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Chapter 1 Working principle and structure of GMAW machine

Section 1 General description

Gas metal arc welding, GMAW for short, is a welding process with a continuously fed consumable wire acting as both electrode and filler metal, along with an inert or semi-inert shielding gas flowed around the wire to prevent the weld site from contamination.

With continuously fed filler electrodes and high current density, GMAW offers high wire deposition rate (except CO_2 welding), little welding deformation and little slag. Therefore, it is energy-saving and of high efficiency.

Welding wire is one of the major factors which affect the welding process in GMAW. Therefore, it should meet the requirements below.

1) The welding wire should be compatible with the base metal. Different wires should be used for different base metal.
2) Select welding wire of appropriate diameter according to the thickness of base metal and welding position.
3) Select proper welding wire type. There are solid wire and flux-cored wire, and copper-coated solid wire is the most widely used.

Another major factor which affects the welding process in GMAW is the shield gas. The welding method using argon, helium or the gas mixture of them as shield gas ia called metal inert gas welding, MIG welding for short. MIG welding is often used in the welding of non-ferrous metals such as aluminum, magnesium, copper, titanium, etc.

If a small amount of oxidizing gas (O_2, CO_2 or the gas mixture of them) is added to the argon gas, and this gas mixture is used as the shield gas, the welding method is called metal active gas welding, MAG welding for short. MAG welding is often used in the welding of ferrous metals.

When welding steel with pure argon as shield gas, phenomena such as unstable arc and undercut may occur. However, if some O_2 or CO_2 is added, wandering of arc caused by the dancing of anodic spot will be eliminated. Mixed gas (20% CO_2 +80% argon) shielded arc welding is commonly used in China. It carries the characteristics of TIG welding such as stable arc, little spatter and spray transfer, and overcomes the problems in pure argon arc welding such as surface tension too big, liquid metal too viscous, easy to undercut and spot dancing. Besides, the weld bead shaping is improved and the arc-shaped deep penetration can be obtained.

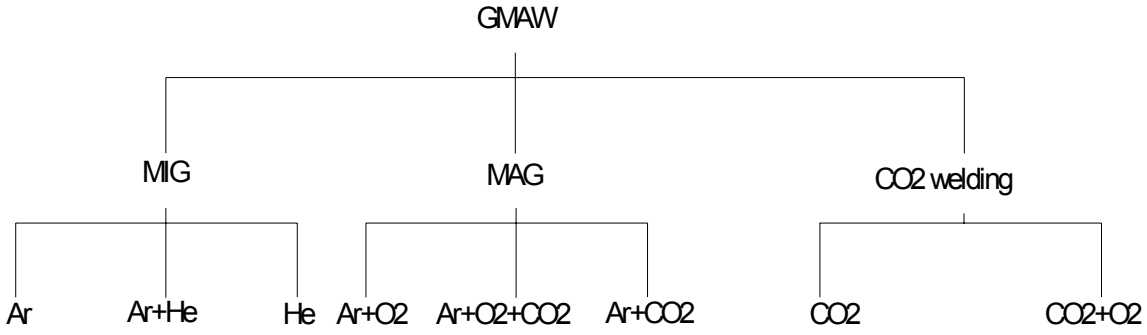
The welding method using CO_2 as shield gas ia called CO_2 gas shielded arc welding, CO_2 welding for short. Mixed gas of CO_2 and O_2 can be used as shield gas as well. MIG welding is often used in the welding of non-ferrous metals such as aluminum, magnesium, copper, titanium, etc. For its low cost and high efficiency, CO_2 welding has now become the major welding process for ferrous metals.

CO_2 welding has many advantages such as high deposition speed, deep penetration, low cost, applicable to both thick and thin plates welding and convenient to carry out welding for various positions.

However, there will be metal spatter produced during welding, and the weld bead will be poorly shaped. Spatter will ont only reduce the deposition efficiency, but also worsen the working condition.

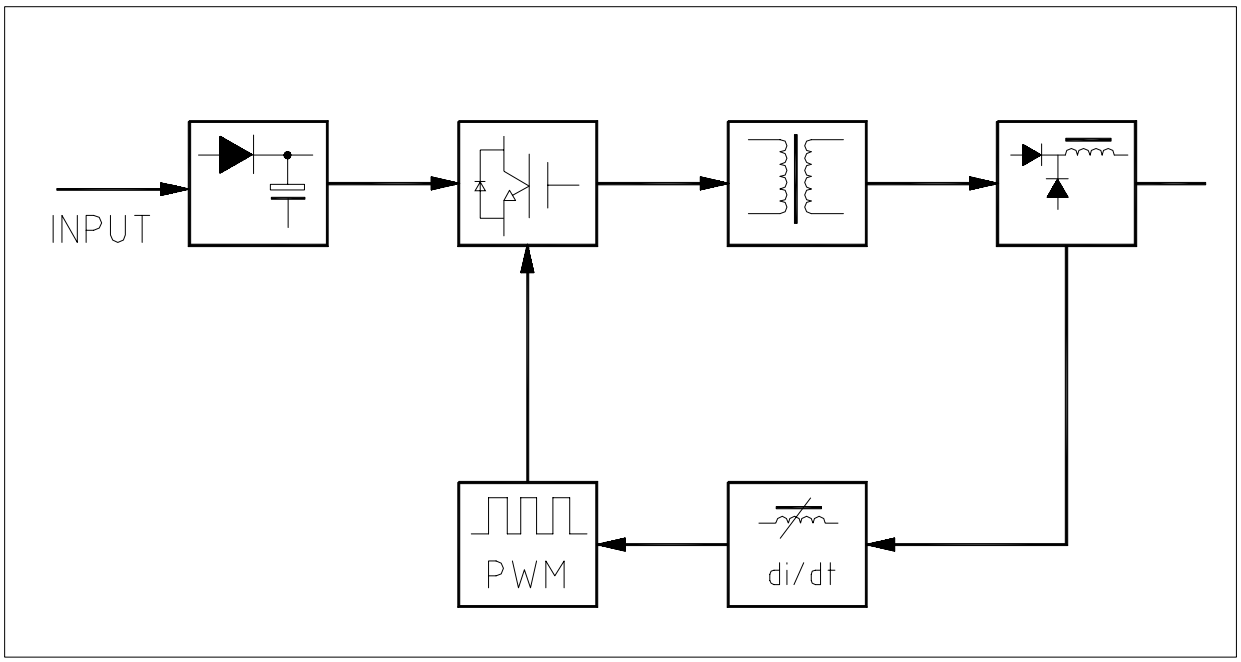
One of the main causes for the spatter is that CO is generated by the interaction of CO_2, a kind of strongly oxidizing gas, and the carbon in the droplet and molten pool, and intense explosion occurs because of the rapid expansion of CO in the metal.

Each welding process of GMAW has its own charaterictics. MIG welding is applicable to welding stainless steel and non-ferrous metals such as aluminum and copper, but it is too expensive for welding mild steel. MAG can help users to get stable welding and beautiful weld bead, but it is not as economic as CO_2 welding. For mild steel welding, CO_2 welding is commonly used. Stable spray transfer can be obtained in the low current range below the critical current in pulsed MIG/MAG welding. Beside, there will be little spatter, and beautiful weld bead can be obtained. For the classification of GMAW, please see the diagram below.



Section 2 Working principle of GMAW

The GMAW machines made by our company can be divided into single-phase models and three-phase models according to their different input power supply, and the machine is composed of the power rectifier module, drive module, inverter switching components, HF transformer, rectifier module and the control circuit. The schematic block diagram is as below.



After the single-phase 220V or 3-phase 380V power supply is input and rectified, it is converted into HF AC by the IGBT inverter. Then, it is stepped down by the HF transformer and rectified by the HF rectifier. After filtering, DC for welding is output. Through this process, the dynamic response speed of the welding machine is improved, and the size and weight of the machine is reduced. With the closed-loop control on the machine by the control circuit, the welding power supply is workable in case of mains voltage fluctuation, and the welding performance is excellent.

The whole control circuit is composed of the voltage regulator, waveform controller and the current regulator. The outer loop is the voltage loop, which ensures the stability of the welding voltage. The inner loop is the current loop, which ensures the dynamic characteristic of the welding power supply together with the waveform controller. It controls the rate of short-circuit current rise when the droplet is shorted with the workpiece. Thus, spatter can be reduced. It regulates the rate of arc energy decline during arc igniting, so the weld bead shaping can be improved.

Section 3 Structure of GMAW machines

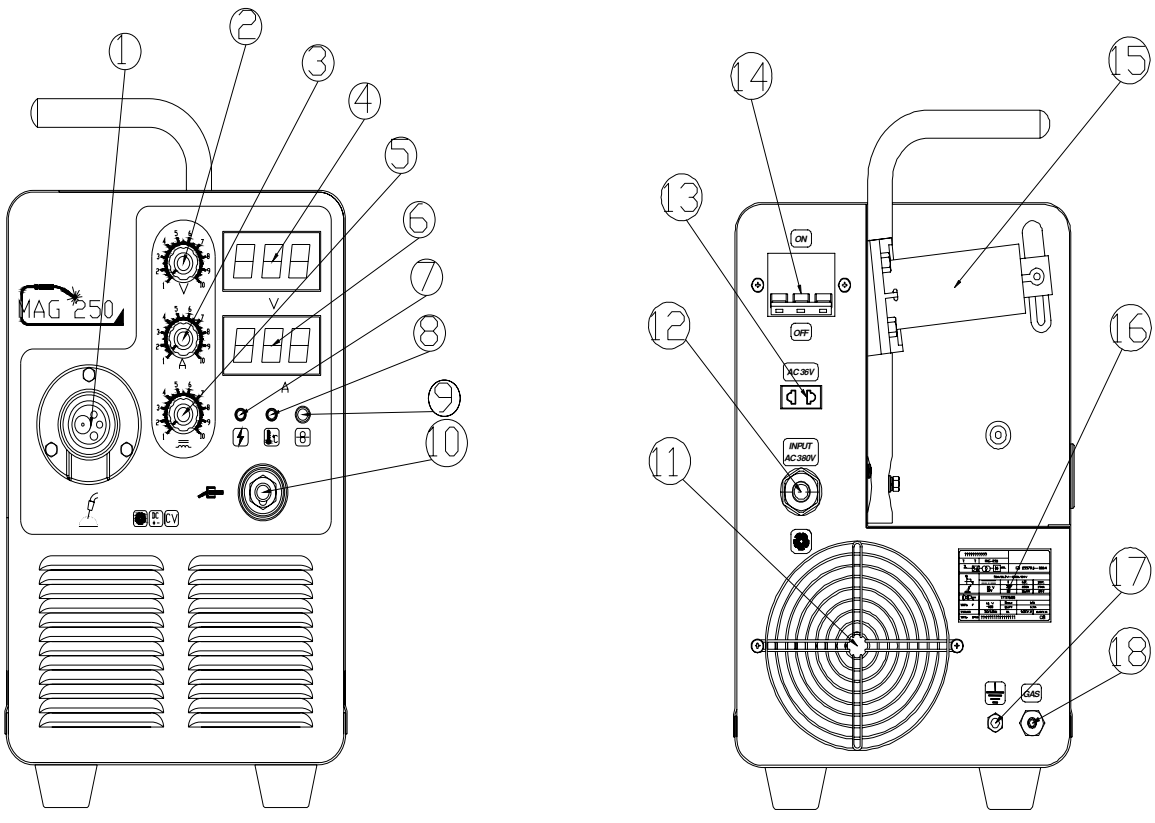
1. Panel description of MIG250 (J04) series

1.1 Front panel (see Figure 3.1-a)

1) Welding torch interface
2) Voltage control knob
3) Wire feed control knob
4) Voltmeter
5) Inductance control knob
6) Ammeter
7) Power LED
8) Overheating LED
9) Manual wire feed switch
10) “-” quick connector

1.2 Back panel (see Figure 3.1-b)

11) Fan
12) Input terminal of the power cord
13) Socket of the heater
14) Power switch
15) Spindle adapter for the wire spool
16) Nameplate
17) Ground terminal
18) Gas inlet



(a) **(b)**

Figure 3.1 Panels of MIG 250(J04) series

2. Panel description of MIG160 (J35) series

2.1 Front panel (see Figure 3.2-a)

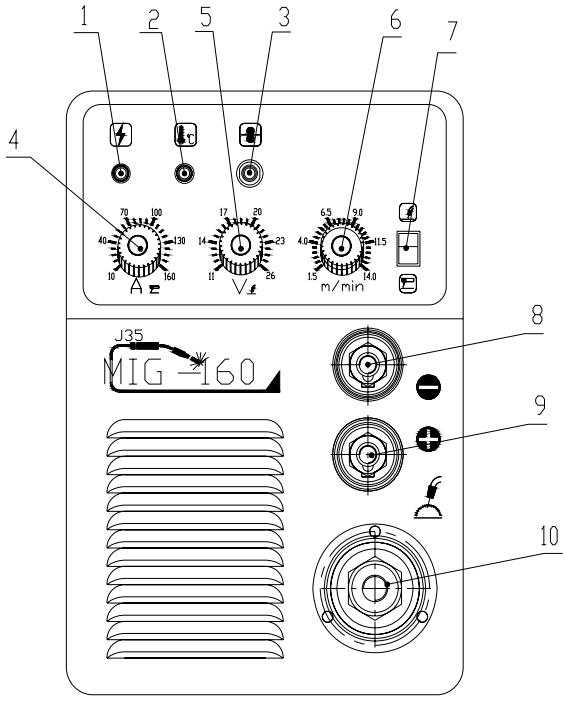
1) Power LED
2) Overheating LED
3) Manual wire feed switch
4) Current control knob (MMA)
5) Voltage control knob (MIG)
6) Wire feed speed control knob (MIG)
7) MIG/MMA switch
8) “-” output terminal “1”
9) “+” output terminal “1”
10) European connector of the welding torch (MIG)

2.2 Back panel (see Figure 3.2-b)

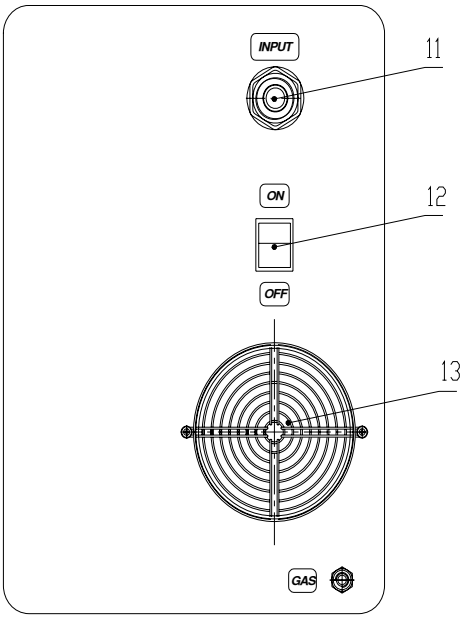
11) Input terminal of power cord
12) Power switch
13) Fan

2.3 Clapboard (see Figure 3.2-c)

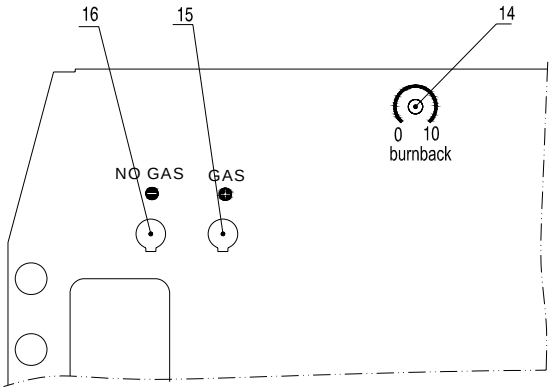
14) Burnback time control knob
15) “+” output terminal “2”
16) “-” output terminal “2”



(a)



(b)



(c)

Figure 3.2 Panels of MIG 160(J35) series

3. Panel description of MIG250 (J67) series

3.1 Front panel (see Figure 3.3-a)

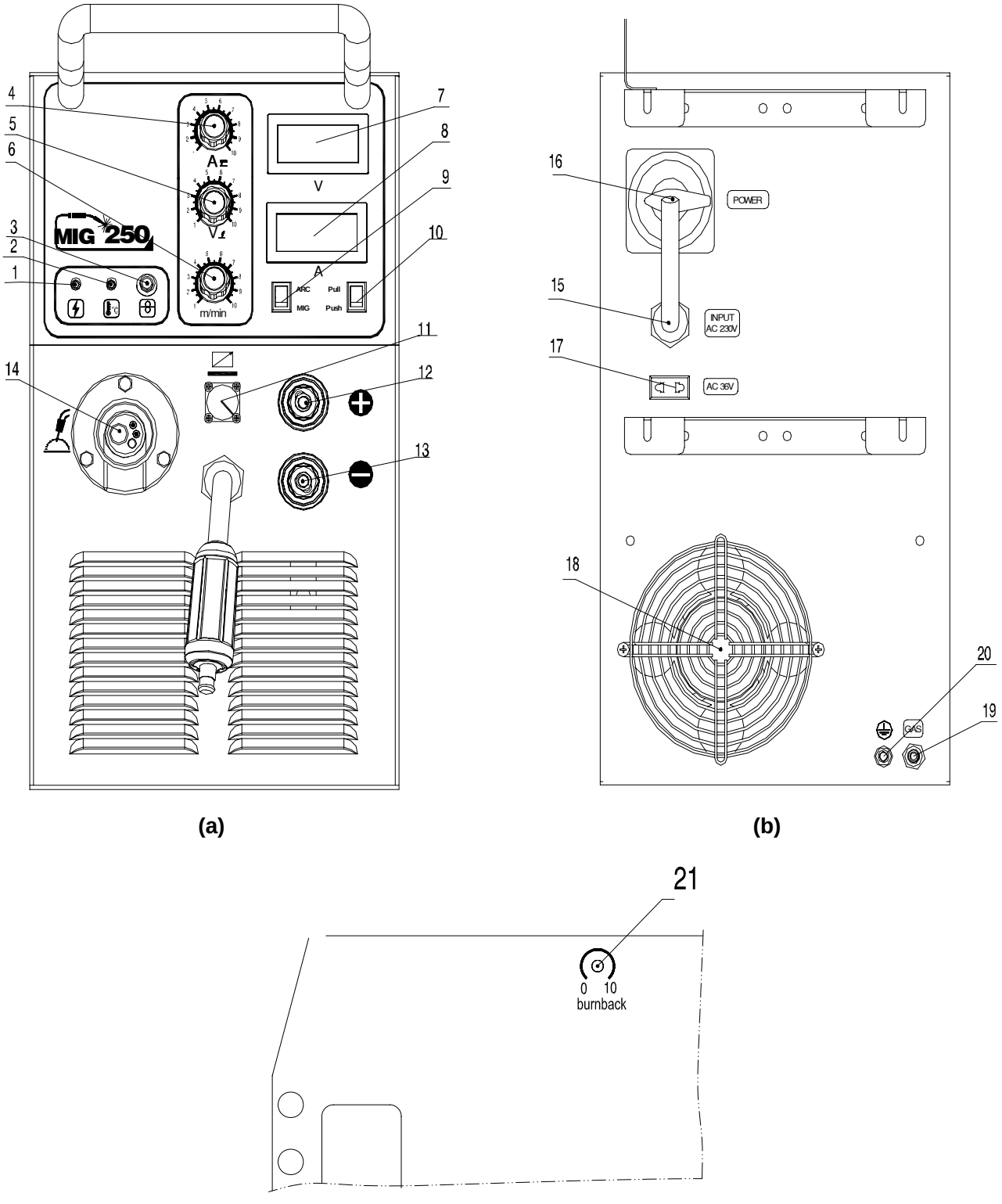
1) Power LED
2) Overheating
3) Manual wire feed switch
4) Current control knob (MMA)
5) Voltage control knob (MIG)
6) Wire feed speed control knob (MIG)
7) Voltmeter
8) Ammeter
9) MIG/MMA switch
10) Pull-wire/Push-wire torch switch
11) Socket for the control wire of pull-wire torch
12) “+” output terminal
13) “-” output terminal
14) European connector of the welding torch (MIG)

3.2 Back panel (see Figure 3.3-b)

15) Input terminal of power cord
16) Power switch
17) Socket for the power supply of gas regulator
18) Fan
19) Gas inlet
20) Ground terminal

3.3 Clapboard (see Figure 3.3-c)

21) Burnback time control knob



(a) **(b)**

(c)

Figure 3.3 Panels of MIG 250(J67) series

4. Panel description of MIG350 (J72) series

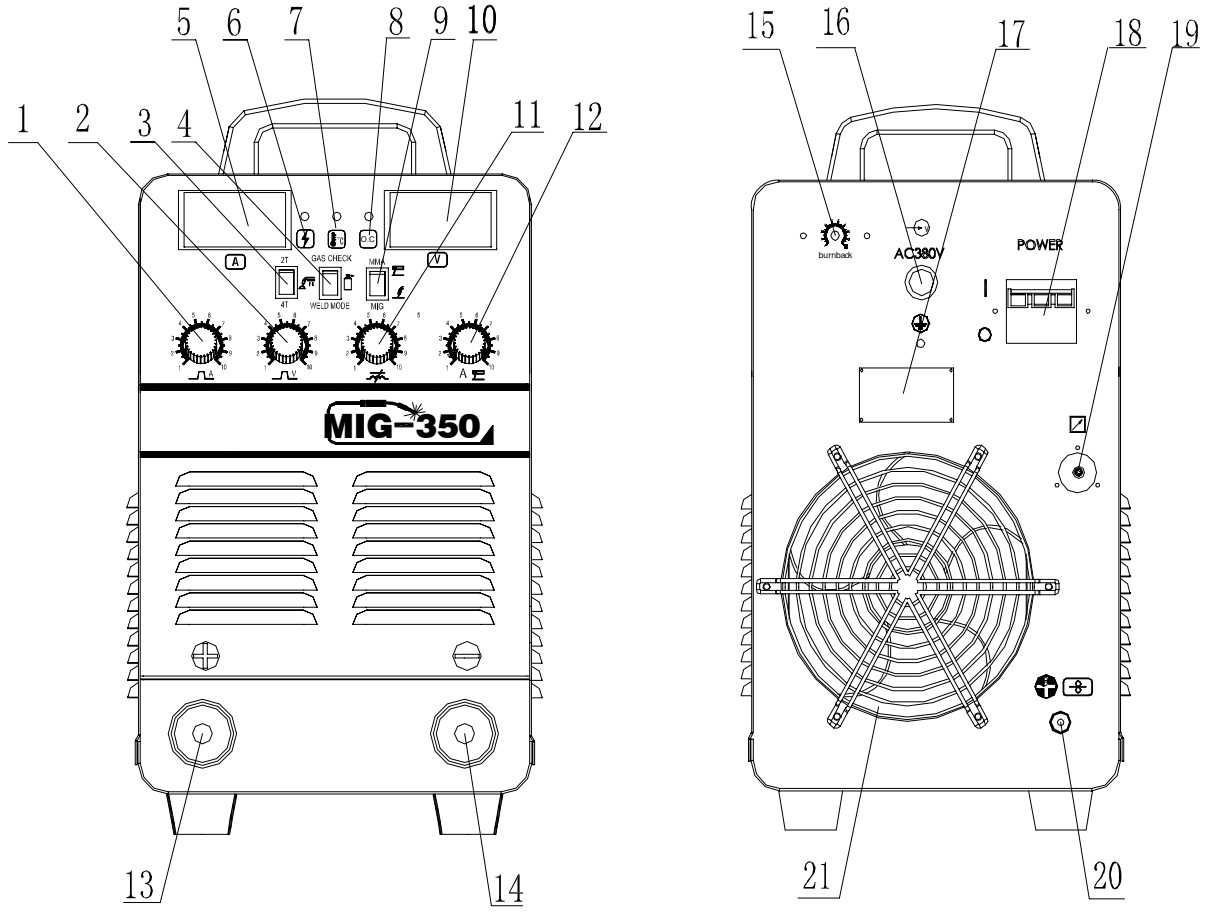
4.1 Front panel (see Figure 3.4-a)

1) Crater current control knob
2) Crater voltage control knob
3) 2T/4T switch

4) Gas-check switch
5) Ammeter
6) Power LED
7) Overheating LED
8) Overcurrent LED
9) MIG/MMA switch
10) Voltmeter
11) Inductance control knob
12) Current control knob (MMA)
13) “+” output terminal “1”
14) “-” output terminal

4.2 Back panel (see Figure 3.4-b)

15) Burnback time control knob
16) Buckle
17) Nameplate
18) Power switch
19) Socket for the wire feeder
20) “+” output terminal “2”
21) Fan



(a) **(b)**

Figure 3.4 Panels of MIG 350(J72) series

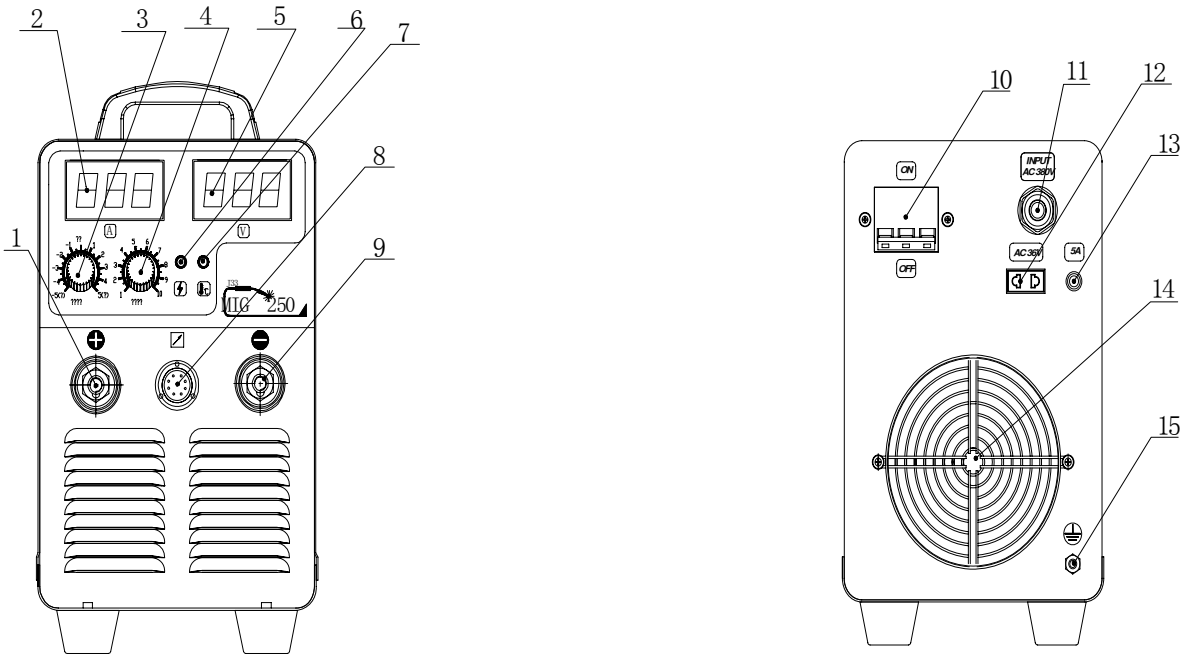
5. Panel description of MIG250F (J33) series

5.1 Front panel (see Figure 3.5-a)

1) “+” output terminal
2) Ammeter
3) Inductance control knob
4) Burnback time control knob
5) Voltmeter
6) Power LED
7) Overheatig LED
8) Aviation socket
9) “-” output terminal

5.2 Back panel (see Figure 3.5-b)

10) Power switch
11) Buckle
12) Socket for the heater
13) Fuse holder
14) Fan
15) Ground terminal



(a) **(b)**

Figure 3.5 Panels of MIG 250F(J33) series

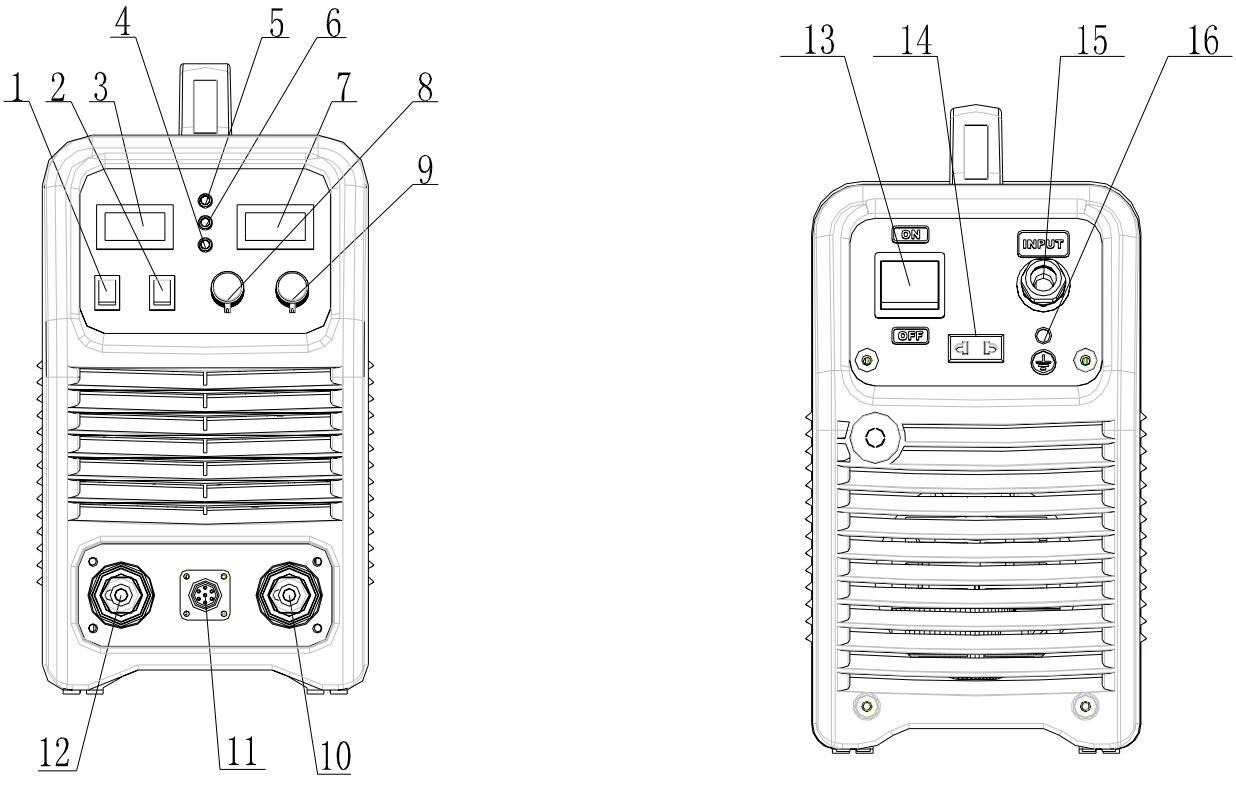
6. Panel description of MIG250F (N201) series

6.1 Front panel (see Figure 3.6-a)

1) Spot welding/longtime welding switch
2) MMA/MIG switch
3) Voltmeter
4) Overcurrent LED
5) Power LED
6) Overheating LED
7) Ammeter
8) Current control knob (MMA)
9) Inductance control knob
10) “-” output terminal
11) Socket for the wire feeder
12) “+” output terminal

6.2 Back panel (see Figure 3.6-b)

13) Power switch
14) Socket for the gas regulator
15) Input terminal of the 3-phase power cord
16) Ground terminal



(a) **(b)**

Figure 3.6 Panels of MIG 250F(N201) series

7. Panel description of MIG350 (J1601) series

7.1 Front panel (see Figure 3.7-a)

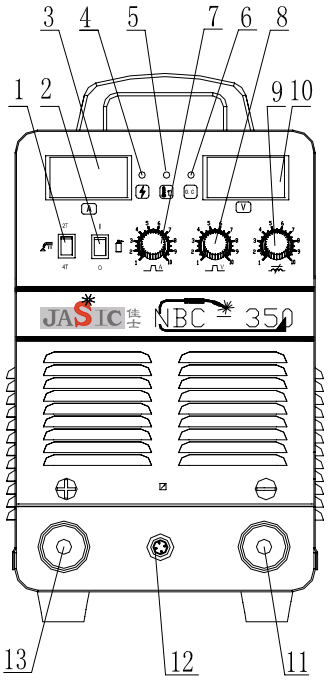
1) 2T/4T switch
2) Gas-check switch
3) Ammeter
4) Power LED
5) Overcurrent LED
6) Overheating LED
7) Crater current control knob
8) Crater voltage control knob
9) Inductance control knob
10) Voltmeter
11) “-” output terminal
12) Socket for the wire feeder
13) “+” output terminal

7.2 Wire feeder panel (see Figure 3.7-b)

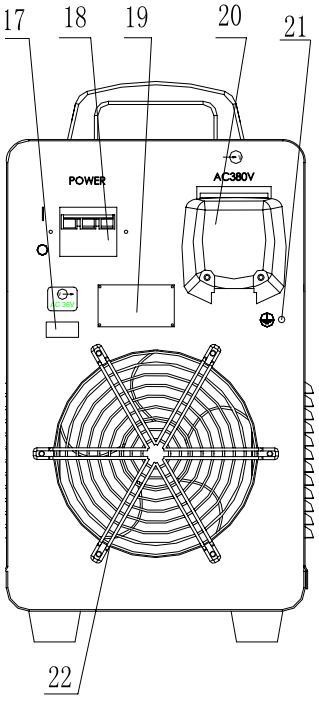
14) Current control knob
15) Manual wire feed switch
16) Voltage control knob

7.3 Back panel (see Figure 3.7-c)

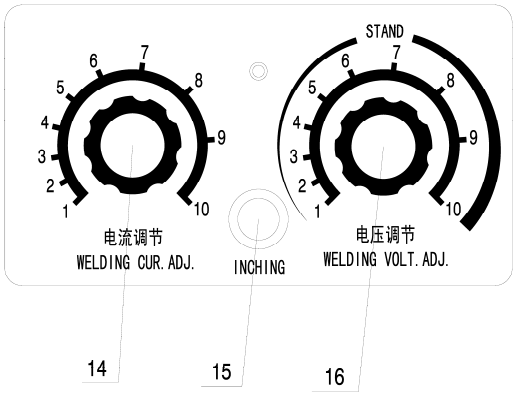
17) Socket for the heater
18) Power switch
19) Nameplate
20) 3-phase power input conjunction box
21) Ground terminal
22) Fan guard



