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北极星
NSTAR

E-9188C型 频率跟踪
自动超声波电火花模具抛光机

使用说明书



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

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

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一、概述

E-9188C型自动超声波电火花模具抛光机是新一代模具加工设备。该机是本公司采用国际最新技术，自行开发的具有频率自动跟踪，功率自动补偿的一种升级换代产品。其设计新颖，结构紧凑，性能优良，适应模具加工手段日益先进之潮流；功能齐备使用便捷，数显直观，领略最新模具尖兵之风采。

E-9188C型自动超声波电火花模具抛光机具有超声波与电火花复合加工功能。该机能使用多种工具，对不同硬度材料制作的模具复杂型腔，如窄槽、盲孔、平面等均可完成从粗至镜面的全部抛光过程。

该机还有如下显著特点：

- ◆引进国外最新技术，采用CAD辅助优化设计；
- ◆性能稳定，能自动适应各种工具，时刻保证工具处于最佳谐振状态，频率数字显示，确保功率大小稳定在所需水平上；
- ◆功效极高，比手工抛光高十倍以上；
- ◆结构紧凑，采用模块化结构，维修方便。

二、工作原理

E-9188C型自动超声波电火花模具抛光机是由装在工具手柄内的压电换能器将输入的高频电能换成纵向的机械振动，经联接在换能器上的夹具传给工具头，工具头尾端以每秒28000次，最大为40微米的振幅高速，强力地研磨工件表面，使工件表面的粗糙度迅速降低，从而实现了手工无法比拟的抛光效果。

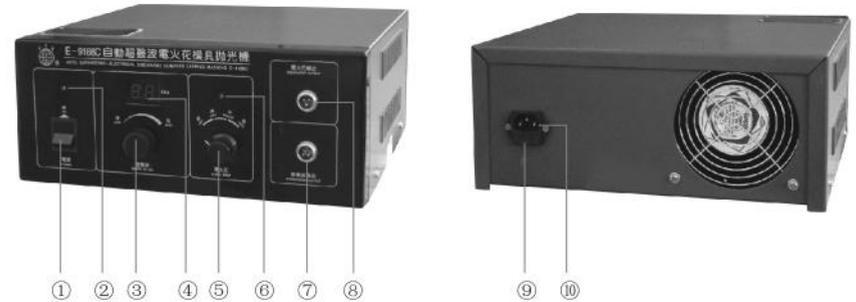
E-9188C型自动超声波电火花模具抛光机也具有超声波与电火花复合抛光之功能，即在超声波振动研磨的基础上复合电火花腐蚀，可对车、铣、电火花和切割等机加工后粗糙度Ra1.6以上的工件表面进行抛光，从而不用或少用金刚石锉刀等工具，降低了使用成本。

三、技术参数

- ◆输入电压：AC220V±10%，50HZ，300VA。
- ◆输出：超声波功率0~20W无级调节，频率20~29KHZ自动跟踪。
电火花功率200W，粗、中、细三档选择。
- ◆抛光工具：进口超级油石(自备)、铜、竹、木质工具等。
- ◆抛光介质：金刚石研磨膏。
- ◆可抛光材料：各种金属、硬质合金、以及玻璃、玉石、玛瑙等非金属
- ◆外形尺寸：325×135×300mm。
- ◆重量：约11Kg。

四、主机结构

1、主机



- ①电源开关
- ③超声波频率调节旋钮
- ⑤电火花功率旋钮
- ⑦超声波输出插座
- ⑨3A保险管座

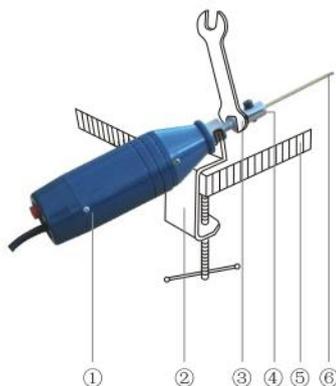
- ②电源指示灯
- ④超声波频率数码显示
- ⑥电火花工作指示灯
- ⑧电火花输出插座
- ⑩电源输入插座

2、工具手柄及工具



- ①控制开关
②电缆线
③工具手柄(换能器)
④工具夹具
⑤工具头
⑥四芯插头

3、紧固工具



- ①工具手柄(换能器)
②紧固架
③呆扳手
④工具夹具
⑤工作台
⑥工具头

五、使用方法

一、超声波抛光操作

1、准备工作

- 1.将工具手柄上的四芯插头插入主机前面板的超声波输出插座，旋紧其固定帽。
- 2.关掉主机电源开关，将电源线插入220v±10%，50HZ，带地线的专用交流电插座。
- 3.将超声波频率调节旋钮旋至最小处（逆时针），电火花功率旋钮至“关”的位置。

