INSPIRED BY MOVE

The New Evolution Series Products

LOW-FLOOR TRAMS
MODERN CITY-FORMING DESIGN

INTERIOR DESIGN: respecting high comfort of passengers.

MODULAR STRUCTURE: exchangeable elements and other applied production technologies do not only facilitate the repair of the main components.

HIGH SAFETY: of passengers and driver.

HIGH OPERATING RELIABILITY: low operating costs.
MODERN DIAGNOSTICS EQUIPMENT

with operation and service diagnostics, the software used has been designed with respect to easy and safe operation and at the same time for the maintenance personnel.

POSSIBILITY OF QUALIFIED TRAINING

for operators by the manufacturer.

TECHNICALLY, TIME AND FINANCIALLY EFFICIENT

repairs after minor collisions.
COMFORT FOR DISABLED PASSENGERS
There is sufficient space left in the low-floor part of the vehicle for disabled persons. There is an extending, or tilting, platform installed by the first double-wing door for easier boarding in areas where minor differences in elevation need to be overcome. In the immediate vicinity, there is an area for fixing the wheelchair. The area for strollers and bicycles can be designed based on customer specification near the vehicle’s double-wing doors.

DRIVER COMFORT
The driver station design, along with the materials used, creates a good working environment. The general design of the station facilitates vehicle steering by the driver. The design respects the passive safety of the driver during collisions. The space in the cabin has been designed with ergonomically arranged control and communication elements in order to provide the driver with the best working comfort and overview. The driver seat is fully adjustable, both vertically and longitudinally, based on the driver’s needs. Thanks to the unobstructed view, the driver can safely monitor the operation and the course of events inside and outside the vehicle.
In vehicles equipped with a camera system, the driver has the possibility to optionally display images on two monitors. The spacious driver cabin is equipped with an air conditioning unit.

MODERN INTERIOR
The interior has been designed with respect to both high passenger comfort and easy maintenance. Comfortable seats, easy access through the vehicle and the option to equip the entire vehicle with air-conditioning units are a matter of course. Easier passenger orientation is facilitated by a synoptical information system. The number and layout of handles and grab bars provides safe transportation even to standing passengers. The floor is made of nonslip, water resistant material. ŠKODA trams can be equipped with intercom or digital information panels by the operator upon customer request.
BRAKES

The main driving brake is the electrodynamic recuperation brake. The electromagnetic brake is automatically able to work even in case of the trolley voltage outage. All bogies are equipped with rail electromagnetic brakes which are engaged in case of emergency or safety braking. There are mechanical disk passive brakes with electro-hydraulic control installed on the traction bogies, which are designated for the final stopping of the vehicle, as well as for parking. If the vehicle is equipped with the idle bogie, there are active mechanical disk brakes with electro-hydraulic control installed on such bogie with undivided disks located outside the wheels. This design enables easy access for the purpose of disk replacement. The drive and brake control system is equipped with anti-slip and anti-skid regulation. Braking is fluent without impacts.

INFORMATION AND CAMERA SYSTEM

There is an information panel displaying the line No. and point of destination on the vehicle front, a panel showing only the line No. on the rear end, side information panels showing the main junctions and point of destination outside both end sections on the door side, and the line No. and sequence of individual stops inside the vehicle. All information panels are controlled by the board computer of the information system. There are three interior boards installed in the passenger compartment. One board is located under the front section ceiling and the other two under the ceiling of the second and fourth section. These boards are used for providing information to passengers. The vehicle is equipped with an audio information system with digital recording on a memory medium with the possibility of direct intervention by the driver using a microphone. For better safety, it is also possible to equip the vehicle with a camera system that provides the driver with a better overview of the course of events inside and outside the vehicle.

WHEELS

The wheels are spring loaded. The rims can be replaced without removal with minimum operational requirements and limited disassembly of other units. The first axle wheels can be fitted with the flange lubrication system upon customer request.

CONTROL AND ACTUATION CIRCUITS

The microprocessor system gathers information from the control elements and the operator's commands. It processes this information and transmits signals to the traction converter and to the brake system. The system is equipped with diagnostic functions. The individual control units communicate along the CAN busbar. The safety circuits and functions are provided by hardware.

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**VEHICLE BODY**

The section bodies consist of the underframe, side, ends and roof. The body frames of the individual sections are made of steel with higher resistance to corrosion and are painted with effective protective coatings. The external shell of the roofs and sides is made of stainless steel plates. The side plates are affixed and connected with the frame by short welds in appropriate places. The body parts with the most exposure to corrosion (steps, plinths on the steps and on the floor, parts on the roof) are also made of stainless steel. The front and rear ends have the supporting frames encased in composite parts made of glass fiber.

The design of the connections between the sections, electrical cables and hydraulics enable fast and easy disconnection. The body consists of three or five articulated sections.

- In case of a five-section tram, it consists of two end load bearing elements, two non-bearing elements and a central load bearing element,
- In case of a three-section tram, it consists of two end load bearing elements and an intermediate non-bearing element.

