KENT USA®
Since 1979

# KEB-CNC Series

## Electrical Discharge Machines

*Operation Manual*

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KEB-CNC Machine Data Sheet

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# 1 Introduction

## 1.1 Keys Symbol Description

Symbols and Texts used in this manual, described as bellow:

| Key | Text Symbol | Description |
|---|---|---|
| Function Key： F1 | Symbol used：【F1】 | Press【F1】 Key means press Function Key F1 |
| Text Key： A | Symbol used：＜A＞ | Press＜A＞ Key means press Text Key A |
| Input Key： ENTER | Symbol used：『Enter』 | Press『Enter』 Key Means press Input Key ENTER |

## 1.2 Hint Symbols

Symbols used in this manual：

| Symbols | Description |
|---|---|
| ⌧Warning | This symbols means wrong operation will damage Operator. |
| ！Note | This symbols means wrong operation will damage workpiece or machine. |
| ✐Hint | This symbols means useful information is provided. |

## 1.3 Things to be careful

⌧Danger

1. Do no touch electrode while discharging。
   The Electrode has high voltage while discharging. Do not touch electrode to prevent electrical shock.
2. Do not open the Power Generator while the Machine power is ON. There is high voltage in Power Generator while the power is on. Do not open the power generator to prevent electrical shock.

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! Note

∗ Please back up programs, machining parameters, machining conditions and other parameters.
Programs, machining condition and parameters are saved in memory chips. Even the power off, machine still keep all the information.

∗ Unfortunately, some information might be lost due to the wrong operation or machine error. Operator always can reload the information from the back up disk.

✐Hint

∗Parameters：
Please setup the right parameters。
Wrong parameters might cause of the machine malfunction. Parameters are very important to the machine.

∗Back up Disk：
Back up program is necessary.

## 1.4 Manual

This manual is design for EDM KEB-CNC series, especially is for system operation and program editing purpose.

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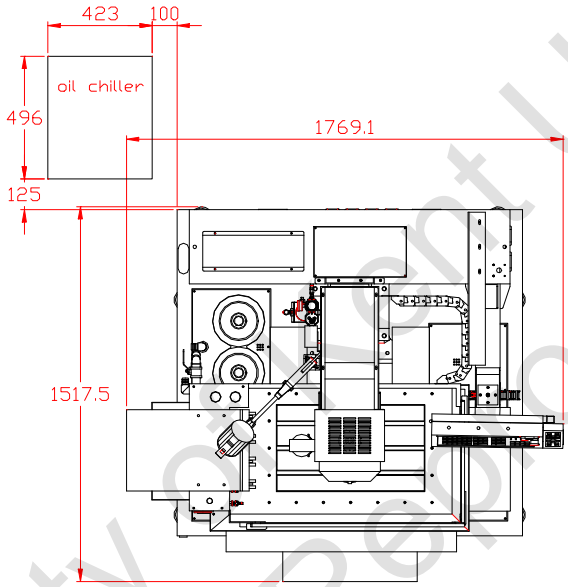
# 2. Machine transportation and installation

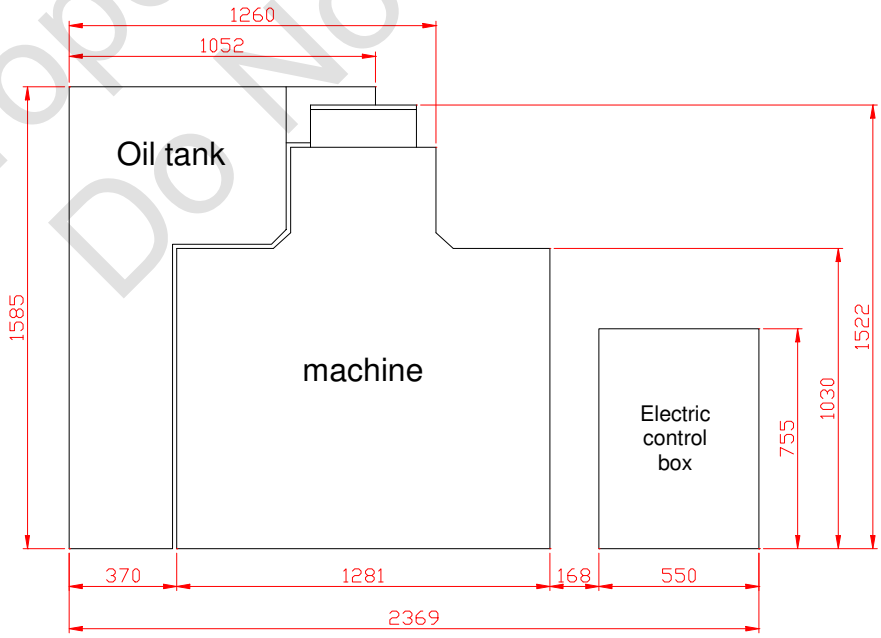
## 2.1 Layout of the machine

For the floor occupied by each mode of the machine, refer you to the following layouts.

*KEB-433CNC* unit: mm




*KEB-600LCNC* unit: mm

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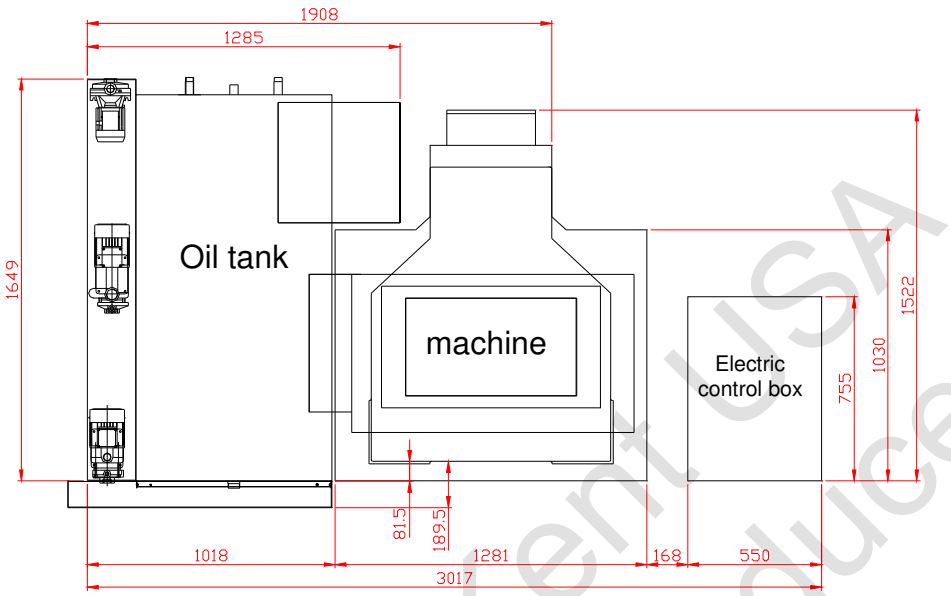
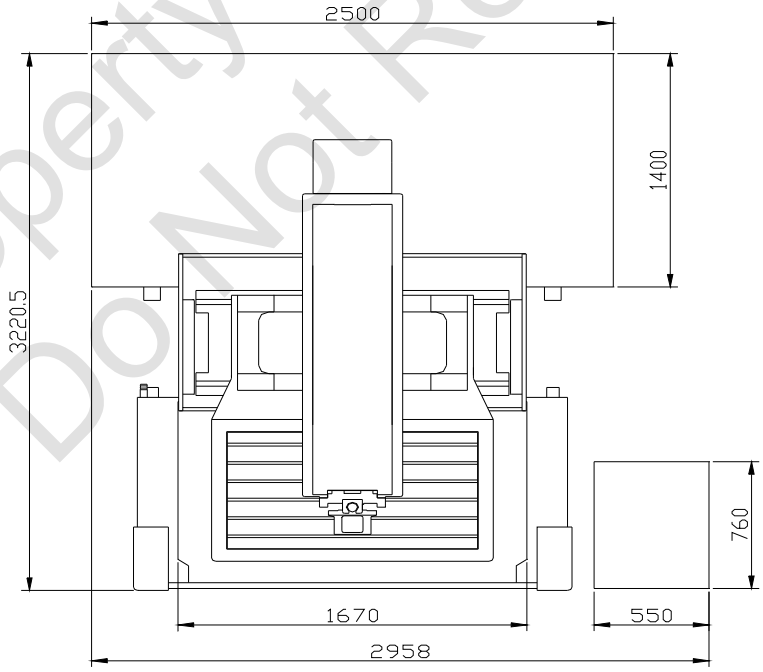
## *KEB-600LCNC **(S.F)***

unit:mm




## *KEB-700LCNC*

Unit: mm

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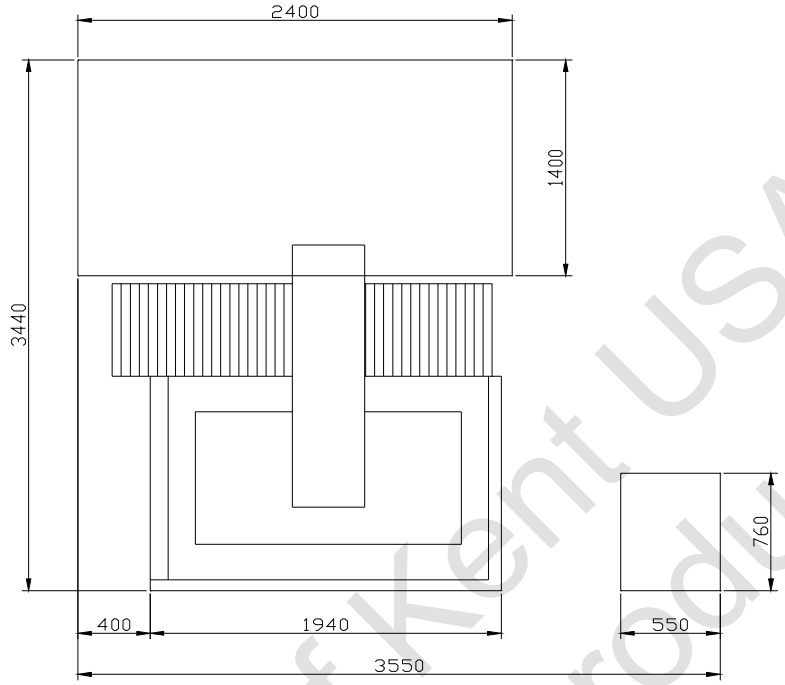
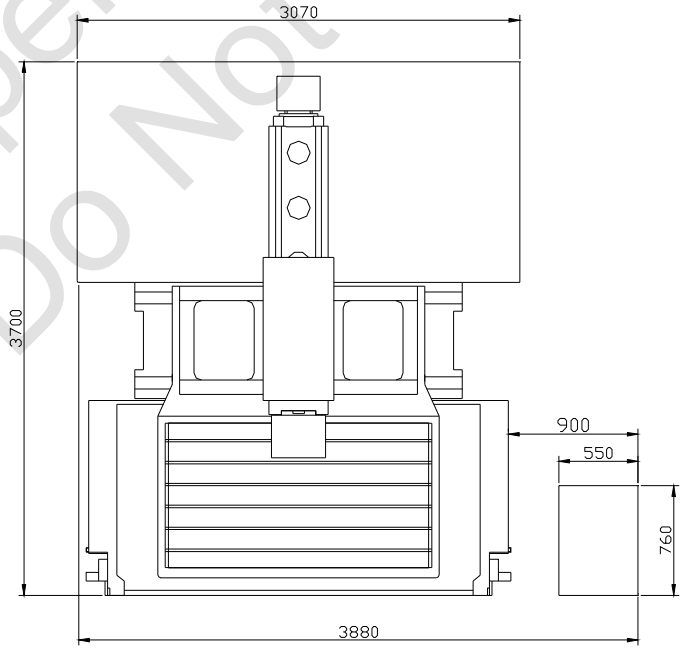
*KEB-800LCNC* Unit: mm




*KEB-900LCNC* Unit: mm

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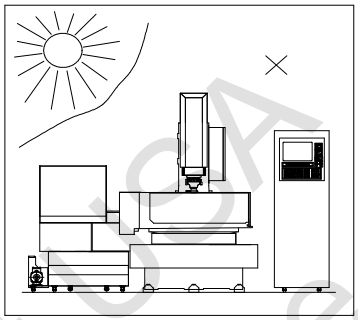
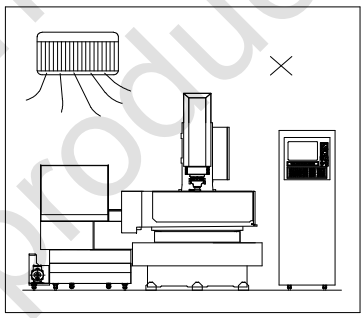
## 2.2 Installation site

### （1）CNC EDM is a precision machine. Please carefully select an installation site according to following points:

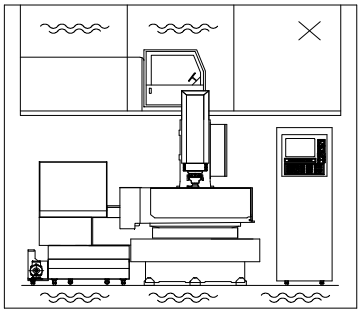
1. Install the machine at less dust and bright place, but avoid being exposed under direct sunlight.



2. The machine must be installed at a well-ventilated and temperature regulated place (Suggested work temperature to be 25℃). Avoid air conditioner to blow air directly to the machine.



3. The machine must be installed on a no-vibration and solid ground.



4. The machine surroundings should be reserved a sufficient space (at least 300mm) for the convenience of loading workpiece and machine service.
5. The path where the machine will pass should be safe and wide enough.

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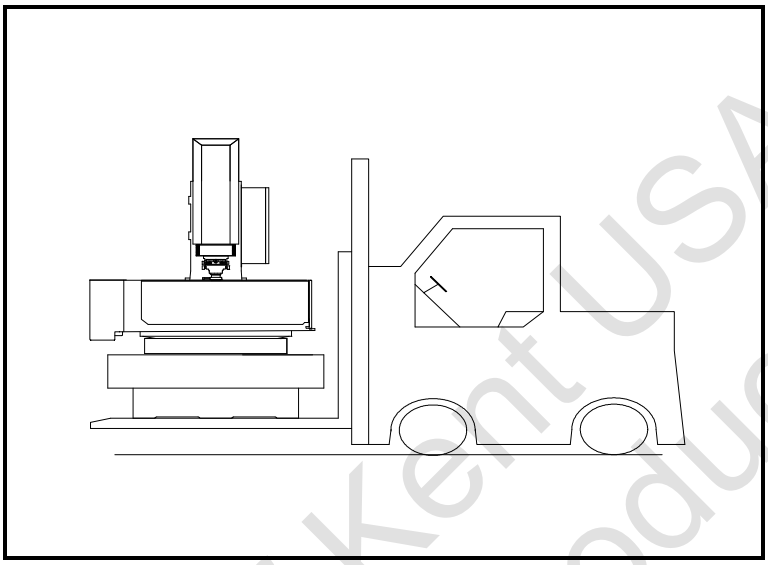
## 2.3 Transportation

### Machine:

（1） Use only forklift to move the machine as following FIG. shown.



（2） KEB-600LCNC needs at least 2.5 Ton forklift.
（3） KEB-700LCNC needs at least 5 Ton forklift.
（4） KEB-800LCNC needs at least 10 Ton forklift.
（5） KEB-800LCNC needs at least 10 Ton forklift.

! Note

∗ Keep machine balanced during transportation. The machine should avoid slanting.
∗ When the machine is lifted by forklift, the center of gravity of the machine should be slightly backward.
∗ Before using the forklift, be careful with the transportation path, and verify that the space is wide enough for making a U-turn.
∗ Only qualified persons are allowed to operate the forklift.

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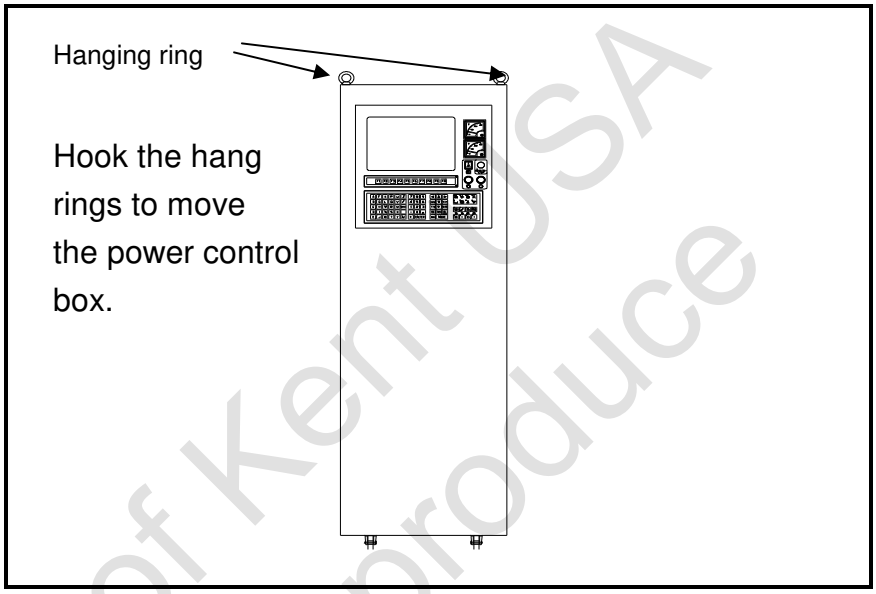
## Power control box:

（1） Use a hoister to hook the power control box as following figure shown. (The power control box has two hanging rings.)




（2）The power control box on the ground can be moved.

! Note

＊ When the power control box is moved on the ground, the ground should be even and without any obstacles.

＊ For pushing the power control box, there should be one man before and behind the power control box so as to avoid losing center of gravity, or the power control box may overturn.

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## Transportation of work liquid tank

（1）Use a forklift to move it.

（2）When the work liquid tank is on the ground, you can use hands to push the work liquid system.

## 2.4 Machine installation

### （1）Power supply and wire connection

1. It would be better to prepare a voltage stabilizer for the power required by the electric control box. It is necessary to have a protective measure for your machine before installation.

**！Note　If the voltage fluctuation in your area is over ± 10%, it is necessary to install a voltage stabilizer to protect the controller, and ensure a normal function with the circuit board. It is to prevent the machine from being damaged.**

2 . The machine must be grounded. It is better that the operator stands on a wooden stand to operate the machine.

3. The wire connection of the machine is as following figure shown. Please connect the electric control box and the wires according to the instructions.

**！Note　Do not connect the auto fire extinguisher to the electric control box in parallel so as to avoid error action on safety functions.**

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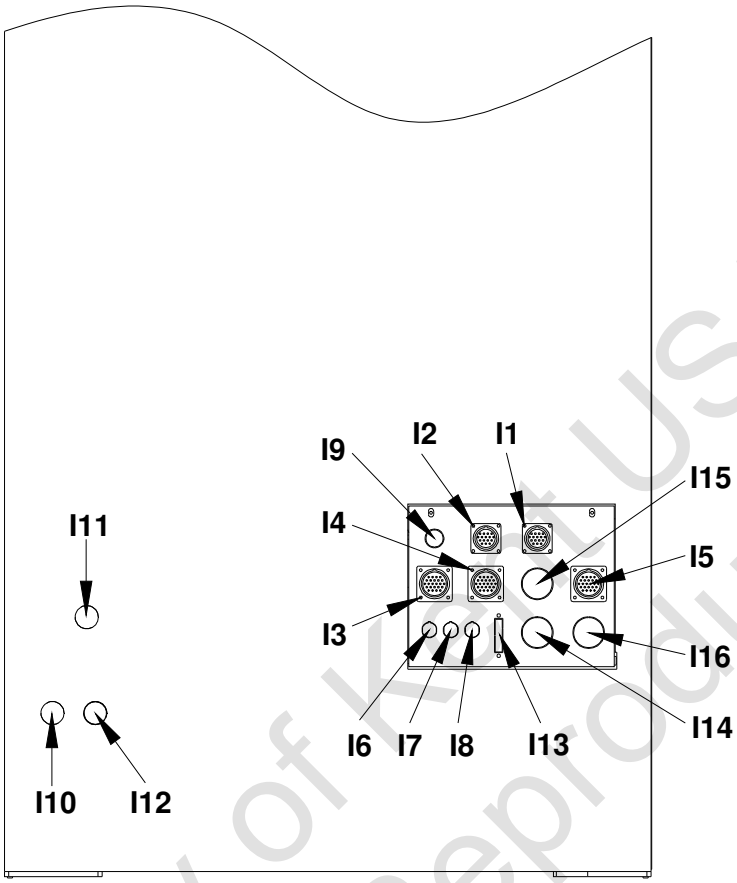


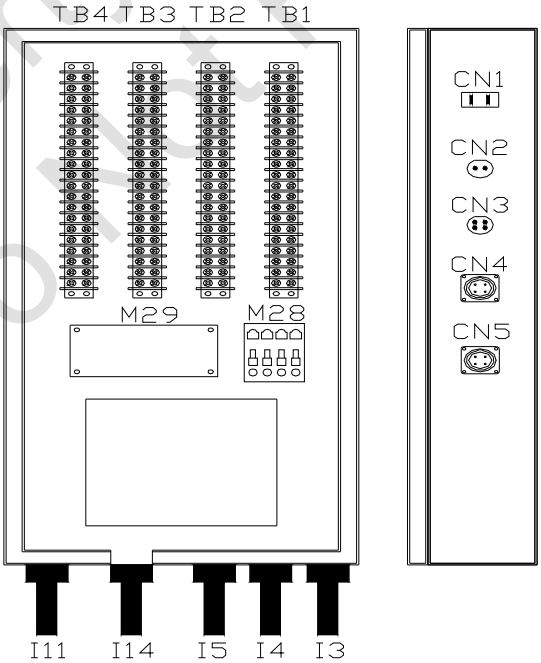


**Wire diagram of machine to electric control box**

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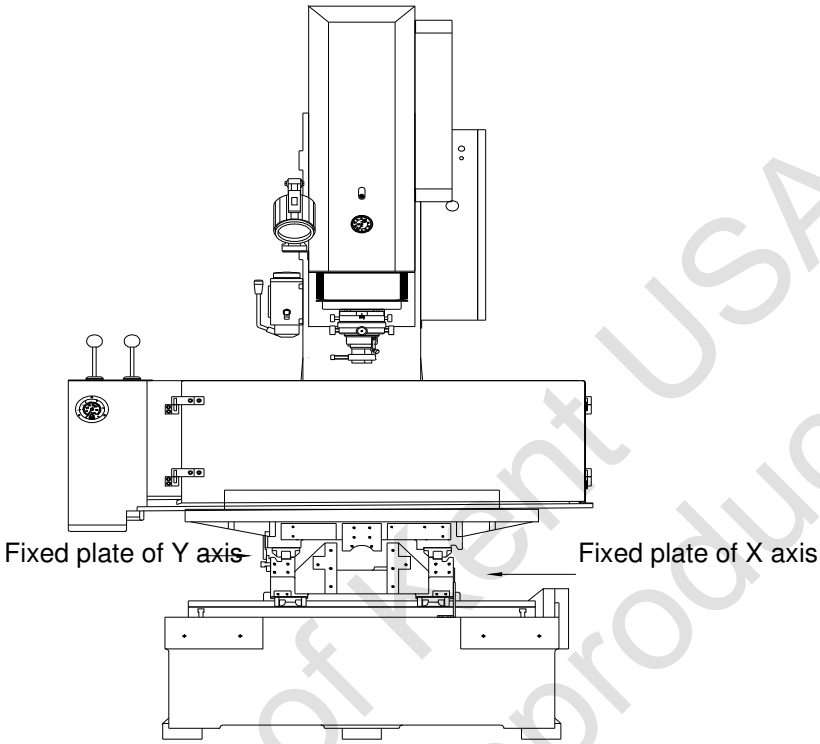
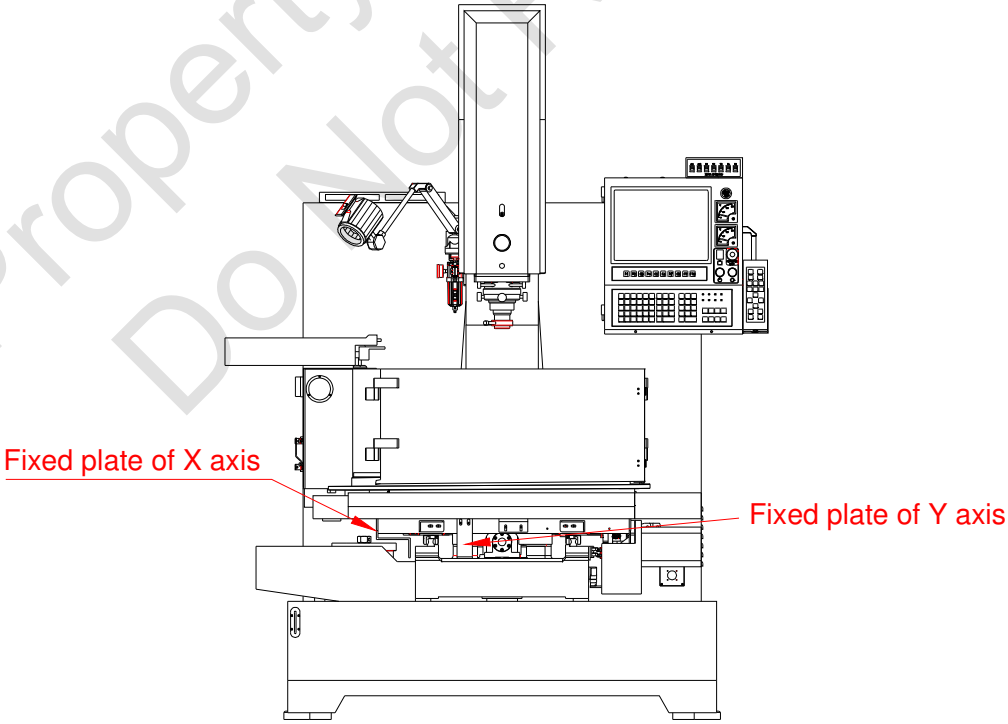
## （2）Remove the red metal plates of X and Y axes




KEB-600L




KEB-433

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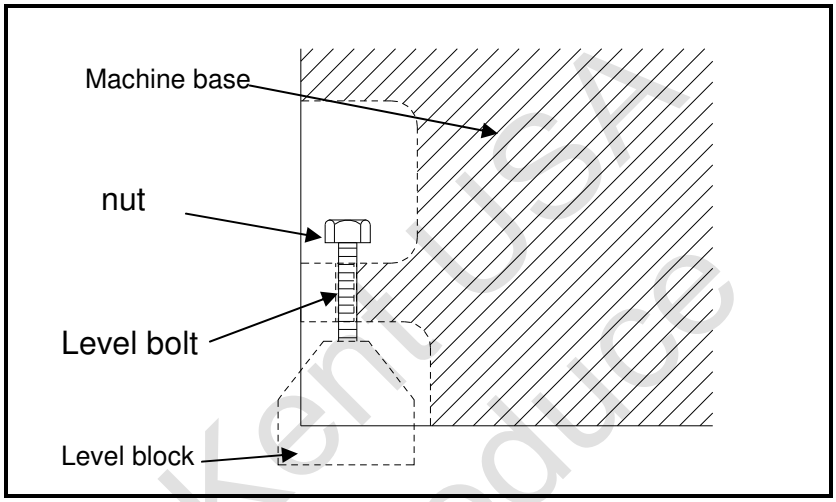
## （3）Level the machine

1 . There are 5 level bolts under the adjusting base. Use a wrench to turn the level bolts, and level the machine.




2. Measure again and again till the machine is practically leveled.

## （4）Remove anti-rust oil

During the storage and transportation, some components and the hand scraping surface of the parts needs to be covered with one layer of anti-rust oil. Before using the machine, it is necessary to degrease them by kerosene, gasoline or methyl benzene. After removing the anti-rust oil, please feed following lubricant or same grade lubricant to the machine.

**SHELL TONNA 68**
**GULF GULF 59**

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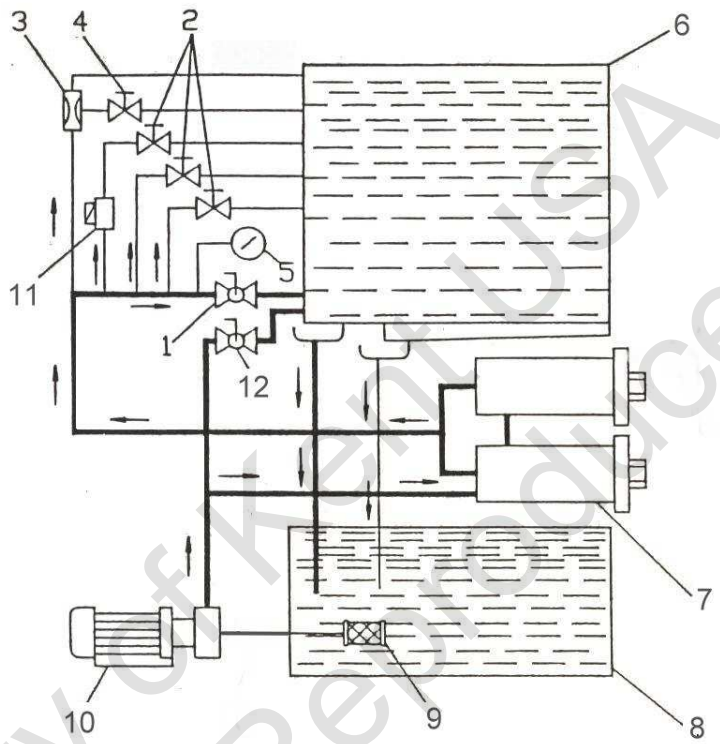
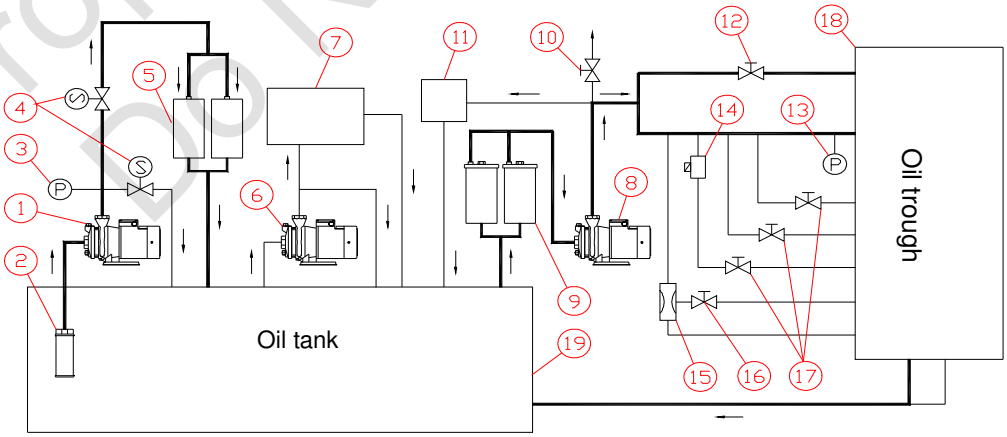
## （5）Install pipes of oil tank

Connect the oil tank to the inlet of the oil trough, and fix the pipe.

01 oil filter valve
02 **oil spray valve**
03 oil sucker
04 oil sucking valve
05 built-in pressure meter
06 oil trough
07 filter barrel
08 oil tank
09 **filter net**
10 oil pump
11 intermittent oil spray
12 fast oil feeding valve




Suitable models: KEB-600L、KEB433




Suitable models: KEB-600L(S.F.)

