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北极星
NSTAR

E-9188A+型 智能保护工模具冷焊机 (新一代冷焊机) 使用说明书



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尊敬的用户：您好！

首先感谢您购买公司产品，公司全体员工以真诚的态度对待每一位用户，我们衷心的希望您在使用本公司的产品以后，能为您带来工作的便利、降低费用、节约成本，提高您的产品市场竞争力，希望您能提出宝贵的意见和建议。

已通过ISO9001:2000国际质量管理体系认证

一、概述

本机工作原理：本机可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的连接点，接触电阻使它们迅速发热而熔接在一起，达到修补目的。这种修补方法，发热范围小($<1\text{mm}^2$)、时间短(ms级)，产生的平均热量很少；所以就工件基体来说，发热很少，故不会产生工件变形、退火、变色现象。这也是本机又称冷焊机的主要原因。

本机非常适用于工件的少量缺损(如加工缺陷，碰撞损坏、氩焊不足、铸造缺陷和积累磨损等)的修复。使用本机对工具或模具作适当的修补，可大大延长它们的使用寿命，有时甚至可以产生起死回生的效果。

本机是塑料行业提高产品质量、降低修剪费用的得力工具；也是铸造行业提高成品率、降低生产成本的理想选择

E-9188A型是我公司自主开发的工模具修补机中的最新产品，它具有以下优点：

1. 熔接强度高：完全冶金融接，修补处可铣、锉等后期加工。
2. 修补精度高：使用薄片补材修补，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(使用厚度0.035mm的补材)。
3. 适用范围广：除铜、铝等电阻率极低的材料和硬质合金外，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. 功率分配合理：使用微电脑芯片控制，0.03-0.22mm间的各种厚度的材料都能获得最佳功率。
6. 多种焊接模式：6种模式选择，适应不同焊补要求。
7. 电压适应范围大：使用开关电源，当电压变化在 $\pm 20\%$ 的范围内波动时，机器仍能保证正常工作，并维持稳定的输出功率。
8. 异常操作保护功能：保护工件表面，免受不当操作引起的损伤。
9. 电连接方便：配有强磁连接器，任意大小的铁质工件均可很方便地接地。
10. 携带方便：整机体积小，(370×200×150)mm³重量轻，8kg

二、性能指标

可修补材料：除铜、铝等电阻率极低的材料和硬质合金外，各种金属材料均可修补。

可修补项目：

1. 工模具使用过程中产生的局部磨损。
2. 制造过程中加工缺陷，如铸造缺陷、尺寸超差、棱角损伤、氩焊不足等。
3. 型腔的锈蚀斑等凹陷。

使用电源：单相220V $\pm 20\%$ 50Hz

功率消耗：5-700W

瞬时最大功率：大于30KW

功率模式：0-5，共6连续输出时脉冲频率：2.8-100Hz，微电脑自动控制。

功率模式：0-5，共6种

主机体积：370×200×150mm³

重量：8kg

三、操作面板与安装示意图

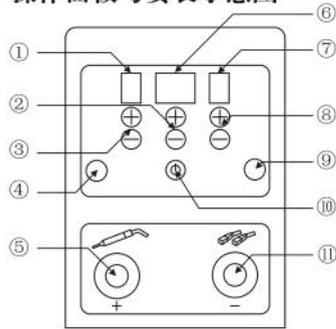


图1-前面板

- ① 模式显示
- ② 补材厚度选择
- ③ 模式选择
- ④ 精密焊接输出
- ⑤ 正极输出接线柱
- ⑥ 补材厚度显示
- ⑦ 焊头直径选择
- ⑧ 焊头直径选择
- ⑨ 脚踏开关插座
- ⑩ 开关按钮
- ⑪ 负极输出接线柱

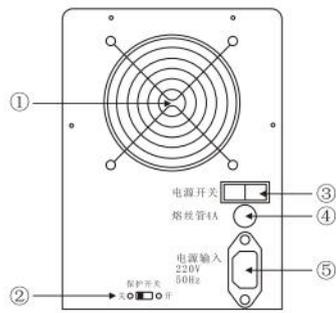


图2-后面板

- ① 冷却风机
- ② 保护选择开关
- ③ 电源开关
- ④ 保险熔丝管座4A
- ⑤ 电源输入 AC220V AC50Hz

安装

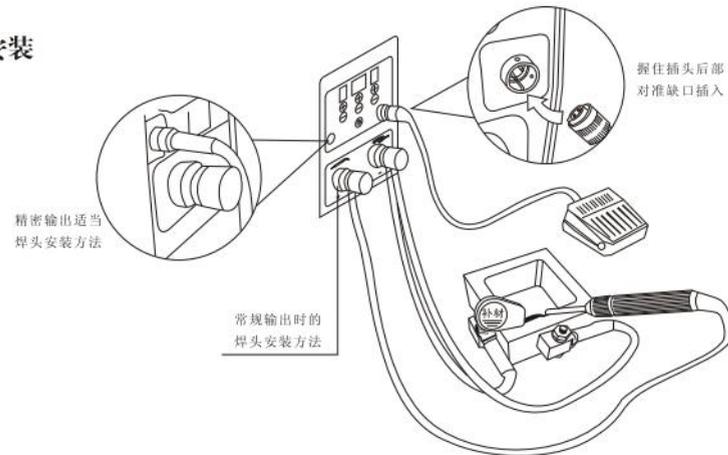


图3-前面板安装方法

前面板部分：

1. 将焊头电缆(直径较粗的一条)拧紧在“输出正极接线柱(5)”上(见前面安装图)；
2. 将磁铁电缆(直径较细的二条)拧紧在“输出负极接线柱(11)”上(见前面安装图)；

