

I. Use and Characteristics

The manufacturing of the inverter-type DC submerged arc welding machine of MZ series conforms to the standard GB15579.1-2004 *Part I for arc welding equipment: welding power source*.

The inverter-type DC submerged arc welding machine of MZ series is a novel highly efficient energy-saving equipment, which includes multiple specifications such as MZ-630, MZ-800, MZ-1000, MZ-1250, etc., can be used for welding the materials such as the carbon structure steel, the stainless steel, the heat resistant steel and the compound steel and is widely applied in various industries such as the shipbuilding, the boilers, the chemical vessels, the bridges, the hoisting machinery, the metallurgical and mechanical manufacturing, etc.

The inverter-type DC submerged arc welding machine of the series has the ideal static characteristics and good dynamic characteristics, and has complete control function. It is mainly characterized in that:

- ✦ The IGBT inverter technology is adopted, thus assuring that the welding current is highly stable and smooth under the circumstances that the network voltage fluctuates and the arc length varies. The arc has strong self-adjusting ability;
- ✦ The function of adjusting the current of arc is provided. It can regulate the current of arc according to the requirement of the welding process, thus greatly enhancing the successful rate of striking arc;
- ✦ The function of adjusting the push current, thus assuring the weld shaping, being convenient for the penetration adjustment and resulting in that the submerged arc welding machine adapts more strongly to the welding process;
- ✦ It is compatible with the function of manual arc welding and can be used for the carbon arc air gouging, the manual arc welding, etc.;
- ✦ The range of current regulation is wide and the minimum current is 60A;
- ✦ It has a small weight, a small size and is convenient for being moved;
- ✦ With high efficiency and high power factor delivered, it is a highly efficient and energy-saving equipment.

II. Safety Precautions

✦ General safety precautions

- Observe the precautions stipulated in this instruction manual, or accident may occur.
- Observe the related standard and regulations in design and construction of the input power supply, the selection of the installation site, and the use of the high pressure gas.
- Irrelative persons are not allowed to enter the welding operation site.
- The installation, maintenance, and operation of the welder should be done by the professional and qualified personnel.
- Never use this welder for purpose other than welding, such as charging, heating, and pipe unfreezing, etc.
- Avoid the welder from being toppled over when the ground is not flat.

※Avoid the welding arc, splashing and welding dregs from harming person.

- Wear glasses of sufficient light shielding degree. Arc can produce eye inflammation, whereas the splashing and welding dregs can burn eyes.
- Use the protection appliance such as the welding leather gloves, long sleeve clothes, caps, hose, and apron, etc. to avoid the arc, splashing and welding dregs from hurting your skin.

※Avoid the welding fume, dust, and gas from hurting person.

- Use the stipulated ventilation equipment to avoid accident such as gas poisoning and suffocation, etc.
- When work at the bottom of a container, the protection gas can be aggraded around to cause suffocation. Pay particular attention to ventilation.

※Avoid electrical sock or burnt.

- Never contact the part with electricity.
- The welder should be grounded with copper wire of stipulated section area by the professional personnel.
- The welder should be connected to the power supply with copper wire of stipulated section area by the professional personnel. The insulation protection sleeve of the wire should not be damaged.
- When work in a wet place limiting action, ensure there is insulation between your body and the material.
- When work overhead, use the safety protection net.
- Turn off the power supply when it is not used.

※Avoid accident such as fire, explosion, or cracking.

- Flammable matters are avoided from the welding site as the splashing and the hot welding seam can cause fire.
- The connection between the cable and the material should be tight, or its heat can cause fire.
- Never weld in flammable gas or on a container containing flammable material, or fire can be caused.
- Never weld a sealed container, or cracking can be caused.
- Work with a fire extinguisher at hand, just in case.

※Prevent the rotating part from hurting person.

- Never put your finger, hair, or clothes near the rotating part of cooling fan, etc.

※Avoid the welder from hurting person when it is moving.

- When move the welder with a forklift or a crane, never stand under the welder or in the front of its way to avoid the welder from squashing person if it is falling down.
- During lifting, the lift rope should have sufficient pull without breaking. The inclination at the lifting hook of the rope should not exceed 30°.

III. Welder Installation

1. Installation surroundings

- (1) It should be installed in a room not under direct sunshine and with rainwater proofing, low temperature, and less dust. The surrounding air temperature should be -10° to $+40^{\circ}$.
- (2) The floor slope should not exceed 15° .
- (3) The welding position should not be ventilated. If yes, shield it.
- (4) The welder should leave wall at least by 20cm, and the distance between welders should be above 10cm.

2. Voltage quality of the power supply

- (1) Its waveform should be a standard sine wave with an effective value $380V \pm 10\%$ and frequency 50Hz/60Hz.
- (2) Unbalance of the three phases of the voltage should be $\leq 5\%$.