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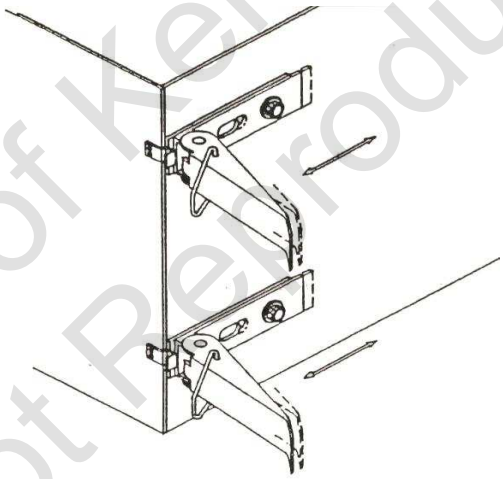
01 motor for filtering silicon powder
02 small filter net
03 vertical pressure meter
04 solenoid valve
05 powder filter net
06 cooling motor
07 cooler
08 motor for filtering metal powder
09 metal powder filter barrel
10 pressure valve for oil spray gun
11 powder tester
12 fast oil feeding valve
13 built-in pressure meter
14 intermittent oil spray
15 oil sucker
16 oil sucking valve
17 oil spray valve
18 oil trough
19 oil tank

## （6）Check the door catch of oil trough

1. Before feeding oil, please check if the door catch is clasped. (For the machine to be exported, its door catch is loosened.) If the door cannot be clasped, please use one 4mm wrench to adjust the tightness.



Suitable models: KEB-600L, KEB-433

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## 2.5 Check before start the machine

**1. Check power**

Before starting the machine, please verify if the input power agrees with the rating power labeled on the electric control box.

**2. Check the electric control box**

If the machine arrived through a long transportation, please ask the installation technician to open the front and the rear doors of the electric control box, and check if any of the contact is loose.

**3. Check the connecting wire**

Verify if every wire is connected to correct position as labeled.

**4. Verify the removal of the shipment blocks**

There is one fixed block to lock X axis and Y axis respectively. It is to prevent X axis and Y axis moving during transportation. Before you switch on the power, please verify these blocks are removed.

**5. Check if oil can enter every oil pipe of the oil feeder**

**6. Check the pipe circuit of work liquid**

A: Close the two doors of the oil trough. Check if the door catch is clasped.

B: Check if the oil trough and the tube harness of the oil tank are tightened.

C: Fill oil to the oil tank and the pump. Close all the oil spray valves. Then, you can switch on power.

D: Switch on power, and start the machine in order. After completing the start procedure of the machine, press PUMP ON, and verify if the pump rotates in arrowheaded direction.

E: Check if the pressure valve of the oil trough reaches 20 KGS (When input 380V to motor, the oil trough reaches 30 KGS) . Please also check if the filter barrel leaks oil.

F: Check the oil spray valve.

G: Check the oil sucking valve.

H: Check if the door of the oil trough leaks oil.

I: Check if the surroundings of the oil trough leaks oil.

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# 3. Safety Directive

**The work liquid used in EDM will sparkle and produce high temperature during work. Therefore, following regulations must be strictly followed.**

**1. Safety Device and its installation**

Do not remove or modify any of the safety devices without permission when you operate the EDM.

（1） power : EDM should have an independent power supply. Do not share a circuit breaker with other machines.

（2） Liquid level sensor: when the level of the work liquid is lower than the setting, the machine will stop working immediately, and sends out a warming.

（3） Fire prevention sensor: When fire alarm happens during work, the machine will stop working immediately, and sends out a warming.

（4） Fire extinguisher : when the work liquid is on fire, the auto fire extinguishing device will spray fire-extinguishing chemical automatically.

（5） Temperature control switch ( limited to the machines with CE mark) : Please set 50℃ for the work liquid. If the temperature is over 50℃, the machine will stop working immediately. 8

（6） The switch of oil trough door (limited to the machines with CE mark): if the door of the oil trough is open, the machine cannot work.

**2. Environment**

Be sure to clean the surroundings of the machine frequently

（1） Avoid harm to the operators

a. The work liquid is one kind of corrosive liquid. It will make human skin allergic. Suggest the operators to wear work gloves, or spread hand ointment. Suggest the operators to wear gloves, or Spread hand care ointment.

b. The work process will produce harmful gas to operators. Please install an exhaust pipe to exhaust the waste gas during the work.

（2） Avoid polluting environment

a. Avoid work liquid leak

b. Prepare a non-leaking floor.

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c. Dispose waste oil and used consuming materials according to your local laws and regulations.

（3） The machine must be far away from heat source, sparks and flammable matter.

**3. Work liquid**

（1） Please use only EDM oil.

① Castrol SE FLUID 180

②「TOTAL」EDM-100

③ RUENTEH EDM NEUTRAL OIL

（2） During the work, keep the liquid level at least 50mm above the workpiece.

（3） During oil flushing, place the fire detector 5-10cm away from the fire source.

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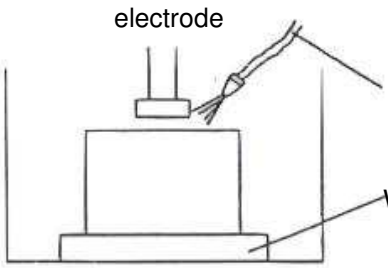
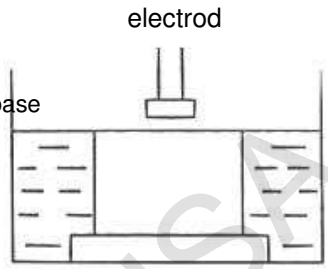
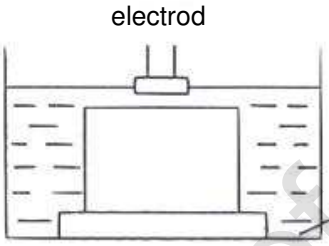
## 4. Taboo during work:



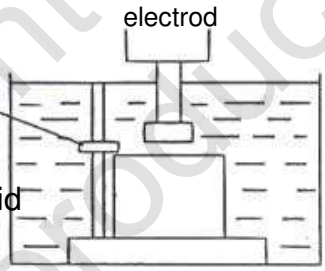

Spray oil.



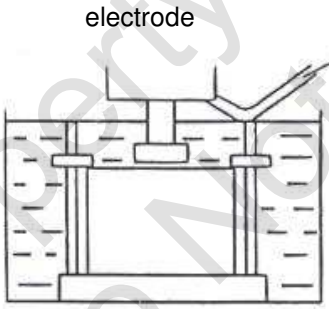

Oil level does not exceed 50mm above the top of the workpiece.



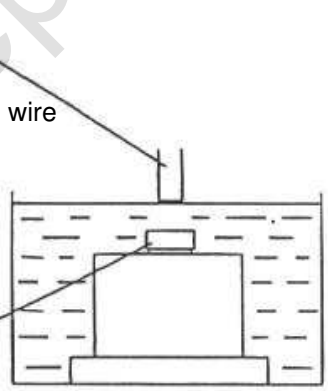

Work liquid is insufficient.



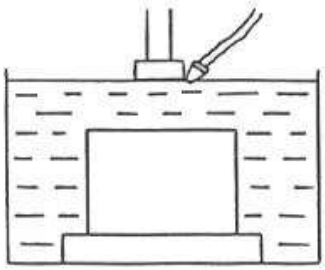

The electrode is too close to the workpiece.




Prevent the electrode wire from touching the jig or the workpiece during work.




The electrode grip falls.




The electrode should not be too close to the oil spray base.

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# 4. Machine Service

1. Daily maintenance and test:
   （1） Fire detector test.
   （2） Check if the pressure meter of the filter is normal.
   （3） Check if the work liquid is sufficient.
   （4） Check if the machine is cleaned after completing the work.
2. Periodical Maintenance
   （1） Feed oil once or twice weekly.
      ① SHELL TONNA68
      ② GULF GULF 59
   （2） Check weekly the pressure of auto fire extinguisher.
   （3） Replace the filter net every 6 months.
   （4） Replace the work liquid annually.
   （5） Please often clean the cotton filters in the Electric box or replace new one once a year.

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# 5 Systematic Specifications

The electric control box of EB-CNC EDM adopts PC-BASED controller. The power of discharge systems are all our self-developed. The systematic specifications, the hardware and the software are detailed in the following -

## 5.1 HARDWARE

（I）Controller: industrial grade PC with following accessories:

① LCD monitor
② power: 250W (Auto Power 220V/110V)
③ one motherboard (CPU & VGA on board, ISA bus)
④1GB CF card or 256MB DOM（Disk on Module）
⑤ one servo control board of 3-axis close circuit (optional→ extendable 6-axis control)
⑥ two I/O boards（32IN and 32OUT）
⑦ one PULSE & GAP board

（II）Servo unit: 3 DC SERVO DRIVERS

（III）Discharge POWER: 60A, 90A and 120A, 3 kinds.

①30A~ 60A → one high voltage board and one low voltage board
② 60A~120A → one high voltage board and two low voltage boards
③ 120A~210A → one high voltage board and three low voltage boards

.

## 5.2 SOFTWARE

① Chinese/English display
② Display and program setting in Metric and the Imperial system
③ one frame setting (one screen setting)
④Word depiction on job program is simple and easy to be understood.
⑤ Work piece program Editor is with graphics aided and form fill-out software. It Is unnecessary to memorize any directive.
⑥Graph shows the tool path during work. It is clear at a glance.
⑦ job program with 1000 blocks
⑧ Work experiences can be stored in 256 parameter memories.
⑨ Parameter search of artificial Intelligence (Search a work parameter depending on the nature of workpiece or electrode.)
⑩ 3-axis positioning and linear interpolation motion.
⑪ motion combination of various vectors
⑫ several steps of fine machining

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⑬ 3 tool-retraction modes (original path, center and Zp)
⑭ Jump on schedule
⑮ Search machine origin (HOME）
⑯ Search the center of inner hole.
⑰ Automatic edge positioning
⑱ 3 manual modes (continuous, jog and no protection)
⑲ Set and memorize work time.
⑳ Capable with C axis or Manual Pulse Generator, ATC and APC extendable functions

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# 6. Start and shut down the machine

## 6.1 Start the machine

Turn on the knob of the main power switch in the front door of electric control box.

⇩

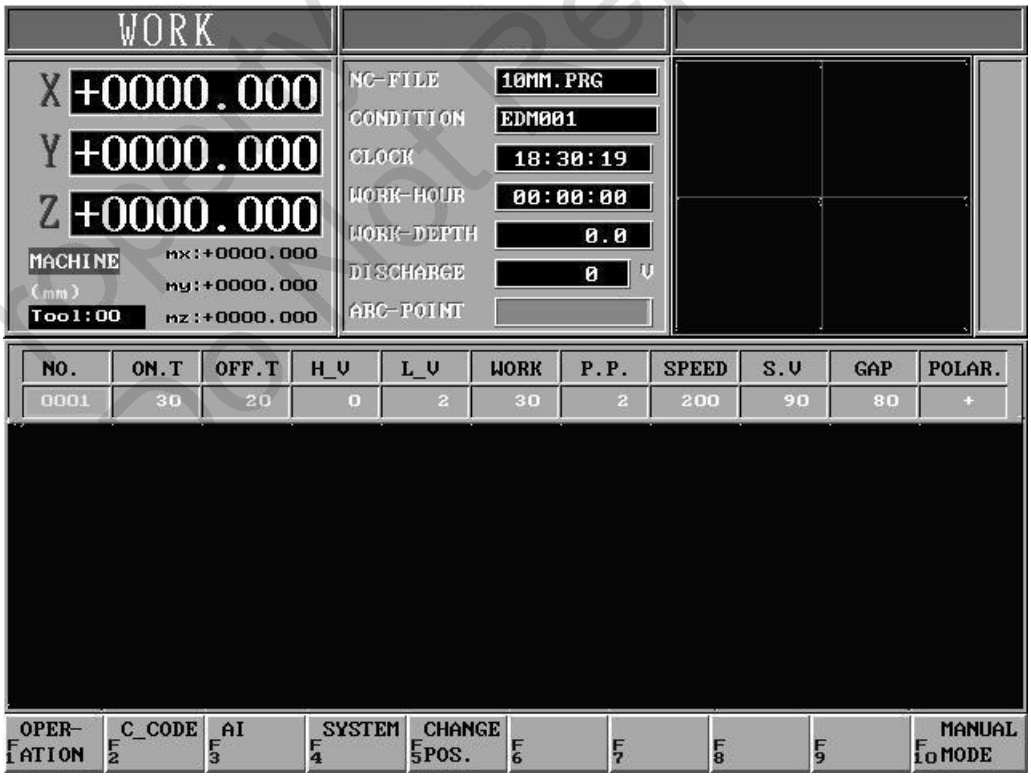
Press the green button【ON】on right side of electric control panel

⇩

Enter the system screen as following figure shown.

⇩

Pull up Emergency Stop" button.

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## 6.2 Shut down the machine

Verify that the system is not on work status. If it is on work status, please press【ESC】or【F10】RESET.

⇩

Press EMERGENCY STOP button.

⇩

Hold down the red button【OFF】on the right side of electric control panel for several seconds.

⇩

Turn the main power switch in the front door of electric control box to position ＜OFF＞.

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# 7. Operation

## 7.1 Screen Layout

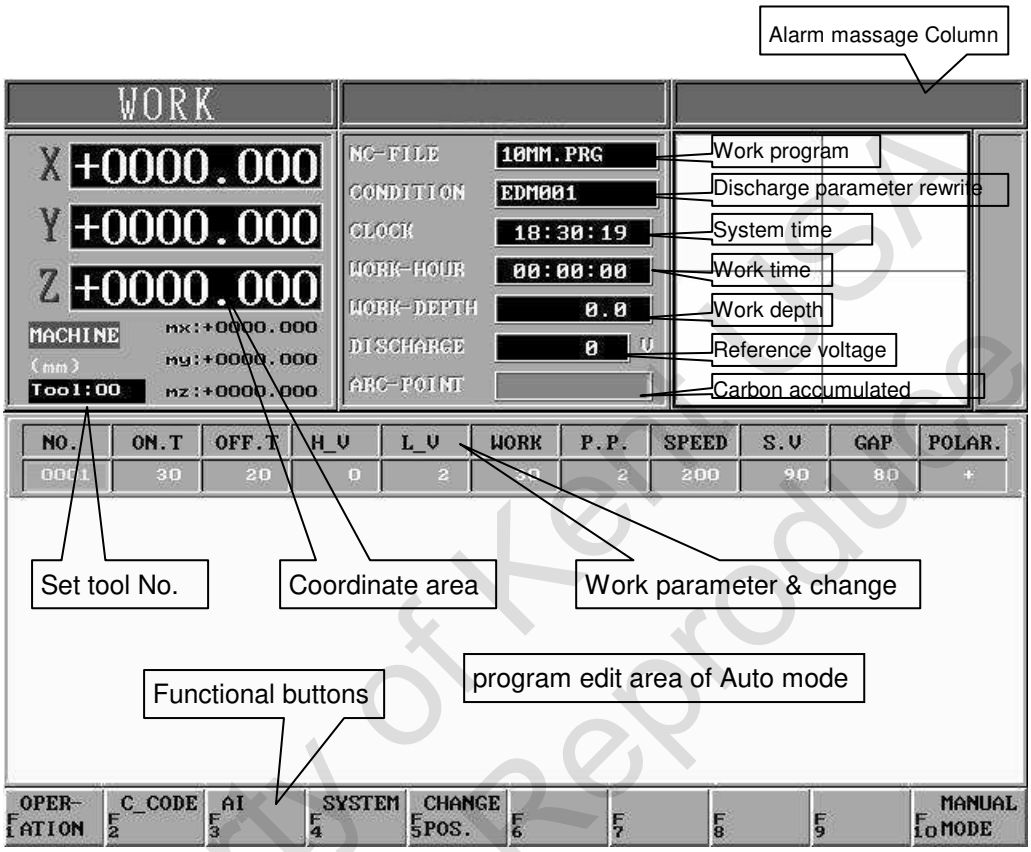


FIG. 7-1 The system screen

Above screen shows 13 areas. The meaning of each area is shown below:

1. Coordinate Area

Display the work coordinate and the machine coordinate where the chuck electrode currently stays. Its unit can be divided into metric system (mm) and Imperial system (inch) depending on the setting of the system. For metric system (mm), the minimum figure is 0.001mm. For Imperial system (inch), the minimum figure is 0.0001 inch.

◎ Work Coordinate：

This coordinate system is a referential coordinate system for work program. Set its coordinate value by pressing【F10】MANUAL MODE→【F8】POS.SETUP, or pressing【F1】OPERATION. Under Program Edit mode, press【F1】INSERT→POSITION→POS.SETUP.

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◎MACHINE COORDINATE：

This coordinate system is a fixed referential coordinate system in the space. The origin of machine coordinate is a fixed point which any axis of the machine moves to a specific position. You may press【F10】to enter to manual mode. Then, press【F1】to search the origin. Move each axis to the origin of the machine coordinate. The machine coordinate represents the position of a fixed point (the origin of machine coordinate) corresponding to the space of the chuck electrode. Therefore, you cannot change this value under manual mode. Only when the electrode is moving in the space, the machine coordinate value can follow the moving to change.

2. Work Program

It shows the name of the current work program. You can press【F1】OPERATION→【F6】LOAD_FILE to change the work program or add a program name.

3. Discharge Parameter Re-Write

It shows the name of the discharge parameter which is currently used. There are total 10 files. This re-write code has only one default file named ”EDM001”. You may press【F4】SYSTEM→【F6】USUAL to CONDITIONS_FILE.

Use “**+**” “**-**“ to change the code name.

4. System Time

It shows the current time of the PC system. You may press【F4】SYSTEM→【F2】TIME_SET to change the time of the system.

5. Work Time

It shows the total accumulated work time by means of “hh：mm：ss”. hh represents hour. mm represents minute. ss represents second. The maximum shown figure is 23 hours , 59 minutes and 59 seconds. For clearing and calculating the work time, please see Chapter 6 Operation Mode.

6. Reference Voltage

It shows the gap voltage of current work. This voltage value shown here is identical to the voltage shown in the analog voltage meter of the electric control box.

7. Work Depth

It shows the current work depth.

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8. Accumulated Carbon

This column has a green background. The red area represents the carbon accumulated index. The length of the red area will change depending on the carbon accumulated degree. If the red area is always shorter than 1/2 length of the column, it indicates that the current work is stable. If the red area is always longer than 1/2 length of the column, it indicates that the work is unstable. It is necessary to adjust the work parameter.

9. Alarm Message

It shows the alarm which the machine is currently sending. When the alarm happens, it is necessary to shoot the trouble. Do not continue to operate the machine.

10. Work parameter and change

It shows the current work parameter of the system. As to the meaning of each parameter, refer you to Chapter 7 Code Mode.

| NO. | ON.T | OFF.T | H_V | L_V | WORK | P.P. | SPEED | S.V | GAP | POLAR. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0001 | 30 | 20 | 0 | 2 | 30 | 2 | 200 | 90 | 80 | + |

FIG. 7-2 Work Parameter and change

When the system is under auto mode, the current work parameter can be changed. Refer you to Chapter 6 Operation Mode.

11. Program Edit Area of Auto Mode

When the system is under auto mode (Press【F1】OPERATION to enter this area), the screen will show the previous work program. At this moment you can edit a program, or start a new work program.

12. Function Button Column

It shows the currently suitable function button in the visual window.

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## 7.2. Screen Layout of each system mode

This system has following 5 systematic modes.

（1） **Operational mode:** On the main screen, press【F1】OPERATION to enter auto mode.

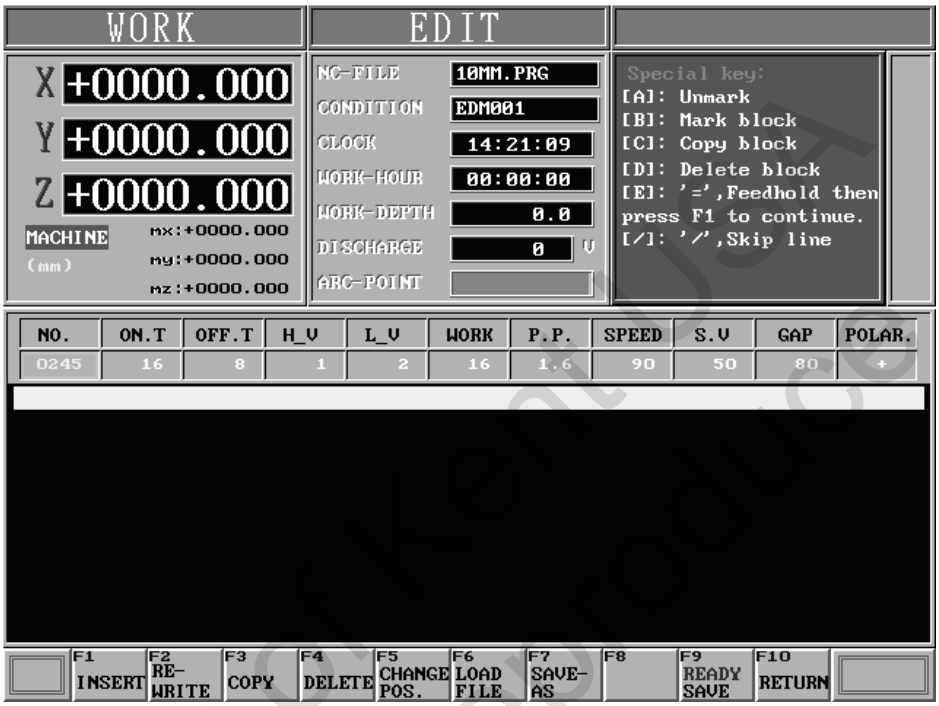


FIG. 7-3 Operation Mode

（2） **Code mode:** On the main screen, press【F2】RE-WRITE to enter code rewrite mode.

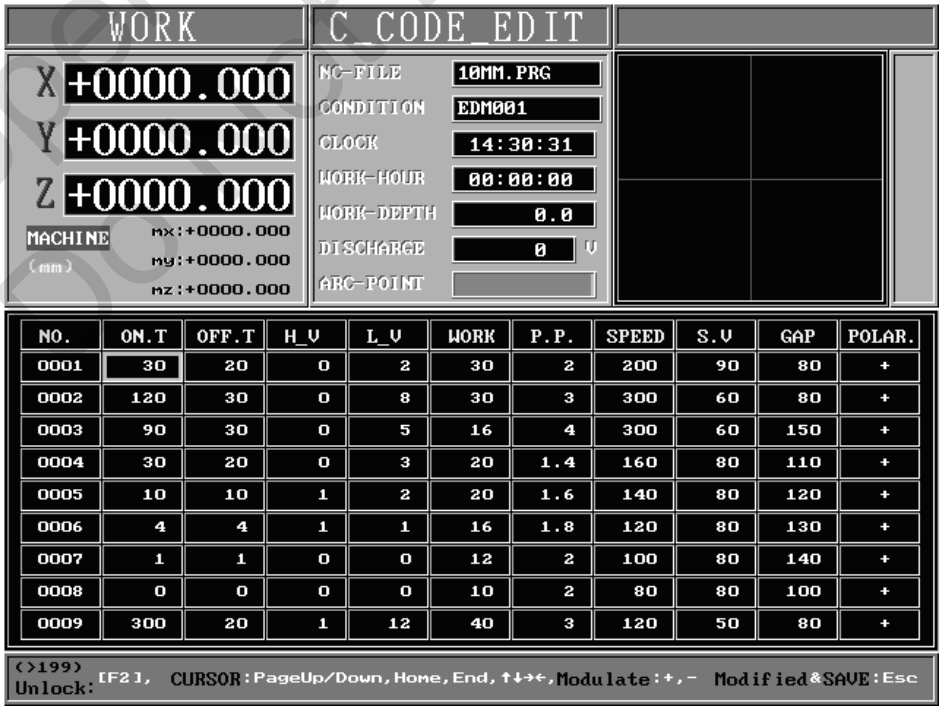


FIG. 7-4 Code rewrite mode

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（3） Artificial Intelligence (AI)**:** On the main screen, press【F3】AI to enter artificial intelligence mode.

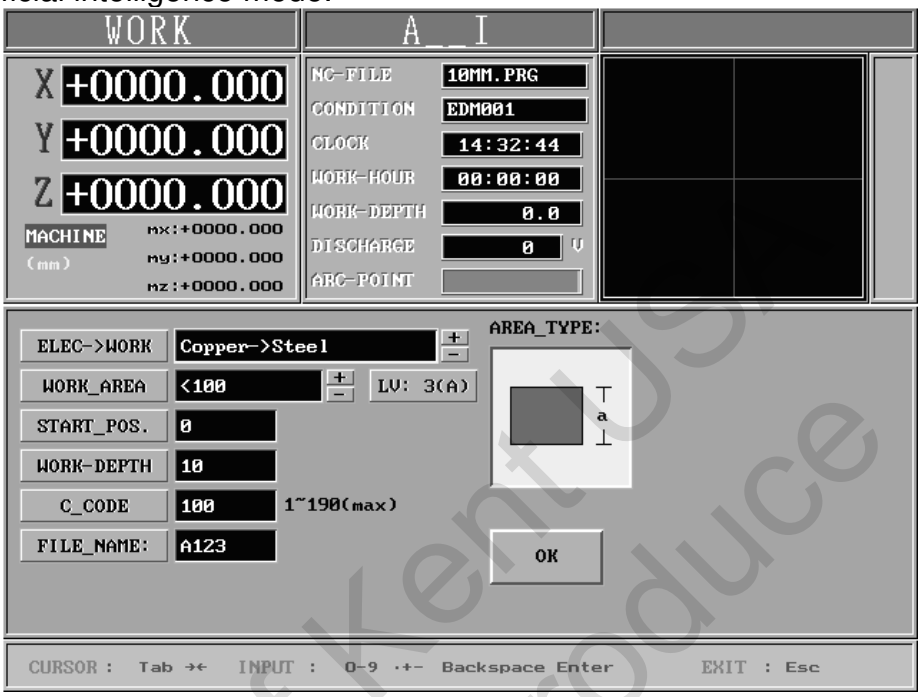


FIG. 7-5 Artificial Intelligence Mode

（4）System mode: On the main screen, press【F4】SYSTEM to enter the system mode.

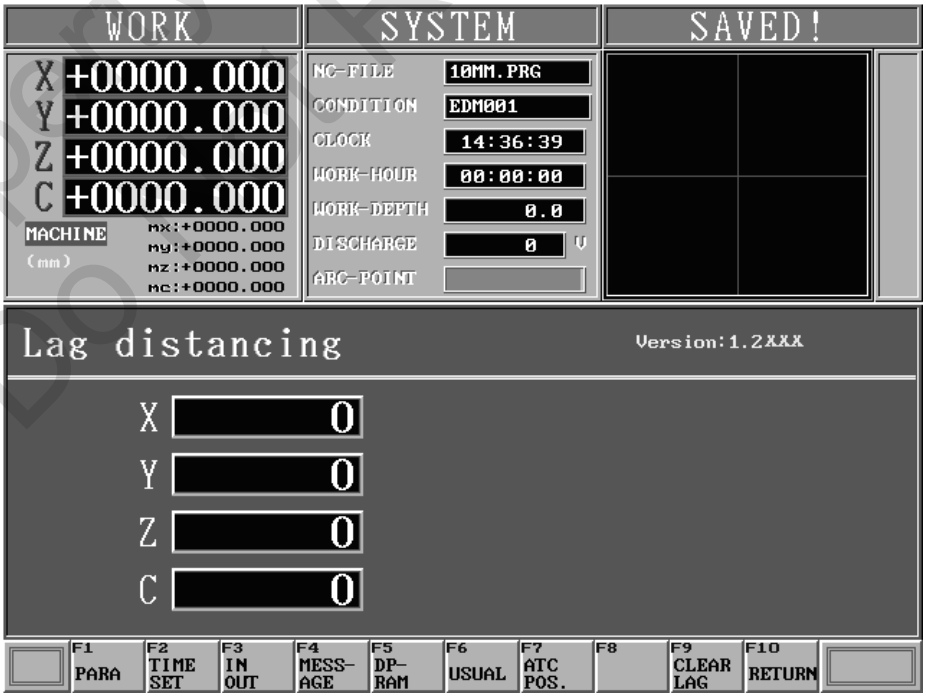


FIG. 7-6 System Mode

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(5) Change pos. mode**:** On the main screen , press【F5】SYSTEM to enter the system mode.

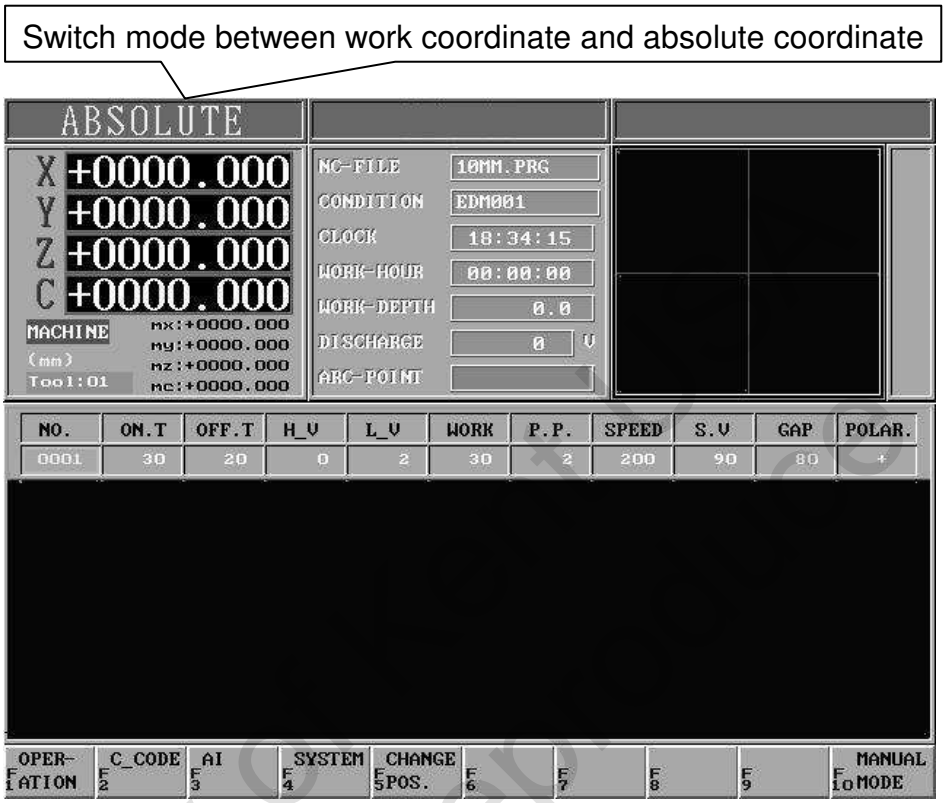


FIG. 7-7 Change pos. Mode

(6) **Manual Mode:** on the main screen, press【F10】Manual Mode to enter the manual mode.

