# Contents

# Function Characteristic Introduction

1.  Provide more than 20,000 units document storage（Decided by the internal hard disk size）Namely more than 20,000 different mold processing conditions can be stored. Have multiple sets of MCS storage function..

2.  With mirror surface processing circuit, a true mirror effect can be achieved. Also, it is even better to use orbit processing and powder mixing processing.

3.  10 segments auto editing function. (1) Manual edit: edit the machining condition by experience. (2)AUTOZ auto edit: max. Depths, initial current and finished procession, machining area selection are provided, and then machining condition edit can be finished automatically. (3) FUZZY Z Intelligent condition edit: electrode shape, electrode and work piece material, work piece section area and finished precision selection, depth setting area are provided, and then machining condition edit can be finished automatically. With either the three edit methods above, machining can be complete at a time by the way rough→moderate→fine..

4.  X.Y.Z axis coordinates are switch with metric and English system。

5.  X Y axis Lock function:Can prevent the continue processing when X Y move and the workpiece be damaged

6.  Z axis Lock function:Convenient discharge to revise mode and using with shaking ( translation) apparatus

7.  In processing can modify processing period or presets processing period conditions

8.  Automatic arcing detection function:if arcing and processing not stable, computer will automatically adjust the parameters and increase deslagging height.till stability.

9.  It could set 2~10 times discharging for raised to the set arbitrary position to processing This could achieve good slagging off performance for deep hole machining.

10. with the function of eliminating the secondary discharge

11. With discharge seeking edge quickly pull-up function, Convenient and accurate to eyeballing the electrode（copper）have touched the workpiece

12. With Power control (EQU) function for homogenizing the machining effect. And this function could be switched off to accelerating graphite electrode machining.

13. With upward discharge processing function Make it easier for special processing

14. With two independent processing coordinate system, Male die cavities and cores can be in different coordinate system points or processing

15. Power off and then restart the system automatically load the last machining conditions and coordinates, Can not move any button panel but directly according to wire control box of discharge

16. Two independent machining coordinates. In the case of keep the electrodes from tensile deformation, improve the efficiency of servo speed and large processing

17. Coordinates and processing data storage function In the different processing can quickly join the same processing conditions

18. With discharge time and boot time two timer function

19. Two kinds of high voltage circuit can be in accordance with customer demand assembly way of partial pressure or shunt way

20. Use industrial PC - BASE controller and DOM new memory instead of traditional hard disk Reading files faster and stability is very high suitable for industrial applications

21. The screen with automatic protection function, make the screen longer service life.

22. The new design conforms to the European CE safety specifications of the electric cabinet and 15 LCD (display),can dustproof, waterproof and tamper-proof and increase the electronic board life.

# Keyboard Introduction
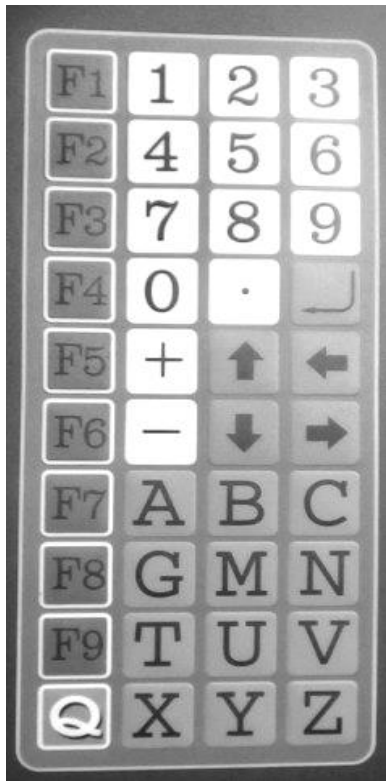


1. Function key: **F1~F9**, according to menu direction with different meaning of each function, please conform to screen display definition operation.

2. Number key: 0 ～ 9 ,on editing coordinate data, these could be use for data input.

3. Decimal: · stands for decimal for inputting coordinate data.

4. Symbol key: ＋ , － stand for replacement direction of coordinate

5. Direction key: ↑ ↓ ← → for controlling cursor moving direction and changing numbers when editing data.

6. Enter key: ↵ enter key: when coordinate data keying in completes, then the enter key should be push to confirm storage in the computer.

7. Control key: 8 functions total, but they will be changed into another 8 function key after **F9 function switch (next page),** so in fact there are 24 functions. These could be set separately by individual habit and the key meanings are showed on the bottom of the display. When setting, the characters are showed in **high brightness**. So relatively the corresponding action is operating at the same time. After another pushing, the characters return in **normal** and the action cancels, too. **\*\*Warning: function switch should be performed in discharging mode.**
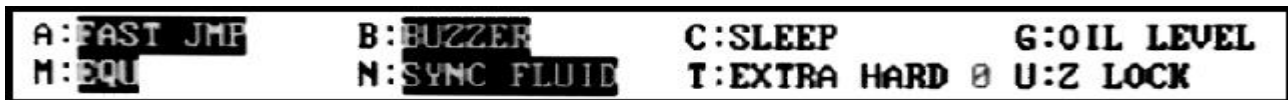


**A: FAST JMP:** Control of discharging, the speed switching of Z axis up and down slaging off which has two kinds of fast and slow.

**B: BUZZER:** Sound control of keyboard input and alarm.

**C:SLEEP:** When auto operation finished, all the power supply would be cut off with it setting on, when setting off only the discharging circuit power would be switch off without the computer on.

**G:OIL LEVEL:** According to the liquid level switch of the machine to control the oiled height.

**M :EQU:** Discharging with equal power energy output with it. When TON<15μs, the energy power control function is auto cut off (according to system parameters), but the display show no change. This function should be cancelled when fine machining and graphite electrode machining with area bigger than 1000m ㎡. The high voltage could not be set to"0":100V, but to over "1":150V when disable energy power control.

**N : SYNC FLUID:** Control the way of the oil providing.When set, provide oil after discharge, no set, provideoil no matter discharge or not

**T: EXTRA HARD:** When fixed value is 0, mean don't start the extra hard circuit;1 mean slightly faster processing,2 mean rapid processing,3 mean more rapider processing. The faster, the greater the loss.Need to install the EXTRA HARD Circuit to get this feature

**U: Z lock:** Z axis will be locked if this switch is opened, press "cancel" then "up" or restart discharge Z axis,it will become normal.

After switching,

```
A:TIME ZERO    B:OSC-HU      C:JMP-UP1    G:Z DOWN INC
M:Z DOWN DEC   N:ARC DET  2  T:ARC SEN    U:JMP-CTL
```

**A: TIME ZERO:** Processing time can be reset, the boot time cannot be reset

**B: OSC-HV:** When set, can improve the processing speed; Don't set, will reduce the processing speed, but can reduce electrode consumption

**C: JMP-UP1:** when up slagging off, the slow speed distance for reducing vacuum pressure(0：0mm、1：0.1mm~9：0.9mm adjustable)

**G: Z DOWN INC:** Down speed of Z axis processing could be set faster.

**M : Z DOWN DEC:** Up speed of Z axis processing could be set slower

**N :ARC DET:** All the arcing detection function will be shut down when set 0. 1 mean start the hardware and arcing detection automatically adjust.2 mean primary arcing detection (applicable trim,sheet, deep hole and no EQU graphite processing).3 mean Intermediate arc detection（Applicable to general plane processing）,4 mean advanced arcing detection, （Applicable to the current relatively great EQU of processing）5 ~ 9 for prepare function the same as the 4, arcing detection automatically adjust need tousing with arcing acuity, The factory value is 2.

**T : ARC SEN:**when set 0,.if only arc detection and adjustment it wont warning,1~9 will arc and warning, the value bigger ,the higher arc sensitivity., The factory value is 1.

**U :JMP-CTL:** Slagging off method setting. The 0 value is normal method and when above 1, machining is generally in jumping type, when below 1; the tool will rise to JM2 height then down process for deep hole taper processing.

After switch again

```
A:ZERO X      B:ZERO Y      C:ZERO Z      G:1/2X
M:1/2Y        N:HUNT-SPD 0  T:PUMP        U:X&Y lock
```

**A: ZERO X**: When discharging, the X axis coordinate could be zero setting.

**B: ZERO Y**: When discharging, the Y axis coordinate could be zero setting.

**C : ZERO Z**: the Z axis coordinate could be zero setting。

**G :1/2 X**: When profile modeling discharging, the current coordinate of X axis could be changed into the half of origin's by keying this button.

**M : 1/2 Y**: When profile modeling discharging, the current coordinate of Y axis could be changed into the half of origin's by keying this button.

**N :HUNT-SPD**: Shut down and start the machine head pull-up speed multiple (0~9) during discharge when short-circuit current, (This function only valid when modeling discharge)

**T : PUMP**: Control the pump motor switch.

**U:XY lock**: If this switch is opened and movie X orY axis it will stop discharge processing immediately and shown a warning message to prevent the damage of workpiece.

   **Warning :**

   1 The control key can be set and cancelled only on the view of main menu or discharging operation, but in the process of editing data, it is disabled.

   2 The computer would set the **FAST JMP, BUZZER, EQU, SYNC FLUID, PUMP** in action automatically when machine starts. It can be seen that these characters are in high brightness, but others not.

8. **QUIT: Q,** Control the finishing of function and action.

9.Hunting V,   When pushing V,machine will start discharging function with the lowest current and no slagging off action, in order to facilitate the profile modeling operation. Also, the <control key> turns to last page to show the X axis zero adjustment and pump motor. Use this function need to close ARC SEN djustment function first.

10. **COORD. CHG: X**, Relative and referenced coordinate can be switched to each other, and processing can be performed in either coordinate. Also this function is for parting and machining of male die and female die.

11.     **Y :** No definition.

12. **Display sleeping : Z**，The display will be shut off automatically by computer during discharge for extend the display life Then can key "Z" to turn it on..

# Slagging off action schematic diagram



First group        Second group        Third group
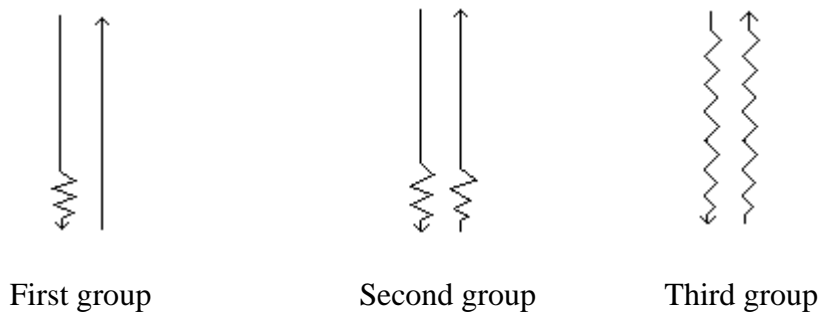
The first group    is the schematic diagram of Z axis slagging off when <JMP-CTL> is setting; <JMP-UP1 > equals 0. The linear part means Z axis rapid moving and the curve part means the speed buffer for approaching machining point.

Second group    is the schematic of Z axis slagging off when < JMP-CTL >is open and < JMP-UP1 > equals 1~9,The distance of upward, slow buffer part (curve part) equals to value of < JMP-UP1> (1~9)*0.1mm.    The method is used for reducing vacuum pull and prevents deformation of electrode, when slagging off upwards on bigger area part machining.

Third group       is the schematic of Z axis slagging off when < JMP-CTL > is closed. When the area of the electrode is large, generally are heavier, itself has a very big inertia;. to prevent the inertia of electrode and damage, the rapid jumping action should be cancelled.

The curve part above can be modified by changing<Z axis speed> to adjust speed after discharging key **F9** to find out the Z DOWN INC or Z DOWN DEC from the function menu, then the **M** or **G** can be chosen to modified the speed.

Because linear part is in the higher speed o f Z axis, it can't be changed. But it can be adjusted by hardware (no detail discussion here).

13、 Below instructions for the remote box control panel

Remote box (standard fitting)

CNT-MPG-01

discharge key&indicator light → DIS  ○    STOP ← stop

Z rise → UP    ○ S/C ← Short circuit relieve&indicator light

Z axis decline → DOWN    ○○○ SLOW ← Speed switch&indicator light

Prepare → C+    C- ← Prepare

Electrode move to Y+ → Y+

Electrode move to X- → X-    X+ ← Electrode move to X+

Electrode move to Y- → Y-
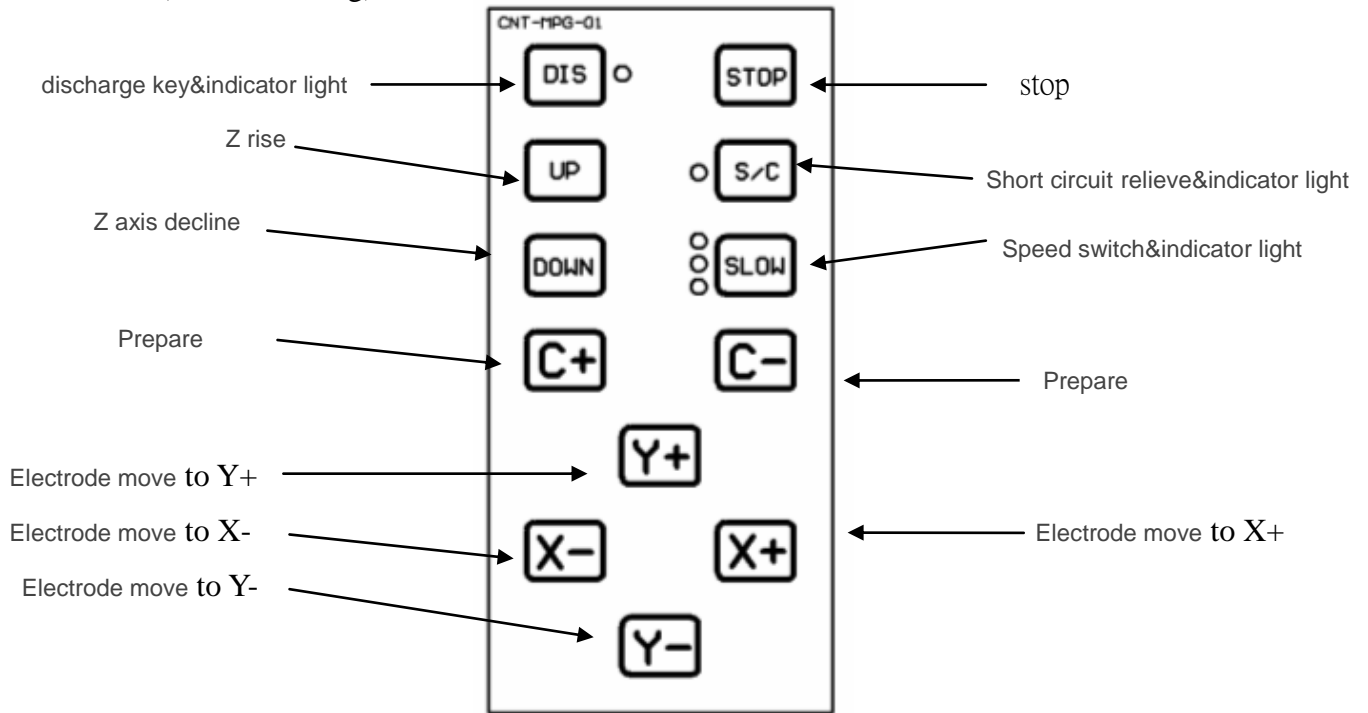
Stereogram:
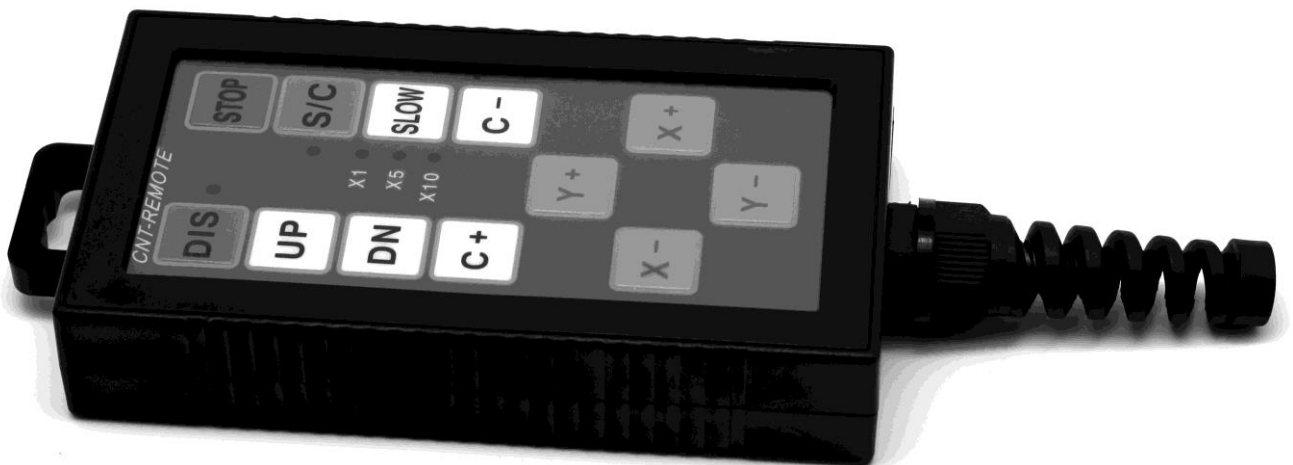
# Menu flow chart

Main functions

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | X | V |
| ·· HOM | ·· X SET | ·· Y SET | ·· Z SET | ·· AUTO TOUCH Z | ·· X/ 2 | ·· Y/2 | ·· EDITOR | ·· DISCHARGE | ·· COORD. CHG | ·· Hunting |

| | | | |
|---|---|---|---|
| F1 | F2 | F3 | F4 |
| ·· X HOME | ·· Y HOME | ·· Z HOME | ·· ZERO REF. XYZ |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | Q |
| ·· EDIT Z | ·· DATA END | ·· LOAD FILE | ·· SAVE FILE | ·· DEL FILE | ·· FILE LIST | ·· CURR. TABLE | ·· AUTO Z SET | ·· FUZZY Z EDIT | ·· QUIT |

| | | | |
|---|---|---|---|
| F7 | F8 | F9 | Q |
| ··Change Disp. | ··Change Form | ··Change Func. | ··QUIT |
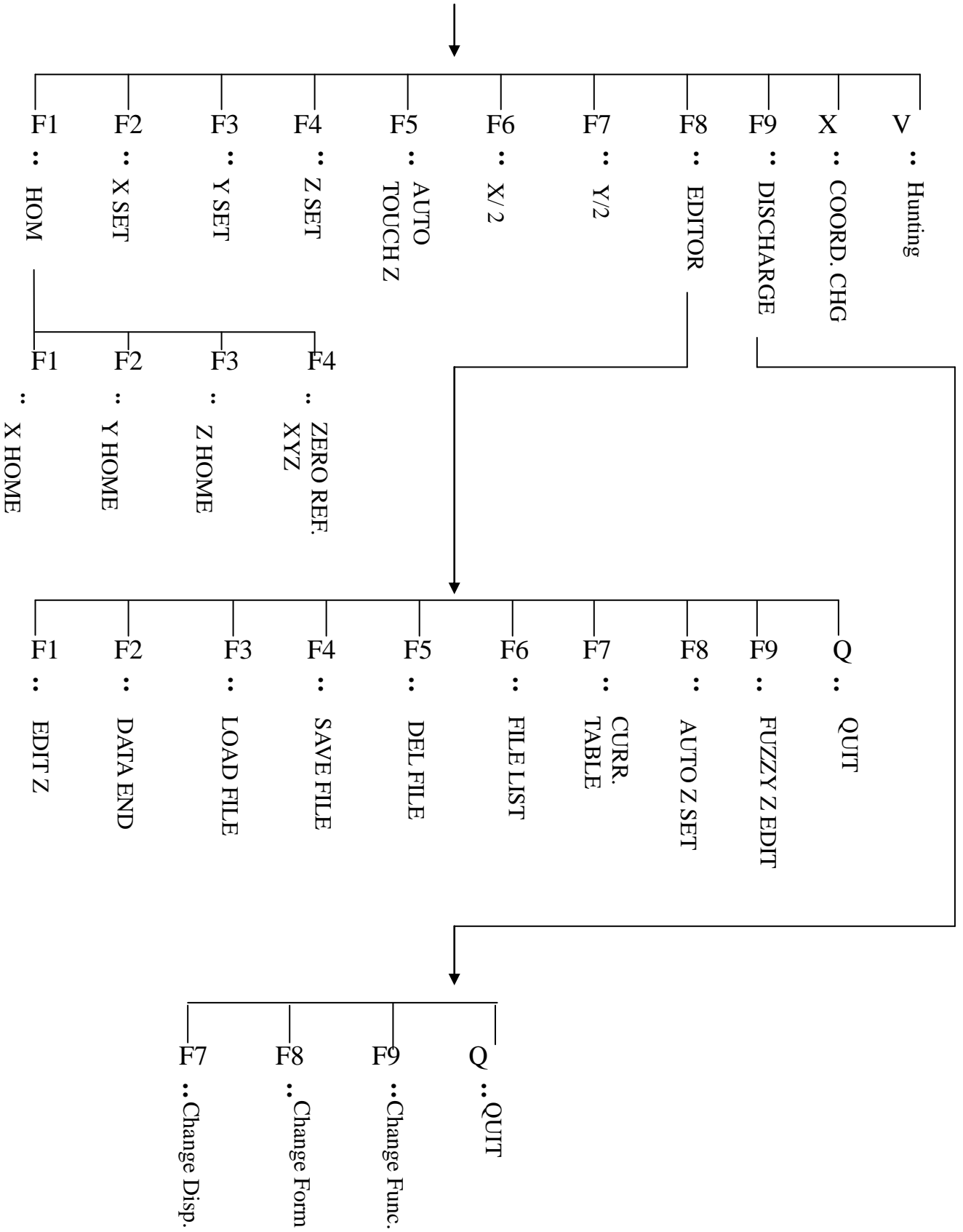
# Main menu introduction

