

NSTAR OF CHINA



北极星
NSTAR

E-9188A 智能保护
工模具修补机

使用说明书

目 录

一、概述	1
二、性能指标	1
三、主机结构	2
四、工作原理	3
五、保护系统	3
六、修补工艺	3-7
七、常见故障及排除	8
八、装箱清单	9

工模具修补机使用说明书

一、概述

随着世界工业技术的不断发展，工模具已成为相关行业中主要的生产工具。然而它的少量缺陷，碰撞损坏和积累磨损等原因，却将引起整副模具甚至整台设备的弃废。为此，本公司研制开发了E-9188A型智能保护式·工模具修补机，它能使您已损坏或报废的模具设备起死回生，重见天日。是工模具少量缺损修复的理想工具，并具有以下优点。

1. 熔接强度高：修补处可铣、锉等加工。
2. 修补精度高：用薄片补材修补不会失去原基准面，多余焊料少，后期整形容易。最小修补量为0.03mm(用60.035补材)。
3. 适用范围广：除铜、铝等电阻率极低的材料外，各种金属材料制成的工件均可修补。
4. 基材损伤小：发热点小，不会造成基材退火变形。
5. 焊接功率稳：当电源电压变化在 $\pm 10\%$ 的范围内波动时，机器仍能保证修补质量稳定。
6. 输出功率大：单点焊接时能焊 1mm的线材。
7. 智能保护：能随时对一切非法操作及电源异常等现象进行保护，并以警声提示。
8. 操作简单：能适用于一般工人操作。
9. 电连接方便：配有强磁连接器，任意大小的工件均可很方便地接电。
10. 携带方便，整机体积小，重量轻，主机仅25kg。

二、性能指标

可修补材料：除铜、铝等电阻率极低的材料外，各种金属材料均可修补。

可修补项目：1. 制造过程中的加工缺陷，如切削过度、尺寸超差、棱角损伤、氩焊不足等。

2. 工模具使用过程中产生和局部磨损。

3. 型腔的锈蚀斑等凹陷。

智能保护范围：1. 一切不正当操作；

2. 电源电压过高；

3. 没有关机而将常规状态直接转换成精密状态。

交流220V 10% 50Hz

50 500W

12KW (0.4mm)

3-30Hz

460 230 310mm³

25kg

三、主机结构



四、工作原理

本机的基本工作原理是：将储存于电容器中的电能瞬间释放于电阻率较大的钢铁等金属材料组成的工件和补材之间的连接处。使它们迅速发热而熔接在一起，达到修补工模具的目的，由于是小范围($< 1\text{mm}^2$)短时间(ms级)的发热，所以就工件基体来说，发热很少，故不会产生工件变形、退火、变色等现象。

五、保护系统

本机的智能保护系统核心采用现代微电脑芯片，通过编程，它可以及时地对由于操作不熟练而造成的非法操作，以及电源电压过高等异常现象进行保护，从而避免了由于操作不当而损坏模具，及电源电压太高而损坏机器等现象发生，当机器开机后能听到三短一长的笛鸣声，说明保护系统工作正常。

六、修补工艺

1.补材的选用：

随机附带的补材主要有合金钢(H08Mn2SiA)、不锈钢(1Cr18Ni9Ti)、弹簧钢(70号钢)三种材质。合金钢与大多数模具钢有较好的结合力，修补点硬度适中（硬度30HRC左右），后期整形容易，且与多数模具钢色泽接近，故修补痕迹小，修补点可烂花和氮化处理。不锈钢补材具有耐腐蚀性能好，与各种材料都有很好的结合力，补材自身具有较好的韧性（硬度20HRC左右）但不适合表面需烂花的模具。弹簧钢淬硬特性较好，修补处具有自行淬硬特性，故硬度较高（硬度 $> 50\text{HRC}$ ），适用于已淬硬和最终需要淬火的模具。

