


Electric bus

Cegelec
Infrastructures & Mobility

Luzern, Cegelec – November 2010

Business in Europe




Our equipment can be found in many european cities

Czech Republic	Slovakia
Poland	Lithuania
Estonia	Hungary
Austria	Sweden
Germany	Italy
Russia	Ukraine
Switzerland	Serbia
Croatia	Netherlands
Belgium	France
Bosnia and Herzegovina	
Bulgaria	

References: trams





GT6-E2 Wien, A


GT8H – Freiburg, D


M8C – Heidelberg, D


M31 – Göteborg, S


KT8 – Prague, Pilsen, Cz


TRIO – Ostrava, Olomouc, Cz


T8M700 – Sofia, Bg


Vario LF2 Plus – Ostrava


T6 – Szeged, H


Vario LF3 – Ostrava, Cz


KT4D – Zwickau, D

References: trolleybuses




Solaris Trollino 18AC, Eberswalde, D

Solaris 18AC, Salzburg, A

MAN – Eberswalde, D

Solaris 12,18, La Chaux-de-Fonds, Ch

Volvo – Szeged, H

ZIU9 – Odessa, Ua

Trans Alfa – Moscow, Ru

Skoda 14 and 21Tr – Szeged, H

Solaris15 – Vilnius, Lt

Solaris 18AC, Bologna, I

SOR TNB 12, Ostrava, Cz

Bogdan10,15 – Киев, Luck, Ua

Products




Traction converters: DC and AC


Auxiliary converters

Incl. integrated version with supercapacitors for trolleybus application

Train control and supervisory system CECOMM

For trams, trolleybuses and metro cars

New product: electric bus

SOR EBN 10,5




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Electric bus: project reasons




Company precondition

- Long-time experience in electric equipment branch
- Deliveries of trolleybuses
- Modernization of tram cars
- Common parts in trolleybus and in electric bus

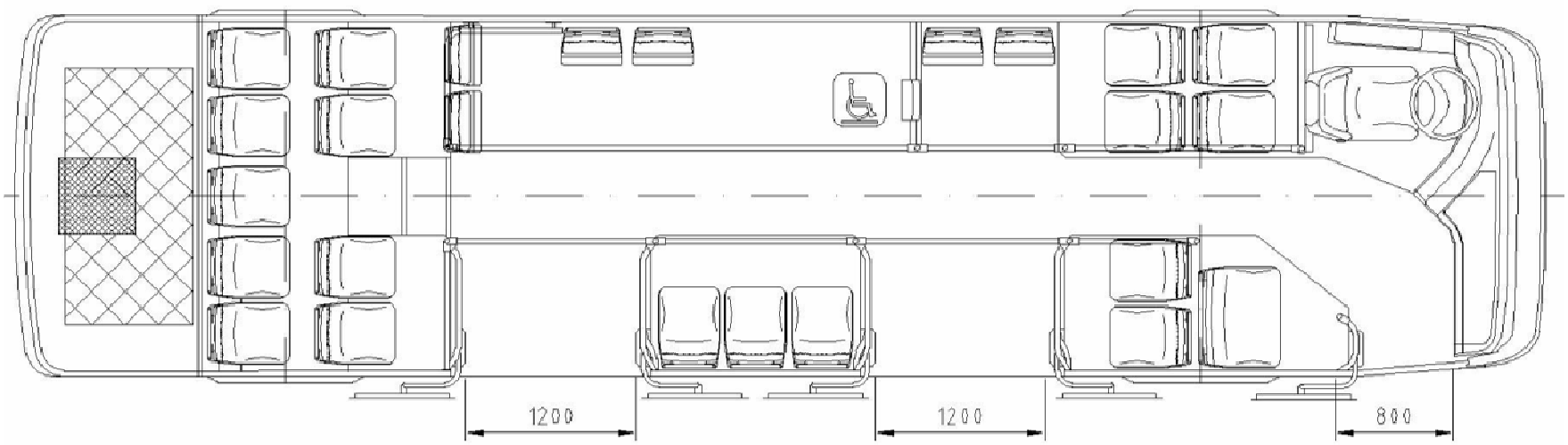
General

- Environment: electric vehicles enter the market
- Missing offer of mature electric buses in Europe
- Zero-emission vehicle for city needed
- Using of renewable energy
- Oil independence

