Circuit diagram SER3 2

Internal code name	SER 3	
Team information	SER (Switzerland) ~~WSC-2019 (Australia)~~ ESC2020 Number: ~~31~~ Team: Solar Energy Racers	
Diagram information	voltages	wire colors
	control DC 12VDC (49-86VDC)	
	PV-voltage ~~72-132VDC~~	(red / red-white)
	BAT-voltage ~~67.5-113.4VDC~~ (75.0-126.0VDC)	(red / red-white)
	Controller-voltage 12VDC	
	sensor-voltage 1 12VDC	
	sensor-voltage 2 5VDC	
Regulations	ambiente temperature around cabinet	50
	relative humidity non-condensing (90% / 20°C)	90

Hinweise zur Schemaanpassung:
Korrekturen sind in rot gezeichnet (allenfalls pink, für gestrichelte Rechtecke). Manchmal sind auch rein kopierte Elemente in schwarz Teil der Korrektur - allerdings nie ohne Anbindung an etwas rotes.

Anmerkungen in diesem blau sollen nicht Teil vom endgültigen Schema sein und dienen nur zur Orientierung

Klemmen/Stecker (Platzhalterbezeichnungen):
X1 = Batteriestecker 12P
X2 = 12VDC Verteilerklemme
X3 = 12V_GND Verteilerklemme
X4 = Stecker zu Oberdeck ?P

SER proprietary information. For internal use only. Not to be shared with 3rd party.

Number of pages ~~34~~ 2

Creation	Created on ~~25.02.2018~~ 16.04.2013	Edit	Last edit on ~~15.07.2019~~ 22.08.2020	Check	Last check on 23.8.2020	EPLAN	Version 2.7.3
	Created by Daniel Sutter		Last editor ~~Annique Müller~~ ~~MuA~~ Remo Schraner		Last editor ~~?~~ Jonas Toma		User U29372

Gesamtes Dokument

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SER2_F06_002

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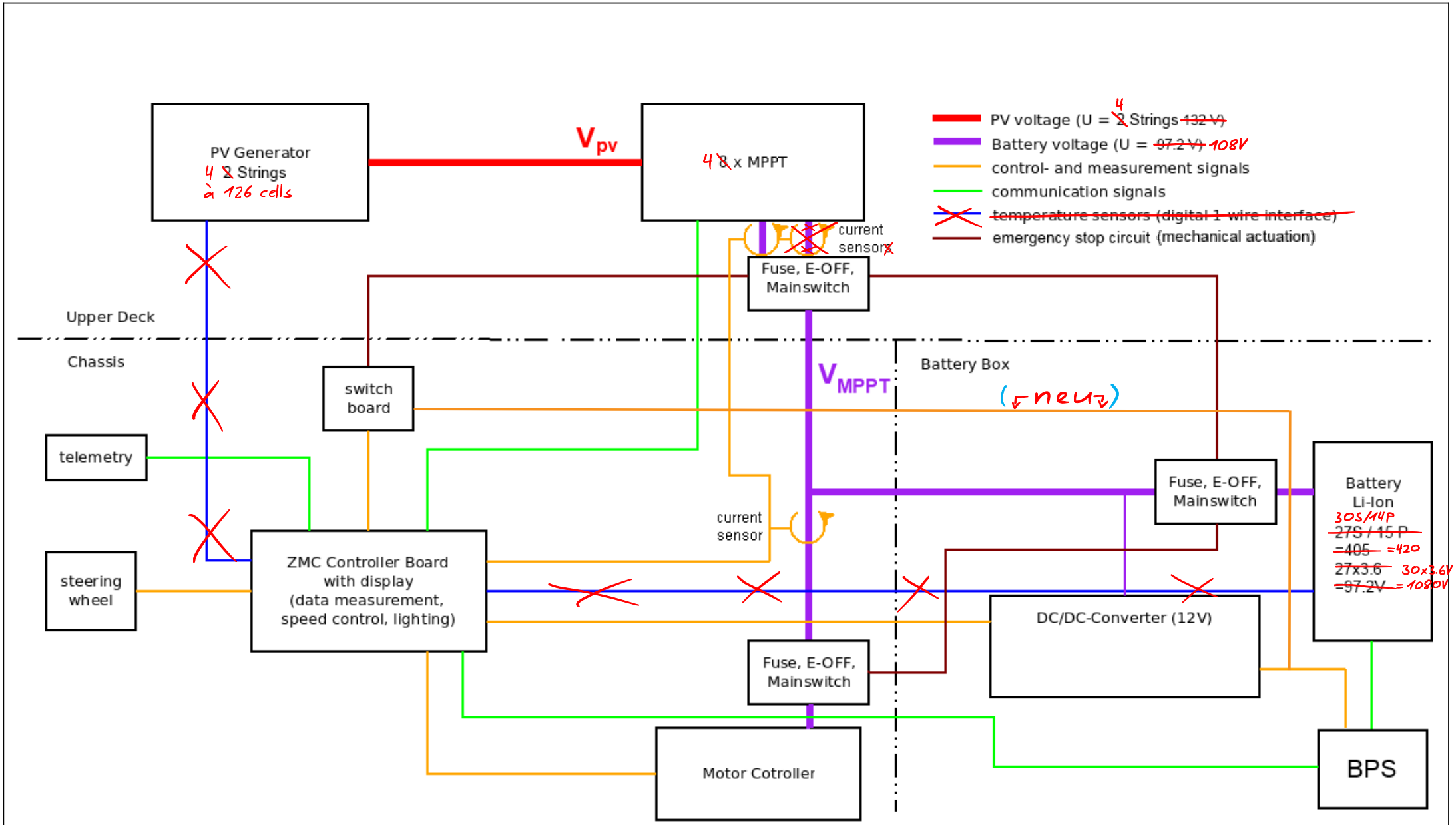
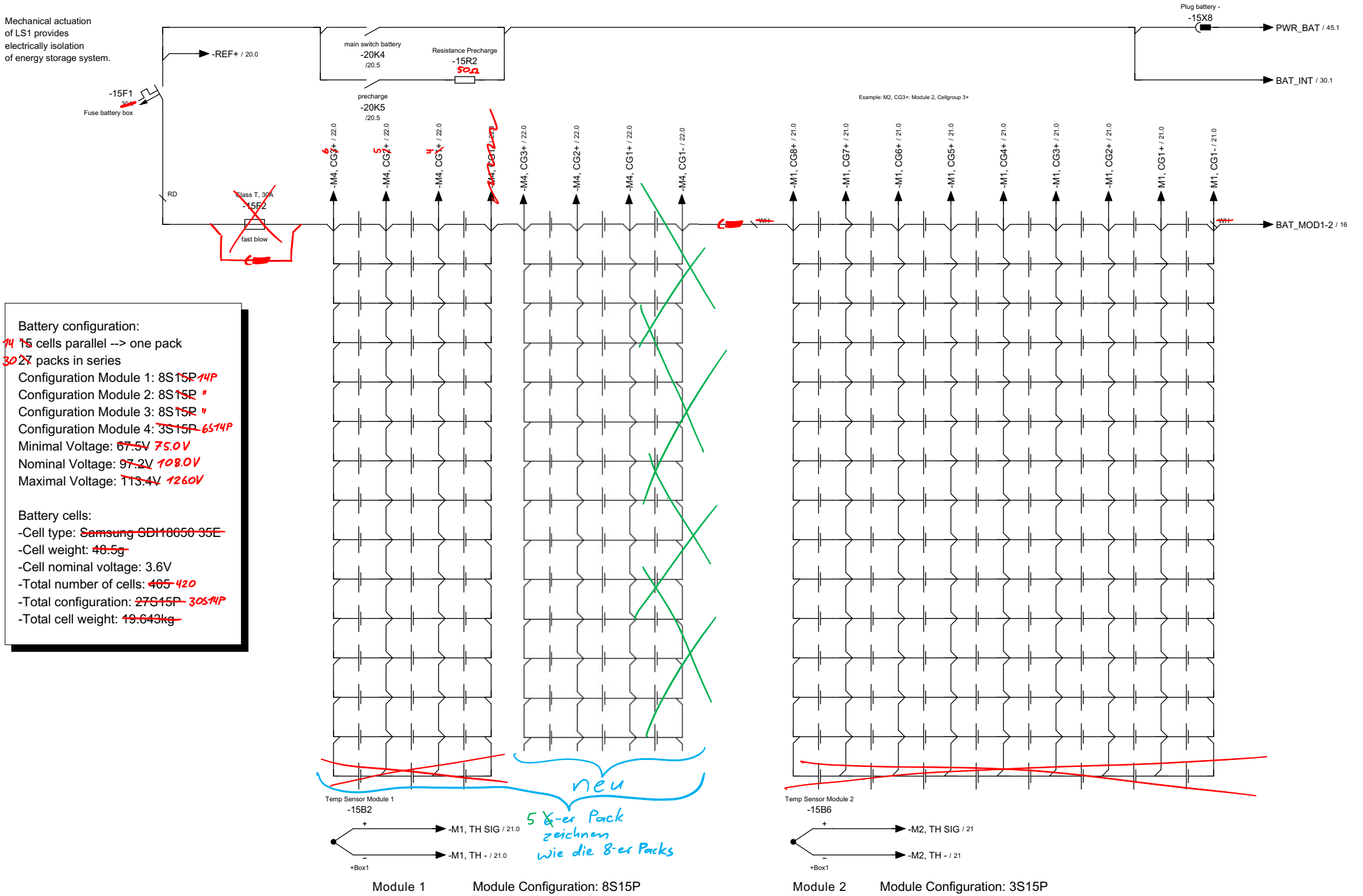
CTRL	CAR	115			03.09.2018	
	CAR	116			03.09.2018	
	CAR	117			03.09.2018	
	CAR	120			05.09.2018	
	CAR	140			23.10.2015	SaR
	CAR	145			23.10.2015	SaR


PV Generator
4 Strings
à 126 cells
V_{pv}
4 x MPPT
PV voltage (U = 4 Strings 132 V)
Battery voltage (U = 97.2 V) 108V
control- and measurement signals
communication signals
temperature sensors (digital 1-wire interface)
emergency stop circuit (mechanical actuation)
current sensors
Fuse, E-OFF, Mainswitch
Upper Deck
Chassis
switch board
V_{MPPT}
Battery Box
(neu)
telemetry
current sensor
Fuse, E-OFF, Mainswitch
Battery Li-Ion
30S/14P
27S / 15 P
=405 =420
27x3.6 30x3.6V
=97.2V =1080V
steering wheel
ZMC Controller Board with display (data measurement, speed control, lighting)
DC/DC-Converter (12V)
Fuse, E-OFF, Mainswitch
Motor Cotroller
BPS

Drawing code:

+Box1	Battery box 1
+S	Steering wheel
+C	Chassis
+U	Upper Deck
+P	Panel cockpit



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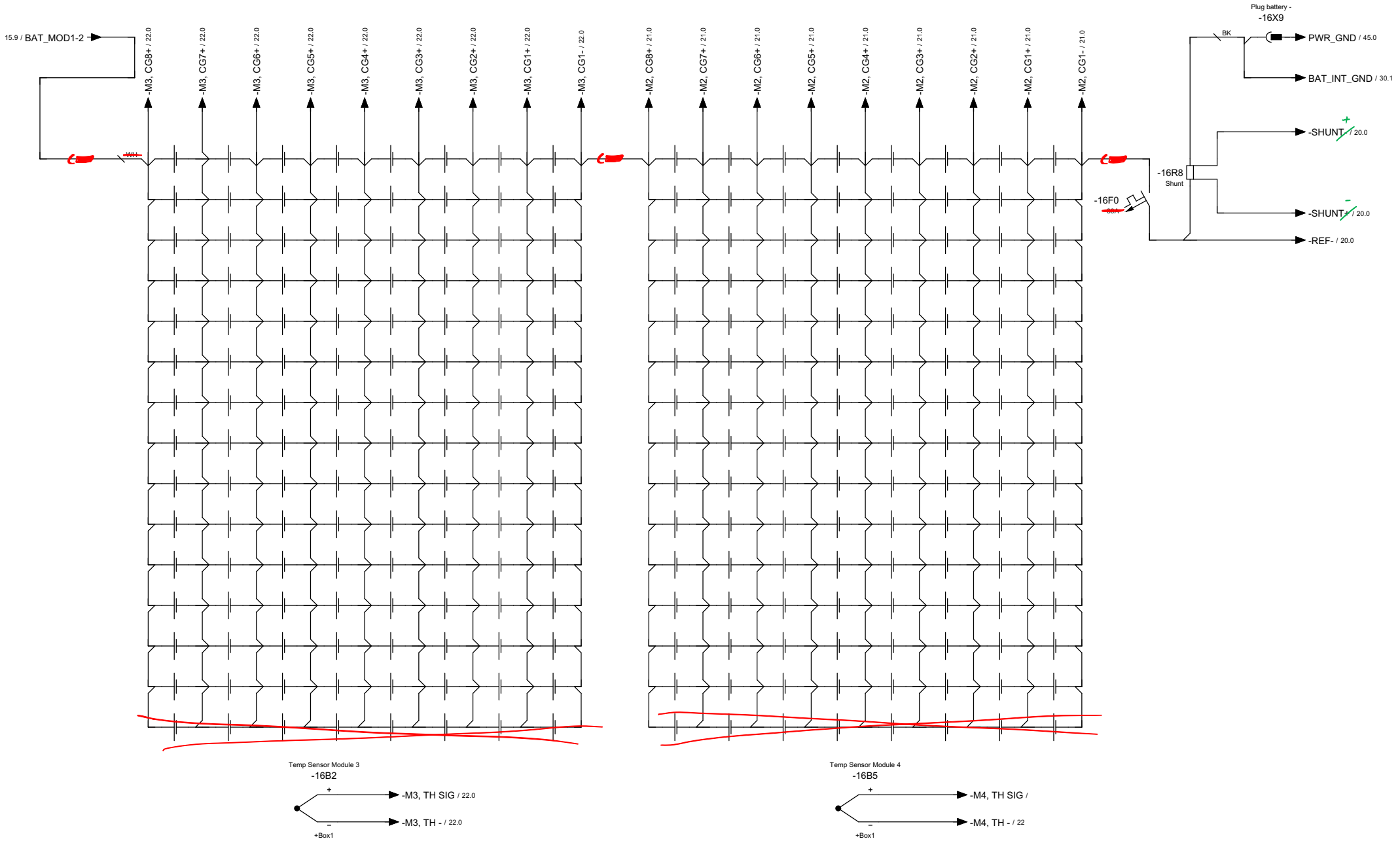


