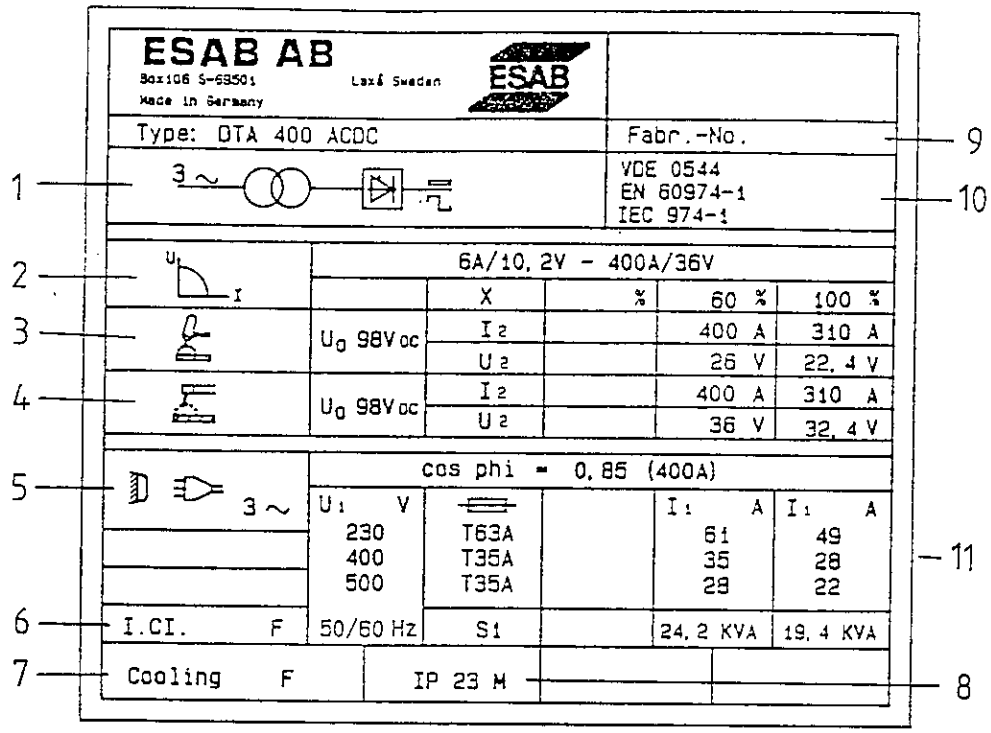
DTA 400 AC DC

LIST OF CONTENTS **Page**

Service manual

0301 005 075 **9310**

Technical Data



Section 1: Schematic diagram of the power source with three-phase transformer and downstream controlled rectifier for DC and AC welding (square wave).

Section 2: Symbol of the static characteristic, here falling.

Section 3: Symbol and data for TIG welding. The welding current and voltage values (I1, U2) are related to the corresponding duty cycle in line X.

Section 4: Symbol and data for electrode welding. The welding current and voltage values (I1, U2) are related to the corresponding duty cycle in line X.

Section 5: Symbol for three-phase mains connection.

Section 6: Insulation class F

Section 7: Type of cooling F

Section 8: Enclosure IP 23 M (with machine running)

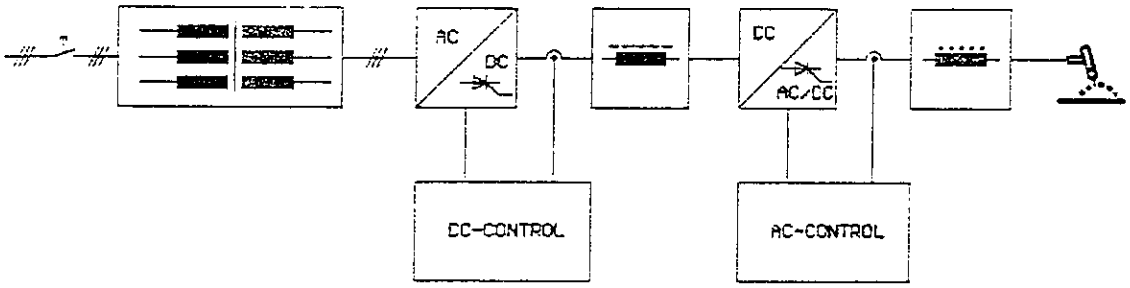
Section 9: Machine serial number

Section 10: Reference to the standards where the requirements are satisfied by the power source.

Section 11: Dimensioning values for mains voltages (U1), mains frequency, current input (I1), fusing, power factor and power consumption (S1).

Technical Description

The DTA 400 AC DC Invertig is a thyristor-controlled power source for TIG and electrode hand welding with direct and alternating current (square wave).
The power source mainly consists of the two modules DC source and inverter.
The DC section consists of a 3-phase AC main transformer, a half-controlled, 6-pulse thyristor bridge, a smoothing reactor and a DC control with constant-current regulation.
The AC section consists of an inverter, a thyristor turn-off circuit and the appropriate control.



1. Mains input, primary side

The power source can be operated on 230V, 400V and 500V 3-phase AC current networks, the appropriate switch-over being made on the terminal board X1. The terminal board has been set at the works to 400V operation.

For 230V operation a mains cable with a larger copper cross section (10 mm²) must be used owing to the higher power input.

The power source fan M1, control transformer T2, cooling water pump M2 and the two fans M3 and M4 of the water cooler integrated in the power source are connected on the terminal board X1 to the 230V tapping point of the main transformer T1.

2. Secondary side, main power circuit

The transformer secondary side is connected to a half-controlled thyristor bridge and, together with the smoothing reactor L1, power shunt R2 and the appropriate control electronics, forms a DC source with a constant-current characteristic.

The auxiliary circuit connected in parallel to the thyristor bridge output serves as a no-load voltage and base current source. This circuit consists of the components base current winding T1, rectifier V6, contactor K1 and resistor R1.

3. AC section, converter

The converter comprising 4 fast power thyristors V1-V4 is located down-stream of the half-controlled thyristor bridge and smoothing reactor. The thyristors are activated in pairs and thus govern the respective polarity at the power source output.

The relevant turn-off thyristors and turn-off capacitors are connected in parallel to each main thyristor.
The turn-off capacitors are charged synchronous with the mains by the charging circuit, comprising transformer T2, charging current limiting resistors R5 and R6 and the corresponding rectifier diodes on the synchronisation board A11. As a result of this link to the mains frequency the frequency of the welding alternating current is equal to the mains frequency.

The converter and turn-off circuit are controlled by the AC module, separated from the DC section, of the control rack assembly A10, and the synchronisation board A11. The AC module contains the controls logic and ignition unit converter A5 and A6.

The converter output AK1 is connected directly to the power source output for mma welding and to the connection for the TIG torch via the HF transformer L2. The converter output AK2 is connected via the welding current detection relay K3 to the workpiece connection of the welding power source.

4. Option - Protective diode circuit A13

Inductivity in the welding current circuit generates high voltage peaks at the converter owing to the steep change-over flanks during AC welding. The inductivity in the welding current circuit can increase substantially through the use of longer torches or earth cables and, depending on the current intensity, result in inadmissibly high voltage peaks at the converter.
A circuit located on the synchronisation board A11 limits the voltage at the converter to 500V through automatic welding current reduction.
This protective circuit, indirectly active as a result of the automatic reduction in the welding current, can be supplemented by retrofitting a protective diode circuit A13. In principle it acts like a bidirectional high-power suppressor diode. The resultant directly active limiting of the voltage to approx. 450V also permits the full power range to be utilised in the case of torch lengths and earth cable lengths >20 m.
The converter inputs AM- and KM+ are incorporated in the protective circuit by means of two coupling diodes.
Moreover, the protective diode circuit is protected against thermal overloading by a thermostatic switch (F5).

5. Control circuit

The control circuit represents the link between the power section and the control electronics and consists of the following components:

42VAC- Control voltage (T1) to supply contactors, gas valve and HF ignition unit.

2x 18VAC- Control voltage (T1) to generate the supply voltages +/-15V DC and +24V DC of the controls in the DC section.

1x 18VAC- Control voltage (T1) to generate the supply voltages +12V DC and +24V DC of the controls in the AC section and for mains synchronisation of the converter ignition unit.

3x 42VAC- Control voltage (T1) for mains synchronisation of the phase control.

Filter A9- Control line filter with electrical isolation prevents HF parasitic voltages on the torch control line reaching the control.

Contactor K4- activates the cooling water pump M2.

The cooling water pump is switched off for mma welding and when the TIG torch is unscrewed (only with power sources with central connection).

HFG- High-frequency ignition unit is used in conjunction with the HF transformer L2 for the contactless ignition of the welding arc.

This is a triggered ignition generator with a 560V peak output voltage and a pulse width of 2.0 µs. The output voltage of the ignition generator is transformed up to 6.7 kV by the HF transformer L2. The ignition generator is triggered via the trigger input T42 with 42V AC for TIG DC welding and during the ignition process in TIG AC welding.

During TIG AC welding in the power range base current up to 40 A triggering is effected via the input T70 with welding alternating voltage. Above 40A AC and after the arc has been ignited in DC welding the HF generator is switched off.

The power supply of the ignition unit is 42V AC.

Filter A16- serves as a feedback branch for the high frequency. The pc board also contains a suppression capacitor 0.1µF which is located between the workpiece connection and the earth connection.

Contactor K1- activates the base current circuit. The drop in voltage caused by the base current at resistor R1 is evaluated as a current-flowing signal and enables the main current via the control electronics.

Y1- is the inert gas valve.

F10- is a thermostatic switch 100°C break contact located on the half-controlled thyristor bridge A7.

F12- are two thermostatic switches 110°C break contacts integrated on the converter and connected in series.

F6- is serving as a water flow switch and located in the return branch of the water cooling circuit. The contact is closed when water is flowing.

A15- Relay board serving as contact reinforcement of the flow switch F6. The relay contact is connected in series with the thermostatic switches and is bridged by a break contact of the contactor K4 when the water cooler is switched off.

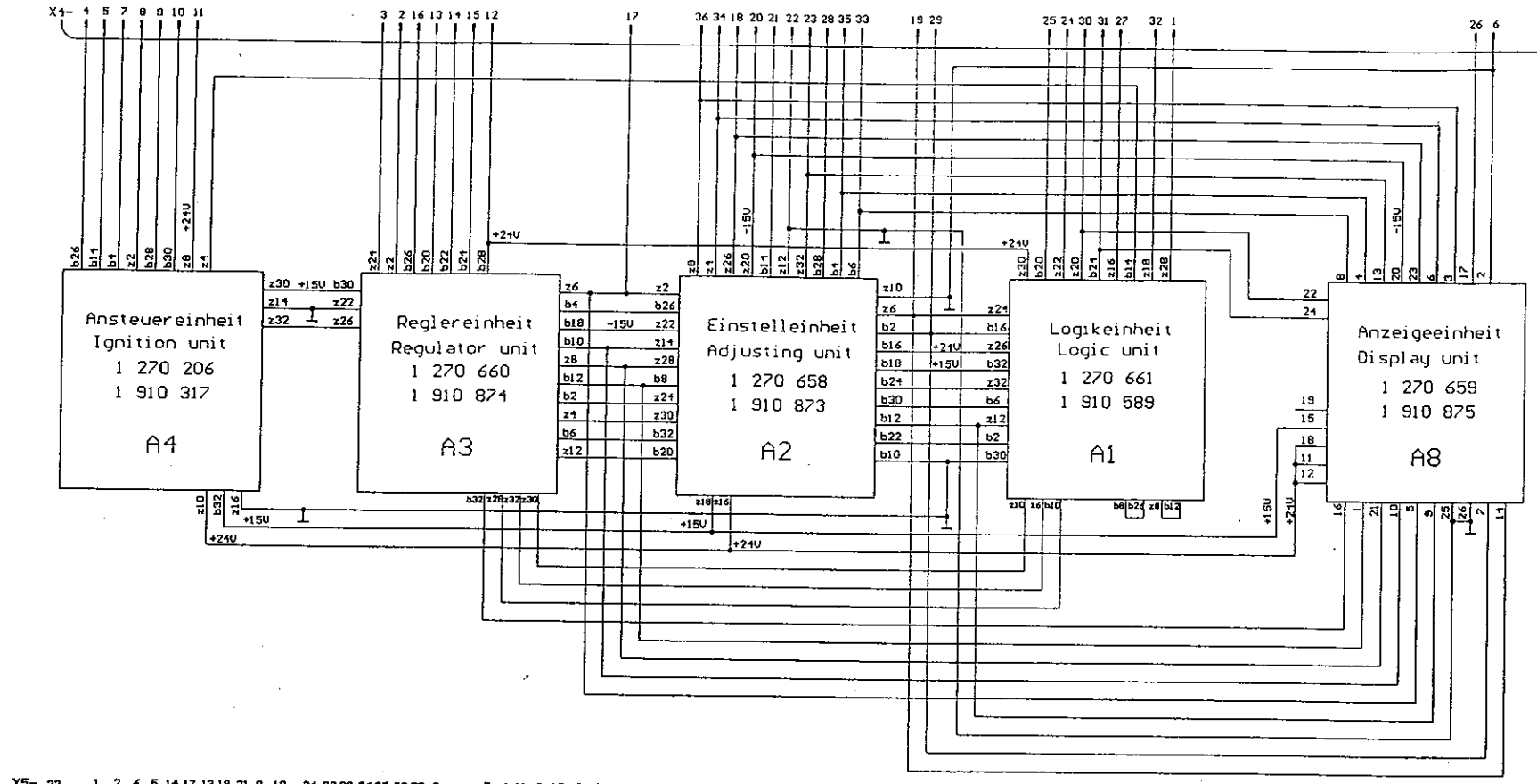
R3 & R31- are primarily series resistors to limit the making current from control transformer T2. After activation of the transformer the two resistors are bridged by the relay contact K2 on the synchronisation board.

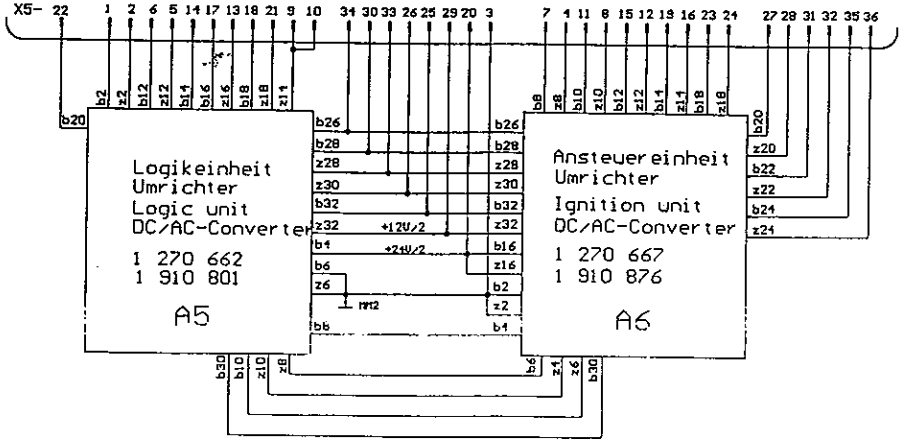
K3- Welding current measuring relay transmits, in conjunction with the base current relay K4 on the synchronisation board, the enabling signal for AC welding to the logic unit DC/AC-converter.

A10 Control rack assembly containing the entire control of the DC section as well as the logic and ignition unit of the AC section of the power source.
The rack assembly A10 consists of the following subgroups:

A1- Logic unit (DC)
A2- Adjusting unit (DC)
A3- Regulator unit (DC)
A4- Ignition unit (DC)
A5- Logic unit converter (AC)
A6- Ignition unit converter (AC)
A8- Display unit (DC)

The wiring between the individual controls and the connections to the interface connectors X4 and X5 are shown in the wiring diagram "Control rack assembly".