2.补材厚度的选择：

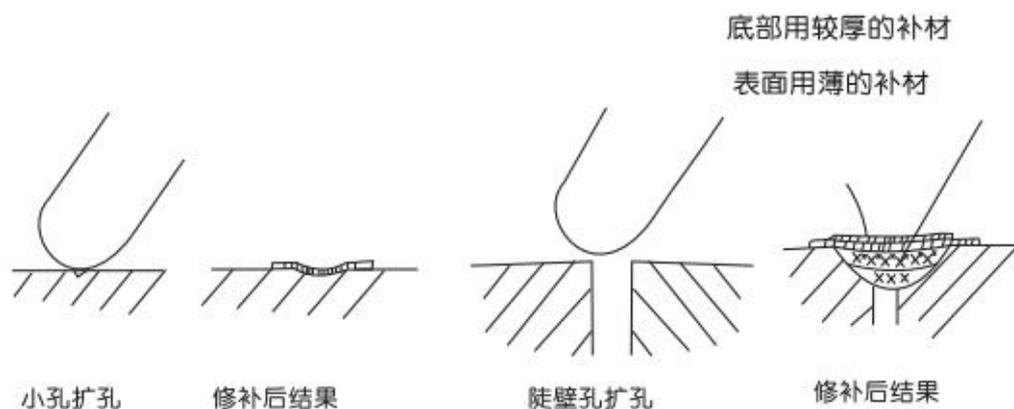
补材厚度的选择主要根据被修补模具的表面光洁度要求和修补量来决定。如待修补的是光洁度要求很高的型腔表面，则补材厚度宜小于0.12mm。对某些材质具有淬硬特性但型腔不需淬火的模具，采用厚度小于0.10mm的补材修补，可减小焊点外圈基体材料发热淬硬产生的痕迹。

3. 修补操作:

A. 接线: 交流电压接220V/50Hz市电; 焊头连线接输出正极接线柱; 强磁连接器接输出负极接线柱, 强磁连接器应吸合在工件的光亮无锈平面上。脚踏开关连接线插入脚踏开关插座。输出接线柱螺母必须拧得很紧。

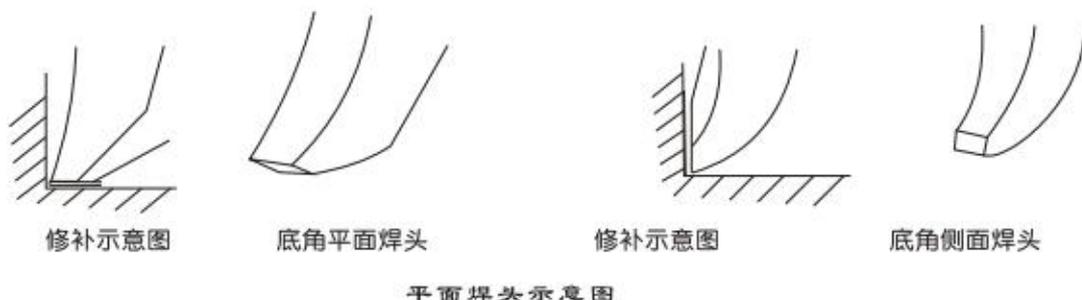
B. 表面清理和焊头准备:

待修补处如有油污, 可用酒精或丙酮擦洗干净, 氧化膜可用砂布或油石清除, 补材上的防锈油和氧化膜也应用同样方法清除。对深小孔(针尖孔)和陡壁孔应先进行适当的扩孔处理, 方法如下: 将功率状态选在精密位置, 焊接方式在连接状态, 功率指示值调在500-700左右。用球形焊头(焊头大小可根据被扩孔的大小决定, 一般取 3- 5的焊头)压在孔上, 脚踏启动开关, 使孔壁的尖端处熔化, 变成球形凹坑, 以增加补材与工件的焊接面。(见下图), 如是成片的小孔, 可用电磨将表面磨去0.1mm左右。



扩孔后再修补示意图

焊头主要分两类: 一类是顶端为半球形的圆棒, 我们称之为球形焊头, 它可在补材上连续滚动压焊, 且焊头接触面积稳定, 较能保证修补质量, 是最常用的焊头。另一类是为了弥补球形焊头不能焊到内角清角处而专门制作的, 其端部接触部位常做成平面, 我们称之为平面焊头。适用于底角处的修补。(如下图所示)



平面焊头接触面的大小以1-2mm为佳, 过小会产生尖端电弧放电而在工件上产生放电电坑, 过大会由于焊接功率不足, 产生虚焊现象。无论何种焊头都要经常修正, 保证接触面光滑。