3. Input of the power supply.

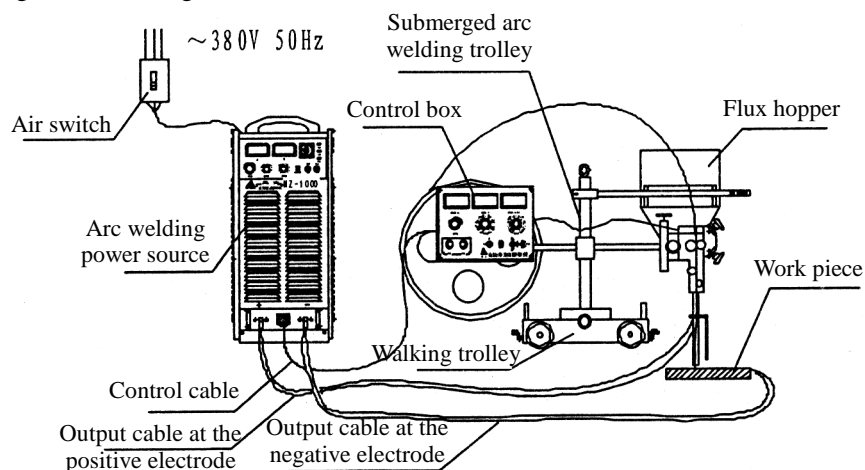
Welder type		MZ-630	MZ-800	MZ-1000	MZ-1250
Input power supply		Three phase 380V~50Hz			
Min. capacity of the transmission-line system of electric power		53KVA	66KVA	83KVA	120KVA
Input protection	Fuse	60A	70A	90A	130A
	Circuit breaker	100A	100A	120A	160A
Min. cable sectional area	Input side	10mm ²	16mm ²	25mm ²	35mm ²
	Output side	95mm ² × 1	50mm ² × 2	70mm ² × 2	95mm ² × 2
	Grounding wire	10mm ²	16mm ²	16mm ²	16mm ²

Note: The capacities of the fuses and circuit breakers in the table above are for reference only.

4. Equipment installation

4.1 The external wire splice when the equipment is mounted is shown as Figure 1.

4.2 The user shall be delivered with the corresponding distribution panel or electric power distribution cabinet, connects the three-phase 380V/50Hz alternating current to the terminal box for input cable of the submerged arc welding machine and reliably connects it with the grounded bolt grounding wire of the submerged arc welding machine.

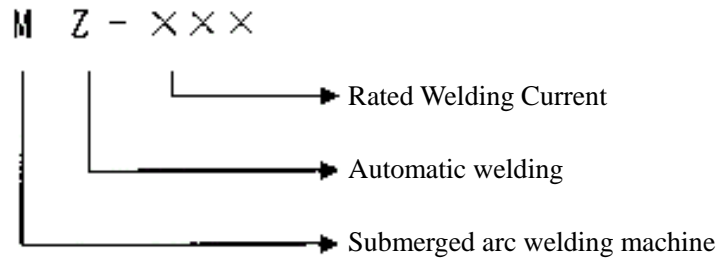


(Figure 1) external wire splice

- 4.3 The submerged arc welding machine is connected with the submerged arc welding trolley using the output cable at the positive electrode.
- 4.4 The submerged arc welding machine is connected with the welded workpiece
- 4.5 The submerged arc welding machine is connected with the control box for the submerged arc welding trolley using the control cable.

IV. Model compilation and Direction

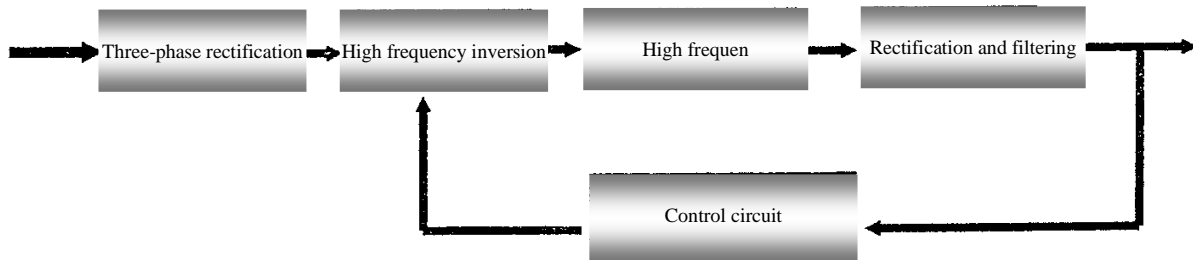
The model compilation and direction for the inverter-type DC submerged arc welding machine of MZ series are shown as Figure 2:



(Figure 2) model compilation and direction for the inverter-type DC submerged arc welding machine of MZ series

V. Brief description for Principles

The principles for the inverter-type DC submerged arc welding machine of MZ series are shown as Figure 3:

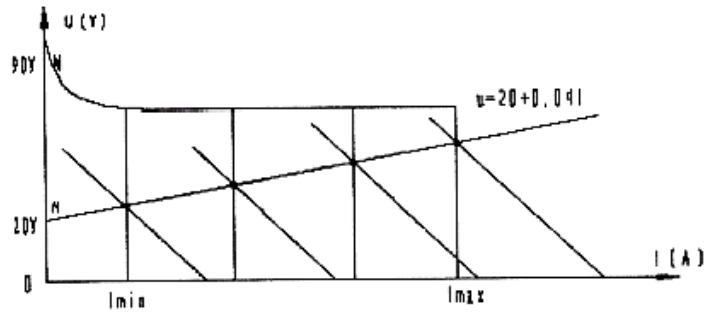


(Figure 3) Principle block diagram for inverter-type DC submerged arc welding machine of MZ series