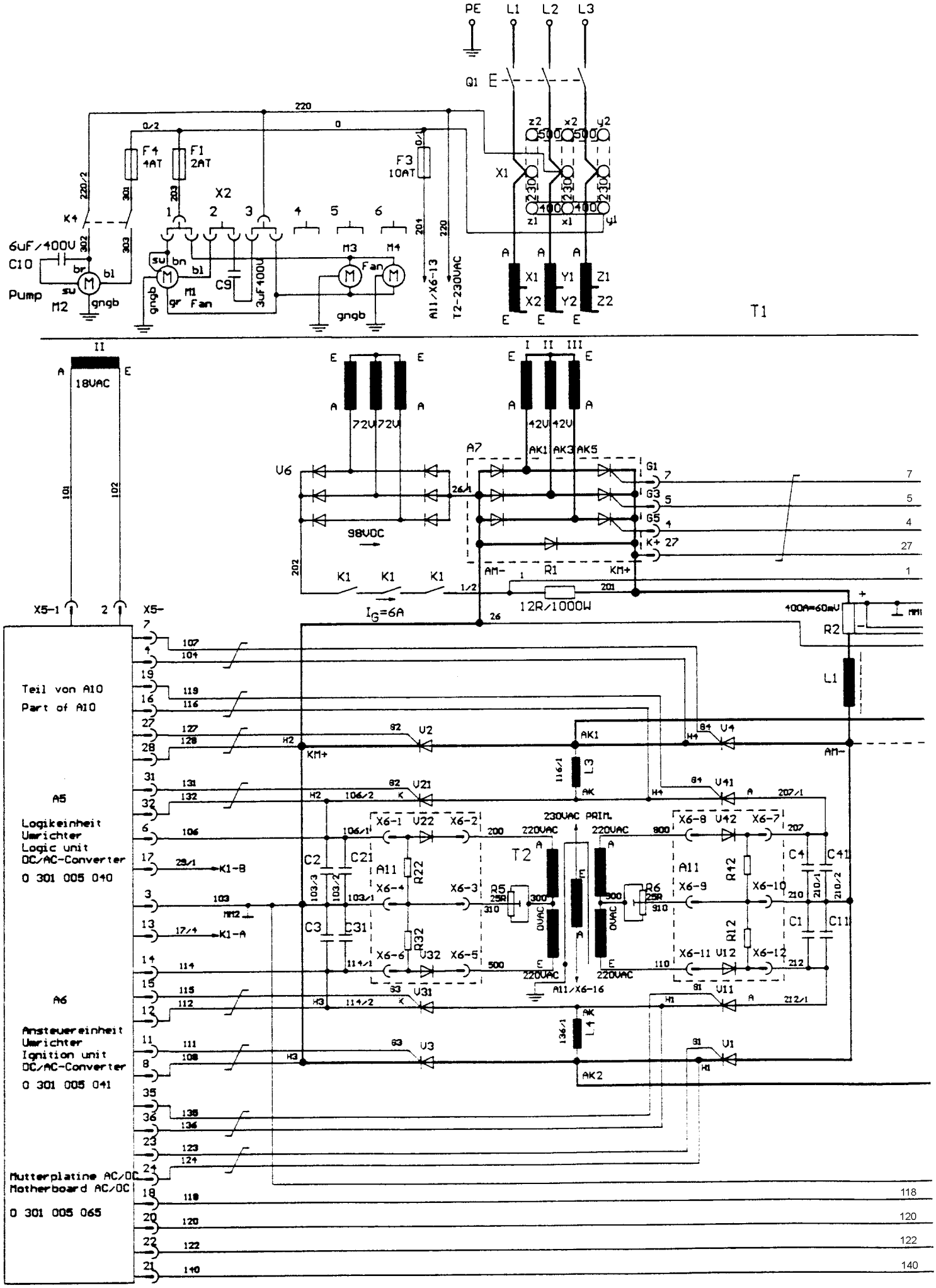


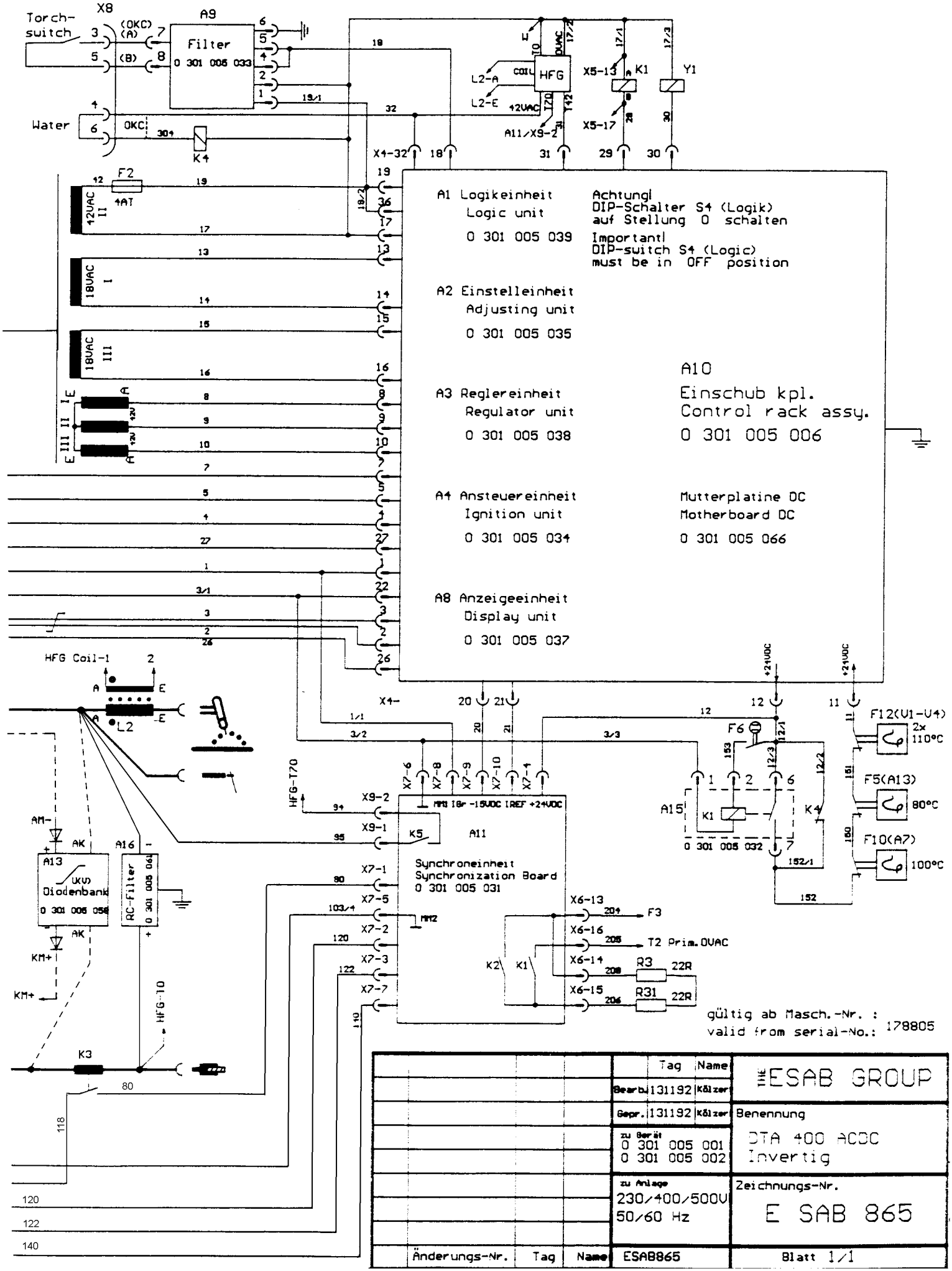
					Tag	Name
				Bearb.	291092	Kölzer
				Gepr.		
				zu Berkl	1 270 165 1 270 359 1 270 358 1 270 365	
				zu Anlage	DTA 400 ACDC 1 010 174/176	
Rev	Änderungs-Nr.	Tag	Name	1910878		

Benennung
Einschub
DTA 400 ACDC

Zeichnungs-Nr.
1 910 878

Blatt 1/1


PE L1 L2 L3
Q1
F4 4AT
F1 2AT
F3 10AT
X2
K4
6uF/400U C10
Pump M2
M1 Fan
C9 3uF400U
M3 M4 Fan
T2-230UAC
X1 Y1 Z1 X2 Y2 Z2
T1
18UAC
72U 72U
42U 42U
A7
AK1 AK3 AK5
U6
98UDC
K1 K1 K1
AM- R1 KM+
12R/1000W
400A=60mV
R2
L1
X5-1 2 X5-
Teil von A10
Part of A10
A5
Logikeinheit
Umrichter
Logic unit
DC/AC-Converter
0 301 005 040
A6
Ansteuereinheit
Umrichter
Ignition unit
DC/AC-Converter
0 301 005 041
Mutterplatine AC/DC
Motherboard AC/DC
0 301 005 065
U2 U21 U22 U31 U3
U4 U41 U42 U11 U12 U1
L3 L4
T2
230UAC PRIM.
220UAC
A11/X6-16
C2 C21 C3 C31 C32
C4 C41 C1 C11
R22 R32 R5 R6 R42 R12
A11
X6-1 X6-2 X6-3 X6-4 X6-5 X6-6 X6-7 X6-8 X6-9 X6-10 X6-11 X6-12
K1-B
K1-A
KM+
AM-
AK1
AK2
AK
118
120
122
140

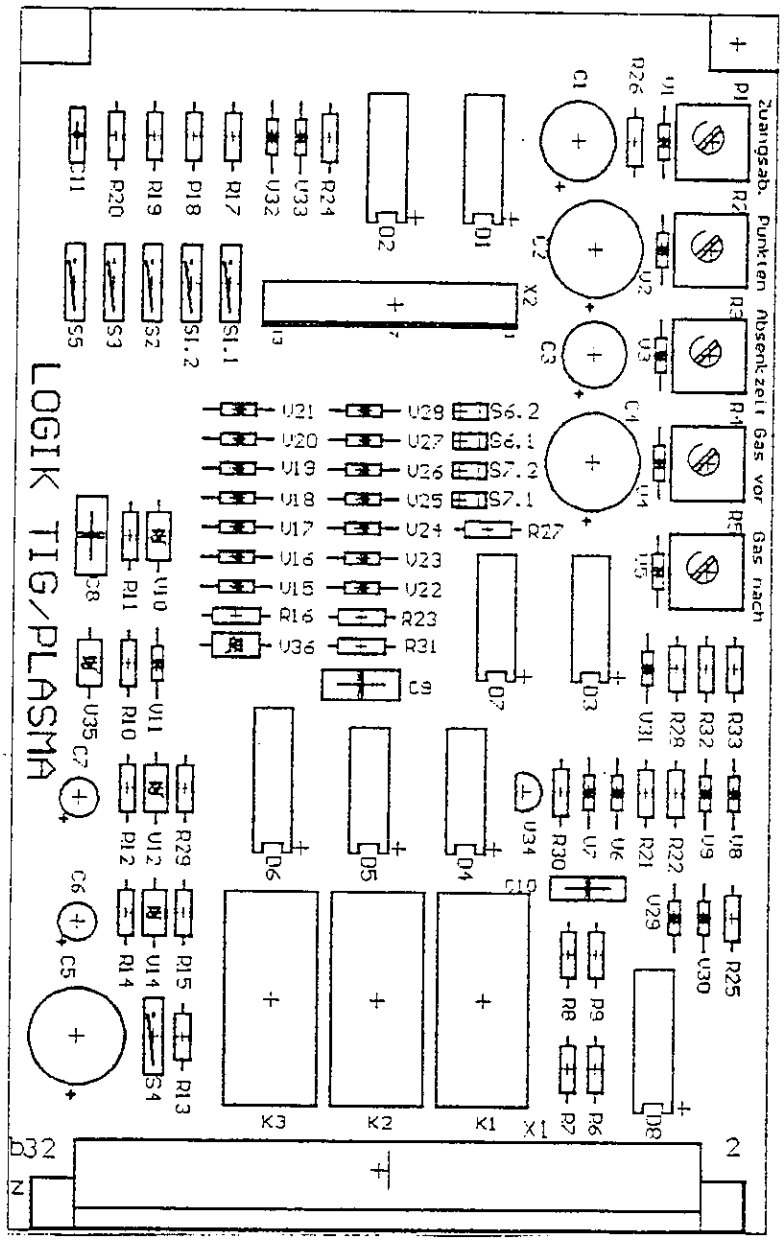

Torch-switch
X8
A9
Filter
0 301 005 033
Water
OKC
K4
F2
4AT
42VAC II
18VAC I
18VAC III
HFG
X5-13
K1
Y1
X5-17
A11/X9-2
X4-32
A1 Logikeinheit
Logic unit
0 301 005 039
Achtung!
DIP-Schalter S4 (Logik)
auf Stellung 0 schalten
Important!
DIP-switch S4 (Logic)
must be in OFF position
A2 Einstelleinheit
Adjusting unit
0 301 005 035
A3 Reglereinheit
Regulator unit
0 301 005 038
A4 Ansteuereinheit
Ignition unit
0 301 005 034
A8 Anzeigeeinheit
Display unit
0 301 005 037
A10
Einschub kpl.
Control rack assy.
0 301 005 006
Mutterplatine DC
Motherboard DC
0 301 005 066
HFG Coil-1
L2
X4-
+24VDC
F12(U1-U4)
2x 110°C
F6
F5(A13)
80°C
F10(A7)
100°C
A15
K1
K4
0 301 005 032
HFG-T70
X9-2
X9-1
K5
A11
Synchroneinheit
Synchronization Board
0 301 005 031
X7-1
X7-5
X7-2
X7-3
X7-7
X6-13
F3
X6-16
T2 Prim.OVAC
X6-14
R3
22R
X6-15
R31
22R
K2
K1
AM-
AK
A13
Diodenbank
0 301 005 056
A16
RC-Filter
0 301 005 061
KM+
K3
gültig ab Masch.-Nr. :
valid from serial-No.: 178805
THE ESAB GROUP
Tag Name
Bearb. 131192 Kölzer
Gepr. 131192 Kölzer
Benennung
DTA 400 ACDC
Invertig
zu Gerät
0 301 005 001
0 301 005 002
zu Anlage
230/400/500V
50/60 Hz
Zeichnungs-Nr.
E SAB 865
Änderungs-Nr. Tag Name
ESAB865
Blatt 1/1

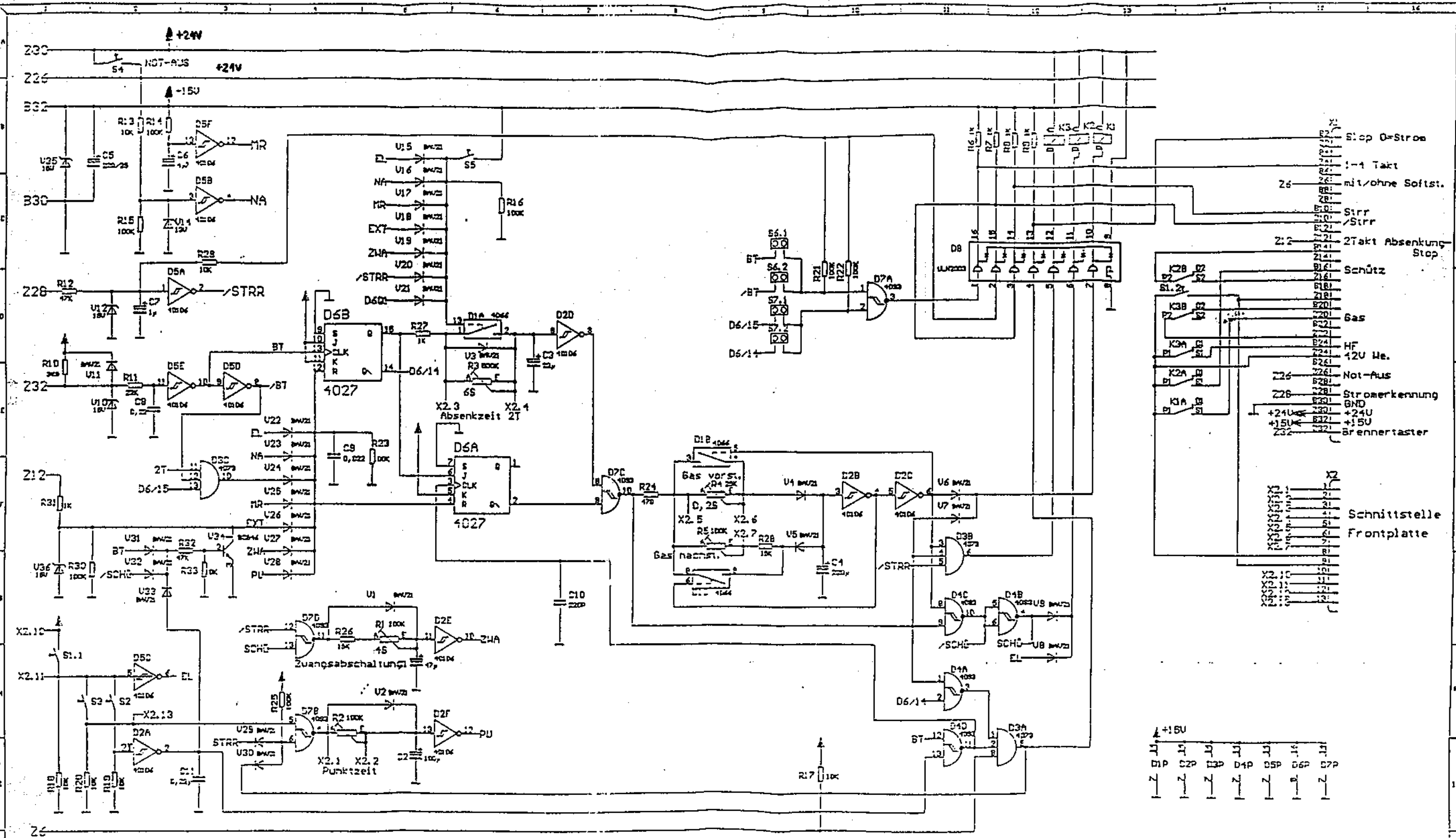
6. Description of the controls

A1- Logic unit

Functions and possible settings:

- Control of the logic function for TIG and electrode welding.
- Selection of the welding processes TIG or electrode welding via selector switch S1 on the front panel.
- Selection 2-stroke or 4-stroke mode via selector switch S2 on the front panel.
- Adjustable gas postflow time via potentiometer R5 on the front panel.
  Setting range 2.5-25 sec.
- Adjustable gas preflow time via trimming potentiometer R4 on the pc board.
  Setting range 0.2-5.0 sec., standard setting 0.2 sec.
- Activation of the base current contactor via relay K2
- Activation of the HF ignition generator via relay K3
- Activation of the gas valve via relay K1
- Adjustable forced cut-out via trimming potentiometer R1, as a function of the start and current relay signal.
  Setting range 0.8-5.0 sec., standard setting 4.0 sec.
- Generation of the current-flowing signal ("current relay") from the voltage drop of the base current resistor R1 in the power source. The signal is used, among other things, to enable the main current and switch off the ignition unit.
- The function 'spot welding' can be selected by closing DIP switch S3. The spot time is set with trimming potentiometer R2.
  Setting range 0-18 sec.
- The emergency-off function is activated by opening the DIP switch S4 and it then operates as a function of the signal level at connector point z26.
  In normal mode +24V DC, in the event of a fault (thermostatic switch or water flow switch) 0V DC are applied to connector point z26.
- Automatic down slope in 2-stroke mode.
  This function is activated by opening the DIP switch S5 on the pc board and it operates in conjunction with the reset signal at connector point z12 (cut-off current threshold of adjusting unit A2-b12).
  The maximum down slope time is set with trimming potentiometer R3.
  Setting range 0-11 sec., standard setting 6 sec.