注意：必须同时使用两条磁铁电缆，否则会导致输出功率减小！

3. 将脚踏开关连接插头插入“脚踏控制开关连接插座(9)”插入时要手握住插头后部；使插头上的凹槽对准插座的凸筋；轻轻推入即会自动锁住。如果要拔出插头时，用手握住插头外套往外拉出即可(见前面安装图)。

4. 如果要使用精密焊头焊接，只要将精密焊头插头旋入“精密焊接输出端(4)”即可(见前面安装图)。(插拔方法同上)

后面板部分：

1. 将插头插在220V50Hz的单相插座上，插座的接地线必须良好接地。
2. 将总电源开关拨在“开”位置。

四、使用

提醒：在某些部位进行焊接时，可能会有飞溅物，必须戴防护眼镜(随机配件中有)保护眼睛。

1. 待机充电：打开后面板上的总电源开关，机器即处于待机状态，电源开关指示灯亮。
2. 开始工作：在待机约30秒后，再按面板上的电源控制开关键，机器会显示下1082四个数字。如果待机充电的时间不足30秒，就按电源控制开关键，则机器显示1082四个数字后会马上熄灭，只有第一位数显示“7”。必须要等待满30秒，机器才能正常工作。
3. 根据待焊处的平整度选择模式。模式范围：0-5。如果待焊接处凹凸不平、高低较多，则选用0模式较好。因为0模式时，补材变形大，焊接时容易与工件结合紧密。使用0模式时，最好关闭异常操作保护功能，否则机器可能会关断输出并报警。如果待焊接处较光滑或为棱角位置，则选择4模式较好。因为4模式时，补材变形小，焊接后表面平整精确。

一般情况下，1模式和2模式是最常用的模式。

4. 单点焊接模式一模式5使用说明：
单点模式与E-9188A型单点模式一致单点焊接模式，配合单点焊接专用焊枪，适用于五金行业中的单面双极的焊接，例如电池、徽章、标牌等背面不能有焊痕的工件。可焊接材质：各种黑色金属(铜、铝和部分电阻率过小的金属材料除外)。

单点焊接专用焊枪不属于标准配件，需要的客户，可与我公司联系购买。
5. 根据需要选择焊头直径。方法：按住“+”或“-”键可加减显示数字，按键时间超过1秒钟数字会自动连续加减。直径数值范围：1-5。直径数值选择越大，输出功率越大。推荐的方案是：直径5mm的焊头，1.5mm或1mm的底角焊头，选择数值5；直径2.5mm的焊头，选择数值2或3。

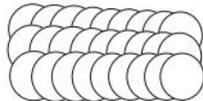
6. 根据需要选择补材厚度。方法：按住“+”或“-”键可加减显示数字，按键时间超过1秒钟数字会自动连续加减。厚度数值范围：03—22。厚度数值选择越大，输出功率越大。推荐的方案是：厚度0.10mm的补材，选择不小于10的厚度数值。

7. 吸合磁铁：将两个磁铁分别同时吸合在工件的非工作面上。请务必保证吸合处通电良好，最好是吸合在干净光亮的平面上。如果工件是由多块材料拼镶而成的，最好将磁铁吸合在待焊接面所在的那块材料上，参见第4页图(4)。



图4-操作顺序

8. 开始修补：将选好的材料放在工件的缺损处，焊头放在补材上，稍用力压住，然后踩脚踏控制开关。此时，焊头和机器会产生有节奏的振动，补材上能看到熔接的痕迹。跟随焊头和机器的振动节奏，慢慢滚动焊头，产生连续的熔接线，多条紧密排列的熔接线就形成一个完整的焊接面。如果焊一层补材不够高度，可多次多层叠焊，但要保证每层都焊接紧密。焊点的排列密度见左面示意图。



9. 异常操作保护功能：将后面板上的保护开关选择在“开”位置时，机器的异常操作保护就被打开。在保护功能打开的情况下，如果在焊头接触工件前先踩下脚踏控制开关，机器会自动关断输出，并发出报警声。如果在焊接时焊头不小心滑脱，机器也会立刻关断输出并报警，防止焊头将工件的完好表面烧损。将后面板上的保护开关选择在“关”位置时，机器的异常操作保护就被关闭，机器就不会产生以上保护动作。

10. 精密焊枪：如果感到常规焊枪和电缆太粗笨，影响对精密工件的修补，此时可以选择精密焊枪。只要旋入精密焊枪，机器就会自动降低输出功率，最大焊接厚度降为12，焊头直径选择限制在4以下，焊接脉率降为原来的四分之一。（精密焊枪使用图见第3页图3。）

五、工艺技巧修补

1. 补材的选用：

随机附带的补材有合金钢(H08Mn2Si)、不锈钢(1Cr8Ni9Ti)、弹簧钢(70号高碳钢)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(硬度在20HRC左右)的性质，但不适合表面需烂花的模具。

