

THREE-SECTION ARTICULATED LOW FLOOR TRAMCAR ŠKODA-INEKON LTM 10.08



ŠKODA DOPRAVNÍ TECHNIKA
INEKON GROUP



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ŠKODA - INEKON three-section low-floor articulated tramcar model LTM 10.08 belongs thanks to its design, conceptual and technical features to the top level of municipal light rail vehicles, and complies with the present trends of mass transit. Asynchronous traction motors, and voltage alternator based on IGBT technology with regeneration of braking power digitally controlled by computer reduce the required power consumption and maintenance costs.

The car meets the requirements of both the conventional in-street traffic and light rail operation; it suits operation in tunnels. The middle low-floor car section makes possible easy boarding and exiting of disabled passengers at station level. A folding platform facilitates transport of persons on wheelchairs or with perambulators.

General Description

The LTM 10.08 tram is a three-section articulated car with two traction non-revolving bogies under the end car sections, with the middle car section suspended in between the former and connected therewith in a revolving way. Transitions between car sections are designed via segment turntables and covered by the transition bellows, flexible walls, and ceiling.

The middle section is designed with a floor elevated 350 mm above the rail top, covering 50 % of the car floor area. The remaining part of the floor above the bogies is designed at an elevation of 780 mm above the rail top.

Car Design

The car is designed so as to provide for both single-ended (one-directional) and double-ended (bi-directional) options, incl. multiple control of coupled cars in trainsets.

Car bodies of different sections are made of light steel frames welded from enclosed and bent profiles and materials with increased resistance against corrosion. External linings of side walls are pasted, and their windows are pasted, as well. Internal linings of side walls are made of plastic panels, all recyclable materials.

Electric Equipment

The car is designed for overhead line voltage of 600 V DC and 750 V DC. The electric equipment is mounted in containers on the car roof, with the controlling computer mounted in the driver's cab partition wall. The supply line voltage circuit rated 600 V DC and auxiliary voltage circuit rated 24 V DC and 3x400 V AC/230 V AC circuit are mutually galvanically separated. The cables used are designed for increased thermal resistance, and do not contain any halogens.

Asynchronous traction motors are supplied by IGBT voltage inverter, controlled by a microprocessor with complex diagnostics. Motors are vector operated. The car is controlled by means of hand controller.

The board auxiliary circuits are supplied from the static converter rated 600 V DC with outputs rated 24 V DC and 3 x 400 V AC/230 V AC, 100 Hz, the latter to feed asynchronous motors.

The car is equipped with maintenance-free battery rated 24 V DC 240 Ah.

Car Interior, Driver's Cab

The spacy interior may be walked over throughout its length, and its design has considered transport of wheelchairs used by disabled persons. The seat brackets mounted on the car body side walls, floor covering without any protruding spots and provided with anti-slipage surface make possible automated cleaning. Comfortable upholstered seats are provided with removable and easily washable covers.

Two double-leave doors in the low-floor section designed with a clear width of 1300 mm, each, and two single-leave doors with a clear width of 700 mm at the car ends ensure smooth and easy boarding and exiting of passengers. All the doors are sliding plug type, electrically operated, opened centrally by the driver or separately by passengers using push-buttons mounted both inside and outside the car.

The car is heated by electric heating elements mounted in the car side wall. The car is equipped with ventilating sets mounted on the roof; it may be additionally ventilated by folding side windows.

The passenger information system is based on sound and visual information. The information panels are controlled by the board computer. External blind screens are designed at the car front, rear, and side. If required, there may be installed other information systems, too.

The driver's cab with maximum possible view out and clear overview of the entire car interior complies with ergonomic and safety requirements; it is separated from the passenger compartment by means of a partition wall with sliding door. The cab is equipped with an air conditioning unit mounted on the roof and a heating unit rated 6 kW.

Car ecology

Savings of electric power, recyclable materials and low noise level are environment - friendly.

Bogies with 1435 mm and Larger Gauges

Non-revolving bogies are of two-axle type designed with the primary and secondary suspensions. Axles are powered separately by asynchronous and self-ventilated traction motors, fully suspended, mounted in a crosswise direction in the bogie. The torque is transmitted by means of flexible coupling to the two-stage axle gearbox. Wheels are suspended and allow for wear up to 80 mm of their original diameter.

The internal H-shaped bogie frame provides easy access to check and maintain the wheels, adjust the track brakes, inspect hydraulic shock absorbers and sensors without any dismantling operations required to be made with a completely assembled car.

