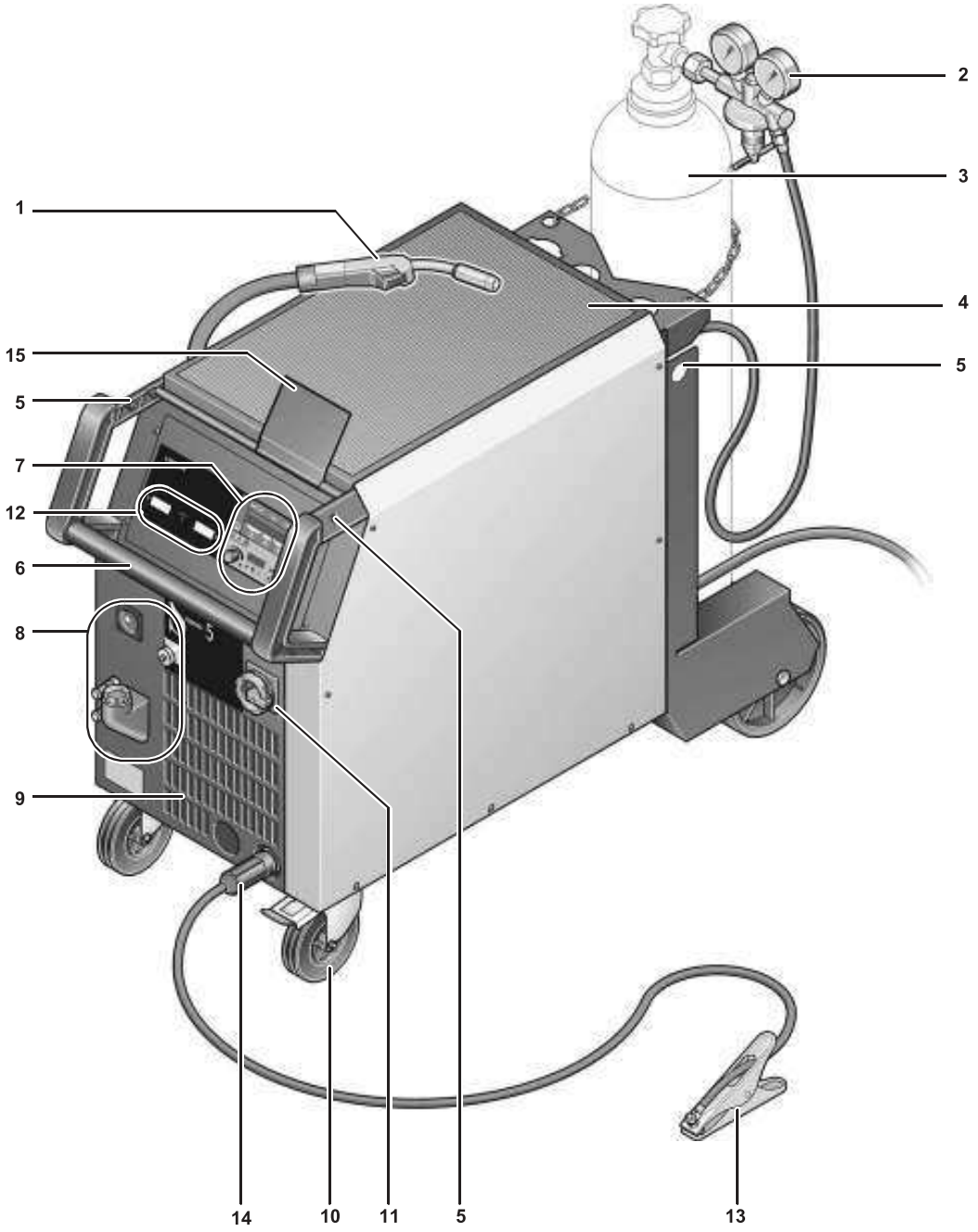
LORCH

Service Manual
Saprom S

909.0620.1-00

Contents

Machine



Machine Elements

1	torch
2	pressure reducer
3	gas cylinder*
4	tray area
5	facility for transport
6	handle
7	front panel
8	connections
9	air intake
10	transport wheels
11	main switch
12	display current/voltage
13	ground clamp
14	connector for ground cable
15	display cover

*)option

Safety precautions

Requirement

Use and maintenance of welding and cutting machines can be dangerous. Please draw user´s attention to follow the safety precautions to avoid injuries. Welding and cutting machines must be used appropriate and only by specialist staff. Please inform yourself constantly about the valid safety precautions and regulations of accident prevention by working with this machine.

Only qualified workers who are knowledgeabel and have been trained to work safely with test instruments and equipment on energized circuits shall be permitted to perform testing work on electrical circuits or equipment were there is danger of injury from accidental contact with energized parts or improper use of the test instruments and equipment.

Use only original spare parts

Replace immediately any components that are not in perfect condition.

