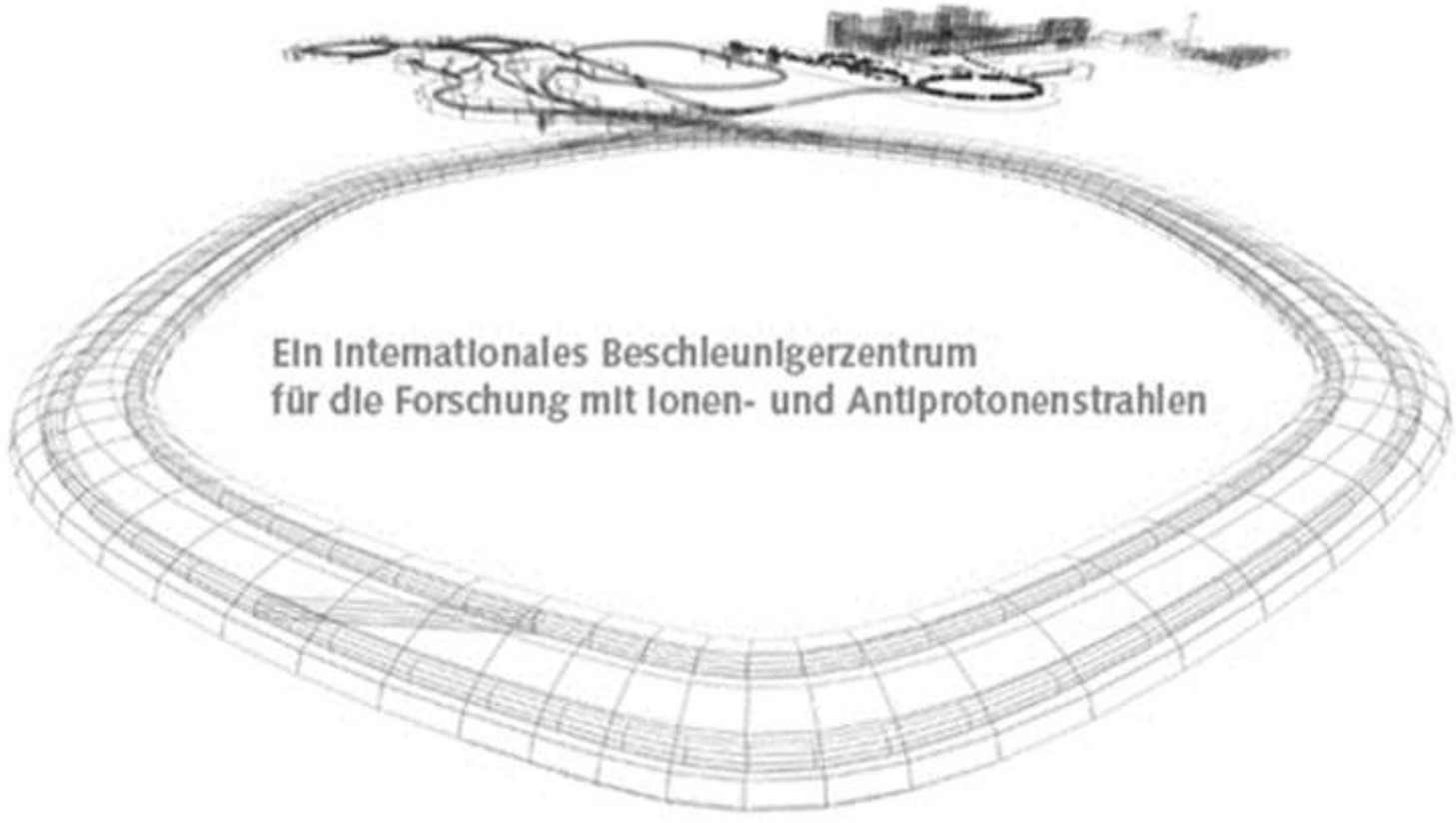
GSI Darmstadt



Customer:	GSI
Description:	SVE60-U
Drawing number:	
Contract number:	

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	SVE60-U Power Converter for Alvarez 2.0	Blatt 1
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

Page	Page type	Page description	Date	Author
3	Specification	Reference documents		
4	Specification	Technical specifications		
5	Mechanical drawing / layout	Front, side and rear view		
6	Mechanical drawing / layout	Cabinet legend		
7	Mechanical drawing / layout	Base of the Cabinet		
8	Schematic multi-line	Overview Schematic		
9	Schematic multi-line	Water cooling circuit		
10	Schematic multi-line	Cabinet supply		
11	Schematic multi-line	Power Part Supply		
12	Schematic multi-line	Control Part Supply		
13	Schematic multi-line	Voltage distrib. of ctr. part		
14	Schematic multi-line	15V IGBT-Drivers		
15	Schematic multi-line	24V Electronics		
16	Schematic multi-line	Main/Charg/Disch Contactor		
17	Schematic multi-line	Trafo		
18	Schematic multi-line	Rectifier		
19	Schematic multi-line	DC_Link_Capacitors		
20	Schematic multi-line	H-Bridge		
21	Schematic multi-line	Output Filter		
22	Schematic multi-line	DCCT / Uout monit.		
23	Schematic multi-line	MFU Power Switch		
24	Schematic multi-line	ACU		
25	Schematic multi-line	Main cont. + 24V distrib.		
26	Schematic multi-line	ICM		
27	Schematic multi-line	Interlocks 1		
28	Schematic multi-line	Interlocks 2		

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Table of contents	Blatt 2
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

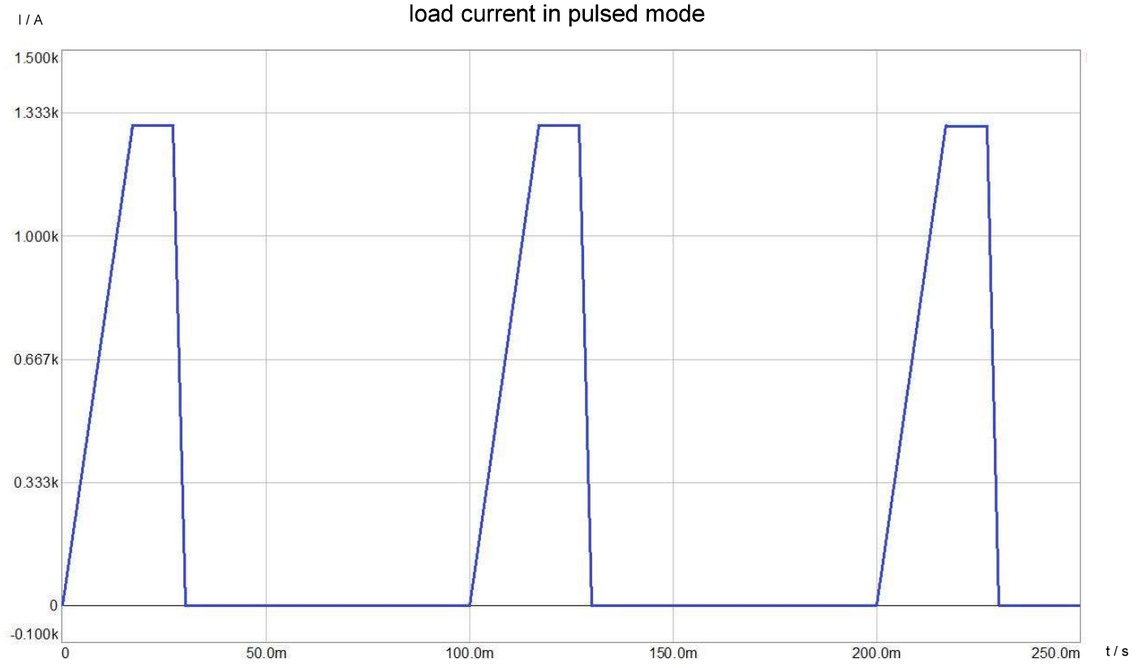
Reference documents

Description	Drawing number
Part List	SVE60-U_Part_List_v1
Mechanical Layout	SVE60-U_Mechanical_Layout_v1

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Reference documents	Blatt 3
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

