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北极星
NSTAR

E-9188F系列 铁铜铝全能精密模具冷焊机

使用说明书



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

公司简介

公司全套引进德国先进技术，专业开发生产，精密模具修补冷焊机（电火花金属表面强化修复机）、超声波模具抛光机等机电设备。

精密模具修补冷焊机，风靡欧洲，有“模具、金属修补专家”之称。专业修复各类金属设备、机件、模具等。广泛用于模具制造业、航天航空工业、汽车制造修理业、造船工业、机械工业、铸造工业、电力工业、化学工业等领域。

该设备是一种环保型设备、通过对机械零件、模具或工夹具等进行预防保护或进行修补可以为企业节省大笔设备购置和维修费用，对提高产品质量和生产效率，降低成本起到很大的作用。不仅是所有加工制造、维修与表面处理企业不可缺少的有用工具；同时也是个人从事特种修复行业快速致富的好帮手。

公司产品严格按公司质量体系生产，公司已通过**ISO9001: 2000**国际质量管理体系认证。公司本着“诚心创造客户，品质营造未来”的经营理念，为客户提供全面的售前、售中、售后技术支持和服务，竭诚欢迎各界人士垂询惠顾，精诚合作，共创锦绣前程。

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。

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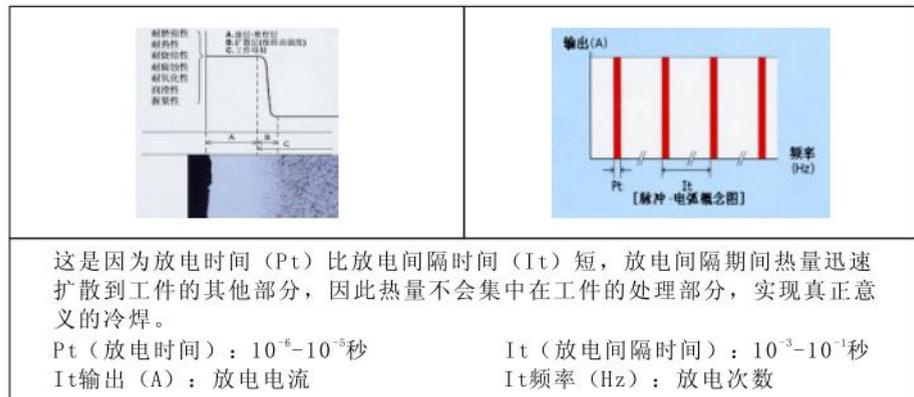
一 概述

目前，随着模具、铸造产业的不断发展。以及对模具和铸造产品等的要求不断提高，特别是越来越多的高端精密模具、铸造产品投入使用，在其制造、使用过程中，不可避免的会出现对模具、铸造产品的伤害，诸如磨损、腐蚀、划伤、针孔、裂纹以及缺损等金属缺陷。传统的修复设备在一定程度上，帮助客户进行修复以节约成本。但也不可避免的出现了一些问题，如修复后容易造成模具、铸造产品变形、硬度降低、内应力、沙眼、损伤甚至报废。

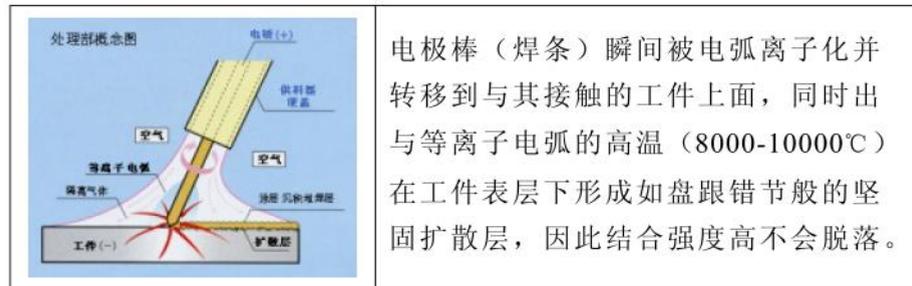
本公司产品精密模具修补冷焊机，又叫金属缺陷修复冷焊机，是利用高频电火花放电原理，对模具、铸件进行无热堆焊，以保证模具、铸件的完好性，也可以利用强化功能对模具、铸件进行强化处理，来实现其耐磨性、耐热性、耐蚀性等等。