2、操作要点

- 1.将所需工具头配上相应的工具夹具，装在工具手柄的末端。
- 2.打开电源开关，电源指示灯应点亮。
- 3.打开工具手柄上的控制开关，频率显示“20”KHZ。
- 4.调节超声波频率旋钮，将数显频率大小调至您所需的并与该种工具头能承受的功率水平，具体选择参考下表：

频率显示(KHz)	工具头	功用
21~24	铜、竹、木	镜面抛光(Ra 0.8以下)
22~26	铜质工具	精细抛光(Ra1.6~0.4)
24~27	进口超级油石(自备)	粗至中抛光(Ra50~30 至Ra 30~20)

- 5.将油石表面或工具头末端在抛光面上轻触地来回推动。不额外给工具头加压，否则将影响工具寿命和抛光质量。

3、注意

- ◆安装工具时，必须使用紧固架和副配扳手将工具头和夹具完全拧紧。否则，接触部分会产生热量或不正常的响声，也不可能正常的超声波输出。
- ◆使用竹、木工具时，显示频率不能超过24KHZ，否则，将因过热导致竹木燃烧。
- ◆使用铜质工具时，显示频率不能超过26KHZ，否则，将导致工具断裂。
- ◆换能器装在工具手柄内，要小心使用，切勿跌落或猛烈撞击而造成损坏。
- ◆抛光过程中轻微的升温是允许的。
- ◆在暂停抛光时，应关掉工具手柄上的控制开关。
- ◆当抛光工作停止或完成后，要关掉电源。

二、超声波与电火花复合抛光操作

- 1.选用所需形状大小的铜质工具头。
- 2.将电火花输出线三芯插头插入主机前面板的电火花输出插座，另一端夹在抛光的工件上。
- 3.将工件抛光面浸没于水中。如工件表面不方便浸没于水中，可用小胶管引水工具头末端与工件接触处。比如：可用一容器盛水置于比工件高0.5~1米处，用医用一次性静脉滴注胶管（该胶管还可以调节出水量的大小），利用虹吸原理以引水出来。
- 4.选择所需电火花功率及调节超声波频率旋钮显示相适应的正常工作频率，具体参考下表：

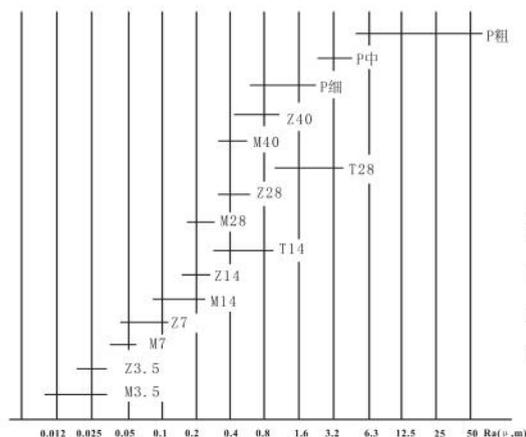
频率显示 (KHz)	电火花功率	粗糙度
22~26	“粗”档	大于Ra 3.2
	“中”档	Ra3.20~Ra1.6
	“细”档	Ra1.6~Ra0.8

- 5.打开电源及手柄控制开关，将工具头末端与工件表面以45度角轻触地来回推动，切勿加压。
- 6.复合抛光过程中，电火花指示灯点亮。

六、抛光工艺简介

要抛光加工的工件，有材料、表面粗糙度和热处理工艺等各种不同的情况，如何正确选择抛光工艺，直接影响抛光的速度和质量。这里且作一简单介绍，仅供参考。

根据工件表面粗糙度，可将抛光过程分为二大阶段，即超声波电火花复合抛光和超声波抛光。超声波与电火花粗至精细抛光工艺可参考下图：



左图中：
P——超声波与电火花复合抛光，后边汉字为电火花功率档位；
T——超声波抛光，刚质工具，后边数字为研磨膏粒度；
Z——超声波抛光，竹质工具，后边数字为研磨膏粒度；
M——超声波抛光，木质工具，后边数字为研磨膏粒度；

一）、超声波抛光工艺

超声波抛光按选用的研磨膏粒度，分五至六级，由Ra1.25一直抛至Ra0.012。

1.电火加工后的表面和常规机加工后的表面，可以用超级油石去加工完成。

以下为加工效果最佳规范：

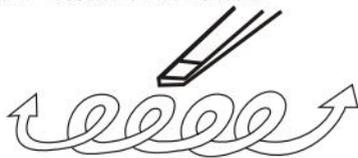
粗糙度	工具
Ra50~Ra30	200#
Ra30~Ra20	320#
Ra20~Ra0.8	500#
Ra0.8以下	1000#

