Service manual

Ver. 1.2

KEMPACT
PULSE 3000

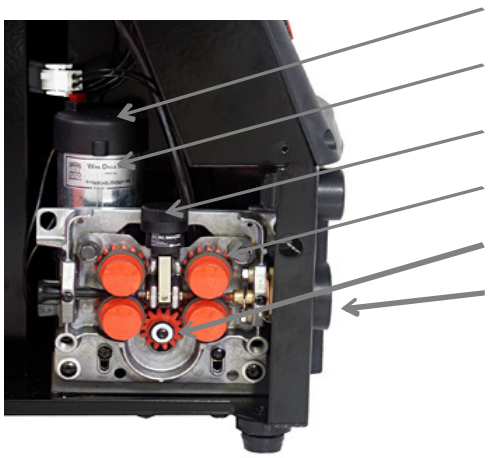
KEMPPI
The Joy of Welding

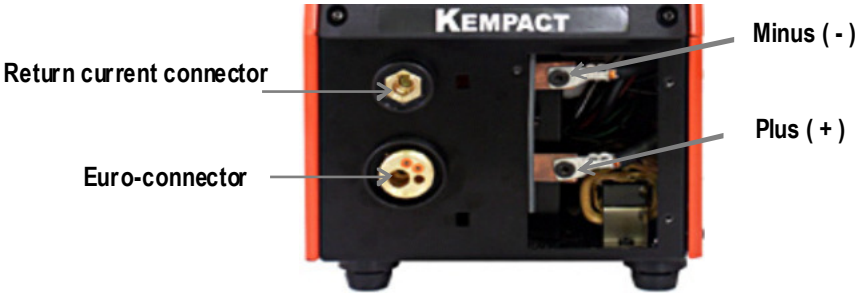
Contents

technical data

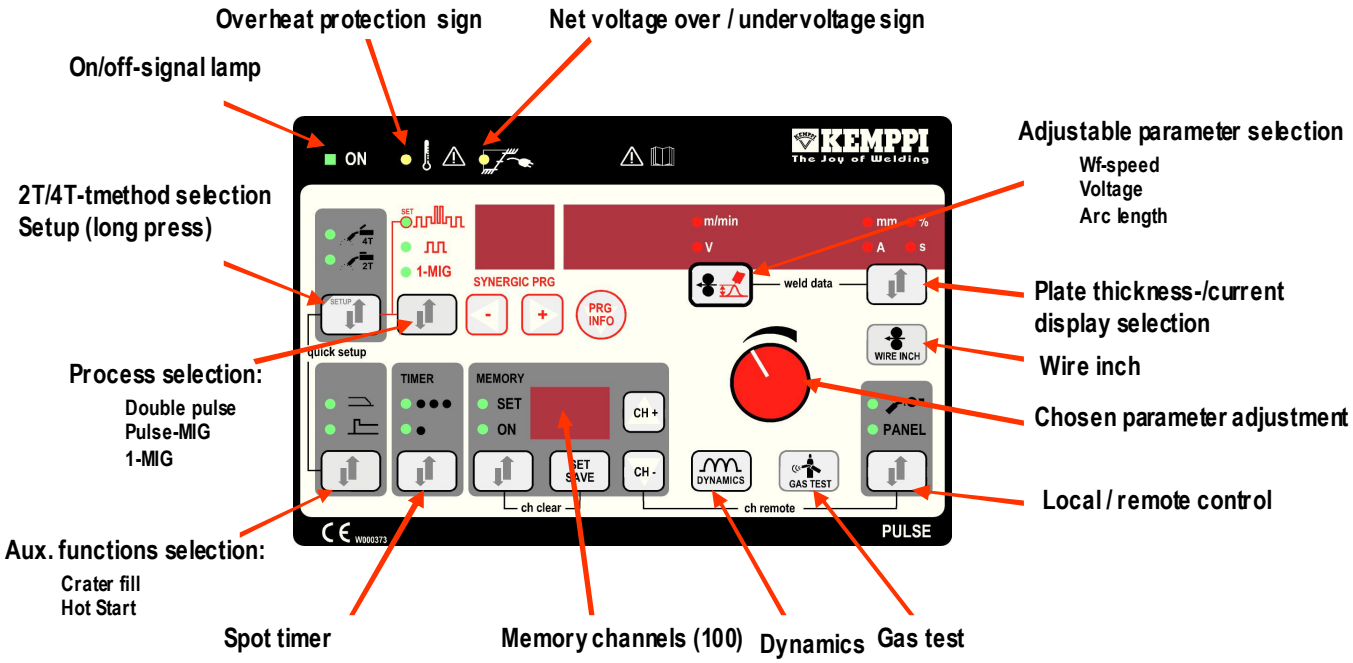
Supply voltage	3~ 400 V ±15% , 50/60 Hz
Loadability (connection power)	40% ED 250 A / 26,5 V (12 kVA) 60% ED 207 A / 24 V (10 kVA) 100% ED 160 A / 22 V (7,5 kVA)
Supply cable(fuse)	4 x 1,5 mm² 2,5 m (16 A slow)
Welding voltage adj. range	8 - 30 V
OCV	Approx. 57 V
Wf-speed adj. range	1 - 18 m/min
Power factor	0,69
Efficiency	0,84
Filler wires Fe, Ss FCW Al CuSi	 0,6…1,0 mm 0,9…1,2 mm 0,9…1,2 mm 0,8…1,0 mm
Wire spool diameter (weight)	300 mm (15 kg)
Dimension(weight)	L580 x W280 x H440 (22 kg)

