Service Manual

KempGouge™ ARC 800

KEMPPI
The Joy of Welding

Table of contents

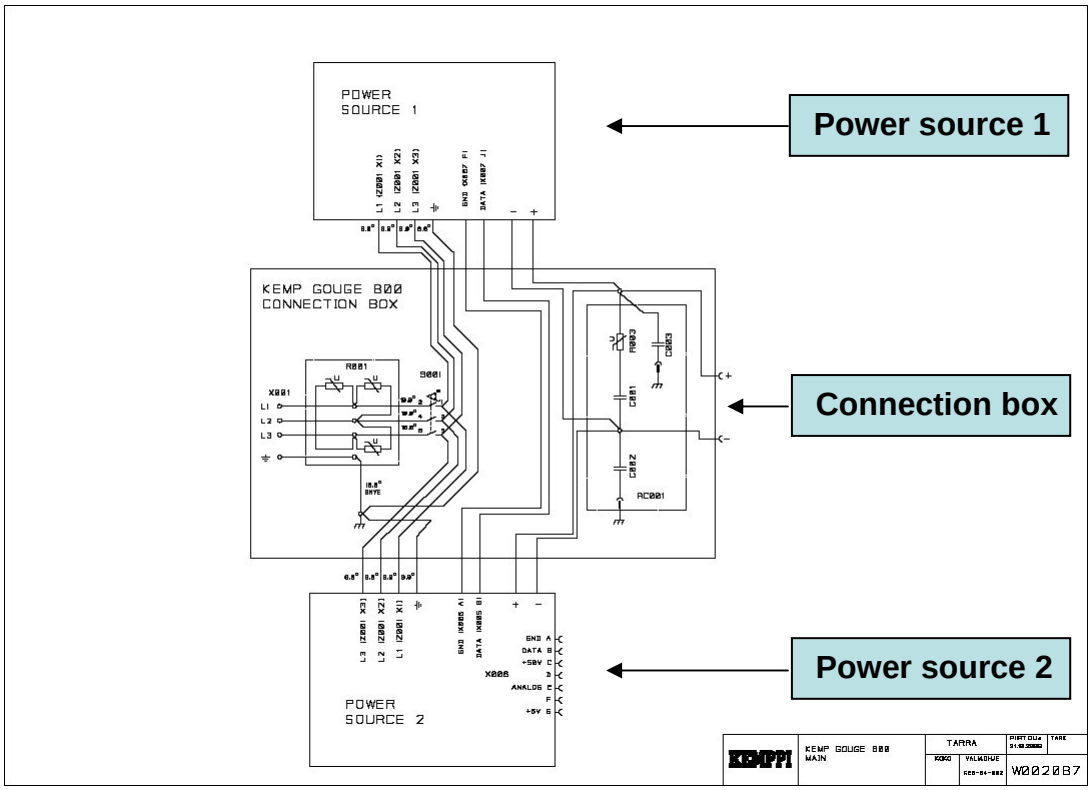
General

- In carbon arc gouging metal is removed by melting it with an arc and blowing the molten metal away from the object with compressed air.
- A carbon rod is used as an electrode which can be either round or flat inshape.
- KempGouge™ ARC 800 suitable for all types of carbon arc gouging.
- 800-ampere power source with control panel.
- Power sources can be connected to the mains supply of 400 V 3~.
- The whole system weight is 115 kg with the transport unit which enable easy moving from one job to another.

Technical data

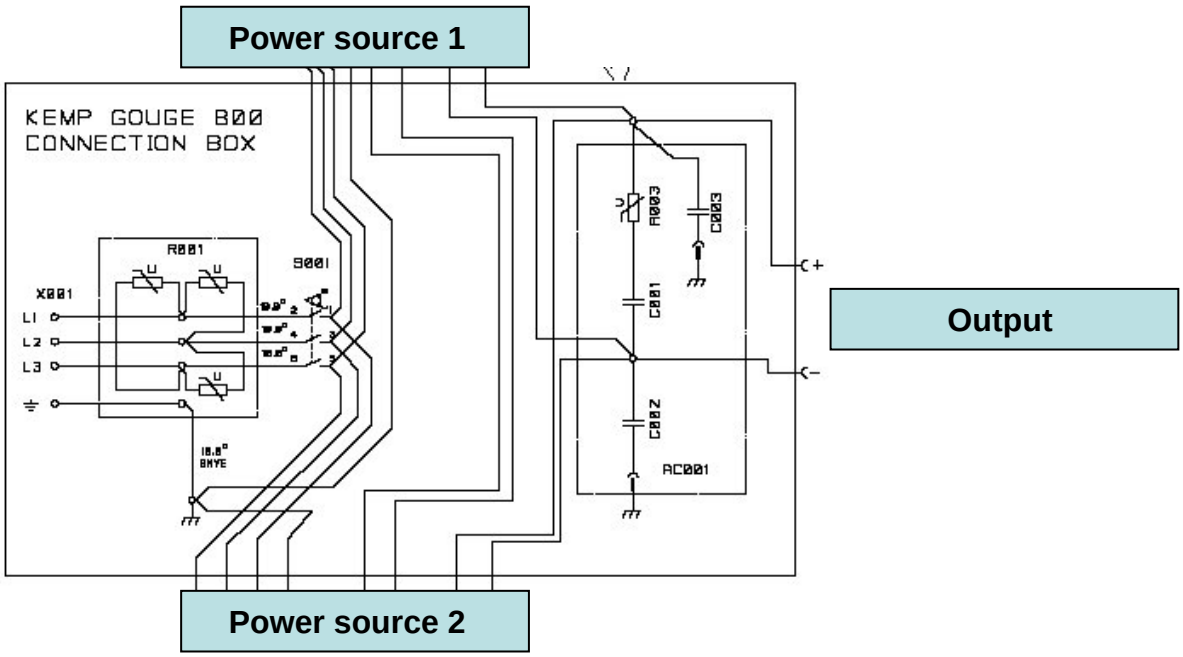
KempGouge ARC 800		400 V
Connection voltage 3~ 50/60 Hz		400 V, -15..+20%
Rated power	50% ED	44 kVA
	100% ED	35 kVA
Primary current	50% ED I_{1max}	65 A
	100% ED I_1	51 A
Connector cable		H07RN-F 4G16 (16 mm²)
Fuse (recommended)		63 A delayed
Idle power		120 W
Efficiency		0.90
Power factor		0.90
Load capacity at 40°C	50% ED	800 A / 44 V
	100% ED	600 A / 44 V
Current adjustment range		20 A ... 800 A
Open circuit voltage		50 V
Gouging carbon		max. size ø 13 mm
Recommended pressure of the compressed air		500 ... 700 kPa (5 ... 7 bar)
Storage temperature range		-40 - +60°C
Operating temperature range		-20 - +40°C
Degree of protection		IP23S
Dimensions (without/with transport unit)	Length	590/700 mm
	Width	230/660 mm
	Height	885/1,400 mm
	Weight	94/115 kg
Maximum load of lifting lug		200 kg