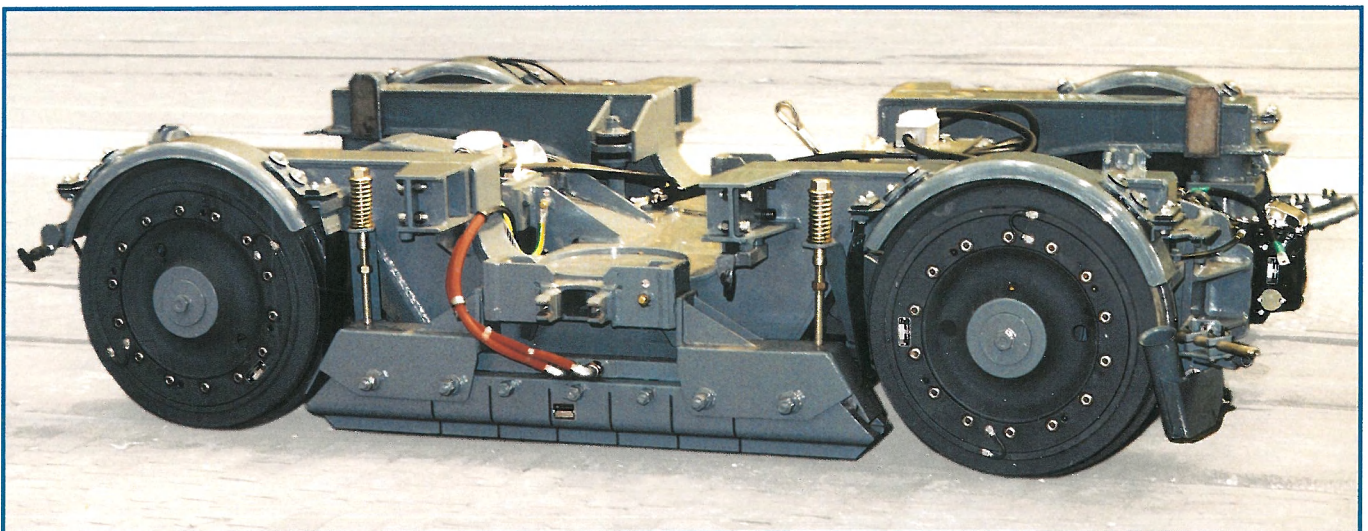
Bogies with 1000mm Gauge (namely 1009 mm, 1067 mm)

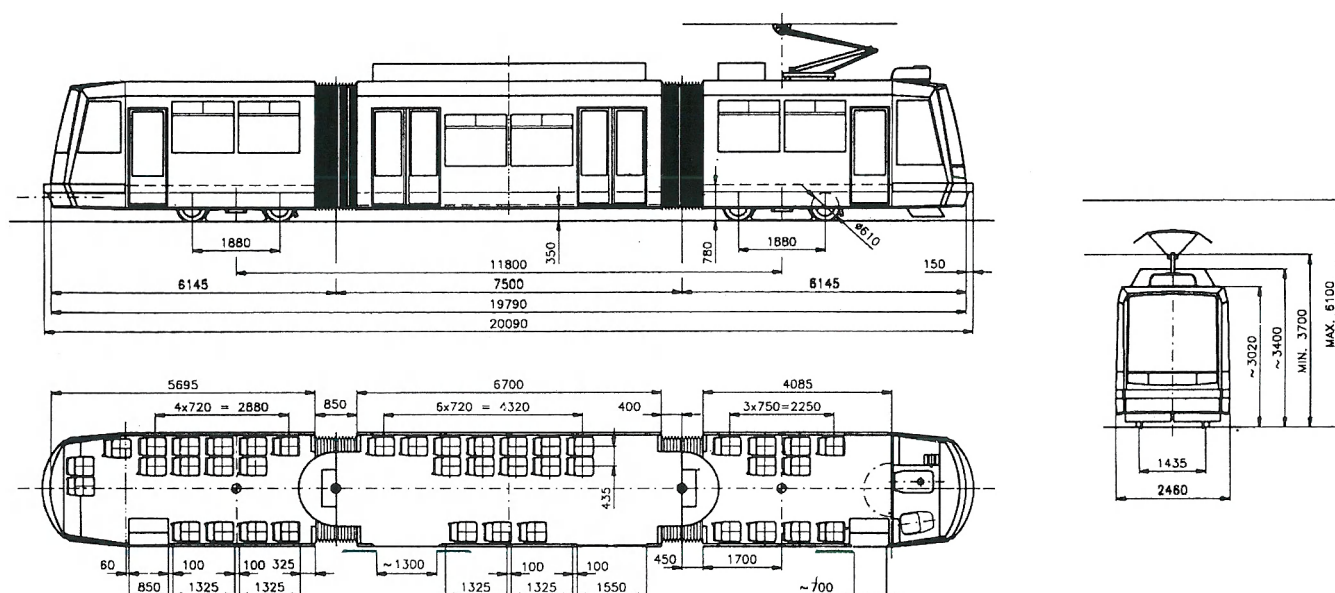
are designed with an external frame, and all other components similar to those mentioned above.