Switches and connectors

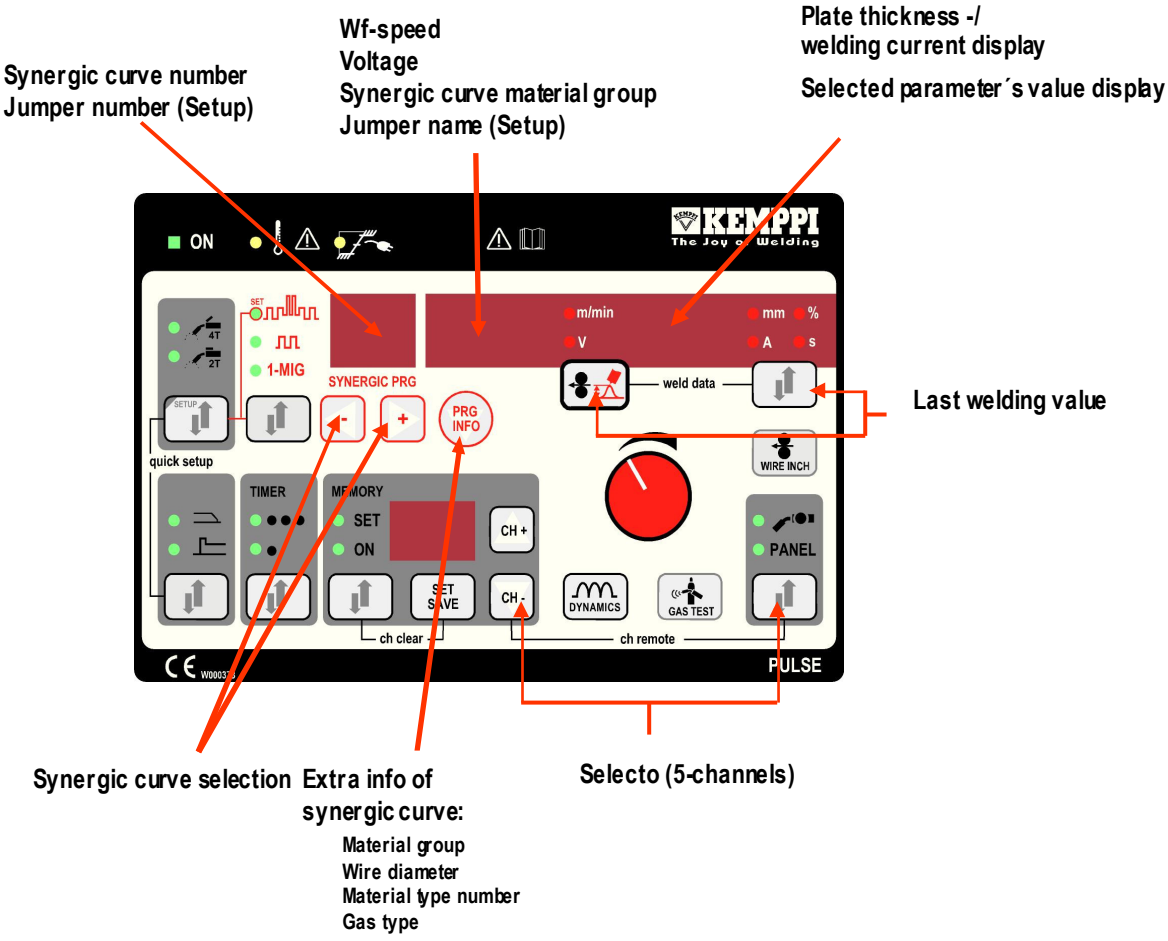




Panel



Panel

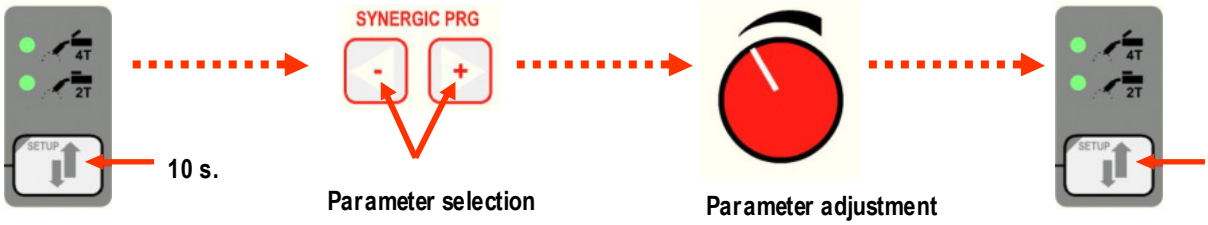


Synergic curves

1-MIG	Pulse-MIG	Program	ϕ	Material	Gas
X		00	All	All	All
Normal-MIG		01	All	All	All
SS-group					
X	X	S1	0,8	SS 308 / 316	Ar + 2% CO_2
X	X	S2	0,9	SS 308 / 316	Ar + 2% CO_2
X	X	S3	1,0	SS 308 / 316	Ar + 2% CO_2
Al-group					
X	X	A1	1,0	AlMg 5 / AlMg 4,5Mn	Argon
X	X	A2	1,2	AlMg 5 / AlMg 4,5Mn	Argon
X	X	A6	1,0	AlSi 5 / AlSi 12	Argon
X	X	A7	1,2	AlSi 5 / AlSi 12	Argon
Cu-group					
X	X	C1	0,8	CuSi 3	Argon
X	X	C3	1,0	CuSi 3	Argon
Fe-group					
X	X	F1	0,8	Fe	Ar + 25% CO_2
X	X	F2	0,9	Fe	Ar + 25% CO_2
X	X	F3	1,0	Fe	Ar + 25% CO_2
X		F5	0,8	Fe	CO_2
X		F7	1,0	Fe	CO_2
X		FA	1,0	Metal core wire	Ar + 25% CO_2

SETUP-functions

The SETUP is entered by pressing the setup-button for 10 seconds.

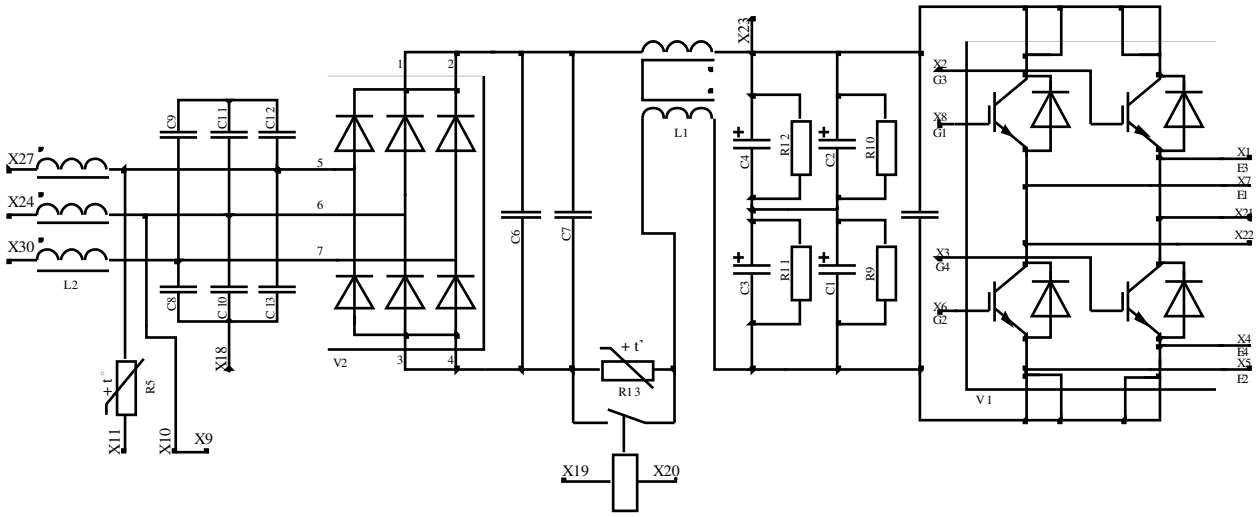


Adjustable parameter	Number	Display	Factory setting	Adj. range	Quantity
Post gas time	1	PoG	Syn	0.0…9.9	s
Pre gas time	2	PrG	Syn	0.0…9.9	s
Hot Start level	11	Hot	30	-50…+75	%
2T Hot Start duration	12	H2t	2.0	0.1…9.9	s
Crater fill end level	14	CFL	30	10…90	%
Crater fill time (angle)	15	CFS	1	1…20	s/10m/min
Creep start starting level	17	CSL	Syn	10…90	%
Creep start time (angle)	18	CSS	0	0.1…5	s/10m/min
Doublepulse freq.	21	dFr	Syn	0.0…8.0	Hz
Double pulse Wf-speed amplitude	22	DA	Syn	0.0…3.0	m/min
Ignition pulse	31	StP	0	-9…0…+9	
Pulse top current	33	PuC	0	-10…+15	%
Post current time	35	PoC	Syn	0.0…10	s
Arc length adj. range	41	ALr	0	-50…+75	%
Calibration	42	CAl	0	1.0	V/100A
Maximum wf-speed	51	FS	18	18 tai 25	m/min
Liquid cooled gun PTC	53	Gun	On	On/Off	
Gun controller automatic detection	54	GrE	On	On/Off	
Display recovery delay	81	dIS	5.0	1.0…20	s
Factory settings recall	99	FAC	OFF	Off/Pan/All	

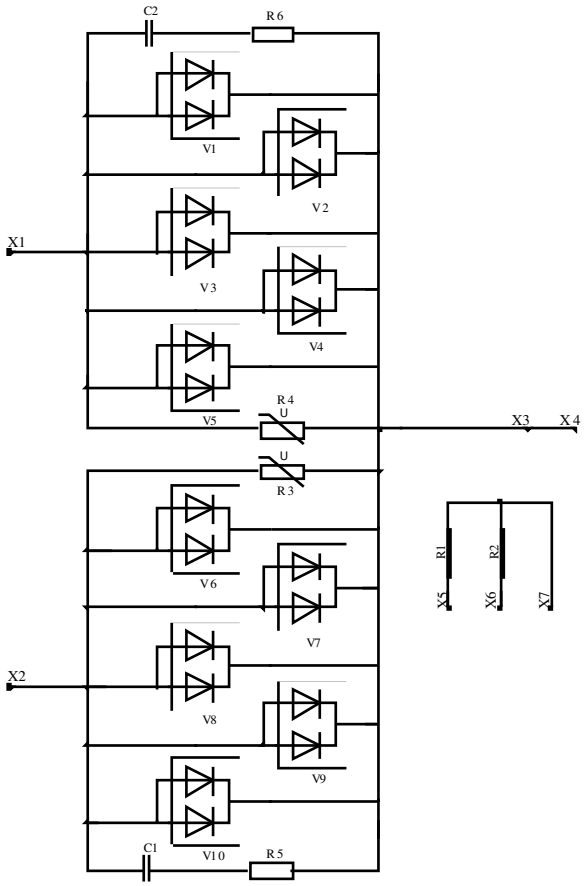
Error codes

Err 3	Net overvoltage
Err 4	Power source overheated
Err 5	Cooling unit has stopped welding
Err 6	Power source output voltage is has risen > 80 Vdc
Err 153	PMT-gun overheated or RMT 10 installed and PMT-gun in FU-position
Err 154	Wf-motor overload (current > 4,5 A/ 5 s.)

