



Kiepe Traction Equipment for the Low-floor Trolleybuses
and Articulated Low-floor Trolleybuses for

Athens, Greece

Traction Equipment for the Low-floor Trolleybusses

As the Olympic Games are to take place in Athens in 2004, the Athens transport authority ILPAP decided to purchase new, reliable trolleybuses with Kiepe traction equipment, which are to provide environment-friendly public transport.

Project characteristics

- Regenerative brake to the standstill of the vehicle
- Automatic rise and fall of the current collector possible
- Powerful auxiliary power unit (APU) with 100 kW electrical power
- Extensive diagnosis program on Windows-basis

91 low-floor solo trolleybuses and 51 articulated low-floor trolleybuses of the type series N6216 and N6221 meet all the requirements for passenger and operator friendliness.

The new low-floor vehicles are based on a Neoplan design, and the interior is from the Greek firm of ELBO.

Besides stronger air conditioning and heating the new vehicle generation has got kneeling and a boarding ramp for passengers restricted in their mobility.

The technical appearance is completed by a VDV driver's workplace with information display, fully automatic current collectors and a state-of-the-art, 100 kW strong diesel generator with an Euro III engine so that the trolleybus can also be operated out of the current collector zone.

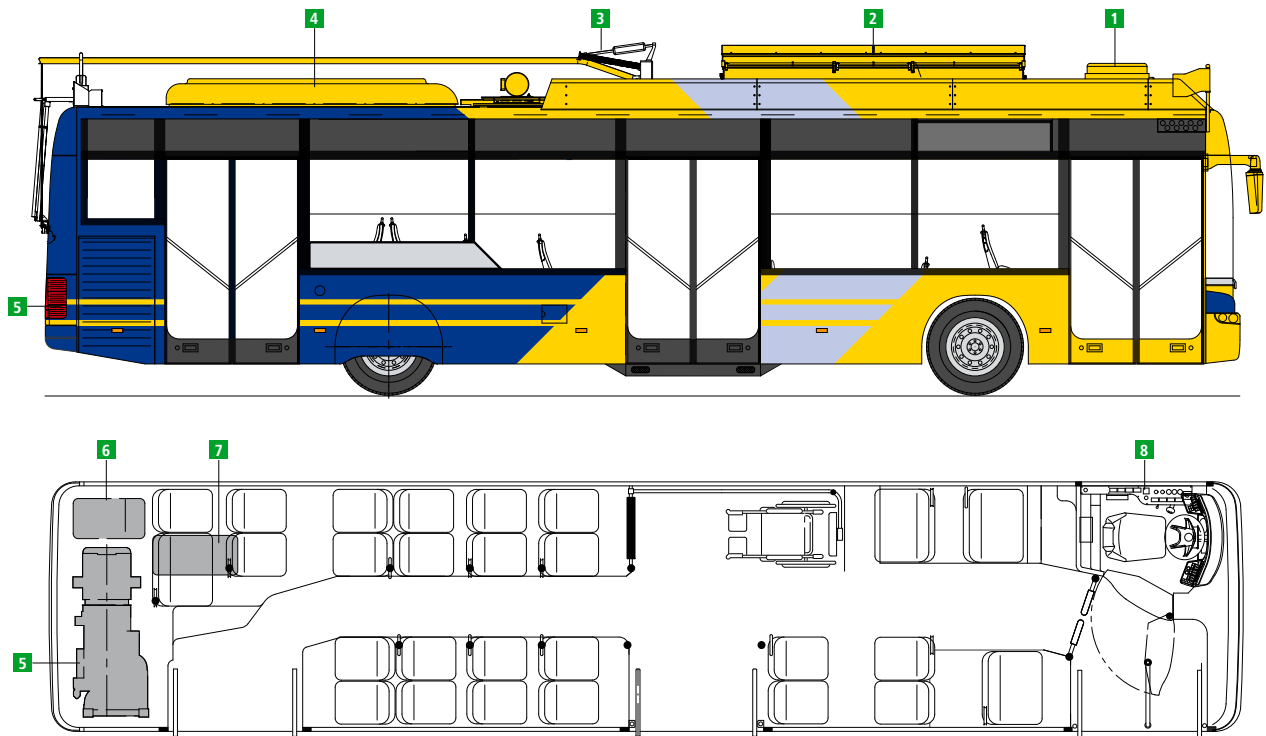
Electronic data messages on a CANopen basis are to reduce the cabling and thus to eliminate interference sources and save weight for the traction equipment and the subsystems.

Moreover, a comfortable and efficient diagnostic system is available, which can be operated via PC.