Main circuit diagram



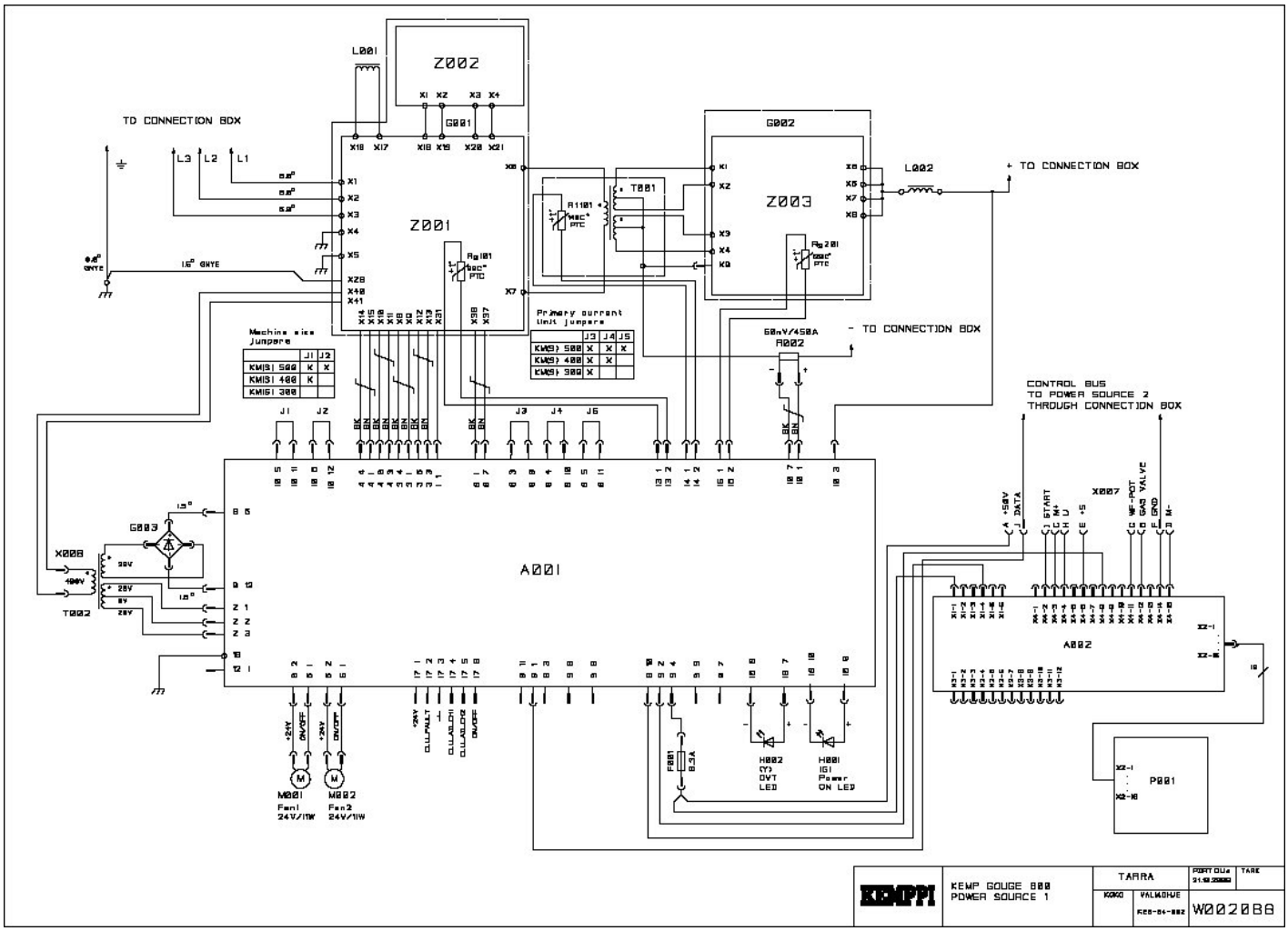
Kemppi KEMPGouge 800 power source is basically one FastMig KM 400 (referred power source 1) and one FastMig KMS 400 (referred as power source 2) power source connected in parallel. Mains voltage is delivered to the power sources 1 and 2 through Connection box which also contains output connectors of the power source.

Connection box



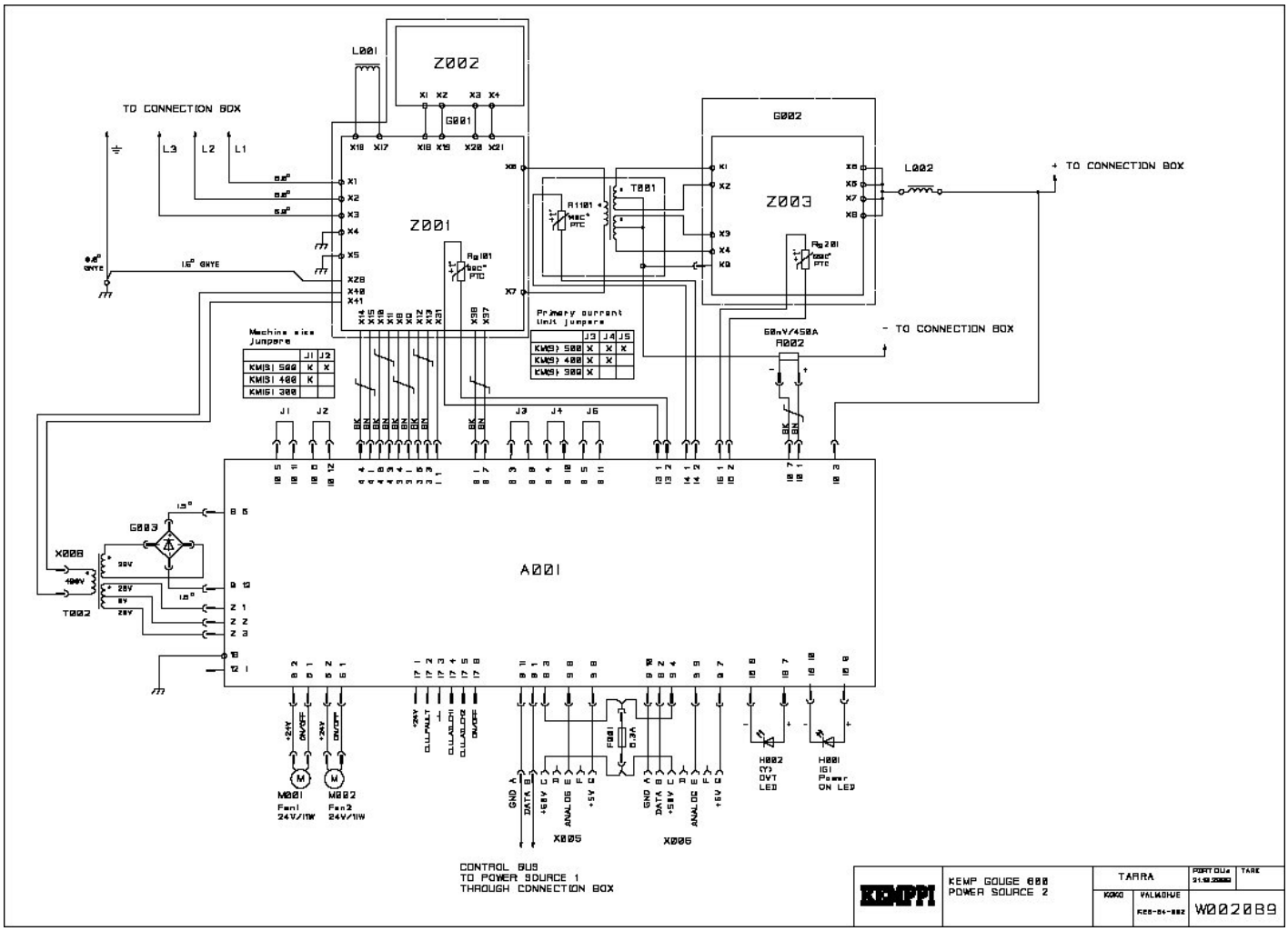
Mains voltage is delivered to the Power Sources 1 and 2 through the Connection Box. Main switch (S001) disconnects power source from the mains and the varistors (R001) protect power source from the low energy voltage spikes. After main switch the voltage branches to power sources 1 and 2. Outputs of power sources 1 and 2 are connected in parallel in connection box and then connected to the output connectors. Capacitors (C002, C003) and varistor (R003) in series with capacitor (C001) reduce radio frequency interference and provide protection against TIG ignition spark.

