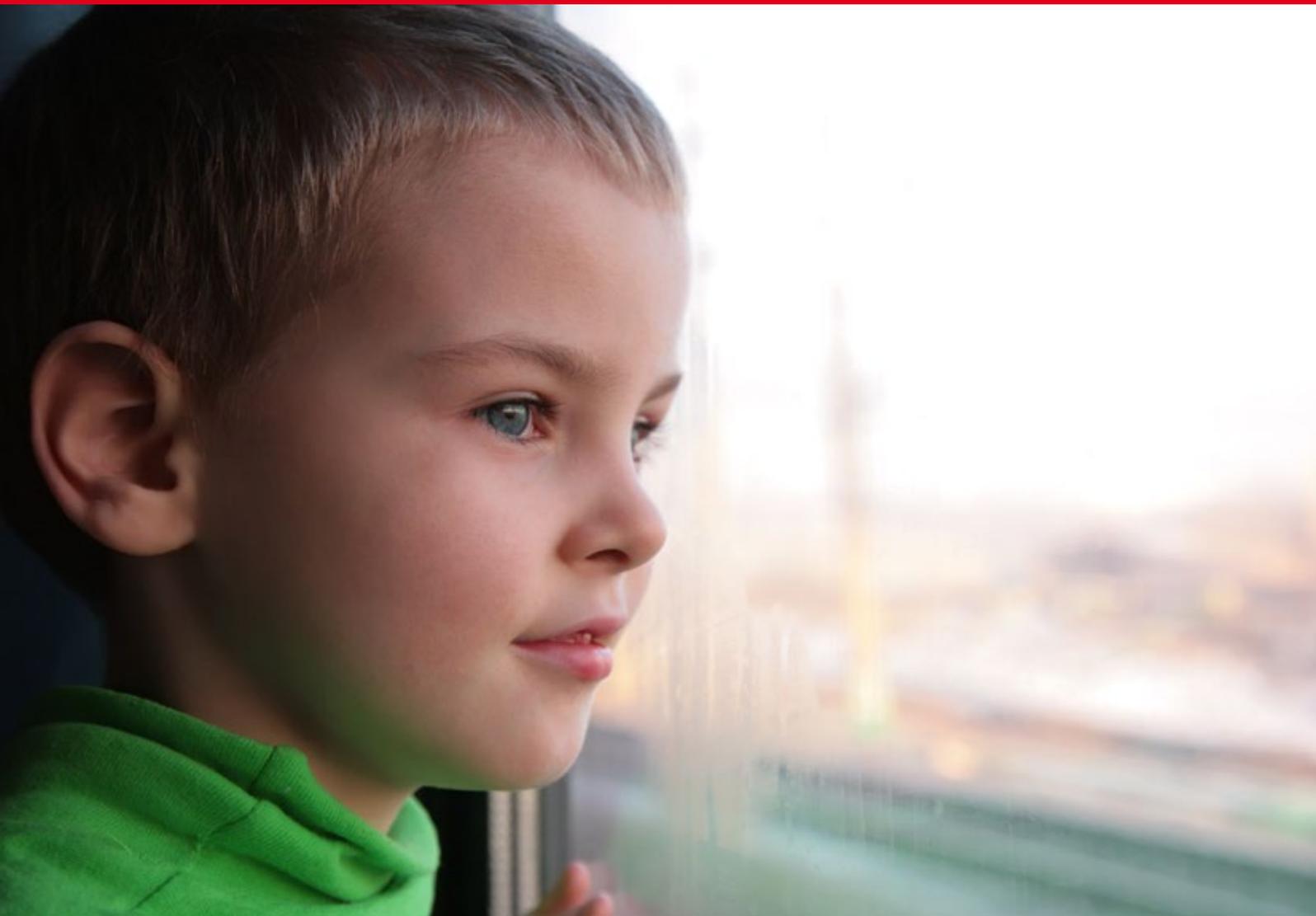


# Trams



Our mission is  
to meet the current and future expectations of  
national and foreign owners of rail rolling stock  
by  
building, upgrading and repairing their vehicles,  
while at the same time maintaining  
the high quality of our products and ensuring users' satisfaction.