弹簧钢淬硬特性较好，修补处具有自行淬火特性，故硬度较高(硬度>50HRC)，适用于已淬火的和最终需要淬火的模具，用弹簧钢焊接后焊点脆性较大。

与弹簧钢性能类似的材料有T10等含碳量适中的工具钢，通常情况下含碳量越低材料修补后韧性越好。

另外，有些热作模具是3Cr2W8V或进口的H13、8407等材料制成的，需要用相应的材料做补材进行修补。

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0.08mm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. 焊头的选择

焊头主要分两类：一类是球形焊头，另一类是底角焊头。

球形焊头的顶端为半球形的圆棒，随机有两种规格，一种是 $\Phi 2.5\text{mm}$ 的，另一种是 $\Phi 5\text{mm}$ 的。球形焊头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。使用球形焊头时，一定要注意保持它的球形形状，不要锉成尖锥形，防止虚焊产生。

底角焊头，是为了弥补球形焊头不能焊到内角边角处而专门制作的，其端部接触部位常做成平面。随机有两种规格，一种是1mm的，另一种是1.5mm的。底角焊头，适用于底角处的修补(如下图所示)。底角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整，保证接触面光滑。保持焊头光滑和尽量不用尖锐的焊头，能减少工件表面沾上焊头铜质的机会，从而提高焊接质量。



底角焊头示意图

4. 修补前的准备

去除污物：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干净。不洁净的表面或补材会影响修补质量，炸，虚焊等。

氮化件的准备：

有些氮化的工件，其表面材质里面有很多氮气。焊接时的高温会使氮气膨胀，将表面一层材料与主体剥离。常用的解决方案是：用电磨磨去氮化层，再放材料焊补。或者先不放补材，单用焊头放电熔焊一次，使氮化层中的氮气挥发一部分后再焊，也会明显改善焊接效果。

扩孔：

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：将厚度数值选在06-09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，踩脚踏开关，使孔壁的尖端处熔化，变成反球形凹坑，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。



5. 修补常见问题

1) 棱角缺损修补不足：

例子：原来棱角缺损量只有0.1mm，但补上去二层0.1mm厚的补材还是不够。

原因：产生这种现象的原因是棱角处接触面积较小，相对来说焊接功率偏大，补材被熔化抛出。

解决办法：减小焊接功率，改变焊接部位和用力方向，避开棱角的尖峰，在两侧面处焊接，如下图所示。



2) 修补、处抛光后发现许多细小针孔：

原因：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。

解决办法：请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，保证补材的纯度，也就消除了修补处的针孔现象。重焊时应先用电磨打磨去0.10mm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。

一种是修补前是边缘较平坦的凹陷，修补平整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，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)。

另一种是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；氮化后的模具修补前没有做好准备工作，也会产生修补点外圈有细缝的现象，只要将需补部位的氮化层全部磨掉再焊即可。

4) 修补点外圈抛光后有轻微突起：

原因：焊接过程中产生的热量，可能会把某些淬硬特性很好的工件基体淬硬。

解决办法：底层(与工件直接接触的一层)用较薄的补材如0.05mm，这样就可以用较小的焊接功率修补，减小被淬硬基体的厚度，从而减轻修补痕迹。抛光前先用1200粒的油石磨平后，再用羊毛轮作短时间抛光，痕迹就会更小。

5) 修补点打光后有轻微凹陷：

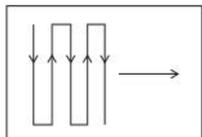
原因：补材硬度低于基体硬度，这种现象多发生在已淬火或氮化的工件上。

解决办法：用硬度较高的材料作补材，利用其良好的淬硬特性，使修补点的材料硬度接近基体的硬度，消除修补点凹陷的现象。

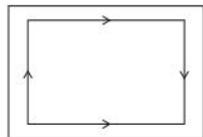
6) 修补点经过热处理后产生气泡状脱落：

原因：修补时的高温将空气溶化在金属内，而热处理时高温又使空气受热膨胀，就会在修补处鼓出一个气泡。

解决办法：在焊接时使熔接线紧密均匀地从补材的一边到另一边依次排列，不能先将四边焊好了再焊中间，或者第一遍焊接时剩下许多空白点，然后再通过焊两遍、三遍完成焊接。



正确的焊接顺序



错误的焊接顺序



精密焊头的保修

精密焊枪除了要经常清理焊杆的氧化层外，使之旋入插座时要旋紧，以增加与输出插座的接触面，保障输出功率。同时，可防止旋入端与插座因打火而粘连。

六、标准装箱清单

主机	一台	熔丝管 (4A)	四只
输出正极连接线(带焊头)	二根	锋钢铁皮剪	一把
输出负极连接线(带磁性连接器)	二根	焊头	四支
精密焊头连接线(带焊头)	一根	不锈钢补材(0.05;0.10;0.15;)	一套
平光防护眼镜	一副	弹簧钢补材(0.10)	一套
脚踏控制开关(带连线)	一只	仪器质量反馈卡、说明书、合格证、保修卡	各一份
电源连接线	一根		