Module 3 Module Configuration: 8S15P

Module 4 Module Configuration: 8S15P

15	0	1	2	3	4	5	6	7	8	9	20

BÜHLER

SER 3
Car name: SER3
Car number: 31

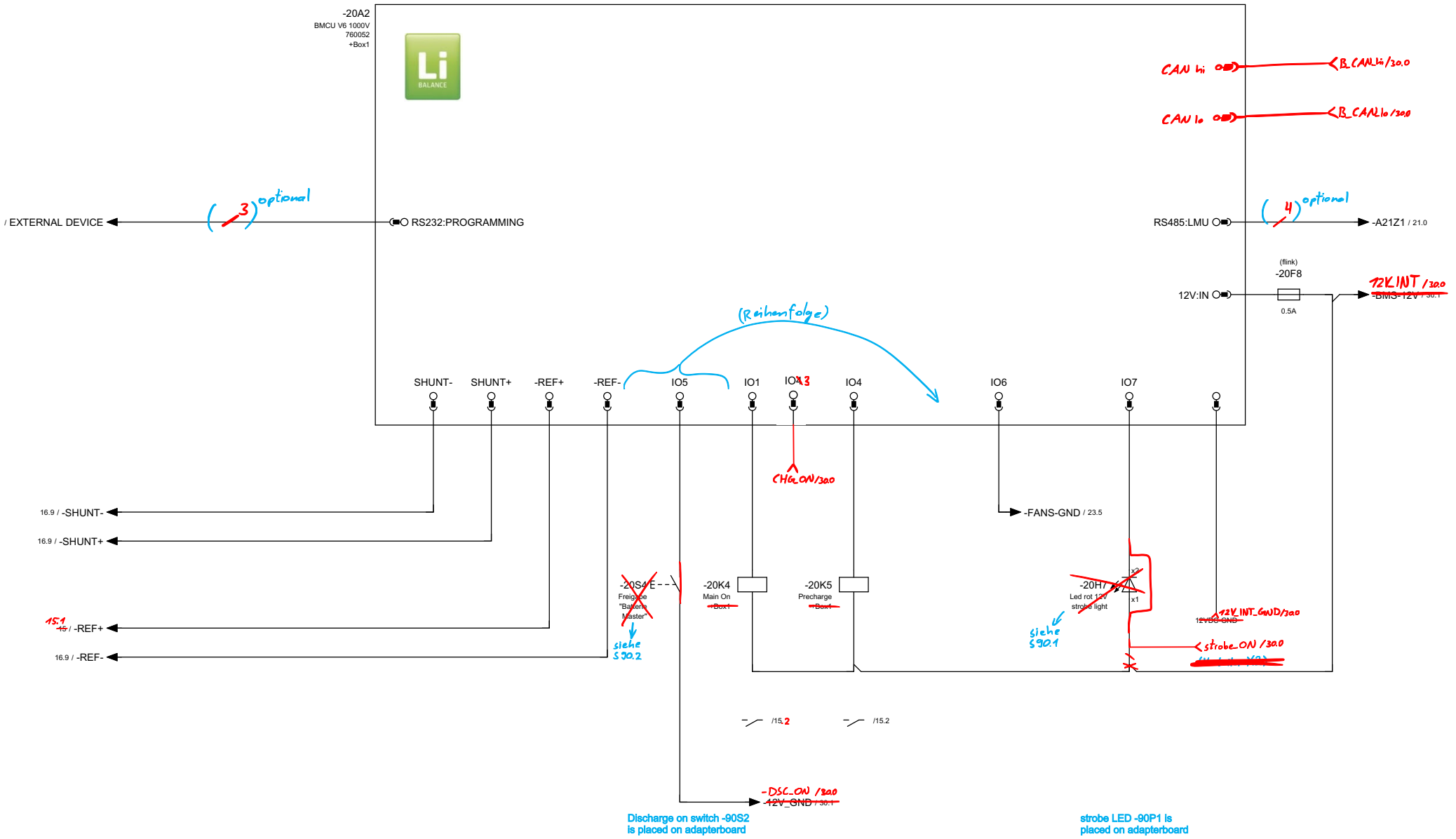
Box heavy

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3 = SOLARCAR
Steuerungssytem = CTRL
Auto Elektrik / Elektronik + CAR



16	0	1	2	3	4	5	6	7	8	9	21

BÜHLER

SER 3
Car name: SER3
Car number: 31

BMS: 1x BMCU

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3 = SOLARCAR
Steuerungssytem = CTRL
Auto Elektrik / Elektronik + CAR

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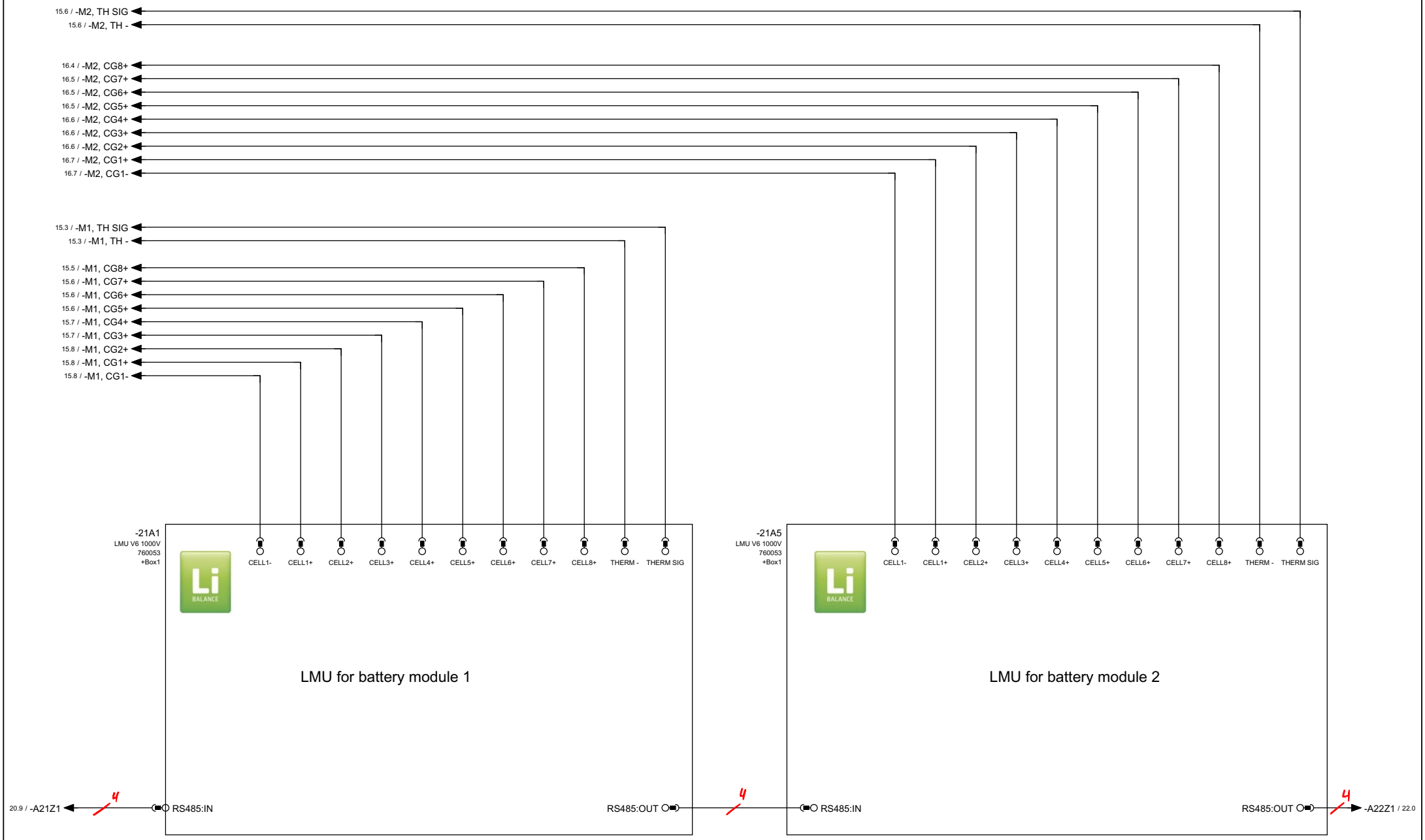

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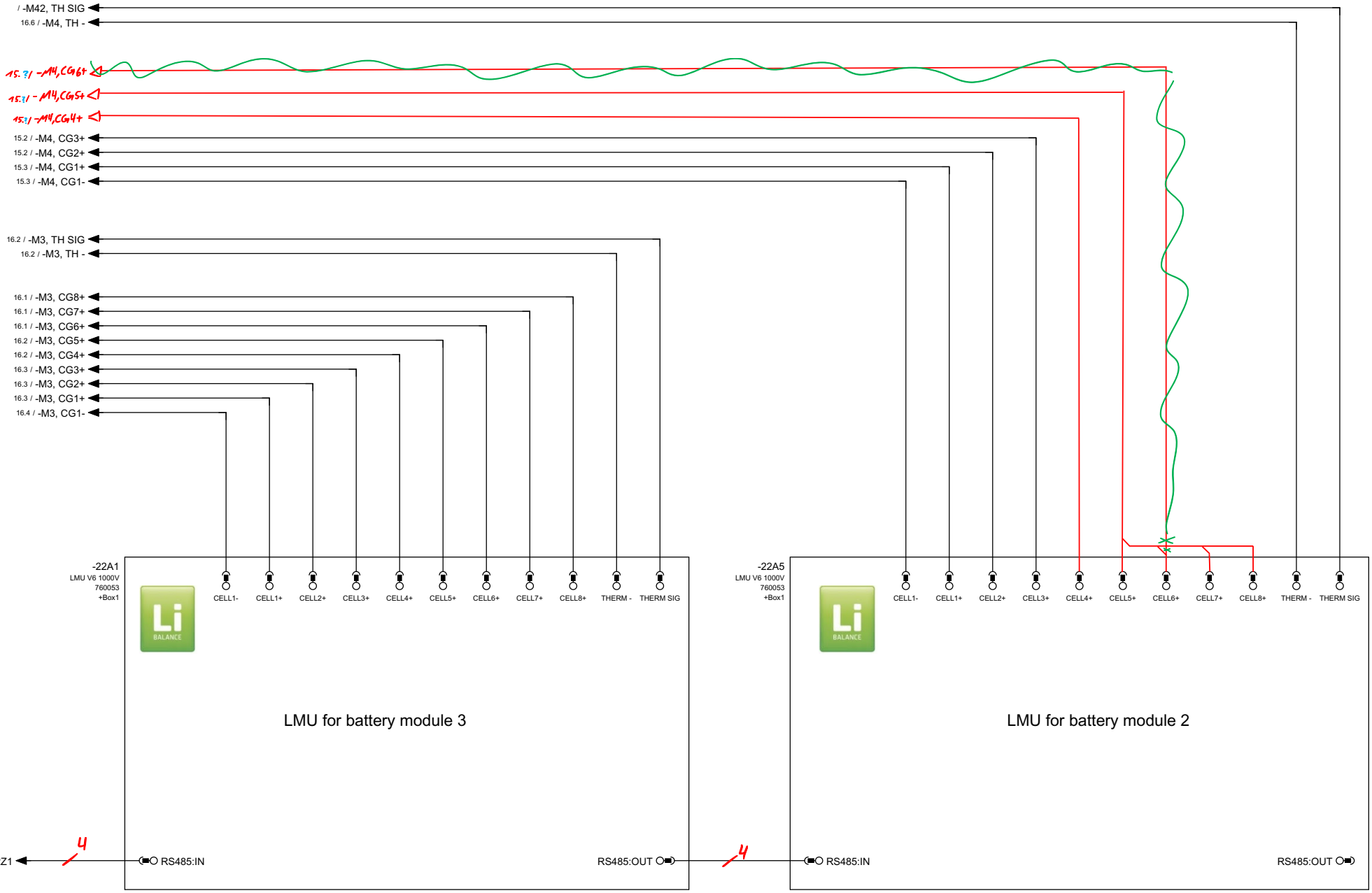
BÜHLER	SER 3 Car name: SER3 Car number: 31	BMS: 2x LMU	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 = SOLARCAR Steuerungssytem = CTRL Auto Elektrik / Elektronik + CAR	Page 21



21	0	1	2	3	4	5	6	7	8	9	23

BÜHLER

SER 3
Car name: SER3
Car number: 31

BMS: 2x LMU

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3 = SOLARCAR
Steuerungssytem = CTRL
Auto Elektrik / Elektronik + CAR