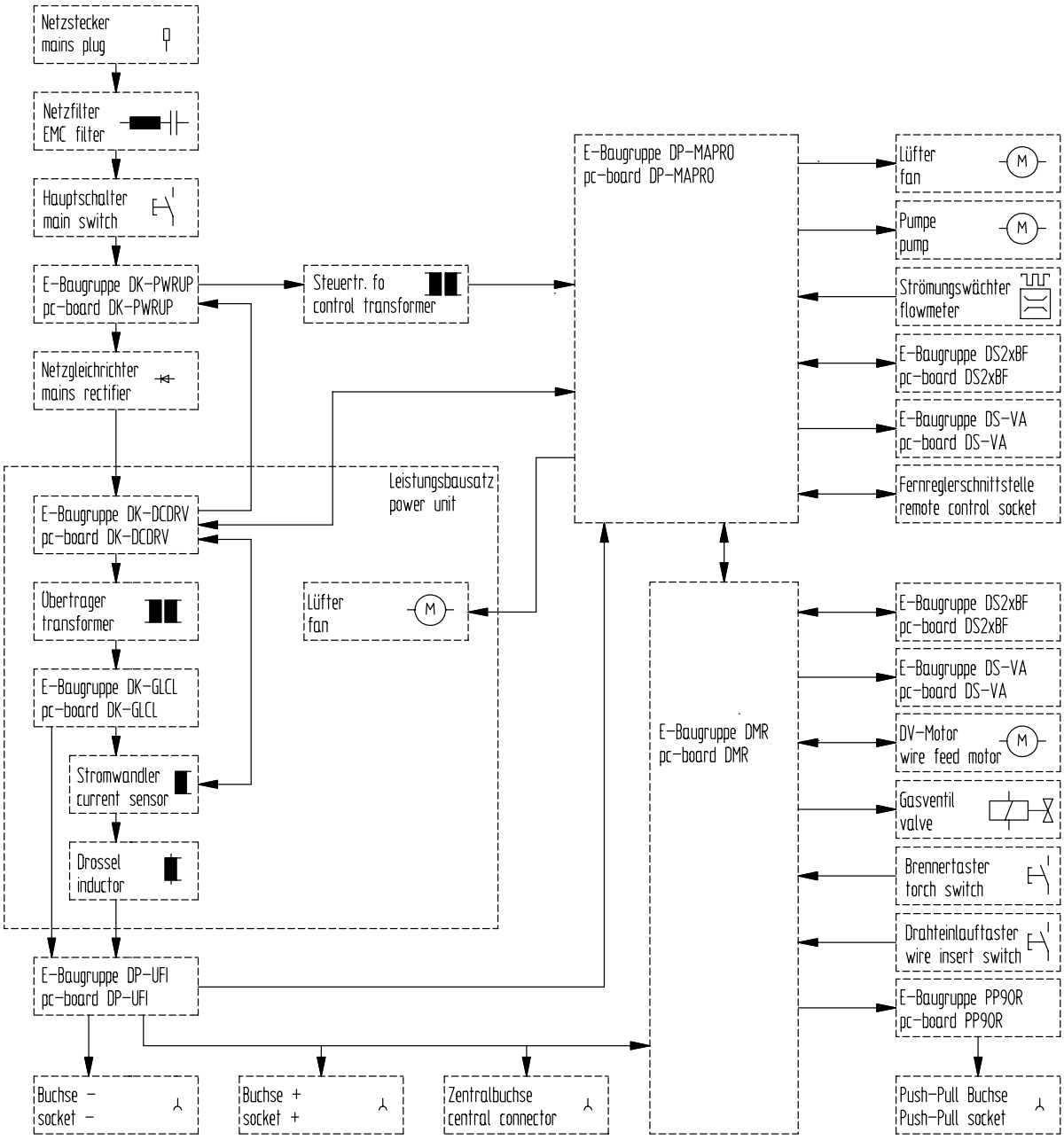
Norms

Please follow the current safety regulations corresponding to your country.

Common Logic Functions

component	function	associated event
fan (power unit)	on	power modul temperature over 40°C
fan (power unit)	off	power modul temperature below 40°C
fan (cooling system)	on	after detection „welding current on“
fan (cooling system)	off	after welding process, two minutes post-cooling time
pump	on	after detection „welding current on“
pump	off	after welding process, two minutes post-cooling time

Schematic S-Series



Blockschaltbild / schematic Saprom S
D00.0090.7-00

gez. 10.09.04 Velker

Troubleshooting guide

code	description	reason	removal
E 00	no program	no welding parameters available for selected material-wire-gas combination (no reasonable combination)	select other material-wire-gas combination
E 01	thermal overload	thermal sensor of power unit measures a too high temperature	let machine cool down in standby (*1)
E 02	mains overvoltage	mains voltage too high (24V supply > 36V)	check mains voltage and control transformer (*2)
E 03	secondary overcurrent	welding current is too high	check pc-board LSW
E 04	air cooling error	Temp. sensor of the power unit detects that the unit heats up too fast	check fan and air hardening lime
E 05	cooling system error	flowrate of the cooling liquid is too low (< 0,3 l/min) pump is not working	check connectors of flow-meter, level of cooling liquid and flowrate (*3) check fuse SI7 (2,5A) on pc-board DP-MAPRO
E 06	secondary overvoltage	Master detects output voltage is too high	exchange power unit
E 07	EEProm checksum error	no welding program stored or error during reading from memory	transfer welding programs to machine again
E 08	wire feed / tacho	power consumption of wire feed motor too high no tacho signal no CAN-Bus connection between MAPRO and DMR	blow out torch package with compressed air check wire feed unit check wiring of wire feed motor and pc-board DMR
E 09	error v/a measuring	measuring difference between Master and Process	check wiring of pc-board LSW and pc-board DK-UFI
E 10	torch socket / cable	short circuit of torch control cables or between torch switch wires and welding potential	check torch control cables and torch interface
E 11	remote-control conn.	short circuit between remote control cables	check remote control and wiring of remote control socket
E 12	Communication Process	Process is not responding to Master	switch the machine off and on again optionally exchange pc-board DP-MAPRO
E 13	Temp. sensor error	Temp. sensor is defective	check resistor value and wiring of the sensor
E 14	Op. voltages error	supply voltage is too low (< 17V)	check mains voltage and control transformer (*2)
E 16	primary overcurrent protection1	power consumption of power unti 1 is too high	exchange power unit
E 18	overload protection	safety shutdown to protect electrical components temp. sensor is disconnected	let machine cool down in standby check temp. sensor
E 20	Overvoltage sec.	Process reports a too high output voltage	exchange power unit
E 21	Output voltage/current	external current/voltage or measure-difference between Master and Process	exchange power unit
E 22	Mains undervoltage 1	power unit 1 reports mains voltage too low	check mains voltage and mains rectifier
E 23	Mains overvoltage	power unit reports mains voltage too high	check mains voltage
E 24	Overcurrent protection2	power consumption of power unti 2 is too high	exchange power unit
E 25	Power module detection	Jumper on pc-board DK-DCDRV have been set wrong	check junper J1, J2 on pc-board DK-DCDRV
E27	no program (DSP)	welding programs faulty or not available	select other material-wire-gas combination transfer welding programs to machine again
E 30	Mains undervoltage 2	power unit 2 reports mains voltage too low	check mains voltage and mains rectifier
E 31	Communication error	Master is not responding to Process	switch the machine off and on again optionally exchange pc-board DP-MAPRO

(*1) display the module temperatures in menu Extras > Diagnosis > Module temperatures
(*2) display the supply voltages in menu Extras > Diagnosis > Operating voltages
(*3) display the flow rate in menu Extras > Diagnosis > Flow rate cooling system

Pc-boards

Pc-board DP-MAPRO

The pc-board DP-MAPRO is responsible for the welding sequence and is managing the process control of the S-Series.
(MAPRO = **MA**ster-**PRO**cess)

Functions
- Logicfunctions of the welding process
- generating and monitoring supply voltages
- driving powerup-relais
- driving power unit/units
- monitoring control and operating elements (DS20BF, remote control, torch buttons)
- driving fans
- driving coolingpump
- monitoring flowmeter
- monitoring mains- and output voltage
- generating signal „welding current on“
- managing communications between PC and machine
- managing and storage of all welding parameters
- CAN-bus

LED displays :

normal

LED	state	designation
1 (green)	flashing (half freq. of LED5)	CPLD-processor ok
2 (red)	off	**D**igital **S**ignal **P**rocessor (DSP) ok
3 (green)	on	supply voltage 3,3V DC ok
4 (red)	off	micro controller ok
5 (green)	flashing	DSP is working
6 (green)	flashing	micro controller is working

malfunction

LED	state	designation
1 (green)	never on	CPLD-processor is not working
2 (red)	on	DSP is not working
3 (green)	off	supply voltage 3,3V DC is missing check 18V~ AC of control transformer X2/1 X2/2
4 (red)	on	micro controller is not working
5 (green)	never on	DSP is not working
6 (green)	never on	micro controller is not working

If the LEDs are indicating a malfunction which can not be relieved by switching the machine off and on again, it is recommended that the pc-board DP-MAPRO is exchanged.