The system is composed of 2 major menu and XYZ three axis coordinate view (including absolute and referenced coordinates), so user can easily recognize the position of machining board. Guided by the menu view, we can finish every setting work by interactive method. The main menu is as follows: (Figure 1)
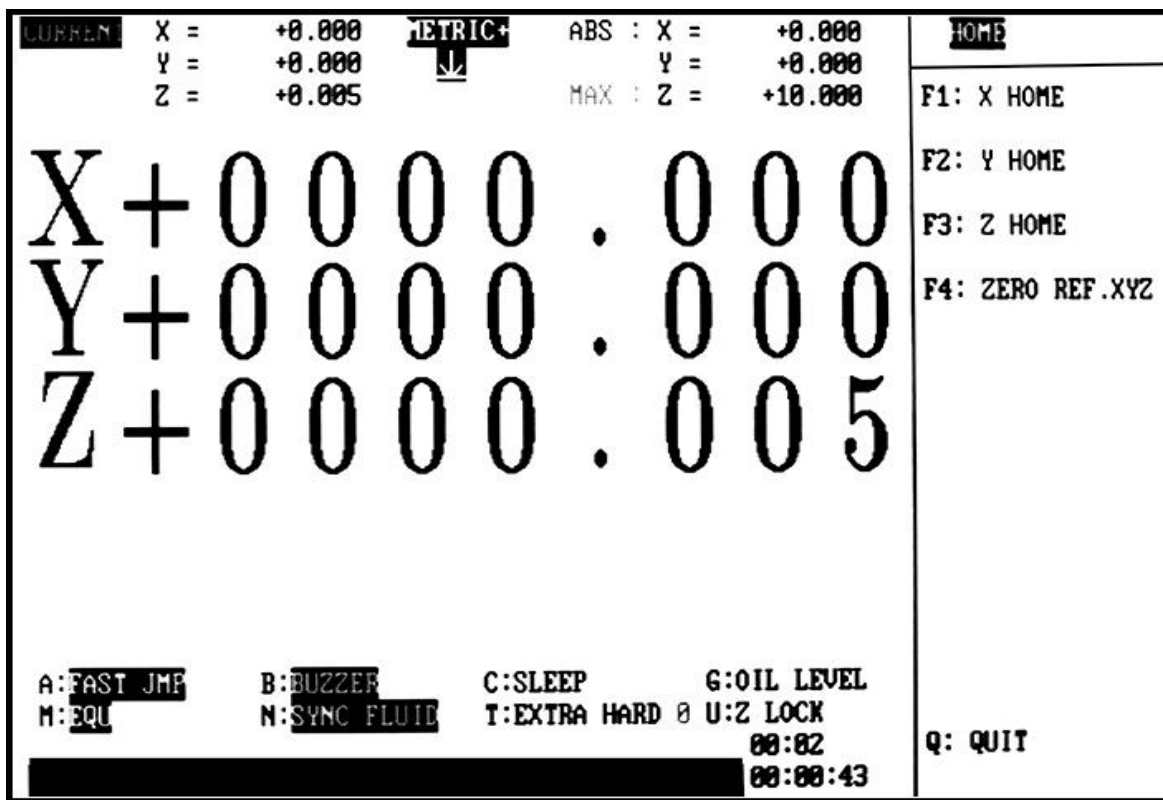
**F1**    =>**HOME** : Three axis machining board zero adjustment and the three axes absolute coordinate (ABS) return to zero.

**F2**    => X SET   : X axis referenced coordinates zero adjustment. Setting the X axis as the first referencing point of mould.

**F3**    => Y SET   : Y axis referenced coordinate zero adjustment. Setting the Y axis as the first referencing point of mould.

**F4**    => Z SET   : Z axis referenced coordinate zero adjustment. Setting the Y axis as the first referencing point of mould.

**F5**    => AUTO TOUCH Z : Computer would help you finish profile modeling action, after that it would make zero adjustment to Z axis referenced coordinate.

**F6**    =>**X /2**       : Plus first referencing point of X axis mould and the current view value and the result divides 2. Then show the operation value on display.

**F7**    => **Y /2**       : Plus first referencing point of Y axis mould and the current view value and the result divides 2. Then show the operation value on display.

**F8**    => **EDITOR**   :   Settings of Z axis depth and machining condition, and file management.

**F9**    => **DISCHARGE** : Execute discharging action, according to settings of Z axis depth and machining condition.

**X**    =>**COORD. CHG** : The switch of **relative and referenced coordinates**. The relative coordinate is used as machining coordinate and the referenced coordinate is for measuring and also for machining.

**V**    => **Hunting**   :   Pushing V, the machine would start discharging function with lowest current and no slagging off action to facilitate profile modeling.

```
CURRENT  X =   +0.000   METRIC↓   ABS : X =   +0.000      MAIN
         Y =   +0.000       ↓          Y =   +0.000
         Z =   +0.000            MAX : Z =   +10.000   F1: HOME

X+0000.000                                            F2: X SET

Y+0000.000                                            F3: Y SET

                                                      F4: Z SET

Z+0000.000                                            F5: AUTO TOUCH Z

                                                      F6: X/2

                                                      F7: Y/2

                                                      F8: EDITOR

                                                      F9: DISCHARGE
                                                       X: COORD.CHG
A:FAST JMP    B:BUZZER     C:SLEEP      G:OIL LEVEL    V: Hunting
M:EQU         N:SYNC FLUID T:EXTRA HARD 0 U:Z LOCK
                                        00:02         ≳Ctek  V9.5D
                                        00:00:18
```

(Figure 1) Main menu view

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(Figure 1) Machining HOME view

**X   HOME**：Press F1: X axis zero adjustment point would turn white, then move X axis till the "toot" sound which means absolute coordinate zero adjusted.

**Y   HOME**：Press F2: Y axis zero adjustment point would turn white, then move Y axis till the "toot" sound which means absolute coordinate zero adjusted.

**Z   HOME**：Press F3: Z axis zero adjustment point would turn white, then move Z axis till the "toot" sound which means absolute coordinate zero adjusted.

★ Because there are mechanical origin for every 50mm of X axis and Y axis, we should mark on the machine board first, move the board to marked position ,then do zero adjustment operation and move at the same direction. So it wouldn't come to the fault mechanical origin.

★ Only X, Y, Z origins are found and edited machining condition is saved, the reloaded file coordinates data can be inerrant. So the first action after booting machine should be board zero adjustment. And the action should at least include Z zero adjustment, so that the machine board moved can return to origin in case of power off.

Referenced point coordinate zero adjustment: press **F4,** referenced point coordinate zero adjustment, then all the three axes should be zero adjusted.

# F8 Editor

Editor function is mainly for entering machining data of Z axis and save these data. Guided by the menu view, the user can enter and save machining data one by one. The detail as follows:

**F1** =>**EDIT Z** : Machining depth, current, cyclem slagging off height…finished by this function (Figure 3).

**F2** =>**DATA END** : Editing Z, need to set an end point for the last segment. Move the cursor to last segment and press **"F2"** then there would be an **"E"** character before the last segment. Finish setting action.

**F3** =>**LOAD FILE** : Load the former data files to avoid repeated entering.

**F4** =>**SAVE FILE** : Finished editing, these data can be saved in DOM harddisk for loading next time.

**F5** =>**DEL FILE** : Press the key and enter file number to delete unnecessary file.

**F6** =>**FILE LIST** : Press the key to show all file numbers entered on the display.

**F7** =>**CURR. TABLE** : Comparison table of current and cycle (T-ON). The cycle value for every segment of current can be preset here, and then it is no need entering the cycle value for later editing.

**F8** => **AUTO Z SET** : Press the key, enter **depth, current, mode and area**. The discharging parameters from rough to fine machining would be arranged automatically by segments to save time.

**F9** =>**FUZZY Z EDIT** : Press the key, select electrode shape, material, area, precision and depth. The discharging parameters from rough to fine machining would be arranged automatically by segments to save time.

**QUIT =>** **Q**: Exit edit function, return to main
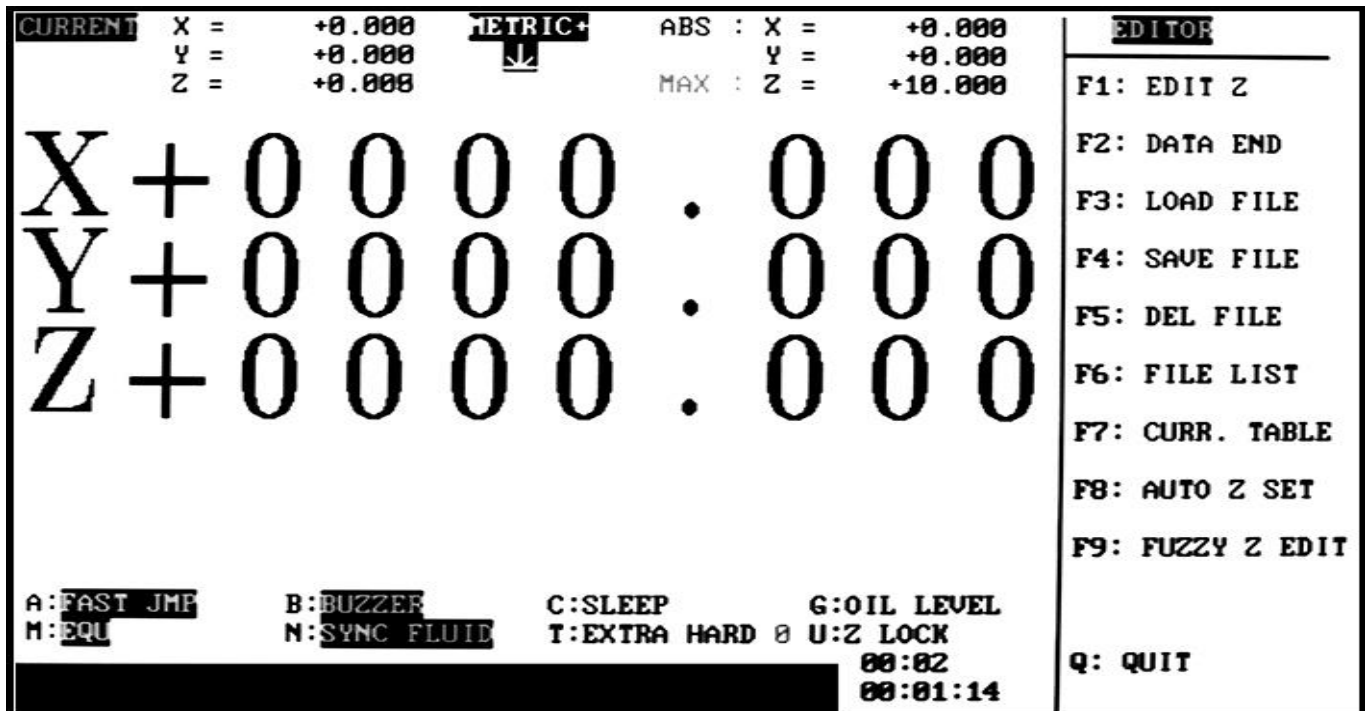


(Figure 2) F8 Editor view

# F1 Edit Z machining data

Please push "F1" then table in figure (3) would be on display. There is a flashing cursor. Please enter corresponding values on the cursor place to edit Z axis machining data one by one.

**CH** : The Z axis segment value to be edited. Total 10, coded with 0-9,no need of entering.

**DEPTH**    : Depth value of Z axis segement to be edited. Because the downward value is positive for Z axis coordinate, there is no need of entering minus or positive sign. The value is defined by absolute coordinate below zero. Max. Value is +40000.000~-40000.000.
Generally small area given depth = given current valye*1.0~1.5/100(mm);given depth for current below 4A = current value of segment/100(mm);given depth for area more than 1000m ㎡ = given current value/100(mm). The given depth for little area or column and taper shape should be bigger.

**I**    : Current for discharging. The value is 0-75.Max. Value could be 75A. The general setting should be accorded to electrode (copper) section area. Current for small area should refer to the table below or there will be big consumption of electrode.

| Section area of copper | Below 3m ㎡ | 3~6m ㎡ | 6~9 m ㎡ | 9~12 m ㎡ | 12~15 m ㎡ |
|---|---|---|---|---|---|
| Max. current | 1A | 1.5A | 2A | 2.5A | 3A |

**T-on**    : The current on time of discharging voltage wave shape. The value is 2~2400( μ S). Gerenally, the value is 20 to 30 times of current value( μ S) for below 10A。About situation of more than 10A, the origin value should be added 20( μ S) for every 1A. In order to reduce consumption, other segments should be 15~20 times ( μ S) of current. About Carbide, it should be 15~20 times ( μ S) of current. About steel to steel, it should be 5~10 times( μ S) of current. About graphite to steel, it should be 10~20 times ( μ S) of current.

**T-off** : The ratio between on time of discharging voltage wave and the whole cycle time.The value is 1~9, namely 10%~90%. Gerenally according to cycle ratio, as follows: If there is any unsteady situation, the efficiency can be reduced 1.

| Cycle | 2~15 | 15~30 | 30~50 | 50~80 | 80~120 | 120~300 | Above 300 |
|---|---|---|---|---|---|---|---|
| Efficiency | 6 | 5 | 4 | 5 | 6 | 7 | 8 |

**Gap**    : The gap voltage between electrode and mould when discharging. The value is 25~99, Min. value is 25 V, Max. Value is 99V. Common setting is 30~80. Tt can be set according to high voltage as follows:

| High voltage | 0(100V) | 1(150V) | 2(200V) | 3(250V) |
|---|---|---|---|---|
| Gap | 35~45 | 45~60 | 50~70 | 65~85 |

Setting as follows when cycle is lower than15 μ S or power control is cancelled.

| High voltage | 0(100V) | 1(150V) | 2(200V) | 3(250V) |
|---|---|---|---|---|
| Gap | 20~35 | 30~45 | 40~50 | 45~60 |

**Jmp**    : The distance between electrode rising and the deepest point, namely slagging off height when discharging. The value is 0~99, slagging off height for every unit is 0.1m/m. "0" means no slagging off and "99" means slagging off height is 9.9m/m. According to depth.

| depth | Below 3mm | 3~6mm | 6~9mm | 9~12mm | Above 12mm |
|---|---|---|---|---|---|
| Jumping | 5 | 7 | 10 | 15 | 20 |

**W-T** : Working time of discharging. Value is 0~99. Time per unit is 0.1 s. Max value is 9.9s.Setting as the current and depth. The lower current, the shorter of discharging time, and the machining depth and machining time should be shorter too. Gerenal time should be equal to current value plus 3. If the result value exceeds 15, it should be 15. The machining time should be 10~20 when boundary mending.

**Pol**: The polarity of electrode and mould. The value is 0~1."0" means electrode is positive and the mould is minus. "1" means electrode is minus and mould is positive. Setting as machining material

**H-V**: **Voltage type**:
The highest voltage between electrode and mould. The value should be 0~3. "0" means no high voltage;"1" means 150V; "2" for 200V; "3" for 250V. The voltage for small area should

be below 150V. Gerenally it is 200V. If small consumption is needed, please set high voltage as "0": no high voltage. The value for area above 1000m ㎡ should be "3": 250V. The high voltage of first segment for area below 10m should be "0": no high voltage. Other segment can be "1":150V. The voltage for current below 4A should be "1":150V; current above 5A should be "2":200V. According to machining area as follows:

| Copper section area | Below 15m ㎡ | 15~100m ㎡ | 100~400 m ㎡ | Above 400 m ㎡ |
|---|---|---|---|---|
| High voltage | 0(100V) | 1(150V) | 2(200V) | 3(250V) |

**Current type**:

The highest voltage between electrode and mould. The value should be 0~3. "0" means 50mA ;"1" means 0.2A; "2" for 0.5A; "3" for 1A. The voltage for small area should be below 0.2A. Gerenally it is 0.5A. If small consumption is needed, please set high voltage as "0": 50mA. The value for area above 1000m ㎡ should be "3": 250V. The high voltage of first segment for area below 10m ㎡ should be "0": no high voltage. Other segment can be "1":0.2A. The voltage for current below 4A should be "1":0.2A; current above 5A should be "2":0.5A. According to machining area as follows:

| Copper section area | Below 15m ㎡ | 15~100m ㎡ | 100~400 m ㎡ | Above 400 m ㎡ |
|---|---|---|---|---|
| High voltage | 0(50mA) | 1(0.2A) | 2(0.5A) | 3(1A) |

※Warning: After entering the data, please move the cursor to the last "segment" you input, and push "F2" to end setting for confirm the end segment of machining. If not, there will be "**Z axis data erro**r" information when executing. Finally please input "Q" after editing to move to another edit form.

**SAFE POS**: It mean the maximum distance between pole and mould while arriving the depth of discharging, When pole reaches the point, it would stop automatically. Minimum is 0 and the maximum is t the maximuml of Z axis. The setting value is positive coordinates and deviation between last step position and safety height. Please reference to process correlative position figure of process setting.