2.欲使表面粗糙度更低，可用铜质和竹、木质工具（带动研磨膏）增加抛光工序。但精抛后效果与工具选择、工件材料及工艺有关。下表为几种不同材料工件的镜面抛光工艺：

工件材料	粗糙度 (Ra)	抛光工具	研磨膏粒度
45#刚	0.8~0.4	竹	W40
	0.4~0.2	先竹后木	W28
	0.2~0.1	木	W14
	0.1~0.05	木	W7
	0.05以下	木	W3.5
碳素工具刚T10 及合金工具钢 3Cr2W8V等	0.8~0.4	竹	W40
	0.4~0.2	竹	W28
	0.2~0.1	竹	W14
	0.1~0.05	先竹后木	W7
	0.05以下	木	W3.5
A3刚	0.8~0.4	竹	W40
	0.4~0.2	木	W28
	0.2~0.1	木	W14
	0.1~0.05	木	W7
	0.05以下	木	W3.5

3. 超声波功率的选择, 功率越大, 工具振幅越大, 故粗抛时, 功率可适当选大些, 精抛时, 功率可选小些。

4. 建议用如图轨迹循环抛光, 可使表面平整并且更精细。



二)、超声波与电火花复合抛光

对不同的工件进行复合抛光, 须弄清以下几点:

- 按切削量由大至小, 电火花有粗、中、细三种不同强度的功率选择。功率越大、火花越大。其中“粗”档主要用于粗中整形(如经电火花、线切割及普通机加工后形成的粗糙表面), 可使表面粗糙度将至Ra3.2左右; 用“中”档可使表面粗糙度从Ra3.2降至Ra1.6左右; “细”档可使表面粗糙度从Ra1.6降至Ra0.8以下, 直接供超声波抛光。
- 采用复合抛光时, 也要适当选择超声波功率。一般地, 粗抛时, 电火花可大些, 精抛时, 电火花可小一些。切记不能将超声波功率减小至相应的显示频率22KHZ以下!

三)、抛光工艺质量影响抛光工艺质量的因素很多, 为帮助用户能进入理想的抛光境界, 特列以下项目, 供参考。

- ◆使用研磨膏时, 应加入干净无硬杂质的稀释油或水;
- ◆每一种粒度的研磨膏应专用一支竹木工具;
- ◆使用某一粒度研磨膏后更换细粒度的研磨膏时, 要用水或其它溶解液清洗抛光面, 保证无旧粒度研磨膏的残留;
- ◆粒度相同的研磨膏采用材质硬的工具头, 要比材质软的工具头抛光后表面粗糙度要高些, 工件硬度越低越明显。
- ◆应保证将工件抛至所用研磨膏相应达到的粗糙度时, 才可以更换细粒度研磨膏, 否则会影响抛光速度, 甚至返工。

- ◆选用研磨膏的粒度, 每级间隔不可过大, 而达不到效果, 也不能间隔太小, 造成浪费。一般地可选用W40、W28、W14、W7、W3.5等五级, 即可满足要求。对于如渗氮处理或淬火后高硬度材料可加W20一级。
- ◆同一粒度的研磨膏经稀释后, 越稀则相对抛光后的粗糙度越低, 但去除痕迹的能力越差。
- ◆抛至最细粒度时, 被抛光面总可以看到有些花纹, 可用绸布蘸适量相同粒度或大一级粒度研磨膏, 用手或木片压紧研磨即可消除。
- ◆为扩大加工范围和抛光加工方便, 可将除进口超级油石外的所有工具头修成与加工面相应的形状。

七、注意事项

- ◆当更换或安装抛光工具时, 必需使用紧固架及扳手。如果安装得不紧, 会产生不正常的声响, 而且工具的连接部位会发热, 以至不能获得正常的抛光效果。
- ◆即使工具和工具手柄联接的很紧密, 在使用了较长的时间后, 它们也会松动, 所以务必经常地拧紧夹头, 特别是竹、木质工具夹头。
- ◆尽可能保证工具和工具手柄末端干净, 避免划伤、弄缺。
- ◆暂停工作时, 应关掉工具手柄上的控制开关。
- ◆使用超声波与电火花复合抛光时, 身体不要同时接触工具手柄金属部分和被加工工件, 否则会有轻微触电感觉(但无危险)。
- ◆超声波与电火花复合加工时, 超声波应有一定的功率输出, 否则不能使电极与工具长时间接触。
- ◆更换保险丝时, 严禁超过规定之规格。(本机采用抽屉式保险座, 分里外两格, 外格放置预备保险管, 里面格放置使用保险管, 换用时, 一定要放入里面一格)
- ◆本机必须使用接地良好的三芯专用交流电源插座。
- ◆如用电远离要求AC 220V±10%范围, 应配置1000VA左右的交流自动稳压器, 否则, 影响正常工作, 有损整机寿命。
- ◆尽可能改善工作环境, 勿忘设备的维护保养。