Power source 1



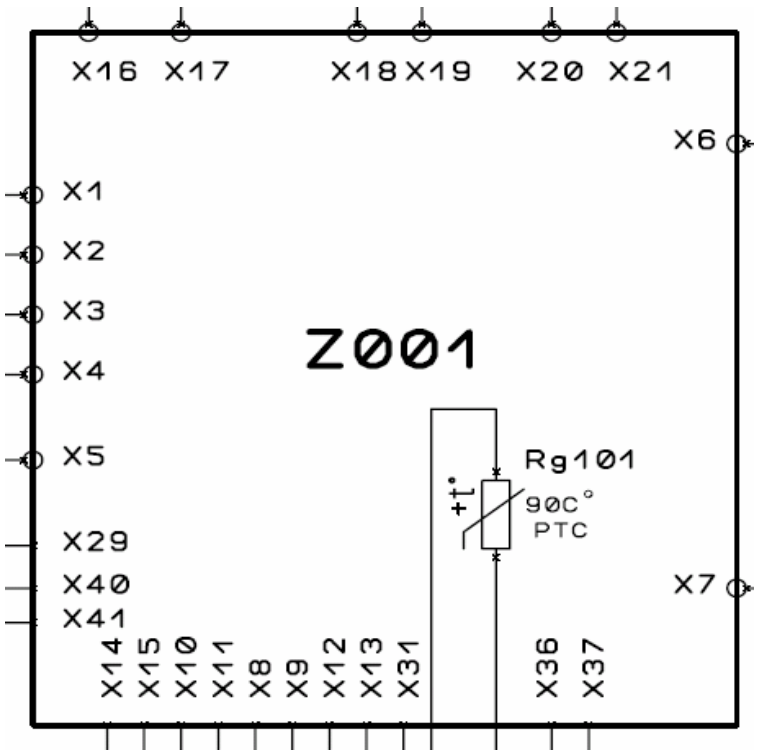
Power source 1 is slightly modified version of FastMig KM 400. The main switch and output connectors are removed. Secondary unit is replaced with KMS 400 secondary unit. Control card A001 is modified version of KMS control card. The purpose of A002 is to provide operating voltage and interface to the system bus for the panel P001.

Power source 2



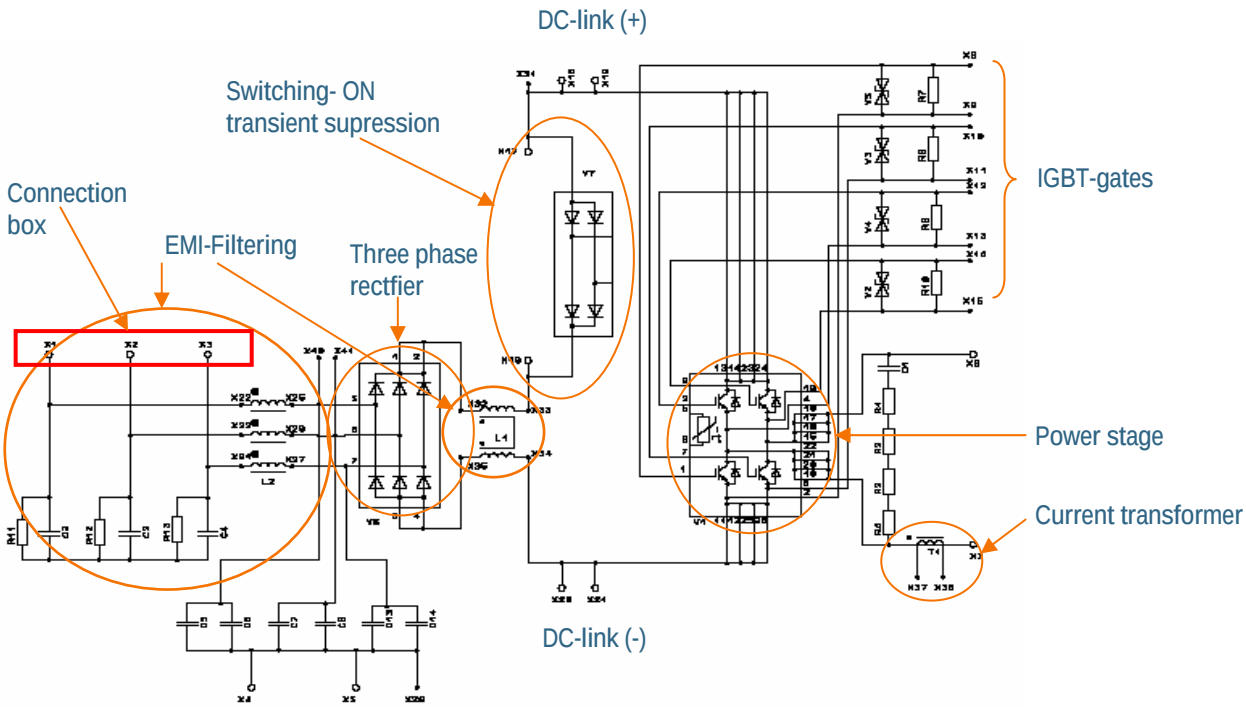
Power source 2 is slightly modified version of FastMig KMS 400. The main switch and output connectors are removed. Control card A001 is modified version of KMS control card. Second system bus connector is removed from the back panel and is used to connect power source 2 to power power source 1. This connection is done through connection box. Second system bus connector is left to the front panel. This connector can be used to update software in the system.

Main circuit card Z001



- EMI filtering
- Three phase rectifier (V6)
- Switching-ON transient suppression
- Power Stage
- Current transformer (T1)

Main circuit card Z001



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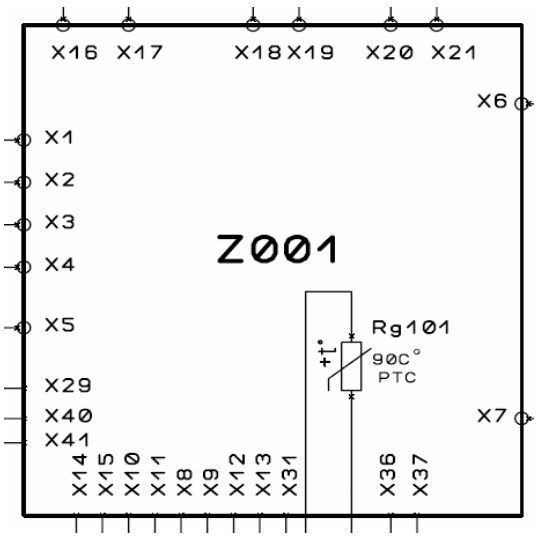
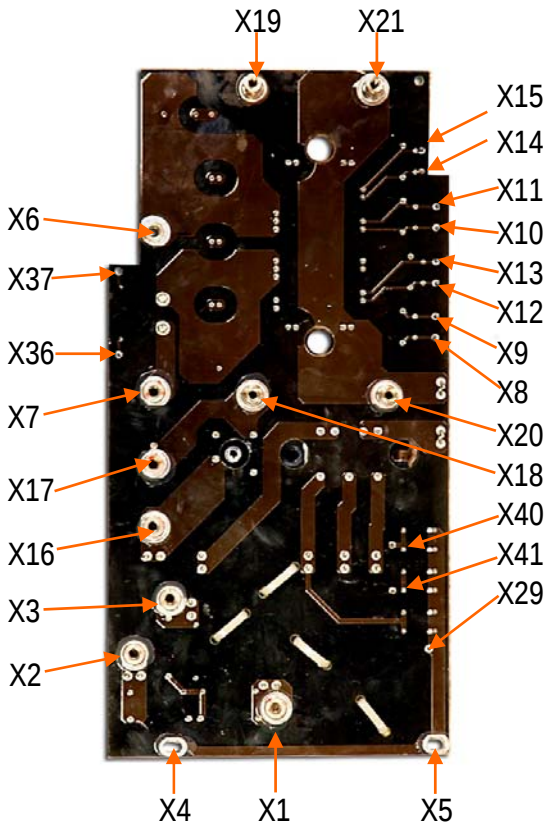
Main circuit card Z001





