Tramino

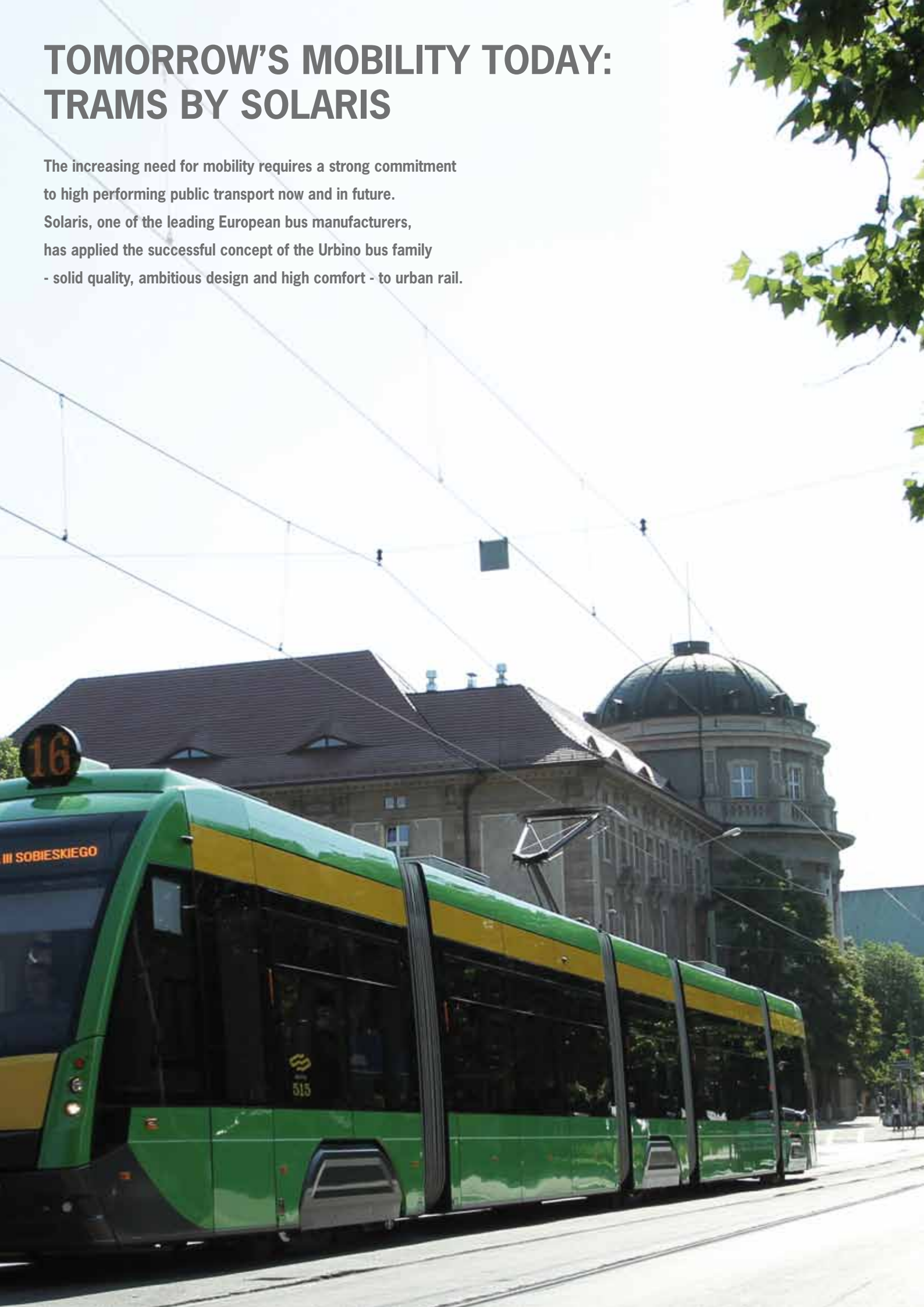
SOLARIS

Power of Enthusiasm


OS. JANA

TOMORROW'S MOBILITY TODAY: TRAMS BY SOLARIS

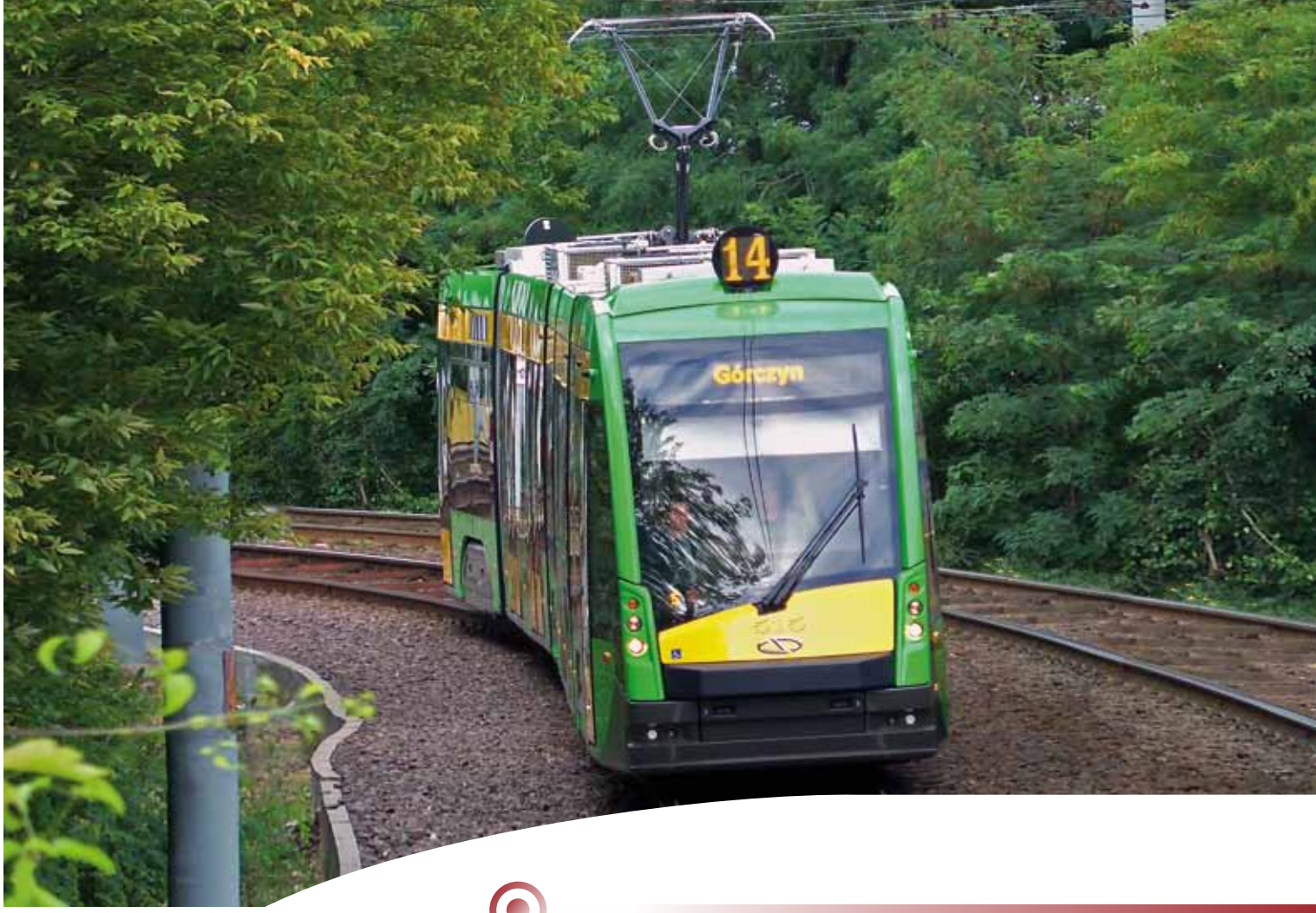
The increasing need for mobility requires a strong commitment to high performing public transport now and in future. Solaris, one of the leading European bus manufacturers, has applied the successful concept of the Urbino bus family - solid quality, ambitious design and high comfort - to urban rail.