The IGBT high-frequency inverter technology is adopted for this equipment. The power frequency three-phase 380V power source is input, and is delivered to the inverter composed of devices such as IGBT, etc after being rectified with being changed into the high-frequency current, which is output as the direct currents suitable for welding after being processed by the high-frequency transformer with lowered voltage and rectified and filtered by the high-frequency rectifier. Through this process, the dynamic response ability of the DC submerged arc welding machine is enhanced and the volume and weight of the transformer and the reactor.

The closed loop control of the overall machine is realized for the design of the control circuit, thus enabling the submerged arc welding machine to assure that the welding specification is stable, the arc ignition is easy to be conducted, the electric arc is stable and the weld is shaped well when the external conditions vary (for example, the network voltage fluctuates, the lengths of the output cables differs, etc.) and simultaneously realizing that the welding current, the push current and the current of arc are continuously adjustable.

The output characteristics of the inverter-type DC submerged arc welding machine of MZ series are shown as Figure 4:



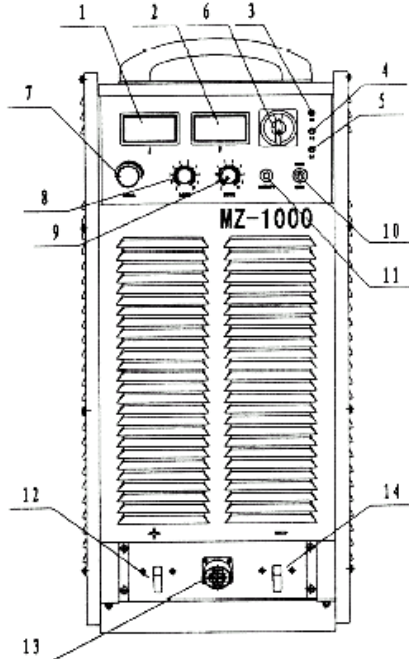
(Figure 4) Output characteristics of inverter-type DC submerged arc welding machine of MZ series

VI.Directions for use and operation

1.Function introduction

1.1 Front panel

The front panel of the inverter-type DC submerged arc welding machine of MZ series (take example for MZ-1000) is shown as Figure 5:



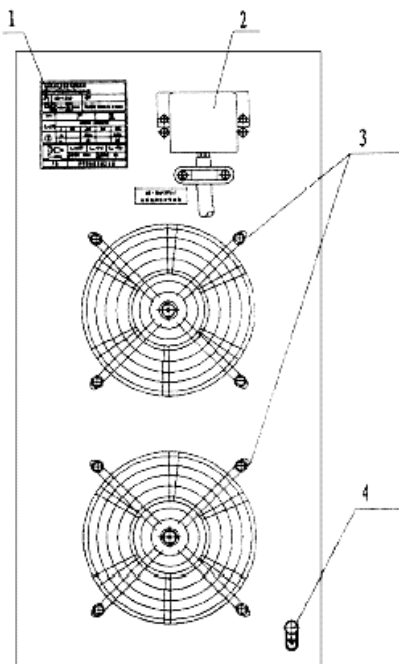
(Figure 5) Front panel of inverter-type DC submerged arc welding machine of MZ series

- (1) Ammeter (A) indicates the preset value of the current of the submerged arc welding machine and the actual value of the welding current;
- (2) Voltmeter (V) indicates the value of the welding voltage of the submerged arc welding machine;
- (3) Power indicator lamp it indicates that the three-phase 380V power supply has already been connected in when the power indicator lamp illuminates;
- (4) Busy indicator it indicates that the submerged arc welding machine has already been started when the busy indicator illuminates;
- (5) Protection indicator lamp it indicates that the submerged arc welding machine stops working due to that the interior temperature is too high when the protection indicator lamp illuminates;

- (6) When the operating switch switches on “1”, the submerged arc welding machine starts to work;When it switches on “0”, the submerged arc welding machine stops working;
- (7) Adjusting knob for welding current used to adjust the welding current;
- (8) Adjusting knob for push current used to adjust the push current, control the weld penetration and improve the weld shaping;
- (9) Adjusting knob for current of arc used to adjust the current of arc, change the arcing performance of the power supply and enable the welding machine to be suitable for the requirements of various welding specifications;
- (10) Selection switch for control mode when this switch is switched on “close control”, the welding current is adjusted on the control panel; when this switch is switched on “remote control”, the submerged arc welding control box can be used to adjust the welding current;
- (11) Operational mode selector switch when this switch is switched on “manual arc welding”, the manual arc welding can be carried out; when this switch is switched on “submerged arc welding”, the submerged arc welding can be carried out;
- (12) Protector for control box (5A) has an effect of safety on the 120V power supply of the control box;
- (13) Output positive electrode of submerged arc welding machine;
- (14) Socket for control cable used to connect the submerged arc welding machine with the control box, provide the working power of the control box and transmit the control signal between the submerged arc welding machine and the control box;
- (15) Output negative electrode of submerged arc welding machine.

