



Service manual FastMig Pulse power sources version 1.1

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WARNING!

400VAC 50/60Hz and 570VDC or higher are inside the machine

Before removing any covers or commencing any testing or measurement disconnect the power source from the mains voltage

Dangerous DC voltage still exist after the removal of the input voltage.

Wait at least one minute for the capacitors to become discharged.

The device may be repaired only by a person legally authorized to perform electric work.

Electrostatic Discharge

Electrostatic discharge (ESD) is a phenomenon that occurs almost everywhere and often. At its most powerful, it is known as thunder and lightning where electrical charges as high as one billion volts can be discharged between clouds or between clouds and the ground below. This type of electrical discharge cannot occur at normal ground level, of course.

Movement and friction generate static discharges of a few thousand volts in certain conditions. For example, stroking a cat can generate thousands of volts.

Electronic appliances and welding machines included are now designed and manufactured in ways that take into account the ESD problem. It is only apparent when an appliance is taken apart for servicing. At that time the ground terminal is often disconnected and sensitive electronic components can be prone to electrostatic discharge. The best way to protect against ESD when handling electronic cards or microchips is an earth connection. You frequently hear of people who wonder why a new, unused electronic card works at first and then stops working afterwards. The reason may well be that some of its components are damaged by ESD. Memory circuits are especially sensitive. It may be that a memory circuit damaged by ESD breaks down only weeks later. It looks like a software problem but in fact it is a tiny defect in the memory circuit itself.

A simple, effective enough way to protect against ESD is to wear an earth bracelet when handling electronic circuits or cards. The bracelet is earthed to the frame of the appliance being serviced. An equally important shielding device is an earth pad on the workbench. Also wearing clothing manufactured from natural fiber (cotton) decreases electrical charging.

All Kemppi factory parts susceptible to ESD (e.g. control cards) are delivered in packaging or pouches that protect and earth the components. Packets and pouches carry yellow ESD labels. Parts susceptible to ESD must be kept in their original packages only removed just before installation.



*Parts subject to ESD
are labelled as such.*

Article taken and abridged from Kemppi PRONEWS

Tools and testing equipments

While repairing Kemppi machines there is no need to have any special hand tools. Most of the work can be done with normal workshop tools and testing can be done by digital multimeter and Kemppi Multipower or a standard workshop power source.

Hand tools and accessories:

Metric combination wrenches 8-19mm, 28mm

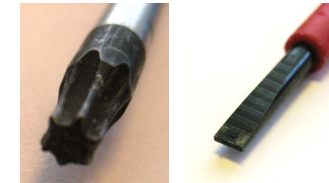
Screwdrivers: flat 0,5 x 3mm and torx T10-T25

Needle-nose pliers

Side cutters

Torque wrench with torx heads

Cable ties



Testing equipments:

Digital multimeter True RMS (800VDC, 600VAC for safe operation)

Regular workshop power source (with 20VAC output) or Kemppi Multipower (22VAC)

PE tester (15-25A e.g. Megger PAT32)

Insulation resistance meter (500VDC, e.g. Megger PAT32)

Useful extra tools:

Kemppi IGBT tester

Digital oscilloscope 10MHz or greater



General service procedure

It is recommended that a systematic method is used on all repair or maintenance work, each repair is a special case and should be handled as required, but by following a routine, less mistakes and safety issues will occur. Here is an example of a general routine:

1. Safety test
2. General troubleshooting
3. Static tests
4. Repair work
5. Low voltage test
6. Load bank test
7. Safety test
8. Test welding

Note! Safety test must be done before and after repair, to be sure machine is not possibly dangerous for user or service man. Remember always use recommended fuse sizes in service workshop equipment to be sure of safety issues.

Always try to isolate failure to certain blocks. This manual has several tests to make conclusions and to isolate the problem. Be careful not to make assumptions, because it might lead you to change the wrong parts.

Safety test

Safety test should be carried out before opening machine or connecting it to the mains power supply, to protect the service technician.

All the new machines are tested in the factory, but it is recommended to repeat these tests before and after service repair work. The safety test is divided into two parts, protective earth (PE) conductor continuity and insulation resistance measuring.

PE conductor continuity measuring:

PE continuity is measured between protective earth conductor and machine chassis. Resistance should be less than 100mΩ (0,1Ω). Below is a calculation to determine the desired test voltage

$$R = 100m\Omega$$

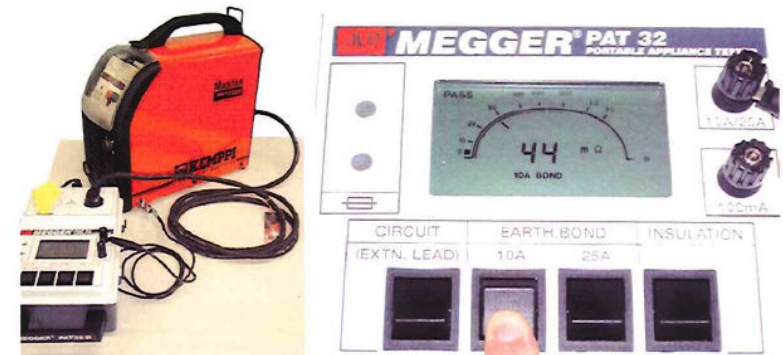
$$I = 15A$$

$$U = ?$$

$$U = R \times I = 0,1\Omega \times 15A = 1,5V$$

When using 15A as the measuring current, the voltage should be less than 1,5V between PE conductor and machine chassis. Then the resistance must be less than 100mΩ.

Easiest way to measure PE conductivity is to have special tester like Megger PAT32. It tests conductivity using an input current of 25A, so voltage should be less than 2,5V.



The protective conductor continuity measuring can be done with equipment similar to that shown in these pictures

Safety test

Insulation resistance measuring:

Insulation resistance is measured using 500VDC. This has to be made in three points. Depending on measuring point there have to be minimum resistance values:

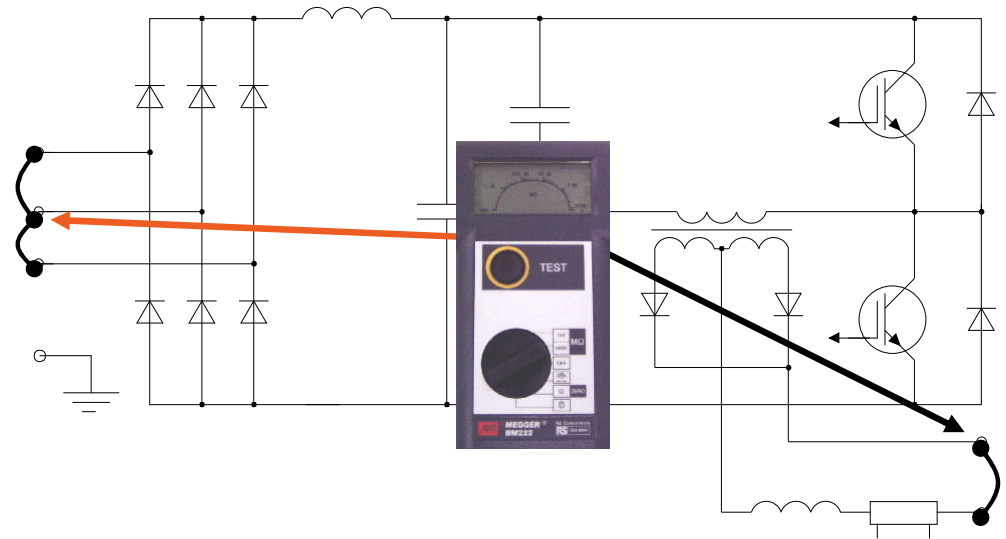
Primary – Secondary	5MΩ
Primary – Ground	2,5MΩ
Secondary – Ground	2,5MΩ

Ground is located in machine chassis. If values are much less than expected there might be insulation break down and it should be inspected.

Note! Wire feeder has only Secondary – Ground point to test

Primary – Secondary 5MΩ

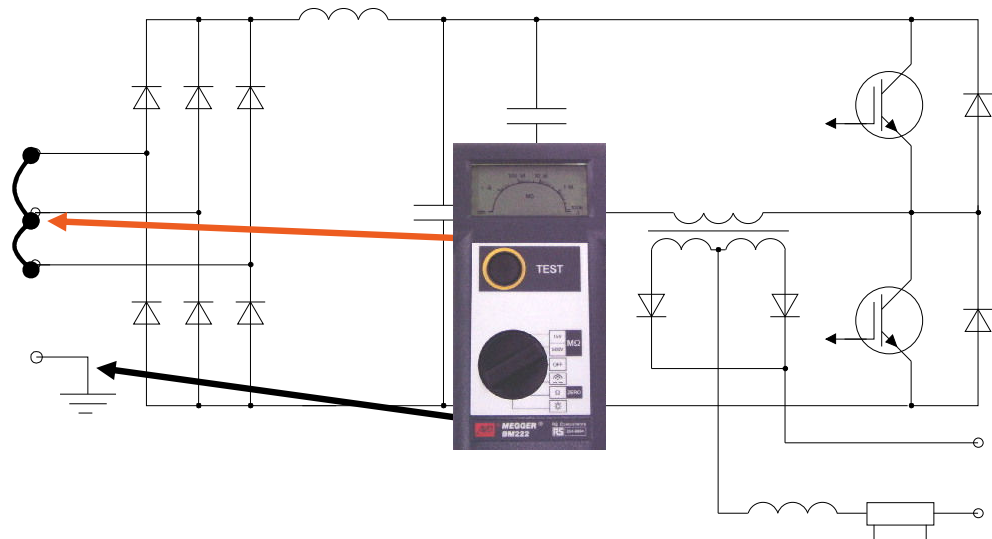
- Phases must be connected together and Dix connectors must be connected together.
- S001 switch is set ON