(a)



(c)



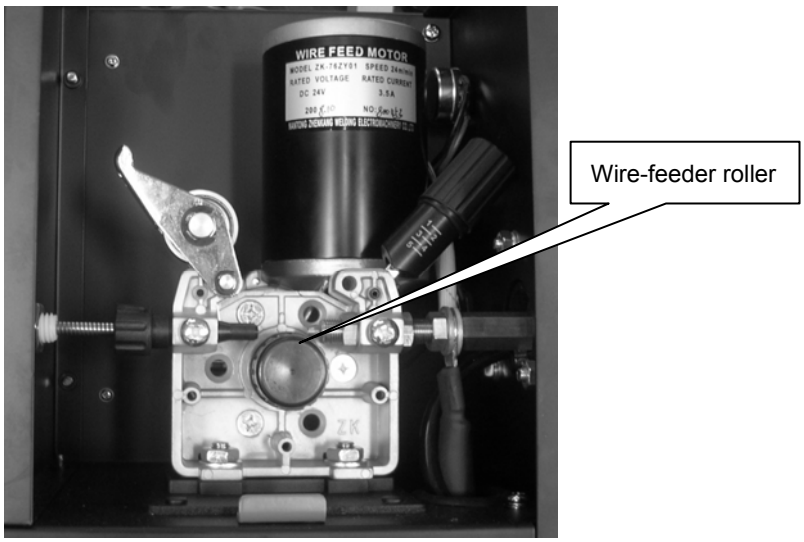
(b)

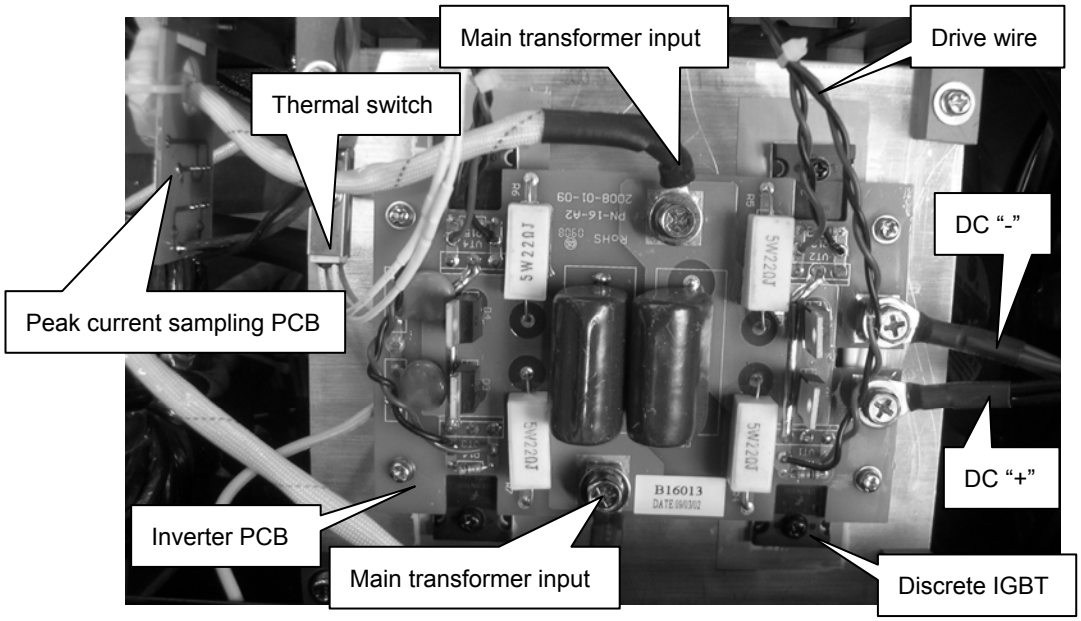
Figure 3.7 Panels of MIG 350(J1601) series

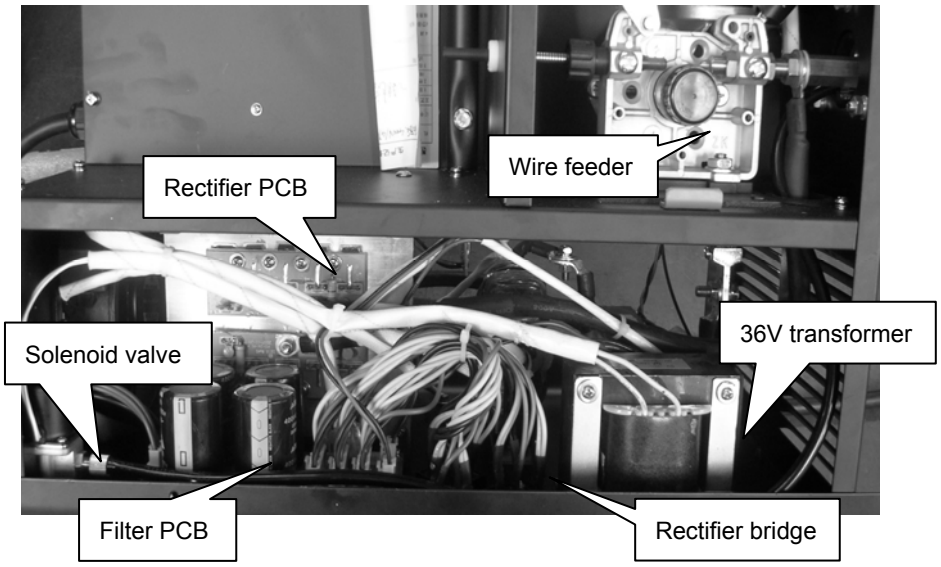
8. Internal structure of GMAW machines

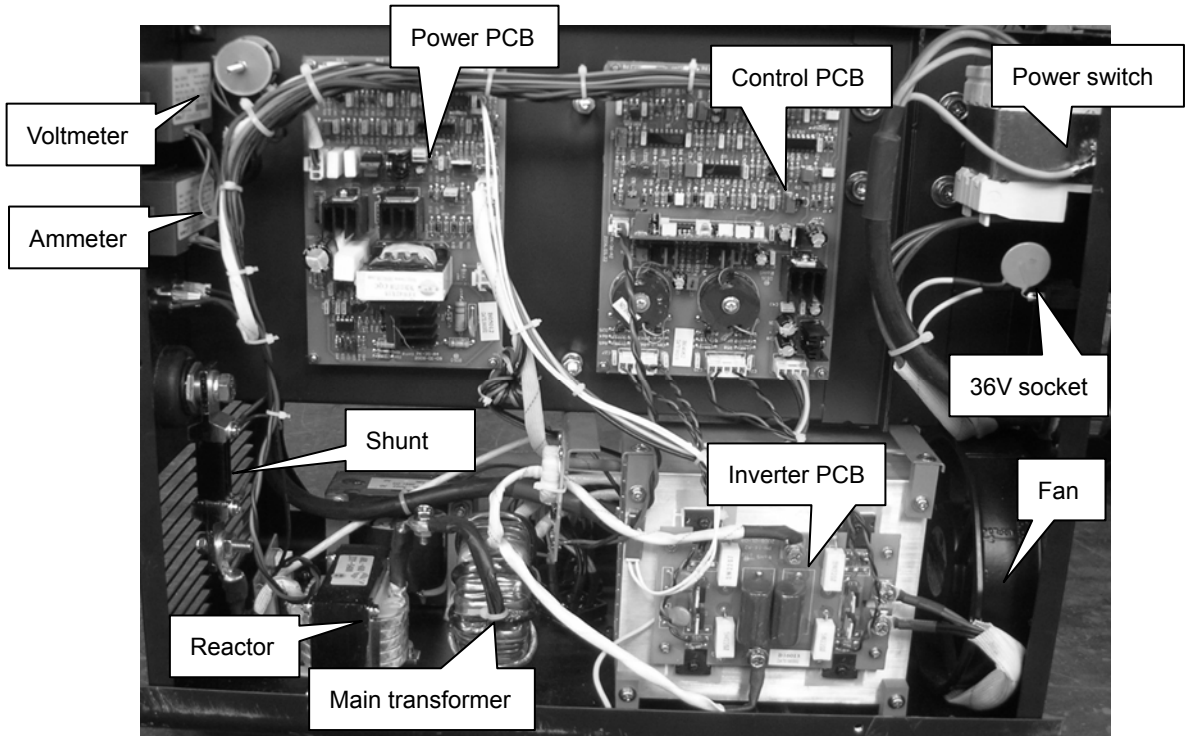
The internal structure layout of the GMAW series models is almost the same. Their differences lie in their appearances, the number of IGBT and output rectifier diodes and the parameters of main transformer. Therefore, only the internal structure of MIG250 (J04), MIG160 (J35), MIG250 (J67), MIG350 (J72), MIG250F (J33), MIG250F (N201) and NBC-350 (J1601) is detailed as below for your reference.

8.1 J03/J04

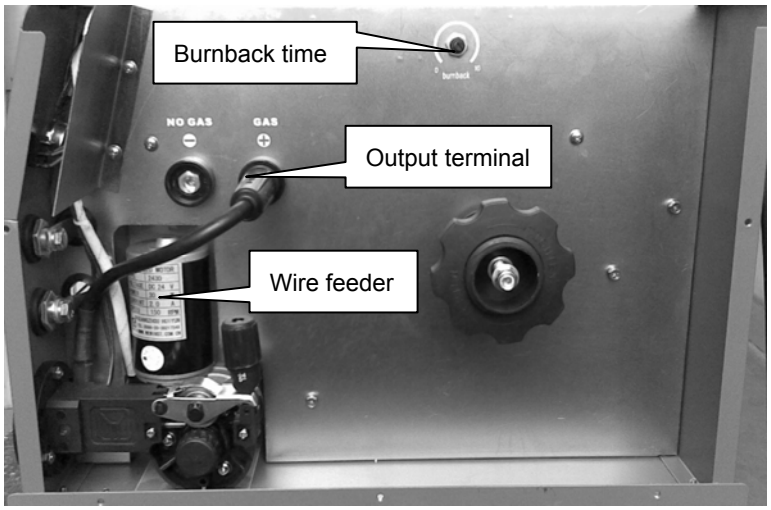


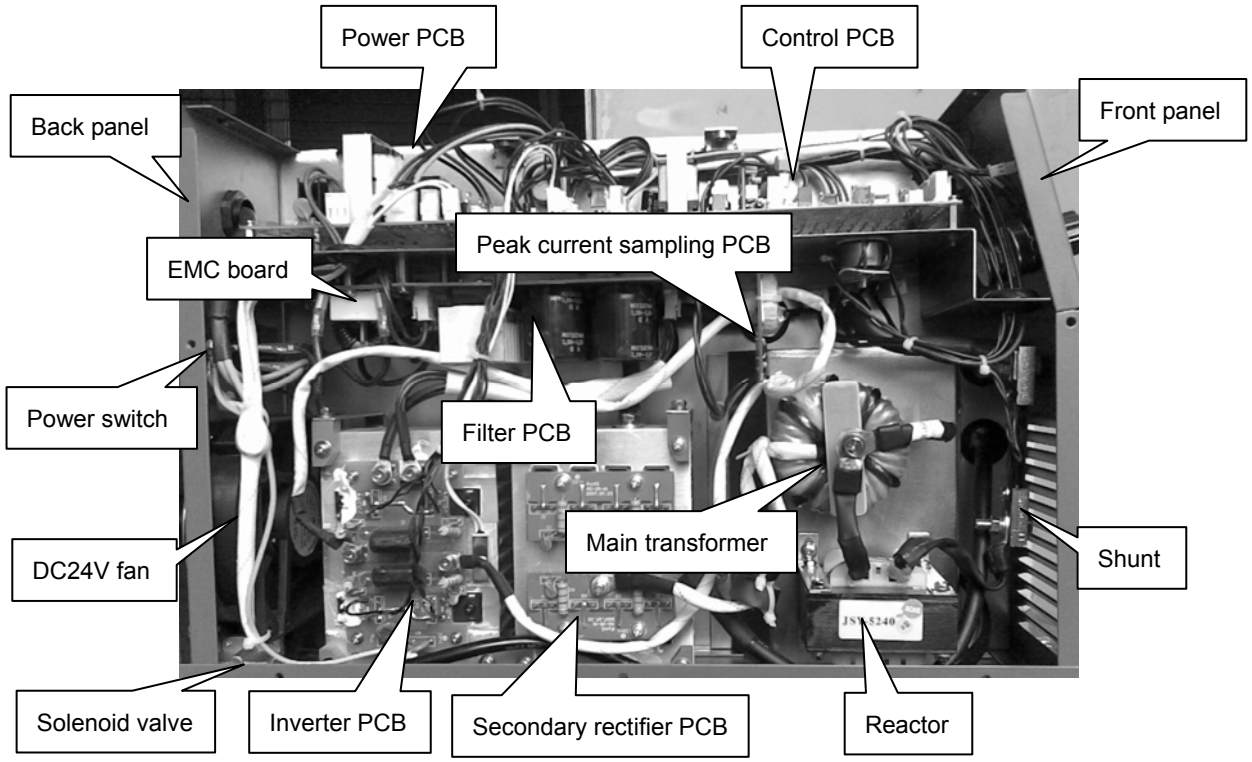



Wire feeder
Rectifier PCB
36V transformer
Solenoid valve
Filter PCB
Rectifier bridge

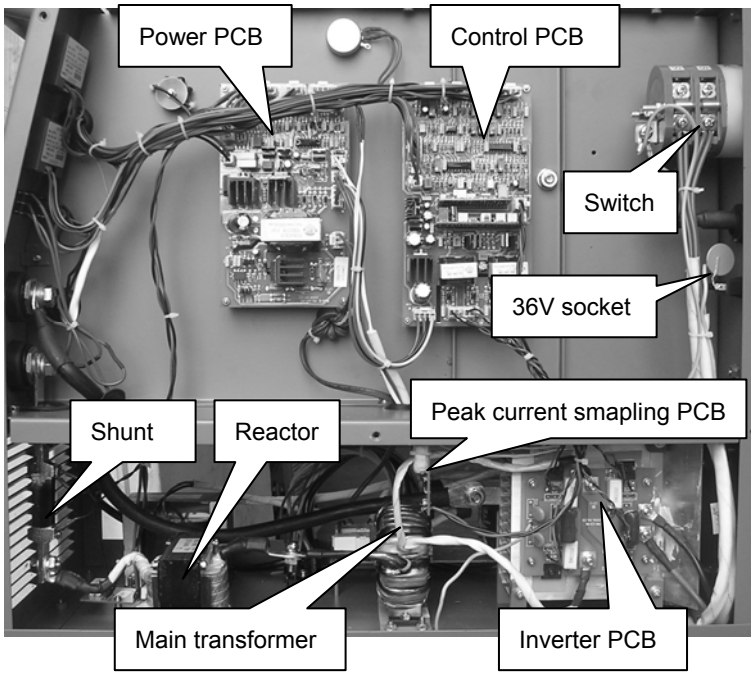

Power PCB
Control PCB
Power switch
Voltmeter
Ammeter
36V socket
Shunt
Inverter PCB
Fan
Reactor
Main transformer

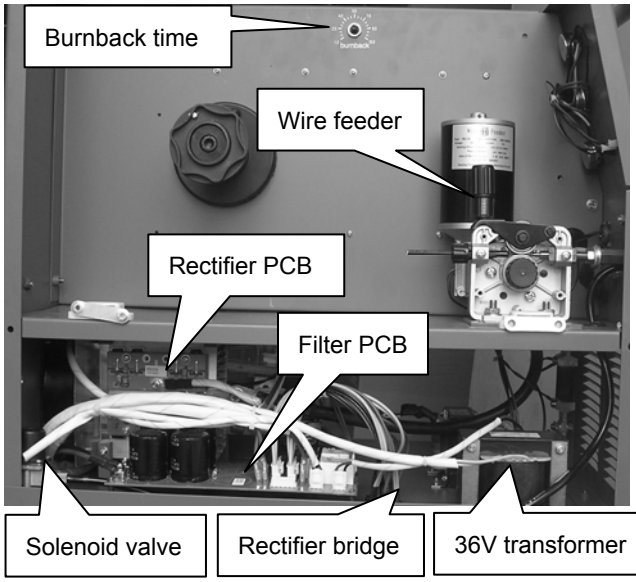
8.2 J35/J46

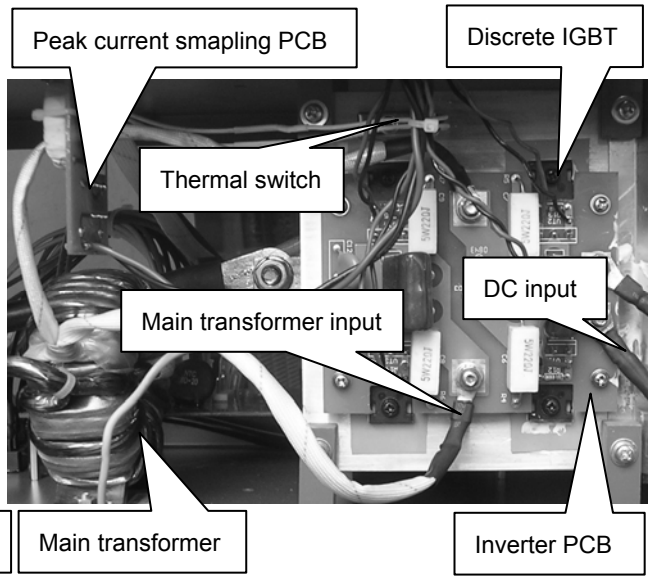

Burnback time
NO GAS
GAS
Output terminal
Wire feeder


Power PCB
Control PCB
Back panel
Front panel
Peak current sampling PCB
EMC board
Power switch
Filter PCB
Main transformer
Shunt
DC24V fan
Solenoid valve
Inverter PCB
Secondary rectifier PCB
Reactor

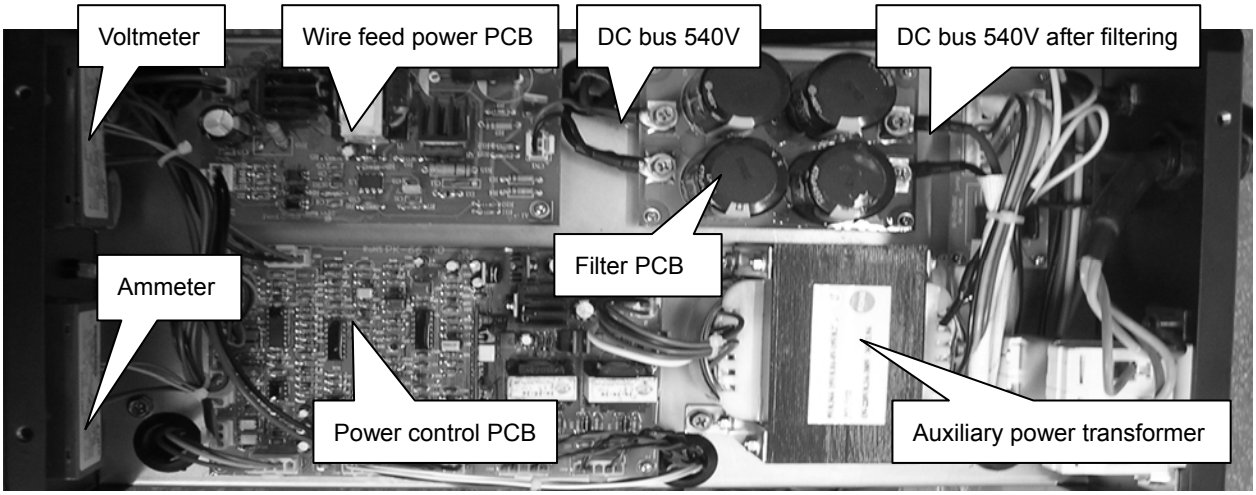
8.3 J66/J67/J80/J92

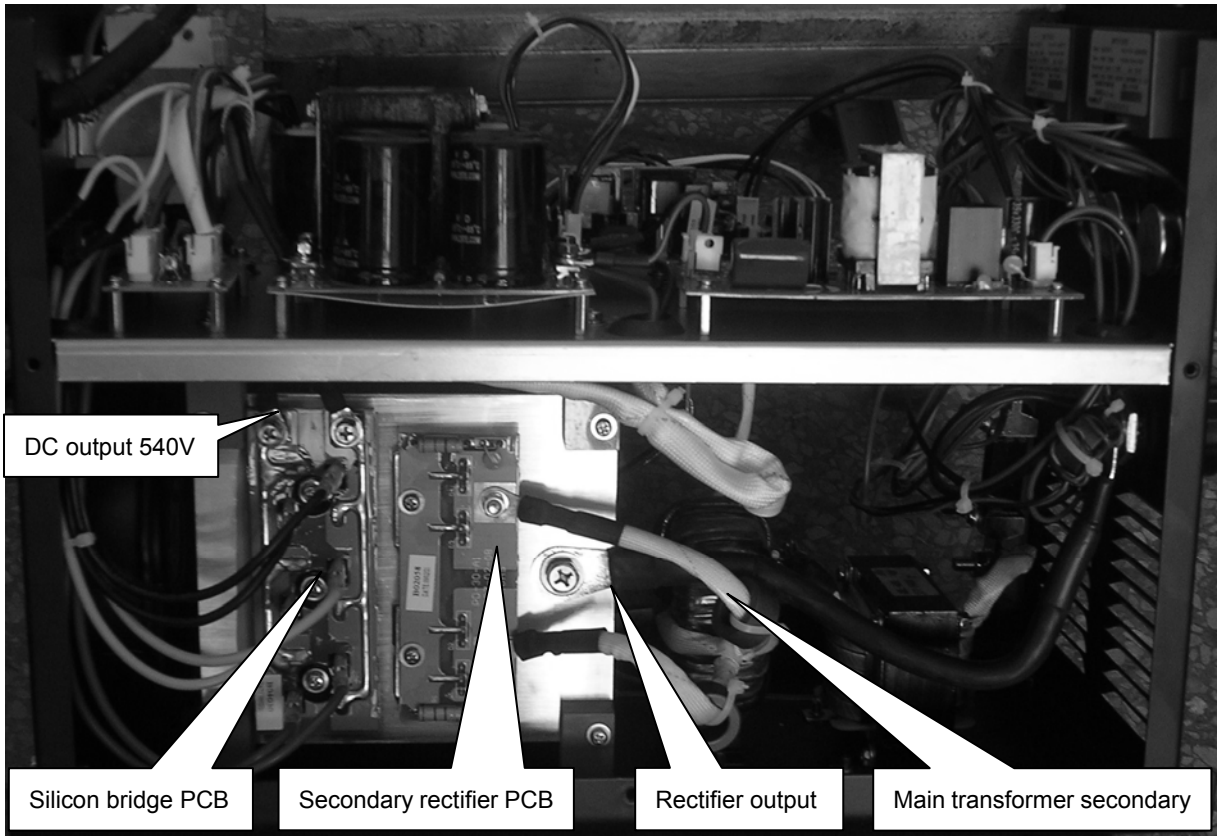


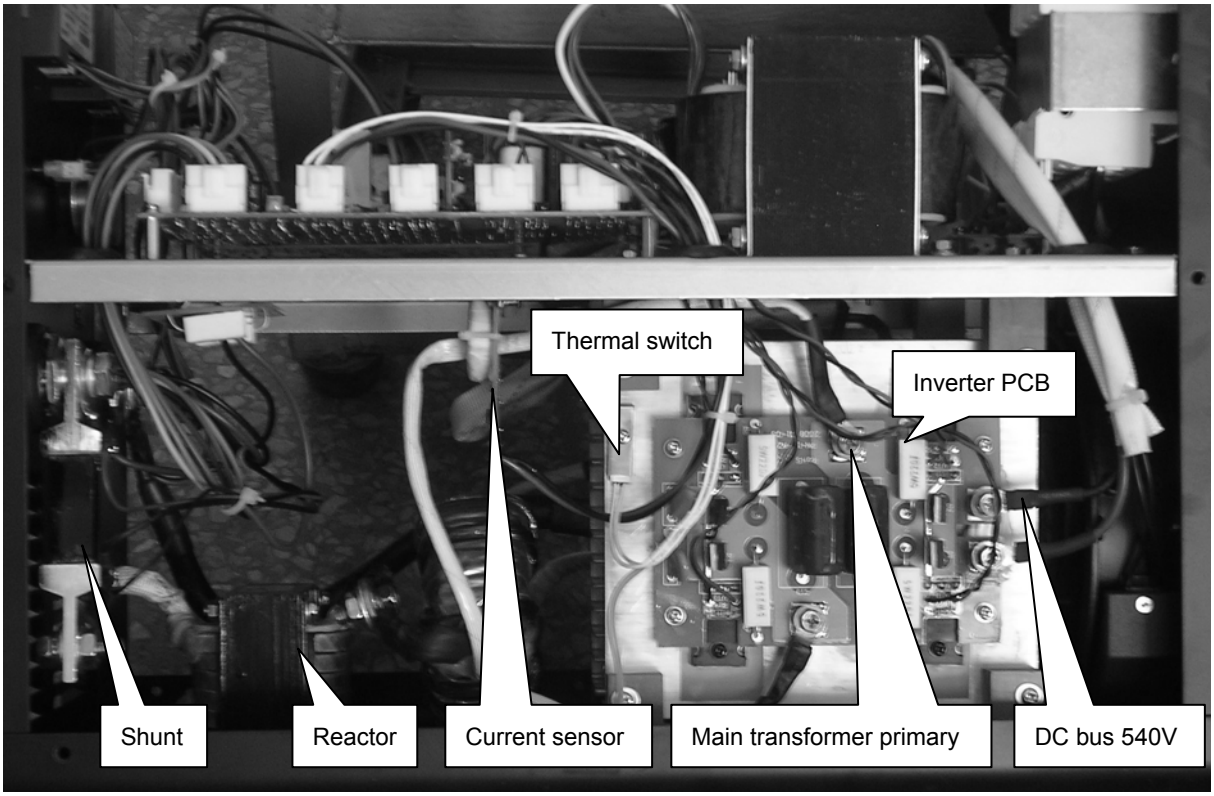


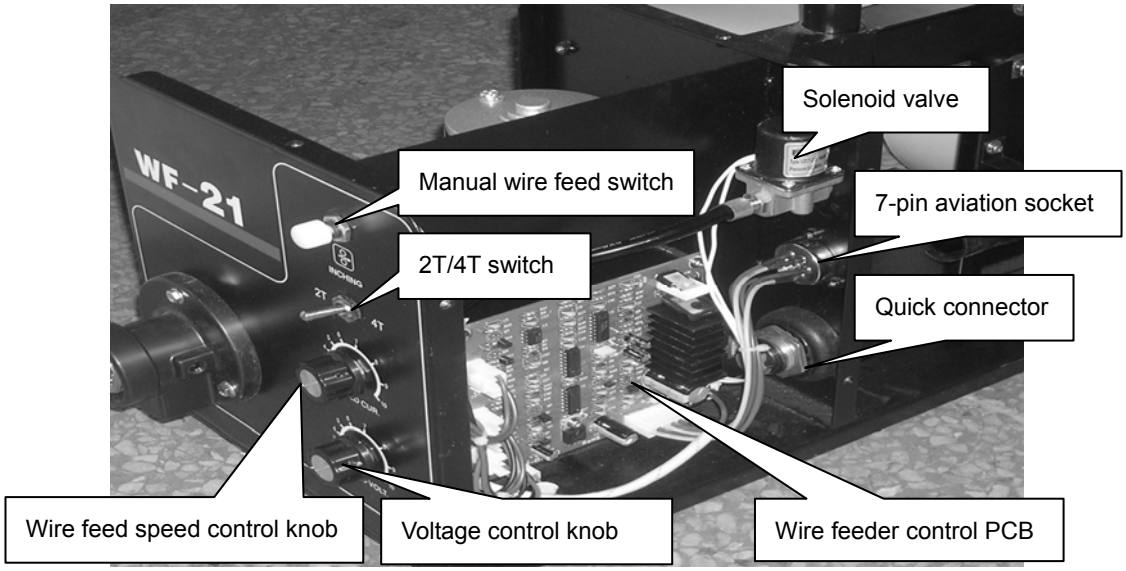


8.4 J33/J44

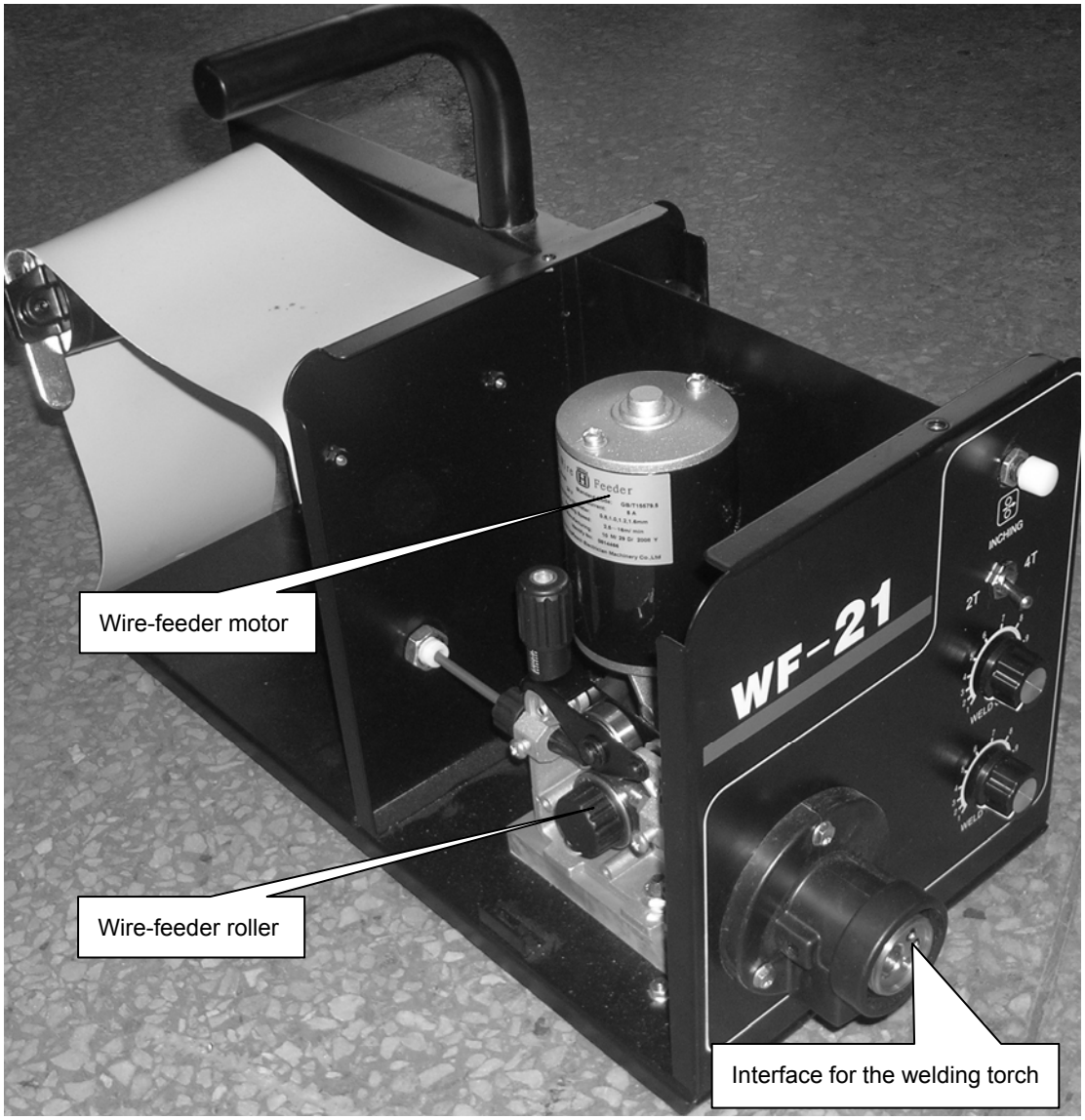

Voltmeter
Wire feed power PCB
DC bus 540V
DC bus 540V after filtering
Filter PCB
Ammeter
Power control PCB
Auxiliary power transformer


DC output 540V
Silicon bridge PCB
Secondary rectifier PCB
Rectifier output
Main transformer secondary


Thermal switch
Inverter PCB
Shunt
Reactor
Current sensor
Main transformer primary
DC bus 540V

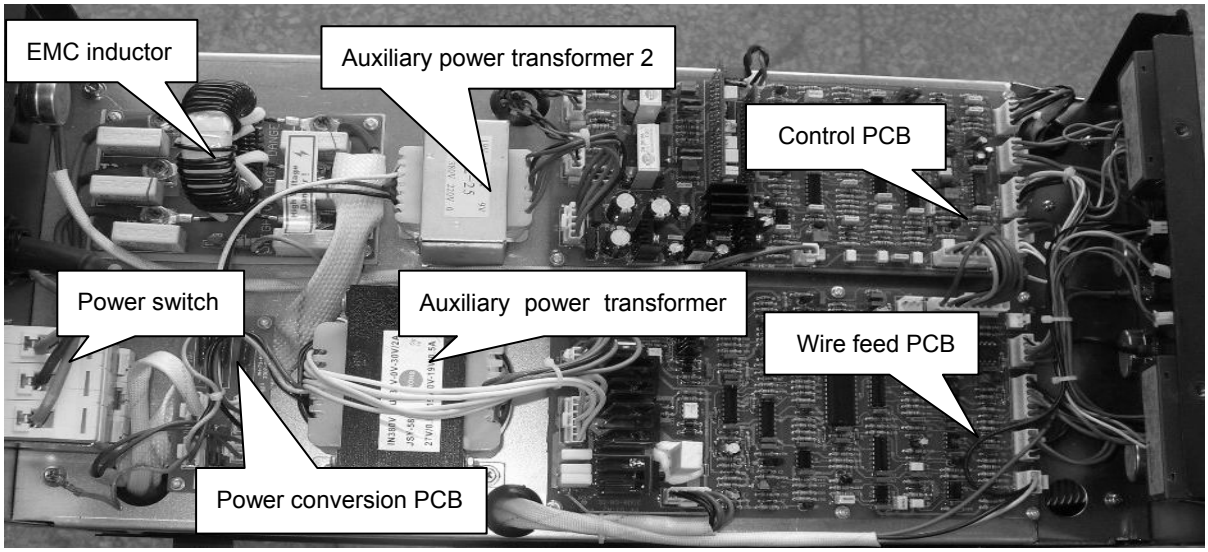

WF-21
Solenoid valve
Manual wire feed switch
7-pin aviation socket
2T/4T switch
Quick connector
Wire feed speed control knob
Voltage control knob
Wire feeder control PCB