八、故障及排除

故障现象	原因	排除方法
无振动	1. 手柄插头没有插好; 2. 手柄控制开关没有大开; 3. 超声波频率旋钮没有调好。	1. 插好手柄插头; 2. 开启手柄控制开关; 3. 调好频率调节旋钮。
振动弱	1. 工具没上紧; 2. 工具不合适; 3. 竹木工具多次夹紧后厚度过小。	1. 上紧工具; 2. 更换本公司标准工具; 3. 更换新的竹木工具。
有不正常的声音或系统过热	1. 工具没上紧; 2. 工具长度过短; 3. 竹木工具多次夹紧后厚度过小; 4. 工具或夹具断裂; 5. 工具或夹具端面被划伤; 6. 接触端面太脏	1. 上紧工具; 2. 更换新的工具; 3. 更换新的竹木工具; 4. 更换新的工具或夹具; 5. 同上; 6. 清洗工具和工具手柄的连接端面, 然后上紧工具。
超声波频率显示数自不稳定	1. 操作压力太大; 2. 超声波频率旋钮没调好。	1. 减小操作压力; 2. 调好调节旋钮。
没有电火花输出	1. 电火花输出线没接上工件; 2. 电火花输出线断。	1. 接好电火花输出线 2. 更换新的电火花输出线。
电火花功率很大, 切削量却很少	水质变坏。	更换清水或加大胶管的输出水量。
机器自检	将一把进口超级油石装上工具手柄, 接通电源并打开手柄控制开关, 将超声波频率调节旋钮至最大, 这时频率显示29KHz说明机器正常。	

九、工具的制作和使用

工具的制作和使用是抛光过程中重要的一步工作，其好坏将直接影响抛光的质量和速度，一个好的（即与本机器完全谐振）工具头有以下特点：开机手摸工具头有很强的均匀滑感，试抛时，稍加压力超声波输出均匀，功率显示数字稳定。

当工具或夹具上的螺丝及有关联接部为松动、未固紧或工具的谐振频率超出了机器的频率锁定范围（20-29KHz）时，将导致机器一直处于频率搜索状态而不能稳定，现象为超声波频率显示数字跳动，并可能伴有异常的声音，此时可通过检查并固紧松动的夹具螺丝及有关联接部位，或更换新的工具头等方法来排除故障，（具体参见使用说明书第八节中故障与排除）。

新工具头的制作和调整，由于材质、尺度等不同，谐振频率也就不同，就装配好的工具头谐振频率可能不在机器的频率跟踪锁定范围之内，这时就应当改变工具头的长度来调整工具头的谐振频率了，方法是取长于参考长度的工具头装入变幅杆，逐次减短2-3毫米，直至完全谐振，另外，有时也可以通过改变工具头的宽度，厚度或形状等进行调整，调整的方法可在实践中摸索、掌握。

本机如能配上红宝石、超级油石等优质抛光工具，可大幅度提高抛光效益，真正实现高效率的抛光作业。

十、标准装箱清单

名称	单位	数量
主机	台	1
工具手柄(换能器)	个	1
电源线	根	1
电火花输出线	根	1
紧固架	副	1
双头呆板手12/14	把	1
内六角板手 M3	支	4
美木刀	把	6
工具夹具、夹竹棒、夹铜片、夹铜棒	条	各2
研磨膏W40、W28、W14、W7、W3.5	支	各1
内六角螺丝M4×12	颗	10
3A保险管	只	3
针筒	支	1
使用说明书	本	1

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-9188C Automatic Polishing Machine with Ultrasonic Wave and EDM Operation Manual

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

E-9188C type automatic polishing machine with ultrasonic wave and EDM is a new generation of mold processing equipment. This machine is an upgrade of product that is designed independently with the international latest technology, it has the automatic frequency track and automatic power compensation. It is ahead of the latest mold, featured with novel design, compact structure and good performance, adapting to the increasingly advanced trend of mold processing means, complete functions, convenient operation and visual digital display.

