

# SMW 型 硬 焊 机

SMW Rigidity Welding Machine



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## SMW-IA 型硬焊机

## SMW- I A Rigidity Welding Machine

SMW 型硬焊机（又名：银铜焊机、银焊机），主要应用于大中型发电机定子线棒上端部和下端部连接板的焊接，以及发电机定子线圈半成品制作时端部的焊接。采用该焊机可以简化工艺，节约成本，缩短焊接时间，且对线棒绝缘无损害，能提高发电机定子线圈焊接质量。

SMW- I A Rigidity Welding Machine, is applied to the welding of the connections between upper and lower coil ends for large or middling generator stator coils. It could simplify the welding technology, save your cost and reduce the welding time. Moreover, it does harmless to coil insulation so to improve the quality of the welding of the coils.

## 焊接原理 Principle

焊机移动式夹钳夹住被焊接处，焊机提供工频低压电源，焊接时产生大电流，利用焦耳效应在被夹位置产生高温，从而熔化焊材达到焊接目的。

The welded location is clipped by the movable tongs, the power (50Hz, low volt) is supplied. At the clipped location, large current is brought and the heat comes into being high temperature, so the welding material is melt to complete the welding.

## 技术参数 Technical Parameter

SMW 型硬焊机分 60kVA，100kVA，150kVA 三种规格

型 号 规 格	SMW-IA 60kVA	SMW-IA 100kVA	SMW-IIA 150kVA
电源电压 Power Volt	AC 380V±15%		
额定容量 Capability		100KVA	
焊接空载电压 Empty Burden Volt	7-14 V	18-21 V	22-24V
焊接电流 Welding Current	1500A-5000A	4000 ~ 7500 A	6000 ~ 9000 A
电源侧电流 Current on the Side of Power	100-220A	310 A	350-450A
冷却水水源最小流量 Cooling water Min. Discharge	25 L / Min		
气源气压 Pressure of Gas	0.7 MPa		
每个接头焊接时间 Welding Time of Every Junction	≤ 60 S		
焊接时线棒绝缘部位最高温度 Highest Temperature at the Insulation Location of the Coil bar	≤ 160 °C		
焊接头直流电阻增加量 DC Resistance Increase of the Welding Tip	≤ 20 %		

焊接夹钳手动操作行程 Manus-operating Journey of the Tongs	49 mm
焊接夹钳自动操作行程 Auto- operating Journey of the Tongs	12 mm
主变压器冷却方式 Cooling Mode of the Main Transformer	水冷却 Water-cooling
电缆冷却方式 Cooling Mode of the Cable	水冷却 Water-cooling
体积 Volume	1000*860*860 mm
重量 Weight	500 kg

### 扩展功能 Extend Function

- 磁极线圈引出线的电阻焊的焊接。Resistance welding for the fetch wire of pole coils.
- 磁极间连接片的焊接。Welding for connections between coils.
- 磁极阻尼环连接片的焊接。Welding for the connections of damp ring.
- 手动夹具用于小面积或特殊连接方式的焊接。  
Welding for small area or especial connections of manus-operating tongs.



### 主要部件 Main Components

- 机身框架一个：焊机主要元器件固定其上。  
One frame: The majority of the machine is mounted on it.
- 主变压器一台：提供工频低压电源。  
One main transformer: It supplies the power (50Hz, low volt).
- 导轨一幅：导轨只在焊接线棒上端时使用，焊接夹具吊于导轨上。  
A pair of slideway: The movable tongs is hung on it when the upper coil end is welded.
- 小车一台：用于支托夹具，支托机构是套筒伸缩式的，并装有防震弹簧。从地面到夹具碳精块中心，最低为 760mm，最高为 1060mm，高度调整幅度为 300mm。  
One small bracket wheeled machine: It is used to support the tongs. The bracket is a sleeve which can be pulled back and forth, a spring is mounted. The lowest and the highest height is 760 mm and 1060 mm respectively from the floor to the center of the carbon lumps. The adjusting height

is 300 mm.

- 焊接夹钳一套：夹钳钳口可手动、自动调节。钳口的自动操作（夹紧、放松），通过装在夹钳上的开关进行控制，自动操作行程 12mm。在焊接过程中由自动操作系统提供的压缩空气使夹钳钳口保持一定压力，以提高焊接质量。夹具钳口内设有冷却水管，只有在冷却水流通并保证一定流量的情况下，才能工作。

One set of welding tongs: The tongs mouth could be adjusted automatically or manually. The automatic operation is controlled by a switch on the tongs, the journey is 12mm., Compressed gas remain the mouth a certain pressure during automatic operation (tighten and loosen). Cooling pipes are set in the mouth. It could not work until the certain discharge of cooling-water is guaranteed.

- 电气自动操作系统一套：主电源由无触点开关投切，无触点开关由脚踏开关控制，只有在主变温度、气、水回路正常、夹钳夹紧的情况下方能接通主电源。

One electric automatic operation system: The power is cut off or supplied by the No-contactor switch which is controlled by foot-switch. The power could not switch on until the circuit of oil-gas-water is normal and the tongs is tightened.