Safety test

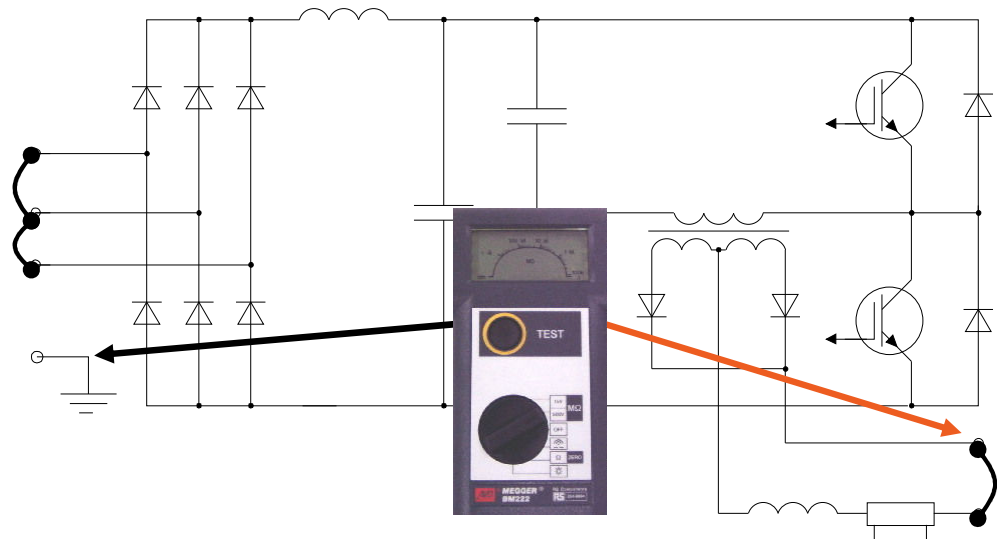
Primary – Ground 2,5MΩ

- Phases must be connected together
- S001 switch is set ON



Secondary – Ground 2,5MΩ

- Dix connectors must be connected together
- S001 switch is set ON



General troubleshooting

Always try to get a detailed description of the complaint!

This troubleshooting guide is to remind the service technician, to check the simple things first, a visual inspection can often help with fault finding. If visual damage can be seen, replace all broken parts. If everything looks normal, or broken parts are changed, it is recommended, that a low voltage test is carried out.

Disconnect the machine from the input supply and remove covers, then check:

- Are there any breaks in the cables?
- Are the cables correctly connected?
- Are there any loose components?
- Are mains fuses/circuit breakers OK & correct values?
- Any signs of burning or arching?

Connect the machine to the mains input supply and check:

- Is there a stable three phase 400VAC input inside the machine?
- Is the machine in shut down mode?
- Are the settings OK?

Diode tests

Ensure that the machine is disconnected from the mains input supply. Use multimeter with diode check function to test machines input rectifier and secondary rectifier. Remember to test forwards and backwards the following.

Input rectifier:

Use positive test lead to check input terminal side and negative test lead to check DC link side. S001 switch must be set ON.

- L1 – X1
- L2 – X1
- L3 – X1

- L1 – X3
- L2 – X3
- L3 – X3

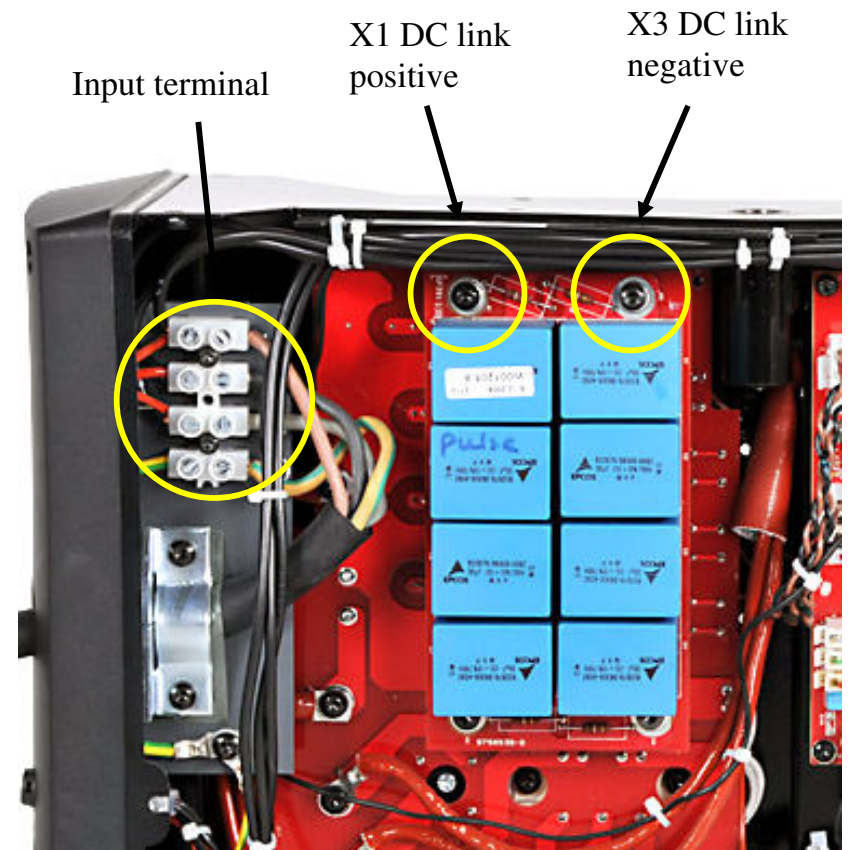
Change test leads and repeat tests.

If diodes OK:

There should be threshold voltage approx. 0,5VDC (forward biased condition) or over the meters limit (reverse biased condition)

If short circuit:

close to 0VDC.



Diode tests

Use multimeter with diode check function to test machines input rectifier and secondary rectifier. Remember to test forwards and backwards the following.

Secondary rectifier:

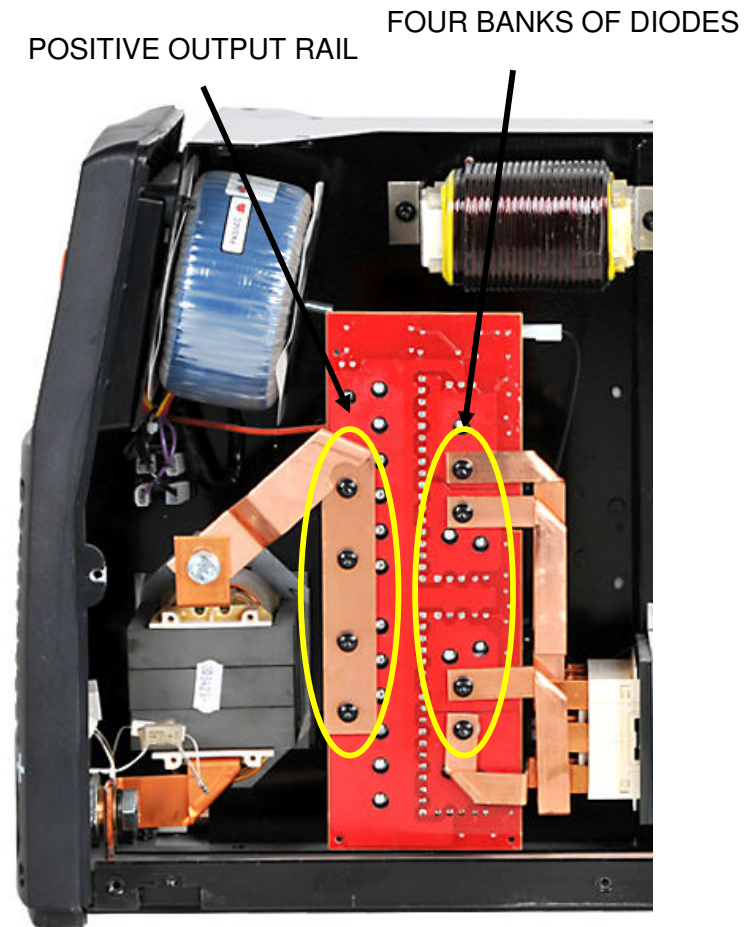
Use positive test lead to check positive output side and negative test lead to check four banks of diodes.

- Positive output rail – Bank 1
- Positive output rail – Bank 2
- Positive output rail – Bank 3
- Positive output rail – Bank 4

Change test leads and repeat tests.

There should be threshold voltage approx. 0,335VDC (forward biased condition) or “over the limit” (OL) (reverse biased condition)

If meter reads close to 0VDC, diodes are in short circuit.



IGBT tests

IGBT module can be tested two different ways. Easiest and fastest is to use DMM to have some info about IGBT module. Another way is to use Kemppi IGBT tester to have exact data.

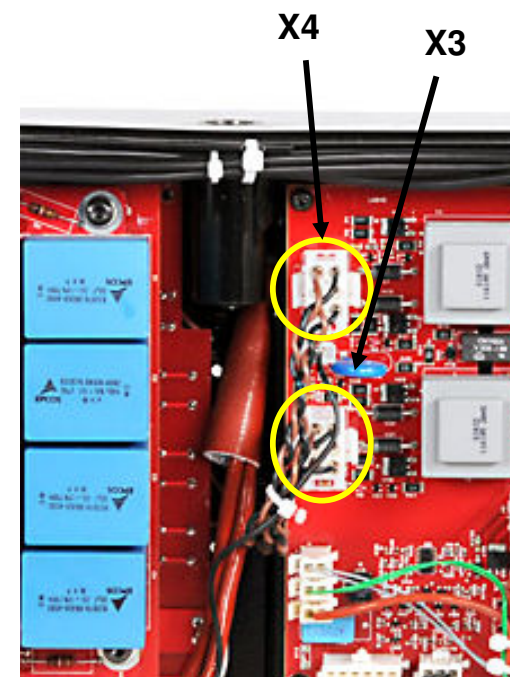
IGBT testing by DMM:

To test the modules four IGBTs individually, disconnect the gate leads X3 and X4 from the A001 card, set the DMM to diode check function, use the chart below.