**DWELL:**   Pause time at ultimatedepth,set "1"as 1 minute, the maximum is 998 minutes,and it is locked all the time if setting "999". The function is the pole reach the ultimatedepth (e.g. 10.000m/m) and Z axial will automatically lock for steady discharge until time out.( Cooperate with sway process to use)
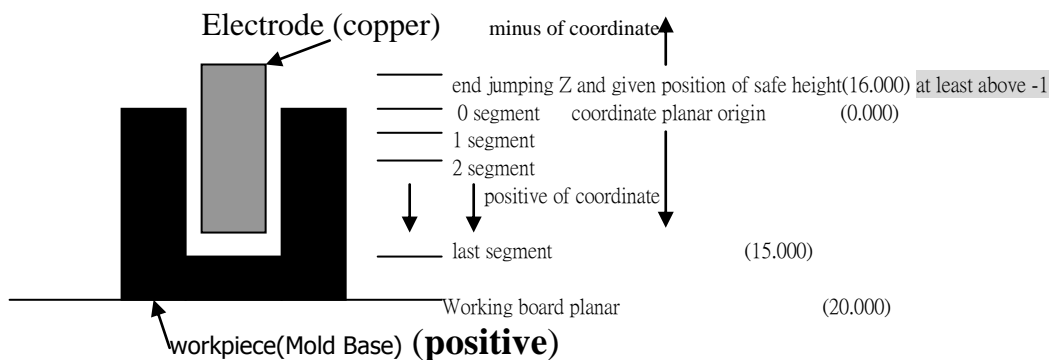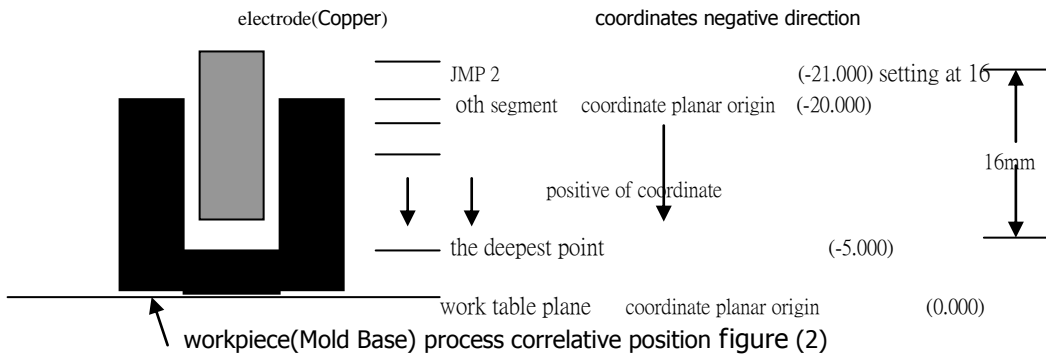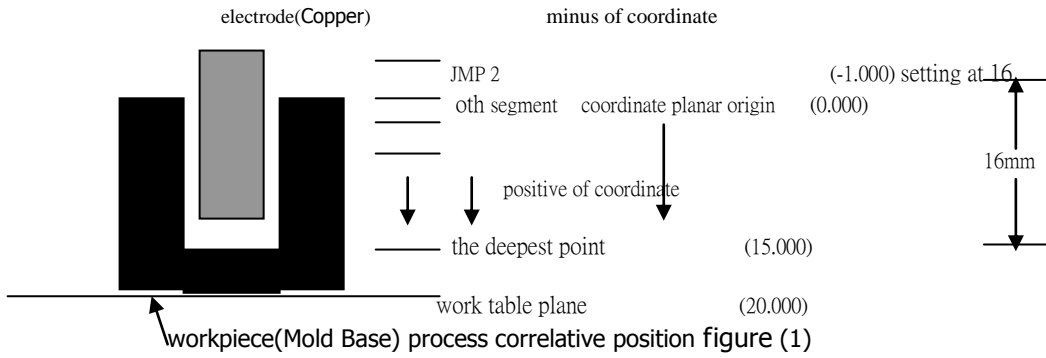


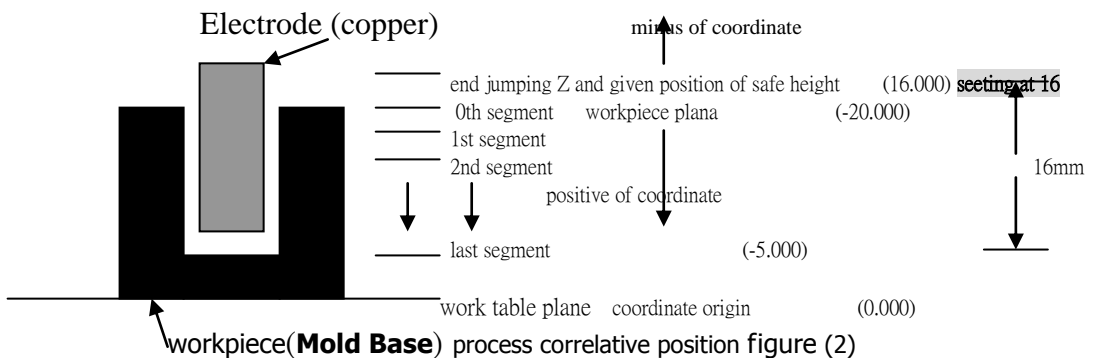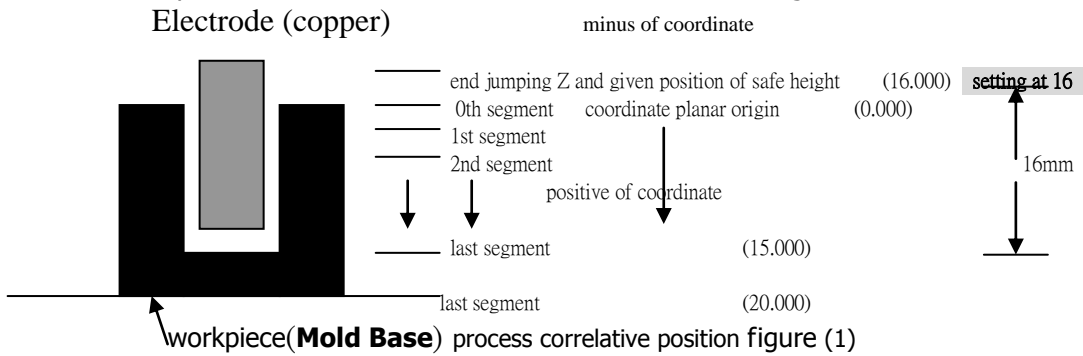Machining relative position schematic diagram (1)
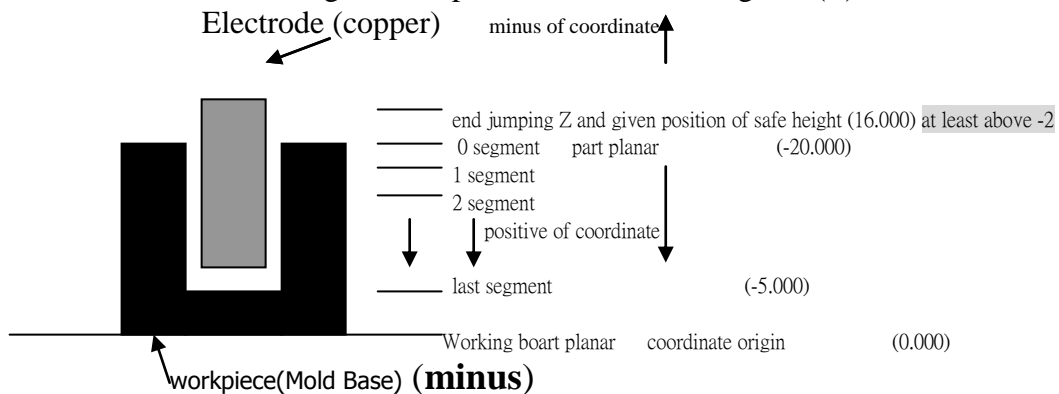


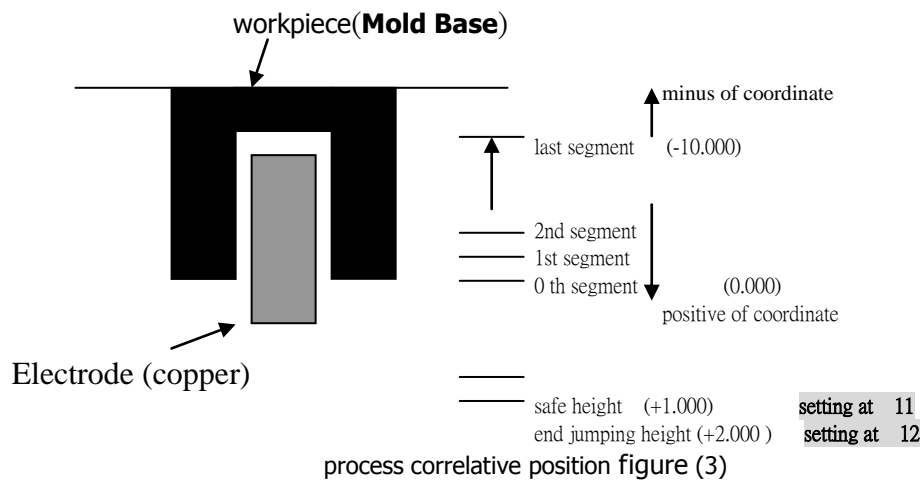Machining relative position schematic diagram (2)

**JMP- 2:**    use for setting the JMP high position of JMP control ,the setting value is how many mm need to jump form the deepest point of the processing at that time.

electrode(Copper)                    minus of coordinate

_____ JMP 2                              (-1.000) setting at 16
_____ oth segment    coordinate planar origin    (0.000)

positive of coordinate

                                                          16mm

_____ the deepest point                    (15.000)

work table plane                    (20.000)
workpiece(Mold Base) process correlative position figure (1)

electrode(Copper)                    coordinates negative direction

_____ JMP 2                              (-21.000) setting at 16
_____ oth segment    coordinate planar origin    (-20.000)

positive of coordinate                              16mm

_____ the deepest point                    (-5.000)

work table plane    coordinate planar origin    (0.000)
workpiece(Mold Base) process correlative position figure (2)

**SAFE POS:** The function is setting the right position for discharge. If discharging on upper position of setting, the arc will accumulated and can't continuous process. Minimum is 0 and the maximum is t the maximuml of Z axis. The setting value is positive coordinates and deviation between last step position and safety height. Please reference to process correlative position figure of process setting. If turn on the jump controller, the jump position as setting,merge the end jumping Z and SAFE POS into one function after Version 9.56.

**INVERSE :** If setting "0"it is normal.It need to process upward and setting at "1"while copper position is lower than workpiece.Please reference to process correlative position figure (3)

Electrode (copper)                    minus of coordinate

_____ end jumping Z and given position of safe height    (16.000)    setting at 16
_____ 0th segment    coordinate planar origin    (0.000)
_____ 1st segment
_____ 2nd segment
positive of coordinate                              16mm

_____ last segment                    (15.000)

last segment                    (20.000)
workpiece(**Mold Base**) process correlative position figure (1)

Electrode (copper)                    minus of coordinate

_____ end jumping Z and given position of safe height    (16.000) seeting at 16
_____ 0th segment    workpiece plana    (-20.000)
_____ 1st segment
_____ 2nd segment
positive of coordinate                              16mm

_____ last segment                    (-5.000)

work table plane    coordinate origin    (0.000)
workpiece(**Mold Base**) process correlative position figure (2)

workpiece(**Mold Base**)



process correlative position figure (3)

| safe height (+1.000) | setting at 11 |
| end jumping height (+2.000 ) | setting at 12 |



(Figure 3)F1 EDIT Z view

F3：INS. LINE    Copy the row floating cursor pointing at, and the under rows would move down.
F4：DEL. LINE    Delete the row floating cursor pointing at, and the under rows would move up.
JMP2 to control the jumping height. it is the referencing value of jumping height.
DWELL means locking the nose for 1~998 minutes, 0 for no pause, 999for locking the head forever.

# F8　AUTO EDIT Z



(Figure 4)F8 AUTO Z SET view

Auto edit Z: Push the key and enter"depth" such as10.000m/m, "current"such as 10A and "precision" such as "3" hyper-precise. Then next page will be showed as figure 5. From rough machining → fine machining, discharging parameters such as segments, depth, current, cycle, efficiency, gap, jumping, time, polarity, high voltage would be arrange by segments to save time automatically(figure 5).

■ When using Edit Z, or after Auto edit Z, and return to F4 Save file to save edit data to the harddisk, and then return to the main menu.

■ If there is any unsteady situation of discharging, you can push function key F1~F9 to modify each parameter in the F9"discharging" mode.



(Figure 5)AUTO Z SET view

# F9 FUZZY Z EDIT

Press F9 condition editor
first select the shape of the electrode 0. Plane 1. carving 3. Needle;
Second choice material 0 ~ 5 choice, total 6;
Then select the area of 0 ~ 9 there are 10 kinds of area of choice;
Then choose Vdi. of 0 ~ 4,there are 5 kinds of   Vdi. Degrees;
Finally set Depth and will automatically form processing conditions.
Because the edit database conditions are not yet complete, it is suggested that using the edit Z

```
CURRENT  X =    +0.000  METRIC+   ABS : X =     +0.000    EDITOR
         Y =    +0.000    ↓↓             Y =     +0.000
         Z =    +0.005            MAX : Z =    +10.000   F1: EDIT Z

Electrode: 0                   0:CU-ST              F2: DATA END
                               1:NU-ST
Material :  ▌                  2:ST-ST              F3: LOAD FILE
                               3:CU-AL
Area     :                     4:NU-AL              F4: SAVE FILE
                               5:CU-WU
 Vdi     :                                          F5: DEL FILE

Depth    :                                          F6: FILE LIST

                                                    F7: CURR. TABLE

                                                    F8: AUTO Z SET

                                                    F9: ▐▐▐▐▐▐▐▐

A:FAST JMP      B:BUZZER     C:SLEEP       G:OIL LEVEL
M:EQU          N:SYNC FLUID  I:EXTRA HARD 0 U:Z LOCK
                                            00:02     Q: QUIT
                                            00:02:30
```

(Figure 6)FUZZY Z EDIT view

# F9 Discharging

After all the Z axis depth and machining parameter settings are finished, we can enter discharging mode to execute mould machining. When entering discharging mode, the function key can be used to change discharging parameter, and the detail function is as follows: figure (5)

F1     =>current(I)     : Changing current value. Push the key and up- down key to change parameter value, then push it again to finish the operation. Setting value is 0-75.

F2     =>Cycle(Ton)     :    Changing the discharging current width of "on" cycle. Push the key and up-down key to change parameter value, and then push it again to finish the operation. Setting value is 1-2400.

F3     =>Efficiency(Toff)    : Changing the discharging current width of "off" cycle. Push the key and up-down key to change parameter value, and then push it again to finish the operation. Setting value is 1-9.

F4     =>Gap voltage: Change voltage. The same process as above , and setting valye is 25-99。

F5     =>Jumping height: Change slagging off height. The same process as above , and setting valye is 0-99。

F6     =>Work time: Change working time. The same process as above , and setting valye is 0-99。

F7     =>Polarity     : Change polarity. The same process as above , and setting valye is 0-1。

F8     =>High voltage     : Change voltage. The same process as above , and setting valye is 0-3。

F9     =>Function change : Control key function change.For changing 8 control key functions to another 8 functions   。

Q     =>QUIT     : Exit edit function, and return to main menu.
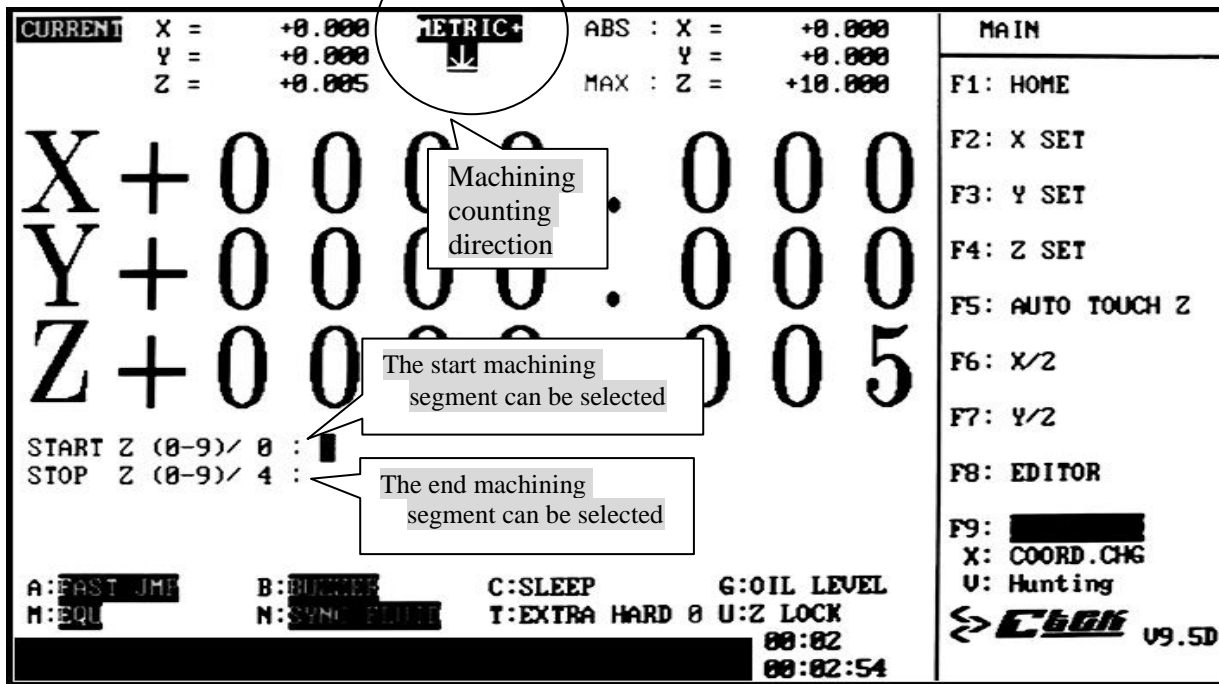
(Figue 6)MAIN view

Select F9：Discharging, the view would be showed.

StartsZ:（0）：The start machining segment can be selected.

endsZ: （4）：The end machining segment can be selected.

| CH | DEPTH | I | Ton | Tof | Gap | Jmp | W-T | Pol | H-U |
|----|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| 30 | +9.630 | 10.0 | 300 | 7 | 50 | 7 | 11 | 0 | 2 |
| 1 | +9.770 | 8.0 | 150 | 7 | 60 | 7 | 10 | 0 | 3 |
| 2 | +9.870 | 6.0 | 120 | 7 | 70 | 7 | 9 | 0 | 3 |
| 3 | +9.940 | 4.5 | 100 | 7 | 80 | 7 | 7 | 0 | 3 |
| E4 | +10.000 | 3.0 | 80 | 6 | 80 | 7 | 6 | 0 | 3 |
| 5 | +0.000 | 1.5 | 8 | 5 | 60 | 8 | 4 | 0 | 2 |
| 6 | +0.000 | 1.0 | 5 | 5 | 45 | 8 | 3 | 0 | 2 |
| 7 | +0.000 | 1.0 | 3 | 5 | 40 | 8 | 3 | 0 | 2 |
| 8 | +0.000 | 0.5 | 2 | 6 | 35 | 8 | 3 | 0 | 2 |
| 9 | +0.000 | 1.0 | 1 | 4 | 30 | 8 | 3 | 0 | 3 |

| SAFE POS | DWELL | JMP-2 | INVERSE |
|----------|-------|-------|---------|
| 8.000 | 0 | 5.000 | 0 |
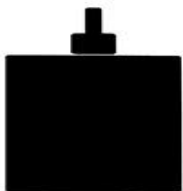
Z SPEED :3
ARC SEN :2
JMP-CTL :0
JMP-UP1 :0

F7: Change Disp.
F8: Change Form
F9: Change Func.