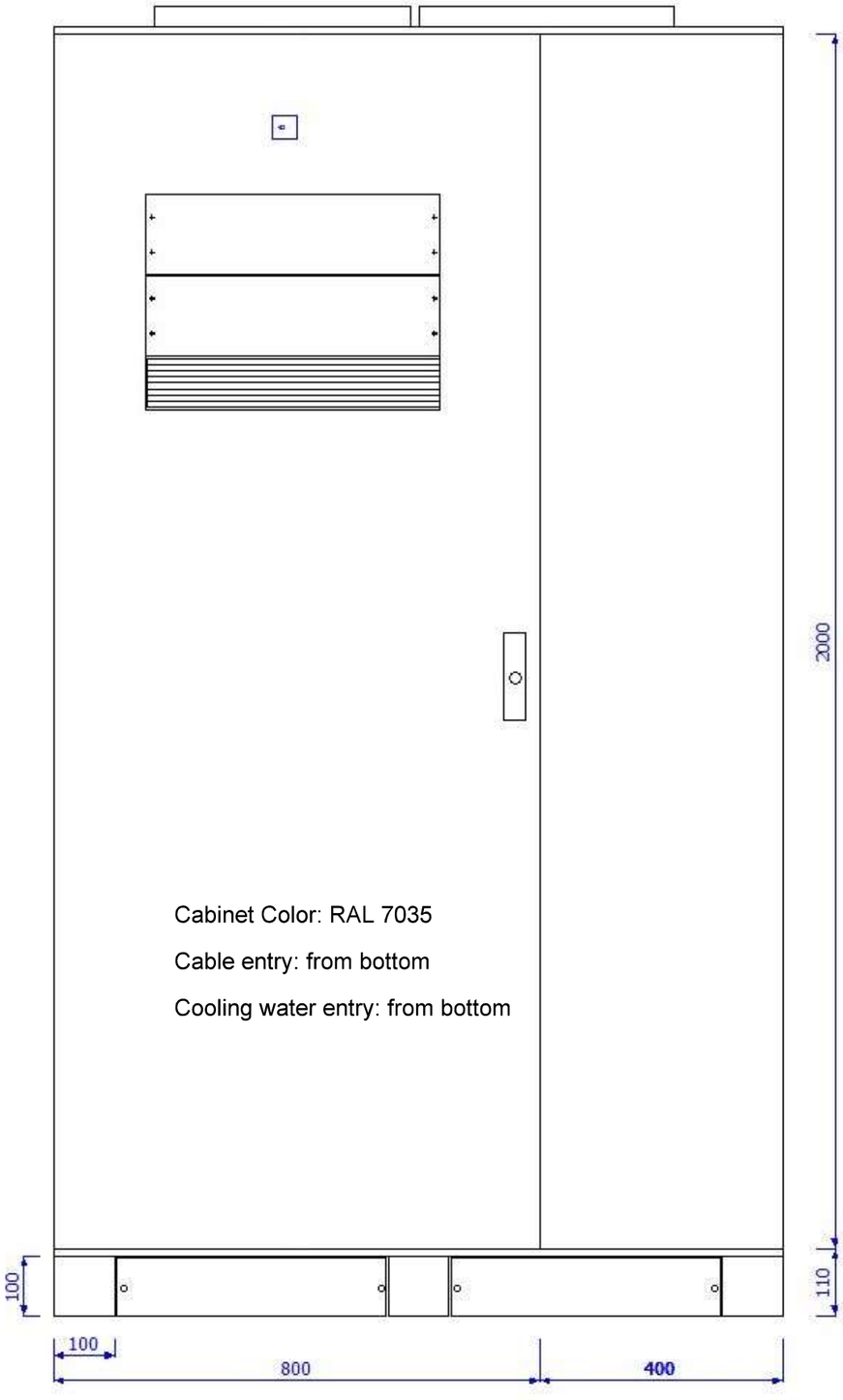
Technical Specifications: PC Alvarez 2.0 SVE60-U pulsed Power Converter	
Maximum peak output current, Imax	1300 A
Nominal peak ouput current, In	569...1233 A
Range of Load Current	0 ... +1233 A
Maximum RMS output current, Imax_rms	550 A
Rise time from 0 to In	10 ms
Fall time from In to 0	3 ms
Cycle frequency, f	10 Hz
Magnets in series	8...13
Magnet inductance, Lm	0,9...4,35 mH
Magnet resistance, Rm	200...670 mOhm
Cable resistance, Rl	3...7 mOhm
Total Deviation (Abs)	100 ppm
Cross section of the load cables	coaxial, 2x150 mm²
Number of load cables in parallel	2
Water flow	10 l/min
Pressure drop	< 5 bar
Nominal apparent power, Sn	55 kVA
Nominal primary current, In	80 A
DC link voltage, Udi	350V
DC link current, Id (max, eff)	180 / 150 A
Maximum load voltage, UL_max	260 V
Nominal load voltage, ULn_dc	200 V
Cross section of input cable for control part	5 x 2.5 mm²
Cross section of input cable for power part	5 x 50 mm²
Fuse in low voltage distribution for control part	16 A
Fuse in low voltage distribution for power part	80 A

load current in pulsed mode

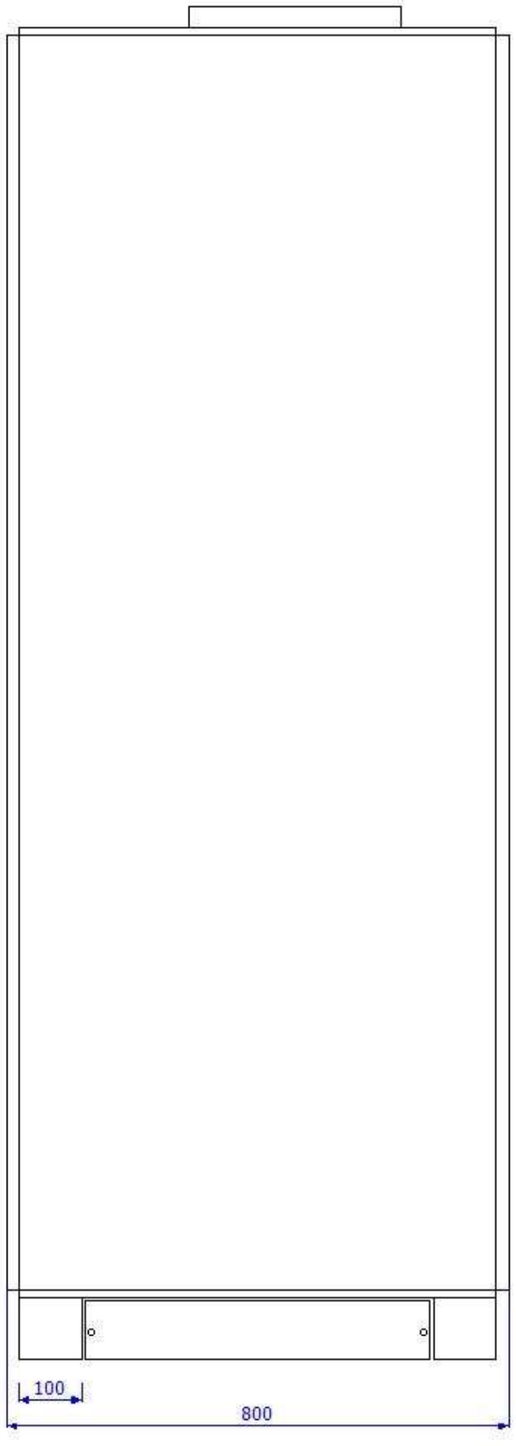


	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Technical specifications	Blatt 4
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