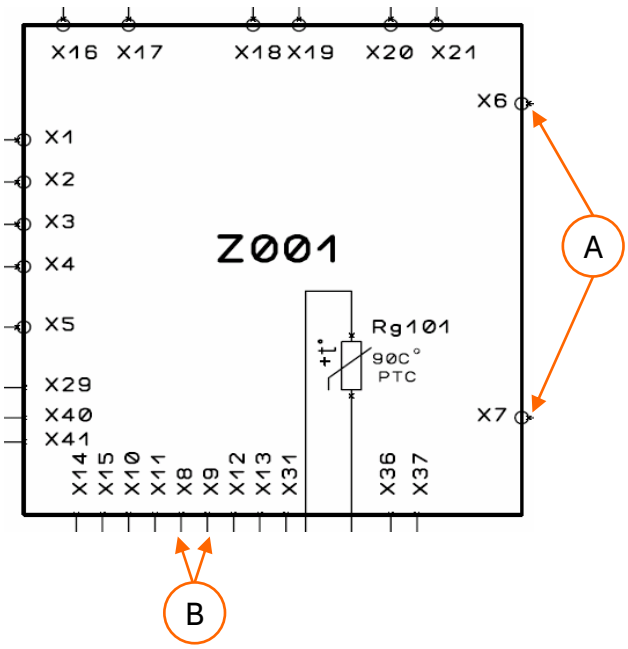
Connectors

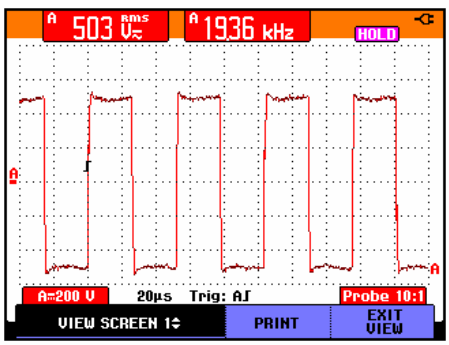
Z001 connectors / signals	
X1	Main switch
X2	Main switch
X3	Main switch
X4	Chassis ground
X5	Chassis ground
X6	Main transformer
X7	Main transformer
X8	IGBT gates and emitters
X9	IGBT gates and emitters
X10	IGBT gates and emitters
X11	IGBT gates and emitters
X12	IGBT gates and emitters
X13	IGBT gates and emitters
X14	IGBT gates and emitters
X15	IGBT gates and emitters

Z001 connectors / signals	
X16	Primary choke
X17	Primary choke
X18	DC-link voltage (+)
X19	DC-link voltage (+)
X20	DC-link voltage (-)
X21	DC-link voltage (-)
X29	Chassis ground
X36	Current transformer secondary
X37	Current transformer secondary
X40	Auxiliary transformer
X41	Auxiliary transformer

Main circuit card Z001

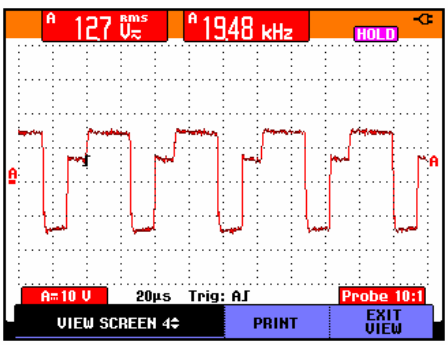
Operational measurings





A.

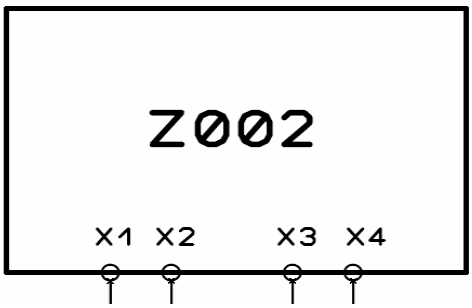
Main transformer T001 primary voltage, set values 50 A/16,5 V



B.

IGBT-gate pulses, set values 50 A/16,5 V

Capacitor card Z002

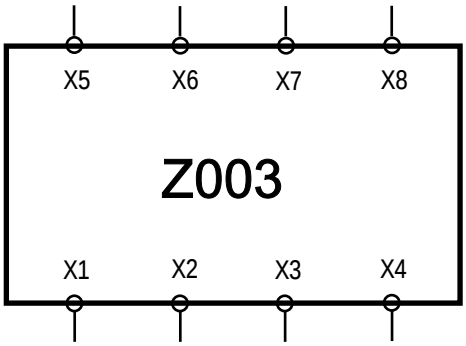


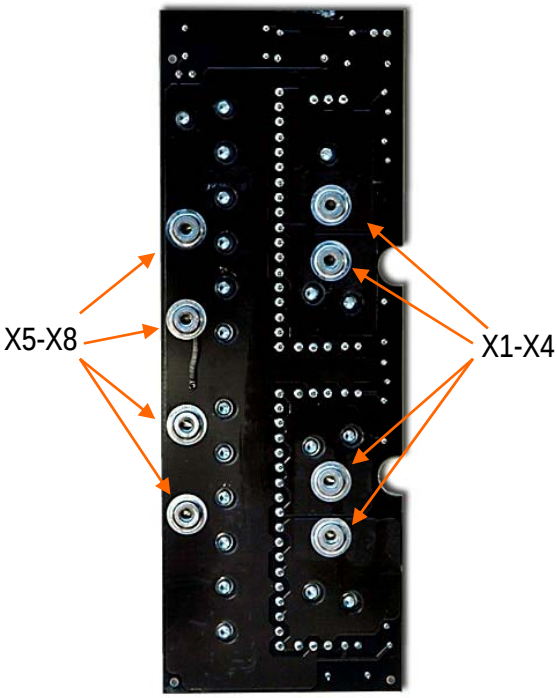
- Energy storage
- Discharging

Connectors

Z002 connectors / signals	
X1	DC +
X2	DC +
X3	DC -
X4	DC -

Secondary rectifier card Z003





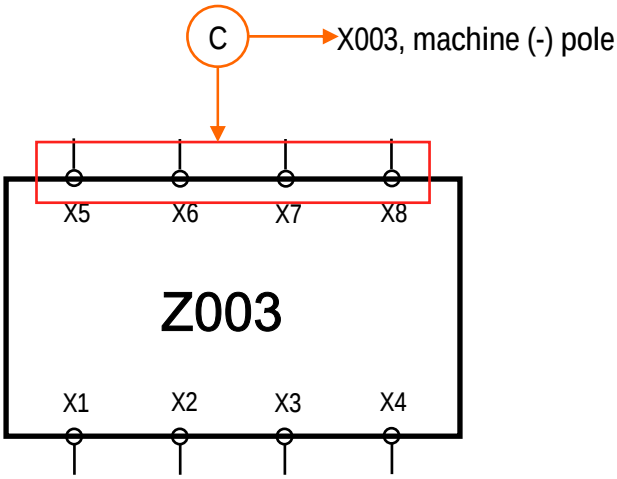
- Rectifying
- Snubber
- Protection against HF