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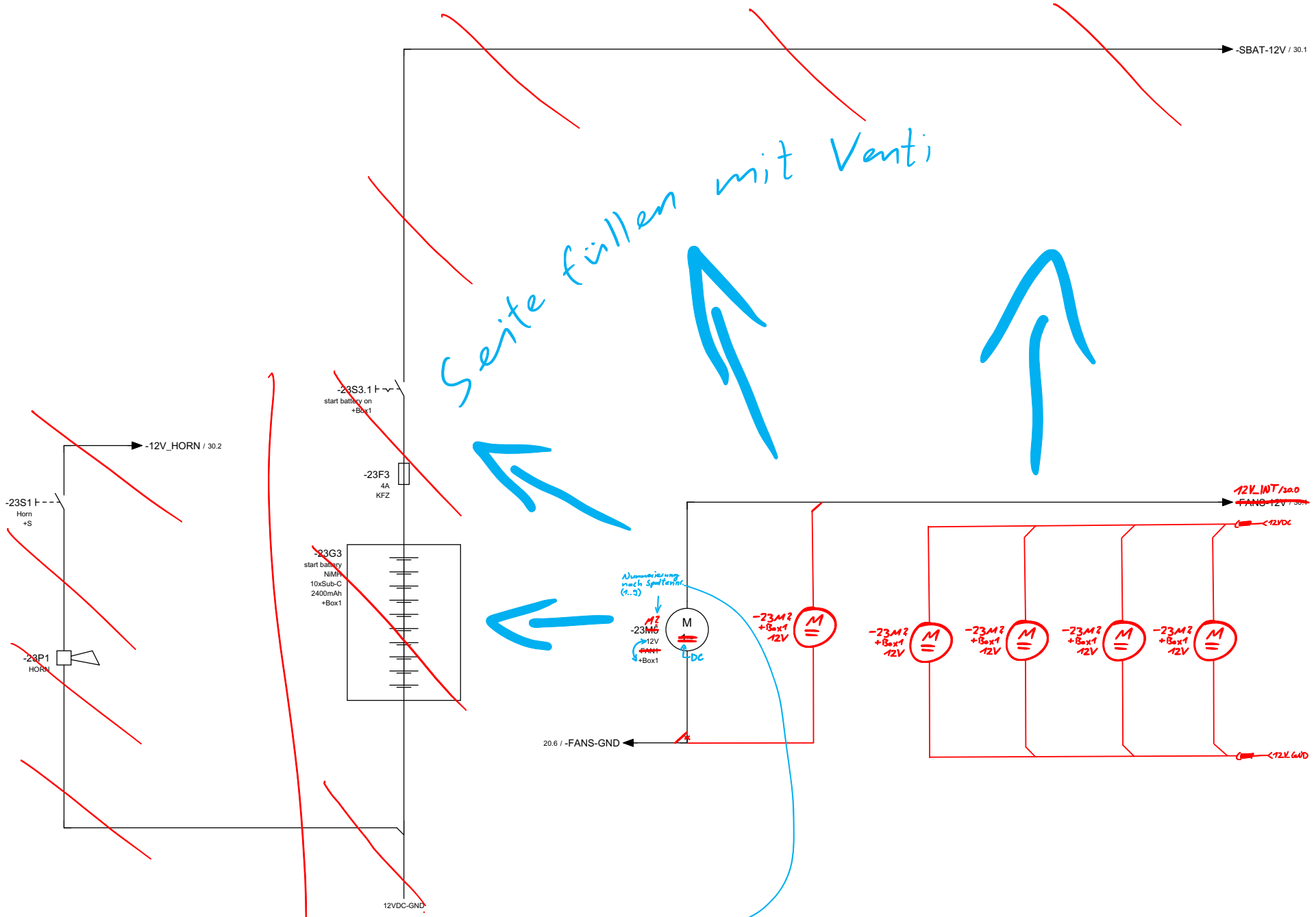
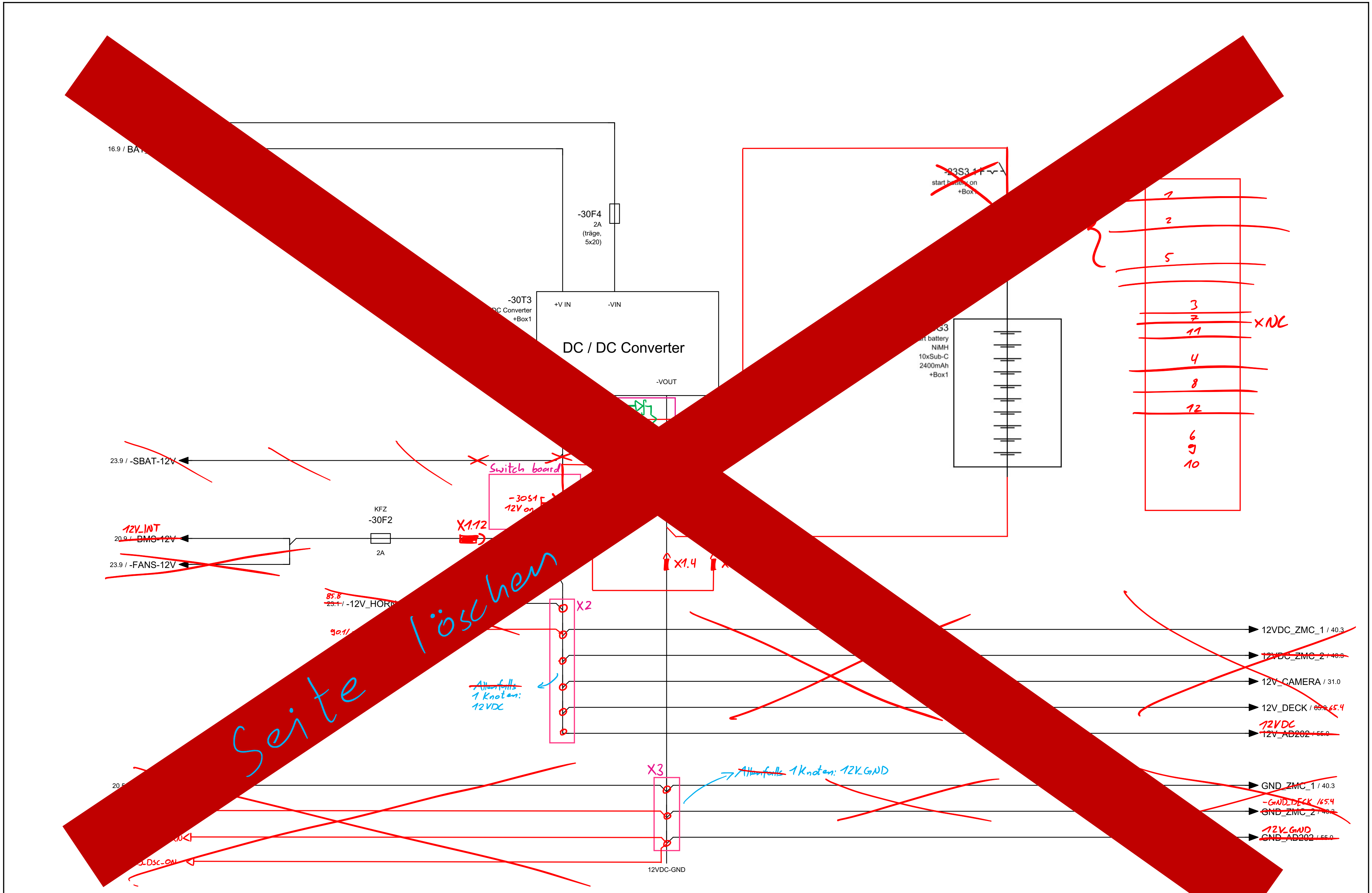


BÜHLER	SER 3 Car name: SER3 Car number: 31	Supp.Battery, Fans	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 23



23 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 31

BÜHLER

SER 3
Car name: SER3
Car number: 31

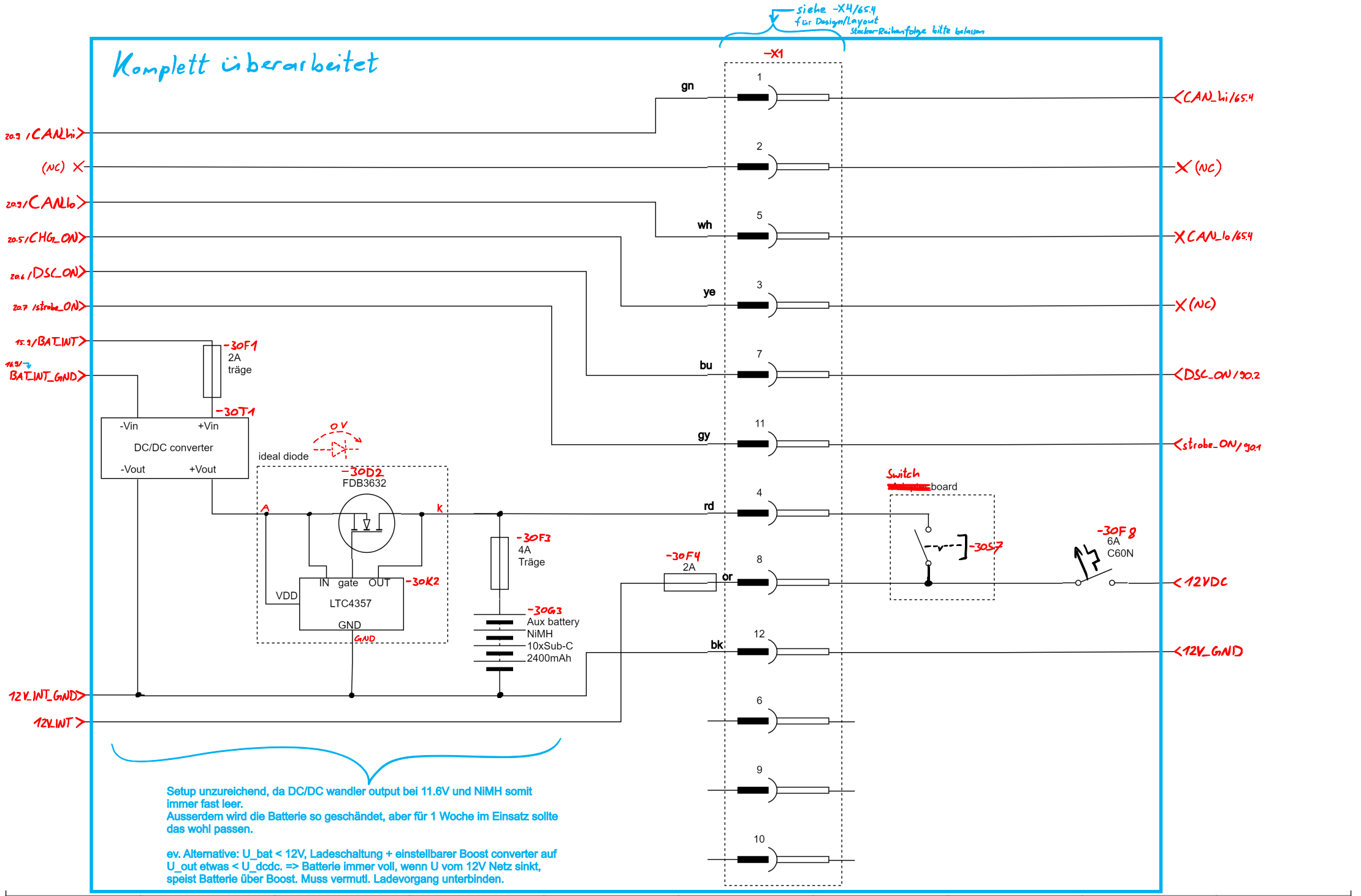
12V Power Board

Internal code name: SER 3

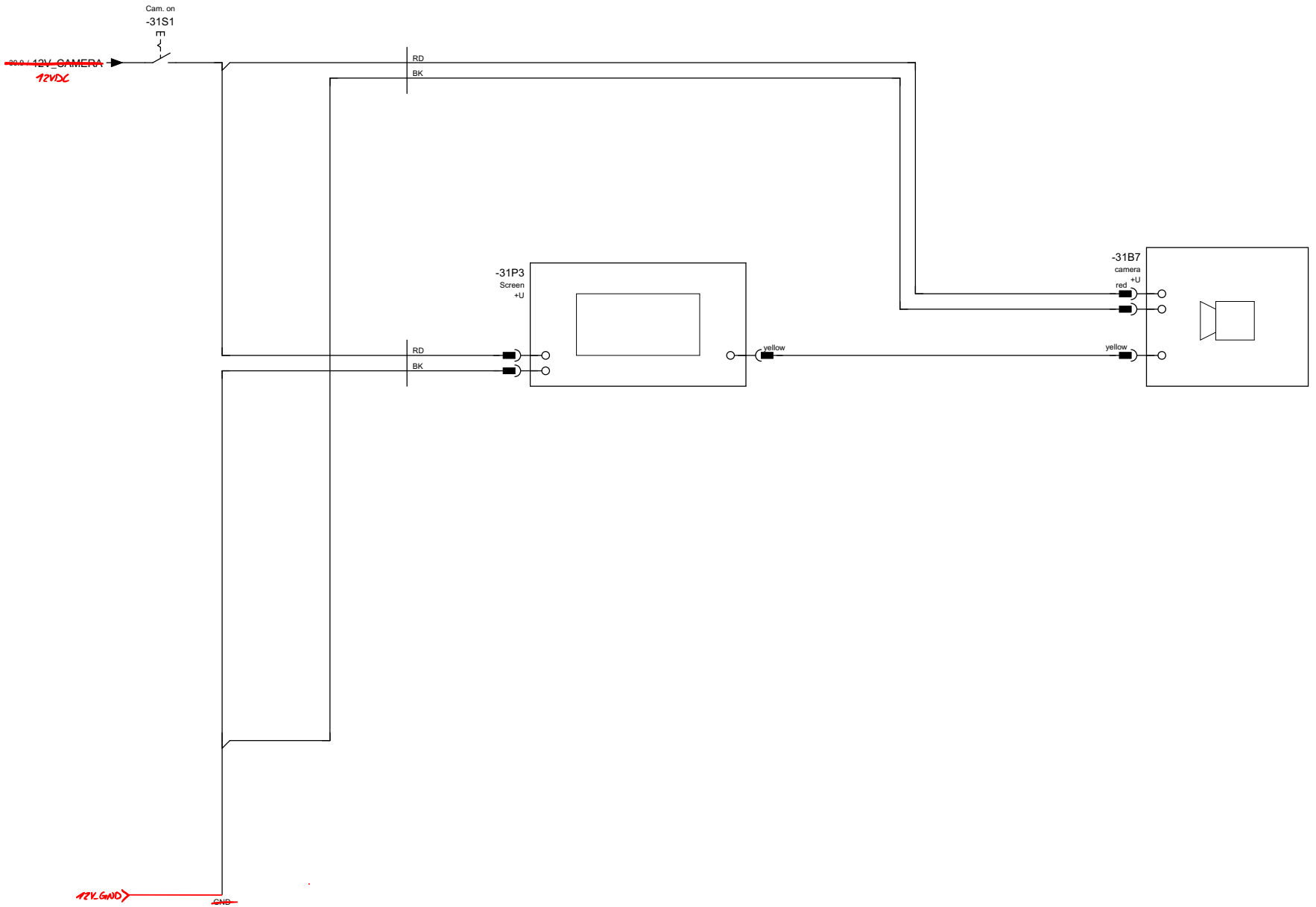
SER3

Creation:	Daniel Sutter	16.04.2013
Edit:	Annique Müller	15.07.2019
Check:	?	
	Print date:	15.07.2019

Solarauto SER3	=	SOLARCAR
Steuerungssytem	=	CTRL
Auto Elektrik / Elektronik	+	CAR



BÜHLER	SER 3 Car name: SER3 Car number: 31	12V Power Board	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 30



◀ 30	0	1	2	3	4	5	6	7	8	9	40 ▶

BÜHLER

SER 3
Car name: SER3
Car number: 31

Rear-View Camera

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3	=	SOLARCAR
Steuerungssytem	=	CTRL
Auto Elektrik / Elektronik	+	CAR

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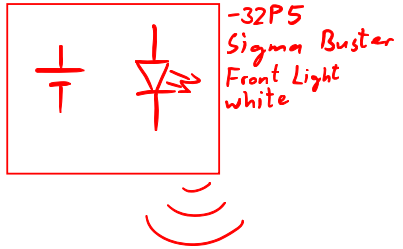
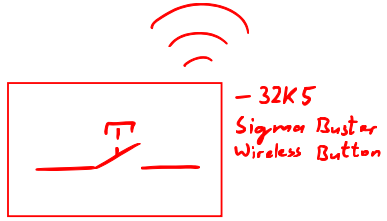
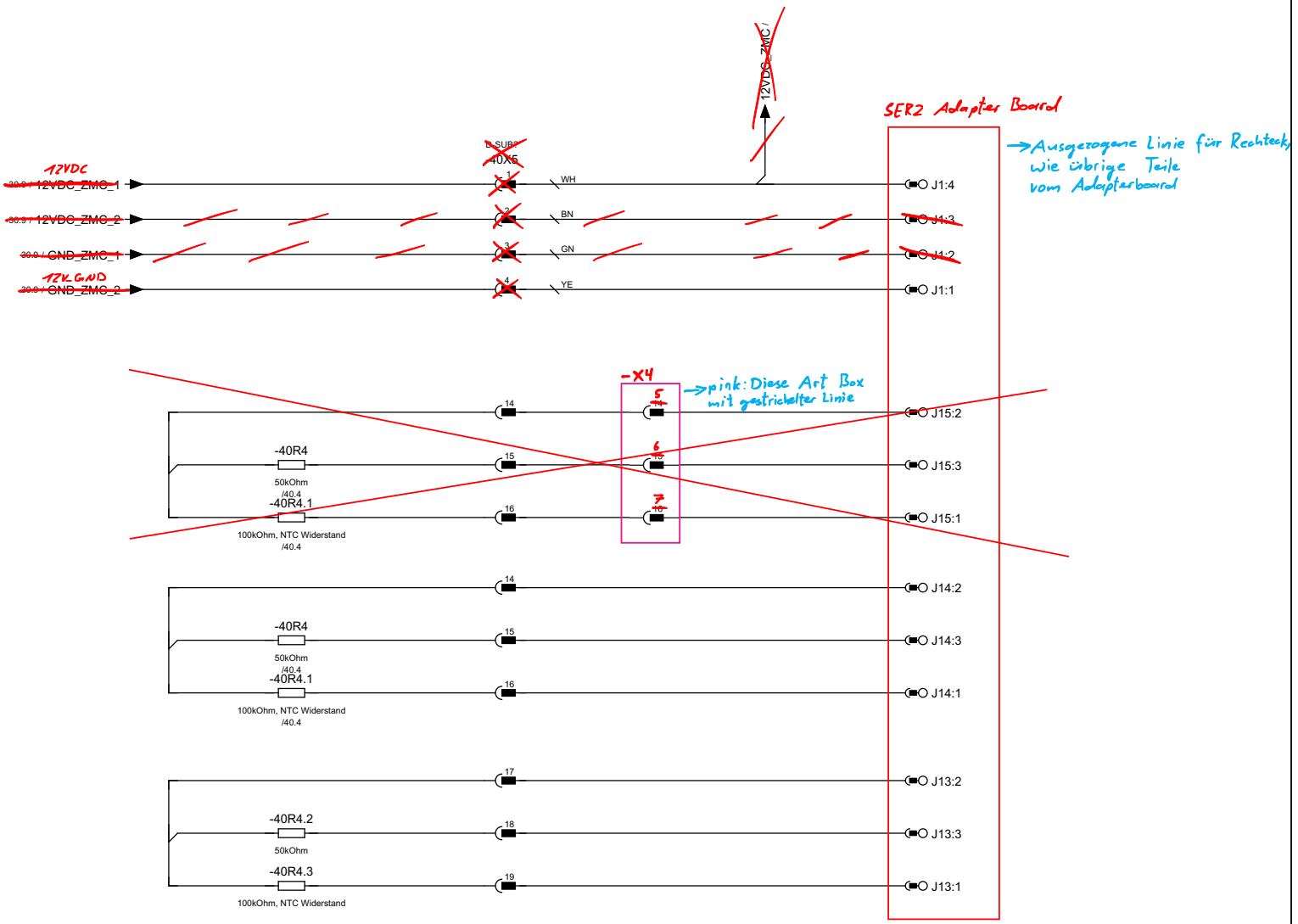