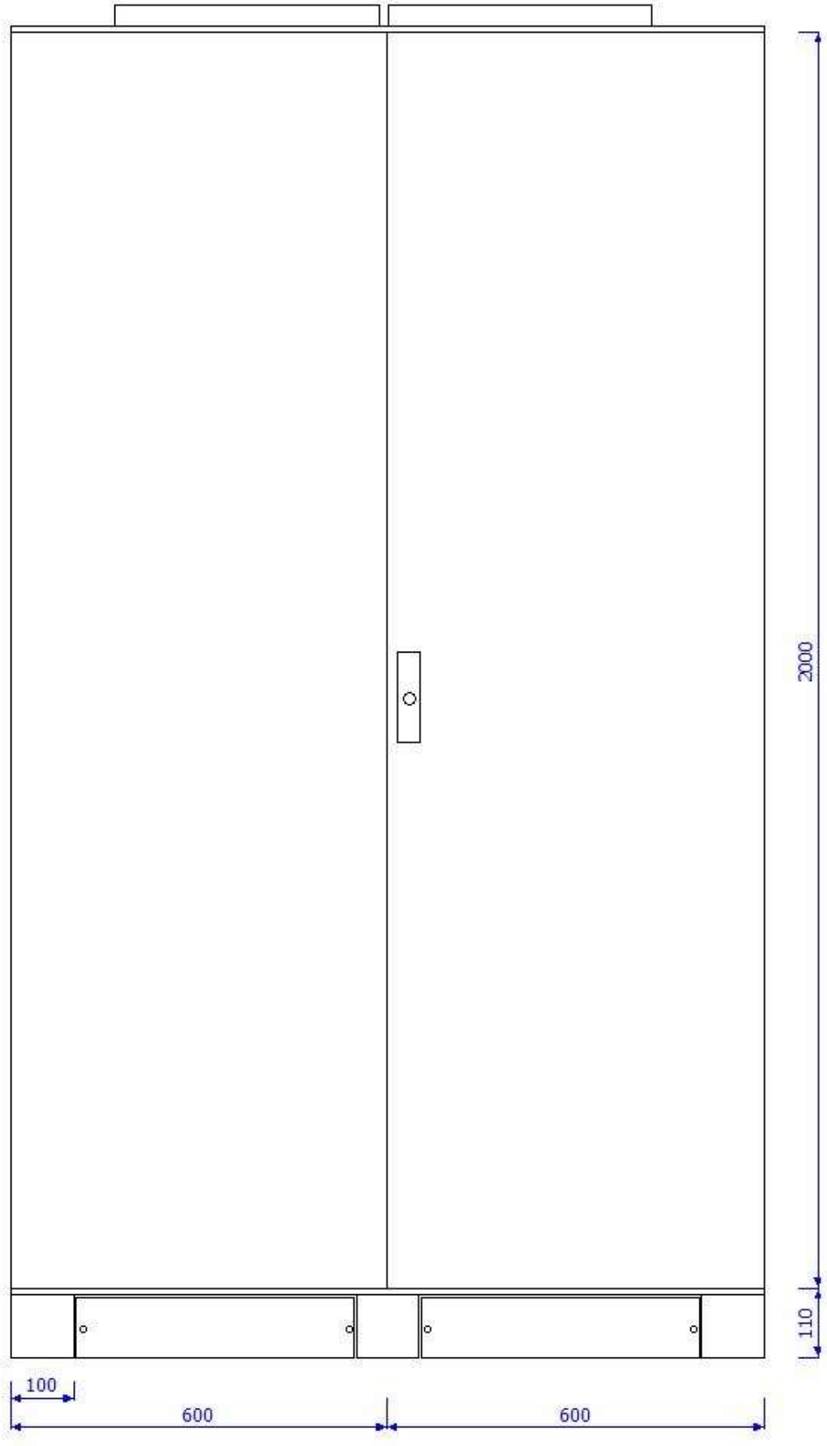
Front



Side



Rear

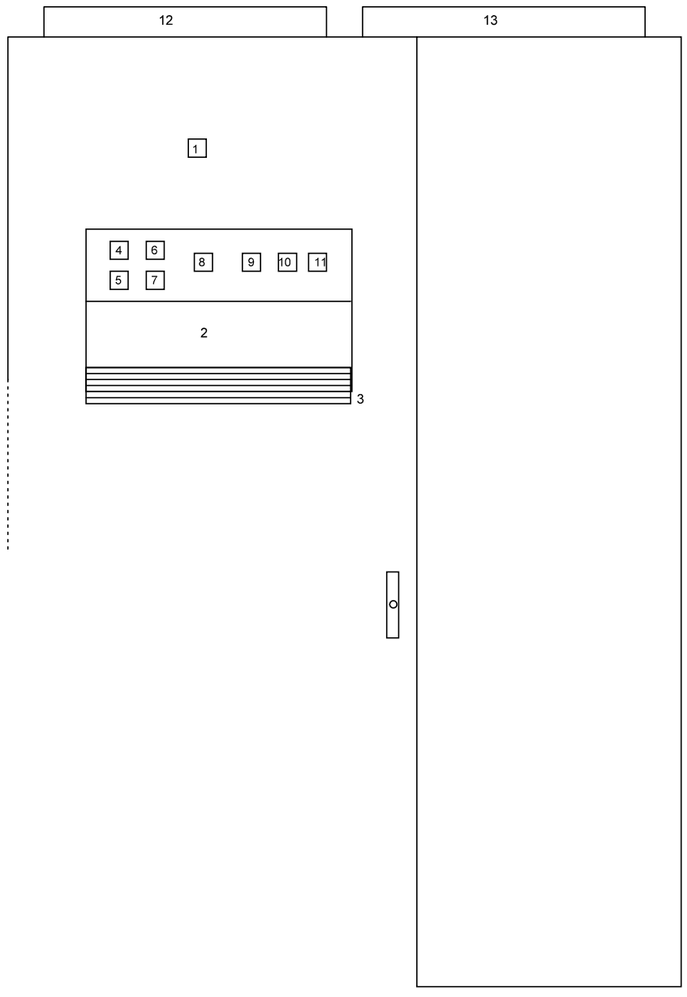


Cabinet Color: RAL 7035

Cable entry: from bottom

Cooling water entry: from bottom

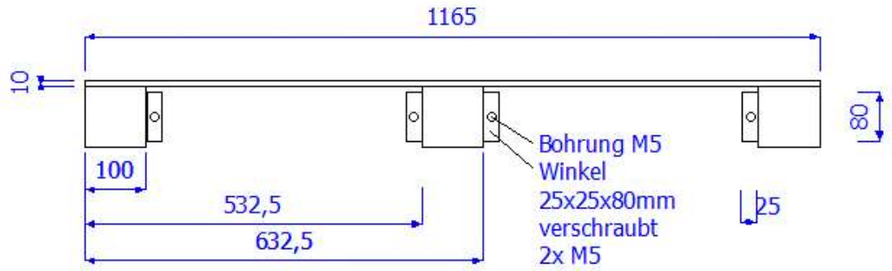
	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Front, side and rear PC cabinet view	Blatt 5
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



Cabinet Legend Description

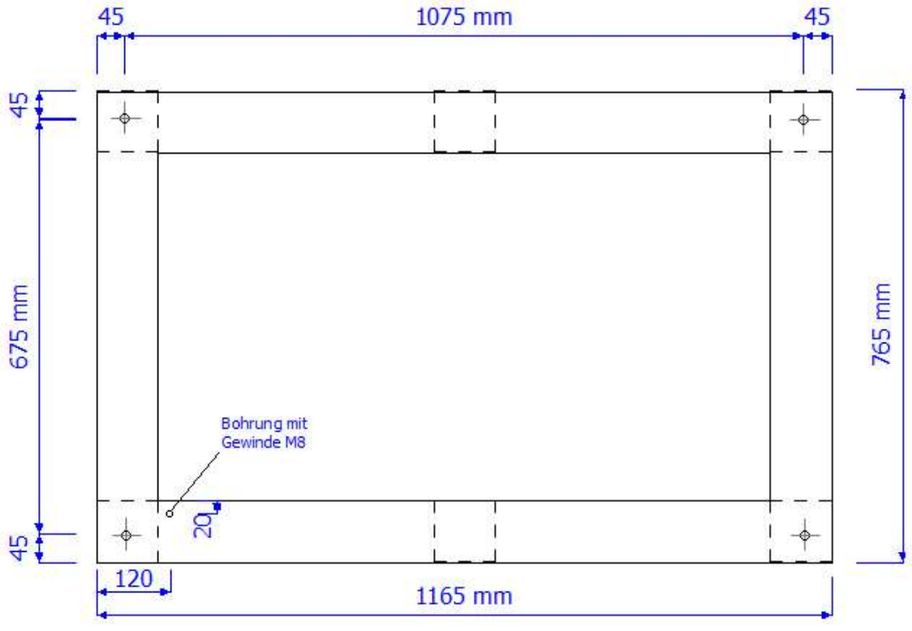
=Front view		
Positions number	Identity	Description
1	-S2	Fast Off
2	-A1	Adaptive Control Unit (ACU) Frame
3	-M1	ACU Fan
4	-P3.2	Control part voltage display
5	-S1.2	Phase selector switch for control part voltage display
6	-P3.1	Power part voltage display
7	-S1.1	Phase selector switch for power part voltage display
8	-S10	ACU power switch
9	-P1	primary current display
10	-P5	DC link voltage display
11	-P6	Output voltage display
12	-M2	Rooftop fan
13	-M3	Rooftop fan

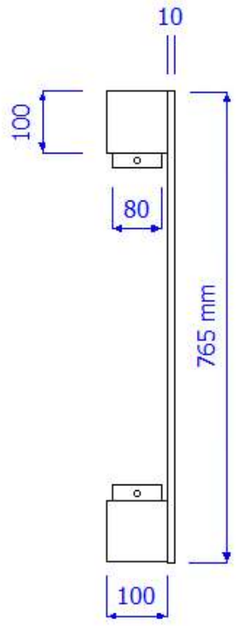
	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Cabinet legend	Blatt 6
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



Sockel incl. angeschraubten
Verkleidungsblechen und Haltewinkeln.

Haltewinkel an den Seitenteilen, an der
Front- und Rückseite verschraubt.



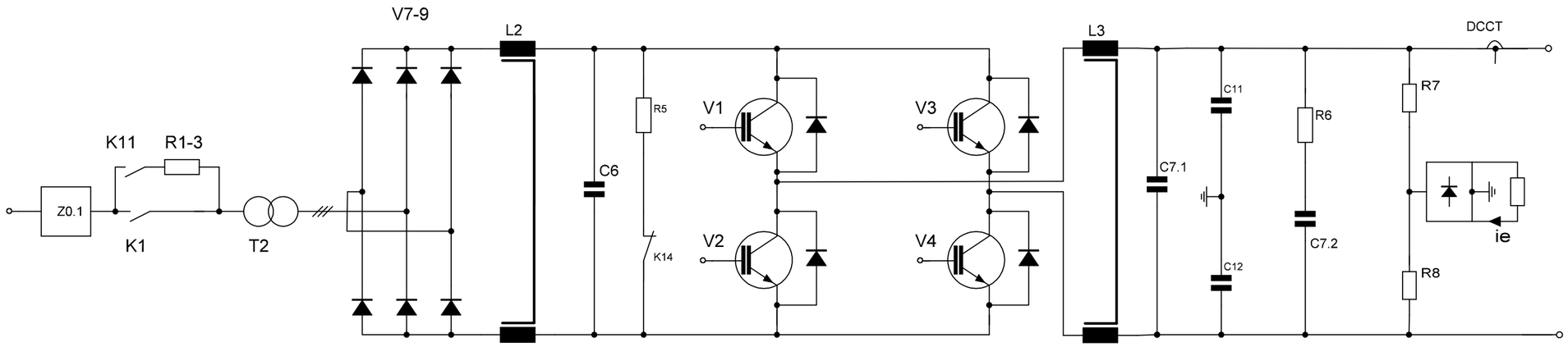


Rahmen aus Flacheisen 100x10mm

Füße: Querschnitt 100x100mm, Höhe 100mm unten geschlossen

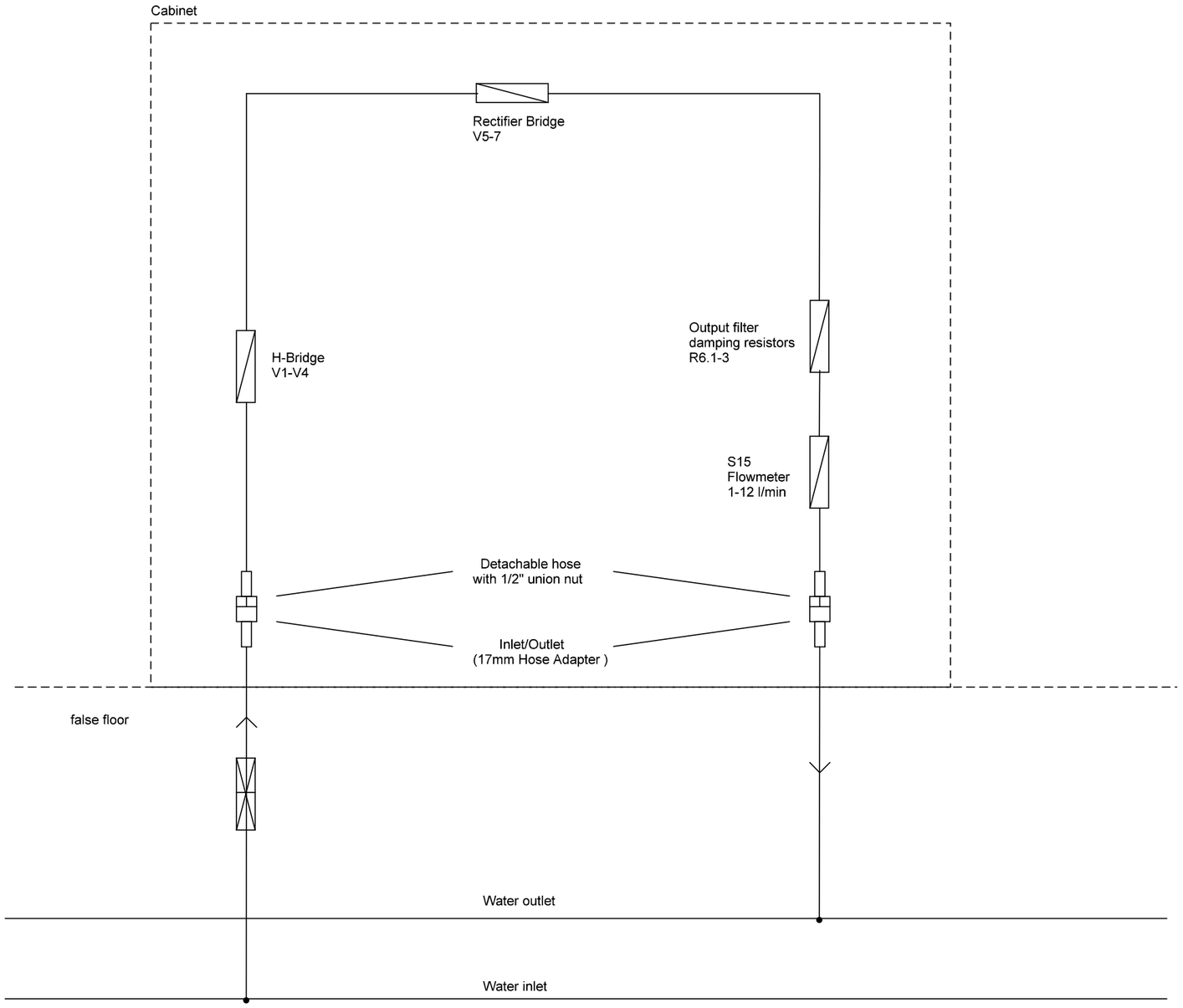
Alle Bohrungen mit Innengewinde M12

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Base of the cabinet view	Blatt 7
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Overview schematic	Blatt 8
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