二 工作原理

当电极棒（焊条）在工作表面旋转，当某些部位间隙很小时，使主机放电回路形成通路。在他们相互接触的微小区域瞬时流过电流，电流密度可达到 $10^5-10^6/cm^2$ ，而放电时间仅 $10^{-6}-10^{-5}$ 秒，由于放电能量在时间上和空间上高度集中，在放电微小的区域内产生了约 $8000-10000^\circ C$ 的高温，使该区域的局部材料高能离子化，电极棒（焊条）在等离子冶金状态下高速转移到工件表面，并扩散进入到工件表层，形成冶金型牢固结合的沉积层。主机电源放电周期为 $10^{-3}-10^{-1}$ 秒，高频率的放电和电极棒（焊条）在工件表面的高速旋转扫描，可实现大面积高效率的沉积涂层。



为什么能实现“冷焊”（热输入低）？



电极棒（焊条）瞬间被电弧离子化并转移到与其接触的工件上面，同时出与等离子电弧的高温（ $8000-10000^\circ C$ ）在工件表层下形成如盘跟错节般的坚固扩散层，因此结合强度高不会脱落。

三、使用方法

1.工作电压调节

冷焊机的输出电压大小决定其输出脉冲电流的大小，通过电压调节旋钮在40-100V之间连续调节，顺时针调节电压增大，反之减小；在正常工作时，工作电压应大于40V，小于110V。输出电压越高输出功率越大，焊接速度越快，焊接表面越粗糙。

2.工作频率调节

冷焊机工作于窄脉冲大电流状态，频率调节范围40-2100Hz，顺时针调节增大，反之减小；工作时，脉冲频率越高，电极沉积速度越快，焊接表面越粗糙；脉冲频率越低，电极沉积越慢，焊接表面光滑，一般情况下，工作频率为200-500Hz。

3.电极转速调节

调节范围10-1000r/min，顺时针调节焊枪转速增大，反之减小；转速越高，沉积速度越快，表面沉积层越疏松、粗糙。

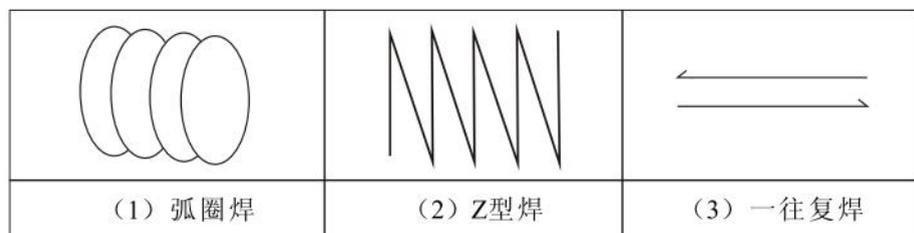
4.保护气体

气体保护可有效提高电极沉积速度和沉积层的致密度，减少沉积层缺陷的形成，一般选用氩气作为保护气体。工作时通过调节器调节氩气流量，通常为5-15L/min。

四、操作参考参数:

- 1.电压表一般在50-90V之间
- 2.频率表一般在200-500Hz之间（如进行强化处理，可调至600-900）
- 3.焊枪转数应在0.20-1.80之间（根据熟练程度而定）
- 4.焊条直径在0.5-3.2mm之间

北极星冷焊机修补三种手法:



操作规范:

- 1.打开焊枪开关，一般情况下焊枪成45度角用上述修补手法进行堆焊。
- 2.拿枪的姿势：像握笔一样，两手紧捏焊枪的枪嘴，尽量把焊枪的重心下压。
- 3.对修复棱角缺损，一般情况下，焊枪应与工件小角度堆焊，逐个面进行堆复。然后进行抛光，即可。
- 4.对修复塌角，最好用焊材的表面（不用焊材的两端）低角度修复，堆复至一定高度，然后逐个面进行堆复，再进行抛光，即可。
- 5.如平面出现沙眼，气孔等缺陷，焊枪角度成90度，轻轻点焊即可，如缺陷较大，可在表面停留几秒。
- 6.对修复精密形产品时，可采取大电压打底，然后用小电压堆复表面（30-50V），抛光后可达镜面效果。
- 7.焊枪手握方式（如右图）



- 8.电压越大，速度越快，修补精密度相对较差。电压越小，速度越慢，修补精密度越高。

五、技术参数:

项目\机型	E-9188F100	E-9188F150	E-9188F200	E-9188F200A
输入(V)	AC220V单相 50/60Hz	AC220V单相 50/60Hz	AC220V单相 50/60Hz	AC220V单相 50/60Hz
最大功率(KVA)	1.0	1.5	2.0	2.8
二次输出电压	20-110	20-110	20-110	20-110
最大容量(UF)	160	320	480	560
频率可变范围(Hz) (放电次数/秒)	40-2100	40-2100	40-2100	40-2100
电极尺寸(mm)	0.5-3.2	0.5-3.2	0.5-3.2	0.5-3.2
尺寸(W*D*Hmm)	470*320*270	500*270*370	530*300*400	530*300*400
重量(kg)	25	31	40	43

六、设备结构



- | | |
|------------|----------------|
| 1. 主机 | 9. 调频旋钮 |
| 2. 旋转焊枪 | 10. 焊枪接口 |
| 3. 220V电源线 | 11. 出气接口 |
| 4. 地线夹 | 12. 地线接口 |
| 5. 电压显示表 | 13. 进气管 |
| 6. 频率显示表 | 14. 氩气瓶 (客户自备) |
| 7. 电压调节旋钮 | 15. 氩气表 (客户自备) |
| 8. 焊枪调速旋钮 | |

七、配套设备



- | | |
|----------|---------|
| 1. 工具箱 | 7. 保护手套 |
| 2. 焊枪 | 8. 保护眼镜 |
| 3. 气管 | 9. 电源线 |
| 4. 扳手 | 10. 地线夹 |
| 5. 氩气表接头 | 11. 说明书 |
| 6. 焊丝 | |

八、注意事项：

不要将焊枪转速调节到最高或最低段，这样能有效的提高焊枪使用寿命；使用冷焊机是需要佩带保护眼镜和手套；工作过程中因电极产生较高温度，切勿电极碰触人体；该设备工作中，电压、频率仪表产生一定的波动，属于正常现象。

九、设备成套件：

主机	1台
工具箱	1支
带3m线地线夹	1组
带3m线焊枪	1把
电源线	1根
气体软管3m	1组
沉积堆焊电极 (2.0*100) mm	10根
保护眼镜	1副
手套	1副
氩气表接头	1支
扳手	1支
说明书	1本

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。



北极星
NSTAR

Use manual



Company profile

We introduce the complete set of vanguard technology and the specialized development production from German, and develop the electromechanical device, such as the precision mold the cold Patching and welding machine (electric spark metal surface strengthening repair machine), the ultrasonic wave mold buffing machine and so on.

The precision mold the cold patching and welding machine, is all the rage over Europe, has been taken as “ the expert of patching the mold and the metal ” .It repair professionally various metalloids equipment, part, mold and so on. It is widely used in mold manufacturing Industry, astronautics aviation industry, automobile manufacture and repair industry, shipbuilding industry, mechanical industry, casting industry, electric power industry, chemical industry and in other domains.

This equipment is one kind of environmental protection equipment, through protecting or repairing the machine parts, the mold and the working clamp and so on, so as to save the big cost of purchasing equipment and the maintenance for the enterprise, it plays a very major role to improves the quality of products and the efficiency,and reduce the cost. Not only is it essential useful tool for all the enterprises of manufacture, repair and surface treatment; Simultaneously also is the good helper who engaged personally in the special repair profession to be rich fast.

The products are made strictly according to the company quality system, and executes strictly internationalISO9001 and 2000 standard. The company is in line with the management Idea of “sincerity creating customer, quality building future” , provides comprehensive technical support and the service of presale, selling, and post-sale for the customer,welcome all the people to inquiring with your wholehearted help and absolute sincerity cooperation, and creating the bright future altogether.

Dear Sir or Madam:

How are you!

Firstly, thank you for your purchasing our company product, all staff in our company treat each user by the sincere manner, we heartfully hope our products bring the convenience for you to reduce the expense and the cost, and enhance the market competitive powerof your products,when you use them. We also honestly hope you can give us your precious comment and the suggestion.

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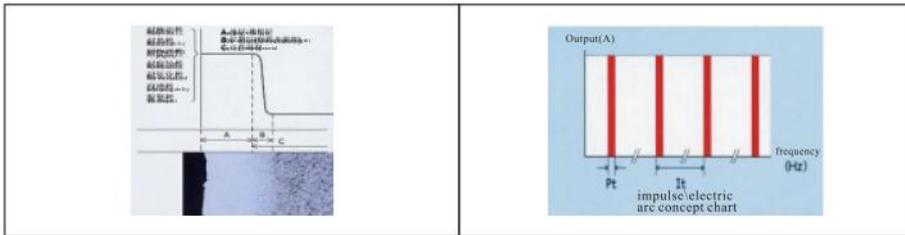
First, summary

As well as the unceasing development of the mold and the casting industry and the request of improving the products, specially the more and more high precision mold, the casting product to be operated and used, during its manufacture and using process, inevitably, it damages the mold, the casting product, such as the attrition, the corrosion, scratches, the pinhole, crack as well as damage and other metal defects. In a certain extent, the traditional repair equipment helps the customer carry on the repair and save the cost. But also inevitably it appears some questions, for example, after the repair, it is easy to lead to distort the mold, and the casting product, reduce degree of hardness and the internal stress, the blister, the damage even discard.