Q: QUIT

A:FAST JMP    B:BUZZER    C:SLEEP    G:OIL LEVEL
M:EQU    N:SYNC FLUID    T:EXTRA HARD 0 U:

# (Figure 7)F9 discharging machining view

Operating method of adjusting machining condition on machining process:
a. Push direction key → or ← or ↓ or ↑ to move the cursor to the parameter position, then input values and push" ENTER" to confirm it.

b Press "F7：Change Disp." discharge display will switch to the big or small coordinate display and the conditions can be modified. (Version 9.56)

c. Press"F8: Change Form" to move cursor to the table below and modify parameters such as"HOME, DWELL", after that push the key again to return cursor to the table above.

d.Press F9:Change Func. To change "ABCGMNTU" function page. Please refer to page 3 ~ 4 function introduce.

| CH | DEPTH | I | Ton | Tof | Gap | Jmp | W-T | Pol | H-V |
|---|---|---|---|---|---|---|---|---|---|
| S0 | +9.630 | 10.0 | 300 | 7 | 50 | 7 | 11 | 0 | 2 |
| 1 | +9.770 | 8.0 | 150 | 7 | 60 | 7 | 10 | 0 | 3 |
| 2 | +9.870 | 6.0 | 120 | 7 | 70 | 7 | 9 | 0 | 3 |
| 3 | +9.940 | 4.5 | 100 | 7 | 80 | 7 | 7 | 0 | 3 |
| E4 | +10.000 | 3.0 | 80 | 6 | 80 | 7 | 6 | 0 | 3 |
| 5 | +0.000 | 1.5 | 8 | 5 | 60 | 8 | 4 | 0 | 2 |
| 6 | +0.000 | 1.0 | 5 | 5 | 45 | 8 | 3 | 0 | 2 |
| 7 | +0.000 | 1.0 | 3 | 5 | 40 | 8 | 3 | 0 | 2 |
| 8 | +0.000 | 0.5 | 2 | 6 | 35 | 8 | 3 | 0 | 2 |
| 9 | +0.000 | 1.0 | 1 | 4 | 30 | 8 | 3 | 0 | 3 |

| SAFE POS | DWELL | JMP-2 | INVERSE |
|---|---|---|---|
| 8.000 | 0 | 5.000 | 0 |

# (Figure 8)F9 discharging machining view

Push" F9:Change Func." to change function page

# Machining current material table

## 50A

| current | Cycle (T-ON) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 15 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 |
| 1 | 300 | 320 | 340 | 360 | 380 | 400 | 420 | 440 | 460 | 480 |
| 2 | 500 | 520 | 540 | 560 | 580 | 600 | 620 | 640 | 660 | 680 |
| 3 | 700 | 720 | 740 | 760 | 780 | 800 | 820 | 840 | 860 | 880 |
| 4 | 900 | 920 | 940 | 960 | 980 | 1000 | 1020 | 1040 | 1060 | 1080 |
| 5 | 1100 | 1120 | 1140 | 1160 | 1180 | 1200 | | | | |

Notice: the table above is machining current and cycle caparison from original factory setting, and the user can manually modify it. Current unit is A; cycle unit(T-ON) is μ S

0 A, cycle 15ms
10 A, cycle300 ms
50 A, cycle 1100 ms

## 75A

| current | Cycle (T-ON) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 15 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 |
| 1 | 300 | 320 | 340 | 360 | 380 | 400 | 420 | 440 | 460 | 480 |
| 2 | 500 | 520 | 540 | 560 | 580 | 600 | 620 | 640 | 660 | 680 |
| 3 | 700 | 720 | 740 | 760 | 780 | 800 | 820 | 840 | 860 | 880 |
| 4 | 900 | 920 | 940 | 960 | 980 | 1000 | 1020 | 1040 | 1060 | 1080 |
| 5 | 1100 | 1120 | 1140 | 1160 | 1180 | 1200 | 1220 | 1240 | 1260 | 1280 |
| 6 | 1300 | 1300 | 1300 | 1300 | 1300 | 1300 | 1300 | 1300 | 1300 | 1300 |
| 7 | 1300 | 1300 | 1300 | 1300 | 1300 | 1300 | | | | |

Notice:the table above is machining current and cycle caparison from original factory setting, and the user can manually modify it. Current unit is A; cycle unit(T-ON) is μ S

1.  Operation sequence:
    1) When starting, please execute X,Y,Z axis panel zero adjustment(F1). At least Z panel axis zero adjustment.
    2) Find out XYZ three axis mould benchmark point (F2-F4) or mould center point (F6-F7).
    3) Enter edit function (F8), key in every Z axis data (F1) or enter AUTOZ edit (F8).
    4) Key in all the data to the disk drive, with file store function (F4).
    5）Return to main menu (Q), enter the discharging function (F9).

2.  Action when power off:
    1) Restart the machine.
    2) Perform X,Y,Z axis panel zero adjustment(F1). At least Z panel axis zero adjustment.
    3) Enter edit function (F8), load the data saved before into memory with the file load function (F3).
    4) Return the main menu (END), readjust benchmark point of XY axis (F2-F3). It is no need of this action, if X, Y axis panel zero adjustment (F1) or no movement of machine frame.
    5) Enter discharging function (F9).
※Warning: All of above should be in sequence, or else there would be some trouble in profile remodeling Z and data editing.

※In case no movement of machine frame after power off, we can enter the discharging function directly(F9) or push discharging key on wire control box(DIS), with low requirement of machining size situation.

3.  When editing or executing, there would be some error or status information, such as"key error" or "data setting error"…please reset data according to these information.

4.  If there are too many files, the unnecessary files can be deleted or the data can be saved in disk with the same number, while new data will cover the old one.

5.  Combination of synchronously oil supply action:
    1) Synchronously oil supply action: supply oil only in discharging situation.
    2) No action of synchronously oil supply: supply oil when no discharging, as well as charging. The function is just for machine frame cleaning.

6.  "**S/C**" key on remote control box controls the movement of machine board when electrode short current. So please be careful of it.
    Push the key, all the short current would no longer be detected and warning information would be showed on display by sound warning.
    If no any short current of electrode, please push the "S/C" key again right now, or else there may be some danger of electricity destroys.

7.  The method of changing machining parameter when discharging：
    Push direction key → or ← or ↓ or ↑ to move the cursor to the parameter position, then input values and push" ENTER" to confirm.

8.  If same part machined by the same electrode(copper) tool, there is no need of push any key on panel when machining, just fixing the part on the original position and then push DIS on wire control box to restart machining.

# Machining condition edit example：

Machining depth=10 m/m

Machining method: rough→moderate→fine in one time , 5 segments machining

1. Rough machining current=8A , Cycle=220μS , efficiency=70%
2. Moderate machining current =6A , Cycle =120μS , efficiency =60%
3. Moderate machining current =4A , Cycle =90μS , efficiency =50%
4. Fine machining current =3A , Cycle =60μS , efficiency =40%
5. Fine machining current =2A , Cycle =40μS , efficiency =40%
6. as follows:

| Segments | Depth | Current | Cycle | efficiency | Gap | Jumping | Time | High voltage | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 9.78 | 8 | 220 | 7 | 75 | 8 | 10 | 2 | 0 |
| 1 | 9.87 | 6 | 120 | 6 | 70 | 8 | 7 | 2 | 0 |
| 2 | 9.93 | 4 | 90 | 5 | 65 | 8 | 7 | 2 | 0 |
| 3 | 9.97 | 3 | 60 | 4 | 60 | 8 | 6 | 2 | 0 |
| E4 | 10.0 | 2 | 40 | 4 | 55 | 8 | 6 | 2 | 0 |

### Machining condition warnings:

★ Every gap of segmental auto fine machining current could be too large; especially the situation below 4A, the gap should be about 1A. Every machining allowance depth should be set, according to the current value and machining area. The higher of current value, the depth should be bigger; also it is better bigger depth for relatively small area condition. Generally, given depth for small area = current value of last segment *1.5/100(mm), given depth for below 4A = current value of last segment /100(mm). If given depth for area more than 1000m㎡ = current value of last segment/100(mm).

★ If there any uneven situation on the bottom of part, it may be because the given machining depth of every segment is not enough or too big distance of every current value gap.

★ If slow machining and big consumption of electrode, it may be because too big given machining depth of every segment or too big difference between every current segment.

★ About cycle setting, the first segment should be the 30 times (us) of current value, others should be 15 times (us) of current value, so that the electrode consumption can be lower and the machining speed could be higher.

★ Generally current should be set according to electrode (copper) area. Electrode current of area below 10m㎡ shoule be lower than 3A, or else it would be a big consumption of electrode.

★ About high voltage setting, for area above 1000m㎡ it should be "3",namely 250V. For area below 10m㎡, the high voltage of first segment should be "0",namely no high voltage. Others with current lower than 4A should be "1", namely 150V;with current above 5A should be "2",namely 2000V.

★ Machining on area above 1000m㎡, JUMP need shut down（or set JMP2 for above 5）the power control need to close. arc detection set 2or 3, sensitivity of carbon deposition set 1 or 2, the gap voltage should be set 50 V.

★ About fine machining, if the cycle is between 30(us) ~10(us), arc detection set 2, and high voltage should be above 150V. If cycle below 10(us), high voltage should be above (2)200V. It should be negative polarity and high voltage should be (3)250V, when mirror machining.

★ If machining depth of slice or tip shape is more than 5mm, the power control should be cancelled and arc detection set 2, At the same time, jumping control is on and efficiency can be higher and the high voltage should be set to above 150V.

# Big area fine machining condition edition example:

Machining depth=0.3 m/m

Machining method: rough→moderate→fine in one time ,         electrode(copper) shape
           10 segment machining
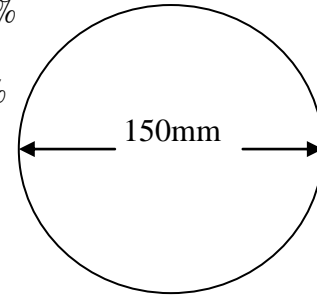
1. Rough maching current=6A , Cycle=180μS ,    Efficiency=70%

2. Moderate maching current =5A , Cycle =100μS , Efficiency =60%

3. Moderate maching current =4 A , Cycle =70μS , Efficiency =50%

4. Fine maching current =3 A , Cycle =50μS ,    Efficiency =50%

5. Fine maching current =2 A , Cycle =30μS ,    Efficiency =50%

6. Fine maching current =2 A , Cycle =20μS ,    Efficiency =50%

7. Fine maching current =1 A , Cycle =15μS ,    Efficiency =50%

8. Fine maching current =1 A , Cycle =10μS ,    Efficiency =50%

9. Fine maching current =1 A , Cycle =6μS ,    Efficiency =45%

10. Fine maching current =1 A , Cycle =3μS ,    Efficiency =40%

round planar

150mm

11. as follows :

| CH | Depth | Current | Ton | Toff | Gap | Jmp | W-T | H-V | Pol |
|----|-------|---------|-----|------|-----|-----|-----|-----|-----|
| 0 | 0.060 | 6 | 180 | 7 | 45 | 5 | 10 | 3 | 0 |
| 1 | 0.120 | 5 | 100 | 6 | 80 | 5 | 10 | 3 | 0 |
| 2 | 0.170 | 4 | 70 | 5 | 75 | 5 | 10 | 3 | 0 |
| 3 | 0.210 | 3 | 50 | 5 | 70 | 5 | 10 | 3 | 0 |
| 4 | 0.240 | 2 | 30 | 5 | 65 | 5 | 8 | 3 | 0 |
| 5 | 0.260 | 2 | 20 | 5 | 55 | 5 | 8 | 3 | 0 |
| 6 | 0.270 | 1 | 15 | 5 | 55 | 5 | 5 | 3 | 0 |
| 7 | 0.280 | 1 | 10 | 5 | 50 | 5 | 5 | 3 | 0 |
| 8 | 0.290 | 1(0.5) | 6 | 5 | 45 | 5 | 4 | 3 | 0 |
| E9 | 0.300 | 1(0.5) | 3 | 6 | 40 | 5 | 4 | 3 | 0 |

## Machining condition warnings

★ Fast Jmp need to close when big area machining thin（or set JMP2 above 5）, the power control need to close. arc detection set 2or 3, sensitivity of carbon deposition set 1 or 2.

★ Z axis speed should set 1 or 2, oil spraying pressure should not be too high. And it is better machine in oil immersing condition to get a good effect.

★ With big area machining, all the high voltage should be set to "3"

# Notice to chip (flake) or side processing

1. Set the processing efficiency below 4(40%).;
2. Set the Work-time below 4.;
3. Turn off the Jump Control (Jmp), (turn on the side processing), to avoid the distortion of electrode;
4. Set the deslagging height as 10~20 according to its depth.;
5. Arc detection set 2, sensitivity of carbon deposition set 1;
6. Turn on the Voltage circuits EQU (when closing the EQU, the processing speed will be slow, not easy to collect arc.);
7. If there's no requirement for the gap, se the Up/Dn OSC as 0 or 2;
8. Set the high voltage as 1, for larger area, set it as 2.or 3;
9. In order to reduce loss of copper cycle set 40 ~ 50 times of current;
10. Set Z axis speed above 4.

# Notice for Deep Hole Processing

1. Set the efficiency below 4(40%).;
2. Set the work-time below 4;
3. Turn on the Jump Control (Jmp).;
4. Set the deslagging height as 15~30, according to its depth;
5. Turn on the arc desposition;
6. Turn on the EQU (when closing the EQU, the processing speed will be slow, not easy to collect arc. );
7. If there's no requirement for the gap, se the Up/Dn OSC as 0 or 2;
8. For larger area set the high voltage as 2 or 3;
9. In order to reduce loss of copper cycle set 40 ~ 50 times of current..

# Introduction to EQU Funation

1. What is EQU?

When the EQU turns off, the set cycle is arc pulse width plus discharging pulse width. When turning on the EQU, if we donot calculate the arc pulse width, the discharging pulse width is the set cycle.

2. merit and demerit of EQU.

When the EQU is on, the average voltage at the gap is higher, with stronger ability for discharging. Therefore, with the same gap voltage, the processing speed is quicker and easy to collect arc, when the current is low, flame will be easy to come out to cause uneven phenomena. So during fine processing, turn off the EQU, or set the gap voltage above 80.

3. Turn off the EQU while processing the graphite.

For the electrode of graphite is pressed with powder, so processing without EQU is better, the condition is not easy to collect arc.

4. When turning off the EQU, set the gap voltage as low.

When turning off the EQU, the average voltage is low, then, we need to lower the gap voltage to enable processing, otherwise, the machine head will jump up.

5. When the cycle is below 25μs, the EQU will be off automatically.

The system's parameter: EQU Set(2-100): 25.   this is a function to set when to turn off the EQU automatically. Chose anything between 2μs~100μs.

# Match Rules for Discharging conditions.

Current Vs. discharging pulse width (cycle)

Copper for steel processing (1st square inch for copper base: 14A~20A)

Current: 1A Discharging pulse width(cycle): 30us～60us

Graphite for steel processing (1st square inch for graphite:40A~50A)

Current: 1A Discharging pulse width(cycle): 15us～25us

Copper for copper processing

Current: 1A Discharging pulse width(cycle): 30us.

Copper for tungsten steel processing (apply high-frequency electrode consumption and negative polarity) (assemble the CBOX to speed up for 2.5 times)

Current: 1A Discharging pulse width(cycle): 2us～15 us

Steel for copper processing

Current: 1A Discharging pulse width(cycle): 30us.

(B) Mirror Processing (1) in order to get fine surface and non-electrode consumption, do not use high-voltage during processing.

(2) during mirror processing with negative polarity, set the discharging pulse width (cycle) a bit higher to get black and brighter powder.

(C) Lower the electrode consumption (If discharging pulse width (cycle) is below 60us, then it's high-frequency electrode consumption. )

(1) set the discharging pulse width (cycle) higher to get rougher particles.

(2) set the inactivate pulse width to reduce the efficiency.

(D) Rules for efficiency.

8    high-efficiency with easy arc collection (not above 8:1)

7    medium-high efficiency (for normal processing)

6    medium efficiency (for normal processing)

5    medium-low efficiency (for normal processing)

4    low efficiency (for the beginning of processing to protect sharp angle, flake, sharp point and side processing)

3    low efficiency (for the beginning part to protect sharp angle, flake, sharp point, side processing and small area processing)

2    low efficiency (for the beginning part to protect sharp angle, flake, sharp point, side processing and small area processing)

(E) Avoid arc deposition.

(1) set the deslagging height higher (above 10mm for flake, side and deep hole processing)

(2) set the gap voltage higher (as 60v or above)

(3) do not discharge too long (as 4 or below for fine processing)

(4) set the inactive pulse width higher, and lower the efficiency.

(F) Match of current and processing gap.

High voltage 0 segment,gap is 0.03 times of processing current,unit is mm (5 hours for efficiency) (for small area processing.)

High voltage: 1 segment, the gap shall increase 0.01mm (for normal processing)

High voltage: 2 segment, the gap shall increase 0.02mm (for deep hole and medium area processing)

High voltage:3 segment, the gap shall increase 0.04mm (for deep hole or large area processing, but with rough surface, or bright surface that do not need fine processing)

When discharging pulse width is certain, set the efficiency below 5 and the gap shall be set based on Efficiency 5.

When discharging pulse width is certain, set the efficiency as 6, the gap shall increase 0.01mm.

When discharging pulse width is certain, set the efficiency as 7, the gap shall increase 0.02mm.

When discharging pulse width is certain, set the efficiency as 8, the gap shall increase 0.03mm or above.

(G) Calculation of processing current: (voltage-gap voltage)/resistance

(H) Average current: low voltage current*efficiency

(I) large area fine processing can cause explosion for current, the vacuum produced during this process is bad for processing.

(1) Slow down the server to maintain a certain supply speed, the speed should not be too slow, otherwise there'll be powder on the part surface.

(2) Raise the gap voltage to stable the process, powder will aslo be produced if the gap voltage is too high.

(3) the powder will affect the efficiency (T-OFF) and smoothness and cause uneven surface, after polishing, there might be some arc deposition.

(4) powder might be vanished by assembling a capacitance, but it will also cause the increase of electrode consumption and rough surface.

(5) apply 2 segments deslagging or turn off the JUMP.

(J) during vertical side processing or the processing with the slope less than 5 degree, the discharging liquid cannot go in to cause problem for deslagging, this is bad for processing.

(1) set the deslagging height below 10mm, increase the discharging liquid.

(2) set the efficiency (T-OFF) lower, for smaller area and low efficiency (T-OFF) processing.

(3) set the gap voltage higher, speed up the deslagging.

(4) fine processing, powder will be caused on part surface.

# Notice for copper shapes and processing parameters

## Rough processing

The contact area is large so the efficiency can be 5-8. at the processing beginningif the situation is the same with (Figure 2),then the efficiency shall not be over 4, otherwise it will cause arc deposition easily, the speed will slow down When processing to the bottom, the efficiency can be set 5~7.

(Figure 1)
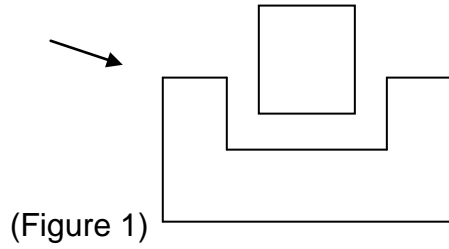
## Thin processing

Due to the small contact area at beginning, the efficiency can not above 4,the current shall not be too high,Otherwise it will cause arc deposition easily.when processing to bottom, the efficiency can be raised to 5~7. In order to reduce loss of copper cycle set 40 ~ 50 times of current.

(Figure 2)
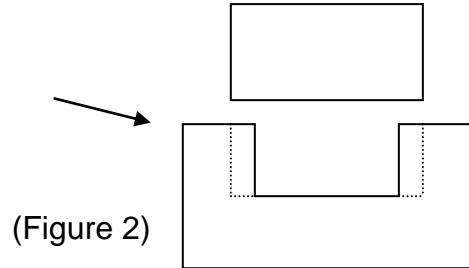
## Side processing

Due to the small area, the efficiency shall not be bigger than 4, the current shall not be too high, otherwise it will cause arc deposition easily.In order to reduce loss of copper cycle set 40 ~ 50 times of current.

(Figure 3)
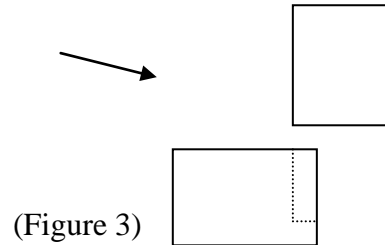
## Positioning

With small contact area, the efficiency shall not be over 4. In order to reduce loss of copper cycle set 40 ~ 50 times of current

(Figure 4)
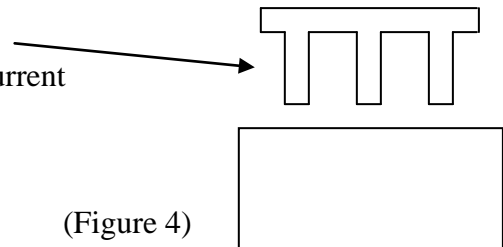
## Needle/small copper or flake processing

with small contact area, the efficiency shall not be over 4. the current shall not be too high, Otherwise it will cause arc deposition easily, Or the parts will be destroyed..