Brakes

The tram is equipped with three independent brake systems working in the operating, emergency, safety, and locking modes.

- Electromagnetic brake operates as the main brake. When braking, it brings the regenerating power back to the line, or wastes the same in the brake resistor. The brake is designed with an output of 750 kW.
- Mechanical disc brake with electromagnetically operated spring. When working in the operating mode, it is designed with the slip protection and weight correction. It ensures completed braking operation of a fully loaded car up to its stop, and parking on a gradient 8,6 %. It substitutes the electrodynamic brake in case of its failure.
- Rail brake fulfilling the task of the safety and emergency brake. The car is designed with four magnetic rail brakes designed with an attracting force of 4x70 kN.





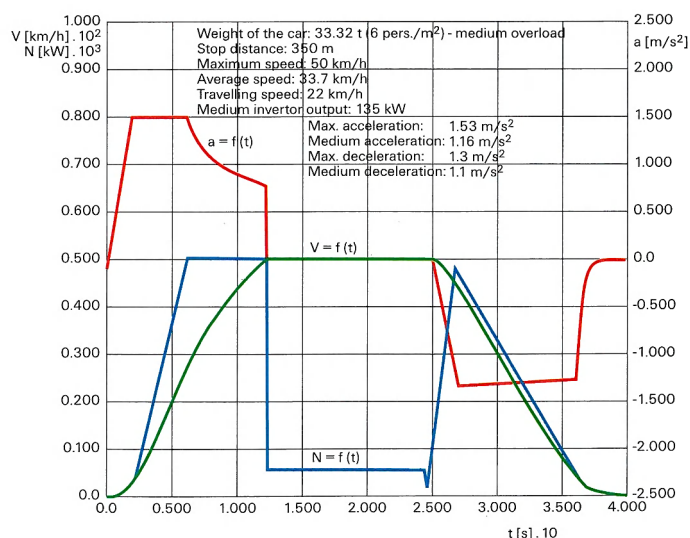
Basic Technical Data

Wheel arrangement	Bo Bo
Maximum operating speed	70 km/hr.
Design speed	75 km/hr.
Length of car body	20 090 mm
Width of car body	2 460 mm
Height of car body from rail top	3 460 mm
Height of floor from rail top:	
- at the lower section	350 mm
- at the elevated section	780 mm
Wheel diameter - new / worn	610 / 530 mm
Weight of empty car	24 200 kg $\pm$ 5%
Weight of maximum loaded car, with driver	39 740 kg
Continuous output	4x85 kW
Starting output	500 kW
Brake maximum output	750 kW

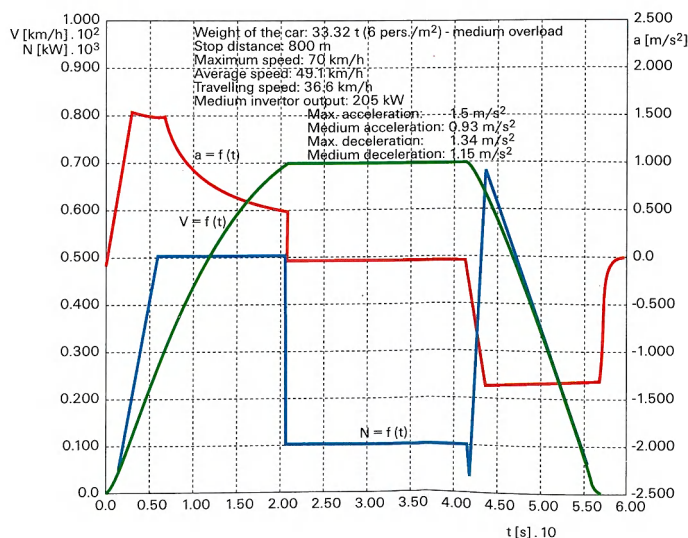
Transport Capacity

No. of sites	41
No. of standees	
• at medium occupancy of 4 pers./sq.meter	90
• at normal occupancy of 5 pers./sq.meter	113
• at maximum occupancy of 8 pers./sq.meter	180
Total occupancy	
• medium	131
• normal	154
• maximum	221

Car in street operation



Car in light rail operation





ŠKODA DOPRAVNÍ TECHNIKA s.r.o., producer of the tramcar, is holder of Quality certificate ISO 9001.



In 1995, the tramcar design was awarded certificate to use the sign of "1995 outstanding design" by the Design Center of the Czech republic.



LTM 10.08 tramcar was awarded the Golden Medal at the International Engineering Fair, Brno, in 1997.





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