# Trams



The modern, low-floor Swing and Twist trams by PESA Bydgoszcz SA have been given a modern, harmoniously looking body and a large glazed surface.

The Swing vehicles are the famous trams that in 2009 were selected by the Warsaw authorities in one of the largest tender for trams in Europe, covering the delivery of 186 units. They have also been chosen by Gdańsk and Szczecin. The Swing was also the first Polish tram to be exported to foreign markets - Hungary and Romania. Its major advantage, which makes it so attractive to potential buyers, is the exceptional price-quality ratio. The new Twist tram is a supplement to PESA's range. In total, since 2009 PESA has manufactured approx. 300 trams.

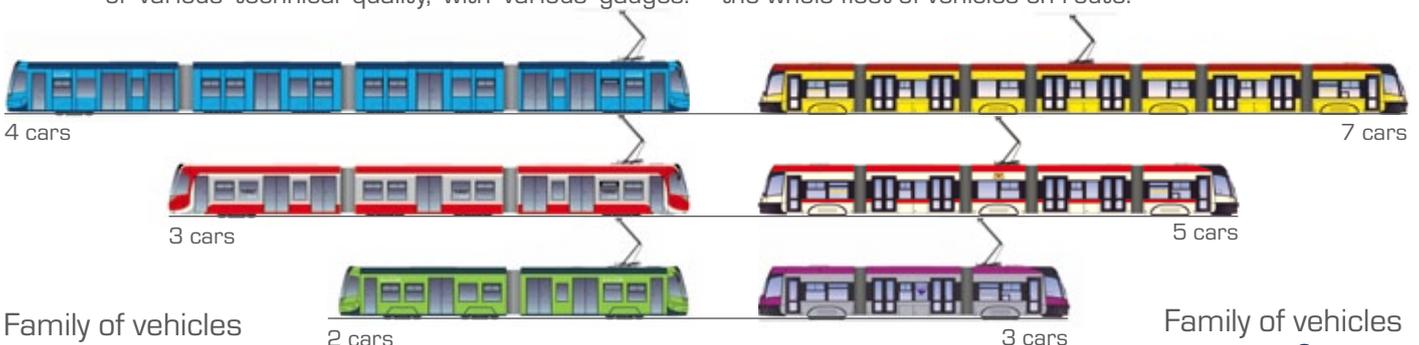
Passenger space in PESA's trams offers comfort and safety. The colours for the exterior and interior of the tram and seats are selected together with the client. The trams are adapted to tracks of various technical quality, with various gauges:

1524 mm, 1435 mm and 1000 mm. Travelling comfort is enhanced by two-stage suspension. Depending on the operator's needs, we offer 2-, 3-, 4-, 5- or 7-car vehicles; one or two-directional.

All trams are built of non-flammable or fire retardant materials, while the installed roll cage and the energy absorbent zone offers additional protection during collisions.

With the modular structure of the trams, both in terms of design, seat arrangement and equipment, the vehicles can be adjusted to clients' requirements. At the client's request we can also install information and advertising systems in the trams.

The use of cutting-edge technologies allows you to optionally monitor the operation of vehicles with on-line diagnostic systems. Using a PC, the depot can monitor and control the basic tram components and safety systems. This offers unmatched opportunities to monitor the technical condition of the whole fleet of vehicles en route.



Family of vehicles  
**TWIST**

Family of vehicles  
**SWING**

The Swing tram offered by PESA Bydgoszcz SA harmoniously combines modern styling and a comfortable interior with durability of the body, as well as ease of use with reliability of operation. The vehicle design is a combination of classic solutions with modernity, while the colour is chosen in consultation with the user and future passengers.

