

ŠOLSKI CENTER ŠKOFJA LOKA  
SECONDARY SCHOOL OF MECHANICAL ENGINEERING



# RECONSTRUCTION OF SMART FROM PETROL TO ELECTRIC DRIVE

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# PRIMARY GOALS

- The car will reach top speed around 100 km/h
- The car will reach around 100 kilometers range with one charge

## Something about electric Smart

- Electric smart has 15kW AC induction motor and electronic controller made in Slovenia.
- Batteries are LiPo and there are 16 cells in the battery box under the car.
- It has charger with BMS (battery management system), electronic control box, diesel heater (Webasto), DC/DC converter from high voltage (60V) to low voltage (12V).



# ELECTRIC MOTOR AND CONTROLLER TECHNICAL DATA

Main technical	data
Max power	15 kW
Nominal power	12kW
Nominal AC voltage	35 V
Max motor Speed	8.000 rpm
Max motor torque	70 Nm
Insulation class	H (180 °C)
Motor weight	36 kg
Operating ambient temperature	-20°C to +45 °C

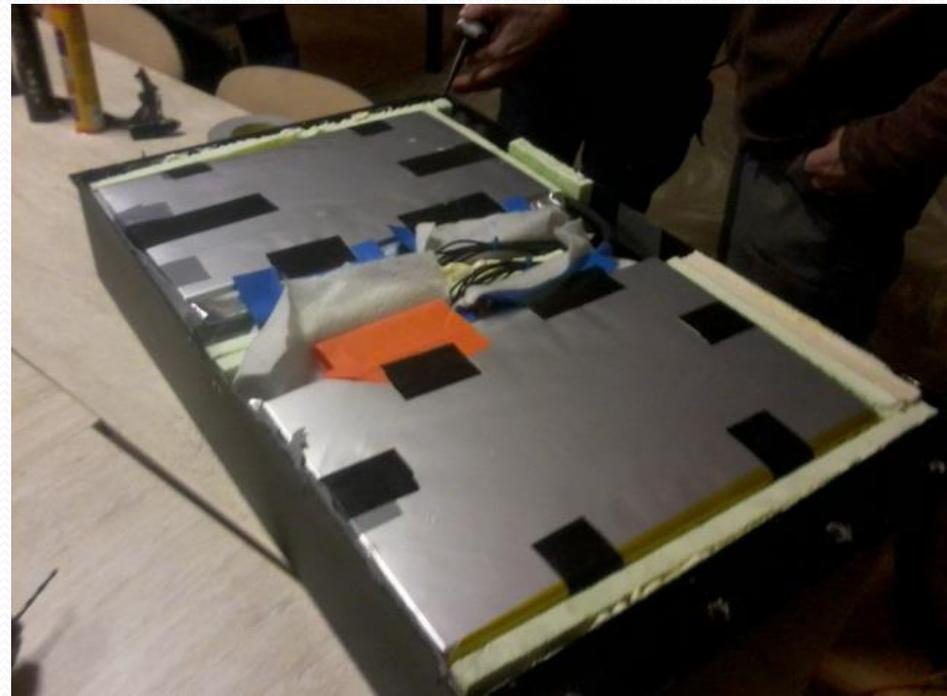




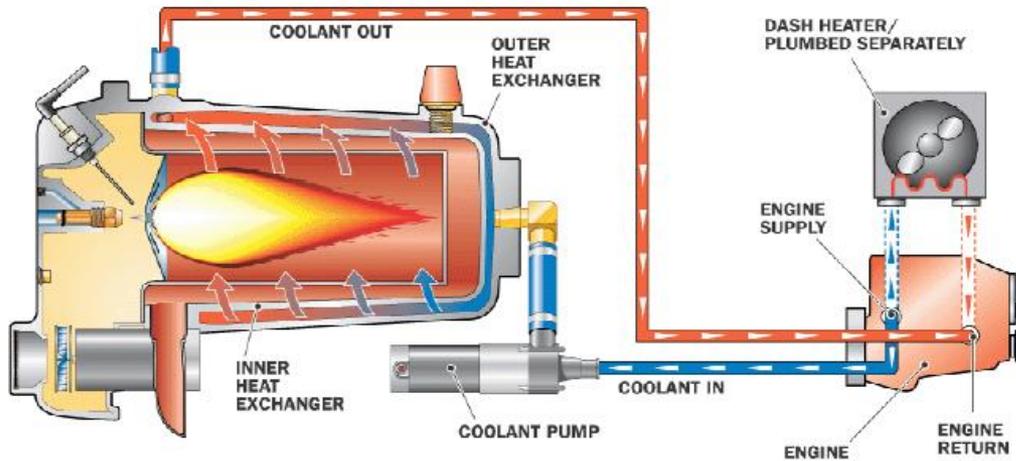
Main technical	data
Nominal voltage	32 to 63 V
Max current	450A for 10 sec 400A for 2 min 160A for 60 min
Operatin frequency	10 kHz
Operating ambiente temperature	-30 °C to +45 °C

# Battery pack

- It's aluminium box measurement cca
- 1.5 x 0.5m
- There are 16 cells which are connected in series
- One cell has 3.7 V
- Total voltage is 63V
- Total capacity 14 kWh
- Weight 90 kgs



# HEATING (WEBASTO)



- We installed webasto instead of electric heater because we need to spare electric power for longer travel distance range. Electric heater needs 800W to 1200W of electric energy. Webasto uses diesel gas. So the car has about 2-3l diesel tank at the front of the car.

# BATTERY CHARGER

- The charger must charge the cells with 1.5-3kW for one phase charge.
- In three phase charge, charging is 3-10kW
- BMS switches off the charging when batteries are fully charged



# BMS (Battery management system)

- BMS controls each cell separately, so the cells are discharging and charging in the same amount of energy
- Each cell is separately connected to BMS
- One BMS is enough for 9 cells
- Smart has 2 BMS



# DC/DC POWER CONVERTER

- DC/DC power converter converts high voltage (60V) energy to low voltage (12V)
- This converter is needed because of all the 12v electric devices like (electric roof, lights, radio, power windows...)



# GLOSSARY

- DC/DC converter- pretvornik visoke napetosti v nizko napetost
- BMS- sistem za nadzorovanje napetosti celic
- Controller- nadzoruje, daje ukaze in javlja napake o delovanju elektromotorja
- Charger- polni baterijske celice
- Webasto- sistem ogrevanja potniške kabine



# WORK PROGRESS





**MT 2400**  
EASY - ALU