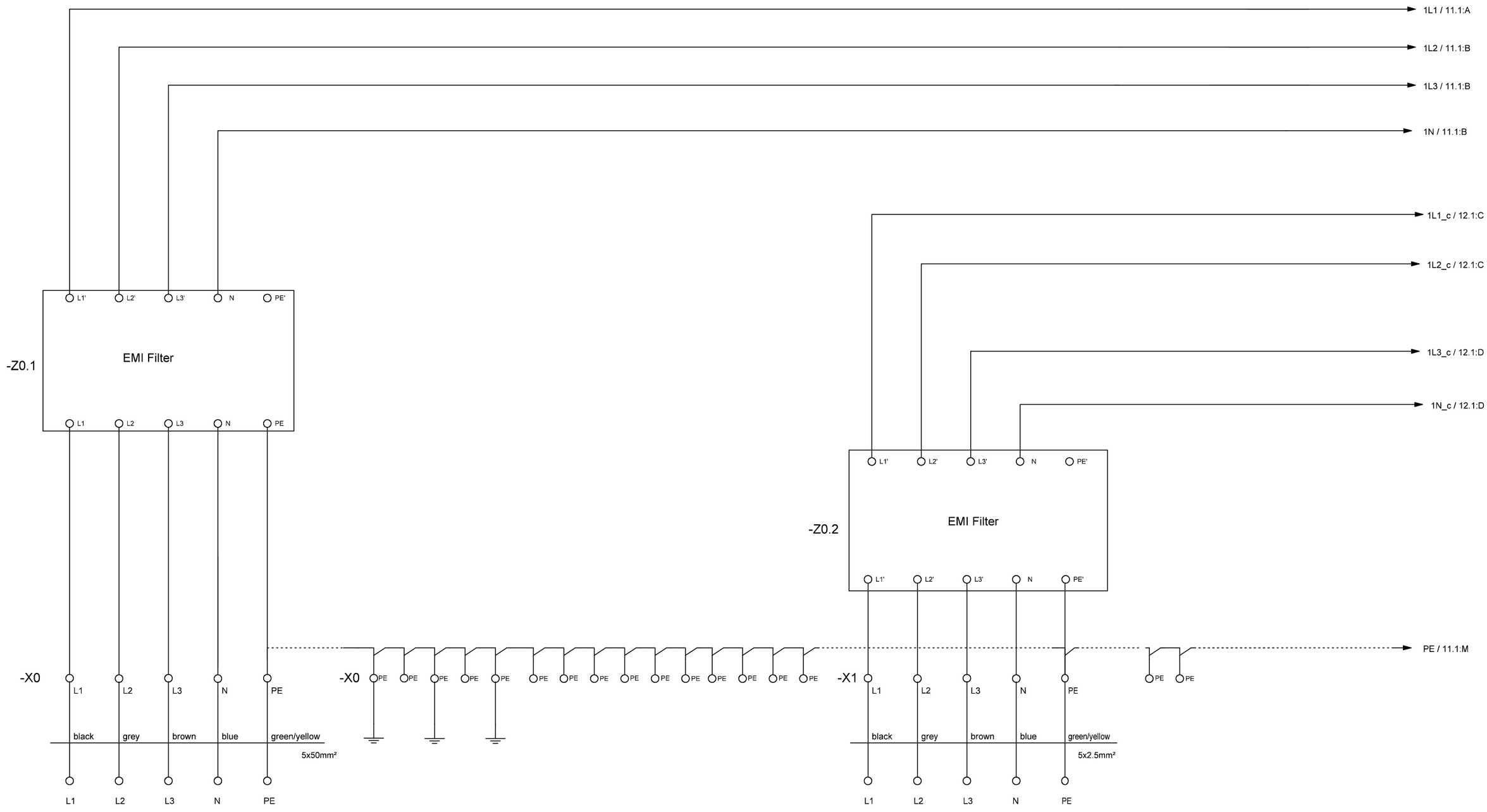
Water Cooling Circuit



Water flow = 10 l/min

Pressure drop < 5 bar

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Water cooling circuit	Blatt 9
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Cabinet supply	Blatt 10
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

1L1 / 10.21:A
1L2 / 10.21.B
1L3 / 10.21:B
1N / 10.21:C

1L1 / 16.2:B
1L2 / 16.2:B
1L3 / 16.2:B

-Q0
3,5...5A
I> I> I>
1 3 5 13 21
2 4 6 14 15
/27.20:D

-Z5.1
-P3.1
V
0...250V
2
1

S1.1
1 2 3
2 8
3 1 5
7
L1-N
L2-N
L3-N

-B10.1
7 N
6 L1
8 L2
10 L3
U<10%>130%, m<3
2 3 1 4
X8.7 / 27.17:C
X8.7+ / 27.17:C

PE / 10.J:21
PE / 12.1:M

Power part voltage monitoring

Power part voltage display with switch

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Power part supply	Blatt 11
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