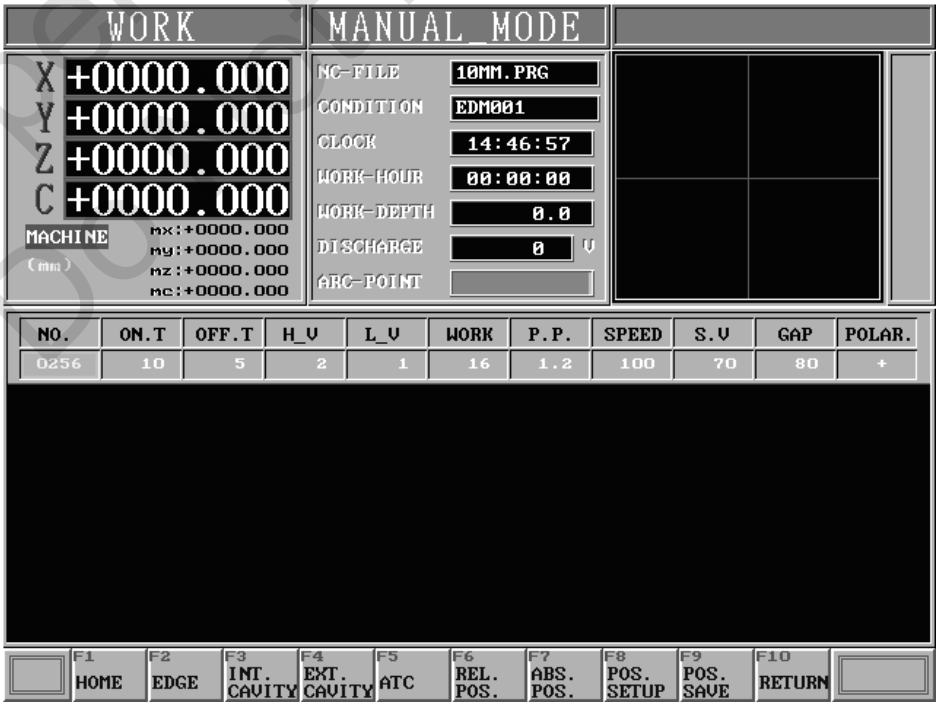


FIG. 7-8 Manual Mode

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## 7.3 Layout of Control Panel and Descriptions

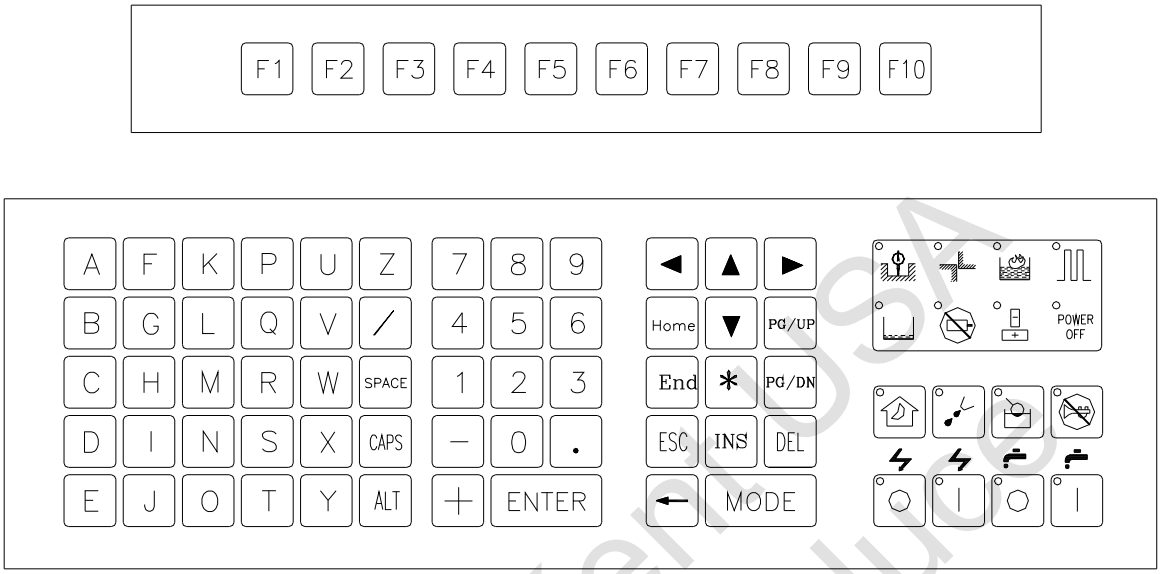


FIG. 7-9 EB-CNC Control Panel

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（1）Buttons on the control panel

| Software Buttons | |
|---|---|
| ESC | Abort the action. For example, under operation mode, before you finish entering the data, you may decide to abort the entering, and return to the status before the data is entered. |
| INS | Not used |
| DEL | Under EDIT status of operation mode, delete the program block where the curser stays. |
| ALT | Not used |
| SPACE | Space bar |
| ← | Back button, similar to【Back Space】of the keyboard. |
| Home | Under code rewrite mode, jump to the 1st line from any line. |
| End | Under code rewrite mode, jump to the last line from any line. |
| PG/UP PG/DN | Under code rewrite mode , switch to previous or next page of the file. |
| ◀ ▶ | Under code rewrite mode or operation mode, the work parameter can be moved to the left or the right column. |
| ▲ ▼ | Under code rewrite mode, the work parameter can be moved to the top or the bottom column. |
| + − | Under code rewrite mode or operation mode, the value of the work parameter can be increased or decreased progressively. |
| ENTER | Accept the data of the input field. |
| MODE | Switch field, amounting to【Tab】button of the keyboard. Besides, it can be used as a switch between manual mode and operation mode. |
| F1 ~ F10 | Function button for each module |
| 0 ~ 9 | Enter a digit, or enter a value in any field. |
| A ~ Z | Enter a letter. |

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| Hardware Buttons | |
|---|---|
| | Sleep Switch: Set sleeping time. When the program is completed, the motor power ( industrial power) will be switched off. |
| | Set intermittent oil spray: Switch on the button to adjust P.P. time (Z- Axis move up time). Then, the work liquid will be sprayed intermittently. Switch off the button, the work liquid in the intermittently controlled oil pipe is supplied continuously. |
| | Set liquid level: When the button is switched on, the level of the work liquid must be higher than the set position of the float in the oil tank. (Set a float height depending on the thickness of the workpiece.) Then, you can start the discharge switch. It is to avoid firing when the level of the work liquid does not exceed the height of the workpiece.<br>If oil submersed work is not used, the liquid level setting must be turned to OFF. Then, you can start the discharge. |
| | No Buzzer setting: When the button is switched on, the buzzer will not sound when any abnormality including firing happens. When the button is switched OFF, the buzzer will sound when any alarm or abnormal discharge happens. |
| RESET | Fire alarm reset |

（2）lamp signs on the control panel

| Lamp signs on the control panel | |
|---|---|
| | This lamp lights when the depth is reached. |
| | This lamp lights when the electrode or the workpiece is short. |
| | When the light sensor receives light, this lamp will light. The system will show “fire alarm”, and the buzzer will make bi bi sound. After the fire alarm is cleared, turn on the work lamp to clear the bi bi sound. |
| | During the work, if the accumulated carbon cannot be removed, this lamp will light. |

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| | |
|---|---|
| | When the liquid level is lower than the set height of the float this lamp will light. It is necessary to turn the liquid level knob to ON. |
| | When the Z axis braker is OFF, this lamp will light. |
| | Switch to positive or negative pole during working, and this lamp will light. (The workpiece is of positive pole, and the electrode is of negative pole |
| POWER OFF | When the motor power (Emergency power) is switched off, this lamp will light. |

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（3）The layout of wire control box

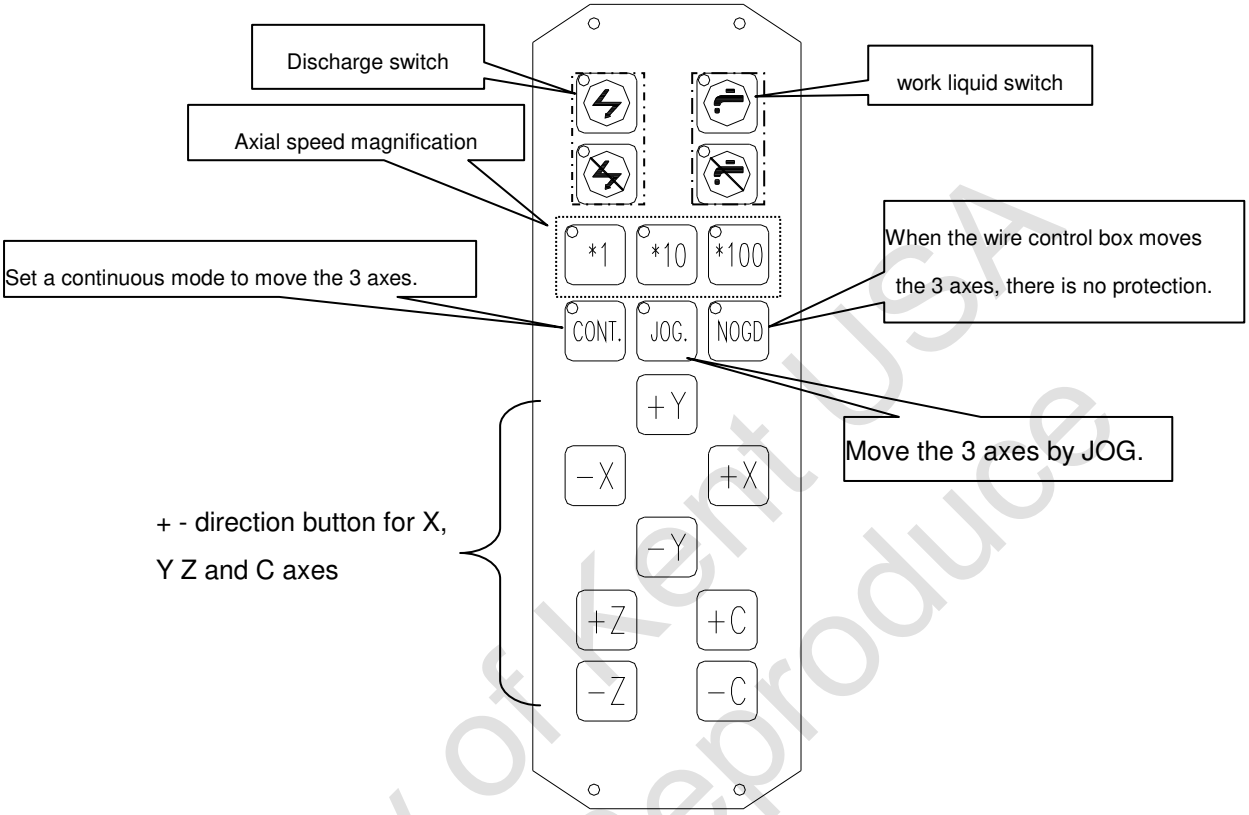
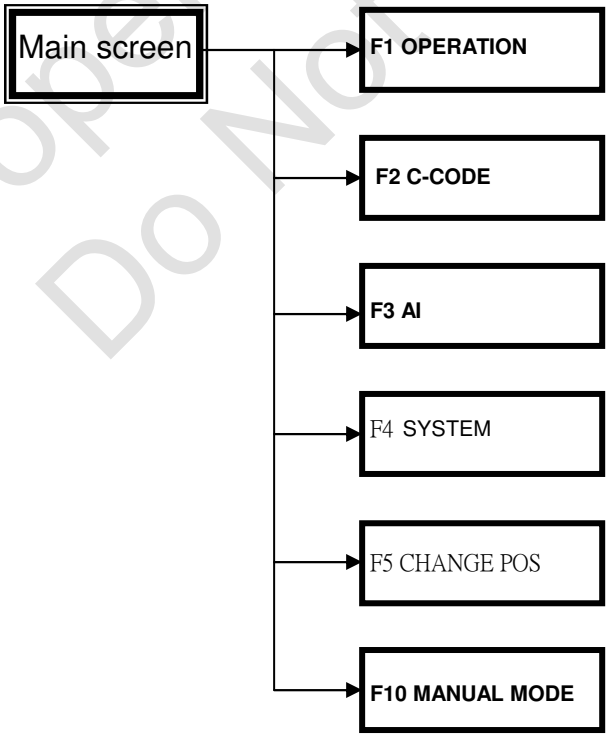



FIG 7-10 Layout of wire control box

## 7-4 Illustration of function buttons:

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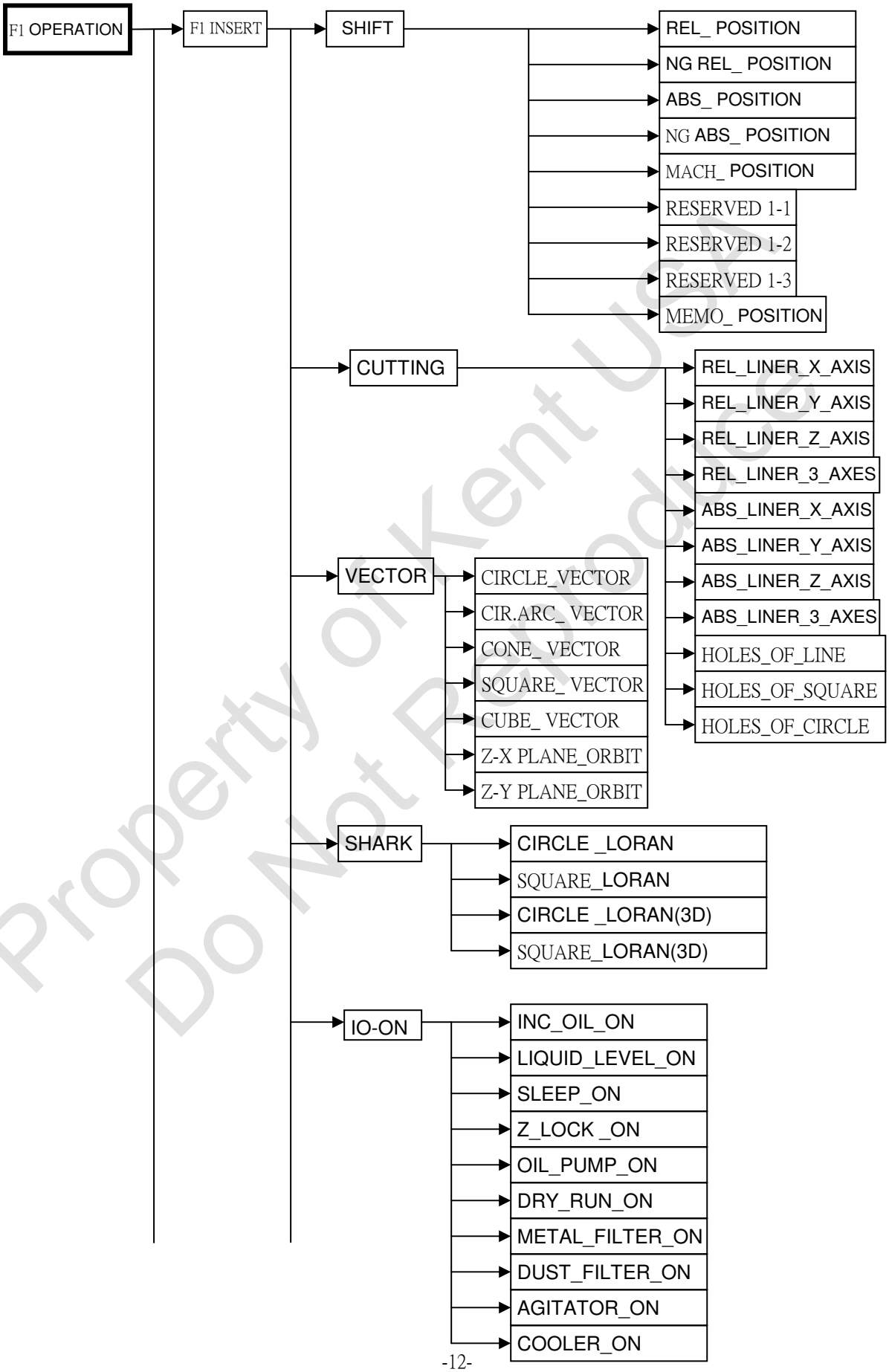


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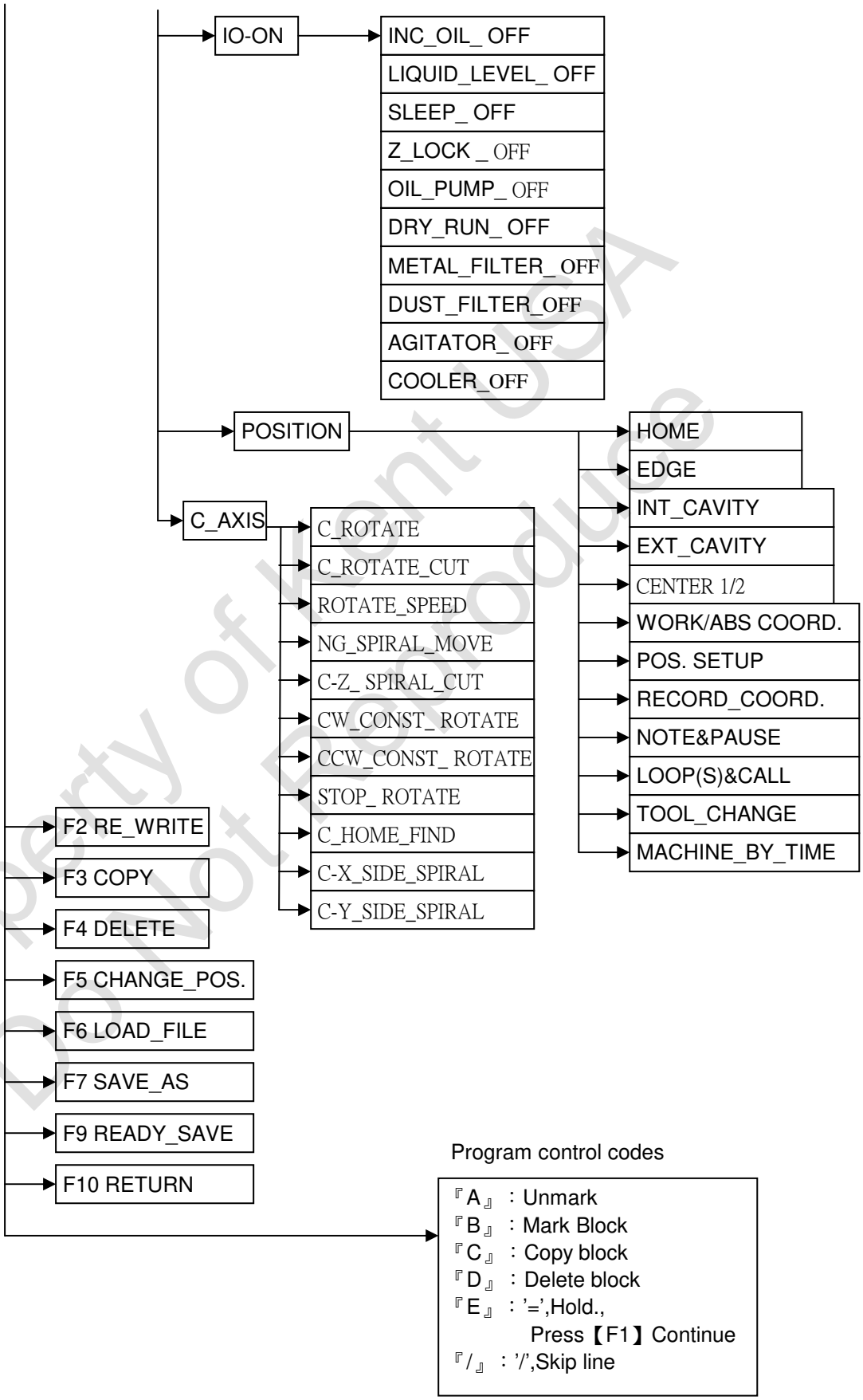


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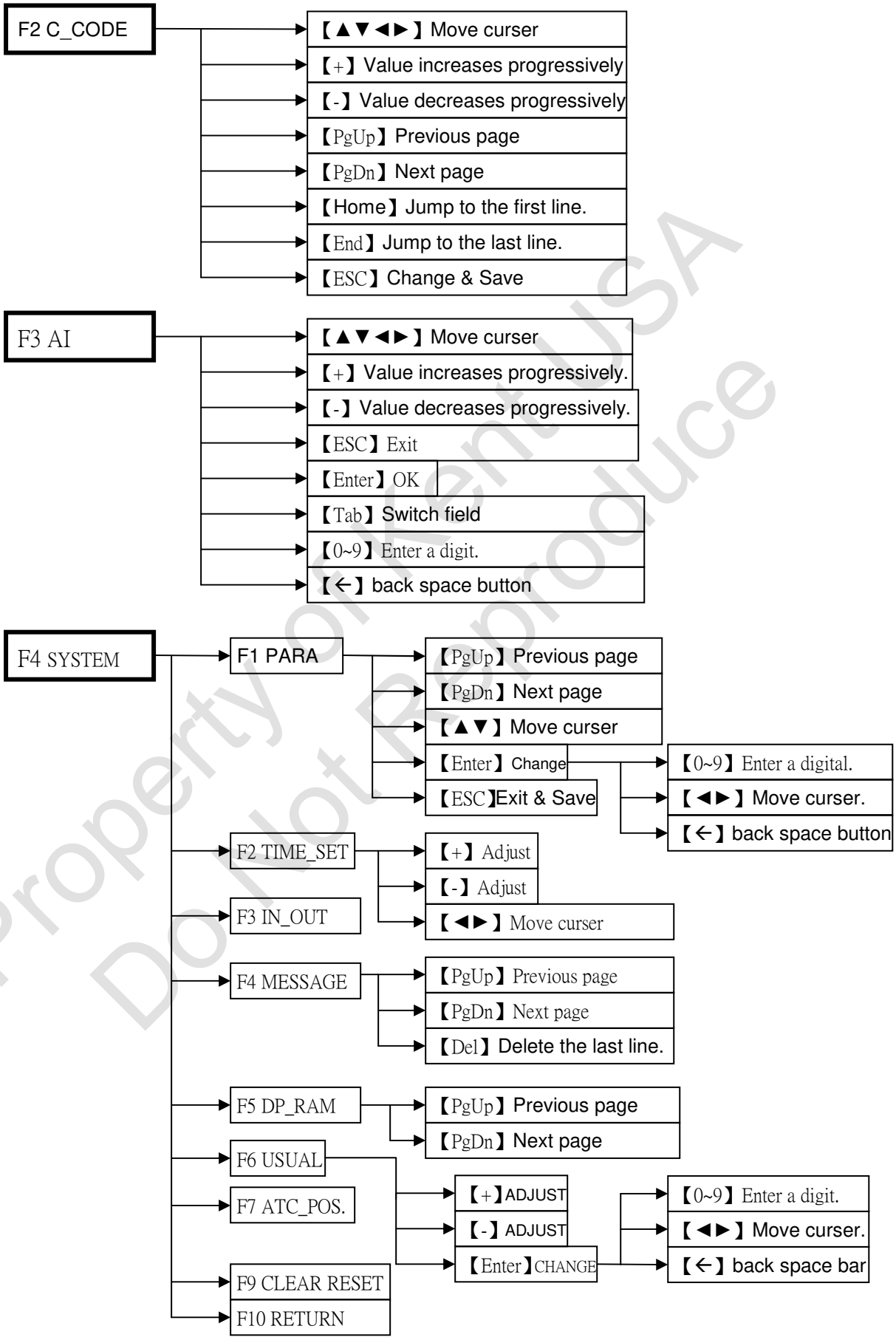


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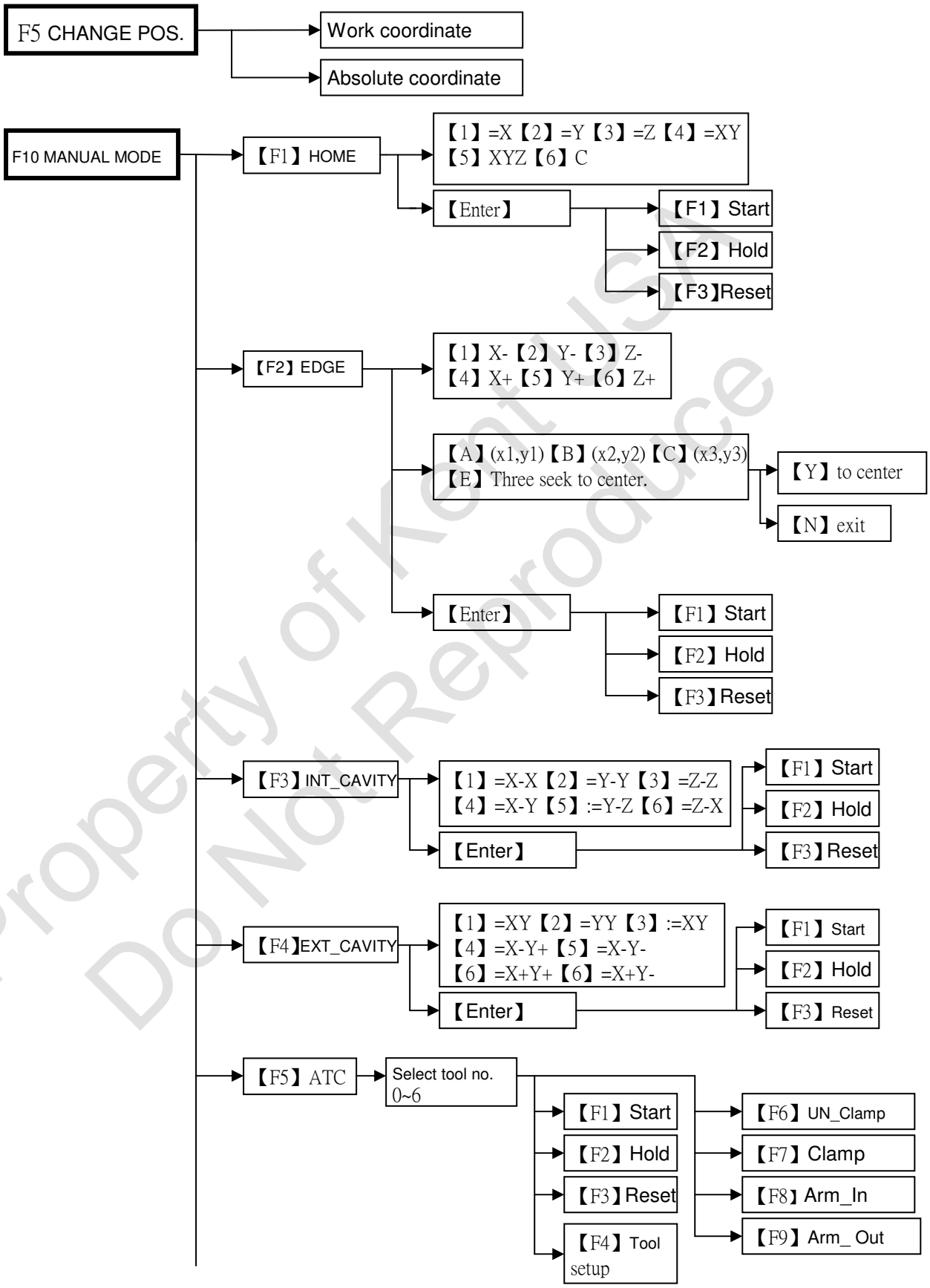


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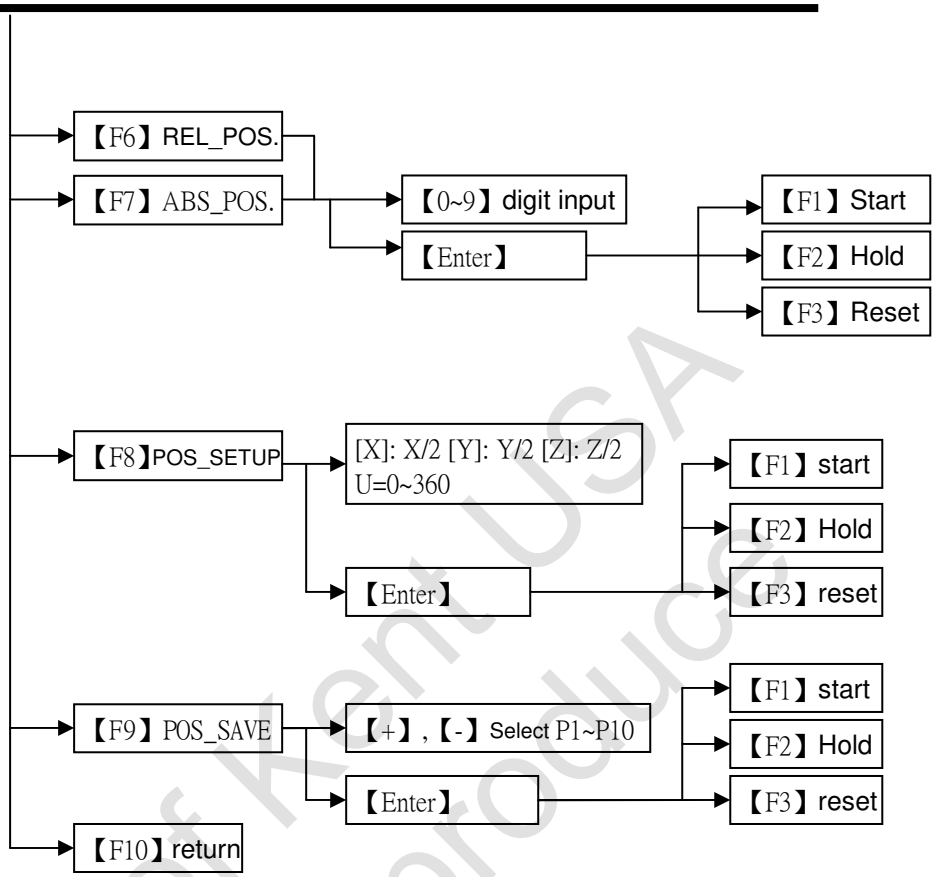


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# 8. Manual mode

This chapter introduces the operation under manual mode and each function. The major application of this mode is for mold calibration, positioning and setting work coordinate – a preparation for pre-work.

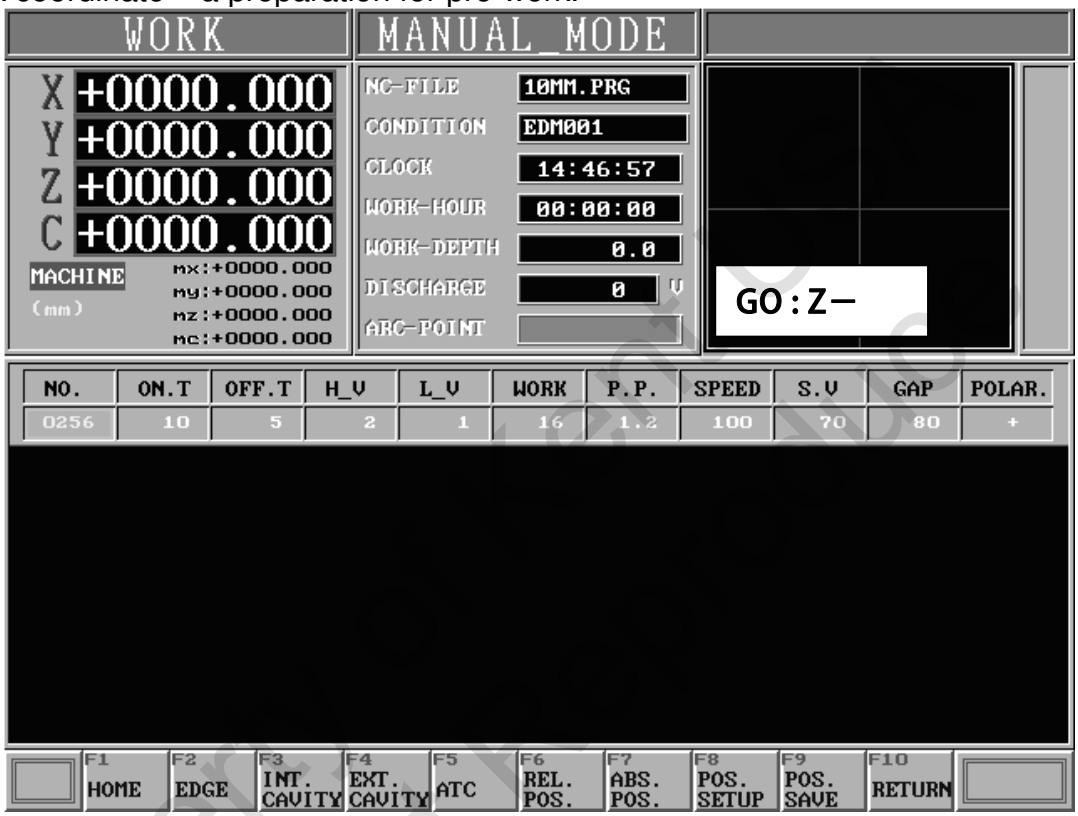


FIG. 8-1 Manual mode

## Discharge Alignment:

In the manual mode, please select the X, Y, Z axis key on the control panel, ( X 、 Y 、 Z ) , and please double click that you can change the direction + / - , and please find the screen GO : Z- position will be change, you can move the electrode to close to (near) the work piece surface position, press key to start sparking calibration function process, , and press key will be stop this function.