1.2 Rear panel

The rear panel of the inverter-type DC submerged arc welding machine of MZ series (take example for MZ-1000) is shown as Figure 6:



(Figure 6) rear panel of inverter-type DC submerged arc welding machine of MZ series

- (1) Terminal box for input cable used for connecting the three-phase 380V alternating current;
- (2) Nameplatemarks the parameters of the submerged arc welding machine;
- (3) Fanused for cooling the heat emitting devices in the submerged arc welding machine;
- (4) Grounded bolt In order to assure the personal safety and the normal use of the equipments, please be sure to ground this bolt using wires.

2. Check before use

2.1 Check the submerged arc welding machine with the power supply disconnected. The main check items are as follows:

- (1) Whether input cables of the submerged arc welding machine are correctly and reliably connected;
- (2) Whether the operational mode selector switch and the selection switch for control mode on the front panel are correctly switched;
- (3) Whether the output cables are correctly and reliably connected;
- (4) Whether the control cables are correctly and reliably connected;
- (5) Whether grounded bolt grounding wire is correctly and reliably connected.

2.2 Noload check with the power supply connected

The noload check with the power supply connected can be put into practice only after the “check with the power supply disconnected” mentioned above ends. The check steps and methods are as follows:

- (1) Switch the power switch on the distribution panel or electric power distribution cabinet ON and connect the 380V power supply, then the power indicator lamp on the control panel of the submerged arc welding machine illuminates;
- (2) Switch the operating switch on “1”, then the busy indicator illuminates and the cooling fan runs. When the operational mode selector switch is switched on “manual arc welding”, the voltmeter indicates a no-load voltage; the operational mode selector switch is switched on “submerged arc welding”, a no-load voltage indication of zero is delivered by the voltmeter;
- (3) Adjust the knob for welding current, then the preset current displays the due corresponding variations;
- (4) Toggle the operating switch to be set on “0”, then the busy indicator is turned off and the fan stops running.

The normal welding can be implemented only after the above steps all go into practice.

3. Normal use

3.1 Used as the manual arc welding

- (1) Well connect the input cables of the submerged arc welding machine;
- (2) Well connect the grounding wire;

- (3) Switch the operational mode selector switch on “manual arc welding”;
- (4) The welding rod holder is connected with the positive electrode of the submerged arc welding machine;
- (5) The negative electrode of the submerged arc welding machine is connected with the welded workpieces using the output cable at the negative electrode;
- (6) The control cables between the submerged arc welding machine and the control box are well connected according to the requirements;
- (7) Select the control mode according to the requirement and determine “remote control” or “close control”;
- (8) Switch the knob for current of arc and the knob for push current on the appropriate position;
- (9) Connect the input three-phase cable on the air switch of the distributor or electric power distribution cabinet and then switch ON;
- (10) Adjust the knob for welding current, preset the welding current and then conduct the welding.

Annotation: When the manual arc welding is carried out, you can refer to the welding specification in Table 1 if the operational mode selector switch is switched on “submerged arc welding”, the user can refer to the welding specifications in Table 1 when no current is output from the welding machine and the user implements the manual arc welding.

Table 1 Welding process specification for manual arc welding (reference)

Weldment thickness (mm)	<1	2	3	4~5	6~12	≥13
Diameter of welding wire (mm)	1.5	2	3.2	3.2~4	4~5	5~6
Welding current (A)	40	40~50	90~120	90~120	160~250	250~400

3.2 Used as the submerged arc welding

- (1) Well connect the input cables;
- (2) Well connect the grounding wire;
- (3) Switch the operational mode selector switch on “submerged arc welding”;
- (4) Connect the positive electrode of the submerged arc welding machine with the trolley using the output cable at the positive electrode;
- (5) Connect the negative electrode of the submerged arc welding machine with the welded workpieces using the output cable at the negative electrode;
- (6) Well connect the control cables between the submerged arc welding machine and the control box;
- (7) Select the control mode according to the requirements and determine “remote control” or “close control”;
- (8) Determine the welding specification according to the workpieces and switch the adjusting knobs

for current of arc and push current on the appropriate positions;

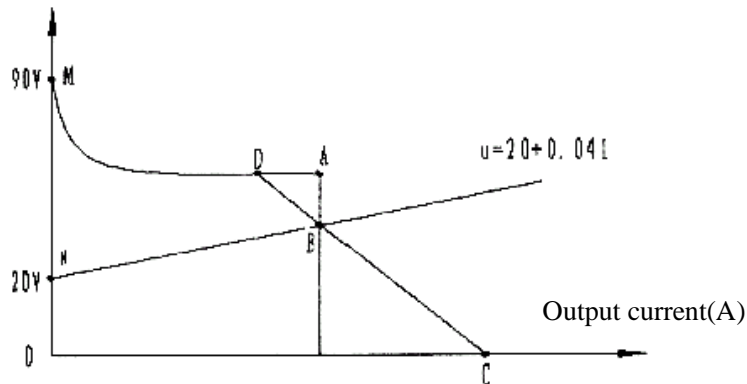
(9) Connect the input three-phase cable on the air switch of the distributor or electric power distribution cabinet and then switch ON;

(10) Adjust the knob for welding current, preset the welding current and then implement the welding.