TRAMINO FAMILY

The experienced project team has developed a modular tram family. The first member of this family is a modern 100% low floor tram, tailored to the needs of the Polish market. Entrances and the tram's interior are entirely step-free. Solaris trams therefore meet highest standards of easy access for passengers with limited mobility.

The pre-production Tramino is a five-section, articulated vehicle with three bogie modules. The bogies are equipped with classic axle sets which provide smooth riding comfort and a pleasant passenger travelling experience.



TRAMINO POZNAŃ

The Tramino Poznań is based on the pre-series vehicle, taking into account the results of meticulous tests. To tailor the tram to the customer's individual requirements substantial changes have been introduced. Thanks to an increased body width of 2.400 mm and straight lower side panels, the gap between tram and platforms has been minimised. By optimizing bogie frames and body design the unladen vehicle weight was reduced to below 39.5 t. Additionally, aisle width above the bogies was increased from 660 to 750 mm, which is a big advantage. Thanks to 1,500 mm wide double-leaf doors, passengers flows are more efficient than on the pre-series tram.

Optimizing the vehicle's dimensions and unladen weight resulted in an increase in passenger capacity to up to 229, without exceeding the permissible maximum axle load of 100 kN, despite the fact that due to numerous changes requested by the customer the production weight increased to 42.5 t. New solutions applied in the bogies significantly improve ride comfort.

CONSTRUCTION PRINCIPLES

Cutting, bending and connecting of the all steel construction of the car body is performed by Solaris using up-to-date laser-cutting machines, CNC-bending machines, CNC-milling machines and partially by welding robots. Weight optimized side wall and portal structures are being assembled from opened profiles. After welding, corrections and measurements are completed, the car body shells are sandblasted and primed, while the closed profiles receive a special interior protection.

The main roof elements are pre-fabricated aluminium-hardfoam sandwich structures, which are glued to the steel structures of the car bodies after pre-assembly of cabling and HVAC ducts. Likewise all windows as well as all outside sheeting are glued flush with the steel structure. The result is a straight exterior surface with a notably high level of quality.

MECHANICS AND INTERIOR

The interior receives sound and temperature insulation before installation of easy-to-clean and visually attractive plastic elements. The whole underside of the tram is coated with a thick-layer elastic protection paint to ensure additional noise dampening. All materials used fulfill all relevant fire protection norms.

The five body sections are connected with three turning hinges and one turning-pitching hinge, which together with the secondary suspension ensure that the body structures are not loaded with torsion forces resulting from unsuitable track conditions.

In order to achieve effective heating and ventilation both passenger compartment and driver's cabin are equipped with individual air conditioning systems. Additional fans and heaters, automatically controlled by the HVAC system plus a number of tilting windows contribute to a pleasant passenger experience.

Drivers enjoy individually adjustable seats and good visibility. All controls are easily accessible for drivers within the 5/95 percentile, with key functions grouped on touch-screens.

BOGIES

Classic axles, rubber-suspended wheels and externally-longitudinally mounted motor-gearbox-units of the motor bogies allow for a passenger compartment without steps. In combination with primary and secondary suspension, an extended life vehicle time plus good riding characteristics even on relatively bad tracks are guaranteed.

The mechanical connection of the bogies to the body shell underframes is accomplished by a traction rod, shock absorbers plus rubber end stops to limit the turning angle. This concept allows for a defined turning angle while keeping shocks and vibration away from the body shells.

Electro-hydraulic spring-loaded brakes, working as a parking brake, plus two magnetic rail brakes per bogie support the electro-dynamic brake system in critical situations.

In case of malfunctions the spring loaded brakes can be released either by the driver by actuating a push-button or by applying a hand pump locally. This allows for quick reactivation of the tram to avoid service disruptions.

ELECTRIC EQUIPMENT AND VEHICLE CONTROL

Traction inverters, static converters, brake resistors, battery set, pantograph and fast switch are located on the roof of the tram. Each of the four 105 kW asynchronous traction motors is fed and controlled by an individual traction inverter module.

The Tramino Poznań is fully prepared for future installation of supercapacitors, which allow the amount of energy supplied from the overhead power supply to be reduced.

