HV 10.3

High Voltage Supply Unit

Operating Instructions

GUTH GMBH 73084 SALACH
Hochspannungsgerätebau

HV10_3e.doc/09.05.96/Me/Ha

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1 Safety Instructions

Attention !

The high voltage supply unit HV 10.3 produces lethal high voltage.

Before start-up all arrangements to protect the personnel for injuries and damages for persons and goods must be provided.

The user of the high voltage supply has to observe all instructions and wamings of the operating instruction.

For protection against the danger of electro shocks the unit has a protective earthing, which must be securely connected to the corresponding grounding system.

The opening of the front door is permitted only for changing the presetting of the setpoints and reading of the error messages.

If work at the unit should be inevitable(adjustments, maintenance, repairs), it should performed by qualified personnel only, which is trained on high voltage related danger.

When working inside the high voltage supply turn off the main switch and secure it against switching on before work is carried out. Before starting to work a discharge time for the filter capacitors must be allowed (min. 2 minutes).

The output of the high voltage must be grounded by linking a grounding wire between the grounding bolt at the rear side and all high voltage outputs (X100 - X102).

Adjustments are allowed only with confirmation of the LEYBOLD SYSTEMS GmbH.

Warning !

Adjustments and settings at the controller module A2 is allowed only if deenergized.

If the unit is operated with grounded positive pole, the controller module A2 is set to earth potential. Settings are possible if high voltage is turned off.

If the unit is operated with grounded minus pole, the controller module A2 is set to high potential. In this operating mode touching the PC-board is forbidden. Adjustments should only carried out if it is secured that no high voltage is present (turn off high voltage, turn off main switch, ground HV-output).

Maintenance and repair works are carried out only by Fa. Guth. In special cases and only with intended approval by Fa. Guth the customer is allowed to carry out maintenance and repair works. Then therefore following must be observed:

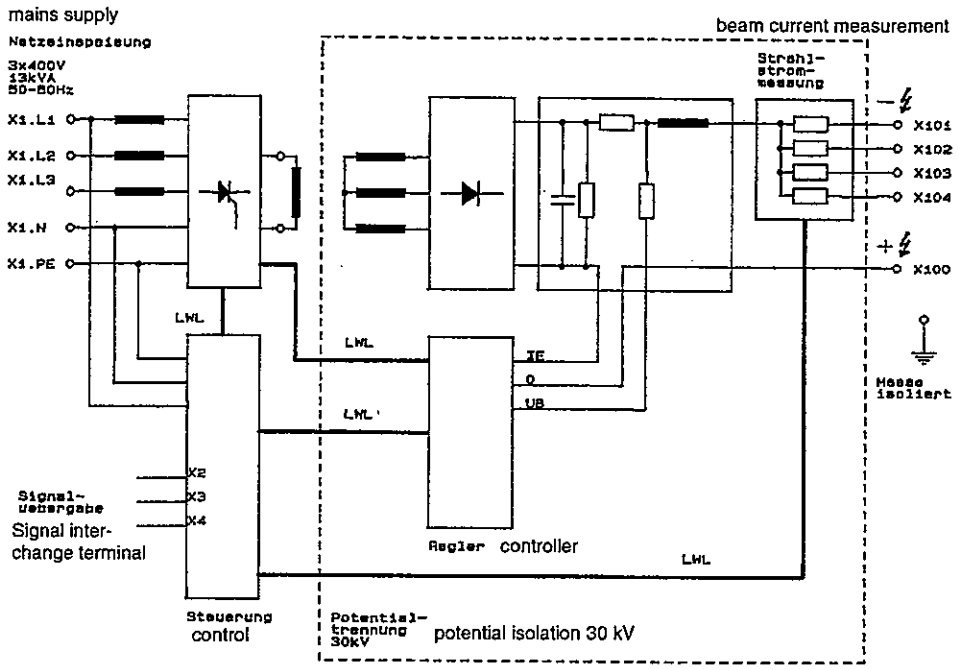
1. Work at the unit should be performed by qualified personnel only, which is trained on high voltage related danger.
2. Before opening the unit the mains supply has to be turned off and secured against reenergizing.
3. Inside the unit are capacitors, there discharge time (approx. 2 minutes) must be observed. The output lines must be withdrawn.
4. The high voltage output must be grounded.

If safety instructions and wamings are not observed, instructions and regulations are violated. For consequences, which occur by not observing the safety instructions, any liability is excluded.

2 Technical description

The high voltage supply unit produces a acceleration voltage for an 10 kW electron beam evaporator.
The voltage is adjustable between 6 kV - 8 kV and 8 kV - 10 kV with a maximum current of 1 A.
The high voltage is produced by a high voltage transformer with high voltage rectifiers and filters attached.
The high voltage is controlled with a primary side thyristor controller operated phase controlled.
The high voltage is measured with a precise voltage divider which gives the result to the controller amplifier. The regulating variable is then sent via fibre optic to the thyristor controller.
The high voltage side is built ungrounded and can be grounded at any pole. However the unit is considered for optimal operation at the positve pole.