E-9188C type automatic polishing machine with ultrasonic wave and EDM has the compound process function of ultrasonic wave and EDM, which can use various tools to finish the overall polishing process from the roughness to the mirror of complicated mould cavities made of different hard material like the narrow groove, blind hole and plane, etc..

The machine also has the following obvious features:

Introducing the international latest technology and CAD auxiliary optimization design;

With stable performance, it can automatically adapt to the various tools, and guarantee the tool in the best resonance state at every time, display the frequency in digits and ensure the power meets the requirements.

With ultra high efficiency, it is 10 times more than that by the manual polishing.

With compact structure, it adopts the modularization structure, taking convenience for maintenance.

II. Working principle

E-9188C type automatic polishing machine with ultrasonic wave and EDM converts the high-frequency energy input by the piezoelectric transducer that is installed in the tool handle to the longitudinal mechanical vibration, passes such vibration to the tool head through the clamp connected at the transducer, to make the head and end of tool strongly grind the surface of workpiece at a high amplitude speed of 28,000 times/s and 40micron (max), to quickly reduce the roughness of working surface, so as to realize the polishing efficiency that the manual polishing process can't be compared with it.

E-9188C type automatic polishing machine with ultrasonic wave and EDM also has the compound polishing function of ultrasonic wave and EDM, that is, the ultrasonic vibration and grinding is compounded with the EDM corrosion, through this compound operation, the workpiece surface of roughness over Ra1.6 can be polished after processed by the lathe, mill, EDM and cutting machine, etc., so as not to use or hardly use the diamond file, thus, the operation cost can be reduced greatly.

III. Technical parameters

Input voltage: AC220V \pm 10%, 50HZ, 300VA

Output: Ultrasonic power 0-20W by stepless adjustment, frequency 20-29KHZ by automatic track

EDM power 200W with three gears for selection: roughness, middle, fineness

Polishing tool: Imported super whetstone (self-contained), copper, bamboo or wooden tools, etc.

Polishing medium: Diamond grinding paste

Polishing material: Non-metallic material like various metals, carbide alloy, glass, jade, agate, etc

Outline size: 325 \times 135 \times 300mm

Weight: Approx. 11Kg

IV. Structure of main frame

1. Main frame



- | | |
|--|---|
| ① Power switch | ② Power indicator lamp |
| ③ Ultrasonic wave frequency adjusting knob | ④ Ultrasonic wave frequency digital display |
| ⑤ EDM power knob | ⑥ EDM indicator lamp |
| ⑦ Ultrasonic wave output socket | ⑧ EDM output socket |
| ⑨ 3A fuse tube holder | ⑩ Power input socket |

2. Tool handle and tool



- ① Control switch
- ② Cable
- ③ Tool handle (transducer)
- ④ Tool clamp
- ⑤ Tool head
- ⑥ Four-core plug

3. Fastener



- ① Tool handle (transducer)
- ② Fastening bracket
- ③ Solid wrench
- ④ Tool clamp
- ⑤ Operation desk
- ⑥ Tool head

V. Operation methods

1. Ultrasonic wave polishing operation

① Preparations

- 1). Insert the four-core plug of tool handle into the ultrasonic wave output socket of fore panel of main frame, tighten its fixed cap.
- 2). Turn off the power switch of main engine, insert the power line into the special AC socket of $220V \pm 10\%$, 50HZ with earthing line.
- 3). Set the ultrasonic wave frequency adjusting knob to the minimum (CCW), adjust the EDM power knob to the "OFF" position.

② Operation points

- 1). Equip a clamp for the required tool head, install it at the end of tool handle.
- 2). Turn on the power switch, the power indicator lamp shall brighten.
- 3). Turn on the control switch of tool handle, the frequency is "20" KHZ displayed.
- 4). Adjust the ultrasonic wave frequency knob, set the digital-display frequency to that you require and the tool head can bear the power level, the detailed selection reference is shown as follows:

Frequency display (KHz)	Tool head	Function
21~24	Copper ,bamboo and wood	Mirror polishing (Ra0.8 below)
22~26	Copper tool	Fine polishing (Ra1.6~0.4)
24~27	Imported super whetstone (self-contained)	Rough to middle polishing (Ra50~30 to Ra 30~20)

- 5). Lightly push the whetstone surface or end of tool head on the polishing surface back and forth. It is unnecessary to apply the pressure to the tool head, otherwise, the tool life and polishing quality will be influenced.