BÜHLER	SER 3 Car name: SER3 Car number: 31	~~Rear-View Camera~~ Front light	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page ~~31~~ 32



31	0	1	2	3	4	5	6	7	8	9	45

BÜHLER

SER 3
Car name: SER3
Car number: 31

Temperature sensors

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3	=	SOLARCAR
Steuerungssytem	=	CTRL
Auto Elektrik / Elektronik	+	CAR

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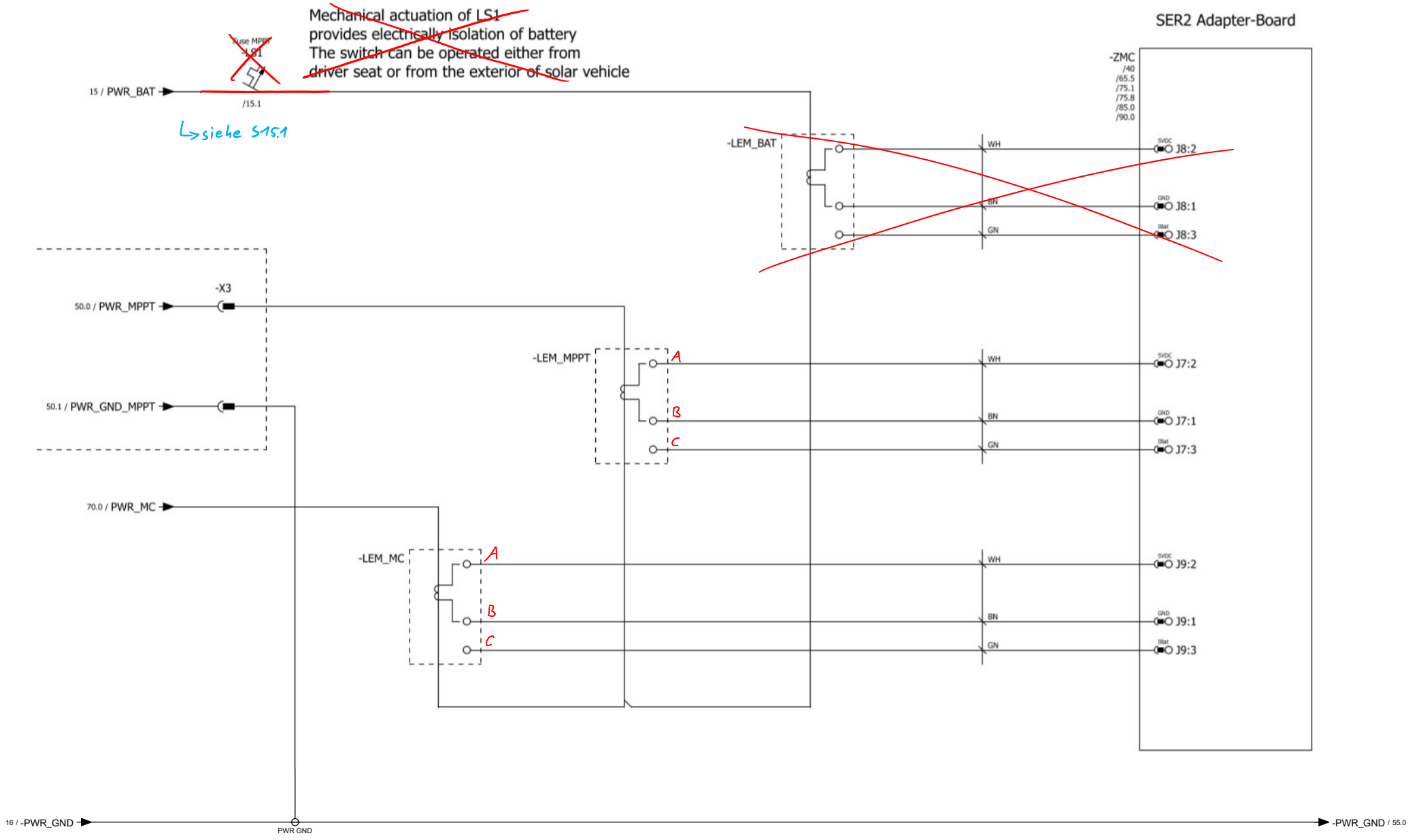


40	0	1	2	3	4	5	6	7	8	9 50

BÜHLER

SER 3
Car name: SER3
Car number: 31

LEM units

Internal code name: SER 3

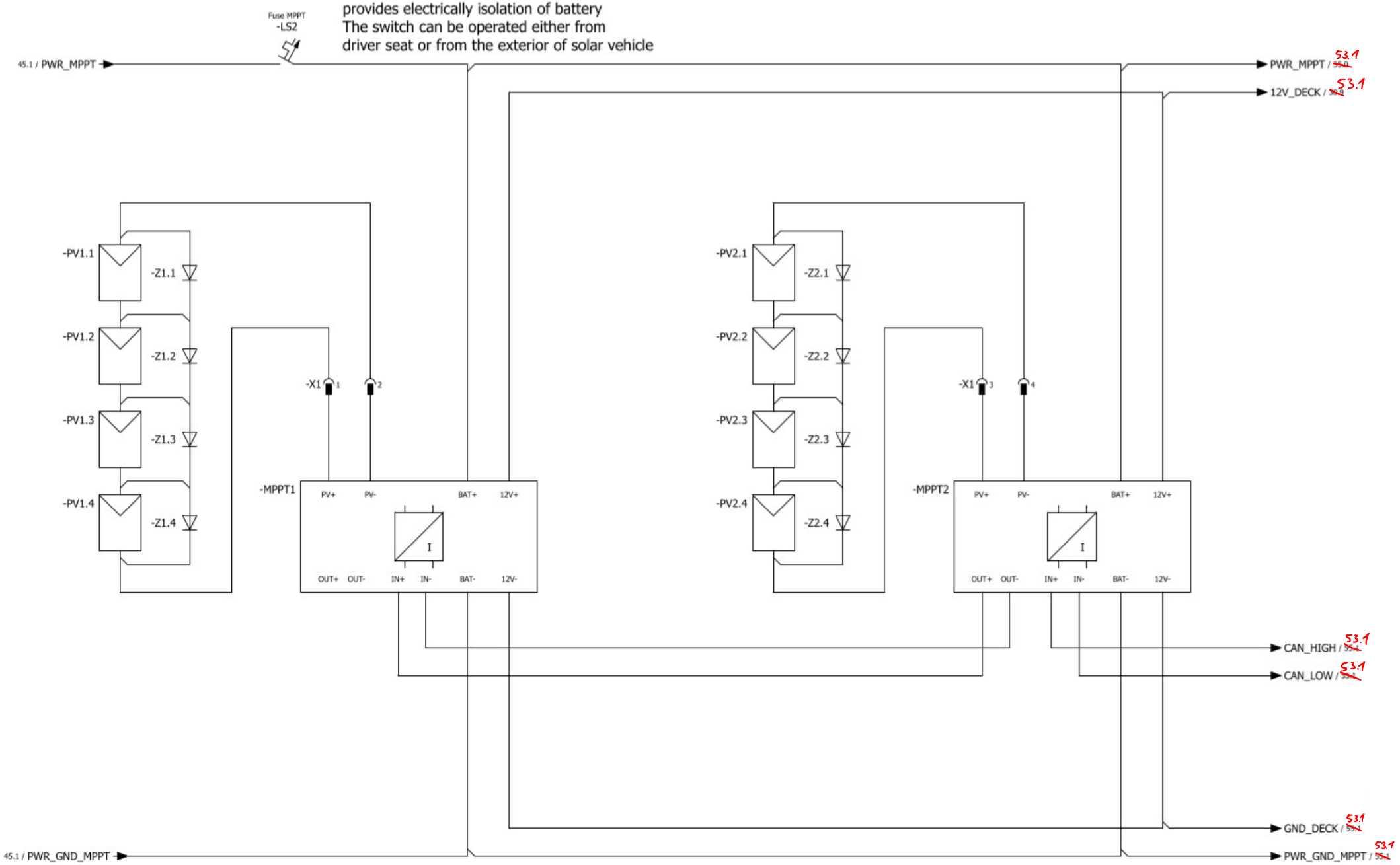
SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3 = SOLARCAR
Steuerungssytem = CTRL
Auto Elektrik / Elektronik + CAR

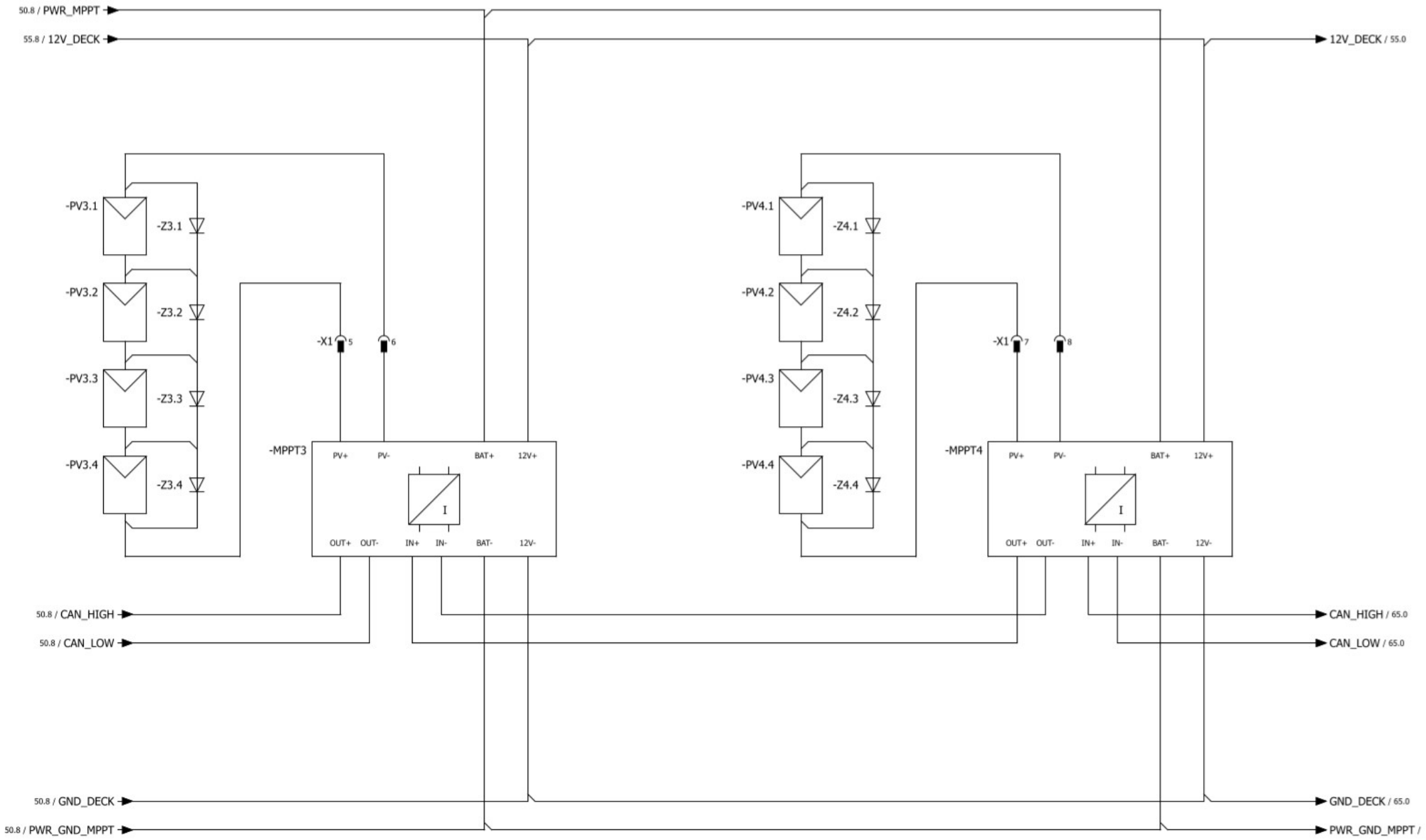
Only schematic overview, see page 115 for detailed configuration of array

Mechanical actuation of LS2
provides electrically isolation of battery
The switch can be operated either from
driver seat or from the exterior of solar vehicle