IGBT number	Positive test lead	Negative test lead
IGBT 1	gate lead X4-1	Z002 X1
IGBT 2	Z002 X3	Gate lead X4-1
IGBT 3	Gate lead X3-3	Z002 X1
IGBT 4	Z002 X3	Gate lead X3-3

The threshold voltage should be approx. 0,335VDC (forward biased)

Reverse the test leads, and repeat the above tests, the meter should read “over the limit” or “OL” (reversed biased)



IGBT tests

IGBT gate lead testing (set to resistance function):

- Disconnect module gate leads X3 and X4
- Measure twisted paired wires

Meter should read approx. 10k Ω

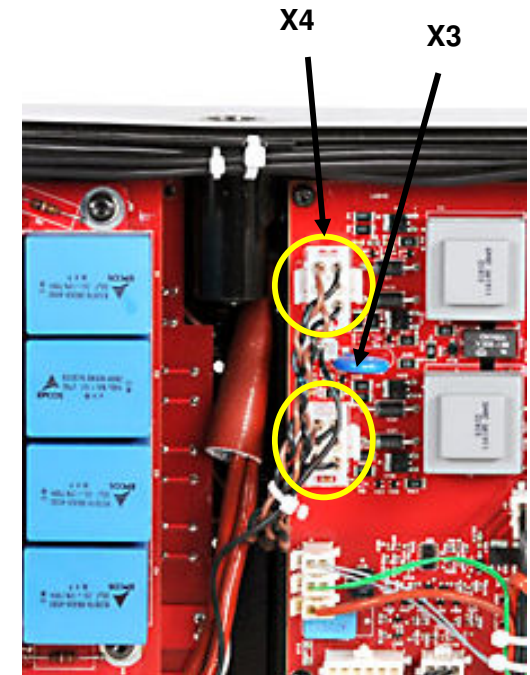
Simple static test of A001 gate circuit (set to diode function):

- Disconnect module gate leads X3 and X4

Positive test lead	Negative test lead
X4-4	X4-1
X4-6	X4-3
X3-4	X3-1
X3-6	X3-3

Meter should read approx. 0,1VDC.

Reverse the test leads, and repeat the above tests, the meter should read “over the limit” or “OL”



IGBT tests

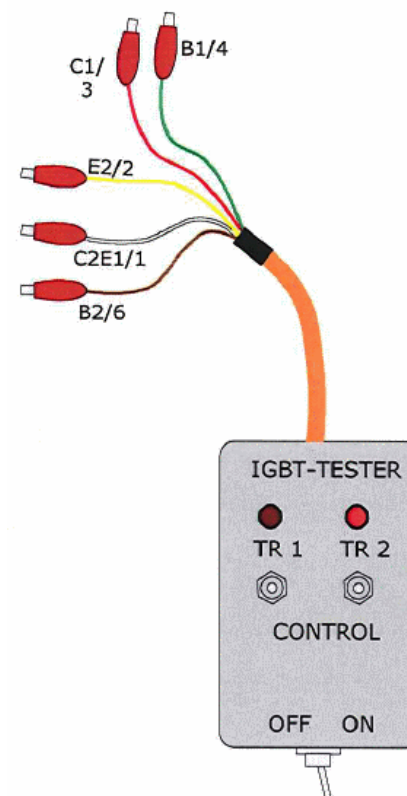
Kemppi IGBT tester:

Kemppi IGBT tester is simple way to be sure that module is working. Tester simulates DC link voltage and gate pulses and measures output voltage. Tester can trigger two IGBTs at the same time (one for positive and one for negative) so it have to be connected two different ways to test the whole IGBT module. Tester takes it power from two 9V battery. This makes possible to have “DC link” voltage as high as 18VDC which makes measuring more reliable.

Kemppi IGBT tester buttons and connectors:

ON/OFF switch	Switches tester ON and OFF
TR1 and TR2:	Trigger buttons for gate controls
LEDS:	Shows if output has a voltage
C1/3:	Emulates DC link positive voltage
E2/2:	Emulates DC link negative voltage
B1/4:	TR1 gate control signal/positive
B2/6:	TR2 gate control signal/negative
C2E1/1:	Pos. / Neg. output voltage measuring

Note! Switching tester OFF saves battery life while not used.



IGBT tests

Kemppi IGBT testing by Kemppi IGBT tester:

- Disconnect X3 and X4 connectors

IGBTs 1 and 2:

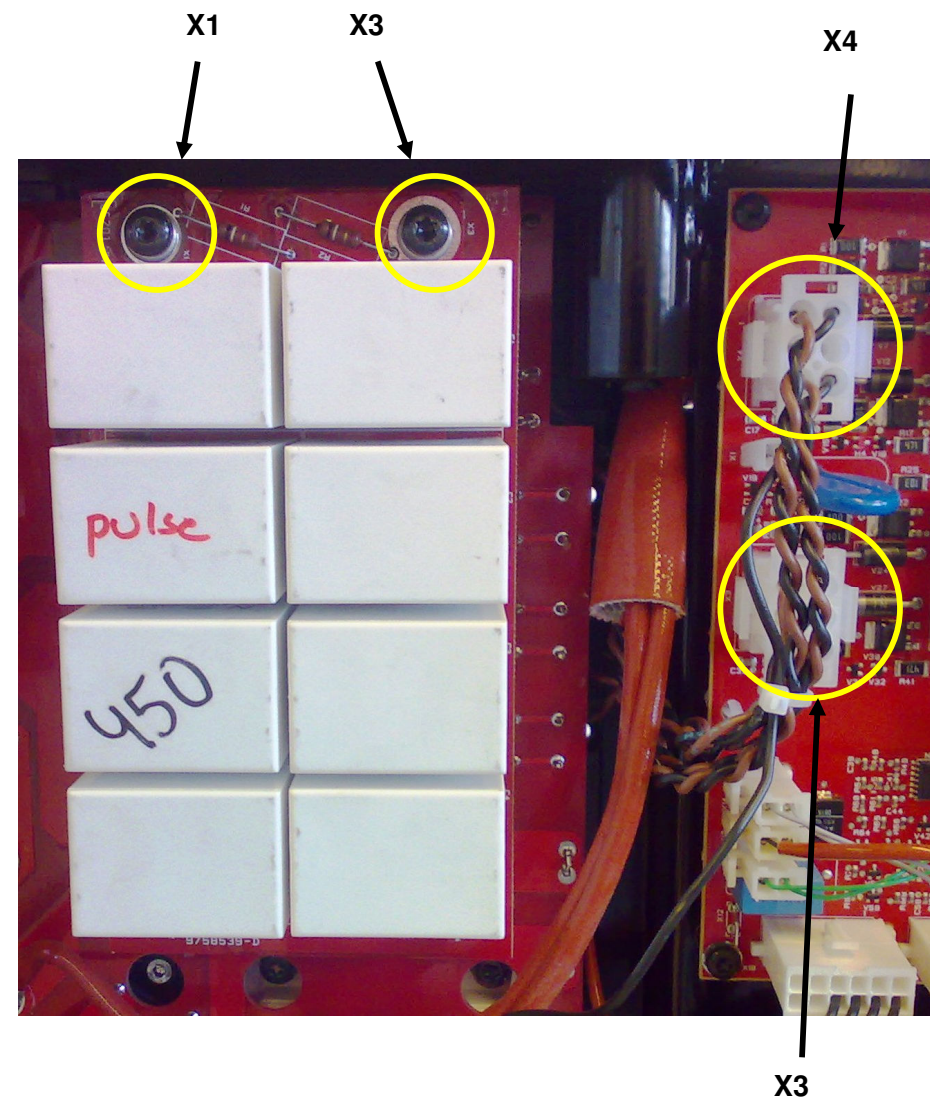
- Connect C1/3 to Z002 X1 (DC link positive)
- Connect E2/2 to Z002 X3 (DC link negative)
- Connect B1/4 to X4-4 (IGBT 1 gate control, positive)
- Connect B2/6 to X4-6 (IGBT 2 gate control, negative)
- Connect C2E1/1 to X4-1 (point between IGBT 1 and 2)

IGBTs 3 and 4:

- Keep C1/3 and E2/2 connected as above
- Connect B1/4 to X3-6 (IGBT 3 gate control, positive)
- Connect B2/6 to X3-4 (IGBT 4 gate control, negative)
- Connect C2E1/1 to X4-1 (point between IGBT 3 and 4)

Only when triggering by buttons TR1 and TR2 LEDs should illuminate.

If LEDs don't light or are lit without triggering, the IGBT module may be faulty. Double check connections to be sure.



Replacing the Z001 card

FastMig production family has a soldering IGBT module and it is not possible to change it separately. Only reliable way to replace the module is to change the whole Z001 main circuit card.

Electrolube HTC NON-Silicone heat transfer compound EHTC10S is supplied for use during equipment repair.

The tools and workshop premises used during this type of work must be kept clean and free from dirt and dust.

Even very small particles (0,050mm) between the surfaces could increase the gap between the module and the heat sink, causing overheating and damage.

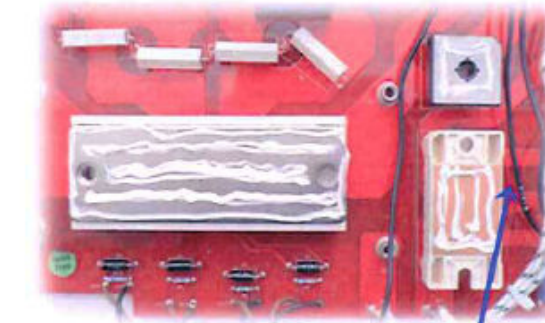
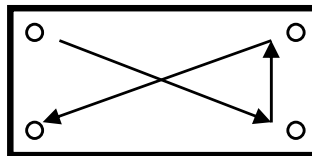
Heat sink transfer compound is to be spread in an even layer of approximately 0,1mm onto the module. Then the module should be immediately mounted onto the heat sink, this minimizes the possibility of any contamination (dirt etc.) getting between the components.

The M5 fixing screws are tightened (stage 1) to 0,5 – 2 Nm. After few minutes the module fixing screws can be finally tightened (stage 2) to a torque of 3 Nm. Note! Input rectifier is tightened to 2 Nm.