LOGIK TIG/PLASMA
Zuendgeb. Punkten Absenkzeit Gas vor Gas nach
P1
R1
R2
R3
R4
R5
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
D1
D2
D3
D4
D5
D6
D7
D8
K1
K2
K3
X1
X2
S1.1
S1.2
S2
S3
S4
S5
S6.1
S6.2
S7.1
S7.2
R16
R23
R27
R31
R34
R35
R36
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
U15
U16
U17
U18
U19
U20
U21
U22
U23
U24
U25
U26
U27
U28
U29
U30
U31
U32
U33
U34
U35
U36
B32
N
2



MR = Reset
NA = Not-Aus
ZWA = Zwangsabschaltung
EL = Elektrode
2T = 2Takt

SCHÜ = Schütz
BT = Brennertaster
/STRR = Stromrelais
PU = Punkten

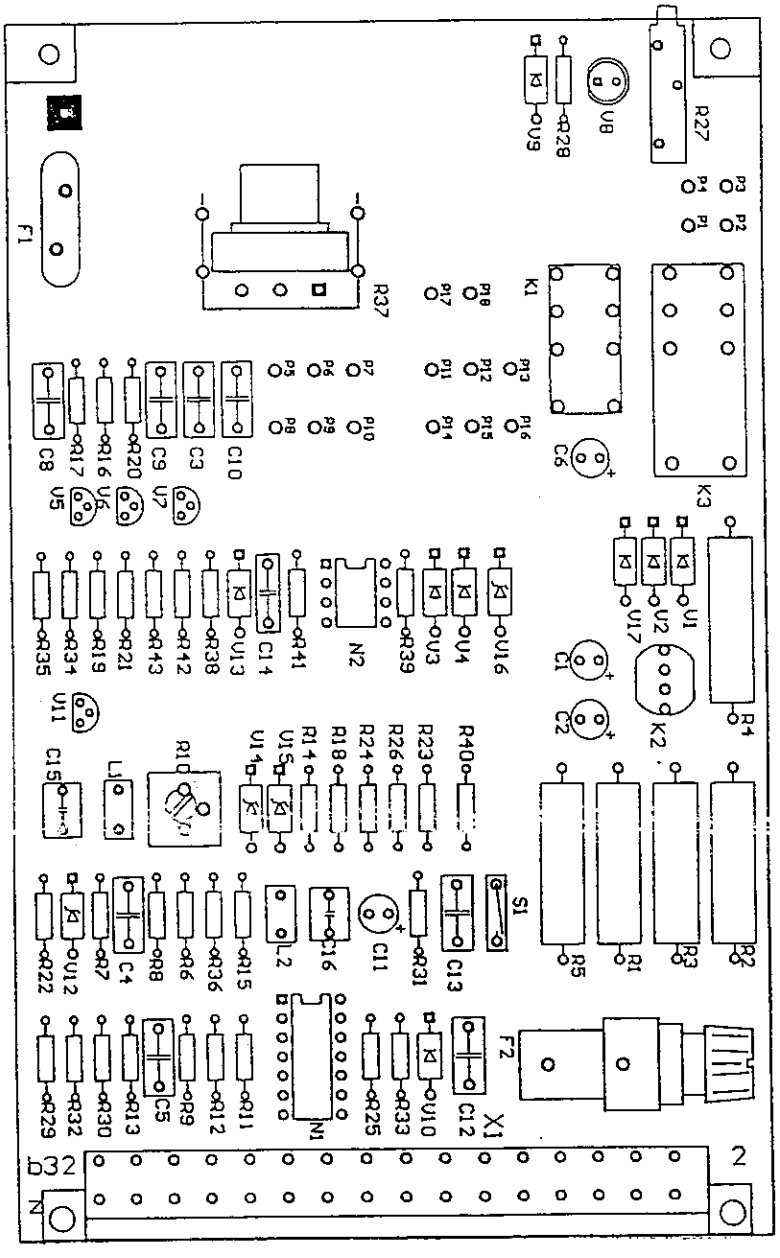
*gezeichnete Schalterstellung
S1 = *Elektrode/WIG
S2 = *4Takt/2Takt
S3 = *Punkten aus
S4 = *mit/ohne Not-Aus
S5 = *mit/ohne 2Takt absenken
S4 bei Plasmaweld offen

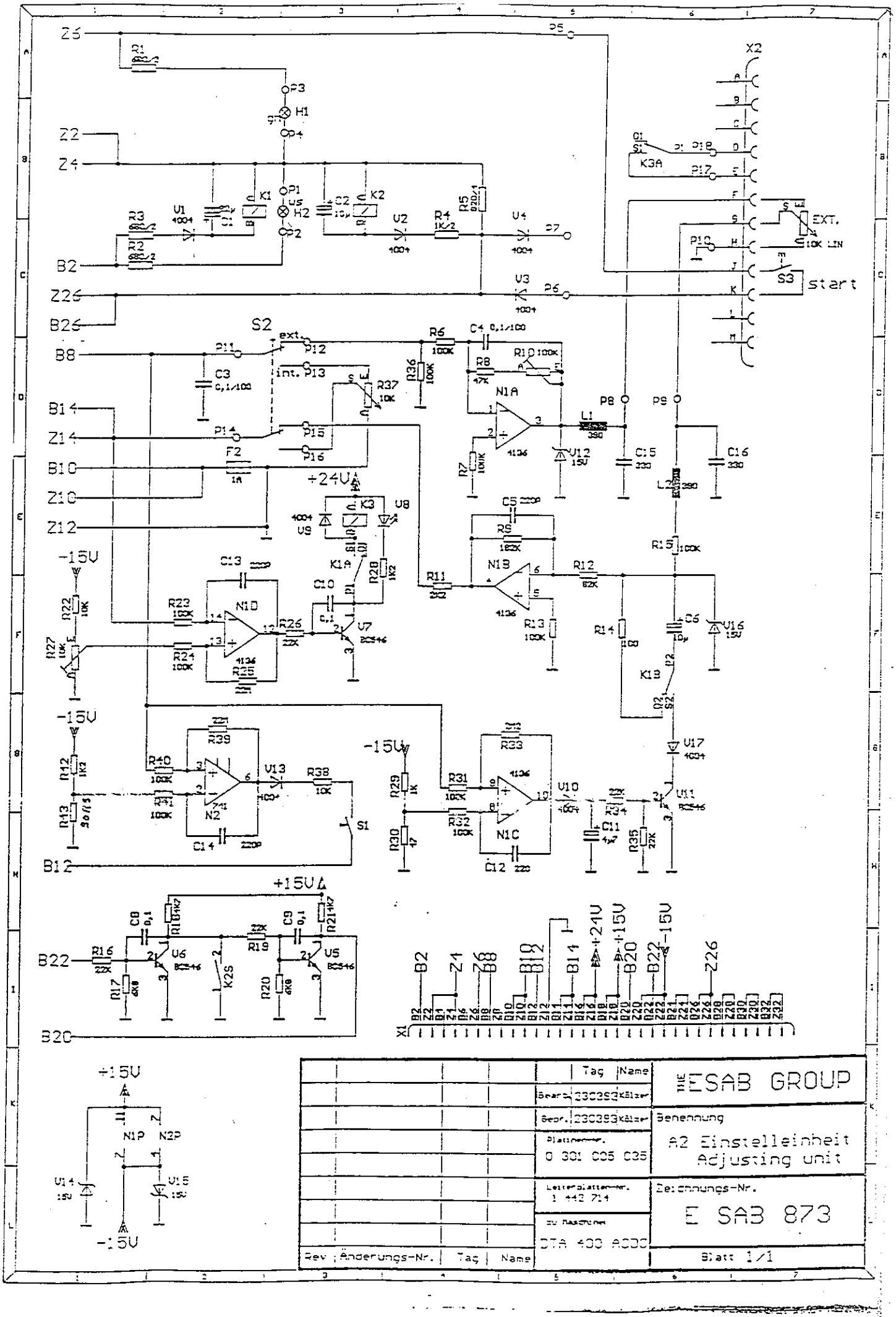
Tag	Name	ESAB GROUP
Bearb. 230293	Kälber	Benennung: A1 Logikeinheit Logic unit
Gepr. 230293	Kälber	
Platinen-Nr. 0 301 005 039		
Leiterplatten-Nr. 1 442 032 C		Zeichnungs-Nr. E SAB 589
zu Maschine: DTA 400 AC/DC		Blatt 1/1

A2- Adjusting unit

Functions and possible settings:

- Welding current setting with main potentiometer R37.
- Display of the operation status by the signal lamps "GREEN"=ready for operation and "WHITE"= start.
- Switch-over from internal to external current setting with switch S2.
- Level conversion of the internal current setpoint from 0-(-)8V DC to 0-(+)10V DC for external current adjustment (N1A) and the corresponding reconversion of the external current setpoint (N1B).
  The 10V reference voltage is set with trimming potentiometer R10.
- Limiting steepness of the external setpoint in the current range base current up to 40A to protect the converter during AC ignition with external setpoint selection (R15, C6, K1B, V11, N1C).
- Adjustable current relay K3 dependent on the current setpoint with potential-free contact led outside to connector X2 for customised applications (N1D, V7, K1A).
  Contact rating of relay K3, 2A/42V AC.
  The operating point can be set from outside using a screwdriver on the trimming potentiometer R27 and is displayed by an LED.
  Setting range: 6-380A.
- Threshold switch for switching off the welding current in the 2-stroke mode with automatic down slope at end of welding (N2).
  The cut-out threshold is 6A (base current).
  The generated signal is activated via DIP switch S1 as a reset signal to the logic unit A1-z12.
- Relay K1 together with relay K1 on the logic unit and the base current contactor K1 is activated when welding is ON. The two contacts serve to enable the steepness limit for external setpoint and to enable the potential-free current relay.
- Relay K2 is activated with external down slope and transmits this signal in conjunction with the transistor stages V6 and V7 to the slope input of the regulator unit.


F1
F2
S1
X1
K1
K2
K3
N1
N2
L1
L2
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R40
R41
R42
R43
V1
V2
V3
V4
V5
V6
V7
V8
V9
V10
V11
V12
V13
V14
V15
V16
V17
P1
P2
P3
P4
P5
P6
P7
P8
P9
P10
P11
P12
P13
P14
P15
P16
P17
P18
2
32



				Tag	Name
				Gezeichnet	230389 Kälzer
				Gepr.	230389 Kälzer
				Platinennr.	0 301 005 035
				Leiterplatten-Nr.	1 442 714
				zu Maschine	DTA 400 A000
Rev.	Änderungs-Nr.	Tag	Name		

THE ESAB GROUP

Benennung

A2 Einstelleinheit
Adjusting unit

Zeichnungs-Nr.

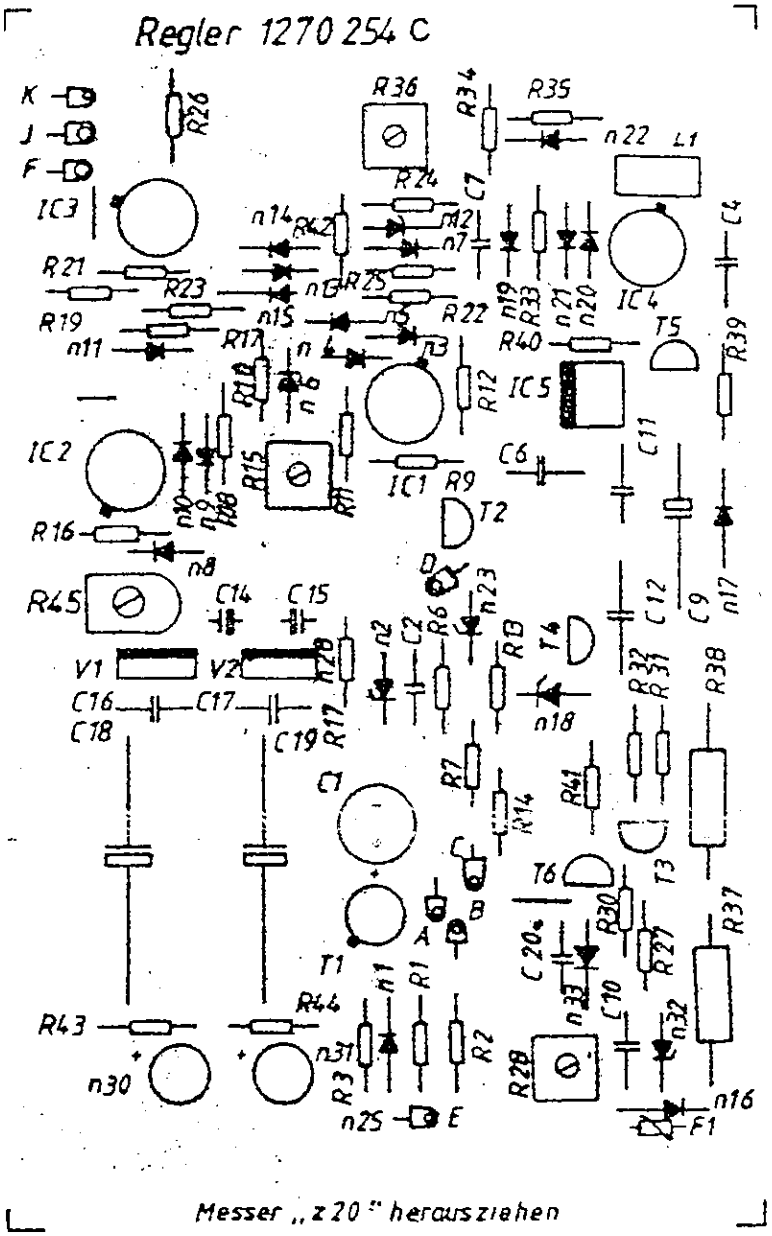
ESAB 873

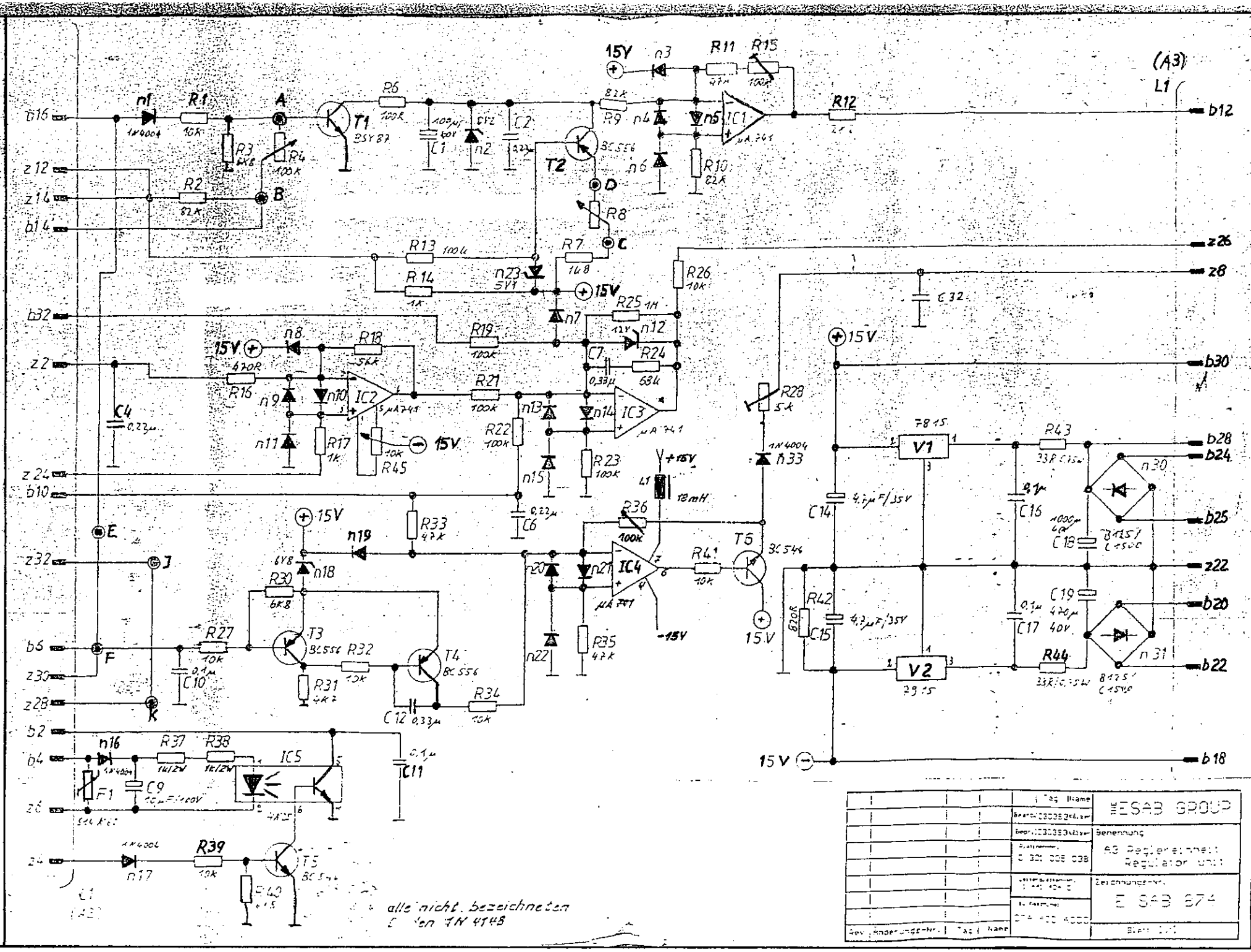
Blatt 1/1

A3- Regulator unit

Functions and possible settings:

- Control voltage supply of the DC control with +/-15V DC1 controlled and +24V DC1 uncontrolled.
- Control of current rise and fall times (transistor stage T2, T1).
  The current rise time can be set with potentiometer R8 in the range of 0.5 to 2.2 sec., the current fall time with potentiometer R4 in the range of 0.2 to 18 sec.
- Output of a reference voltage 0 to (-)8V DC to generate the current setpoint (IC1). The voltage can be set using trimming potentiometer R15 on the pc board and specifies the maximum possible current setpoint (Imax). At the start and end of welding the reference voltage runs as a function of the potentiometer settings (R8 and R4) as a ramp.
- Amplification of the actual current (IC2) with the possibility of balance via trimming potentiometer R45.
- Welding current regulation with constant-current characteristic (IC3) and output of the corresponding control voltage for phase control A4.
- Amplification and output of the current setpoint for welding current display (IC4, T6). The output can be balanced with the trimming potentiometers R28 and R36.
- Level conversion and electrical isolation of the start signal from 42V AC to +15V DC via optocoupler IC5.