③ Attentions

- ◆ When installing the tools, user must tighten the tool head and clamp with the fastening bracket and auxiliary spanner. Otherwise, the contact part will produce the heat or abnormal sound, and, it is impossible that the normal ultrasonic wave will output.
- ◆ When using the bamboo or wooden tools, the displaying frequency shall not exceed 24KHZ, otherwise, the bamboo or wood will be burned for over heat.
- ◆ When using the copper tool, the displaying frequency shall not exceed 26KHZ, otherwise, the fracture of tool will be produced.
- ◆ It is careful to use the transducer that is installed in the tool handle, never make it fall off or suffer from the serious impact.
- ◆ In polishing, the slight temperature rise is permissible.
- ◆ If requiring the pause polishing operation, the control switch of tool handle shall be turned off first.
- ◆ After the polishing operation is stopped or finished, the power supply shall be switched off.

2. Compound polishing operation of ultrasonic wave and EDM

- ① Select the copper tool head of required shape.
- ② Insert three-core plug of EDM output wire into the EDM output socket that is located at fore panel of main frame, the other end is clamped at the polishing workpiece.
- ③ Immerse the polishing surface of workpiece into the water. If the surface of workpiece can't be immersed into the water, the end of channel-off tool like small hose is kept contact with the workpiece, for instance, a container with the water is placed at 0.5~1m higher than the workpiece first, then an one-off intravenous drip hose (it can adjust the water output) draws the water out from the container according to the siphon principle.
- ④ Select the required EDM power and adjust the ultrasonic wave frequency knob to the required normal power frequency, the detailed references are shown as follows:

Frequency display (KHz)	EDM power	Roughness
22~26	"Rough" gear	More than Ra 3.2
	"Mid" gear	Ra3.20~Ra1.6
	"Fine" gear	Ra1.6~Ra0.8

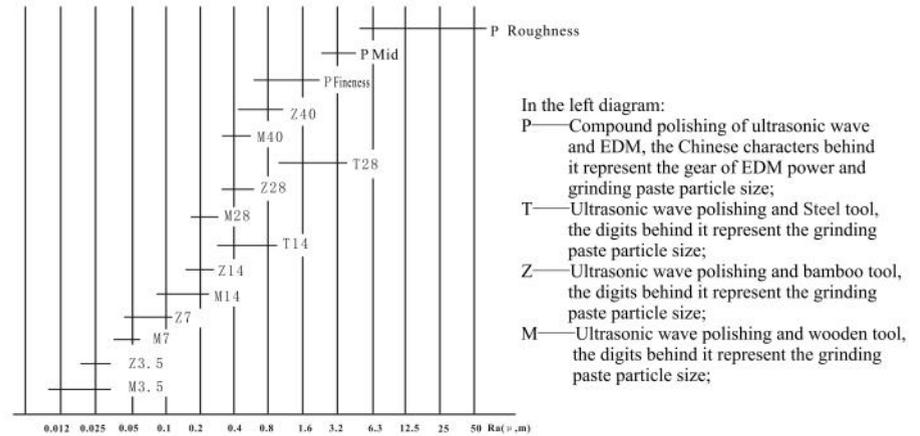
- ⑤ Turn on the power supply and the handle control switch, lightly push the end of tool head and workpiece surface with a 45 degree angle back and forth, never apply the pressure.
- ⑥ In compound polishing operation, the EDM indicator lamp always brightens.

VI. Instructions for polishing process

As for the working piece requiring the polishing process, the correct selection of polishing technique depends on the material, surface roughness and heat treatment process. The selected polishing technique directly influences the polishing speed and quality. The following simple introductions are only for reference.

According to the surface roughness of workpiece, the polishing process can be divided into two stages, that is, compound polishing of ultrasonic wave and EDM and ultrasonic wave polishing.

The roughness to fineness polishing process of ultrasonic wave and EDM is shown as the following diagram:



1. Ultrasonic wave polishing process

The ultrasonic wave polishing process is divided into five to six classes according to the particle size of grinding paste, it can polish the workpiece from Ra1.25 to Ra0.012

- ① The surfaces by EDM process and by common machine process can be finished with the super whetstone; The following expresses the best specifications of processing efficiency

Roughness	Tool
Ra50~Ra30	200#
Ra30~Ra20	320#
Ra20~Ra0.8	500#
Less than Ra0.8	1000#

- ② If requiring the lower surface roughness, the copper, bamboo or wood tools (driving the grinding paste) can increase the polishing process. However, the fine polishing efficiency is relevant to the selection of tool, workpiece material and techniques. The following introduces the mirror polishing process of workpiece made of different material.