Block diagram:



3.0 Technical Data

Main supply	3 x 400 V, 50-60 Hz, 13 kVA
Main Fusing	Protective switch with short circuit release at 160 A
	Thermic release at 23 A
Output voltage	6 - 8 kV, 8 - 10 kV
Output current	1 A
Residual ripple	< 2 %
Control accuracy	< 1 %
Setpoint pre -setting	External or internal potentiometer
	0 - 10 V corresponding 0 - 10 kV
	setpoint transmission potential free
Soft start	High voltage follows a preset ramp
High voltage measuremennt	0 - 10 kV corresponding 0 - 10 V
Beam current measurement	0 - 1 A corresponding 0 - 10 V
	Measurment value transmission potential free
Protection devices	Blanking out at IE > 1,2 A
	System off at IE > 1,1 A after 10 s
Full isolated high voltage power unit	
Customer specific signal interchange	

4.0 Operating conditions

Main supply	3 x 400 V, 50-60 Hz
Ambient temperature	0 - 40 °C
Air conditions	relative huminity max. 75%
	short time max. 95%
	non condensing
	free of aggressive dust and gases
Installation elevation	max. 1000 m above NN

5.0 Scope of delivery

1 x High voltage supply unit with 4 eye hooks
4 x Fixing screws for the lid
2 x Keys
1 x Operating Instruction

6.0 Transport and Packing

6.1 Transport inside buildings

The unit weights approx. 400 kg.

The unit can be lifted and transported using the 4 eye hooks at the top of the unit.

The unit also can be lifted and transported using a fork lift.

6.2 Transport outside buildings

The unit weights approx.. 400 kg.

Place unit on a wooden palett with runners (e.g. EURO-palette).

Wrap unit in plastic foil.

Put unit into packing with lid made of cartonage.

Apply corner protectives.

Fix unit with metall bands on palette.

Lift and transport palette with fork lift.

7.0 Installation

The installation of the high voltage supply should be performed by qualified personnel only,

The mains supply, the measuring and signal lines must be fed thru PG's at the rear side socket.

The screenings of the measuring and signal lines must be fed to the screening bar at the socket sheet.

7.1 Mains line

Connect mains line (5 x 4 mm2, L1/L2/L3/N/PE) to terminal X1. See electric circuit diagram U0015 01/3.

7.2 Measuring and signal lines

The measuring and signal lines must be led thru the cable channel to control A1. Connect the measuring and signal lines to terminals X2 and X4, respectively X3. See electric circuit diagram U0015 01/1.

7.3 High voltage lines

Connect high voltage lines to the HV-receptacles X100, X101, X102. See electric circuit diagram U0015 01/1.

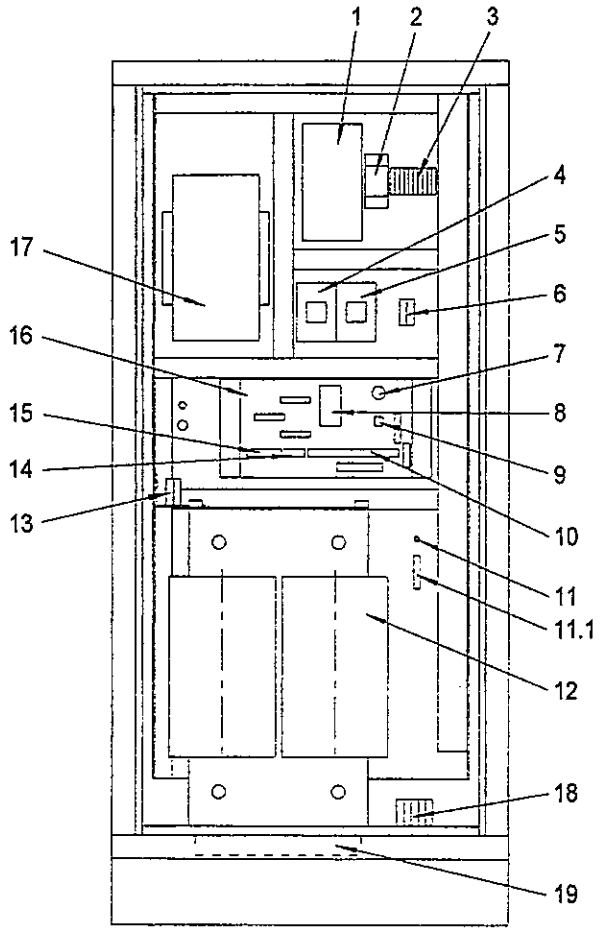
8.0 Unit description

Unit arrangement

Inside the cabinet, behind the front door, the line control is located, the line voltage terminals, the signal interchange, the error messages and the internal setpoint potentiometer assemled on a mounting plate.