Our precision molds the cold patching welding machine, also is called as the cold welding machine for repair the defect metal, which makes use of discharge electric principle of high frequency electric spark, to weld the mold and the casting without heating, so as to guarantee the integrity of the mold and the casting, also may carry on strengthened processing the mold and the casting so as to realize its resistance to wear, thermal stability, corrosion resistance and so on.

Second, the principle of work

When the electrode (welding rod) is revolving in the working surface, and certain spot gap is very small, it will cause the main engine discharge electric and form the circuit. The small region contacts mutually which in them flickers the fashion electric current, the current density can achieve $105 \sim 106/cm^2$, but discharge time is only $10^{-6} \sim 10^{-5}$ second, because the electric discharge energy in the time and the space is extra-ordinary concentrated, has produced approximately the high temperature $8000 \sim 10000^\circ C$ in the electric discharge small region, which causes high energy ionization of the partial material in this region, under the plasma metallurgy condition, the electrode (welding rod) is shifted to the work piece surface by high speed, and proliferated to the work piece surface layer, and then forms the deposit formation of the metallurgy reliable union. The electric discharge cycle of the main engine power source is $10^{-3} \sim 10^{-1}$ second, the high speed revolving scanning of the high-frequency electric discharge and the electrode (welding rod) in the work piece surface, which may realize the big area high efficiency deposition coating.



This is because discharge time (P_t) is shorter than electric discharge interval time (I_t), the quantity of heat in the electric discharge gap period proliferates rapidly to other parts of the work piece, therefore the quantity of heat cannot be concentrated in the work piece processing part, and then realize true significance cold welding.

P_t (discharge time): $10^{-6} \sim 10^{-5}$ second
 I_t output (A): Discharging current

I_t (discharge interval time): $10^{-3} \sim 10^{-1}$ second
 I_t frequency (Hz):

Why can the electric discharge realize "cold welding" (hot inputs so lowly)?

The electrode (welding rod) instantaneously is shifted and ionized by the electric arc to above the work piece which contacts, simultaneously leaves with the high temperature ($8000 \sim 10000^\circ C$) of the plasma electric arc forms like the plate under the work piece surface layer with the complications firm diffusion layer, therefore such as high intensity cannot be dropped off.

Third, Methods of use

1. Adjustment of the working voltage

The output voltage of the cold welding machine decides its output of electric current, through adjusting continuously the knob of the voltage between $40 \sim 100V$, voltage will increase by the clockwise adjustment, otherwise the voltage will reduce; When work is normal, the working voltage should be higher than $40V$, is lower than $110V$. The higher the output voltage is, the bigger the output power is, the quicker the welding speed, the rougher the welding surface is.

2. Adjustment of the operating frequency

When the cold welding mechanic works in the narrow pulse condition with big electric current, the controlling scope of the frequency is during 40 and $2100Hz$, it will increase by the clockwise adjustment, otherwise it will reduce; When working, the higher the pulse frequency is, the quicker the electro-deposition speed is, the rougher the welding surface is; The lower the pulse frequency is, the slower the electro-deposition is, the more smooth the welding surface is, in the ordinary circumstances, the operating frequency is from 200 to $500Hz$.

3. Adjustment of electrode rotate speed

The scope of adjustment is from 10 to $1000r/min$, the rotational speed of the welding torch increases by the clockwise adjustment, otherwise it reduces; The higher the rotational speed is, the quicker the deposition rate is, the looser and the more rough the superficial deposit formation is.

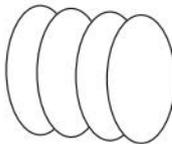
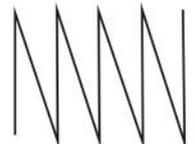
4. Protect the gas

Gas protection may enhance effectively the electro-deposition speed and the deposit density, and reduces the flaw formation of the deposit, generally speaking, selects the argon as the protection gas. When working, adjust the flux of the argon through the regulator, its flux is usually from 5 to $15L/min$.