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# 8.1 HOME

Function: Help users to search a machine origin.
Function List: Under manual mode, press【F1】to activate the function of origin search.

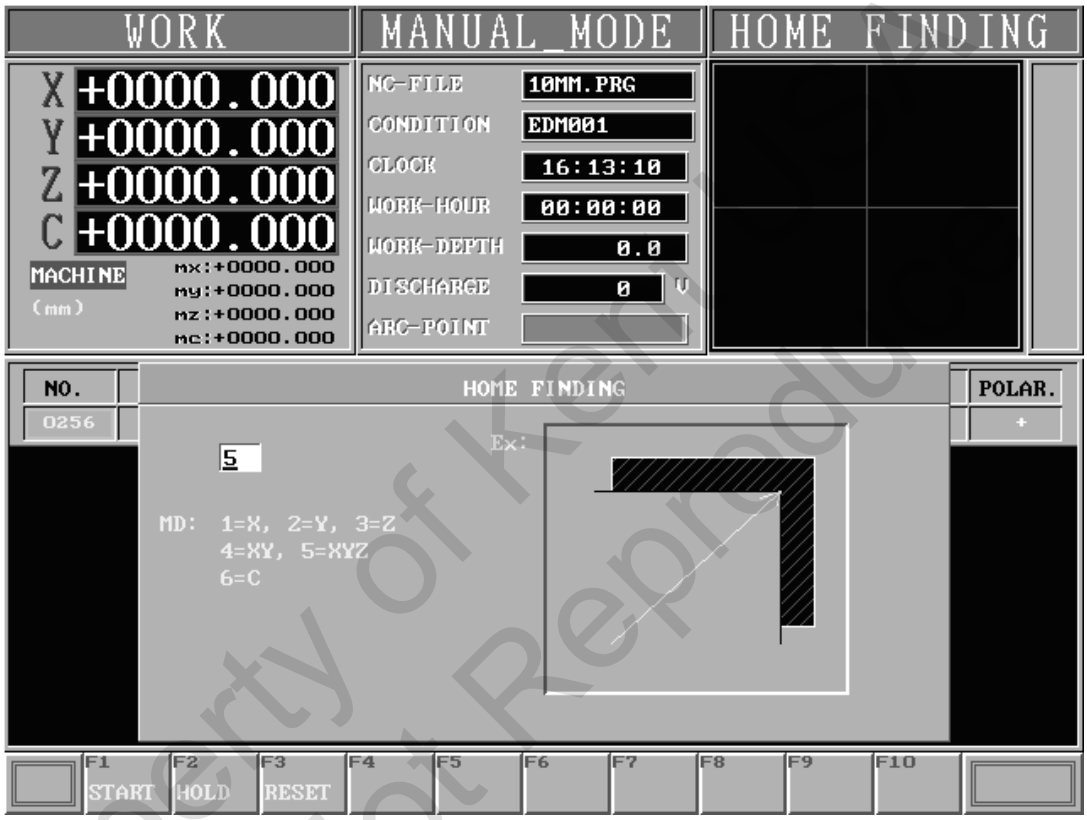


FIG. 8-2 Home

Execution

1. Press【1】=X,【2】=Y,【3】=Z. Select the axial direction for origin search. Press【4】=XY to search the origins of X and Y axes at the same time. Press【5】=XYZ to search the origins of X, Y and X axes. Press【6】=C to search the origin of C axis. ※Install the C axis to validate this function.
2. Press【Enter】or【F1】Start。
3. Press【F2】Hold to temporarily stop searching the origin. Press【F1】or【F2】again to proceed the unfinished actions.
4. Press【F3】RESET to cancel ORIGIN SEARCH.

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**Note** **<u>During ORIGIN SEARCH, if the workpiece program is error, or the operator is careless, the tool may touch the surface of workpiece. In this case the system will detect it automatically, stop origin search action, and send an error signal.</u>**

## 8.2. Edge

Function: Provide users with a datum point for finding a mold.
Function list: Under manual mode, press【F2】EDGE to enter the edge finding function.

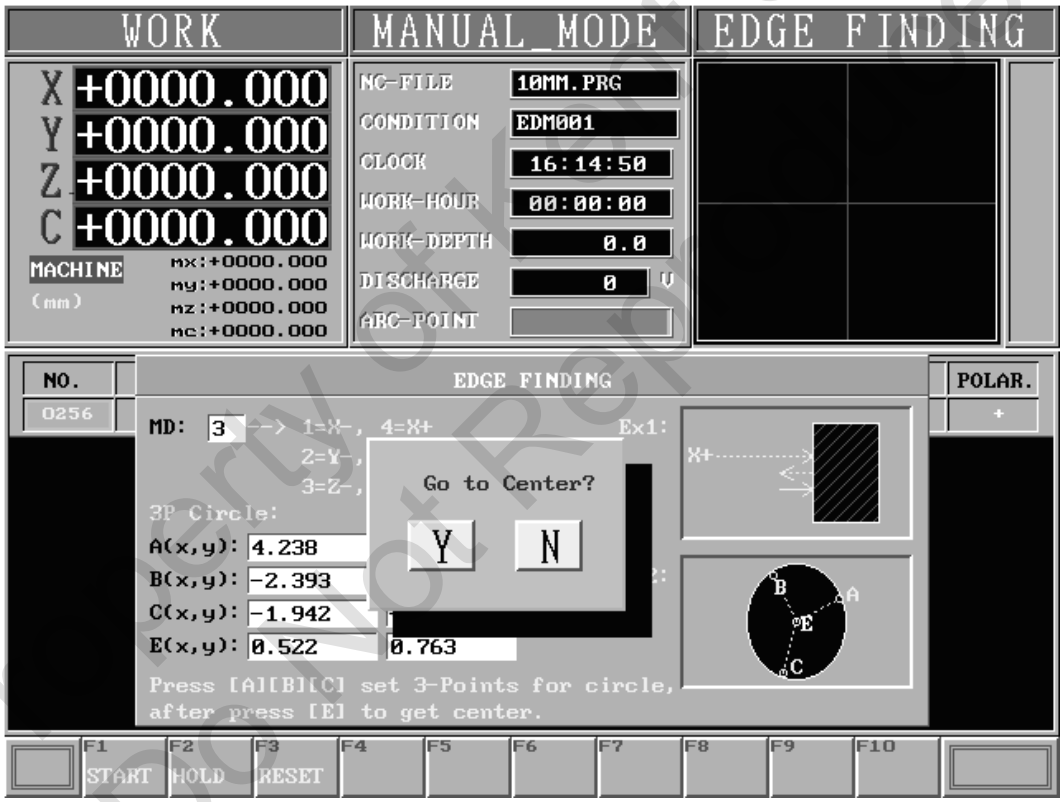


FIG. 8-3 Edge

Execution
1. Press【1】=X-,【2】=Y-,【3】=Z-,【4】=X+,【5】=Y+ and【6】=Z+. Select the axial direction for edge finding.
2. Press【Enter】or【F1】START.
3. Press 【F2】HOLD to temporarily stop finding edge. Press 【F1】 or 【F2】 again to proceed with the unfinished actions.
4. Press【F3】RESET to cancel edge finding.

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| | |
|---|---|
| Finding center with 3-points | Use finding edge function to find any 3 points A(x,y) , B(x,y), C(x,y) and press [E] to get the coordinate of center. User can press [Y] to move the electrode to center position when the screen is shown hint "Go to Center?" .<br>※To avoid the 3 points in alignment. |
| **Note** | **Before finding edge, be sure to verify that there is no insulation article on the touch surface of theworkpiece or on the touch surface of the tool. If there is any insulation article, it may result in damage to the workpiece, the tool and the machine.** |

## ◎ Work examples: Find edge Z-mode

(1) Based on the preset moving speed in the system, the electrode is approaching the edge in Z- direction till the system detects the short circuit. Thus, the coordinate of point 1 in negative direction is obtained.

(2) If the distance between the tool and the workpiece ＞0.05mm, the electrode should retracts 0.05mm toward the reverse direction of the preset axis. (The current direction is Z＋). If the distance between the tool and the workpiece ＜0.05mm. the electrode retraction distance is 1/2 of the actual distance.

(3) Repeat (1) to obtain the coordinate of point 2.

(4) The electrode retracts to a position between point 1 and point 2.

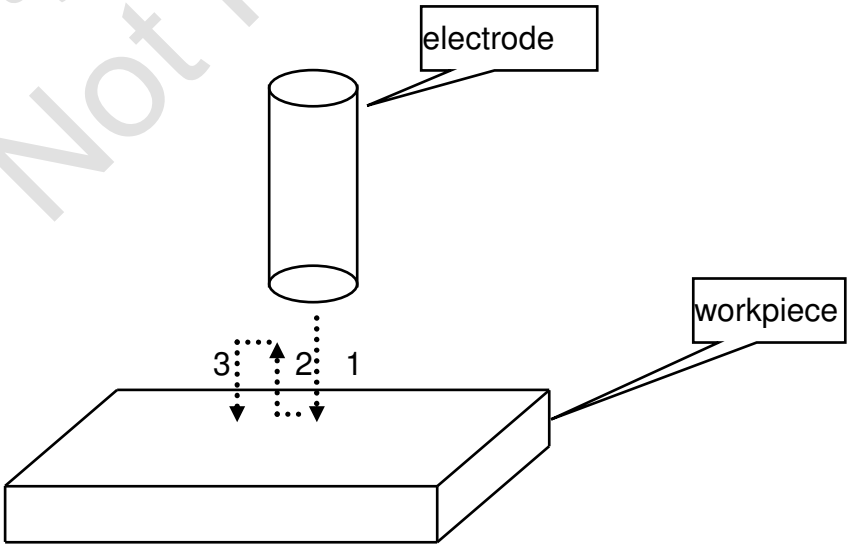


**Illustration: Electrode moving path for finding edge**

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## 8.3 INT_CAVITY

Function: Provide the user with a method to search the inner hole of the mold or the middle point of the slot.

Function menu: Under manual mode, press【F3】to activate the function of searching the center of inner hole.

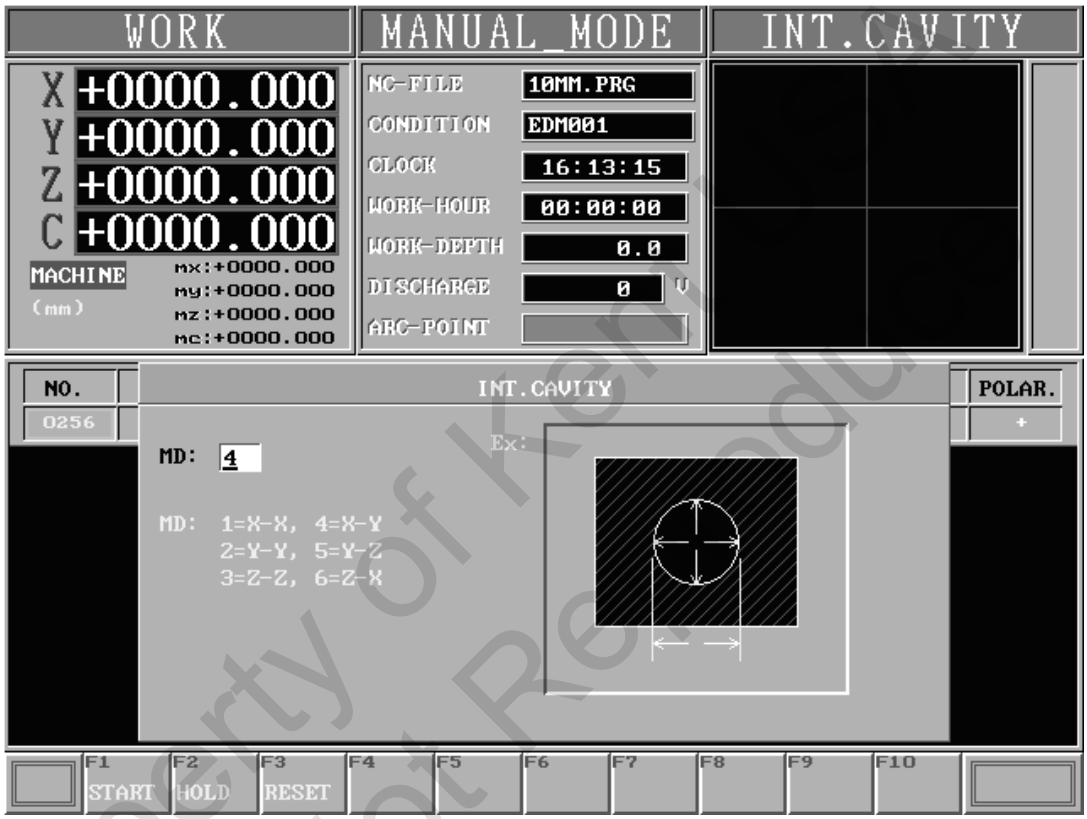


FIG. 8-4 INT_CAVITY

Execution
1. Press【1】=X-X,【2】=Y-Y,【3】=Z-Z,【4】=X-Y,【5】=Y-Z 【6】=Z-X. Select the axial direction for searching the center of inner hole.
2. Press【Enter】or【F1】START
3. Press【F2】HOLD to temporarily stop searching the center of inner hole. Press【F1】or【F2】again to proceed the rest actions.
4. Press【F3】RESET to cancel the action of searching the center of inner hole.

**Note** **Before searching the center of inner hole, be sure to verify that there are no insulating objects on the contact surfaces of the workpeice and the tool, or the workpiece, the tool and the machine may be damaged.**

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## ◎ Work example: the center of inner hole, mode【4】X-Y

Put the tool in the hole of the workpiece, and the tool does not contact the workpiece. Select mode【4】X-Y. Press【F1】START.

（1） The tool finds the edge in －X direction. The coordinate value of this hole in －X direction is obtained.

（2） Return to the start point of X.

（3） The tool finds edge in ＋X direction. The coordinate value of this hole in ＋X direction is obtained.

（4） At this moment the system will figure out the central position of X axis, and the electrode will move to this position.

（5） The tool finds edge in－Y direction. The coordinate value of this hole in －Y direction is obtained.

（6） Return to the start point of Y.

（7） The tool finds edge in ＋Y direction. The coordinate value of this hole in ＋Y direction is obtained.

（8） At this moment the system will figure out the central position of Y axis. The electrode will move to this position. This position is the center of the inner hole.

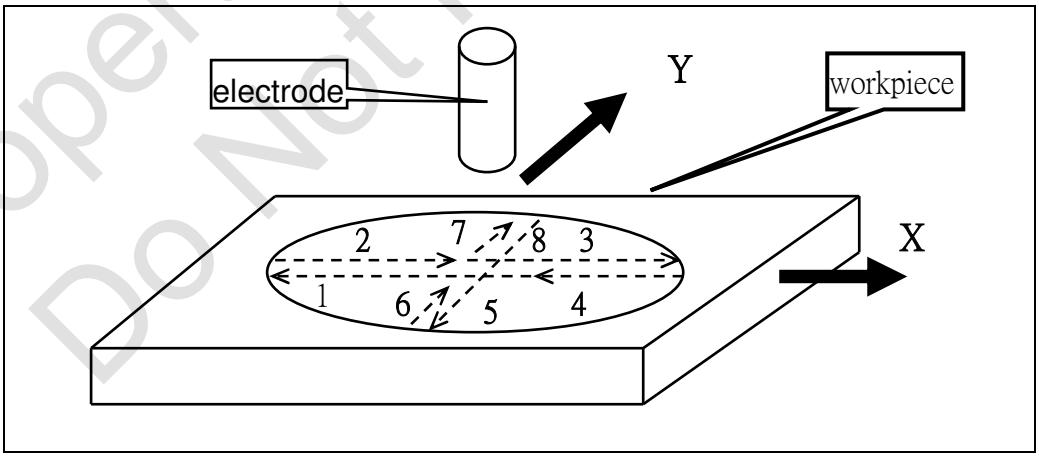


**Illustration:** “INT_CAVITY” **– electrode moving path**

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## 8.4 EXT_CAVITY

Function: Provide the user with a method to search the center of mold plate.
Function menu: Under manual mode, press【F4】EXT_CAVITY to activate the function of searching the center of outer hole.

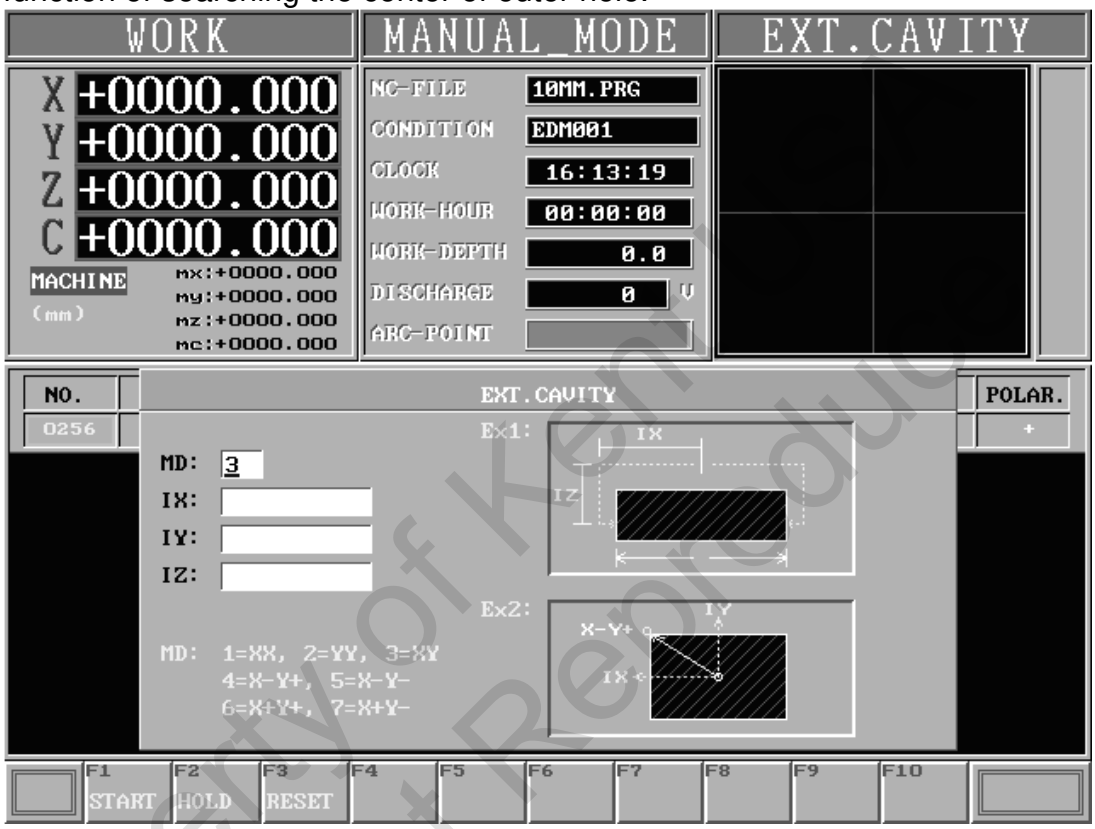


FIG. 8-5 EXT_CAVITY

Execution

1. Press【1】=XX,【2】=YY,【3】=ZZ,【4】=X-Y+,【5】=X-Y- 【6】=X+Y+【7】=X+Y-. Select the axial direction for searching the center of outer hole.
2. Press【Enter】or【F1】START.
3. Press【F2】HOLD to temporarily stop searching the center of outer hole. Press【F1】or【F2】again to proceed the rest actions.
4. Press【F3】RESET to cancel the action of searching the center of outer hole.

**Note** Before searching the center of inner hole, be sure to verify that there are no insulating objects on the contact surfaces of the workpeice and the tool, or the workpiece, the tool and the machine may be damaged.

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2. The setting values of IX and IY must be larger than the size in the workpiece direction so as to avoid short circuit between the tool and the workpiece. In case of short circuit, the system will automatically detect it, and stop the motion.

## ◎ Work example: Center of outer hole, mode 【3】XY

**IX: 50 IY: 30 IZ: 15**

Please verify that before performing the directive, the electrode is above the surface of the workpiece. The setting values of IX and IY must be larger than the size in the workpiece direction so as to avoid short circuit between the tool and the workpiece. If short circuit happens, the system will automatically detect it, and stop the motion.

（1） Based on IX setting, the electrode moves 50mm in －X direction.
（2） Based on IZ setting, the electrode moves 15mm in－Z direction.
（3） Find edge in＋X direction. Get the coordinate value in －X direction of the edge of outer hole.
（4） When the edge finding ends, the electrode moves 0.05mm in－X direction.
（5） Z axis ascends 15mm.
（6） Return to the start point of X.
（7） Based on IX setting, the electrode moves 50mm in ＋X direction.
（8） Based on IZ setting, the electrode moves 15mm in－Z direction.
（9） Find edge in－X direction. Get the coordinate value in＋X of the edge of outer hole.
（10） When the edge finding ends, the electrode moves 0.05mm in＋X direction.
（11） Z axis ascends 15mm.
（12） The electrode moves to the position of the center of the round column in X direction.
（13） Based on IY setting, the electrode moves 30mm in －Y direction.
（14） Based on IZ setting, the electrode moves 15mm in－Z direction.
（15） Find edge in ＋Y direction. Get the coordinate value in －Y direction of the edge of outer hole.
（16） When the edge finding ends, the electrode moves 0.05mm in －Y direction.

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（17） Z axis ascends 15mm.
（18） Return to the start point of Y.
（19） Based on IY setting, the electrode moves 30mm in ＋Y direction.
（20） Based on IZ setting, the electrode moves 15mm in －Z direction.

（21） Find edge in－Y direction. Get the coordinate value in ＋Y direction of the edge of outer hole.
（22） When the edge finding ends, the electrode moves 0.05mm in＋Y direction.
（23） Z axis ascends15mm.
（24） The electrode moves to the position of the center of round column in Y direction. This point is the center of the round (square) column.

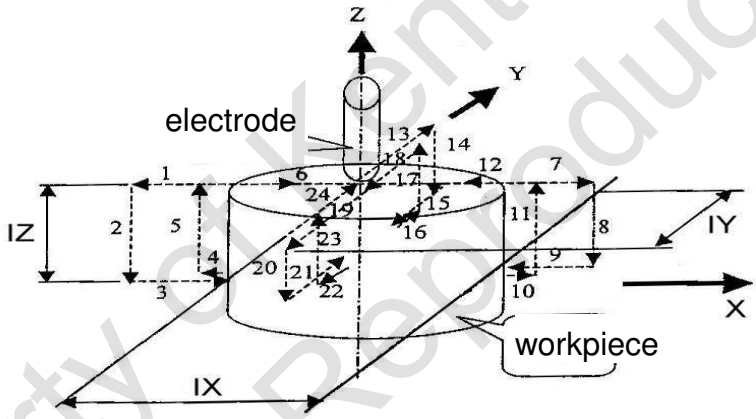


**Illustration –** “EXT_CAVITY”**, the moving path of the electrode**

## ◎ Work example: center of outer hole, mode 【7】X+Y- IX: 50 IY: 30 IZ: 15

Please verify that before performing the directive, the electrode is above the surface of the workpiece. The values of IX and IY must be larger than the size in the workpiece direction so as to avoid short circuit between the tool and the workpiece. If the short circuit happens, the system will automatically detect it, and stop the motion.

（1） Based IX setting, the electrode moves 50mm in ＋X direction.
（2） Based on IZ setting, the electrode moves 15mm in －Z direction.
（3） Find edge in －X direction. Get the coordinate value in X direction of outer apex.

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（4） When the edge finding ends, the electrode moves 0.05mm in ＋X direction.
（5） Z axis ascends 15mm.
（6） Return to the start point of X.
（7） Based on IY setting, the electrode moves 50mm in －Y direction.
（8） Based on IZ setting, the electrode moves 15mm in －Z direction.
（9） Find edge in ＋Y direction. Get the coordinate value in Y direction of outer apex.
（10） When the edge finding ends, the electrode moves 0.05mm in ＋X direction.
（11） Z axis ascends 15mm.
（12） Return to the start point of Y.
（13） The electrode moves to the X and Y coordinates of the apex.

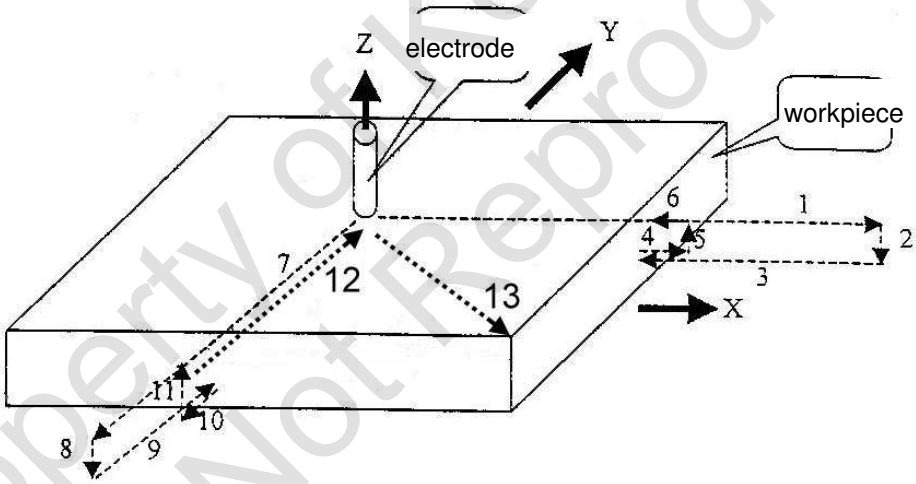


**Illustration: “Apex” electrode moving path**

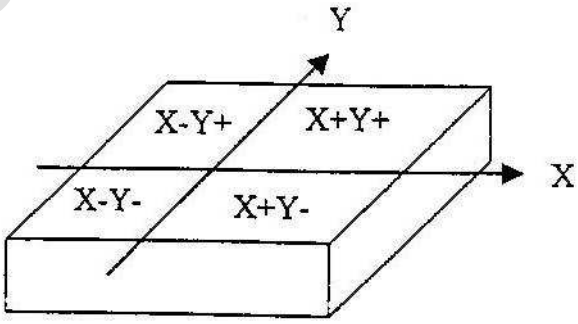


**Illustration: a variety of modes**

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## 8.5 ATC (Option: ATC models)

Function: Provide the user with a method for automatic tool change.
Function menu: Under manual mode, press【F5】Tool Setup to change the tool.

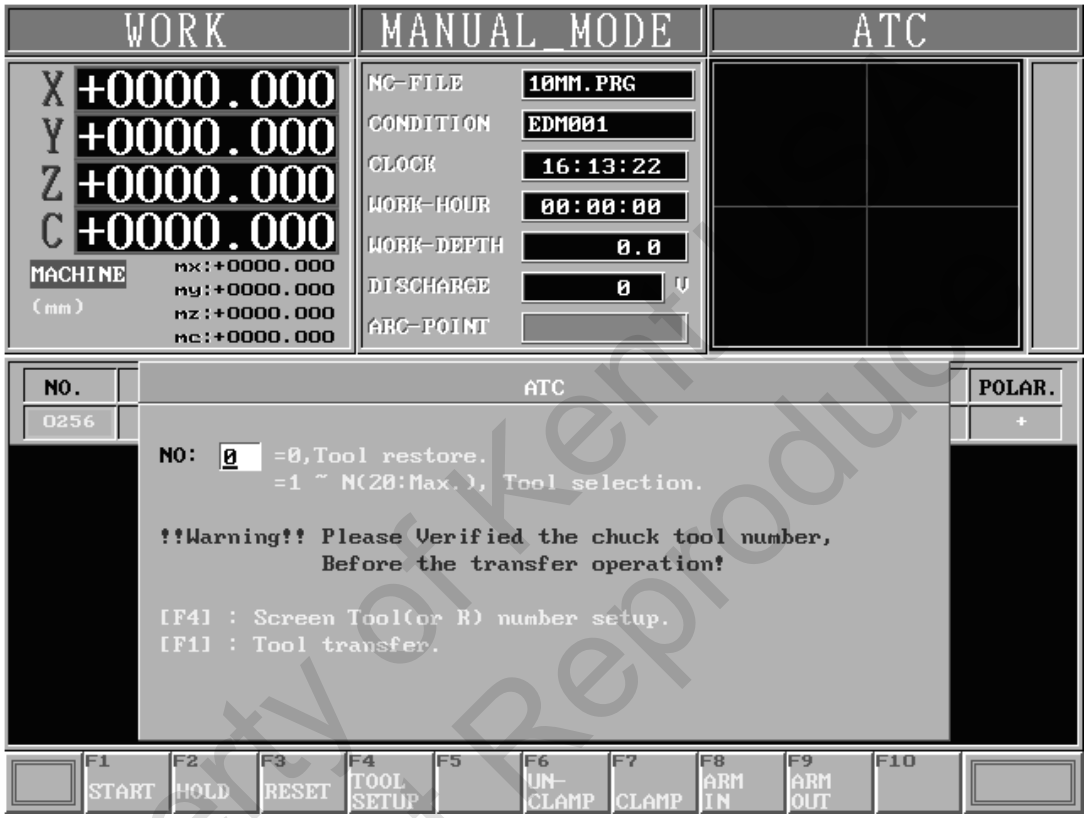


FIG. 8-6 ATC

Execution
1. Press【F4】TOOL SETUP to setup the tool (0~6) required.
2. Press【F1】START.
3. Press【F2】HOLD to temporarily stop the tool change. Press【F1】or 【F2】 again to proceed the rest actions.
4. Press【F3】RESET to cancel the action of tool setup.
5. Press【F6】to unclamp the tool. (for C axis only)
6. Press【F7】Clamp the tool. (for C axis only)
7. Press【F8】ARM IN (Watch out for Z axis position when the arm is in.)
8. Press【F9】ARM OUT to restore the tool arm.

**Note** **1. Find origin: For the 1st time to change the tool, it is necessary to complete the finding of origin first (X, Y and Z axes).**

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**2. Check air pressure: Before ATC, please see the air pressure meter, and check if the pressure is above 6 kgs.**

**3. Check tool number: In the screen, TOOL= stands for the tool number (under the work coordinate) of the chuck. If the tool number does not match the actual tool number, please press F5 TOOL under manual mode. -> Enter a correct tool number. Then, press ENTER to setup tool number.**

**4.Safety of C axis surroundings: Every time before changing the tool, the system will perform the finding of origin for C axis. Please verify that the surroundings of C axis is safe when it rotates.**

**5. The tool numbers overlap: Do not set the same tool number for the tools in the chucks or in the tool turret!**

**6. Do not touch: During the tool change, do not approach the motion range of the travel, or touch the tool arm.**

**7.Strictly prohibited: The C-AXIS UNCLAMP button at the machine head is easy to be activated any time. During discharge of tool change…, it is strictly prohibited to touch this button.**

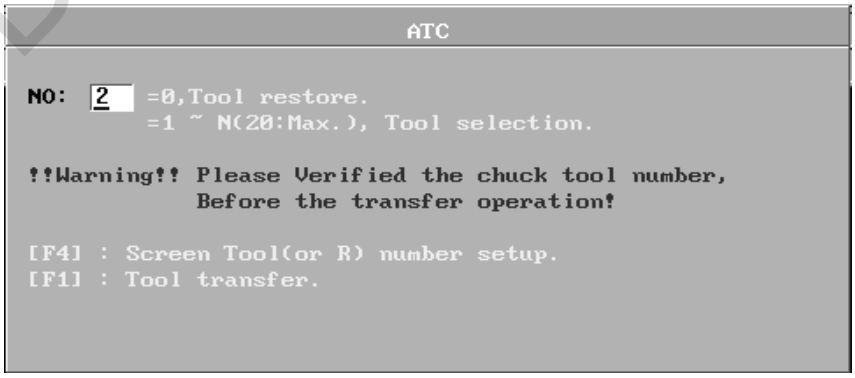
## ◎ Work example

### 1. Change tool under manual mode:

Set tool number.