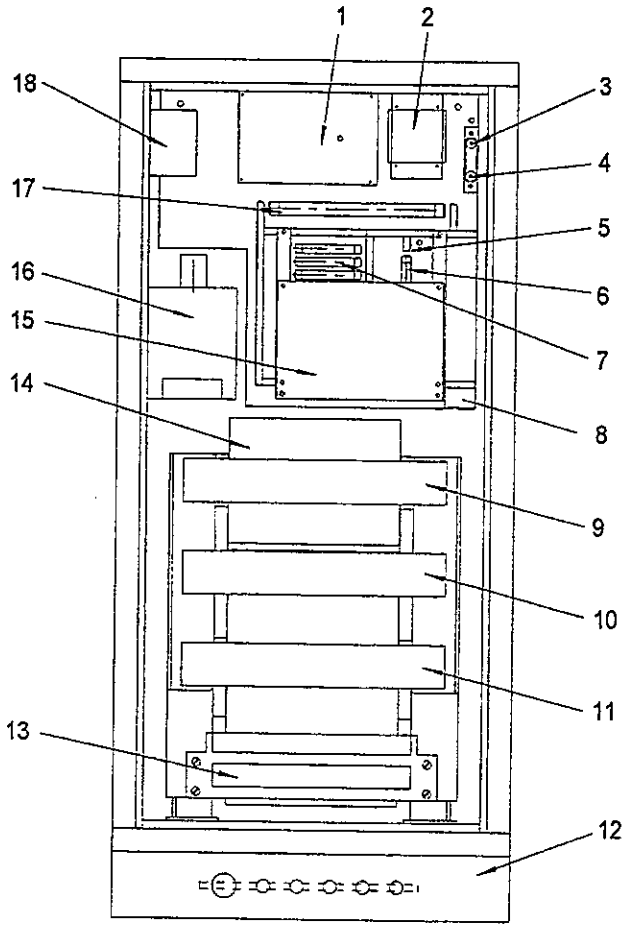
Behind the rear side door are installed the high voltage transformer, the isolated high voltage unit, the controller module and the beam current measurement.

8.1 Front side



1 Safety switch Q1
2 Fuse F2
3 Terminal X2
4 Relay K1
5 Short curcuit relay K2
6 Terminal X1.1 starting unit no. 59
7 Setpoint potentiometer R17
8 Error messages
9 Reset-button S2
10 Signal interchange X2
11 Central grounding point
11.1 Ground bus bar
12 Primary choke L1 BV.0118 00
13 Terminal X6
14 Signal interchange X3
15 Signal interchange X4
16 Control A1 BV.0143 00
17 Thyristor controller A3 BV.0144 00
18 Terminal X1 starting unit no. 52
19 Filter Z1

8.2 Rear side



1 Beam current measurement A6
2 HV-choke L2 BV.0148 00
3 Pre-resistor R3
4 Recovery diode D4 BV.0089 00
5 Varistor chain R5 BV.0149 00
6 Resistor R4 BV.0149 00
7 Base load resistor R1 BV. 0150 00
8 Isolating transformer A4 BV.0092 00
9 Rectifier D3
10 Rectifier D2
11 Rectifier D1
12 Socket with PG-union and grounding bar
13 Terminal X3
14 3-phase isolating transformer T1 BV.0105 00
15 Controller A2
16 HV-capacitor C1
17 Reducing resistor R2 BV.0146 00
18 Isolating transformer A5 BV.0139 00

8.3 Functional description

Line supply

The mains supply has to be connected to the terminal X1 with a wire of minimum 4 mm^2.
The correct allocation of the wires has to be observed to achieve a right turning rotary field. A left turning rotary field locks the thyristor controller A3. The lock is shown by a LED and an error message is transmitted to controller A1.
The high voltage transformer T1 has taps (terminal X3) to adjust to main supplies with permanent over or under voltage. The location is shown on circuit diagram. U0015 01/2.

Signal interchange

At the upper pc-board of the controller A1 all signals nescessary for the unit control are fed or indicated. The signal transmission is potential free. See circuit diagram U0015 01/3.
At the additional Sub-D-connector X5 all signals are lead which are available at X2, X3 and X4. X5 is for service purposes, but can also be used for normal operation.
The upper pc-board can be folded down after removing the screws. At the second pc-board are the transmitter and receiver for the fibre optics transmission of the analog signals. When folding down the upper pc-board the trimm potentiometers are easily to access.

Internal setpoint setting

At the controller module A1 is the potentiometer R17 for setpoint value pre-selection.The adjustment range is 5 - 10 kV. Beside the potentiometer the setpoint can be controlled with a multimeter (< 1 MOhm) at the measuring points. 10 V corresponds to 10 kV. If the setpoint value should be fed from outside, the solder link S1 beside the potentiometer must be removed. When changing back to internal pre-selection the solder link S1 must be made.

Error messages

The LED 's at the controller module A1 indicate different error messages.See 8.4 error messages.

High voltage

The high voltage is led from the high voltage connectors X100-X102 with shielded cable to the chamber. There the positive pole X100 is grounded.
The high voltage can be adjusted with the internal potentiometer R17. A remote control is possible via the signal interchange terminal X2 with 0 - 10 V for 0 - 10 kV.
The high voltage transformer T1 has taps at the terminal X3 for the range modification for 6 - 8 kV and 8 - 10 kV. The connection of the terminal is shown in circuit diagram U0015 01/2.
With a "UB EIN"-order at the signal terminal X2 the high voltage is switched on. The high voltage is brought to the value set by setpoint potentiometer R17 by a ramp.
The high voltage is controlled by the thyristor controller A3 at the primary side of the HV-transformer.
By deleting the "UB EIN"-order the high voltage is switched off.

Beam current measurement

Behind the high voltage lead thrus X100 - X102 is the pc-board A6 for the beam current measurement of the different outputs. There are 2 complete assembled measuring units. The beam current measurement can be extended to 4 channels. Therefore the high voltage lead thrus and measuring boards must be retrofitted.