(Figure 5)
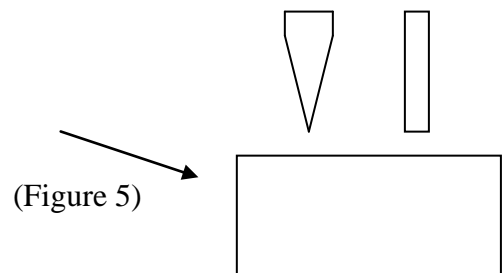
# Appendix

Eletrode: steel
Pol: 0 (+/-)
Part: steel
Area: 20m ㎡
Depth: 5mm

Gap: 60 V
Jmp: 8
W-T: 15
H-V: 3(250) V

| (A) Current | µS Cycle | % Efficiency | µmRa Surface finish | % Consume | mm/min Speed | (mm) Gap between two sides |
|---|---|---|---|---|---|---|
| 4 | 10 | 3 | 23 | 42 | 1 | 0.04 |
| 7 | 10 | 3 | 29 | 40 | 2 | 0.14 |
| 13 | 20 | 3 | 20 | 25 | 10 | 0.12 |
| 13 | 30 | 3 | 28 | 22 | 11.2 | 0.14 |
| 13 | 100 | 5 | 30 | 20 | 13.6 | 0.16 |
| 13 | 250 | 6 | 32 | 16 | 17.2 | 0.17 |
| 13 | 320 | 7 | 33 | 7 | 21 | 0.20 |
| 13 | 520 | 7 | 34 | 1 | 15.5 | 0.22 |
| 25 | 45 | 3 | 37 | 30 | 43 | 0.18 |
| 25 | 110 | 5 | 38 | 20 | 47 | 0.20 |
| 25 | 150 | 6 | 39 | 15 | 50 | 0.22 |
| 25 | 250 | 7 | 40 | 8 | 52 | 0.24 |
| 25 | 320 | 7 | 41 | 3.8 | 57 | 0.26 |
| 25 | 520 | 8 | 42 | 2 | 50 | 0.28 |
| 25 | 900 | 8 | 43 | 1 | 47 | 0.30 |
| 50 | 150 | 6 | 43 | 15 | 83 | 0.29 |
| 50 | 250 | 7 | 44 | 11 | 85 | 0.31 |
| 50 | 320 | 8 | 45 | 9 | 87 | 0.33 |
| 50 | 520 | 9 | 46 | 3 | 90 | 0.35 |
| 50 | 900 | 9 | 47 | 1 | 82 | 0.38 |

# Machining material

Electrode : Copper (+)  Gap : 50 V
Machining part : S 45C steel (-)  Jmp : 5
Maching diameter : ψ16mm  W-T : 7
depth : 1mm  Pol : 0(+\ -)
Psraying oil pressure : 0.7 kg/cm  Machining liquid : MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 0 | 2 | 2 | 2 | 0.587 | 0.01 | 3 | 0.00026 |
| 0 | 6 | 2 | 2 | 0.742 | 0.01 | 1.5 | 0.0011 |
| 0 | 12 | 2 | 2 | 1.095 | 0.01 | <1 | 0.00096 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Electrode : Copper (+)  Gap : 50 V
Machining part : S 45C steel (-)  Jmp : 5
Maching diameter : ψ16mm  W-T : 7
depth : 1mm  Pol : 0(+\ -)
Psraying oil pressure : 0.7 kg/cm  Machining liquid : MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 1 | 12 | 2 | 2 | 1.065 | 0.06 | 6.6 | 0.00043 |
| 1 | 25 | 4 | 2 | 1.295 | 0.07 | <0.1 | 0.0019 |
| 1 | 50 | 4 | 2 | 1.352 | 0.08 | <0.1 | 0.0014 |
| 1 | 100 | 4 | 2 | 1.466 | 0.1 | <0.1 | 0.0009 |
| 1 | 200 | 4 | 2 | 1.58 | 0.13 | <0.1 | 0.0004 |
| 1 | 400 | 4 | 2 | 1.694 | 0.17 | <0.1 | 0.0001 |

※ Testing material :MITUTOYO Surface finish detecing machine ,SUFTEST-211

※ Testing length :3.2mm

# Machining material

Electrode      :   Copper (+)                                    Gap          : 50 V
Machining part :    S 45C steel (-)                          Jmp        :   5
Maching diameter   :    ψ 16mm                             W-T        :   20
Depth   :   10mm                                                    Pol     :   0(+\ -)
Psraying oil pressure :   0.7 kg/cm                         Machining liquid     :   MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 5 | 25 | 7 | 2 | 3.215 | 0.1 | 1.4 | 0.043 |
| 5 | 50 | 7 | 2 | 3.502 | 0.11 | 0.5 | 0.024 |
| 5 | 100 | 7 | 2 | 3.52 | 0.14 | 0.2 | 0.02 |
| 5 | 200 | 7 | 2 | 3.538 | 0.18 | 0.1 | 0.018 |
| 5 | 400 | 7 | 2 | 3.556 | 0.24 | <0.1 | 0.016 |
| 5 | 800 | 7 | 2 | 3.574 | 0.31 | <0.1 | 0.014 |

Electrode      :   Copper (+)                                    Gap          : 50 V
Machining part :    S 45C steel (-)                          Jmp        :   5
Maching diameter   :    ψ 16mm                             W-T        :   20
Depth   :   10mm                                                    Pol     :   0(+\ -)
Psraying oil pressure :   0.7 kg/cm                         Machining liquid     :   MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 10 | 25 | 7 | 2 | 4.41 | 0.14 | 2.14 | 0.114 |
| 10 | 50 | 7 | 2 | 4.985 | 0.15 | 1.7 | 0.167 |
| 10 | 100 | 7 | 2 | 6.402 | 0.18 | 1.6 | 0.116 |
| 10 | 200 | 7 | 2 | 7.819 | 0.21 | 1.5 | 0.065 |
| 10 | 400 | 7 | 2 | 9.236 | 0.26 | 1.4 | 0.024 |
| 10 | 800 | 7 | 2 | 10.653 | 0.29 | 1.3 | 0.016 |

※  Testing material :MITUTOYO Surface finish detecing machine ,SUFTEST-211
※  Testing length :3.2mm

# Machining material

Electrode     :   Copper (+)                        Gap           : 50 V
Machining part :   S 45C steel (-)                  Jmp         :   5
Maching diameter   :   ψ16mm                        W-T         :   20
Depth   :   10mm                                    Pol       :   0(+\ -)
Psraying oil pressure :   0.7 kg/cm                 Machining liquid     :   MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 15 | 50 | 7 | 2 | 5.31 | 0.16 | 3 | 0.25 |
| 15 | 100 | 7 | 2 | 6.992 | 0.21 | 1.7 | 0.235 |
| 15 | 200 | 7 | 2 | 7.977 | 0.25 | 0.7 | 0.191 |
| 15 | 400 | 7 | 2 | 8.962 | 0.29 | 0.3 | 0.147 |
| 15 | 800 | 7 | 2 | 9.862 | 0.34 | 0.1 | 0.103 |
|  |  |  |  |  |  |  |  |

Electrode     :   Copper (+)                        Gap           : 50 V
Machining part :   S 45C steel (-)                  Jmp         :   5
Maching diameter   :   ψ16mm                        W-T         :   20
Depth   :   10mm                                    Pol       :   0(+\ -)
Psraying oil pressure :   0.7 kg/cm                 Machining liquid     :   MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 20 | 50 | 7 | 2 | 6.275 | 0.21 | 5.8 | 0.33 |
| 20 | 100 | 7 | 2 | 8.585 | 0.24 | 1 | 0.38 |
| 20 | 200 | 7 | 2 | 9.085 | 0.26 | 0.43 | 0.35 |
| 20 | 400 | 7 | 2 | 9.585 | 0.31 | 0.2 | 0.32 |
| 20 | 800 | 7 | 2 | 10.085 | 0.36 | 0.1 | 0.29 |
|  |  |  |  |  |  |  |  |

※   Testing material :MITUTOYO Surface finish detecing machine ,SUFTEST-211
※   Testing length :3.2mm

# Machining material

Electrode : Copper (+)      Gap  : 50 V
Machining part : S 45C steel (-)    Jmp  : 5
Maching diameter : ψ 32mm    W-T  : 20
Depth : 10mm         Pol  : 0(+\ -)
Psraying oil pressure : 0.7 kg/cm    Machining liquid : MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 30 | 50 | 6 | 2 | 9.682 | 0.24 | 8.6 | 1.098 |
| 30 | 100 | 7 | 2 | 11.43 | 0.28 | 3.18 | 1.155 |
| 30 | 300 | 7 | 2 | 12.195 | 0.43 | 1.2 | 0.958 |
| 30 | 500 | 7 | 2 | 12.96 | 0.52 | 0.6 | 0.86 |
| 30 | 700 | 7 | 2 | 13.755 | 0.58 | 0.4 | 0.77 |
| 30 | 900 | 7 | 2 | 14.515 | 0.64 | 0.2 | 0.68 |

Electrode : Copper (+)      Gap  : 50 V
Machining part : S 45C steel (-)    Jmp  : 5
Maching diameter : ψ 32mm    W-T  : 20
Depth : 10mm         Pol  : 0(+\ -)
Psraying oil pressure : 0.7 kg/cm    Machining liquid : MENTOR

| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 40 | 75 | 7 | 2 | 14.155 | 0.26 | 9.4 | 1.652 |
| 40 | 150 | 7 | 2 | 17.447 | 0.38 | 5.8 | 1.385 |
| 40 | 300 | 7 | 2 | 18.505 | 0.5 | 2.5 | 1.264 |
| 40 | 500 | 7 | 2 | 19.563 | 0.61 | 1.5 | 1.2 |
| 40 | 700 | 7 | 2 | 20.621 | 0.7 | 1 | 1.15 |
| 40 | 900 | 7 | 2 | 21.679 | 0.75 | <1 | 1.099 |

※ Testing material :MITUTOYO Surface finish detecing machine ,SUFTEST-211
※ Testing length :10mm

# Machining material

Electrode    :   Copper (+)                    Gap        : 50 V
Machining part :   S 45C steel (-)             Jmp        :   5
Maching diameter   :   ψ 32mm                  W-T        :   20
Depth   :   10mm                               Pol        :   0(+\ -)
Psraying oil pressure :   0.7 kg/cm            Machining liquid    :   MENTOR

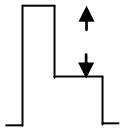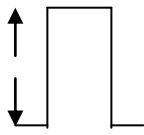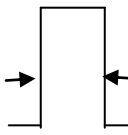| CURRENT (A) | ON-TIME Cycle (μS) | OFF-TIME Efficiency *10% | H.V. (V) | Surface finish μmRa | 2*GAP (mm) | Electrode consume % | Machining speed g/MIN |
|---|---|---|---|---|---|---|---|
| 50 | 100 | 7 | 2 | 18.23 | 0.38 | 11.5 | 1.979 |
| 50 | 300 | 7 | 2 | 19.5 | 0.52 | 3.8 | 1.608 |
| 50 | 500 | 7 | 2 | 20.77 | 0.64 | 1.2 | 1.483 |
| 50 | 700 | 7 | 2 | 22.04 | 0.76 | 1 | 1.421 |
| 50 | 900 | 7 | 2 | 23.31 | 0.8 | 0.9 | 1.359 |
|  |  |  |  |  |  |  |  |
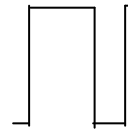
※   Testing material :MITUTOYO Surface finish detecing machine ,SUFTEST-211

※   Testing length :10mm

# Machining data
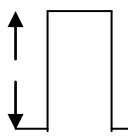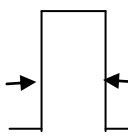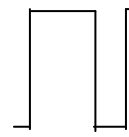
Matetial：copper to steel                                        Polarity：+

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 4 | 0.5 | 13 | <0.2 | 0.04 |
| 1 | 1 | 4 | 4 | 0.55 | 10 | <0.2 | 0.045 |
| 1 | 1 | 8 | 4 | 0.65 | 7.5 | <0.3 | 0.052 |
| 1 | 1 | 10 | 4 | 0.7 | 5 | <0.4 | 0.057 |
| 1 | 1 | 15 | 4 | 0.8 | 4 | <0.4 | 0.063 |
| 1 | 1 | 20 | 4 | 0.9 | 3 | <0.5 | 0.069 |
| 1 | 1 | 30 | 4 | 1.0 | 2.3 | <0.6 | 0.076 |
| 1 | 1 | 50 | 5 | 1.1 | 1.5 | <0.8 | 0.084 |
| 1 | 1 | 70 | 5 | 1.2 | 0.8 | <1 | 0.088 |
| 1 | 2 | 4 | 4 | 11 | 8 | <0.4 | 0.058 |
| 1 | 2 | 8 | 4 | 13 | 6 | <0.5 | 0.063 |
| 1 | 2 | 10 | 4 | 13 | 5 | <0.5 | 0.068 |
| 1 | 2 | 15 | 4 | 15 | 4.8 | <0.6 | 0.075 |
| 1 | 2 | 20 | 4 | 18 | 4.5 | <0.7 | 0.083 |
| 1 | 2 | 30 | 4 | 21 | 4.3 | <0.8 | 0.087 |
| 1 | 2 | 50 | 5 | 25 | 1.6 | <1 | 0.089 |
| 1 | 2 | 70 | 5 | 28 | 1.2 | 1.2 | 0.095 |
| 1 | 2 | 90 | 5 | 31 | 0.8 | 1.4 | 0.105 |
| 1 | 3 | 6 | 4 | 1.4 | 9 | 2.8 | 0.065 |
| 1 | 3 | 10 | 4 | 1.8 | 7 | 5 | 0.072 |
| 1 | 3 | 15 | 4 | 2 | 4.5 | 7 | 0.08 |
| 1 | 3 | 20 | 4 | 2.2 | 2.5 | 8 | 0.09 |
| 1 | 3 | 30 | 4 | 2.5 | 1.5 | 8.5 | 0.10 |
| 1 | 3 | 45 | 5 | 2.8 | 0.8 | 7 | 0.11 |
| 1 | 3 | 60 | 5 | 3.2 | 0.6 | 6 | 0.12 |
| 1 | 3 | 90 | 6 | 3.5 | 0.5 | 4.5 | 0.13 |
| 1 | 3 | 120 | 6 | 4 | - | 3 | 0.14 |

# Machining data

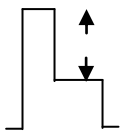Matetial：copper to steel                                   Polarity：+
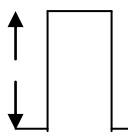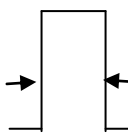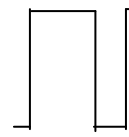
| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 1 | 4 | 10 | 4 | 1.7 | 7 | 6 | 0.08 |
| 1 | 4 | 15 | 4 | 1.9 | 6 | 8 | 0.09 |
| 1 | 4 | 20 | 4 | 2.1 | 4.5 | 9 | 0.1 |
| 1 | 4 | 30 | 4 | 2.4 | 2.5 | 10 | 0.11 |
| 1 | 4 | 45 | 4 | 2.8 | 1.5 | 10 | 0.12 |
| 1 | 4 | 60 | 5 | 3.2 | 0.8 | 9 | 0.13 |
| 1 | 4 | 90 | 6 | 3.5 | 0.5 | 8 | 0.14 |
| 1 | 4 | 120 | 6 | 4 | 0.3 | 6 | 0.15 |
| 1 | 4 | 150 | 7 | 4.5 | - | 4 | 0.16 |
| 2 | 5 | 15 | 4 | 1.8 | 7 | 17 | 0.09 |
| 2 | 5 | 20 | 4 | 2 | 5 | 20 | 0.1 |
| 2 | 5 | 30 | 4 | 2.2 | 3 | 23 | 0.11 |
| 2 | 5 | 45 | 4 | 2.5 | 1.5 | 25 | 0.12 |
| 2 | 5 | 60 | 5 | 3 | 1.2 | 22 | 0.14 |
| 2 | 5 | 90 | 6 | 3.5 | 0.8 | 18 | 0.15 |
| 2 | 5 | 120 | 6 | 4 | 0.5 | 13 | 0.16 |
| 2 | 5 | 150 | 7 | 4.5 | - | 11 | 0.17 |
| 2 | 5 | 180 | 7 | 5 | - | 9 | 0.18 |
| 2 | 6 | 15 | 4 | 2.4 | 10 | 20 | 0.1 |
| 2 | 6 | 20 | 4 | 2.8 | 5.5 | 23 | 0.11 |
| 2 | 6 | 30 | 4 | 3.2 | 4 | 26 | 0.12 |
| 2 | 6 | 45 | 4 | 3.5 | 2.5 | 29 | 0.13 |
| 2 | 6 | 60 | 5 | 4 | 2 | 30 | 0.15 |
| 2 | 6 | 90 | 6 | 4.2 | 1 | 25 | 0.16 |
| 2 | 6 | 120 | 6 | 4.5 | 0.8 | 22 | 0.17 |
| 2 | 6 | 150 | 7 | 5 | 0.5 | 18 | 0.18 |
| 2 | 6 | 180 | 7 | 6 | - | 15 | 0.2 |

# Machining data

Matetial：copper to steel　　　　　　　　　　　　　　　Polarity：+
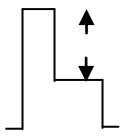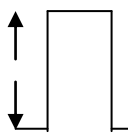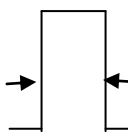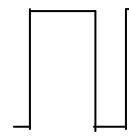
| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 2 | 8 | 30 | 4 | 3.5 | 5.5 | 36 | 0.12 |
| 2 | 8 | 60 | 5 | 4 | 2.8 | 42 | 0.14 |
| 2 | 8 | 90 | 6 | 4.5 | 1.8 | 44 | 0.16 |
| 2 | 8 | 120 | 6 | 5.5 | 1.3 | 40 | 0.17 |
| 2 | 8 | 150 | 7 | 6 | 0.8 | 36 | 0.19 |
| 2 | 8 | 200 | 7 | 7 | 0.5 | 34 | 0.21 |
| 2 | 8 | 250 | 7 | 8 | - | 32 | 0.22 |
| 2 | 8 | 300 | 7 | 9 | - | 29 | 0.23 |
| 2 | 8 | 350 | 7 | 10 | - | 25 | 0.24 |
| 2 | 9 | 30 | 4 | 3.5 | 6 | 38 | 0.14 |
| 2 | 9 | 60 | 5 | 4 | 3 | 45 | 0.16 |
| 2 | 9 | 90 | 6 | 4.5 | 2 | 47 | 0.18 |
| 2 | 9 | 120 | 6 | 5.5 | 1.5 | 44 | 0.19 |
| 2 | 9 | 150 | 7 | 6 | 1 | 40 | 0.21 |
| 2 | 9 | 200 | 7 | 7 | 0.5 | 37 | 0.23 |
| 2 | 9 | 250 | 7 | 8 | - | 35 | 0.24 |
| 2 | 9 | 300 | 7 | 9 | - | 34 | 0.25 |
| 2 | 9 | 350 | 7 | 10 | - | 32 | 0.26 |
| 2 | 10 | 50 | 5 | 4 | 6 | 54 | 0.17 |
| 2 | 10 | 100 | 6 | 5 | 4 | 63 | 0.19 |
| 2 | 10 | 150 | 7 | 6 | 1.5 | 53 | 0.21 |
| 2 | 10 | 200 | 7 | 7 | 1 | 50 | 0.24 |
| 2 | 10 | 250 | 7 | 8 | 0.5 | 48 | 0.26 |
| 2 | 10 | 300 | 7 | 9 | - | 45 | 0.27 |
| 2 | 10 | 350 | 7 | 10 | - | 42 | 0.28 |
| 2 | 10 | 400 | 8 | 11 | - | 40 | 0.29 |
| 2 | 10 | 450 | 8 | 12 | - | 38 | 0.3 |

# Machining data

Matetial：copper to steel　　　　　　　　　　　　　　　Polarity：+
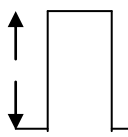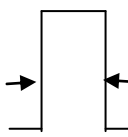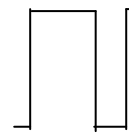
| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 2 | 15 | 50 | 5 | 5 | 7 | 91 | 0.17 |
| 2 | 15 | 100 | 6 | 6 | 3.8 | 97 | 0.2 |
| 2 | 15 | 150 | 7 | 7.5 | 1.5 | 105 | 0.24 |
| 2 | 15 | 200 | 7 | 8.5 | 1 | 96 | 0.26 |
| 2 | 15 | 250 | 7 | 9.8 | 0.8 | 94 | 0.28 |
| 2 | 15 | 300 | 7 | 10 | 0.5 | 92 | 0.3 |
| 2 | 15 | 350 | 7 | 10.5 | - | 90 | 0.31 |
| 2 | 15 | 400 | 8 | 11 | - | 88 | 0.32 |
| 2 | 15 | 450 | 8 | 12 | - | 80 | 0.33 |
| 2 | 20 | 50 | 5 | 5 | 10 | 138 | 0.21 |
| 2 | 20 | 100 | 6 | 7 | 5 | 149 | 0.25 |
| 2 | 20 | 150 | 7 | 9 | 3 | 155 | 0.28 |
| 2 | 20 | 200 | 7 | 10 | 1.5 | 150 | 0.3 |
| 2 | 20 | 250 | 7 | 10.5 | 1.3 | 150 | 0.31 |
| 2 | 20 | 300 | 7 | 11 | 1 | 150 | 0.33 |
| 2 | 20 | 400 | 8 | 12 | 0.5 | 135 | 0.35 |
| 2 | 20 | 500 | 8 | 13 | 0.3 | 130 | 0.37 |
| 2 | 20 | 600 | 8 | 14 | - | 115 | 0.41 |
| 2 | 25 | 50 | 5 | 5 | 15 | 130 | 0.18 |
| 2 | 25 | 100 | 6 | 7 | 9 | 155 | 0.22 |
| 2 | 25 | 150 | 7 | 9 | 6 | 160 | 0.24 |
| 2 | 25 | 200 | 7 | 10 | 3.5 | 170 | 0.28 |
| 2 | 25 | 300 | 7 | 11 | 2 | 180 | 0.3 |
| 2 | 25 | 400 | 8 | 12 | 1 | 165 | 0.32 |
| 2 | 25 | 500 | 8 | 13 | 0.5 | 160 | 0.35 |
| 2 | 25 | 600 | 8 | 15 | 0.5 | 152 | 0.4 |
| 2 | 25 | 700 | 8 | 16 | 0.5 | 145 | 0.43 |