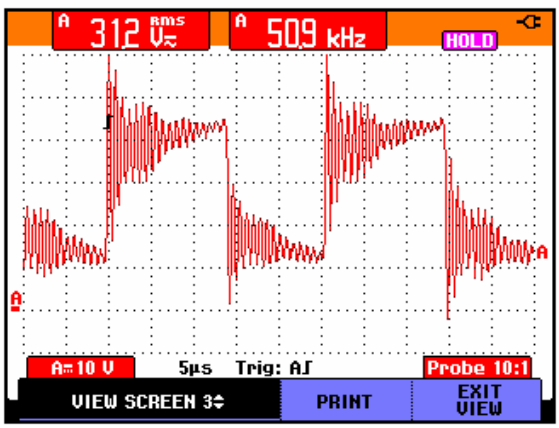
Connectors

Z003 connectors / signals	
X1	Main transformer secondary
X2	Main transformer secondary
X3	Main transformer secondary
X4	Main transformer secondary
X5	Secondary choke
X6	Secondary choke
X7	Secondary choke
X8	Secondary choke

Secondary rectifier card Z003

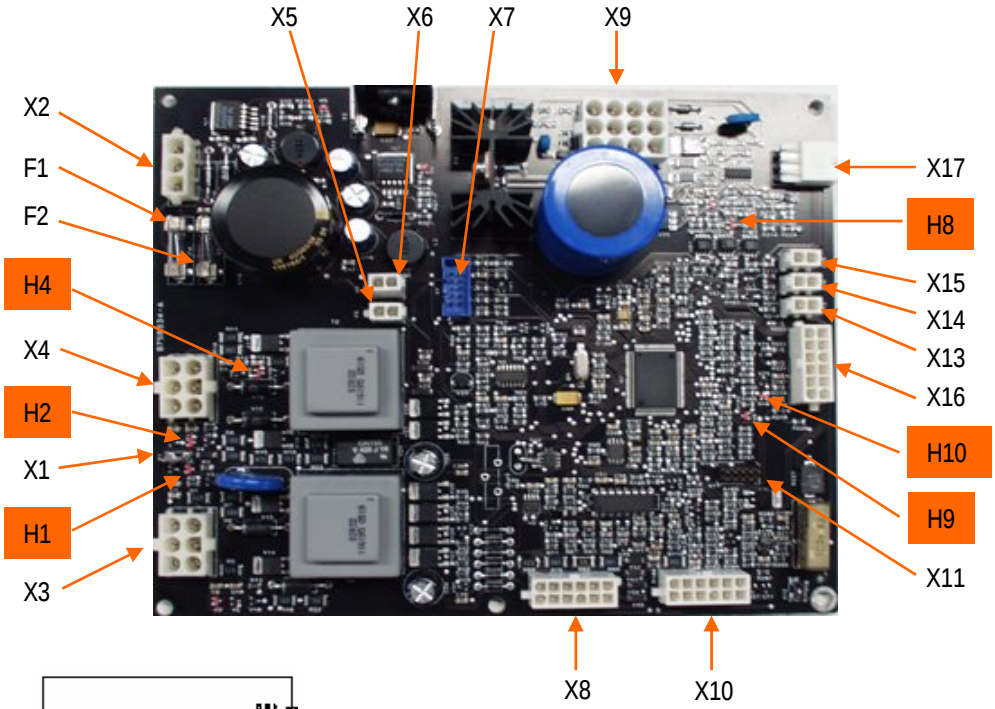
Operational mesurings

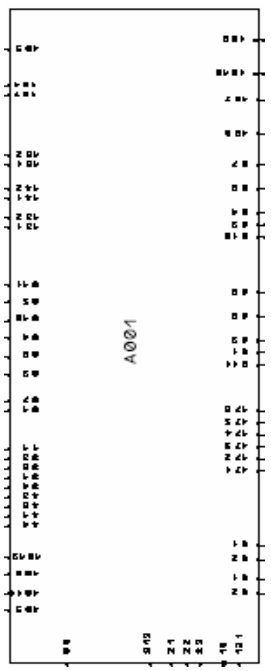




C.
Voltage after secondary rectifier card Z003,
set values 50 A/16,5 V

Control card A001





- Microcontroller
- PWM circuit
- Secondary voltage measurement
- Secondary current measurement
- IGBT drive
- Auxiliary power supply
- Machine size jumpers (J1, J2)
- Primary current limit jumpers (J3, J4, J5)
- Operational jumpers
- LED's

Control card A001

Connectors

A001 / X1	
X1	DC-link voltage (+)

A001 / X2	
X2/1	20V auxiliary voltage~
X2/2	20V auxiliary voltage ground
X2/3	20V auxiliary voltage~

A001 / X3	
X3/1	IGBT emitter
X3/3	IGBT emitter
X3/4	IGBT gate
X3/6	IGBT gate

A001 / X4	
X4/1	IGBT emitter
X4/3	IGBT emitter
X4/4	IGBT gate
X4/6	IGBT gate

A001 / X5	
X5/1	Fan (-) (M002)
X5/2	Fan (+) (M002) 24 VDC

A001 / X6	
X6/1	Fan (-) (M001)
X6/2	Fan (+) (M001) 24 VDC

A001 / X7	
X7	Production programming bus

A001 / X8	
X8/1	Current transformer ~
X8/3	Primary current limit jumper (J3)
X8/4	Primary current limit jumper (J4)
X8/5	Primary current limit jumper (J5)
X8/6	-
X8/7	Current transformer ~
X8/9	GND (Primary current limit jumper J3)
X8/10	GND (Primary current limit jumper J4)
X8/11	GND (Primary current limit jumper J5)
X8/12	-

A001 / X9 / PS1	
X9/1	System bus DATA
X9/2	System bus DATA to control card A002/X4-8
X9/3	-
X9/4	+ 50 V
X9/5	G003 + 38 VDC
X9/7	-
X9/8	-
X9/9	-
X9/10	Connection A002 X1/4
X9/12	G003 –

A001 / X9 / PS2		
X9/1	System bus DATA B	(X005)
X9/2	System bus DATA B	(X006)
X9/3	+50V	(X005)
X9/4	+50V	(X006)
X9/6	+5V	(X005)
X9/7	+5V	(X006)
X9/8	Analog DATA	(X005)
X9/9	Analog DATA	(X006)
X9/10	GND	(X006)
X9/11	GND	(X005)

Control card A001

Connectors

A001 / X10	
X10/1	Shunt (+)
X10/2	-
X10/3	To connection box (+)
X10/4	-
X10/5	Machine size jumper J1
X10/6	Machine size jumper J2
X10/7	Shunt (-)
X10/8	-
X10/9	-
X10/10	-
X10/11	GND(Machine size jumper J1)
X10/12	GND(Machine size jumper J2)

A001 / X11	
J6	-
J7	Device number jumpers
J8	Device number jumpers
J9	-

A001 / X13	
X13/1	PTC, Rg 101 (Z001)
X13/2	PTC, Rg 101 (Z001)

A001 / X14	
X14/1	PTC, Rt 101 (T001)
X14/2	PTC, Rt 101 (T001)

A001 / X15	
X15/1	PTC, Rg 201 (Z003)
X15/2	PTC, Rg 201 (Z003)

A001 / X16	
X16/7	H002 + (yellow led) over temperature
X16/8	H002 -
X16/9	H001 + (green led) power on
X16/10	H001 -