The compact Kiepe drive container has been fitted on the roof of the trolleybus. This container is easily accessible for maintenance and safely protected in case of traffic accidents. It is made of aluminium and includes the most important electronic units for the traction and the on-board power supply. The modern technology also offers ABS and TCS as well as automatic hill holding and allows powerful driving up to a maximum speed of 65 km/h, at which it is limited electronically.



Arrangement of equipment



1 Braking resistor

2 Roof equipment container

- Direct pulse inverter
- Static converter for auxiliary devices

- Converter for air conditioning
- Line filter, EMC filter
- Main contactors and main fuses

3 Current collector

4 A/C for passenger compartment

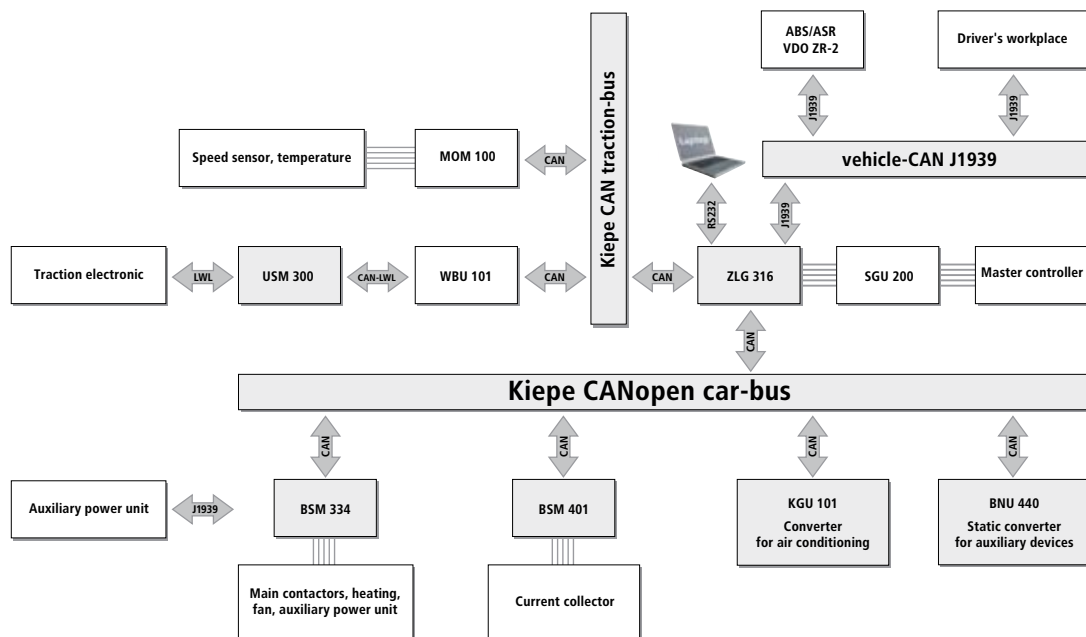
5 Auxiliary power unit

6 Compressor for compressed air supply

7 Traction motor

8 Heating of driver's cab

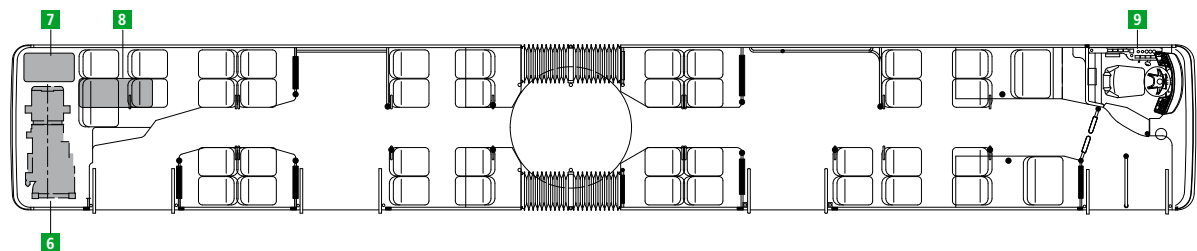
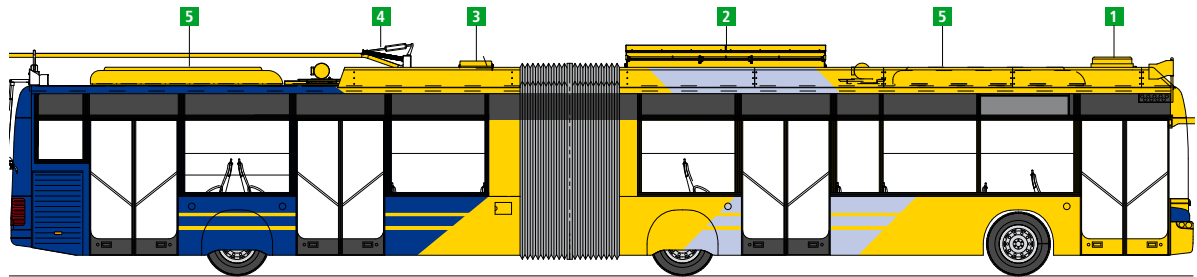
System outline