Material of workpiece	Roughness (Ra)	Polishing tool	Particle size of grinding paste
45# steel	0.8~0.4	Bamboo	W40
	0.4~0.2	Bamboo first, then wood	W28
	0.2~0.1	Wood	W14
	0.1~0.05	Wood	W7
	0.05以下	Wood	W3.5
Carbon tool steel T10 and alloy tool steel 3Cr2W8V, etc.	0.8~0.4	Bamboo	W40
	0.4~0.2	Bamboo	W28
	0.2~0.1	Bamboo	W14
	0.1~0.05	Bamboo first, then wood	W7
	0.05以下	Wood	W3.5
A3 steel	0.8~0.4	Bamboo	W40
	0.4~0.2	Wood	W28
	0.2~0.1	Wood	W14
	0.1~0.05	Wood	W7
	0.05以下	Wood	W3.5

③. Selection of ultrasonic wave power: The larger power, the larger tool amplitude; so, when performing the rough polishing, the power may be larger, and when performing the fine polishing, the power may be small.

④. It is suggested that the circular polishing operation should be performed with the track as shown in the diagram, to get the flat and fine surface.



2. Compound polishing of ultrasonic wave and EDM

As for the compound polishing of different workpieces, the following points must be mastered:

① According to the cutting amount, EDM has the power of three kinds of intensities: roughness, mid and fineness for your selection. The larger power, the larger spark. Hereinto, the "rough" gear is used for the rough polishing (e.g. the rough surface that is formed by the EDM, wire cutter and common machine, etc.), to get the surface roughness up to Ra3.2; the "mid" gear is used for declining the surface roughness from Ra3.2 to Ra1.6; the "fine" gear is used for decline the surface roughness from Ra1.6 to Ra0.8 below, which is directly provided for the ultrasonic wave polishing.

② When selecting the compound polishing, the ultrasonic power may also be selected properly. Usually, in rough polishing, the electric spark may be large; in fine polishing, the electric spark may be small. Never reduce the ultrasonic wave power to the one less than that corresponding to the display frequency 22KHZ.

3. There are so many factors influencing the quality of polishing process, therefore, the following items are specially listed for helping user get the ideal polishing process, only for your reference.

- ◆ When using the grinding paste, the clean diluents oil or water without the hard impurities shall be added into it.
- ◆ The grinding paste of every particle size shall specially employ one bamboo or wooden tool.
- ◆ When changing the old grinding paste of a certain particle into a new grinding paste of fine particle, the polishing surface shall be cleaned with the water or other solutions, to guarantee there is no residue of old grinding paste.
- ◆ Even if the grinding paste is same in the particle size, provided that the tool head of hard material is used, the workpiece roughness will be higher than the one that adopting the tool head of soft material, and, it is more obvious for the lower workpiece hardness.
- ◆ Only the workpiece is polished to the roughness that the grinding paste reaches, the grinding paste of fine particle shall be replaced, otherwise, the polishing speed will be influenced, even the rework will be made.

◆ If the particle of grinding paste is selected, the gap of every class shall not be too large or too small, otherwise, any waste will be produced. In general, five classes: W40, W28, W14, W7 and W3.5 may be selected, which can reach the requirements. The high-hardness material by nitriding or quenching treatment may be added with W20.

◆ After the grinding paste of same particle size is diluted, the more diluted one, the lower polishing roughness after polishing. However, the ability to remove the track is quite low.

◆ When polishing to the finest particle, some patterns in the polished surface can always be seen, the cloth with a quantity of grinding pastes of same particle size or higher-level particle size can remove them by manual or wood sheets pressing.

◆ To enlarge the processing range and take the convenience for polishing process, trim all tool heads except the imported super whetstone to the shapes corresponding to the processing surface.

VII. Attention

◆ When changing or installing a polishing tool, the fastening bracket and spanner must be used. If the polishing tool is not installed firmly, there will be abnormal sound made, and the tool connecting part will heat, so as not to get the normal polishing efficiency.

◆ Even if the tool is firmly connected with the tool handle, after the long-time use, they will be loosen, therefore, the clamping head must be often tightened, especially, the clamping head of bamboo or wooden tool.

◆ Try to guarantee the tool and tool head ends are clean, no scratch or defect.

◆ If requiring the pause operation, the control switch of tool handle must be turned off first.

◆ When using the compound polishing operation of ultrasonic wave and EDM, the body can't contact the metallic part of tool handle and processed workpiece at the same time, otherwise, a slight electric shock will be produced (but it has no danger).

◆ When using the compound polishing operation of ultrasonic wave and EDM, the ultrasonic wave shall have a certain power output, otherwise, the electrode won't contact with the tool for a long time.

◆ The new fuse can't exceed the specified specification (this machine adopts the drawer type fuse holder, with two inner and outer drawers, hereinto, the outer drawer is used for putting the standby fuse tube, the inner drawer is used for putting the service fuse tube, when changing, the fuse holder must be put into the inner drawer.)