Caution: the welding machine shall be turned OFF when the welding cables and wires and the current contact nozzle are changed.

3.3 Parameter setting and directions for matching relationship of the welding specifications

The output static characteristic curve for the inverter type DC submerged arc welding machine is shown as Figure 7.



(Figure 7) Output characteristics of inverter type DC submerged arc welding machine of MZ series

M-A-B-C is the output static characteristic curve.

N-B is the load curve

(1) The current adjusting knob is used for adjusting the welding current, namely adjusting the distance between AB segment and the longitudinal axis on the output characteristic curve.

The curve of the AB segment is the constant current output segment of the submerged arc welding machine and the adjustment range covers from the minimum current to the rated welding current.

(2) The adjusting knob for push current is used for adjusting the push current, which corresponds to the DC segment of the output characteristic curve. When the thrust potentiometer is adjusted, namely the slope of the DC segment is changed (shown as the straight line with Point B as the axis in Figure 7).

When the submerged arc welding machine is in the state of the manual arc welding, the thrust adjusting range: 0~150A; when it is in the state of the submerged arc welding, the thrust adjusting range: 0~450A.

(3) The adjusting knob for current of arc is used for adjusting the additional current when the arc ignition of the welding is carried out. The reasonable current of arc can effectively prevent the stick from being stuck and enhance the success rate of the arc ignition. The current adjustment range covers from $80 \pm 10A$ to $I/4$ (I is the rated current of the submerged arc welding machine).

(4) Weld shaping and specification adjustment

The weld shaping is densely and tightly related to the welding specifications, which usually follows the following laws:

When the specification is within the constant current area (when the push current is zero), the penetration is shallow, the reinforcement is large and the weld is narrow;

When the specification is within the descent area (when the push current is not zero), the penetration is large, the reinforcement is small and the weld is wide;

When the welding current is adjusted to be stronger, the penetration is large and the weld is wide;

When the push current is adjusted to be stronger, the penetration is increased and the reinforcement becomes smaller;

When the welding voltage for submerged arc welding is adjusted to be higher, the penetration is reduced, the weld becomes wider and the reinforcement becomes smaller;

When the travel speed of the welding torch is adjusted to be slower, the penetration is increased and the weld becomes wider;

The above parameters need to be comprehensively adjusted, and then a good weld can be generated.

When the user uses the submerged arc welding machine, he or she can refer to the welding specifications in Table 2~8. When a welding defect occurs, it can be usually eliminated according to the causes in Table 9 and the prevention measures.

Table 2: Welding current range suitable for welding wires of different diameters

Diameter of welding wire (mm)	2	3	4	5	6
Current density (A/mm ²)	63~125	50~85	40~63	35~50	28~42
Welding current (A)	200~400	350~600	500~800	700~1000	820~1200

Table 3 Specifications for double-sided automatic welding of flux rim strip groove

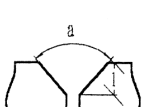
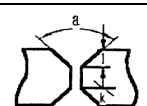
Weldment thickness (mm)	Groove diagram	Diameter of welding wire (mm)	Weld order	Size of groove		Arc voltage (V)	Welding current (A)	Welding speed (m/h)
				α (°)	r/κ (mm)			
14		$\phi 5$	Front	80	6	36~38	830~850	25
Back			—	—	36~38	600~620	45	
16		$\phi 5$	Front	70	7	36~38	830~850	20
Back			—	—	36~38	600~620	45	
18		$\phi 5$	Front	60	8	36~38	830~860	20
Back			—	—	36~38	600~620	45	
22		$\phi 6$	Front	55	13	38~40	1050~1150	18
			Back	—	—	36~38	600~620	45
24	$\phi 6$	Front	40	14	38~40	1100	24	
		Back	40	14	36~38	800	28	
30	$\phi 6$	Front	80	10	36~40	1000~1100	18	
		Back	60	10	36~38	900~1000	20	

Table 4 Specifications for automatic welding with forming in double faces through welding in single face on flux backing

Weldment thickness (mm)	Assembly clearance (mm)	Diameter of welding wire (mm)	Welding current (A)	Arc voltage (V)	Welding speed (m/h)	Pressure of flux backing MPa
2	0~1.0	$\phi 1.6$	120	24~28	43.5	0.08
3	0~1.5	$\phi 3$	400~425	25~28	70	0.08
4	0~1.5	$\phi 4$	525~550	28~30	50	0.10~0.15
5	0~2.5	$\phi 4$	575~625	28~30	46	0.10~0.15
6	0~3.0	$\phi 4$	600~650	28~32	40.5	0.10~0.15
7	0~3.0	$\phi 4$	650~700	30~34	37	0.10~0.15
8	0~3.5	$\phi 4$	725~775	30~36	34	0.10~0.15