C.功率选择: 功率大小应根据补材厚度决定, 具体搭配见下表:

表 1

功率显示值	常规状态补材厚度	精密状态补材厚度
300	0.10mm	0.03mm
400	0.12mm	0.04mm
500	0.14mm	0.05mm
600	0.16mm	0.06mm
700	0.17mm	0.07mm
800	0.18mm	0.08mm
900	0.19mm	0.09mm
1000以上	0.20 / 0.30 / 0.40mm	0.10 / 0.15mm

表1中所列数据是在标准焊头($\phi 5$ 半球形焊头)时得出的。一般情况下, 焊头与补材的接触面积越大, 则同样补材厚度时需要的功率也就越大, 反之则越小。用户可根据实际情况, 参考表1作适当加减。

功率与所选补材是否适应, 可用试焊的方法检验, 用所选的补材在不重要处焊一小块试样。然后用锉刀锉试样, 如锉下去补材厚度的1/2时还有凹孔现象时, 可能是功率偏大或者是焊头接触面积偏小。如在补材将要锉完时, 出现焊接处补材部分剥离现象, 则说明功率偏小或滚压不均匀有漏焊。

注意：常规状态转换到精密状态时，由于储能电容高压不能立即降低，机器会因电压偏高而发出报警声。此时只要关掉电源，2秒钟后重新开机即可。

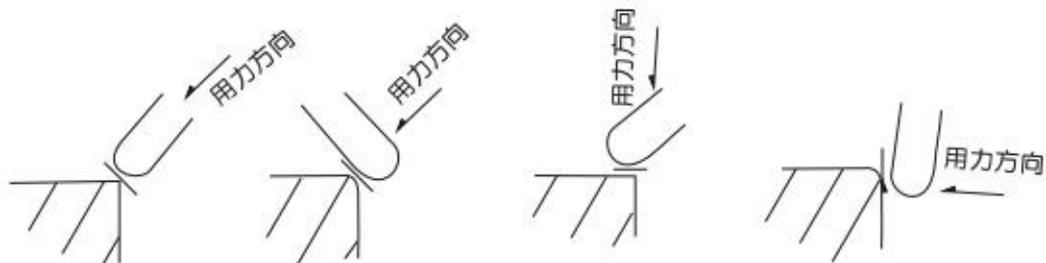
D.开机、打开主机电源开关，电源指示灯亮，听到三短一长的鸣响后，系统便进入修补等待状态。

E、修补：焊接方法是将焊头压住补材，脚踏启动开关，即可产生一个焊点。如焊接方式开关在连续位置，则脚踏住启动开关可产生连续的焊接脉冲，缓慢滚动焊头使焊点一个紧挨一个，就可把补材紧密地焊接在工件上。焊头压住工件的压力要适当，压力太小可能使焊头与补材接触不良而产生火花放电，压力过大会使焊接效果下降。通常的修补方法是这样的：在前面选好补材和功率的基础上，先将焊接方式选择在单点状态，将补材（如有防锈油和铁锈应先清理干净）用几个焊点定位在待补处。然后将焊接方式选择在连续状态，用焊头在补材滚压均匀。注意不要将焊头压出补材范围；以免在工件上产生熔焊坑。如果需要多条补材拼宽或多层补材叠厚时，可用同样的方法重复多次完成。

注意：修补时必须先用焊头压住补材，再踏下脚踏开关，修补完后，必须先放开脚踏开关，再移开焊头，否则为非法操作，保护系统将关闭输出并报警，当系统进入保护状态时，只要放开脚踏开关，系统便可退出保护重新进入监控状态，另外，修补操作时应戴上防护眼镜，以防止高温飞溅物损伤眼睛。

修补质量不良的几个原因及解决方法：

①棱角缺损不易补足：(例如修补前棱角缺损量只有0.1mm,但补上去二层0.1mm厚的补材还是不够充足。)产生这种现象的原因是棱角下接触面积较小，相对来说焊接功率偏大，补材被熔化抛出，解决办法是减小焊接功率，改变焊接部位和用力方向，避开棱角尖峰，在两侧面处焊接，如下图所示。