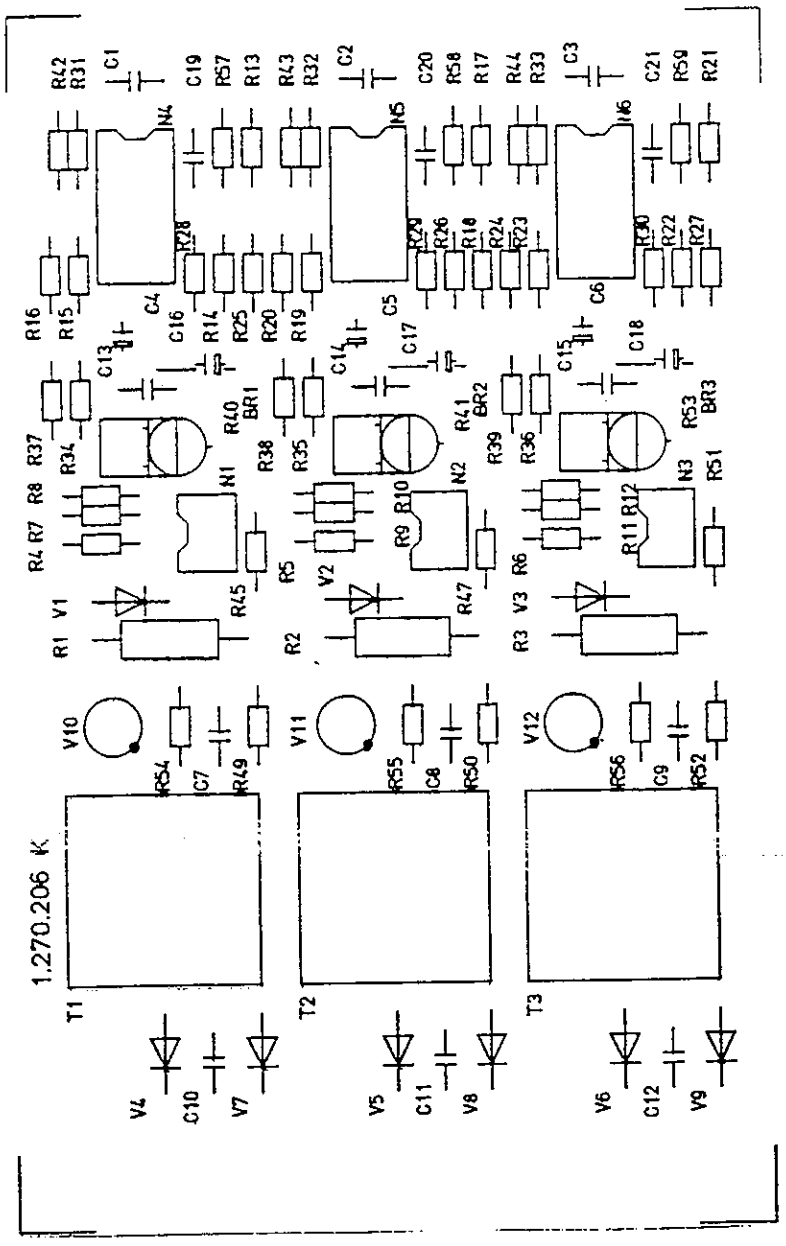

Regler 1270 254 C
K
J
F
IC3
IC2
IC1
IC4
IC5
R26
R36
R34
R35
R24
R21
R23
R19
R17
R22
R40
R39
R12
R15
R9
R16
R45
R14
R41
R38
R37
R30
R27
R28
R43
R44
R2
R3
C7
C4
C6
C11
C14
C15
C12
C9
C16
C17
C18
C19
C1
C20
C10
T1
T2
T3
T4
T5
T6
V1
V2
L1
D
A
B
E
F1
n22
n16
n30
n31
n32
n25
Messer „z 20" herausziehen

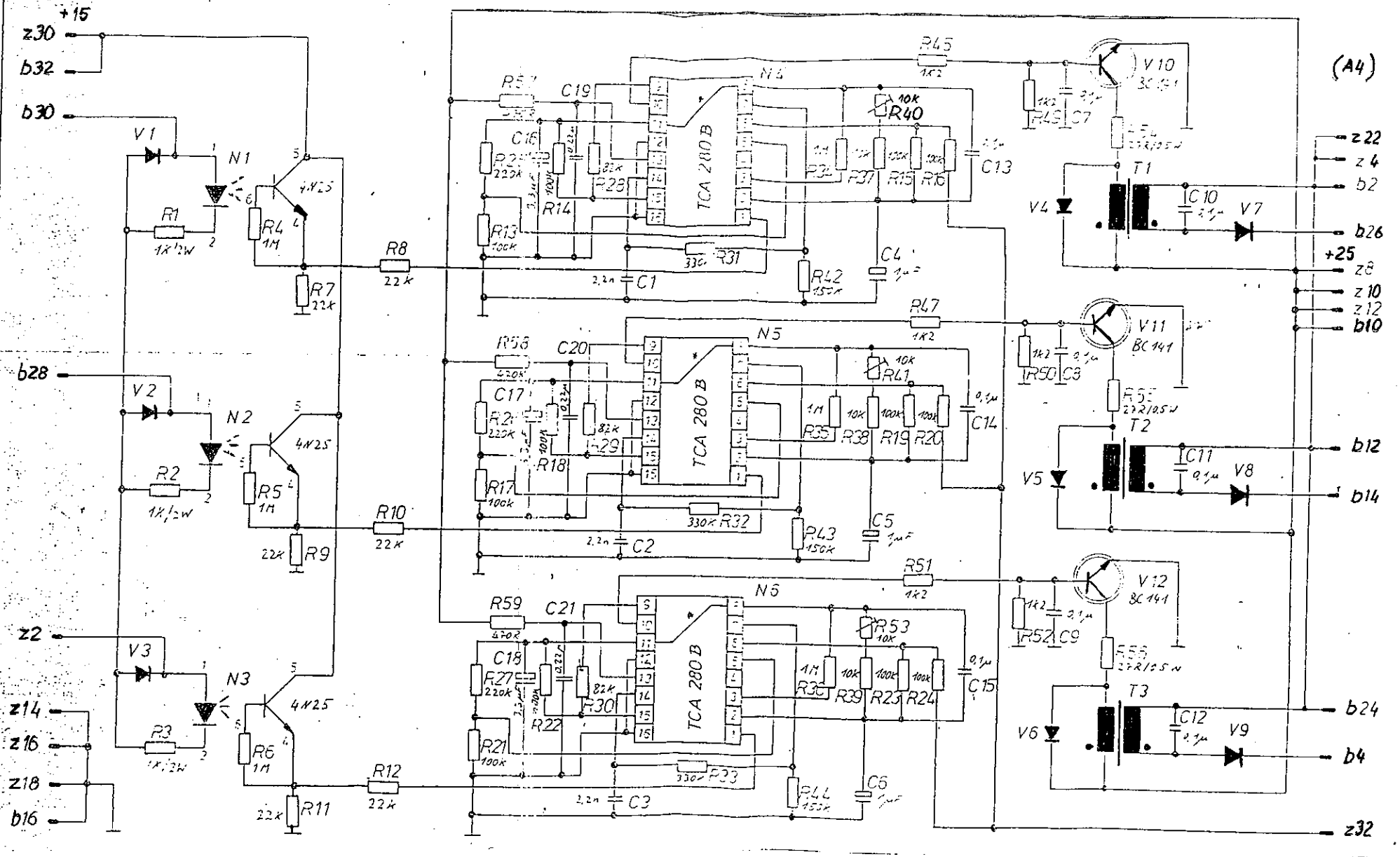

(A3)
L1
15V
n3
R11
R15
R12
b12
b16
n1
R1
A
T1
BSY87
R6
C1
n2
C2
T2
BC556
R9
n4
n5
IC1
µA741
R10
n6
D
R8
C
R7
R2
B
z12
z14
b14
R13
R14
n23
5V1
R26
z26
z8
C32
b32
z2
n8
R18
R19
R25
n7
n12
C7
R24
R16
n9
n10
IC2
R21
n13
n14
IC3
R22
R23
n15
R45
R17
C4
0,22µ
z24
b10
C6
R28
5K
n33
1N4004
L1
18mH
+15V
-15V
R36
100K
T5
BC546
R41
IC4
n19
n20
n21
n22
R33
R35
R30
n18
R27
T3
R32
T4
R31
C12
0,33µ
R34
C10
E
J
F
K
z32
b6
z30
z28
b2
b4
z0
n16
R37
R38
IC5
F1
C9
C11
z4
n17
R39
T5
R40
alle nicht bezeichneten
Dioden 1N 4148
15V
b30
b28
b24
b25
z22
b20
b22
b18
V1
7815
V2
7915
R43
33R/1,5W
n30
C14
4,7µF/35V
C16
0,1µ
C18
1000µ
40V
B125/
C1500
C19
470µ
40V
C17
0,1µ
R44
33R/1,5W
n31
R42
820R
C15
4,7µF/35V
MESAB GROUP
Benennung
AB Regelelektronik
Regulator unit
E SAB 874

A4- Ignition unit

Functions and possible settings:

- Ignition pulse formation to activate a half-controlled 3-phase AC bridge circuit using three integrated circuits, type TCA 280B (N4-N6).
- Synchronisation of the three ignition circuits by the secondary voltage of the main transformer with electrical isolation via optocouplers (N1-N3).
- Ignition pulse amplification and tapping to the main thyristors via pulse transformers (V10-V12, T1-T3).
- The ignition pulse is generated after the intersection of an internally generated synchronous saw-tooth voltage with the control voltage emitted from the control amplifier. The ignition pulses are pulse chains, starting from the ignition time up to the next passage through zero of the synchronisation voltage. The ignition circuits are balanced with the trimming potentiometers R40, R41 and R53.


1.270.206 K
R42 R31 C1 C19 R57 R13 R43 R32 C2 C20 R58 R17 R44 R33 C3 C21 R59 R21
N4 N5 N6
R16 R15 C4 C16 R14 R25 R20 R19 C5 C17 R26 R18 R24 R23 C6 R22 R27
C13 C14 C15 C18
R37 R34 BR1 R38 R35 BR2 R41 R39 BR3 R36 R53 R51
R8 R7 R4 N1 R5 N2 R10 R9 N3 R12 R11 R6
V1 R45 V2 R47 V3
R1 R2 R3
V10 V11 V12
R54 C7 R49 R55 C8 R50 R56 C9 R52
T1 T2 T3
V4 C10 V7 V5 C11 V8 V6 C12 V9



* Daten 4N4054

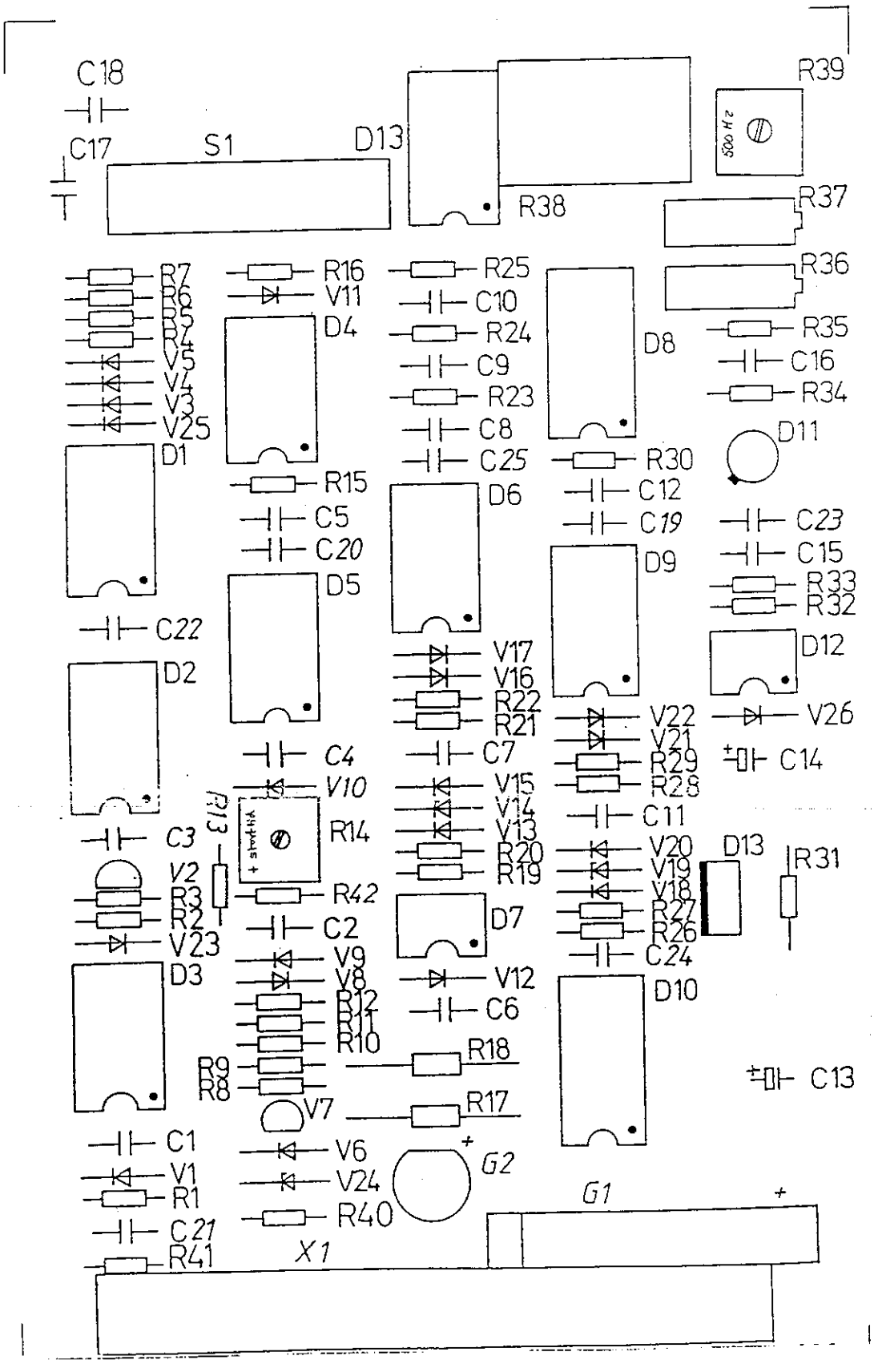
* IC Verbindung 8-11 Platinenlayout

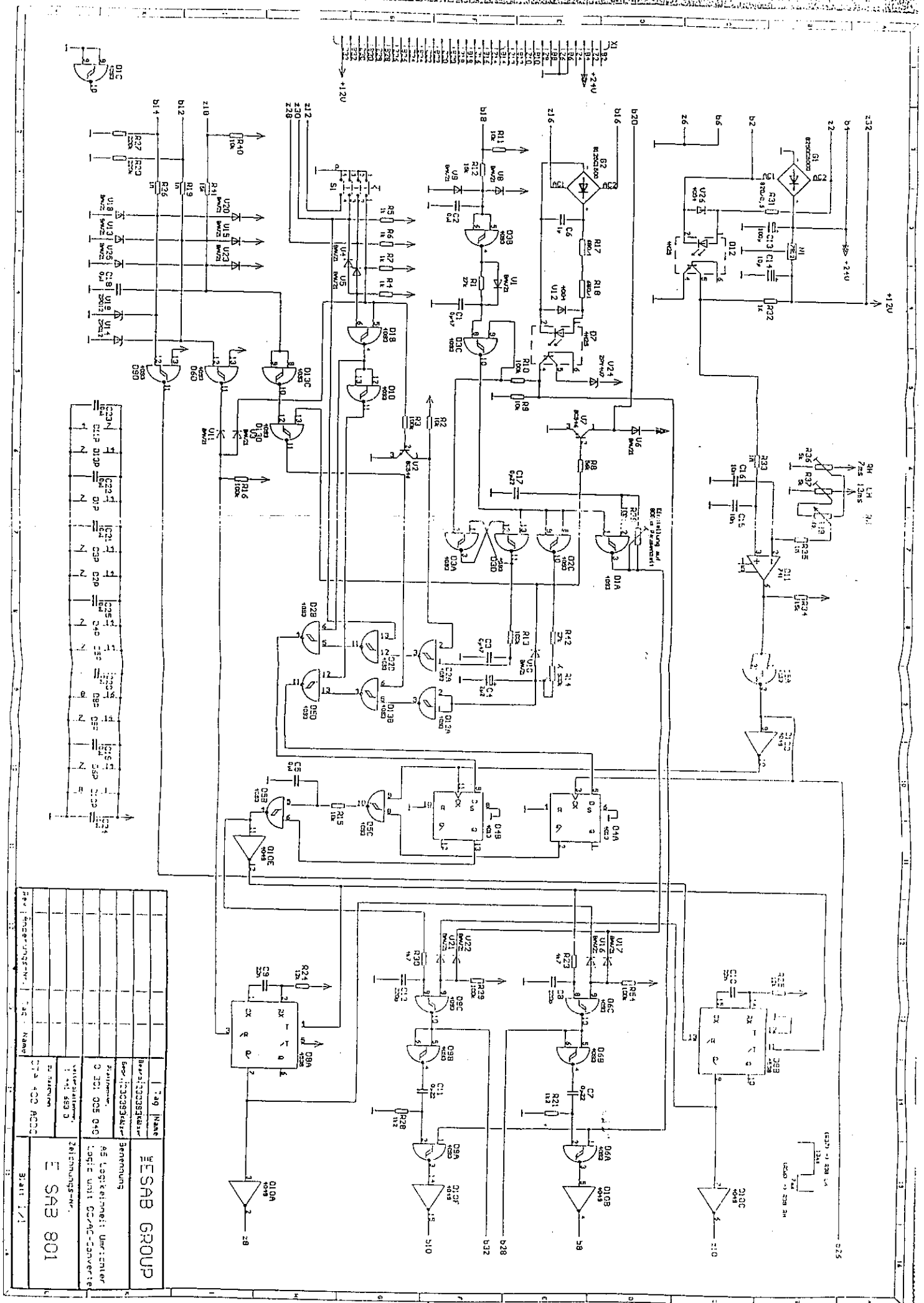
	Tag	Name	ESAB GROUP
	Bearb.		Benennung: A4 Ansteuereinheit Ignition unit
	Gepr.		
	Platinennr. 0 301 005 034		Zeichnungs-Nr. E SAB 317
	Werkstoff-Nr.		
	Ers. für:	Ers. durch:	Blatt 1