Table 5 Welding specifications for fillet welding in the flat position

Fillet height (mm)	Diameter of welding wire (mm)	Welding current (A)	Arc voltage (V)	Welding speed (m/h)
6	φ 5	450-475	34-36	40
8	φ 5	550-600	34-36	30
8	φ 5	575-625	36-36	30
10	φ 5	600-650	34-36	23
10	φ 5	650-700	34-36	23
12	φ 5	600-650	34-36	15
12	φ 5	725-775	36-38	20
12	φ 5	775-825	36-38	18

Table 6 Specifications for gantry pressure frame type welding with self forming in double faces through welding in single face on copper wall

Thickness of steel plate (mm)	Assembly clearance (mm)	Diameter of welding wire (mm)	Welding current (A)	Arc voltage (V)	Welding speed (m/h)
3	2	φ 3	380-420	27-29	47
4	2-3	φ 4	450-500	29-31	40.5
5	2-3	φ 4	520-580	31-33	37.5
6	3	φ 4	550-600	33-35	37.5
7	3	φ 4	640-680	35-37	34.5
8	3-4	φ 4	680-720	35-37	32
9	3-4	φ 4	720-780	36-38	27.5
10	4	φ 4	780-820	38-40	27.5
12	5	φ 4	850-900	39-41	23
14	5	φ 4	880-920	39-41	21.5

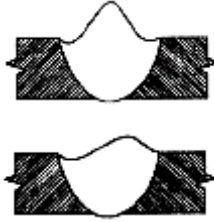


Table 7 Specifications for automatic welding by both sides with pre-welding gap on flux backing



Thickness of steel plate (mm)	Assembly clearance (mm)	Diameter of welding wire (mm)	Welding current (A)	Arc voltage (V)	Welding speed (m/h)
14	3-4	φ 5	700-750	34-36	30
16	3-4	φ 5	700-750	34-36	27
18	4-5	φ 5	750-800	36-40	27
20	4-5	φ 5	850-900	36-40	27
24	4-5	φ 5	900-950	38-42	25
28	5-6	φ 5	900-950	38-42	20
30	6-7	φ 5	950-1000	40-44	16

Table 8 Specifications for hanging automatic welding by both sides

Diameter of welding wire (mm)	Thickness of steel plate (mm)	Welding order	Welding current (A)	Welding voltage (V)	Welding speed (m/h)
φ 4	6	Front	380-420	30	34.6
		Back	430-470	30	32.7
φ 4	8	Front	440-480	30	30
		Back	480-530	31	30
φ 4	10	Front	530-570	31	27.7
		Back	590-640	33	27.7
φ 4	12	Front	620-660	35	25
		Back	680-720	35	24.8
φ 4	14	Front	680-720	37	24.6
		Back	730-770	40	22.5
φ 4	15	Front	800-850	34-36	38
		Back	850-900	36-38	26
φ 4	17	Front	850-900	35-37	36
		Back	900-950	37-39	26
φ 4	18	Front	850-900	36-38	36
		Back	900-950	38-40	24
φ 4	20	Front	850-900	36-38	35
		Back	900-1000	38-40	24
φ 4	22	Front	900-950	37-39	32
		Back	1000-1050	38-40	24

Table 9 weld defects of the submerged arc automatic welding, causes and prevention measures

Defect category	Morphological characteristic	Cause	Prevention measure
The weld is not uniform	The weld widths differ from each other	(1) The welding speed is not uniform (2) The wire feed is not stable (3) The contact of the current contact nozzle is not stable	(1) Clear the circuit faults (2) Adjust the wire feed rolling wheel (3) Replace the current contact nozzle
Undercutting		(1) The welding speed is too high (2) The welding current is too strong (3) The arc voltage is too high (4) The wire ends are not accurately aimed	(1) Lower the welding speed or adopt double-arc or multi-arc welding (2) Reduce the welding current (3) Lower the welding voltage (4) Correct the position of the welding wire
Inflection		The pressure over the flux backing is too large	Improve the flux backing
满溢 Brim over		(1) The wire extension of the welding wire is too large (2) The groove is too small (3) The arc voltage is too low (4) The wire ends are not accurately aimed	(1) Reduce the wire extension (2) Change the size of the groove (3) Increase the arc voltage (4) Correct the position of the welding wire