Fourth, The reference parameter of operation

- 1.The voltmeter generally is between 50 and 90V.
- 2.The frequency meter generally is between 200 and 500Hz (for example, if it carries on strengthened processing, adjustable to 600-900).
- 3.The rotation speed of the welding torch should (basis on your skill) be between 0.20 and 1.80.
- 4.The diameter of the welding rod is between 0.5 and 3.2mm.

*Three kinds of techniques of repairing LH cold welding machine

		
(1) Arc circle welding	(2) Z welding	(3) To-and-fro welding

****The operation standard:**

- 1.Turns on the switch of the welding torch, in the ordinary circumstances, the welding torch has 45 degrees angles,and carry on the welding with the above patching technique.
- 2.The posture of taking the gun: Be same as grasping the pen, two hands pinch the gun mouth of the welding torch tightly, press the center of gravity of the welding torch as far as possible.
- 3.To repair the damage of the edges and corners. In the ordinary circumstances, the welding torch should carry on built-up welding with the work piece at small angle, the surface will be carried on one by one.And then carries on polishing, so it is.
- 4.To repair the collapse angle, the best way is to use the surface of welding materials (don't use both sides of the welding materials),repairing by the low angle, and get to certain altitude, and the surface be carried on one by one, and then carry on polishing, so it is.
- 5.If the plane appears the blisters, blowholes and other flaws, the welding torch angle becomes 90 degrees, use the spot welding gently, if the flaw is a little big, you can pause for several seconds in the surface.
- 6.When repair the precise product, you can adopt the great voltage as render, and then repair the surface with the small voltage (30-50V), after polishing ,it looks like a mirror.
- 7.the methods of holding welding torch



- 8.The bigger the voltage is, the quicker the speed is, patching accuracy is relatively bad.The smaller the voltage is, the slower the speed is, the higher the patching accuracy is.

Fifth, technical parameter

Project \ Model	E-9188F100	E-9188F150	E-9188F200	E-9188F200A
Input(V)	AC220V single-phase 50/60Hz	AC220V single-phase 50/60Hz	AC220V single-phase 50/60Hz	AC220V single-phase 50/60Hz
Max. power (KVA)	1.0	1.5	2.0	2.8
Twice output voltages	20-110	20-110	20-110	20-110
Max. capacity (UF)	160	320	480	560
Frequencies invariable scopes (Hz) (times of electric discharge /seconds)	40-2100	40-2100	40-2100	40-2100
Electrode size (mm)	0.5-3.2	0.5-3.2	0.5-3.2	0.5-3.2
Overall dimensions (W*D*H:mm)	470*320*270	500*270*370	530*300*400	530*300*400
Weight(kg)	25	31	40	43

Sixth, equipment structure



- | | |
|---|---|
| 1. Main engine | 9. Frequency modulation knobs |
| 2. Revolving welding torch | 10. Welding torch connections |
| 3. 220V electrical source line | 11. Air vent connections |
| 4. Ground line nip | 12. Grounding connection |
| 5. Voltage demonstration table | 13. Air feeder |
| 6. Frequency demonstration table | 14. Argon air bottle(provide by yourself) |
| 7. Voltage regulation knob | 15. Argon gas meter(provide by yourself) |
| 8. Welding torch velocity modulation knob | |

Seventh, Supplementary equipment



- | | |
|---------------------------------|--------------------------|
| 1. Toolbox | 7. Protection glove |
| 2. Welding torch | 8. Protection eyeglasses |
| 3. Trachea | 9. Power line |
| 4. Spanner | 10. Ground line nip |
| 5. The argon gas meter attaches | 11. Use manual |
| 6. Welding wire | |

Eighth, Notices

Do not adjust the welding torch rotational speed to the highest or the lowest section, like this, it can prolong effectively the life of the welding torch; When using the cold welding machine, you should wear the protection eyeglasses and the protection gloves; In the work process, because the electrode brings the high temperature, please don't touch the electrode; When the equipment is working, the voltage and the frequency meter give birth to certain undulation, which it is a normal phenomenon.

Ninth, The whole set of equipment

Main engine	1 unit
Toolbox	1 pcs
Ground line nip with 3m lines	1 set
Welding torch with 3m lines	1 pcs
Electrical source line	1 pcs
Gas tube 3m	1 set
Deposition built-up welding electrode (2.0*100)mm	10 pcs
Protection glasses	1 set
Glove	1 set
Argon gas meter connections	1 pcs
Spanner	1 pcs
Use manual	1 pcs

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.