Switching off the unit

The unit is protected against flashovers, short circuit and overload.
A flashover proceeds a blankig out by blocking shortly the thyristors. Reswitching the high voltage is done during a short ramp.

If several flashovers occur reapeatedly once after another the high voltage is switched off totally. The number of blanking outs and also the time window during the flash overs are registered, can be set at the controller board A2. At the pc-board P0054 01/1 the time window is set with the coding switch S2 to 1 s, 3 s, 10 s or variable. With variable all time between 0.5 s to 10 s is possible. With coding switch S1 the number of blank outs can be selected between 1 and 9. Performing these settings are allowed only with the permission of Leybold Systems GmbH.
When a short circuit occurs the high voltage is switched off instantly.
If an permanent overload over the nominal current occur the high voltage is switched off after approx. 10 seconds.
An overload, respectively a switch off is indicated by LED 's at the controller module A1.
Simultanuously at the signal interchange terminal X2 a message contact is switched.
After the unit is switched off it can only be resetted with a new "UB-EIN" - Signal. The overload message is acknoledged with the push-button S2 at the control module A1.

8.4 Error messages

The high voltage supply monitors a few operating status. By drop outs, limit exceedings of maximum values and malfunctions a summary error message is indicated at the controller module A1 and at the same time at the signal interchange terminal X2 a message contact is switched over.
As long as the mains supply of the HV 10.3 is on, the different error messages are stored and must be deleteed by pushing the rest button S2. The message "system off" Abschaltung) can only be deleted with a new "UB-EIN" - order. All errors activate the message "Sammelfehler"(summary error). At the same time at the signal interchange terminal X2 a message contact is switched. If an error repeatedly occurs the reason therefore must be searched and solved.

Q 1
The LED „Q 1" is illuminated if power switch Q1 is activated.

F 2
The LED „F 2" is illuminated if controller fuse F2 is activated.

Over temperature
This error message is not active in the HV 10.3.

Overload
The LED " Überlast " (overload) is illuminated, if the emission current IE reaches 110 % of the nominal value. The error message is time delayed for approx. 10 s. At the same time the message "system off" (Abschaltung) is set.

Thyristor controller
The LED " Thyristorsteller " (thyristor controller) is illuminated, if at the thyristor block A3 a faulty rotary field or a drop out of the phase is registered.. Which error has occured can be read at the LED `s of the thyristor controller.

Beam current measurement
The LED " Strahlstrommessung "(beam current measurement) is illuminated, if the ± 15V supply voltage at the module A6 is to low.

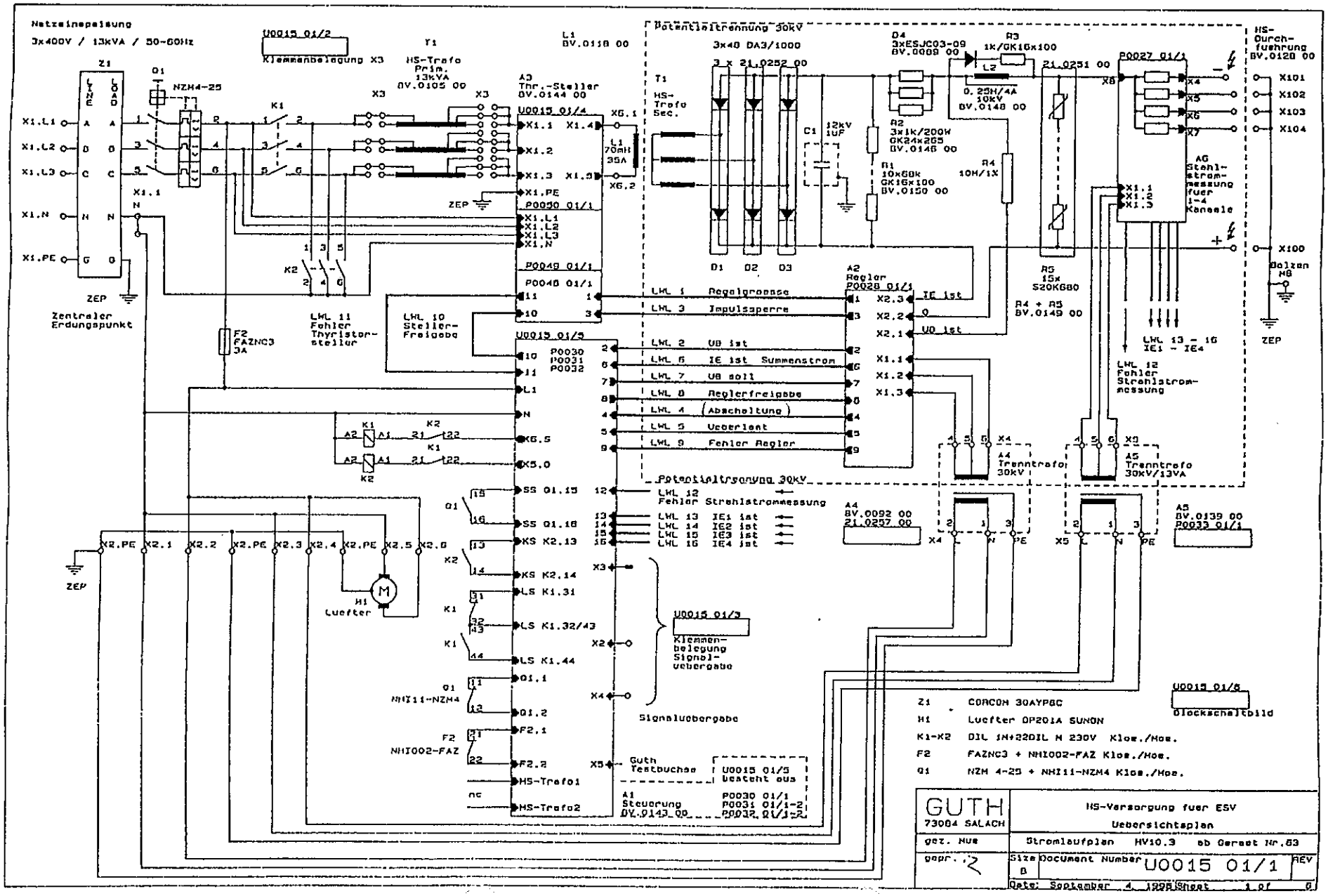
Controller
The LED " Regler " (controller) is illuminated, if the ± 15V supply voltage at the controller module A2 is to low.