1L1_c / 10.21:D
1L2_c / 10.21:E
1L3_c / 10.21:F
1N_c / 10.21:G

1N_c / 13.2:K

-F10
B16A

-Q1
ACU
11...16A

-Z5.2

-P3.2
V
0...250V

S1.2
L1-N
L2-N
L3-N

-X2

F1.1 / 13.3:C
F11.1 / 13.2:C
F12.1 / 13.3:C
1L3_c / 16.2:B

-B10.2
N
L1
L2
L3
U<10%>130%, m<3

-X10
L1
PE
N

X8.6 / 27.15:C
X8.6+ / 27.15:C

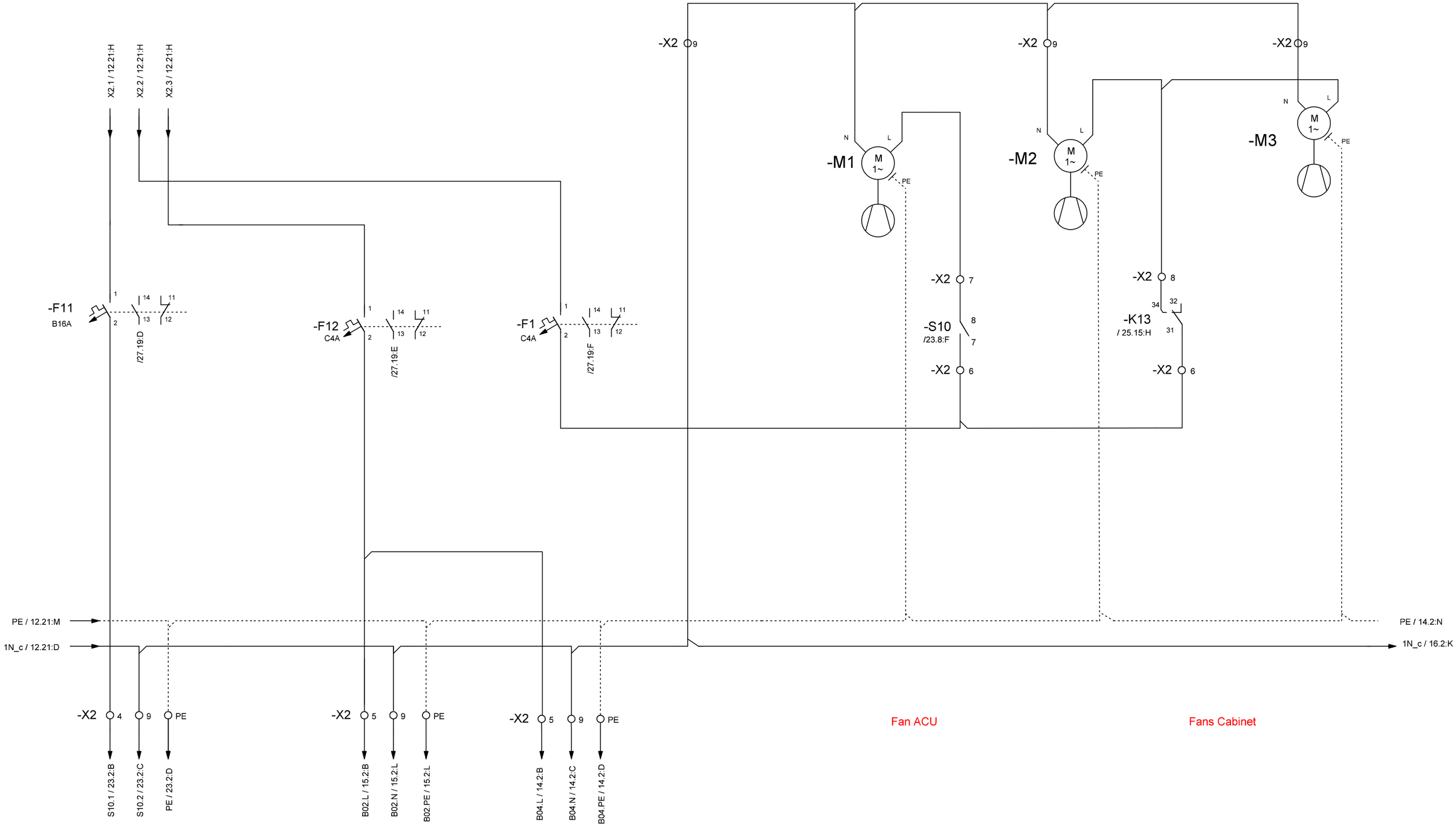
PE / 11.21:M
PE / 13.2:J

Service plug

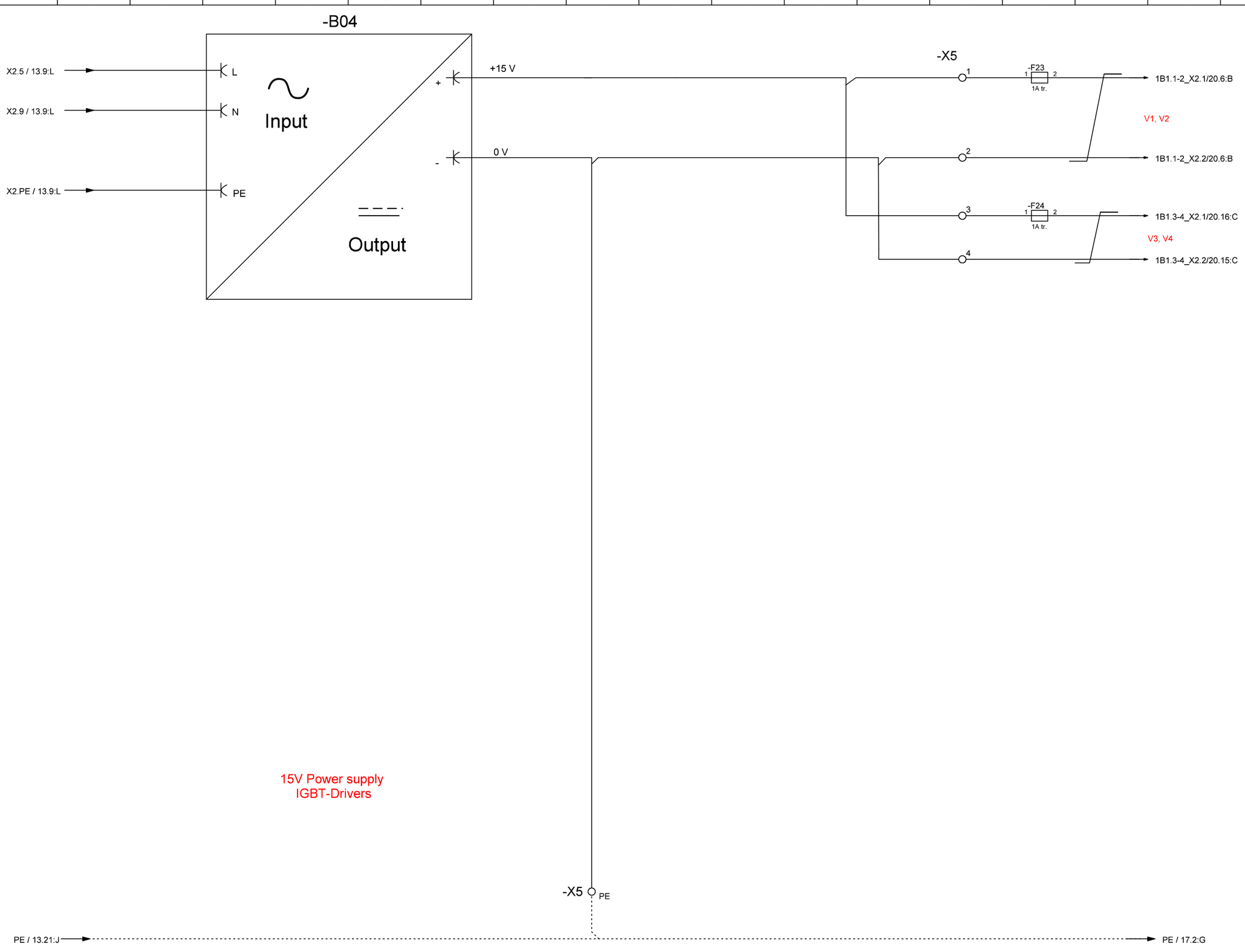
Voltage Monitoring Control Part

Control Part - Voltage Display with switch

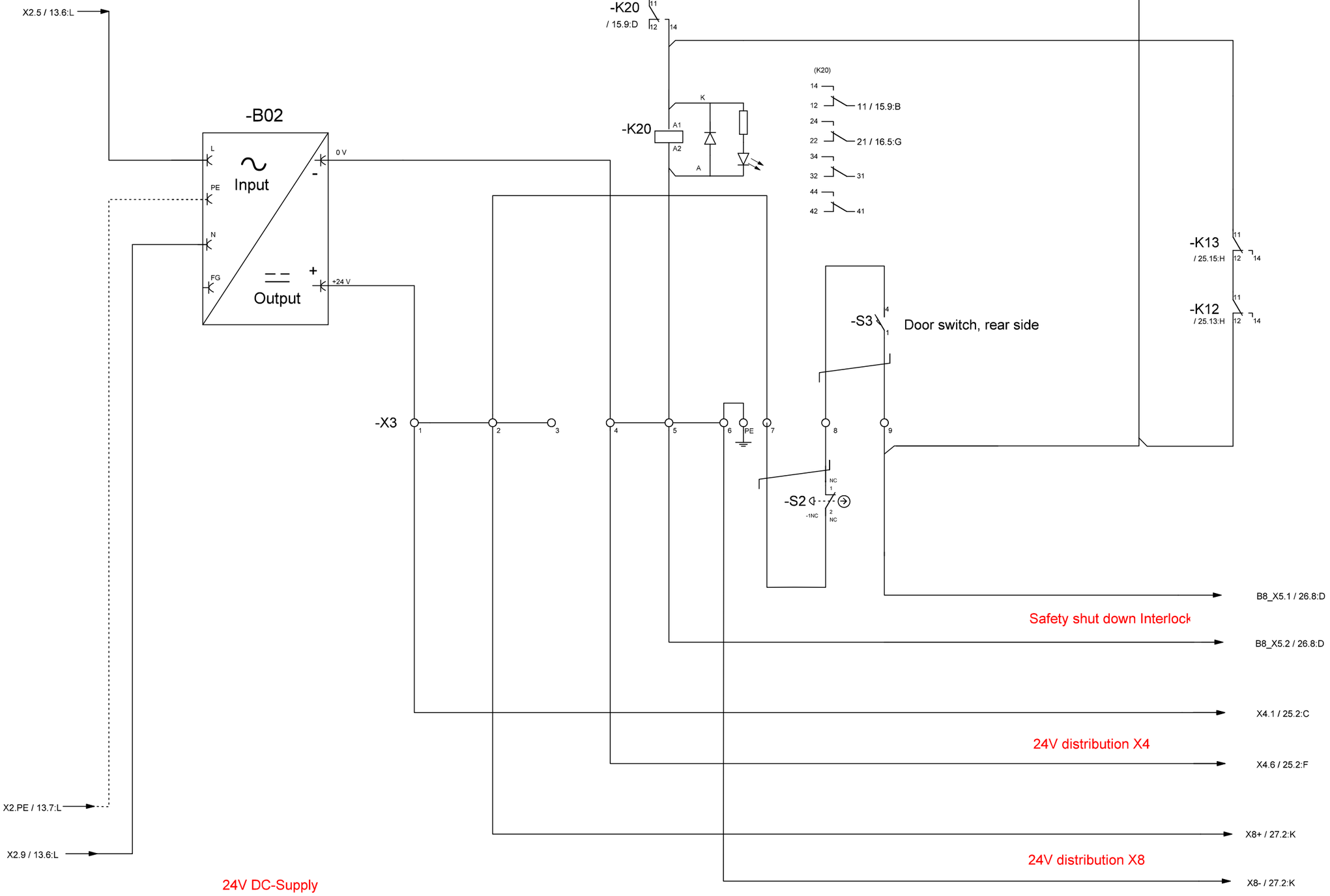
	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Control part supply	Blatt 12
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



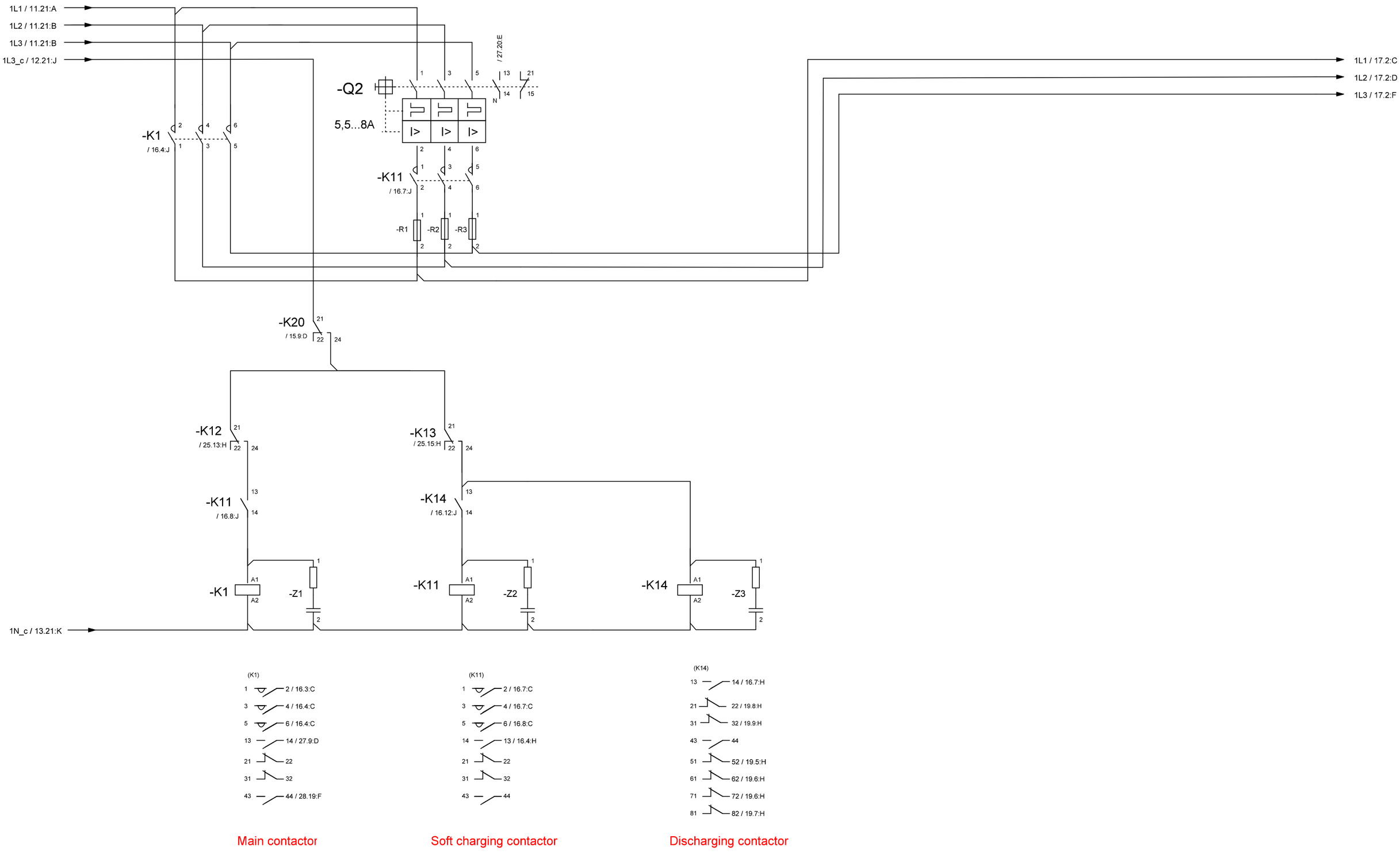
	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Voltage distribution of the control part	Blatt 13
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	15V IGBT-Drivers	Blatt 14
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	24V Electronics	Blatt 15
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