（1）Press 【MODE】to change the screen to manual mode.

（2）Press【5】TOOL (ATC), and the ATC screen will pop up.

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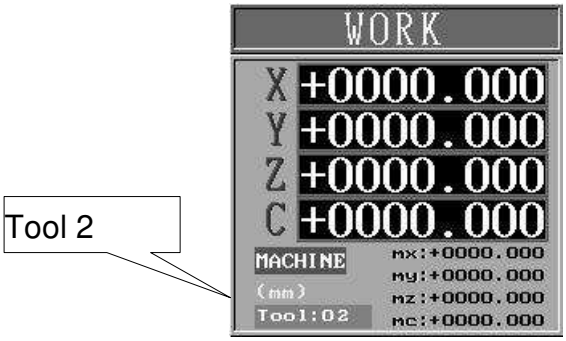
（3）In the NO. field, enter the tool number (1~4) required. This example is 2.

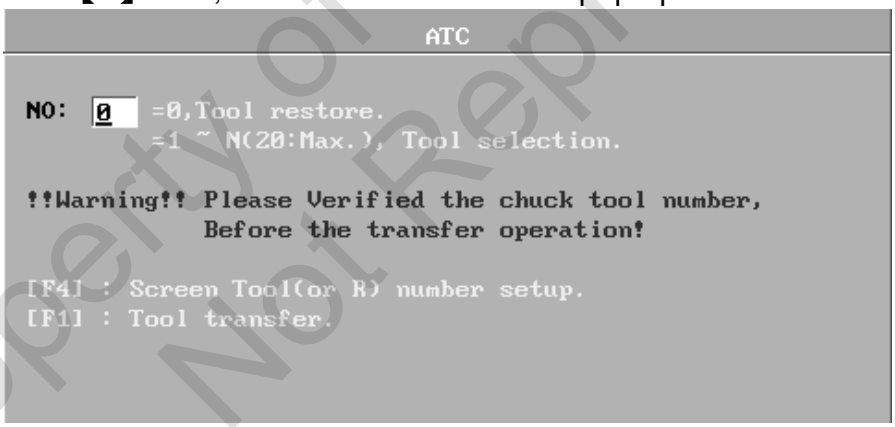



（4）Press【Enter】to change the display of tool number. TOOL= the tool number which is set.

**Reset Tool**

Follow the previous page. If tool 2 is in the chuck (TOOL=2),

（1）Press【5】ATC, and the ATC screen will pop up.




（2）Enter 0 in the field of NO.

（3）Press【F1】again to activate ATC.

（4）After completing ATC, TOOL=0 will appears.

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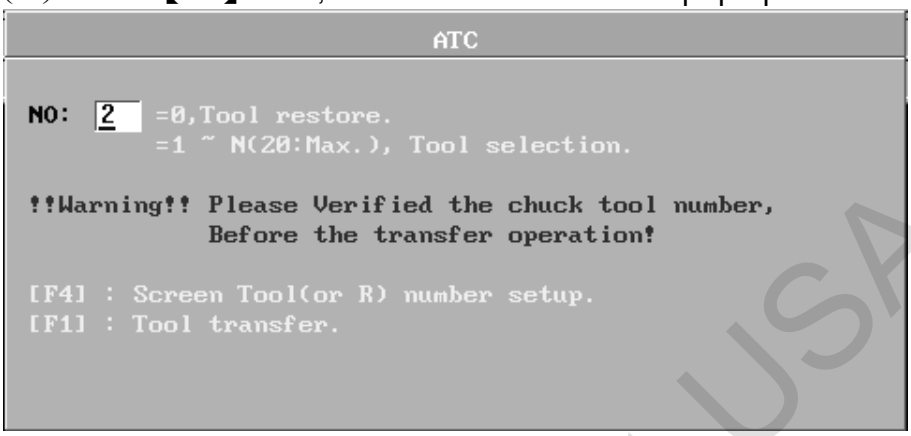
**Change Tool**

（1）Press【F5】ATC, and the ATC screen will pop up.




（2）Enter the tool number (1~4) required in the field of NO. This example is 2.

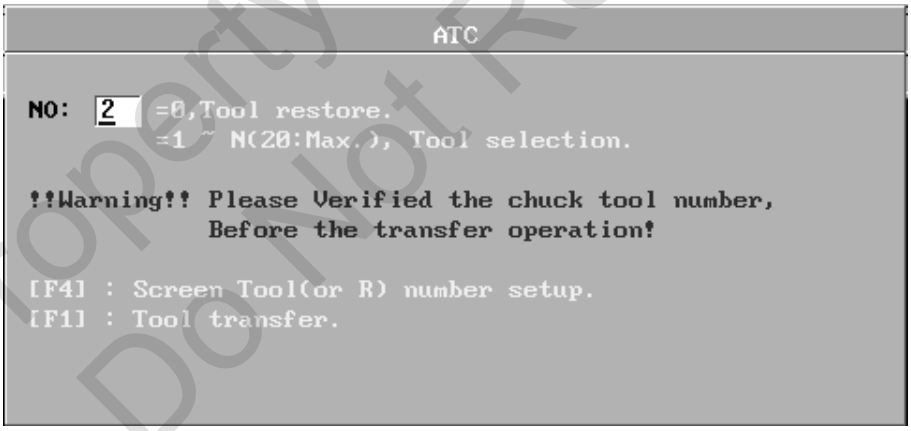
（3）Press【F1】to active the procedure of tool change.

（4）After completing the tool change, TOOL=2 will appear.

**Continuous action**

（1） When the chuck of the electrode has tool 4,

（2） Press【F5】ATC. The ATC screen will pop up.




（2）In NO. field, enter a tool number (1~4) needed. (Here is 2.)

（3）Press【F1】again to start tool transfer. The step is “Reset tool 4, and then clamp Tool 2.”

（4）After above action is completed, “TOOL= 4” will become “TOOL= 2” .

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**2. Operation under auto mode and examples:**

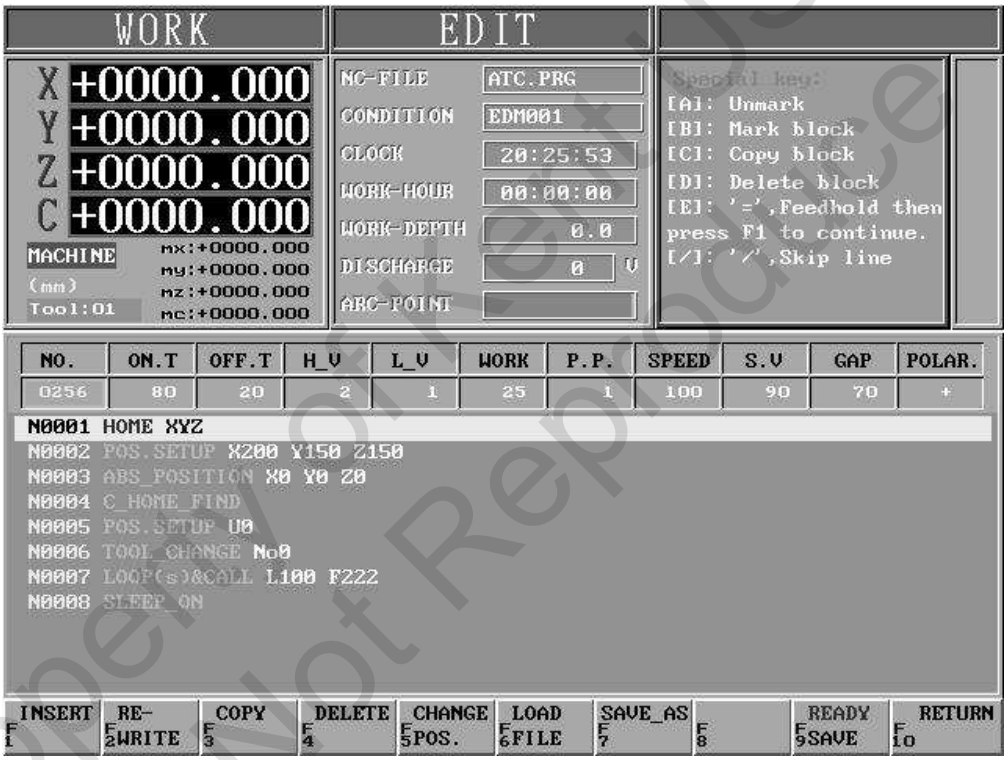
※ Firstly verify if the tool number on the chuck corresponds to the vacant tool number on the turret.

※ Check the path and the travel.

※ Check the air pressure.

The following example is illustrated based on master program ATC.PRG and subprogram 222.PRG:

Master program (ATC.PRG):




Master Program:

N0001 Search origin of XYZ ← Search the origin of XYZ

N0002 Set coordinate of X200 Y150 Z150 ← Set the work coordinate to be X200, Y150 and Z150.

N0003 Absolute coordinate X0 Y0 Z0 ← Position each axis to X0, Y0 and Z0 respectively.

N0004 origin of C axis ←Search the origin of C axis.

N0005 Coordinate U0 ← Reset the work coordinate of C axis to zero.

N0006 Change tool No0 ← Reset tool. (If the chuck of C axis has a tool, there will be a tool reset action. If the chuck has no tool, C axis will automatically jump over after C axis searches the origin.

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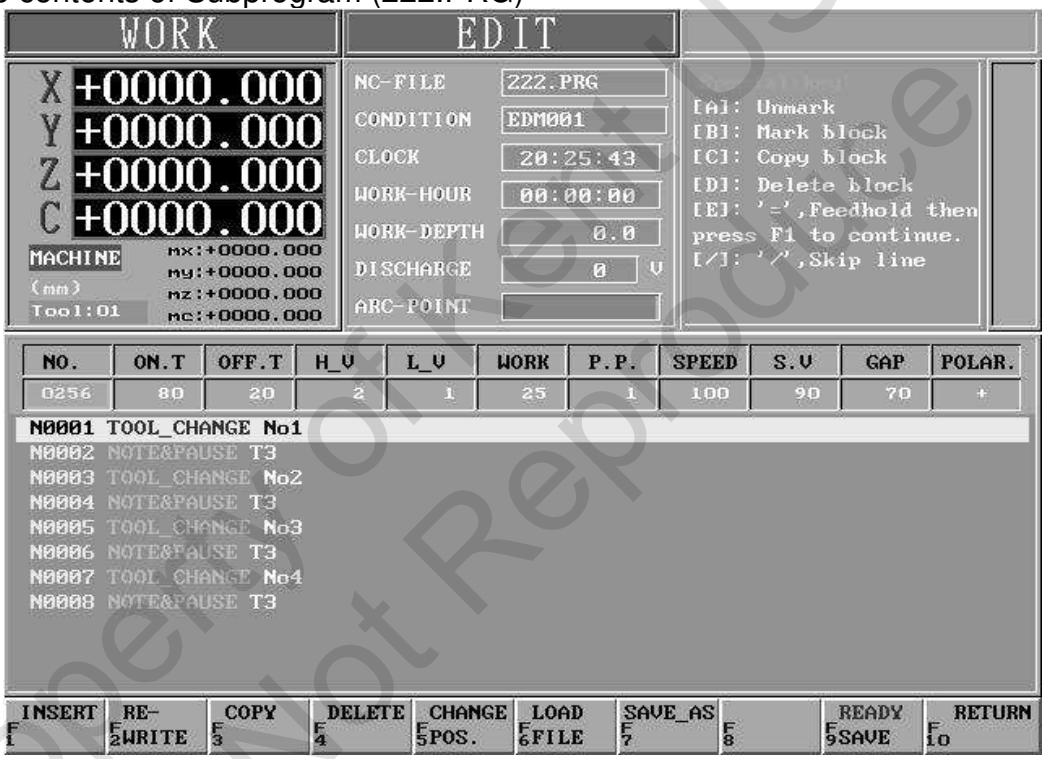
N0007 loop & subprogram L100 F222 ← Subprogram calls. L100 stands for 100 times. F222 is a file calling the subprogram 222.PRG. (Note ! The file name of a subprogram must be numerals.)

N0008 Sleep ON ← When the work is ended, the sleep action is ON. (While sleep action is ON, the system will switch off all the motor power including fan power. When the user presses any button, the switched-off power will be switched on immediately.)

The contents of Subprogram (222.PRG)




Subprogram:

※ The symbol * on the left-hand side of the coordinate stands for the completion of searching the origin for the axis.

N0001 Change tool No1 ← Change Tool 1.

N0002 Mark & Hold T3 ← (# for mark, no action) T3 = Hold 3 seconds.

N0003 Change tool No2 ← Change Tool 2.

N0004 Mark & Hold T3 ← (# for mark, no action) T3 = Hold 3 seconds.

N0005 Change tool No3 ← Change Tool 3.

N0006 Mark & Hold T3 ← (# for mark, no action) T3 = Hold 3 seconds.

N0007 Change tool No4 ← Change Tool 4.

N0008 Mark & Hold T3 ← (# for mark, no action) T3 = Hold 3 seconds.

N0009 Change tool No0 ← Reset tool.

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## 8.6 REL_POS.

Functions: Provide the users with a method to move the workpiece to the point of relative coordinate quickly.

Function menu: Under manual mode, press【F6】REL_POS. to enter the relative positioning function.

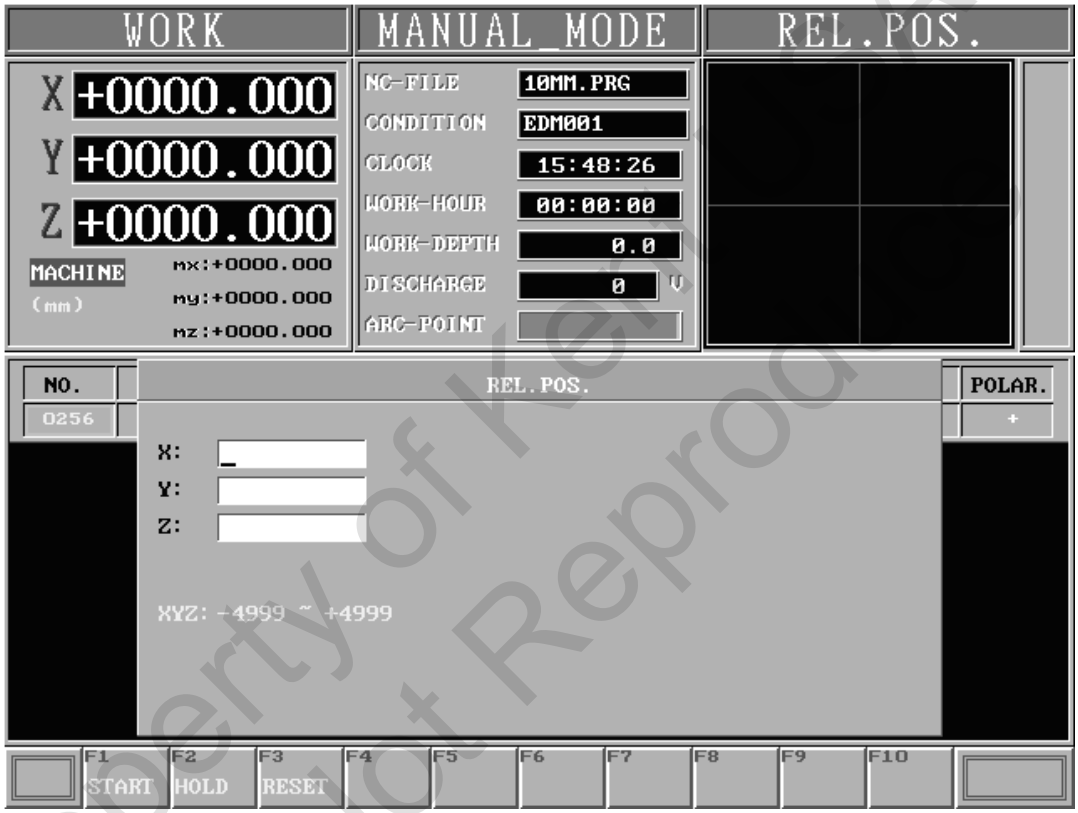


FIG. 8-7 REL_POS.

Execution
1. Press【0】~【9】Set the coordinate values of X, Y and Z.
2. Press【Enter】or 【F1】START.
3. Press【F2】HOLD to temporarily hold the execution of relative positioning. Press【F1】or【F2】again to proceed with the rest actions.
4. Press【F3】RESET to cancel the action of relative positioning.

**Note** **During the relative positioning motion, if the work program is error, or the operator is careless which results in tool contacts, the system will automatically detect it, stop the motion, and send an ERROR message.**

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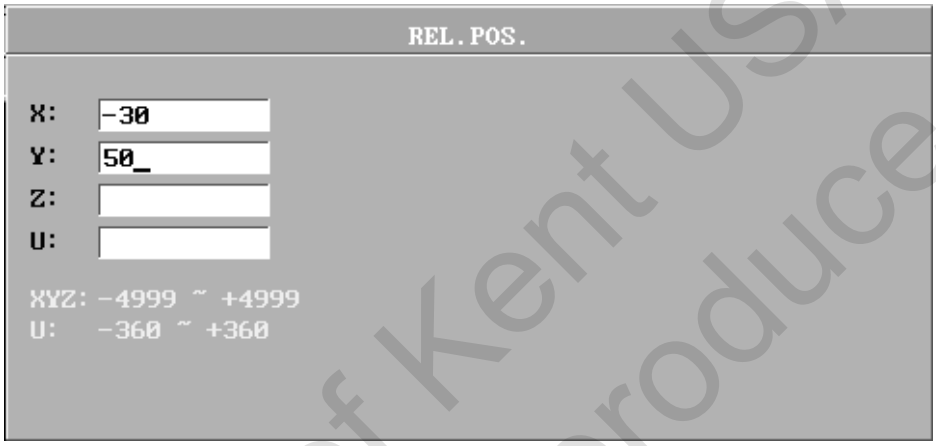
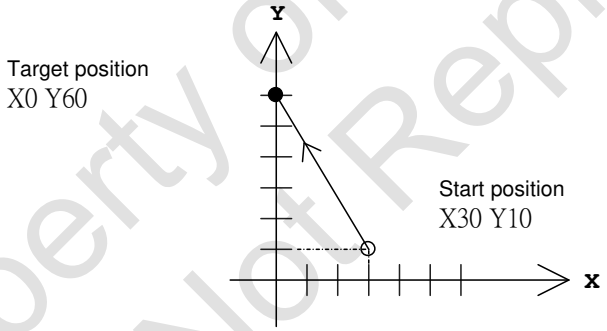
## ◎ Work example: REL_POS X-30 Y50 Z

（1） Now the tool is at the work coordinate X30.0 Y10.0 Z0.0.
（2） Set a coordinate value for X-30 and Y50.
（3） 【F1】START.
（4） X and Y move to the work coordinate (X0.0, Y60.0, Z0.0).




**Tool moving path**

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## 8.7 ABS_POS.

Functions: Provide the users with a method to move the workpiece to the point of absolute coordinate quickly.
Function menu: Under manual mode, press【F7】ABS_POS. to enter the absolute positioning function.

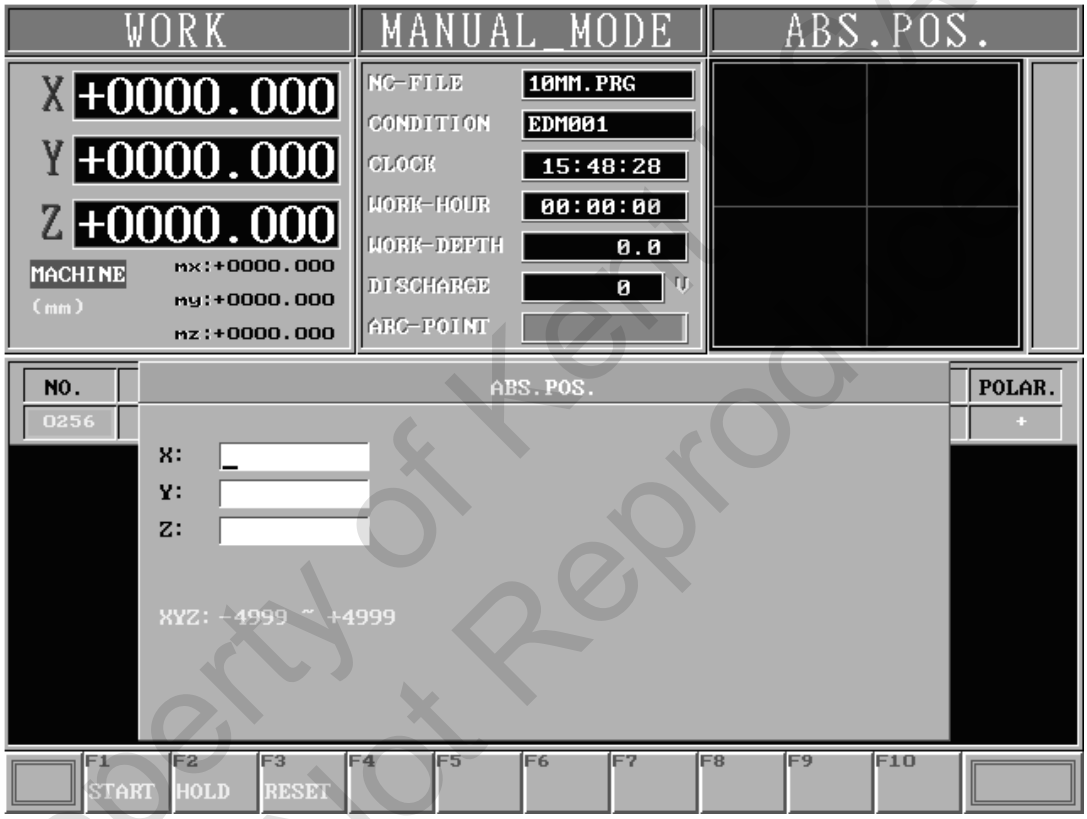


FIG. 8-8 ABS_POS.

Execution
1. Press【0】~【9】. Set coordinate values for X, Y and Z.
2. Press【Enter】or 【F1】START.
3. Press【F2】HOLD to temporarily hold the action of absolute positioning. Press【F1】or【F2】 to proceed with the rest actions.
4. Press【F3】RESET to cancel the action of absolute positioning.

**Note** **<u>During the relative positioning motion, if the work program is error, or the operator is careless which results in tool contacts, the system will automatically detect it, stop the motion, and send an ERROR message.</u>**

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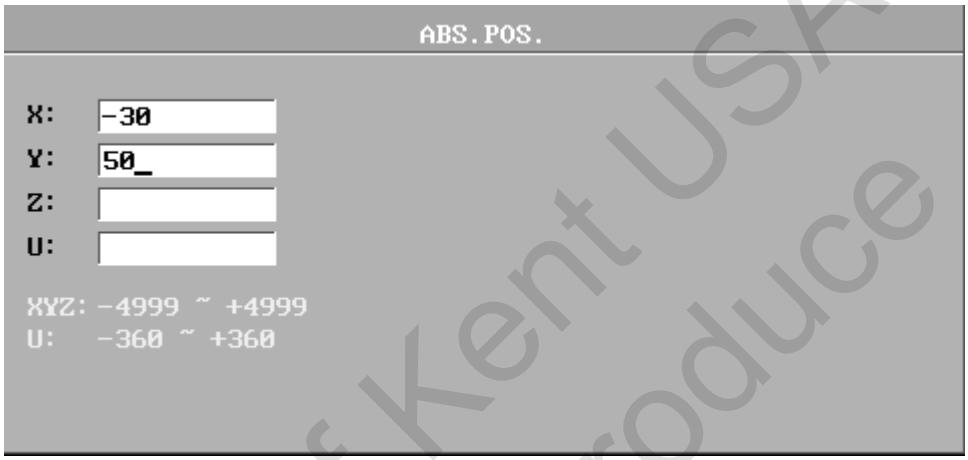
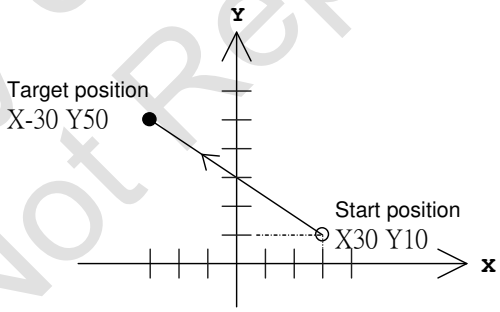
## ◎ Work example: ABS_POS. X-30 Y50 Z

（1） Now the tool is at the work coordinate ( X30.0, Y10.0 and Z0.0)
（2） Set the coordinate value for X-30 and Y50.
（3） 【F1】START.
（4） X and Y move to the work coordinate ( X30.0 Y50.0 Z0.0)




**Tool moving path**

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## 8.8 POS_SETUP

Functions: Provide the users with a method to set a current work coordinate or a value for referential coordinate.

Function menu: Under manual mode, press【F8】POS_SETUP to enter the coordinate setting function.

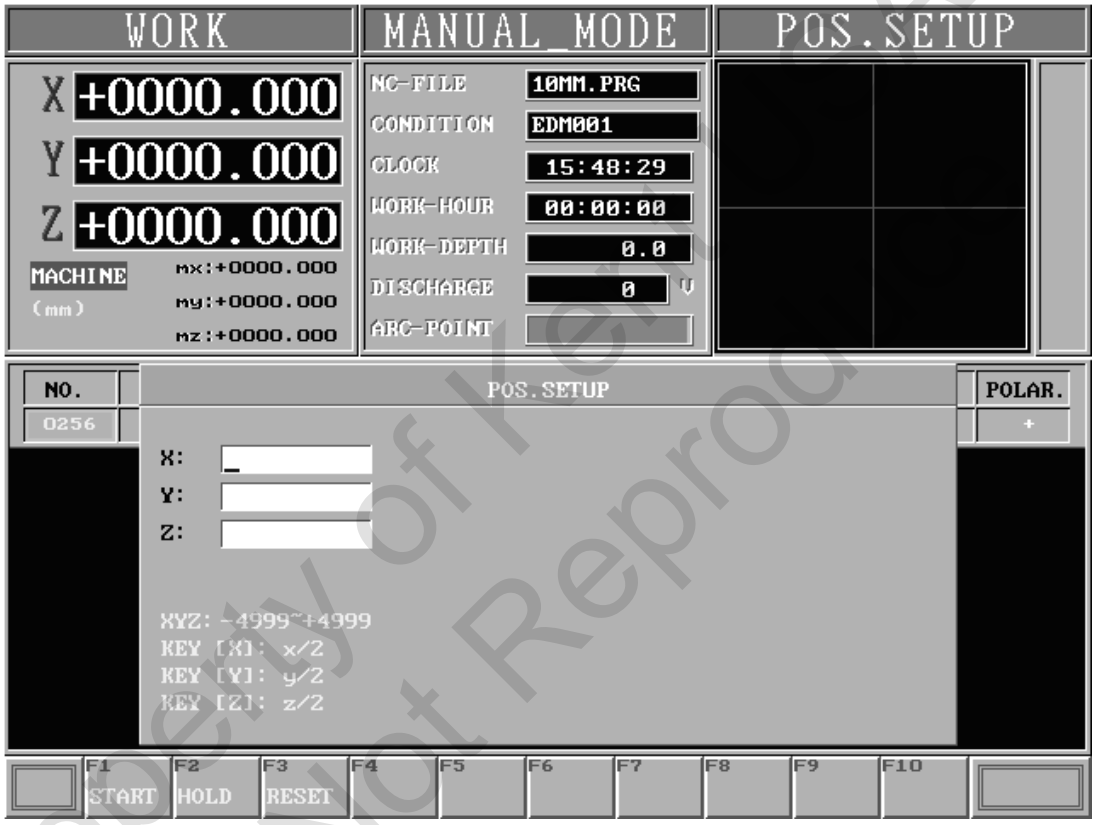


FIG. 8-9 POS_SETUP

Execution
1. Press【0】~【9】to set the coordinate values for X, Y and Z.
2. Press【Enter】or【F1】START to change the work coordinate into a setting value.
3. Press X, Y or Z to divide the work coordinate by 2.

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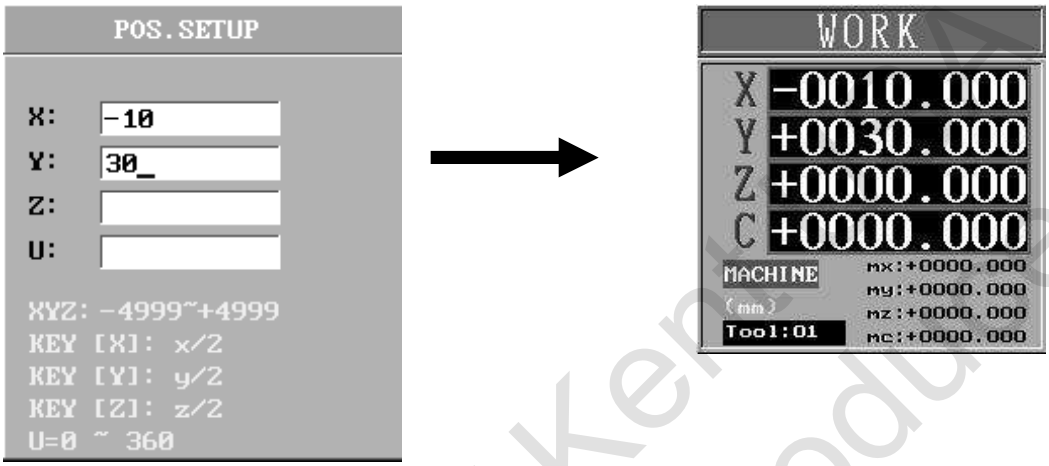
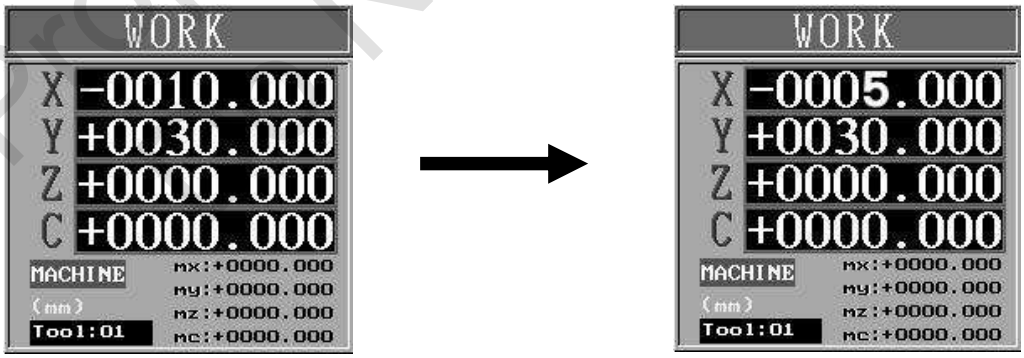
## ◎ Work Example: POS_SETUP (X-10, Y30)

（1） Set the coordinate value for (X-10, Y30).
（2） 【F1】START.
（3） Change the work coordinates of X and Y into (X-10, Y30).




## ◎ Work Example: Divide X axis by 2

（1） Use ▲▼ buttons to select X axis.
（2） Press [X] button to change the work coordinate into **– 5 .**
（3） For Y and Z, it is the same as above steps.

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## 8.9 POS_SAVE

Functions: Provide the users with a method to save the current work coordinate or the value of referential coordinate.

Function menu: Under manual mode, press【F9】POS_SAVE to enter the coordinate saving function.