Main circuit

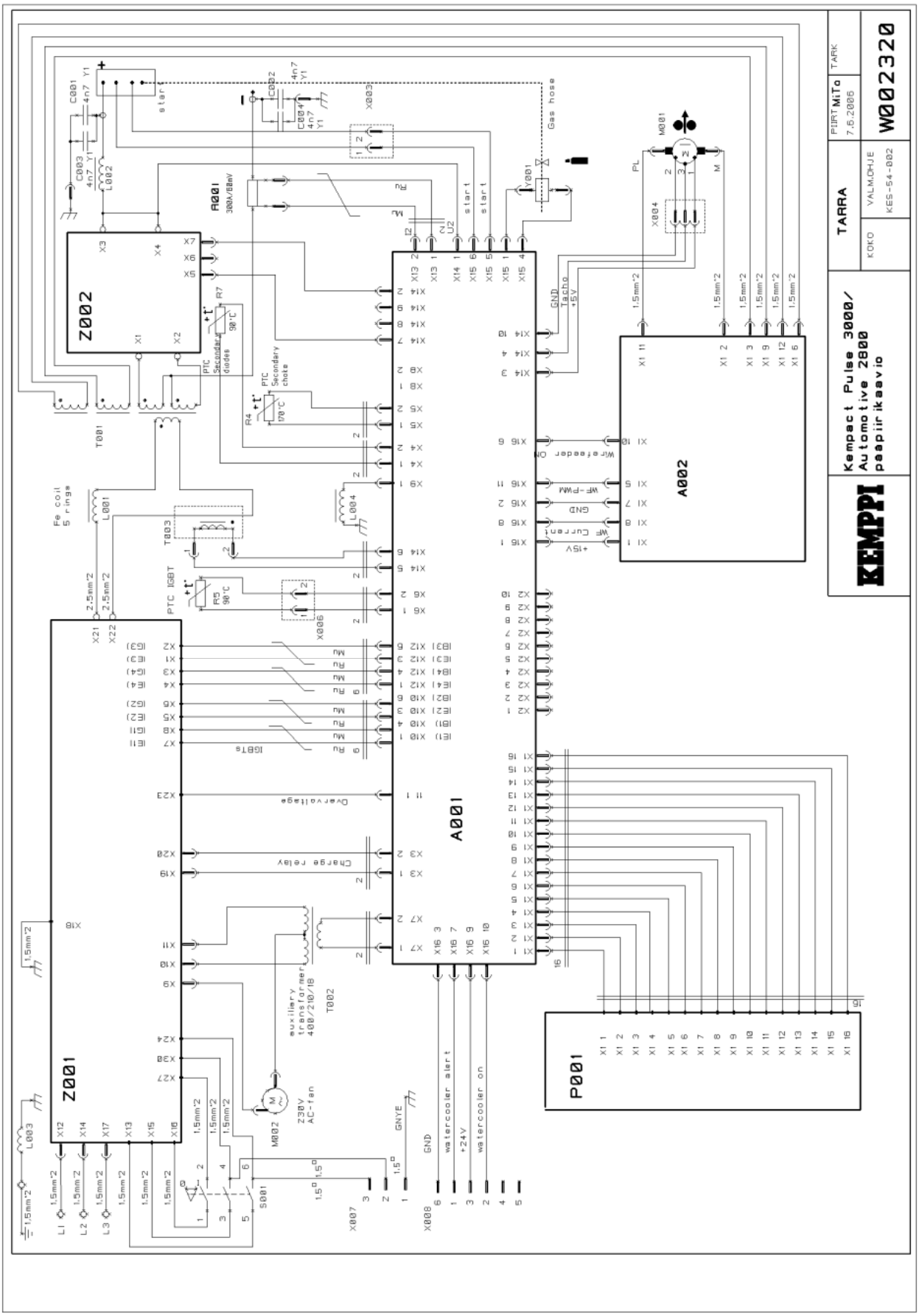


Primary circuit.



Secondary circuit.

Main circuit diagram



General

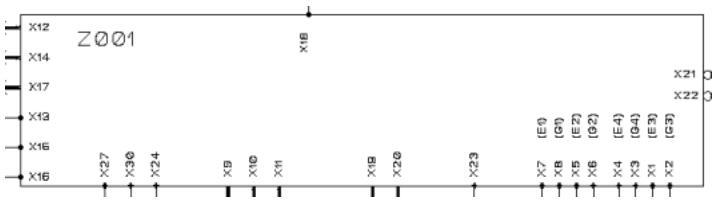
The machine may be repaired only by an authorized and licensed technician or workshop!

First do a visual check to find the possible loose connectors, broken wires or signs of overheating

Troubleshooting diagram

PROBLEM	POSSIBLE CAUSE	REMEDY
Power source doesn´t start	Net fuses or supply cable.	Check the net fuses and supply cable condition.
Power source can´t provide full power.	Net fuses or supply cable. Main transformer T001 or secondary siode card Z002.	Check the net fuses and supply cable condition. Check the main transformer T001´s ferrites and secondary diode card diodes.

Main circuit card Z001 functions and connectors

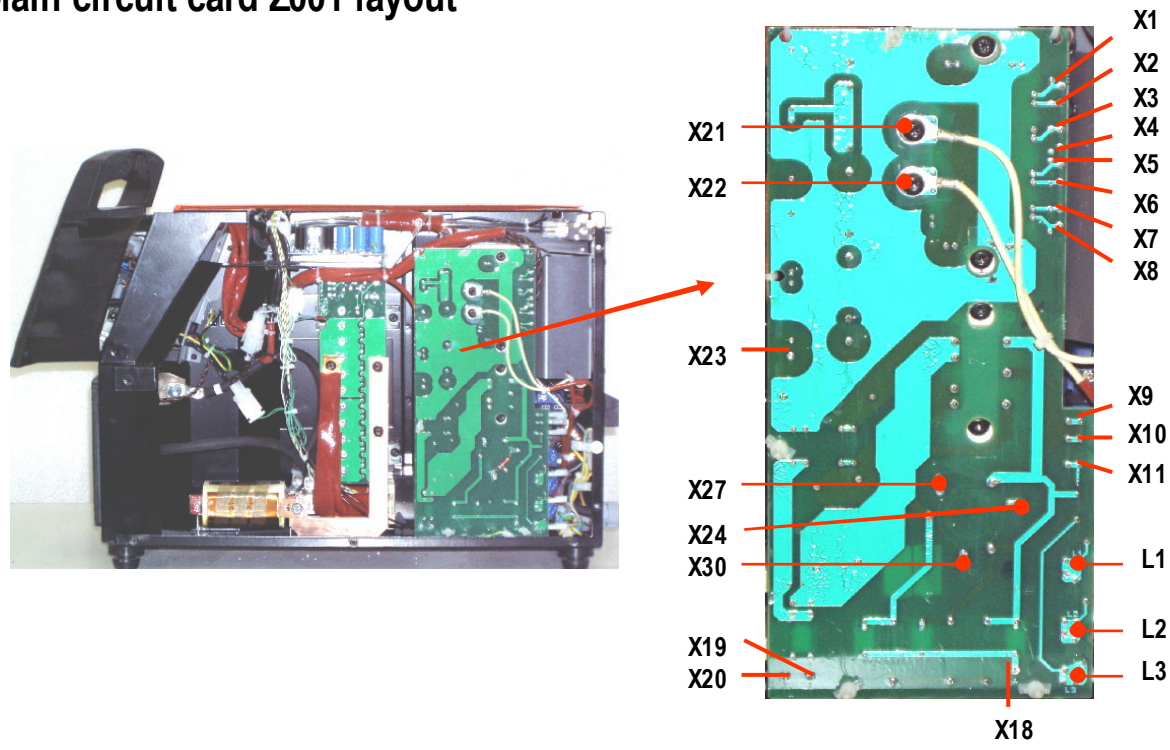


Main circuit card Z001 includes the following operational blocks:

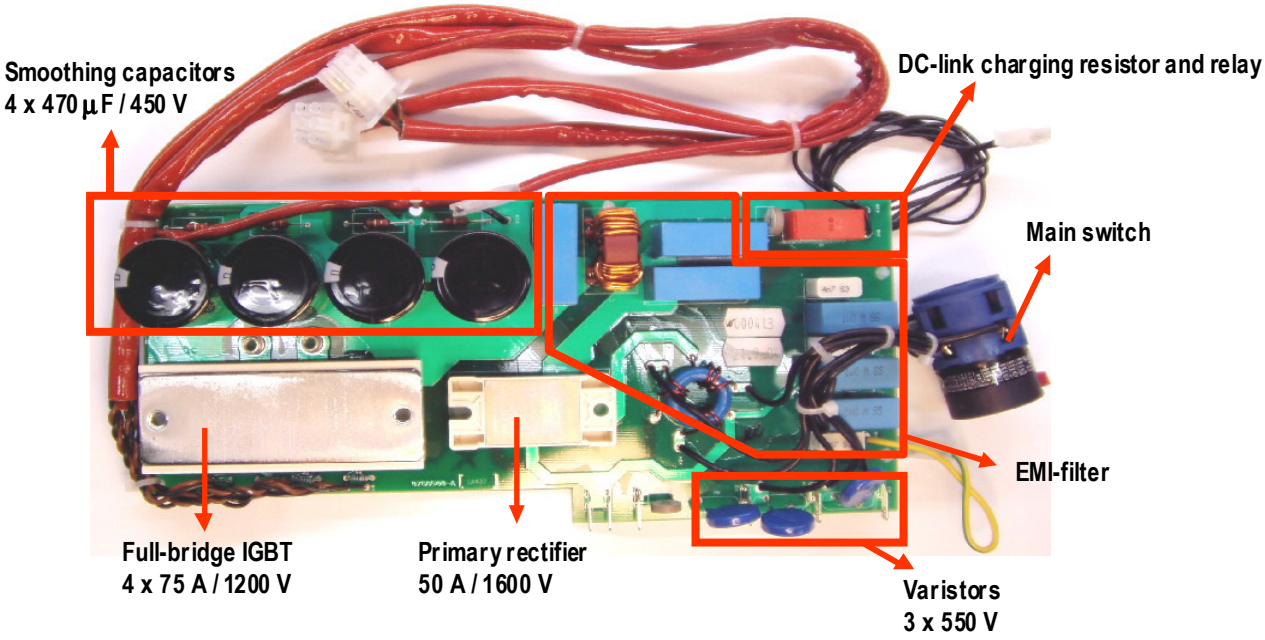
- Overvoltage protection
- EMI-filter
- Primary rectifier
- DC-link charging
- DC-voltage filtering
- Full-bridge IGBT-module

Connectors	
X1…X8	IGBT gates and emitters
X9	Fan M002
X10 and X11	Aux. transformer T002
X12, X14 and X17	Net voltage 400 Vac
X13, X15 and X16	Main switch S001
X18	Protective earth
X19 and X20	Charge relay
X21 and X22	Main transformer T001
X23	Intermediate circuit DC-voltage
X24, X27 and 30	Main switch S001