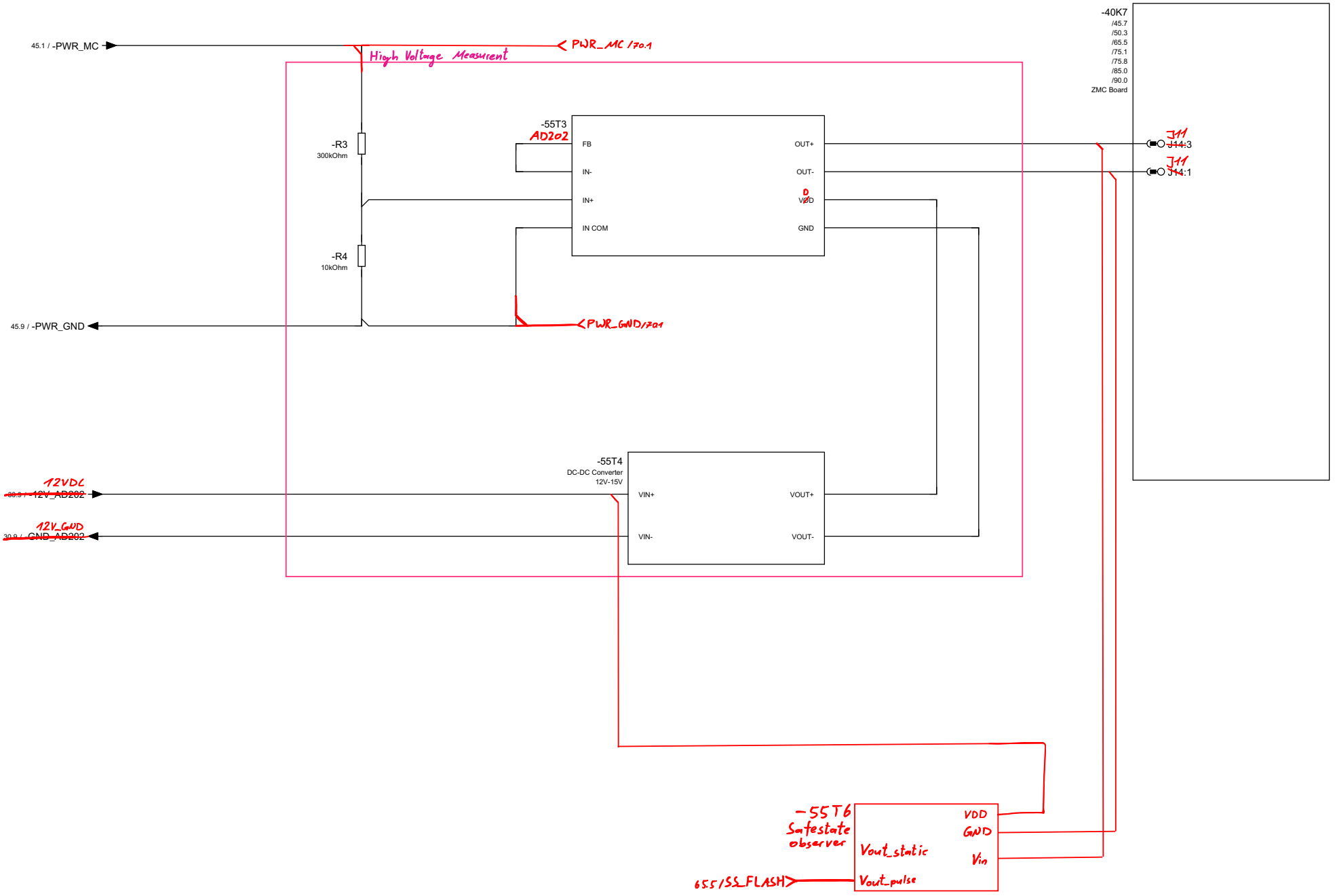
◀ 45	0	1	2	3	4	5	6	7	8	9 55 ▶

BÜHLER	SER 3 Car name: SER3 Car number: 31	MPPT 1-8, PV arrays	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: 05.09.2018 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 50



45	0	1	2	3	4	5	6	7	8	9	55

BÜHLER	SER 3 Car name: SER3 Car number: 31	MPPT 1-8, PV arrays	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: 05.09.2018 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 50 53

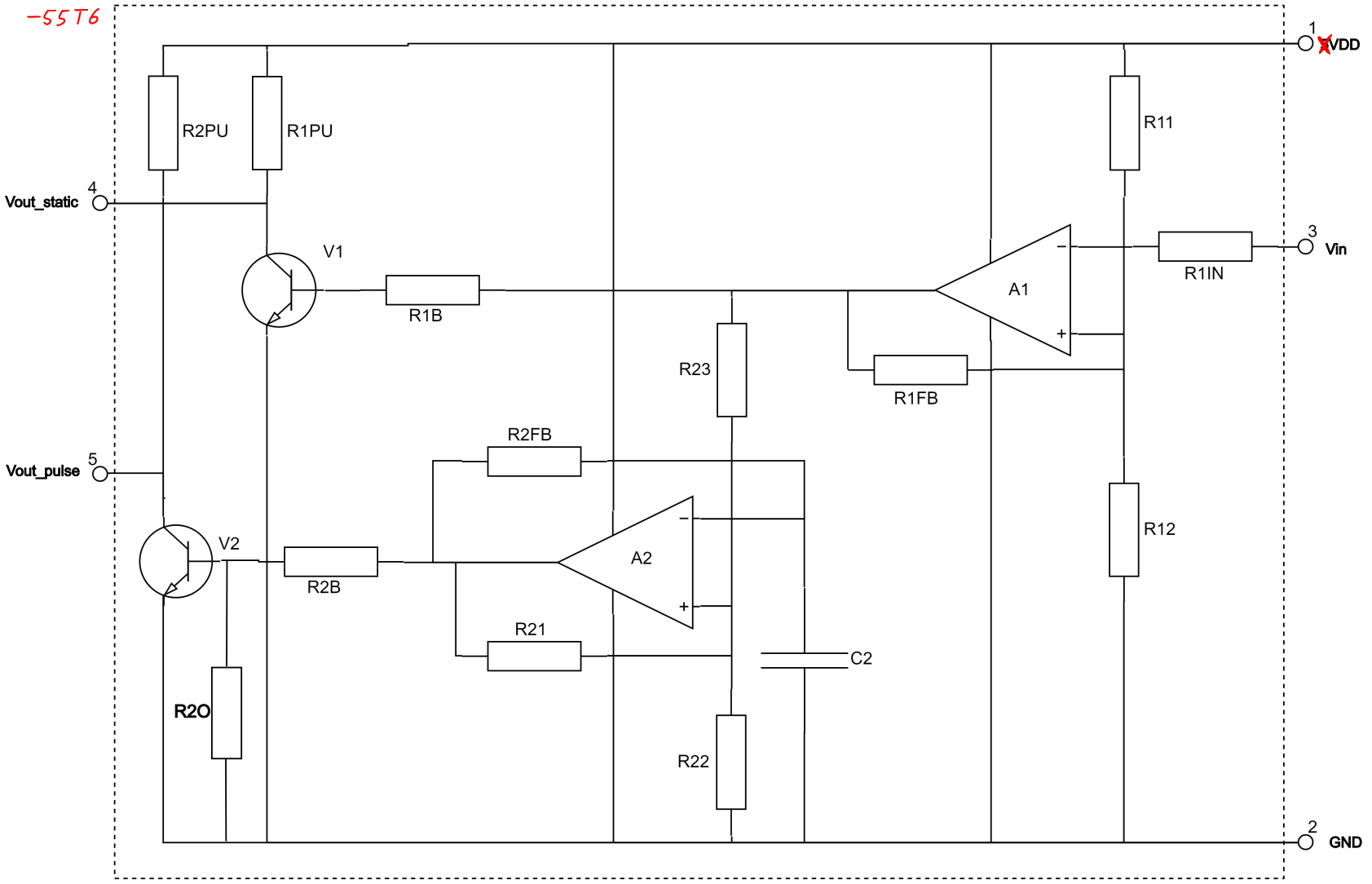


◀ 50	0	1	2	3	4	5	6	7	8	9	65 ▶

BÜHLER	SER 3 Car name: SER3 Car number: 31	AD202	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 55

Safestate observer

-55T6



R1IN: 68k
R11: 180k
R12: 7.5k
R1FB: 2.2M

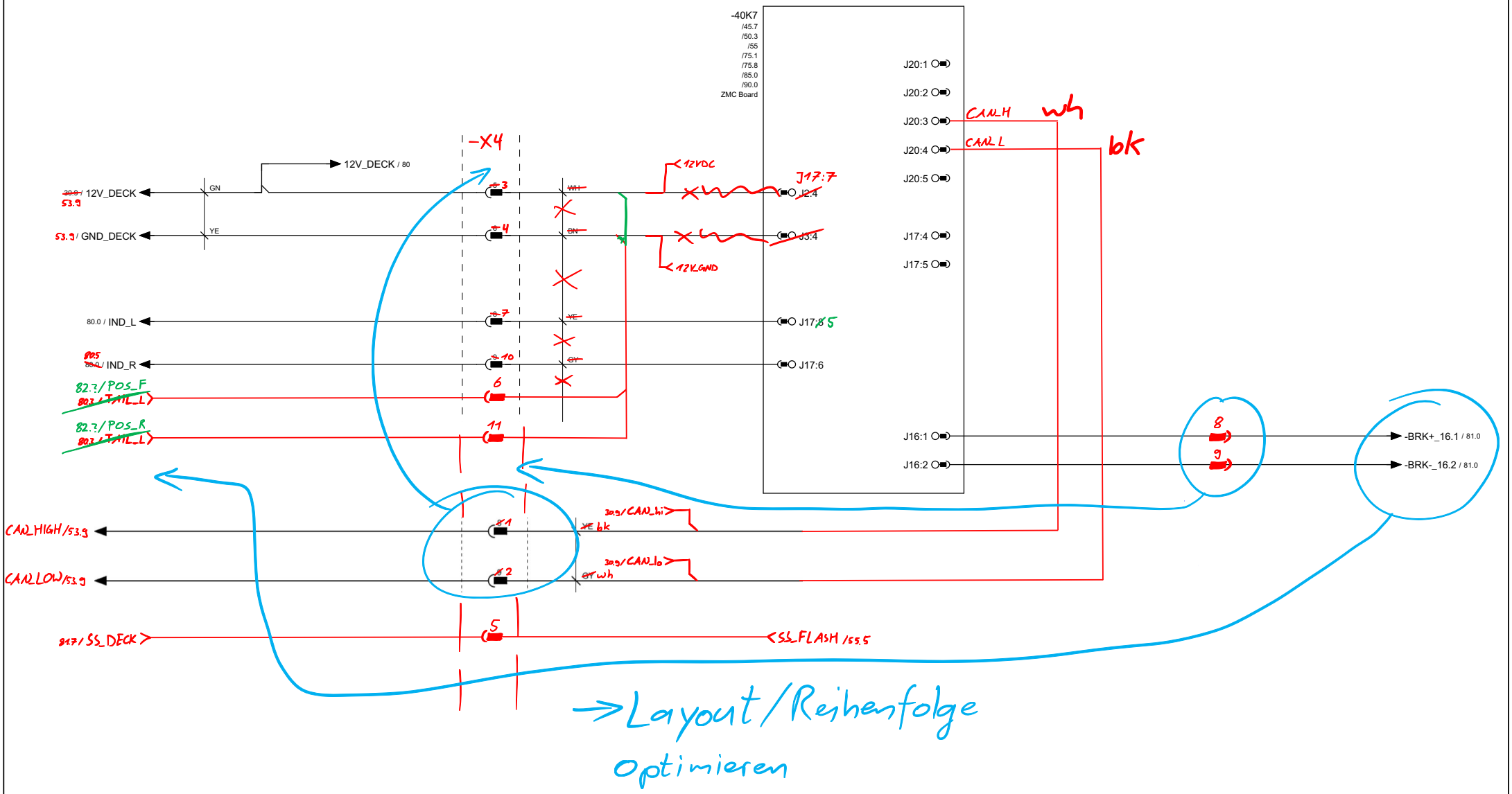
R21: 20k
R22: 47k
R23: 47k
R2FB: 68k
C2: 4.7uF

R1B: 330
R2B 330
R1PU: 180k
R2PU: 180k

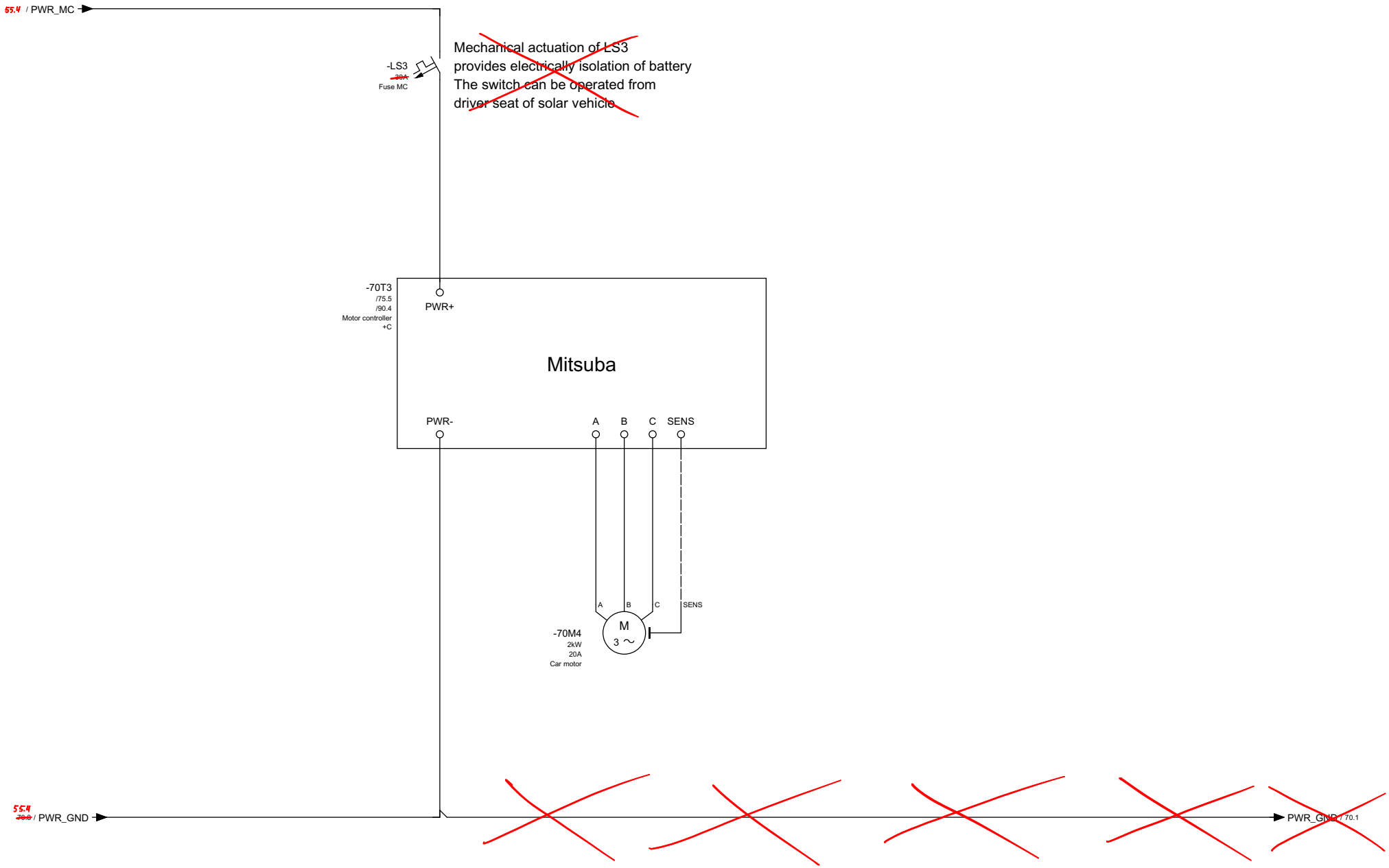
V1: BC337
V2: BC337
A1 = A2 = LM324

R2O: 1k

BÜHLER	SER 3 Car name: SER3 Car number: 31	~~AD202~~ safestate observer	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 56 ~~55~~



BÜHLER	SER 3 Car name: SER3 Car number: 31	CAN-ZMC Board	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 65



65	0	1	2	3	4	5	6	7	8	9	75

BÜHLER

SER 3
Car name: SER3
Car number: 31

Motor Controller

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3	=	SOLARCAR
Steuerungssytem	=	CTRL
Auto Elektrik / Elektronik	+	CAR