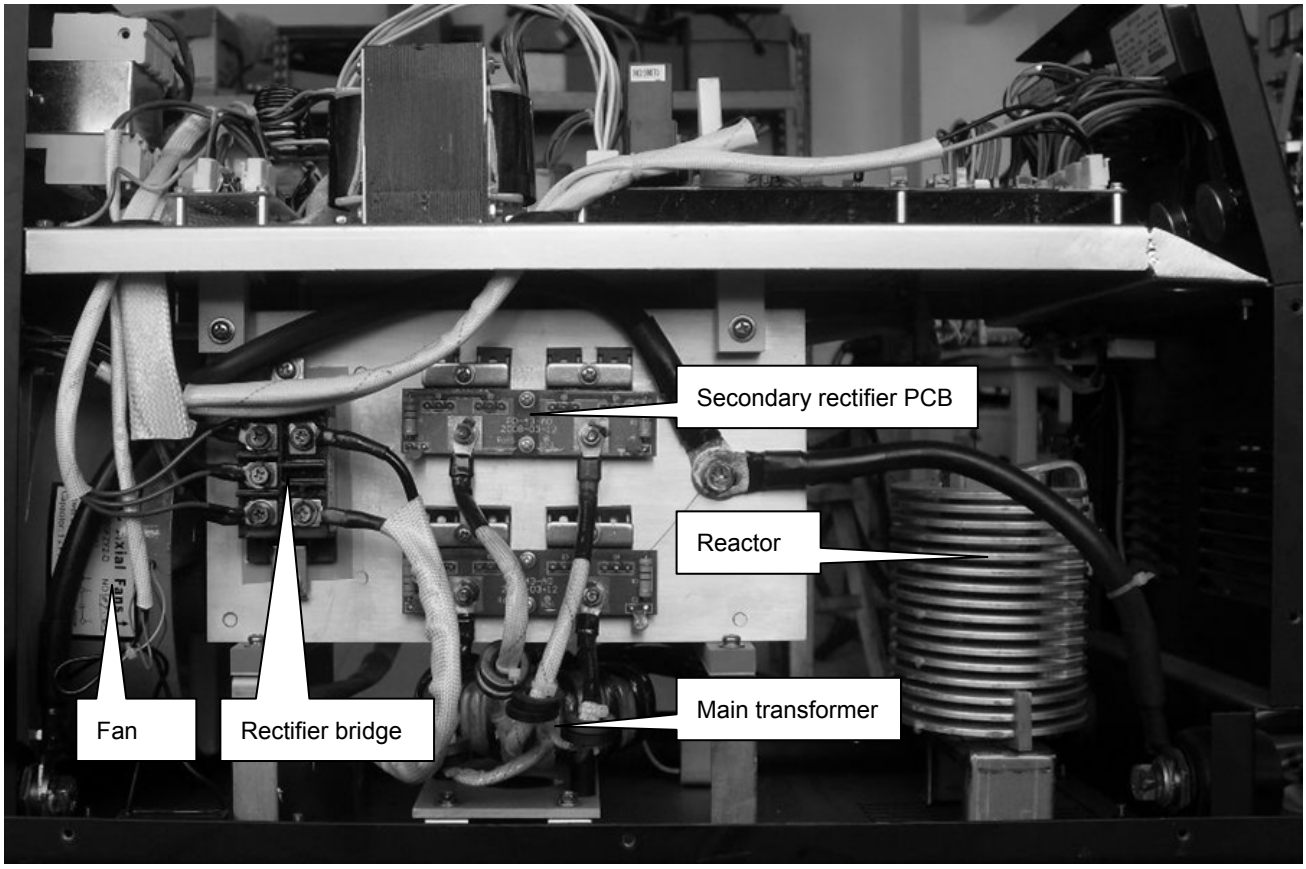
Wire feeder

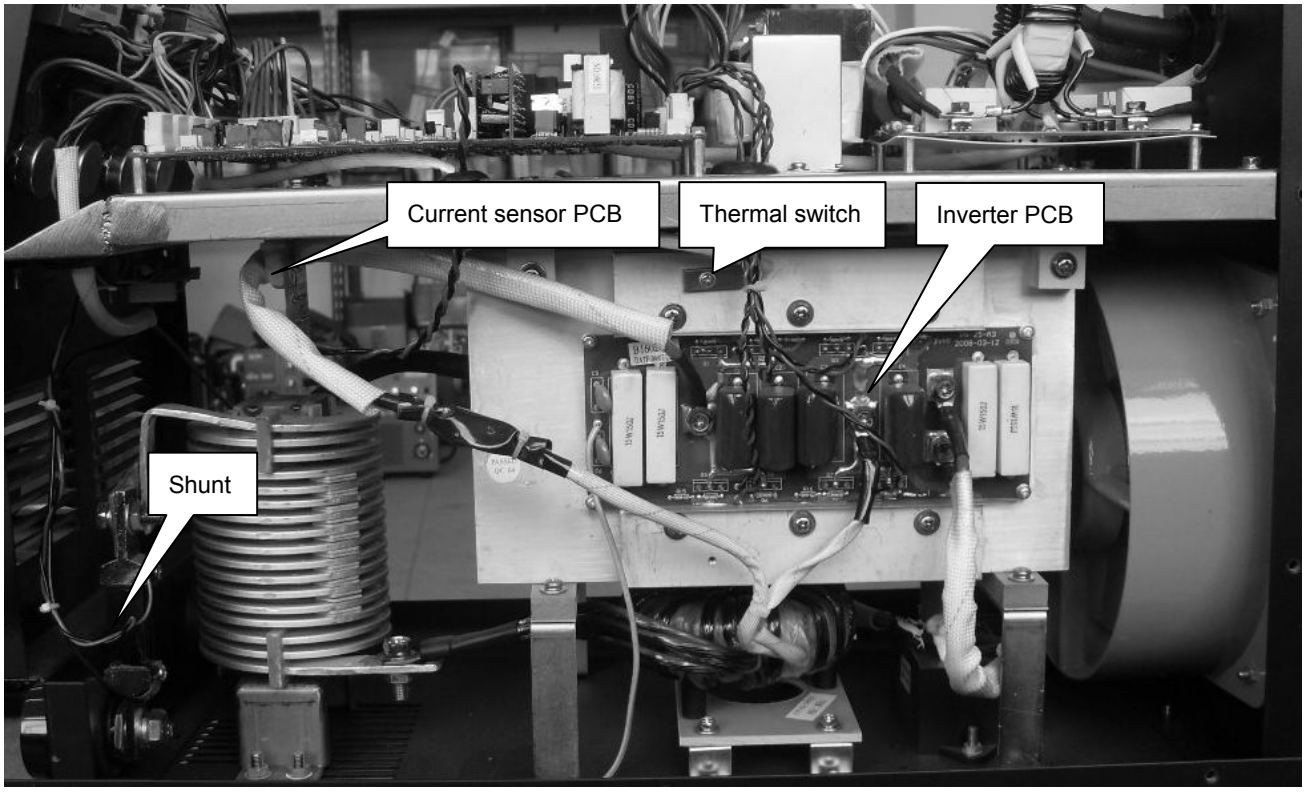


Wire feeder

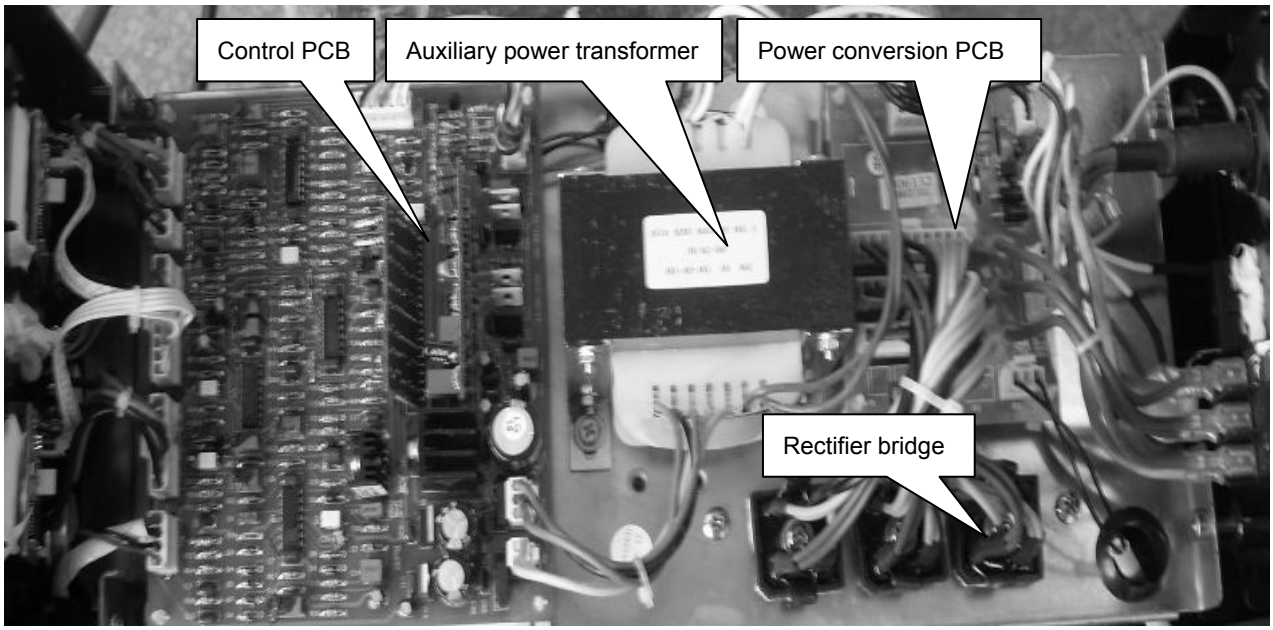
8.5 J72/J73/J91

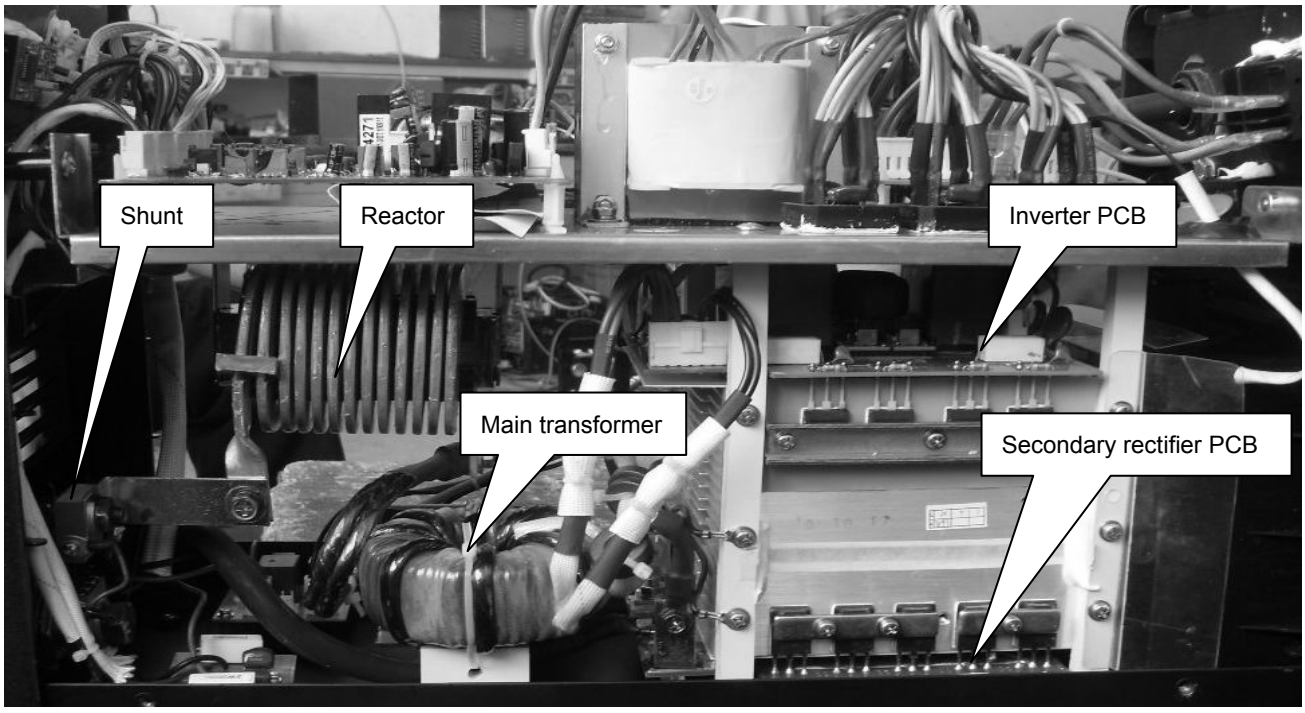


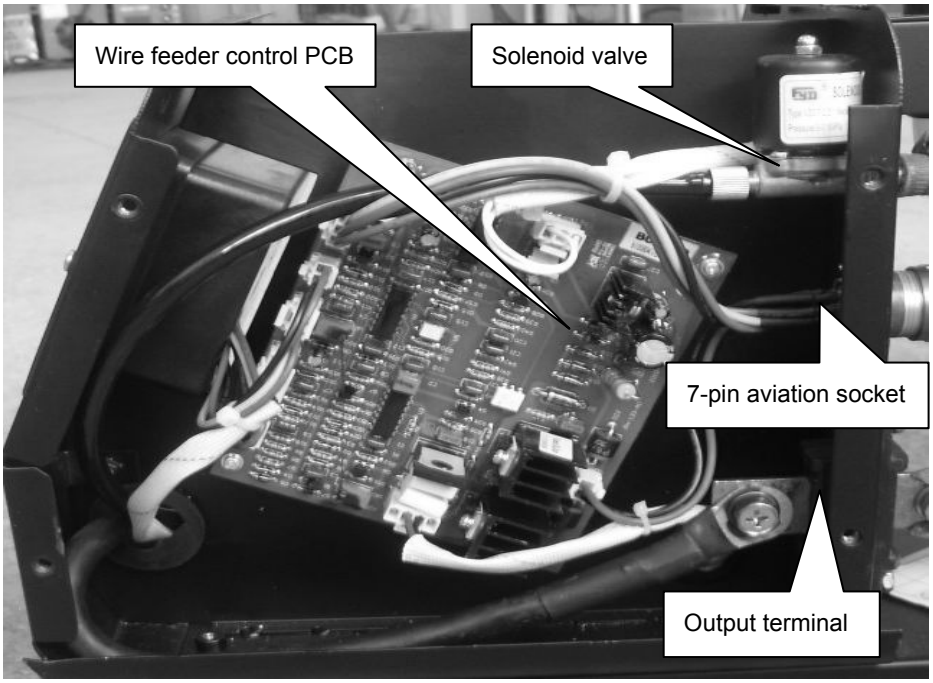

Secondary rectifier PCB
Reactor
Main transformer
Fan
Rectifier bridge

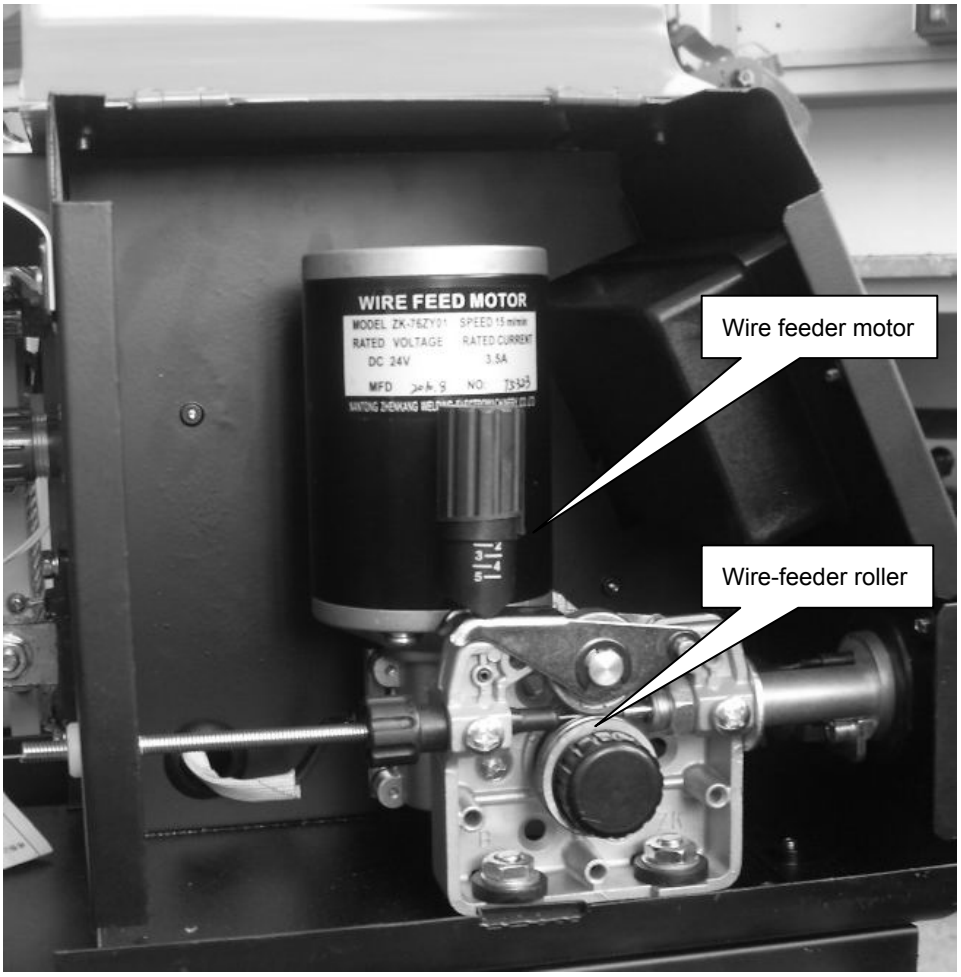

Current sensor PCB
Thermal switch
Inverter PCB
Shunt

8.6 N201/N202

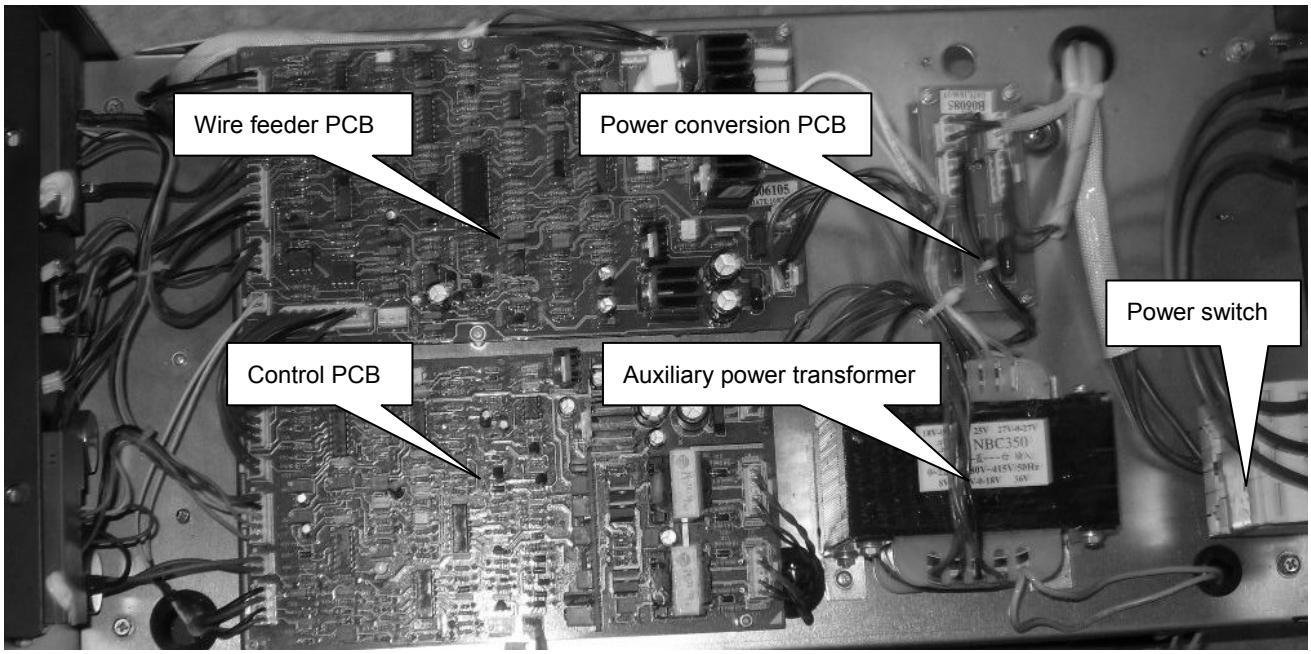

Control PCB
Auxiliary power transformer
Power conversion PCB
Rectifier bridge

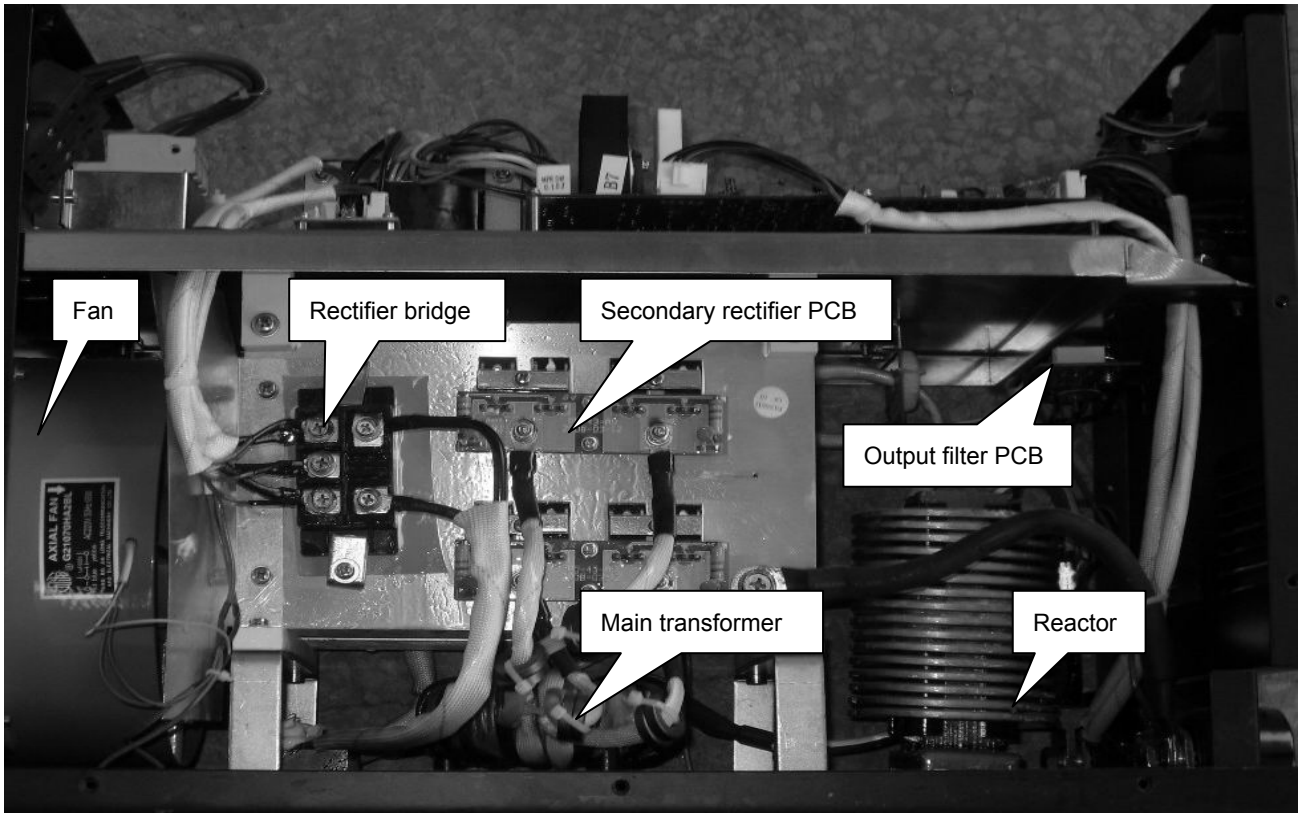

Shunt
Reactor
Inverter PCB
Main transformer
Secondary rectifier PCB

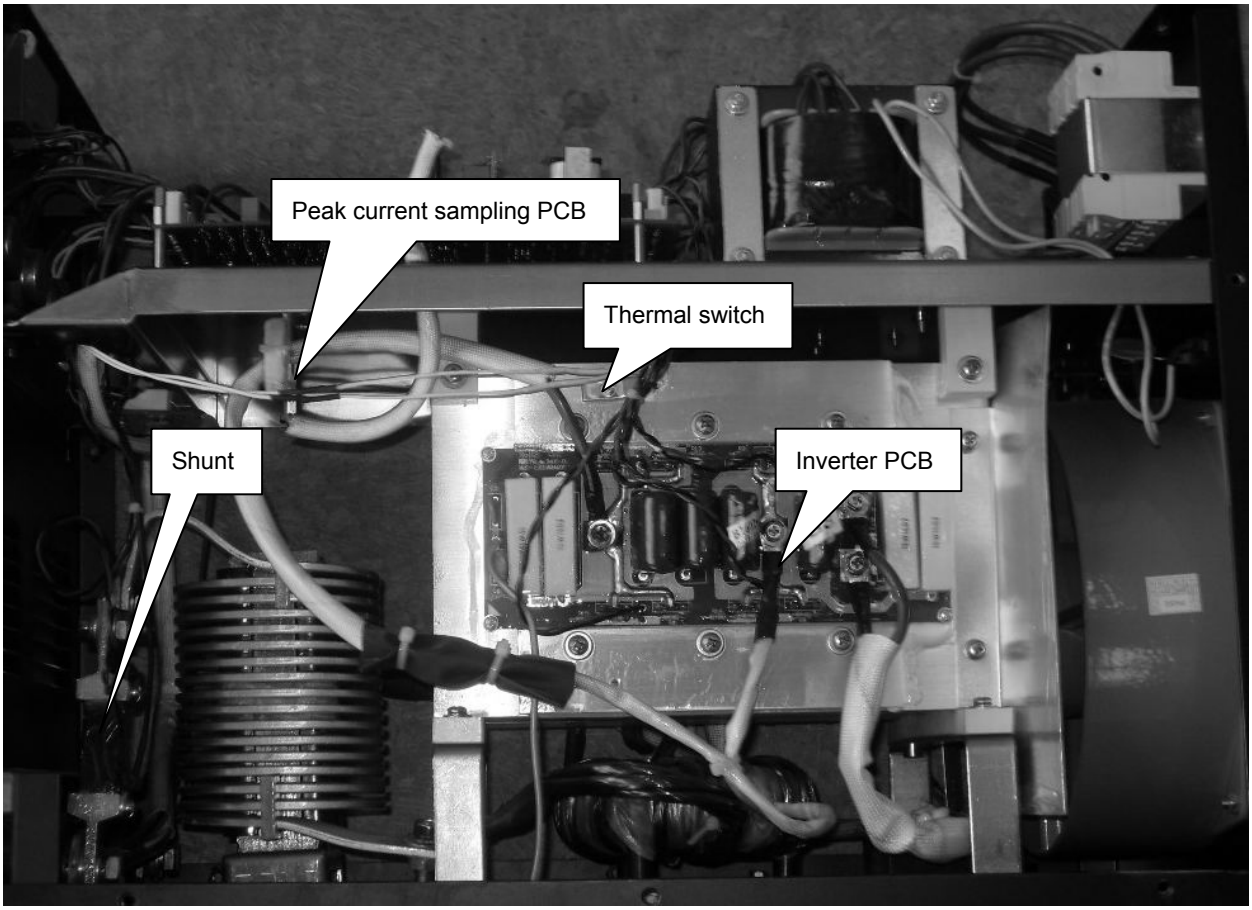

Wire feeder control PCB
Solenoid valve
7-pin aviation socket
Output terminal


WIRE FEED MOTOR
Wire feeder motor
Wire-feeder roller

8.7 J1601


Wire feeder PCB
Power conversion PCB
Power switch
Control PCB
Auxiliary power transformer


Fan
Rectifier bridge
Secondary rectifier PCB
Output filter PCB
Main transformer
Reactor



Section 3 Main components of GMAW machines

1. Power cord

It brings the external mains power into the inverter welder. Since the power consumption of the welder is large, the current-carrying capacity of the power cord should be high enough. If the diameter of the power cord is too small, the power cord will be heated, and the sheath of the power cord will be hardened or even burned if used for a long time.

2. Fan

It is a component inside the machine for cooling purpose. Currently, there are two kinds of fans for this series machines, namely AC fans and DC fans. AC fans are divided into two types; one type is with capacitor and the other without. DC fans are divided into two types; one type is with sleeve bearing, and the other is with oilless bearing.

AC fan is more durable and with less noise, but the air flow of it is not as strong as that of DC fan. DC fan may generate more noise because of its stronger air flow.

3. Inverter circuit

It is one of the important components to complete the inversion of power supply in the inverter welder. It converts the DC rectified from the mains power into HF AC. The inverter circuit is composed of the IGBT and main transformer. The IGBT, controlled by the PWM drive signal generated by the control PCB, is one of the critical components to convert the DC into AC. Generally, the maximum allowable voltage for IGBT in single-phase inverter machine is 600V, and the maximum allowable voltage for IGBT in three-phase inverter machine is 1000V or 1200V.

Inverter welder has the following advantages when compared with the traditional industrial frequency

welding machine.

1) Small size and light weight

   The traditional arc welding transformer is essentially a high-power industrial frequency transformer. And transformer is designed according to the formula “U=KfNBS”, in which “U” stands for the voltage of the transformer winding, “K” stands for the form factor (For square wave, K=4; for sine wave, K=4.4), “f” stands for the frequency, “N” stands for the turns of the copper wire, “B” stands for the working magnetic induction, and “S” stands for the section area of the ferrite core. Therefore, the the transformer used in the inverter welder is with smaller ferrite core (determined by “S” in the formula) and less turns of copper wire (determined by “N” in the formula), since the working frequency of inverter welder is above 20KHz generally, which is much higher than 50Hz. Thus, the inverter welder is much smaller in zise and lighter in weight.

2) High efficiency and energy-saving

   Since the copper used in inverter welder is much less than that used in the traditional arc welding machine, the magnetic and resistance loss of inverter welder is greatly reduced, which obviously enhances the welding efficiency and energy saving effect. The efficiency of the inverter welder can reach up to 85%, while that of the traditional welding machine is very low.

3) Wide applicability

   The frequency of the inverter welder is very high, so the machine can make quick response to the external disturbance. Especially, this is helpful to the waveform controlling of the gas shielded arc welding machine. Therefore, the inverter welder has a wide applicability.

4) It adopts IGBT as its power switching device.

   The working frequency of the IGBT can reach up to 50KHz, second only to that of MOSFET, and much higher than that of GTO.

   The capacity of the IGBT is high with the withstand voltage up to 1500V and the rated current up to 150A, second only to that of GTO, and much higher than that of MOSFET.

4. Primary rectifier-filter circuit

It rectifies and filters the mains frequency AC to get the DC of good quality.

5. Secondary rectifier-filter circuit

It rectifies and filters the output of the HF transformer.

This circuit should adopt fast recovery diode or ultra-fast recovery diode when compared with the primary rectifier-filter circuit, because the AC frequency after inverting is very high, and the carrier in the diode commonly adopted by the rectifier can only make slow response to the voltage changes. The carrier has a memory effect, which will lead to a short circuit when inverse voltage is added to the HF AC signal. However, the fast recovery diode can make quick response to the voltage changes, and such instantaneous short circuit can be avoided.

6. Auxiliary power circuit

It supplies power for the control circuit and drive circuit. There is two kinds of auxiliary power, linear regulated power supply and switching regulated power supply. Linear regulated power supply can only be applicable to the input power supply within a narrow range. Therefore, if the lower input power supply is considered, the power loss on the regulator would be very high, and the regulator would be damaged easily. However, for switching power supply, the work of regulator depends on the switch state, and the power loss of regulator will not greatly increase with the increasing of the inpuit voltage. Therefore, the switching regulated power supply can be appicalbe to wide input power supply.

The industrial frequency transformer has little interference against the machine, and the switching power supply is small in size.

7. Control circuit

The control circuit and inverter circuit of the single-phase GMAW machines are integrated. As the main component of the inverter welder, the control PCB includes many modules, namely auxiliary power module, IGBT control module, voltage detection module, current detection module, temperature detection module, VRD/anti-sticking/lift arc function module and digital meter display module (Some models are without this module.).

It has the below characteristics.

1) IGBT: The working temperature of it should be not greater than 90℃, IGBT of Fairchild, IR in the United States and Infineon are used.
2) PWM chip: KA3846 made by Fairchild.
3) Capacitor: All capacitors used are made in China. Polyester film capacitors and electrolytic capacitors are commonly used, and tantalum capacitors and ceramic capacitors are used in some key positions.
4) Rectifier bridge: It is made in China, and it converts the AC power supply into DC power supply to produce DC voltage.
5) Integrated operational amplifier: LM324, TL084 and LM358.
6) IGBT drive MOSFET: IRFZ24 and IRF9Z24 made by IR in the United States.
7) Regulator: KA7805, KA7815 and KA7915 made by Fairchild.
8) Optical coupler: P521 made by Toshiba and PC817 made in China.