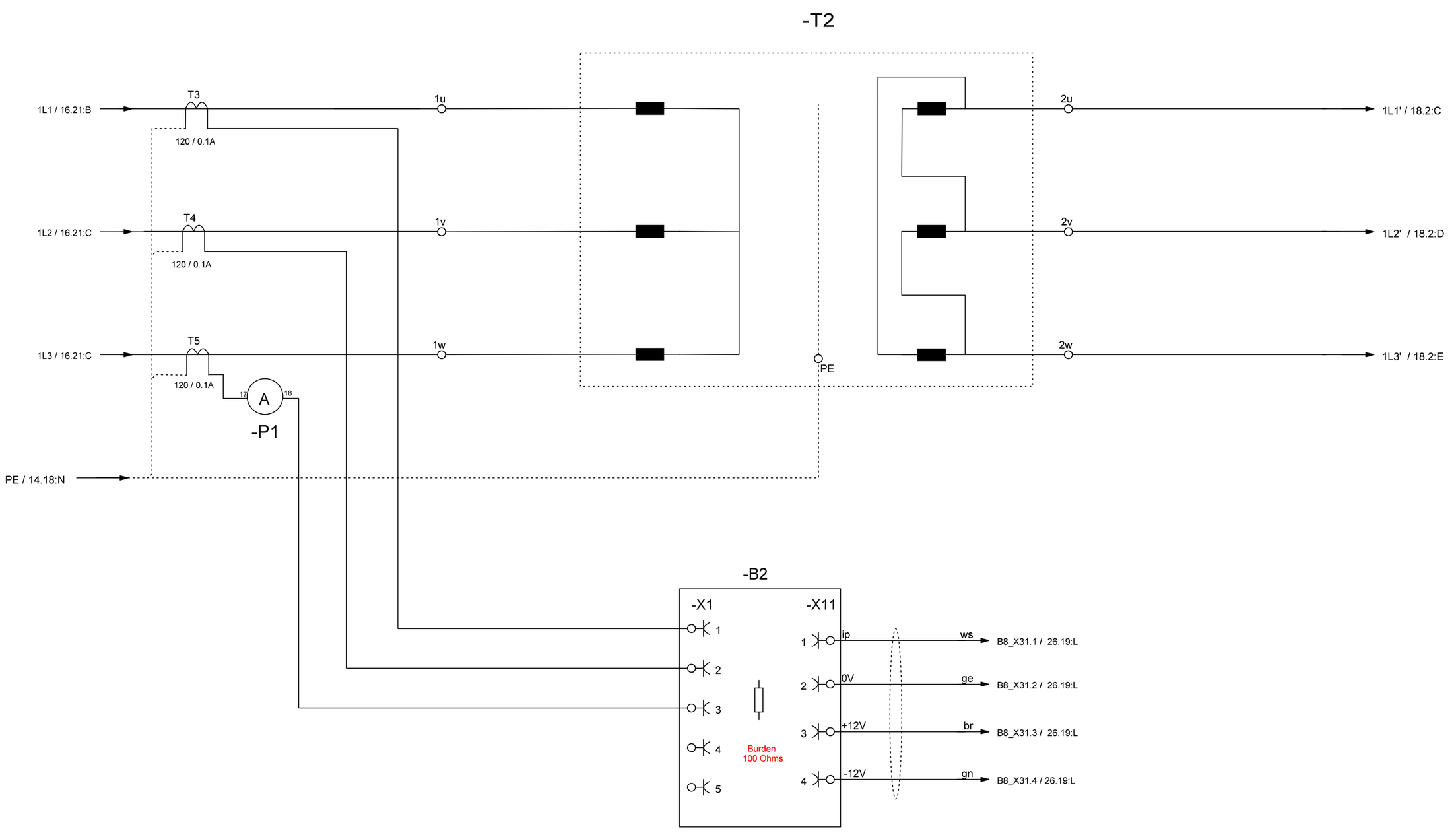


Main contactor

Soft charging contactor

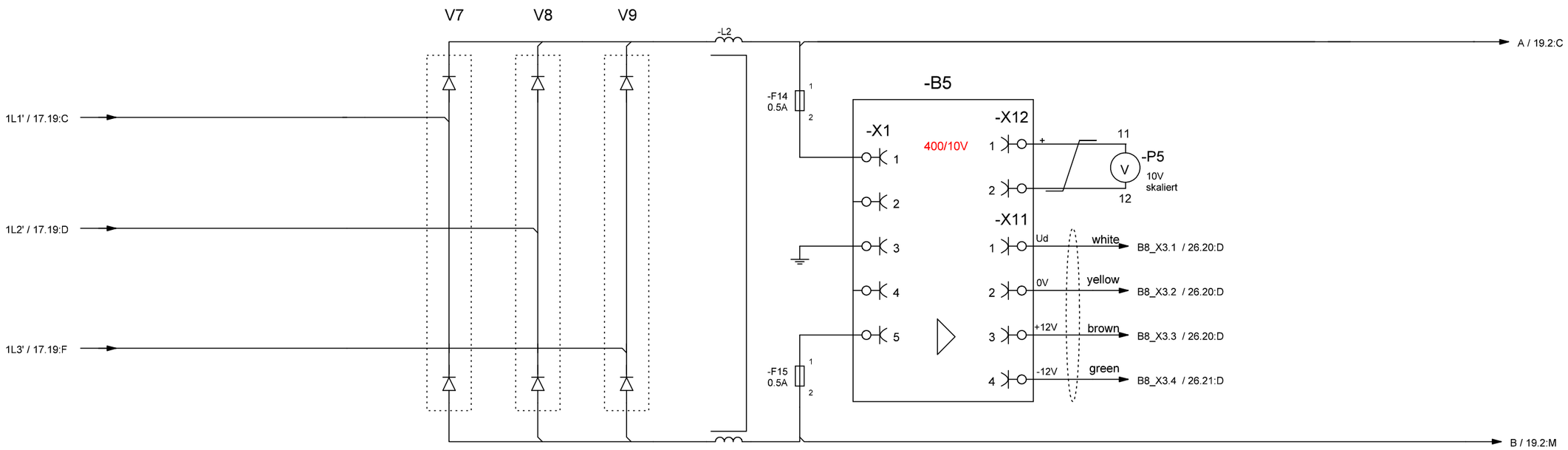
Discharging contactor

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Main, charging and discharging contactors	Blatt 16
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



Primary current measurement

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Transformer	Blatt 17
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



Rectifier Bridge

DC link measurement

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Rectifier, DC link measurement	Blatt 18
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

A / 18.20:B

A / 20.2:A

-R5.1 1 2

-R5.2 2 1

-K14

/16.12:J 51 52

/16.12:J 61 62

/16.12:J 71 72

/16.12:J 81 82

/16.12:J 21 22

/16.12:J 31 32

-C6.1 -C6.2 -C6.3 -C6.4

32x 27mF = 0,864F

-C6.30

B / 18.20:G

B/ 20.2:M

Discharging Resistor

Capacitor Bank

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	DC-link capacitor bank	Blatt 19
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

