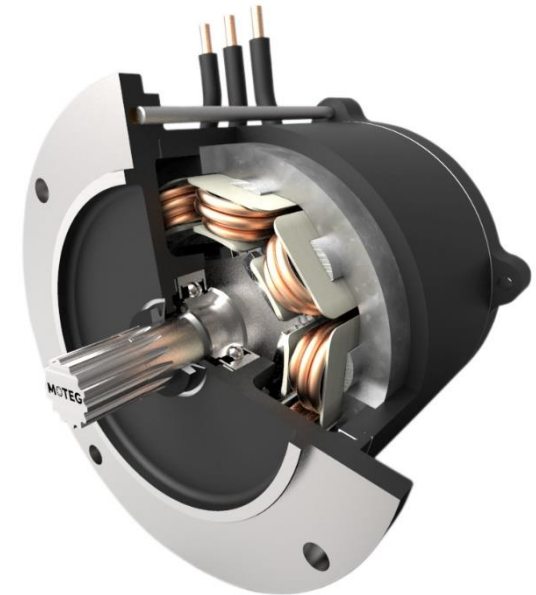
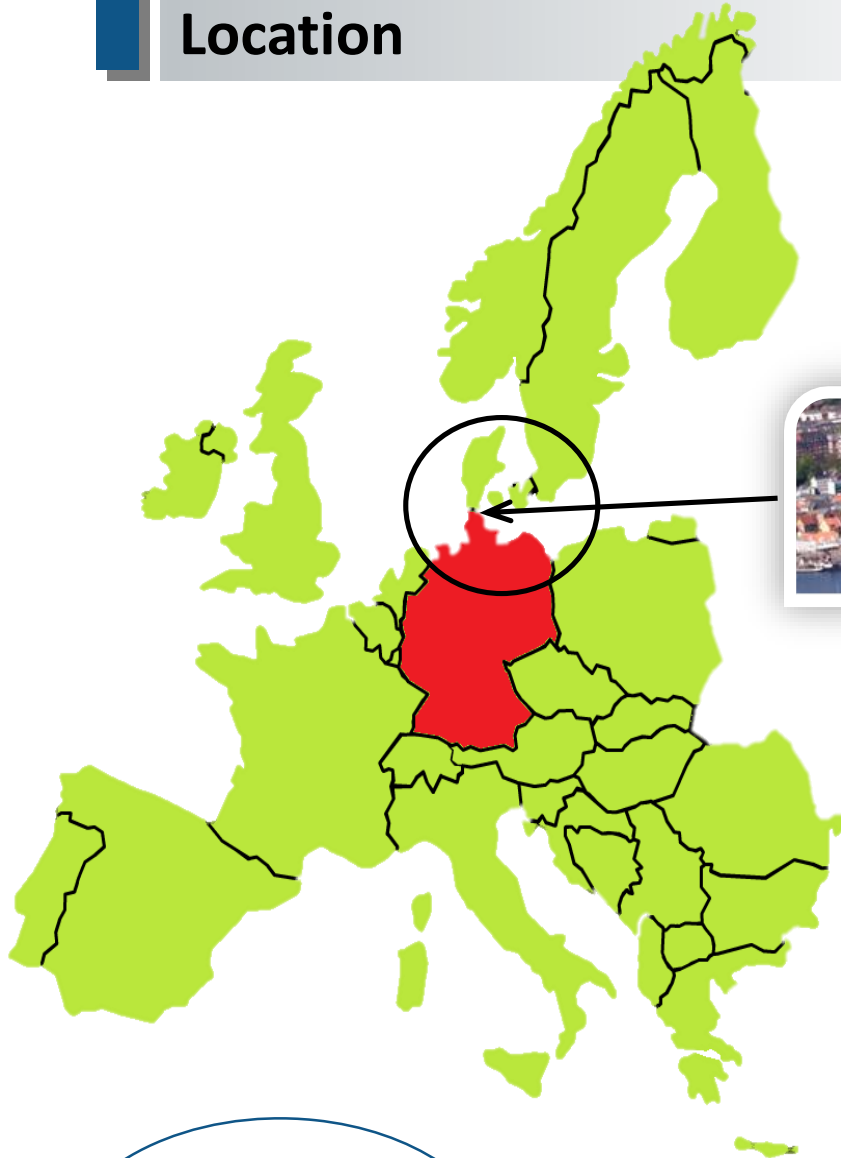