不正确的棱角修补方法示意图

正确的棱角修补方法示意图

②修补处抛光后发现许多细小针孔。发生这种现象的原因是焊接功率太大或焊头与补材的接触面太小（如焊头太小、太尖等），使补材变形量太大，在反复滚压时将空气、氧化层和焊头铜材等杂质裹进补材中的缘故。解决办法是尽量用较薄的补材修补，这样就可以用较小的功率，补材的变形量就少，保证了补材的纯净度，也就消除了修补处的针孔现象。（重焊时应先用电磨头磨去0.1mm左右再补）。

③修补点外圈有细缝或细孔。发生这种情况有两种原因要区别对待。一种是修补前边缘较平坦的凹陷，修补整平后补点外出现圈状缺陷，仔细观察可发现是补材少量剥离产生的，原因是焊接功率不足之故，可增加焊接功率或减少补材厚度解决。（重焊时应将原补材去除干净）如修补前是边缘较陡的孔或凹陷，则应考虑是工件表面的氧化层等杂质影响；修补时面积焊得不够大，没有把缺陷部位全部压焊到。可用扩孔的方法清除杂质和增加接触面积。并使压焊部分的面积大于缺陷部。

④修补点外圈抛光后有轻微突起，产生原因是工件被修补时，产生的热量将工件基材淬硬造成的。这种情况在淬火特性较好的材料上尤其明显。解决办法是用较薄的补材如0.05mm，这样就可以用较小的焊接功率修补，从而减轻基材被淬硬的现象。

⑤修补点打光后有轻微凹陷。产生这种现象的主要原因是补材硬度低于基材硬度的缘故，这种现象多发生在已淬火或氮化的工件上，解决办法是用弹簧钢作补材，利用其良好的淬硬特性，使修补点材料硬度接近基材的硬度，消除修补点凹陷的现象。

七、常见故障及排除方法

故障现象	产生原因	排除方法
开机无显示	机器无电源输入或保险管熔断	检查输入电源或更换保险管
机内嘟嘟响,不能焊接	输入市电电压超过245V,或常规转换成精密时没有重新开机及非法操作。	检查并降低电源电压,关机2秒钟,重新开机。纠正操作方法。
焊接功率减小甚至无焊接能力	强磁连接器有污物或吸合在不干净金属表面,接线柱螺母松动。	清理强磁连接器和工件接合部位,拧紧接线柱螺母。
输出发生脉冲关不断现象	脚踏启动开关常闭触点接触不良或连接线断。	修理或更换开关,接通断开连线。
无输出脉冲(排除输出线松动原因后)	脚踏启动开关常开触点接触不良,或连接线断。	修理或修理开关,接通断开连线。
调节功率时,数显示屏乱跳	功率调节电位器接触不良。	用煤油或酒精清洗电位器触点。

注意：机内某些部位与市电直通，打开机箱修理时应切断电源或接隔离变压器，机箱外壳与电源插头地线端相连，插座应可靠接地，接地电阻应小于4Ω。

八、装箱清单

主机	1台
输出正极连接线(带焊头)	2条
输出负极连接线(带磁性连接器)	2条
平光防护眼镜	1副
脚踏控制开关(带连线)	1只
电源线	1条
保险管(3A)	4只
锋钢铁皮剪	1把
φ5焊头.....	9支
H08补材	1套
不锈钢补材	1套
弹簧钢补材	1套
说明书	1份
合格证	1份
仪器质量反馈表	1份