8. Isolated drive circuit

Generally, the control circuit should be isolated from the main circuit. There are several driving modes for the drive circuit, such as transformer driving, ASIC driving and optical isolator driving, and each driving mode has its own advantages and disadvantages. Currently, transformer isolation driving is adopted by our products.

9. Sampling circuit

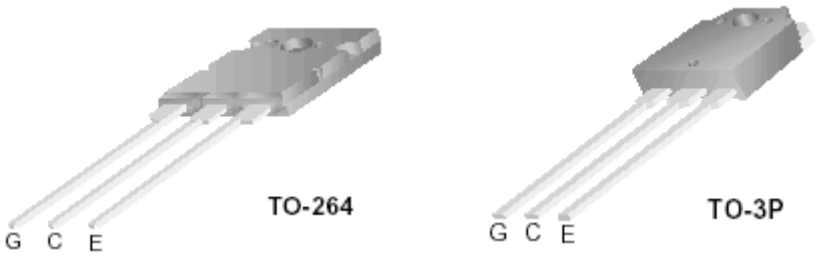
There are many methods for output current sampling used by welders, such as open-loop Hall sensor sampling, closed-loop Hall sensor sampling, shunt sampling and current sensor sampling, among which closed-loop Hall sensor sampling is best one, because it can isolate the control circuit from the output circuit, and the sampling value is accurate and no calibration is needed. Open-loop Hall sensor sampling can isolate the control circuit from the output circuit, and accurate sampling value can be obtained as well, but not so accurate as that obtained by closed-loop Hall sensor sampling. Shunt sampling can not isolate the control circuit from the output circuit, and the sampling value varies with the temperature of the shunt. Current sensor sampling can isolate the control circuit from the output circuit, but the sampling value would be affected by the output voltage. Whether the current sampling is isolated from the control circuit or not would affect the interference against the control circuit and the dielectric strength. Considering the performance cost ratio, current sensor sampling is adopted by our products.

The two main methods for voltage sampling used by welders are direct sampling by voltage-distributing and voltage sensor sampling. For some models, it is directly connected to the control circuit after direct sampling by voltage-distributing, and for other models, it is connected to the control circuit through an optical coupler. Whether the voltage sampling is isolated from the control circuit or not would affect the interference against the control circuit and the dielectric strength. The sampling method adopted by our products is direct sampling by voltage-distributing.

Section 4 Preparation before repair

1. **Repair tools:** Digital multimeter, Phillips screwdriver, iron and other fittings.
2. **Critical components testing**

1) With the multimeter in diode check mode, check if there is any breakdown among the emitter, connector and gate. If the emitter to gate and the connector to gate are tested as open in both positive and negative directions, the IGBT is not damaged. See the below photos for the pin assignment of IGBT.



2) Check the appearance of the electrolytic capacitor and if the CBB non-inductive capacitor is burned by eyeballing
3) Check the appearance of the main transformer to see if it is burned by eyeballing.
4) Check if the rectifier is open or shorted with the “DIODE” mode of a multimeter.
5) Check if the power switch is in good contact. Switch the power switch to “ON” position after making sure that the power cord is disconnected from the mains power supply, and check if both ends of the switch is shorted with the “DIODE” mode of a multimeter.

Section 5 Notes for repair

1) Power supply must be disconnected from the machine before each maintenance and service.
2) After each repair, make sure that all connections, especially the fan, are correctly connected before the power is switched on. Otherwise, the IGBT will explode.
3) Make sure that IGBT is coated with heat conductive silicon grease.
4) There are dangerous voltage areas on the high voltage and low voltage PCBs inside the machine, so take care during live testing.
5) Make sure that the switches on the front panel are switched to the correct position.
6) Make sure that the input voltage is within the rated range, and that no phase lack problem exists.
7) Make sure that the input power cord is correctly and reliably connected to the machine.
8) Make sure that the machine is reliably grounded through the ground terminal.
9) Make sure that the welding cable is correctly and reliably connected.
10) Make sure that the gas circuit is in good connection, and that the CO_2 regulator works normally.

Note: The maximum voltage inside the machine can reach up to 600V, so do not open the enclosure at will to ensure your safety. Take precautions to avoid an electric shock when repairing the machine. Power supply must be disconnected from the machine before the installation of the welding cable and the replacement of the torch parts.

Chapter 2 MIG200 series (J03/J04)

Section 1 Troubleshooting

1. There is no response after the machine is started, the power LED and the digital meter are off.

1.1 Cause analysis

1) The power cord is not well connected or the power switch fails.
2) The auxiliary power supply fails.
3) The 3-port manostat or some part of the control circuit fails.

1.2 Solution

1) Make sure the power cord is welll connected and there is no bad contact inside the machine, and then switch on the power. Check if there is input voltage (single-phase 220V AC or 3-phase 380VAC) at the input terminal of the rectifier PCB (rectifier bridge) with the “AC” mode of multimeter. If there is no input voltage, replace the power switch for it is damaged.
2) If there is nothing wrong with the power switch, check the auxiliary power. (For J04, check the industrial frequency auxiliary transformer directly.) Since J03 adopts switching power supply, check if the voltage between pin-1 of P16 and the other 3 pins is 18V DC, -18V DC and 9V DC respectively with the “DC” mode of multimeter. If there is no such voltage, there must be something wrong with the switching power supply part. Check if there are any parts (such as VT3, R51, R52, U3, Q7 and transformer) damaged, and replace them if necessary. Otherwise, check the machine further from input to output ccording to the schematic diagram or replace the power PCB.
3) If there is nothing wrong with the switching power supply, check the 3-port manostats on the control PCB, and replace them if their working resistance or input/output electric potential is abnormal.

2. The power LED is on after the machine is started, welding can be carried out, but the fan does not work.

2.1 Cause analysis

1) The fan is not well connected or poor soldering exists.
2) The fan fails.

2.2 Solution

1) Check if the fan is not well connected, connecting terminal is open, or the socket connected is poorly soldered, and eliminate such problems if necessary.
2) Check if the shaft of the fan is locked by something. Otherwise, replace the fan.

3. The overheating LED is on after the machine is started, and there is no output.

3.1 Cause analysis

1) The thermal switch fails.
2) The control PCB fails.
3) The working current is overly high or the working time is overly long.

3.2 Solution

1) Pull out the thermal switch, and check if the overheating LED is off. If it is, replace the thermal switch for it is damaged.
2) Check if pin-1 to pin-2 of P10 on the wire-feeder power control PCB is shorted.
3) Check if the working current is overly high and the machine is overloaded. Do operate the machine according to the operator’s manual.

4. There is no response when pushing the torch trigger, and the protection LED is off.

4.1 Cause analysis

1) Check if the power LED and the digital meter are on. If not, check the power supply part.
2) Check if the torch trigger is in good contact and the welding torch is well connected to the machine.
3) Check the wire-feeder power PCB.

4.2 Solution

1) If the power supply part fails, refer to “1”.
2) Check if the torch trigger is in good contact. Firstly, make sure that the welding torch is well connected. Secondly, check if pin-1 and pin-2 of P13 is shorted with the “DIODE” mode of multimeter when pushing the torch trigger. Otherwise, replace the torch trigger or welding torch.
3) If there is nothing wrong with the torch trigger, the wire-feeder power PCB must fail. Check if Q1, U1, Q3 or Q4 is damaged according to the schematic diagram.

5. There is gas output when pushing the torch trigger, the wire feeder works, but there is no current output and the protection LED is off.

5.1 Cause analysis

1) The earth wire is not in good contact.
2) The welding torch is damaged.
3) The wire-feeder interface is not in good contact.
4) The feedback wire is broken.
5) Some part in the maiin circuit fails or the connection is incorrect.
6) The control PCB fails.

5.2 Solution

1) Check if there is voltage at the output terminal with the “DC” mode of multimeter when pushing the torch trigger. If there is, check if the earth wire and the welding torch are correctly connected.
2) Check if the welding torch is damaged.
3) Check if the wire-feeder interface is in good contact.
4) Check if the feedback wire is broken.
5) If there is no output voltage when pushing the torch trigger, check if the DC bus is well connected to the inverter PCB and the main transformer wire is correctly connected. Then, check if there is some part in the main circuit such as IGBT and rectifier bridge damaged or wrongly connected, and reconnect them or replace them if necessary.
6) Check if the peak current feedback wire at P9 on the control PCB is broken or not in good contact. Then, check if the IGBT drive on the control PCB works normally. Otherwise, check the drive transformer, VT1-VT4, R64-R68, U5, U9 and U16 orderly. Resolder them if they are poorly soldered, and replace them if they are damaged.

6. There is gas output when pushing the torch trigger, there is voltage output, but the wire feeder does not work.

6.1 Cause analysis

1) The wire feeder is locked or damaged.
2) The power PCB fails.

6.2 Solution

1) Check if there is voltage at both terminals of P14 on the wire feed PCB. If there is, check if the power cord for wire feeder is well connected, and then check if the wire feeder is locked by foreign matter or

it is damaged.

2) If there is no voltage at both terminals of P14 on the wire feed PCB, the wire feed PCB must fail. Check if VT1-VT2, U2, Q5 or U1 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

7. Welding can be carried out when pushing the torch trigger, but the current is very high, the voltage is nonadjustable, and the no-load voltage is overly high.

7.1 Cause analysis

1) The voltage feedback wire is broken.
2) The voltage feedback circuit on the control PCB is disconnected.

7.2 Solution

1) Check if the voltage feedback wire is broken, disconnected or in bad contact.
2) Check the voltage feedback circuit on the control PCB. Check if R26, R27, U2, U5 or VR2 is shorted, poorly soldered or damaged according to the schematic diagram of the control PCB. Resolder them or replace them if necessary.

8. Welding current is unstable.

8.1 Cause analysis

1) The moment of wire feeder is inappropriately adjusted.
2) The wire feed roller does not match the welding wire.
3) The contact tip of the welding troch is worn, loosely connected or not suited.
4) The welding wire is of poor quality.
5) The welding cable is overly twisted or pressed.
6) The metal joint of the output terminal is loose.
7) The feedback wire is loosely connected or not in good contact.

8.2 Solution

1) Check if the moment of wire feeder is appropriately adjusted.
2) Check if the v-groove of the wire feed roller matches the diameter of the welding wire.
3) Check if the contact tip of the welding torch is worn, loosely connected or not suited.
4) Check if the welding wire is affected with damp or it is of poor quality.
5) Check if the welding cable is overly twisted or pressed.
6) Check if the metal joint of the output terminal is loose.
7) Check if the feedback wire is loosely connected or not in good contact.

9. The gas regulator cannot be heated.

9.1 Cause analysis

1) There is no voltage at the socket for heater power supply of the gas regulator.
2) The heater inside the gas regulator is damaged.

9.2 Solution

1) Firstly, check if the socket id not well connected. Secondly, check the resettable fuse. Thirdly, check if the industrial frequency transformer is burned.
2) Replace the gas regulator.

10. The weld bead is not well protected in the end of welding.

10.1 Cause analysis

1) The welding torch is moved away as soon as welding stops.
2) The postflow time is overly short.

10.2 Solution

1) Do not move the welding torch away so quickly when welding stops.
2) Prolong the postflow time. (Contact your supplier for details.)

11. Welding can be carried out normally, but electrode sticking occurs.

11.1 Cause analysis

1) The crater time is overly short or the crater voltage is overly low.

11.2 Solution

1) Replace the control PCB or adjust the crater time and crater voltage properly. (For details of the latter, please contact your supplier.)

12. The power switch trips after the machine is started.

12.1 Cause analysis

1) The main circuit is shorted for there is foreign material inside the machine.
2) The capacitor does not work.
3) The silicon brodge does not work.

12.2 Solution

1) Check if there is any foreign material inside the machine.
2) Check if there is any capacitors damaged.
3) Check if the silicon bridge fails.

13. Welding voltage is nonadjustable.

13.1 Cause analysis

1) The voltage potentiometer fails.
2) The control PCB fails.
3) The voltage feedback wire is broken.
4) The inductance potentiometer fails.

13.2 Solution

1) Check if there are any wires for the voltage potentiometer disconnected or breaking off. Then, check if the adjustable resistance is normal.
2) Check the voltage giving circuit on the control PCB. Check if D1, D2, U1, Q2, Q3 or D11 is shorted or damaged according to the schematic diagram. Replace them if necessary.
3) Check if the voltage feedback wire is broken.
4) Check if the inductance potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.

14. Wire feed speed is nonadjustable. (Current is nonadjustable.)

14.1 Cause analysis

1) The current potentiometer fails.
2) The wire feed PCB fails.
3) The current feedback wire is broken.

14.2 Solution

1) Check if the current potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.
2) Check the current giving circuit on the wire feed PCB. Check if U17 or U2 is shorted or damaged according to the schematic diagram. Replace them if necessary.
3) Check if the current feedback wire is broken.

15. The wire feeder works and there is gas output and no-load voltage after the machine is started, even though the torch trigger is not pushed.

15.1 Cause analysis

1) The torch trigger fails.
2) The wire feed PCB fails.

15.2 Solution

1) Check if the torch trigger is shorted or normally closed.
2) Check if Q2 on the wire feed PCB is damaged.

16. There is gas output after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and the wire feeder does not work.

16.1 Cause analysis

1) The wire feed PCB fails.

16.2 Solution

1) Check if U1 or Q6 on the wire feed PCB is damaged.

17. The wire feeder works after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and gas output.

17.1 Cause analysis

1) The wire feed PCB fails.

17.2 Solution

1) Check if U2 or VT2 on the wire feed PCB is damaged.

Section 2 Appendix

1. Test data for chip pins

Tested machine: MIG200(J03)/MIG250(J04)							
Tested chip (U1 on PWM control module): KA3846							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	6.0K	6.0K	2.5V	9	3.91K	3.91K	
2	4.2K	4.2K	5V	10	12.56K	12.56K	
3	Grounded	Grounded	0V	11	1.99M	18.54M	
4	116.5Ω	116.5Ω		12	0.0Ω	0.0Ω	
5	15.16M	∞		13	900Ω	900Ω	
6	12.85M	∞		14	13.13M	18.58M	
7	12.85M	∞		15	900Ω	900Ω	15V
8	13.20M	∞		16	75Ω	75Ω	

Note: Do not test pin-4 and pin-5 of KA3846 with the multimeter when it is electrified.

Tested machine: MIG200(J03)/MIG250(J04)							
Tested chip (U2 on PWM control module): TL084							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	22.9K	22.9K	12.31V	8	1.11K	1.11K	
2	59.2K	59.2K		9	1.11K	1.11K	
3	0.0Ω	0.0Ω		10	13.15M	∞	
4	900Ω	900Ω	15V	11	6.51K	6.51K	-15V
5	4.1K	4.1K		12	9.85K	10K	
6	2.6K	2.6K	5.4V	13	15.13M	∞	
7	∞	3.04M		14	15M	∞	

Tested machine: MIG200(J03)/MIG250(J04)							
Tested chip (U1 on the control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	16.62 MΩ	16.94MΩ		8	61.6KΩ	61.6KΩ	
2	16.62 MΩ	16.94MΩ		9	46.7KΩ	46.7KΩ	
3	29KΩ	29KΩ		10	Grounded	Grounded	
4	888Ω	888Ω	15V	11	3.19KΩ	3.19KΩ	-15V
5	2.42KΩ	2.42KΩ		12	Grounded	Grounded	
6	989KΩ	989KΩ		13	8.72KΩ	8.72KΩ	
7	15.89M	567KΩ		14	28.9KΩ	29KΩ	

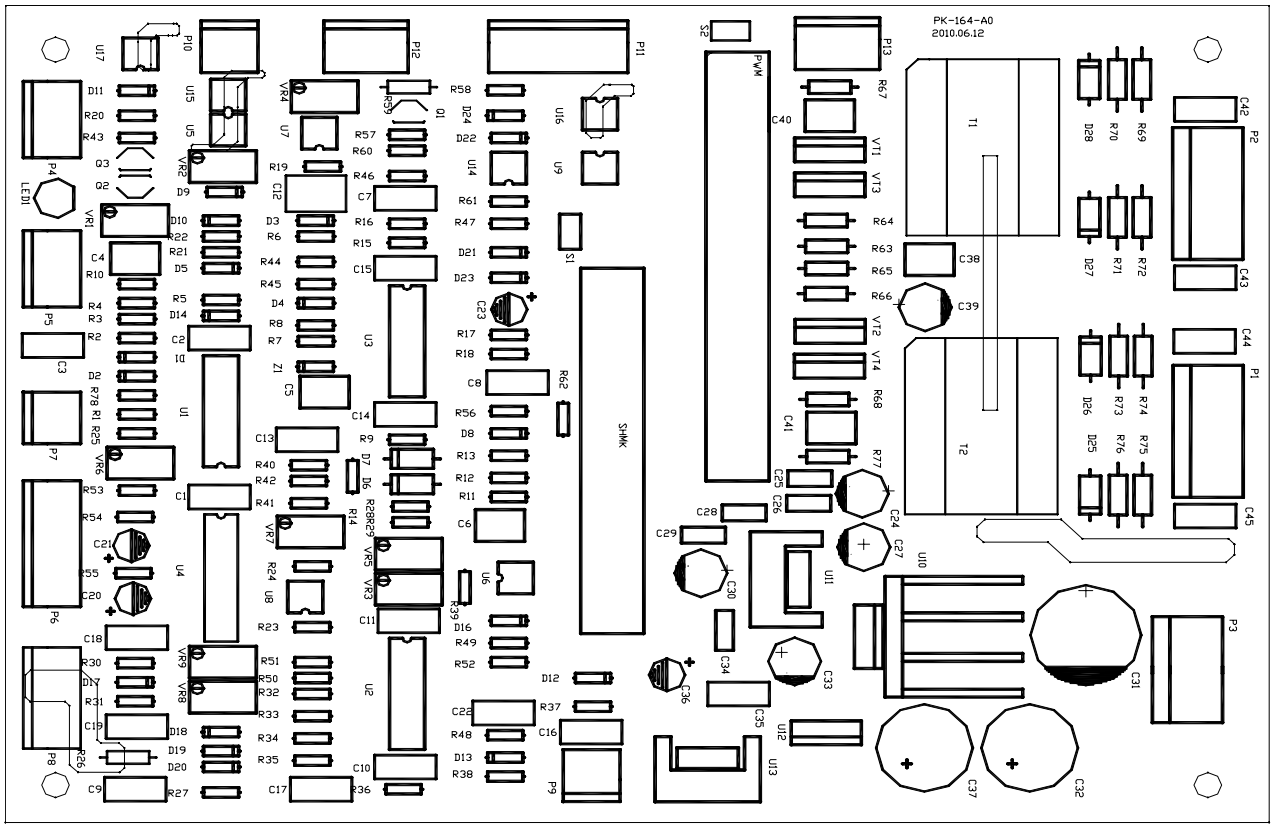
Tested machine: MIG200(J03)/MIG250(J04)							
Tested chip (U2 on the control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	2.81KΩ	2.81KΩ		8	14.33MΩ	133KΩ	
2	98.8Ω	98.8Ω		9	8.62KΩ	8.62KΩ	
3	98.2Ω	98.2Ω		10	Grounded	Grounded	
4	889Ω	889Ω	15V	11	3.19KΩ	3.19KΩ	-15V
5	Grounded	Grounded		12	8.72KΩ	8.72KΩ	
6	3.72KΩ	3.72KΩ		13	75.6KΩ	75.6KΩ	
7	7.88KΩ	7.88KΩ		14	75.6KΩ	75.6KΩ	

Tested machine: MIG200(J03)/MIG250(J04)							
Tested chip (U3 on the control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	17.37MΩ	17.37MΩ		8	27.4KΩ	27.4KΩ	
2	Grounded	Grounded		9	27.4KΩ	27.4KΩ	
3	328KΩ	328KΩ		10	90.3KΩ	2.75 KΩ	
4	889Ω	889Ω	15V	11	3.19KΩ	3.19KΩ	-15V
5	69.2KΩ	69.2KΩ		12	Grounded	Grounded	
6	3.72KΩ	1.97KΩ		13	9.84KΩ	9.65KΩ	
7	92.2KΩ	16.8KΩ		14	12.73KΩ	13.28KΩ	

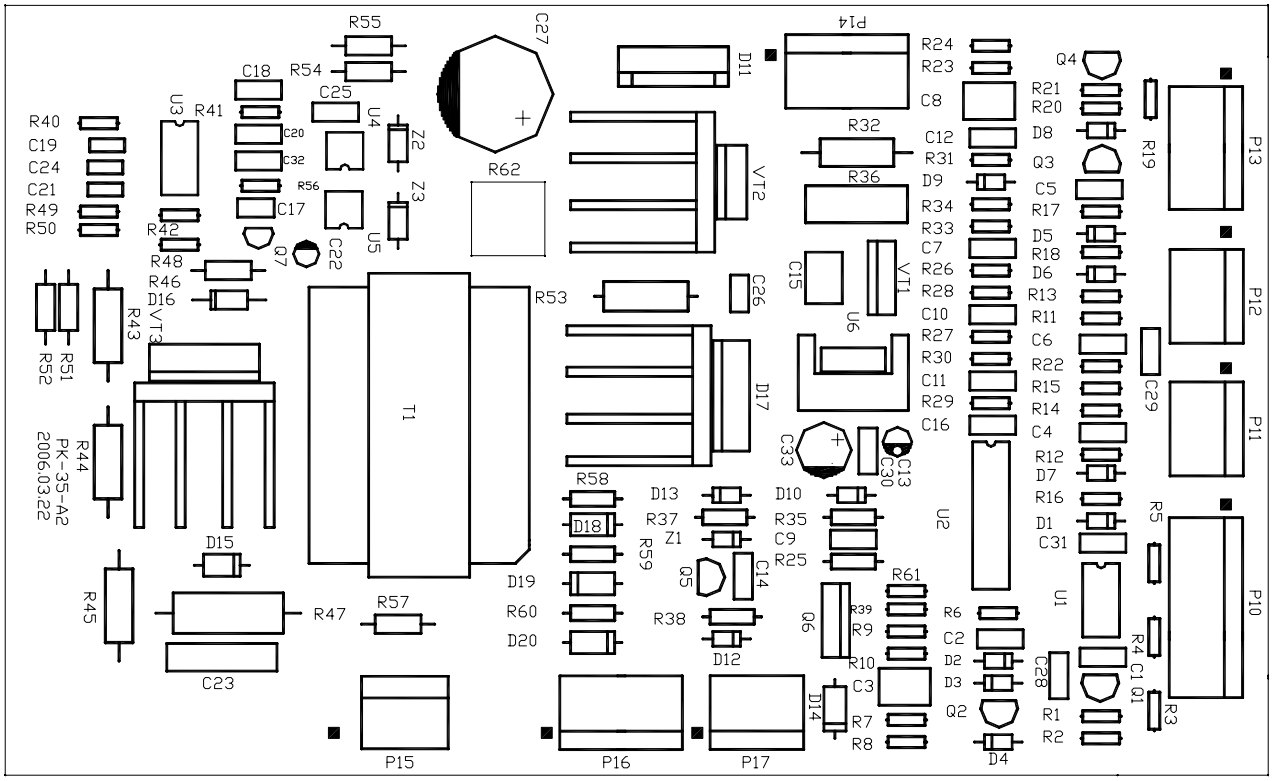
Tested machine: MIG200(J03)/MIG250(J04)							
Tested chip (U4 on the control PCB): CD4053							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	160.4KΩ	160.4KΩ		9	99.5 KΩ	50.2KΩ	
2	16.95MΩ	16.44 MΩ		10	99.7KΩ	99.7KΩ	
3	67.6KΩ	67.6KΩ		11	Grounded	Grounded	
4	9.89KΩ	9.89KΩ		12	Grounded	Grounded	
5	320KΩ	320KΩ		13	Grounded	Grounded	
6	Grounded	Grounded		14	Grounded	Grounded	
7	Grounded	Grounded		15	9.84KΩ	9.84KΩ	
8	Grounded	Grounded		16	889Ω	889Ω	15V

2. Bare PCB diagrams

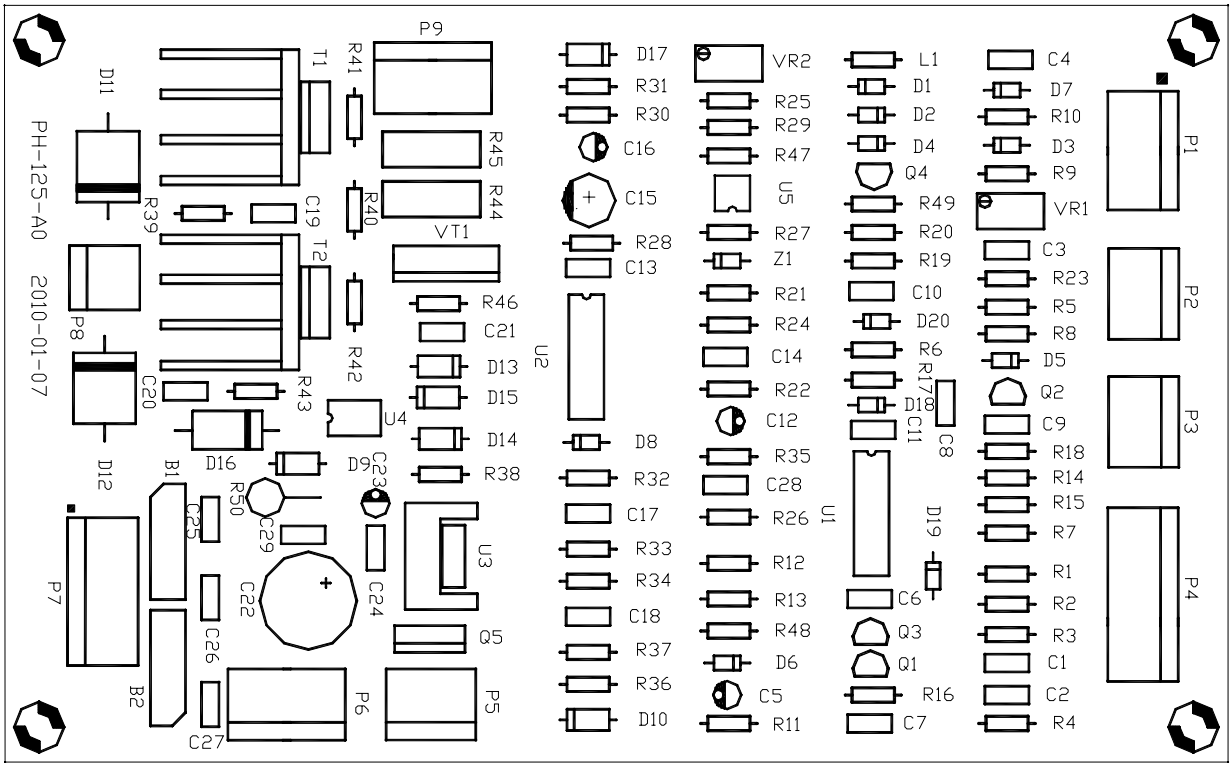
1) Control PCB



2) Wire feed power PCB (PK-35)



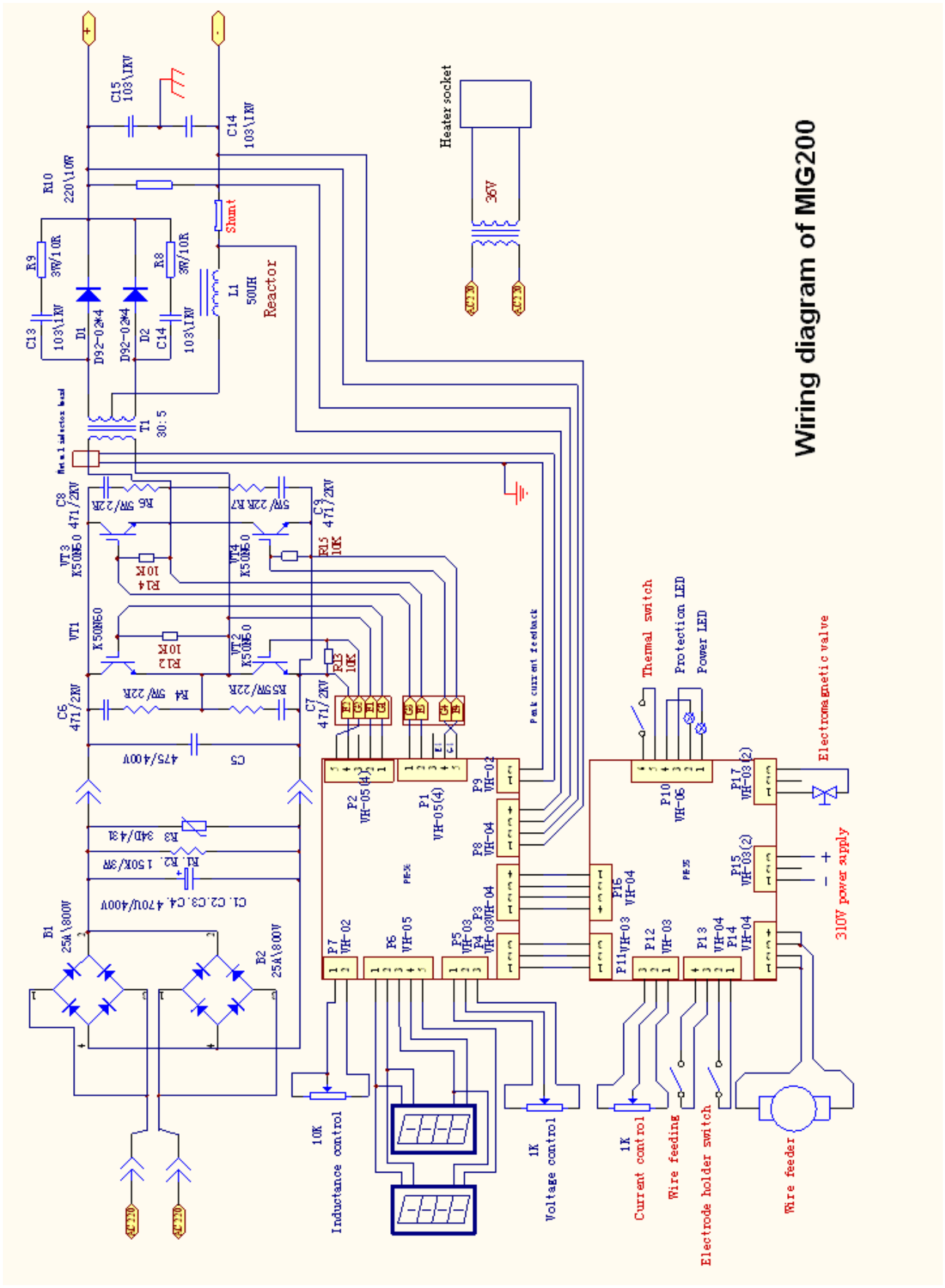
3) Wire feed PCB of J04 (PH-125)

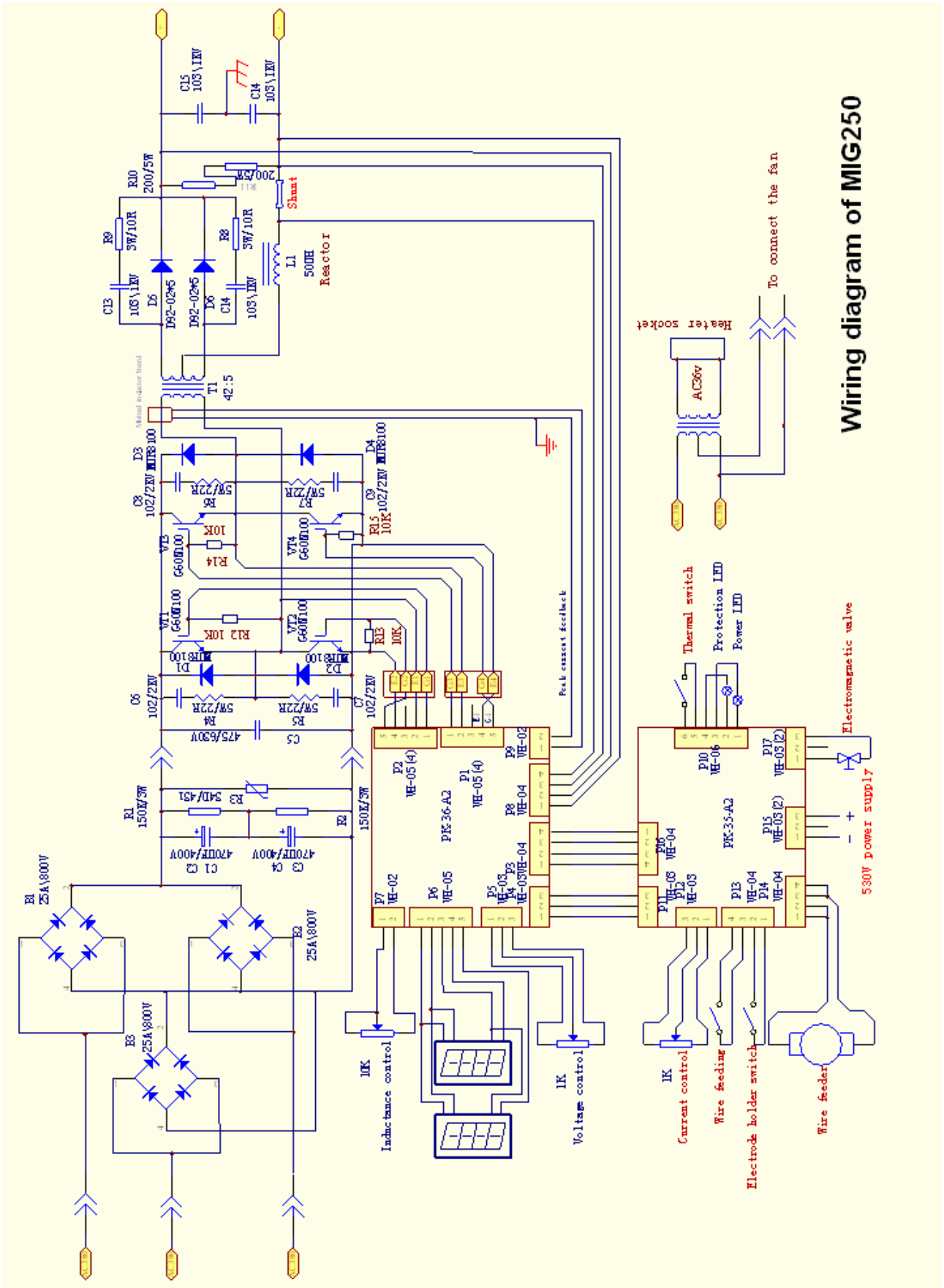


3. Spare parts list

No.	Part name	Part number	
		MIG200(J03)	MIG250(J04)
1	Power PCB	B05011	--
2	Wire feed PCB	--	B06162
3	Control PCB	B04062	B04062
4	Voltage potentiometer	D15101	D15101
5	Current potentiometer	D15101	D15101
6	Voltge/current digital meter	D20025	D20025
7	Filter PCB	B03060	B03061
8	Inductance potentiometer	D15103	D15103
9	Power LED	D08003	D08003
10	Wire feed buttom	C17021	C17021
11	Center socket	C05001	C05001
12	LED	D08009	D08009
13	Quick socket	C02015	C02015
14	Fan	D28008	D28015
15	Reactor	B18011	D16207-1
16	Main transformer	D03113	D03113
17	Heat sink	J20106	J20108/J20109
18	Inverter PCB	B16013	B16012
19	Triode (S8050/S8550)	D07001/D07002	D07001/D07002
20	MOSFET (IRFPE40/2SK2611)	D05014/D05113	--
21	Manostat (7805/7815/7915)	D19009/ D19011/ D19017	D19009/ D19011/ D19017
22	Power switch	C15005	C15004

4. Wiring diagram




Wiring diagram of MIG250
To connect the fan
Heater socket
AC36v
Thermal switch
Protection LED
Power LED
Electromagnetic valve
530V power supply
Peak current feedback
PK-36-A2
PK-35-A2
Inductance control
Voltage control
Current control
Wire feeding
Electrode holder switch
Wire feeder
Shunt
Reactor
50UH
T1
42:5
E1
E2
E3
25A\800V

Chapter 3 MIG160 series (J35/J46/J66/J67/J80/J92)

Section 1 Troubleshooting

1. There is no response after the machine is started, and the power LED is off.

1.1 Cause analysis

1) The power cord is not well connected or the power switch fails.
2) The auxiliary power supply fails.
3) The 3-port manostat or some part of the control circuit fails.