System off
The LED " Abschaltung " (system off) is illuminated, if following operating status at the controller module A2 are registered:

Low voltage	The high voltage did not reach the preset setpoint, lower than 1.2 kV.
Overload	The emmision current reaches 1.1 A.
Number of blank outs	In the preset time (1s, 3s, 10s) the selected number of blank outs (1-9) is reached.

9.0 Appendix

Circuit diagrams	U0015 01/1
	U0015 01/2
	U0015 01/3
	U0015 01/4
	U0015 01/5
	U0015 01/6


Netzeinspeisung
3x400V / 13kVA / 50-60Hz
U0015 01/2
Klemmenbelegung X3
T1
HS-Trafo Prim. 13kVA BV.0105 00
L1 BV.0118 00
A3 Thr.-Steller BV.0144 00
U0015 01/4
Potentialtrennung 30kV
3x40 DA3/1000
3 x 21.0252 00
T1 HS-Trafo Sec.
D4 3xESJC03-09 BV.0009 00
R3 1k/GK16x100
L2 0.25H/4A 10KV BV.0148 00
21.0251 00
P0027 01/1
HS-Durch-fuehrung BV.0120 00
X101
X102
X103
X104
X100
Bolzen M8
ZEP
AG Strom-messung fuer 1-4 Kanaele
C1 12kV 1uF
R2 3x1k/200W GK24x265 BV.0146 00
R1 10x68k GK16x100 BV.0150 00
R4 10M/1%
R5 15x S20K680 R4 + R5 BV.0149 00
D1 D2 D3
A2 Regler P0028 01/1
LWL 1 Regelgroesse
LWL 3 Impulssperre
LWL 2 UB ist
LWL 6 IE ist Summenstrom
LWL 7 UB soll
LWL 8 Reglerfreigabe
LWL 4 (Abschaltung)
LWL 5 Ueberlast
LWL 9 Fehler Regler
IE ist
UD ist
LWL 13 - 16 IE1 - IE4
LWL 12 Fehler Strahlstrom-messung
A4 Trenntrafo 30kV
A5 Trenntrafo 30kV/13VA
A4 BV.0092 00 21.0257 00
A5 BV.0139 00 P0033 01/1
Potentialtrennung 30kV
LWL 12 Fehler Strahlstrommessung
LWL 13 IE1 ist
LWL 14 IE2 ist
LWL 15 IE3 ist
LWL 16 IE4 ist
U0015 01/3
Klemmen-belegung Signal-uebergabe
Signaluebergabe
U0015 01/6
Blockschaltbild
Z1 CORCOM 30AYP8C
H1 Luefter DP201A SUNON
K1-K2 DIL 1N+22DIL N 230V Kloe./Hoe.
F2 FAZNC3 + NHI002-FAZ Kloe./Hoe.
Q1 NZM 4-25 + NHI11-NZM4 Kloe./Hoe.
Zentraler Erdungspunkt
F2 FAZNC3 3A
LWL 11 Fehler Thyristor-steller
LWL 10 Steller-Freigabe
Guth Testbuchse
U0015 01/5 beatent aus
A1 Steuerung BV.0143 00
P0030 01/1
P0031 01/1-2
P0032 01/1-2
GUTH 73084 SALACH
HS-Versorgung fuer ESV
Uebersichtsplan
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Stromlaufplan HV10.3 ab Geraet Nr.83
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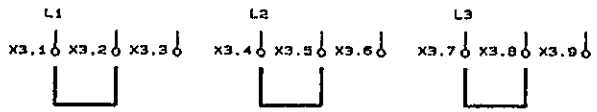
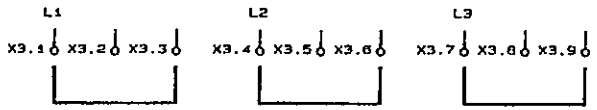
Document Number U0015 01/1
REV
Date: September 4, 1998 Sheet 1 of 6

Klemmenbelegung X3
HS-Trafo

Anzapfung 0kV :



Anzapfung 10kV :