<p>Weld penetration and the weld on the back is too high</p>		<ol style="list-style-type: none"> (1) The welding current is too strong (2) The welding speed is too low (3) The groove gap is too large (4) The gasket is not tightly attached 	<ol style="list-style-type: none"> (1) Reduce the welding current (2) Increase the welding speed (3) Improve the assembly quality (4) Improve the holding apparatus
<p>Incomplete penetration</p>		<ol style="list-style-type: none"> (1) The welding current is too weak (2) The welding speed is too high (3) The arc voltage is too high (4) The wire ends are not accurately aimed (5) The net voltage fluctuation is too large 	<ol style="list-style-type: none"> (1) Appropriately increase the current (2) Lower the welding speed (3) Lower the arc voltage (4) Straighten the welding wire and adjust the welding head (5) Avoid the peak period of the power consumption
<p>Stomata</p>	<ol style="list-style-type: none"> (1) Cylindrical ditch form (2) Distributed along the center of the weld (3) Single or in group 	<ol style="list-style-type: none"> (1) The parent materials are sullied or not cleaned (2) The rust or oil of the welding wire is not completely eliminated (3) The flux is humid (4) The components or performances of the flux are not good 	<ol style="list-style-type: none"> (1) Intensify the clear work (2) Dry the flux (3) Change the appropriate flux
<p>Thermal crack</p>	<ol style="list-style-type: none"> (1) Generated along the longitudinal or transverse grain boundary of the weld (2) Generated at the beginning end or tail end when the forming in two faces through welding by on side is carried out 	<ol style="list-style-type: none"> (1) The low melting point sulphide is excessively segregated (2) No sufficient binding force is delivered when the weld at the beginning end or tail end is crystallized. 	<ol style="list-style-type: none"> (1) Select the welding wire with low carbon and sulphur contents and a high manganese content and the low-silicon high-manganese flux (2) Appropriately increase the widths of the end table and the run-off tab and the welding fastness and adopt the notch end tab.
<p>Slag inclusion</p>		<ol style="list-style-type: none"> (1) The slag between layers is not completely cleared when the welding by multi-layer is carried out (2) The wire end is not accurately aimed when the rear-pass welding is carried out 	<ol style="list-style-type: none"> (1) Completely clear the slag between layers (2) Adjust the position of the welding head

VII. Service and Maintenance

The professionals shall be in charge of the maintenance of the DC submerged arc welding machine. When the user encounters with the problems that can not be solved, he or she shall contact with the goods supply candidate of our company in time.

Cautions: the maximum voltage in the machine is up to 600V. In order to assure the safety, that the casing is arbitrarily opened is strictly prohibited. When the maintenance is put into practice, the air switch shall be turned off in the machine and the safety protection work of preventing the electric shock shall be well prepared.

1. Normal phenomenon easy to be misunderstood

The following phenomenon of the DC submerged arc welding machine occurring in the work all is normal:

- 1.1 When the input voltage is too low, the DC submerged arc welding machine does not work;
- 1.2 When the DC submerged arc welding machine is used in a high-temperature environment for a long time or works with a strong current for a longer period of time, the thermal relay in the machine will automatically makes the equipment stopped from working, and then the protection indicator lamp illuminates. When this condition occurred, As long as it works without load (does not need to be shut down) for several minutes, the equipment will automatically go back to normal.

2. Application notice

- 2.1 When the equipment is used, it shall be put in the place where it is dry and the ventilation equipment is mounted and should not be stored in the high-temperature humid place.
- 2.2 The line voltage of the three-phase power supply ranges from 340V to 420V and there should not be the open-phase.
- 2.3 The grounding wire shall be correctly and reliably connected
- 2.4 Various connection cables and wires shall be periodically checked. If the joints are found to be loosened, they shall be screwed tightly at any time, or the joints will be burned down and the instability in the process of welding will be caused.
- 2.5 After the welding ends, the power supply shall be turned OFF.

3. Faults and Elimination

- 3.1 Carry out the following checks before the maintenance
 - (1) Whether the line voltage of the three-phase power supply ranges from 340V to 420V and there is an open phase;
 - (2) Whether the connection of the input cables of the power supply is correct and reliable;
 - (3) Whether the protective earthing is correct and reliable;
 - (4) Whether the output cables are correctly connected and well contacted.

3.2 See Appendix A for information of the common fault phenomenon, fault causes and elimination method.

4. Periodical check and maintenance

4.1 The professionals eliminate the dust of the DC submerged arc welding machine using the compressed air for one time each season. Simultaneously pay attention to checking whether the phenomenon that the fastener is loosened exists in the machine. If it exists, it shall be immediately eliminated. The contact conditions of the input and output wiring terminals shall be frequently checked and carry out the check for at least one time each month.