MOTEG



Energy Efficiency in Electric Utility Vehicles - Demand and Solutions -

Location



Flensburg, Germany



Source: WIREG

History of Electric Drive Technology



- **2014:** - MOTEG GmbH was founded by Dr. S. Götz
- **2015:** - Development of Electric Motor for the suspension of a German high class car
- Extending business: Consultancy of how to run electric bus fleets
- **2016:** - Start of Development of two electric Motors for helicopter rescue hoist
- Creating a legal entity in Nanjing (China) due to MOTEG electric bus consultancy business
- **2017:** - Open manufacturing site in Enge-Sande (Green Tec Campus)
- Production ramping up of auxiliary aggregates for electric utility vehicles

Our focuses is on **special solutions for mobile applications** and their ever-growing challenges in:

Energy Efficiency, Weight, Available space, Noise, EMC, Costs

History of eMobility Consultancy Know-how

- **2012:** Founding of a research project, supported by European government at the University of Applied Science in Flensburg.
- **2013/14:** Conduction of several studies for the introduction of electric busses within the public transportation sector: (e.g. Sylt, Nordfriesland, Sonderborg, Flensburg, ...). Development of a concept for successful implementation of electric vehicles within existing fleets of the public transportation system.
- **2015:** **Integration of the complete project team into MOTEG.** Based on the existing experience and know-how, Moteg has **developed powerful calculation/simulation tools and** the S.O.R.S concept for an efficient conversion to e-busses in the public transportation system.

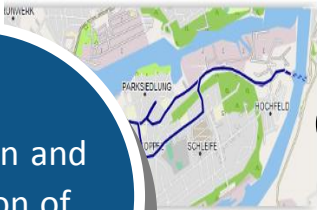


Presentation S.O.R.S.

Your personal guideline for transitioning to electric buses in public transport



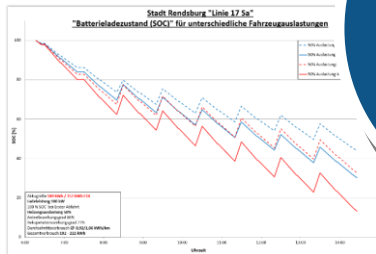
Simulation and calculation of lines & courses



eMobility in public transport?!

System consultancy & realisation support

Optimized System design



Return on investments & costs



eMobility Portfolio

Conception

- Analyses of existing tracks, lines and courses regarding e-bus suitability
- Calculations of energy balance (Simulations based on measured tracks)
- Specification of needed traction drive and necessary battery capacity
- Optimized charging infrastructure solutions via junction analysis
- Comparison of different concepts and systems
- Benchmark e-bus vs. Diesel

Consultancy

- Assistance in acquisition of electric vehicles
- Support during Call for tenders
- Charging infrastructure & workshop concept
- Preparations of applications for funding

➔ **Energy efficiency is an important factor in eMobility for batteries, inverters, motors & auxiliaries to reduce climate pollution and improve vehicle range!**

E-Bus Suitability (Different Manufacturers)

	E-Bus 1	E-Bus 2	E-Bus 3	E-Bus 4	E-Bus 5	Legend:
Costs per km	Green	Green	Yellow	Red	Yellow	Well Suited
Battery Size	Red	Green	Green	Green	Yellow	Suited with Limitation
Drivetrain	Grey	Green	Red	Green	Green	Unsuitable
Payload	Yellow	Green	Red	Grey	Green	No Manufacturer Information
Fast Charge Ability	Yellow	Green	Green	Red	Grey	Not Necessary
Battery Warranty	Red	Green	Green	Green	Grey	
Vehicle Warranty	Yellow	Green	Green	Yellow	Green	
Service/Maintenance	Green	Green	Red	Grey	Green	