Technical data	
Design	2-axle low-floor trolleybus
Manufacturer of the chassis and vehicle body	Neoplan
Manufacturer of the interior	ELBO
Manufacturer of the traction electronic	Vossloh Kiepe
Maximum speed	65 km/h
Line voltage	DC 600 V (+ 25 %, - 30 %)
Vehicle length	12.0 m
Vehicle width	2.5 m
Gear ratio	11.02 : 1
Tyres	275 /70 R-22.5
Tare mass of the vehicle / $\frac{2}{3}$ full	approx. 13.7 t / approx. 19.5 t
Vehicle capacity	27 + 1 seating, 56 standing
Traction inverter	IGBT direct pulse inverter
Input voltage	DC 600 V (+ 20 %, - 30 %)
Output permanent/max.	160 kW /270 kW for t < 60 s
Cooling	Forced air cooling
Mass (Weight)	approx. 90 kg
Characteristics	- Action of the regenerative brake to the standstill of the vehicle - Contactless power/brake/direction changeover
Control system	Control and adjustment of traction by microprocessor technology. Signal transmission between car-bus and traction-bus via optical waveguide CANopen protocol Wheel slip/slide protection, gradient slope slide protection, line current limitation, regenerative brake Diagnosis program on Windows-basis: failure analysis, event / fault storage
Traction motor	Force-ventilated three-phase asynchronous motor
Rated output	210 kW
Number of poles	4
Dimensions	983 x 510 x 430 mm (length x width x height)
Mass (weight)	585 kg
Current collector	Kiepe OSA 307
Characteristics	With pneumatic quick-lowering, triggered by the maximum height (static) and monitoring of the rope drum (dynamic). Automatic rise and fall possible.
On-board power supply	Static on-board converter Kiepe BNU 440
Outputs	3/N AC 400/230 V, 50 Hz, 14 kVA DC 24 V, 250 A, battery charge 25 A up to 100 A adjustable
Mass (Weight)	approx. 275 kg
Converter for air conditioning	Kiepe KGU 101
Output	25 kVA, 3 AC, 400 V,
Auxiliary power unit (APU)	Water-cooled 4-cylinder turbo-diesel engine Type BF 4M 1013 FC/EURO III, with permanent excited brushless three-phase synchronous motor
Output diesel engine	125 kW at 2400 rpm
Output of generator	100 kW at 2300 rpm
	Automatic speed control according to power requirement of consumers (infinitely variable)
Heating operator's stand	Electric heating for the operator's stand Kiepe HKL 210
Output	8 kW, 3 AC, 400 V, 50 Hz, infinitely variable
Heating passenger compartment	El. heating for the passenger compartment, 2 x Kiepe HKL412 plus heating capacity of the roof air condition
Output	each 3 kW, 3 AC, 400 V, 50 Hz
Compressed air supply	Screw compressor ES-6-5.5HH Sullair
Output	4.1 kW, 10 Bar, 490 l/min

Subject to change without notice

Arrangement of equipment



1 Braking resistor

2 Roof equipment container

- Direct pulse inverter
- Static converter for auxiliary devices
- Converter for air conditioning
- Line filter, EMC filter