A001 / X17	
X17/1	+24V
X17/2	CLU_fault
X17/3	GND
X17/4	CLU_AD_CH1
X17/5	CLU_AD_CH2
X17/6	ON/OFF

Control card A001

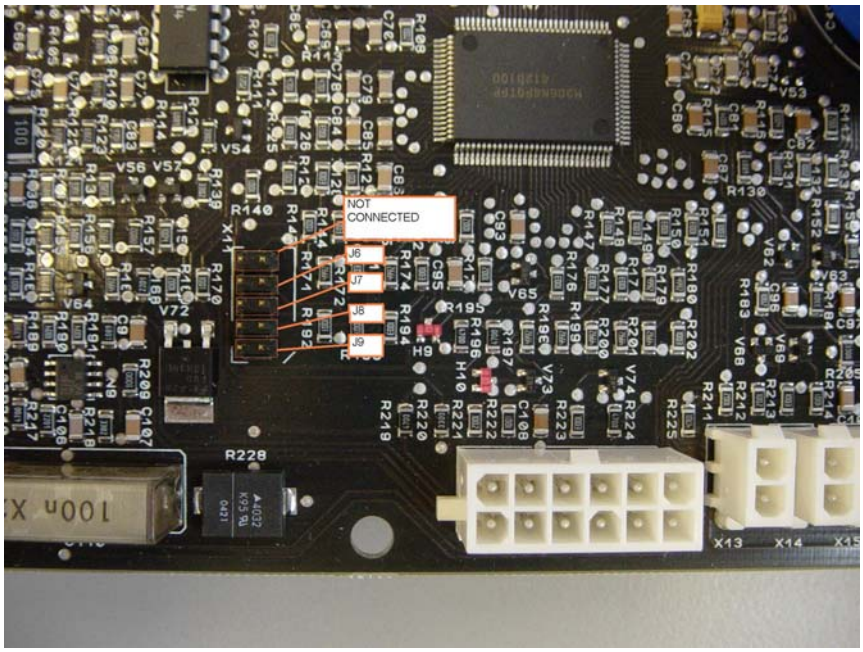
Operation of the LEDs on control card

A001 / LEDS	
H1	IGBT gate pulses
H2	IGBT gate pulses
H3	IGBT gate pulses
H4	IGBT gate pulses
H5	+15V
H6	+5V
H8	Data communication
H9	Micro controller operation
H10	Micro controller operation

H1-H4: Indicate the existence of the gate pulses.
H5, H6: Indicate that auxiliary voltages exist (+5V and +15V). If these Leds are not lit when the power source is switched on, first thing to do is check if control card fuses are OK.
H8: Indicates that there is data communication taking place through the system bus when it is lit.
H9, H10: Indicate state of the microcontroller. In normal situation both leds should be lit.

Control card A001

Jumper settings



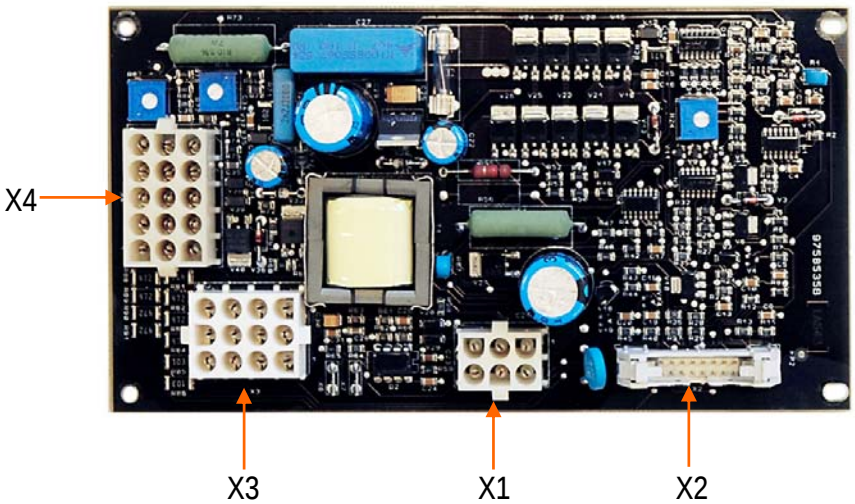
Operation of the Jumpers J7-J8 (Connector X11 on control card A001):
Power sources 1 and 2 has to have different device numbers in the system.
Device number is given using jumpers J7 and J8 as follows:

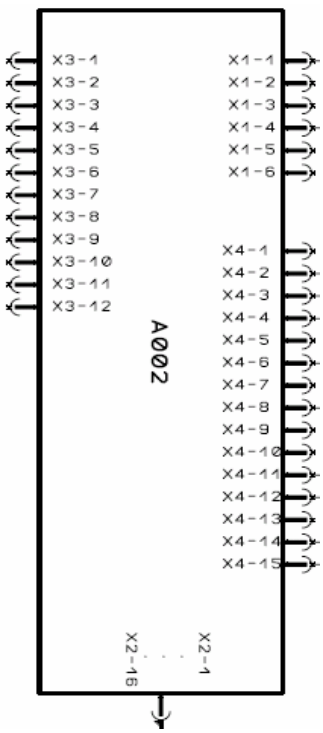
- J7 not placed, J8 not placed -> Device number 2
- J7 placed, J8 not placed -> Device number 13
- J7 not placed, J8 placed -> Device number 14
- J7 placed, J8 placed -> Device number 15

Limitations:
- Power source 1 must have device number 2.
- Power source 2 can have device numbers 13, 14 or 15.

Control card A002

Connectors





- Connection to the panel card P001
- Fuse

Control card A002

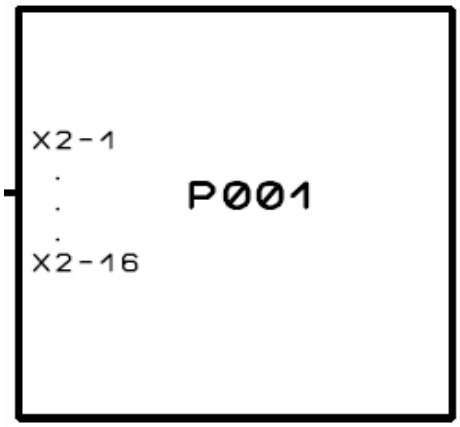
Connectors

A002 / X1	
X1/1	Connection to A001, X9/4
X1/4	Connection to A001, X9/10

A002 / X2	
X2	Connection to panel card

A002 / X4	
X4/2	Start
X4/3	M +
X4/4	U-measurement
X4/6	+5V
X4/8	Connection to A001 X9/2
X4/11	-
X4/12	Valve
X4/14	GND
X4/15	M-

Panel card P001

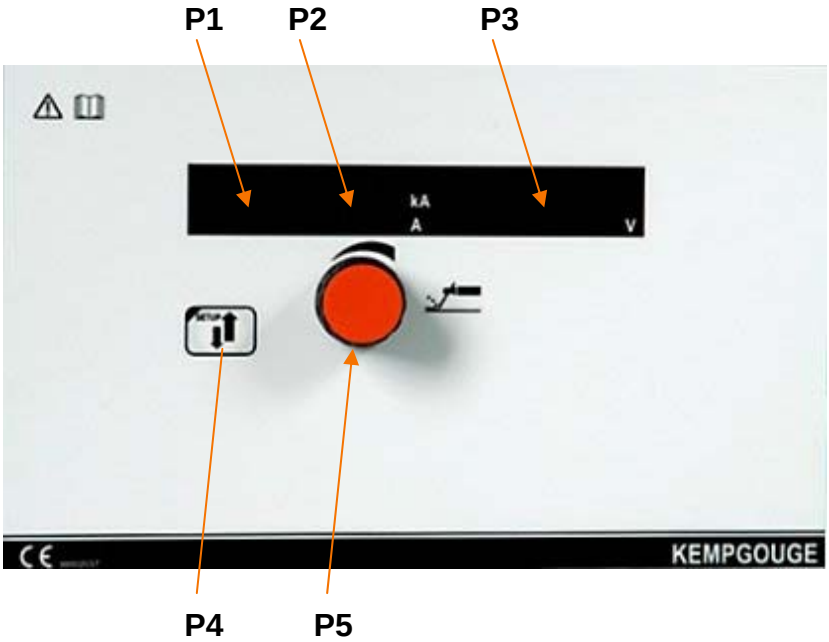


- Main micro controller
- User interface (buttons, potentiometers, display)
- Connection to the A002