1.2 Solution

1) Make sure the power cord is welll connected and there is no bad contact inside the machine, and then switch on the power. Check if there is input voltage (single-phase 220V AC or 3-phase 380VAC) at the input terminal of the rectifier PCB (rectifier bridge) with the “AC” mode of multimeter. If there is no input voltage, replace the power switch for it is damaged.
2) If there is nothing wrong with the power switch, check the auxiliary power. check if the voltage between pin-1 and the other 3 pins of P2 on the power PCB (PK-64) is 18V DC, -18V DC and 9V DC respectively with the “DC” mode of multimeter. If there is no such voltage, there must be something wrong with the switching power supply part. Check if there are any parts (such as VT3, R51, R52, U3, Q7 and transformer) damaged, and replace them if necessary. Otherwise, check the machine further from input to output ccording to the schematic diagram or replace the power PCB.
3) If there is nothing wrong with the switching power supply, check the 3-port manostats on the control PCB, and replace them if their working resistance or input/output electric potential is abnormal.

2. The power LED is on after the machine is started, welding can be carried out, but the fan does not work.

2.1 Cause analysis

1) The fan is not well connected or poor soldering exists.
2) The fan fails.

2.2 Solution

1) Check if the fan is not well connected, connecting terminal is open, or the socket connected is poorly soldered, and eliminate such problems if necessary.
2) Check if the shaft of the fan is locked by something. Otherwise, replace the fan.

3. The overheating LED is on after the machine is started, and there is no output.

3.1 Cause analysis

1) The thermal switch fails.
2) The control PCB fails.
3) The working current is overly high or the working time is overly long.

3.2 Solution

1) Pull out the thermal switch, and check if the overheating LED is off. If it is, replace the thermal switch for it is damaged.
2) Check if pin-3 to pin-4 of P4 on the wire-feeder power control PCB is shorted.
3) Check if the working current is overly high and the machine is overloaded. Do operate the machine according to the operator’s manual.

4. There is no response when pushing the torch trigger, and the protection LED is off.

4.1 Cause analysis

1) Check if the power LED and the digital meter are on. If not, check the power supply part.
2) Check if the torch trigger is in good contact and the welding torch is well connected to the machine.
3) Check the wire-feeder power PCB.

4.2 Solution

1) Check if the MMA/MIG switch is switched to “MIG” position. Then check the power supply part. If the power supply part fails, refer to “1”.
2) Check if the torch trigger is in good contact. Firstly, make sure that the welding torch is well connected. Secondly, check if pin-3 and pin-4 of P8 is shorted with the “DIODE” mode of multimeter when pushing the torch trigger. Otherwise, replace the torch trigger or welding torch.
3) If there is nothing wrong with the torch trigger, the wire-feeder power PCB must fail. Check if Q2, U1, U6, Q3 or Q4 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

5. There is gas output when pushing the torch trigger, the wire feeder works, but there is no current output and the protection LED is off.

5.1 Cause analysis

1) The earth wire is not in good contact.
2) The welding torch is damaged.
3) The wire-feeder interface is not in good contact.
4) The feedback wire is broken.
5) Some part in the maiin circuit fails or the connection is incorrect.
6) The control PCB fails.

5.2 Solution

1) Check if there is voltage at the output terminal with the “DC” mode of multimeter when pushing the torch trigger. If there is, check if the earth wire and the welding torch are correctly connected.
2) Check if the welding torch is damaged.
3) Check if the wire-feeder interface is in good contact.
4) Check if the feedback wire is broken.
5) If there is no output voltage when pushing the torch trigger, check if the DC bus is well connected to the inverter PCB and the main transformer wire is correctly connected. Then, check if there is some part in the main circuit such as IGBT and rectifier bridge damaged or wrongly connected, and reconnect them or replace them if necessary.
6) Check if the peak current feedback wire at P3 on the control PCB is broken or not in good contact. Then, check if the IGBT drive on the control PCB works normally. Otherwise, check the drive transformer, VT1-VT4, R53, R54, R58, R59, U6, and U10 orderly. Resolder them if they are poorly soldered, and replace them if they are damaged.

6. There is gas output when pushing the torch trigger, there is voltage output, but the wire feeder does not work.

6.1 Cause analysis

1) The wire feeder is locked or damaged.
2) The power PCB fails.

6.2 Solution

1) Check if there is voltage at both terminals of P9 on the wire feed PCB. If there is, check if the power cord for wire feeder is well connected, and then check if the wire feeder is locked by foreign matter or it is damaged.
2) If there is no voltage at both terminals of P9 on the wire feed PCB, the wire feed PCB must fail. Check if VT1, VT2, U2, Q5 or U1 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

7. Welding can be carried out when pushing the torch trigger, but the current is very high, the voltage is nonadjustable, and the no-load voltage is overly high.

7.1 Cause analysis

1) The voltage feedback wire is broken.
2) The voltage feedback circuit on the control PCB is disconnected.

7.2 Solution

1) Check if the voltage feedback wire is broken, disconnected or in bad contact.
2) Check the voltage feedback circuit on the control PCB. Check if R26, R27, U2, U5 or VR2 is shorted, poorly soldered or damaged according to the schematic diagram of the control PCB. Resolder them or replace them if necessary.

8. Welding current is unstable.

8.1 Cause analysis

1) The moment of wire feeder is inappropriately adjusted.
2) The wire feed roller does not match the welding wire.
3) The contact tip of the welding troch is worn, loosely connected or not suited.
4) The welding wire is of poor quality.
5) The welding cable is overly twisted or pressed.
6) The metal joint of the output terminal is loose.
7) The feedback wire is loosely connected or not in good contact.

8.2 Solution

1) Check if the moment of wire feeder is appropriately adjusted.
2) Check if the v-groove of the wire feed roller matches the diameter of the welding wire.
3) Check if the contact tip of the welding torch is worn, loosely connected or not suited.
4) Check if the welding wire is affected with damp or it is of poor quality.
5) Check if the welding cable is overly twisted or pressed.
6) Check if the metal joint of the output terminal is loose.
7) Check if the feedback wire is loosely connected or not in good contact.

9. The gas regulator cannot be heated.

9.1 Cause analysis

1) There is no voltage at the socket for heater power supply of the gas regulator.
2) The heater inside the gas regulator is damaged.

9.2 Solution

1) Firstly, check if the socket id not well connected. Secondly, check the resettable fuse. Thirdly, check if the industrial frequency transformer is burned.
2) Replace the gas regulator.

10. The weld bead is not well protected in the end of welding.

10.1 Cause analysis

1) The welding torch is moved away as soon as welding stops.
2) The postflow time is overly short.

10.2 Solution

1) Do not move the welding torch away so quickly when welding stops.
2) Prolong the postflow time.

11. Welding can be carried out normally, but electrode sticking occurs.

11.1 Cause analysis

1) The crater time is overly short or the crater voltage is overly low.

11.2 Solution

1) Replace the control PCB or adjust the crater time and crater voltage properly. (For details of the latter, please contact your supplier.)

12. The power switch trips after the machine is started.

12.1 Cause analysis

1) The main circuit is shorted for there is foreign material inside the machine.
2) The capacitor does not work.
3) The silicon brodge does not work.

12.2 Solution

1) Check if there is any foreign material inside the machine.
2) Check if there is any capacitors damaged.
3) Check if the silicon bridge fails.

13. Welding voltage is nonadjustable.

13.1 Cause analysis

1) The voltage potentiometer fails.
2) The control PCB fails.
3) The voltage feedback wire is broken.
4) The inductance potentiometer fails.

13.2 Solution

1) Check if there are any wires for the voltage potentiometer disconnected or breaking off. Then, check if the adjustable resistance is normal.
2) Check the voltage giving circuit on the control PCB. Check if D1, U1, Q2 or D11 is shorted or damaged according to the schematic diagram. Replace them if necessary.
3) Check if the voltage feedback wire is broken.
4) Check if the inductance potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.

14. Wire feed speed is nonadjustable. (Current is nonadjustable.)

14.1 Cause analysis

1) The current potentiometer fails.
2) The wire feed PCB fails.
3) The current feedback wire is broken.

14.2 Solution

1) Check if the current potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.
2) Check the current giving circuit on the wire feed PCB. Check if U5 on the control PCB or U2 on the power PCB is shorted or damaged according to the schematic diagram. Replace them if necessary.
3) Check if the current feedback wire is broken or loosely connected.

15. The wire feeder works and there is gas output and no-load voltage after the machine is started, even though the torch trigger is not pushed.

15.1 Cause analysis

1) The torch trigger fails.
2) The wire feed PCB fails.

15.2 Solution

1) Check if the torch trigger is shorted or normally closed.
2) Check if Q2 on the wire feed PCB is damaged.

16. There is gas output after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and the wire feeder does not work.

16.1 Cause analysis

1) The wire feed PCB fails.

16.2 Solution

1) Check if U1 or Q6 on the wire feed PCB is damaged.

17. The wire feeder works after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and gas output.

17.1 Cause analysis

1) The wire feed PCB fails.

17.2 Solution

1) Check if U2 or VT2 on the wire feed PCB is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

18. Current is non-adjustable in MMA welding.

18.1 Cause analysis

1) The wire connecting to the MMA current potentiometer breaks off or is loosely connected, or the potentiometer is damaged.
2) The MMA module (PK-132) on the control PCB fails.
3) The current feedback wire is broken.

18.2 Solution

1) Check if the wire connecting to the MMA current potentiometer breaks off or is loosely connected, or the potentiometer is damaged.
2) Check if D1, U1 or U2 on the MMA module (PK-132) on the control PCB is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.
3) Check if the current feedback wire is broken.

Section 2 Appendix

1. Test data for chip pins

Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U1 on PWM control module): KA3846							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	6.0K	6.0K	2.5V	9	3.91K	3.91K	
2	4.2K	4.2K	5V	10	12.56K	12.56K	
3	Grounded	Grounded	0V	11	1.99M	18.54M	
4	116.5Ω	116.5Ω		12	0.0Ω	0.0Ω	
5	15.16M	∞		13	900Ω	900Ω	
6	12.85M	∞		14	13.13M	18.58M	
7	12.85M	∞		15	900Ω	900Ω	15V
8	13.20M	∞		16	75Ω	75Ω	

Note: Do not test pin-4 and pin-5 of KA3846 with the multimeter when it is electrified.

Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U2 on PWM control module): TL084							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	22.9K	22.9K	12.31V	8	1.11K	1.11K	
2	59.2K	59.2K		9	1.11K	1.11K	
3	0.0Ω	0.0Ω		10	13.15M	∞	
4	900Ω	900Ω	15V	11	6.51K	6.51K	-15V
5	4.1K	4.1K		12	9.85K	10K	
6	2.6K	2.6K	5.4V	13	15.13M	∞	
7	∞	3.04M		14	15M	∞	

Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U1 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	2.61KΩ	2.6KΩ		8	30.4KΩ	30.4KΩ	
2	97Ω	97Ω		9	17.5KΩ	17.5KΩ	
3	98Ω	98Ω		10	Grounded	Grounded	
4	821Ω	821Ω	15V	11	7.5KΩ	7.5KΩ	-15V
5	9.04KΩ	8.89KΩ		12	38.4KΩ	34.4KΩ	
6	42.9KΩ	42.9KΩ		13	1.93KΩ	1.93KΩ	
7	42.9KΩ	42.9KΩ		14	83.1KΩ	7.5KΩ	

Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U2 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	13.35KΩ	13.35KΩ		8	2.82MΩ	18.74MΩ	
2	10.4KΩ	10.28KΩ		9	Grounded	Grounded	
3	Grounded	Grounded		10	138.8KΩ	137KΩ	
4	821Ω	821Ω	15V	11	7.5KΩ	7.5KΩ	-15V
5	2.4KΩ	2.4KΩ		12	80.4KΩ	10.1KΩ	
6	991KΩ	996KΩ		13	27.7KΩ	27.6KΩ	
7	16.9MΩ	2.89MΩ		14	27.7KΩ	27.6KΩ	

Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U3 on control PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	7.8KΩ	7.8KΩ		5	Grounded	Grounded	
2	3.5KΩ	3.52KΩ		6	8.5KΩ	8.5KΩ	
3	Grounded	Grounded		7	15.8MΩ	153.5 KΩ	
4	7.5KΩ	7.5KΩ	-15V	8	821Ω	821Ω	+15V

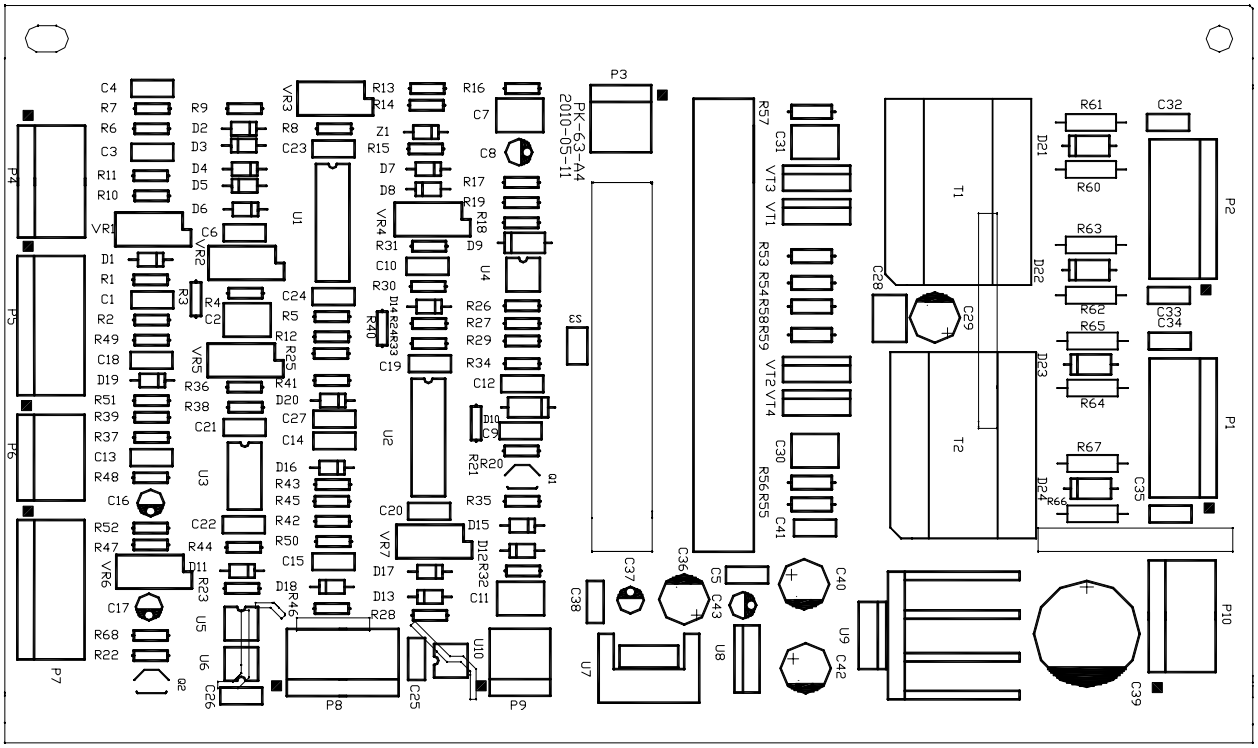
Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U1 on power PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	18.6MΩ	1.88MΩ		5	49.1KΩ	50KΩ	
2	5.94KΩ	5.94KΩ		6	5.54KΩ	5.54KΩ	
3	396K	494K		7	7.65KΩ	7.65 KΩ	
4	Grounded	Grounded	-15V	8	2.32KΩ	2.32KΩ	+15V

Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U3 on power PCB): UC2845							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	150KΩ	153.7KΩ		5	Grounded	Grounded	
2	5.0K	5.0K		6	13.61MΩ	18.9MΩ	
3	1.02KΩ	1.02KΩ		7	56KΩ	63KΩ	
4	15.6KΩ	15.6KΩ		8	3.7KΩ	3.7KΩ	

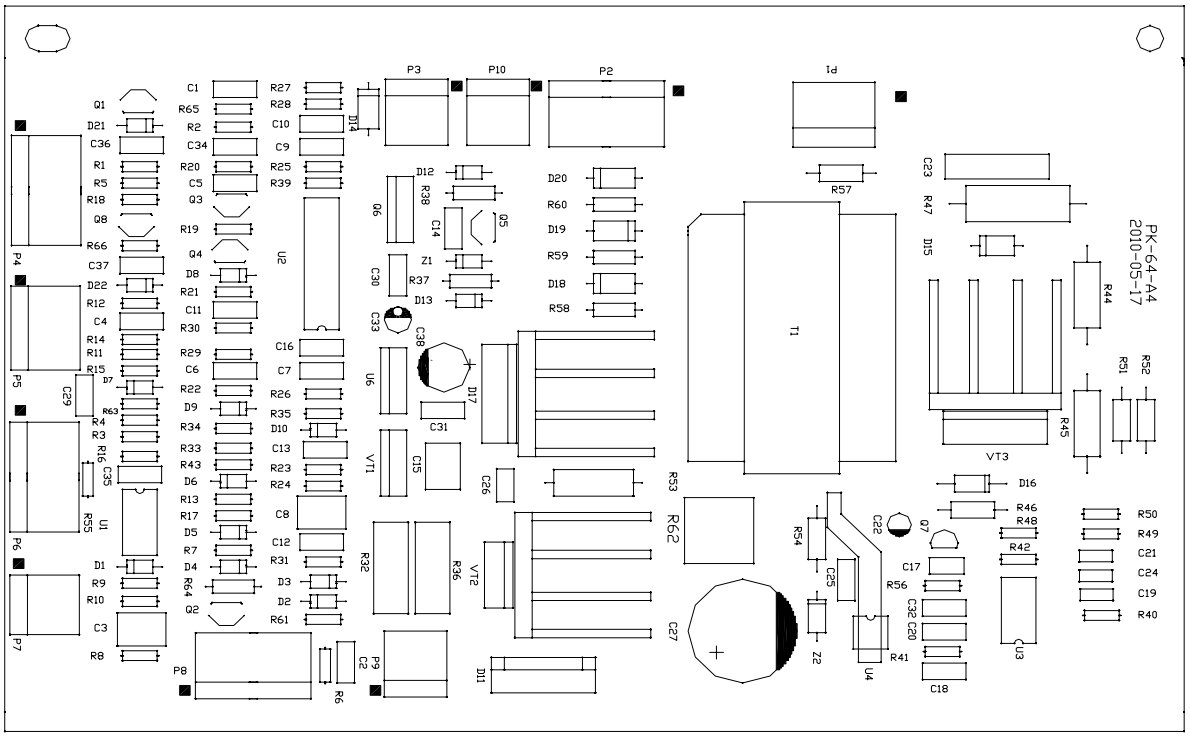
Tested machine: MIG160(J35)/MIG200(J66/J80)/MIG250(J46/J67/J92)							
Tested chip (U2 on power PCB): TL494							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	3.95KΩ	3.95KΩ		9	Grounded	Grounded	
2	9.86KΩ	9.86KΩ		10	Grounded	Grounded	
3	90K	90K		11	12.2K	12.2K	
4	11.8K	11.6KΩ		12	2.32KΩ	2.32KΩ	
5	14.3M	∞		13	Grounded	Grounded	
6	5.0K	5.0K		14	3.53K	3.95K	
7	Grounded	Grounded		15	9.15KΩ	9.15KΩ	
8	12.2K	12.2K		16	9.90KΩ	9.90KΩ	

2. Bare PCB diagrams

1) Control PCB (PK-63)



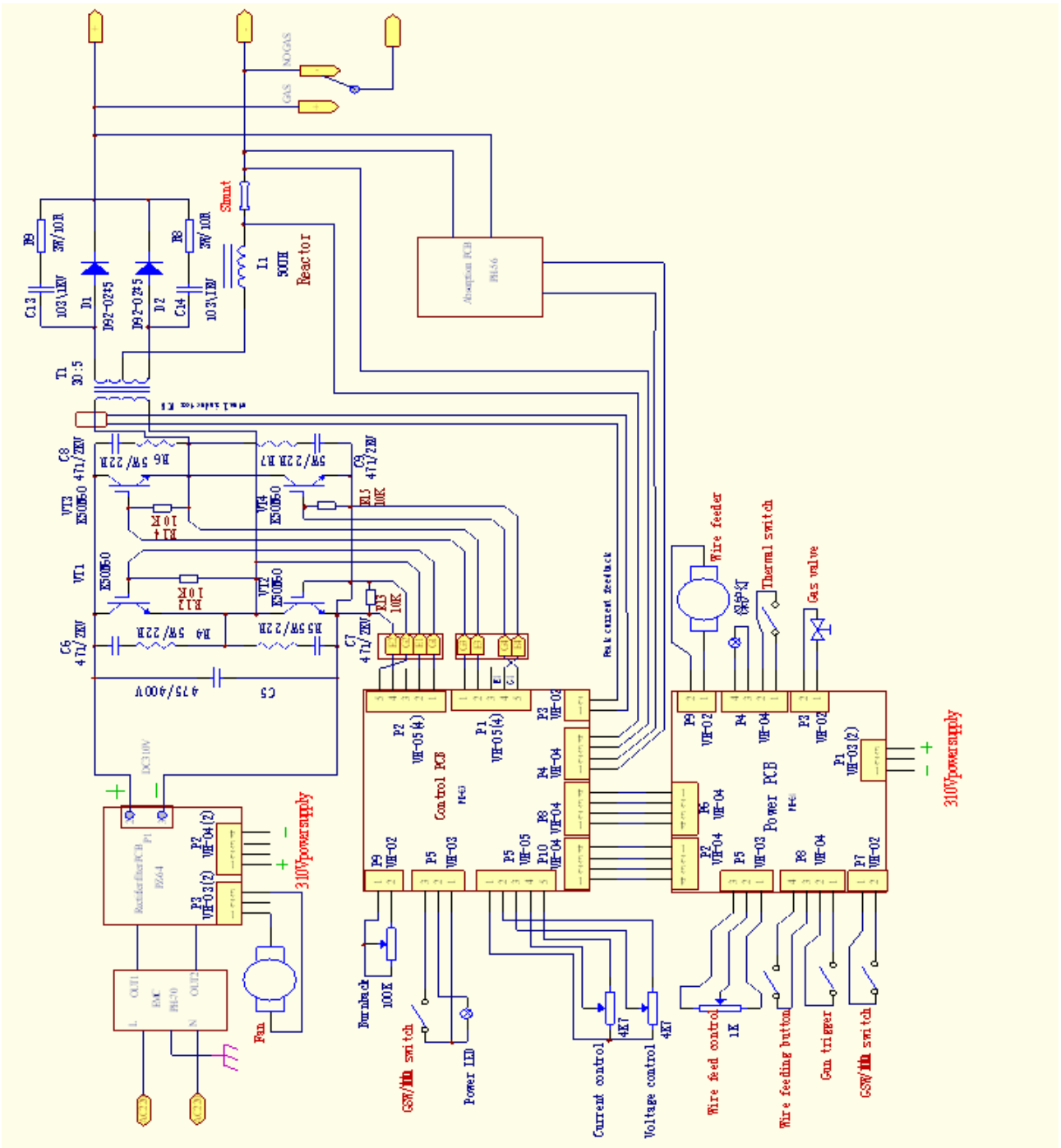
2) Wire feed PCB (PK-64)



3. Spare parts list

No.	Part name	Part number			
		MIG160(J35)	MIG250(J46)	MIG200(J66/J80)	MIG250(J67/J92)
1	Power PCB	B05107	B05108	B01075	B05110
2	Control PCB	B04106	B04083	B04114	B04083
3	Inverter PCB	B16028	B16031	B16012-1	B16037
4	Current/voltage potentiometer	D15102	D15102	D15102	D15102
5	Wire feed speed potentiometer	D15101	D15101	D15101	D15101
6	Current/voltage digital meter	--	--	D20025	D20025
7	Power LED	D08003	D08003	D08003	D08003
8	Overheating LED	D08009	D08009	D08009	D08009
9	Wire feed button	C17021	C17021	C17021	C17021
10	Center socket		C05001	C05001	C05001
11	Quick socket	C02014	C02015	C02015	C02015
12	Wire feeder	D30050	D30047	D30002/D30051	B30002/ D30051
13	Power switch	C16023	C16025	C16025	C16025
14	Fan	D28001	D28001	D28008	D28015
15	Reactor	D16220	D16207-1	D16207-1	D16207-1
16	Main transformer	D03519	D03524	D03530	D03211
17	Rocker switch	C16012-1	C16012-1	C16012-1	C16012-1
18	Triode (S8050/S8550)	D07001/D07002	D07001/D07002	D07001/D07002	D07001/D07002
19	MOSFET (IRFPE40/ 2SK2611)	D05014/D05113	D05014/D05113	D05014/D05113	D05014/D05113
20	Manostat (7805/7815/ 7915)	D19009/ D19011/D19017	D19009/ D19011/D19017	D19009/ D19011/ D19017	D19009/ D19011/ D19017

4. Wiring diamgram



Chapter 4 MIG350 series (J72/J73/J91)

Section 1 Troubleshooting

1. There is no response after the machine is started, and the power LED is off.

1.1 Cause analysis

1) The power cord is not well connected or the power switch fails.
2) The auxiliary power supply fails.
3) The 3-port manostat or some part of the control circuit fails.

1.2 Solution

1) Make sure the power cord is welll connected and there is no bad contact inside the machine, and then switch on the power. Check if there is input voltage at the input terminal of the rectifier PCB (rectifier bridge) with the “AC” mode of multimeter. If there is no input voltage, replace the power switch for it is damaged.
2) If there is nothing wrong with the power switch, check if the output of the auxiliary power transformer is normal.
3) If there is nothing wrong with the switching power supply, check the 3-port manostats on the control PCB, and replace them if necessary.

2. The power LED is on after the machine is started, welding can be carried out, but the fan does not work.

2.1 Cause analysis

1) The fan is not well connected or poor soldering exists.
2) The fan fails.

2.2 Solution

1) Check if the fan is not well connected, connecting terminal is open, or the socket connected is poorly soldered, and eliminate such problems if necessary.
2) Check if the shaft of the fan is locked by something. Otherwise, replace the fan.

3. The overheating LED is on after the machine is started, and there is no output.

3.1 Cause analysis

1) The thermal switch fails.
2) The control PCB fails.
3) The working current is overly high or the working time is overly long.

3.2 Solution

1) Pull out the thermal switch, and check if the overheating LED is off. If it is, replace the thermal switch for it is damaged.
2) Check if the two pins of P7 on the wire-feeder power control PCB is shorted.
3) Check if the working current is overly high and the machine is overloaded. Do operate the machine according to the operator’s manual.

4. There is no response when pushing the torch trigger, and the protection LED is off.

4.1 Cause analysis

1) Check if the power LED and the digital meter are on. If not, check the power supply part.
2) Check if the torch trigger is in good contact and the welding torch is well connected to the machine.
3) Check the wire-feeder power PCB.

4.2 Solution

1) Check the auxiliary power supply part and the wire feed power supply part. If the power supply part fails, refer to “1”.
2) Check if the torch trigger is in good contact. Firstly, make sure that the welding torch is well connected. Secondly, check if pin-1 and pin-2 of P1 is shorted with the “DIODE” mode of multimeter when pushing the torch trigger. Otherwise, replace the torch trigger or welding torch.
3) If there is nothing wrong with the torch trigger, the wire-feeder power PCB must fail. Check if U7, U8, U2, U4 or Q1 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

5. There is gas output when pushing the torch trigger, the wire feeder works, but there is no current output and the protection LED is off.

5.1 Cause analysis

1) The earth wire is not in good contact.
2) The welding torch is damaged.
3) The wire-feeder interface is not in good contact.
4) The feedback wire is broken.
5) Some part in the maiin circuit fails or the connection is incorrect.
6) The control PCB fails.

5.2 Solution

1) Check if there is voltage at the output terminal with the “DC” mode of multimeter when pushing the torch trigger. If there is, check if the earth wire and the welding torch are correctly connected.
2) Check if the welding torch is damaged.
3) Check if the wire-feeder interface is in good contact.
4) Check if the feedback wire is broken.
5) If there is no output voltage when pushing the torch trigger, check if the DC bus is well connected to the inverter PCB and the main transformer wire is correctly connected. Then, check if there is some part in the main circuit such as IGBT and rectifier bridge damaged or wrongly connected, and reconnect them or replace them if necessary.
6) Check if the peak current feedback wire at P3 (or P10) on the control PCB is broken or not in good contact. Then, check if the IGBT drive on the control PCB works normally. Otherwise, check the drive transformer, VT1-VT4, R12-R15, Q6 and Q5 orderly according to the schematic diagram. Resolder them if they are poorly soldered, and replace them if they are damaged.

6. There is gas output when pushing the torch trigger, there is voltage output, but the wire feeder does not work.

6.1 Cause analysis

1) The wire feeder is locked or damaged.
2) The power PCB fails.

6.2 Solution

1) Check if there is voltage at both terminals of P11 on the wire feed PCB (PK-93). If there is, check if the power cord for wire feeder is well connected, and then check if the wire feeder is locked by foreign matter or it is damaged.
2) If there is no voltage at both terminals of P11 on the wire feed PCB, the wire feed PCB must fail. Check if R84, N1, N2, U14, U13, Z6, Z4, Z3, VT1, Q4, U6, U19 or U20 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

7. Welding can be carried out when pushing the torch trigger, but the voltage is very high and nonadjustable, and the no-load voltage is overly high.

7.1 Cause analysis

1) The voltage feedback wire is broken.
2) The voltage feedback circuit on the control PCB is disconnected.

7.2 Solution

1) Check if the voltage feedback wire is broken, disconnected or in bad contact.
2) Check the voltage feedback circuit on the control PCB (PK-94). Check if R8, R9, U1, U19 or U20 is shorted, poorly soldered or damaged according to the schematic diagram of the control PCB. Resolder them or replace them if necessary.

8. Welding current is unstable.

8.1 Cause analysis

1) The moment of wire feeder is inappropriately adjusted.
2) The wire feed roller does not match the welding wire.
3) The contact tip of the welding troch is worn, loosely connected or not suited.
4) The welding wire is of poor quality.
5) The welding cable is overly twisted or pressed.
6) The metal joint of the output terminal is loose.
7) The feedback wire is loosely connected or not in good contact.

8.2 Solution

1) Check if the moment of wire feeder is appropriately adjusted.
2) Check if the v-groove of the wire feed roller matches the diameter of the welding wire.
3) Check if the contact tip of the welding torch is worn, loosely connected or not suited.
4) Check if the welding wire is affected with damp or it is of poor quality.
5) Check if the welding cable is overly twisted or pressed.
6) Check if the metal joint of the output terminal is loose.
7) Check if the feedback wire is loosely connected or not in good contact.

9. The gas regulator cannot be heated.

9.1 Cause analysis

1) There is no voltage at the socket for heater power supply of the gas regulator.
2) The heater inside the gas regulator is damaged.

9.2 Solution

1) Firstly, check if the socket id not well connected. Secondly, check the resettable fuse. Thirdly, check if the industrial frequency transformer is burned.
2) Replace the gas regulator.