# Machining data
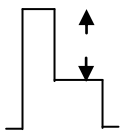
Matetial：copper to steel                                    Polarity：+
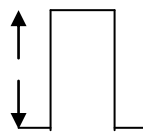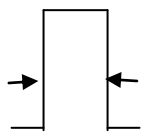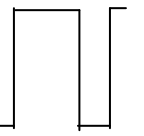
| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 2 | 30 | 50 | 5 | 6 | 12 | 180 | 0.24 |
| 2 | 30 | 100 | 6 | 8 | 10 | 210 | 0.27 |
| 2 | 30 | 200 | 7 | 11 | 3.5 | 220 | 0.33 |
| 2 | 30 | 300 | 7 | 12 | 2 | 230 | 0.36 |
| 2 | 30 | 400 | 7 | 14 | 1 | 220 | 0.4 |
| 2 | 30 | 500 | 8 | 15 | 0.5 | 210 | 0.43 |
| 2 | 30 | 600 | 8 | 18 | 0.5 | 205 | 0.45 |
| 2 | 30 | 700 | 8 | 18 | 0.5 | 200 | 0.48 |
| 2 | 30 | 900 | 8 | 20 | - | 200 | 0.53 |
| 2 | 40 | 50 | 5 | 7 | 20 | 320 | 0.26 |
| 2 | 40 | 100 | 6 | 8 | 13 | 350 | 0.29 |
| 2 | 40 | 200 | 7 | 9 | 9 | 360 | 0.33 |
| 2 | 40 | 300 | 7 | 10 | 6 | 370 | 0.37 |
| 2 | 40 | 400 | 7 | 12 | 4 | 370 | 0.41 |
| 2 | 40 | 500 | 8 | 14 | 2.5 | 360 | 0.45 |
| 2 | 40 | 600 | 8 | 16 | 1.5 | 350 | 0.49 |
| 2 | 40 | 800 | 8 | 20 | 0.8 | 330 | 0.56 |
| 2 | 40 | 1000 | 8 | 24 | - | 280 | 0.65 |
| 2 | 50 | 50 | 5 | 8 | 23 | 420 | 0.29 |
| 2 | 50 | 100 | 6 | 10 | 18 | 460 | 0.33 |
| 2 | 50 | 200 | 7 | 12 | 13 | 470 | 0.37 |
| 2 | 50 | 300 | 7 | 14 | 10 | 480 | 0.4 |
| 2 | 50 | 400 | 7 | 16 | 7 | 465 | 0.44 |
| 2 | 50 | 500 | 8 | 18 | 4 | 460 | 0.48 |
| 2 | 50 | 600 | 8 | 20 | 2 | 450 | 0.52 |
| 2 | 50 | 800 | 8 | 24 | 0.5 | 420 | 0.6 |
| 2 | 50 | 1000 | 8 | 26 | 0.5 | 350 | 0.7 |

# Machining data
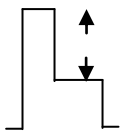
Material：copper tungsten alloy to Carbide alloy          Polarity：-
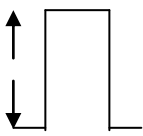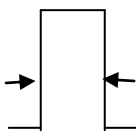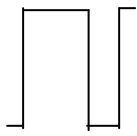
| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 2 | 6 | 2 | 5 | 1.12 | 18.5 | 3.06 | 0.12 |
| 2 | 6 | 4 | 5 | 1.26 | 16 | 2.84 | 0.12 |
| 2 | 6 | 8 | 5 | 1.6 | 16 | 2.24 | 0.12 |
| 2 | 6 | 12 | 5 | 1.8 | 15 | 1.86 | 0.12 |
| 2 | 6 | 25 | 5 | 2 | 14 | 1.09 | 0.13 |
| 2 | 6 | 50 | 5 | 2.5 | 14 | 0.8 | 0.14 |
| 2 | 6 | 75 | 5 | 2.8 | 14 | 0.66 | 0.15 |
| 2 | 6 | 100 | 5 | 3.2 | 11 | 0.51 | 0.16 |
| 2 | 6 | 150 | 5 | 3.2 | 11 | 0.36 | 0.16 |
| 2 | 8 | 2 | 5 | 2.2 | 20 | 4.67 | 0.13 |
| 2 | 8 | 4 | 5 | 2.2 | 17 | 4.3 | 0.13 |
| 2 | 8 | 8 | 5 | 2.5 | 16 | 3.94 | 0.13 |
| 2 | 8 | 12 | 5 | 2.8 | 16 | 3.55 | 0.14 |
| 2 | 8 | 25 | 5 | 3.2 | 14 | 2.48 | 0.14 |
| 2 | 8 | 50 | 5 | 3.2 | 13 | 1.68 | 0.15 |
| 2 | 8 | 75 | 5 | 3.2 | 13 | 1.28 | 0.15 |
| 2 | 8 | 100 | 5 | 3.5 | 13 | 0.87 | 0.16 |
| 2 | 8 | 150 | 5 | 3.5 | 12 | 0.47 | 0.16 |
| 3 | 12 | 2 | 5 | 1.6 | 20 | 2.04 | 0.14 |
| 3 | 12 | 4 | 5 | 1.8 | 20 | 2.70 | 0.14 |
| 3 | 12 | 8 | 5 | 2 | 18 | 3.35 | 0.14 |
| 3 | 12 | 12 | 5 | 2.2 | 18 | 4.01 | 0.15 |
| 3 | 12 | 25 | 5 | 3.2 | 16 | 4.67 | 0.15 |
| 3 | 12 | 50 | 5 | 3.5 | 16 | 4.23 | 0.16 |
| 3 | 12 | 75 | 5 | 3.5 | 16 | 4.01 | 0.16 |
| 3 | 12 | 100 | 6 | 4 | 14 | 3.79 | 0.17 |
| 3 | 12 | 150 | 6 | 4.5 | 14 | 3.57 | 0.17 |

# Machining data

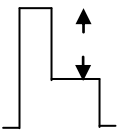Material：copper tungsten alloy to Carbide alloy          Polarity：-
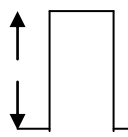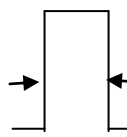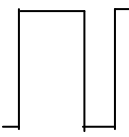
| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm$^3$/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 3 | 18 | 2 | 5 | 1.6 | 20 | 3.23 | 0.15 |
| 3 | 18 | 4 | 5 | 1.8 | 20 | 4.05 | 0.15 |
| 3 | 18 | 8 | 5 | 2.2 | 18 | 5.08 | 0.15 |
| 3 | 18 | 12 | 5 | 2.2 | 18 | 5.30 | 0.16 |
| 3 | 18 | 25 | 5 | 3.2 | 16 | 5.74 | 0.16 |
| 3 | 18 | 50 | 5 | 3.5 | 16 | 4.67 | 0.16 |
| 3 | 18 | 75 | 6 | 3.5 | 16 | 4.14 | 0.16 |
| 3 | 18 | 100 | 6 | 4.5 | 14 | 3.61 | 0.17 |
| 3 | 18 | 150 | 6 | 4.5 | 14 | 3.07 | 0.17 |
| 3 | 25 | 4 | 5 | 2.2 | 21 | 5.48 | 0.16 |
| 3 | 25 | 8 | 5 | 2.2 | 18 | 5.72 | 0.16 |
| 3 | 25 | 12 | 5 | 2.5 | 18 | 5.80 | 0.16 |
| 3 | 25 | 25 | 5 | 2.8 | 18 | 9.15 | 0.16 |
| 3 | 25 | 50 | 6 | 3.2 | 16 | 6.10 | 0.17 |
| 3 | 25 | 100 | 6 | 3.2 | 16 | 5.18 | 0.17 |
| 3 | 25 | 150 | 6 | 3.5 | 16 | 4.73 | 0.17 |
| 3 | 25 | 200 | 6 | 3.5 | 14 | 4.27 | 0.18 |
| 3 | 25 | 300 | 6 | 3.5 | 14 | 3.81 | 0.18 |
| 3 | 35 | 4 | 5 | 2.2 | 19 | 9.92 | 0.17 |
| 3 | 35 | 8 | 5 | 2.5 | 18 | 10.33 | 0.17 |
| 3 | 35 | 12 | 5 | 3.2 | 18 | 9.85 | 0.17 |
| 3 | 35 | 25 | 5 | 3.5 | 17 | 8.93 | 0.17 |
| 3 | 35 | 50 | 6 | 4.0 | 15 | 6.79 | 0.18 |
| 3 | 35 | 100 | 6 | 4.5 | 12 | 4.62 | 0.18 |
| 3 | 35 | 150 | 6 | 4.5 | 12 | 4.26 | 0.18 |
| 3 | 35 | 200 | 6 | 4.5 | 9 | 3.89 | 0.19 |
| 3 | 35 | 300 | 6 | 4.5 | 9 | 3.52 | 0.19 |

# Machining data

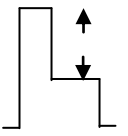Material：graphite to steel                                     Polarity：+
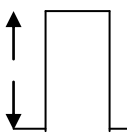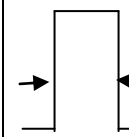
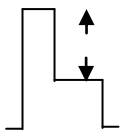| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 3 | 6 | 2 | 4 | 2 | 24 | 9 | 0.1 |
| 3 | 6 | 4 | 5 | 2.24 | 13.4 | 11 | 0.12 |
| 3 | 6 | 8 | 5 | 2.5 | 11 | 14 | 0.14 |
| 3 | 6 | 12 | 5 | 3 | 7.9 | 17 | 0.14 |
| 3 | 6 | 18 | 5 | 3 | 5.5 | 19 | 0.16 |
| 3 | 6 | 25 | 6 | 3.5 | 1.96 | 22 | 0.16 |
| 3 | 6 | 35 | 6 | 4 | 0.79 | 21 | 0.2 |
| 3 | 8 | 4 | 5 | 3 | 14.5 | 19 | 0.16 |
| 3 | 8 | 8 | 5 | 2.5 | 11.9 | 21 | 0.18 |
| 3 | 8 | 12 | 5 | 3 | 8 | 29 | 0.18 |
| 3 | 8 | 18 | 5 | 3 | 5.9 | 31 | 0.2 |
| 3 | 8 | 25 | 6 | 3.5 | 1.7 | 35 | 0.22 |
| 3 | 8 | 35 | 6 | 5 | 1.4 | 36 | 0.26 |
| 3 | 8 | 50 | 6 | 6.5 | - | 34 | 0.26 |
| 3 | 12 | 6 | 5 | 3.15 | 13.7 | 28 | 0.18 |
| 3 | 12 | 12 | 5 | 3.5 | 8 | 39 | 0.2 |
| 3 | 12 | 18 | 5 | 3.5 | 6 | 42 | 0.22 |
| 3 | 12 | 25 | 6 | 4 | 1.9 | 46 | 0.24 |
| 3 | 12 | 35 | 6 | 5.5 | 1.5 | 49 | 0.26 |
| 3 | 12 | 50 | 6 | 7 | 1.0 | 47 | 0.28 |
| 3 | 12 | 75 | 6 | 8.5 | - | 33 | 0.32 |
| 3 | 18 | 12 | 5 | 6.3 | 7 | 53 | 0.22 |
| 3 | 18 | 25 | 5 | 6.5 | 2.2 | 75 | 0.26 |
| 3 | 18 | 35 | 6 | 7 | 2 | 78 | 0.28 |
| 3 | 18 | 50 | 6 | 7.5 | 0.9 | 81 | 0.28 |
| 3 | 18 | 75 | 6 | 8.5 | 0.7 | 79 | 0.30 |
| 3 | 18 | 100 | 6 | 9 | - | 61 | 0.34 |

# Machining data

Material：graphite to steel　　　　　　　　　　　Polarity：+

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
| 3 | 25 | 12 | 6 | 6.5 | 7.4 | 66 | 0.22 |
| 3 | 25 | 25 | 6 | 7 | 2.3 | 100 | 0.28 |
| 3 | 25 | 35 | 6 | 7.5 | 2 | 107 | 0.32 |
| 3 | 25 | 50 | 6 | 8 | 1 | 115 | 0.34 |
| 3 | 25 | 75 | 7 | 8.5 | 0.8 | 111 | 0.36 |
| 3 | 25 | 100 | 7 | 9 | - | 85 | 0.36 |
| 3 | 25 | 200 | 7 | 11 | - | 64 | 0.4 |
| 3 | 35 | 25 | 6 | 7 | 2.3 | 105 | 0.28 |
| 3 | 35 | 35 | 6 | 8 | 1.9 | 174 | 0.28 |
| 3 | 35 | 50 | 6 | 8.5 | 1.1 | 180 | 0.30 |
| 3 | 35 | 75 | 7 | 8.5 | 0.9 | 168 | 0.36 |
| 3 | 35 | 100 | 7 | 9 | 0.2 | 141 | 0.40 |
| 3 | 35 | 200 | 7 | 11 | - | 133 | 0.42 |
| 3 | 35 | 400 | 7 | 12.5 | - | 116 | 0.44 |
| 3 | 50 | 25 | 6 | 8.5 | 2.5 | 209 | 0.28 |
| 3 | 50 | 35 | 6 | 9 | 2.1 | 222 | 0.28 |
| 3 | 50 | 50 | 6 | 10 | 1.3 | 236 | 0.30 |
| 3 | 50 | 75 | 7 | 11 | 1.2 | 243 | 0.36 |
| 3 | 50 | 100 | 7 | 11 | 0.4 | 237 | 0.42 |
| 3 | 50 | 200 | 7 | 12.5 | - | 180 | 0.46 |
| 3 | 50 | 400 | 7 | 17 | - | 175 | 0.50 |
| 3 | 75 | 50 | 6 | | 8.6 | 357 | 0.76 |
| 3 | 75 | 75 | 7 | | 2.2 | 360 | 0.82 |
| 3 | 75 | 100 | 7 | | 1.7 | 373 | 0.86 |
| 3 | 75 | 200 | 7 | | - | 321 | 0.92 |
| 3 | 75 | 400 | 7 | | - | 312 | 0.96 |
| 3 | | | | | | | |

# Machining data

Material ：                                                    polarity：

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm$^3$/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
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# Machining data
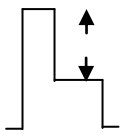
Material ：                                                    polarity：

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
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# Machining data
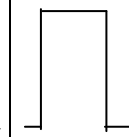
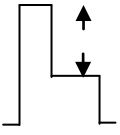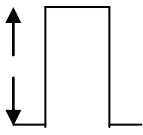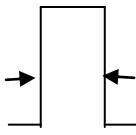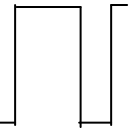Material ：                                                                 polarity：

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm$^3$/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
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# Machining data

Material ： polarity：

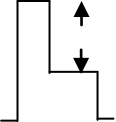| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
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# Machining data

Material ：                             polarity：

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm$^3$/min | 2-GAP mm |
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# Machining data

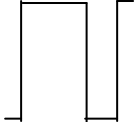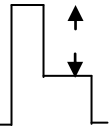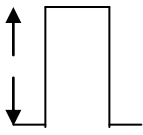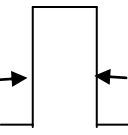Material ：                                                                 polarity：

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm$^3$/min | 2-GAP mm |
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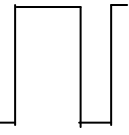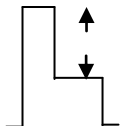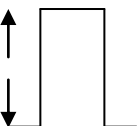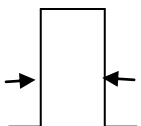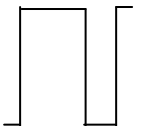Material ：                                                                polarity：

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm$^3$/min | 2-GAP mm |
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# Machining data

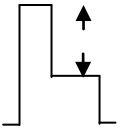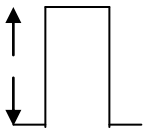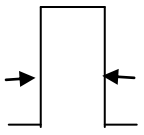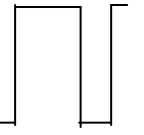Material ：                                                                    polarity：

| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
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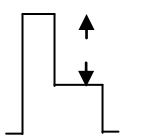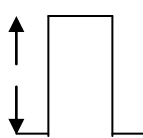
Material ：                                                polarity：

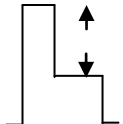| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
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Material :                      polarity：
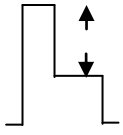
| High voltage HV | Current I(A) | T-ON us | T-OFF *10% | SURFACE FINISH Ra(um) | WEAR % | SPEED mm³/min | 2-GAP mm |
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# Attachment 2（Just for the Technical Maintenance Staff）
## Parameter setting and functional specification

I. How to enter the parameter setting

Press "Q" and then press "1" under the main menu, then INPUT PASSWORD: input 530509 to enter the setting menu.

II. See the following setting menu:

SYSTEM   PARMETER   MODIFY   (setting mode for system parameters)
1. SYSTEM                                (setting for system parameters, enter for setting)
2. Z PARAMETER SET              (Set Z parameter, enter to set AUTOZ condition)
3. CURRENT RELAY MAPPING   (comparative editing for relay and current)
4. I/O TEST                              (I/O self-test)
5. HUNTING SET                       (Discharging condition for profile modeling)
6. QUIT                                    (Quit the setting)
----------------------------------------------
SELECT (1-6)?

III. Parameter setting for the system. Enter to set the system parameters

Parameter Table for ZNC956

| | |
|---|---|
| Reserved              : 1 | BUZZER ON TIME(S) :5 |
| Language: 0 for English; 1 for Chinese | Buzzer time setting |
| OIL LEVEL(0:NO)      : 0 | ARC SET                    : 0 |
| Oil level setting | Arc deposition sensor setting |
| ABS TYPE (0:UP)        : 0 | JUMP CONTROL        : 0 |
| Scaler ABS direction setting | Jump control setting |
| SCALER(1:1u 5:5u)      : 5 | BUZZER short(0-1)    : 1 |
| Choose the scaler, 1u, 5u | Short circuit alarming for Buzzer: 0 for broken tone, 1 for long tone. |
| METRIC(0)/INCH(1)   : 0 | Up/Dn OSC (0-2)      : 0 |
| Unit mode setting: (0)for metric, (1) for UK | Deslagging setting: 0 for semi-close, 1 for close, 2 for open |
| HOME MOVE Z(M/M): 25.000 | EQU Set(2-100)             : 5 |
| Zero adjustment for Z axis | set the cycle range to disable EQU Set"0"for no EQU. |
| AUTO Z                      : 1 | Hunting speed             : 0 |
| Choose AUTOZ edit | Set the speed for raising during short circuit in profile modeling |
| HOUR METER             : 1 | Default oil level             : 0 |
| Discharging hours | Set the supervision for oil level switch |
| SCREEN REST TIME   : 5 | Default arj adj             : 0 |
| Scanning time for key panel | Adjust the arc deposition when turning on |
| MAX CURRENT             : 50 | Default OSC-HV           : 1 |
| Max current setting | Set the voltage lapping when turning on |
| CE MODE                  : 0 | S/C control                  :1 |
| CE EU safety rules | Set the S/C key on the controller box |
| Default ARC det             : 1 | Dis. seg control            :0 |
| Set the detection for arc deposition when turning on | Choose the start point or end point when discharging |
| Z COORDINATE (0=+) : 0 | Dis. remote cntr             :0 |
| Z axis direction setting | the Dis key's function on the controller box. |
| FUZZY EDIT (0:NO)      : 0 | Dis. fast home               :0 |
| Condition editing | When discharging, whether the Z axis can get home fast enough to discharge. |

Z DOWN SPEED(0-9)  : 3          JMP up1(0～9*.1m)  :0

The larger the value the quicker for Z axis          Preset value for 2 segment Jump during discharging

          (1~9)

BACK COLOR(0-15)  : 1          Disp. Timer(0/1)          :0

Color for the screen          whether the time-in-total is displayed at the right side.

