

FSE 2011 FMEA

Car No.: Exx

University:

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FMEA No.:	Component/Item	Function	Failure Mode	Failure Cause	Failure Effect		Sev	Severity Reasoning	Occ	Occurrence Reasoning	Failure Detection	Det	Detection Reasoning	Risk	Failure Handling	Comments
					Local	Global										
1	Tractive DC Wiring	Energy transfer from/to Inverter	Positive pole lost isolation to the chassis structure	Wiring insulation degradation	Potentially dangerous condition if operator touches the negative pole of the battery and the chassis	Possible chassis reference voltage potential change	4	Burns by electric arc, bruises and fractures caused by uncontrolled muscle movement due to the electric shock. Ventricular fibrillation not likely with DC voltages up to 600V, therefore not severity 5	2	All wire insulations chosen with respect to the environment, additional thermal oder mechanical protection attached where needed, all wires are securely attached and professionally built to lower the risk of damages by vibrations	Insulation resistance monitoring system.	1	IMD detects every isolation failure to the chassis, since the chassis is connected to control system ground	8	Isolation Lost Alarm enabled. Apposite procedure to be executed once the car back in the PIT to restore the isolation.	
2	Tractive DC Wiring	Energy transfer from/to Inverter	Negative pole lost isolation to the chassis structure	Wiring insulation degradation	Potentially dangerous condition if operator touches the positive pole of the battery and the chassis	Possible chassis reference voltage potential change	4	Burns by electric arc, bruises and fractures caused by uncontrolled muscle movement due to the electric shock. Ventricular fibrillation not likely with DC voltages up to 600V, therefore not severity 5	2	All wire insulations chosen with respect to the environment, additional thermal oder mechanical protection attached where needed, all wires are securely attached and professionally built to lower the risk of damages by vibrations	Insulation resistance monitoring system.	1	IMD detects every isolation failure to the chassis, since the chassis is connected to control system ground	8	Isolation Lost Alarm enabled. Apposite procedure to be executed once the car back in the PIT to restore the isolation.	
3	Accumulator	Energy Storage	Accumulator/Cell temperature above data sheet specification											0		
4	Accumulator	Energy Storage	Cell voltage above data sheet specification											0		
5	Accumulator	Energy Storage	Cell voltage below data sheet specification											0		
6	Torque Encoder	Signaling the pedal position	Sensor 1 and Sensor 2 deliver different position values											0		
7	Torque Encoder	Signaling the pedal position	Sensor 1 or Sensor 2 signal not plausible											0		
8	Torque Encoder	Signaling the pedal position	Sensor 1 or Sensor 2 no signal											0		
9	Accumulator Insulation Relay(s)	Cutting the accumulator poles	Accumulator Insulation Relay short-circuit											0		
10	Accumulator Insulation Relay(s)	Cutting the accumulator poles	Accumulator Insulation Relay control connection lost											0		
11	Motor Controller	Controlling the motor power	Motor Controller output stage short-circuit											0		
12	Motor Controller	Controlling the motor power	Motor Controller control connection lost											0		
13	Motor Controller	Controlling the motor power	Motor Controller does not react plausible to control input											0		
14	Insulation Monitoring Device	Monitoring the insulation of the tractive system	Insulation Monitoring Device lost connection to reference ground											0		
15	Insulation Monitoring Device	Monitoring the insulation of the tractive system	Insulation Monitoring Device lost power supply											0		
16	Insulation Monitoring Device	Monitoring the insulation of the tractive system	Insulation Monitoring Device is faulty											0		
17	Battery Management System	Monitoring the accumulator condition	Battery Management System is faulty											0		
18														0		