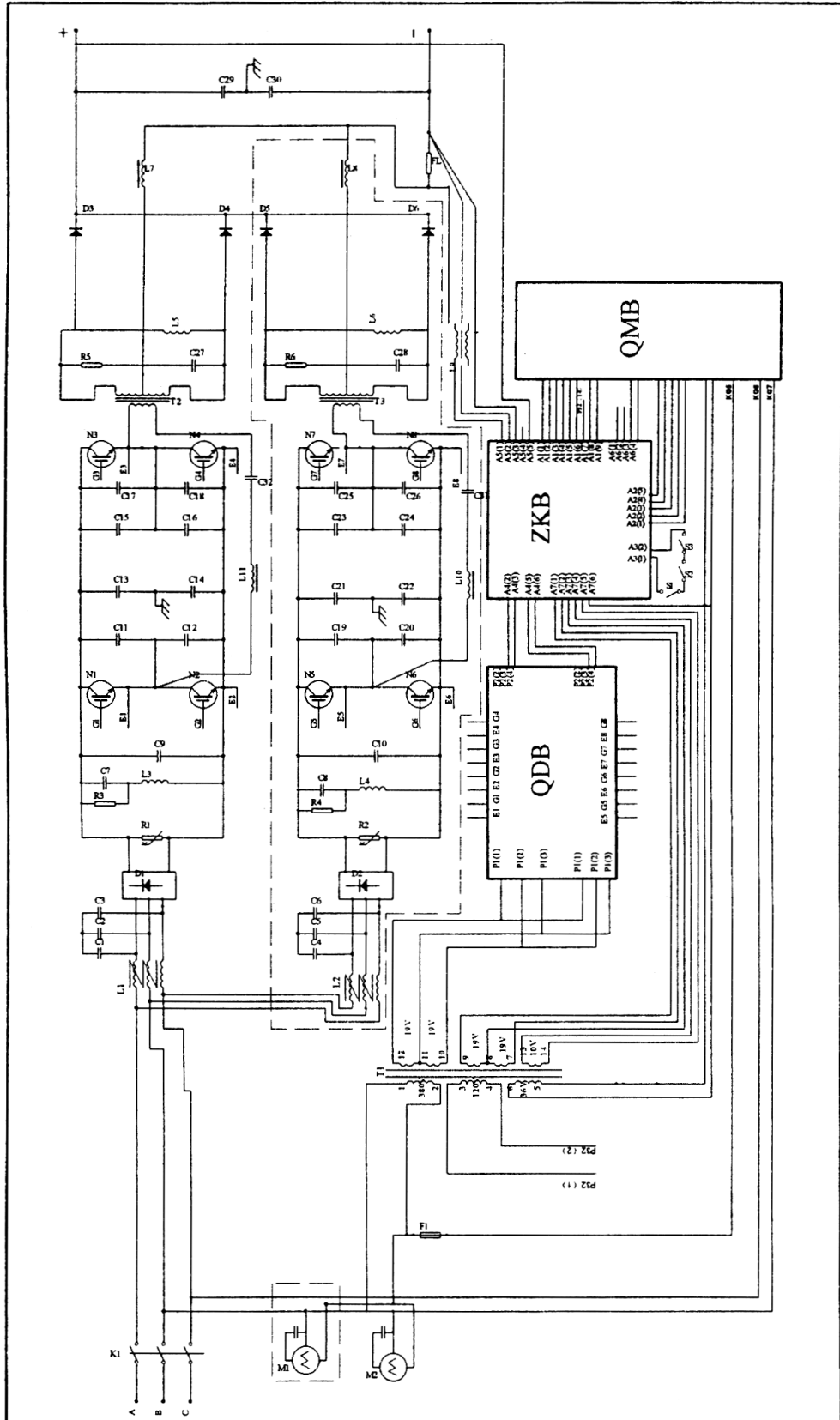
4.2 Check whether the remote control plug and the adjusting knobs are loosened, the control cable is disrepaired and the switches on the panel are flexibly used in time.

VIII. Technical data

1. Main technical parameters

Model	MZ-630	MZ-800	MZ-1000	MZ-1250
Input voltage/frequency	Three phase 380V ~50/60Hz			
Rated output capacity	27KW	35KW	44KW	55KW
Rated input current	52A	66A	83A	120A
Rated duty cycle	100%			
Current adjustment range	60~630A	60~800A	60~1000A	60~1250A
Nonloaded voltage	Submerged arc welding:90V		Manual arc welding:67V	
Full load efficiency	92%			
Full-load power factor	0.88			
Welding wire diameter	1.6-4mm	3-5mm	3-6mm	3-6mm
Insulation grade	Main transformer		H	
	Power transformer, output reactance, etc.		B	

2. Circuit diagram of main circuit



IX.Common fault phenomenon, fault causes and elimination methods:

No.	Phenomenon	Cause	Measure
1	After the machine is started, the indicator lamp does not illuminate, the welding machine does not work and the fan does not rotate	<ul style="list-style-type: none"> ① Lack of one phase ② The protective tube (5A) in the machine is broken ③ Disconnection ④ The air switch in the machine is under voltage trip. <p>The following devices might be damaged: IGBT module, three-phase rectifier module, output diode module, other devices</p>	<ul style="list-style-type: none"> ① Check the power supply ② Check whether the fan, the power transformer and the main control board are in good condition ③ Check the wires ④ The professionals carry out the check and maintenance. <p>When the IGBT is damaged, various elements of the output part of the driver board might be usually also damaged and need to be checked and changed.</p>
2	The welding current is not stable	<ul style="list-style-type: none"> ① Lack of phase ② The following elements might be damaged: various potentiometers on the front panel ③ The main control board is damaged 	<ul style="list-style-type: none"> ① Check the power supply ② Check and replace
3	The welding current can not be adjusted	<ul style="list-style-type: none"> ① The wires in the machine are disconnected ② The main control board is damaged ③ The control cable is damaged 	Check and replace