MAIN FEATURES

ENVIRONMENTAL ADAPTABILITY

- The tram can be operated safely and reliably within a temperature range of -35 ~ +40.
- The minimum railway curve radius is 19m in C curve and reverse S curve.
- The vehicle's maximum gradeability is 70%.
- The Min. axle load is 10 tons. The tram can be operated on rails that are directly laid onto a road surface
- Max. emergency braking deceleration can reach up to 2.8m/s2. Emergency braking distance is less than 98m at a speed of 70km/h; operates safely in a multi-modal urban environment
- Charging at stations allows our low floor tram to store energy, which in turn enables it to operate catenary-free on local routes. In addition, our fuel cell/supercapacitor tram can also operate catenary-free on the whole line, which allows it to suit a range of different urban landscapes.

LARGE PASSENGER CAPACITY

- Our modular design allows flexible configurations of two to nine cars, with a subsequent passenger capacity range between 197 to 786 people. Cars can be coupled to cope with unexpectedly large passenger flows.

SAFETY AND RELIABILITY

- RAMS standard EN 50126 is implemented at all stages of the development process, from design to manufacture, accessory procurement, testing, etc.
- Design, verification and test of car body strength are based on En12663.
- Design, verification and test of bogie frame strength are based on En13749.
- Design and verification of crashworthiness are based on EN15227; the front of the tram has been designed to ensure that pedestrians cannot fall under the vehicle if a collision occurs.
- Design, verification and test of braking system are based on En13452.
- Each vehicle is fitted with a fire alarm system, which is designed to meet international standard DIN 5510.
- High safety redundancy, a four-module 100% low floor tram can continue normal operation even with 1/3 power loss.

IMPROVED PASSENGER COMFORT AND USER-FRIENDLY DESIGN

- Our tram is designed to be flexible, and includes various options available for the front end of the vehicle. Large opening side doors and large windows throughout the cars give our trams good permeability and light transmission. Our trams can be fully customized, including all interior equipment.
- In accordance with ISO 3095, exterior noise emission levels do not exceed 55dB when vehicles are static; are no higher than 75dB when vehicles accelerate at 30km/h, and no louder than 79dB when vehicles operate at a constant speed of 60km/h. In accordance with ISO 3381, internal noise levels do not exceed 62dB under static conditions, and are no louder than 75dB when vehicles operate at constant speed of 60km/h .
- The vehicle includes many benefits for the comfort of passengers, including low impact during braking deceleration, low transverse force when negotiating curves, and low vibration levels when passing through a track switch.
- The driver's cab benefits from a large windscreen, independent air-conditioner, rotating seat, user-friendly operating console and related communication devices. An additional seat, filing cabinet and coat hooks are just some of the extras that can be added to suit our customers' individual needs.
- A transition plate by the side door in passenger compartments allows wheelchairs to get on and off the vehicle easily. Inside the cars, a dedicated space and fixed device can be used to secure the wheelchair during travel. Designed to meet VDV7011, the gradient of the inside floor in passenger compartments is no larger than 6% to allow convenient access for passengers with reduced mobility.
- Passenger compartments benefit from high-power variable frequency air conditioning and electric heating.
- WiFi is provided throughout the cars.

WORKING WITH YOU TO
CONNECT THE WORLD

CRRC

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CRRC

LOW FLOOR **TRAM**

Green, intelligent, passenger-focused urban transport

Max. gradeability can reach to **70‰**

Min. axle load **10t**

OVERVIEW

CRRC's low floor tram is the most technologically advanced product of its kind on the global market. It is the latest development in our line of products that began with the first generation 70% low floor tram. This was followed by the second generation 100% low floor tram, the third generation 100% energy storage low floor tram, and now the fourth generation fuel cell/supercapacitor hybrid 100% low floor tram.
As one of the world's largest tram manufacturers, we have mastered all core systems and components' technology, such as vehicle integration, lightweight car body, bogie production and catenary-free operation. We have also made significant advances in the technology of energy efficiency features, artificial intelligence, and vibration and noise reduction among other key technologies. Our aim is to provide a safe, reliable, highly functioning and customized transportation solution at a good value.