乐清市北极星电子有限公司
YUEQINGSHI NORTH STARELECTRON CO.,LTD

地 址: 浙江省乐清市柳市镇新光工业园区张瞿路3号

电 话: 0577-61719111 61719112 61719113

传 真: 0577-61719188

财务部: 0577-61719115

行政部: 0577-61719116

维修部: 0577-61719117

技术部: 0577-61719118

总经理: 0577-61719119

手 机: (0) 13905874212 13505875169

网 址: www.chinanstar.com

邮 箱: chinanstar@foxmail.com

开 户: 中信银行温州柳市支行

帐 号: 7335410182600016661

邮 编: 325604

总经理: 余小龙 联系人: 南小萍

NSTAR OF CHINA



北极星
NSTAR

E-9188A(B)Intelligent

Protection Type Mould Repair Welding Machine

Operating manual

VII. Usual symptom and remedy

Symptom	Cause	Remedy
The machine has no display after being turned on	No power input to machine or the protective tube is blown out.	Check the input power or change the protective tube
There is sound in the machine, it can't be welded	The commercial power voltage inputting exceeds 245V, or, you perform illegal operation or haven't turned on the machine again when transferring the routine state into the precise state.	Check and step down the power voltage, turn on the machine again after turning off it for 2s. Correct the operating method.
The welding power is down, even, there is no welding capability	The ferromagnetic connector has dirt or is attracted on the dirty metal. The nut of binding post looses.	Clear away the dirt on ferromagnetic connector and connecting part of work piece, tighten the screw of binding post.
Stop the output impulse	The NC contact of foot starting switch fails in contacting or its connecting wire is broken.	Repair or change the switch Make and break the connecting wire
No output pulse (after excluding the reason of output wire loosing)	The NO contact of foot starting switch fails in contacting or its connecting wire is broken.	Repair or change the switch Make and break the connecting wire
When adjusting the power, the digital display screen jumps disorderly.	Electric potentiometer for adjusting power fails in contacting	Clean the contact of electric potentiometer with coal oil or alcohol.

Notice: Because some parts of machine are connected through the commercial power, please cut off the power or connect with a isolating transformer when you open the machine for repairing. The enclosure of machine is connected with earth wire terminal of power plug, the socket shall be earthed reliably, the earth resistance shall be less than 4 Ω .

VIII. Packing list

Mainframe.....	1 piece
Outputanodeconnectingwire(with weldinghead).....	2 pieces
Outputcathodeconnectingwire(with magneticconnector).....	2 pieces
Protectionglassesofzerodiopter	1 pair
Footcontrolswitch(With connectingwire).....	1 piece
Powerline	1 piece
Fusetube(3A).....	4 pieces
Leatherscissorof high speedsteel.....	1 piece
Φ 5 welding head.....	9 pieces
H08 repairingmaterial.....	1 set
Repairingmaterialof stainlesssteel.....	1 set
Repairingmaterialof springsteel.....	1 set
Manual.....	1 copy
Certificate.....	1 copy
Feedbacklistof instrumentquality.....	1 copy



YUEQINGSHI NORTH STARELECTRON CO.,LTD

Add:Town xinguang liu yueqing City Industrial
Park Road on the 3rd Zhang Qu

Tel:+86-577-61719111 61719112 61719113

Fax:+86-577-61719188

M.T:13905874212 13505875169

Http://www.chinanstar.com

E-mail:chinanstar@foxmail.com

Open:CITIC Bank bank branchin Wenzhou City Liu

Username:7335410182600016661

P.C:325604

Contents

I. General	1
II. Performance index	1
III. Structure of mainframe	2
IV. Working principle	3
V. Protection system	3
VI. Technology of repair	3-7
VII. Usual symptom and remedy	8
VIII. Packing list	9

Operating manual for mould repair welding machine

I. General

As the world industrial technology continuously developing, the industrial mould has been a main production tool in relevant industries. However, its few defects, damage and abrasion results in the whole set mould, even the whole equipment being disused, in term of this, E-9188A (B) intelligent protection type mould repair welding machine developed by us enables your damaged or disused mould to be used again, it is the ideal tool for industrial mold with few defects, while, its virtues as follows:

1. High strength of welding: the repairing place can be milled and filed.
2. High accuracy of repair: repairing with slice can't miss the original datum plane, and it uses little residual welding material, easy for reshaping at late stage. The min repairing: 0.03mm (with δ 0.035 repair material).
3. Wide applicable range: the work piece made by kinds of metal material except for copper and aluminum of ultra-low resistance rate can be repaired.
4. Little damage of basic material: due to little heating point, the basic material can't deform or anneal.
5. Stable welding power: when the supply voltage is waved in the range of $\pm 10\%$, the machine still can make sure the quality of repairing is stable.
6. High output power: welding with single point, it can weld $\phi 1$ mm wire.
7. Intelligent protection: protect against all illegal operating and abnormal power supply, and prompt with alarm.
8. Simple operating: can be operated workers of common level.
9. Convenient electric connecting: ferromagnetic connector supplied that takes convenience for any work pieces to connect the power supply.
10. Convenient carrying, small volume, light weight, the main machine is only 25kg or 20kg.

II. Performance index

Repairable material: kinds of metal material can be repaired except the material of ultra-low resistance rate such as copper and aluminum.