Overview fuses DP-MAPRO

fuse	value [A]	Safeguarding
Si 6	1	fans (power unit)
Si 7	2,5	cooling pump

Measuring Points

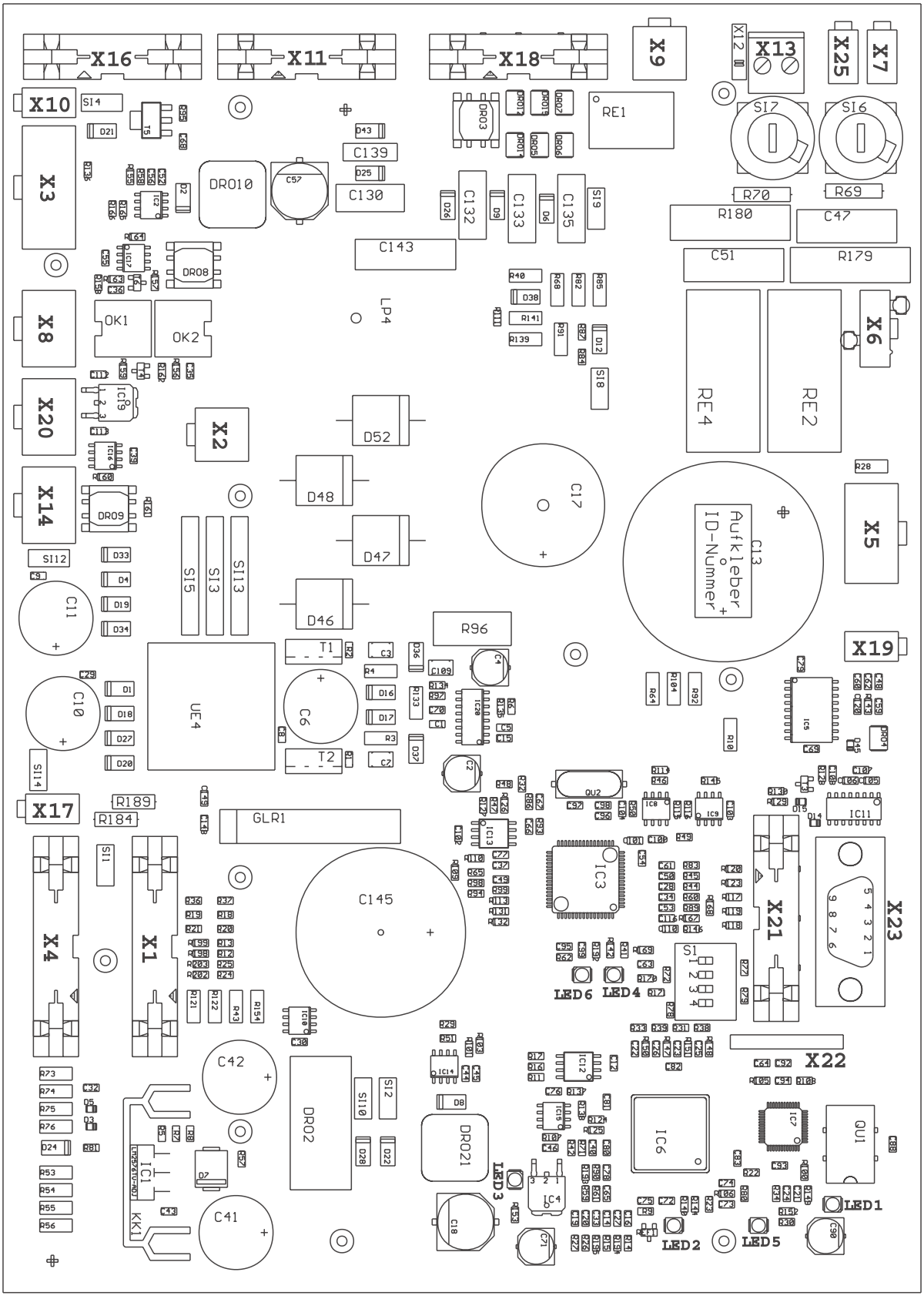
designation	measure point		result
solenoid valve	X10/1 X10/2	+ GND	+24V DC
supply voltage control transformer	X6/1 X6/3	~ ~	230V AC
supply voltage fan group 1	X7/1 X7/2	~ ~	230V AC
supply voltage fan group 2	X25/1 X25/2	~ ~	230V AC
supply voltage cooling pump	X13/1 X13/2	~ ~	230V AC
supply voltage control transformer	X2/1 X2/2	~ ~	18V AC
	X2/3 X2/4	~ ~	42V AC
supply voltage flow meter	X9/1 X9/3	+ GND	+15V DC
supply voltage CAN bus	X8/1 X8/2	GND +	+15V DC
	X14/1 X14/2	GND +	+15V DC
	X20/1 X20/2	GND +	+15V DC

Settings DIP Switch

If the machine is to be programmed via the serial port, the DIP switches 1-3 has to be set to “ON“. In normal operation they has to be set to “OFF“.
If the pc-board is used in a Saprom S3 mobile, the DIP switch 4 has to be set to “ON“. For the use in a standard Saprom S3, S5 or S8, DIP switch 4 has to be set to “OFF“.

DIP switch	ON	OFF
1	mode seriel programming	mode normal operation
2	mode seriel programming	mode normal operation
3	mode seriel programming	mode normal operation
4	configuration S3 mobile	configuration S3, S5, S8

Picture Pc-board DP-MAPRO



Pc-board DMR

The pc-board DMR is the wire feed motor control of the machine.

Functions

- control and monitoring wire feed motor
- driving solenoid valve
- control and monitoring of operating elements (DS20BF, remote control, torch buttons)
- monitoring wire insert button
- supply pc-board PP90R (Push-Pull)

LED displays

normal

LED	state	designation
1 (red)	off	microcontroller ok
2 (green)	on	supply voltage 5V ok

malfunction

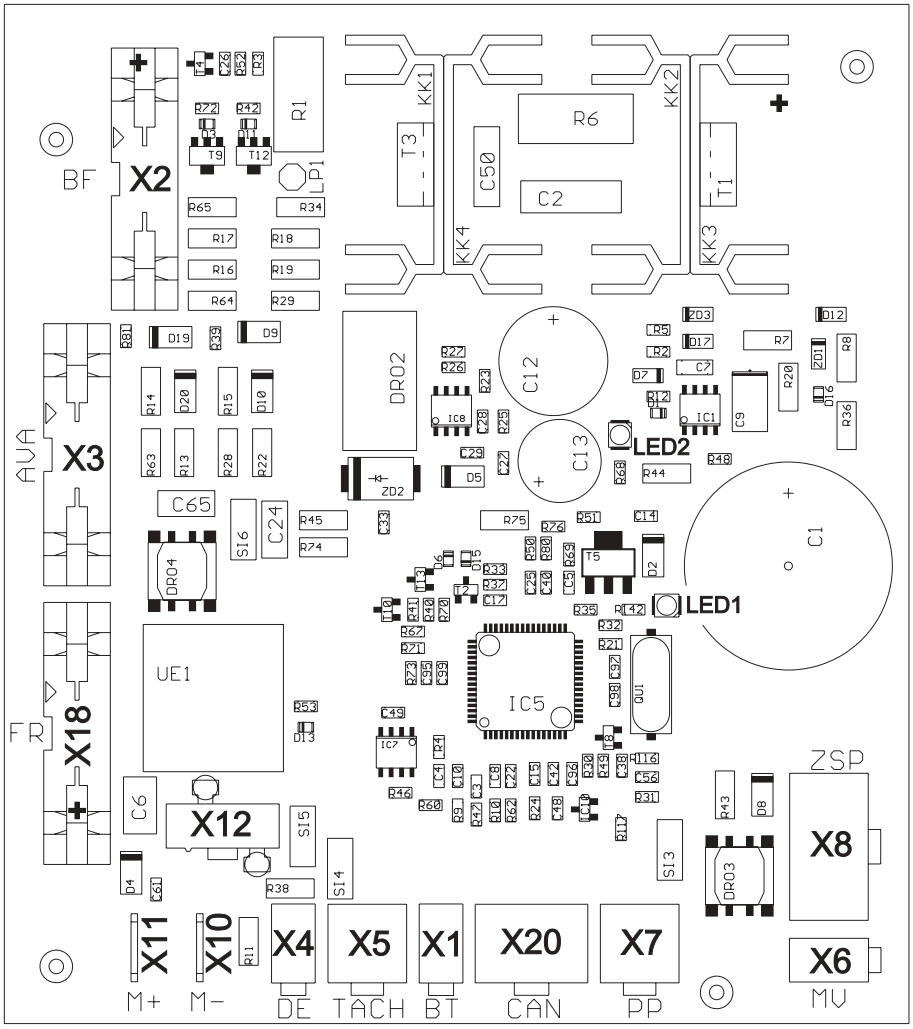
LED	state	designation
1 (rot)	is lit weak	microcontroller not programmed
	flashes	malfunction CAN bus
2 (grün)	off	supply voltage 5V not ok