3 Roof equipment container, rear bank

- Main contactors and main fuses

4 Current collector

5 A/C for passenger compartment

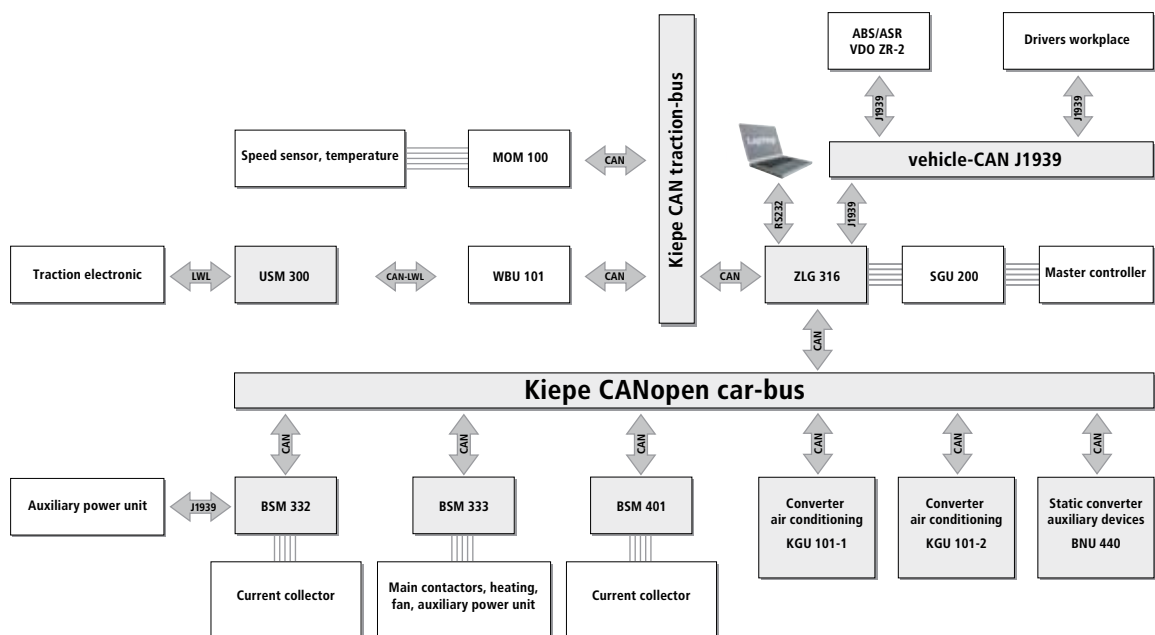
6 Auxiliary power unit

7 Compressor for compressed air supply

8 Traction motor

9 Heating of driver's cab

System outline



Technical data	
Design	3-axle low-floor trolleybus N 6221
Manufacturer of the chassis and vehicle body	Neoplan
Manufacturer of the interior	ELBO
Manufacturer of the traction electronic	Vossloh Kiepe
Maximum speed	65 km/h
Line voltage	DC 600 V (+ 25 %, - 30 %)
Vehicle length	18.0 m
Vehicle width	2.5 m
Gear ratio	11.47 : 1
Tyres	275/70 R-22.5
Tare mass of the vehicle / $\frac{2}{3}$ full	approx. 19.4 t / approx. 28.5 t
Vehicle capacity	40 + 1 seating, 94 standing
Traction inverter	IGBT direct pulse inverter Kiepe DPU 551
Input voltage	DC 600 V (+ 20 %, - 30 %)
Output permanent/max.	250 kW/600 kW for $t < 30$ s
Cooling	Forced air cooling
Mass (Weight)	approx. 100 kg
Characteristics	- Action of the regenerative brake to the standstill of the vehicle - Contactless power/brake/direction changeover
Control system	Control and adjustment of traction by microprocessor technology. Signal transmission between car-bus and traction-bus via optical waveguide CANopen protocol Wheel slip/slide protection, Gradient slope slide protection, Line current limitation, Regenerative brake Diagnosis program on Windows-basis: failure analysis, event / fault storage
Traction motor	Force-ventilated three-phase asynchronous motor
Type	14 ML 3550 K/4 (with gear 1,85 : 1)
Rated output	240 kW
Number of poles	4
Dimensions	1167 x 534 x 430 mm (length x width x height)
Mass (weight)	720 kg
Current collector	Kiepe OSA 307
Characteristics	With pneumatic quick-lowering, triggered by the maximum height (static) and monitoring of the rope drum (dynamic). Automatic rise and fall possible.
On-board power supply	Static on-board converter Kiepe BNU 440
Outputs	3/N AC 400/230 V, 50 Hz, 14 kVA DC 24 V, 250 A, battery charge 25 A up to 100 A, adjustable
Mass (Weight)	approx. 275 kg
Converter for air conditioning	2 x Kiepe KGU 101
Output	25 kVA, 3 AC, 400 V
Auxiliary power unit (APU)	Water-cooled 4-cylinder turbo-diesel engine Type BF 4M 1013 FC/EURO III, with permanent excited brushless three-phase synchronous motor
Output diesel engine	125 kW at 2400 rpm
Output of generator	100 kW at 2300 rpm Automatic speed control according to power requirement of consumers (infinitely variable)
Heating operator's stand	Electric heating for the operator's stand Kiepe HKL 210
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Heating passenger compartment	El.heating for the passenger compartment, 4 x Kiepe HKL 412 plus heating capacity of the roof air condition
Output	each 3 kW, 3 AC, 400 V, 50 Hz
Compressed air supply	Screw compressor ES-6-5.5HH Sullair
Output	4.1 kW, 10 Bar, 490 l/min

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