A / 19.21:B

B / 19.21:M

X5.2 / 14.18:C

X5.1 / 14.18:B

0V

+15V

-1B2.1

-1B1.1-2

R120=R121=R220=R221= 2 Ohm
R122=R123=R222=R223= 6,8 Ohm

2SP0320T2C0-12

B8.D57 / 26.3:L — 1V2

B8.D4 / 26.3:D — 1V2

B8.D56 / 26.3:L — 1V1

B8.D3 / 26.3:D — 1V1

9/11

-1V1/2

-1V1

-1V2

8

10/12

Ribbon cable

-2B1.1-2

-2B2.1

B8.D8 / 26.5:D — 2V2

B8.D7 / 26.5:D — 2V1

-2V1/2

-2V1

-2V2

8

10/12

X5.4 / 14.18:D

X5.3 / 14.18:D

0V

+15V

-1B2.2

-1B1.3-4

R120=R121=R220=R221= 2 Ohm
R122=R123=R222=R223= 6,8 Ohm

2SP0320T2C0-12

B8.D59 / 26.4:L — 1V4

B8.D6 / 26.4:D — 1V4

B8.D58 / 26.4:L — 1V3

B8.D5 / 26.4:D — 1V3

9/11

-1V3/4

-1V3

-1V4

8

10/12

V1 / 21.2:B

Ribbon cable

-2B1.3-4

-2B2.2

B8.D10 / 26.6:D — 2V4

B8.D9 / 26.6:D — 2V3

11/6

-2V3/4

-2V3

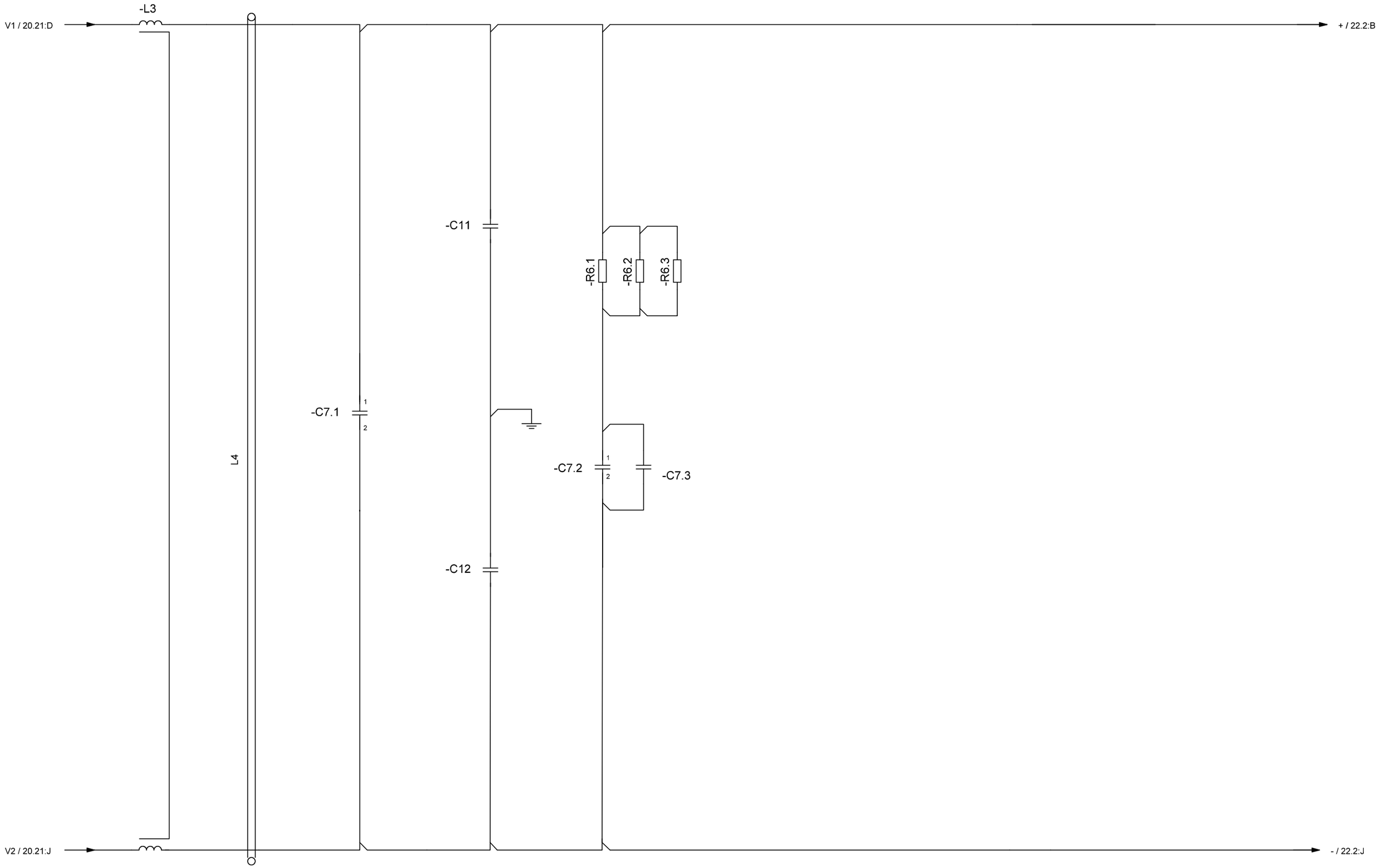
-2V4

8

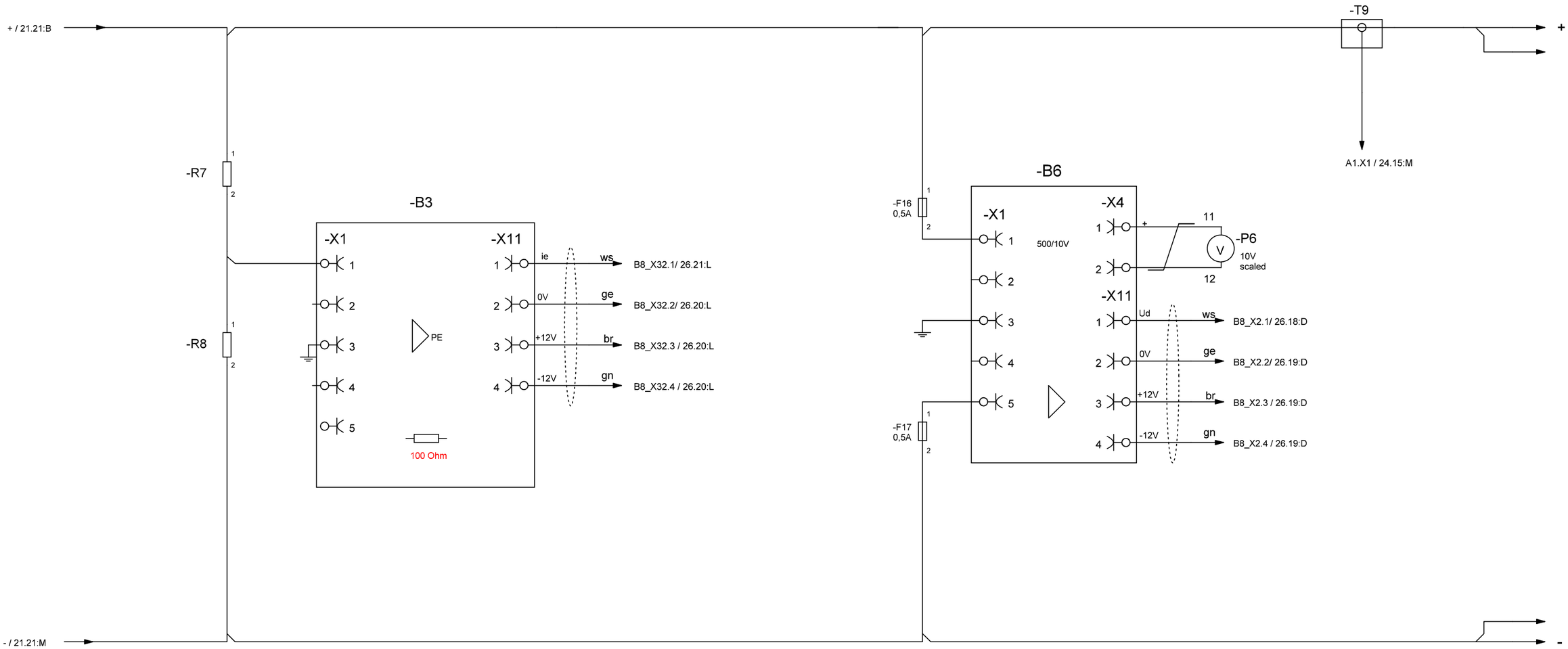
10/12

V2 / 21.2:M

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	H-Bridge	Blatt 20
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Output filter	Blatt 21
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



Earth fault detection

Output voltage monitoring

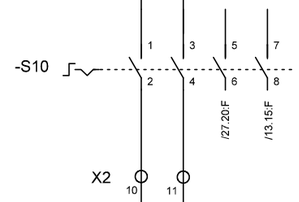
DCCT

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	DCCT and output voltage monitoring	Blatt 22
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

X2.4 / 13.2:L

X2.9 / 13.2:L

X2.PE / 13.2:L



X2
10
11

A1_X11.L1 / 24.19:M

A1_X11.N / 24.20:M

A1_X11.PE / 24.20:M

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	MFU Power switch	Blatt 23
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

-A1

-A10

Power Supply
12V, 6A

28 L1
30 N
32 PE
4 +Sense
8 +12V
12 -Sense
16 GND

-X8
1
2
3
4

-A11
FAIR-Bus Backplane

-X1
Interface-Karte
-P1

-X2
Multifunction Unit
-P2

-X7
26
-X108

-A12
DCCT Backplane

-X1
Optional: ADC-Karte :
-P1

-X2
ADC-Karte 1
-P2

-X3
DCCT-Karte
-P3

-X106
+15V -1 4
GND -2 8
+24V -3 20
GND -4 22

-X105
+15V -1 4
GND -2 8
+24V -3 20
GND -4 22

-A13.1
Power Supply
Bivolt/PK45 Low Nois

-A13.2
Power Supply
Bivolt/PK45 Low Nois

32 PE 32
28 N 28
30 L 30

L1 N PE
(Load)

IEC
Inlet Filter

(Line)
L1 N PE

-X11

X2.10 / 23.7:I
X2.11 / 23.8:I
PE / 23.9:I

-X3
34
-X1

-A14
4xUSI-Terminal

-X6 USI4 -X5 USI3 -X4 USI2 -X3 USI1

Rückwand
klappbar

Slave 1 / 26.10:L

-X103
9

-X2

Feld Istwert
Option

-X101
15

-X1

DCCT IN

T9 / 22.19:D

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	ACU	Blatt 24
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

-X4

X3.1 / 15.17:K — +24V

1 → B8_X1.1 / 26.2:D (ICM)

2 → B8_X28.1 / 26.8:L

3 → B8_X28.2 / 26.8:L

4 → B8_X28.3 / 26.7:L

5 → B8_X28.4 / 26.7:L

X3.4 / 15.17:L — 0V

6 → B8_X1.2 / 26.2:D (ICM)

7

8

9

10

-K12

K

A1

A2

A

-K13

K

A1

A2

A

(K12)

14 — 12 — 11 / 15.17:F

24 — 22 — 21 / 16.4:H

34 — 32 — 31 / 28.19:D

44 — 42 — 41

Main contactor control

(K13)