ENERGY CONSERVATION AND ENVIRONMENTAL PROTECTION

- A Lightweight design is applied to all systems of the vehicle, axle load can reach up to 10t under maximum passenger capacity.
- Regenerative braking allows energy to be fed back into the catenary. Vehicles fitted with a supercapacitor can recover up to 70% energy through regenerative braking.
- Clean energy—our fuel cell/supercapacitor hybrid power 100% low floor tram uses hydrogen as fuel. The resulting waste is water and heat, making this a zero carbon emission transportation solution. The cold air resulting from the exhaust gas from the passenger compartment is used to cool the battery box; heat generated by the fuel cell is used to heat the passenger cars in winter, and 30% of the energy recovered from braking can be used as an emergency power supply.

HIGH INTELLIGENCE

- Vehicle control bus is fully reliable and designed to meet IEC61375 standards.
- The vehicle is equipped with a wireless transmission system that allows data to be uploaded and downloaded between the train network control and a ground server. This system also facilitates monitoring and maintenance of the vehicle's condition.
- Big data processing drives communication between the vehicle and the platform. This allows passengers to receive transfer information and actual traffic conditions in real time.
- Wi-Fi is fitted throughout the cars for the convenience of passengers, providing fast and accurate travel information, as well as Internet access.

LIFECYCLE

- We apply LCC analysis at every stage of development from design, manufacture and accessory procurement, to testing and after-sales services. The ongoing maintenance of vehicles is evaluated at the design and manufacturing stages to ensure the efficiency of our products throughout their lifetime. Our trams are made from standardized, modular and generalized component parts to ensure that these can easily be replaced. The use of mature technology and products for all key systems and parts provides outstanding reliability.

KEY SYSTEMS AND TECHNOLOGIES

BOGIE

Independent wheel technology is adopted. There are two kinds of bogie: power bogie and non-power bogie. The power bogie is composed of framework, wheel set, primary suspension, secondary suspension, traction device, foundation brake device, driving system, flange lubrication device, etc.; The non-power bogie is composed of framework, wheel set, primary suspension, secondary suspension, traction device, foundation brake device, etc. .Two kinds of bogie have basically same structure and completely same interface between carbody.

LIGHTWEIGHT CAR BODY

Carbodies include a lightweight barrel or drum-shaped integral load carrying structure, and can be made in a range of different materials, including all-welded aluminium alloy, stainless steel or composite materials. The design, verification and testing for our carbodies' strength, rigidity and fatigue meet international standard EN 12663. The design and verification of crashworthiness of the car bodies is based on EN 15277.

ON-BOARD ENERGY STORAGE TECHNOLOGY

SUPERCAPACITOR AND BATTERY TECHNOLOGY

Matching design for configuration of super capacitor and power battery is based on full utilization of high power density of super capacitor and high energy density of power battery. Each train is equipped with one set of super capacitor with capacity of 30F and formation of 11-serial & 2-parallel and one set of power battery with capacity of 27Ah and formation of 196-serial & 3-parallel.

SUPERCAPACITOR TECHNOLOGY

The vehicle is equipped with two sets of supercapacitors, each with a capacity of 69.4F and 12.26kW·h of stored energy. Charging can be completed within 30 seconds during station dwell time, and the train can operate for at least 2 kilometers on a single charge.

FUEL CELL TECHNOLOGY

The vehicle is equipped with two sets of fuel cell systems with a power rating of 150kW. The combination of high energy density fuel cell and supercapacitor technology allows the vehicle to operate at a constant speed of up to 40km.Fuel cell technology allows our vehicles to operate caternary free thanks to its high energy conversion efficiency, zero carbon emissions and lack of need for hydrogenation filling.