Source: NVH

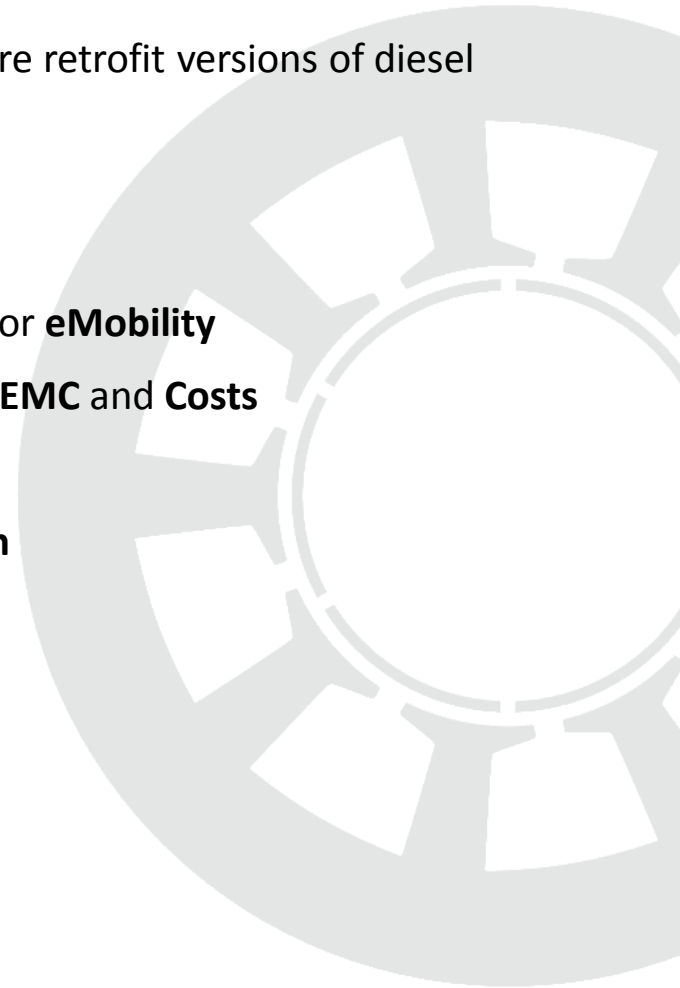
compAUX-Auxiliaries for utility vehicles and busses

■ Problem & Demand:

Today: Auxiliaries for electric utility vehicles and busses are retrofit versions of diesel vehicles.

■ Solution:

- **Combining Know-How of eMobility & Motor Experts**
- **Development & Production of Auxiliaries particular for eMobility**
- **Optimized in Efficiency, Weight, Construction Space, EMC and Costs**
- **Energy Efficient PM-Motor technology**
- **Inverter controlled to optimize Device for application**
- **Available devices: Compressor & Steering Pump**
- **2017 start of production**



compAUX-Auxiliaries for utility vehicles and busses

Product Examples:

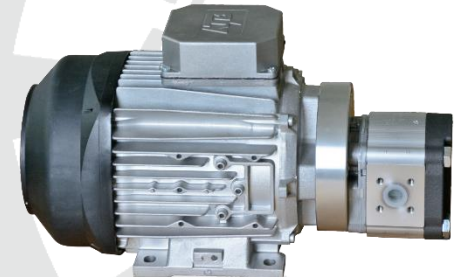
- Typ eAir
→ Compressor



- Typ eAir 2.0
→ Watercooled Compressor

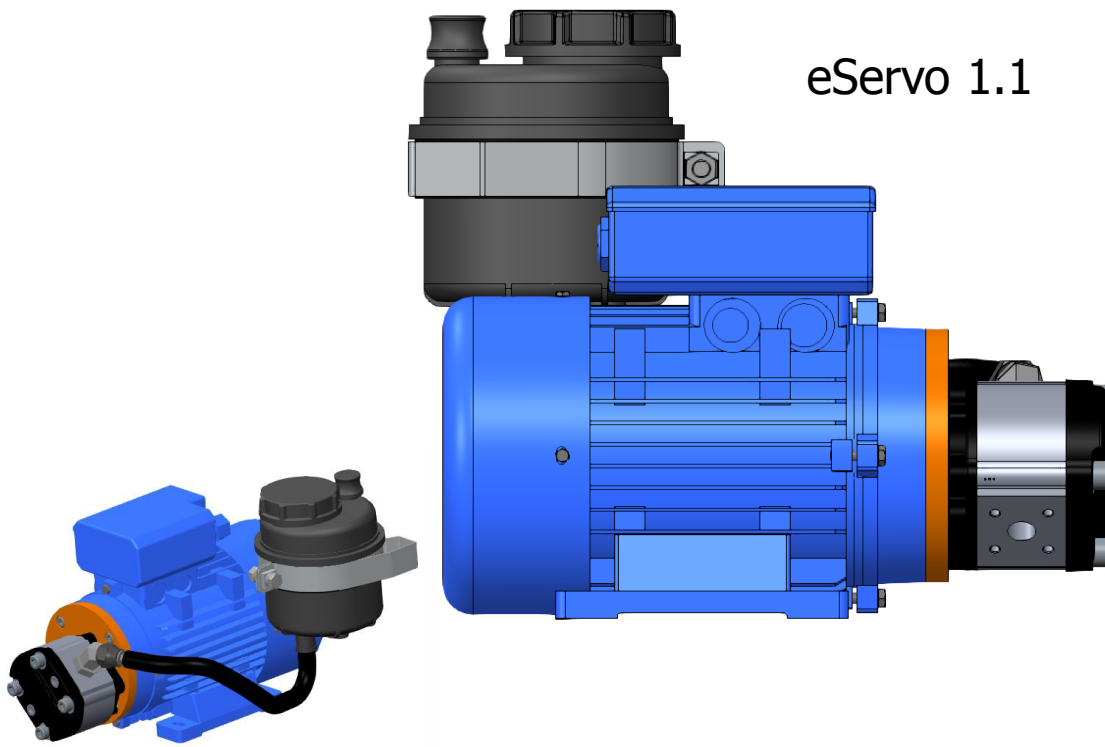


- Type eServo
→ Power-Steering-Pump



compAUX-Auxiliaries for utility vehicles and busses

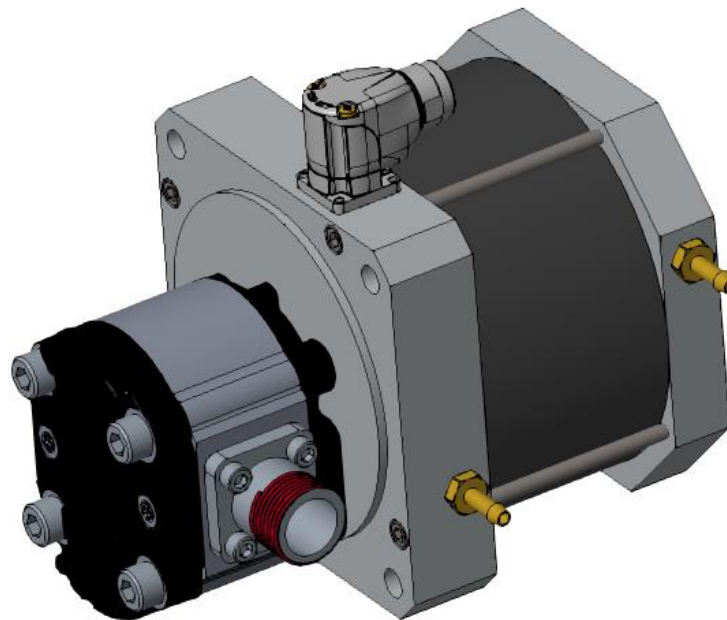
- Type eServo= Power-Steering-Pump → Evolution of development



compAUX-Auxiliaries for utility vehicles and busses

- Type eServo= Power-Steering-Pump → „Silence Plus“ with water cooled motor

eServo 2.1

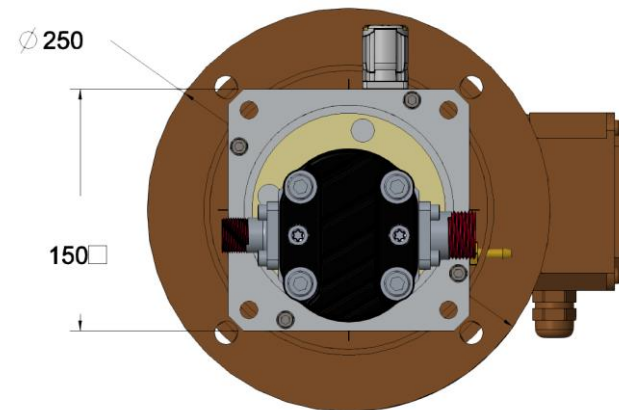
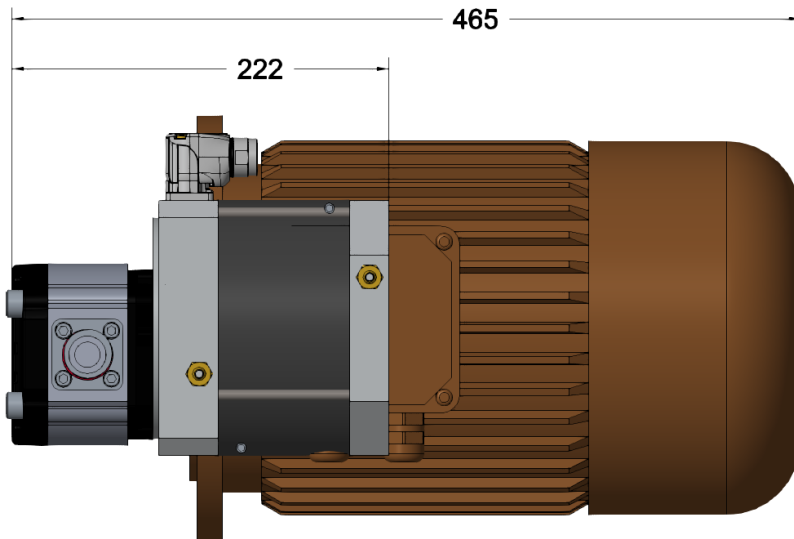