Measuring points

designation	**measure point**		**result**
solenoid valve	X6/1 X6/2	+ GND	+24V DC
supply voltage Tacho	X5/1 X5/3	+ GND	5V DC
drive level for pc-board PP90R (Push-Pull)	X7/1 X7/3	+ GND	+24V DC
wire insert button (when button pressed)	X1/1 X1/2		0Ω
wire insert button (when button pressed)	X4/1 X4/2		0Ω
supply wire feed motor	X10 X11	- +	0-42V DC
supply voltage CAN bus	X20/1 X20/2	GND +	+15V DC

Picture Pc-board DMR

650.1261.x DMR RP340
D00.0090.9-00



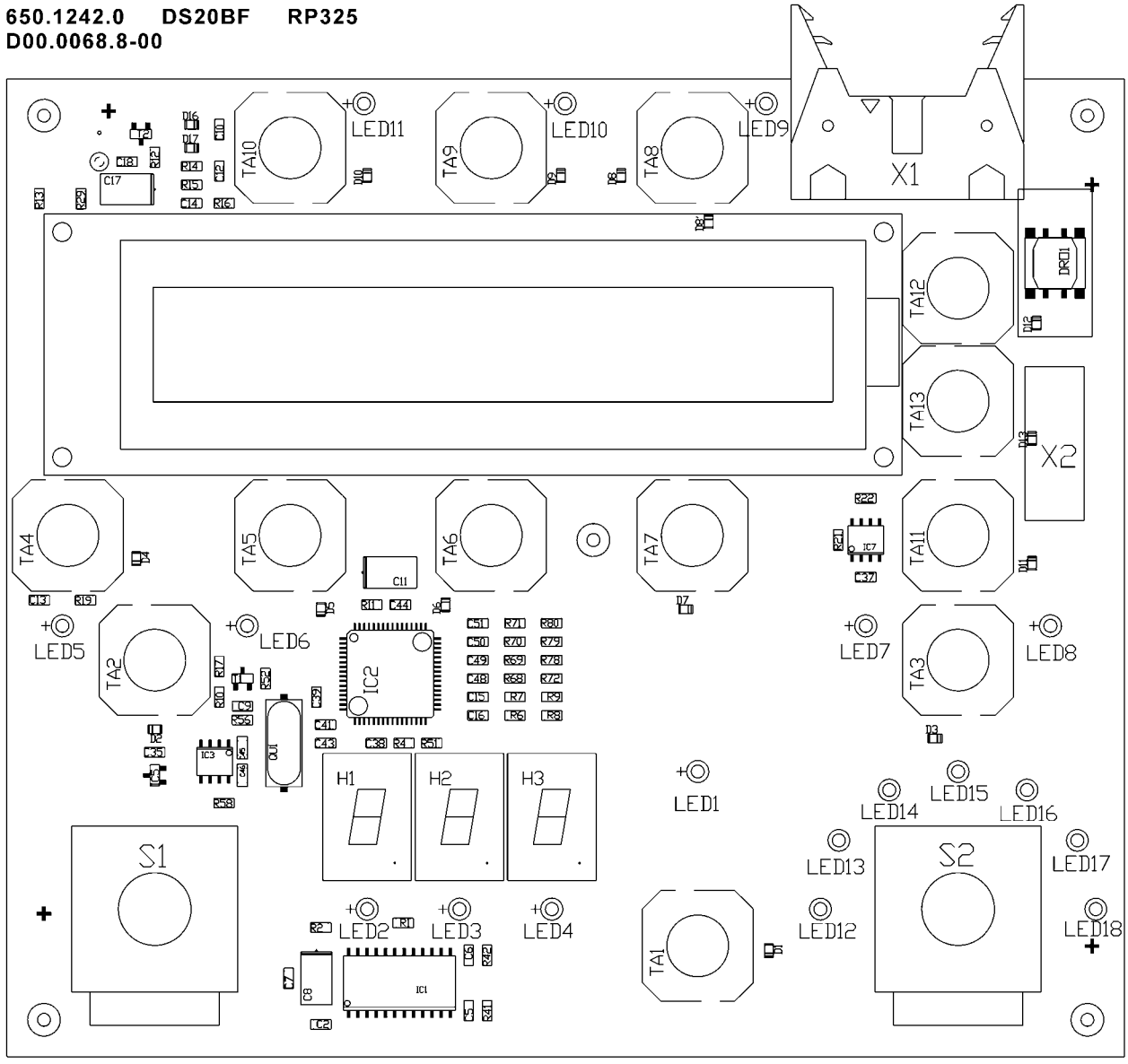
Pc-board DS20BF

The pc-board DS20BF is the front panel with all buttons, rotary impulse encoder and all displays.

Functions

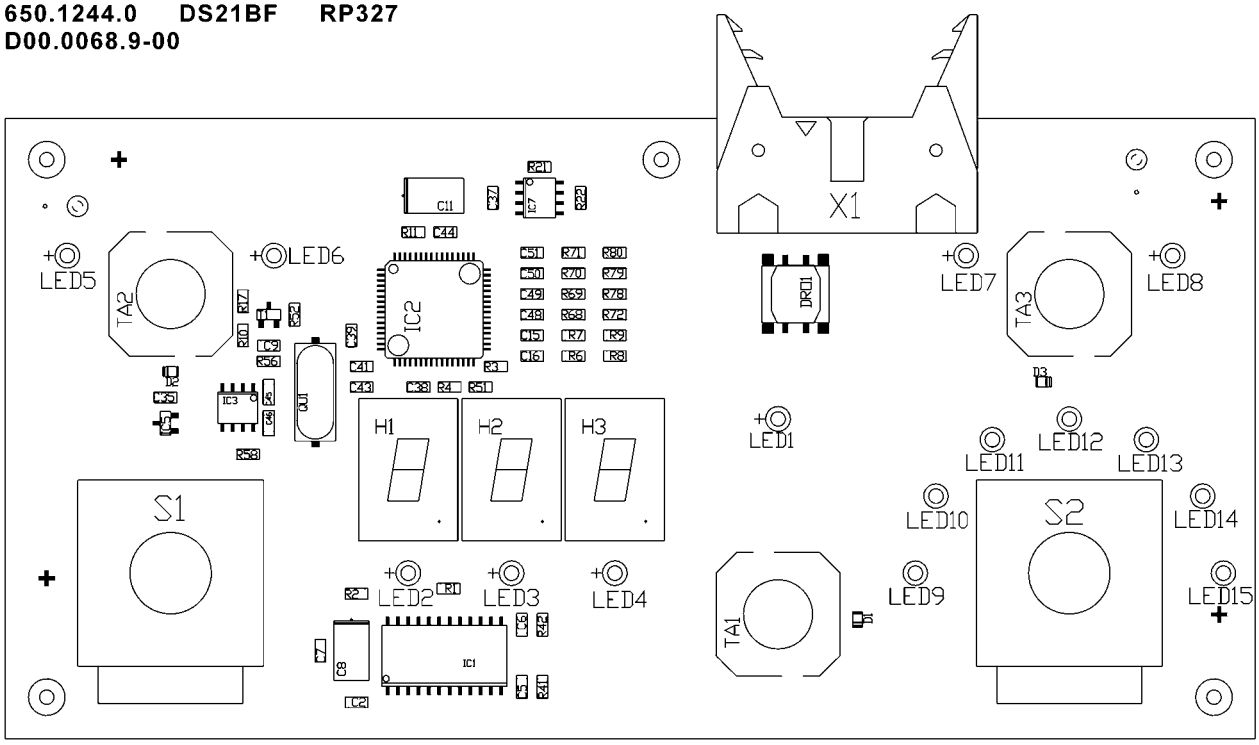
- operating/setup the machine
- display of all welding parameters
- display error messages
- display machine parameters (version operating system, actual values etc.)