A5- Logic unit DC/AC- converter

Functions and possible settings:

- Supply of control voltage to the controls of the AC section with +12CV DC2 and +24V DC2.
- Generation of a synchronous clock signal (50 HZ) to control the converter. The pulse-duty factor of this clock signal, the so-called AC balance, can be set between 30% and 70% with potentiometer R38. The two limiting values of 30% and 70% are preset on the pc board with the trimming potentiometers R36 and R37.
- Selector switch to select the desired welding process:
  * Reverse polarity start; start with reverse polarity of the electrode and subsequent automatic change-over to straight polarity.
  * Reverse polarity welding; polarity of the electrode positive.
  * Straight polarity welding; polarity of the electrode negative.
  * AC welding; welding with square-wave alternating current 50 Hz with adjustable balance.
- Generator to generate a higher thyristor ignition pulse sequence during welding start-up. The circuit serves to improve the ignition properties of the welding arc.
  The pulse frequency is preset to 500 Hz on the pc board with trimming potentiometer R39.
- Timer circuit to specify the maximum reverse polarity starting time with the processes reverse polarity and AC welding. With these two processes ignition is performed in each case with a positive electrode polarity and after reaching 100 A welding current or after exceeding the maximum reverse polarity start time specified by the timer a switch-over is made to straight polarity or AC welding.
  The required reverse polarity start time depends on the electrode diameter used and can be set to between 50 ms and 1 sec. on the pc board with trimming potentiometer R14. The reverse polarity start time has a major impact on the ignition of the AC arc.
- Logic circuit to start the converter and enable AC welding, depending on the start (base current contactor K1), current relay (DC intermediate circuit) and welding circuit measuring relay K3 (reed switch).
- Logic to activate the turn-off charging circuit.
- Logic to control the main and turn-off thyristors of the converter section.


C18
C17
S1
D13
R38
R39
500 Hz
R37
R36
R35
C16
R34
D11
R30
C12
C19
C23
C15
R33
R32
D12
V26
C14
C13
R31
R7
R6
R5
R4
V5
V4
V3
V25
D1
C22
D2
C3
V2
R3
R2
V23
D3
C1
V1
R1
C21
R41
R16
V11
D4
R15
C5
C20
D5
C4
V10
R13
R14
R42
C2
V9
V8
R12
R11
R10
R9
R8
V7
V6
V24
R40
X1
R25
C10
R24
C9
R23
C8
C25
D6
V17
V16
R22
R21
C7
V15
V14
V13
R20
R19
D7
V12
C6
R18
R17
G2
D8
D9
V22
V21
R29
R28
C11
V20
V19
V18
R27
R26
C24
D10
G1

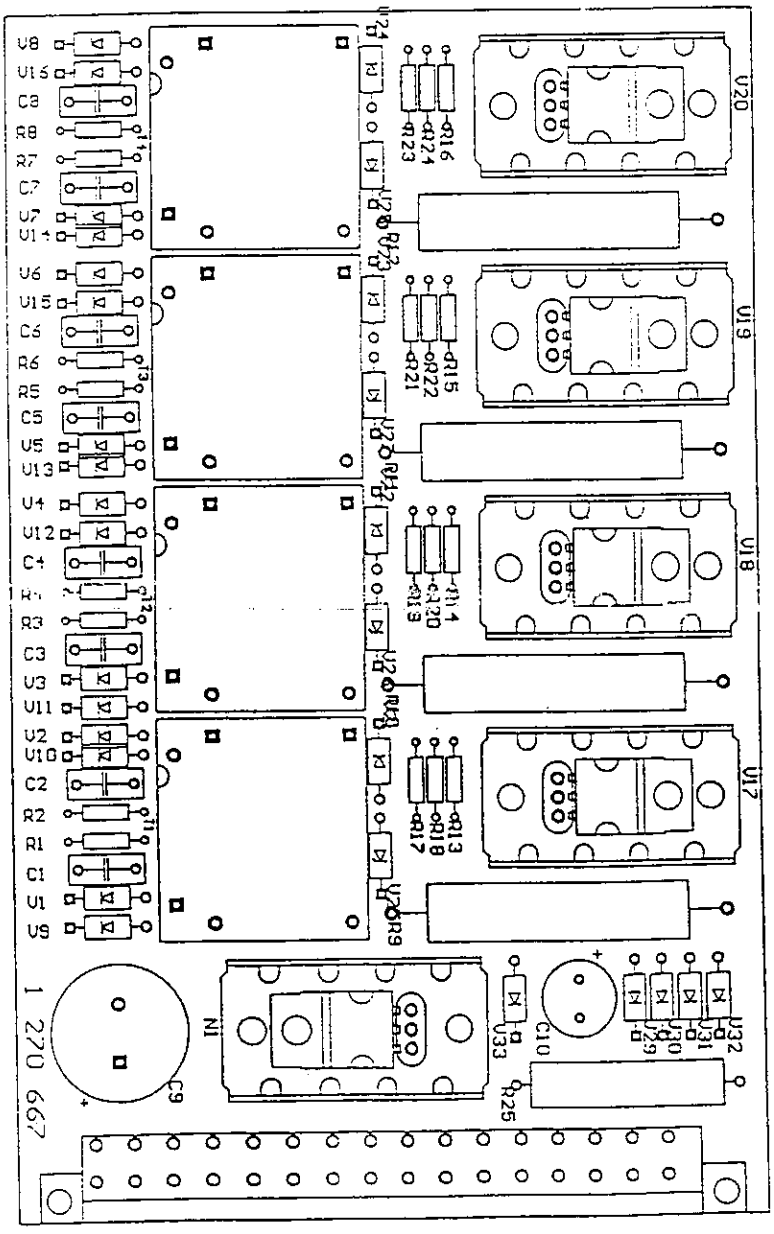


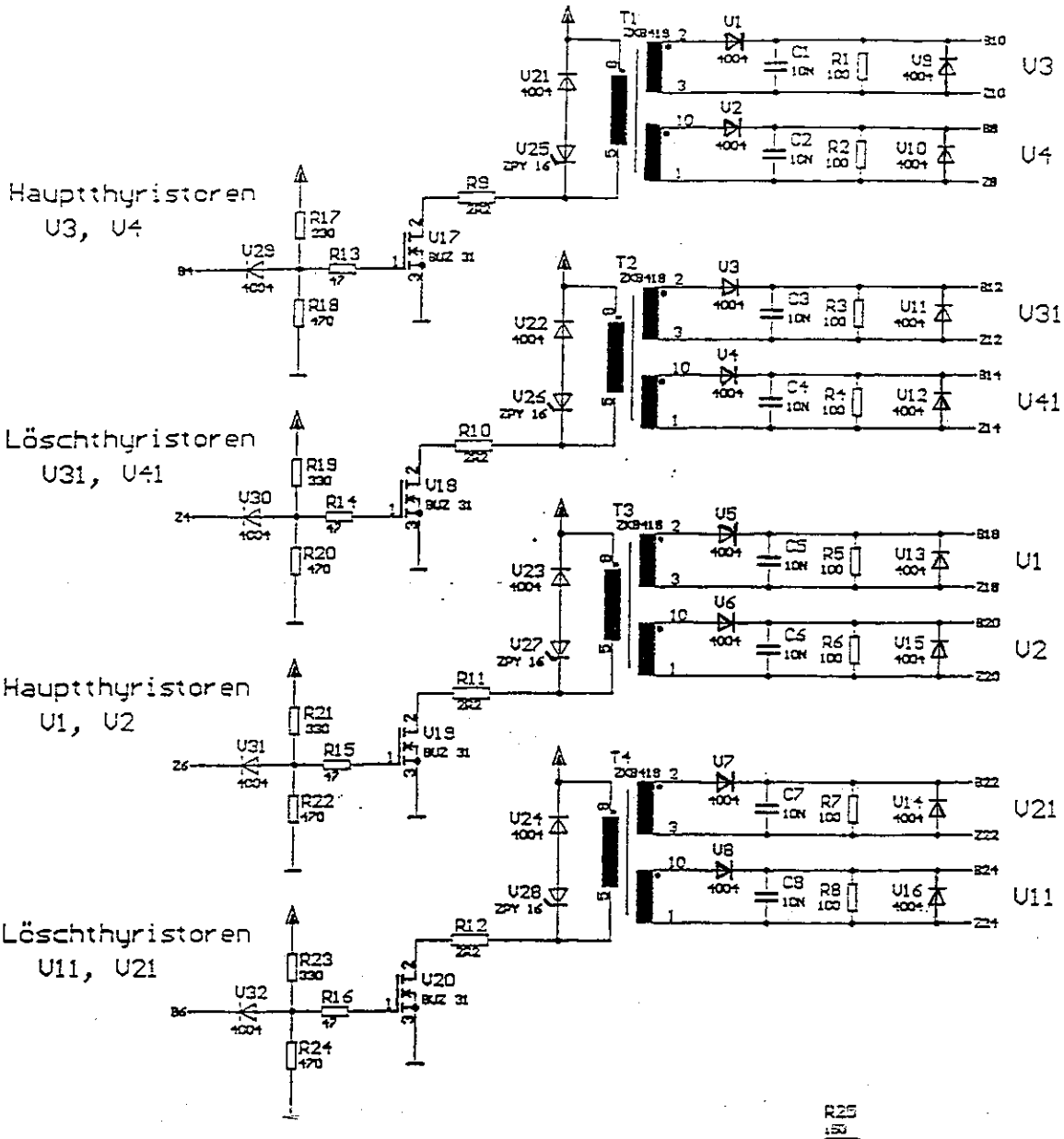
Änderungsnr.	Datum	Name	Tag	Name	
			Bearb.		ESAB GROUP
			Gepr.		Benennung
			Norm		65 Logikeinheit Umrichter
					Logic unit DC/AC-Converter
					Zeichnungs-Nr.
					E SAB 801
					Blatt 1/1

A6- Ignition unit converter

Functions and possible settings:

- Conditioning of the power supply from uncontrolled +24V DC2 into +15V2.
- Transmission, amplification and distribution of the thyristor ignition pulses through pulse transformers with upstream transistor switches (see diagram).



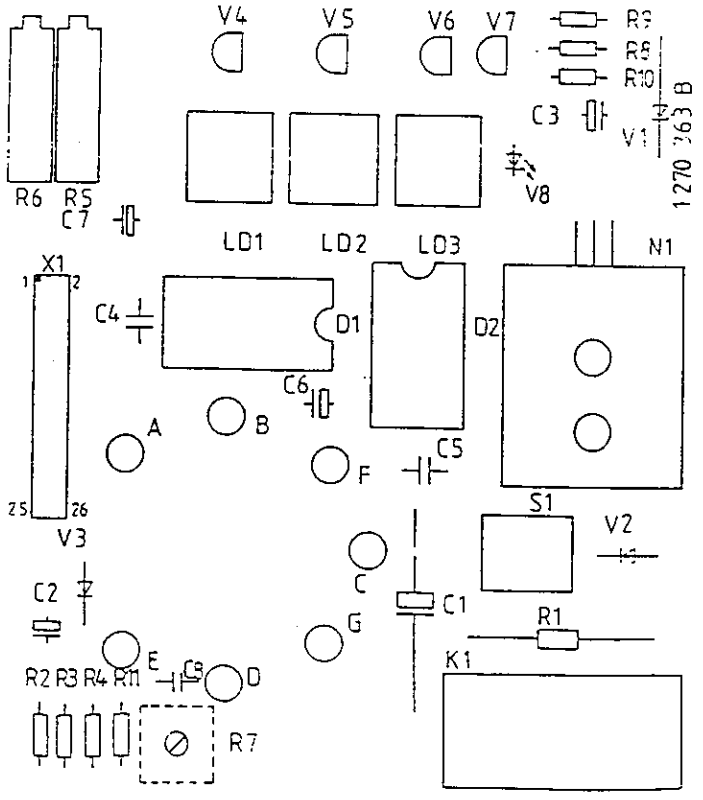


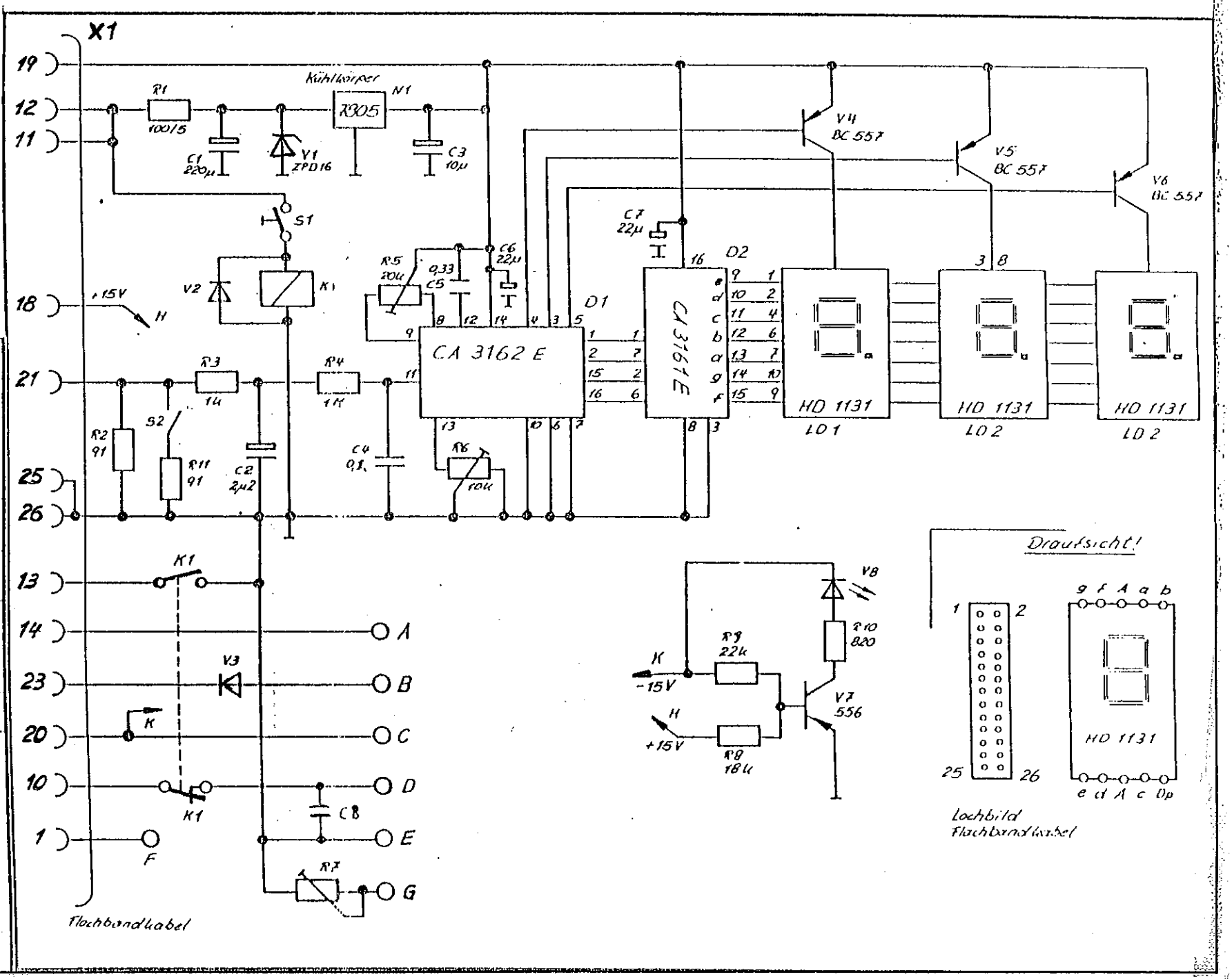
				Tag / Name	THE ESAB GROUP
				Bearb. 230383 Kälzer	
				Gepr. 230383 Kälzer	Benennung
				Platinen-Nr. 0 301 005 041	A6 Ansteuereinheit Umrichter Ignition unit DC/AC-Converter
				Leiterplatten-Nr. 1 442 713	Zeichnungs-Nr. E SAB 876
				zu Geräten DTA 400 ACDC	
Rev	Änderungs-Nr.	Tag	Name		Blatt 1/1

A8- Display unit

Functions and possible settings:

- Generation of an internal supply voltage +5V DC 1 from +24V DC1.
- Adaption, analog/digital conversion and display of the input signal (current setpoint) on a 3-digit LED display.
  Zero point and amplification are preset with the trimming potentiometers R6 and R5 on the pc board.
- Button S1 enables the current setpoint via a relay, thus permitting it to be displayed and set in the no-load condition.
- Fault display by flashing LED V8 and dark digital display in the event of excessive temperature or water deficiency.
- DIP switch S2 serves to switch over the measuring range to 200A and should be open.





