3.1.2 Technical characteristics

The tram carriages have to meet following technical characteristics:

Table 1

3.1.2.1	**Carriage type**	**4-axis** **2-section**
3.1.2.2	**Mass a size characteristics**	
1)	Measurements of the tram carriage with a new bandage	
	- carriage length (wagon box), mm, maximum	21000
	- carriage width (chassis), mm	2200±25
	- heigtht from the top of the rails to..., mm carriage roof carriage, measured by the designated equipment on the roof (except of the collector) carriage with a folded collector	 3150 3600 3600
	- heigtht from the top of the rails to the floor, mm, maximum in the entrance sections above the engine chassis	 370 520

2)	The mass of the empty carriage, t, maximum	24
3)	Maximum static load by one axle to the rails, t, maximum	10
3.1.2.	**Chassis characteristics**	
1)	Type and number of chassis, pcs., maximum	Propelled pivoting chassis – 2
2)	The chassis base, mm	(1800…1900)±1
3)	Ride height (except of the rail breaks, under maximum static load with maximum worn out bandages, mm, minimum	110
4)	Size of the worn out bandage to the side, minimum, mm	30
5)	Railway gauge by maximum unification of the chassis construction, mm	1000
6)	Diameter of the wheel, mm	$630_{-0,5}$
7)	Type of the transmission	2-speed, cylindrical, with involute engage,
8)	General relay number of the reduction gear	6,85…6,95

3.1.2.4	**On-road performance of the carriage**	
1)	Maximum carriage construction speed, minimum, km/h	82
2)	The rate of acceleration altering during the start and the rate of deceleration during the breaking of the empty carriage on a horizontal section of the track, m/s^3, maximum	1,5
3)	The acceleration time of the carriage with all motorized axis´s from standing to the 40 km/h with a nominal load and a voltage in the contact electric network, while moving ont the straight-line horizontal section of the tracks, deviating maximum ± 0,3% on the dry and clean rails	11
4)	Maximum braking distance of the carriage with nominal load, while decelerating from the speed 40 km/h, m - service braking - emergency braking	 60 30
5)	Specific energy consumption of the traction during the nominal calculated speed 25 km/h and nominal load in W/hour	60
6)	The ratio of the motion fluency by the nominal speed and load, point, maximum	3,5

3.1.2.5	**Main electric parametres**	
1)	Engine	
	- number, pcs., maximum	4
	- power, KW, minimum	50
2)	Collector voltage, V	550
3)	Voltage oscillation, V	400…720
4)	Collector device	Half-pantograph type with an electric drive
5)	Control chains voltage, V	$24^{+6}_{-7,2}$
6)	Tractive engines control	Electronic
7	Accumulator batteries capacity, A/h, minimum - control unit - autonomous emergency traction	 160 160
8)	Number of accumulator bateries, pcs, minimum - control unit - autonomous emergency traction	 2 4

3.1.2.6	Carriage characteristics	
1)	Capacity, persons, minimum: nominal (5 persons/m^2) maximum (8 persons/m^2)	 106 170
2)	Seats, pcs., minimum	20
3)	Seats for the physically disabled passengers, minimum	1
4)	Total number of the doors on the one side of the carriage while both-way traffic, pcs., minimum	4
5)	Total number of the double doors on the one side of the carriage while both-way traffic, pcs., minimum	4
6)	The dimensions of the double doors, mm, minimum, height width of the doorway	 2100 1300

7)	The dimensions of the wagon box and construction of the chassis must secure the safety clearance in accordance with the requirements SNiP 2.05.09 during the passage of the minimum radius of the curved rail tracks, m, minimum	On the city territory and the intercections	20
8)		On the turning points, junctions, service tracks and the tracks situated in the territory of a factory or a depot.	16
9)		On the „S“ curved tracks with a straight section minimum 3 m	16

D. Requirements to the chassis

D.1 The construction of propelled pivoting wheeled chassis must support 100 % of the low-floor tram carriage.

D.2 The component scheme of the chassis must presume the usage of the external performance cylindric reduction gear.

D.3 Chassis weight, kg, maximum,.....5000

D.4 The difference of the wheels diameter, mm, maximum 0,5

D.5 Size measurements of the chassis

- length, mm, maximum 2516
- width, mm, maximum 2500
- height in the central part ..... по п. Г.27
- diameter of the described circumference, mm, maximum 3320

D.6 The chassis has to be of a frame construction with a solid frame.

D.7 The chassis has to include two axis, axis with the pair of wheels must be in accordance with GOST 6144.