The load bearing elements are placed on traction two-axle fixed bogies. In case of the central load bearing element, it is possible to use a low-floor bogie. The non-bearing elements form the low-floor part of the vehicle with the floor height of 350 mm above the top of rail. They are installed using spherical bearings on the front ends of the end load bearing elements and central element.

**BOGIES**

The vehicles can have all traction bogies or an idle central bogie. The traction bogie is a twin-axle bogie with an internal frame. The frame has an H-shape and is made from welded steel plates. It consists of two side sills and a crossbar. The bogie frames are placed on a primary spring system that comprises pairs of rubber-metal elements. Each axle can be driven by its own traction engine fixed to the frame cross member, in parallel with the axle. The secondary spring system comprises steel bolt springs, complemented with rubber elements and vertical and transverse hydraulic dampers. The traction bogie is equipped with an electrodynamic brake, electro-hydraulic disk brakes and electromagnetic rail brakes.

**DOORS**

ŠKODA trams are equipped with sliding double-wing doors in the low-floor part of the vehicle. There can always be one sliding single-wing door installed in the front and rear section based on the tram layout. All doors are equipped with effective gripping protection. They can also be equipped with an “optical latch”, registering passenger movement in the door area (in case of door control by passengers), as well as with the buttons for opening upon demand. Each door is equipped with a light and audio alarm system, notifying passengers of closing.

**THE CONTROL CIRCUITS ENSURE:**

- blocking of vehicle departure in case of open doors
- protection against passenger gripping
- option for passenger control when opening the door
- pre-selections

**ELECTRIC EQUIPMENT**

The electric equipment has been designed for the optimally efficient operation of the vehicle, while fully utilizing the recuperation option. The electric equipment is installed in easily accessible compact containers on the vehicle roof. The vehicle is driven by fully closed asynchronous traction engines which are supplied from the microprocessor-controlled IGBT traction converters. The traction converter is a compact unit that contains the charging, protection and voltage measurement circuits, as well as the input suppressor and filter. There is a line contactor on the input of each converter, enabling galvanic disconnection of the converter. The traction converter enables recuperation of the braking energy back to the mains. If the energy during braking cannot be absorbed by the traction mains, i.e. the recuperation is not desired, a portion of it is preferentially used for supplying the auxiliary appliances in the vehicle and a portion of it is then wasted in the brake resistor. The traction converters are supplied through a high-speed switch. The converter of auxiliary drives consists of the input part, primary converter, separation transformer, output converter and output part. The input part ensures connection of the converter to the trolley voltage via contactor, fuse and input filter. The main part of the converter is divided into two sections, while each supplies the respective group of auxiliary drives (fans of traction converters, warm-air furnace, air-conditioning, ventilation units). In case of a failure of one section, there is a backup supply ensured from the other section (with limited output). The auxiliary drive converter container also contains the automatic transformer for supplying the single-phase output (socket for cleaning).
### Main Technical Parameters

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>03 T</th>
<th>06 T</th>
<th>10 T</th>
<th>13 T</th>
<th>14 T</th>
<th>16 T</th>
<th>19 T</th>
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<tbody>
<tr>
<td>% of Low-Floor Level</td>
<td>approx. 50</td>
<td>approx. 70</td>
<td>approx. 50</td>
<td>approx. 50</td>
<td>approx. 50</td>
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<td>Number of Sections</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
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<td>Bi-Directional Vehicle</td>
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<td>Yes</td>
<td>No</td>
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<tr>
<td>Axle Arrangement</td>
<td>Bo’Bo’</td>
<td>Bo’2’Bo’</td>
<td>Bo’Bo’</td>
<td>Bo’Bo’ Bo’Bo’</td>
<td>Bo’Bo’</td>
<td>Bo’2’Bo’</td>
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<tr>
<td>Gauge (mm)</td>
<td>1,435</td>
<td>950</td>
<td>1,435</td>
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<tr>
<td>Length Over Couplers (mm)</td>
<td>21,150</td>
<td>30,590</td>
<td>20,130</td>
<td>31,060</td>
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<tr>
<td>Body Width (mm)</td>
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<td>2,460</td>
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<td>Maximum Speed (km per hour)</td>
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<td>70</td>
<td>70</td>
<td>70</td>
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<td>Voltage (V)</td>
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<td>Air-conditioning – Driver Cabin</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<tr>
<td>Air-conditioning – Passenger Compartment</td>
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<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Transport Capacity</td>
<td>41t+166</td>
<td>42t+238</td>
<td>42t+170</td>
<td>68t+201</td>
<td>69t+210</td>
<td>69t+210</td>
<td>51t+241</td>
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<tr>
<td>(Sitting + Standing: 8 persons per m²)</td>
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<tr>
<td>Longitudinal Body Strength (kN)</td>
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<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>400</td>
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<tr>
<td>Height of Low-Floor Part Above Top of Rail (mm)</td>
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