14 — 12 — 11 / 15.17:E

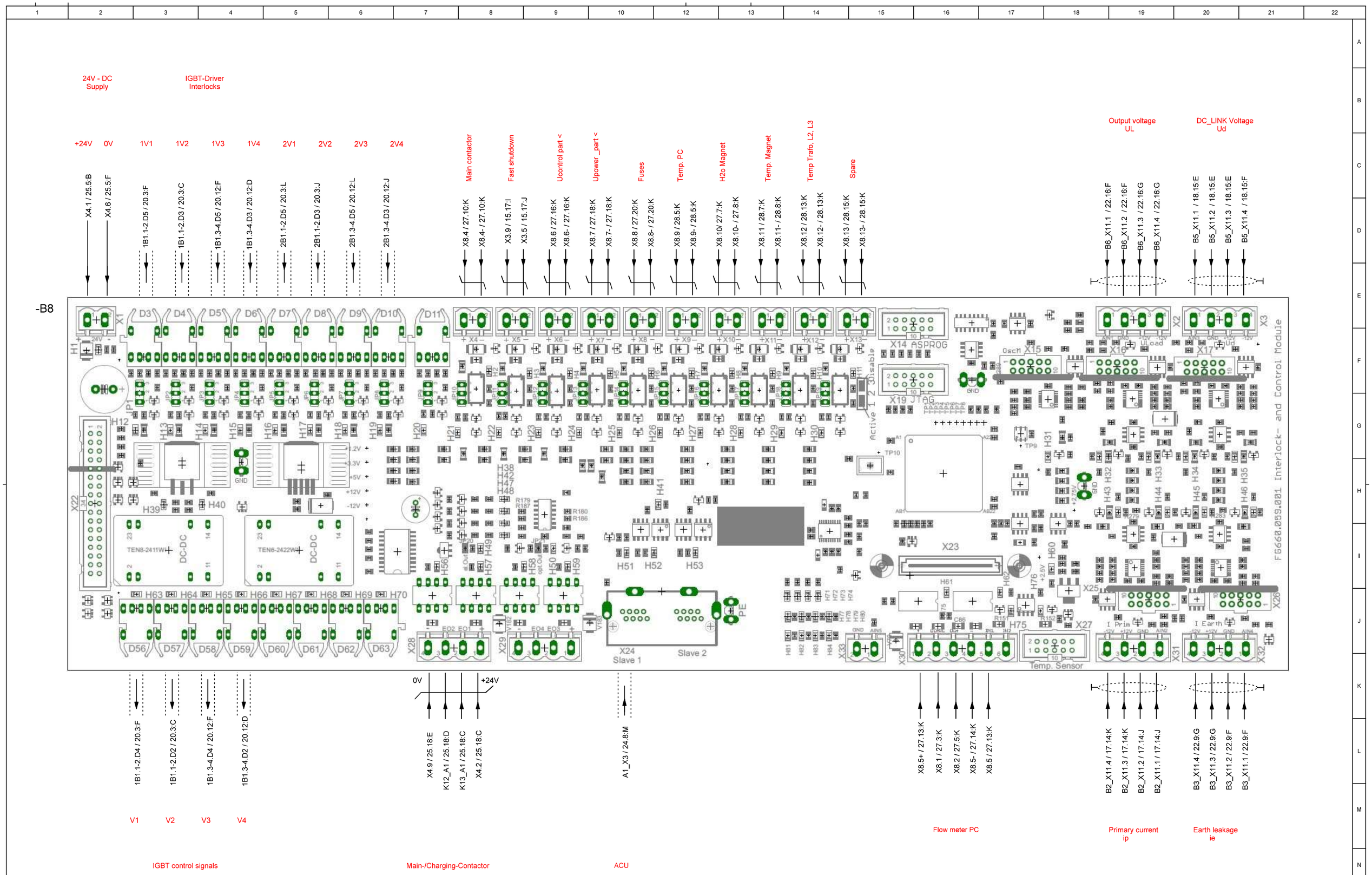
24 — 22 — 21 / 16.7:H

34 — 32 — 31 / 13.18:F

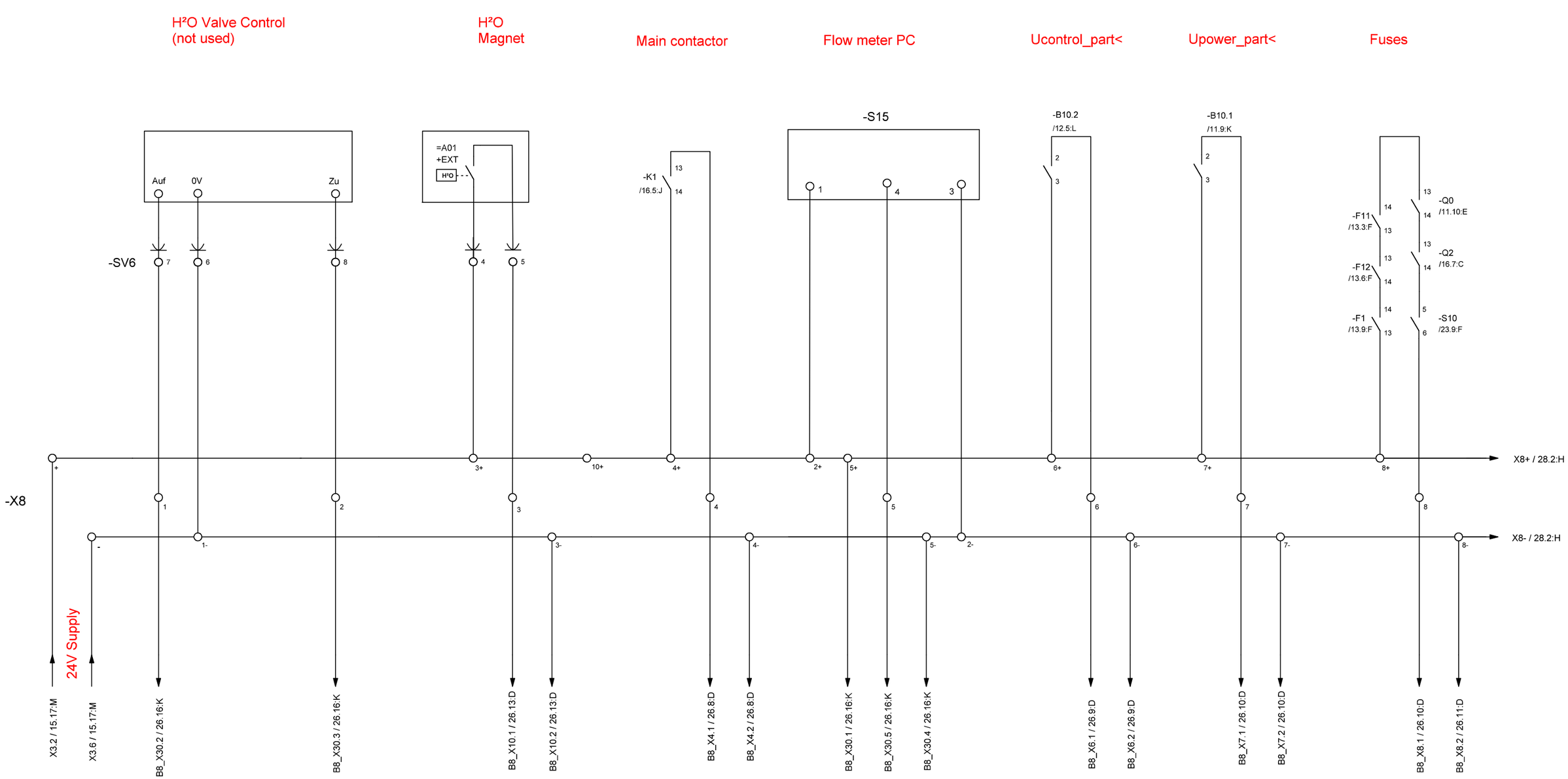
44 — 42 — 41

Soft charging control

	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Main contactors control + 24V supply distribution	Blatt 25
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Interlock control module (ICM)	Blatt
gepr.:				26
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			



	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Interlocks 1	Blatt 27
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			

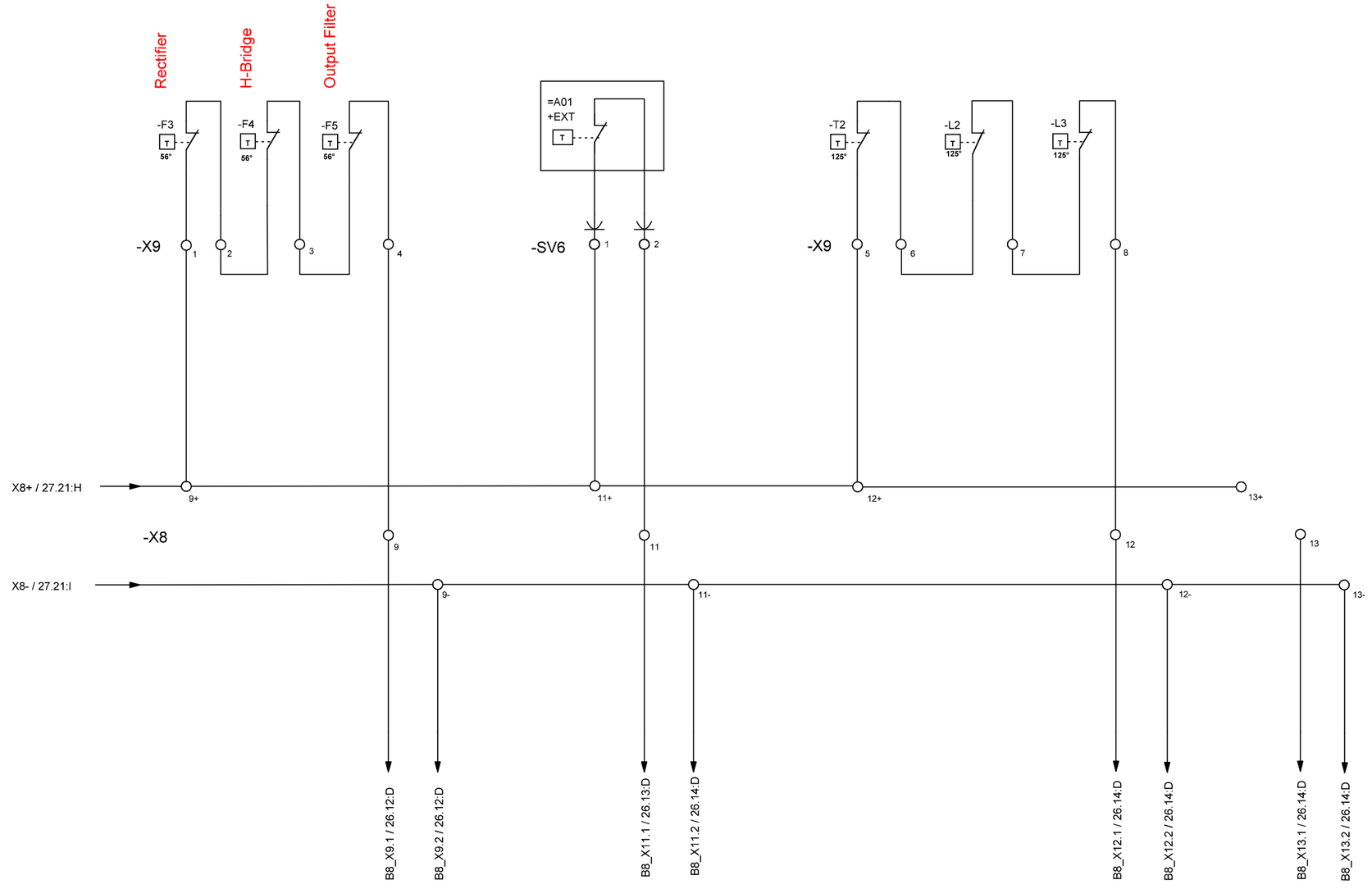
Temp. PC

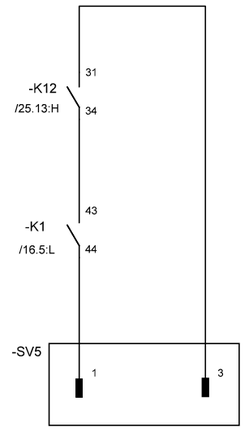
Temp. Magnet

Temp. Trafo/ L2 / L3

Spare

Beam Interlock





	Datum	Name	Bezeichnung	
gez.:	20.07.2026	C. Hunkel	Interlocks 2	Blatt 28
gepr.:				
Norm:			Zeichnungs-Nr.:	von
Firma:	GSI // EPS			