Vehicle data




• Saloon	Partially low floor	
• Barrier-free boarding	Bus body kneeling	
• Passenger capacity	Seats	19 + 6 + 1
	Standing passengers	66
	Total	85 + 1



Vehicle data

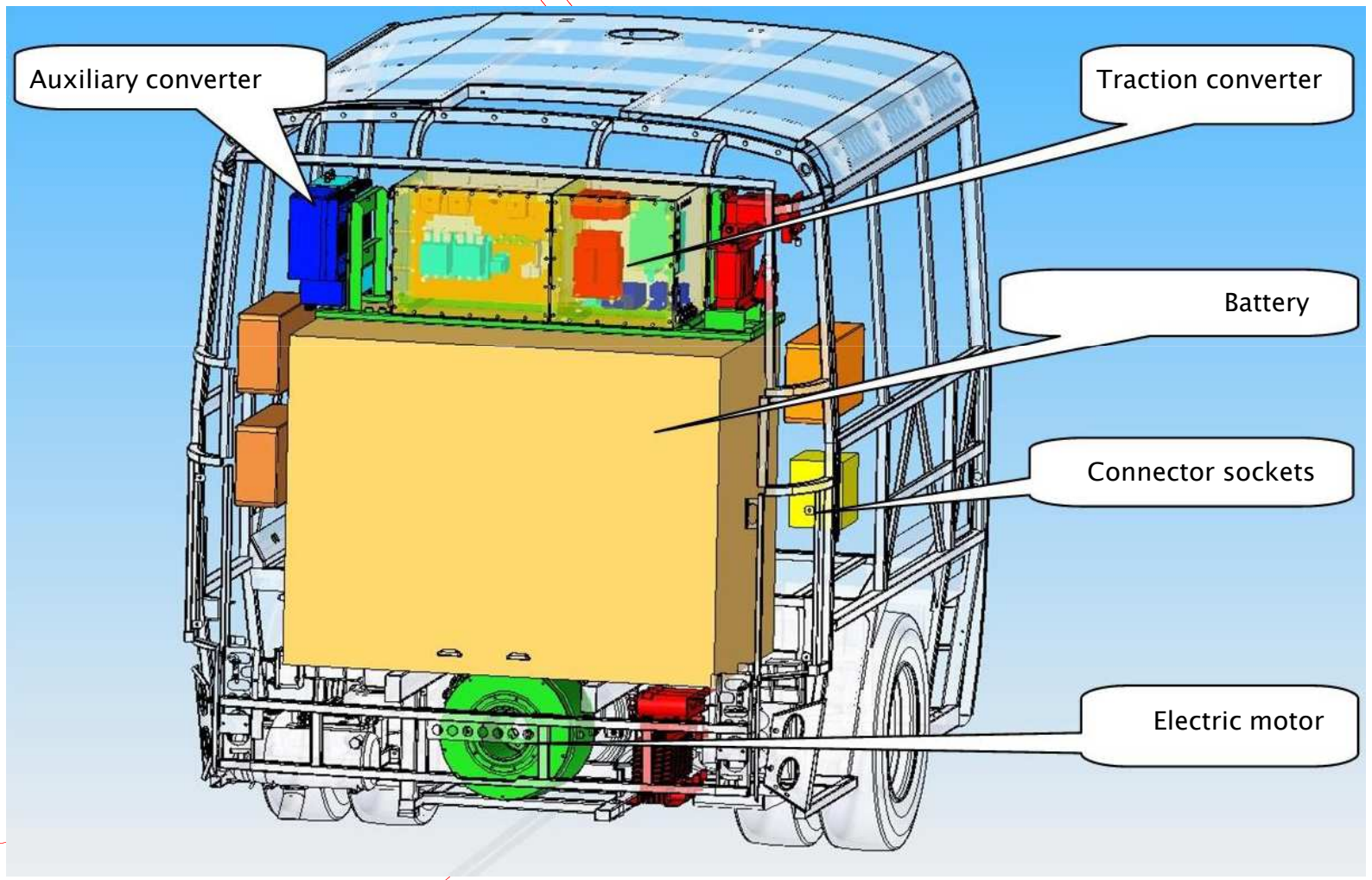



„Mature electric bus“

• Dimmensions	Length	10 370 mm
	Width	2 525 mm
	Height	2 800 mm
	Wheelbase	6 320 mm
• Bus body	Number of doors	3
• Weight	Curb weight	10 100 kg
	Total weight	16 500 kg
• Performance	Range	140 km
	Max speed	limited to 80 km/h

Main components



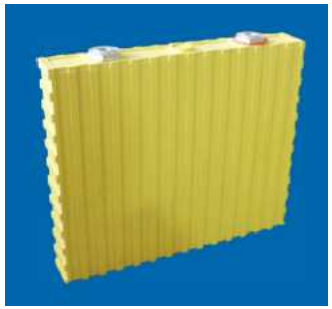



Traction battery




Battery



• Operating voltage	600 V DC
• Type of batteries	Li-Ion, Thunder-sky TS-LFP, 300 Ah
• Number of elements	180
• Total energy amount stored	170 kWh
• Typical range 1	140 km (70 % of energy consumed)
• Operation lifetime	3 000 cycles
• Battery weight	1 980 kg
• Charging time	8 hours (current 32 A)
	1 hour (current 250 A)

Battery charging




Connector plugs
400 V / 250 A
400 V / 32 A

Battery charging




•Regular charging	32 A from 3x400 V AC Including battery balancing (8 hours)
• Fast charging	Up to 250 A from 3x400 V AC Max. charge up to 92-95% of the bat.cap. 1 hour/ 3x20 minutes a day = double range
• Alternative charging	32 A from 3x400 V AC standard distribution network 8 hours, by means of a special charging box


Dashboard panel




Charge indicator

Heating




- Diesel heater
  - Main vehicle heating
  - Eberspaecher Hydronic 24 kW
- Electric heating
  - Heating during battery charging
  - Operating voltage 3x 400 V AC