以上附件，本公司长期供应。

本机自售出起对主机保修一年。其它附件易损部件，不在保修范围之内，请谅解。

七、常见问题及解决方案

故障现象	产生原因	排除方法
开机无显示	机器无电源输入或熔丝管断	检查输入电源和更换熔丝管
焊接功率减小甚至无焊接能力	强磁连接器有污染物或吸合在不干净的金属表面，接线柱螺母松动。焊把转动部位太脏	1. 清理强磁连接器和工件结合部位，拧紧接线柱螺母 2. 拆开焊杆将接触部分清理干净，并调整好接触压力。
踩脚踏开关时，机器有报警声，不能焊接。	在异常操作保护“开”的状态使用“0”模式	不要将模式选择在“0”，或者将异常操作保护关掉。
	焊头与补材接触不好或焊头内部接触不好	1. 清理工件待补处，使之呈现金属光亮； 2. 将焊头修整光滑 3. 拆开焊杆将接触部分清理干净并调整好接触压力。
	还未接触工件时脚踩了开关	反复训练，做到每次焊接先放焊头并施压，再踩脚踏开关结束焊接时，先放松脚踏开关再提起焊头。
	磁铁与工件连接不良	将磁铁吸合在干净光亮而且与待补处是同以一体的工件上(防止拼接处接触不好)。如有氧化层应清理干净后再吸磁铁，磁铁的铜皮应保持清洁，不能有铁屑等杂物。
机器工作几十分钟后停机，并在模式显示窗显示“1”其它几个数字全灭。	这是机器的保护动作，一般是由于温度太高引起，可能是风扇不转或者进出风口被堵住。	检查风扇；移开挡物，使机箱左右保持10厘米后部保持15厘米的通风空间，或待机几分钟后工作。
厚度选择最大只能到12并且焊头直径只能达到4，焊接频率明显降低。	这种现象说明机器工作在精密焊接状态	如果要使机器工作在大功率的常规焊接状态只要拔出精密输出插头即可使机器退出精密焊接状态。

产品合格证

品名	
型号	
出厂编号	
检验员	
备注	检验合格、准予出厂

产品保修卡

客户姓名		联系电话	
详细地址			
产品型号		出厂编号	
购机日期		发票号码	
购机地点			
经销商			
故障发生日期			
故障现象			
维修记录			

产品保修细则

- 1、自购买之日起，本公司负责主机保修一年，对元件正常的损坏，本公司负责免费修理。
- 2、保修期内因不正当使用或自行拆卸导致损坏，如需修理，则要适当收取修理费和零件费。
- 3、保修期内，如产品有任何质量问题，可凭保修卡或购机发票到本公司或就近的分公司维修。
- 4、保修卡请妥善保管，并在保修时出示本卡和购机票据，如遗失，则本公司不负责免费维修。



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E-9188A⁺ Intelligent Protection Tools & Moulds Cool Welding Machine

New Generation Cold Welding Machine

User's Manual



YUEQINGSHI NORTH STARELECTRON CO.,LTD

Dear Users: How are you!

Congratulations on your purchase of the production of our company! Our company treats every customer in a faith attitude and we sincerely hope that our products can bring you conveniences, lower and reduce costs, improve your product market competitiveness after using our products. We hope your can put forward valuable comments and suggestions.

Our company has passed ISO9001: 2000 international quality management system certification.

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I. General

Working principle: the machine can instantaneously release the electric energy stored in the capacitor to the connecting point of work pieces and repairing materials which are composed of metal materials of large resistance, such as steel, to contact the resistance to rapidly heat and weld together for repair welding. This repair welding is characterized by heating in small range (<1mm²), short time (ms level) and at low average heat value. The work piece body is heated a little without any deformation, annealing and fading. This is the main cause to call the machine as the cool welding machine.

The machine is extremely suitable for repairing small defects on the work piece (such as processing defect, collision damage, inadequate argon arc welding, founding defect and accumulative abrasion). The tool or die, after properly repaired by this machine, can largely prolong the service life, even has a miracle effect.

The machine is an important tool for plastic industry to improve the product quality and reduce the repairing and cutting expense, and an ideal option for foundry industry to improve the finished product ratio and reduce the product cost.

E-9188A+ type is the latest tools & moulds repairing machine developed by our company, which has the following advantages:

1. High welding strength: full metallurgical fusing, the repairing places can be subject to milling and filing and other post-processing.
2. High repairing precision: use sheets repairing materials to repair, without lose the original base level, less redundant solders, and easy for post-phase shaping. The minimum repair amount is 0.03mm (repairing materials of 0.035mm in thickness is used).
3. Wide application: the workpieces made of various metal materials can be repaired other than the materials and hard alloys of rather low resistivity such as copper and aluminum, etc.
4. Less damage to base materials: small hot spots, without causing annealing and deformation of base materials.
5. Reasonable distribution of power: microcomputer chip control is adopted, and various materials of different thickness from 0.03mm to 0.22mm can obtain the best power.
6. Multi welding modes: 6 types for selection, adapting to different welding and repairing requirements.
7. Large adaptive range of voltage: the switching power supply is used. When the voltage changes within the range of $\pm 20\%$, this machine can work in normal state and maintain a stable output power.
8. Protection function against abnormal operation: it protects the surface of workpiece against damages caused by misoperation.
9. Convenient for electricity connection: with strong-magnetic connector, it is very convenient for connection and installation of various iron workpieces.
10. Easy to carry: small size of the whole machine: (370×200×150)mm³, light weight: 8kg.

II. Performance indicators

Scope of application: the workpieces made of various metal materials can be repaired other than the materials and hard alloys of rather low resistivity such as copper and aluminum, etc.

Applicable for:

1. Partial wearing generated during using of tools and moulds.
2. Processing defects in the manufacturing process, such as casting defects, size over-tolerance, corner damage, insufficient argon welding, and so on.
3. Corrosive pits of cavity and other defects.