The Swing, with its 100% low floor, is easily accessible for the elderly, disabled and people in wheelchairs. Comfortable access to the tram, also for passengers with prams, is provided by an extendible manual or automatic ramp.







Basic technical specifications of the Swing - one and two-directional	3-car version	5-car version	7-car version
Length (m)	19.37	30.12	43.4
Width (m)	2.3/2.4/2.65	2.3/2.4/2.65	2.3/2.4/2.65
Voltage (V)	600/750	600/750	600/750
Track gauge (mm)	1000/1435/1524	1000/1435/1524	1000 /1435 /1524
Passenger no. (5 people/m <sup>2</sup> )*	from 100 to 130	from 200 to 232	from 280 to 343

\*Depending on the vehicle configuration (arrangement of seats, width, one/two-directional)



Its open-space structure and wide aisles enable smooth exchange of passengers. Their safety is enhanced by the monitoring system.

For greater ease of travelling, a ticket machine and passenger information system (with the possibility of broadcasting advertisements) have been placed inside the vehicle (see the pictures above). The passenger count system facilitates monitoring of the fleet load.

The tram, both in the passenger area and in the driver's cab, is air-conditioned.

Travelling comfort is ensured by the two-stage suspension, while the comfort of the driver is ensured by the ergonomic and modern cab.

Safety is no less important than comfort. The SWING's structural compression durability is 400 kN, and it conforms to the requirements of the crash standard EN-15227. Depending on the operator's needs, PESA offers 3-, 5-, and 7-car vehicles, which is possible with the modular structure of the tram. The Swing can ride on 1524mm, 1435mm and 1000mm gauge tracks.

The modern drive system enables energy recuperation. Upon the client's request the tram can be equipped with accumulators, which contributes to lower operating costs. With the applied drive system it is possible for the vehicle to ride even in the case of power failure. Using the energy accumulated in the batteries the tram can travel several dozen additional meters without power supply from overhead lines.





Basic technical specifications of the Twist - one and two-directional	2-car version	3-car version	4-car version
Length (m)	22.80	32.00	41.90
Width (m)	2.3/2.4/2.65	2.3/2.4/2.65	2.3/2.4/2.65
Voltage (V)	600 /750	600 /750	600/750
Track gauge (mm)	1000/1435/1524	1000/1435/1524	1000/1435/1524
Passenger no. (5 people/m2) *	from 140 to 158	from 208 to 243	from 270 to 310

\*Depending on the vehicle configuration (arrangement of seats, width, one/two-directional)

This latest tram by PESA Bydgoszcz is neither a continuation of the Swing nor its rival. Instead it is a carefully thought-out addition to our range. The Twist has been designed for operators rendering services in cities and on routes with smaller passenger streams. That is why Częstochowa, with a population of 240,000, was the first city to order seven vehicles of this type.

The low floor and the absence of any steps inside the vehicle makes the tram comfortable (see the pictures above) and facilitates travelling for the disabled. Its 3-car version features four rotating bogies and 16 wheels to reduce the pressure exerted on rails. The benefit of that is prolonged utilization of tracks and less money spent on repairs.

The floor level in the entry zone is 350 mm over the rail head (see the picture below), and the ramp for prams and wheelchairs helps the disabled use the tram and speeds up passenger exchange.

The drive system enables energy recuperation during braking and returning it to the network (or optionally - collecting the energy and using it during start-up and acceleration). It contributes to the reduction of maintenance costs of the tram. A very important advantage of this drive is the vehicle's ability to ride in emergency conditions, using the energy stored in the battery.

The efficient drive systems installed in the PESA trams offer high acceleration, while the applied control system reduces the braking distance.

Just as in the case of the Swing, it is possible to apply the on-line diagnostic system in the Twist to monitor the condition of the vehicle fleet. The driver, on the other hand, can - with the use of the event classification system - precisely determine the method of conduct at a particular moment on his own.



**TWIST**



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