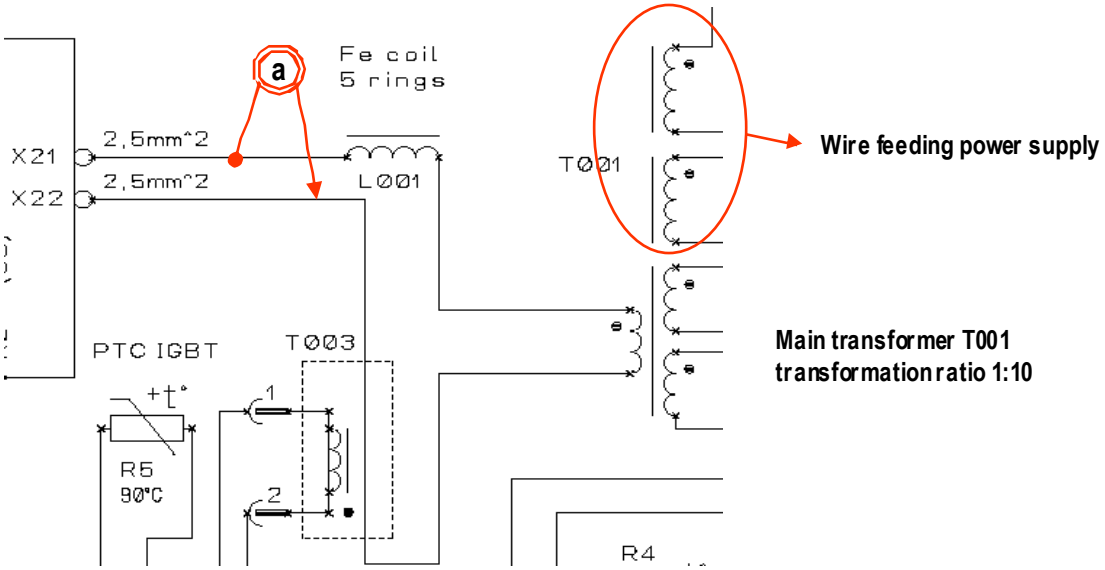
Main circuit card Z001 layout



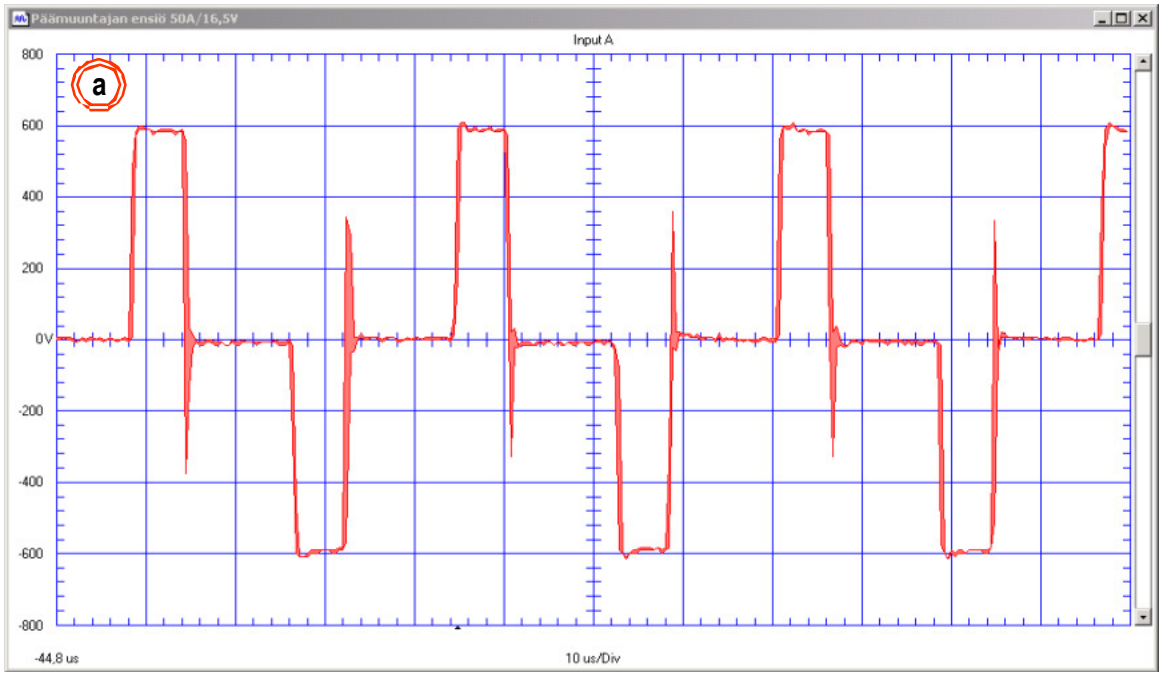
Main circuit card Z001 layout



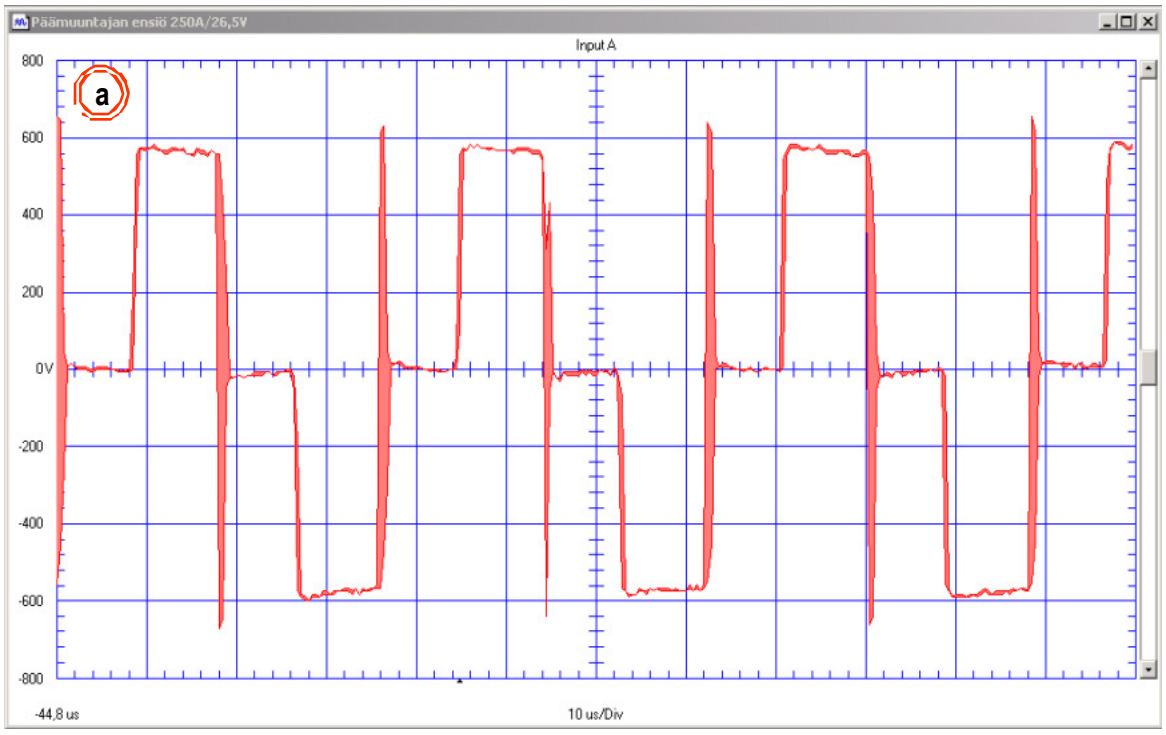
Main transformer T001 primary voltage



Main transformer T001 primary voltage

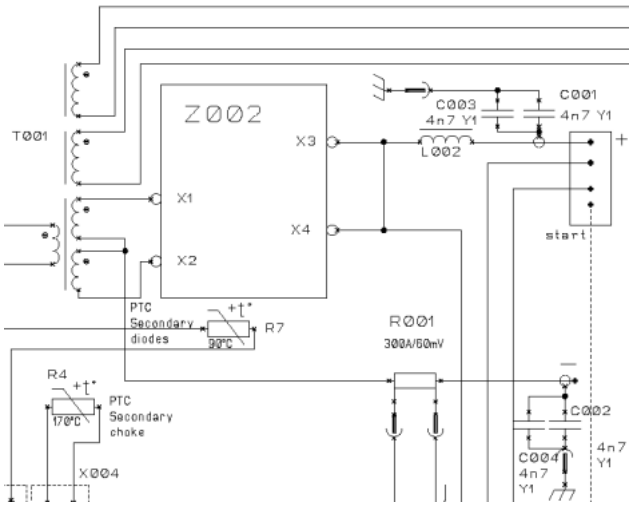


Main transformer T001 primary voltage with values 50 A/16,5 V (Synergic curve 00), meas. point **a**.



Main transformer T001 primary voltage with values 250 A/26,5 V (Synergic curve 00), meas. point **a**.