- Electric motor and traction converter
  - Using waste heat for saloon heating

Line experience




- In use on the line 38 in Ostrava, Czech Republic, since AUG 2010
- Covered distance 175 km each day* (75 km a.m., 100 km p.m.)
- 75 km comport with consumption from 100 % to 68 % of the battery capacity
- then fast charging period follows, up to 250 A charge rate (up to 95 % bat.cap.)
- 100 km comport with consumption from 95 % to 48 %
- then low charge rate period follows, 32 A up to 100 % bat.cap.

the longest covered distance achieved with empty bus on full charge:* ***250 km*

Average energy consumption
0,87 kWh/km
(0,83 – 0,91 kWh/km)

Expenses




	Electric bus	Diesel bus 12m	Trolleybus 12m
Total cost	42,95	38,50	53,27
Cost composition			
Drive energy	2,44	7,20	2,70
Repairs vehicle	6,75	4,23	6,03
Repairs infrastructure	0,03	0,03	2,42
Depreciation vehicle	12,50	6,88	12,25
Depreciation infrastructure	0,25	-	2,01
Overhead costs	20,98	20,16	27,86

Costs in CZK recalculated to vehicle-kilometers
Source: Ostrava Transport authority




Summary

Electric bus
Range about 140 km, driving time 4hours, capacity 80 passengers

Trolleybus
Unlimited range (distance and time), capacity 90-150 passengers

Electric bus is suitable ecologically friendly vehicle for specific application

- Two shift operation
- Intermittent transport (shuttle bus)
- Spa transport (silent vehicle)
- City-center and suburban traffic

Kontakt

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