### 焊接前的准备工作 Preparation Work

- 将碳精块装于钳口夹板。碳精块的尺寸按焊接面积进行修正。

The carbon lumps are placed in the mouth of the tongs. The dimension of the carbon lumps should be modified in terms of the welding area.

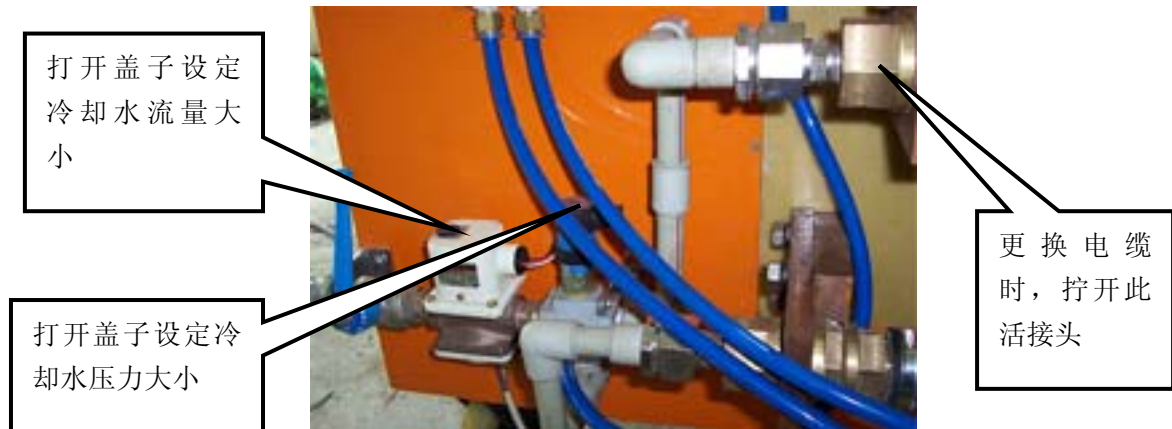
- 接上 0.7 MPa 压缩空气，把三联体进气侧空气滤清器里的积水排出，出气侧油雾发生器内的 30#透平油油面应保证在 1/2-2/3 处，调节中间位置的减压阀至规定压力。

Supply the 0.7 MPa compressed-gas and drain the accumulated water in the gas filter on the side of the gas-in. The level of the 30# oil in the oil-fog generator on the side of gas-out is sure to be 1/2 to 2/3. The pressure amounts to standard by regulating the middle part's valve of reducing pressure.

接上水源，水流量大于 25 升/分，夹钳上的排水管接往下水道。

Supply the cooling water with discharge more than 25L/min. The drainage pipe of the tongs should be led to waterway.





- 接上主变压器 380V ( 二相 ) 交流电源。电源应设一个 400A 空气开关，电源至焊机的电线或电缆截面一般不小于 90 mm<sup>2</sup> ( 铜芯 )。

Supply the alternating current power (380v,2-phases) which should have one gas-switch. The section of wire or cable (copper center) from the machine to the power commonly no less than 90 mm<sup>2</sup>.

- 将夹钳操作电缆和脚踏开关电缆接到机身框架上的插座。

Link the plugs of cables, for operating the tongs and for the foot-switch, to the socket which is on the frame.

- 无论是线棒股间初焊，还是线棒端部对焊，都应将焊接处绝缘材料等影响焊接质量的杂物清理干净，并用酒精清洗，焊前应有相应的加固措施，防止股线发生欠焊。

In order to get full welding of the coil, the dirty which effects the welding quality at the welding location, such as insulation material, must be cleaned then washed by alcohol.

- 线棒端部必须留出一定长度的绝缘部位，焊接前应将线棒端部靠近绝缘部分的铜线用石棉泥（石棉布）或冷却钳加水冷却，保证线棒绝缘不受损坏。

A certain insulation part on the coil bar end should be left. The copper wire close to the insulation part should be cooled with asbestos cloth or cooling grip filled of water before welding in order not to harm the insulation.

## 焊接操作步骤 Operation Process

- 打开供水管切换阀，流量控制器动作正常，夹钳排水管应有水流出。

Open the valve on the supplied-water pipe, the flow-controler is sure to be well operated, and the drainpipe of the tongs has some outflow.

- 打开进气管切换阀，调节气压为正常值。



Open the valve of the supplied-gas pipe and adjust the pressure to a normal value

- 合上主电源开关及操作电源开关。

Shut on the main power switch and operates it.

- 每个接触面间放一张箔状焊料，如果厂家对线棒股间未进行过初焊，应在股间再放 2—3 张箔状焊料。连接板位置对准后，用手虎钳使之暂时固定。

Put a piece of foil solder between the connection surfaces. If the initial welding wasn't adopted in advance, please put 2 or 3 pieces of foil solder additionally. After the connections are adjusted well, fix them with pliers temporarily.

- 将准备焊接一端的手虎钳拿掉，放于焊接夹钳工作位置，手动调节钳口距离使之初步夹紧，要求钳口碳精块和要焊接的表面全部接触。

Take away the pliers from the end of the wanted welding coil to the working location of the tongs. Adjust the tongs mouth by manus to tighten it slightly in order that the surface between the carbon lump and the welding coil wholly contacted.