Repairable items: 1. Defects occurring in processing, such as extreme cutting, much difference in sizes, damage edge angle, not enough argon welding.

2. Part abrasion produced in operating industrial mould.

3. Pitting of mould cavity.

Range of intelligent protection: 1. All inappropriate operating;

2. Over high supply voltage

3. Haven't turn off the machine, while, transform the routine state into precision state.

Applicable power: Single-phase AC 220V $\pm 10\%$, 50Hz.

Power consumption: 50~500W

Instantaneous max power: more than 10KW. (Max repairing material thickness: >0.2mm)

Working mode: Single point and continuous

Pulse frequency under continuous state: 3~30 Hz, auto frequency conversion.

Power mode: precision and routine

Volume of mainframe: 460×230×310mm³.

Weight: 25kg.

IV. Working principle

Basic working principle of this machine: release the electric energy stored in capacitor into connecting place between work piece made up of metal material with high resistance rate like steel and repairing material, to make them weld together for rapid heating and get the aim of repairing the industrial mould. Because the heat happens in the small range ($<1\text{mm}^2$) for short time (grade ms), the basic body of work piece can't deform, anneal or change the color.

V. Protection system

The core of intelligent protection system adopts the modern microcomputer chip, through programming, it can protect against illegal operation for unskillful doing, over high supply voltage, so that it can prevent the mould and machine being damaged, when the machine is turned on, it will make three short whistles and one long whistles, it shows that the protection system is normal.

VI. Technology of repair

1. Selection of repairing material

There is alloy steel (H08Mn2SiA), stainless steel (1Cr18Ni9Ti), spring steel (70#) supplied for repairing material with the product. Alloy steel has fine binding force with most mould steels, its hardness of repairing point is moderate (about 30HRC), and it is easy to reshape at last stage, because its color approximates to that of most mould steels, the trace of repairing is little, the repairing point can be treated with the burnt-out and azotizing technology. The stainless steel has fine anti-corrosion property, good binding force with kinds of material, the repairing material itself has good toughness (about 20HRC), however, it is not suitable for module surface requiring burnt-out. Spring steel has excellent quench hardening property, the repairing place can quench by itself, so its hardness is very high ($>50\text{HRC}$), it is suitable for the module that has been quenched and needs to be quenched finally.

2. Selection of repairing material thickness

Selection of repairing material thickness is determined by module surface fineness and repairing range, if the module cavity requiring high fineness needs to be repaired, the thickness of repairing material shall be less than 0.12mm. The module, whose material has quench hardening property, but module cavity needn't to be quenched, the thickness of repairing material required shall be less than 0.08 mm, so that it can reduce the trace caused by heating and harden quenching from welding basal body material of welding point outer ring.

3.Repairing

A. Connect wire: Input AC 220V/50Hz commercial power; the wire of welding head is connected with anode binding post, ferromagnetic connector is connected with cathode binding post, and attracted on the bright and rustless surface of work piece. The wire of foot switch is inserted into its socket. The screw of output binding post shall be tightened.

B. Clean surface and repair welding head

If there is oil stain on the repairing place, you can clear away with alcohol and acetone, the oxide film on it can be cleared away with abra sive cloth or abrasive stick, the anti-rust oil and oxide film on the repairing material also can be cleared away in this way. Enlarge the hole to the deep and small hole (pinpoint hole) and bluff hole, the methods as follows: choose the power state at the precise place, make the welding mode in the state of connecting, adjust power indication value for about 500-700, use ball welding head (the size of welding head depends on the size of enlarging hole, in general, the welding head is $\phi 3-\phi 5$) to press on the hole, turn on the starting switch with foot, let the tip of hole wall fuse and change into a ball pit, so as to increase the welding face between repairing material and work piece. (Refer to following diagram), if the flaky small holes, you can grind away about 0.1mm thickness of surface with electric grinder.