Name	Tag	Datum	Änderungsindex

ETA 400 A000

Leiterplatten-Nr.
1 442 742 2

Stückliste:
Q 301 005 037

Bestell-Nr.: 230059 Käufer

Benennung:
AB Anzeigeeinheit
Display unit

Zeichnungs-Nr.
E SAB 875

Blatt 1/1

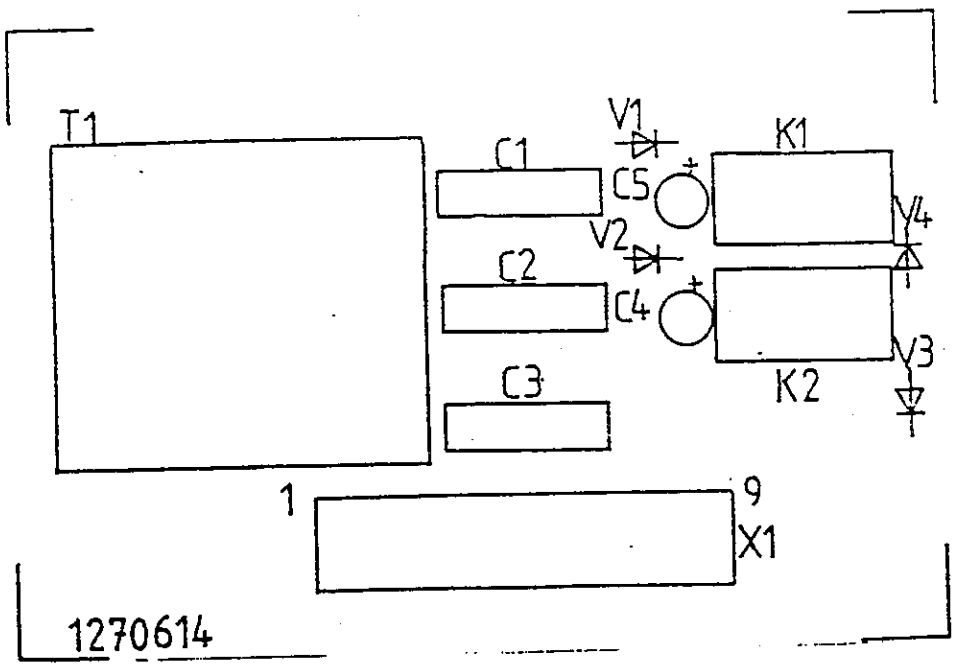
ESAB GROUP

Functions:

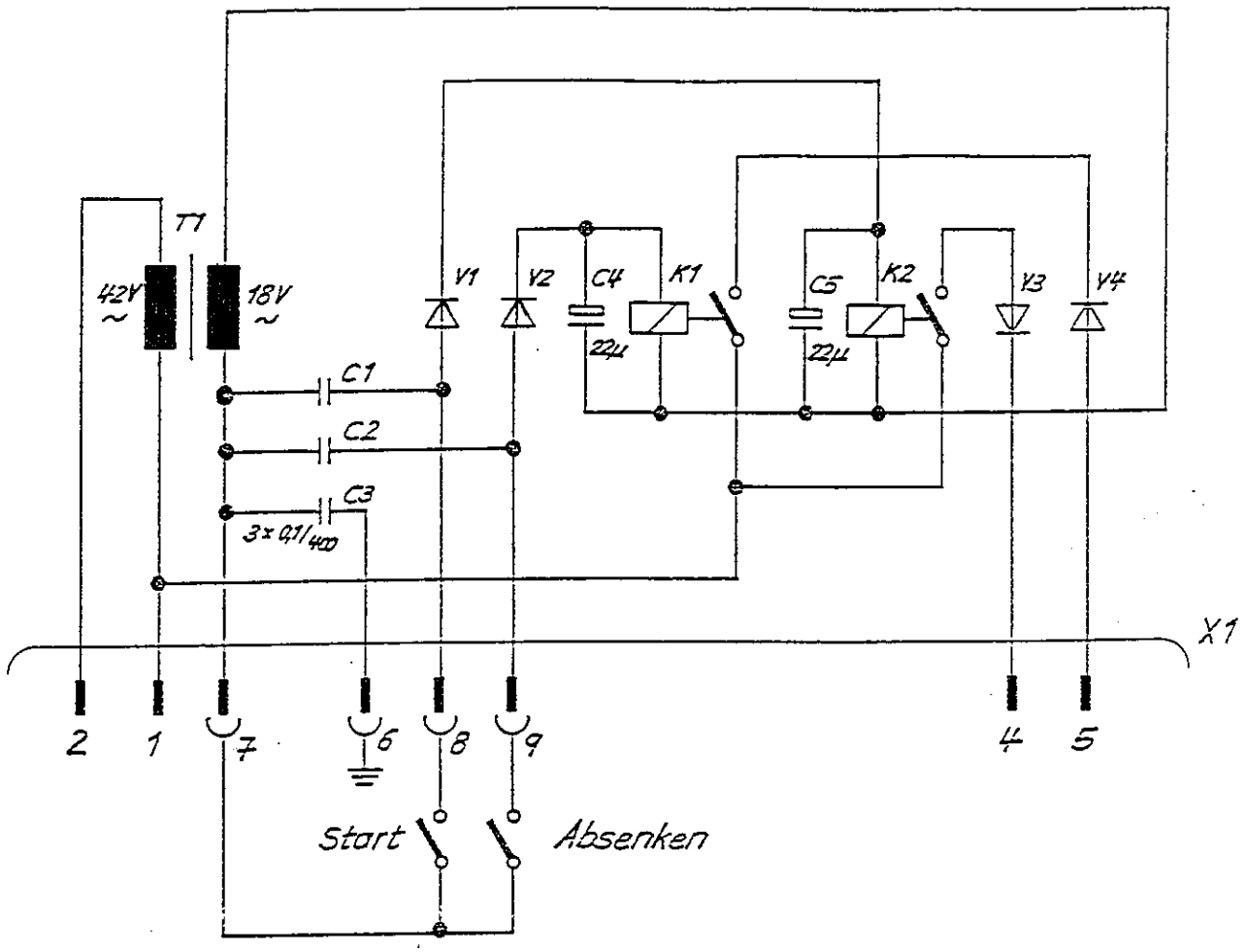
Electrical isolation and level conversion (42V AC to 18V AC) of the torch control line using the integrated control transformer T1.

Measurement and evaluation of the incoming control signals using the relay diode combinations K1/V4 (down slope) and K2/V3 (start).

Filtering out and discharging of parasitic HF faults.



"Schutzvermerk nach DIN34 beachten"

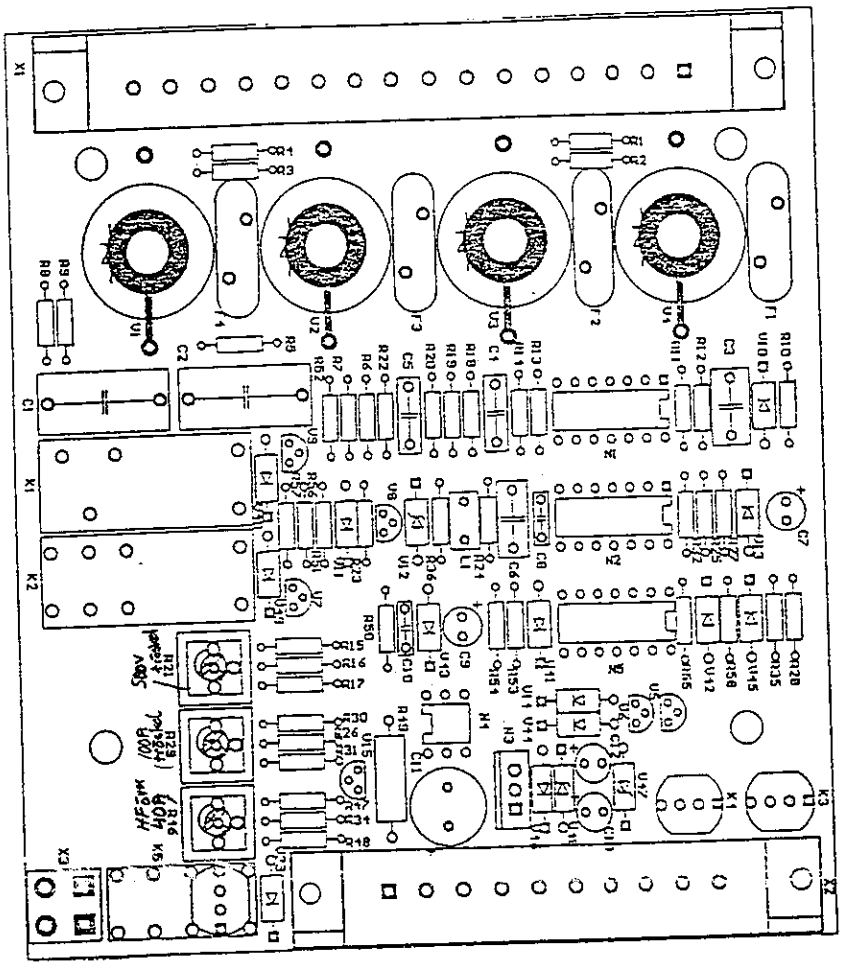


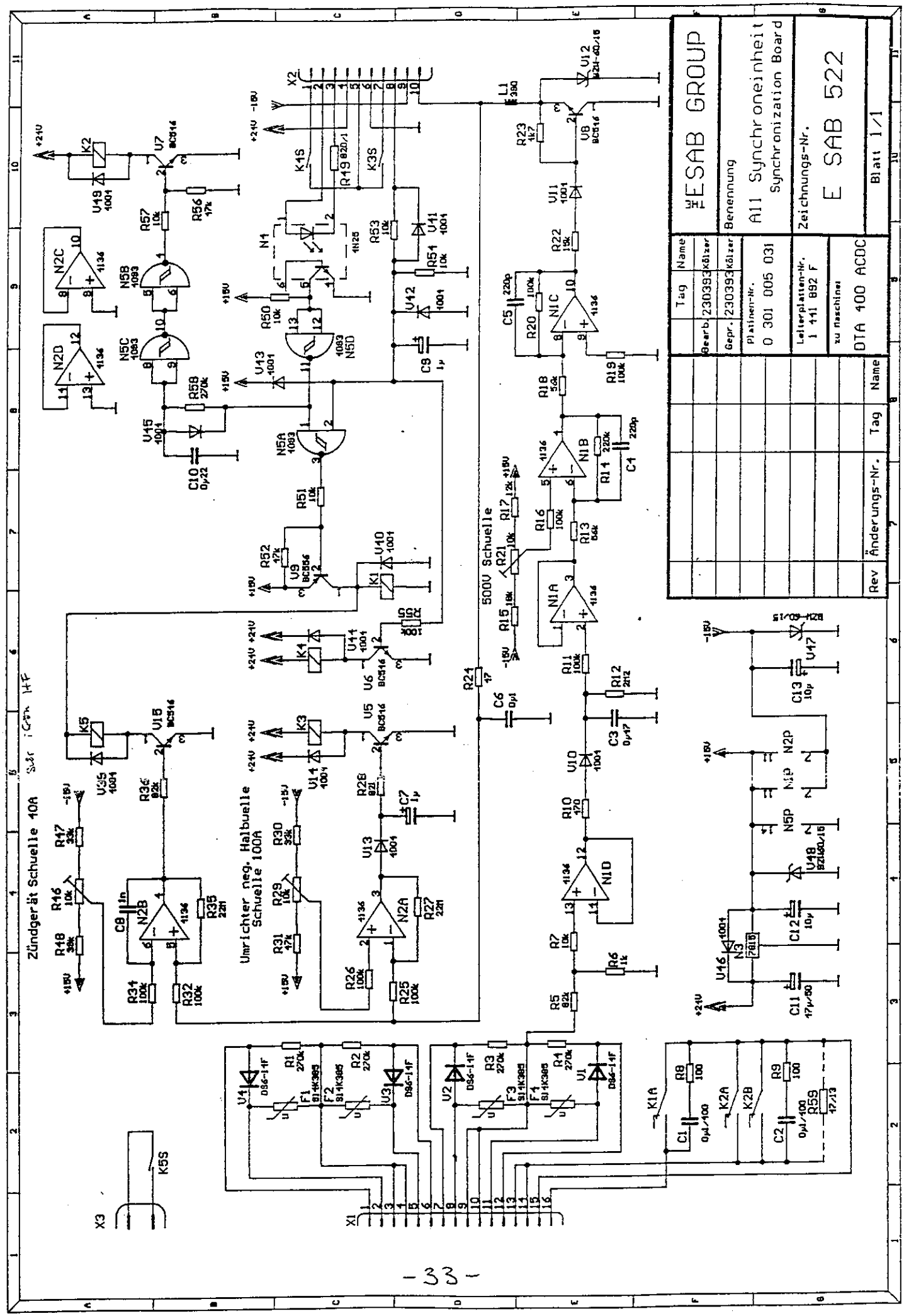
					Tag	Name	THE ESAB GROUP
					Bearb.	230393	kälzer
					Gepr.	230393	kälzer
					Plattennr. 0 301 005 033		Benennung AS Filter
					Lesematerialnr. 1 442 570		Zeichnungs-Nr. E SAB 805
					zu Maschine DTA 400 ACDC		
Rev	Änderungs-Nr.	Tag	Name				Blatt 1/1

A11- Synchronisation board

Functions and possible settings:

- Charging of the turn-off capacitors via diodes V1 to V4.
- Control of the charging transformer T2 using relays K1 and K2.
  The transformer T2 is activated via relay K1, connected in series with the external making current limiting resistors R3 and R31, as a function of the base current and transformer-on signal of the logic unit converter A5. The transformer-on signal A5-b20 depends in turn on the base current contactor K1 and welding current measuring relay K3.
  After the charging transformer T2 has been switched on, the making current limiting resistors are bridged after approx. 60 ms delay by relay K2 and the transformer is supplied with the full input voltage of 230V AC.
- Monitoring and limiting of the voltage across the thyristors of the converter to max. 500V through automatic reduction of the welding current (N1A-D, V8). The 500V threshold is preset with trimming potentiometer R21.
  Caution! Adjustment of the trimming potentiometer to higher voltages (turning counterclockwise) results automatically in the total failure of the converter thyristors if longer torches are used and a protective diode circuit is not installed.
- Formation of the enabling signal for changing polarity after a reverse polarity start or switch-over of the converter from reverse polarity to AC mode.
  The signal is formed using a threshold switch (N2A) and switches it via relay K3 to the logic unit DC/AC converter A5-z18.
  The threshold value is 100A welding current is preset with trimming potentiometer R29.
- Cut-off of the HF ignition generator in the current range >40A AC by threshold switch N2B in conjunction with relay K5.
  The 40A-cut-off threshold is set with trimming potentiometer R46.
- Formation of a separate base-current-flowing signal (relay K4) to enable converter activation in conjunction with welding current measuring relay K3.
- Generation of +15V DC controlled supply voltage from +24V DC1.



