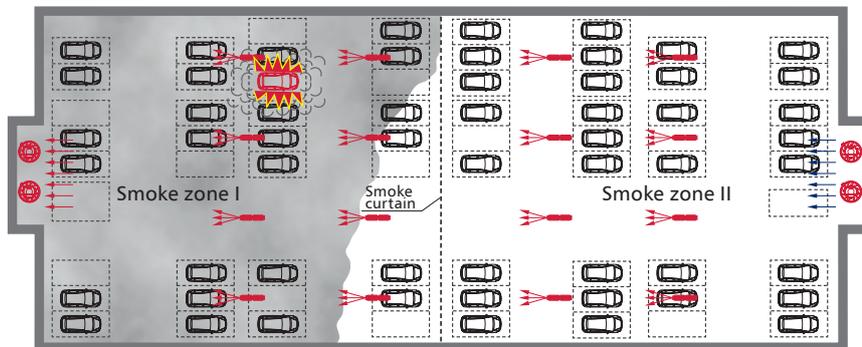
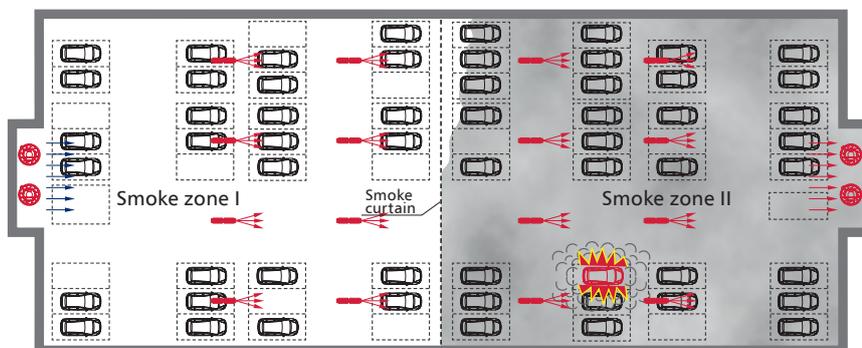


Fig. 3 Diagram of reversible smoke removal by smoke exhaust fans in smoke zone II



Immediately upon the detection of smoke, main supply and exhaust fans begin to work with the appropriate capacity, allowing safe evacuation. Dampers are closed in areas not covered by the fire threat. After completion of the evacuation, the jet fans are running in the direction of exhausting points, in order to remove harmful combustion fumes and hot gases.

The CFD analysis should be included in designing of each jet ventilation system. Mercor provides the necessary computer simulations in order to properly calculate the desired parameters of the system designed to control the spread of heat and smoke.

The CFD analysis allows determining the following, among others:

- scenarios of a fire in the garage
- number of devices required for correct operation of the system
- number of emergency exits in relation to the expected smoke conditions
- arrangement of jet fans (both their location and direction of operation)
- time delay in switching the jet fans on
- effects of starting the jet fans (acceleration of smoke and heat flow)
- capacity of main exhaust fans
- conditions of safe escape of the garage users and expected time of it
- safety requirements for rescue teams
- structure safety criteria

Below are CFD analysis diagrams for an exemplary garage shown.

Fig. 4 The distribution of air velocity at the jet fans in the garage at the height of 2.3 m

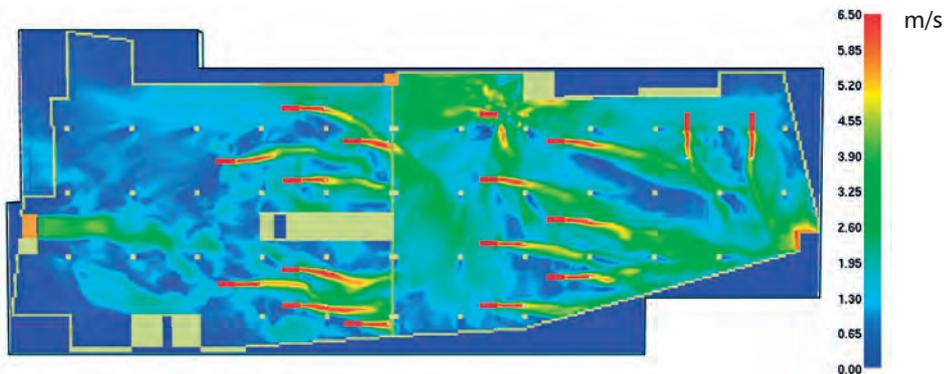


Fig. 5 Temperature distribution in 240th second after detecting fire, until the total evacuation of people from the garage