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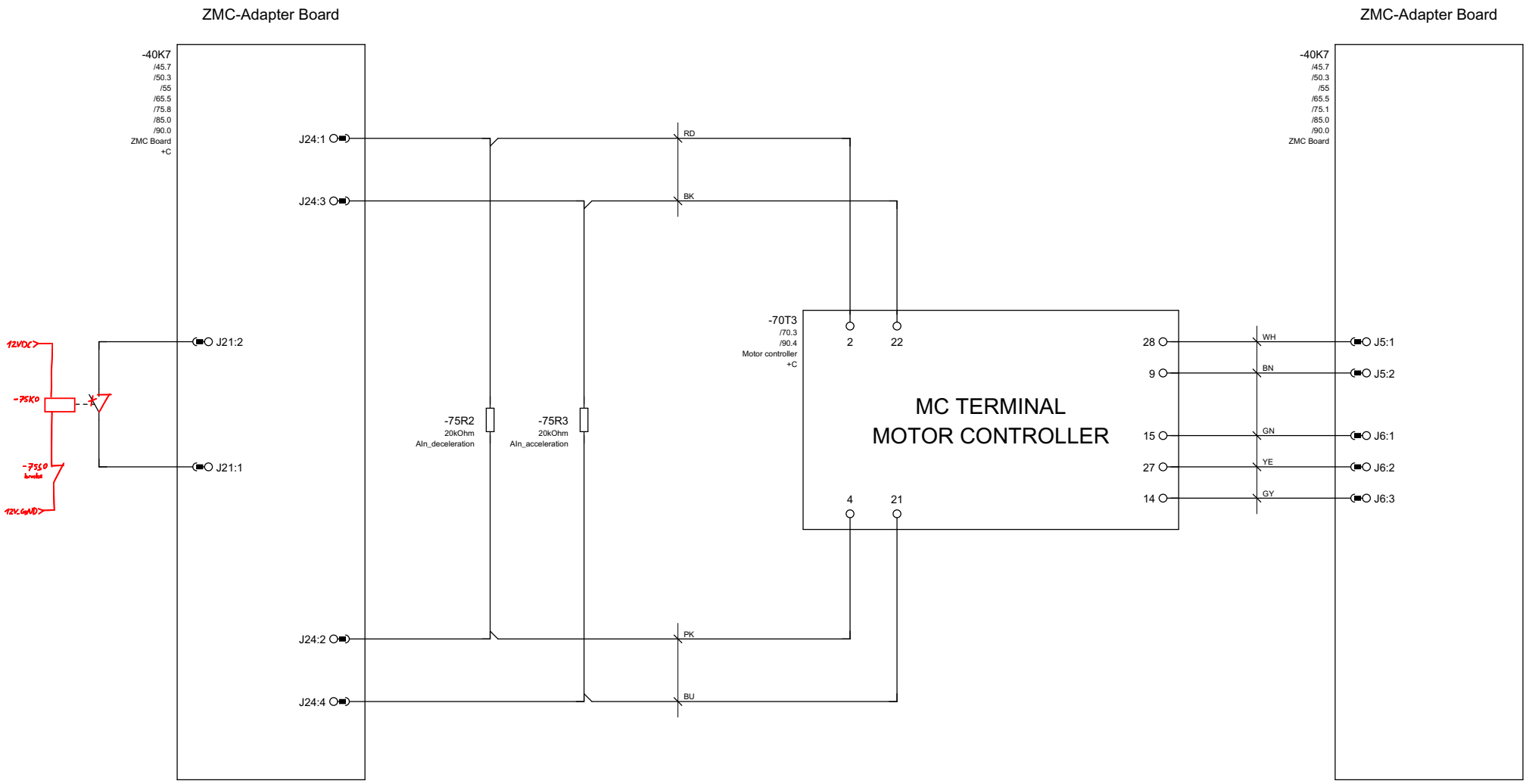

70	0	1	2	3	4	5	6	7	8	9 80

BÜHLER

SER 3
Car name: SER3
Car number: 31

Motor Controller

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: 05.09.2018
Check: ?
Print date: 15.07.2019

Solarauto SER3 = SOLARCAR
Steuerungssytem = CTRL
Auto Elektrik / Elektronik + CAR

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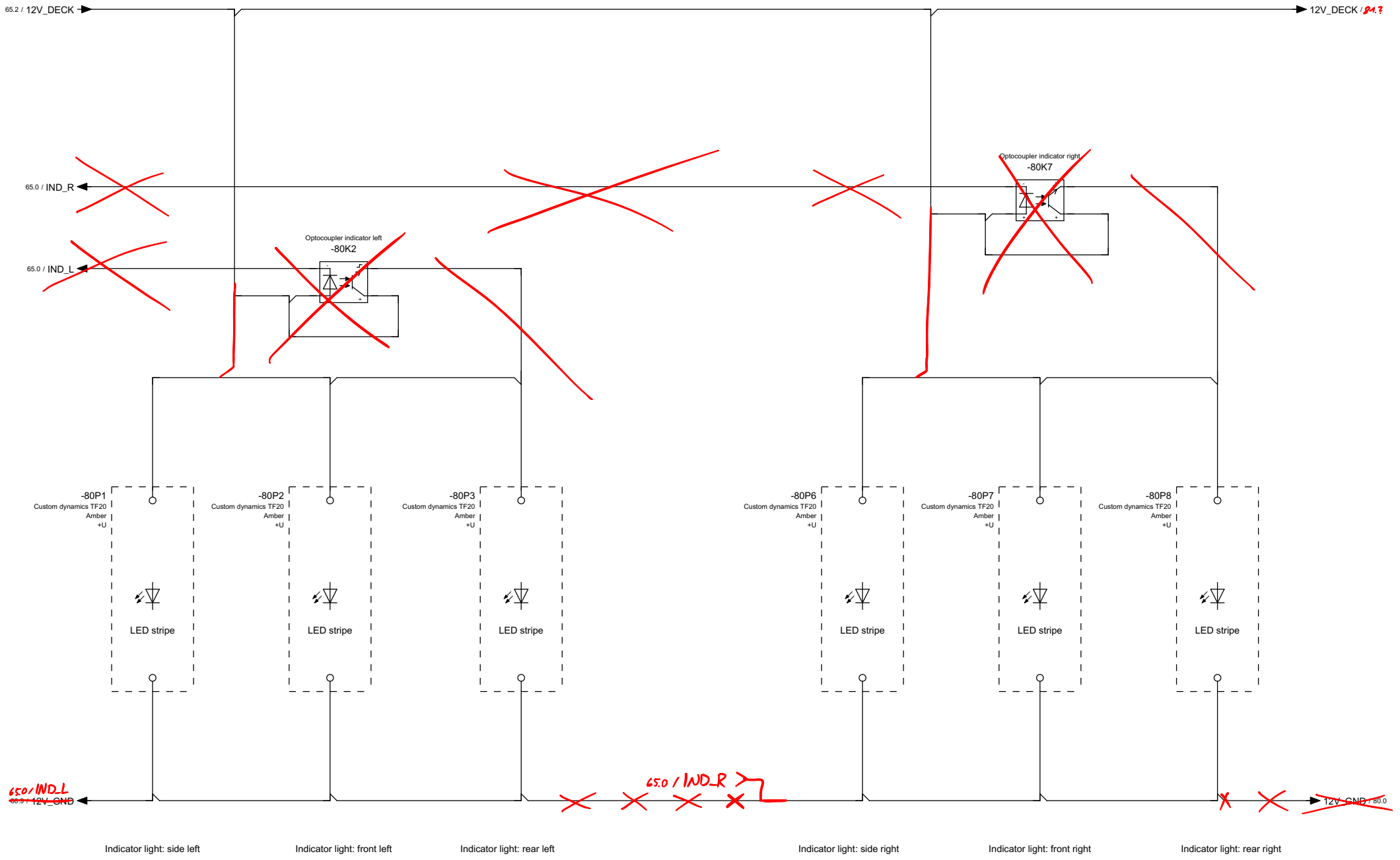

75	0	1	2	3	4	5	6	7	8	9	81

BÜHLER

SER 3
Car name: SER3
Car number: 31

Light control 1

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: Annique Müller 15.07.2019
Check: ?
Print date: 15.07.2019

Solarauto SER3 = SOLARCAR
Steuerungssytem = CTRL
Auto Elektrik / Elektronik + CAR

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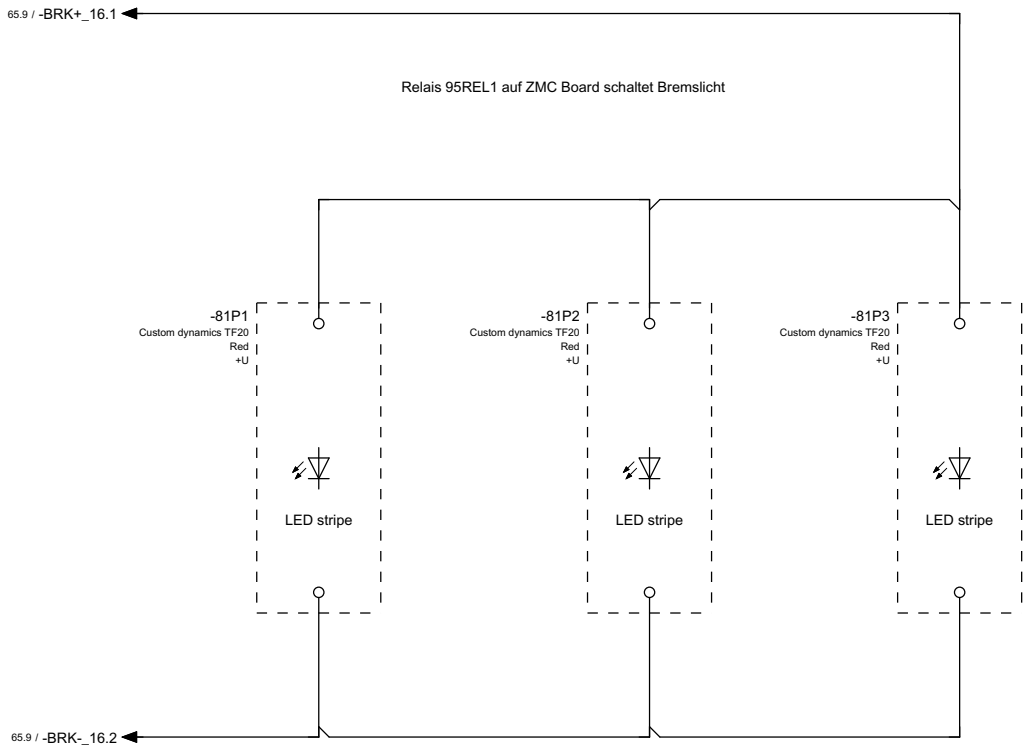
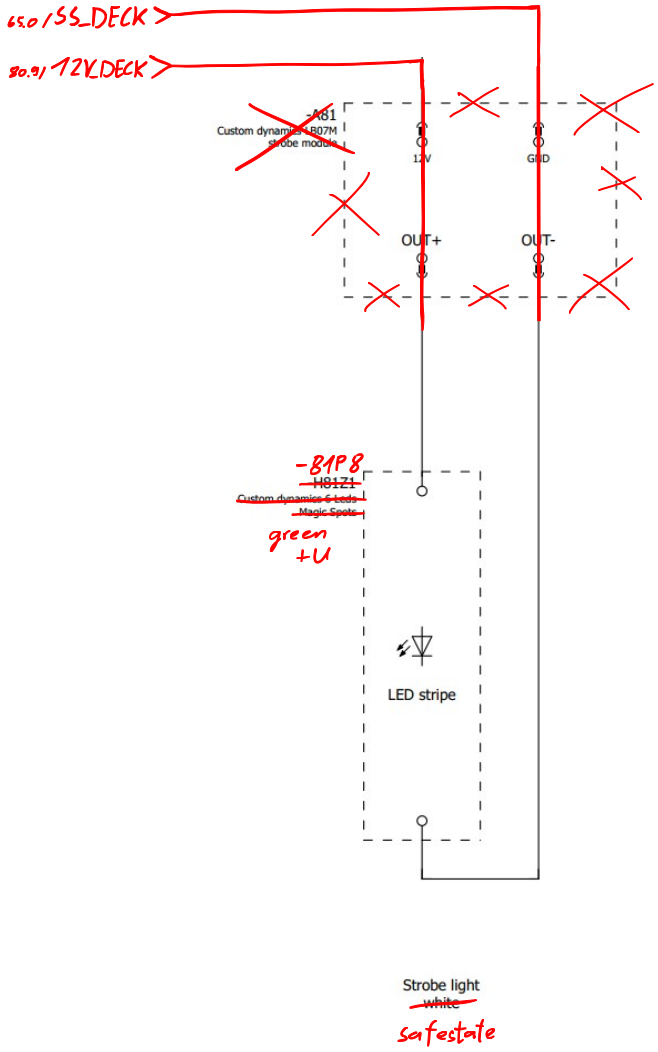
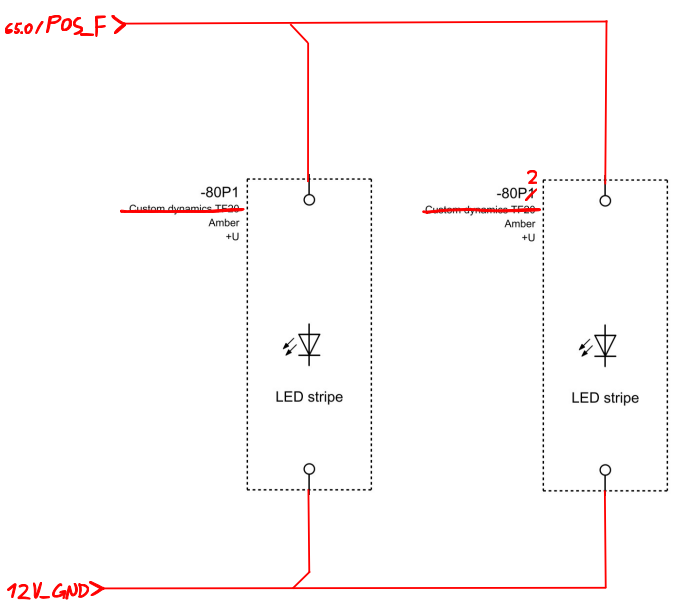
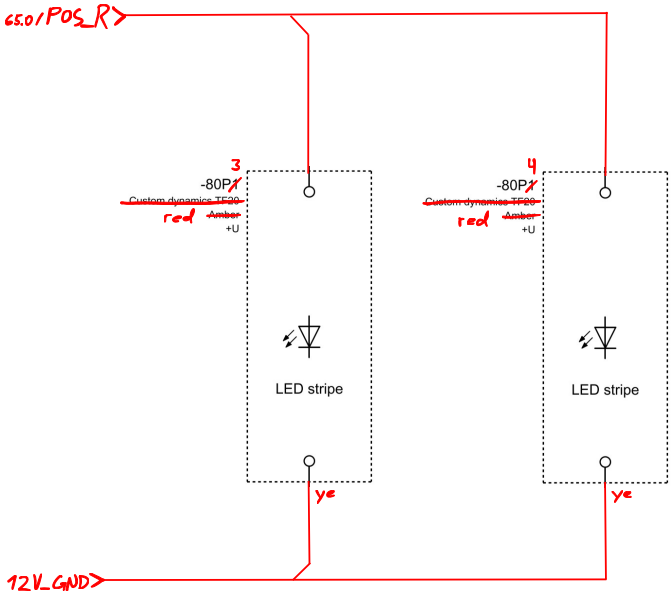