Power: single-phase 220V $\pm 20\%$ 50Hz

Power consumption: 5-700W

Instantaneous maximum power: over 30KW

Power mode: 0-5, totally 6 modes, continuous output pulse frequency: 2.8-100Hz, automatic microcomputer control.

Power mode: 0-5, totally 6 modes

Host size: 370×200×150mm³

Weight: 8kg

III. Operation panel and installation diagram

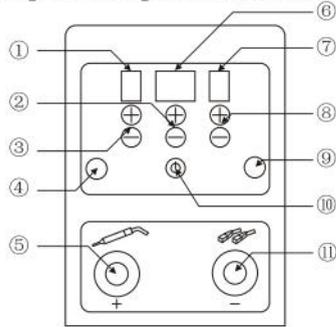


Diagram 1: Front panel

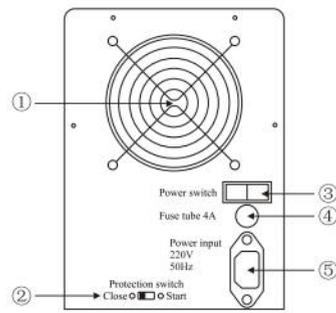


Diagram 2: Rear panel

- | | |
|--|----------------------------------|
| ① Mode display | ⑦ Welding tip diameter display |
| ② Repairing material thickness selection | ⑧ Welding tip diameter selection |
| ③ Mode selection | ⑨ Foot switch socket |
| ④ Precise welding output | ⑩ Switch button |
| ⑤ Positive output terminal | ⑪ Negative output terminal |
| ⑥ Repairing material thickness selection | |

- | |
|-------------------------------|
| ① Cooling fan |
| ② Protection switch selection |
| ③ Power switch |
| ④ Fuse tube seat 4A |
| ⑤ Power input AC220V AC50Hz |

Installation

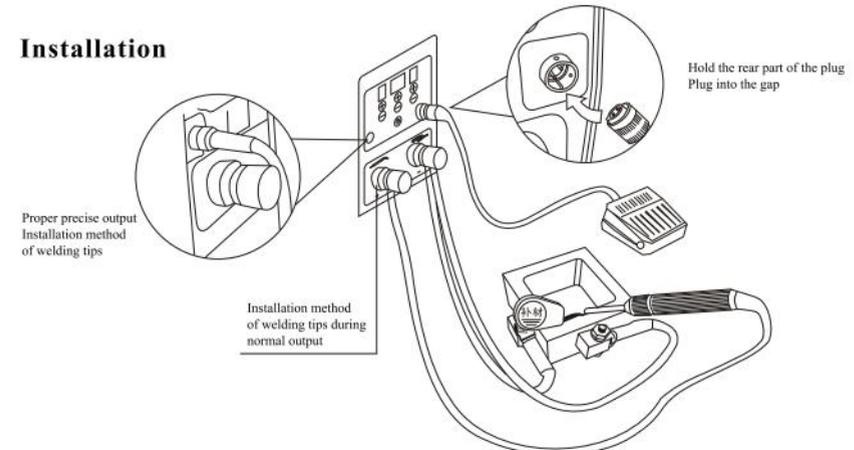


Diagram 3: Installation method of front panel

Front panel part:

1. Screw down the welding tip cable (the larger one) to "positive output terminal (5)" (see the above installation diagram);
 2. Screw down the magnet cable (two smaller cables) to "negative output terminal (11)" (see the above installation diagram);
- Note: two magnet cables should be used at the same time; otherwise, the output power will be reduced.
3. Insert the foot switch connecting line plug into "foot control switch socket (9)" hold the rear part by hands when inserting, align the plug groove to the raised rib on the socket, lightly push it and automatically lock. Hand the plug cover by hands to pull out (see the above installation diagram), if pulling out the plug.
 4. If it's welded by the precise welding tip, it's only needed to screw the precise welding tip into "precise welding output end (4) (see the above installation diagram)". (It's same with pulling and inserting above.)

Rear panel part:

1. Insert the plug into a 220V50Hz single phase socket. The socket should be grounded well.
2. Switch the main power switch to "ON"

IV. Use

Note: splash may happen to welding on the some parts and protective glasses should be worn (available in accompanying accessories) to protect eyes.

1. Standby charge: switch on the main power switch on the rear panel to allow the machine in a standby mode. The power indicator light is on.
2. Work starting: repress the power control switch button on the panel after about 30s standby, 1082 will be displayed on the machine. If press the power control switch button within 30s standby charge, 1082 will be displayed on the machine and instantly out, and "7" in the first position will be displayed. The machine can work normally only after 30s standby.
3. The mode is selected according to the flatness of welding spot. Mode range: 0-5. If the welding spot is extremely uneven, it's better to select Mode 0. The repairing materials are largely deformed on Mode 0, and easy to tightly bond with the work piece upon welding. When it's on Mode 0, it's highly recommended to switch off abnormal operation protection functions; otherwise, the machine may cut off the output and alarm. It's better to select Mode 4 for smooth welding spots or the welding spot at edges and corners. The repairing materials are deformed a little on Mode 4, and the surface is flat and accurate after welding.

Generally, Mode 1 and 2 are most commonly used.

4. Single point welding mode: use description of Mode 5

The single point mode is the same with E9188A single point mode, and suitable for the single face double pole welding in the hardware industry together with special welding gun for the single welding spot, such the work piece which should not have welding trace on the back, such as battery, badge and trademark. Weldable material: all ferrous metals (except copper, aluminum and low resistance metal).