Traction equipment, doors, brakes, HVAC, lighting systems and control elements are connected by a CAN open bus system, which allows for efficient vehicle diagnostics.

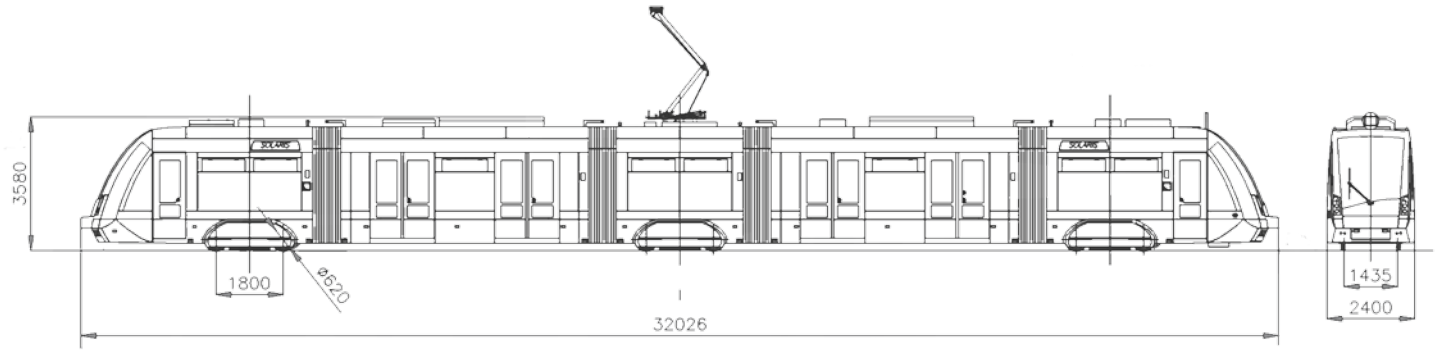
TRAMINO JENA

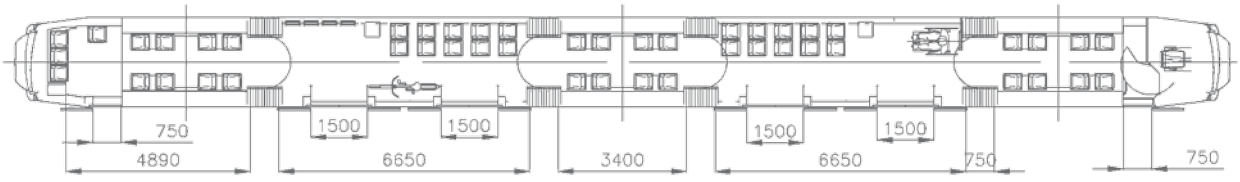
In early June 2011, Jenaer Nahverkehr GmbH chose Solaris as preferred supplier of five trams for Jena, Germany. The contract was Solaris's first international order for trams.

The Tramino for Jena is a low-floor, bi-directional, three-section articulated tram with one bogie under each body section. The trams for Jena will be built to 1.000 mm gauge and will have a body width of 2.300 mm.

Delivery of the vehicles will be concluded by mid-2013.

	standard ●	option ○	**Tramino Poznań**
Total length of vehicle			32026 mm
Width of body shell			2400 mm
Internal width of body shell (maximum)			2195 mm
Height at retracted pantograph			3760 mm
Number of body sections			5
Number of bogies			
powered			2
non-powered			1
Track gauge			1435 mm
Wheel diameter (new/worn)			620 / 540 mm
Minimum horizontal curve radius			18 m
Floor height above top of rail			350 mm
Percentage of low-floor area			100 %
Number of seats (+ folding seats)			48 (+5)
Number of standees (5 passengers/m²)			181
Number of wheelchair spaces			2
Number of doors			
single-leaf doors (width 750 mm)			2
double-leaf doors (width 1500 mm)			4
Network voltage			600 V (+120 V, -200 V)
Number and power rating of traction motors			4 x 105 kW
Traction motors			asynchronous
Design maximum speed			80 km/h
Maximum speed			70 km/h
Air-conditioning			
driver's cabin			●
passenger compartment			●
Tram design life			30 years





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