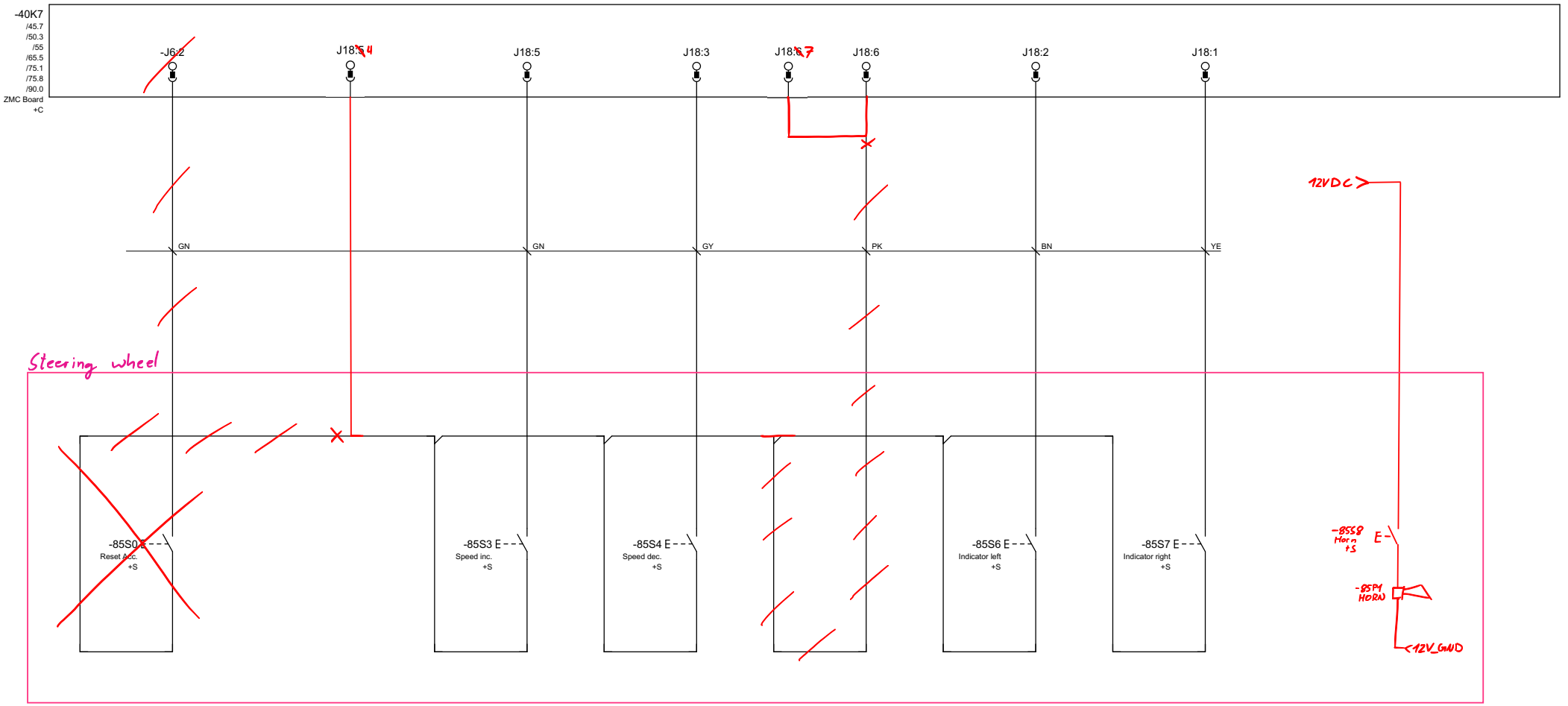
◀ 80	0	1	2	3	4	5	6	7	8	9	85 ▶

BÜHLER	SER 3 Car name: SER3 Car number: 31	Light control 2	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 81





BÜHLER	SER 3 Car name: SER3 Car number: 31	Light control 2 3	Internal code name: SER 3	Creation: Daniel Sutter 16.04.2013 Edit: Annique Müller 15.07.2019 Check: ?	Solarauto SER3	= SOLARCAR	Page 81 82
			SER3	Print date: 15.07.2019	Steuerungssytem	= CTRL	
					Auto Elektrik / Elektronik	+ CAR	



Reset Acceleration

GND

Speed increase

Speed decrease

GND

Tempomat on (bridged)

Indicator light: left

Indicator light: right

Horn

◀ 81	0	1	2	3	4	5	6	7	8	9 90 ▶

BÜHLER

SER 3
Car name: SER3
Car number: 31

SolarEV Steering wheel

Internal code name: SER 3

SER3

Creation: Daniel Sutter 16.04.2013
Edit: 05.09.2018
Check: ?
Print date: 15.07.2019

Solarauto SER3 = SOLARCAR
Steuerungssytem = CTRL
Auto Elektrik / Elektronik + CAR

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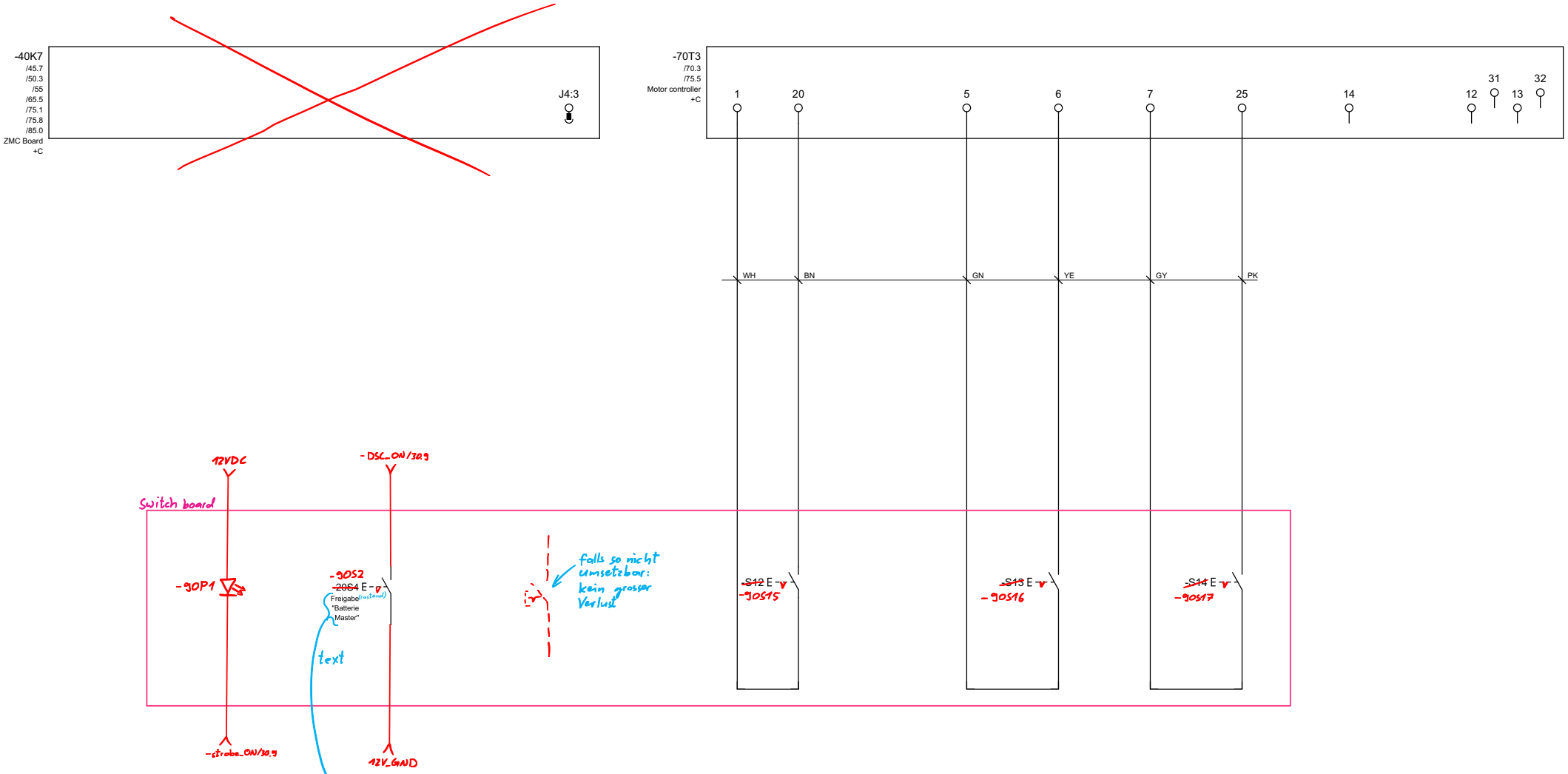
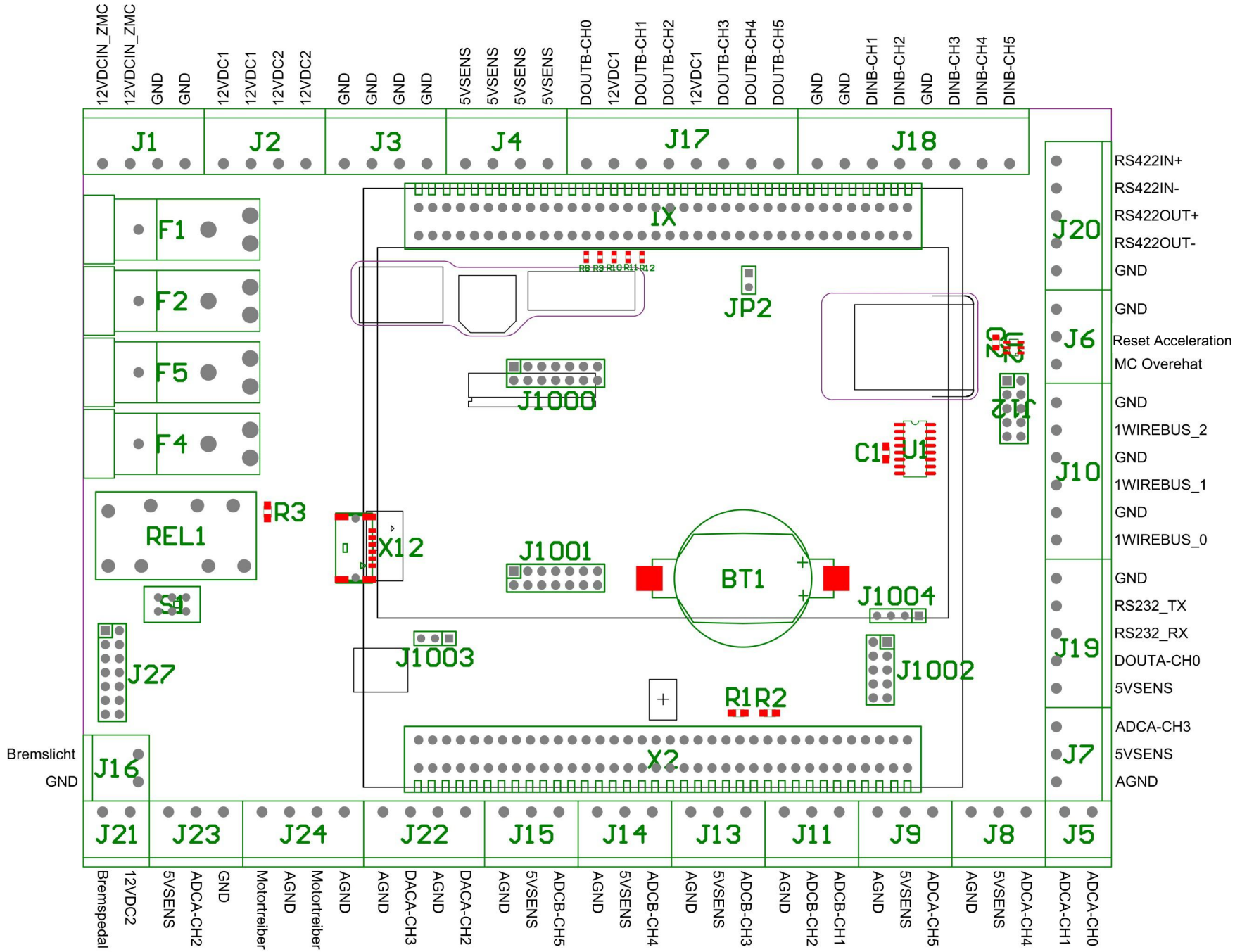
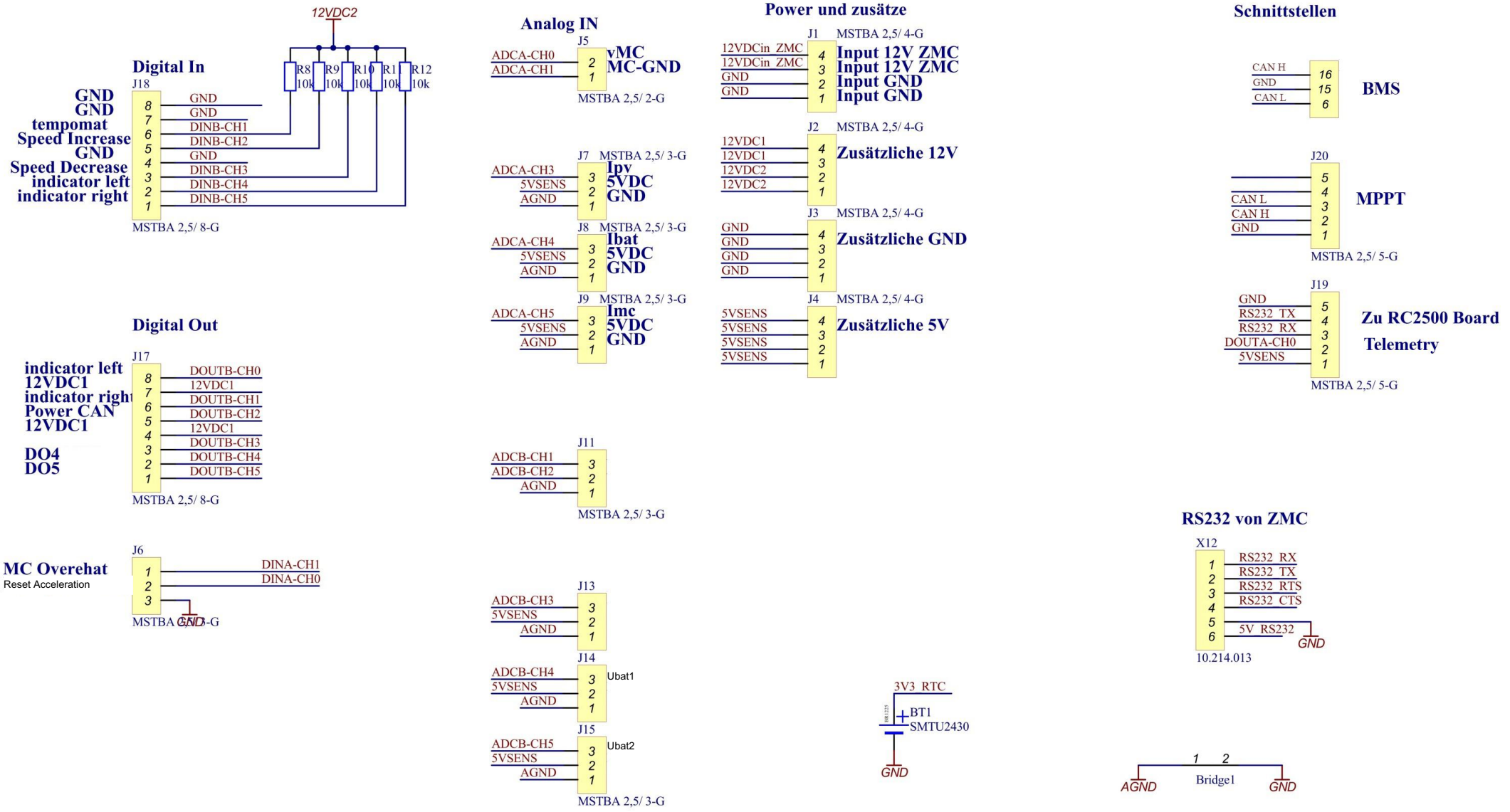