Picture Pc-board DS20BF

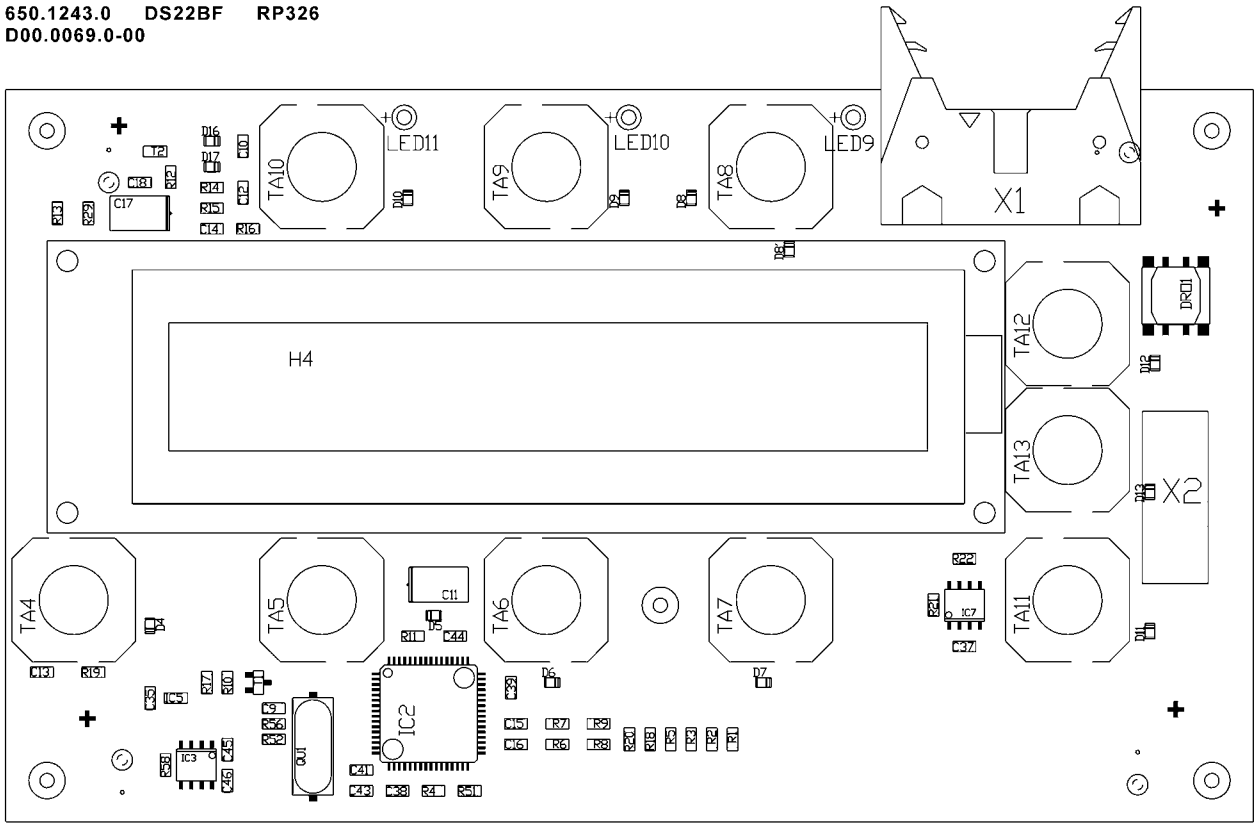


At a machine with separated front panels, the pc-boards DS21BF and DS22BF are used.

650.1244.0 DS21BF RP327
D00.0068.9-00



650.1243.0 DS22BF RP326
D00.0069.0-00



Display test
The display has a internal function test. To execute the test press the buttons „-“ (TA13) and „manual mode“ (TA4) at the same time. Now the LCD-Display shows „Display Test“ and the version number of the operating system. Press any button to start the first test, where all LEDs and the LCD-Display are turned on and off alternately. The LCD-Display shows „LEDs on, Backlight off“.
Press any button to go to the next test. In this test all buttons are checked, by pressing all 12 buttons one after another. The button which is to be pressed, is indicated by a lit LED. After that the rotary impulse encoders are checked. The LCD-Display shows a cursor which can be moved by the rotary impulse encoders. At first the cursor has to be moved to the left with the left rotary impulse encoder then to the right. After that the cursor has to be moved to the left and right with the right rotary impulse encoder.
Then the test are completed and the LCD-Display shows „End of Tests“ and the machine goes back into normal mode, which was displayed before the display test was executed.

Pc-board DK-DCDRV / DK-S3DRV

The pc-board DK-DCDRV is managing the primary drive level of the power unit Saprom S5 and S8.
The pc-board DK-DCDRV is managing the primary drive level of the power unit Saprom S3.