10. The weld bead is not well protected in the end of welding.

10.1 Cause analysis

1) The welding torch is moved away as soon as welding stops.
2) The postflow time is overly short.

10.2 Solution

1) Do not move the welding torch away so quickly when welding stops.
2) Prolong the postflow time.

11. Welding can be carried out normally, but electrode sticking occurs.

11.1 Cause analysis

1) The crater time is overly short or the crater voltage is overly low.

11.2 Solution

1) Replace the control PCB or adjust the crater time and crater voltage properly. (For details of the latter, please contact your supplier.)

12. The power switch trips after the machine is started.

12.1 Cause analysis

1) The main circuit is shorted for there is foreign material inside the machine.
2) The capacitor does not work.
3) The silicon brodge does not work.

12.2 Solution

1) Check if there is any foreign material inside the machine.
2) Check if there is any capacitors damaged.
3) Check if the silicon bridge fails.

13. Welding voltage is nonadjustable.

13.1 Cause analysis

1) The voltage potentiometer fails.
2) The control PCB fails.
3) The voltage feedback wire is broken.

13.2 Solution

1) Check if there are any wires for the voltage potentiometer disconnected or breaking off. Then, check if the adjustable resistance is normal.
2) Check the voltage giving circuit on the control PCB. Check if U18, D2, D3, U1, U17, U19 or U20 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.
3) Check if the voltage feedback wire is broken.

14. Wire feed speed is nonadjustable. (Current is nonadjustable.)

14.1 Cause analysis

1) The current potentiometer fails.
2) The wire feed PCB fails.
3) The current feedback wire is broken.

14.2 Solution

1) Check if the current potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.
2) Check the current giving circuit on the wire feed PCB. Check if U5 on the control PCB, R84, N1, N2, U14, U13, Z6, Z4, Z3, VT1, Q4, U6, U19 or U20 on the wire feed PCB is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.
3) Check if the current feedback wire is broken or loosely connected.

15. The wire feeder works and there is gas output and no-load voltage after the machine is started, even though the torch trigger is not pushed.

15.1 Cause analysis

1) The torch trigger fails.
2) The wire feed PCB fails.

15.2 Solution

1) Check if the torch trigger is shorted or normally closed.
2) Check if P1 on the wire feed PCB (PK-93) is shorted. If not, the wire feed PCB must fail. Check if U7, U8, U2, U4 or Q1 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

16. There is gas output after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and the wire feeder does not work.

16.1 Cause analysis

1) The wire feed PCB fails.

16.2 Solution

1) Check if U11, N3, Q1 or U5 on the wire feed PCB is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

17. The wire feeder works after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and gas output.

17.1 Cause analysis

1) The wire feed PCB fails.

17.2 Solution

1) Check if R84, N1, N2, U14, U13, Z6, Z4, Z3, VT1, Q4, U6, U19 or U20 on the wire feed PCB is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

18. 2T/4T function is unavailable.

18.1 Cause analysis

1) The 2T/4T switch is damaged.
2) The wire feed PCB fails.

18.2 Solution

1) Check if the wire connecting to the 2T/4T switch breaks off or is loosely connected, or the 2T/4T switch is damaged.
2) Check if U2, U3 or U4 is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

19. Current is non-adjustable in MMA welding.

19.1 Cause analysis

1) The wire connecting to the current potentiometer breaks off or is loosely connected, or the potentiometer is damaged.
2) The current feedback wire is broken.
3) The control PCB fails.

19.2 Solution

1) Check if the wire connecting to the current potentiometer breaks off or is loosely connected, or the potentiometer is damaged.
2) Check if the current feedback wire is broken.
3) Check if U1 on the MMA module (PK-132), D1-D4, U1, VR3 or R21 on the control PCB (PK-94) is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

Section 2 Appendix

1. Test data for chip pins

Tested machine: MIG350(J72)							
Tested chip (U1 on PWM control module): KA3846							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	6.0K	6.0K	2.5V	9	3.91K	3.91K	
2	4.2K	4.2K	5V	10	12.56K	12.56K	
3	Grounded	Grounded	0V	11	1.99M	18.54M	
4	116.5Ω	116.5Ω		12	0.0Ω	0.0Ω	
5	15.16M	∞		13	900Ω	900Ω	
6	12.85M	∞		14	13.13M	18.58M	
7	12.85M	∞		15	900Ω	900Ω	15V
8	13.20M	∞		16	75Ω	75Ω	

Note: Do not test pin-4 and pin-5 of KA3846 with the multimeter when it is electrified.

Tested machine: MIG350(J72)							
Tested chip (U2 on PWM control module): TL084							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	22.9K	22.9K	12.31V	8	1.11K	1.11K	
2	59.2K	59.2K		9	1.11K	1.11K	
3	0.0Ω	0.0Ω		10	13.15M	∞	
4	900Ω	900Ω	15V	11	6.51K	6.51K	-15V
5	4.1K	4.1K		12	9.85K	10K	
6	2.6K	2.6K	5.4V	13	15.13M	∞	
7	∞	3.04M		14	15M	∞	

Tested machine: MIG350(J72)							
Tested chip (U3 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	12.65KΩ	13.19KΩ		8	7.98KΩ	7.98KΩ	
2	9.47KΩ	9.31KΩ		9	3.7KΩ	3.7KΩ	
3	Grounded	Grounded		10	Grounded	Grounded	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	504KΩ	493KΩ		12	Grounded	Grounded	
6	Grounded	Grounded		13	8.72KΩ	8.72KΩ	
7	468KΩ	13.64MΩ		14	15.62MΩ	3.21MΩ	

Tested machine: MIG350(J72)							
Tested chip (U4 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	146KΩ	142KΩ		8	87.8KΩ	492KΩ	
2	146.8KΩ	574KΩ		9	1.93KΩ	1.93KΩ	
3	8.97KΩ	8.74Ω		10	122.5 KΩ	125.3 KΩ	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	98Ω	98Ω		12	86.7KΩ	2.56KΩ	
6	98Ω	98Ω		13	27KΩ	27KΩ	
7	2.82KΩ	2.82KΩ		14	27KΩ	27KΩ	

Tested machine: MIG350(J72)							
Tested chip (U1 on control PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	17.56MΩ	16.25MΩ		5	Grounded	Grounded	
2	5.1KΩ	5.1KΩ		6	Grounded	Grounded	
3	9.54KΩ	9.7KΩ		7	18.4MΩ	19.88MΩ	
4	Grounded	Grounded		8	693Ω	693Ω	+15V

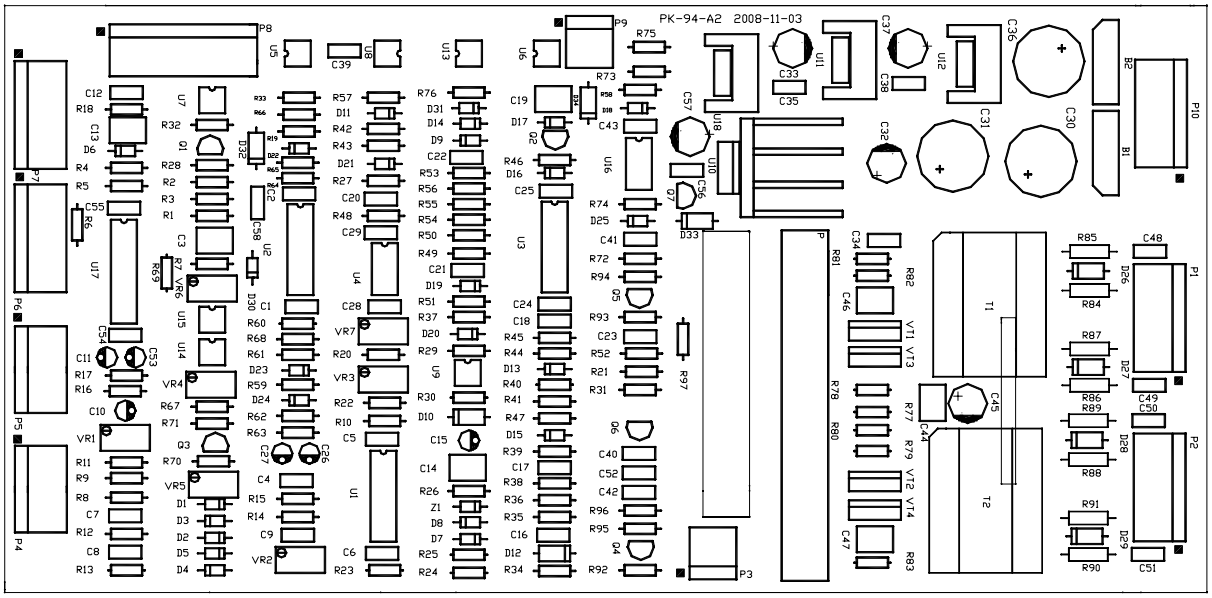
Tested machine: MIG350(J72)							
Tested chip (U5 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	2.81KΩ	2.81KΩ		8	14.33MΩ	133KΩ	
2	98.8Ω	98.8Ω		9	8.62KΩ	8.62KΩ	
3	98.2Ω	98.2Ω		10	Grounded	Grounded	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	Grounded	Grounded		12	8.72KΩ	8.72KΩ	
6	3.72KΩ	3.72KΩ		13	75.6KΩ	75.6KΩ	
7	7.88KΩ	7.88KΩ		14	75.6KΩ	75.6KΩ	

Tested machine: MIG350(J72)							
Tested chip (U6 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	197.4KΩ	197.4KΩ		8	14.33MΩ	14.33MΩ	
2	197.4KΩ	197.4KΩ		9	3.79KΩ	3.79KΩ	
3	Grounded	Grounded		10	2.13KΩ	2.13KΩ	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	102.9KΩ	102.9KΩ		12	5.07KΩ	5.07KΩ	
6	17.18MΩ	17.18MΩ		13	12MΩ	12MΩ	
7	17.18MΩ	17.18MΩ		14	14.84KΩ	14.84KΩ	

Tested machine: MIG350(J72)							
Tested chip (U13 on control PCB): CD4053							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	160.4KΩ	160.4KΩ		9	99.5 KΩ	50.2KΩ	
2	16.95MΩ	16.44 MΩ		10	99.7KΩ	99.7KΩ	
3	67.6KΩ	67.6KΩ		11	Grounded	Grounded	
4	9.89KΩ	9.89KΩ		12	Grounded	Grounded	
5	320KΩ	320KΩ		13	Grounded	Grounded	
6	Grounded	Grounded		14	Grounded	Grounded	
7	Grounded	Grounded		15	9.84KΩ	9.84KΩ	
8	Grounded	Grounded		16	693Ω	693Ω	15V

2. Bare PCB diagrams

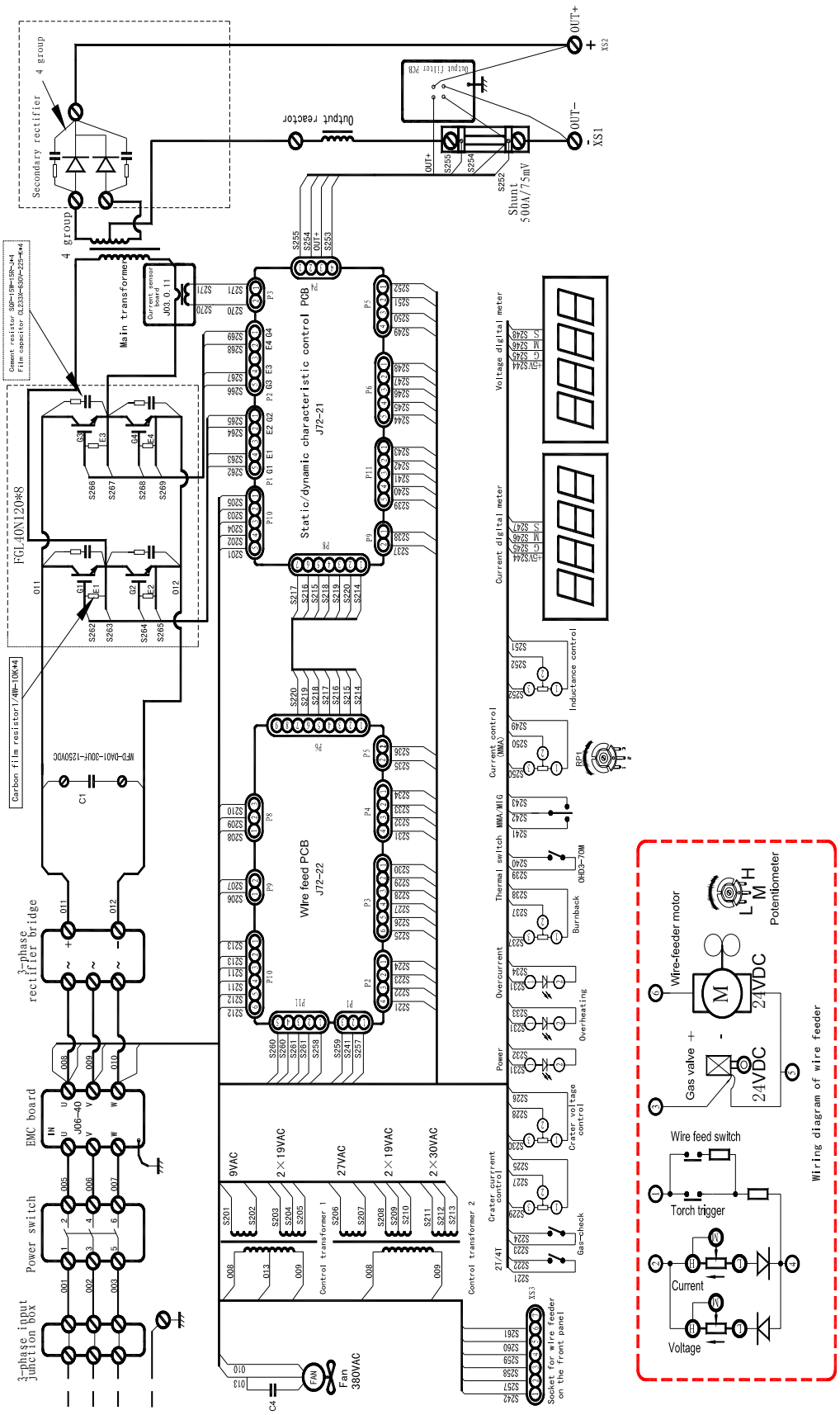
1) Control PCB



3. Spare parts list

No.	Part name	Part number		
		MIG250(J73)	MIG350(J72)	MIG500(J91)
1	Wire feed PCB	B05108	B06105	B04110
2	Control PCB	B04083	B04089	B04042
3	Inverter PCB	B16031	B16026-1	B16039
4	Power conversion PCB	B06085	B06085	B06085
5	Crater current/voltage potentiometer	D15102	D15102	D15102
6	Inductance potentiometer	D15112	D15104	D15104
7	Current potentiometer (MMA)	D15102	D15102	D15102
8	Current/voltage digital meter	D20025	D20025	D20025
9	Power LED	D08003	D08003	D08003
10	Overheating/overcurrent LED	D08009	D08009	D08009
11	Auxiliary power transformer	D03156	D03013	D03158
12	Industrial frequency transformer	D03185	D03185	D03185
13	Quick socket	C02015	C02012	C02013
14	Power switch	C15005	C15004	C15004
15	Fan	D28015	D28006	D28021
16	Reactor	D16207-1	B18033	B18038
17	Main transformer	D03211	D03448	D03215
18	Rocker switch	C16012-1/C16014-1	C16012-1/ C16014-1	C16012-1/ C16014-1
19	Triode (S8050/S8550)	D07001/D07002	D07001/D07002	D07001/D07002
20	SCR (BT137/BT151)	D10003/D10002	D10003/D10002	D10003/D10002
21	MOSFET (IRFP260N)	D05119	D05119	D05119
22	Manostat (7805/7815/ 7915)	D19009/ D19011/ D19017	D19009/ D19011/ D19017	D19009/ D19011/ D19017

4. Wiring diagram



Chapter 5 MIG250F series (J33/J44)

Section 1 Troubleshooting

1. There is no response after the machine is started, and the power LED is off.

1.1 Cause analysis

1) The power cord is not well connected or the power switch fails.
2) The auxiliary power supply fails.
3) The 3-port manostat or some part of the control circuit fails.

1.2 Solution

1) Make sure the power cord is welll connected and there is no bad contact inside the machine, and then switch on the power. Check if there is input voltage (single-phase 220V AC or 3-phase 380VAC) at the input terminal of the rectifier PCB (rectifier bridge) with the “AC” mode of multimeter. If there is no input voltage, replace the power switch for it is damaged.
2) If there is nothing wrong with the power switch, check the auxiliary power. check if there is 24V DC between the two pins of CN3 on the power PCB (PS-14) with the “DC” mode of multimeter. If not, there must be something wrong with the switching power supply part. Check if there are any parts (such as Q1, R9, U1, SCR1 and the transformer T1) damaged, and replace them if necessary. Otherwise, check the machine further from input to output ccording to the schematic diagram or replace the power PCB.
3) If there is nothing wrong with the switching power supply, check the 3-port manostats on the control PCB, and replace them if their working resistance or input/output electric potential is abnormal.

2. The power LED is on after the machine is started, welding can be carried out, but the fan does not work.

2.1 Cause analysis

1) The fan is not well connected or poor soldering exists.
2) The fan fails.

2.2 Solution

1) Check if the fan is not well connected, connecting terminal is open, or the socket connected is poorly soldered, and eliminate such problems if necessary.
2) Check if the shaft of the fan is locked by something. Otherwise, replace the fan.

3. The overheating LED is on after the machine is started, and there is no output.

3.1 Cause analysis

1) The thermal switch fails.
2) The control PCB fails.
3) The working current is overly high or the working time is overly long.

3.2 Solution

1) Pull out the thermal switch, and check if the overheating LED is off. If it is, replace the thermal switch for it is damaged.
2) Check if pin-3 to pin-4 of CN10 on the wire-feeder power control PCB is shorted.
3) Check if the working current is overly high and the machine is overloaded. Do operate the machine according to the operator’s manual.

4. There is no response when pushing the torch trigger, and the protection LED is off.

4.1 Cause analysis

1) Check if the power LED and the digital meter are on. If not, check the power supply part.
2) Check if the torch trigger is in good contact and the welding torch is well connected to the machine.
3) Check the wire-feeder power PCB.

4.2 Solution

1) Check if the MMA/MIG switch is switched to “MIG” position. Then check the power supply part. If the power supply part fails, refer to “1”.
2) Check if the torch trigger is in good contact. Firstly, make sure that the welding torch is well connected. Secondly, check if pin-3 and pin-4 of P8 is shorted with the “DIODE” mode of multimeter when pushing the torch trigger. Otherwise, replace the torch trigger or welding torch.
3) If there is nothing wrong with the torch trigger, the wire-feeder power PCB must fail. Check if Q2, U1, U6, Q3 or Q4 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

5. There is gas output when pushing the torch trigger, the wire feeder works, but there is no current output and the protection LED is off.

5.1 Cause analysis

1) The earth wire is not in good contact.
2) The welding torch is damaged.
3) The wire-feeder interface is not in good contact.
4) The feedback wire is broken.
5) Some part in the maiin circuit fails or the connection is incorrect.
6) The control PCB fails.

5.2 Solution

1) Check if there is voltage at the output terminal with the “DC” mode of multimeter when pushing the torch trigger. If there is, check if the earth wire and the welding torch are correctly connected.
2) Check if the welding torch is damaged.
3) Check if the wire-feeder interface is in good contact.
4) Check if the feedback wire is broken.
5) If there is no output voltage when pushing the torch trigger, check if the DC bus is well connected to the inverter PCB and the main transformer wire is correctly connected. Then, check if there is some part in the main circuit such as IGBT and rectifier bridge damaged or wrongly connected, and reconnect them or replace them if necessary.
6) Check if the peak current feedback wire at P3 on the control PCB is broken or not in good contact. Then, check if the IGBT drive on the control PCB works normally. Otherwise, check the drive transformer, VT1-VT4, R53, R54, R58, R59, U6, and U10 orderly. Resolder them if they are poorly soldered, and replace them if they are damaged.

6. There is gas output when pushing the torch trigger, there is voltage output, but the wire feeder does not work.

6.1 Cause analysis

1) The wire feeder is locked or damaged.
2) The power PCB fails.

6.2 Solution

1) Check if there is voltage at pin-4 and pin-5 of CN5 on the wire feed PCB. If there is, check if the power cord for wire feeder is well connected, and then check if the wire feeder is locked by foreign matter or it is damaged.
2) If there is no voltage at pin-4 and pin-5 of CN5 on the wire feed PCB, the wire feed PCB must fail. Check if Q6, Q7, U5, Q5 or U1 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

7. Welding can be carried out when pushing the torch trigger, but the voltage is nonadjustable, and the no-load voltage is overly high.

7.1 Cause analysis

1) The voltage feedback wire is broken.
2) The voltage feedback circuit on the control PCB is disconnected.

7.2 Solution

1) Check if the voltage feedback wire is broken, disconnected or in bad contact.
2) Check the voltage feedback circuit on the control PCB. Check if R16, R17, U11, D10 or VR2 is shorted, poorly soldered or damaged according to the schematic diagram of the control PCB. Resolder them or replace them if necessary.

8. Welding current is unstable.

8.1 Cause analysis

1) The moment of wire feeder is inappropriately adjusted.
2) The wire feed roller does not match the welding wire.
3) The contact tip of the welding troch is worn, loosely connected or not suited.
4) The welding wire is of poor quality.
5) The welding cable is overly twisted or pressed.
6) The metal joint of the output terminal is loose.
7) The feedback wire is loosely connected or not in good contact.

8.2 Solution

1) Check if the moment of wire feeder is appropriately adjusted.
2) Check if the v-groove of the wire feed roller matches the diameter of the welding wire.
3) Check if the contact tip of the welding torch is worn, loosely connected or not suited.
4) Check if the welding wire is affected with damp or it is of poor quality.
5) Check if the welding cable is overly twisted or pressed.
6) Check if the metal joint of the output terminal is loose.
7) Check if the feedback wire is loosely connected or not in good contact.

9. The gas regulator cannot be heated.

9.1 Cause analysis

1) There is no voltage at the socket for heater power supply of the gas regulator.
2) The heater inside the gas regulator is damaged.

9.2 Solution

1) Firstly, check if the socket id not well connected. Secondly, check the resettable fuse. Thirdly, check if the industrial frequency transformer is burned.
2) Replace the gas regulator.

10. The weld bead is not well protected in the end of welding.

10.1 Cause analysis

1) The welding torch is moved away as soon as welding stops.
2) The postflow time is overly short.

10.2 Solution

1) Do not move the welding torch away so quickly when welding stops.
2) Prolong the postflow time.

11. Welding can be carried out normally, but electrode sticking occurs.

11.1 Cause analysis

1) The crater time is overly short or the crater voltage is overly low.

11.2 Solution

1) Replace the control PCB or adjust the crater time and crater voltage properly. (For details of the latter, please contact your supplier.)

12. The power switch trips after the machine is started.

12.1 Cause analysis

1) The main circuit is shorted for there is foreign material inside the machine.
2) The capacitor does not work.
3) The silicon brodge does not work.

12.2 Solution

1) Check if there is any foreign material inside the machine.
2) Check if there is any capacitors damaged.
3) Check if the silicon bridge fails.

13. Welding voltage is nonadjustable.

13.1 Cause analysis

1) The voltage potentiometer fails.
2) The control PCB fails.
3) The voltage feedback wire is broken.

13.2 Solution

1) Check if there are any wires for the voltage potentiometer disconnected or breaking off. Then, check if the adjustable resistance is normal.
2) Check the voltage giving circuit on the control PCB. Check if D1, U1, Q2 or D11 is shorted or damaged according to the schematic diagram. Replace them if necessary.
3) Check if the voltage feedback wire is broken.

14. Wire feed speed is nonadjustable. (Current is nonadjustable.)

14.1 Cause analysis

1) The current potentiometer fails.
2) The wire feed PCB fails.
3) The current feedback wire is broken.

14.2 Solution

1) Check if the current potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.
2) Check the current giving circuit on the wire feed PCB. Check if U5 on the control PCB or U2 on the power PCB is shorted or damaged according to the schematic diagram. Replace them if necessary.
3) Check if the current feedback wire is broken or loosely connected.

15. The wire feeder works and there is gas output and no-load voltage after the machine is started, even though the torch trigger is not pushed.

15.1 Cause analysis

1) The torch trigger fails.
2) The wire feed PCB fails.

15.2 Solution

1) Check if the torch trigger is shorted or normally closed.
2) Check if Q2, U2 or U3 on the wire feed PCB is damaged.

16. There is gas output after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and the wire feeder does not work.

16.1 Cause analysis

1) The wire feed PCB fails.

16.2 Solution

1) Check if U1 or Q1 on the wire feed PCB is damaged.

17. The wire feeder works after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and gas output.

17.1 Cause analysis

1) The wire feed PCB fails.

17.2 Solution

1) Check if U5 or Q7 on the wire feed PCB is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

Section 2 Appendix

1. Test data for chip pins

Tested machine: MIG250(J33/J44)							
Tested chip (U1 on PWM control module): KA3846							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	6.0K	6.0K	2.5V	9	3.91K	3.91K	
2	4.2K	4.2K	5V	10	12.56K	12.56K	
3	Grounded	Grounded	0V	11	1.99M	18.54M	
4	116.5Ω	116.5Ω		12	0.0Ω	0.0Ω	
5	15.16M	∞		13	900Ω	900Ω	
6	12.85M	∞		14	13.13M	18.58M	
7	12.85M	∞		15	900Ω	900Ω	15V
8	13.20M	∞		16	75Ω	75Ω	

Note: Do not test pin-4 and pin-5 of KA3846 with the multimeter when it is electrified.

Tested machine: MIG250(J33/J44)							
Tested chip (U2 on PWM control module): TL084							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	22.9K	22.9K	12.31V	8	1.11K	1.11K	
2	59.2K	59.2K		9	1.11K	1.11K	
3	0.0Ω	0.0Ω		10	13.15M	∞	
4	900Ω	900Ω	15V	11	6.51K	6.51K	-15V
5	4.1K	4.1K		12	9.85K	10K	
6	2.6K	2.6K	5.4V	13	15.13M	∞	
7	∞	3.04M		14	15M	∞	

Tested machine: MIG250(J33/J44)							
Tested chip (U5 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	130KΩ	97.6Ω		8	32.9KΩ	32.9KΩ	
2	1.95KΩ	1.95MΩ		9	32.9KΩ	32.9KΩ	
3	29.5KΩ	29.5KΩ		10	129K	89.7K	
4	840Ω	840Ω	15V	11	4.5KΩ	4.5KΩ	-15V
5	49KΩ	49KΩ		12	Grounded	Grounded	
6	Grounded	Grounded		13	15.2KΩ	14.6KΩ	
7	34K	34KΩ		14	12.1KΩ	12.37KΩ	

Tested machine: MIG250(J33/J44)							
Tested chip (U5 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	130KΩ	97.6Ω		8	32.9KΩ	32.9KΩ	
2	1.95KΩ	1.95MΩ		9	32.9KΩ	32.9KΩ	
3	29.5KΩ	29.5KΩ		10	129K	89.7K	
4	840Ω	840Ω	15V	11	4.5KΩ	4.5KΩ	-15V
5	49KΩ	49KΩ		12	Grounded	Grounded	
6	Grounded	Grounded		13	15.2KΩ	14.6KΩ	
7	34K	34KΩ		14	12.1KΩ	12.37KΩ	

Tested machine: MIG250(J33/J44)							
Tested chip (U6 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	14.8MΩ	125.3KΩ		8	7.86KΩ	7.86KΩ	
2	937KΩ	963KΩ		9	3.69KΩ	3.69KΩ	
3	2.38KΩ	2.38KΩ		10	Grounded	Grounded	
4	840Ω	840Ω	15V	11	4.5KΩ	4.5KΩ	-15V
5	∞	15.7M		12	Grounded	Grounded	
6	49.2KΩ	49.3KΩ		13	8.6KΩ	8.6KΩ	
7	49.3KΩ	49.3KΩ		14	11.3MΩ	1.74MΩ	

Tested machine: MIG250(J33/J44)							
Tested chip (U4 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	2.87KΩ	2.78KΩ		8	15.7MΩ	18.1MΩ	
2	100Ω	100Ω		9	3.76KΩ	3.76KΩ	
3	98.4Ω	98.4Ω		10	1.55K	1.55K	
4	840Ω	840Ω	15V	11	4.5KΩ	4.5KΩ	-15V
5	12.7K	12.7K		12	Grounded	Grounded	
6	79.2KΩ	79.2KΩ		13	17.45KΩ	17KΩ	
7	79.2KΩ	79.2KΩ		14	8.5KΩ	8.5KΩ	

Tested machine: MIG250(J33/J44)							
Tested chip (U11 on control PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	14.8KΩ	14.8KΩ		5	8.9KΩ	8.7KΩ	
2	17.9M	12M		6	9.6KΩ	9.7KΩ	
3	4.9KΩ	4.9KΩ		7	9.6KΩ	9.7KΩ	
4	4.5KΩ	4.5KΩ	-15V	8	840Ω	840Ω	15V

Tested machine: MIG250(J33/J44)							
Tested chip (U10 on control PCB): CD4053							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	8.5KΩ	8.5KΩ		9	Grounded	Grounded	
2	9.7KΩ	9.7KΩ		10	16.6MΩ	12.6MΩ	
3	Grounded	Grounded		11	5.9K	5.9K	
4	∞	15.6MΩ		12	947Ω	1.3KΩ	
5	Grounded	Grounded		13	8.5KΩ	8.5KΩ	
6	Grounded	Grounded		14	∞	∞	
7	4.5KΩ	4.5KΩ		15	89.8KΩ	89.8KΩ	
8	Grounded	Grounded		16	840Ω	840Ω	15V

Tested machine: MIG250(J33/J44)							
Tested chip (U1 on power PCB): UC2845							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	148.5KΩ	153.7KΩ		5	Grounded	Grounded	
2	5.0K	5.0K		6	1.85MΩ	12.4MΩ	
3	988Ω	988Ω		7	128.7KΩ	9.6KΩ	
4	9.61KΩ	9.6KΩ	-15V	8	4.14KΩ	4.14KΩ	15V

Tested machine: MIG250(J33/J44)							
Tested chip (U2 on wire feed PCB): TC4013							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	15MΩ	∞		8	9.9K	9.9K	
2	15.2MΩ	∞		9	14MΩ	18M	
3	15.9MΩ	15.9KΩ		10	Grounded	Grounded	
4	15.1K	∞		11	14.9MΩ	∞	
5	6.0K	6.0K		12	13.1MΩ	∞	
6	Grounded	Grounded		13	17.1MΩ	∞	
7	Grounded	Grounded		14	6.0KΩ	6.0KΩ	15V

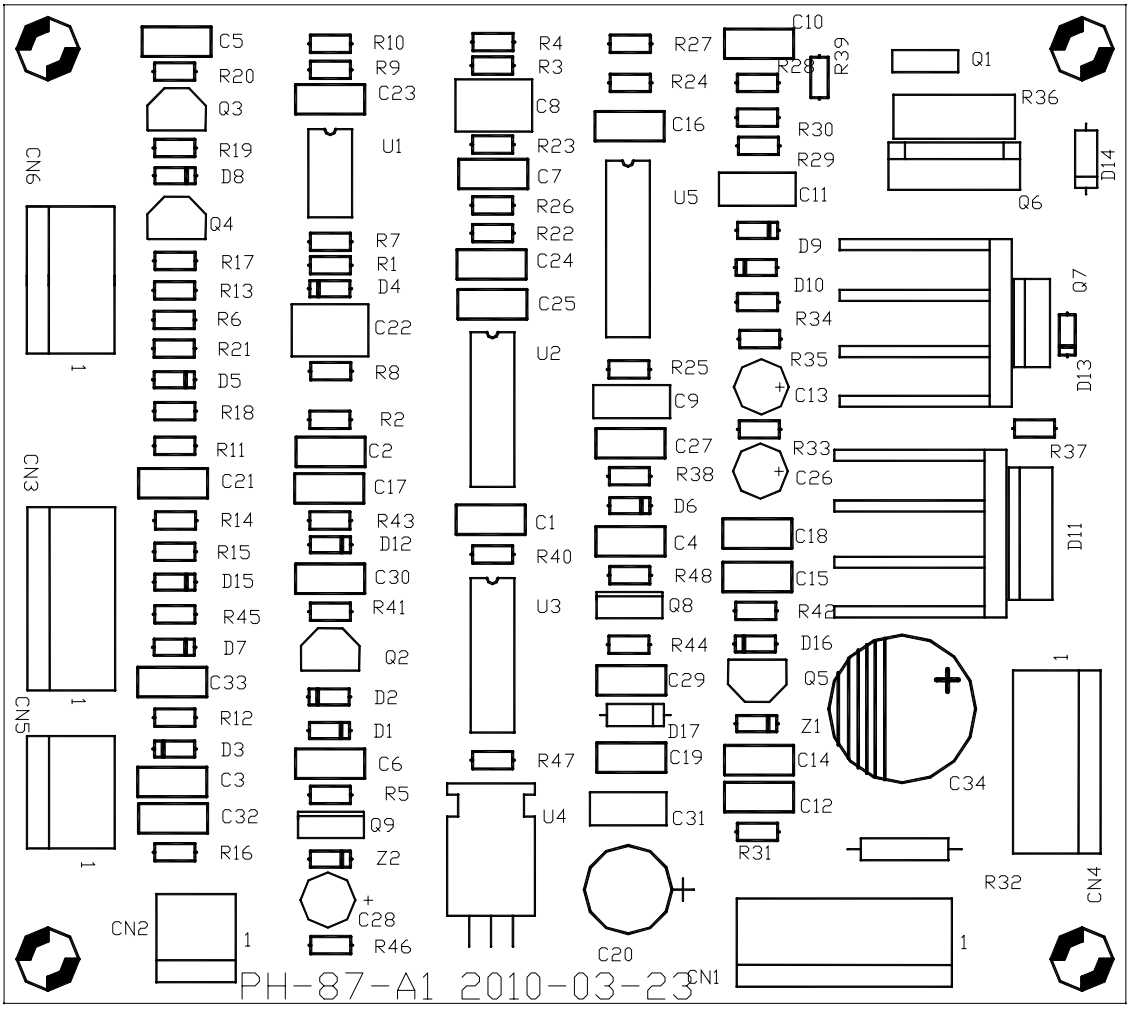
Tested machine: MIG250(J33/J44)							
Tested chip (U3 on wire feed PCB): CD4093							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	9.9KΩ	9.9K		8	15.9K	15.9K	
2	9.9KΩ	9.9K		9	15.9KΩ	15.9K	
3	15.9KΩ	15.9KΩ		10	55K	5.4K	
4	671K	16.2M		11	14.6MΩ	17.1M	
5	11K	11K		12	Grounded	Grounded	
6	11K	11K		13	Grounded	Grounded	
7	Grounded	Grounded		14	6.0KΩ	6.0KΩ	15V