Connectors

P001 / X2	
X2	Connection to A002

Control panel



P1	Left display (gouging current or name of adjustable parameter)
P2	Indicator lights for the current area
P3	Right display (gouging voltage or value of adjustable parameter)
P4	Setup button
P5	Control knob (gouging current adjustment, factory reset)

User Setup menu:

Parameters:
FAC (restore factory settings)

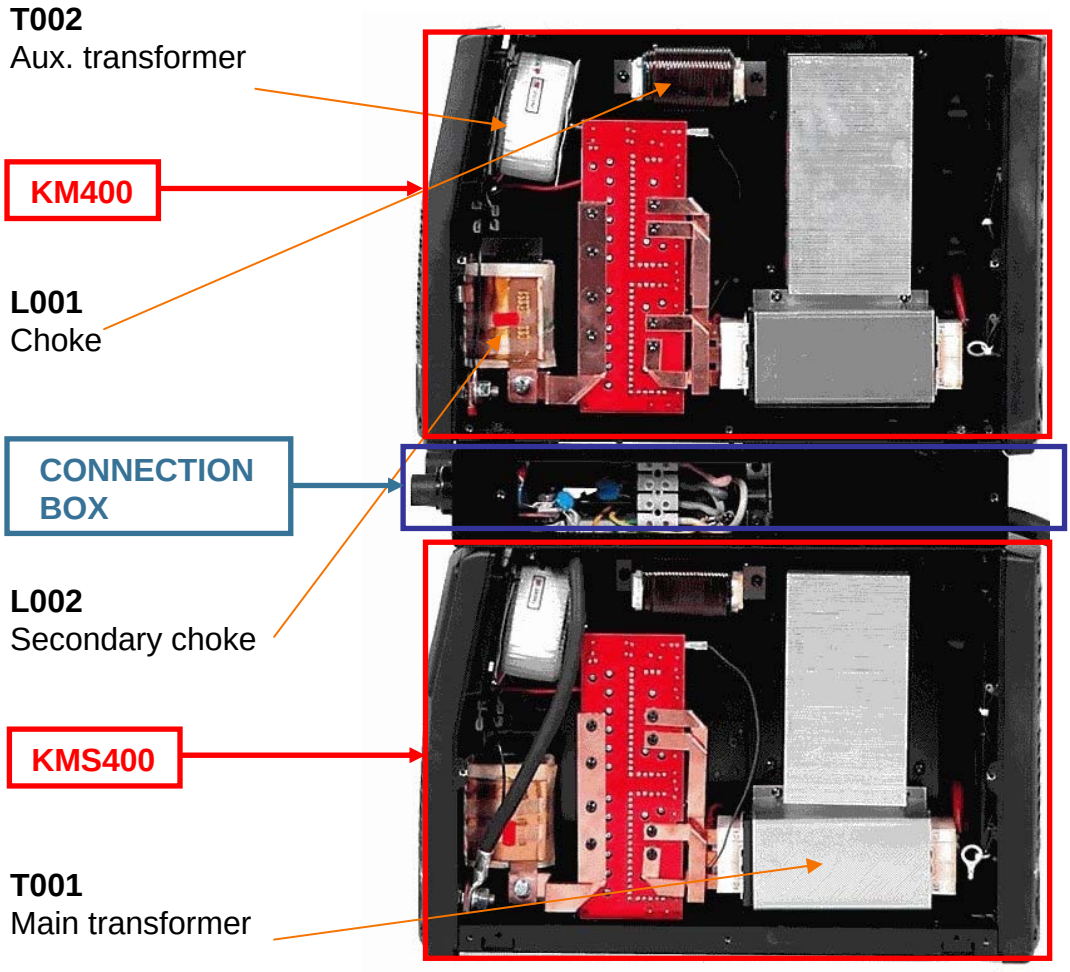
1. Press Setup-button P4 (~5s)
2. Select by Control knob ”FAC ALL”
3. Press Setup-button

Error codes

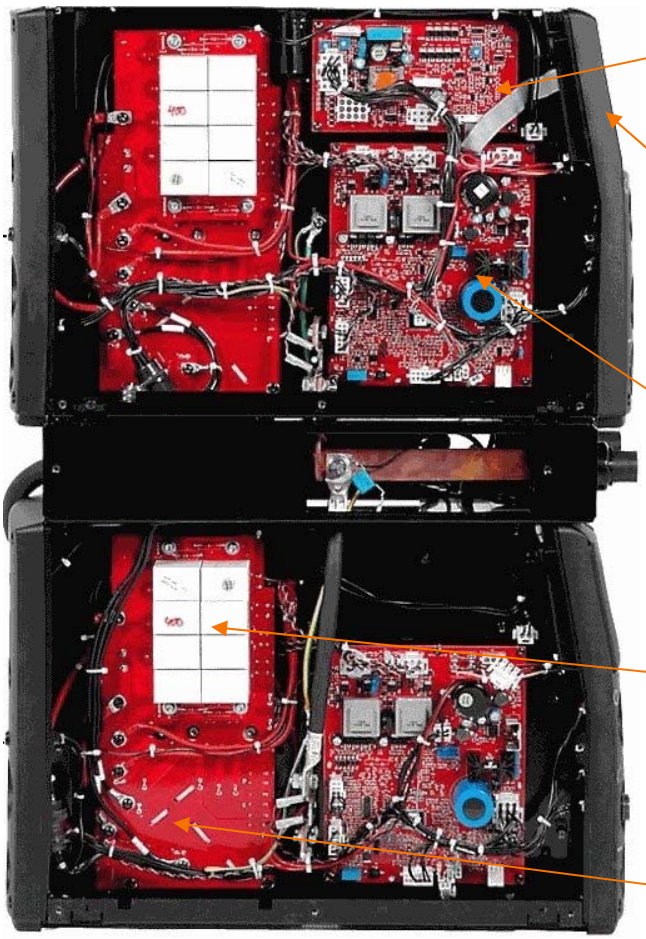
Power source	1…….50
User interface	201……250
DLI	251……255
Others	0…….999

Err 2:	Power source undervoltage (new start up)
Err 3:	Power source overvoltage (new start up)
Err 4:	Power source is overheated
Err 11:	Two units have the same address in the system bus
Err 12:	Data error on communication
Err 13:	Member of a wrong FastMIG family connected
Err 14:	Data communication problem between power source and auxiliary unit
Err 15:	Power source program / updating method problem
Err 21:	Power source´s control card +5 V aux. Voltage too low
Err 22:	Power source´s control card +15 V aux. Voltage too low
Err 23:	Temporarily power source overvoltage
Err 31:	Power source calibration error. Welding only possible with default values.
Err 205:	Error on setting current. Perhaps one of the power sources are not operational
Err 221:	Data error of the panel (1)
Err 222:	Data error of the panel (2)
Err 223:	Data error of the panel (3)
Err 224:	Data error of the panel (4)
Err 225:	Program updating problem.
Err 241:	EEPROM is faulty
Err 251:	DLI data communication error(another unit in the bus is using same code=conflict)
Err 252:	DLI data error (2)
Err 254:	DLI data communication error(connection to other units has been interrupted(maybe bad connectors or cable damages)
Err 255:	DLI data communication error(program update problem, maybe a wrong program version etc.
Err 0, 999:	Unidentified error (system bus has sent an error message not identified by the panel)