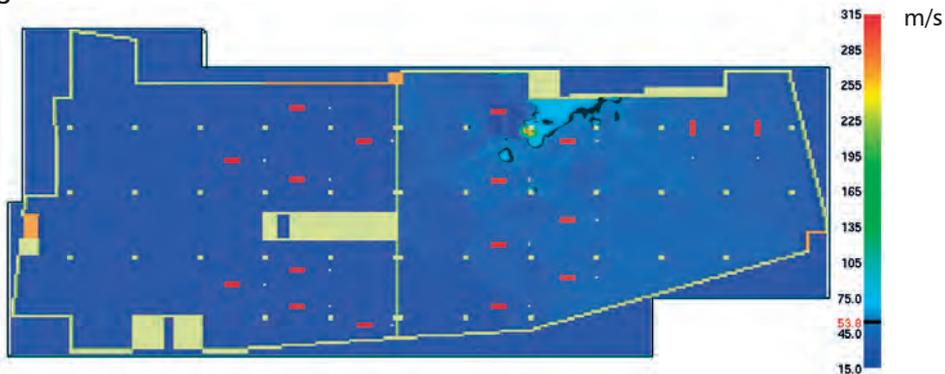
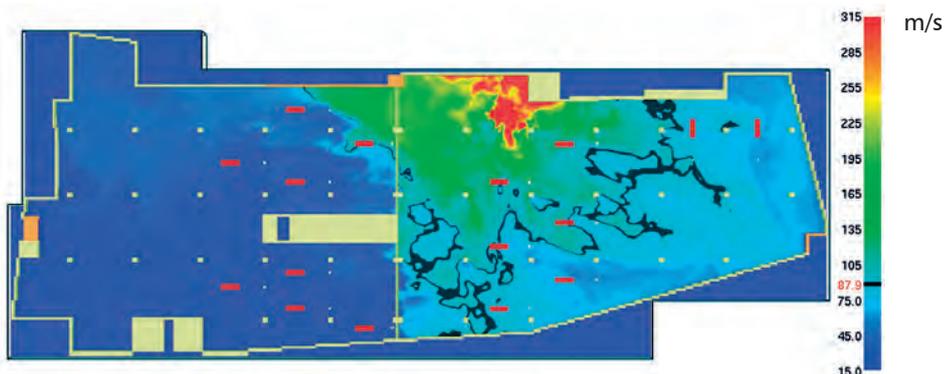


Fig. 6 Temperature distribution in 900th second after detecting fire, until the arrival of the rescue team



SYSTEM ADVANTAGES

- operates both in the fire ventilation and comfort ventilation modes
- lower operating costs as a result of smaller capacity of main fans
- a reduction of the garage height, thereby saving on deep excavation costs under higher garage
- no smoke ventilation ducts allow gaining more space under the ceiling
- reducing the number of fire dampers in the absence of ducts, thus reducing the automation control
- lower jet system cost compared to a conventional smoke exhaust ducts
- high efficiency of carbon monoxide and propane-butane removal
- easy identification of the source of fire
- lowering the temperature of gases resulting in a reduction of losses after a fire in the building construction
- easy and quick installation of the system

TECHNICAL SUPPORT

Mercor provides technical support for the:

- preparation of the conceptual design of the system
- implementation of the necessary CFD simulation
- selection of all components of the system
- system installation in a facility
- hot smoke tests
- commissioning and adjustments of the selected system
- preparation of as-built documentation
- warranty and post-warranty service



FIRE PROTECTION SYSTEMS

- ▶ smoke and heat exhaust systems
- ▶ fire ventilation systems
- ▶ fire protection of building structures



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