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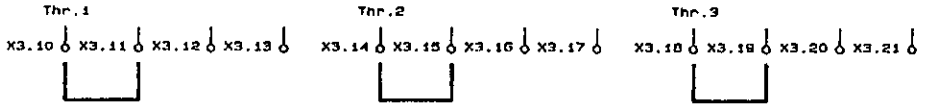
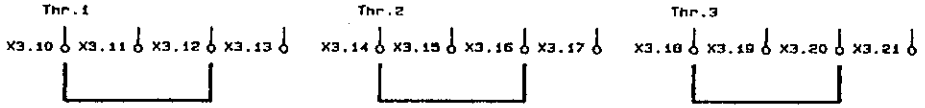


Anzapfung 0 :



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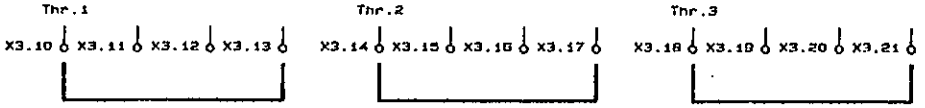

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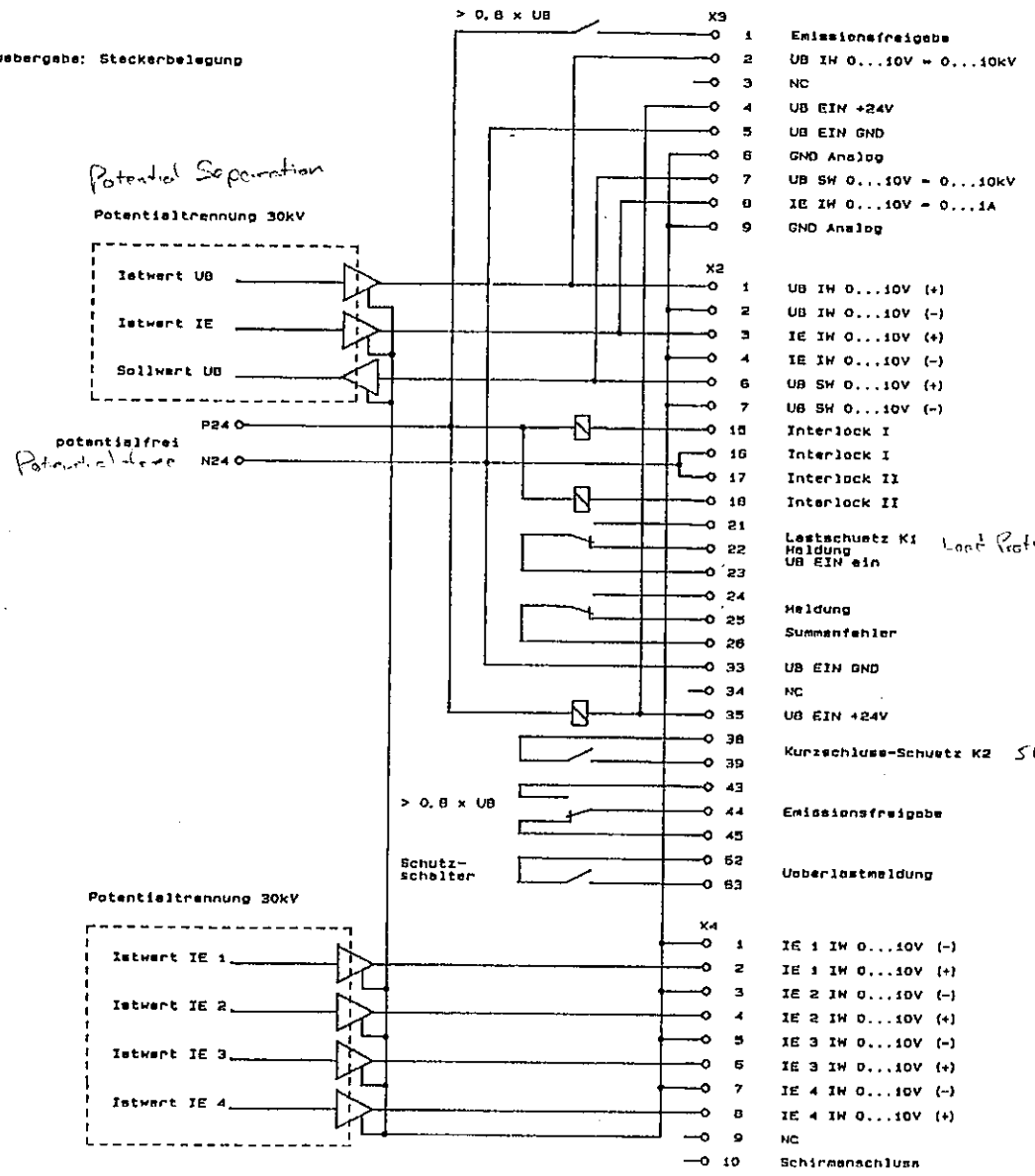
Signaluebergabe: Steckerbelegung



Load Protection

Short Circuit Protection

X1
PE
N Netzeinspeisung
L1 3 x 400V 50-60Hz
L2 13kVA
L3

X1
alle Anschluesse (ohne PE)
gegen Erde 1.5kV isoliert

X2/X3
alle Anschluesse potentialfrei
gegen Erde 1.5kV isoliert

Klemmen X1 1...9 6qmm
Klemmen X2 1...63 2.5qmm
X3 SUB D 9polig
Klemmen X4 1...10 2.5qmm

Nicht genannte Klemmen
werden nicht bestueckt.