Tested machine: MIG250(J33/J44)							
Tested chip (U5 on wire feed PCB): TL494							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	4.0KΩ	4.0KΩ		9	Grounded	Grounded	
2	30KΩ	30KΩ		10	Grounded	Grounded	
3	91.2K	91.2K		11	10.8K	10.8K	
4	12.9K	12.9KΩ		12	6.0KΩ	6.0KΩ	
5	14.3M	∞		13	Grounded	Grounded	
6	5.0K	5.0K		14	3.68K	3.68K	
7	Grounded	Grounded		15	9.1KΩ	9.1KΩ	
8	10.8K	10.8K		16	10.1KΩ	10.1Ω	15V

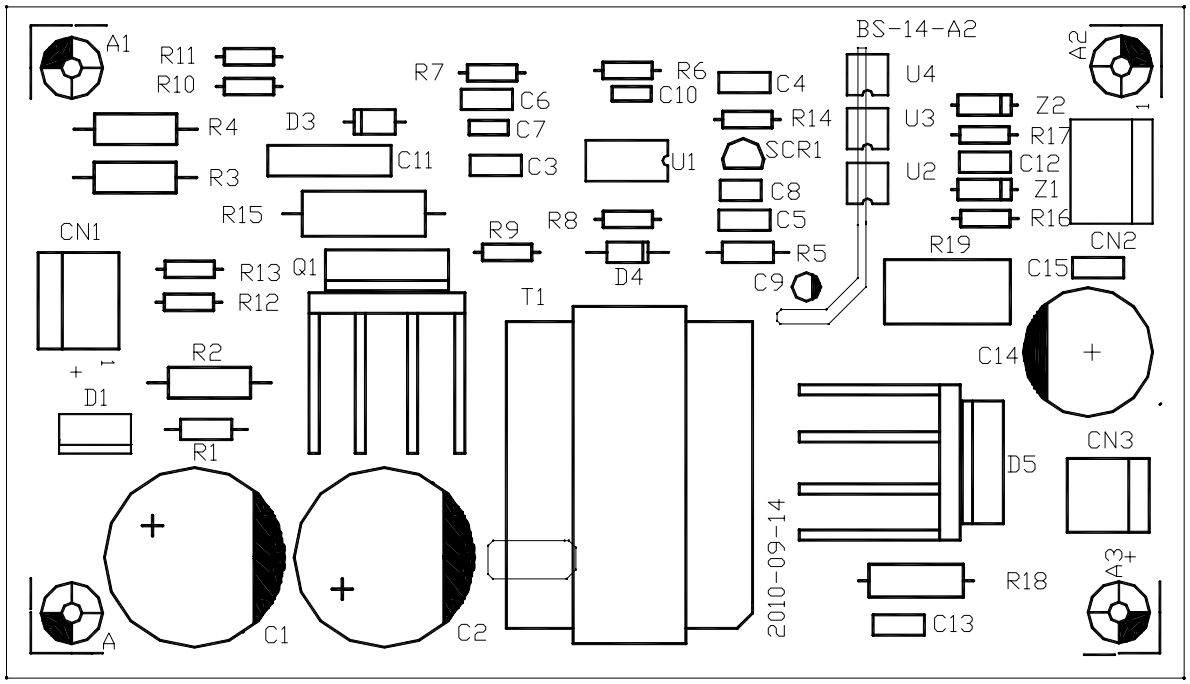
Tested machine: MIG250(J33/J44)							
Tested chip (U1 on wire feed PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	17.5MΩ	11.9MΩ		5	50K	48.8K	
2	3.68K	3.68M		6	6.4KΩ	6.4KΩ	
3	165.6KΩ	494KΩ		7	6.9KΩ	6.9KΩ	
4	Grounded	Grounded		8	6.9KΩ	6.0KΩ	15V

2. Bare PCB diagrams

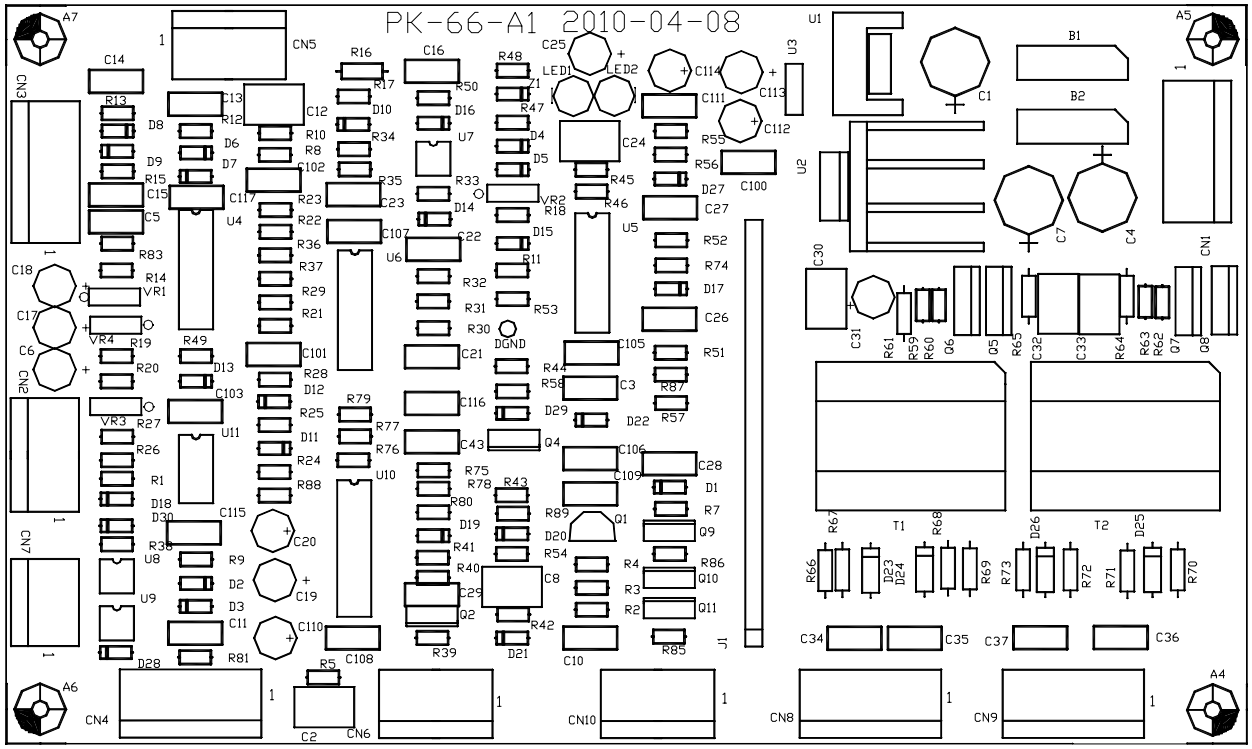
1) Wire feed PCB (PH-87)



2) Wire feed power PCB (PS-03)



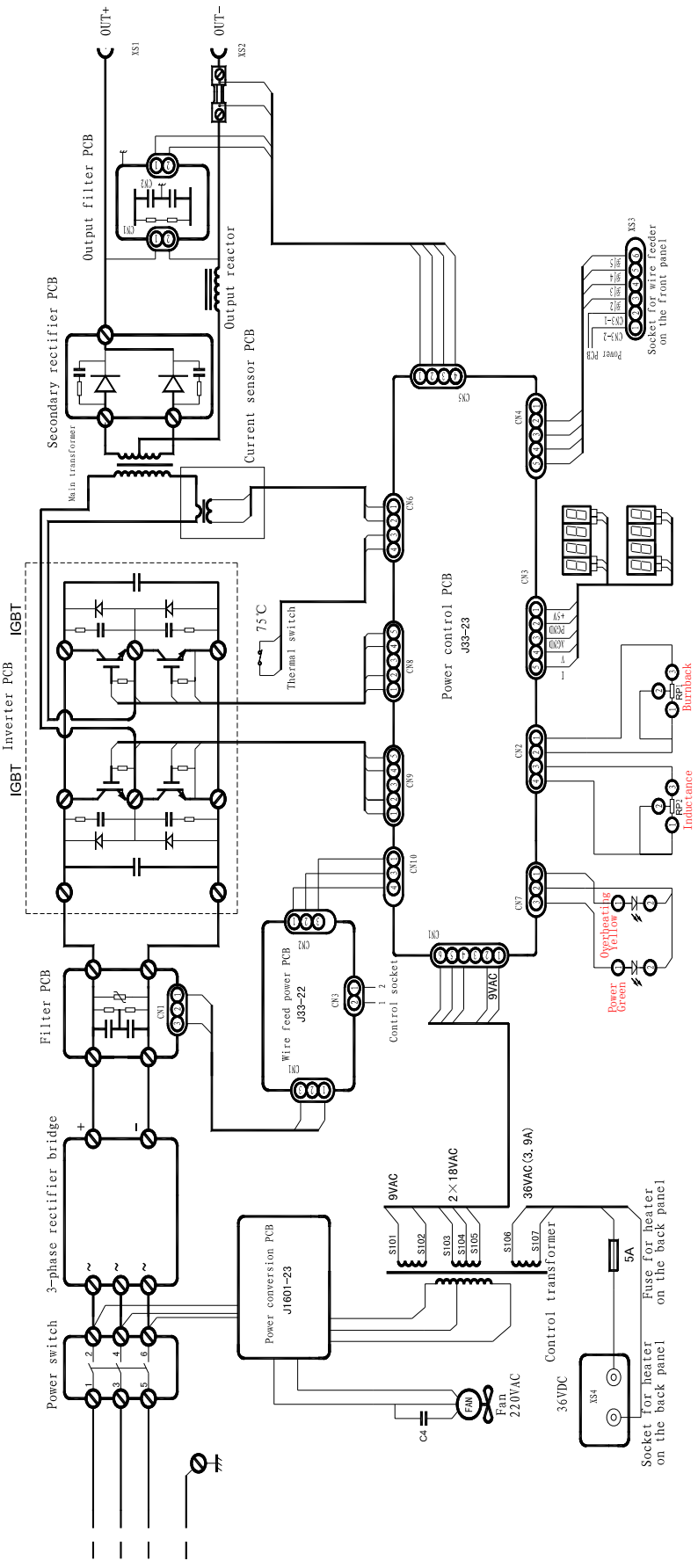
3) Control PCB (PK-66)



3. Spare parts list

No.	Part name	Part number	
		MIG250(J33)	MIG250(J44)
1	Wire feed PCB	B05106	B05106
2	Control PCB	B04105	B04105
3	Inverter PCB	B16013-1	B16024
4	Power conversion PCB	B06085	B06095
5	Burnback time control potentiometer	D15104	D15104
6	Inductance control potentiometer	D15112	D15112
7	Current/voltage digital meter	D20025	D20025
8	Power LED	D08003	D08003
9	Overheating/overcurrent LED	D08009	D08009
10	Auxiliary power transformer 1	D03449	D03152
11	Auxiliary power transformer 2	D03003	D03003
12	Quick socket	C02015	C02012
13	Power switch	C15004	C15005
14	Fan	D28015	D28015
15	Noninductive capacitor	D02548	
16	Reactor	D16207-1	D16207-1
17	Main transformer	D03517	D03520
18	Triode (S8050/S8550)	D07001/D07002	D07001/D07002
19	SCR (MCR100-6)	D10001	D10001
20	IGBT (K08T120)	D24028	D24028
21	Manostat (7805/7815/ 7915)	D19009/ D19011/ D19017	D19009/ D19011/ D19017

4. Wiring diagram



Chapter 6 MIG250F series (N201/N202)

Section 1 Troubleshooting

1. There is no response after the machine is started, and the power LED is off.

1.1 Cause analysis

1) The power cord is not well connected or the power switch fails.
2) The auxiliary power supply fails.
3) The 3-port manostat or some part of the control circuit fails.

1.2 Solution

1) Make sure the power cord is welll connected and there is no bad contact inside the machine, and then switch on the power. Check if there is input voltage at the input terminal of the rectifier PCB (rectifier bridge) with the “AC” mode of multimeter. If there is no input voltage, replace the power switch for it is damaged.
2) If there is nothing wrong with the power switch, check if the output of the auxiliary power transformer is normal. Otherwise, replace the auxiliary power transformer.
3) If there is nothing wrong with the switching power supply, check the 3-port manostats on the control PCB, and replace them if their working resistance or input/output electric potential is abnormal.

2. The power LED is on after the machine is started, welding can be carried out, but the fan does not work.

2.1 Cause analysis

1) The fan is not well connected or poor soldering exists.
2) The fan fails. (For MIG315F, the fan control PCB may fail.)

2.2 Solution

1) Check if the fan is not well connected, connecting terminal is open, or the socket connected is poorly soldered, and eliminate such problems if necessary. (For MIG315F, check the wire connection and 3-port manostats on the fan control PCB, and replace the 3-port manostats if necessary.)
2) Check if the shaft of the fan is locked by something. Otherwise, replace the fan.

3. The overheating LED is on after the machine is started, and there is no output.

3.1 Cause analysis

1) The thermal switch fails.
2) The control PCB fails.
3) The working current is overly high or the working time is overly long.

3.2 Solution

1) Pull out the thermal switch, and check if the overheating LED is off. If it is, replace the thermal switch for it is damaged.
2) Check if pin-1 and pin-2 of P9 on the wire-feeder power control PCB is shorted.
3) Check if the working current is overly high and the machine is overloaded. Do operate the machine according to the operator’s manual.

4. There is no response with the protection LED off when pushing the torch trigger.

4.1 Cause analysis

1) Check if the power LED and the digital meter are on. If not, check the power supply part.
2) Check if the torch trigger is in good contact and the welding torch is well connected to the machine.
3) Check the wire-feeder power PCB.

4.2 Solution

1) Check if the MMA/MIG switch is switched to “MIG” position. Then, check the power supply part. If the power supply part fails, refer to “1”.
2) Check if the torch trigger is in good contact. Firstly, make sure that the welding torch is well connected. Secondly, check if pin-1 and pin-2 of P2 is shorted with the “DIODE” mode of multimeter when pushing the torch trigger. Otherwise, replace the torch trigger or welding torch.
3) If there is nothing wrong with the torch trigger, the wire-feeder power PCB must fail. Check if U1, U2 or Q3 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

5. There is gas output when pushing the torch trigger, the wire feeder works, but there is no current output and the protection LED is off.

5.1 Cause analysis

1) The earth wire is not in good contact.
2) The welding torch is damaged.
3) The wire-feeder interface is not in good contact.
4) The feedback wire is broken.
5) Some part in the maiin circuit fails or the connection is incorrect.
6) The control PCB fails.

5.2 Solution

1) Check if there is voltage at the output terminal with the “DC” mode of multimeter when pushing the torch trigger. If there is, check if the earth wire and the welding torch are correctly connected.
2) Check if the welding torch is damaged.
3) Check if the wire-feeder interface is in good contact.
4) Check if the feedback wire is broken.
5) If there is no output voltage when pushing the torch trigger, check if the DC bus is well connected to the inverter PCB and the main transformer wire is correctly connected. Then, check if there is some part in the main circuit such as IGBT and rectifier bridge damaged or wrongly connected, and reconnect them or replace them if necessary.
6) Check if the peak current feedback wire at pin-1 and pin-2 of P8 on the control PCB is broken or not in good contact. Then, check if the IGBT drive on the control PCB works normally. Otherwise, check the drive transformer, VT1-VT4, R53, R54, R58, R59, U6 and U10 orderly according to the schematic diagram. Resolder or replace them if necessary.

6. There is gas output when pushing the torch trigger, there is voltage output, but the wire feeder does not work.

6.1 Cause analysis

1) The wire feeder is locked or damaged.
2) The power PCB fails.

6.2 Solution

1) Check if there is voltage between pin-1 and pin-4 of P8 on the wire feed PCB. If there is, check if the power cord for wire feeder is well connected, and then check if the wire feeder is locked by foreign matter or it is damaged.
2) If there is no voltage between pin-1 and pin-4 of P8 on the wire feed PCB, the wire feed PCB must fail. Check if T1, T2, U2, U4, U1 or U2 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

7. Welding can be carried out when pushing the torch trigger, but the current is very high , the voltage is nonadjustable, and the no-load voltage is overly high.

7.1 Cause analysis

1) The voltage feedback wire is broken.
2) The voltage feedback circuit on the control PCB is disconnected.

7.2 Solution

1) Check if the voltage feedback wire is broken, disconnected or in bad contact.
2) Check the voltage feedback circuit on the control PCB. Check if R11, R12, U2 or U1 is shorted, poorly soldered or damaged according to the schematic diagram of the control PCB. Resolder them or replace them if necessary.

8. Welding current is unstable.

8.1 Cause analysis

1) The moment of wire feeder is inappropriately adjusted.
2) The wire feed roller does not match the welding wire.
3) The contact tip of the welding troch is worn, loosely connected or not suited.
4) The welding wire is of poor quality.
5) The welding cable is overly twisted or pressed.
6) The metal joint of the output terminal is loose.
7) The feedback wire is loosely connected or not in good contact.

8.2 Solution

1) Check if the moment of wire feeder is appropriately adjusted.
2) Check if the v-groove of the wire feed roller matches the diameter of the welding wire.
3) Check if the contact tip of the welding torch is worn, loosely connected or not suited.
4) Check if the welding wire is affected with damp or it is of poor quality.
5) Check if the welding cable is overly twisted or pressed.
6) Check if the metal joint of the output terminal is loose.
7) Check if the feedback wire is loosely connected or not in good contact.

9. The gas regulator cannot be heated.

9.1 Cause analysis

1) There is no voltage at the socket for heater power supply of the gas regulator.
2) The heater inside the gas regulator is damaged.

9.2 Solution

1) Firstly, check if the socket id not well connected. Secondly, check the resettable fuse. Thirdly, check if the industrial frequency transformer is burned.
2) Replace the gas regulator.

10. The weld bead is not well protected in the end of welding.

10.1 Cause analysis

1) The welding torch is moved away as soon as welding stops.
2) The postflow time is overly short.

10.2 Solution

1) Do not move the welding torch away so quickly when welding stops.
2) Prolong the postflow time.

11. Welding can be carried out normally, but electrode sticking occurs.

11.1 Cause analysis

1) The crater time is overly short or the crater voltage is overly low.

11.2 Solution

1) Replace the control PCB or adjust the crater time and crater voltage properly. (For details of the latter, please contact your supplier.)

12. The power switch trips after the machine is started.

12.1 Cause analysis

1) The main circuit is shorted for there is foreign material inside the machine.
2) The capacitor does not work.
3) The silicon brodge does not work.

12.2 Solution

1) Check if there is any foreign material inside the machine.
2) Check if there is any capacitors damaged.
3) Check if the silicon bridge fails.

13. Welding voltage is nonadjustable.

13.1 Cause analysis

1) The voltage potentiometer fails.
2) The control PCB fails.
3) The voltage feedback wire is broken.

13.2 Solution

1) Check if there are any wires for the voltage potentiometer disconnected or breaking off. Then, check if the adjustable resistance is normal.
2) Check the voltage giving circuit on the control PCB. Check if Q1, U1, Z3, D1, Z1, D2 or Q2 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.
3) Check if the voltage feedback wire is broken.

14. Wire feed speed is nonadjustable. (Current is nonadjustable.)

14.1 Cause analysis

1) The current potentiometer fails.
2) The wire feed PCB fails.
3) The current feedback wire is broken.

14.2 Solution

1) Check if the current potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.
2) Check the current giving circuit on the wire feed PCB. Check if Q1 or U1 on the wire feed PCB is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.
3) Check if the current feedback wire is broken or loosely connected.

15. The wire feeder works and there is gas output and no-load voltage after the machine is started, even though the torch trigger is not pushed.

15.1 Cause analysis

1) The torch trigger fails.
2) The wire feed PCB fails.

15.2 Solution

1) Check if the torch trigger is shorted or normally closed.
2) Check if U1 on the wire feed PCB is damaged.

16. There is gas output after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and the wire feeder does not work.

16.1 Cause analysis

1) The wire feed PCB fails.

16.2 Solution

1) Check if U1, Q3 or U3 on the wire feed PCB is damaged.

17. The wire feeder works after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and gas output.

17.1 Cause analysis

1) The wire feed PCB fails.

17.2 Solution

1) Check if U2 or VT2 on the wire feed PCB is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

18. Current is non-adjustable in MMA welding.

18.1 Cause analysis

1) The wire connecting to the current potentiometer breaks off or is loosely connected, or the potentiometer is damaged.
2) The MMA module (PK-132) on the control PCB fails.
3) The current feedback wire is broken.

18.2 Solution

1) Check if the wire connecting to the current potentiometer breaks off or is loosely connected, or the potentiometer is damaged.
2) Check if D1, U1 or U2 on the MMA module (PK-132) on the control PCB is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.
3) Check if the current feedback wire is broken.

Section 2 Appendix

1. Test data for chip pins

Tested machine: MIG250(N201)/MIG315(N202)							
Tested chip (U1 on PWM control module): KA3846							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	6.0K	6.0K	2.5V	9	3.91K	3.91K	
2	4.2K	4.2K	5V	10	12.56K	12.56K	
3	Grounded	Grounded	0V	11	1.99M	18.54M	
4	116.5Ω	116.5Ω		12	0.0Ω	0.0Ω	
5	15.16M	∞		13	900Ω	900Ω	
6	12.85M	∞		14	13.13M	18.58M	
7	12.85M	∞		15	900Ω	900Ω	15V
8	13.20M	∞		16	75Ω	75Ω	

Note: Do not test pin-4 and pin-5 of KA3846 with the multimeter when it is electrified.

Tested machine: MIG250(N201)/MIG315(N202)							
Tested chip (U2 on PWM control module): TL084							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	22.9K	22.9K	12.31V	8	1.11K	1.11K	
2	59.2K	59.2K		9	1.11K	1.11K	
3	0.0Ω	0.0Ω		10	13.15M	∞	
4	900Ω	900Ω	15V	11	6.51K	6.51K	-15V
5	4.1K	4.1K		12	9.85K	10K	
6	2.6K	2.6K	5.4V	13	15.13M	∞	
7	∞	3.04M		14	15M	∞	

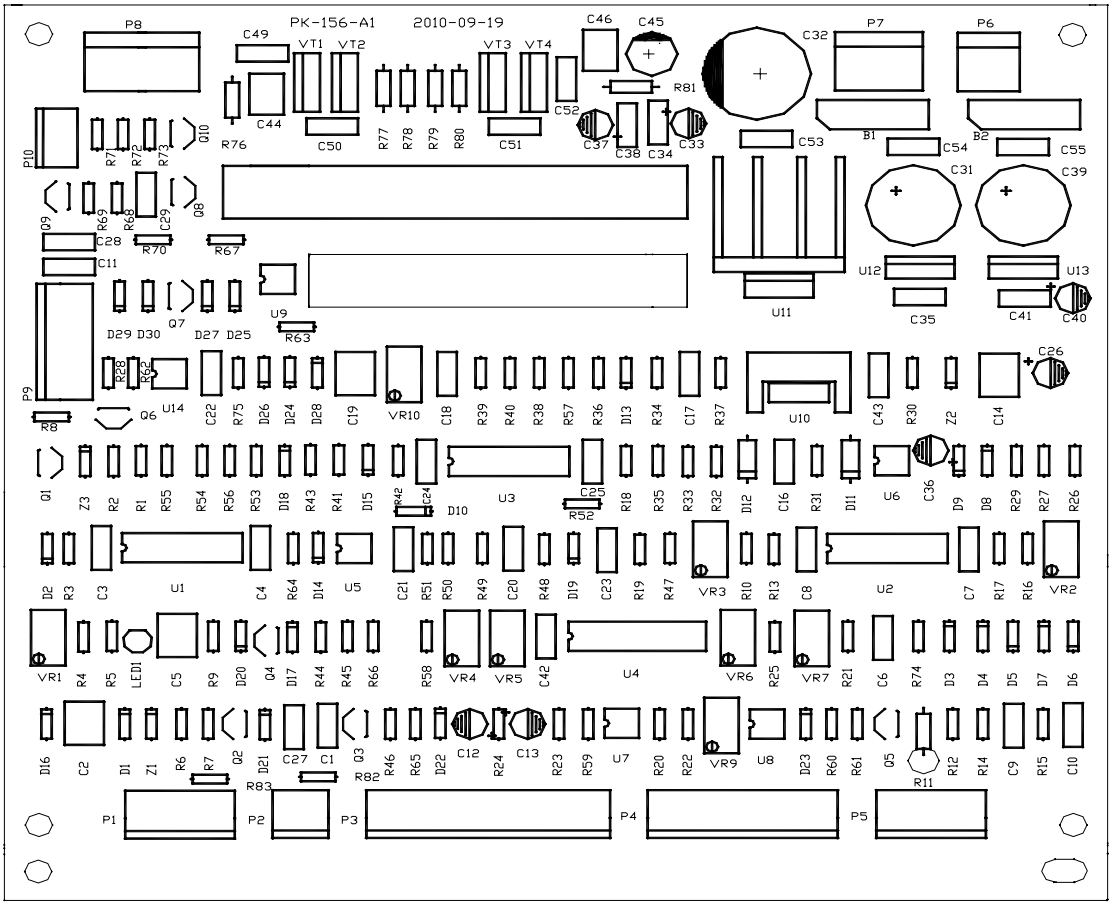
Tested machine: MIG250(N201)/MIG315(N202)							
Tested chip (U1 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	16.62 MΩ	16.94MΩ		8	61.6KΩ	61.6KΩ	
2	16.62 MΩ	16.94MΩ		9	46.7KΩ	46.7KΩ	
3	29KΩ	29KΩ		10	Grounded	Grounded	
4	888Ω	888Ω	15V	11	3.19KΩ	3.19KΩ	-15V
5	2.42KΩ	2.42KΩ		12	Grounded	Grounded	
6	989KΩ	989KΩ		13	8.72KΩ	8.72KΩ	
7	15.89M	567KΩ		14	28.9KΩ	29KΩ	

Tested machine: MIG250(N201)/MIG315(N202)							
Tested chip (U2 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	2.81KΩ	2.81KΩ		8	14.33MΩ	133KΩ	
2	98.8Ω	98.8Ω		9	8.62KΩ	8.62KΩ	
3	98.2Ω	98.2Ω		10	Grounded	Grounded	
4	889Ω	889Ω	15V	11	3.19KΩ	3.19KΩ	-15V
5	Grounded	Grounded		12	8.72KΩ	8.72KΩ	
6	3.72KΩ	3.72KΩ		13	75.6KΩ	75.6KΩ	
7	7.88KΩ	7.88KΩ		14	75.6KΩ	75.6KΩ	

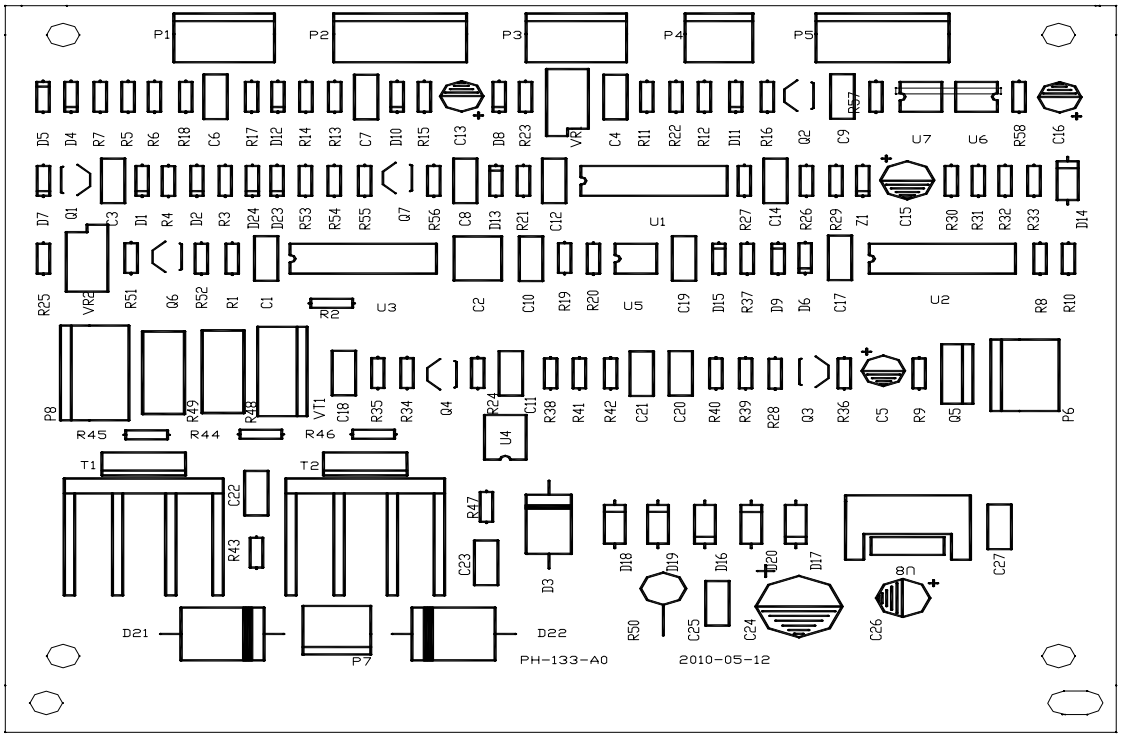
Tested machine: MIG250(N201)/MIG315(N202)							
Tested chip (U3 on control PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	17.37MΩ	17.37MΩ		8	27.4KΩ	27.4KΩ	
2	Grounded	Grounded		9	27.4KΩ	27.4KΩ	
3	328KΩ	328KΩ		10	90.3KΩ	2.75 KΩ	
4	889Ω	889Ω	15V	11	3.19KΩ	3.19KΩ	-15V
5	69.2KΩ	69.2KΩ		12	Grounded	Grounded	
6	3.72KΩ	1.97KΩ		13	9.84KΩ	9.65KΩ	
7	92.2KΩ	16.8KΩ		14	12.73KΩ	13.28KΩ	

2. Bare PCB diagrams

1) Control PCB (PK-156)



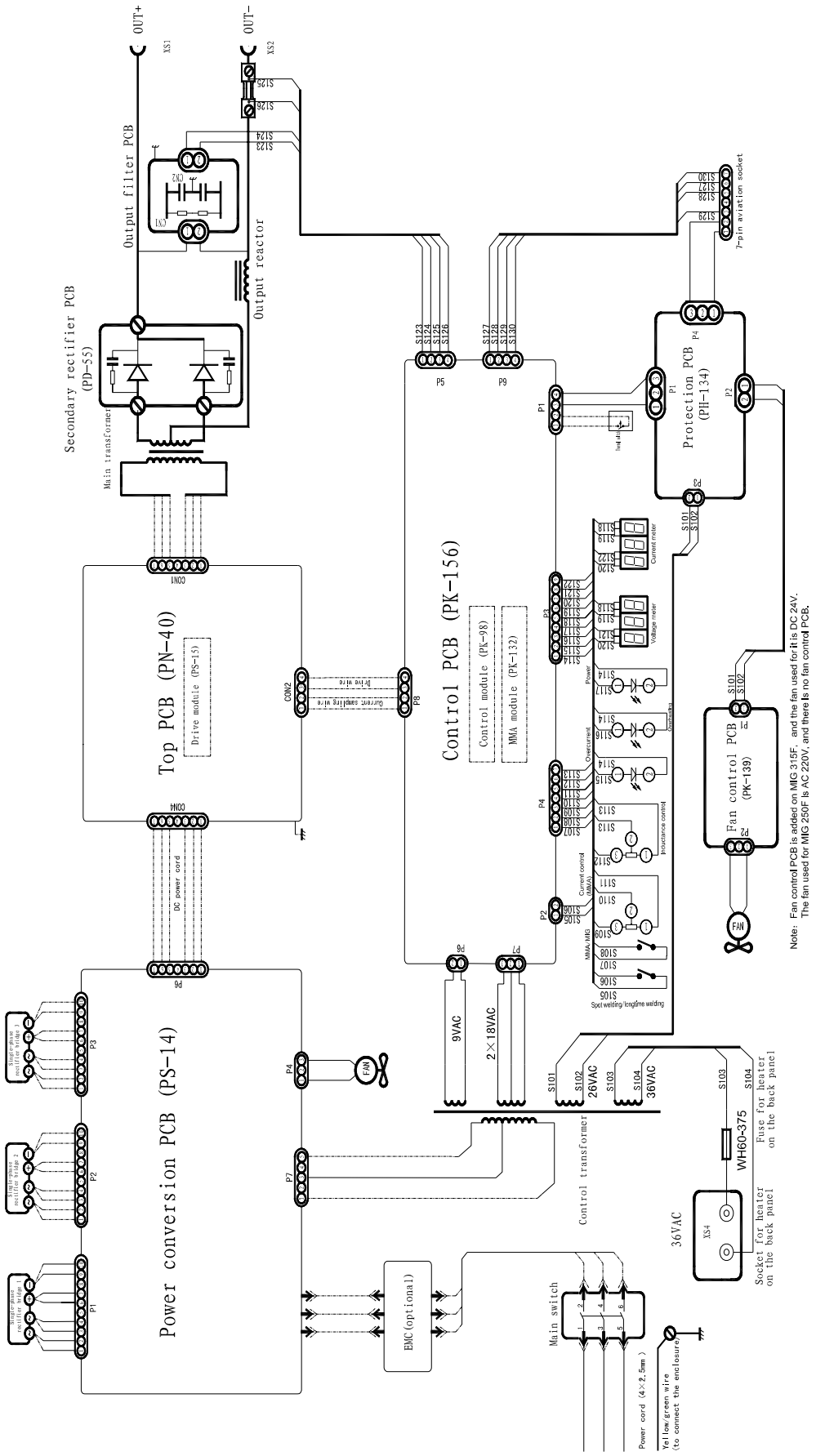
2) Wire feed PCB (PH-133)



3. Spare parts list

No.	Part name	Part number	
		MIG250F(N201)	MIG315(N202)
1	Rectifier PCB	B02150	B02150
2	Control PCB	B04271	B04271
3	Inverter PCB	B16229	B16228
4	Power conversion PCB	B06132	B06131
5	MIG250F protection PCB	B06174	B06174
6	Fan control PCB		B04149
7	Current control potentiometer	D15103	D15103
8	Inductance control potentiometer	D15112	D15112
9	Current/voltage digital meter	D20037	D20037
10	Power LED	D08003	D08003
11	Overheating/overcurrent LED	D08009	D08009
12	Industrial frequency transformer	D03700	D03700
13	Quick socket	C02015	C02012
14	Power switch	C16031	C16031
15	Fan	D28002	D28001
16	Rocker switch	C16014-1	C16014-1
17	Reactor	B18051	B18051
18	Main transformer	D03224	D03225
19	Triode (S8050/S8550)	D07001/D07002	D07001/D07002
20	Resettable fuse (WH60-500)	D09019	D09019
21	Silicon bridge (S25VB100)	D18018	D18018
22	Manostat (7805/7815/ 7915)	D19009/ D19011/ D19017	D19009/ D19011/ D19017

4. Wiring diagram



Chapter 7 MIG350 series (J1601)

Section 1 Troubleshooting

1. There is no response after the machine is started, and the power LED is off.

1.1 Cause analysis

1) The power cord is not well connected or the power switch fails.
2) The auxiliary power supply fails.
3) The 3-port manostat or some part of the control circuit fails.