TRACTION AND AUXILIARY CONVERTER SYSTEM

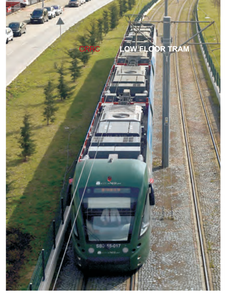
Roof-mounted traction and auxiliary converter system is adopted. Each set of system comprises a highly-integrated traction auxiliary converter, a braking resistance cabinet (integrated in cooling water box) and four traction motors. The traction system is an AC driving system controlled by VVVF in 1C2M mode. Power unit of VVVF inverter is high power electric/electronic appliance IGBT. Water cooling mode, with advantages of reliable technology and low failure rate, serves as cooling mode. Vehicle can continuously operate at low speed through using of traction motors from other power bogies in case of failure on some power bogies or the corresponding converters that supply power to power bogie. Each power bogie is equipped with four traction motors-- three-phase 4-pole squirrel-cage asynchronous motor, self-ventilated cooling mode, with advantages of good air dust filtration function serves as cooling mode.

BRAKING SYSTEM

Our electro-hydraulic braking system is controlled by a microprocessor and consists of a combination of electric and hydraulic braking with five braking modes including service brake, emergency brake, safety brake, hold brake and parking brake. The aforementioned braking functions can also be carried out manually by a driver, through the operational console. The electro-hydraulic braking system is composed of a hydraulic system, brake control system, foundation brake equipment, magnetic track brake system, antiskid system and accessory equipment.

FUEL CELL SYSTEM

Fuel cell technology is a perfect example of new, clean energy. The basic principle is that a chemical reaction occurs between hydrogen and oxygen, which generates power and produces electricity and heat, with zero carbon emissions. A fuel cell system has a high conversion rate, low noise, zero carbon emissions, high energy density and is maintenance friendly. Our design for on-board hydrogen storage is based on international safety and reliability standards.



MAIN PERFORMANCE PARAMETERS

Items	Energy storage type four-module 100% low floor tram	Energy storage type five-module 100% low floor tram	Fuel cell/supercapacitor hybrid power 100% low floor tram
Configuration	-Mc1+M*Tp+Mc4-	-MC1+F1+Tp+F2+MC2-	-Mc1+T+Mc3-
Axle load (t)	≤10	≤12	≤10.5
Gauge (mm)	1,435	1,435	1,435
Min. negotiation radius of vertical curve (m)	500	1000	200
Min. negotiation curve radius (m)	19	20	19
Gradeability	70‰	50‰	50‰
Rated voltage of power supply (VDC)	750V	750V	750V
Length of tram (mm)	37,540	34,800	31,080
Height from floor surface of side door to top surface of rail (mm)	350	350	350
Height of tram(mm)	3,00	3,500	3,500
Width of tram (mm)	2,650	2,650	2,650
Height in passenger compartment (mm)	2,160	2,160	2,160
Width of side door (mm)	1,300	1,300	1,300
Height of side door (mm)	1,950	1,900	1,950
Rigid wheel base (mm)	1,850	1,800	1,850
Wheel diameter (new/old) (mm)	600/540	500/500	600/540
Max. running speed (km/h)	70	70	70
Max. safe reversing speed (km/h)	10	10	10
Coupling speed (km/h)	≤3	≤3	≤3
Acceleration at speed of 0-40km/h (m/s²)	1.3	0.95	1.2
Acceleration at speed of 0-70km/h (m/s²)	1	0.6	0.8
Service braking deceleration (m/s²)	1.2	1.1	1.1
Emergency braking deceleration (m/s²)	2.8	2.5	2.5
Continuous operation mileage (km)			40
Hydrogenation filling time (min)			20

APPLICATIONS OF CRRC'S LOW FLOOR TRAMS AROUND THE WORLD

At the end of 2012, 5 trains of 100% low floor tram order (four-module and whole-line overhead line system) winning the bidding by CRRC in Samsun City of Turkey have been safely operating for 250,000 kilometers so far (average per train).

OVERSEAS CONTRACTS SUCCESSFULLY COMPLETED FOR THE SUPPLY OF OUR LIGHT RAIL VEHICLES FROM 2010 TO 2016 INCLUDE

- Mashhad, Iran – sixty 70% low floor light rail vehicles have been delivered and are currently in operation.
- Addis Ababa, Ethiopia - forty-one 70% low floor light rail vehicles have been delivered and are currently in operation.
- Tel Aviv, Israel – 120 100% low floor light rail vehicles are on order and currently at the design stage.