- 操作夹钳上的开关使电磁阀动作，夹钳钳口自动保持一定压力。

Operate the switch of the tongs to let the electromagnetism valve work, automatize the mouth of the tongs keeps a certain pressure.

- 踩脚踏开关，无触点开关合上，产生大电流。当碳精块变红时，不断间隔地踩击脚踏开关，直至焊接部位渐呈深红色，即焊箔熔化（约 750 左右）为止，同时用棒状焊料在焊接部位周围添加适量的焊料。

Step on the foot-switch and turn on the No-contactor switch and the large current is generated. When the carbon lumps turn red, stop stepping the foot-switch alternately until the welding part turns dark red. That means the foil is melted (about 750℃). In the same time, add proper solder around the welding part with bar solder.

- 夹钳保持原状数秒钟，待焊缝冷凝后，断开夹钳上的开关，自动转入“放松”状态，再手动松开钳口。

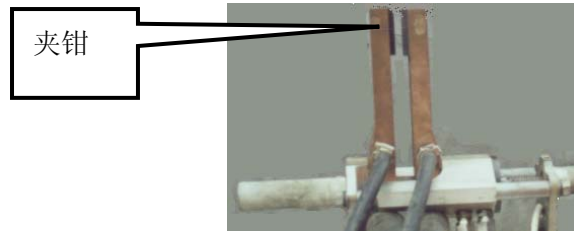
Keep the tongs with initial mode several seconds. Turn off the switch on the tongs when the weld is cold, and it will turns to "loosen" mode automatically. Later, loosen the mouth by hand.

- 将连接板另一端手虎钳拿掉，按上述同样步骤进行焊接操作。

Take away the pliers on the other end of connection, and carry out the welding as former process.

- 焊接后用细砂布擦碳精块接触面，使其平整光滑，能延长碳精块的寿命，如果温度过高而产生发光点时，就必须更换钳口碳精块。

Wipe the contacted surface of the carbon lumps with emery cloth after welding to make it even in order to prolong the life of the carbon lumps. If flashing dots are produced because of the over-high temperature, the carbon lamps should be replaced.

**注意事项 Notes**

- 电源灯亮表示外部已送入电源，合上大、小开关即可工作。  
The power is turned on if power-lamp is shining, and the machine will work after shut the big and small switches.
- 断水灯亮表示冷却用水供水流量不足或未供水，系统停止工作。  
The cooling water does not in order if the non-water lamp is shining, and the system stops working.
- 高温灯亮表示主变压器温度过高，系统强迫停止工作，保护主变。  
The transformer's temperature is too high if the over-high temperature lamp is shining, and the system is forced to stop to protect the transformer.
- 电源灯亮，系统正常，但仍不能工作，可能操作电源熔丝烧断，应查明原因后再换上熔丝。  
The power-lamp is shining and the system is good, but the machine can't work yet. In this case, the power fuse is likely to be melted, you should replace the fuse after detecting.
- 不焊接时应使夹具处在自动松开位置，避免电磁阀线圈因长时间通电而损坏。  
The tongs should be automatically in loose mode when it isn't in use in order that the electromagnetic valve's coil won't be damaged on long terms current.
- 至夹钳的两根低压大电流电线应互相靠紧，以减少由于感抗而产生的电压降，否则将影响大电流产生及焊接质量。  
The two large current wires linked to the tongs must be very close to each other to reduce the voltage decreasing with inductance.. Otherwise, it would effect the generation of large current and the quality of welding.
- 导轨转动只能在焊机一定范围，否则因偏重可能造成焊机翻倒。

Rotation of the slideway is limited in a certain scope, otherwise, the machine would turn over because of eccentricity.

- SMW-IA 硬焊机是基于 SMW-I 硬焊机改进而成，具有多档不同功率输出，在不影响使用的情况下，尽可能不要使用功率最大档输出，可确保焊机更长的使用寿命。



多档不同功率输出

SMW-I A Rigidity Welding Machine is improved on the SMW-I type. Its output has grades. The max. grade is avoided to be selected in order to get the longer life, if it is not affected in using.

## 维护 Maintenance

- 将空气滤清器积水排出。

Drain the accumulated water in the gas filter.

- 检查三联体油罐油位，油位应在 1/2-2/3 处，否则应添加 30#透平油。

Check the oil level of the tank. It should be 1/2 to 2/3 of the tank volume, otherwise, add 30# oil to the tank.

- 检查铜焊夹钳密封接口，如有漏水、漏气，应予更换。

Check the sealing joints of copper welding tongs. It should be replaced if the leaking water, gas and oil is found.

- 如铜焊夹钳不能自动操作，则检查信号指示及电气回路、电磁阀动作是否正常，再检查夹钳内密封圈是否损坏。

If the copper welding tongs can't be operated automatically, check the electric circuit and the electromagnetic valve, then check the sealing coin in the tongs.

- 当焊机长期不用时，应放在通风干燥的地方。

Place the machine in ventilative and dry place when it is out of work for a long time.