The single point welding special welding gun is not the standard accessory. If needed, please contact us.

5. The welding tip diameter is selected according to actual situation. Method: press "+" or "-" button to increase or decrease displayed figure. If pressing is more than 1s, the figure will be automatically and continuously increase or decrease. Diameter range: 1-5. The output power increases along with the increase of the diameter value. It's recommended that figure 5 is selected for the welding tip of 5mm diameter, 1.5mm or 1mm bottom welding tip, and 2 or 3 for the welding tip of 2.5mm diameter.

6. The repairing material thickness is selected according to actual situation. Method: press "+" or "-" button to increase or decrease the displayed figure. If pressing is more than 1s, the figure will be automatically and continuously increase or decrease. Thickness range: 03-22. The output power increases along with the increase of the diameter value. It's recommended that the figure less than 10mm is selected for 0.10mm thick repairing materials.

7. Magnet absorption: two magnets respectively absorb to the non working face of the work piece at the same time. Please ensure the power on at absorption. It's best to absorb on the clean and bright plane. If the work piece is molded by many materials, it's best for the magnet to absorb on the welding surface of the welded material. See to Diagram 4 on Page 4.

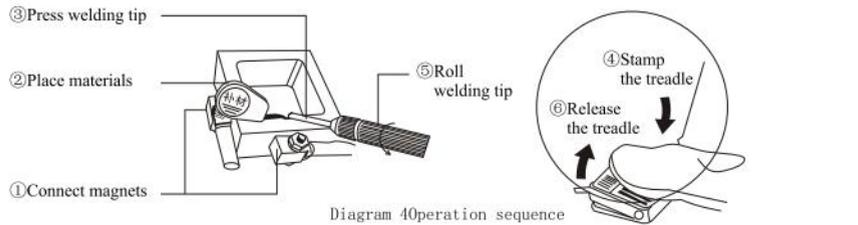
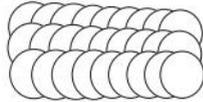


Diagram 4: Operation sequence

8. Start to repair: place the selected material on the defect and the welding tip on the repairing material, forcefully press and step the foot control switch by a foot. The welding tip and the machine will generate regular vibration at this time and the welding trace is visible on the repairing material. Roll the welding tip along with the vibration rhythm of the welding tip and the machine to generate continuous welding lines. Multi welding lines are compactly arrayed to form a whole welding face. If one layer of the repairing material is not high enough, multilayer welding can be overlapped. Tight welding should be ensured on the every layer. The array density of the welding spot is shown in left diagram.



9. Abnormal operation protection: switch the protection switch on the rear panel to "ON" to turn on the abnormal operation protection of the machine. If the protection function is on and step the foot control switch before the welding tip contacts the work piece, the machine will automatically cut off the output and alarm. If the welding tip is falling during welding, the machine will also instantly cut off the output and alarm to prevent the fine surface of the working piece damaged by the welding tip. If the protection switch on the rear panel is switched off, the abnormal operation protection of the machine will be off and the machine will not generate the above protection action.

10. Precise welding gun: if it's thought that the normal welding gun and the cable are not proper and affect precise work piece repairing, the precise welding gun can be selected. The machine automatically reduces the output power upon the precise welding gun screwed into. The welding thickness is low to 12 and the welding tip diameter is limited to less than 4. The welding pulse frequency is low to 1/4. (The use diagram of the precise welding gun is shown in Diagram 3 on Page 3.)

V. Process skill repairing

1. Selection of repairing material :

There are three materials together with machine supply, alloy steel (H08Mn2Si), stainless steel (1Cr8Ni9Ti) and spring steel (number 70 high carbon steel).

The alloy steel can be bonded well with most of die steel, have a proper hardness at repairing spots (hardness: about 30HRC), is easy to dress well at the post phase, and have a similar color with most of die steels; so the repairing trace is small. And the repairing spot can be treated by opal printing and .nitrogen.

The stainless steel repairing material can resist the corrosion well, and be bonded well with all materials. The repairing material has a good toughness (hardness: about 20HRC), but is not suitable for the die that needs the opal painting on the surface.

The spring steel is hard; the repairing spot can be automatic quenching and has a strong hardness (hardness>50HRC). It's suitable for the die that has been quenched and needs final quenching. The welding spot has a strong brittleness after welded by the spring steel.

The material that is similar to the performance of the spring steel is tool steel that has a proper carbon content of T10. Generally, the material that has lower carbon content is a better toughness after repair welding.

In addition, some hot work dies made of 3Gr2W8V or imported H13 and 8407 need the according repairing material for repair welding.

2. Selection of repairing material thickness:

The selection of the repairing material thickness is decided by the surface cleanness of repaired die and the repair quantity. If the cavity surface with strict cleanness requirements is to be repaired, it's recommended the repairing material is less than 0.12mm thick. For some dies that needs no quenching on the cavity and have hard milling materials, the repairing material is selected as less than 0.08mm to reduce the trace generated by heating and hard milling by the base material outside the welding spot.