Secondary diode card Z002 functions / connectors

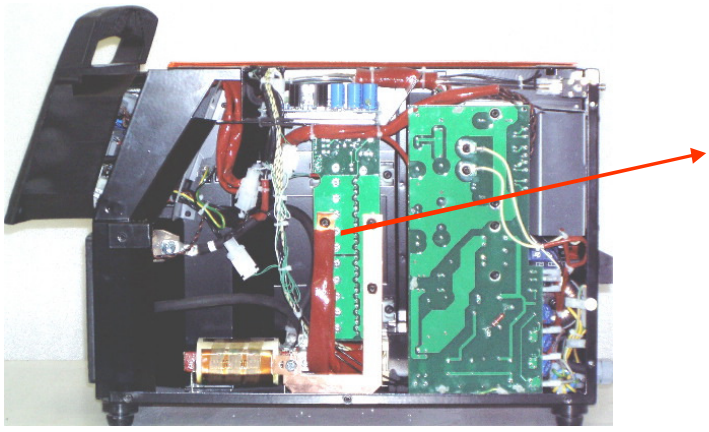


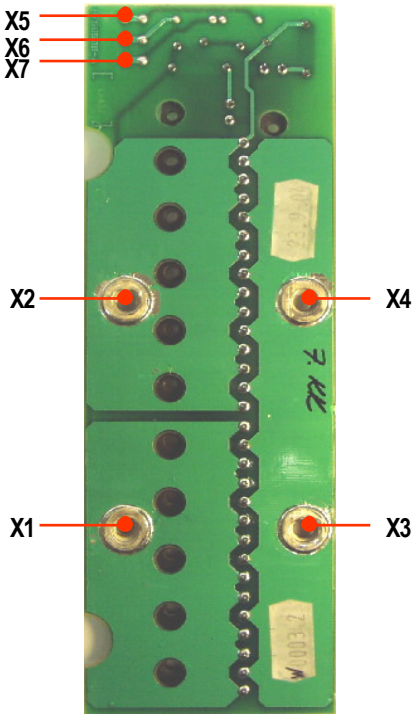
The secondary diode card Z002 has these operational blocks:

- Secondary rectifying
- Machine size coding
- Overvoltage protections
- Dampening circuits

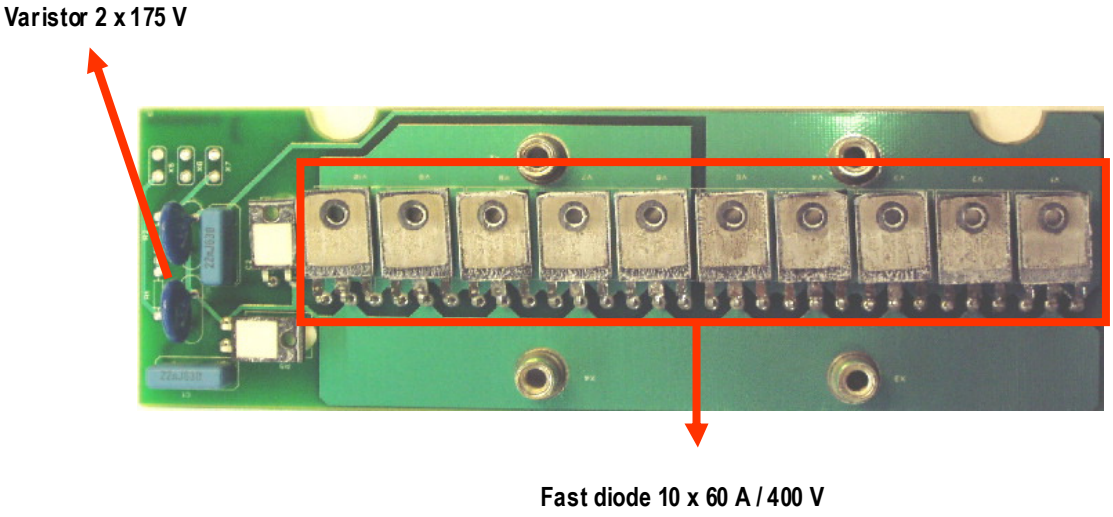
Connectors	
X1 and X2	Main transformer secondary
X3 and X4	Euro-connector
X5…X7	Machine size coding

Secondary diode card Z002 layout

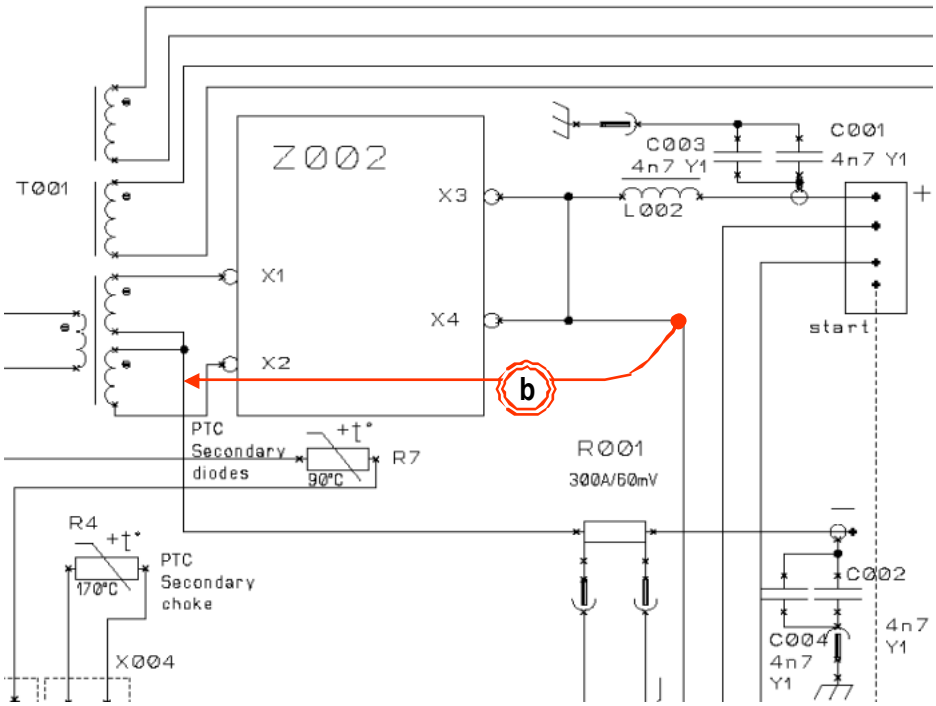




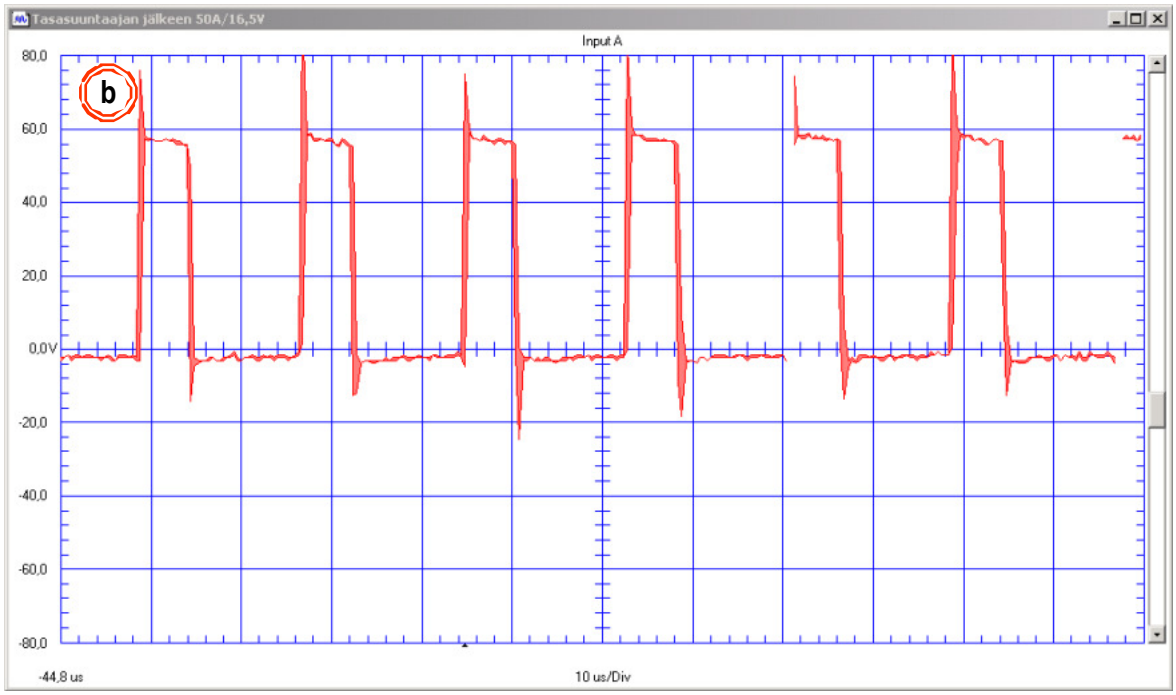
Secondary diode card Z002 layout



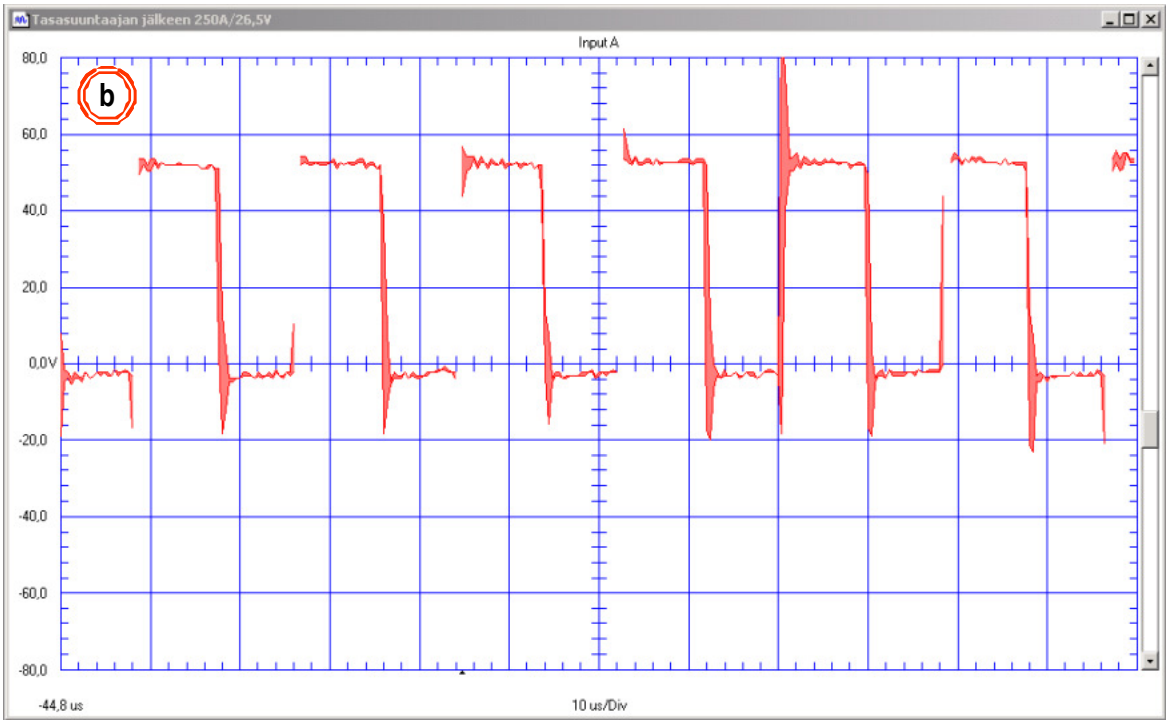
Voltage after the secondary diode card Z002