Tightening sequence:

Stage 1: All four screws to 0,5 – 2 Nm

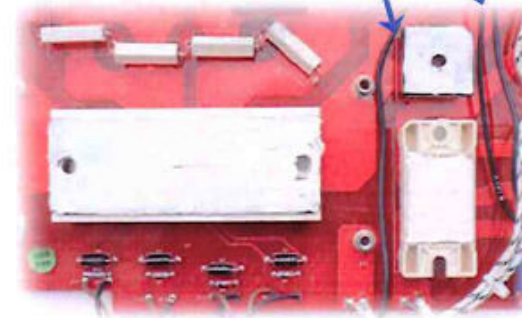
Stage 2: All four screws to 3 Nm



Compound applied prior to spreading



Make sure that these wires are NOT trapped during the re-assembly of the Z001 to the heatsink

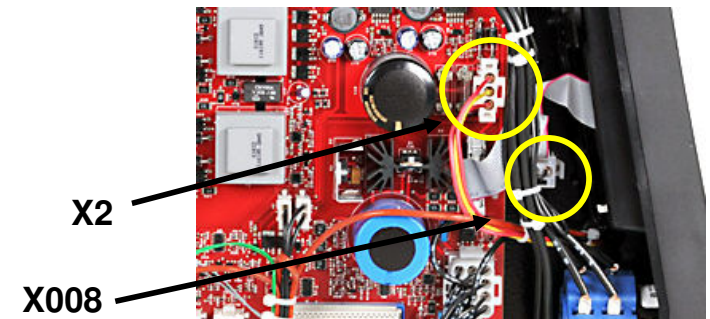


Compound spread correctly

Low voltage test

Low voltage test gives basic information where machine has fault. Machine will be fed from auxiliary transformer secondary winding to control blocks and via primary winding to DC link. Because of reversed power feeding (and current limited to 5A) there is lesser possibility to burn more components. Also after replacing components it is recommended to start from low voltage test.

Low voltage test is a three stage test. First stage will test only the A001, A002 and P001 cards. Second stage will test the same cards and, the CAN bus voltage (there is possibility to connect wire feeder). Third stage test all the above and the DC link.



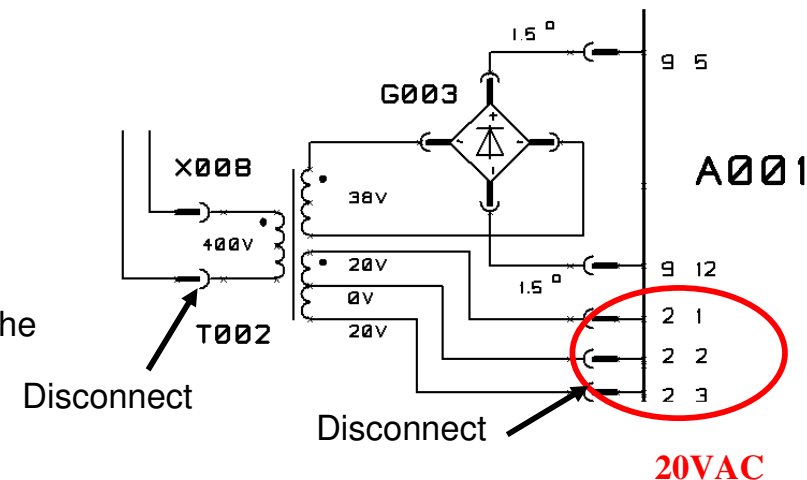
Testing First stage:

- Current must be limited to 5A in workshop PSU
- Disconnect X2 and X008 connectors
- Input 20VAC straight to A001 card connector X2 pins 1 - 2 or 2 - 3.

If machine starts up control cards are working (LED's lit, P65 display on)

- By pressing Menu button, demo mode is available

Note! Power source gives bus error, because there is no 38VAC to be rectified for the bus voltage 50VDC



Low voltage test

Testing Second state:

- Current must be limited to 5A in a workshop PSU
- Connect only X2 and input 20VAC to connector X2 pins 1-2 or 2-3
- Voltage goes to another secondary coil as 38VAC
- Wire feeder unit can be connected and all setups used
- Wire feeder can be triggered and wire feed speed adjusted

If no wire feeder is connected, P65 display show's "Local loop".

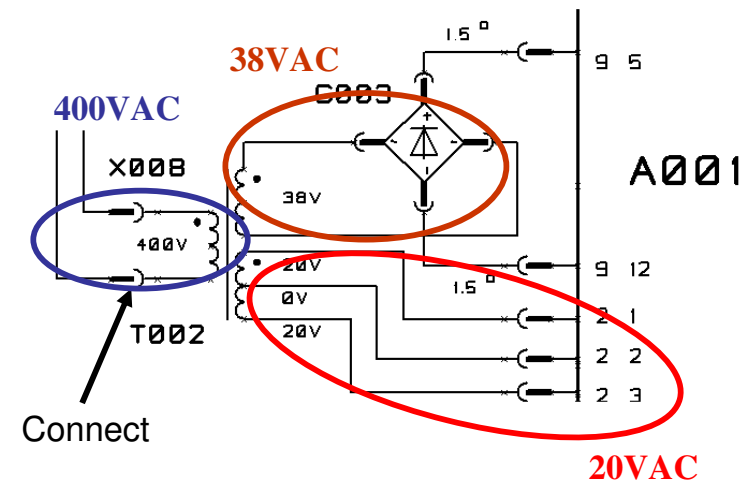
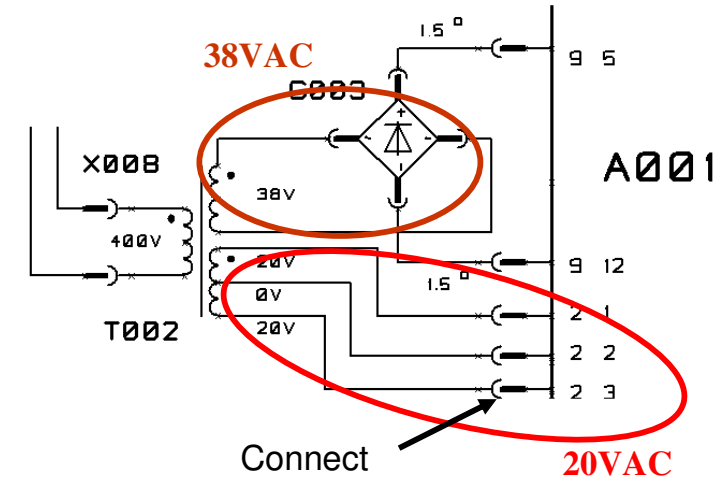
If machine can start up, control cards and CAN bus is working (check voltage).

Testing Third stage:

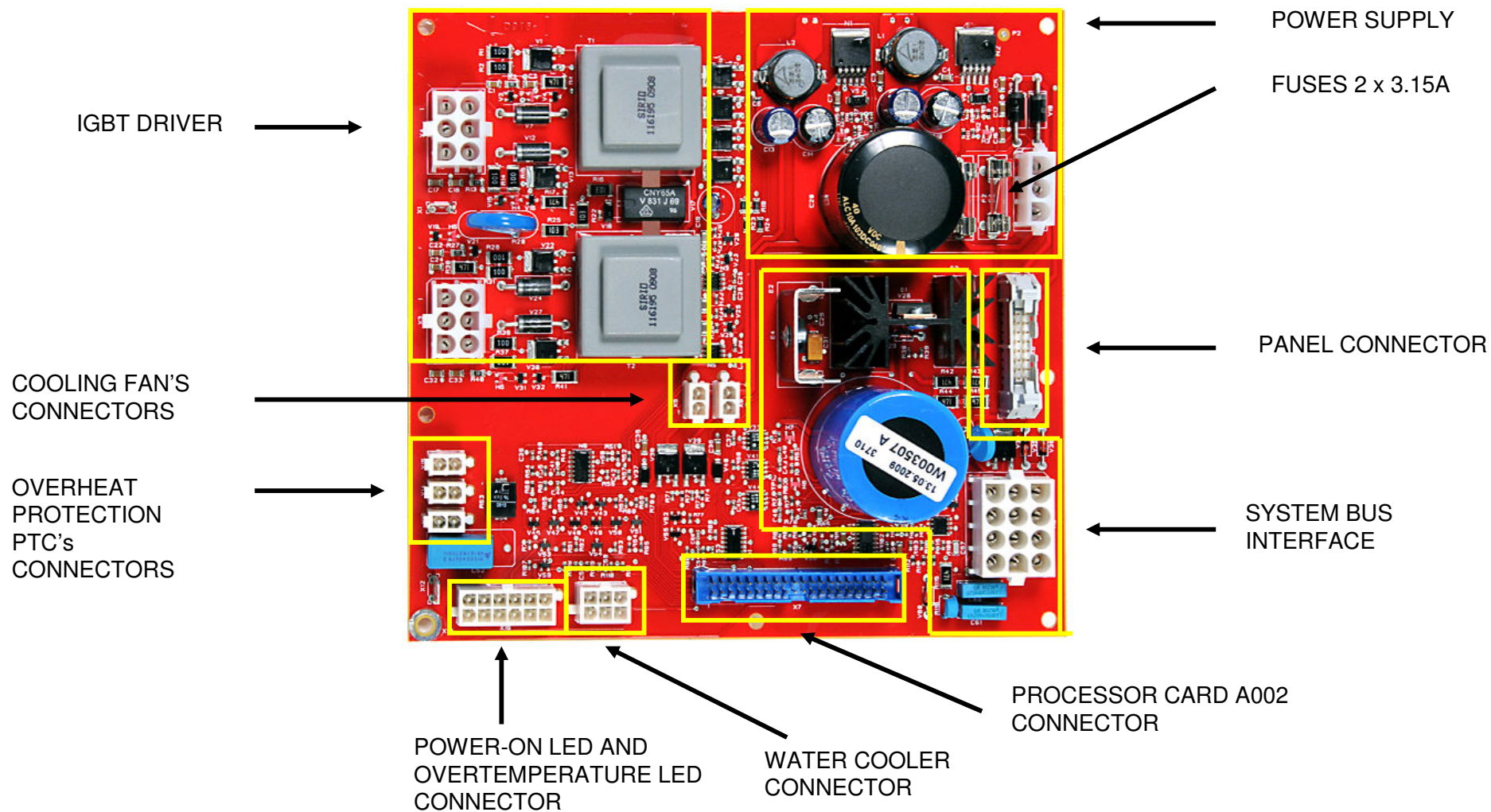
- Current must be limited to 5A in a workshop PSU
- Input 20VAC to aux. transformers connector X2 pins 1-2 or 2-3
- Voltage goes through secondary winding to primary side as 400VAC
- Voltage goes also to another secondary coil as 38VAC (as above)
- Machine starts up and DC link voltage can be measured Z002 X1 and X3
 - Note! There can be over 400VDC in DC link!
- Wire feeder unit can be connected and all setups used

If machine does not start up or current goes to 5A limit, there is probably a short circuit somewhere in the primary.