Functions

- encoding power unit
- connection temperature sensor of heat sink
- supply pc-board LSW
- monitoring DC link voltage and supply voltage
- safety shut-down of power unit
- passthrough signal powerup relais
- passthrough signal „welding current on“ (from pc-board LSW)

Encoding Power Unit

jumper J1	jumper J2	setting	machine type
0	0	240 A	S5
0	1	270 A	S3
1	0	300 A	S8
1	1	reserved	

0 = contact open
1 = contact closed
If DIP switches are used instead of jumper: 0 = “OFF“, 1 = “ON“

LED displays

normal

LED	state	designation
1 (red)	off	primary overcurrent shut down
2 (green)	on	drive level of low-side is ok
4 (green)	on	DC link voltage max is ok
5 (green)	on	drive level of high-side is ok
6 (green)	on	DC link voltage min is ok

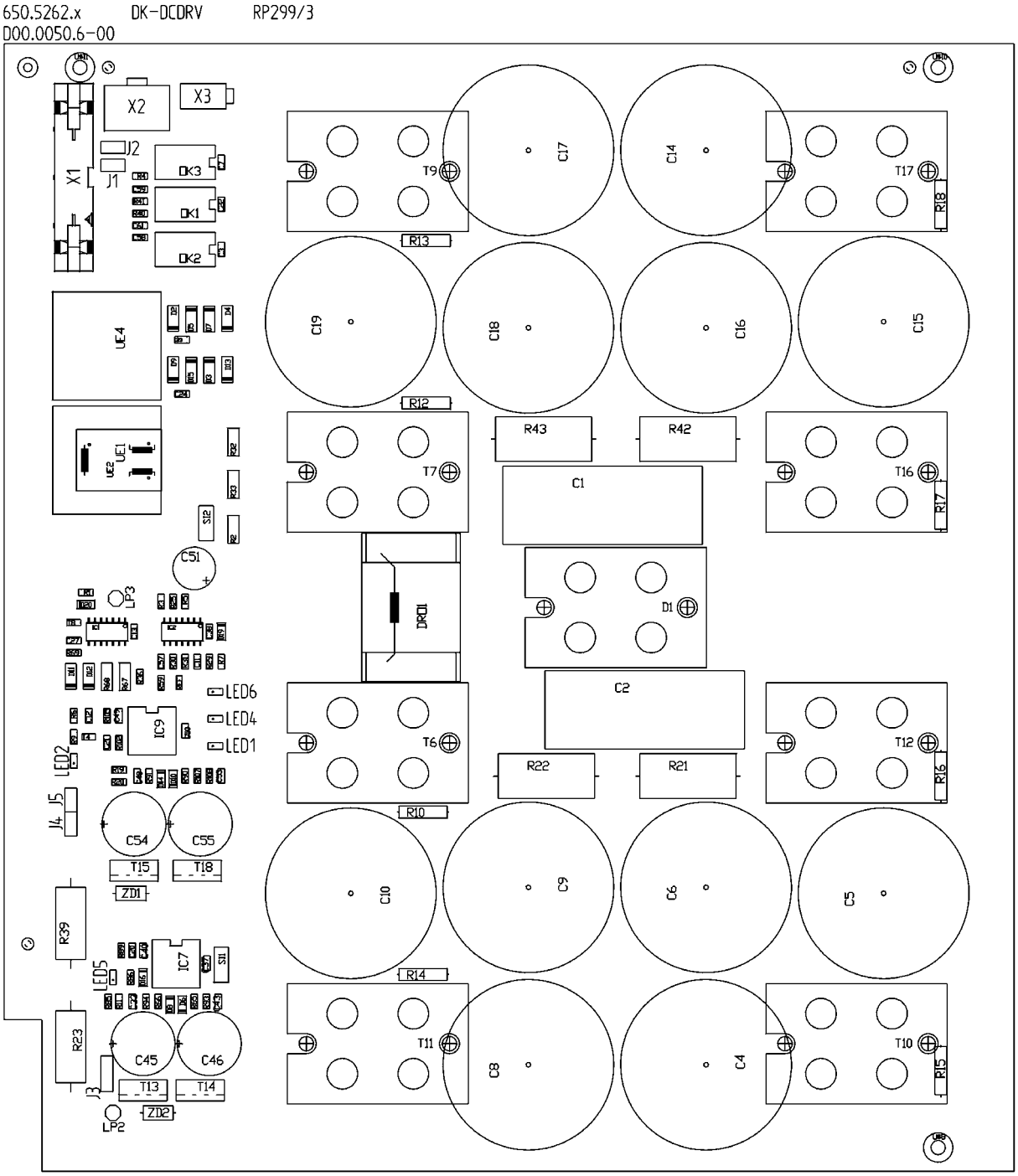
malfunction

LED	state	reason
1 (red)	on	primary current is too high, power unit has been switched off
2 (green)	never on	no drive level low-side
4 (green)	off	DC link voltage is too high (e.g. mains overvoltage)
5 (green)	never on	no drive level high-side
6 (green)	off	DC link voltage is too low (e.g. mains voltage too low)

Measuring Points

designation	Messpunkt		Messergebnis
supply voltage pc-board LSW	X2/1 X2/6	+ GND	15V DC
supply voltage pc-board LSW	X2/3 X2/6	- GND	-15V DC
thermal sensor	X3/1 X3/2	GND +	10kΩ at 25°C (about +2V DC)

Picture Pc-board DK-DCDRV / DK-S3DRV



Pc-board DK-PWRUP

The pc-board DK-PWRUP is the power up-circuit of the Saprom S3.

Functions

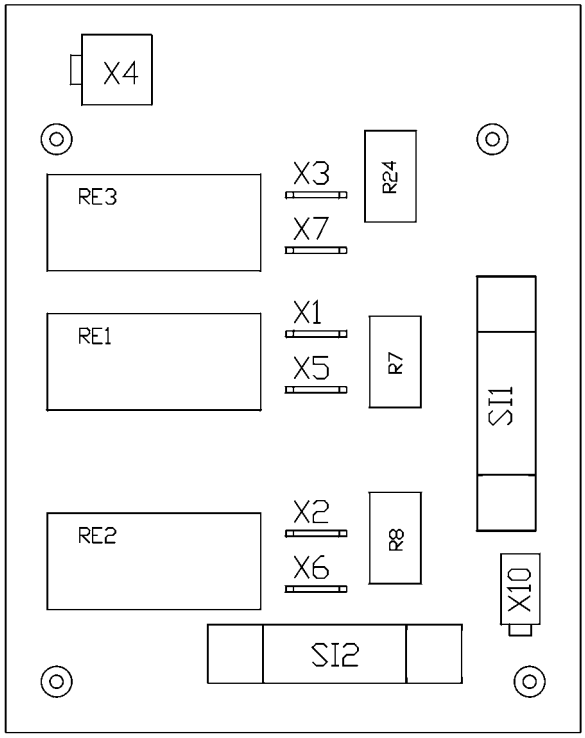
- reducing start-up peak current for capacitors
- supply and safeguarding of control transformer

Measuring Points

Beschreibung	Messpunkt		Messergebnis
mains input L1 mains input L2 mains input L3	X5 X6 X7	~ ~ ~	400V AC
mains output L1 mains output L2 mains output L3	X1 X2 X3	~ ~ ~	400V AC
supply voltage control transformer	X10/1 X10/2	~ ~	400V AC
drive level relay	X4/1,3 X4/2,4	+ -	24V DC

Picture Pc-board DK-PWRUP

650.5264.x DK-PWRUP RP296/2
D00.0050.8-01



Fuses

Safeguarding the control transformer via Si1, Si2 : each 4A idle

Pc-board PWRUP04

The pc-board DK-PWRUP is the power up-circuit of the Saprom S5 und S8.

