

MODERNIZATION OF ŠKODA 16T TRAMS FOR WROCŁAW



In 2006 and 2007, Wrocław purchased a total of 17 unidirectional Škoda 16T trams featuring a distinctive front design developed by the Porsche design studio. After approximately 12 years of operation, the operator MPK Wrocław decided to carry out a major overhaul of all vehicles combined with a modernization process, which also included the replacement of the complete electrical equipment, for which ENIKA was selected as the supplier.

The Škoda 16T trams are five-section vehicles with a length of 30,250 mm, designed according to the “*Multigelenk*” concept, with two suspended sections and three bogies located under the first, third, and fifth sections. Unlike the related vehicles for Prague (type 14T), the trams operated in Wrocław have powered bogies at the front and rear, while the middle bogie is a running bogie. This solution made it possible to achieve a low-floor share of 65%, with only a single step leading to the raised end sections of the interior. The trams were originally intended primarily for operation on lines 6 and 7, and later also appeared on other routes.

After about 10 years of service, the mileage of the Škoda 16T vehicles approached 500,000 kilometers. With their continued operation in mind, the operator decided to invest in a comprehensive modernization aimed at increasing operational reliability, improving spare parts availability, refreshing the exterior and interior design, and significantly enhancing comfort for both passengers and drivers. The contract for the modernization was

awarded to SAATZ, which selected ENIKA as the partner for the supply of the new electrical equipment. The work on all 17 vehicles was carried out between 2020 and 2022.

In the mechanical part, a complete refurbishment of the vehicles was carried out. The frames of the individual carbody sections were refurbished and repaired, and new side panels and glazing (with sliding windows instead of tilting ones) were installed. The floor and roof structures were reinforced, including the use of new stainless-steel reinforcements. A new floor covering was installed, steel handrails with integrated lighting for visually impaired passengers were added, the seats were reupholstered, interior panels were renewed, and door drives were replaced. The interior and exterior lighting was also completely replaced with LED technology. These changes also resulted in a partial redesign of the front of the vehicle. Combined with a new, attractive blue-and-black livery, the overall appearance of the trams was significantly refreshed.



Comparison of the appearance of the Škoda 16T tram before and after modernization.

The bogies were refurbished separately, including the use of new rubber-metal elements to improve suspension characteristics, and the braking system was comprehensively overhauled. The entire hydraulic system and all cabling were also replaced. Other changes included, for example, replacing the wheelchair ramp (the original failure-prone electric platform was replaced with a manually operated one), replacing the pantograph and exterior mirrors, and upgrading the passenger information system to a modern generation.

An important part of the modernization was also the replacement of the original ventilation units with a full air-conditioning system. The installation of air-conditioning units was made possible by a reduction in the overall vehicle weight, despite the previously implemented structural modifications. This weight reduction was primarily achieved through the use of new electrical equipment from ENIKA, which replaced the original asynchronous traction system (with IGBT components) supplied by Škoda Electric.

The scope of supply included two traction converters of type ENI-F600/200X.3, whose parameters were adapted to the refurbished asynchronous traction motors from Škoda (4×95 kW). To supply the air-conditioning units, a new auxiliary power converter ENI-PT600/24/AC/50 was delivered, with a DC output of 10 kW for the onboard network and an AC output of 40 kVA (32 kW) for supplying the air-conditioning systems. In this application, the AC part of the converter is still based on IGBT components, while the DC part already uses SiC components.

In the driver's cab, a new touch display ENI-PO1024/768/2 was

installed, presenting operational data in the form of modern graphics. It also serves diagnostic purposes.

The scope of supply also included the complete vehicle control system (TCMS) with the main control unit ENI-CPU/16T. This unit is also responsible for data acquisition and communication with selected vehicle subsystems (doors, HVAC, sanders, wipers, etc.).

The objectives defined for the modernization of the Škoda 16T trams were fully achieved. At a cost corresponding to approximately one-third of a new tram of comparable capacity, a comprehensive rebuild was carried out, extending the service life of the vehicles by at least 20 years. The trams feature improved running characteristics and high operational reliability.



Interior view of the modernized Škoda 16T tram.

(photo credit: MPK Wrocław)