Note! Wire feeder can not be triggered, power source takes too much power and machine shuts down.

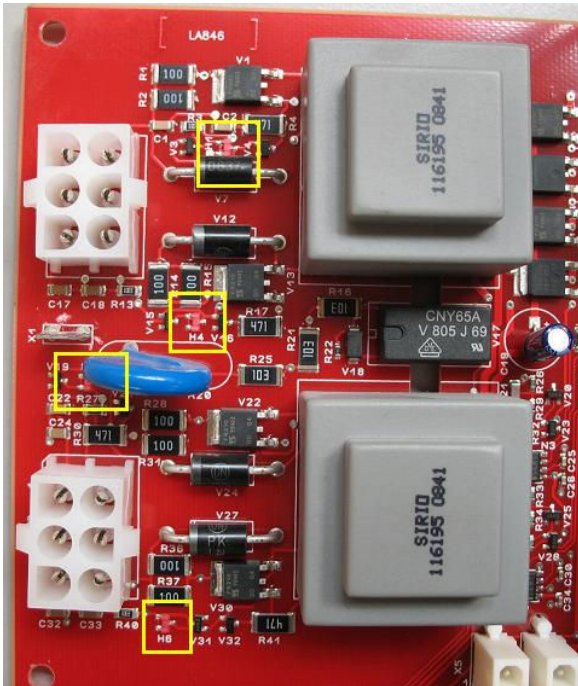


Gate driver card A001 layout

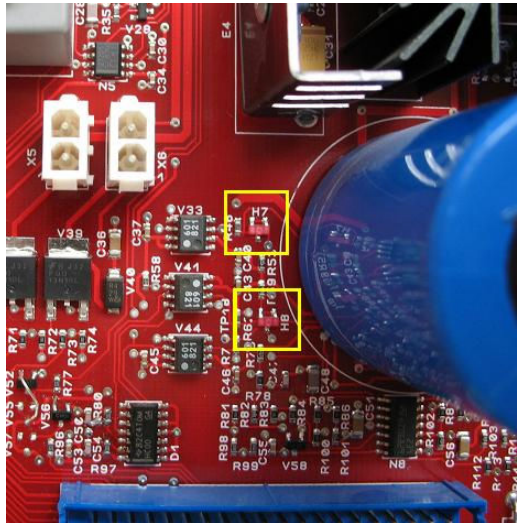


Gate driver card A001 LED info

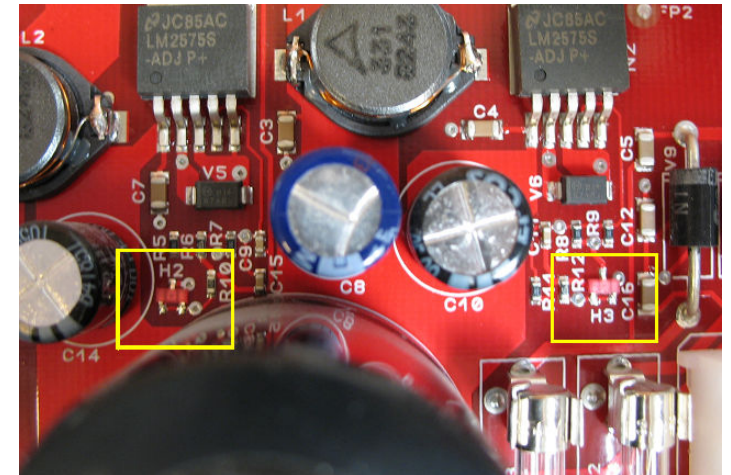
A001 Gate driver card has several LEDs to show basic information of cards functions and states. LEDs H1, H4, H5 and H6 shows if IGBT can have control signals. LEDs H7 and H8 show if there is feeder unit connected and if data is available in CAN bus. LEDs H2 and H3 shows if there is needed control voltages from cards own PSU.



H1 IGBT gate pulses
H4 IGBT gate pulses
H5 IGBT gate pulses
H6 IGBT gate pulses



H7 Remote control unit connected
H8 Data communication



H2 +5V
H3 +15V

Gate driver card A001 connectors

Connector/pin	Connector type	Description
X1	Tab terminal 6,3mm	DC-link voltage (+)
X2/1	3-pin wire to board	20V auxiliary voltage ~
X2/2	MATE-N-LOCK	20V auxiliary voltage ground
X2/3		20V auxiliary voltage ~
X3/1	6-pin wire to board	IGBT emitter
X3/2	MATE-N-LOCK	Not Connected
X3/3		IGBT emitter
X3/4		IGBT gate
X3/5		Not Connected
X3/6		IGBT gate

Connector/pin	Connector type	Description
X4/1	6-pin wire to board	IGBT emitter
X4/2	MATE-N-LOCK	Not Connected
X4/3		IGBT emitter
X4/4		IGBT gate
X4/5		Not Connected
X4/6		IGBT gate
X5/1	2-pin wire to board	Switched Fan M002 (-)
X5/2	MATE-N-LOCK2	Fan M002 +24VDC

Connector/pin	Connector type	Description
X6/1	2-pin wire to board	Switched Fan M001 (-)
X6/2	MATE-N-LOCK2	Fan M001 +24VDC
X7	40-pin box header	Connects gate driver and processor board
X8	16-pin box header with locking latches	Panel board connector

Connector/pin	Connector type	Description
X9/1	12-pin wire to board	System bus DATA
X9/2	MATE-N-LOCK	System bus DATA
X9/3		System bus +50V
X9/4		System bus +50V
X9/5		System bus +50V
X9/6		Remote control +5V
X9/7		Remote control +5V
X9/8		Remote control analog input
X9/9		Remote control analog input
X9/10		System bus GND
X9/11		System bus GND
X9/12		System bus GND

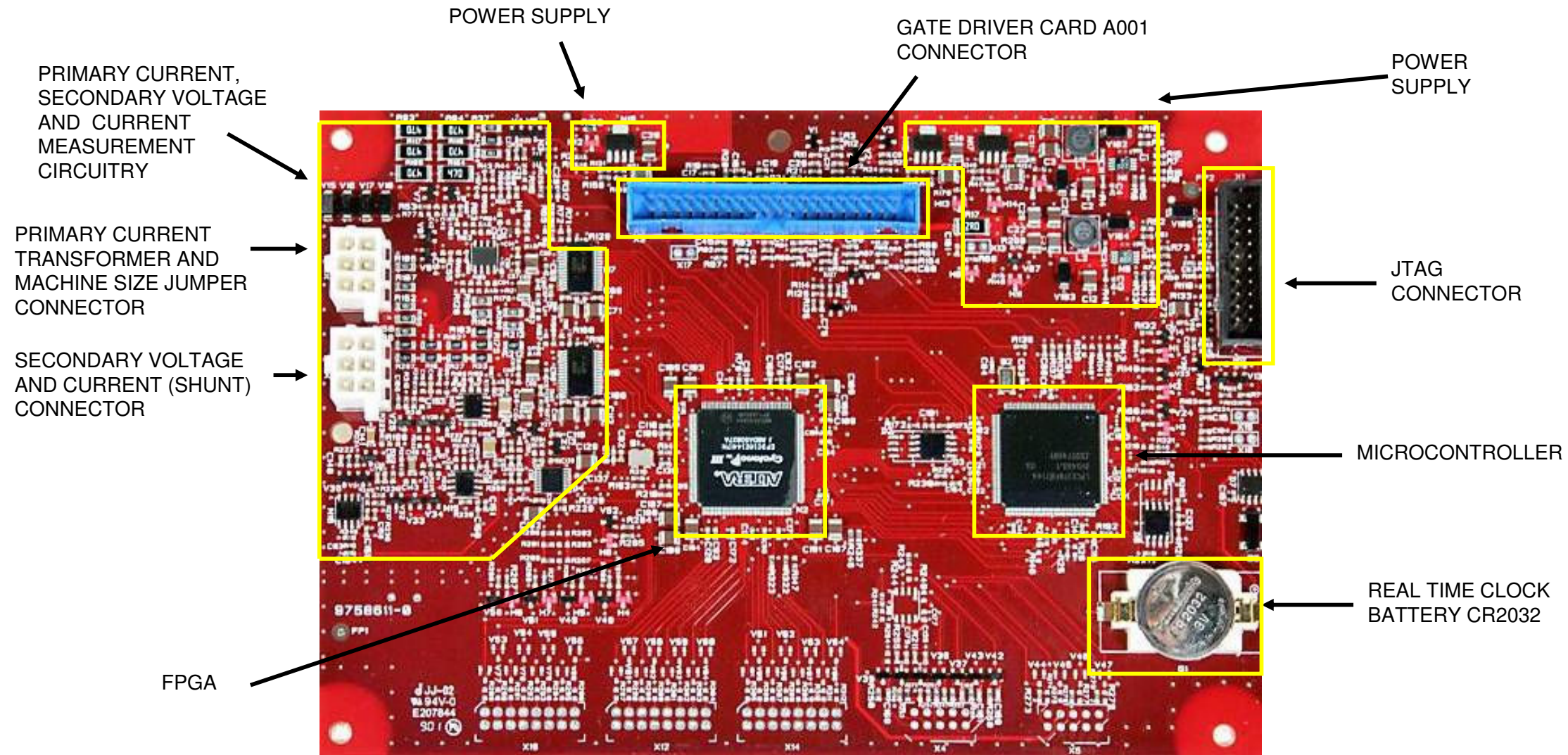
Gate driver card A001 connectors

Connector/pin	Connector type	Description
X12	Tab terminal 6,3mm	Chassis ground
X13/1	2-pin wire to board	PTC, primary heat sink profile
X13/2	MATE-N-LOCK2	PTC, primary heat sink profile
X14/1	2-pin wire to board	PTC, main transformer
X14/2	MATE-N-LOCK2	PTC, main transformer
X15/1	2-pin wire to board	PTC, secondary heat sink profile
X15/2	MATE-N-LOCK2	PTC, secondary heat sink profile