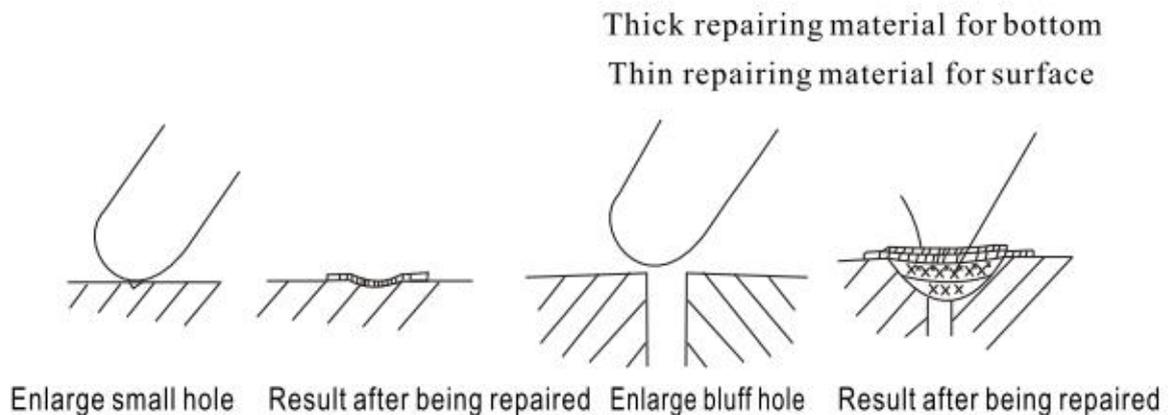


Diagram for after enlarging hole and then repairing

The welding head is sorted into two types; one is the round rod whose top is the half ball, we name it ball welding head, it can roll continuously and press welding on the repairing material, has stable contacting surface so as to make sure repairing quality, it is the welding head used most. The other is named plane welding head, it is specially manufactured for making up for the interior angle place that the ball welding head can't weld, its contacting part of terminal is made into a plane usually. It is suitable for repairing the base angle place. (Refer to following diagram)



Diagram of repairing Plane welding head for base angel Diagram of repairing Side welding head for base angle
 Diagram of plane welding head

The contacting surface of plane welding head is 1-2mm best, if it is too small, it will result in tip electric arc discharging and cause the work piece shows discharging pit, if it is too big, it will cause the false welding for lack welding power. Whichever welding head, all of them shall be corrected so as to make sure the contacting surface is smooth.

C. Power selection: the power size depends on the thickness of repairing material. The mating situation as shown following in table:

Table 1

Display value of power	Thickness of repairing material in the routine state	Thickness of repairing material in the precise state
300	0.10mm	0.03mm
400	0.12mm	0.04mm
500	0.14mm	0.05mm
600	0.16mm	0.06mm
700	0.17mm	0.07mm
800	0.18mm	0.08mm
900	0.19mm 0.25mm	0.09mm
1000	0.20mm 0.40mm	0.10mm 0.15mm

The data listed in the table is supplied for standard welding head ($\phi 5$ half ball welding head). In general, the larger contacting area between welding head and repairing material, the higher power required by repairing material. According to practical situation, user can increase and decrease the data referring to table 1.

Check if the power is proper for the repairing material by means of testing welding, try to weld the unimportant small part of the repairing material, then file the small part with file, if filing up to 1/2 thickness of repairing material, it has pit that may be caused by higher power or less contacting area of welding head. If the repairing material is finished filling, there will be stripping at the repairing part of welding, which indicates that the power is lower or the rolling is not even and there is welding missed.

Notice: During transferring the routine state into precise state, because the high voltage of energy stored capacitor can't step down at once, the machine will make the alarm for higher voltage. Just switch off the power, then turn on the machine again after 2s.

D. Turn on machine: turn on the power switch of main machine, the power indicator lamp goes on, after making three short whistles and one long whistles, the system accesses to the state of ready for repairing.

E Repair: the welding method that the welding head presses the repairing material firmly, stepping on the starting switch with the foot, there will be a welding spot. If the switch of welding mode is in the continuous position, stepping on the starting switch with the foot, there will be continuous welding pulse, by means of rolling the welding head slowly, make the one welding spot close up to the another, thus, the repairing material can be welded tightly on the work piece. The pressure for pressing work piece shall be proper, if the pressure is too little, it will lead that the welding head fails in contacting with repairing material and spark shows; if the pressure is too big, the welding efficiency reduces. The general repairing method as follows: Basing on choosing proper repairing material and power, select single point state for welding mode, locate the repairing material (clear away the anti-rust oil and iron rust, if any) at the repairing place required with several welding spots, then select the continuous state for welding mode, roll the repairing material evenly with the welding head. Pay attention that you don't have the welding head press the range beyond the repairing material, to prevent welding pit on the work piece. If you need multi repairing material to be used for increasing width or thickness, you can complete the operating with the same methods.