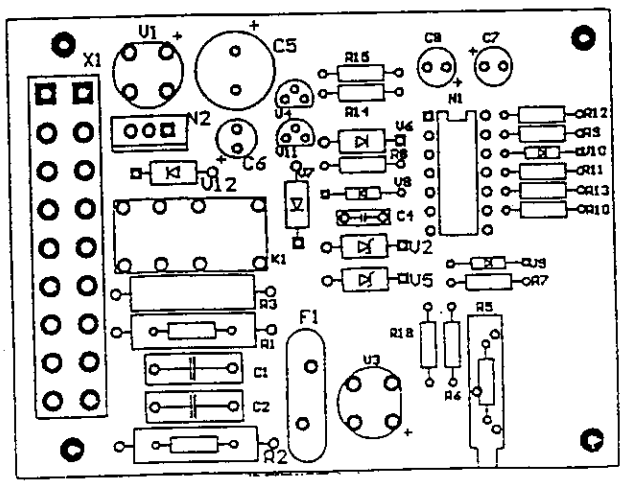

ESAB GROUP
Benennung
A11 Synchroneinheit
Synchronization Board
Zeichnungs-Nr.
E SAB 522
Blatt 1/1
Name
Tag
Gezeichnet 230393 Kölzer
Gepr. 230393 Kölzer
Platinen-Nr.
0 301 005 031
Leiterplatten-Nr.
1 111 892 F
zu Maschine
DTA 400 ACDC
Rev
Änderungs-Nr.
Tag
Name
Zündgerät Schuelle 10A
Umrichter neg. Halbuelle
Schuelle 100A
500V Schuelle
K1S
K2S
K3S
K4S
K5S
X1
X2
X3
L1
N1
N1A
N1B
N1C
N1D
N2A
N2B
N2C
N2D
N2P
N3
N5A
N5B
N5C
N5D
N5P
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
U15
U16
U17
U18
U19
U20
U21
U22
U23
U24
U25
U26
U27
U28
U29
U30
U31
U32
U33
U34
U35
U36
U37
U38
U39
U40
U41
U42
U43
U44
U45
U46
U47
U48
U49
U50
U51
U52
U53
U54
U55
U56
U57
U58
U59
U60
U61
U62
U63
U64
U65
U66
U67
U68
U69
U70
U71
U72
U73
U74
U75
U76
U77
U78
U79
U80
U81
U82
U83
U84
U85
U86
U87
U88
U89
U90
U91
U92
U93
U94
U95
U96
U97
U98
U99
U100
U101
U102
U103
U104
U105
U106
U107
U108
U109
U110
U111
U112
U113
U114
U115
U116
U117
U118
U119
U120
U121
U122
U123
U124
U125
U126
U127
U128
U129
U130
U131
U132
U133
U134
U135
U136
U137
U138
U139
U140
U141
U142
U143
U144
U145
U146
U147
U148
U149
U150
U151
U152
U153
U154
U155
U156
U157
U158
U159
U160
U161
U162
U163
U164
U165
U166
U167
U168
U169
U170
U171
U172
U173
U174
U175
U176
U177
U178
U179
U180
U181
U182
U183
U184
U185
U186
U187
U188
U189
U190
U191
U192
U193
U194
U195
U196
U197
U198
U199
U200
U201
U202
U203
U204
U205
U206
U207
U208
U209
U210
U211
U212
U213
U214
U215
U216
U217
U218
U219
U220
U221
U222
U223
U224
U225
U226
U227
U228
U229
U230
U231
U232
U233
U234
U235
U236
U237
U238
U239
U240
U241
U242
U243
U244
U245
U246
U247
U248
U249
U250
U251
U252
U253
U254
U255
U256
U257
U258
U259
U260
U261
U262
U263
U264
U265
U266
U267
U268
U269
U270
U271
U272
U273
U274
U275
U276
U277
U278
U279
U280
U281
U282
U283
U284
U285
U286
U287
U288
U289
U290
U291
U292
U293
U294
U295
U296
U297
U298
U299
U300
U301
U302
U303
U304
U305
U306
U307
U308
U309
U310
U311
U312
U313
U314
U315
U316
U317
U318
U319
U320
U321
U322
U323
U324
U325
U326
U327
U328
U329
U330
U331
U332
U333
U334
U335
U336
U337
U338
U339
U340
U341
U342
U343
U344
U345
U346
U347
U348
U349
U350
U351
U352
U353
U354
U355
U356
U357
U358
U359
U360
U361
U362
U363
U364
U365
U366
U367
U368
U369
U370
U371
U372
U373
U374
U375
U376
U377
U378
U379
U380
U381
U382
U383
U384
U385
U386
U387
U388
U389
U390
U391
U392
U393
U394
U395
U396
U397
U398
U399
U400
U401
U402
U403
U404
U405
U406
U407
U408
U409
U410
U411
U412
U413
U414
U415
U416
U417
U418
U419
U420
U421
U422
U423
U424
U425
U426
U427
U428
U429
U430
U431
U432
U433
U434
U435
U436
U437
U438
U439
U440
U441
U442
U443
U444
U445
U446
U447
U448
U449
U450
U451
U452
U453
U454
U455
U456
U457
U458
U459
U460
U461
U462
U463
U464
U465
U466
U467
U468
U469
U470
U471
U472
U473
U474
U475
U476
U477
U478
U479
U480
U481
U482
U483
U484
U485
U486
U487
U488
U489
U490
U491
U492
U493
U494
U495
U496
U497
U498
U499
U500
U501
U502
U503
U504
U505
U506
U507
U508
U509
U510
U511
U512
U513
U514
U515
U516
U517
U518
U519
U520
U521
U522
U523
U524
U525
U526
U527
U528
U529
U530
U531
U532
U533
U534
U535
U536
U537
U538
U539
U540
U541
U542
U543
U544
U545
U546
U547
U548
U549
U550
U551
U552
U553
U554
U555
U556
U557
U558
U559
U560
U561
U562
U563
U564
U565
U566
U567
U568
U569
U570
U571
U572
U573
U574
U575
U576
U577
U578
U579
U580
U581
U582
U583
U584
U585
U586
U587
U588
U589
U590
U591
U592
U593
U594
U595
U596
U597
U598
U599
U600
U601
U602
U603
U604
U605
U606
U607
U608
U609
U610
U611
U612
U613
U614
U615
U616
U617
U618
U619
U620
U621
U622
U623
U624
U625
U626
U627
U628
U629
U630
U631
U632
U633
U634
U635
U636
U637
U638
U639
U640
U641
U642
U643
U644
U645
U646
U647
U648
U649
U650
U651
U652
U653
U654
U655
U656
U657
U658
U659
U660
U661
U662
U663
U664
U665
U666
U667
U668
U669
U670
U671
U672
U673
U674
U675
U676
U677
U678
U679
U680
U681
U682
U683
U684
U685
U686
U687
U688
U689
U690
U691
U692
U693
U694
U695
U696
U697
U698
U699
U700
U701
U702
U703
U704
U705
U706
U707
U708
U709
U710
U711
U712
U713
U714
U715
U716
U717
U718
U719
U720
U721
U722
U723
U724
U725
U726
U727
U728
U729
U730
U731
U732
U733
U734
U735
U736
U737
U738
U739
U740
U741
U742
U743
U744
U745
U746
U747
U748
U749
U750
U751
U752
U753
U754
U755
U756
U757
U758
U759
U760
U761
U762
U763
U764
U765
U766
U767
U768
U769
U770
U771
U772
U773
U774
U775
U776
U777
U778
U779
U780
U781
U782
U783
U784
U785
U786
U787
U788
U789
U790
U791
U792
U793
U794
U795
U796
U797
U798
U799
U800
U801
U802
U803
U804
U805
U806
U807
U808
U809
U810
U811
U812
U813
U814
U815
U816
U817
U818
U819
U820
U821
U822
U823
U824
U825
U826
U827
U828
U829
U830
U831
U832
U833
U834
U835
U836
U837
U838
U839
U840
U841
U842
U843
U844
U845
U846
U847
U848
U849
U850
U851
U852
U853
U854
U855
U856
U857
U858
U859
U860
U861
U862
U863
U864
U865
U866
U867
U868
U869
U870
U871
U872
U873
U874
U875
U876
U877
U878
U879
U880
U881
U882
U883
U884
U885
U886
U887
U888
U889
U890
U891
U892
U893
U894
U895
U896
U897
U898
U899
U900
U901
U902
U903
U904
U905
U906
U907
U908
U909
U910
U911
U912
U913
U914
U915
U916
U917
U918
U919
U920
U921
U922
U923
U924
U925
U926
U927
U928
U929
U930
U931
U932
U933
U934
U935
U936
U937
U938
U939
U940
U941
U942
U943
U944
U945
U946
U947
U948
U949
U950
U951
U952
U953
U954
U955
U956
U957
U958
U959
U960
U961
U962
U963
U964
U965
U966
U967
U968
U969
U970
U971
U972
U973
U974
U975
U976
U977
U978
U979
U980
U981
U982
U983
U984
U985
U986
U987
U988
U989
U990
U991
U992
U993
U994
U995
U996
U997
U998
U999
U1000

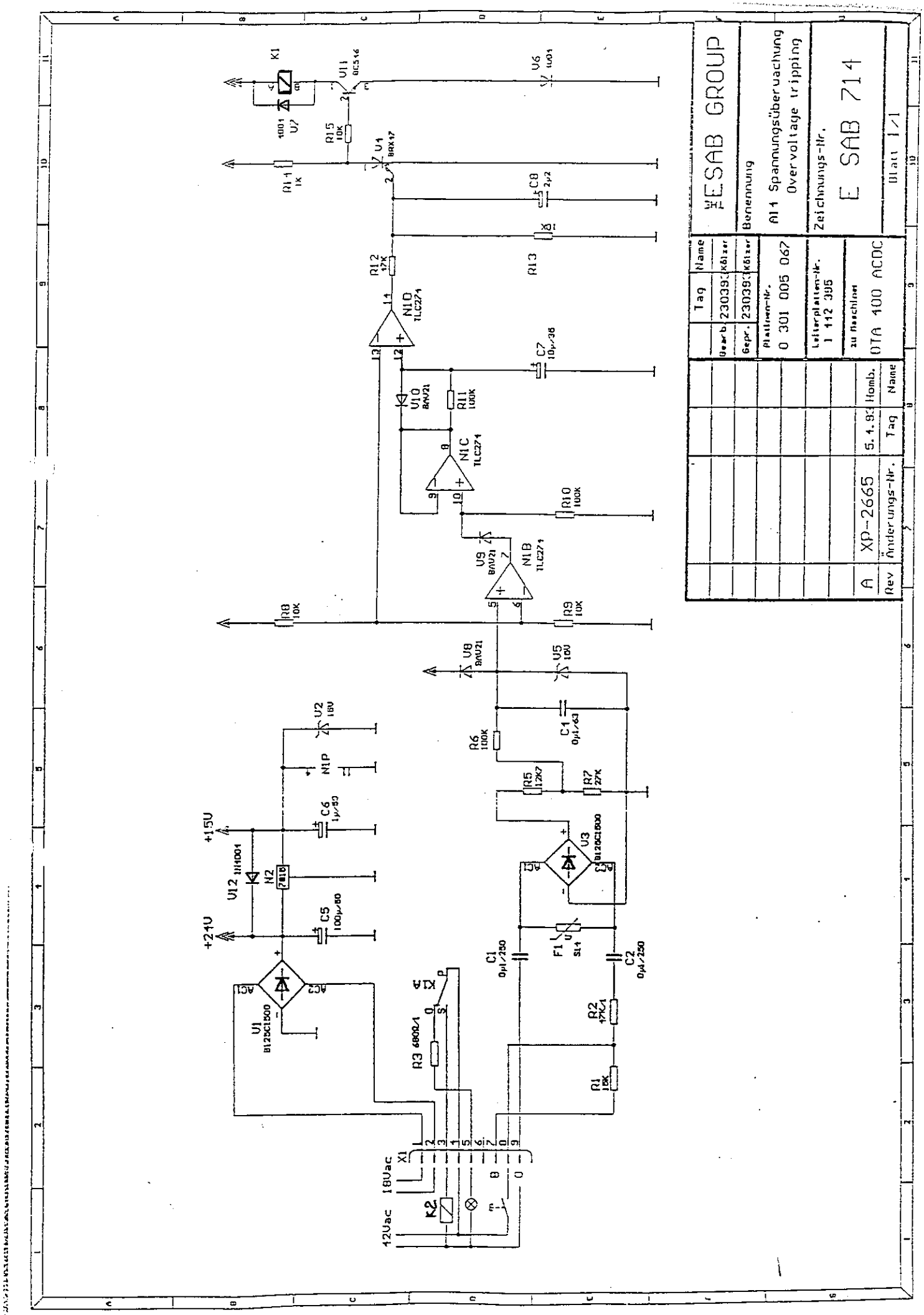
8. Description of hazard reducing device

If welding operations are to be performed in an environment with an increased electrical hazard to VBG 15, the welding power source must be fitted with an overvoltage tripping facility which switches off all poles of the power source when the admissible no-load voltage is exceeded (48V AC eff.).
The conversion kit 48V protective circuit contains a main contactor K2, control transformer T3, fuse F7, control A14, test button S1, status lamp H1, the relevant cabling and an adapter plate to attach the test button and status lamp to the front panel.
The control transformer T3 supplies the overvoltage tripping control with the necessary supply voltages 18V AC and 42V AC.
After the power source has been switched on with the main switch Q1, the main contactor K2 is automatically switched on and the output voltage of the power source is monitored by the control A14. Should in the event of a fault the admissible output voltage be exceeded, the power source is switched off by the main contactor and the red signal lamp H1 comes on. The power source remains de-activated until the circuit is unlocked by switching the main switch off and on again.
The function of the protective circuit can be tested by activating the button S1.

Functions and possible settings of the control overvoltage tripping device A14

- Conditioning of the 18V AC control voltage into +24V DC uncontrolled and +15V DC controlled.
- Monitoring of the power source output voltage.
  The limiting value of the output voltage is set at 42V AC.
- Locking of the relay output signal K1 via thyristor stage V4.




K1
U11
U6
U7
R15 10K
U4
R14 1K
C8 2µ2
R13
R12 12K
N1D TLC274
C7 10µ/35
U10 BAV21
R11 100K
N1C TLC274
R10 100K
U9 BAV21
N1B TLC274
R8 10K
R9 10K
U8 BAV21
U5 16V
U2 16V
N1P
C1 0µ1/63
R6 100K
R5 1K67
R7 27K
C6 1µ/50
+15U
U12
N2 7818
C5 100µ/50
+24U
U3 B120C1800
F1 SI4
C1 0µ1/250
C2 0µ1/250
U1 B120C1800
K3
R3 680Ω/1
R2 47K/1
R1 15K
X1
18Vac
12Vac
K2
B
0
Benennung
A14 Spannungsüberwachung
Overvoltage tripping
Zeichnungs-Nr.
E SAB 714
Blatt 1/1
Name
Tag
Gezeichnet
Gepr.
Plattien-Nr.
0 301 005 067
Leiterplatten-Nr.
1 112 395
zu Maschine
DTA 400 ACDC
Hamb.
Rev
Änderungs-Nr.
A
XP-2665

9. Notes on troubleshooting

Required instruments and aids:

- Digital multimeter
- Oscilloscope (operated by battery or isolating transformer) with probes 1:1, 10:1 and 100:1.
- Shunt or clip-on ammeter with analog output to measure the welding current.
- Adapter card for measurements on control rack assemblies.

General checks:

- Visual check of the entire power source
- Mains voltage supply
- Fuses
- Torch incl. control line
- Workpiece connection
- Setting parameters
- Gas supply
- Cooling water circuit
- Fans
- Check of the internal supply voltages as per wiring diagram

Functional checks:

- Operate power source manually without accessories such as remote controller, pulser etc.
- Signal lamps: "GREEN" when mains switch ON, "WHITE" on start of welding.
- Current display: Display 000 in no-load condition, 400 at max position of the current setpoint potentiometer with preselector switch depressed at the same time.

  Dark display and flashing LED for overtemperature or water deficiency.

  Zero or incorrect current display when preselector switch depressed indicates missing or incorrect setpoint voltage. You must then search for the cause of the fault in the area of the regulator unit, adjusting unit, synchronisation board or display unit.
- Control functions: Activate torch button - white signal lamp, gas valve, base current contactor and HF generator must come on, current display remains at zero. Forced cut-off after 4 sec.

  Select electrode welding - white signal lamp and base current contactor must come on, current display remains at zero, no-load voltage must be applied to the output jacks.

  Test all switch positions of the polarity selector switch!

If current is displayed during these tests and the flow of current inside the power source can be detected as a noise, there is in all probability a defect in the converter. This must be measured and replaced if defective.

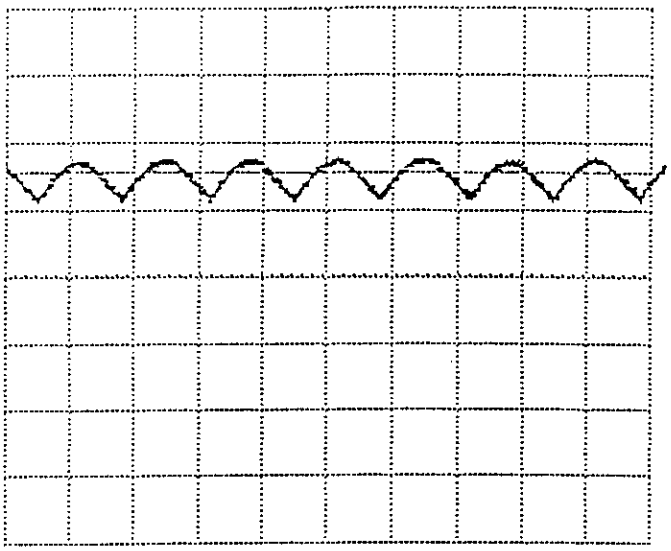
- Welding test: 1.) Set TIG DC, polarity negative and 4-stroke mode. With the torch button depressed, gas flows and the HF must ignite the base current. In the second cycle (torch button released) the main current is enabled and must attain the preset setpoint. Without base current the main current is not enabled.

  2.) Set TIG DC, positive polarity, 4-stroke mode and welding current not too high owing to the electrode loading.
  Procedure as under 1.).

  3.) TIG DC, negative polarity, with reverse polarity start and 4-stroke mode. With the torch button depressed, gas flows and the HF must ignite the base current. The polarity of the electrode is positive in this case. In the second cycle the main current is enabled and the converter changes the electrode polarity.
  Should in this case the welding arc go out and the ammeter display the preset welding current, there is a short circuit in the converter. Possible causes are main thyristors in the converter, turn-off modules, turn-off capacitors, charging circuit of the turn-off capacitors incl. control transformer and back-up fuse F3, synchronisation board, logic unit converter or ignition unit converter.