Connector/pin	Connector type	Description
X16/1	12-pin wire to board	Spare supply voltage +15V
X16/2	MATE-N-LOCK	Auxiliary voltage ground
X16/3		Spare supply voltage +5V
X16/4		Auxiliary voltage ground
X16/5		Not connected
X16/6		Auxiliary voltage ground
X16/7		Over temperature LED +5VDC
X16/8		Over temperature LED switched Gnd
X16/9		Power ON LED switched +5VDC
X16/10		Power ON LED Gnd
X16/11		Spare supply voltage +24V
X16/12		Auxiliary voltage ground

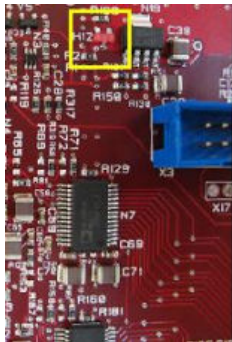
Connector/pin	Connector type	Description
X17/1	6-pin wire to board	Cooling unit, supply voltage +24V
X17/2	MATE-N-LOCK2	Cooling unit, error signal (0 – active)
X17/3		Cooling unit, GND
X17/4		Cooling unit, analog input
X17/5		Cooling unit, analog input
X17/6		Cooling unit, on/off signal (+5VDC = on)
X18	Plated PCB hole	Chassis ground

Processor card A002 layout

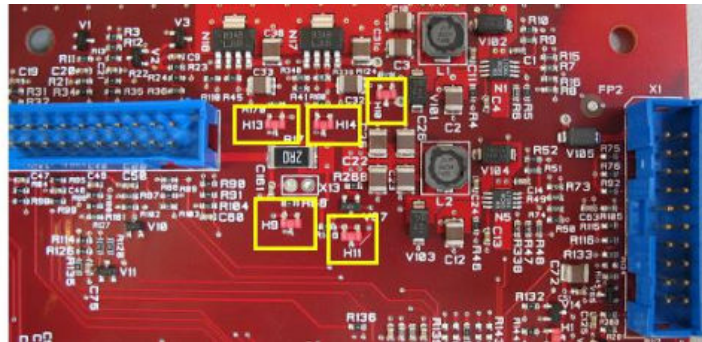


Processor card A002 LED info

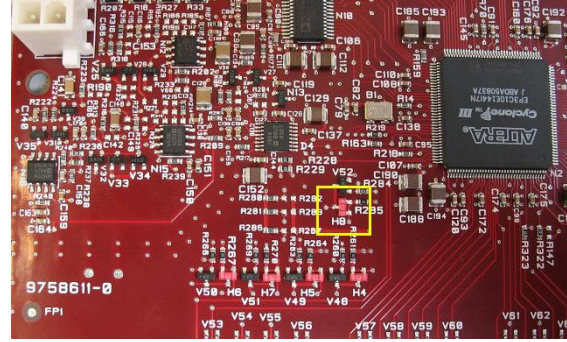
A002 processor card also has LEDs for easy card level checking. H9 – H14 show different voltages in card. Led H8 shows if FBGA configuration is executed successfully (LED should illuminate). H1 shows microcontrollers operation state and H2 – H3 shows if there is activity in data communication lines.



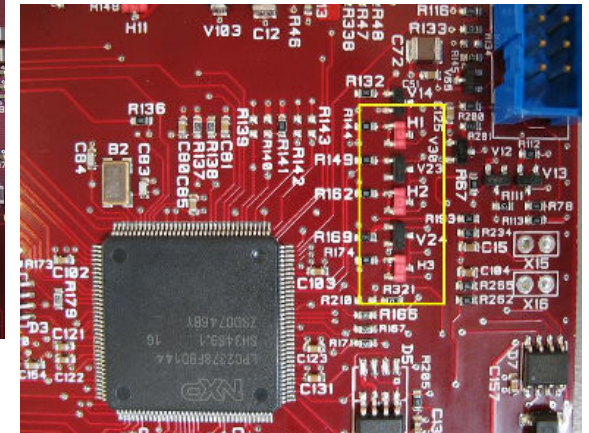
H12 +5V
(analog)



H9 +15V
H10 +5.3V
H11 +1.2V
H13 +2.5V
H14 +3.3V



H8 FPGA Configuration



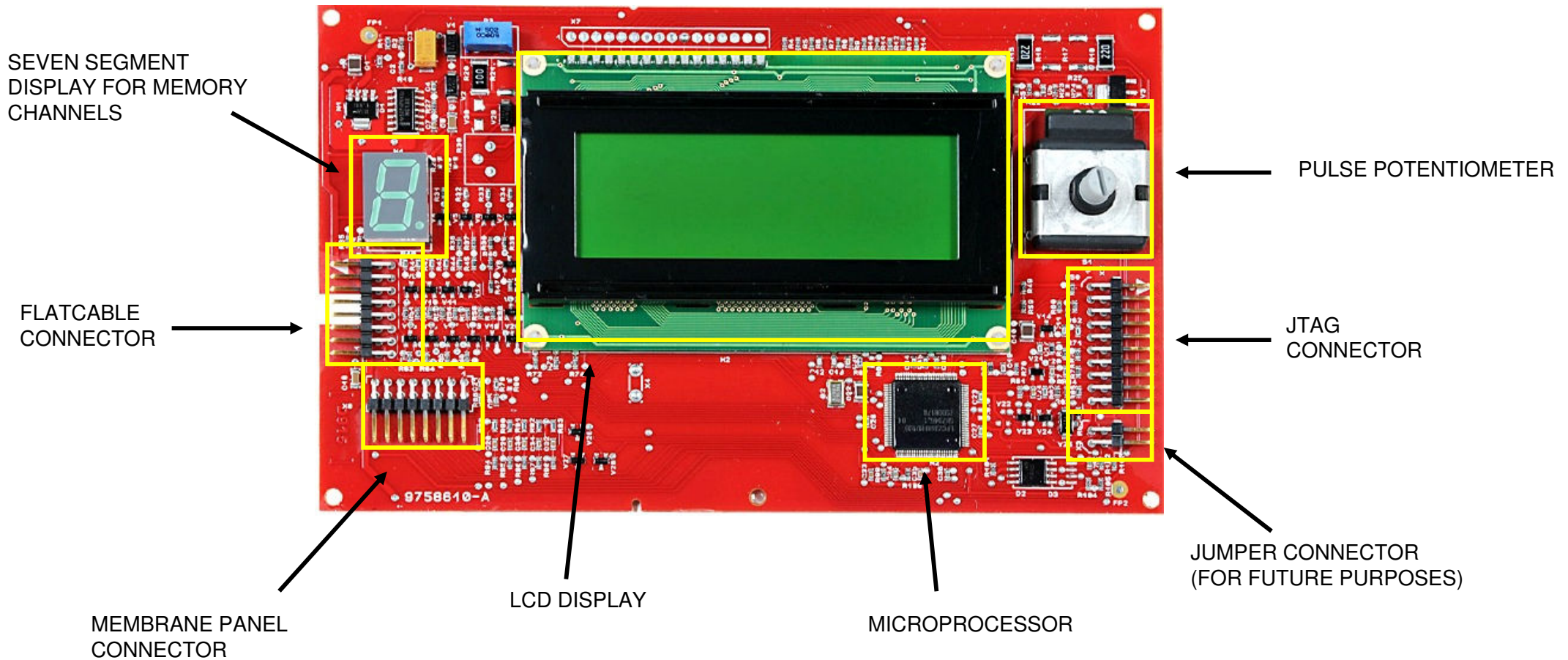
H1 Microcontroller state
H2, H3 Data communication

Processor card A002 connectors

Connector/pin	Connector type	Description
X1	20-pin box header	JTAG (production programming)
X3	40-pin box header	Connects gate driver and processor board
X9/1	6-pin wire to board	Current transformer (ac)
X9/2	MATE-N-LOCK2	Machine size jumper J1
X9/3		Machine size jumper J2
X9/4		Current transformer (ac)
X9/5		Machine size jumper J1
X9/6		Machine size jumper J2

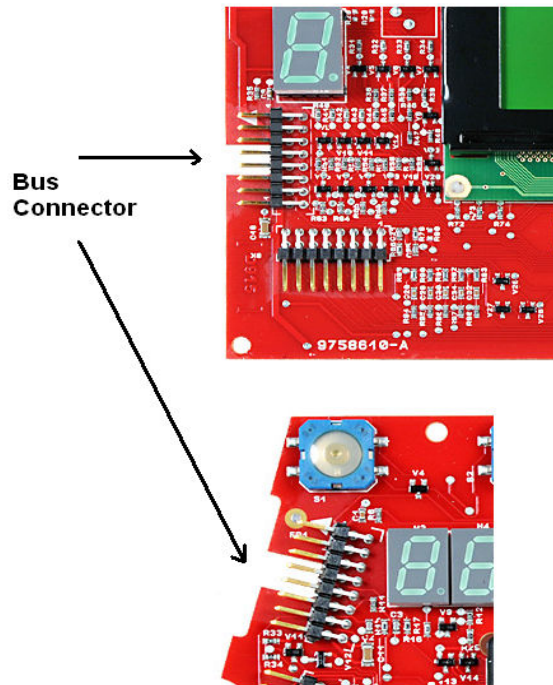
Connector/pin	Connector type	Description
X11/1	6-pin wire to board	Not connected
X11/2	MATE-N-LOCK2	Spare A/D, not connected
X11/3		Shunt (+)
X11/4		Secondary voltage (+)
X11/5		Not connected
X11/6		GND, Shunt (-)
G1	2032 battery holder	RTC battery

