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Vehicle Tests

Proposal for test procedures:

- Partial acceleration and partial deceleration
- Full acceleration and full deceleration
- Partial acceleration and partial deceleration (backward driving)
- Full acceleration and full deceleration (backward)

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Questions Partial acceleration and partial deceleration

Prepare traces of measurement data over time to answer the following questions:

- What is the maximum torque on front and rear motor, what is the maximum power?
- What is the maximum current out of the battery, what is the voltage at battery?
- What is the speed profile in the test? What is the acceleration?
- What happens with current and voltage during deceleration?
- Is the brake pedal applied?
- What happens at the end of the test with ("standstill-management")?

Prepare the following calculations:

- Calculate the traction force at the wheels
- Put traction force and vehicle acceleration into the correct relationship
- Calculate the efficiency

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Questions Full acceleration and full deceleration

Prepare traces of measurement data over time to answer the following questions:

- What is the maximum torque on front and rear motor, what is the maximum power?
- What is the maximum current out of the battery, what is the voltage at battery?
- What is the speed profile in the test? What is the acceleration?
- What happens with current and voltage during deceleration?
- Is the brake pedal applied?
- What do you see on each wheel (torque/speed/etc.)
- What happens at the end of the test with ("standstill-management")?

Prepare the following calculations:

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2.3.1 Technical Specification

2.3.1.1 Front Motor

The Tesla Model 3 long range uses a 3-phase AC induction motor with copper rotor as a front drive unit.

Technical Data[8]	
Manufacturer	Tesla
Engine	Front
Motor type	AC induction/asynchronous
Max Power	158 kW @ 6622 rpm
Max Torque	240 Nm @ 0-6200 rpm
Rated Voltage	335 Volts (nominal)
Additional Features	Liquid cooled, Integrated Variable frequency drive Transmission, Single speed fixed gear
Gear ratio	9:1

2.3.1.2 Rear Motor

The rear drive unit of Tesla Model 3 features a reluctant permanent magnet synchronous motor.

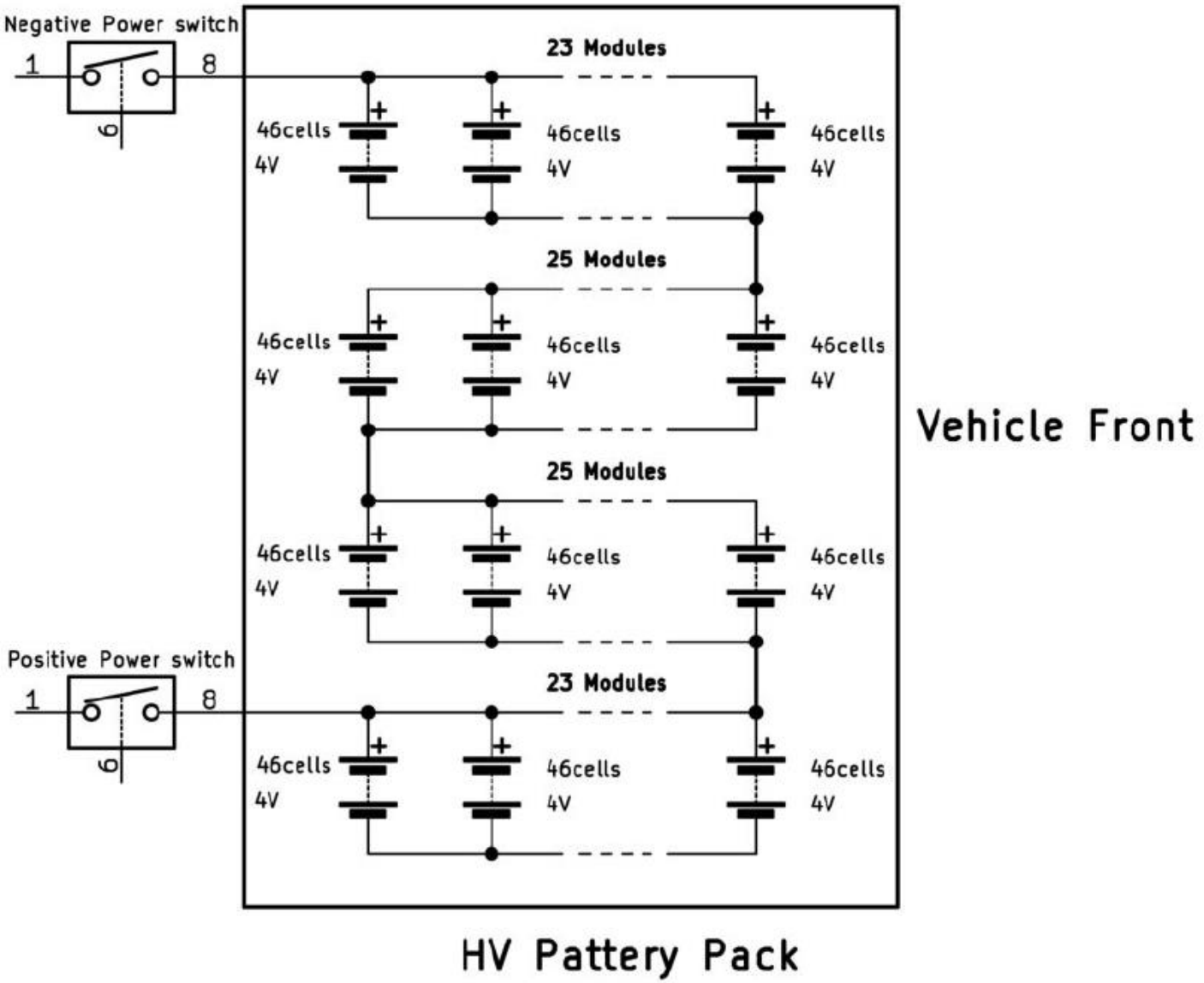
Technical Data[8]	
Manufacturer	Tesla
Engine	Rear
Motor type	IPM-SynRM motor
Max Power	208 kW @ 6000-8000 rpm
Max Torque	353 Nm @ 400-5500 rpm
Rated Voltage	335 Volts (nominal)
Additional Features	Liquid cooled, Integrated Variable frequency drive Transmission, Single speed fixed gear
Gear ratio	9:1

Table 2.4: Technical data-sheet of HV Battery pack[10]

Manufacturer	Tesla and Panasonic
Model	NCR21700A
Battery type	Lithium-Ion
Battery Capacity	74 kWh
Number of cells	4416
Rated Voltage	360 Volts
Modules	2 Module of 25 Bricks 2 Module of 23 Bricks
Total cells in Brick	46 Cells
Energy density	260 Wh/kg
Weight	478 kg
Location	Under the floor middle
Cooling	Water based coolant circulation
Charger type 2	Power: 11 kW AC Time: 8h15m, Speed: 60 km/h
Charger type CCS	Power: max. 250 kW DC(Avg. 124 kW) Time: 25 min, Speed: 750 km/h

Table 2.5: Battery Data[11]

Cell Format	21700
Dimension	21x70 mm
Weight	68.5 g
Capacity	4.80 Ah(nominal)
Current	7 A(continuous), 17.8 A(peak)
Nominal Voltage	3.6V*/4.2V
Power	24.0 W(continuous),64.6 W(peak)
Energy	17.1 Wh
Power Density	943 W/kg(gravimetric), 2.66 kW/l(volumetric)
Energy Density	250 Wh/kg(gravimetric), 707 Wh/l(volumetric)



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