0.1 AMP(0:N,1:Y)          : 1          HV sel.(0/1)          :0

Function setting for 0.1A          High voltage: 0 for partial pressure; 1 for partial current

Z MODE ROUGH          : 2          Pos ,lock(0=NO):     0

 Rough processing setting.          Set the XY locking function when processing

          Set "1" to take effect

Z MODE MID-ROUGH : 3          Pos ,error(0.01mm): 2

Mid-rough processing setting          Alarm position for XY axis shifting, 2 mean 0.02mm

Z MODE FINISH          : 4          Current map table:3

Fine processing setting          Current data sheet, 0 for 0.1A~50A,1 for 0.5A~75A,

 Z MODE F-FINISH          : 5          2 for 1A~100A、3 for old version 0.5A~50A

Ultra-fine processing setting          4 for old    version 1A~75A,5 for old version 1A~200A

          F1:Next Page ( for page turning)

Z zero mhen Dis :0          No effect when set 0,if set 1 when the first time discharge process electrode touch the

          workpiece that cause sparks,meanwhile the value of Z axis is zero clearing。

Dely T(10ms): 0          To set the delay time for the axis value zero clearing when discharging electrode touch

          workpiece cause sparks, 10ms/ unit, maximum is 999.

HOME MOVE Z(M/M): Setting:

    1. Set the value as 5.000 under the main menu.

    2. Move the Z axis to the top or limit, set the Z axis as zero.

    3. Enter zero adjustment to home the value of Z axis. And then move Z to the top/limit, take down the value.

    4. Minus the value with 1 and then input the final value into HOME MOVE Z (M/M). if the lower part of Z axis is positive, then input positive value; if the lower part of Z axis is negative, then input negative value.

# IV. Z PARAMETER SET    Enter to set AUTOZ, edit related conditions.

Choose the function to get the menu, input current value of (1-50)75A, then the screen will display (1-75). Apply the value (1-50A(75A)) to edit AUTOZ, as well as all other conditions for processing.

| CH | DEPTH | I | Ton | Tof | Gap | Jmp | W-T | Pol | H-V |
|----|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | +0.115 | 2.0 | 60 | 5 | 40 | 7 | 6 | 0 | 1 |
| 1 | +0.085 | 2.0 | 30 | 4 | 50 | 8 | 5 | 0 | 2 |
| 2 | +0.065 | 1.5 | 15 | 4 | 50 | 8 | 4 | 0 | 2 |
| 3 | +0.050 | 1.5 | 8 | 4 | 45 | 8 | 4 | 0 | 2 |
| 4 | +0.040 | 1.0 | 5 | 5 | 40 | 8 | 4 | 0 | 2 |
| 5 | +0.025 | 1.0 | 3 | 6 | 35 | 8 | 3 | 0 | 2 |
| 6 | +0.015 | 0.5 | 2 | 6 | 35 | 8 | 3 | 0 | 2 |
| 7 | +0.010 | 0.0 | 2 | 6 | 35 | 8 | 3 | 0 | 3 |
| 8 | +0.005 | 0.0 | 2 | 6 | 30 | 8 | 3 | 0 | 2 |
| E9 | +0.000 | 0.0 | 2 | 6 | 28 | 8 | 3 | 0 | 1 |

Input the current value (1 – 75):1002

The auto editing value for AUTOZ is 4 digit number, the first number means the area, 0 for small area, 1 for medium area, 2 for large area, 3 fro ultra large area; the following 3 numbers represent the current value, the range is 1~150A.

Condition editing is a 5 digit number, the first number is 9; the second number represents the electrode shape, 0 for flat, 1 for flowery, 2 for needle; the third number represents the material, 0 for copper for steel, 1 for graphite for steel, 2 for steel for steel, 3 for copper for aluminum, 4 for graphite for aluminum, 5 for copper for tungsten steel; the fourth number represents the area, 0 for 1~4mm, 1 for 4~10mm, 2 for 10~25mm, 3 for 25~70mm, 4 for 70~80mm, 5 for 180~400mm, 6 for 400~1200mm, 7 for 1200~3600mm, 8 for 3600~7200mm, 9 for above 7200mm; the fifth number represents the roughness, 0 for rough, 1 for mid-rough, 2 for mid-fine, 3 for fine, 4 for ultra-fine.

# V. CURRENT RELAY MAPPING

Set current map table:0   50A CURRENT RELAY MAPPING

Customer define of current relay mapping

| CURRENT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | A | B | C | D | E |
|---------|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0.8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.9 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1.4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1.5 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1.6 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1.7 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

F1:PAGE UP

F2:PAGE DOWN

Set current map table:1   75A CURRENT RELAY MAPPING

Customer define of current relay mapping

| CURRENT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | A | B | C | D | E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.5 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.6 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.7 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0.9 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1.0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1.1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1.2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1.3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1.4 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1.5 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1.6 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.7 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

F1:PAGE UP

F2:PAGE DOWN

Set current map table :2    100A CURRENT RELAY MAPPING

Customer define of current relay mapping

| CURRENT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | A | B | C | D | E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.9 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.7 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

F1:PAGE UP

F2:PAGE DOWN

F1: PAGE UP

F2: PAGE DOWN

0: RELAY OFF          set"0" mean current relay close

1: RELAY ON           set"1"mean current relay open

1,2,3,4,5,6,7 represent CR1~CR7 on RESBASE board

A=CR10(CR3-2)
B=CR11(CR4-2)

C,D,E are on EXPAND RELAY
I/O_RELAY can be used with 100A

VI. I/O TEST          I/O Self-TEST
                ＊＊＊＊  I/O TEST  ＊＊＊＊
Z+ LIMIT   : *    Positve limit on Z axis
Z- LIMIT   : *    Negative limit on Z axis
Y+ LIMIT  :      Positve limit on Y axis
Y- LIMIT  :      Negative limit on Y axis
X+ LIMIT  :       Positive limit on X axis
X- LIMIT  :      Negative limit on X axis
S/C        :      Short circuit switch
STOP       :      Stop discharging
Oil Lev.   :       Oil level switch
Oil Temp.  :      Liquid temperature switch
Fire Alm.  :       Fire alarm
DIS        :      Discharging switch
UP         :      Up key
DOWN      :      Down Key
SLOW      :       Speed key
＊＊＊＊＊＊＊＊＊：  168
Offset adj.  ：  0 (Adjment EDMDRV offset VR)
               ----PRESS ANY KEY TO STOP TEST----
Enter the I/O TEST, test all key, limit switch, oil level, oil temperature, fire-prevention sensor to see if they are working normally.

VII. HUNTING SET        set the discharging condition for profile modeling.
      HUNTING MODE SET
      I            :0.0        current condition
      T_ON         :100        cycle condition
      T_OFF        :7        Efficiency condition
      GAP          :50        Gap voltage condition
      JMP          :0        Deslagging height (no deslagging)
      W_T          :10        Processing hour
      POL          :0         Polarity(positive)
      HV           :2        High voltage(200V)

VIII. QUIT    Quit the parameter setting mode back to the main menu.

# Attachment 3（ Just for the Technical Maintenance Staff）
# ZNC EDM machine troubleshooting process

EDMZNT(control board)　ZNC_ I/O（keyset）　DRIVER1 (servo board)　RESBASE (resistance board)
POWER(power board)　MACH1 ( machine connection plate)　NEWKEY (keypad)
REMOTE(manual control board)

一、Boot-strap no power
　　1.　Check and measure whether the power AC380V could charging,whether the fuse-switch close or broken。
　　2.　Check whether the wirings #1,#2,#3 is poor，whether the FU1,FU2,FU3 are poor contact or broken。
　　3.　Check whether the wirings #4,#5,#6 are poor,whether the protective tube for FU4,FU5,FU6 have been fused
　　4.　Check whether the wirings #19,#20 are poor，whether the MG4 over loading of power is tripping or broken。
　　5.　Check whether protective tube FU7 fuse，whether the transformer TF2 get AC380V and AC24V or broken-down。
　　6.　Check whether the wirings from CN-11 to WMG5 #27,#28,#29 are poor or the MG5 is broken。
　　7.　Check whether the wirings from CN-11W to emergency switch 、light switch#37,#94,#95,#27,#28,#29 are poor contact or the two switches are broken。
　　8、Check whether the wirings  from CN-12M to ZNC_I/O board #94,#95,#29 are poor or the ZNC_I/O board is broken。

二、There is power for boot-strap but no display on screen.
　　1、Check whether the wirings MG5 #5,#6 and #61,#62 are poor, whether the protective tube for FU16,FU17 have been fused。
　　2、Check whether the wirings #63,#64 to transformer TF3 are poor，whether the transformer TF3 is broken。
　　3、Check whether the wirings from #133,#134 of TF3 to PC case are poor.
　　4、Check whether the power supply wiring inside the PC box to mainboard is poor contact or the power supply broken-down.
　　5、Check whether the mainboard inside PC case have not been correctly installed or the mainboard is broken。
　　6、Check whether the screen signal-line is poor contact，whether the screen  power line is poor contact or the screen is broken。

三、Unusual screen display after boot-strap
　　1、If the screen display CAR ERROR,then Check whether the EDMZNT board inside the PC case have  not been correctly installed or broken-down。
　　2、If the screen display WAIT A MOMENT in midway then hang，check if the EDMZNT board is defective assembled or broken.whether the wiring connect PC case CN26 and monitor is poor.
　　3、If the machine crash in the midway to enter the system, Check if the DOM have not been correctly installed or broken-down
　　4、If screen enter DOS without entering the system.that mean there is some problem with the Internal program
四、The screen display Z-axis short circuit under the electrode is not short circuit。
　　1、Check to see if there is deflexion with voltmeter,if no,mean electrode have no DC24V voltage。Procedure is as follows：
　　①Check whether the 24V LED indicator for POWER board is bright,check whether the FUSE1 for

POWER board is poor.

②Check if the DC24V commutate return circuit for POWER board is broken。

③If no display Z-axis short circuit when take apart the electrode wire，that mean short circuit between the positive electrode wire and machine frame or positive and negative electrode wire is wrong side out 。

④Check if the fast diodes installed on #90,#14 of MG3,MG2 is wrong side out or broken or short circuit。

⑤Check whether the #14,#89,#90,#91 wiring position of MG2,MG3 are wrong,whether the auxiliary contact of MG1 is poor.

⑥Check if the wirings #38,#39,#14,#90 on auxiliary contact of MG1 and the wirings #38,#39 on POWER board TB1 are poor。

⑦Check if the #38,#37 on POWER board TB1 are short circuit,if so,Check the wiring connect POWERBASE TB3 #92,#93 and ZNC_I/O board X8 is wrong connected or short circuit,if DC24V Circuit of ZNC_I/O.PCB is broken-down。

⑧Check if the #41,#42 of POWER board TB1 get AC18V power。

⑨Check if the wirings from #41,#42 of POWER board TB1 to transformer TF3# 41,#42 are poor。

⑩Check if the transformer TF3# 41,#42 get AC18V power。If no,that mean transformer TF3 is broken。

2、If voltmeter get DC24V voltage then check if the wiring connect RESBASE board TB1 LVG EP+ and EDMZNT board X3 is poor,whether the EDMZNT board is unfitting assembly or broken。

五、Screen display Z+ limit Indication

    **1**、Check if the wiring from EDMZNT board X4 to ZNC_I/O X2 is poor or wrong connected。

    **2**、Check if the wiring from ZNC_I/O board X3 to IO BOX CN17 is poor or wrong connected。

    **3**、Check if the wiring from IO BOX CN17 to MACH1 is poor or wrong connected。

    **4**、Check if the wiring from MACH1 to Z+ limit is poor or wrong connected。

    **5**、Check if the EDMZNT board have not been correctly installed or broken。

    **6**、Check if the ZNC_I/O is broken。

六、NOVO no reading

    **1**、Check if on the MACH1board MCN5,MCN6,MCN7, 1pin and10pin get DC5Vpower。

    **2**、Check if there is some problem with the circuit when DC24V translate DC5V on the EDMZNT.PCB。

    **3**、Check if the connection for NOVO wiring switch over to MACH1.PCB is poor or wrong connected。

    **4**、Check if the wiring between MACH1board MCN5,MCN6,MCN7 and IO BOX CN16 is poor or wrong connected。

    **5**、Check if the wiring between IO BOX CN16 and X2 of EDMZNT board is poor or wrong connected。

    **6**、Check if there some is problem with the circuit when DC24V translate DC5V on EDMZNT.PCB。

七、NOVO reading is unnormal or working depth is not exact

    **1**、Check if the machine frame upside、middle part、under-part have been connected with electrode wire。

    **2**、Check if the customer's Pi input power is 10% error。

    **3**、Check to make sure the 4 Copper Pillars fixed on MACH1.PCB have been connected with machine frame.If no,then need to connect with machine frame with a lead。

    **4**、Check if the tie-in crust of the triaxial NOVA have been connected to the machine frame with wiring。

    **5**、Check if the negative polarity output point of control box have been connected to Control Box Cabinet with earth wire。

    **6**、Check if the connection between NOVO wiring and MACH1.PCB is poor or poor welding spot is too large。

    **7**、Check if the wiring between MCN5,MCN6,MCN7 of MACH1 board and IO BOX CN16 get

too large poor welding spot or poor contact，if the masks have been correctly connected.

**8**、 Check if the aviation tie-in of CN16 was not tight locked。

**9**、 Check if the wiring between MCN5,MCN6,MCN7 of MACH1 board and X1 of EDMZNT board is poor contact or been wrong connected。

**10**、 Check if the EDMZNT board have not been correctly installed or broken。

**11**、 The MACH1 or NOVA or DOM is broken。

**12**、 If the above-mentioned still can not solve the problem,that can parallel connection 103 capacitance in the legs 2、5 and the legs 3、5 for the MCN2 MCN3 MCN4 of MACH1。

八、Appear arc deposition in processing（arc deposition position action）

1、If the value for arc deposition sensitivity is too low, the value usually set as 5～7

2、If the value for arc deposition height is wrong setting.（should set over the machining face ）。

3、The value for discharge efficiency or gap voltage is too high ,that electrode discharge can not pull up higher than the value for the arc deposition height.。

4、Check if the wiring between RESBASE board -- TB1 LVG EP+ and EDMZNT X2 is poor or the assembling for EDMZNT board is poor。

5、Check if the wiring between EDMZNT board X2 and POWER board X1 is poor or wrong connected。

6、EDMZNT board or POWER board is broken。

九、Arc discharge appearing in processing（dc discharge）

1、Check if the wiring between EDMZNT board X2 and POWER board X1 is poor or wrong connected。

2、Check if the diode for the POWER board is poor or broken。

3、Check if the Fast diode for the MG3,MG2 #90,#14 is broken。

4、Check if the IRF250 or IRF840 for POWER board is broken。

5、Check if the POWER board or EDMZNT board is broken。

十、Processing results macula and asymmetry

1、Check if the value for discharge efficiency is too high or the value for gap voltage is too low。

2、Check if the value for copper area is large and the value for high voltage is too low.。please refer to the manual to set。

3、Check if the EQU is open when refining processing。

4、Check if the wiring between EDMZNT board X2 and POWER board X1 is poor or wrong connected。

5、EDMZNT board or POWER board is broken。

十一、Colliding mould appear in processing

1、Check if the speed for DRIVER board adjust too fast,if so,Clockwise the VR1 a little lower.

2、Check if the servomotor belt is too loose or the lead screw gap for Z axis is too large.

3、If Collid mould after finishing processing ,Check if the Z asis position for end jumping is wrong.

4、Check if the wiring between EDMZNT board CN1 and DRIVER board is poor.

5、Check if the EDMZNT board is broken or poor assembled.The DRIVER is broken.

十二、There is strange sound when Z axis up and down

1、Check if the speed for DRIVER board adjust too fast,if so,Clockwise the VR1 a little lower.

2、Check if there is some problem with servo motor or the belt is too tight。

3、Check if there is not lubricant in Z axis lead screw。

4、Check if the assembling for Z axis lead screw is poor.

十三、Z axis could not move up and down

1、Check if the indicator light for DRIVER board is abnormal。If only LED5 is bright，then

a、Check if the L2 for DRIVER board is poor contact。

b、Check if the 8 A protective tube for the DRIVER borad have been fused。

c、Check if the wirings between transformer TF3 and the #260,#261 for DRIVER board AC35V are poor.

d、Check if there is AC35V power in transformer TF3 #260,#261 or the transformer TF3 is broken。

e、Check if the wiring for servo motor is poor or has dropped off 。

f、Check if the return circuit between DRIVER board and MACH1 board is poor。

g、Check if is the wirings from EDMZNT board X2 to the CNZ #104,#245,#249 for DRIVER board are poor。

h、Check if the key-press for REMOTE board or the wiring is poor。

i、Check the wiring between IO BOX CN17 and ZNC_ I/O is poor。

j、The DRIVER board is broken。

2、If all the indicator lights for DRIVER board are off，then

    a、Check if the 2A protective tube for the DRIVER board have benn fused。

    b、Check if the wirings from transformer TF3 to the AC110V #100,#101 for DRIVER board are poor。

    c、Check if there is AC35V power in transformer TF3 #100,#101 or the transformer TF3 is broken。

    d、The DRIVER board is broken。

3、If the DRIVER board light LED5 and LED1，then

    a、Check if the wirings for the Z axis limit switch #105,#107,#108(Z_REV_STOP,Z_FWD_STOP) are poor。。

    b、Check if the wirings from CN19 of the electricity box to the TM2 #105,#107,#108 of MACH1 board are poor。

    c、Check if the wiring between CN19 of the electric cabinet and the CNZ of DRIVER board is poor。

    d、The DRIVER board is broken。

4、If the DRIVER board light LED5 and LED4，then

    a、Check if the VR1 for DRIVER board anticlockwise has be adjusted too much。

    b、Check if the VR1 for DRIVER board have not been clockwise adjusted to the largest。

    c、Check if the servo motor is broken。

    d、The open-circuit for the DRIVER board IRF250 or the DRIVER board is broken。

5、If the DRIVER board light LED5 and LED3，then

    a、Check if the servo motor is broken。

    b、Check if the IRF250 for the DRIVER board short circuit or the DRIVER board is broken。

6、If the DRIVER board light LED5 and LED2，then

    a、Check if the principal axis or servo motor is stuck or not lubricant enough。

    b、Check if the plummer electrode is too heavy or the fast jumping processing is not turned off。

    c、Check if the VR10 for DRIVER board have not been clockwise adjusted to the largest。

    d、Check if the servo motor is broken。

    e、The DRIVER is broken。

7、Screen display"Z axis driver is abnormal"

    a、The wiring for EDMZNT board X6 is poor contact。

    b、Check if the the screw for power wiring tie-in of electric cabinet have not been tight locked，or the factory have not supply a stability voltage for electric cabinet，that would cause voltage instability。

    c、There is short circuit between EDMZNT- X2 and DRIVER -CN1

    d、DRIVER.PCBor EDMZNT.PCB is broken。

十四、Could not enter the processing display by pressing discharge or modeling discharge。

1. If press discharge and display a group of digit,it mean locking machine,please ask the dealer to help for decoding.
2. If press discharge and display processing ending，then check if the depth is wrong setting。
3. If press discharge and display processing ending，then check if there is some problem with the software version or there is a pirate return circuit。
4. If press discharge and could not enter the discharge display or enter immediately jump out，then check if there is some problem with the software version or there is a pirate return circuit。
5. If press discharge and could not enter the discharge display or enter immediately jump out，Then check the key-press for the NEWKEY is poor or broken.

十五、No discharge in processing and the machine head go straight down。

1、Check if the wiring between the IO BOX and the electrode wire of machine frame is loose or no fixed good。

2、Check if the wiring between IO BOX and the TB2 #86,#87 of POWERBASE is loose or no fixed good。

3、Check if the wirings connected on TB2 #80,#86,#87 and TB1 #88 for the POWERBASE are poor

4、Check if the wirings connected on #89,#91,#14,#90 for MG2,MG3 are poor or poor contact。

5、Check if the contact point for MG2,MG3 is poor or broken。

十六、No current and voltage when start discharge and enter the discharge display.