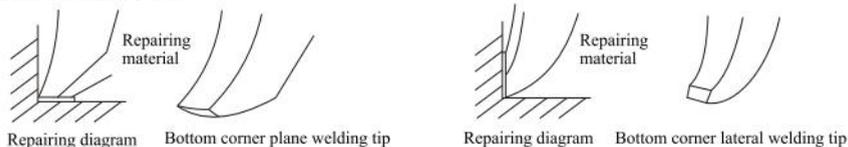
3. Selection of welding tip:

The welding tip is mainly divided into two types, ball welding tip and bottom corner welding tip.

The ball welding tip is a half ball round rod at the top and has two specifications with machine supply, ϕ 2.5mm and ϕ 5mm. The ball welding tip can be continuously welded under rolling and pressing on the repairing material, and has a stable contact area, which can ensure better repair welding quality and is the most commonly used. When using the ball welding tip, attention should be paid to keeping the ball shape, not damaging into the sharp cone and preventing faulty welding.

The bottom corner welding tip is specially made for the place where the ball welding tip can't be welded. Its end interface is made into a plane. There are two specifications with the machine supply, 1mm and 1.5mm. The bottom corner welding tip is suitable for repair welding on bottom corners (see the following diagram). 1-2mm interface of the bottom corner is optimum. Smaller interface will generate tip arc discharging and discharging under working; and larger interface will cause faulty welding because of inadequate welding power.

Every type of the welding tip should be often repaired to ensure a smooth interface. Keep a smooth welding tip, use the flat welding tip as much as possible, and reduce the opportunity that the working surface contacts the copper on the welding tip, so as to improve the welding quality.



Bottom corner welding tip diagram

4. Preparations for repair

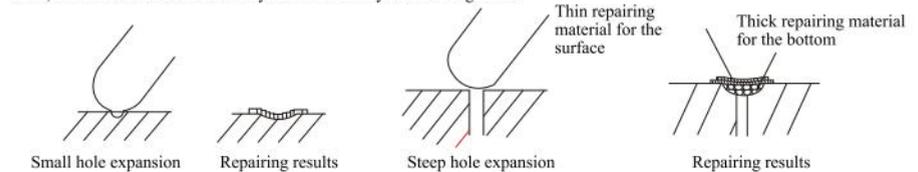
Remove filth: the repairing spot can be cleaned by ethanol or acetone to remove oil stain; and the oxidation film can be removed by emery cloth or oil varnish. The antirust oil and the oxidation on the repairing material should be cleaned in the same way. Unclean surface or repairing materials will affect repair welding quality and cause explosion and faulty welding etc...

Preparations for nitrided work piece:

Some nitrided work pieces have much nitrogen in the material. The high temperature causes the nitrogen expansion upon welding to peel off the surface layer material from the body. The common solution is to remove the nitrided layer by electric grinding and repair welding by material placement or weld for one time by the welding tip discharging to release the partial nitrogen from the nitride layer, and then weld, which will notably improve the welding quality.

Hole expansion:

Deep and small holes (needle tip holes) and steep holes should be going through proper hole expansion as follow: select the thickness between 06 and 09, press the hole by the ball welding tip (the welding tip size can be decided by the expanded hole, generally the welding tip is 3-5.), step the foot switch to weld the tip of the hole wall and form a reverse ball pit, so as to increase the welding surface between the repairing material and the work piece (see the following diagram). If there are small holes in a large area, the surface can be removed by about 0.1mm by an electric grinder.



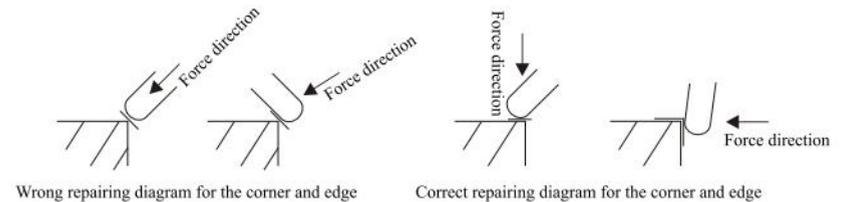
5. Common repairing problem

1) Inadequate repairing on the edge defect:

Example: the defect of original corners and edges is 0.1mm, but repairing for two layers of 0.1mm thick is still not enough.

Cause: the interface area of the corner and edge is too small; comparatively, the welding power tends to be large and the repairing material is thrown away by welding.

Solution: reduce the welding power, change welding spot and force direction, avoid the sharp tip of the corner and edge and weld at both sides as follows:



2) Discovery of many needle holes after repairing and polish removal

Cause: over large welding power or over small interface between the welding tip and the repairing material (for example: the welding tip is too small or sharp etc...) causes over deformation, and such impurities as air, oxidation layer and welding tip copper are into the repairing material during reduplicative rolling and pressing.

Solution: please use the thinner repairing material as much as possible, smaller power will cause little deformation on the repairing material, ensure the purity of the repairing material and eliminate needle holes on the repairing spot. The electric grinder should be used to remove about 0.10mm for re-welding.

3) Minor cracks or holes on the outer ring of the repairing spot

Attention should be paid to analysis on two causes.

One is the flat hollow on the edge before repairing and the circularity defects outside the repairing spot after repairing. Little repairing materials are peeled off upon careful observation, which are caused by insufficient welding power, and can be solved by increasing the welding power or reducing the repairing material thickness (the original repairing material should be thoroughly removed before re-welding).

The other is the steep hole or hollow before repairing. The affection by oxidation impurities on the work piece surface should be considered. Poor preparation for nitrided die before repairing will also cause cracks outside the repairing spot. The nitrification layer should be ground off and repair welding again on the repair welding spot.