Setup panel card P001 layout



Setup panel card P001 connectors

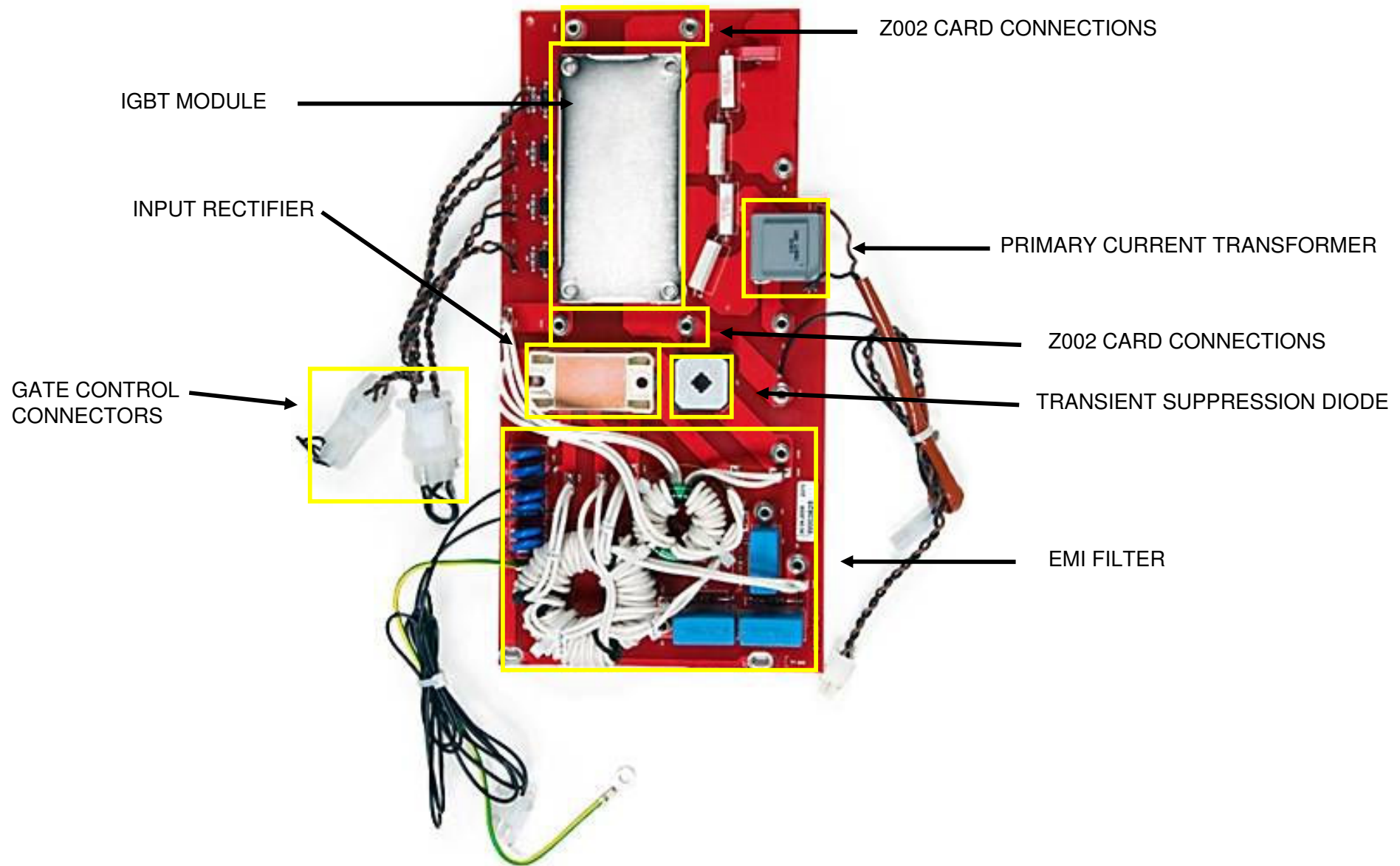
PF65 (X1) and P65 (X1) CAN bus interfaces are identical. Both Panels use CAN interface and KeBus protocol.



Connector/pin	Connector type	Description
X1/1	Pin header, 2.54mm	Not connected
X1/2	Pin header, 2.54mm	Not connected
X1/3	Pin header, 2.54mm	Not connected
X1/4	Pin header, 2.54mm	Not connected
X1/5	Pin header, 2.54mm	WF number
X1/6	Pin header, 2.54mm	CAN transfer
X1/7	Pin header, 2.54mm	GND
X1/8	Pin header, 2.54mm	CAN receive
X1/9	Pin header, 2.54mm	Not connected
X1/10	Pin header, 2.54mm	Not connected
X1/11	Pin header, 2.54mm	Not connected
X1/12	Pin header, 2.54mm	Not connected
X1/13	Pin header, 2.54mm	Not connected
X1/14	Pin header, 2.54mm	Not connected
X1/15	Pin header, 2.54mm	+5VDC
X1/16	Pin header, 2.54mm	GND

When panel starts panel software version number in display, during this period of any of the buttons are pressed, all memory channel segments turn on and all LCD pixels are also turned on. This function can be used to test the panel buttons and LEDs/displays. This test mode is only possible when panel is starting

Main circuit card Z001 layout



Main circuit card Z001 connectors

Connector/pin	Connector type	Description
X1	Bolt on	Main switch
X2	Bolt on	Main switch
X3	Bolt on	Main switch
X4	Plated PCB hole	Chassis ground
X5	Plated PCB hole	Chassis ground
X29	Soldered wire	Chassis ground
X6	Bolt on	Main transformer
X7	Bolt on	Main transformer
X8-X15	Soldered wire	IGBT gates and emitters

Connector/pin	Connector type	Description
X16	Bolt on	Primary choke
X17	Bolt on	Primary choke
X18	Bolt on	DC-link voltage (+)
X19	Bolt on	DC-link voltage (+)
X20	Bolt on	DC-link voltage (-)
X21	Bolt on	DC-link voltage (-)
X31	Soldered wire	DC-link voltage (+)

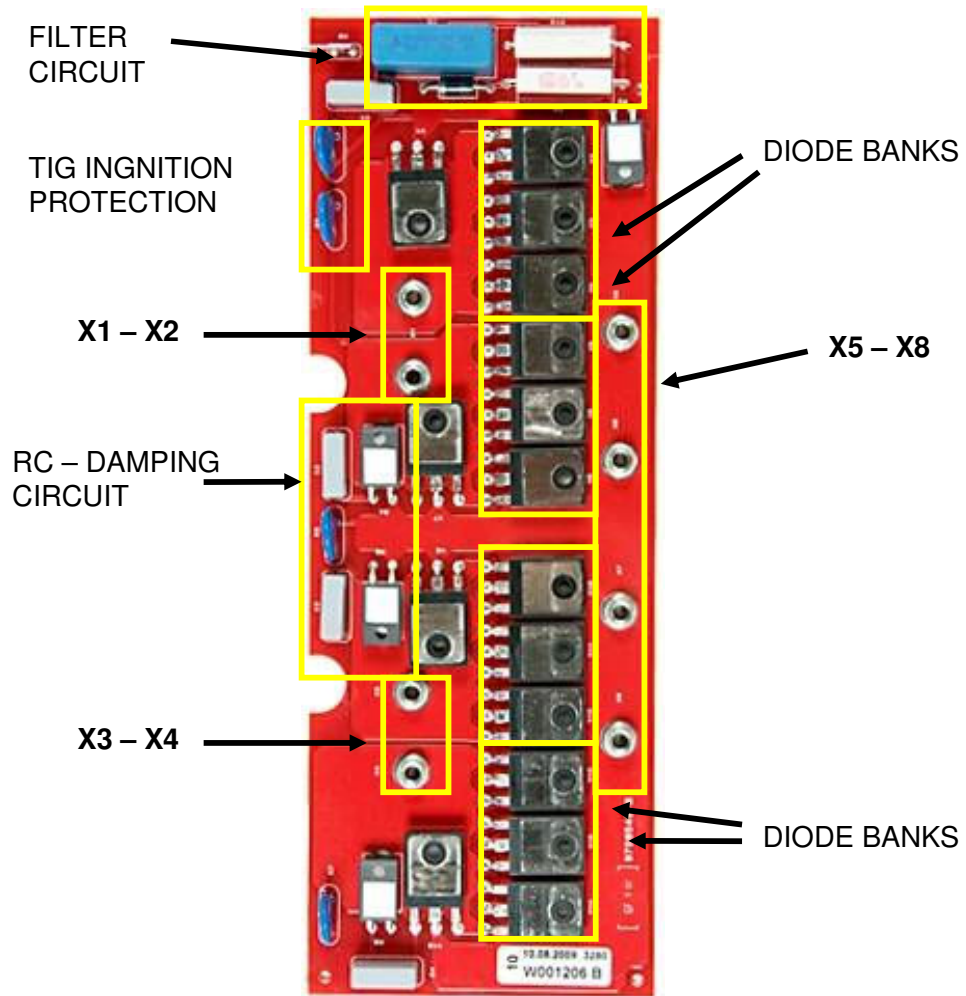
Connector/pin	Connector type	Description
X36	Soldered wire	Current transformer secondary
X37	Soldered wire	Current transformer secondary
X40	Soldered wire	400VAC Aux. transformer
X41	Soldered wire	400VAC to Aux. transformer

Capacitor card Z002 layout and connectors



Connector/pin	Connector type	Description
X1	Bold on	DC-link voltage (+)
X2	Bold on	DC-link voltage (+)
X3	Bold on	DC-link voltage (-)
X4	Bold on	DC-link voltage (-)

Secondary rectifier card Z003 layout and connectors



Connector/pin	Connector type	Description
X1	Bold on	Main transformer
X2	Bold on	Main transformer
X3	Bold on	Main transformer
X4	Bold on	Main transformer
	Bold on	
X5	Bold on	Secondary choke
X6	Bold on	Secondary choke
X7	Bold on	Secondary choke
X8	Bold on	Secondary choke
X9	Tab terminal 6,3mm	Main transformer

Other tests

Here are several useful tests not mentioned before.