1、Check if there is normal operation for MG1,If there is,then
   a、Check if the wirings #31,#35 have not been correctly connected and measure to see if there is AC24V control source。
   b、Check if the wiring between CN12-M and CN7( X7 ) of ZNC_I/O has not been correctly connected or the wiring is poor。
   c、Check if the DC12V LED for ZNC_I/O is bright，if no,that mean protectivetube has been burned or the wiring for ( X10 )CN10-CN22 has not been correctly connected or the wiring is poor。
   d、If the LED is bright then check if the wiring ( X2 )CN2-CN29 has not been correctly connected or poor contact。
   e、The ZNC_I/O board or EDMZNT board is broken。

2. If the operation for MG1 is normal,then measure if there is DC100V power for 10000uF/200V,if no,then
   a、Check if the wirings #4,#5,#6 for MG1 are poor or if the I/OV for #4,#5,#6 is normal。
   b、Check the wirings #7,#8,#9 and #76,#77,#78 for MG1 are poor or the transformer of TF4 is broken。

3. Check if the indicator lights for HV+,HV-,LV+,LV on power board are all bright,if no,then
   a、Check if there is AC380V power input from the TF1 transforme，if no then check if the protective tube has been fused。
   b、Check if the wirings 25,#62 are poor or have not been correctly connected。
   c、Check if there are 2groups power for 9V,0V,9V 9V,0V,9V CN2 on POWER board,if there is,that mean the TF1 is broken。
   d、If no,then check if the wirings for #46,#47,#48and #43,#44,#45 have not been correctly connected。

4. Check if there is a signal to output when the #49,#50,#51,#52 of X1 on POWER board discharge，if there is, mean the POWER board is broken。

（Note:the frequency for the discharge signal from PC case is too high to measure with multimeter,then could refer to the right drawing to connect with 2 shiny diodes、1 ceramic capacitor of 104、and 1 resistance of 500ohms。The arrow insert in the place that need to measure，if the 2 lights light at the same

time，that mean there is a shake signal，if not，that mean have no shake signal，this measure also can be used for the 5V shake signal，include the NOVO signal）

　　　　5、If no signal output then check if the wiring between the X2 for EDMZNT board and the X1 for POWER board is poor。

　　　　6、The EDMZNT board is broken。
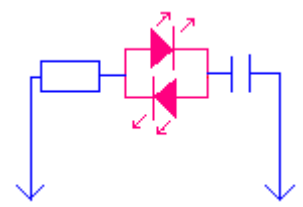
十七、When process there is high-tension current but have no low-tension current or the low-tension current is unnormal，then

　　　1. Check if there is AC75V power with 10000uF/200V capacitance，if no then

　　　　a、Check if there is AC75V power with TF4 #68,#69,#70 or the wirings are poor。

　　　　b、Check if the 10000uF/200V capacitance and the three-way rectifier is broken ot the wirings are poor.

　　　2、If there is DC100V power，then Check if there is a signal for the X1 #51,#52 on POWER board，if no signa，then

　　　　a、Check if the wiring between X2 of EDMZNT board and X1 #51,#52 of POWER board is poor。

　　　　b、The EDMZNT board is broken。

　　　3、Check if there is a signal on X1 #51,#52 of POWER board，if there is，then

　　　　a、Check if the #13,#15 of POWER board have been reversely connected.

　　　　b、Check if the wirings #43,#44,#45 for POWER board have been correctly connected and if there is 9V,0V,9V power or not。

　　　　c、Check if the IRF250 of POWER board or the POWER board is broken。

　　　4、Check if the wiring for the diverter of RESBASE board has been correctly connected or if the wiring is poor or not。

　　　5、Check if there is some problem with the wiring between X4 of ZNC_I/O board and the CN13 of RESBASE board。

　　　6、Check if the wiring for the RESBASE board and the low voltage power resistance is wrong connection or the value for the power resistance is wrong。

　　　7、Check if the parameter for resistance is set correct or not。

　　　8、The RESBASE board is broken。

十八、when process the low-tension current is normal but the high-tension current is unnormal

　　　1、Check if there is a signal on X1 #49,#50 of POWER board，if no，then

　　　　a、Check if the wirings from X2 of EDMZNT board to X1 #49, #50 of POWER board are poor。

　　　　b、The EDMZNT board is broken。

　　　2、Check if there is a signal on X1 #49, #50 of POWER board ,if there is,then

　　　　a、Check if there is 9V,0V,9V power on #46, #47, #48 of POWER board or check if the TF1 is broken。

　　　3、Check if there is some problem with the wiring between the X4 of ZNC_ I/O board and the CN13 of RESBASE board。

　　　4、Check if the wiring between the RESBASE board and the high voltage power resistance is not connected correctly or the value for the power resistanc is wrong.

　　　5、The RESBASE board is broken。

# 放电加工机检验报告

**Electric discharge machine inspection report**

表单编号 **Form Number**：＿＿＿＿＿＿＿＿＿

记录序号 **Record Number**：＿＿＿＿＿＿＿＿

客户名称 **Customer Name**：＿＿＿＿＿＿＿＿

机台型号 **Machine Model**：＿＿＿＿＿＿＿＿
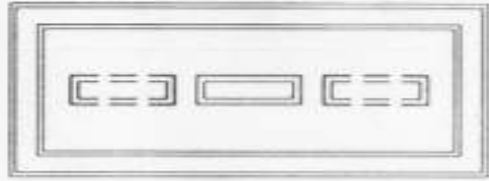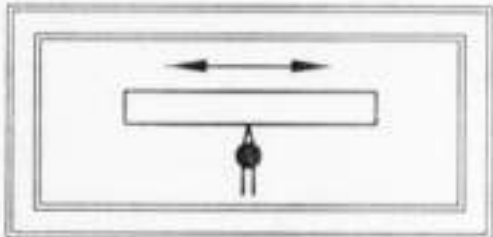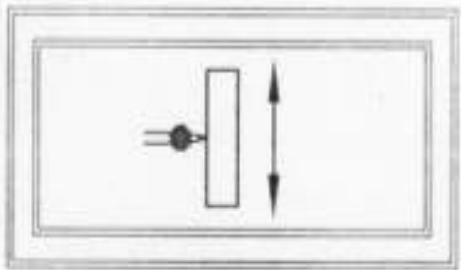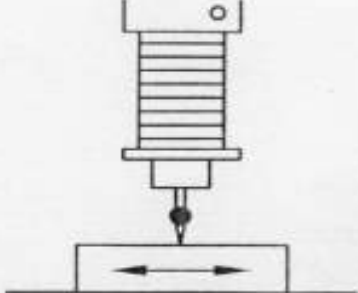
机台编号 **Machine Number**：＿＿＿＿＿＿＿

电箱编号 **Electrical cabinet Number**：＿＿＿＿＿＿

制造日期 **Manufacturing date**：＿＿＿＿＿＿

检验者 **Proofer**：＿＿＿＿＿＿＿＿＿＿

检验日期 **Inspection date**：＿＿＿＿＿＿＿
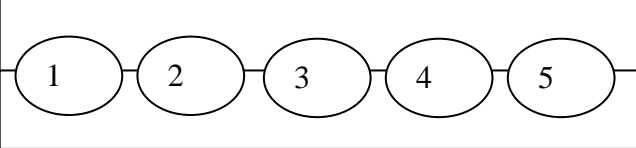
| 项目<br>Item | 检验项目<br>Inspection item | 图 示<br>Diagram | 许可差<br>Allowable error | 实测差<br>Actualmeasurement error |
|---|---|---|---|---|
| 1 | 台面真平行度(X 轴方向)<br>Table parallel degree（X axis orientation） | | X 轴方向移动量 500 以下为 0.04mm<br>500-100 以内为 0.05mm<br>Amount of movement for X axis orientation: under 500 be 0.04mm, 500--100 be 0.05mm | |
| 2 | 台面真平行度(Y 轴方向)<br>Table parallel degree（Y axis orientation） | | Y 轴方向移动量 500 以下为 0.04mm<br>500-100 以内为 0.05mm<br>Amount of movement for Y axis orientation: under 500 be 0.04mm, 500--100 be 0.05mm | |
| 3 | X 轴方向运动之直角度<br>The right-angle degree of X axis orientation movement | | 每 300mm 为 0.01mm<br>0.01 mm for every 300 mm | |
| 4 | Y 轴方向运动之直角度<br>The right-angle degree of Y axis orientation movement | | 每 300mm 为 0.01mm<br>0.01 mm for every 300 mm | |
| 5 | 工作台运动与台面之平行度(X 轴方向)<br>The parallel degree between table movement and table （X axis orientation） | | 每 300mm 为 0.02mm<br>0.02 mm for every 300 mm | |

| 项目<br>Item | 检验项目<br>Inspection item | 图 示<br>Diagram | 许可差<br>Allowable error | 实测差<br>Actualmeasurement error |
|---|---|---|---|---|
| 6 | 工作台运动与台面之平行度(Y轴方向)<br>The parallel degree between table movement and table （Y axis orientation) |  | 每300mm 为 0.02mm<br>0.02 mm for every 300 mm | |
| 7 | 台面之X轴方向运动与Y轴方向运动间之直角度<br>The right-angle degree between X axis movement and Y axis movement |  | 每300mm 为 0.015mm<br>0.015 mm for every 300 mm | |
| 8 | 传动箱，下运动与台面之直角度(X轴方向)<br>Transmission case,the right-angle degree between downward movement and table （X axis orientation) |  | 每300mm 为 0.02mm<br>0.02 mm for every 300 mm | |
| 9 | 传动箱，下运动与台面之直角度(Y轴方向)<br>Transmission case,the right-angle degree between downward movement and table （Y axis orientation） |  | 每300mm 为 0.02mm<br>0.02 mm for every 300 mm | |
| 10 | Z轴上下运动与台面之直角度(X轴方向)<br>The right-angle degree between Z axis up-and-down motion and table （X axis orientation） |  | 每300mm 为 0.01mm<br>0.01 mm for every 300 mm | |
| 11 | Z轴上下运动与台面之直角度(Y轴方向<br>The right-angle degree between Z axis up-and-down motion n and table （Y axis orientation） |  | 每300mm 为 0.01mm<br>0.01 mm for every 300 mm | |

| 项目<br>Item | 检验项目<br>Inspection item | 图 示<br>Diagram | 许可差<br>Allowable error | 实测差<br>Actualmeasurement error |
|---|---|---|---|---|
| **12** | 主轴受外力约10KGS推力时所产生的误差在,在原点时(X轴方向)<br>When at origin,the error if the spindle external force be about 10KGS thrust, at origin (X axis orientation) | | **0.1mm** | |
| **13** | 主轴受外力约10KGS推力时所产生的误差在,下降至180mm时(X轴方向)<br>When drop to 180mm,the error if the spindle external force be about 10KGS thrust (X axis orientation | | **0.1mm** | |
| **14** | 主轴受外力约10KGS推力时所产生的误差在,在原点时(Y轴方向)<br>When at origin,the error if the spindle external force be about 10KGS thrust, at origin (Y axis orientation) | | **0.1mm** | |
| **15** | 主轴受外力约10KGS推力时所产生的误差在,下降至180mm时(Y轴方向)<br>When drop to 180mm, the error if the spindle external force be about 10KGS thrust, (Y axis orientation) | | **0.1mm** | |
| **16** | X轴和Y轴之反复精度(Y轴方向)<br>Repeat accuracy between X and Y axis (Y axis orientation) | | **0.005mm** | |

# 粗细度样品测试

Thick degree sample Testing

电极材料:铜
电极截面积:78.5mm
工件材料:S45C
加工深度：0.2mm

Electrode material：copper
Electrode cross-sectional area：78.5mm
Workpiece Material:S45C
Working depth：0.2mm

电极形状图形:
Electrode shape graphics

加工每一孔都需在当孔的表面 z 轴归零再加工
Processing each hole need Z axis making zero in the hole surface first

| 1 | 2 | 3 | 4 | 5 |

每个孔移位 23MM 一次打两块样品
Make two pieces samples at a time when each hole shift 23 MM

## 1

| Step 段 | Depth 深度 | I 电流 | T-on 周率 | T-off 效率 | GAP 间隙 | JMP 跳升 | W-T 时间 | POL 极性 | H-V 高压 | EQU 能量 | Fast Jump 快跳 | SURFACE FINISH Ra(um) | Process time 加工时间 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.135 | 2 | 60 | 5 | 45 | 6 | 5 | 0 | 2 | ON | ON | | |
| 2 | 0.155 | 1.5 | 30 | 4 | 50 | 7 | 5 | 0 | 2 | ON | ON | | |
| 3 | 0.17 | 1 | 15 | 4 | 50 | 7 | 5 | 0 | 2 | OFF | ON | | |
| 4 | 0.18 | 1 | 8 | 4 | 40 | 8 | 4 | 0 | 2 | OFF | ON | | |
| 5 | 0.19 | 0.5 | 4 | 4 | 35 | 8 | 4 | 0 | 2 | OFF | ON | | |
| 6 | 0.2 | 0.5 | 2 | 4 | 32 | 8 | 3 | 0 | 3 | OFF | ON | | |

## 2

| Step 段 | Depth 深度 | I 电流 | T-on 周率 | T-off 效率 | GAP 间隙 | JMP 跳升 | W-T 时间 | POL 极性 | H-V 高压 | EQU 能量 | Fast Jump 快跳 | SURFACE FINISH Ra(um) | Process time 加工时间 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 2 | 60 | 5 | 45 | 6 | 5 | 0 | 2 | ON | ON | | |
| 2 | 0.17 | 1.5 | 30 | 4 | 55 | 6 | 4 | 0 | 2 | ON | ON | | |
| 3 | 0.185 | 1 | 14 | 4 | 50 | 7 | 3 | 0 | 2 | OFF | ON | | |
| 4 | 0.2 | 1 | 5 | 4 | 45 | 7 | 3 | 0 | 2 | OFF | ON | | |

## 3

| Step 段 | Depth 深度 | I 电流 | T-on 周率 | T-off 效率 | GAP 间隙 | JMP 跳升 | W-T 时间 | POL 极性 | H-V 高压 | EQU 能量 | Fast Jump 快跳 | SURFACE FINISH Ra(um) | Process time 加工时间 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.16 | 2 | 60 | 5 | 45 | 6 | 5 | 0 | 2 | ON | ON | | |
| 2 | 0.18 | 1.5 | 30 | 4 | 55 | 7 | 4 | 0 | 2 | ON | ON | | |
| 3 | 0.2 | 1.5 | 15 | 4 | 60 | 7 | 4 | 0 | 2 | ON | ON | | |

## 4

| Step 段 | Depth 深度 | I 电流 | T-on 周率 | T-off 效率 | GAP 间隙 | JMP 跳升 | W-T 时间 | POL 极性 | H-V 高压 | EQU 能量 | Fast Jump 快跳 | SURFACE FINISH Ra(um) | Process time 加工时间 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.17 | 2 | 60 | 5 | 50 | 6 | 5 | 0 | 2 | ON | ON | | |
| 2 | 0.2 | 2 | 30 | 4 | 60 | 8 | 4 | 0 | 2 | ON | ON | | |

## 5

| Step 段 | Depth 深度 | I 电流 | T-on 周率 | T-off 效率 | GAP 间隙 | JMP 跳升 | W-T 时间 | POL 极性 | H-V 高压 | EQU 能量 | Fast Jump 快跳 | SURFACE FINISH Ra(um) | Process time 加工时间 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.16 | 3 | 90 | 5 | 50 | 6 | 5 | 0 | 2 | ON | ON | | |
| 2 | 0.2 | 3 | 50 | 4 | 60 | 7 | 3 | 0 | 2 | ON | ON | | |

# 粗细度样品测试
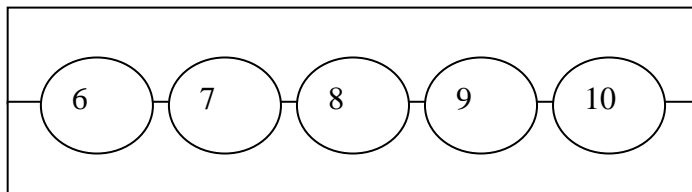## Thick degree sample Testing

| 电极材料:铜<br>电极截面积:78.5mm<br>工件材料:S45C<br>加工深度：0.2mm<br>Electrode material：copper<br>Electrode cross-sectional area：78.5mm<br>Workpiece Material:S45C<br>Working depth：0.2mm | 电极形状图形:<br>Electrode shape graphics<br><br>加工每一孔都需在当孔的表面 z 轴归零再加工<br>Processing each hole need Z axis making zero in the hole surface first<br><br>6　7　8　9　10<br><br>每个孔移位 23MM　一次打两块样品<br>Make two pieces samples at a time when each hole shift 23 MM |
| --- | --- |

**6**

| Step<br>段 | Depth<br>深度 | I<br>电流 | T-on<br>周率 | T-off<br>效率 | GAP<br>间隙 | JMP<br>跳升 | W-T<br>时间 | POL<br>极性 | H-V<br>高压 | EQU<br>能量 | Fast<br>Jump<br>快跳 | SURFACE<br>FINISH<br>Ra(um) | Process<br>time<br>加工时间 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.15 | 4 | 120 | 7 | 50 | 7 | 7 | 0 | 2 | ON | ON | | |
| 2 | 0.2 | 4 | 80 | 7 | 50 | 7 | 7 | 0 | 2 | ON | ON | | |

**7**

| Step<br>段 | Depth<br>深度 | I<br>电流 | T-on<br>周率 | T-off<br>效率 | GAP<br>间隙 | JMP<br>跳升 | W-T<br>时间 | POL<br>极性 | H-V<br>高压 | EQU<br>能量 | Fast<br>Jump<br>快跳 | SURFACE<br>FINISH<br>Ra(um) | Process<br>time<br>加工时间 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.14 | 5 | 150 | 7 | 50 | 7 | 6 | 0 | 2 | ON | ON | | |
| 2 | 0.2 | 5 | 120 | 7 | 50 | 7 | 6 | 0 | 2 | ON | ON | | |

**8**

| Step<br>段 | Depth<br>深度 | I<br>电流 | T-on<br>周率 | T-off<br>效率 | GAP<br>间隙 | JMP<br>跳升 | W-T<br>时间 | POL<br>极性 | H-V<br>高压 | EQU<br>能量 | Fast<br>Jump<br>快跳 | SURFACE<br>FINISH<br>Ra(um) | Process<br>time<br>加工时间 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.12 | 7 | 210 | 7 | 50 | 7 | 6 | 0 | 2 | ON | ON | | |
| 2 | 0.2 | 7 | 150 | 7 | 50 | 7 | 6 | 0 | 2 | ON | ON | | |

**9**

| Step<br>段 | Depth<br>深度 | I<br>电流 | T-on<br>周率 | T-off<br>效率 | GAP<br>间隙 | JMP<br>跳升 | W-T<br>时间 | POL<br>极性 | H-V<br>高压 | EQU<br>能量 | Fast<br>Jump<br>快跳 | SURFACE<br>FINISH<br>Ra(um) | Process<br>time<br>加工时间 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.11 | 10 | 300 | 6 | 50 | 7 | 6 | 0 | 2 | ON | ON | | |
| 2 | 0.2 | 10 | 200 | 6 | 50 | 7 | 6 | 0 | 2 | ON | ON | | |

**10**

| Step<br>段 | Depth<br>深度 | I<br>电流 | T-on<br>周率 | T-off<br>效率 | GAP<br>间隙 | JMP<br>跳升 | W-T<br>时间 | POL<br>极性 | H-V<br>高压 | EQU<br>能量 | Fast<br>Jump<br>快跳 | SURFACE<br>FINISH<br>Ra(um) | Process<br>time<br>加工时间 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.1 | 15 | 450 | 6 | 45 | 10 | 6 | 0 | 2 | ON | ON | | |
| 2 | 0.2 | 15 | 300 | 6 | 45 | 10 | 6 | 0 | 2 | ON | ON | | |

| 编号<br>Number | 零件及配件明细<br>Parts and accessories details | 数 量<br>Quantity | 备 注<br>Remarks |
|---|---|---|---|
| 1 | -73- | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 编号<br>Number | 零件及配件明细<br>Parts and accessories details | 数 量<br>Quantity | 备 注<br>Remarks |