4) Minor raise on the outer ring of the repairing spot after polishing

Cause: the heat generated during the welding may hard mill the base material of the fine quenching work piece.

Solution: the bottom layer (directly contact the work piece) is welded under small power and by the thinner repairing material, such as 0.05mm, to reduce the thickness of hard milling base material, so as to reduce repair welding trace. It should be ground well by 1200 whetstones before polishing, and polished by a wool wheel for a short time to have little trace.

5) Minor depression on the repairing spot after polishing

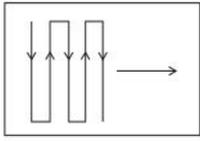
Cause: the repairing material is weaker than the base material, which has happened to the quenched or nitride work pieces for many times.

Solution: use the high hard supplement materials, take advantage of its fine quenching to have a similar hardness of the supplement material to the hardness of the base material and eliminate the depression on the repairing spot.

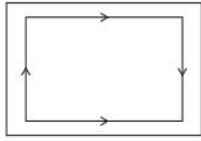
6) Repairing spot falling as air bubbles after heat treatment

Cause: the metal is melted into the air under the high temperature during welding and the air is expanded by the high temperature during heat treatment, so many air bubbles are generated on the repairing spot.

Solution: the welding lines should be evenly arrayed from one side of the repairing material to another side during welding. The welding should not done from four sides to the center, or many blanks should not be left after the first welding, secondary and third welding are done to repair.



Correct welding sequence



Wrong welding sequence



Warranty of precise welding tips

The precise welding gun, except that the oxidation layer should be removed, should be screwed down upon screwing into the socket, so as to increase the interface with the socket and ensure the output power, as well as prevent bonding between the screwing end and the socket because of sparkling.

V. Standard packing list

Host	1 set	Fuse tube (4A)	4 pieces
Positive output connecting line (with welding tip)	2 pieces	Sharp steel scissor	1 piece
Negative output connecting line (with magnetic connector)	2 pieces	Welding tip	4 pieces
Precise welding tip connecting line (with welding tip)	1 piece	Stainless steel repairing material (0.05; 0.10 and 0.15)	1 set
Plain protective glasses	1 set	Spring steel repairing material (0.10)	1 set
Foot control switch (with connecting line)	1 piece	Apparatus quality feedback card, instruction manual, quality certificate and warranty card	1 piece respectively
Power line	1 piece		

The company supplied the above accessories in a long term.

The warranty period for the host is 1 year from sold; except damageable parts of other accessories.

VII. Common troubles and troubleshooting

Trouble	Cause	Troubleshooting
No display after switch on	No power input into the machine or fuse break	Check input power and change fuse tube
Welding power reduction, even no welding capacity	There are pollutants on the strong magnetic connector or absorbed on dirty metal surface. The terminal nut is loosened. The rotary part of the welding holder is too dirty.	1. Clean the interface between the strong magnetic connector and the work piece, and screw down the terminal nut. 2. Disassemble the welding gun and clean the interface, adjust the contact pressure well.
No welding when the machine alarms upon stepping the foot switch.	Use Mode 0 when the abnormal operation protection is "ON"	No selection on Mode "0" or abnormal operation protection "OFF"
	Poor contact between the welding tip and the repairing material or inside the welding tip	1. Clean the metal surface of the work piece to be repaired to be bright 2. Dress the welding tip to smooth 3. Disassemble and clean the contact part of the welding tip, and adjust the contact pressure well
	Step the switch before contacting the work piece	Repeat training, place the welding tip at first, and then execute the welding. When step the foot switch to end the welding, step the foot switch at first, and then take off the welding tip.
	Poor connection between the magnet and the work piece	Absorb the magnet to clean and bright work piece to be repaired (prevent poor contact on the assembly). Clean any oxidation at first, and then absorb the magnet. The magnet copper should be kept clean, without any impurity, such as iron slag.
The machine is off after dozens of minutes' working and displays "E" on the display window, and other figures are out.	This is the protection action by the machine, generally caused by over high temperature, or fan blocked or ventilation port clogged.	Check the fan, remove air block, and keep 10cm ventilation space beside the machine box and 15cm behind the machine box, or startup after standby for several minutes.
The maximum thickness is up to 12 and the maximum welding tip diameter is to 4. The welding frequency is reduced notably.	This shows the machine is under precise welding status.	If the machine is wanted to work at the normal welding status under a large power, please pull out the precise output plug; namely the machine is withdrawn from the precise welding status.

Product certificate

Product name	
Model	
Exwork serial number	
Inspector	
Remark	Only permit the qualified products leave factory, after examining

Maintenance card

Customer name		Telephone	
Detailed address			
Model		Exwork serial number	
The date of purchasing machine		Receipt serial number	
The place of buying machine			
Dealer			
The date of breakdown			
Breakdown			
Service record			

Regulation of maintenance:

1. The company is responsible for the main engine maintain in a year, in the warranty time we will change the normal damage part for the free.
2. In the warranty period because you can not use right, or disassemble voluntarily, which causes the damage, if need repair, we will account the repair expense and the components expense suitably.
3. In the warranty period, if the product has any quality question, you can repair the product in the company or the near subsidiary company service depend on the maintenance card or the receipt of buying machine.
4. Please take care of the maintenance card properly, when repair, please show this card and the receipt of buying machine, if lose them, the company will not be responsible for the free service.