Functions

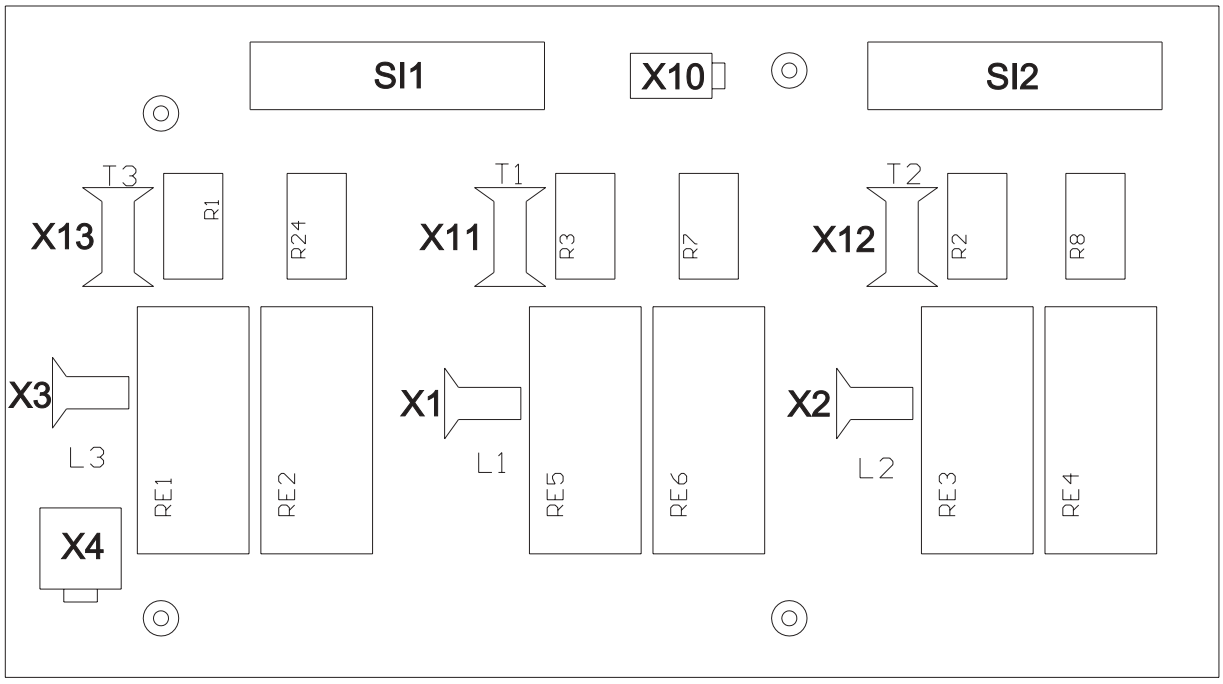
- reducing start-up peak current for capacitors
- supply and safeguarding of control transformer

Measuring Points

designation	measure point		result
mains input L1 mains input L2 mains input L3	X5 X6 X7	~ ~ ~	400V AC
mains output L1 mains output L2 mains output L3	X1 X2 X3	~ ~ ~	400V AC
supply voltage control transformer	X10/1 X10/2	~ ~	400V AC
drive level relay	X4/1,3 X4/2,4	+ -	24V DC

Picture Pc-board PWRUP04

650.1252.x PWRUP04 RP337/1
D00.0090.8-00



Fuses

Safeguarding the control transformer via Si1, Si2 : each 4A idle

Pc-board DK-GLCL

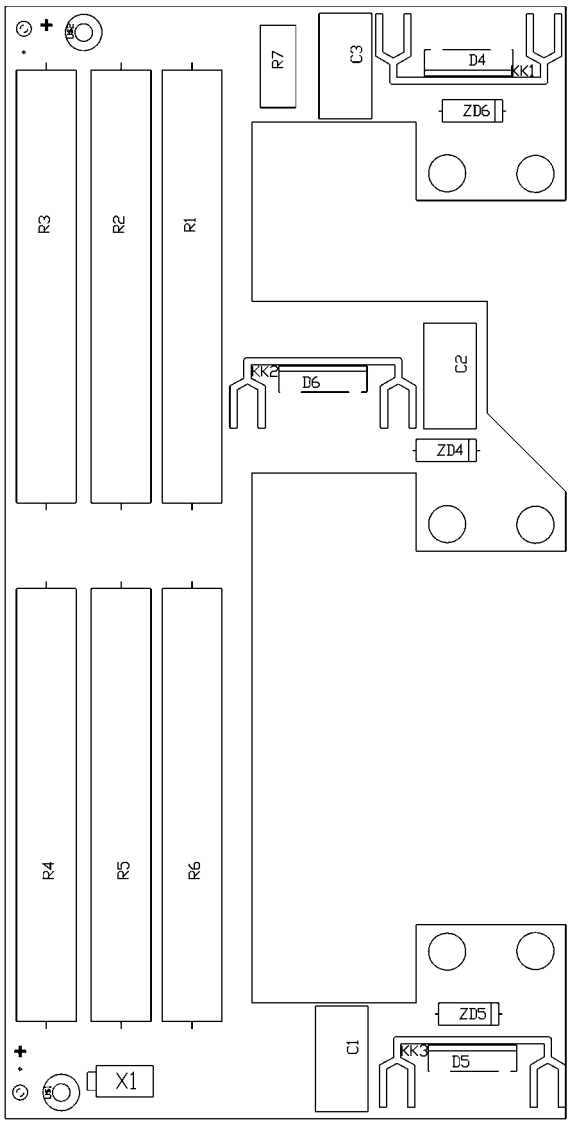
The pc-board DK-GLCL is for wiring the secondary rectifier diodes.

Functions

- wiring
- pulse smoothing

Picture pc-board DK-GLCL

650.5265.x DK-GLCL RP312/2
D00.0050.9-00



Pc-board DP-UFI

The pc-board DK-UFI is for wiring the welding sockets.

Functions

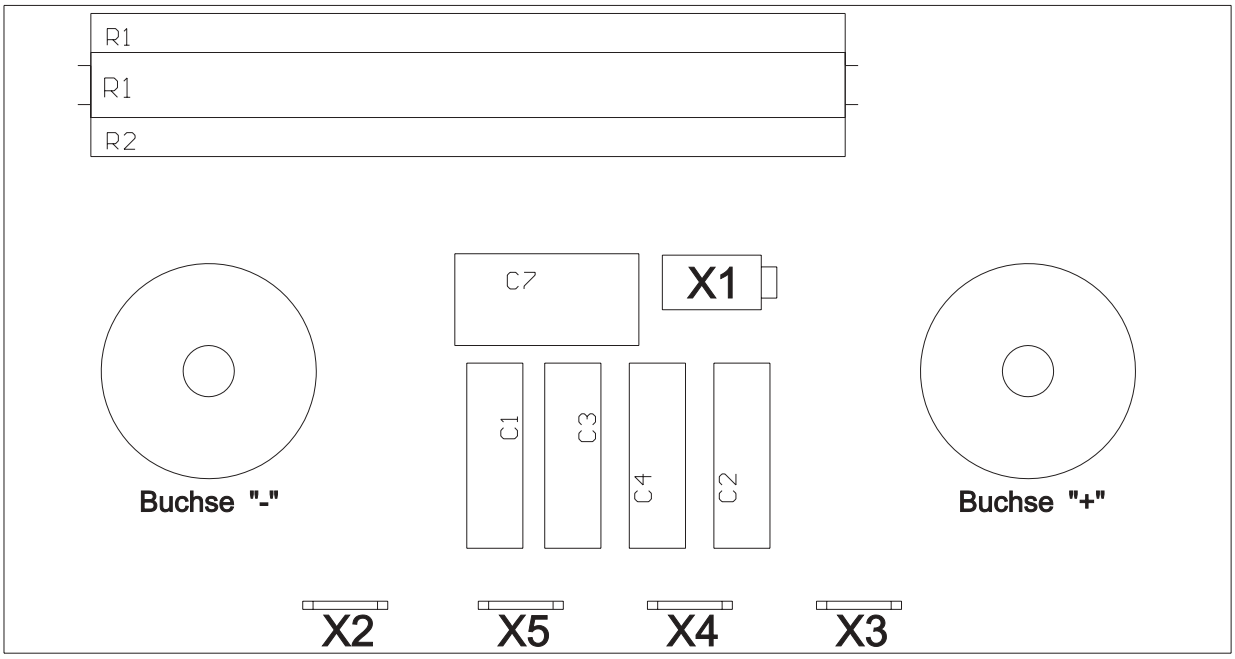
- wiring welding sockets
- providing output voltage

Measuring points

designation	measure point		result
secondary output voltage (nm MMA mode)	X3 X2	+ GND	ca. 81V DC
	socket „+“ socket „-“	+ GND	ca. 81V DC
	X1/1 X1/2	+ GND	ca. 81V DC

Picture Pc-board DP-UFI

650.1262.x DP-UFI RP341
D00.00911-00



Pc-board LSW

The pc-board LSW is a potential free current sensor.