D.8 Every pair of wheels must be equipped with an individual tractive asynchronous-type engine, providing a performance both in a tractive and a generator regime. Size and conjunctive measurements of the engine shall be agreed in a separate document.

D.9 The type of a tractive transmission – cylindrical reduction gear. The transmission of the torque from the tractive engine to the main reduction gear shaft has to be realized via compensating coupling.

D.10 The tractive engine must have a bearing frame suspension. The tractive reduction gear must have a frame bearing suspension.

D.11 The wheel the chassis must have the concentric-situated buffers. The wheel construction must support a possibility of the assembling-disassembling of the bandage and the hub, using the technology of the “hydrothrust“.

D.12 The bandages of the wheels must meet the requirements of GOST 25712 and GOST 5257 as to the profile, chemical composition and mechanical characteristics.

D.13 The deviation from the sequence of the same wheels of the front and back axis of the chassis must not exceed ±2 мм.

D.14 The chassis must have a two stage bogie-swing suspension: axel-box and central.

D.15 The quenching of the wagon box oscillation must be realized with the help of the hydraulic buffers. The springing must be of two levels. The first level of the springing should be between the axis and chassis frame, the second level – between the chassis frame and chassis girder.

D.16 Total vertical rigidity of the first level of one chassis suspension must be 7 280±730 N/mm. Total vertical rigidity of the second level of one chassis suspension must be 1500^{+200} Н/мм.

D.17 The main buffer element of the central bogie swing suspension are the cylindrical squeeze spiral springs. Together with the springs must be established additional rubber buffers for quenching the high frequency oscillation. Quenching the low frequency oscillation of the springs in a vertical direction must be realized by the hydraulic buffers of the oscillation.

D.18 Axle-box suspension must be worked out in two variants of the construction performance:

- 1st variant (priority one) based on the rubber-metallic buffers of the V-figurative form.
- 2nd variant (alternative one) based on the cylindrical steel squeese springs, established in parallel with the rubber-metallic buffers – type Konuslager or an analogic one.

D.19 Every chassis must be equipped with a load indicator, performing the role of the regulator of the brake forces depending on the information about the carriage workload.

D.20 Every chassis consists of the girder equipped with a center plate, enabling to fixing the wagon box of the carriage to the chassis. The centre plate must enable the rotation of the chassis with regard to the wagon box of the carriage in a horizontal plane during the inscription of the carriage into the radial tracks parts.

D.21 The parking brakes must brake based on the function of the spring accumulator of the brake gear and must support the manual unbraking.

D.22 The construction of a disk brake must support the possibility to regulate a clearance between the brake blocks and brake disk in the established range.

D.23 Suspension of a rail brake must support the regulation of the clearance between its block and the top of a track within the range of 8…12 мм.

D.24 In case of an emergency derail of the chassis, when using a lifting force to the wagon box of the carriage, the construction of the chassis must presume having the elements supporting lifting of the chassis and limiting the extension of the second level suspension strings, as well as a system preventing the hydraulic quenchers of the oscillation from being damaged.

D.25 There must be connections enabling the assembly of devices for spreading sand to the rails on the chassis.

D.26 The propelled pivoting chassis, situated under the first section of the carriage, must be equipped with an impingement plate, supporting a cleaning of the rail track off the garbage items of the size 100×100×100 (mm) while moving the carriage.

D.27 Connecting spots of the chassis and wagon box must be agreed in a separate document ensuring the maximum height of the floor in the highest part does not exceed 520 mm and following lowering of the floor level by a maximum 4°30' gradient.

D.28 The chassis composition must enable free space for constructing the passage in an above-chassis zone of the following width:

- 744 mm – when turning the chassis by a 16^0 angle;
- 944 mm – when turning the chassis by a 14^0 angle;
- 1020 mm – when turning the chassis by a 10^0 angle.

D.29 Propelled pivoting chassis must be interchangeable and their construction must permit mutual reassembly and manipulation.

D.30 Metallic and non-metallic inorganic coating must be in accordance with GOST 9.301. The conditions od the exploitation У1 in GOST 9.303.

D.31 All metallic coatings being a subject to the paint coatings must be prepared in accordance with GOST 9.402.

D.32 The conditions of the exploitation of the paint coatings as to the weather conditions impact are contained in У1 of GOST 9.104, as to the specific environments impact – 4 in GOST 9.032. The class of coatings - □ in GOST 9.032.

Na Balkáně 61
582 63 Ždírec nad Doubravou
Czech Republic

Tel.: +420 739 337 817
E-mail: info@zimatechnik.cz
Comp. Reg. No.: 49825496