Voltage after the secondary diode card Z002

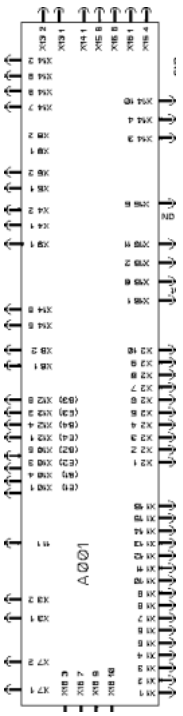


Voltage after the secondary diode card with values 50 A/16,5 V (Synergic curve 00), meas. point **b**.



Voltage after the secondary diode card with values 250 A/26,5 V (Synergic curve 00), meas. point **b**.

Control card A001 functions / connectors



The control card A001 has these operational blocks:

- RENESAS M16C26-microcontroller
- Panel connection
- Service bus (programming)
- Aux. voltages developement / - monitoring
- Power stage on/off-control
- Power stage PWM-control
- Primary current measuring
- Secondary current measuring
- Secondary voltage measuring
- Dynamics
- Ignition pulse
- Post Current
- Overheat protection
- Net overvoltage watch
- DC-link charging control
- Welding gun connection
- Wire feed control
- Solenoid valve control

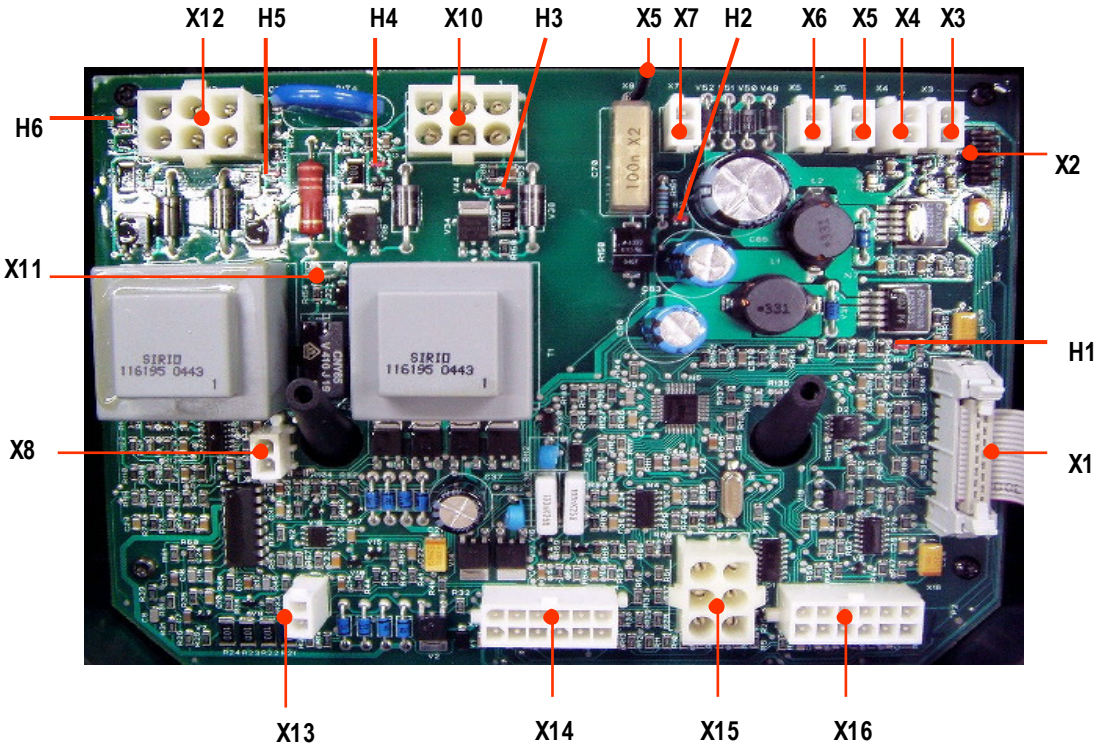
Connectors	
X1/1	CNVss
X1/2	Empty
X1/3	Empty
X1/4	Reset
X1/5	Empty
X1/6	Panelbus, (transmit)
X1/7	Empty
X1/8	Empty
X1/9	Serial bus 1, transmit
X1/10	Serial bus 1, receive
X1/11	Empty
X1/12	Empty
X1/13	Empty
X1/14	Panel bus, (receive)
X1/15	+ 5 V
X1/16	GND
X2/1	CNVss
X2/2	Empty
X2/3	GND
X2/4	Empty
X2/5	Empty
X2/6	Reset
X2/7	+ 5 V
X2/8	Empty
X2/9	Serial bus 1, transmit
X2/10	Serial bus 1, receive

Connectors	
X3/1,2	Charging relay
X4/1,2	PTC, sec. Diodes
X5/1,2	PTC, sec. Choke
X6/1,2	PTC, IGBT
X7/1,2	Aux. transformer secondary
X8	Empty
X9	Protective earth
X10/1	E1, IGBT
X10/2	Empty
X10/3	E2, IGBT
X10/4	G1, IGBT
X10/5	Empty
X10/6	G2, IGBT
X11	Intermediate circuit DC-voltage
X12/1	E4, IGBT
X12/2	Empty
X12/3	E3, IGBT
X12/4	G4, IGBT
X12/5	Empty
X12/6	G3, IGBT
X13/1,2	Shunt
X14/1	Sec. Voltage
X14/2	GND
X14/3	+ 5 V
X14/4	WF-motor tachometer
X14/5,6	Current transformer

Control card A001 connectors

Connectors	
X14/7-9	Machine size coding
X14/10	GND
X14/11	Empty
X14/12	Empty
X15/1	+ 24 V / Solenoid valve
X15/2	Empty
X15/3	Empty
X15/4	Solenoid valve
X15/5,6	Gun switch
X16/1	+ 15 V
X16/2	GND
X16/3	GND
X16/4	Empty
X16/5	Empty
X16/6	Wire feed on/off-control
X16/7	Cooling unit alarm
X16/8	Wf-motor current measuring
X16/9	+ 24 V
X16/10	Cooling unit on/off control
X16/11	Wf-motor speed set value
X16/12	Empty

Control card A001 layout



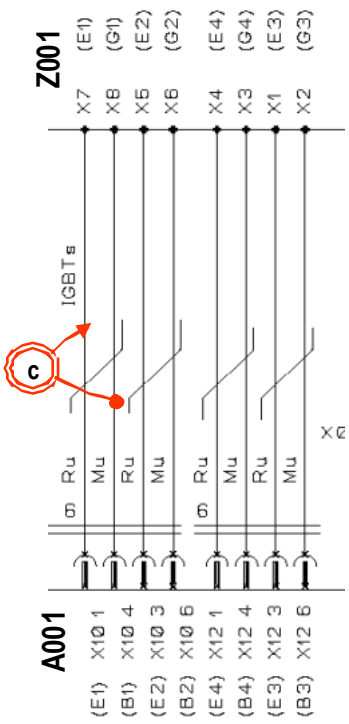
LEDs:

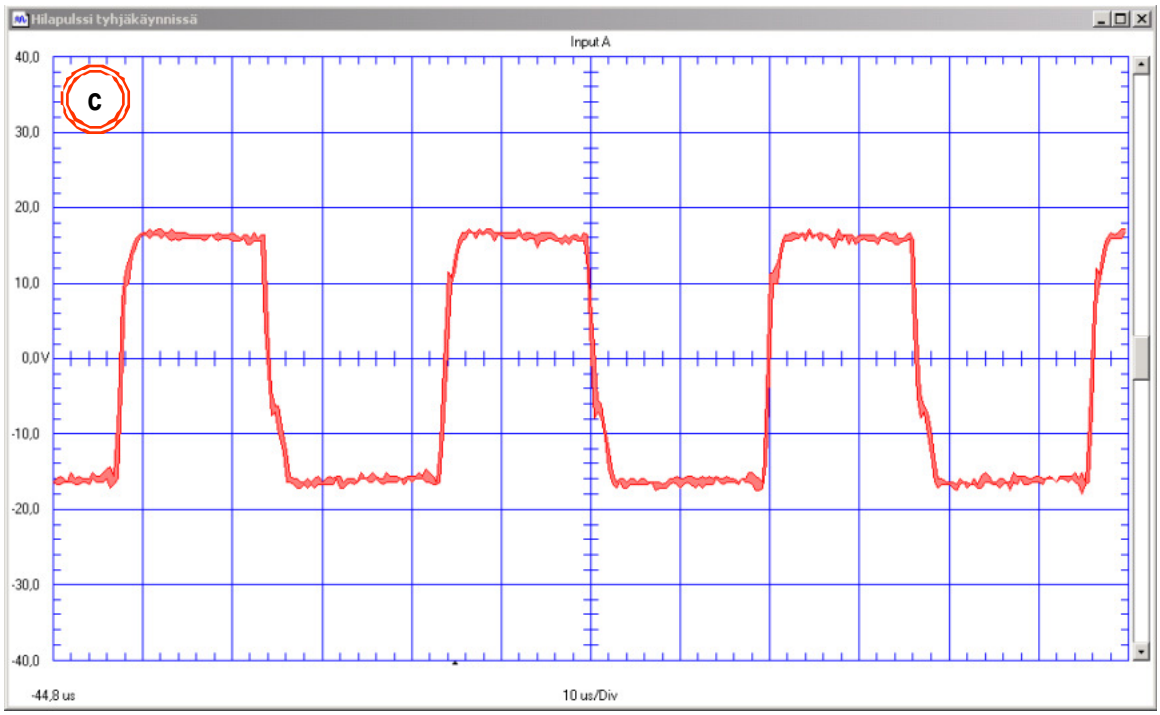
H1 + 5V

H2 + 15V

H3...H6 Gate pulses

IGBT gate pulses



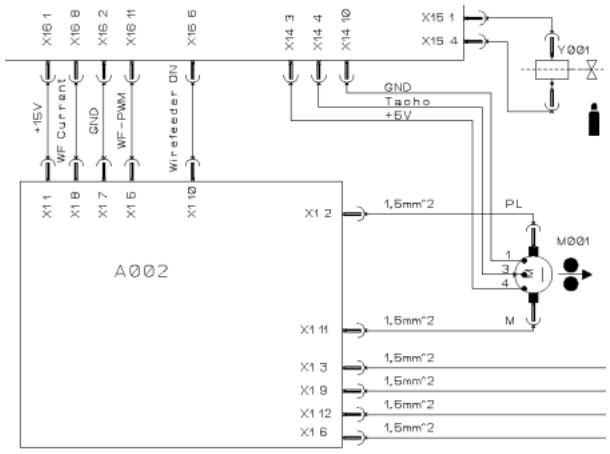


Gate pulse in idling, measuring point **c**.

Control card A002 functions / connections

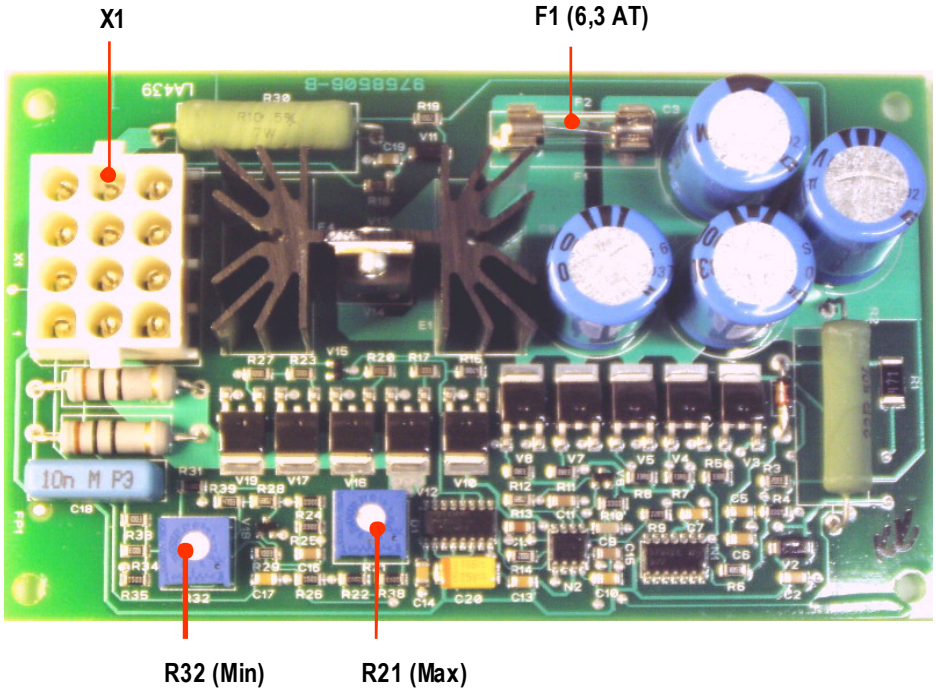
Control card A002 has these operational blocks:

- Wf-motor control (PWM)
- Power supply filtering
- Overvoltage protection

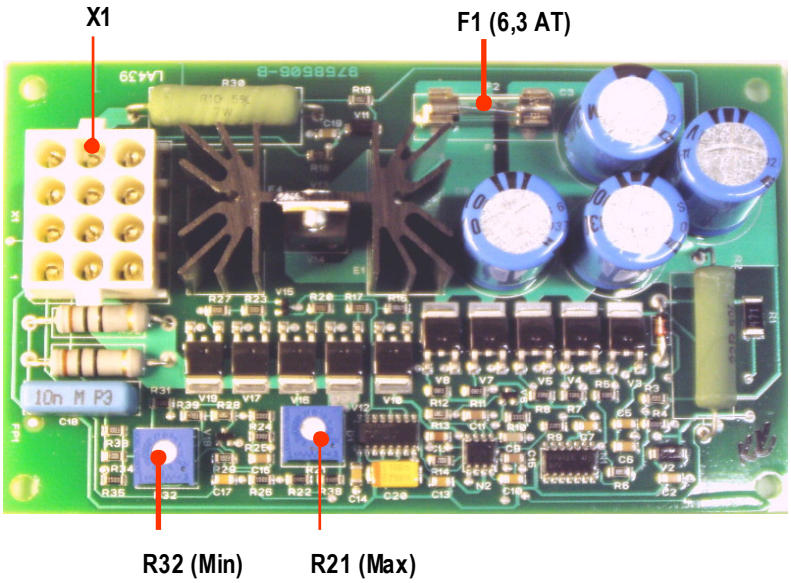


Connectors	
X1/1	+ 15 V
X1/2	Wf-motor plus
X1/3	Main transformer aux. coil
X1/4	+ 5 Vref2
X1/5	Wf-speed set value
X1/6	Main transformer aux. coil
X1/7	GND
X1/8	Wf-motor current
X1/9	Main transformer aux. coil
X1/10	Wire feed on/off control
X1/11	Wf-motor minus
X1/12	Main transformer aux. coil

Control card A002 layout



Wire feed speed minimum and maximum adjustments



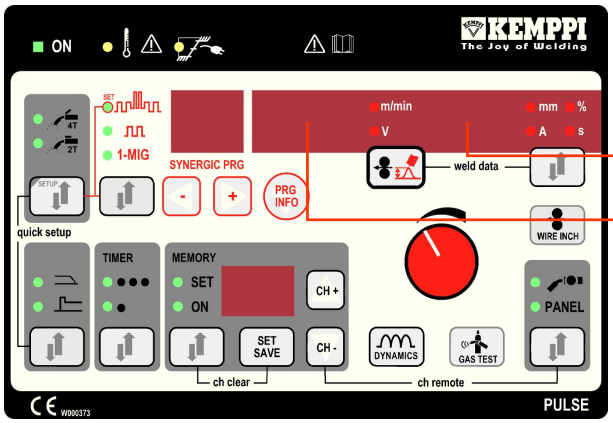
After replacing control card A002 or feed motor M001, the wf-speed has to be checked and adjusted as follows:

1. From panel, choose synergic curve 00
2. Connect the power source to a load bank
3. Set wf-speed to 18 m/min
4. Check the actual speed and if necessary, adjust by trimmer R21
5. From panel, set the speed to 1 m/min
6. Check the actual speed and if necessary, adjust it by trimmer R32
7. Re-check maximum and minimum

If not using load bank, you have to check creep start level because of without short circuit creep start won't upslope to the welding value:

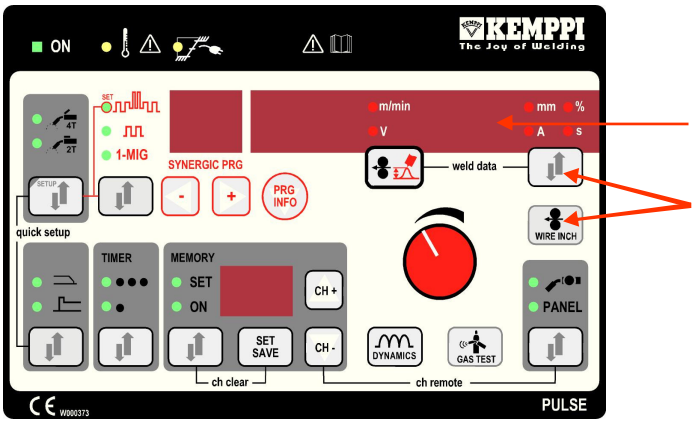
1. From panel, choose synergic curve 00
2. Set wf-speed to 18 m/min
3. Enter the setup and adjust parameter CSL value to 'syn'
4. When 'syn' is plinking you can see the creep start value (in case of welding value 18m/min, the actual value will be 12m/m)
5. Measure fed wire length and if necessary, adjust by trimmer R21
6. From panel, set the speed to 1 m/min (also creep start value will be 1m/min)
7. Measure fed wire and if necessary, adjust it by trimmer R32
8. Re-check maximum and minimum

Panel testing



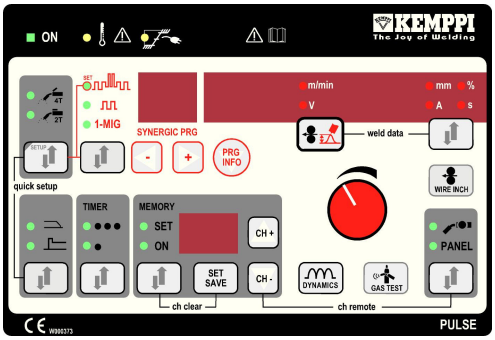
Panel switches, LEDs and displays can be tested. After turning the power source on (3 sec.) all LEDs and displays should be lighted and after pressing any of the buttons the program versions should be shown on the panel.