GUTH 73084 SALACH	HS-Versorgung fuer ESV Klemmenbelegung Signaluebergabe
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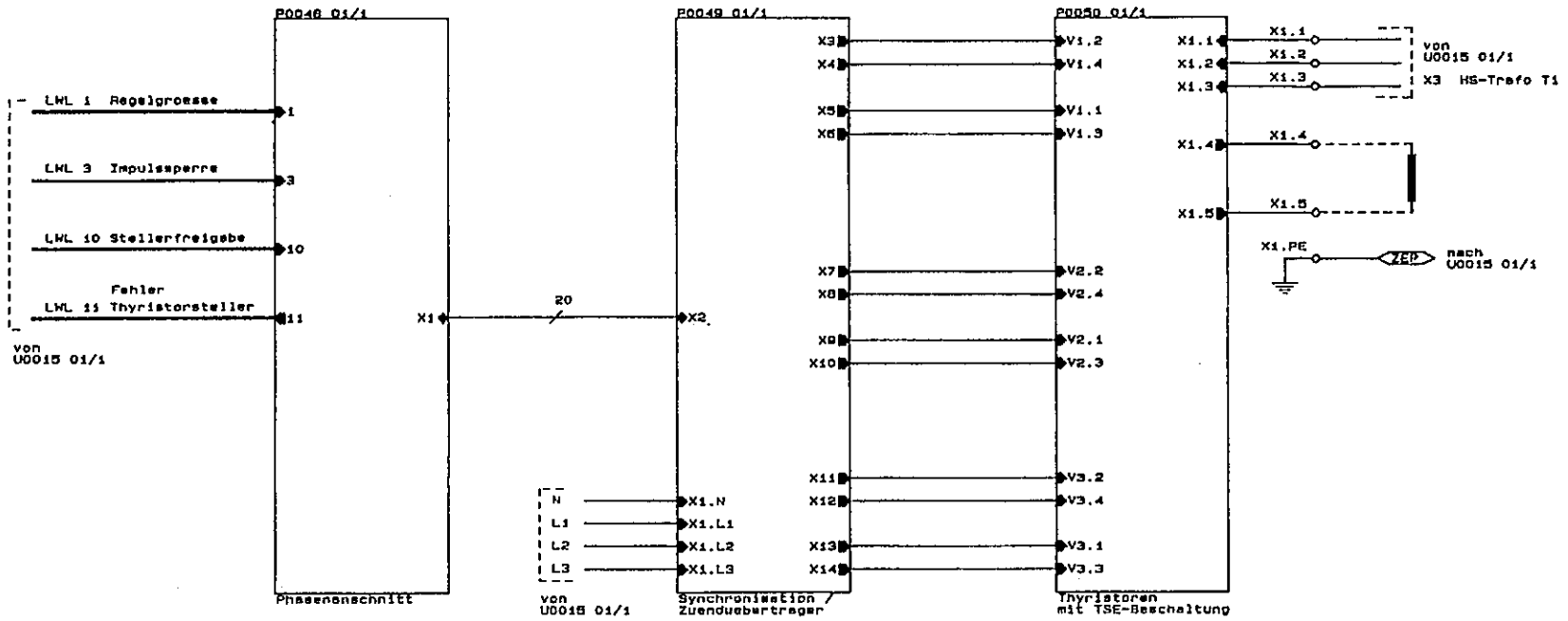