Functions

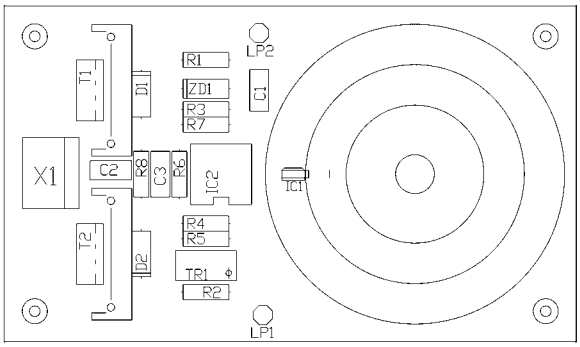
- measuring the welding current

Measuring points

designation	measure point		result
supply voltage	X1/1 X1/3	- +	 +30V DC

Picture Pc-board LSW

650.5160.x LSW RP163/1
D0000231-00



Pc-board DS-VA

Digital display

Functions:

- display nominal and actual values of welding voltage and welding current
- hold-function of the last welding values

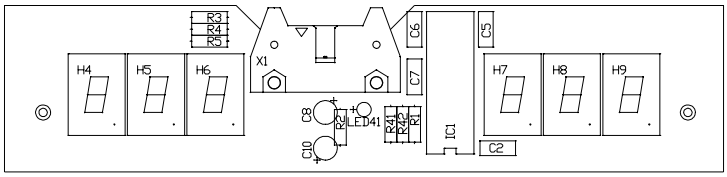
LED displays

normal

LED	state	designation
41 (green)	on	hold-function active

Picture Pc-board DS-VA:

650.1228.0 DS-VA RP260/2
D0000138-00



Pc-board PP-90R

management for Lorch Push-Pull torches.

Functions:

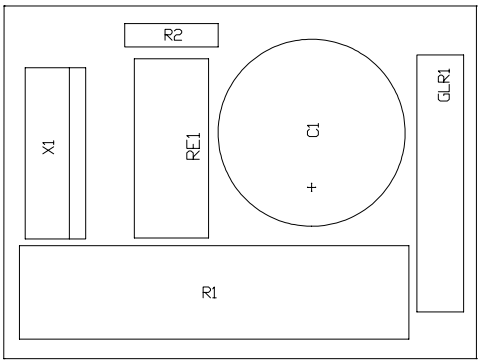
- supply Push-Pull motor
- managing start signal

Measuring points:

designation	measuring point		result
supply voltage	X1/2 X1/5	~ ~	42VAC
motor voltage	X1/4 X1/1	- +	+60VDC
drive level relay	X1/7 X1/6	GND +	+24VDC

Picture Pc-board PP-90R:

650.6271.0 PP-90R RP87/2
D0000139-00



Pc-board DS-ERW

The pc-board DS-ERW is the extension pc-board for machines with additional wire feed case.

Functions

- switching between wire feed 1 / wire feeder 2
- driving solenoid valve
- driving water valves

LED displays

normal

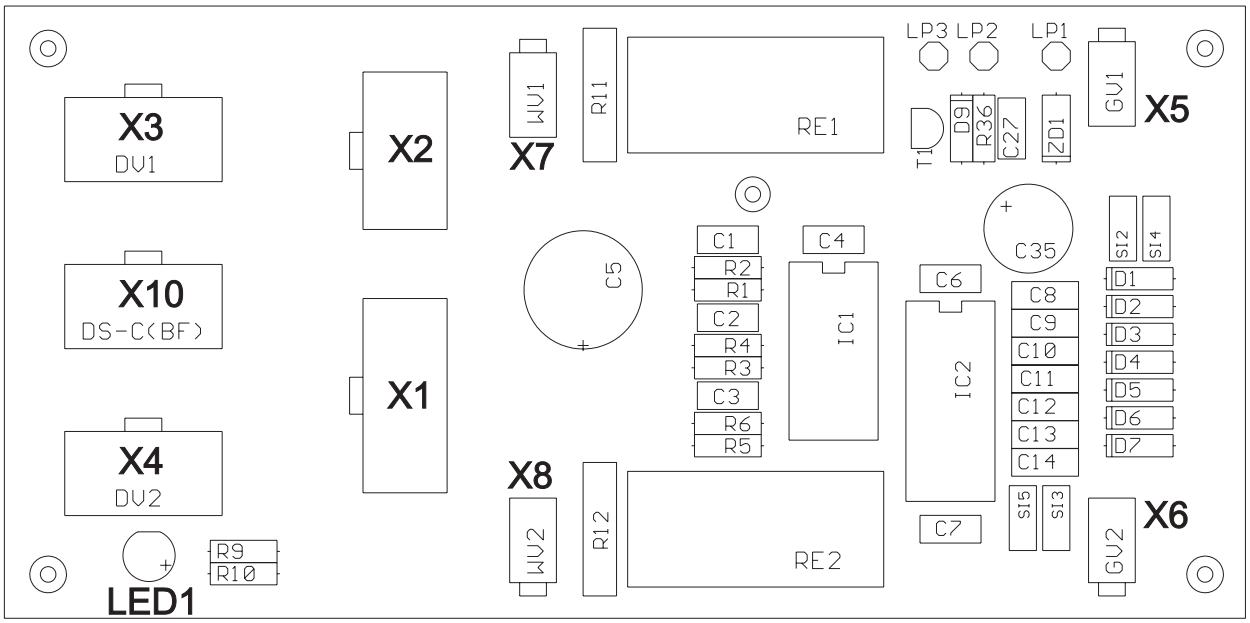
LED	state	designation
1 (green)	off	wire feed unit 1 active
	on	wire feed unit 2 active

Measuring Points

designation	measuring point		result
solenoid valve 1	X5/1 X5/2	GND +	24V DC
solenoid valve 1	X6/1 X6/2	GND +	24V DC
water valve 1	X7/1 X7/2	~ ~	42V AC
water valve 2	X8/1 X8/2	~ ~	42V AC

Picture Pc-board DS-ERW

650.1248.x DS-ERW RP331
D00.0091.0-00



Servisní manuál angl. pro ATA 350-500 PULS 2 MG034-1					
Vypracoval: Worked out:	DJ 21/1/2010	Přezkoumal: Inspected:	DJ 21/1/2010	Schválil: Approved:	VS 21/1/2010