◆ The machine must use the special three-core AC power socket of good earthing.

◆ If the power is far beyond the range of AC 220V ± 10%, AC automatic stabilizer of 1,000VA shall be equipped, otherwise, the machine will work in the abnormal state, and its life will be reduced. If the power is far beyond the range of AC 220V ± 10%, AC automatic stabilizer of 1,000VA shall be equipped, otherwise, the machine will work in the abnormal state, and its life will be reduced.

◆ Try to improve the working environment, never forget the maintenance of equipment.

VIII. Faults and removal

Symptoms	Causes	Remedy
No vibration	1. The handle plug fails in insertion; 2. The handle control switch is not turned on; 3. The ultrasonic power knob is improperly adjusted.	1. Insert the handle plug well; 2. Turn on the handle control switch; 3. Adjust the frequency adjustment knob well;
Weak vibration	1. The tool is not tightened; 2. The tool is improper; 3. The bamboo or wooden tool thickness is too small after several clamping operations.	1. Tighten the tool; 2. Replace it into the standard tool of our company; 3. Change it into a new bamboo or wooden tool.
Abnormal sound or overheat system	1. The tool is not tightened; 2. The tool is too short; 3. The bamboo or wooden tool thickness is too small after several clamping operations; 4. The tool or clamp is fractured; 5. The end face of tool or clamp is scratched; 6. The contact end face is too dirty.	1. Tighten the tool; 2. Change it into a new one; 3. Change it into a new bamboo or wooden tool; 4. Change it into a new tool or clamp; 5. Ditto; 6. Clean the connecting end face between the tool and tool handle, then tighten the tool.
Unstable digital display of ultrasonic frequency	1. Too large operation pressure 2. The ultrasonic frequency knob is improperly adjusted.	1. Reduce the operation pressure; 2. Adjust the knob well.
No EDM output	1. EDM output line is not connected with the workpiece; 2. The EDM output line is disconnected.	1. Connect the EDM output wire; 2. Change the EDM output wire.
Large EDM power, little cutting amount	Deterioration of water quality	Change the water or increase the water output of rose
Self check of machine	Install a tool handle at the imported super whetstone, switch on the power and turn on the handle control switch, adjust the ultrasonic frequency knob to the max, at this moment, the frequency displays 29KHz, this represents the machine is normal.	

IX. Fabrication and operation of tool

The fabrication and operation of tool is the important step in the polishing process, they directly influence the polishing speed and quality, a good tool head (complete resonance with this machine) has the following features: strong uniformly smooth sense by manual touch once startup, uniform ultrasonic output when slightly applying the pressure in trial polishing and stable power digital display.

If the screws of tool or clamp or relevant connections are slack or the resonance frequency of tool exceeds the frequency locking range (20-29KHz) of this machine, the machine will always be in the frequency searching state and won't reach the stable state, the phenomena is that the unstable digital display of ultrasonic wave power and possible abnormal sound, in that case, the clamp screws and relevant connections shall be fastened or the tool head is replaced to remove the faults (refer to the section VIII: faults and removal in this manual for details).

As for the fabrication and adjustment of new tool heads, the resonance frequency is different with the material and size, therefore, the resonance frequency of tool head that has been assembled may not be in the frequency tracking and locking range of this machine, thus, the length of tool head shall be changed to adjust the resonance frequency of tool head, the method is to install a tool head whose length is longer than the reference length into the amplitude transformer, and shorten it by 2-3mm successively, till the complete resonance is got, in addition, sometimes, the width, thickness or shape of tool head may be changed, the adjustment methods can be found and mastered in practice.

If this machine is equipped with the top polishing tools such as the ruby and super whetstone, the polishing efficiency can be improved greatly, to really realize the high-efficiency polishing operation.

X. Standard packing list

Name	Unit.	Qty.
Main frame	Pcs.	1
Tool handle (transducer)	Pcs.	1
Power line	Pcs.	1
EDM output line	Pcs.	1
Fastening bracket	Set	1
Double-end spanner 12/14	Pcs.	1
Inner-hexagon spanner M3	Pcs.	4
Art knife	Pcs.	6
Tool clamp, bamboo clamping bar, copper clamping sheet, copper clamping bar	Pcs.	2 each
Grinding paste W40, W28, W14, W7 and W3.5	Pcs.	1 each
Hex socket cap screw M4×12	Pcs.	10
3A fuse tube	Pcs.	3
Needle cylinder	Pcs.	1
Operation manual	Copy	1

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.