GUTH 73084 SALACH	HS-Versorgung fuer ESV Uebersicht Thyristorsteller	
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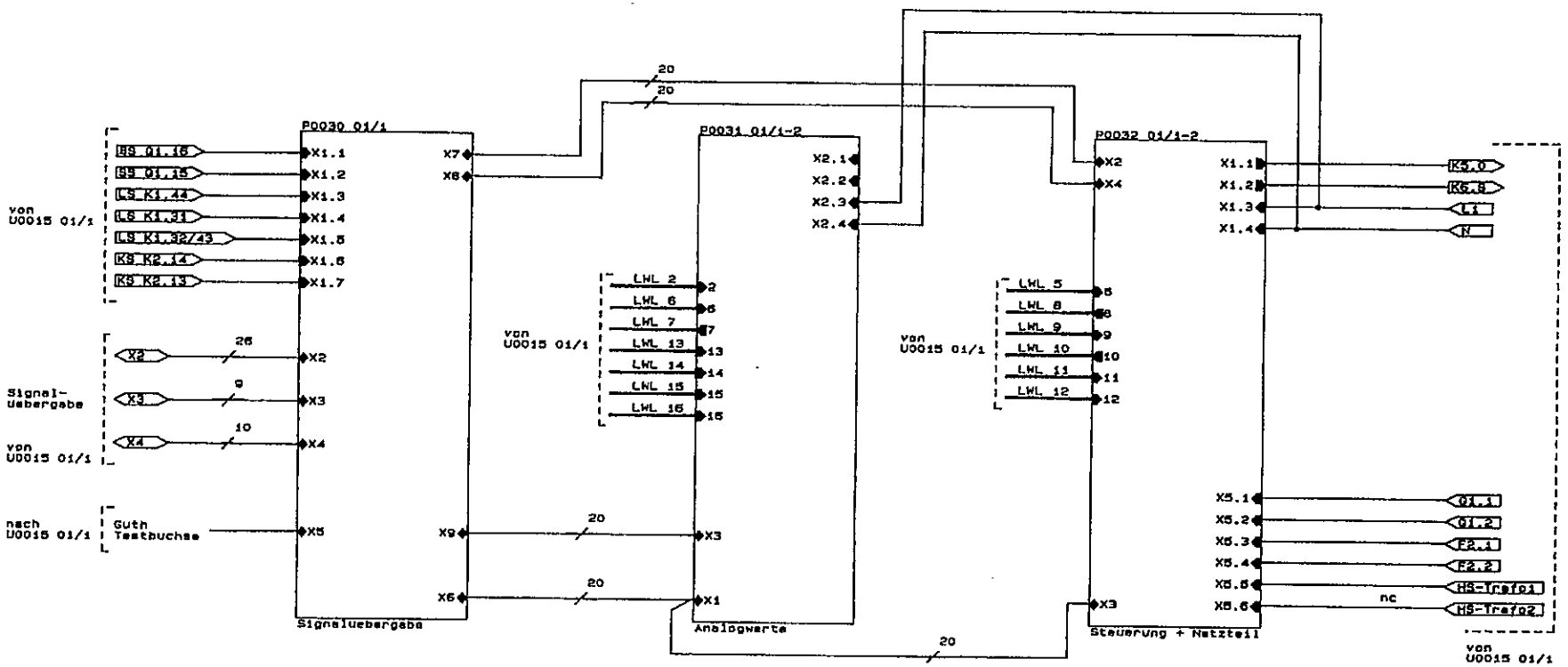
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P0031 01/1-2
P0032 01/1-2
von U0015 01/1
BS 01.16
BS 01.15
LS K1.44
LS K1.31
LS K1.32/43
KS K2.14
KS K2.13
X1.1
X1.2
X1.3
X1.4
X1.5
X1.6
X1.7
X7
X8
20
20
X2.1
X2.2
X2.3
X2.4
X2
X4
X1.1
X1.2
X1.3
X1.4
K5.0
K5.8
L1
N
LWL 2
LWL 6
LWL 7
LWL 13
LWL 14
LWL 15
LWL 16
LWL 5
LWL 8
LWL 9
LWL 10
LWL 11
LWL 12
X2
X3
X4
26
9
10
Signal-uebergabe
X5
X9
X6
X3
X1
X5.1
X5.2
X5.3
X5.4
X5.5
X5.6
Q1.1
Q1.2
F2.1
F2.2
HS-Trafo1
HS-Trafo2
nc
nach U0015 01/1
Guth Testbuchse
Signaluebergabe
Analogwerte
Steuerung + Netzteil
GUTH
73084 Salach
gez. Hue
gepr.
HS-Versorgung fuer ESV
Steuerung
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Document Number U0015 01/5
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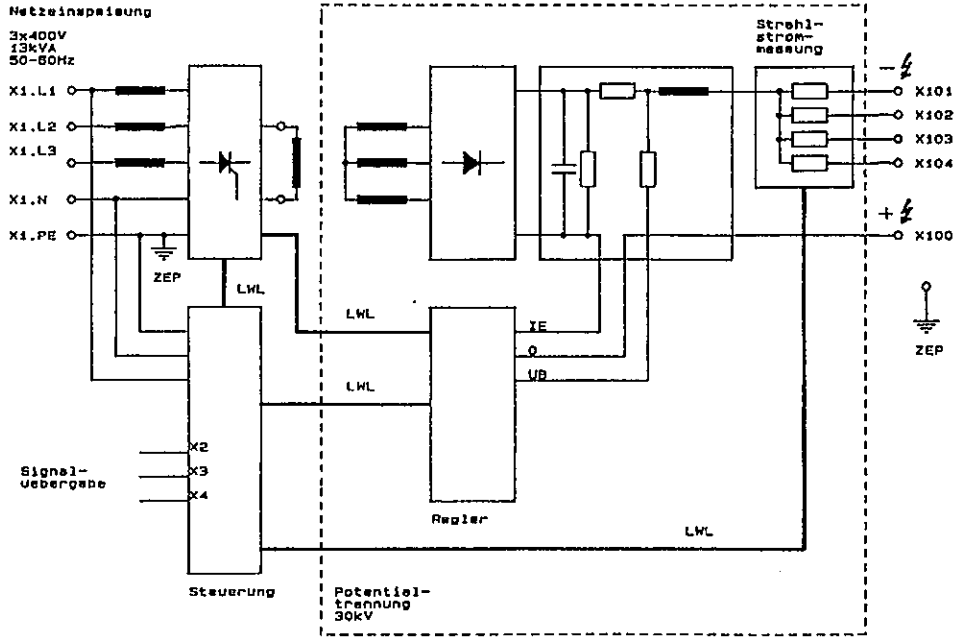
Date: April 16, 1998 Sheet 5 of 6

Blockschaltbild

Grid Feed-in



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depr.	Size B	Document Number U0015 01/6 REV
	Date: May 9, 1996	Sheet 6 of 6