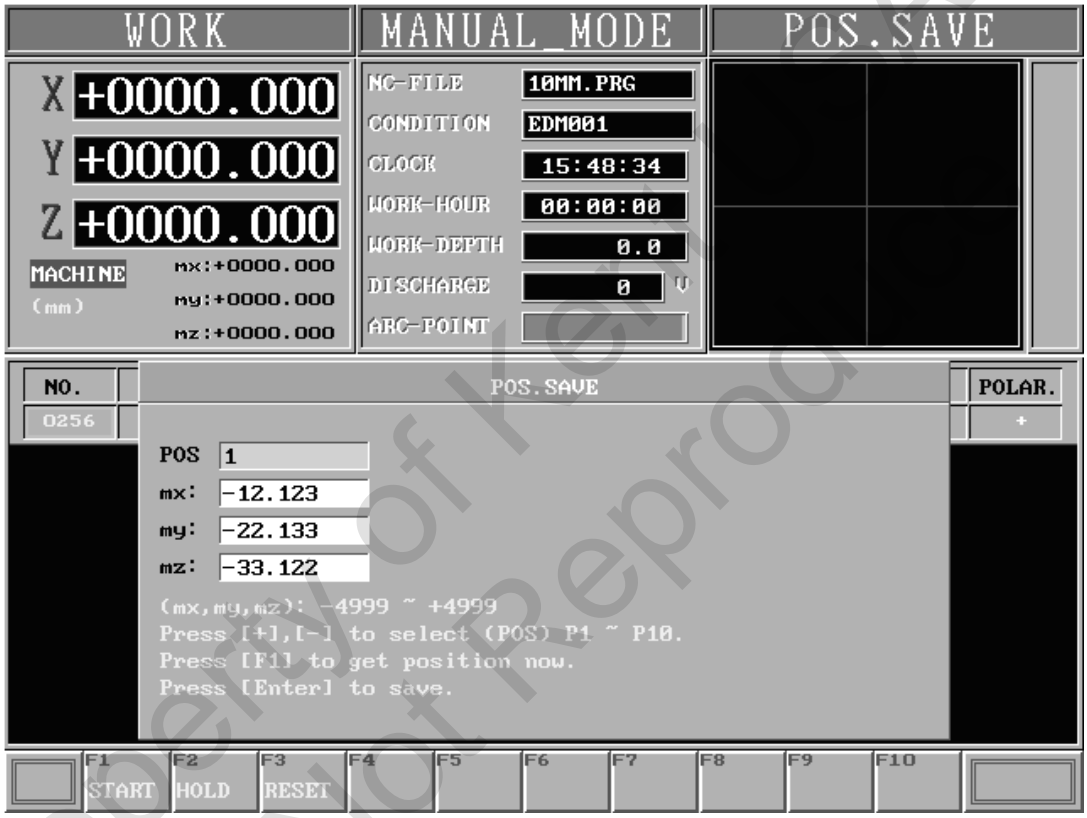


FIG. 8-10 POS_SAVE

Execution 1. Press【＋】or【－】to set P1~P10.

2. Press【F1】to enter the “machine” coordinate value. You can save 10 sets of coordinate value in P1~P10.

Please press [Enter] key to store after determining.

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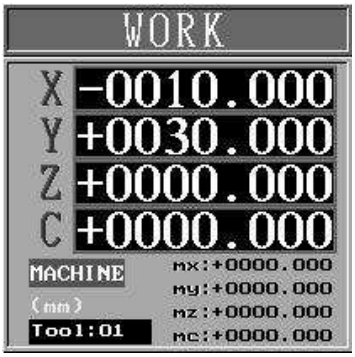
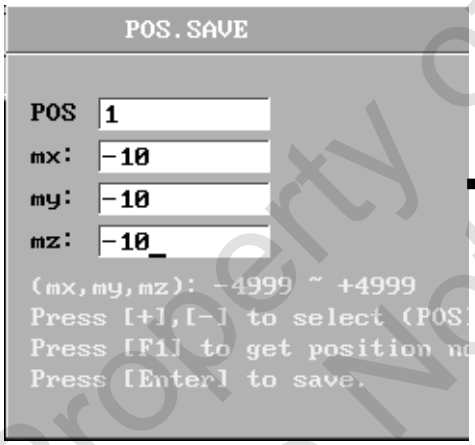
## ◎ Work Example:

（1） When the work coordinate arrives at the requested position, use ⊞ ⊟ buttons to select the group number.

（2） Press【F1】button to change the saving of coordinate.

（3） For Y and Z, it is the same as above steps.



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## 8.10 Set a speed mode for manual wire control box

The wire control box provides the users with a method to set manual speeds (1%, 10% and 100%) and manual moving modes (continuous, jog and no guard). Under manual continuous mode, if you press axial button, the machine will move at a constant velocity. Under JOG mode, if you press and release the axial button once, the machine will make a certain movement. Under no guard mode, if you press the axial button, there is no short circuit protection for the electrode when the machine performs a continuous movement. .Refer you to FIG. 8-9 Layout of wire control box for details.

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# 9 Operation Mode

This chapter introduces the operation mode as well as the usage of other functions. This mode provides the users with an environment where the work program can be edited, accessed and performed. After entering this mode, the status columns of the operational mode are as following figure shown.

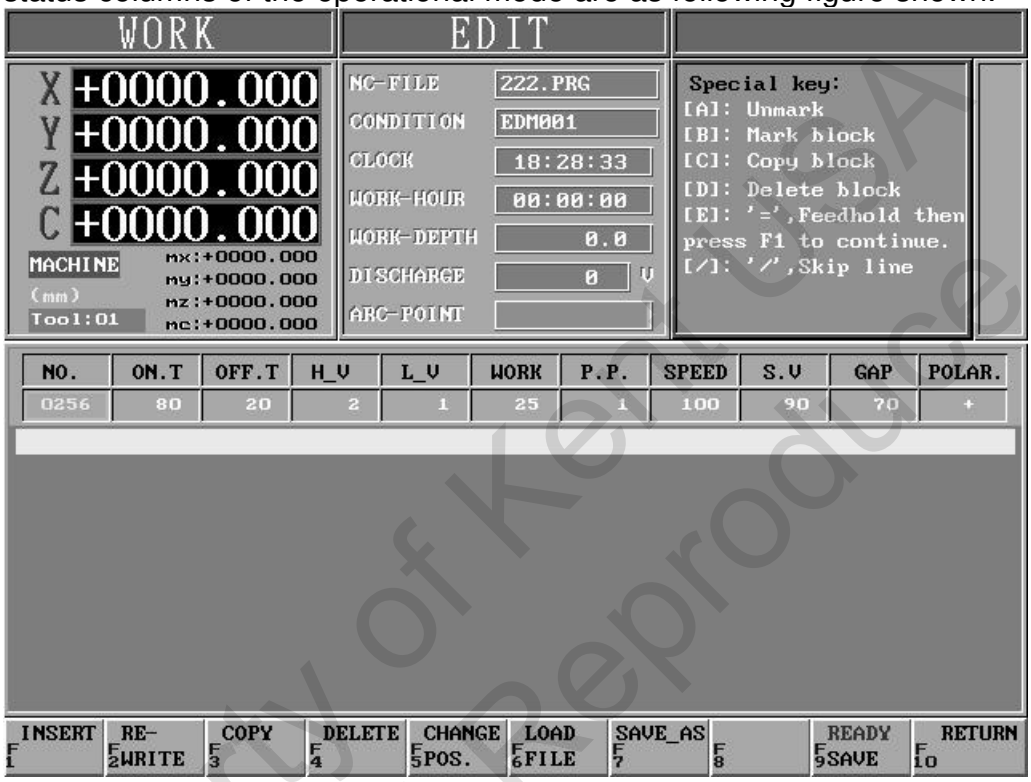


FIG.9-1 screen of operation mode

When the system enters the operation mode, the columns of functional buttons are as above figure shown. Introduce functional buttons as follows -

（1）Insert：Press【F1】INSERT. Then, use【▲】and【▼】to move the button to edit the block required for the program. After completing the edition, the block of the program will be inserted under the program block where the curser currently stays. For detailed operation on insert functions, refer you to The Introduction to insert subfunction mode.

（2）Rewrite：Press【F2】REWRITE to change the contents of the program block where the curser currently stays.

（3）Copy：Press【F3】COPY to copy the program block where the curser currently stays to next block.

（4）Delete：Press【F4】DELETE to delete the program block where the curser currently stays.

（5）Change position：Press【F5】Change Position to switch the current work coordinate and referential coordinate. This function is the same as the coordinate switch function under manual mode.

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（6）Load File：Press【F6】Load File to access, copy or delete the file. For detailed operation on the file function, refer you to the introduction to the file subfunction.

（7）Save a new file：Press【F7】SAVE _AS to save the present file as another new file.

（8）Work /Save：Press【F9】READY SAVE to perform the currently edited program, and save the present file.

（9）Return：Press【F10】RETURN or【ESC】button on the control panel to make the screen return to previous screen of operation mode.

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## Instruction Group

The smallest unit of one workpiece program is called program node . One program node consists of program instruction and program data byte,

**Program node ＝program instruction ＋ space ＋ program data byte ＋ B code ＋ C code**

Not all the program nodes need these.

Each block uses Line Bytes (not over 80 bytes) as an ending code.
At lease one space exists between program instruction and program data byte.
Data byte consists of data identification code and data. In other words, data byte = data identification code ＋ data. It is not allowed to have a space between the data identification code and the date. In following 3 examples, example 1 is a cutting program node with program instruction, program data byte, B code and C code. Example 2 has only a program instruction and a positioning program node of program data byte. Example 3 has only a program instruction.

**Data identification code** **data**

Example 1: absolute straight line Z -10.0 B1 C1

program instruction program data byte

Example 2: relative positioning IX10

Program instruction program data byte

Example 3: C axis finds origin

Program instruction

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**A. Residue Removing mode (P.P. Mode)**

| | | | |
|---|---|---|---|
| B1 | Z axis ascends. | | Height of removing residue (P. P. height) |
| B2 | Reserve | | |
| B3 | Lateral original path | ◎ During lateral discharge or sway machining, the depth of Z axis is 0. Z axis returns to the center, and ascends. | |
| | | ◎ IF the depth is not 0, Z axis returns to the start point, and ascends.<br>※Z axis ascends or not depending on the setting ON or OFF made by 7th parameter PP_1 of [F4 SYSTEM] -> [F6 USUAL] | |
| B4 | 3 axes ascend synchronally to P.P. position. | ◎ When the P.P. height is 2mm, the 3 axes will ascend synchronally to 2mm height. When the P.P. height is 0.5mm, the 3 axes will ascend synchronally to 0.5 mm height. | |

- B3 returns to the center or the start point. Z axis ascends depending on 【F4SYSTEM】→【F6 USUAL】→ 7th parameter PP_1 = ON or OFF.
- When PP_1 is set for ON or OFF. When PP_1 is set for OFF, Z axis returns to the center, and ascends. When PP_1 is set for ON, Z axis returns to the center, and will not ascend.
- **Lateral discharge employs B3 residue removing mode. An example is shown below. (start position X0 Y0 Z0)**

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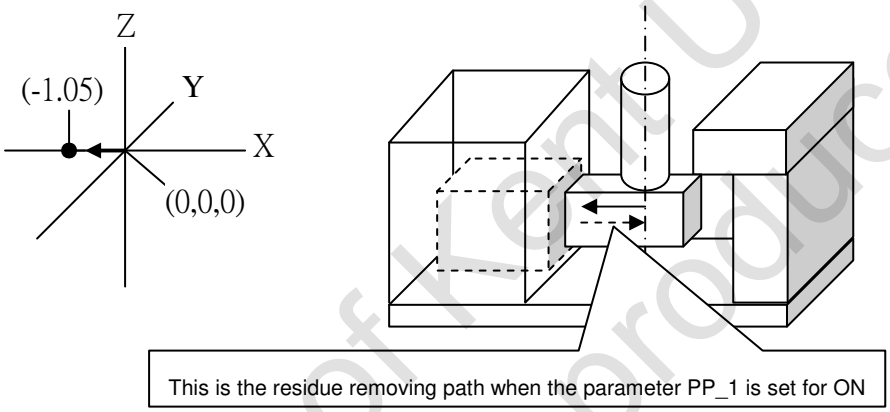
**C-CODE (discharge group code)：**

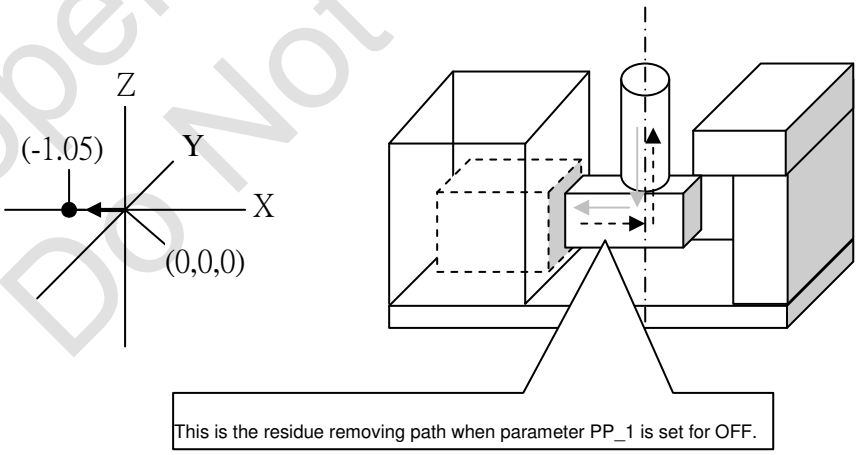
| NO. | ON.T | OFF.T | HV | LV | WORK | P.P | SPEED | SV | GAP | POL | HV2 | Arc.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **11** | 120 | 20 | 0 | 6 | X | **2** | 160 | 80 | 80 | + | 0 | 40 |

**instruction：N0001 relative straight line of X axis, X-1.05 B3 C11**

- 【F6 USUAL】 Start position X0 Y0 Z0. Set parameter PP_1 for ON, then the residue removing path is to return to the start position (X0 Y0 Z0) Z axis won't ascend.




- 【F6 USUAL】the residue removing path when the parameter PP_1 is set for **OFF** (Z axis will ascend.)

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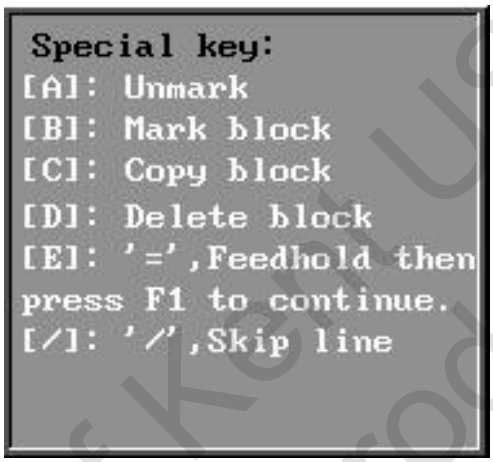
**B. Program Control Code**

The program control code provides the users with a setting in the program. Thus, some sections in the program can be copied or deleted, or some single columns can be set for no execution. When the system enters Operation Mode, the program control code will be shown on the upper right-hand corner of the screen as following figure shown.




Program Control Codes

Use the program control codes:

（1） Move the curser to the 1st line of the block which you want to copy or delete. Press【B】button. Then, a red curser will appear for the program of the line.

（2） Move the curser to the last line of the program block to be copied or deleted. Press【B】button. Then, a red curser will appear for said block.

（3） Move the curser to the program block to be copied or deleted. Press【C】. Then, the marked block will be inserted to the line next to the line where the curser stays.

（4） Press【D】button to delete the marked block.

（5） Press【A】button to cancel the mark of the block.

（6） Move the curser to a line of the program. Then, press【E】. A sign “=” will appear in front of the program number of the line. It indicates that the program will hold at this line. Under “HOLD” status, press【F1】button. The program will continue to run.

（7） If move the curser to one line of the program, and press【/】. A sign “/” will appear in front of the program number. It indicates that the program of the line will be ignored (no execution).

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◎ **Example of operation**

1. Press【B】at the program no.N0003. Then, press【B】at the program no.N0005. Then, the block from N0003 through N0005 will be marked with red as following figure shown.

```
N0001   ABS_POSITION X0 Y0
N0002   ABS_POSITION Z1
N0003   REL_LINER_Z_AXIS Z-5 B1 C1
N0004   REL_LINER_Z_AXIS Z-3 B1 C2
N0005   ABS_POSITION Z1
```

2. Press【C】at the program no. N006. Then, the marked block will be copied to N0007~N0009 as following figure shown.

```
N0001   ABS_POSITION X0 Y0
N0002   ABS_POSITION Z1
N0003   REL_LINER_Z_AXIS Z-5 B1 C1
N0004   REL_LINER_Z_AXIS Z-3 B1 C2
N0005   ABS_POSITION Z1
N0006   ABS_POSITION X10 Y0
N0007   REL_LINER_Z_AXIS Z-5 B1 C1
N0008   REL_LINER_Z_AXIS Z-3 B1 C2
N0009   ABS_POSITION Z1
```

If you want to continue to copy the originally marked block, just move the curser to the insert point. Then, press【C】to proceed the copy.

3. Press【D】to delete the block marked by the programN0003 as following figure shown.

```
N0001   ABS_POSITION X0 Y0
N0002   ABS_POSITION Z1
N0003   REL_LINER_Z_AXIS Z-5 B1 C1   →This line will be deleted.
N0004   REL_LINER_Z_AXIS Z-3 B1 C2
N0005   ABS_POSITION Z1
```

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4. Press【A】to cancel the mark of the program block N0003 as shown below.

| | | |
|---|---|---|
| N0001 | ABS_POSITION X0 Y0 | |
| N0002 | ABS_POSITION Z1 | |
| N0003 | REL_LINER_Z_AXIS Z-5 B1 C1 | → The mark will be cancelled. |
| N0004 | REL_LINER_Z_AXIS Z-3 B1 C2 | |
| N0005 | ABS_POSITION Z1 | |

5. Press【E】at the program no.N0003. Press【/】at the program no. N0004. It means that the program will hold at N0003. Press【F1】button, and the program will continue to run. When the program performs at the program N0004 , the program will ignore said line, and directly performs the program N0005 as following figure shown.

| | | |
|---|---|---|
| N0001 | ABS_POSITION X0 Y0 | |
| N0002 | ABS_POSITION Z1 | |
| ＝N0003 | REL_LINER_Z_AXIS Z-5 B1 C1→ | |
| ／N0004 | REL_LINER_Z_AXIS Z-3 B1 C2→ HOLD | |
| N0005 | ABS_POSITION Z1 | |

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## 9.1 INSERT

### 9.1.1 POSITIONING－Positioning is a linear positional moving under no discharge status.

**A. REL_POSITION**

Action: Make a relative positioning moving.

Directive format: REL_POSITION IX* IY* IZ*

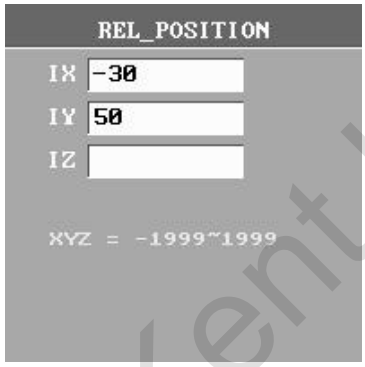


FIG. 9-2 dialogue window of REL_POSITION

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

**Note：** **During the relative positioning motion, if the workpiece program is error, or the operator is careless to cause contact between tools, the system will automatically detect it, stop the motion, and send a message showing error.**

**◎ Operational example: REL_POSITION IX-30 IY50**

If the tool is currently at the work coordinate X30.0 Y10.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X0.0 Y60.0 Z0.0. The tool moving path is shown in following figure.

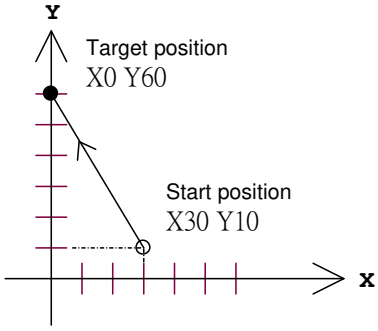


FIG. 9-3 Tool moving path

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**B. NG REL_POSITION**

Action：Make a “relative positioning” moving under No Guard.

Directive (instruction) format ：NG REL_POSITION IX* IY* IZ*

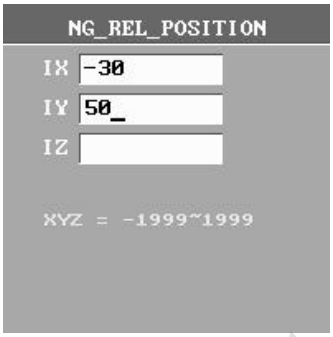


FIG. 9-4 dialogue window of NG REL_POSITION

Execution：1. “*” stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.

3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

**Note：** 1. **During NG “relative position” motion, if the workpiece program is error, or the operator is careless to cause contact between tools, the system will not stop the motion**

2. **This directive is used at the end of discharge to force the system not to make short circuit detect, and to move the tool to a safe position.**

◎ **Operational example：NG REL_POSITION IX-30 IY50**

If the tool is currently at the work coordinate X30.0 Y10.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X0.0 Y60.0 Z0.0, and the tool moving path is as following figure 10-2 shown.

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### C. ABS_POSITING

Action：Make an absolute position moving.

Directive format：ABS_POSITING X* Y* Z*

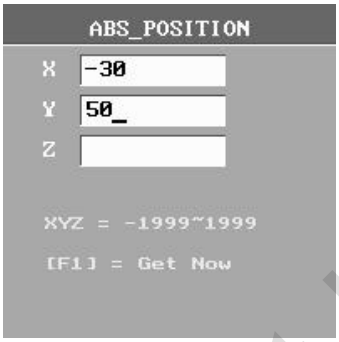


FIG. 9-5 Dialogue window of ABS_POSITING

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

**Note：** **During absolute positioning motion, if the workpiece program is error, or the operator is careless to cause contact between tools, the system will automatically detect it, stop the motion, and send a message showing error.**

**◎ Operational example：ABS_POSITING IX-30 IY50**

If the tool is currently at the work coordinate X30.0 Y10.0 Z0.0, after the directive of this segment is performed, it work coordinate is at X-30.0 Y50.0 Z0.0, and the tool moving path is as following figure shown.

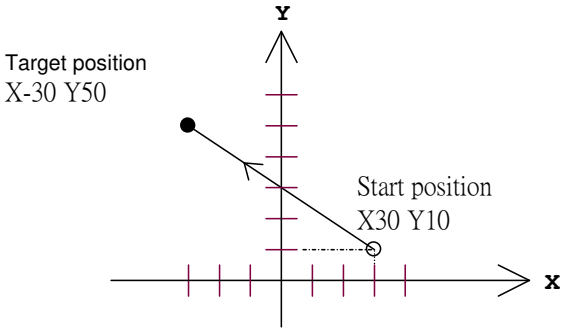


FIG. 9-6 Tool moving path

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**D. NG ABS_POSITING**

Action：Make an "absolute position" moving under NG.

Directive (instruction) format : NG ABS_POSITING X* Y* Z*

FIG. 9-7 dialogue window of NG ABS_POSITING

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

**Note:**

1. **During NG "absolute position" motion, if the workpiece program is error, or the operator is careless to cause contact between tools, the system not stop the motion,**
2. **This directive is used at the end of discharge to force the system not to make short circuit detect, and to move the tool to a safe position.**

**◎ Operational example：NG ABS_POSITING IX-30 IY50**

If the tool is currently at the work coordinate X30.0 Y10.0 Z0.0, after the directive of this segment is performed, its work coordinate is X-30.0 Y50.0 Z0.0, and the tool moving path is as following 10-5 figure shown.

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**E. MACH_POSITION**

Action：Move to the requested mechanical coordinate.

Directive format：MACH_POSITION X* Y* Z*

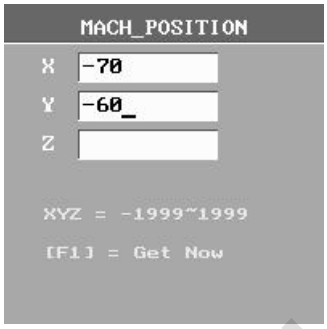


FIG. 9-8 Dialogue window of MACH_POSITION

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

**Note：** **<u>During "mechanical positioning" motion, if the workpiece program is error, or the operator is careless to cause contact between tools, the system will automatically detect it, stop the motion, and send a message showing error.</u>**

◎ **Operational example：MACH_POSITION (X-70 Y-60)**

If the tool is currently at the work coordinate X30.0 Y10.0 Z0.0, and the mechanical coordinate is at X0.0 Y0.0 Z0.0, after the directive of this segment is performed, the work coordinate is at X-40.0 Y-50.0 Z0.0, and the mechanical coordinate is at X-70.0 Y-60.0 Z0.0. The tool moving path is as following figure shown.

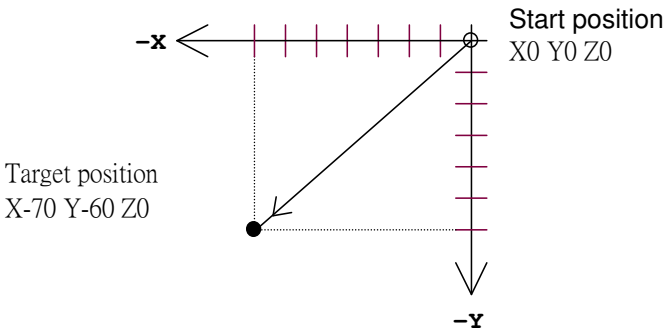


FIG. 9-9 tool moving path

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**F. MEMO_POSITION**

Action：Move to the mechanical coordinate where the memory set is stored.

Directive format: MEMO_POSITION P*

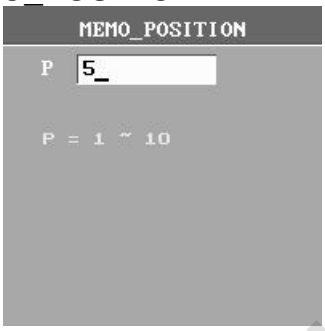


FIG. 9-10 Dialogue window of MEMO_POSITION

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. The coordinate value stored in memory set is the mechanical coordinate.

**Note：** **During positioning motion, if the workpiece program is error, or the operator is careless to cause contact between tools, the system will automatically detect it, stop the motion, and send a message showing error.**

◎ **Operational example：MEMO_POSITION P5**

If the tool is currently at the work coordinate X30.0 Y10.0 Z0.0, the mechanical coordinate is at X0.0 Y0.0 Z0.0. Besides, the mechanical coordinate value stored in the memory coordinate set P5 is X-50.0 Y-50.0 Z-50.0. After the directive of this segment is performed, its work coordinate is at X-20.0 -40.0 Z-50.0, and the mechanical coordinate is at X-50.0 Y-50.0 Z-50.0.

## RESERVE 1-1、1-2、1-3

Action： They will be used for future functional extension.

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## 9.1.2. CUTTING－Cutting is to linearly discharge electricity to the workpiece.

### A. REL_LINER_X_AXIS

Action：Make a linear cutting relatively to X axis.

Directive format：REL_LINER_X_AXIS　IX*　B code　C code

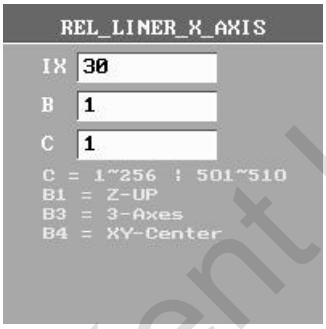


FIG. 9-11 Dialogue window of REL_LINER_X_AXIS

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

◎ **Operational example：REL_LINER_X_AXIS IX30 B1 C1**

If the tool is currently at the work coordinate X-10.0 Y10.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X20.0 Y10.0 Z0.0, and the tool moving path is as following figure shown.

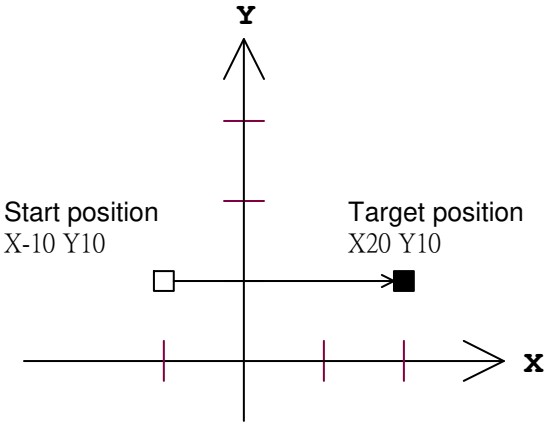


FIG. 9-12　Tool cutting path

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**B. REL_LINER_Y_AXIS**

Action：Make a linear cutting relatively to Y axis.

Directive format：REL_LINER_Y_AXIS IY* B code C code

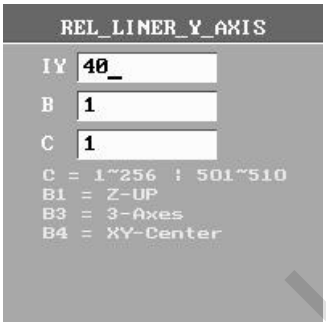


FIG. 9-13 Dialogue window of REL_LINER_Y_AXIS

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

◎ **Operational example：REL_LINER_Y_AXIS IY40 B1 C1**

If the tool is currently at the work coordinate X20.0 Y10.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X20.0 Y50.0 Z0.0, and the tool moving path is as following figure shown.

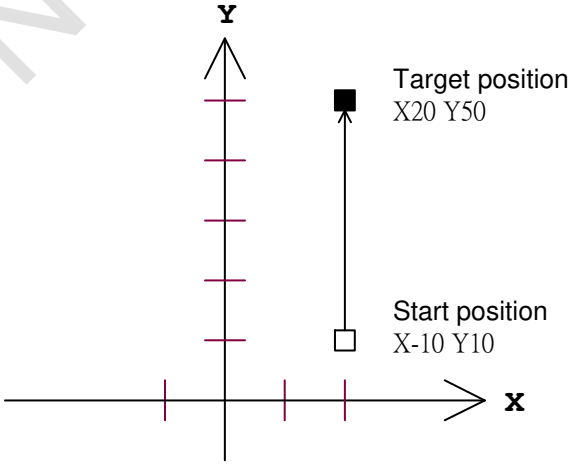


FIG. 9-14 Tool cutting path

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**C. REL_LINER_Z_AXIS**

Action：Make a linear cutting relative to Z axis.

Directive format：REL_LINER_Z_AXIS IZ* B code C code

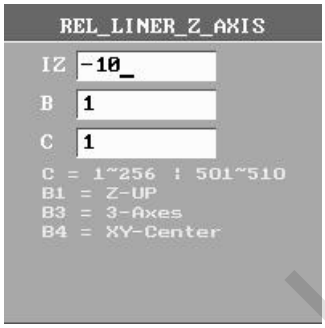


FIG. 9-15 Dialogue window of REL_LINER_Z_AXIS

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

◎ **Operational example：REL_LINER_Z_AXIS IZ-10 B1 C1**

If the tool is currently at work coordinate X0.0 Y0.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X0.0 Y0.0 Z-10.0, and the tool moving path is as following figure shown.

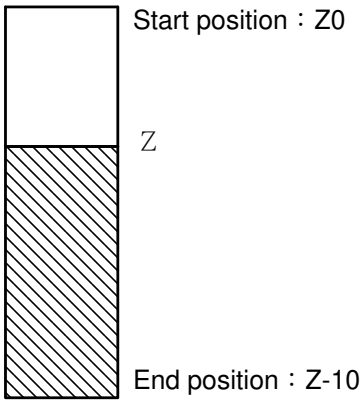


FIG. 9-16 Tool cutting path

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**D. REL_LINER_3_AXES**

Action：Make a linear cutting relatively to the 3 axes.

Directive format：REL_LINER_3_AXES IX* IY* IZ* B code C code

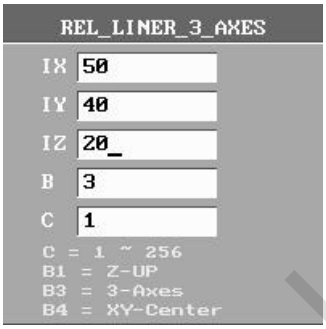


FIG. 9-17 Dialogue window of REL_LINER_3_AXES

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

**◎ Operational example：REL_LINER_3_AXES IX50 IY40 IZ20 B3 C1**

If the tool is currently at the work coordinate X10.0 Y0.0 Z-10.0, after the directive of this segment is performed, its work coordinate is at X60.0 Y40.0 Z10.0, and the tool moving path is as the following figure shown.