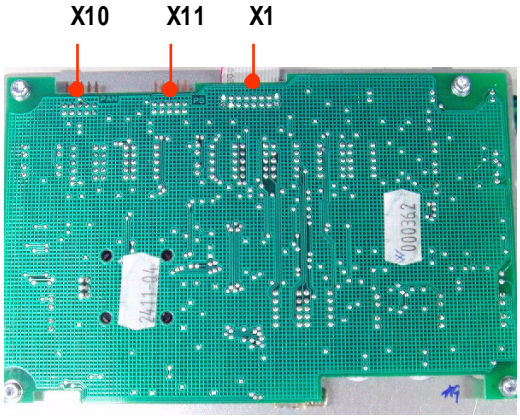
Wire feed motor current measuring



By pressing the Wire Inch-button and plate thickness-button simultaneously the motor M001 current will be seen on the right side of the display.

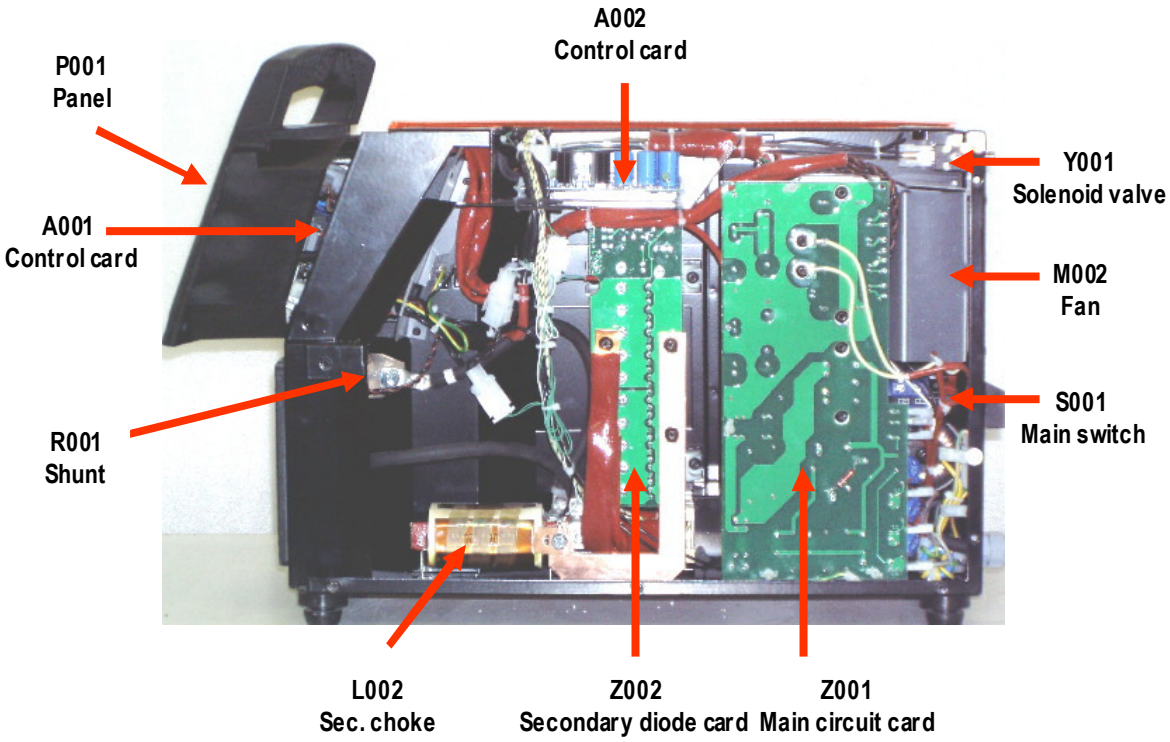
Panel layout





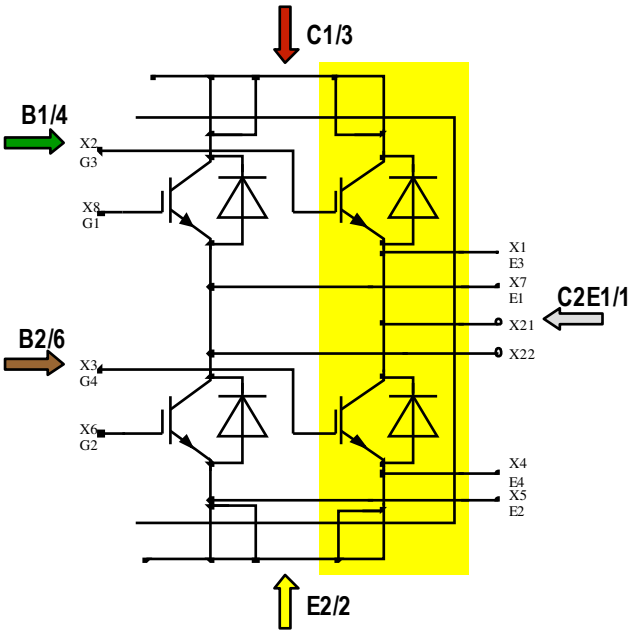
X1	Flat cable panel > power source
X10	Programming connector, panel
X11	Programming connector, power source

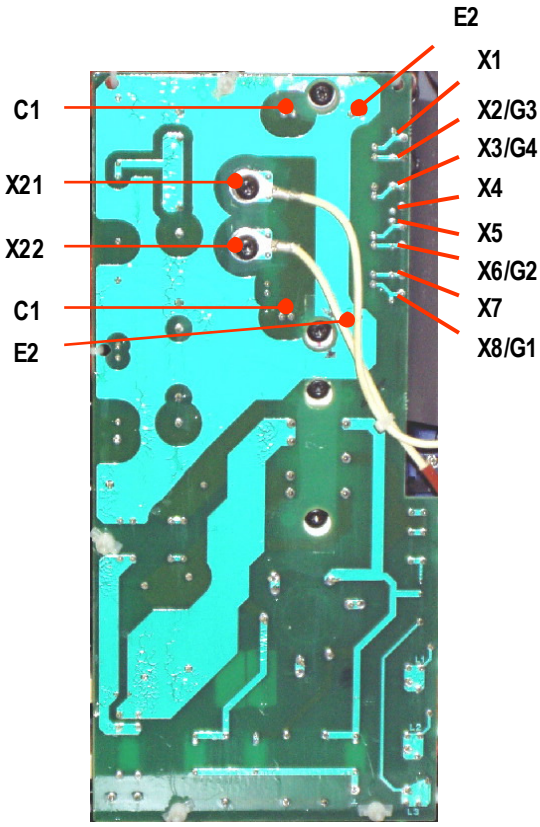
Structure

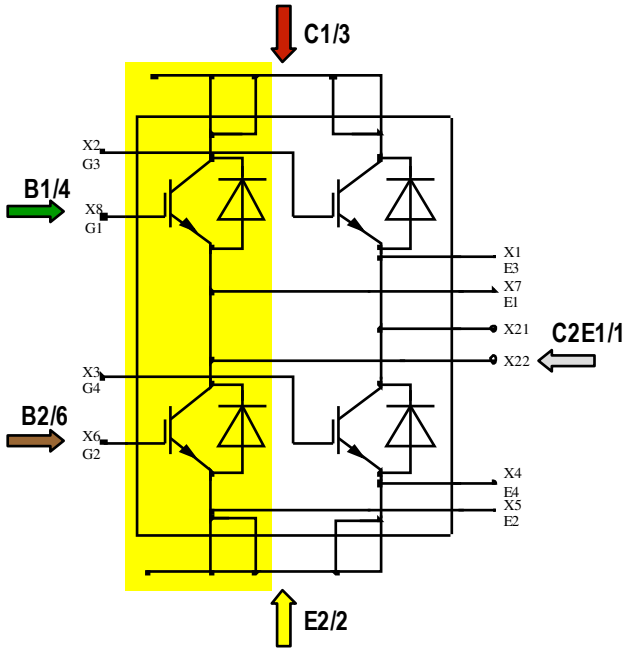

A002
Control card
P001
Panel
Y001
Solenoid valve
A001
Control card
M002
Fan
S001
Main switch
R001
Shunt
L002
Sec. choke
Z002
Secondary diode card
Z001
Main circuit card

IGBT testing

IGBT-module can be tested in two phases with an IGBT tester as seen in picture below:







IGBT replacement

IGBT mounting onto the heat sink

The installation surfaces must be clean, even very small particles (0,050mm) between the surfaces increase the gap between heat sink and module, causing module overheating and possibly destruction.

Heat transfer paste is spread as an even layer about 0,1 mm thick, onto the modules base plate. The module is immediately attached to the heat sink, in order to avoid any dirt to get between the components.

At first all M5 screws are tightened carefully to torque of **0,5…2 Nm,** after which the module can be tightened to the nominal torque of **3 Nm**.

After a few minutes the screw torques are checked again to be **3 Nm**.

Notes