-40K7
/45.7
/50.3
/55
/65.5
/75.1
/75.8
/85.0
ZMC Board
+C
J4:3
-70T3
/70.3
/75.5
Motor controller
+C
1
20
5
6
7
25
14
12
31
13
32
WH
BN
GN
YE
GY
PK
12VDC
-DSC_ON/30.9
Switch board
-30P1
-30S2
-20S4 E
Freigabe (rastend)
"Batterie Master"
text
falls so nicht umsetzbar: kein grosser Verlust
-S12 E
-30S15
-S13 E
-30S16
-S14 E
-30S17
-strobe_ON/30.9
12V_GND
See page 23 for "Start up" switch S23Z2
LED red 12V strobe light BMS
See page 30.6 for 12V on switch -30S6
Text auch falls Schalter nicht umsetzbar
Motor Controller
PWR/Eco
FW0/BCK
alle Schalter rastend

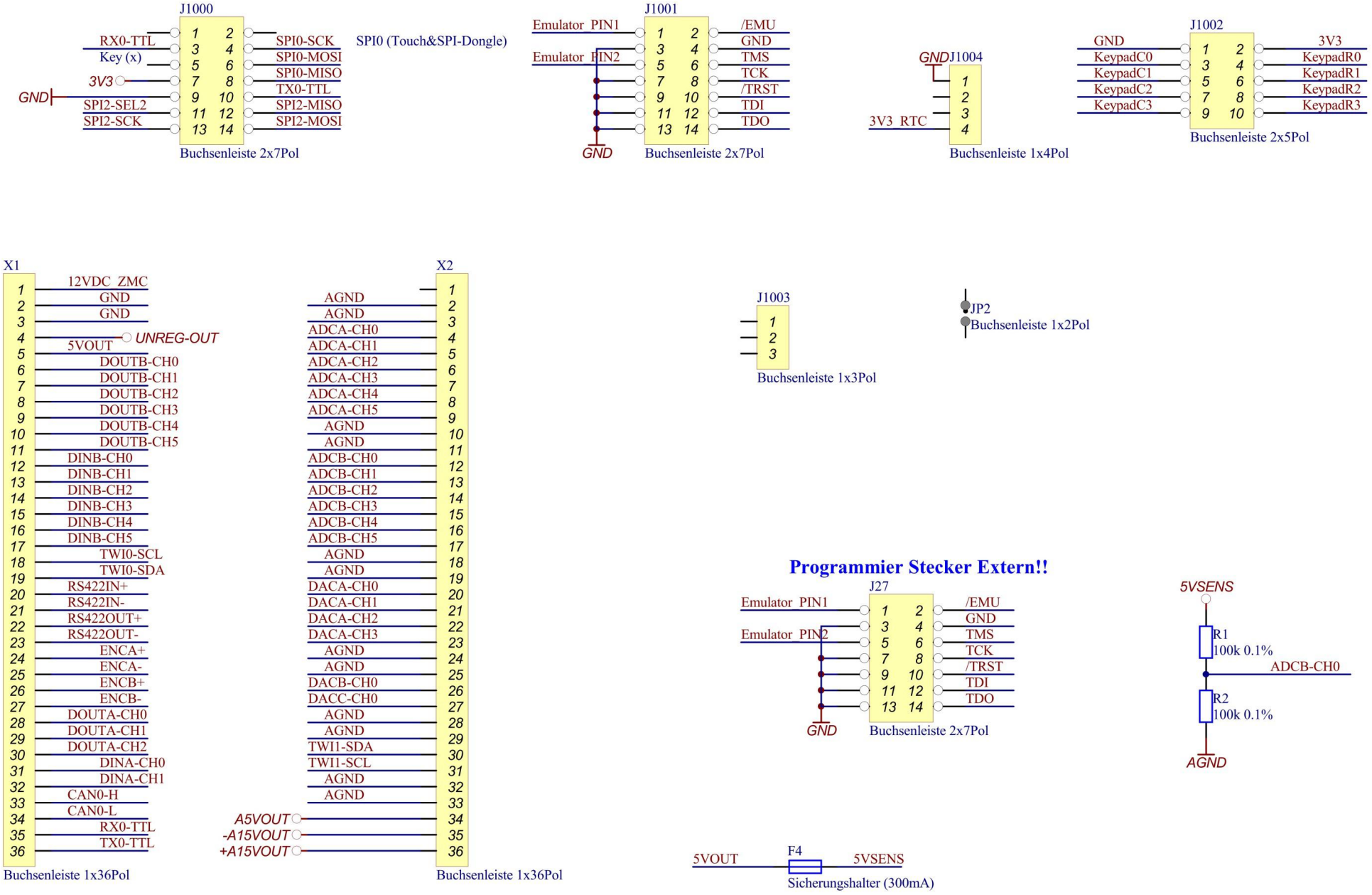


BÜHLER	SER 3 Car name: SER3 Car number: 31	SER3 Adapter Board	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: 05.09.2018 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 95

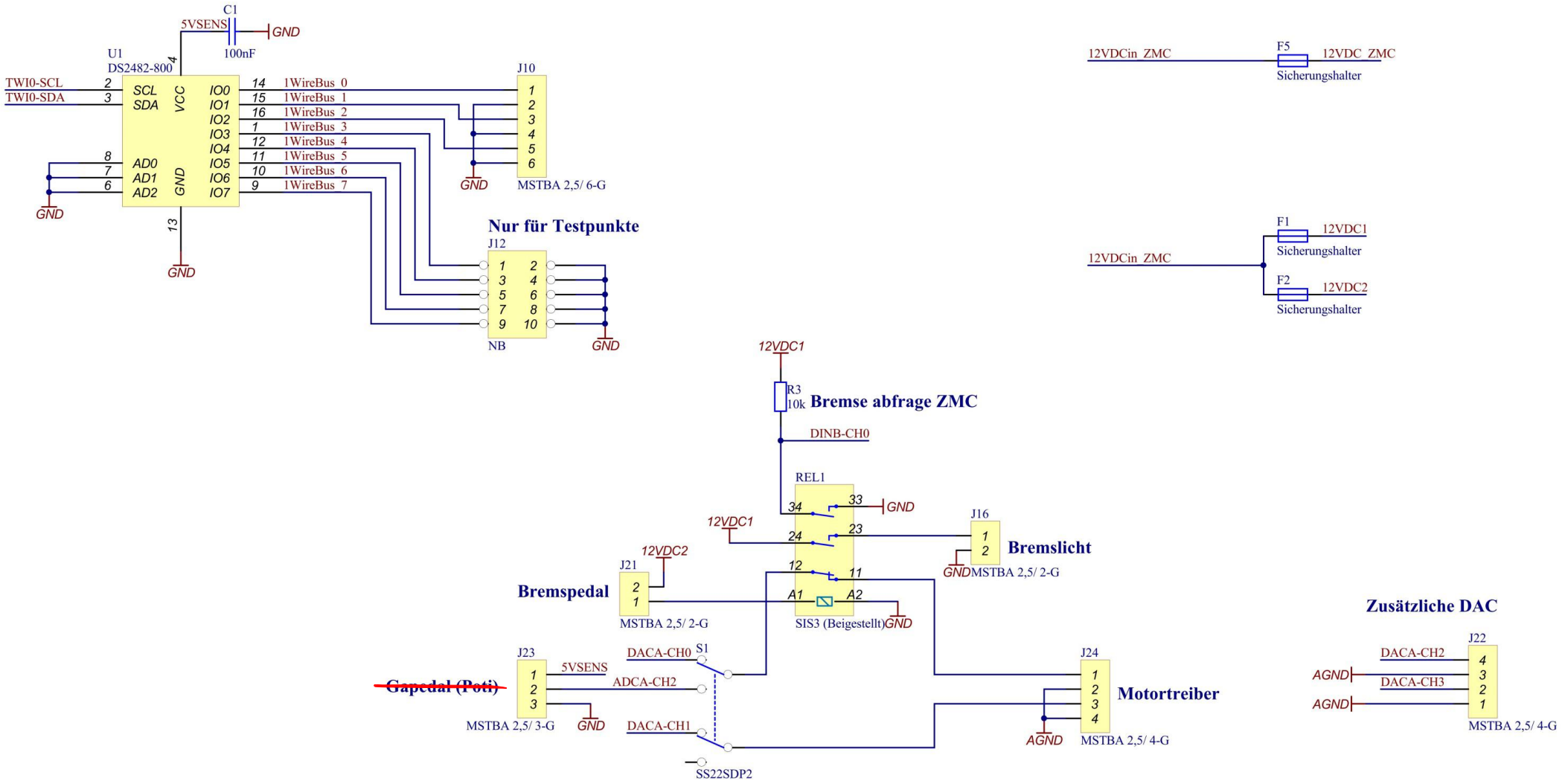


95	0	1	2	3	4	5	6	7	8	9	105

BÜHLER	SER 3 Car name: SER3 Car number: 31	SER3 Adapter Board	Internal code name: SER 3	Creation: Daniel Sutter 16.04.2013 Edit: 05.09.2018 Check: ?	Solarauto SER3	= SOLARCAR	Page 100
			SER3	Print date: 15.07.2019	Steuerungssytem	= CTRL	
					Auto Elektrik / Elektronik	+ CAR	



BÜHLER	SER 3 Car name: SER3 Car number: 31	SER3 Adapter Board	Internal code name: SER 3 SER3	Creation: Daniel Sutter 16.04.2013 Edit: 05.09.2018 Check: ? Print date: 15.07.2019	Solarauto SER3 Steuerungssytem Auto Elektrik / Elektronik	= SOLARCAR = CTRL + CAR	Page 105


C1
5VSENS
GND
100nF
U1
DS2482-800
TWI0-SCL
TWI0-SDA
SCL
SDA
VCC
GND
AD0
AD1
AD2
IO0
IO1
IO2
IO3
IO4
IO5
IO6
IO7
1WireBus_0
1WireBus_1
1WireBus_2
1WireBus_3
1WireBus_4
1WireBus_5
1WireBus_6
1WireBus_7
J10
MSTBA 2,5/ 6-G
Nur für Testpunkte
J12
NB
12VDCin_ZMC
F5
12VDC_ZMC
Sicherungshalter
F1
12VDC1
F2
12VDC2
12VDC1
R3
10k
Bremse abfrage ZMC
DINB-CH0
REL1
J16
Bremslicht
MSTBA 2,5/ 2-G
J21
Bremspedal
MSTBA 2,5/ 2-G
SIS3 (Beigestellt)
Gapedal (Poti)
J23
MSTBA 2,5/ 3-G
DACA-CH0
DACA-CH1
ADCA-CH2
S1
SS22SDP2
J24
Motortreiber
MSTBA 2,5/ 4-G
Zusätzliche DAC
J22
DACA-CH2
DACA-CH3
AGND
MSTBA 2,5/ 4-G

Hier Seiten 115, 120, 125, 135 aus SER2-Schema einfügen

MITSUBA motor & motor controller

controller – terminal

description	parts terminal of number and position	wire color	terminal bar terminal number	D-sub connector terminal number	note
main switch	center	white	01	01	
	side	black	20	20	
acceleration volume	2	white	02	02	
	1	black	21	21	
	3	red	03	03	
generating brake volume	2	white	22	22	
	1	black	04	04	
	3	red	23	23	
power / normal mode switch	center	white	05	05	
		—	24	24	prohibit to connect
	side	black	06	06	
forward / reverse switch	center	white	25	25	
	side	black	07	07	
			26	26	Test Mode_SW
			08	08	Test Mode_GND-0V
			27	27	motor rotation pulse out put signal (0-5V)
			09	09	motor rotation analog output signal
			28	28	GND-(0V)
			10	10	Comm_Tx(LCD)
			29	29	Comm_Rx(LCD)
			11	11	Comm_GND-PE(LCD)
			30	30	Comm_CTS(LCD)
digital switch		red	12	12	Map_Bit0
		orange	31	31	Map_Bit1
		yellow	13	13	Map_Bit2
		green	32	32	Map_Bit3
LED	K (-) :3	black / (brown)	14	14	LED_GND-0V (Map_GND)
cooling fan	fan SIG	white	33	33	only use for genuine cooling fan
LED	A (+) :1	white	15	15	LED_+
			34	34	prohibit to connect
			16	16	prohibit to connect
			35	35	prohibit to connect
			17	17	prohibit to connect
			36	36	prohibit to connect
			18	18	prohibit to connect
			37	37	prohibit to connect
cooling fan	fun GND 0V	black	19	19	only use for genuine cooling fun

motor sensor signal cable – controller

sensor circuit board	wire color	panel connector positions of R05-PB6M	
CON01	yellow	A	power input (+)
CON02	black	B	GND (0V)
CON03	red	C	A line
CON04	white	D	B line
CON05	green	E	C line
—	sealed	F	sealed

motor – controller

motor	controller
red	A
white	B
black	C

battery – controller

battery	controller
positive +	+
negative —	—

If make mistake connection which will be make damage or broken this kit.

※please contact to us if you require cooling fan.

【signals for speed】

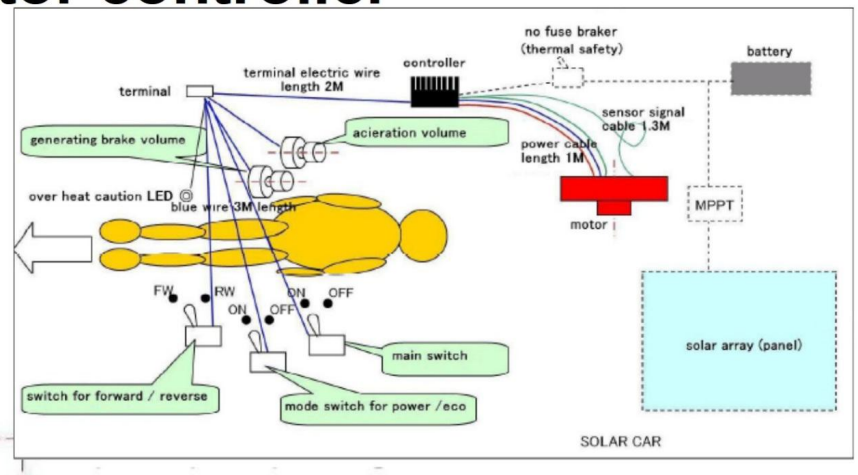
①pulse out put signal
- you will have 0/5V (off/on) at terminal 27 – 28(GND(0V))
- 36pulse/1rotation

②voltage signal
- you will have from 0V – up to 5V at terminal 09 – 28GND(0V)
- 370[rpm]/[V]
- the tlerance±15%・・・(maximum)
- you need test actual speed for [rpm]/V.
- we have not checked temperature influence.

【acceleration volume】

Mitsuba recommend volume switch 5kΩ~10kΩ
and at full acceleration you will have 4.85V
at 02 – 21GND(0V)which are correct voltage.

MITSUBA motor & motor controller



electric schematic