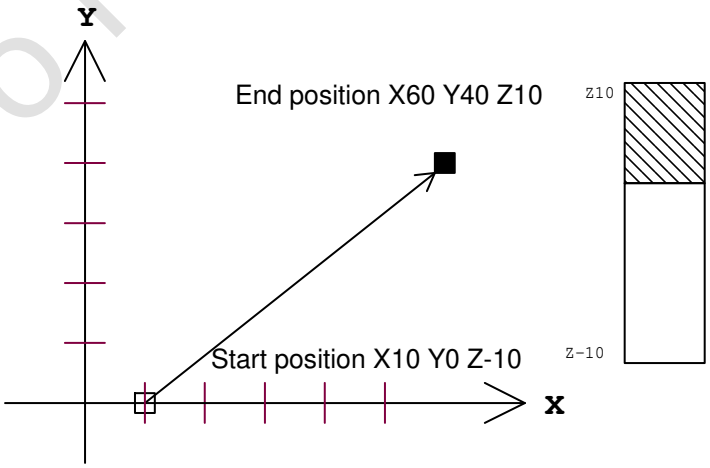


FIG. 9-18 Tool cutting path

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**E. ABS_LINER_X_AXIS**

Action：Make a liner cutting relatively to X axis.

Directive format：ABS_LINER_X_AXIS X* B code C code

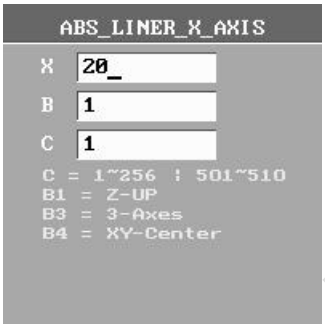


FIG. 9-19 Dialogue window of ABS_LINER_X_AXIS

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

◎ **Operational example：ABS_LINER_X_AXIS X20 B1 C1**

If the tool is currently at the work coordinate X-10.0 Y10.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X20.0 Y10.0 Z0.0, and the tool moving path is as the following figure shown.

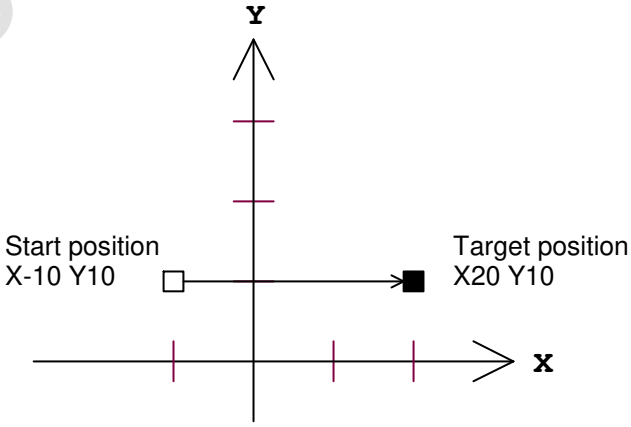


FIG. 9-20 Tool cutting path

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**F. ABS_LINER_Y_AXIS**

Action：Make a linear cutting relatively to Y axis.

Directive format：ABS_LINER_Y_AXIS Y*  B code  C code

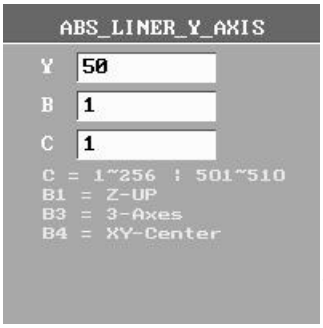


FIG. 9-21  Dialogue window of ABS_LINER_Y_AXIS

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.

3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

◎ **Operational example：ABS_LINER_Y_AXIS Y50 B1 C1**

If the tool is currently at the work coordinate X20.0 Y10.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X20.0 Y50.0 Z0.0, and the tool cutting path is as following figure shown.

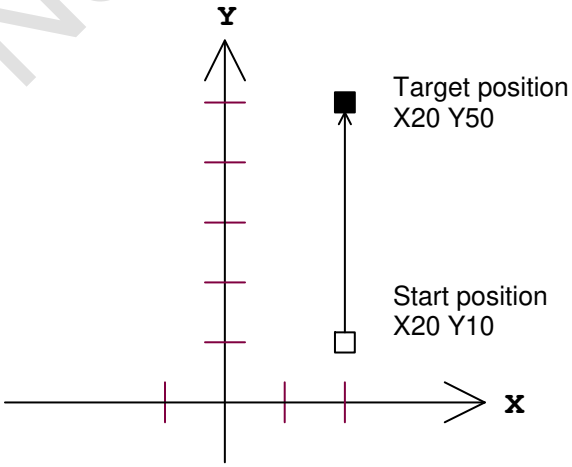


FIG. 9-22  Tool cutting path

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**G. ABS_LINER_Z_AXIS**

Action：Make a linear cutting relatively to Z axis.

Directive format：ABS_LINER_Z_AXIS Z* B code C code

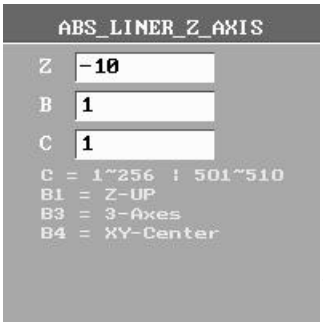


FIG. 9-23 Dialogue window of ABS_LINER_Z_AXIS

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

◎ **Operational example：ABS_LINER_Z_AXIS IZ-10 B1 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, after the directive of this segment is performed, its work coordinate is at X0.0 Y0.0 Z-10.0, and the tool moving path is as following figure shown.

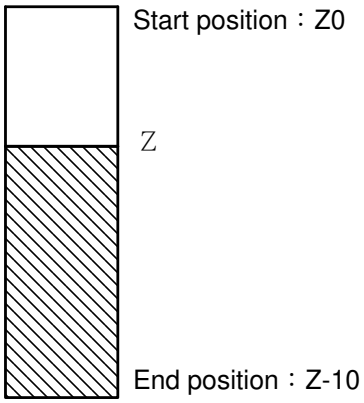


FIG. 9-24 Tool moving path

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### H. ABS_LINER_3_AXES

Action：Make a linear cutting to the absolute 3 axes.

Directive format：ABS_LINER_3_AXES X* Y* Z* B code C code

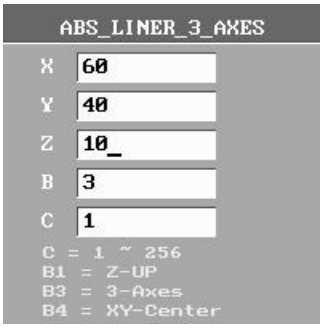


FIG. 9-25 Dialogue window of ABS_LINER_3_AXES

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.

◎ **Operational example：ABS_LINER_3_AXES X60 Y40 Z10 B3 C**

If the tool is currently at the work coordinate X10.0 Y0.0 Z-10.0, after the directive of the segment is performed, its work coordinate is at X60.0 Y40.0 Z10.0, and the tool cutting path is as the following figure shown.

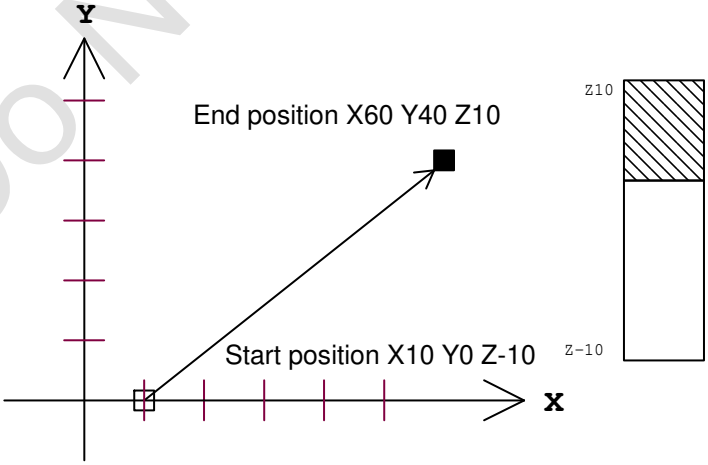


FIG. 9-26 Tool moving path

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## I. HOLES_OF_LINE

After this directive is completed, the tool returns to the start position.

Action：Make a linear and multiple-hole machining.

Directive format：HOLES_OF_LINE IZ* C code IX* IY* N code

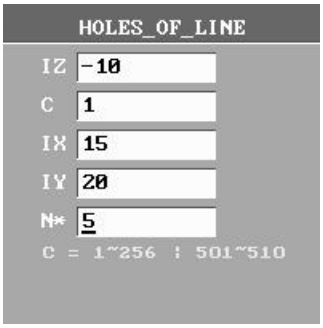


FIG. 9-27 Dialogue window of HOLES_OF_LINE

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.
4. N code stands for the number of the hole to be machined. Therefore, only positive numbers can be input.

**◎ Operational example：HOLES_OF_LINE IZ-10 C1 IX15 IY20 N*5**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. In other words, when the vertical depth is at Z-10, Z axis ascends to Z1.0. Then, X axis moves 15mm, and Y axis moves 20mm. After that, the tool proceeds the machining for 2nd hole. The machining is in this order to the 5th hole (N*5). The moving path is as following figure shown. (N1→N5)

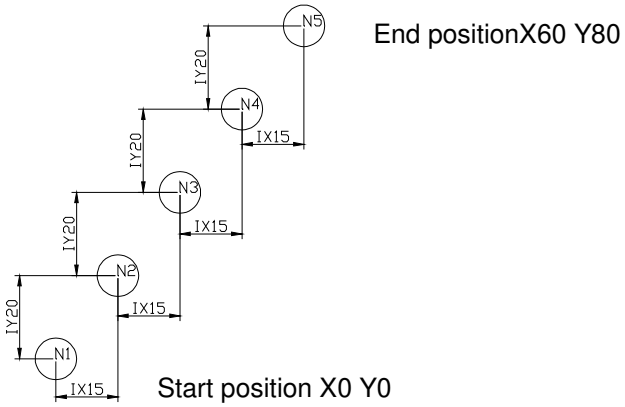


FIG. 9-28 Tool moving path

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## J. HOLES_OF_SQUARE

After this directive is completed, the tool returns to the start position.

Action：Make a machining of “square matrix” multiple holes

Directive format：HOLES_OF_SQUARE IZ* C code IX* IY* X code Y code

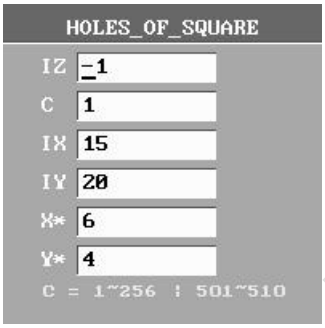


FIG. 9-29 Dialogue window of HOLES_OF_SQUARE

Execution：1. “*” stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.
4. X code stands for the no. of the line to be machined. Y code stands for the no. of the row to be machined. Therefore, only positive numbers can be input.

◎ **Operational example：HOLES_OF_SQUARE IZ-1 C1 IX15 IY20 X*6 Y*4**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. In other words, If the vertical depth is at Z-1.0, Z axis will ascend to Z1.0. Then, X axis moves 15mm, and the tool begins to machine the 2nd hole. After the tool machines 6 holes on X axis, the tool moves 20mm to Y axis, and continue to machine the 2nd row. The tool proceeds the machining in this order. The tool moving path is as the following figure shown (N1→N24).

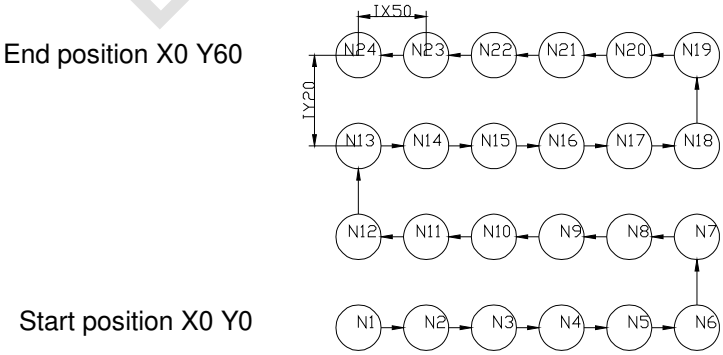


FIG. 9-30 Tool moving path

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### K. HOLES_OF_CIRCLE

After this directive is completed, the tool returns to the start position.)

Action：Make a “round Matrix” multiple hole machining.

Directive format：HOLES_OF_CIRCLE IZ* C code HR code N code

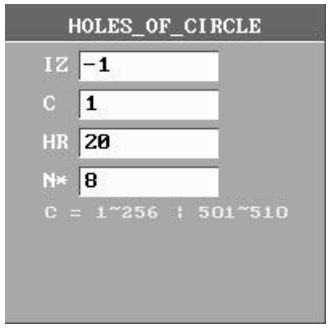


FIG. 9-31 Dialogue window of HOLES_OF_CIRCLE

Execution：1. “*” stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. When the input unit is mm, the input parameter value is -1999~1999. The smallest input unit is 0.001mm.
3. When the input unit is inch, the input parameter value is -1999~1999. The smallest input unit is 0.0001 inch.
4. N code stands for the no. of the hole to be machined. Therefore only positive numbers can be input.
5. HR is the radius of round matrix. Only positive numbers 0~1999 can be input.

◎ **Operational example：HOLES_OF_CIRCLE IZ-1 C1 HR20 N*8**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. The tool moves 20mm to X axis, and begins to machine hole N1 till the tool is at Z-10. Then, the tool begins to machine holes N2~N8 (N*8) in clockwise direction (radius 20mm). The tool moving path is as the following figure shown.（N1→N8）

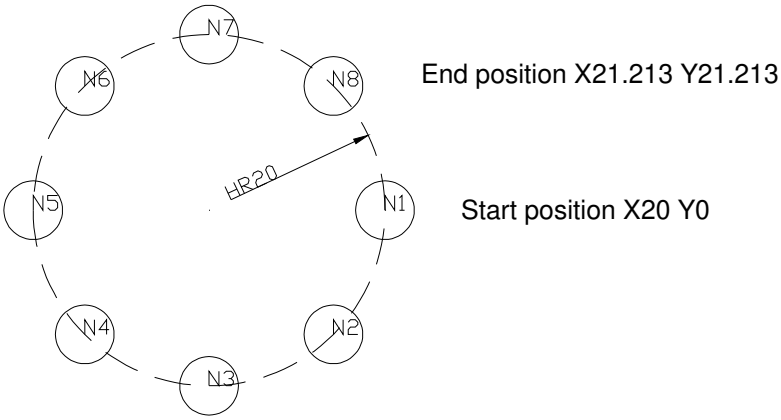


FIG. 9-32 Tool moving path

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## 9.1.3 VECTOR－Vector is a combination of straight lines, and discharges electricity to acute angle.

### A. CIRCLE_VECTOR

After this directive is completed, the tool returns to the start position.

Action：Trim the plane round, or round the angle.

Directive format：CIRCLE_VECTOR HR* code　IA* code　C code

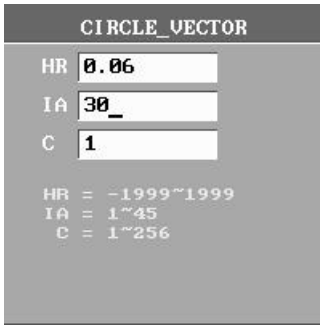
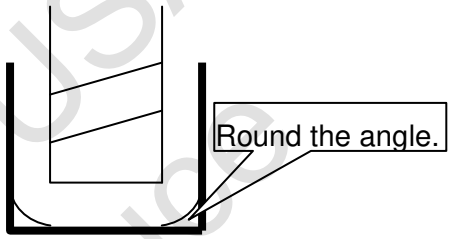



FIG. 9-33　dialogue window of the CIRCLE_VECTOR




Discharge electricity to acute angles.

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

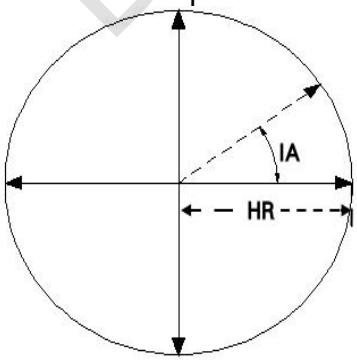
2. Horizontal Radius (HR) : 0.001~1999

3. Horizontal increment angle (IA)1~45: Only positive integrals can be input.

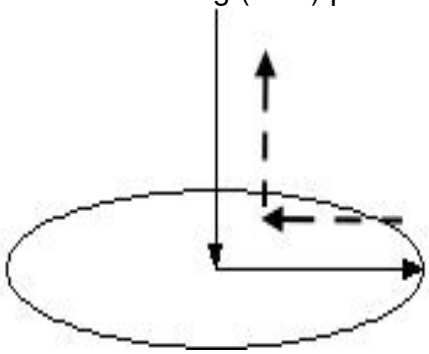
◎ **Operational example：CIRCLE_VECTOR HR0.06　IA30　C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive is performed by relative increment. The tool moves to X axis to proceed the machining till the tool is at the maximum radius 0.06mm. Then, every counterclockwise turn of 30°, the tool machines the circumference once.

Work path




Residue removing (P.P.) path



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**B. CIR.ARC_ VECTOR**

After this directive is completed, the tool returns to the start position.

Action：Trim the edge or round the angle of the round (arc) radical vector

Directive format：CIR.ARC_ VECTOR SA* code EA* code IA* code HR* code C code

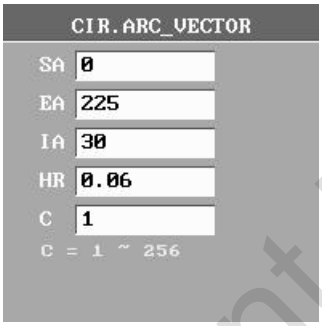



FIG.9-34 Dialogue window of CIR.ARC_ VECTOR

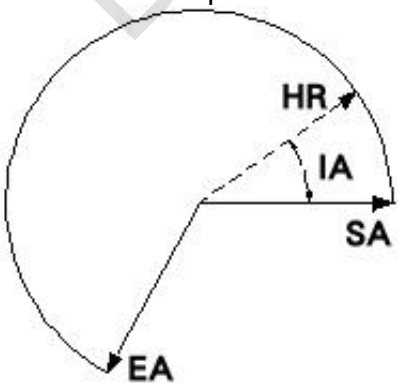
Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Start angle (SA) : 0° ~359° , start angle ＜ end angle
3. End angle（EA）: 1° ~360° , start angle ＜ end angle
4. Horizontal increment angle（IA）: 1° ~45° . Only positive integrals can be input.
5. Horizontal Radius (HR) : 0.001~1999

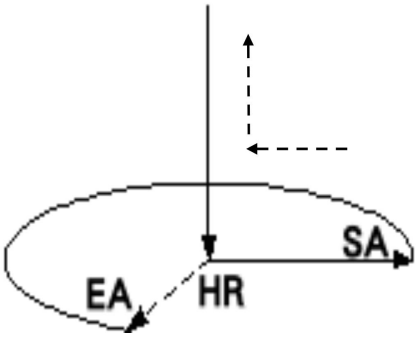
◎ **Operational example：CIR.ARC_ VECTOR SA0 EA225 IA30 HR0.06 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, this directive is performed by relative increment. Firstly, the tool moves to X axis to work till the tool is at the maximum radius 0.06mm. The start angle of work begins from 0° . Every reverse turn of 30° , the tool machines the circumference once till the circle turns 225° . It is one cycle.

Work path




Residue removing (P.P.) path

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### C. CONE_ VECTOR

After the directive is completed, the tool returns to the start position.

Action：Trim the edge, or round the angle of the column vector.

Directive format：CONE_ VECTOR SA* code EA* code IA* code HR* code VD* code C code

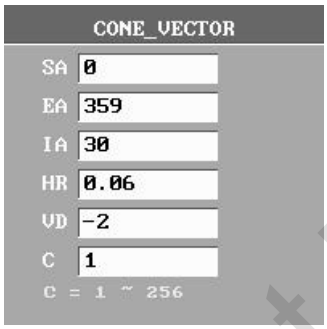



FIG. 9-35 Dialogue window of CONE_ VECTOR

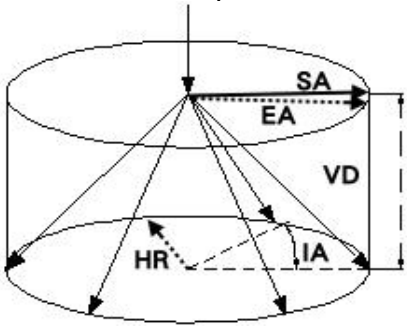
Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Start angle (SA): 0° ~359°. start angle ＜ end angle
3. End angle（EA）: 1° ~360°, start angle ＜end angle。
4. Horizontal increment angle（IA）: 1° ~45°. Only positive integrals can be input.
5. Vertical Depth（VD）: When the input unit is mm, the input parameter -1999. The smallest input unit is 0.001mm.
6. Horizontal Radius (HR) : 0.001~1999

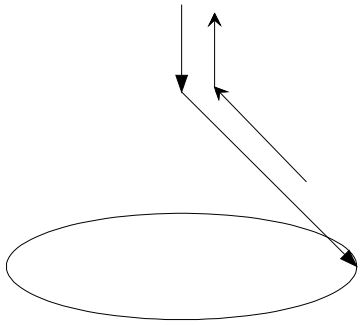
◎ **Operational example：CONE_ VECTOR SA0 EA359 IA30 HR0.06 VD-2 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. The tool works at 0° till the tool is at the maximum radius 0.06mm and 2mm depth. The tool works on the circumference at each reverse turn of 30° till the tool is at the maximum radius 0.06mm and the depth-2mm. The tool stops at 359°. It is one cycle. The work ends.

Work path




Residue removing (P.P.) path



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**D. SQUARE_VECTOR**

After this directive is completed, the（此 tool returns to the start position

Action：Trim the edge, or round the angle of the plane square vector.

Directive format：SQUARE_VECTOR HR* code　C code

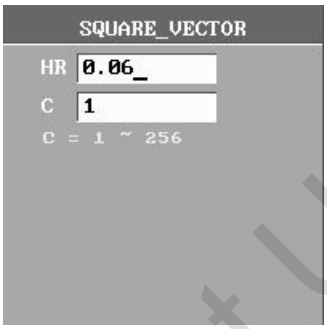



FIG.9-36 Dialogue window of SQUARE_VECTOR

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

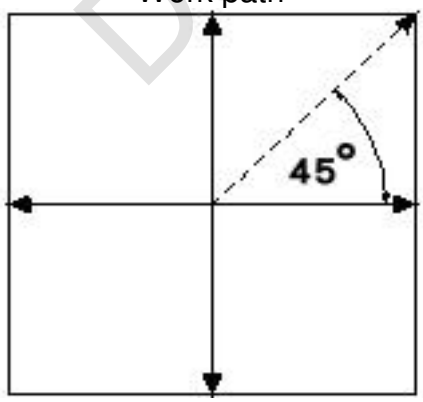
2. Horizontal Radius (HR) : 0.001~1999

3. The horizontal increment angle is built in. The range is 45° only. Only positive integrals can be input.

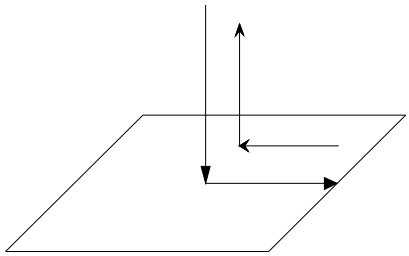
◎ **Operational example：SQUARE_VECTOR HR0.06　C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. Firstly the tool works at 0° till the tool reaches the radius 0.06mm. Then, in counterclockwise direction, the tool works at 45° . The program will automatically figure out the linear cutting distance of 45° till the tool reaches 360° . It is one cycle. The work ends.

Work path




Residue removing (P.P.) path



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**E. CUBE_TAPER**

After this directive is completed, the tool returns to the start position.

Action：Trim the edge or round the angle of the square column vector.

Directive format：CUBE_TAPER SA* code EA* code IA* code HR*code VD* code C code

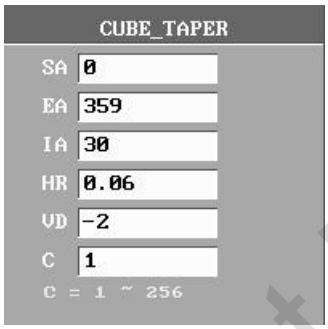



FIG. 9-37 Dialogue window of CUBE_TAPER

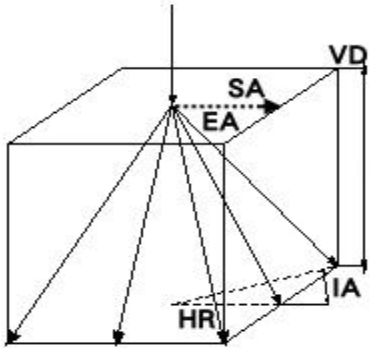
Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Start angle（SA）: 0° ~359° Start angle＜end angle
3. End angle（EA）: 1° ~360° Start angle＜end angle
4. Horizontal increment angle（IA）: 1° ~45° Only positive integrals can be input.
5. Vertical depth（VD）: When the input unit is mm, the input parameter values are 1999~ -1999. The smallest input unit is 0.001mm.
6. Horizontal Radius (HR) : 0.001~1999

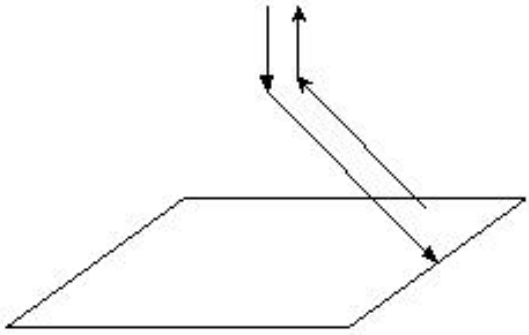
◎ **Operational example：CUBE_TAPER SA0 EA359 IA30 HR0.06 VD-2 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. Firstly, the tool works at 0° till the tool is at the maximum radius 0.06mm and the depth -2mm. Then, the tool works at every reverse turn of 30° till the tool is at the maximum radius and the depth -2mm. The program will automatically figure out the linear cutting distance of 30° . The tool will stop at 359° . It is one cycle.

Work path




Residue removing (P.P.) path



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### F. ZX_PLANE_ORBIT

After this directive is completed, the tool returns to the start position.

Action：Trim the edge or round the angle.

Directive format：ZX_PLANE_ORBIT SA* code EA* code IA* code HR* code VD* code C code

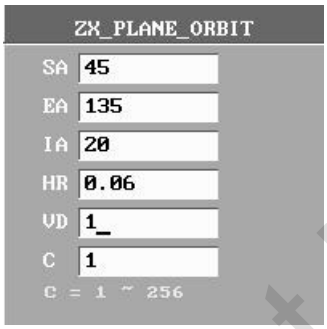



FIG. 9-38 Dialogue window of ZX_PLANE_ORBIT

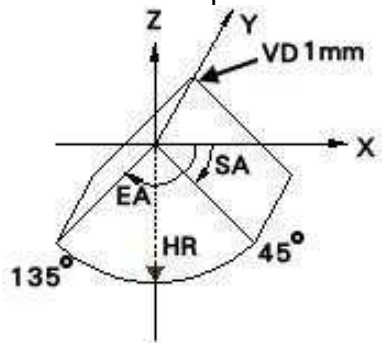
Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Start angle（SA）: 0° ~180°, start angle ＜ end angle
3. End angle（EA）: 1° ~180°, start angle ＜end angle
4. Horizontal increment angle (IA): 1° ~45° Only positive integrals can be input.
5. Vertical Depth（VD）: When the input unit is mm, the input parameter values are 1999~ -1999. The smallest input unit is 0.001mm.
6. Horizontal Radius (HR) : 0.001~1999

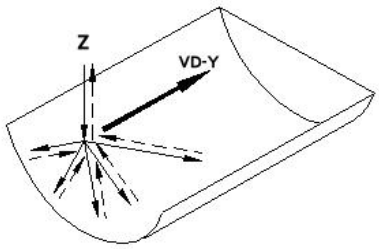
◎ **Operational example：ZX_PLANE_ORBIT SA45 EA135 IA20 HR0.06 VD1 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. Firstly, the tool works at 45˚till the tool is at the maximum radius 0.06mm. The depth (VD) stands for the tool in clockwise direction working at 65˚after the tool cuts 1mm on Y axis. Then, the tool is at the maximum radius and 1mm depth. At last the tool is at 135˚. It is one cycle. Thus the work ends.

Work path




Residue removing (P.P.) path

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## G. ZY_PLANE_ORBIT

After this directive is completed, the tool returns to the start position.

Action：Trim the edge or round the angle of Z-Y semi-circle.

Directive format：ZY_PLANE_ORBIT SA* code EA*code IA* code HR* code VD* code C code

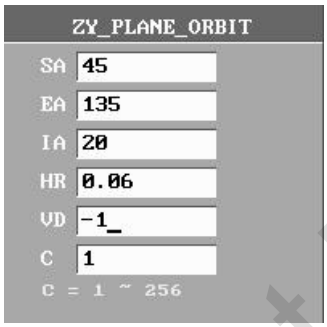



FIG. 9-39 Dialogue window of ZY_PLANE_ORBIT

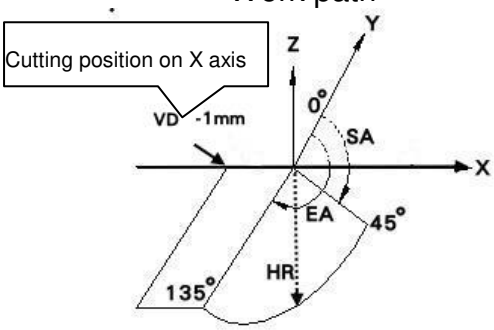
Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Start angle（SA）: 0° ~180°, start angle＜end angle
3. End angle（EA）: 0° ~180°, start angle＜end angle
4. Horizontal increment angle（IA）: 1° ~45°. Only positive integrals can be input.
5. Vertical Depth（VD）: When the input unit is mm, the input parameter values are 1999~ -1999. The smallest input unit is 0.001mm.
6. Horizontal Radius (HR) : 0.001~1999

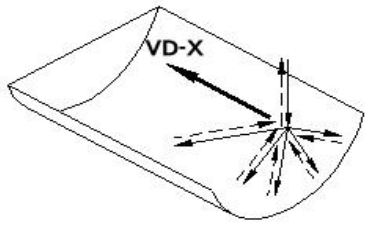
◎ **Operational example**：column vector **SA45 EA135 IA20 HR0.06 VD3 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the directive will be performed by relative increment. Firstly the tool works at 45˚ till the tool is at the maximum radius 0.06mm. This depth (VD) stands for the tool in clockwise direction working at 65˚after the tool cuts -1mm on X axis till the tool is at the maximum radius., and cut -1mm on X axis. At last the tool is at 135˚. It is one cycle. The work ends.

Work path




Residue removing (P.P.) path

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## 9.1.4 SHAKE - 『Sway and trim depending on circles and square columns.

### A. CIRCLE_LORAN

Action：Sway and trim the edge of circle (round column).