Prototypes to be ready end of 2017, Serial production will start in beginning of 2018

compAUX-Auxiliaries for utility vehicles and busses

- Type eServo= Power-Steering-Pump → „Silence Plus“ with water cooled motor

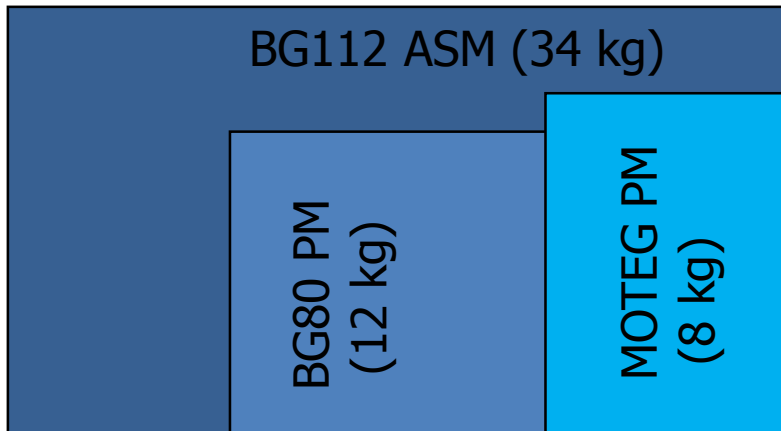
eServo 2.1 vs ASM (BG 112)



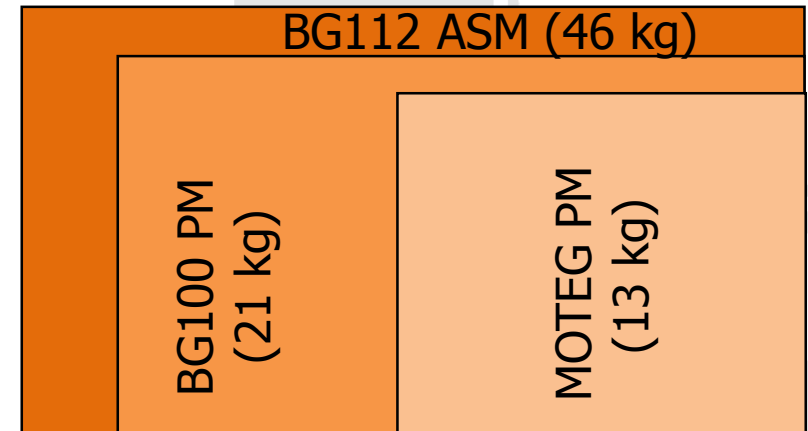
Size and weight

- IEC Housing 4 kW motors for the the two kind of steering pumps
- ASM vs. PM
- IE4

Silence 5,5ccm (3000rpm)



Silence Plus 12ccm (1500rpm)



Benefits of compAUX-Series

- Freely placeable
- CAN-Bus communication interface
- No DC/DC-Conversion necessary
- Power supply directly from HV-Battery
- Frequency Inverter controlled
- Runs only on demand (**Saving Energy**)
- compact in size (**Up to 3 times smaller**)
- Lower weight (**Up to 6 time lighter**)
- Energy efficient motor (**93-94% peak efficiency**)
- Low maintenance (**saving resources**)
- Long service life (**saving resources**)