1.2 Solution

1) Make sure the power cord is welll connected and there is no bad contact inside the machine, and then switch on the power. Check if there is input voltage at the input terminal of the rectifier PCB (rectifier bridge) with the “AC” mode of multimeter. If there is no input voltage, replace the power switch for it is damaged.
2) If there is nothing wrong with the power switch, check if the output of the auxiliary power transformer is normal.
3) If there is nothing wrong with the switching power supply, check the 3-port manostats on the control PCB, and replace them if necessary.

2. The power LED is on after the machine is started, welding can be carried out, but the fan does not work.

2.1 Cause analysis

1) The fan is not well connected or poor soldering exists.
2) The fan fails.

2.2 Solution

1) Check if the fan is not well connected, connecting terminal is open, or the socket connected is poorly soldered, and eliminate such problems if necessary.
2) Check if the shaft of the fan is locked by something. Otherwise, replace the fan.

3. The overheating LED is on after the machine is started, and there is no output.

3.1 Cause analysis

1) The thermal switch fails.
2) The control PCB fails.
3) The working current is overly high or the working time is overly long.

3.2 Solution

1) Pull out the thermal switch, and check if the overheating LED is off. If it is, replace the thermal switch for it is damaged.
2) Check if the two pins of P5 on the wire-feeder control PCB is shorted.
3) Check if the working current is overly high and the machine is overloaded. Do operate the machine according to the operator’s manual.

4. There is no response when pushing the torch trigger, and the protection LED is off.

4.1 Cause analysis

1) Check if the power LED and the digital meter are on. If not, check the power supply part.
2) Check if the torch trigger is in good contact and the welding torch is well connected to the machine.
3) Check the wire-feeder power PCB.

4.2 Solution

1) Check the auxiliary power supply part and the wire feed power supply part. If the power supply part fails, refer to “1”.
2) Check if the torch trigger is in good contact. Firstly, make sure that the welding torch is well connected. Secondly, check if pin-1 and pin-2 of P1 is shorted with the “DIODE” mode of multimeter when pushing the torch trigger. Otherwise, replace the torch trigger or welding torch.
3) If there is nothing wrong with the torch trigger, the wire-feeder power PCB must fail. Check if U7, U8, U2, U4 or Q1 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

5. There is gas output when pushing the torch trigger, the wire feeder works, but there is no current output and the protection LED is off.

5.1 Cause analysis

1) The earth wire is not in good contact.
2) The welding torch is damaged.
3) The wire-feeder interface is not in good contact.
4) The feedback wire is broken.
5) Some part in the maiin circuit fails or the connection is incorrect.
6) The control PCB fails.

5.2 Solution

1) Check if there is voltage at the output terminal with the “DC” mode of multimeter when pushing the torch trigger. If there is, check if the earth wire and the welding torch are correctly connected.
2) Check if the welding torch is damaged.
3) Check if the wire-feeder interface is in good contact.
4) Check if the feedback wire is broken.
5) If there is no output voltage when pushing the torch trigger, check if the DC bus is well connected to the inverter PCB and the main transformer wire is correctly connected. Then, check if there is some part in the main circuit such as IGBT and rectifier bridge damaged or wrongly connected, and reconnect them or replace them if necessary.
6) Check if the peak current feedback wire at P3 (or P10) on the control PCB is broken or not in good contact. Then, check if the IGBT drive on the control PCB works normally. Otherwise, check the drive transformer, VT1-VT4, R12-R15, Q6 and Q5 orderly according to the schematic diagram. Resolder them if they are poorly soldered, and replace them if they are damaged.

6. There is gas output when pushing the torch trigger, there is voltage output, but the wire feeder does not work.

6.1 Cause analysis

1) The wire feeder is locked or damaged.
2) The power PCB fails.

6.2 Solution

1) Check if there is voltage at both terminals of P11 on the wire feed PCB (PK-93). If there is, check if the power cord for wire feeder is well connected, and then check if the wire feeder is locked by foreign matter or it is damaged.
2) If there is no voltage at both terminals of P11 on the wire feed PCB, the wire feed PCB must fail. Check if R84, N1, N2, U14, U13, Z6, Z4, Z3, VT1, Q4, U6, U19 or U20 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

7. Welding can be carried out when pushing the torch trigger, but the current is very high, the voltage is nonadjustable, and the no-load voltage is overly high.

7.1 Cause analysis

1) The voltage feedback wire is broken.
2) The voltage feedback circuit on the control PCB is disconnected.

7.2 Solution

1) Check if the voltage feedback wire is broken, disconnected or in bad contact.
2) Check the voltage feedback circuit on the control PCB (PK-118). Check if R28, R29, U4, U19 or U20 is shorted, poorly soldered or damaged according to the schematic diagram of the control PCB. Resolder them or replace them if necessary.

8. Welding current is unstable.

8.1 Cause analysis

1) The moment of wire feeder is inappropriately adjusted.
2) The wire feed roller does not match the welding wire.
3) The contact tip of the welding troch is worn, loosely connected or not suited.
4) The welding wire is of poor quality.
5) The welding cable is overly twisted or pressed.
6) The metal joint of the output terminal is loose.
7) The feedback wire is loosely connected or not in good contact.

8.2 Solution

1) Check if the moment of wire feeder is appropriately adjusted.
2) Check if the v-groove of the wire feed roller matches the diameter of the welding wire.
3) Check if the contact tip of the welding torch is worn, loosely connected or not suited.
4) Check if the welding wire is affected with damp or it is of poor quality.
5) Check if the welding cable is overly twisted or pressed.
6) Check if the metal joint of the output terminal is loose.
7) Check if the feedback wire is loosely connected or not in good contact.

9. The gas regulator cannot be heated.

9.1 Cause analysis

1) There is no voltage at the socket for heater power supply of the gas regulator.
2) The heater inside the gas regulator is damaged.

9.2 Solution

1) Firstly, check if the socket id not well connected. Secondly, check the resettable fuse. Thirdly, check if the industrial frequency transformer is burned.
2) Replace the gas regulator.

10. The weld bead is not well protected in the end of welding.

10.1 Cause analysis

1) The welding torch is moved away as soon as welding stops.
2) The postflow time is overly short.

10.2 Solution

1) Do not move the welding torch away so quickly when welding stops.
2) Prolong the postflow time.

11. Welding can be carried out normally, but electrode sticking occurs.

11.1 Cause analysis

1) The crater time is overly short or the crater voltage is overly low.

11.2 Solution

1) Replace the control PCB or adjust the crater time and crater voltage properly. (For details of the latter, please contact your supplier.)

12. The power switch trips after the machine is started.

12.1 Cause analysis

1) The main circuit is shorted for there is foreign material inside the machine.
2) The capacitor does not work.
3) The silicon brodge does not work.

12.2 Solution

1) Check if there is any foreign material inside the machine.
2) Check if there is any capacitors damaged.
3) Check if the silicon bridge fails.

13. Welding voltage is nonadjustable.

13.1 Cause analysis

1) The voltage potentiometer fails.
2) The control PCB fails.
3) The voltage feedback wire is broken.

13.2 Solution

1) Check if there are any wires for the voltage potentiometer disconnected or breaking off. Then, check if the adjustable resistance is normal.
2) Check the voltage giving circuit on the control PCB. Check if U18, D2, D3, U1, U17, U19 or U20 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.
3) Check if the voltage feedback wire is broken.

14. Wire feed speed is nonadjustable. (Current is nonadjustable.)

14.1 Cause analysis

1) The current potentiometer fails.
2) The wire feed PCB fails.
3) The current feedback wire is broken.

14.2 Solution

1) Check if the current potentiometer breaks off or is disconnected. Then, check if the adjustable resistance is normal.
2) Check the current giving circuit on the wire feed PCB. Check if U9 on the control PCB, R84, N1, N2, U14, U13, Z6, Z4, Z3, VT1, Q4, U6, U19 or U20 on the wire feed PCB is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.
3) Check if the current feedback wire is broken or loosely connected.

15. The wire feeder works and there is gas output and no-load voltage after the machine is started, even though the torch trigger is not pushed.

15.1 Cause analysis

1) The torch trigger fails.
2) The wire feed PCB fails.

15.2 Solution

1) Check if the torch trigger is shorted or normally closed.
2) Check if P1 on the wire feed PCB (PK-93) is shorted. If not, the wire feed PCB must fail. Check if U7, U8, U2, U4 or Q1 is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

16. There is gas output after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and the wire feeder does not work.

16.1 Cause analysis

1) The wire feed PCB fails.

16.2 Solution

1) Check if U11, N3, Q1 or U5 on the wire feed PCB is shorted, poorly soldered or damaged according to the schematic diagram. Resolder them or replace them if necessary.

17. The wire feeder works after the machine is started, even though the torch trigger is not pushed. However, there is no no-load voltage and gas output.

17.1 Cause analysis

1) The wire feed PCB fails.

17.2 Solution

1) Check if R84, N1, N2, U14, U13, Z6, Z4, Z3, VT1, Q4, U6, U19 or U20 on the wire feed PCB is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

18. 2T/4T function is unavailable.

18.1 Cause analysis

1) The 2T/4T switch is damaged.
2) The wire feed PCB fails.

18.2 Solution

1) Check if the wire connecting to the 2T/4T switch breaks off or is loosely connected, or the 2T/4T switch is damaged.
2) Check if U2, U3 or U4 is shorted, poorly soldered or damaged. Resolder them or replace them if necessary.

Section 2 Appendix

1. Test data for chip pins

Tested machine: NBC350(J1601)							
Tested chip (U1 on PWM control module): KA3846							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	6.0K	6.0K	2.5V	9	3.91K	3.91K	
2	4.2K	4.2K	5V	10	12.56K	12.56K	
3	Grounded	Grounded	0V	11	1.99M	18.54M	
4	116.5Ω	116.5Ω		12	0.0Ω	0.0Ω	
5	15.16M	∞		13	900Ω	900Ω	
6	12.85M	∞		14	13.13M	18.58M	
7	12.85M	∞		15	900Ω	900Ω	15V
8	13.20M	∞		16	75Ω	75Ω	

Note: Do not test pin-4 and pin-5 of KA3846 with the multimeter when it is electrified.

Tested machine: NBC350(J1601)							
Tested chip (U2 on PWM control module): TL084							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	22.9K	22.9K	12.31V	8	1.11K	1.11K	
2	59.2K	59.2K		9	1.11K	1.11K	
3	0.0Ω	0.0Ω		10	13.15M	∞	
4	900Ω	900Ω	15V	11	6.51K	6.51K	-15V
5	4.1K	4.1K		12	9.85K	10K	
6	2.6K	2.6K	5.4V	13	15.13M	∞	
7	∞	3.04M		14	15M	∞	

Tested machine: NBC350(J1601)							
Tested chip (U3 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	12.65KΩ	13.19KΩ		8	7.98KΩ	7.98KΩ	
2	9.47KΩ	9.31KΩ		9	3.7KΩ	3.7KΩ	
3	Grounded	Grounded		10	Grounded	Grounded	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	504KΩ	493KΩ		12	Grounded	Grounded	
6	Grounded	Grounded		13	8.72KΩ	8.72KΩ	
7	468KΩ	13.64MΩ		14	15.62MΩ	3.21MΩ	

Tested machine: NBC350(J1601)							
Tested chip (U4 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	146KΩ	142KΩ		8	87.8KΩ	492KΩ	
2	146.8KΩ	574KΩ		9	1.93KΩ	1.93KΩ	
3	8.97KΩ	8.74Ω		10	122.5 KΩ	125.3 KΩ	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	98Ω	98Ω		12	86.7KΩ	2.56KΩ	
6	98Ω	98Ω		13	27KΩ	27KΩ	
7	2.82KΩ	2.82KΩ		14	27KΩ	27KΩ	

Tested machine: NBC350(J1601)							
Tested chip (U1 on control PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	17.56MΩ	16.25MΩ		5	Grounded	Grounded	
2	5.1KΩ	5.1KΩ		6	Grounded	Grounded	
3	9.54KΩ	9.7KΩ		7	18.4MΩ	19.88MΩ	
4	Grounded	Grounded		8	693Ω	693Ω	+15V

Tested machine: NBC350(J1601)							
Tested chip (U5 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	2.81KΩ	2.81KΩ		8	14.33MΩ	133KΩ	
2	98.8Ω	98.8Ω		9	8.62KΩ	8.62KΩ	
3	98.2Ω	98.2Ω		10	Grounded	Grounded	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	Grounded	Grounded		12	8.72KΩ	8.72KΩ	
6	3.72KΩ	3.72KΩ		13	75.6KΩ	75.6KΩ	
7	7.88KΩ	7.88KΩ		14	75.6KΩ	75.6KΩ	

Tested machine: NBC350(J1601)							
Tested chip (U6 on control PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	197.4KΩ	197.4KΩ		8	14.33MΩ	14.33MΩ	
2	197.4KΩ	197.4KΩ		9	3.79KΩ	3.79KΩ	
3	Grounded	Grounded		10	2.13KΩ	2.13KΩ	
4	693Ω	693Ω	15V	11	5.83KΩ	5.83KΩ	-15V
5	102.9KΩ	102.9KΩ		12	5.07KΩ	5.07KΩ	
6	17.18MΩ	17.18MΩ		13	12MΩ	12MΩ	
7	17.18MΩ	17.18MΩ		14	14.84KΩ	14.84KΩ	

Tested machine: NBC350(J1601)							
Tested chip (U13 on control PCB): CD4053							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	160.4KΩ	160.4KΩ		9	99.5 KΩ	50.2KΩ	
2	16.95MΩ	16.44 MΩ		10	99.7KΩ	99.7KΩ	
3	67.6KΩ	67.6KΩ		11	Grounded	Grounded	
4	9.89KΩ	9.89KΩ		12	Grounded	Grounded	
5	320KΩ	320KΩ		13	Grounded	Grounded	
6	Grounded	Grounded		14	Grounded	Grounded	
7	Grounded	Grounded		15	9.84KΩ	9.84KΩ	
8	Grounded	Grounded		16	693Ω	693Ω	15V

Tested machine: NBC350(J1601)							
Tested chip (U13 on wire feed PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	3.9MΩ	11MΩ		8	86.3KΩ	85.3KΩ	
2	9.78KΩ	9.87KΩ		9	4.94KΩ	4.96KΩ	
3	17.2MΩ	10.38MΩ		10	2.57KΩ	2.57KΩ	
4	929Ω	929Ω	15V	11	17.5KΩ	14.79KΩ	-15V
5	Grounded	Grounded		12	10.83KΩ	10.67KΩ	
6	110KΩ	110kΩ		13	982Ω	982Ω	
7	10.75KΩ	10.75KΩ		14	51KΩ	50.9KΩ	

Tested machine: NBC350(J1601)							
Tested chip (U12 on wire feed PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	118.3KΩ	119.9KΩ		8	17.2MΩ	10.48MΩ	
2	118.5KΩ	119.2KΩ		9	98.4KΩ	95.8KΩ	
3	13.5MΩ	13MΩ		10	Grounded	Grounded	
4	929Ω	929Ω	15V	11	17.5KΩ	17.5KΩ	-15V
5	962Ω	2.5MΩ		12	Grounded	Grounded	
6	125.9KΩ	128.7KΩ		13	1.13MΩ	17.35MΩ	
7	125.9KΩ	127.4KΩ		14	1.13MΩ	17.35MΩ	

Tested machine: NBC350(J1601)							
Tested chip (U6 on wire feed PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	16.99MΩ	11MΩ		5	19.39MΩ	16.07MΩ	
2	7.62KΩ	7.72KΩ		6	185.9KΩ	165.1KΩ	
3	6.68KΩ	6.68KΩ		7	185.9KΩ	165.1KΩ	
4	17.5KΩ	14.82KΩ	-15V	8	929Ω	929Ω	+15V

Tested machine: NBC350(J1601)							
Tested chip (U5 on wire feed PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	135.6KΩ	18.9MΩ		5	164.4KΩ	16.07MΩ	
2	47.3KΩ	49KΩ		6	3.54KΩ	165.1KΩ	
3	10.1KΩ	101KΩ		7	16.9MΩ	165.1KΩ	
4	Grounded	Grounded		8	929Ω	929Ω	+15V

Tested machine: NBC350(J1601)							
Tested chip (U4 on wire feed PCB): CD4514							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	929Ω	929Ω		13	1.88MΩ	17.1MΩ	
2	14.9MΩ	147.7KΩ		14	1.8MΩ	17.1MΩ	
3	17.4Ω	18.85MΩ		15	1.92MΩ	17.1MΩ	
4	1.87MΩ	17.2MΩ		16	1.77MΩ	16.9MΩ	
5	1.87MΩ	17.1MΩ		17	1.87MΩ	17.0M	
6	1.9MΩ	16.3MΩ		18	11.74MΩ	16.9M	
7	1.71MΩ	146.6KΩ		19	1.87MΩ	17.1MΩ	
8	1.9MΩ	17.1MΩ		20	1.89MΩ	17.1MΩ	
9	1.62MΩ	147.3KΩ		21	10.8KΩ	10.8KΩ	
10	140.5KΩ	16.1MΩ		22	Grounded	Grounded	
11	1.77MΩ	145.5KΩ		23	14.7MΩ	130.2KΩ	
12	Grounded	Grounded		24	929Ω	929Ω	15V

Tested machine: NBC350(J1601)							
Tested chip (U2 on wire feed PCB): NE555							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	Grounded	Grounded		5	3.68KΩ	3.68KΩ	
2	22.6KΩ	22.6KΩ		6	22.6KΩ	22.6KΩ	
3	148.2KΩ	15.1MΩ		7	∞	16MΩ	
4	929Ω	929Ω	+15V	8	929Ω	929Ω	+15V

Tested machine: NBC350(J1601)							
Tested chip (U10 on wire feed PCB): NE555							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	Grounded	Grounded		5	3.56KΩ	3.56KΩ	
2	5.96KΩ	5.96KΩ		6	800KΩ	800KΩ	
3	19MΩ	19MΩ		7	800KΩ	800KΩ	
4	10.7KΩ	10.7KΩ	-15V	8	929Ω	929Ω	+15V

Tested machine: NBC350(J1601)							
Tested chip (U3 on wire feed PCB): TC4013							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	17.6MΩ	∞		8	Grounded	Grounded	
2	17.6MΩ	∞		9	17.6MΩ	∞	
3	Grounded	Grounded		10	124.4KΩ	16.1MΩ	
4	Grounded	Grounded		11	14.8MΩ	147.6KΩ	
5	Grounded	Grounded		12	17.6MΩ	∞	
6	Grounded	Grounded		13	17.3MΩ	18.8MΩ	
7	Grounded	Grounded		14	929Ω	929Ω	15V

Tested machine: NBC350(J1601)							
Tested chip (U17 on wire feed PCB): CD4053							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	2.78K	2.78K		9	1.93M	16.4M	
2	19.56K	19.56K		10	1.93M	16.4M	
3	2.34K	2.34K		11	Grounded	Grounded	
4	∞	16M		12	Grounded	Grounded	
5	19.6K	19.6K		13	Grounded	Grounded	
6	Grounded	Grounded		14	Grounded	Grounded	
7	Grounded	Grounded		15	19.5M	16M	
8	Grounded	Grounded		16	929	929	15V

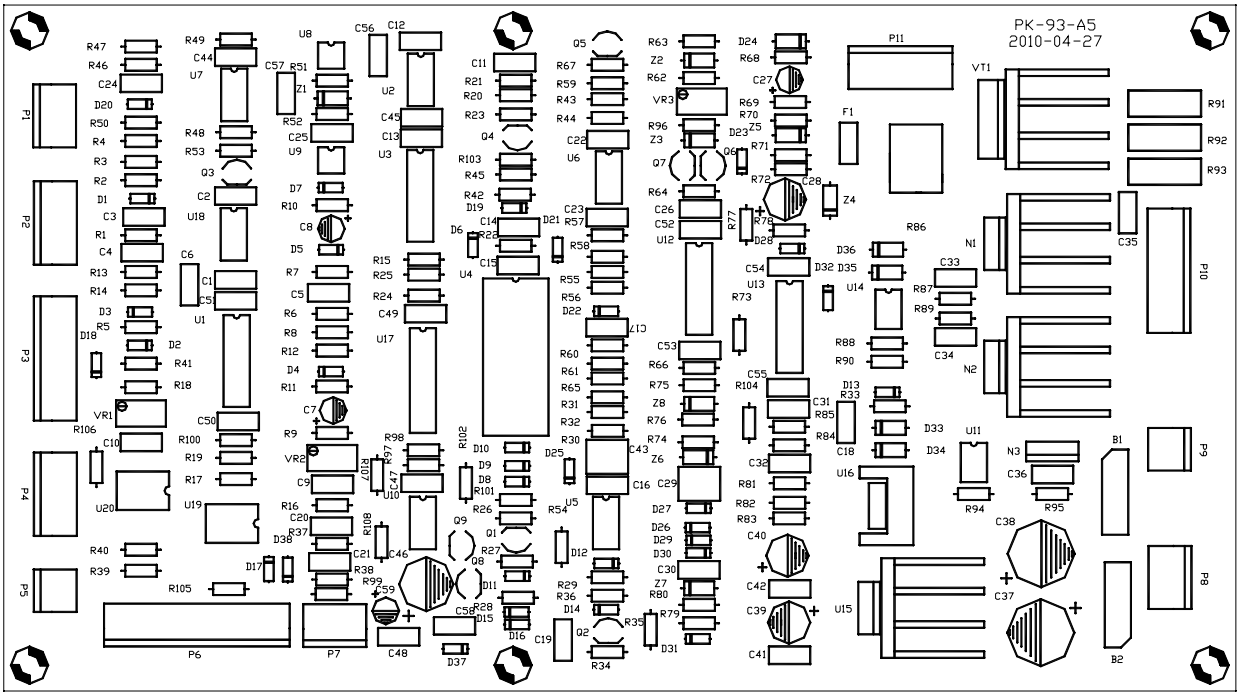
Tested machine: NBC350(J1601)							
Tested chip (U18 on wire feed PCB): LM358							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	24.2KΩ	24.2KΩ		5	∞	∞	
2	74.1KΩ	74.1KΩ		6	∞	∞	
3	5.0KΩ	5.0KΩ		7	∞	∞	
4	17.3KΩ	14.82KΩ	-15V	8	929Ω	929Ω	+15V

Tested machine: NBC350(J1601)							
Tested chip (U7 on wire feed PCB): LM393							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	16.5MΩ	∞		5	4.85KΩ	4.85KΩ	
2	6KΩ	74.1KΩ		6	976KΩ	126.7KΩ	
3	976KΩ	5.0KΩ		7	3.89KΩ	3.9KΩ	
4	Grounded	Grounded	-15V	8	929Ω	929Ω	+15V

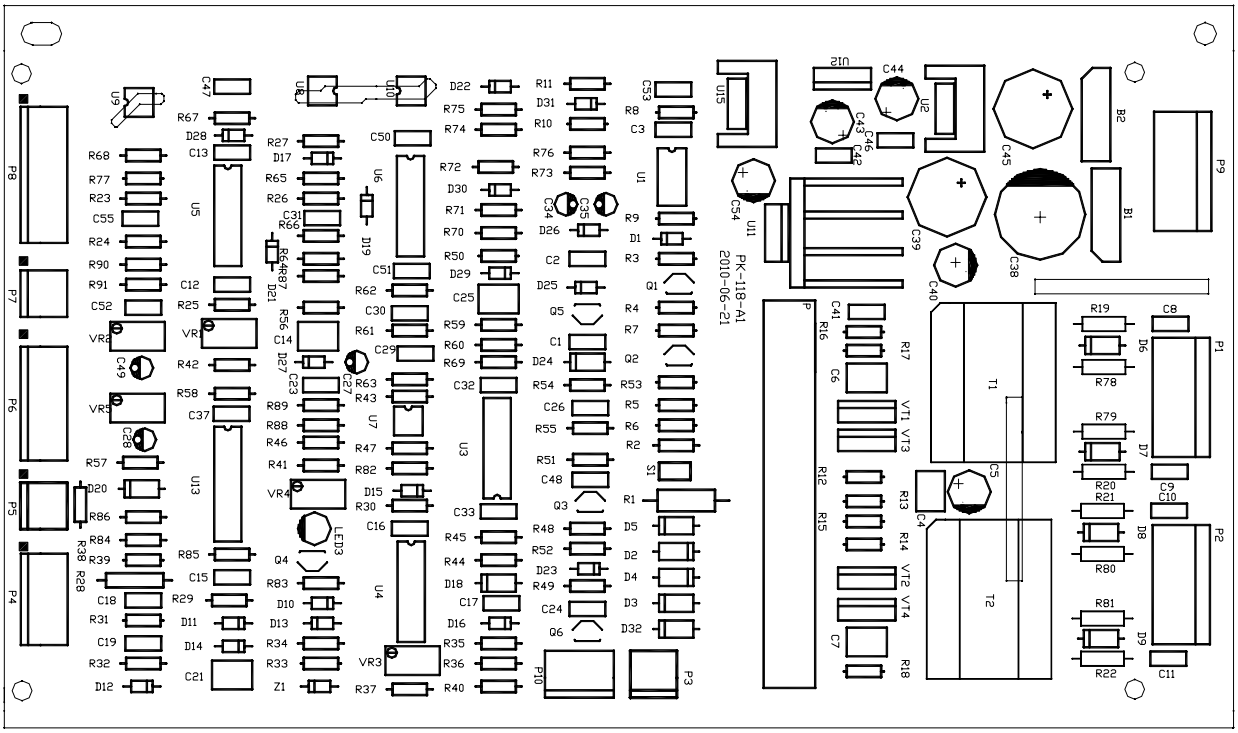
Tested machine: NBC350(J1601)							
Tested chip (U1 on wire feed PCB): LM324							
Test data: Working voltage, working resistance							
Pin	Working resistance		Working voltage	Pin	Working resistance		Working voltage
	Red probe grounded	Black probe grounded	Working state		Red probe grounded	Black probe grounded	Working state
1	45.7KΩ	42.8KΩ		8	1.78MΩ	∞	
2	45.7KΩ	42.8KΩ		9	207KΩ	207KΩ	
3	33.6KΩ	33.6KΩ		10	∞	16M	
4	929Ω	929Ω	15V	11	17.5KΩ	17.5KΩ	-15V
5	19.6MΩ	16MΩ		12	Grounded	Grounded	
6	882KΩ	882KΩ		13	40.8KΩ	38.4KΩ	
7	1.78MΩ	∞		14	43.6KΩ	41KΩ	

2. Bare PCB diagrams

1) Wire feed PCB (PK-93)



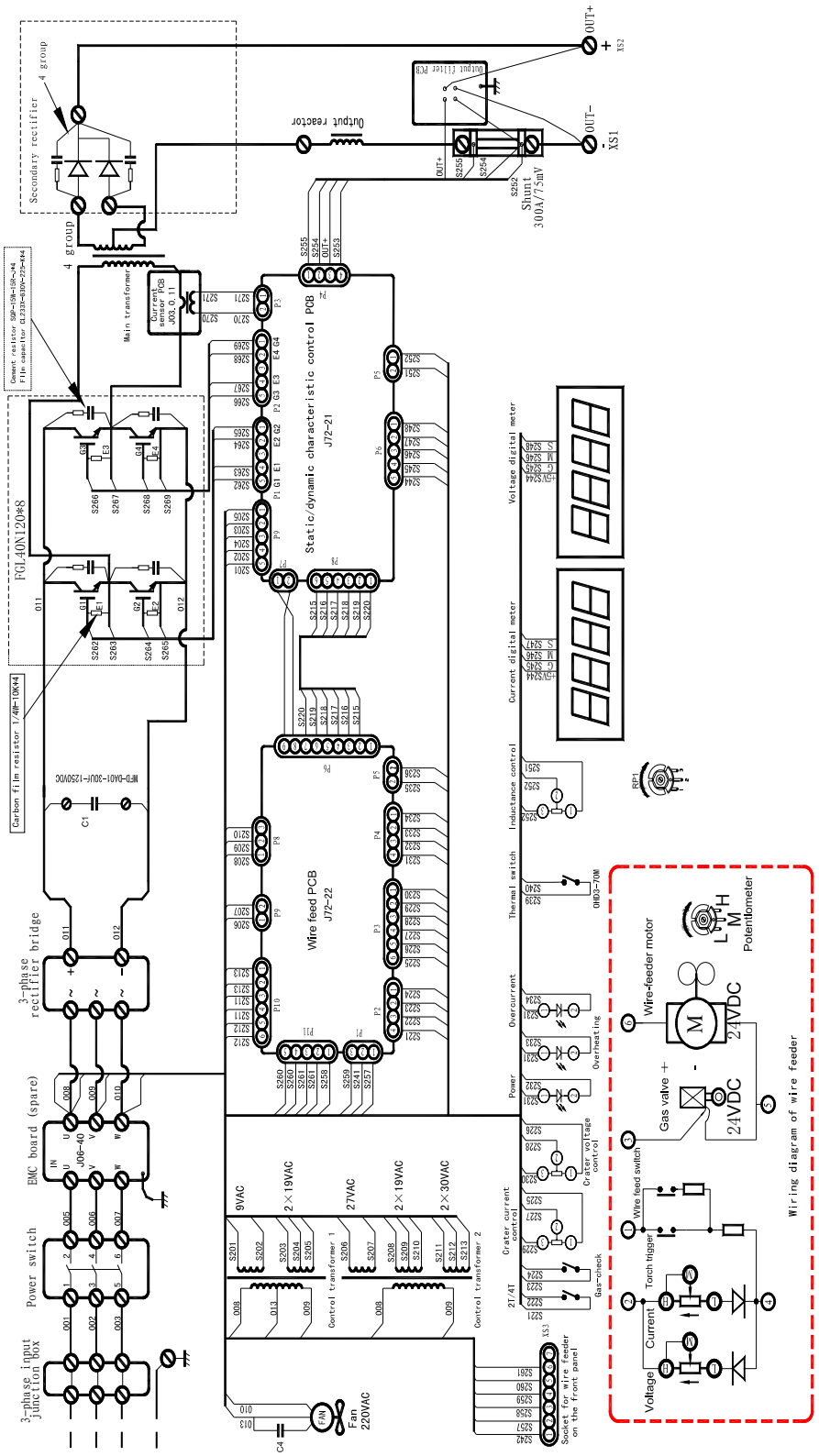
2) Control PCB (PK-118)



3. Spare parts list

No.	Part name	Part number	
		MIG350(1601)	--
1	Wire feed PCB	B06105	--
2	Program control PCB	B04135	--
3	Inverter PCB	B16026	--
4	Power conversion PCB	B06085	--
5	Crater current/voltage potentiometer	D15102	--
6	Inductance control potentiometer	D15104	--
7	Current/voltage digital meter	D20025	--
8	Power LED	D08003	--
9	Overheating/overcurrent LED	D08009	--
10	Auxiliary power transformer	D03545	--
11	Noninductive capacitor (1250V/30UF)	D02547	--
12	Quick socket	C02012	--
13	Power switch	C15004	--
14	Fan	D28021	--
15	Reactor	B18033	--
16	Main transformer	D03448	--
17	Rocker switch	C16012-1/ C16014-1	--
18	Triode (S8050/S8550)	D07001/D07002	--
19	SCR (BT137/BT151)	D10003/D10002	--
20	MOSFET (IRFP260N)	D05119	--
21	Manostat (7805/7815/ 7915)	D19009/ D19011/ D19017	--

4. Wiring diagram



This manual is susceptible to mistakes or omissions, and your suggestions and criticisms are greatly appreciated. We are still constantly improving this series machines, so some parts of the machine may be changed in order to achieve better quality, but the main functions and operations will not be alternated. Your understanding would be greatly appreciated.