  4.) TIG AC in 4-stroke mode.
  Procedure as under 3.).

  In all cases it is advisable during the above tests to monitor the welding current with an oscilloscope.



DATE: 19.04.1993
TIME: 10:19

SIGNALPARAMETER:

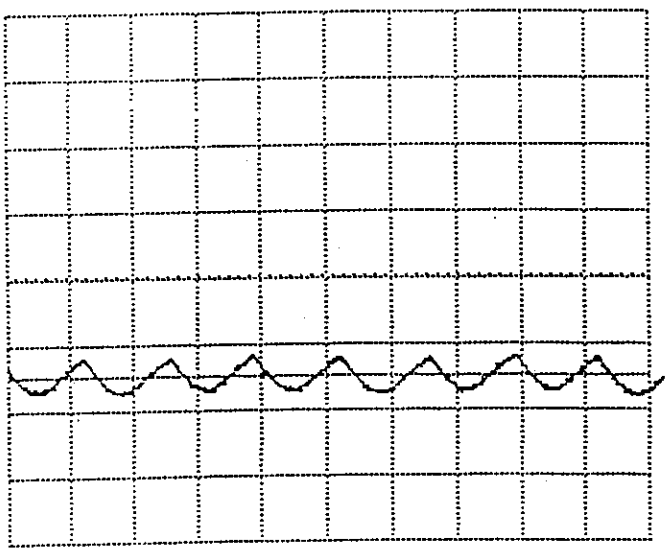
CH1 - VOLTS/DIV: =10mV
TIMEBASE-SEC/DIV: =5ms
TRIGGERLEVEL CH1: AUTO
PRETRIGGER : 25%
DELTA CURSOR CH1: -15.2m'
ADD CH1,CH2 : OFF

PRINTERPARAMETER:

ZOOMRANGE - CH1: 0-9
HARDCOPY SOURCE : HM 408

REMARKS:

WIG- Gleichstrom 100A, Elektrodenpolarität positiv, Shunt 400A/60mV.



DATE: 19.04.1993
TIME: 10:18

SIGNALPARAMETER:

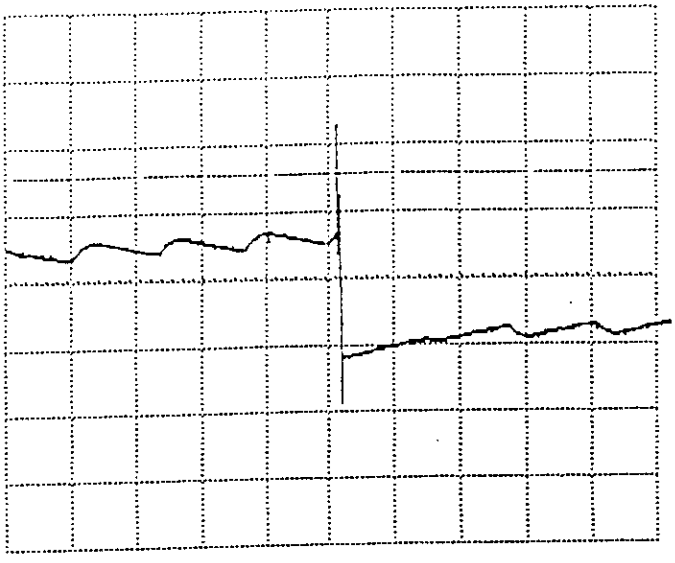
CH1 - VOLTS/DIV: =10mV
TIMEBASE-SEC/DIV: =5ms
TRIGGERLEVEL CH1: AUTO
PRETRIGGER : 25%
DELTA CURSOR CH1: 15.2mV
ADD CH1,CH2 : OFF

PRINTERPARAMETER:

ZOOMRANGE - CH1: 0-9
HARDCOPY SOURCE : HM 408

REMARKS:

WIG- Gleichstrom 100A, Elektrodenpolarität negativ, Shunt 400A/60mV.



DATE: 19.04.1993
TIME: 10:25

SIGNALPARAMETER:

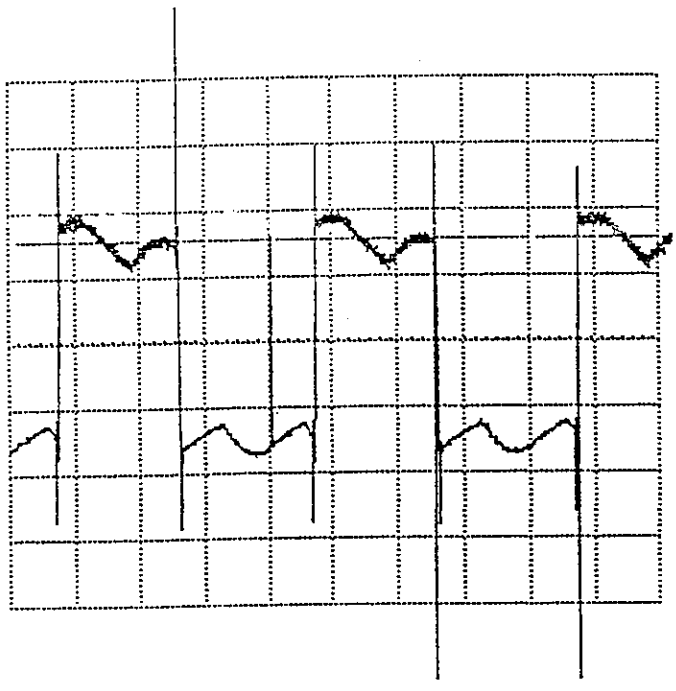
CH1 - VOLTS/DIV: =10mV
TIMEBASE-SEC/DIV: =5ms
TRIGGERLEVEL CH1: =-53.6mV
PRETRIGGER : 50%
DELTA CURSOR CH1: -15.2mV
ADD CH1,CH2 : OFF

PRINTERPARAMETER:

ZOOMRANGE - CH1: 0-9
HARDCOPY SOURCE : HM 408

REMARKS:

WIG- Gleichstrom 100A, Funktion Plusstart,
Shunt 400A/60mV.



DATE: 19.04.1993
TIME: 10:21

SIGNALPARAMETER:

CH1 - VOLTS/DIV: =10mV
TIMEBASE-SEC/DIV: =5ms
TRIGGERLEVEL CH1: AUTO
PRETRIGGER : 25%
DELTA CURSOR CH1: -15.2mV
ADD CH1,CH2 : OFF

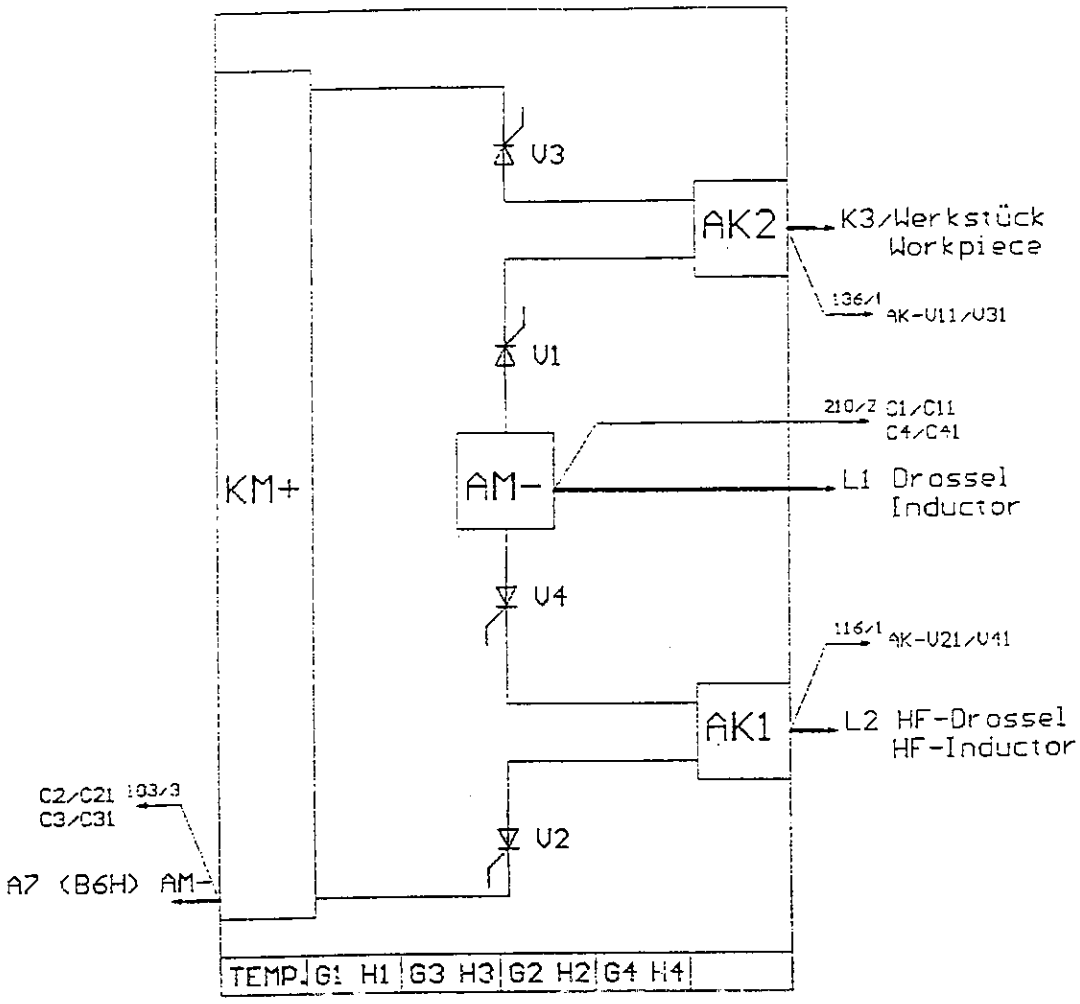
PRINTERPARAMETER:

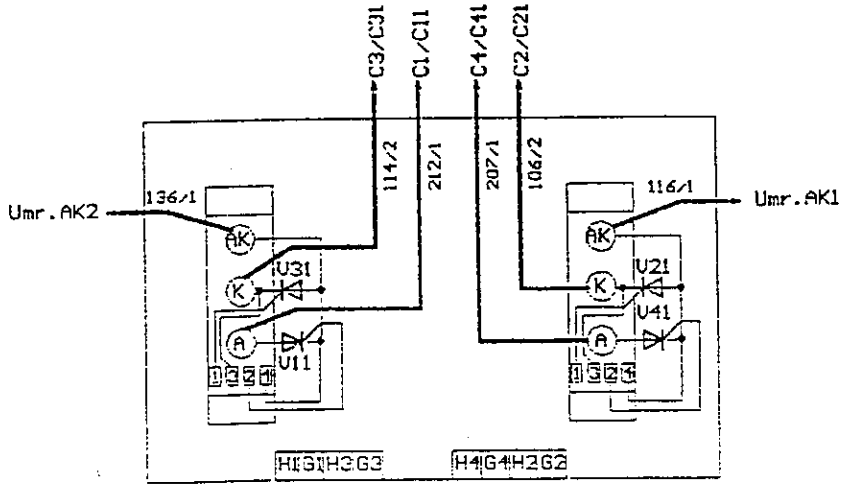
ZOOMRANGE - CH1: 0-9
HARDCOPY SOURCE : HM 408

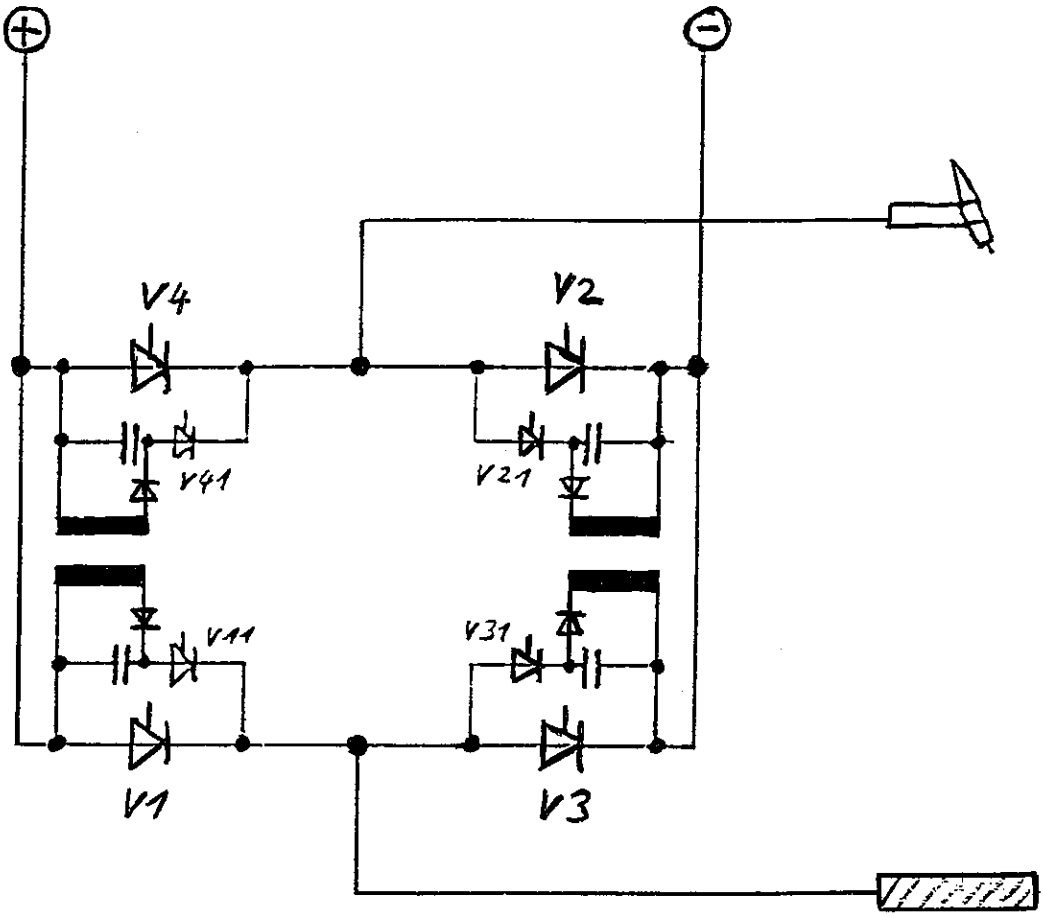
REMARKS:

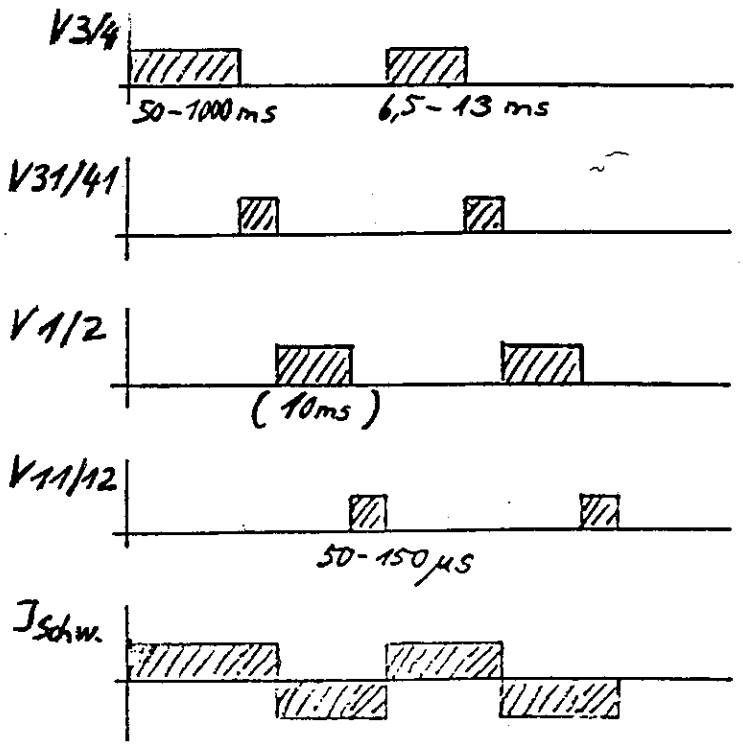
WIG- Wechselstrom 100A,
Shunt 400A/60mV.

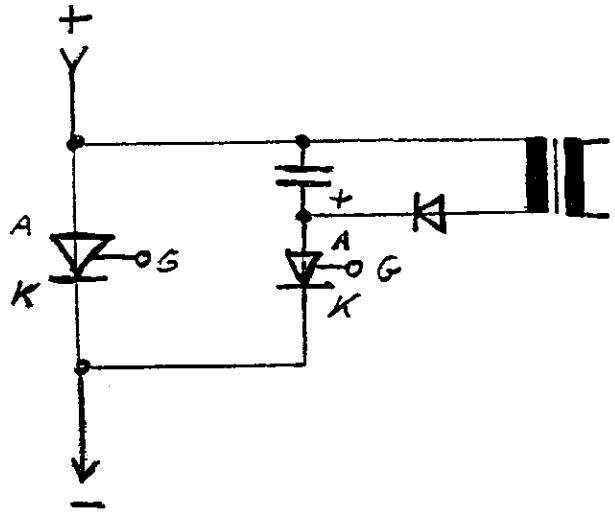
10. Aufbau und Anschluß von Umrichter und Löschmodulen






⊕
⊖
V4
V2
V41
V21
V11
V31
V1
V3


V3/4
50-1000 ms
6,5-13 ms
V31/41
V1/2
(10ms)
V11/12
50-150 µs
Jschw.


+
A
G
K
A
G
K
−