



## Technical data

Ziegler Tunnel rescue vehicle "MERKUR"	
<b>Chassis</b>	
Engine	2x water cooled electromotors
Power	2x 76,6 kW nominal (max. 2x 95 kW)
Drive line	4x4
Torque	538 Nm
Wheel base	3800 mm
Dimension	6600x2310x3100 mm
Weight	12300 kg
<b>Performance</b>	
Maximum speed	60 km/h (limited)
Autonomy	4 hours (mixed condition)
Turning circle	14 m
<b>Superstructure</b>	
Driver cab	Two driver cabs
Driver seat	BA seat
Superstructure	ALPAS - C, compact superstructure
Passenger seating place	8
Passenger standing place	4
Crew	2
Entrances, number	2 pneumatic doors, 2 emergency doors
Internal lighting	LED
<b>Ziegler High pressure Air storage</b>	
Capacity	210000 l (8 bar)
Air cylinder	14x 50 l, 300 bar
Rescue hood	16
<b>Battery packages</b>	
Capacity	2x 180 Ah
battery cells	2x 90 LiFe Po 416
<b>Self protection</b>	
Water tank, volume	2x 200 l
Self-protection nozzle	10



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# TRV ZE1 „MERKUR“ ZIEGLER Tunnel rescue vehicle



# Tunnel Rescue Vehicle TRV ZE1 "MERKUR"

The Tunnel Rescue Vehicle TRV ZE1 "MERKUR" was developed and produced by the Ziegler Group, headquartered in Giengen, Germany.

This vehicle is unique in the world. In compliance with European norms and regulations and in accordance with Ziegler Group's quality standards, this vehicle uses modern technological solutions to solve age-old problems. This is the world's first electro drive tunnel rescue/evacuation bi-directional vehicle with two driver cabins. The primary purpose

of Ziegler's "MERKUR" is to enable the rescue and evacuation of persons from a tunnel fire scenario. Various studies as well as experience gained around the world have shown that there are two major problems which make tunnel fires extremely dangerous for fire fighters to attempt a rescue. First there is a lack of fresh air in a tunnel where a fire is raging. Second it is extremely difficult for a rescue vehicle to turn around within a tunnel due to the limited tunnel width and space available. These two problems led Ziegler, a world leader in the fire fighting technology,

to design and develop a new vehicle which solves these two problems. The key was to design a vehicle which assures maximal protection and safety for both the crew and rescued persons. The crew and persons being evacuated are completely protected from outside danger inside of an ergonomic safety chamber. Evacuation directions are clearly marked on the outside of the vehicle. The "MERKUR" is also equipped with a dual drive train system which allows the vehicle to function properly in the unlikely event that one of the two motors should fail.



## Concept

The vehicle has 3 compartments: 2 driver cabins and 1 rescue chamber. The sections are divided by sliding doors. This enables fast and easy transfer from one cabin to another without needing to exit the vehicle. The rescue chamber is purposefully separated from the driver cabins to

prevent any danger from the rescued persons who might be in a state of shock. However it still allows access by the crew members in order to provide first aid treatment if it is required. The vehicle is designed to carry 12 rescued persons out of the tunnel safely. There are 8 seated and 4 standing positions in the rescue chamber. All of these positions have an individual

rescue-hood with a breathing mask which is connected to the vehicle's breathing air storage unit.

All systems in the vehicle are operated by 1 person - the driver. There is also one crew member in the vehicle. Driver cabins are equipped with 2 Ziegler integrated breathing apparatuses.



## Steering

The Ziegler "MERKUR" vehicle can be driven in both directions. Only one cabin (driving position) can be active at a time. When one cabin is activated, including the control panel and thermal image camera, the other one is automatically deactivated, as well as the axle steering under the deactivated cabin. In addition all traffic lighting automatically changes depending on the driving direction.

Interesting is that the driver does not need to think about what is happening in the other cabin or in which position the steering wheel was left. When one cabin is activated, the hydraulic unit automatically returns the steering wheel in the other cabin to the central position and locks the steering axle.



## Drive

Electrical 4x4 power is driven by two water cooled electric motors with a nominal power of 2x 76,6 kW (max. 2x 95 kW). There is one electrical motor for each axle. The vehicle is easily operated and is designed without a gearbox. The driver only chooses the driving direction - forward - reverse or neutral position. There are 2 battery packages, each with capacity of 180 Ah. Each package consists of 90 LiFePo4 battery cells. Battery chargers are mounted on the vehicle. Maximum speed is limited to 60 km/h. Autonomy is 4 hours in mixed conditions. Full turning radius is 14 m. The vehicle is equipped with a pneumatic braking system.



## Security

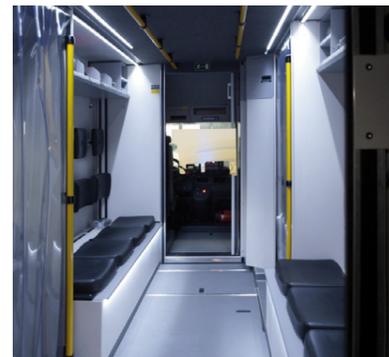
The entire security system is computer controlled. All data is collected via the CAN-Bus and can be read on the instrument display in both driver cabins.

High-tech solutions enable the "MERKUR" to drive in the worst possible conditions. Thermal image cameras are mounted on each cabin as well as rear-view driving cameras. Color LCD monitors located in all cabins show forward or rear-view thermal images depending on the driving direction.



## Entrance

The vehicle has two pneumatic doors, one on each side. Special anti-smoke PVC strips are mounted in these entrances. These strips, in combination with an overpressure of air in the cabin, prevent smoke, ash and other particles from entering the vehicle during the rescue. There are also two emergency exit doors in the driver cabins and two driver doors.



## Lighting

Outer and inner lighting is based on LED technology. This provides the "MERKUR" with optimal lighting, low energy consumption, weight reduction and contributes to the appealing look of the vehicle. Furthermore, external surround lighting as well as blue lights are also LED providing excellent visibility for rescued persons as well as traffic on the road. The vehicle is also equipped with a fire-fighting siren.



## Breathing air

The Ziegler high pressure breathing air storage unit (300 bars) consists of 2x 7 cylinders. Each cylinder has a volume of 50 liters. Breathing air from the storage unit is reduced from 300 bar to 8 bar and is distributed to the 12 rescue hoods and the cabin over-pressure nozzle. A VarioGard central unit with two O2 sensors for monitoring oxygen levels is mounted on the vehicle. One sensor is inside the vehicle and the other one outside. Data is collected and processed via the computer on the central unit. The breathing system can be switched on automatically or manually by the driver. Autonomy is 5 hours with all 12 rescued persons included.



## Development

Numerous tests and simulations were made on the vehicle. The cabin air overpressure system was tested, as well as smoke permeability and the ability to drive uphill under full load. Driving and brake systems were also tested, speed and acceleration were measured, as well as maneuverability and vehicle autonomy. Tests were performed by certified institutions. The vehicle was tested and approved by VCC (Vehicle Centre of Croatia). Independent authorities are very important in the development of new products as they are indicators of our success and a guarantee for our customers. These tests were highly successful and demonstrate Ziegler's innovation skills using modern fire fighting technology.

**Ziegler experts develop new products and technologies continuously.**



## Self-protection

The bottom of the vehicle is protected with a full thermal protection shield. It is also equipped with self protection by water, 10 nozzles in total protect the vehicle from heat and fire. 6 nozzles are located on the roof and 4 for tire protection on the floor. Also, run-flat tires are installed on the vehicle.