Machines three PTCs in connectors X13 – X15:

- PTCs are serial wired and any of them can affect thermal alert
- Resistance should be 55 - 70Ω
 - Values measured in 20 Celsius degrees and may vary depending environment temperature
 - If machine is warmed up values may vary
 - Broken PTC has mostly hundreds of kilo ohms or no value at all

Cooling fans:

- Cooling fans operating voltage is 24VDC (max. current 458mA)
- When cooling fans start, ground is switched

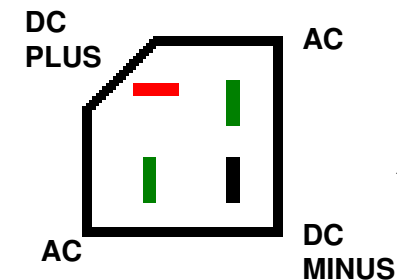
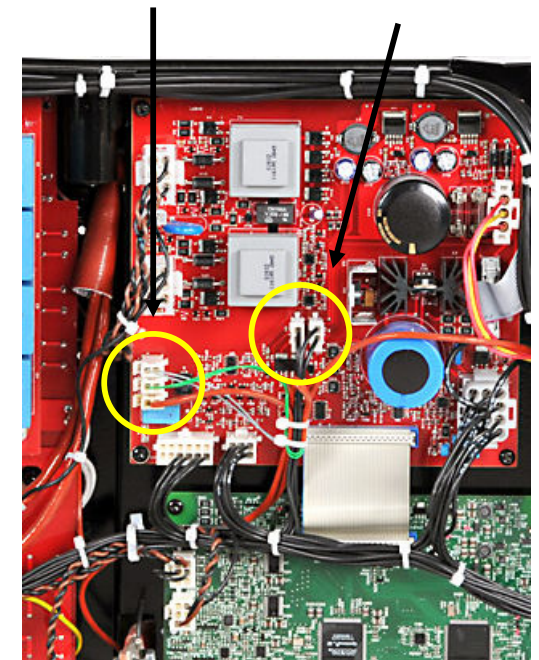
If cooling fans are not working, they might be short circuited or A001 card has failure in control logic.

Note! There is delay in cooling fan start up.

CAN bus voltage 0VDC

- Check if there is aux. voltage 38VAC to aux rectifier G003
- Check if there is CAN bus voltage 50VDC in rectifiers output
- Check if there is burned fuse in back plate fuse socket (6,3A)

PTC CONNECTORS FAN CONNECTORS



CAN bus voltage rectifier

Load bank test

Load bank test is used not only to simulate welding but also to check voltage/current characteristics. Load bank can be passive load with switchable power resistors or active with selectable voltage/current curves. If using passive load bank a multimeter is used for voltage and clamp meter for current measuring. Some passive loads have integrated meter for easier testing. Active loads have mostly meters because of their special construction (its control electronics needs values to adjust active load).

To be sure load bank is adjusted correctly, a calculation is required for voltage or current to have desired nominal curve. Constant voltage (e.g. MIG/MAG) and constant current (MMA) have different voltage/current values and they can be calculated from following formulas.

CC (MMA machines) curve's secondary voltage can be calculated when certain current is set:

$$U_2 = 0,04 \times I_2 + 20$$

CV (MIG/MAG machines) curve's secondary current can be calculated when certain voltage is set:

$$I_2 = \frac{U_2 - 14}{0,05}$$

Voltage/current have to be set for nominal curve, correct output power. E.g. when making PTC test there must be right values to meet duty cycle specified in technical specification.

Most useful tests to be made with a load bank are to check maximum and minimum current and to check if machines voltage/current adjustments and control electronics work.

Load bank test

Fastmig pulse power source can be tested without wire feeder in local loop mode. In local loop mode it is possible to have a secondary current up to 100A. To adjust current, remote controller have to be connected

Note! Local loop mode does not include MMA nominal curve so it is not possible to weld by MMA

Example 1: Constant current test (local loop mode)

- Turn the machines main switch OFF
- Connect machine to load bank
- Turn the machines main switch ON
- Connect remote controller to power source
 - In panel P65 can be seen title “Local loop”
- Add some load to load bank
- When current starts to flow, raise current to desired level (this example uses maximum value 100A)
 - Be fast when increasing load, there can exist arc inside the load bank switches
- Measure current by clamp meter and voltage by DMM
 - Values can be seen also in panel P65

Current should be 100A and voltage can be calculated from following equation:

$$I_2 = 100A$$

$$U_2 = 0,04 \times I_2 + 20$$

$$= 0,04 \times 100A + 20 = 4 + 20 = 24V$$

To get required voltage increase or decrease load in the load bank. Before disconnecting the load, decrease machine current to minimum to avoid unnecessary arc inside the load bank switches.

Load bank test

To make MIG/MAG load bank test for Fastmig Pulse, wire feeder must be connected to the power source.

Example 2: Constant voltage test (MIG/MAG)

- Turn the machines main switch OFF
- Connect machine to load bank
- Turn the machines main switch ON, be sure machine start is OFF (open)
- Add some load to load bank
- Adjust machine voltage to desired level (this example uses 22V)
- Start the machine
- Measure current by clamp meter and voltage by DMM
 - Values can be seen also in panels P65 and PF65

Now voltage should be 22V and current can be calculated from following equation:

$$U_2 = 22V$$

$$I_2 = \frac{U_2 - 14}{0,05}$$

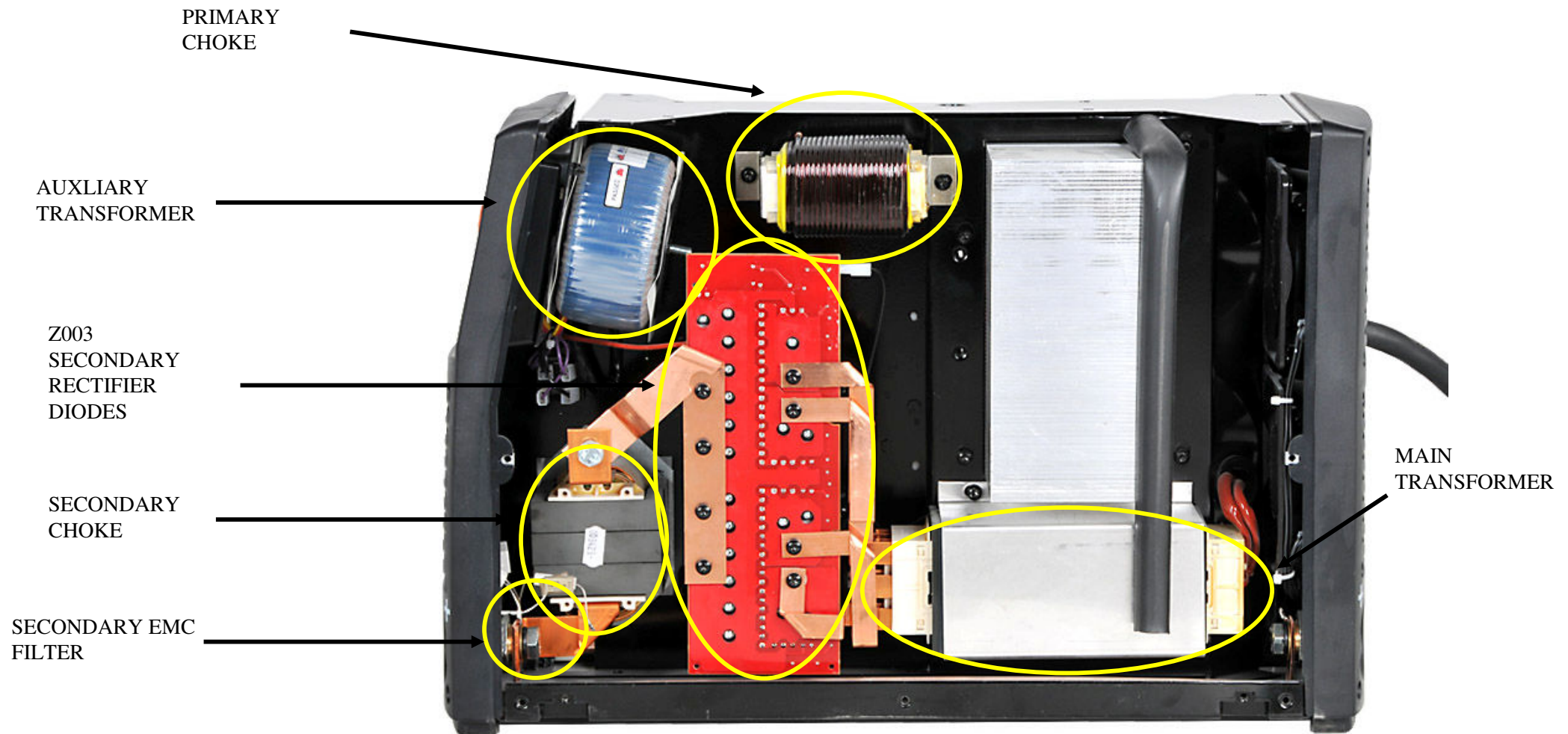
$$= \frac{22V - 14}{0,05} = \frac{8}{0,05} = 160A$$

To get the required current increase or decrease load in the load bank. Before disconnecting the load, put machine start to OFF to avoid unnecessary arc inside the load bank switches.

Error codes

Error	Problem description	Solution description
Err 1	Power source not calibrated or calibration data cannot be read	Restart power source, if the problem continues after multiple startups, check the power source control cards.
Err 3	Over voltage, mains supply	Check the main voltage.
Err 4	Over heat, power source	Do not shut down the machine, cooling fans will cool the machine. Check the ventilation. If cooling fans are not running, check the power source connections and voltages.
Err 5	Auxiliary voltage +15VDC too low (control card led H9 +15VDC)	Main supply voltage is too low or aux supply faulty, check the main/aux supplies. Can show up also if one of the mains phases is missing. Note! Only one of the three phases can affect this error if missing (one where aux transformer is NOT connected).
Err 8	FPGA not configured	Restart the power source, if the problem continues after multiple startups check the power source control cards.
Err 27	Water cooler error	Check the water cooler connections and functions. For more details check the cooler service manual.
Err 42	WF Motor over current <u>warning</u> , delayed fault at 3,5A	Check the gun and the consumable parts.
Err 43	WF Motor over current <u>error</u> , delayed lock at 5A	Check the gun and the consumable parts.
Err 45	Gas guard alert (only if gas guard connected and activated)	Check the shielding gas, gas guard and all the connections.
Err 50	Function is not activated	If function is required, please order proper license.
Err 62	Power source not connected or not identified	Check the intermediate cable. Feeder is powered up but it can not identify the power source.
Err 81	Welding program not found	If welding program is required, please order proper welding program and license.
MEM ERR	Error while reading or writing to memory	Machine can not write to feeder memory card, check the cables and connections, possibly broken control/memory card.
NO BUS	Panel can not connect to the CAN bus	Check the flat cables. Check the panels

Construction, right side



Construction, left side