Notice: When repairing, please press the repairing material with the welding head, turn on the foot switch, after finishing repairing, please turn off the foot switch at first, then remove the welding head, otherwise, the operation would be illegal, the protection system would close, output and alarm, when the system accesses to the protection state, only turning off the foot switch, the system can exit the protection and enters into the monitor state again, in addition, when repairing, please wear the protection glasses, to prevent damaging eyes for high-temperature splashing material.

Causes of bad repairing and solutions:

① Difficult to repair enough for the defect of edge angle: (example: defect of edge angle before repairing is only 0.1mm, but it is still not enough given two-layer 0.1mm thickness.) The reason that the contacting area is quite small under the edge angle, and the welding power is higher, the repairing will be fused and ejected, the solution that you can reduce the welding power, change the welding part and direction of using force, keep away from the cusp of edge angle, weld on the both side, refer to following diagram.

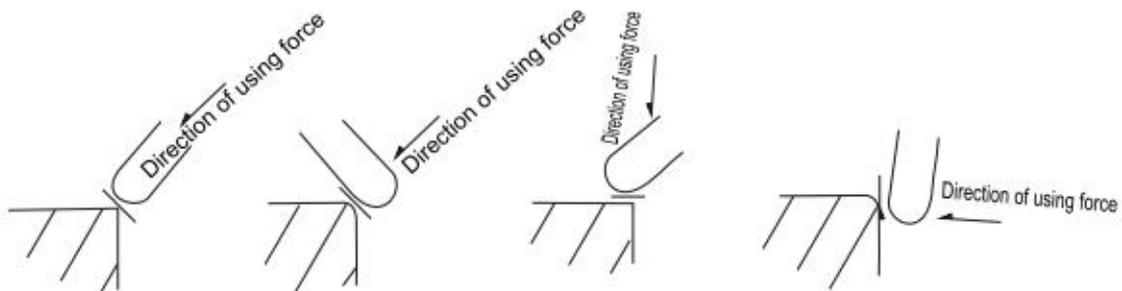


Diagram of incorrect repairing edge angle Diagram of correct repairing edge angle

② Find many pinholes after finishing at repairing place: the reason as follows: the welding power is too high or the contacting area between welding head and repairing material is too small (such as the welding head is too small or too tip), which causes the deforming of repairing is too large, besides, there are impurities like air, oxide layer, copper of welding head getting in the repairing material during rolling again and again. The solution as follows: repair with the thinnest repairing material so that lower power can be used, de form of repairing material can be reduced, make sure the purity of repairing material, also get ride of pinholes. (when welding again, please grind away 0.1mm with electric grinder, then repair).

③ There is seam or slim holes in the outer ring of repairing point: it is caused by two reasons, so you shall distinguish the m. One reason: welding power is not enough, which leads the repairing material strips little, then, outer ring of repairing point shows circularity defect after being repaired and trimmed, however, the pit at edge is quite even before being repaired. Solution: you can increase welding power or reduce the thickness of repairing material. (if welding again, please clear away the original repairing material). The other reason: impurity such as the oxide layer on the work piece takes effect, the area welded is not enough during being repaired, and all defect parts haven't been welded, then, the bluff holes or pits at the edge shows before being repaired. Solution: clear away the impurity and increase the contacting area with the enlarging hole method, make the pressure welding area larger than defect part.

④ There is little protrusion after the outer ring of repairing point is finished: reason as follows: the heat from work piece being repaired causes the basal material of work piece happens harden quenching, it is obvious that the material with fine quenching happens this situation. Solution: use the thinner repairing material (0.05mm), thus, the lower welding power can be got, the harden quenching of basal material can be reduced.

⑤ There is little pit after repairing point is finished: reason as follows: the hardness of repairing material is lower than that of basal material, the work piece having been quenched or azotized almost happens this situation. Solution: Take spring steel as the repairing material, Make use of its fine property of quench hardening, thus, the hardness of repairing point material approximate to that of basal material, the pit of repairing point can be removed.