Construction



Construction



A002
Control card

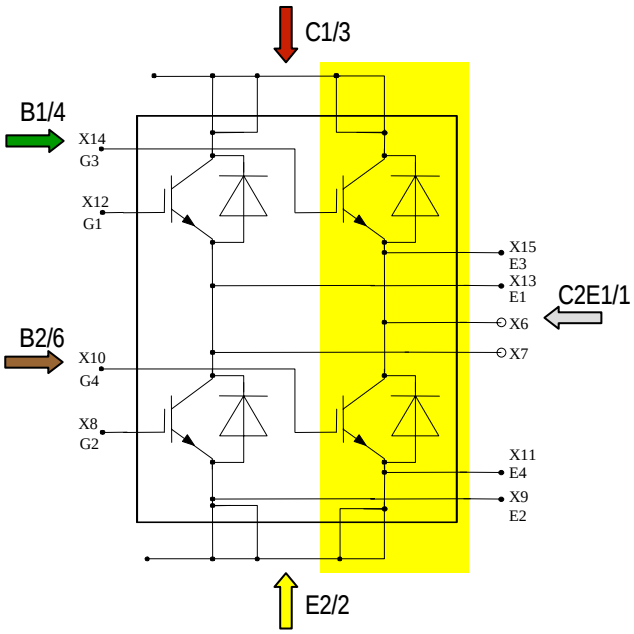
P001
Panel card

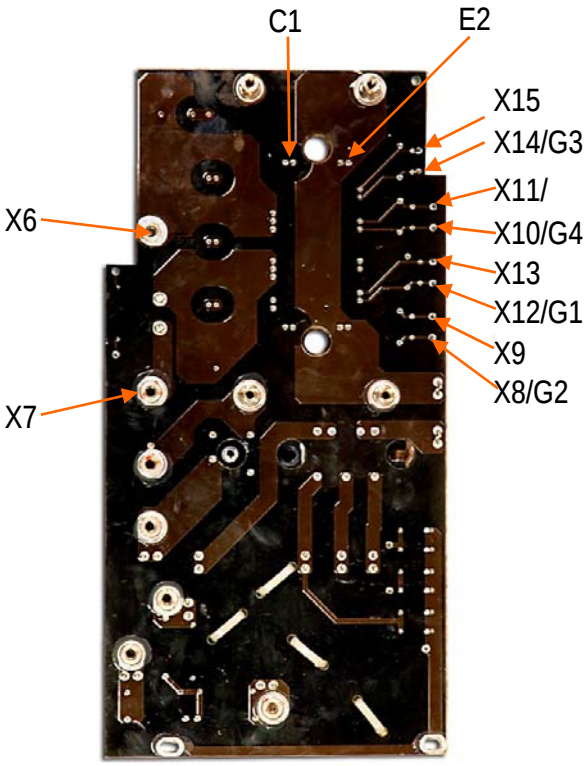
A001
Control card

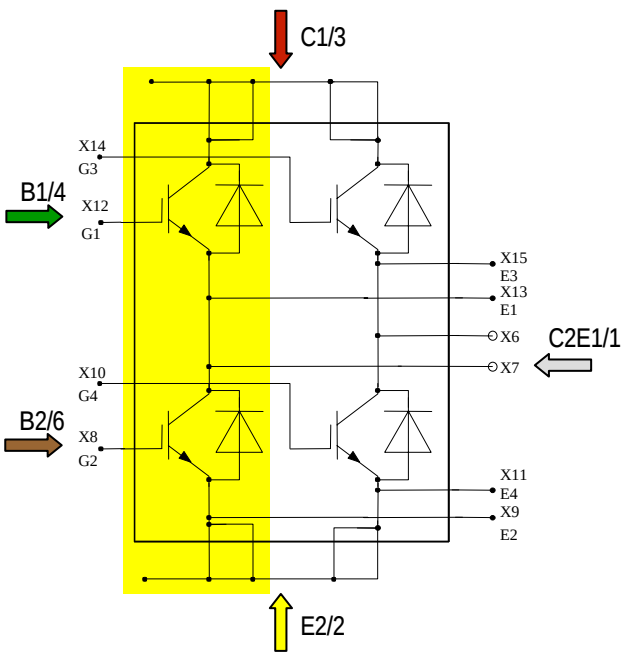
Z002
Capacitor card

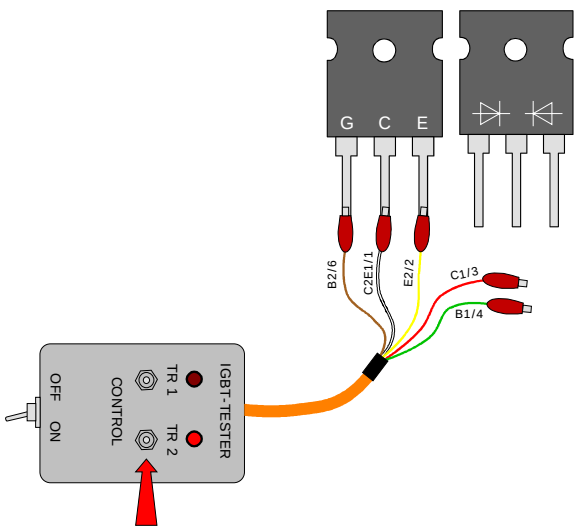
Z001
Main circuit card

IGBT testing









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IGBT replacing

Mounting the IGBT to the heat sink

The tools and premises used in this work must be clean and free of dirt and dust. Even very small particles (0,050mm) between the surfaces may increase the gap between heatsink and module, causing overheating ans possible damage.

Heat transfer compound is to be spread in even layer of approximately 0,1 mm onto the module base. Then the module should be immediately mounted on the heatsink, in order to minimize the possibility of dirt getting between the components.

Firts, all the M5 type screws are tightened 0,5...2 NM. After a few minutes the module can be tightened into the torque of 3 NM.

Testing cable connection / low voltage test

Testing cable makes possible to test power sources separately.

Notice !
If you got an error code 205, make factory recall settings from machine setup

Power source(PS)1:
1. Disconnect Control Bus-connector X005 from PS2 (7-way amphenol, left corner inside PS2)
2. Disconnect cooler fans from both of power sources.
3. Connect Kemppi Multipower ~22 VAC to control card A001: X2/1,2
- after testing power source 1 connect all connectors back as original connections

Power source(PS)2:
1. Disconnect jumper(s) from A001/X11 (device number setting)
2. Disconnect cooler fans from both of power sources.
3. Disconnect PS1 connectors: A002/X4, A002/X1
4. Disconnect PS2 connector: A001/X9
5. Connect Test Cable:
    -connect connector A to PS2/A001/X9
    -connect connector B to PS2/A001,X9 (baum)
    -connect connector C to PS1/A002/X1
    -connect connector D to PS1/A002/X4
6. Connect Kemppi Multipower ~22 VAC to PS1 control card A001: X2/1,2
- after testing power source 2 connect all connectors back as original connections

.

Testing cable connection

Necessary parts:

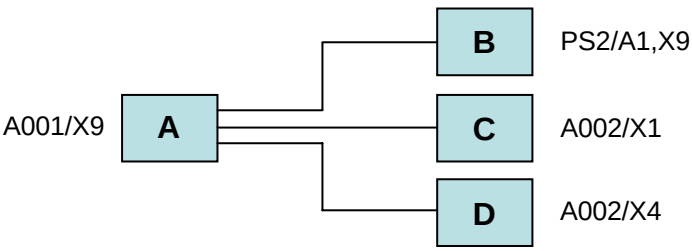
• Connector A:	Plug 12 poles, male	9770459	(pins: 5 pcs female	9770463)
• Connector B:	Contact body 12 poles, female	9770453	(pins: 2 pcs male	9770462)
• Connector C:	Plug 6 poles, male	9770458	(pins: 2 pcs female	9770463)
• Connector D:	Plug 15 poles, male	9770460	(pins: 1 pcs female	9770463)
• Electric wire				

A

B

C

D



Connections:
A;2 - D;8
A;4 - C;1
A;5 - B;5
A;10 - C;4
A;12 – B;12