Directive format：CIRCLE_LORAN HR* code VD* code B code C code

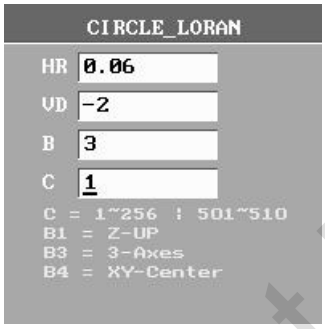



FIG. 9-40 Dialogue window of CIRCLE_LORAN

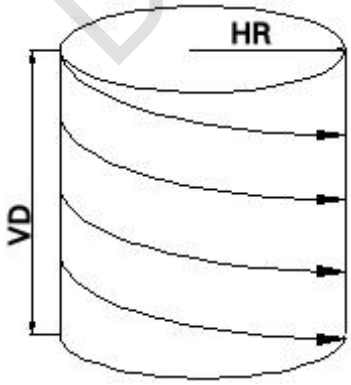
Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Horizontal Radius (HR) : 0.001~1999
3. Vertical Depth（VD）: When the input unit is mm, the input parameter values are 1999~ -1999. The smallest input unit is 0.001mm.
4. Mode (B): Refer you to the description of Residue Removing.

◎ **Operational example：CIRCLE_LORAN HR0.06 VD-2 B3 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the work path B will be selected. This directive will be performed by relative increment. At the beginning the tool works directly to reach VD : -2mm on Z axis. Then, the tool moves at constant speed, and begins to sway along the circumference till the tool is at the maximum radius HR0.06mm. After that, the work is ended.

Work path




Residue removing (P.P.) path

The residue path varies depending the setting of B value.

B=1：Z axis vertical movement

B=2：standby

B=3：along the original path to the center, Z axis ascends.

B=4：3 axes are pulled back synchronically to the center at residue removing (P.P.) height.

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**B. SQUARE_LORAN**

Action：square（column）sway trimming

Directive format：SQUARE_LORAN HR* code VD* code B code C code

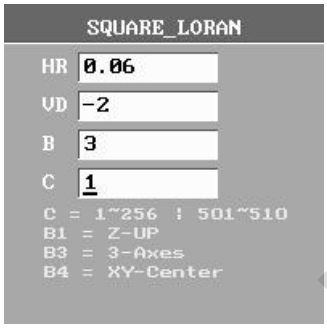



FIG. 9-41 Dialogue window of SQUARE_LORAN

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Horizontal Radius (HR) : 0.001~1999

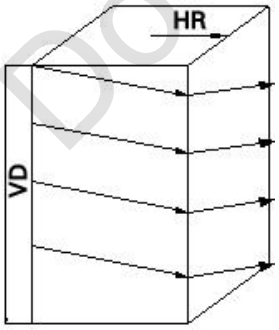
3. Work depth（VD）: When the input unit is mm, the input parameter values are 1999~ -1999. The smallest input unit is 0.001mm.

4. Mode (B): Refer you to the description of Residue Removing.

◎ **Operational example：SQUARE_LORAN HR0.06 VD-2 B3 C1**

If the tool is currently at X0.0 Y0.0 Z0.0, the work path B will be selected. This directive will be performed by relative increment. At the beginning the tool will work on Z axis to VD : -2mm. Then, the tool moves at constant speed, and begins to sway till the tool is at the maximum radius HR0.06mm. After that, the work is ended.

Work path




Residue removing (P.P.) path

The residue removing path varies depending on the setting of B value.

B=1：Z vertical movement

B=2：standby

B=3：along original path to the center, Z axis ascends.

B=4：The 3 axes are pulled back synchronically to the center at residue removing (P.P.) height.

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**C. CIRCLE_LORAN(3D)**

Action：circle (round column) spiral trimming

Directive format：CIRCLE_LORAN(3D) HR* code VD* code B code C code

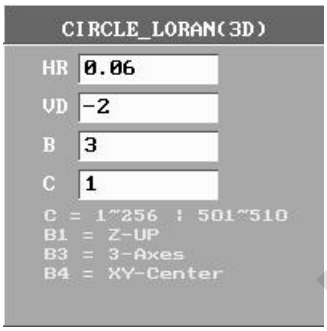



FIG. 9-42 Dialogue window of CIRCLE_LORAN(3D)

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Horizontal Radius (HR) : 0.001~1999

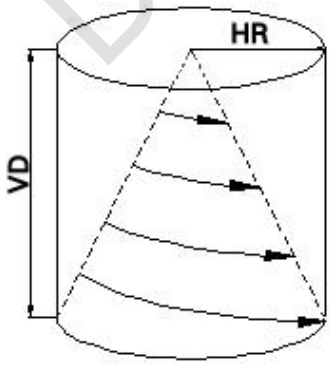
3. Vertical depth（VD）: When the input unit is mm, the input parameter values are 1999~ -1999. The smallest input is 0.001mm.

4. Mode (B): Refer you to the description of Residue Removing.

◎ **Operational example: CIRCLE_LORAN(3D) HR0.06 VD-2 B3 C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the work path B will be selected. This directive will be performed by relative increment. At the beginning the tool, from the start point as the center, gradually sways outward to the work depth（VD）-2mm and the radius (HR) 0.06mm at the same time. Then, the work is ended.

Work path




Residue removing (P.P.) path

The residue removing path varies depending on the setting of B value.

B=1：Z axis vertical movement

B=2：standby

B=3：along the original path to the center, Z axis ascends.

B=4：The 3 axes are pulled back synchronically to the center at residue removing (P.P.) height.

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**D. SQUARE _LORAN(3D)**

Action：square (column) spiral trimming

Directive format：SQUARE _LORAN(3D)　HR* code　VD* code　C code

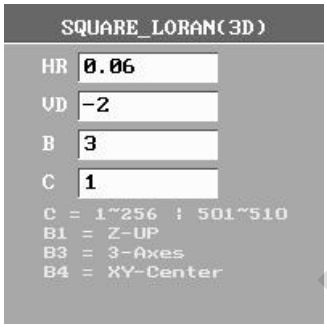



FIG. 9-43 Dialogue window of SQUARE _LORAN(3D)

Execution：1. "*" stands for a real number in reasonable range. Please input the prompt in the prompt field.

2. Horizontal Radius (HR) : 0.001~1999

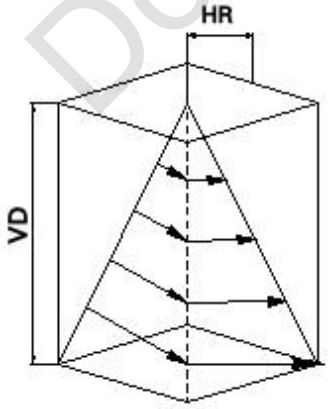
3. Work depth（VD）: When the input unit is mm, the input parameter values are 1999~ -1999. The smallest input unit is 0.001mm.

4. Mode (B): Refer you to the description of Residue Removing.

◎ **Operational example：SQUARE _LORAN(3D) HR0.06　VD-2　B3　C1**

If the tool is currently at the work coordinate X0.0 Y0.0 Z0.0, the work path B will be selected. This directive will be performed by relative increment. At the beginning the tool, from the start point as the center, gradually sways outward till the tool is at the work depth（VD） -2mm and the radius (HR) HR0.06mm at the same time. Then, the work is ended.

Work path　　Residue removing (P.P.) path




The residue removing path varies depending on the setting of B value.

B=1：Z vertical movement

B=2：standby

B=3：along the original path to the center, Z axis ascends.

B=4：The 3 axes are pulled back synchronically to the center at the residue removing (P.P.) height.

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### 9.1.5 IO-ON－Provide the users with some often used software.

（1） INC_OIL_ON: The oil intermittent spray ON is controlled by the program.
（2） LIQUID_LEVEL_ON: It is controlled by the program.
（3） SLEEP_ON: It is controlled by the program.
（4） Z_LOCK_ON: It is controlled by the program.
（5） OIL_PUMP_ON: It is controlled by the program.
（6） DRY_RUN_ON: It is controlled by the program.
（7） METAL_FILTER_ON: It is controlled by the program. (Display only on S.F. machines.)
（8） DUST_ FILTER_ON: It is controlled by the program. (Display only on S.F. machines.)
（9） AGITATOR_ON: Display only on S.F. machines.
(10) COOLER_ON: It is controlled by the program. (Display only on S.F. machines.)

**（10） ※ explanation for Items（7）~（10）:**

1. TF stands for the OFF time for the directive. (The unit is Minute. The range is 0 ~ 6000.)
2. TN stands for the ON time for the directive(The unit is Minute. The range is 0 ~ 600.)
3. When “Control ON－Filter metal powder ON, Filter silicon powder ON, Mixing motor ON and Cooler ON” and “Save work program- Filter metal powder, Filter silicon powder, Mix and Cool” coexist, only “Save work program” will be valid. Even if there are (7) ~ (10) items in the program, they will be ignored.
4. When TF>0 and TN>0 in recurring action, it is the time to switch off TF, and then switch on TN.
5. According to the directive “Filter metal powder ON, TF60 and TN5”, the motor of filtering metal powder is switched off for 60 minutes. Then, “Filter metal powder” is switched on for 5 minutes. After 60 minutes, the motor is switched on again. Such steps repeat till the program ends.

5. The users may adjust the time for TF and TN depending on the work status.

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### 9.1.6 IO-OFF－Provide the users with some often used software

（1） INC_OIL_OFF: controlled by the program.
（2） LIQUID_LEVEL_OFF: controlled by the program.
（3） SLEEP_OFF: controlled by the program.
（4） Z_LOCK_OFF: controlled by the program.
（5） OIL_PUMP_OFF: controlled by the program.
（6） DRY_RUN_OFF: controlled by the program.
（7） METAL_FILTER_OFF: controlled by the program. (Display only for S.F. machine.)
（8） DUST_ FILTER_OFF: controlled by the program. (Display only for S.F. machine.)
（9） AGITATOR_OFF: controlled by the program. (Display only for S.F. machine.)
(10) COOLER_OFF: controlled by the program. (Display only for S.F. machine.)

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### 9.1.7 POSITION

The position directive groups are shown below -

**A. HOME**

Explanation: During the work, if there is a directive of “HOME” in the program directive row, the machine will perform the action of finding the origin.

Directive format (instruction format)：MD* code

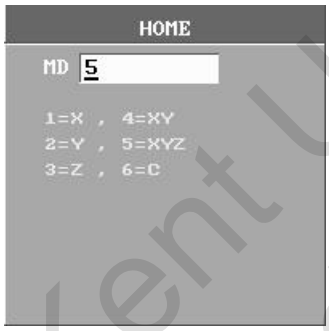


FIG. 9-44 Dialogue window of HOME

Execution 1. “*” stands for a real number in a reasonable range. Enter a number according to the cue in the prompt column.

2. For the motion, refer you to “Find the origin” in Chapter 9 Manual Mode-A.

**Note** 1 When you edit the program, let the tool return to the work start position first. Then, find the origin.

2. During the motion, if the workpiece program is error, or the operator is neglectful which results in tool contact, the system will automatically detect it, and stop the motion, and send ERROR message.

◎ **Work example**

N0001 HOME XYZ → **During the work, perform the finding of origin for XYZ**

N0002 ABS_POSITION X-200 Y-100 Z-200

N0003 POS.SETUP X0 Y0 Z0

N0004 ABS_LINER_Z_AXIS Z-10 B1 C1

N0005 ABS_POSITION X0 Y0 Z0 → **The tool returns to the work start position.**

N0006 HOME XYZ.

**B. EDGE**

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Explanation: During the work, if there is a directive of EDGE in the program directive row, the machine will perform the action of finding edge.

Directive format: MD* code

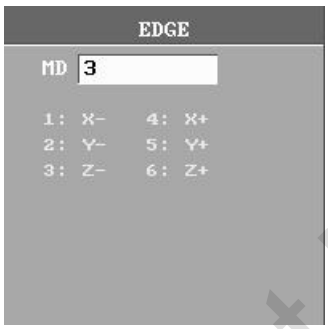


FIG. 9-45 dialogue window for EDGE

Execution 1. "*" stands for a real number in a reasonable range. Enter a number according to the cue in the prompt column.

2. For the motion, refer you to Find Edge in Chapter 9 Manual Mode-B.

**Note** 1. When the program is edited, the work path shouldn't have a short circuit.

2. During the motion, if the workpiece program is error, or the operator is neglectful which results in tool contact, the system will automatically detect it, and stop the motion, and send ERROR message.

◎ **Work example: Z axis works. Find the datum plane for the workpiece.**

N0001 EDGE Z → **The tool and the workpiece shouldn't have a short circuit. Find edge for Z axis.**

N0002 POS.SETUP X0 Y0 Z0

N0003 NG ABS_POSITION Z1 → **Force Z axis to leave the surface of the mold.**

N0004 ABS_LINER_Z_AXIS Z-10 B1 C1

**C. INT_CAVITY**

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Action: During the work, if there is a directive “INT_CAVITY”in the program directive row, the machine will perform the action of “INT_CAVITY”.

Directive format: MD* code

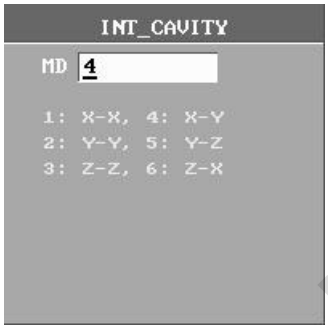


FIG. 9-46 Dialogue window of “INT_CAVITY”

Execution
1. “*” stands for a real number in a reasonable range. Enter a number according to the cue in the prompt column.
2. For the motion, refer you to “INT_CAVITY” in Chapter 9 Manual mode-C.

**Note**
1. When the program is edited, the work path shouldn’t have a short circuit.
2. During the motion, if the workpiece program is error, or the operator is neglectful which results in tool contact, the system will automatically detect it, and stop the motion, and send ERROR message.

◎ **Work example: After rough machining, make fine machining in the interior of the hole.**

N0001 POS.SETUP X0 Y0 Z0
N0002 CIRCLE_LORAN HR0.06 VD-10 B3 C1 → Column trims the edge.
N0003 NG ABS_POSITION Z1
N0004 ABS_POSITION X20
N0005 ABS_POSITION Z-5 → Tool of hole 2 in place
N0006 INT_CAVITY X-Y → Perform X-Y action for the center of INT_CAVITY
N0007 NG ABS_POSITION Z1
N0008 CIRCLE_LORAN HR0.06 VD-10 B3 C1

**D. EXT_CAVITY**

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Action: During the work, if there is a directive “EXT_CAVITY” in the program directive row, the machine will perform the action of “EXT_CAVITY”.

Directive format: MD* code, IX* code, IY* code, IZ* code

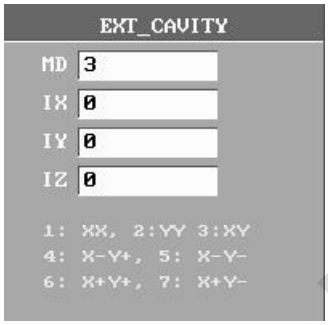


FIG. 9-47 Dialogue window “EXT_CAVITY”

Execution
1. “*” stands for a real number in a reasonable range. Enter a number according to the cue in the prompt column.
2. For the motion, refer you to Center of Outer Hole in Chapter 9 Manual Mode –D.

**Note**
1. The values of IX, IY and IZ should be larger than the radius of the mold plate.
2. When the program is edited, the work path shouldn’t have a short circuit.
3. During the motion, if the workpiece program is error, or the operator is neglectful which results in tool contact, the system will automatically detect it, and stop the motion, and send ERROR message.

**Work example: If the mold plate is (X20 Y30 Z20), move the tool to the center of the mold plate (approximate value). Set 0 for XYZ coordinate. On the setting screen of the outer hole center, enter IX=11, IY=16 and Z=5.**

N0001 ABS_POSITION X0 Y0 Z1
N0002 EXT_CAVITY MD3 IX11 IY16 Z5 → **Perform XY action of EXT_CAVITY.**
N0003 ABS_POSITION X20
N0004 ABS_LINER_Z_AXIS Z-10 B1 C1

**E. CENTER 1/2**

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Action: During the work, if there is a directive “CENTER 1/2” in the program directive row, the work coordinate will perform the action.
Directive format: MD* code

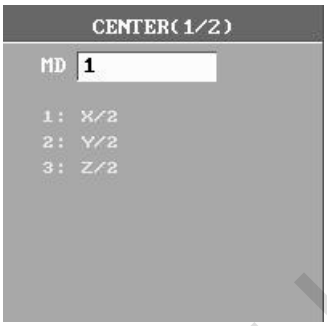


FIG. 9-48 Dialogue window of “CENTER 1/2”

Execution 1. “*” stands for a real number in a reasonable range. Enter a number according to the cue in the prompt column.

◎ **Work example: If the current coordinate value is (X-150，Y210，Z50).**

N0001 CENTER 1/2 X/2 → **X/2= -75**

## F. WORK/ABS_COORD

Action: During the work, if there is a directive “WORK/ABS_COORD.” in the program directive row, the coordinate system will be changed.
Directive format: MD* code

FIG. 9-49 Dialogue window of “WORK/ABS_COORD.”

Execution 1. “*” stands for a real number in a reasonable range.
Enter a number according to the cue in the prompt column.

◎ **Work example: If the current work coordinate is (X0，Y0，Z0),**

N0001 WORK/ABS_COORD.REF → The work coordinate will become an absolute coordinate.

## G. POS.SETUP

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Action: During the work, if there is a directive “POS.SETUP” in the program directive row, the work coordinate will perform the action.

Directive format: X* code, Y* code, Z* code and U* code

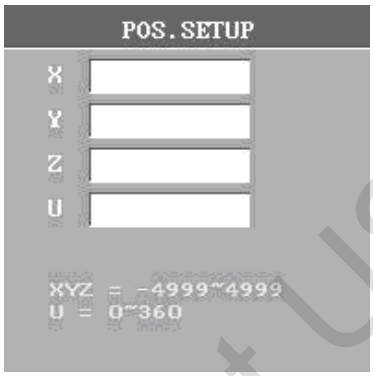


FIG. 9-50 Dialogue window of POS.SETUP

Execution 1. “*” stands for a real number in a reasonable range.
Enter a number according to the cue in the prompt column.

◎ **Work example: If the current coordinate is (X0 Y0 Z0),**

N0001 POS.SETUP X10 Y20 Z10 → The work coordinate value will be automatically changed to (X10, Y20, Z10).

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### H. RECORD_COORD

Explanation: If there is a directive “RECORD_COORD” in the program directive row during the work, the work coordinate will perform this action.

Directive format: P* code

FIG. 9-51 Dialogue window of RECORD_COORD

Execution 1. “*” stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.

2. This function has 10 sets (P1~P10) of memory to store the positions of the machine coordinates.
3. For setting P value, refer you to Saving Coordinate in Chapter 9. Manual Mode.

◎**Work example:** If the current machine coordinate is - mx:-100.100, my:-120.200, mz:-50.300, record this coordinate as P1. Move the die block (machine Head) to the position (mx:-200.005, my:-50.600, mz:-0.800). Record this coordinate as P2.

N0001 RECORD_COORD P1 → The machine coordinate will automatically move to work point 1.

N0002 REL_LINER_Z_AXIS Z-10 B1 C1

N0003 NG REL_POSITION Z11

N0004 RECORD_COORD P2 → The machine coordinate will automatically move to work point 2.

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## I. NOTE&PAUSE

Action: If the program directive has one “NOTE&PAUSE” directive during the work, the program will perform the action.

Directive format: #* code and T* code

FIG. 9-52 dialogue window of “NOTE&PAUSE”

Execution 1. “*” stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.

2. “#” is often used as a note when the program has several lines. It is for user’s reading convenience, and won’t affect the machine action.

3. ”T” parameter stands for the number of hold second.

◎ **Work example**

N0001 ABS_POSITION Z1
N0002 REL_LINER_Z_AXIS Z-11 B1 C1
N0003 NG REL_POSITION Z11
N0004 NOTE&PAUSE #1 T20 → Hold 20 seconds at work point 1.
N0005 REL_POSITION X10
N0006 REL_LINER_Z_AXIS Z-11 B1 C1
N0007 NG REL_POSITION Z11
N0008 NOTE&PAUSE #2 T20 → Hold 20 seconds at work point 2.

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**J. LOOP (S) & CALL**

Action: If the program directive has a directive “LOOP (S) & CALL” during the work, the program will perform this action.

Directive format: L* code and F* code

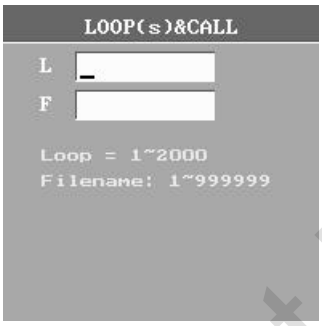


FIG. 9-53 dialogue window “LOOP (S) & CALL”

Execution
1. “*” stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.
2. L (loop) stands for the number of execution made by the subprogram.
3. F (subprogram) stands for the file name of the subprogram. The file name of the subprogram consists of only figures.

◎ **Work example**

N0001 ABS_POSITION X0 Y0 Z0

N0002 LOOP (S) & CALL L10 F11 → Call the file name of the subprogram ( 11.prg) 10 times.

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**K. TOOL_CHANGE ( available only for ATC models)**

Action: If the program directive has a “TOOL_CHANGE” directive during the work, the program will perform this action.

Directive format: No* code

FIG. 9-54 Dialogue window “TOOL_CHANGE”

Execution 1. “*” stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.

2. “No” stands for the tool number. Take tool: 1~16 ( depending on the ATC turret specifications). Reset tool: 0

## L. MACHINE_BY_TIME

Action: If the work directive has “MACHINE_BY_TIME”, the program will perform this action.

Directive format: B* code and P* code

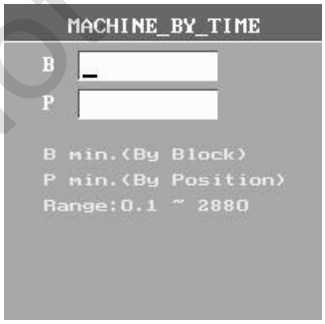


FIG. 9-55 dialogue window “MACHINE_BY_TIME”

Execution 1. “*” stands for a real number in a reasonable range (maximum 2880 minutes). Please enter a number according to the cue in the prompt column.

2. When the program performs B code, the count-down function is activated at the same time. When the time is over, the program will perform next direction.

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3. When P code is performed, the count-down function will be activated when the machining depth reaches the set depth.

**Note** 1. **B code and P code cannot be performed at the same time. If they are performed at the same time, only P code is valid.**
2. **The time directive of block work should be given before the cutting directive ( line or vector)**

◎ **Work example**

**Example 1**

N0001 ABS_POSITION X0 Y0 Z0
N0002 MACHINE_BY_TIME B10 → When the directive of this line is performed, the count-down work will be activated.
N0003 ABS_LINER_Z_AXIS Z-10 B1 C1 → After the directive of this line is performed for 10 minutes, the program of next line will be activated immediately.
N0004 ABS_POSITION Z20

**Example 2**

N0001 ABS_POSITION X0 Y0 Z0
N0002 MACHINE_BY_TIME P10 → After this directive is performed, the count-down function will be activated when the directive of next line finishes the set depth.
N0003 ABS_LINER_Z_AXIS Z-10 B1 C1
N0004 ABS_POSITION Z20

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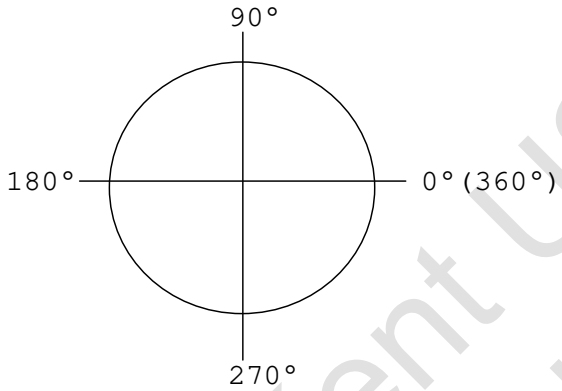
### 9.1.8 C AXIS (only for C-axis model)

**1. Brief introduction**

One turn of C-axis is 0~360˚. The turning angle is at the absolute position. The turning direction is decided by + and – signs. When + sign is entered, the axis turns clockwise. If – sign is entered, the axis turns counterclockwise.




**2. Directive of C axis**

1. C_ROTATE
2. C_ROTATE_CUT
3. ROTATE_SPEED
4. NG_SPIRAL_MOVE
5. C-Z_SPIRAL_CUT
6. CW_CONST_ROTATE
7. CCW_CONST_ROTATE)
8. STOP_ROTATE
9. C_HOME_FIND
10. C-X_SIDE_SPIRAL
11. C-Y_SIDE_SPIRAL

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**A. C _PROTATE**

Action: If there is C _PROTATE in the work program directive row, the program will perform this action.

Directive format: U* code

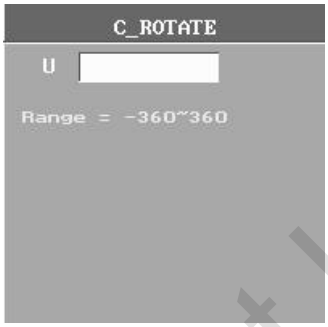


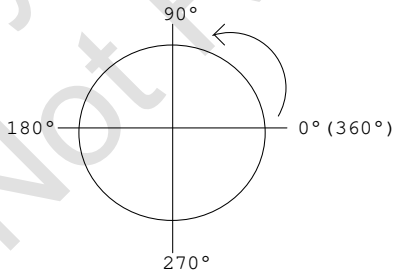

FIG. 9-56 dialogue window “C _PROTATE”

Execution 1. “*” stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.

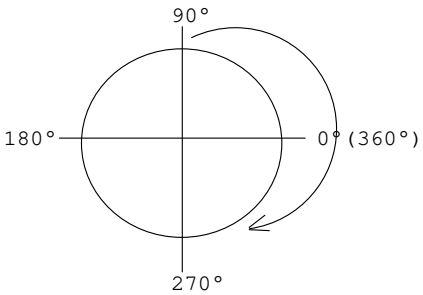
2. U stands for a rotating angle whose range is -360~360.

◎ **Work example**

N0001 C _PROTATE U-90 ← Counterclockwise (CCW) turn to 90° .




N0001 C _PROTATE U270 ← Clockwise turn (CW) to 270°

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**B. C _ROTATE_CUT**

Action: If the work program row has “C _ROTATE_CUT”, the system will properly control the electrode to rotate, advance and retract according to the discharge conditions and the detected gap voltage.

Directive format: U* code

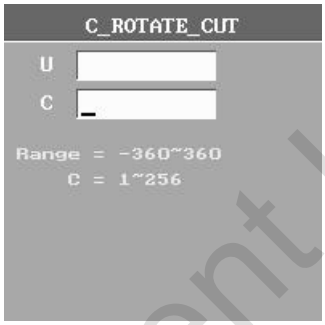


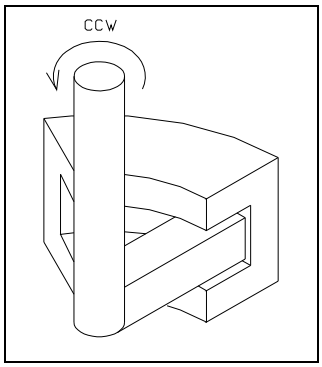

FIG. 9-57 dialogue window “C _ROTATE_CUT”

Execution 1. “*” stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.

2. U stands for a rotating angle of cutting. The range of cutting is -360~360.

◎ **Work example**

N0001 C _ROTATE_CUT U-100 C1 → After the tool and the workpiece is calibrated, the workpiece is continuously machined till C-axis counterclockwise rotates 100°

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**C. ROTATE_SPEED**

Action: If the work program directive row has “ROTATE_SPEED” , it is the rotating speed of C axis.

Directive format: S* code

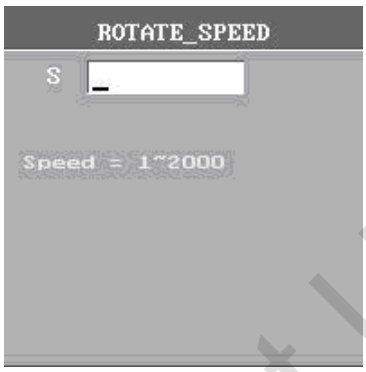


FIG. 9-58 dialogue window “ROTATE_SPEED”

Execution 1. “*” stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.

2. S stands for the rotating speed whose range is 1~2000 (0.4166 rpm ~1000 rpm)

**Note** 1. **<u>For performing this directive, it is necessary to add CW constant rotation or CCW constant rotation so that C axis can rotate.</u>**

◎ **Work example**

**Example 1**

N0001 ROTATE_SPEED S100 → If the program of next line Is without CW constant rotation or CCW constant rotation, C axis will have no action.

N0002 C _ROTATE_CUT 100 → The cutting speed is determined by work parameter. It has nothing to do with C axis rotating speed.

N0003 CW_COMNST_ROTATE → The rotation is according to the speed set by N0001.

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**D. NG_SPIRAL_MOVE**

Action: If the directive row of work program has the directive “NG_SPIRAL_MOVE ”, C axis will make a side spiral rack positioning or spiral positioning according to the set range.

Directive format: IX* code (IY* code or IZ* code ) PT* code

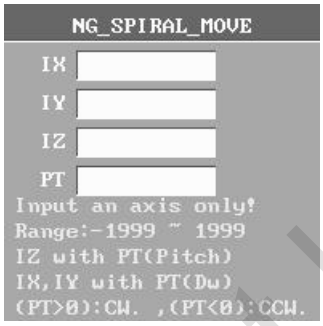



FIG. 9-59 dialogue window “NG_SPIRAL_MOVE”

Execution 1. * stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.

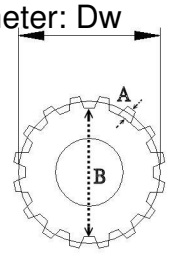
2. IX, IY and IZ stands for the selected axial direction.

3. When PT>0, C axis moves clockwise under NG. When PT<0, C Axis moves counterclockwise under NG. If C axis works with X axis or Y axis, the system will make a side spiral positioning rack position). If C axis and Z axis work together, the system will make a spiral positioning.

4 Diameter of pitch circle:

A+B=Dw

Distance away from pitch diameter: Dw




Top view

**Note** 1. **<u>You can select only one parameter from the 3 parameters ( X, Y and Z). If you enter 2 or more parameters, only the 1st parameter is valid.</u>**

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### E. C-Z SPIRAL_CUT

Action: If the directive row of work program has the directive “C-Z SPIRAL CUT”, C axis will coordinate with Z axis to make spiral work.

Directive format: IZ* code, PT* code

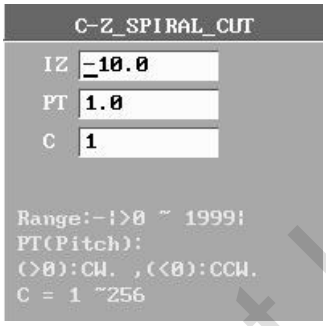
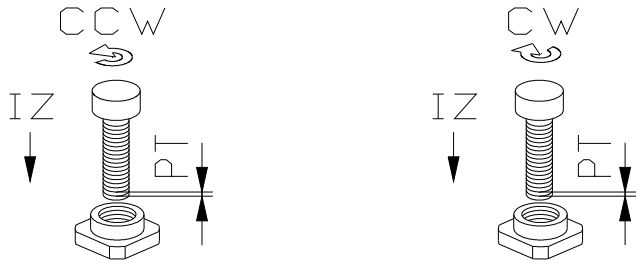



FIG. 9-60“ dialogue window “C-Z SPIRAL CUT”

Execution
1. * stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.
2. “IZ” is the depth unit of Z axis, a negative “absolute value”.
3. This function with a correct pitch diameter can be used for machining a spiral object or threads.
   If PT<0 , reserve threads will be produced. If PT>0, positive threads will be produced. Please see the following figures.

**Note**

1. **During the work, if you press【F3】manual, the tool will return to the start point along the original path, but do not press 【F3】manual again before the 1st manual action is completed.**
2. **If you use NG spiral positioning, the motion direction must be reverse to the direction of spiral cutting. The error input, if any, will result in damage to the workpiece and the electrode.**

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◎ **work example**

N0001 ABS_LINER_Z_AXIS Z axis Z0 B1 C21 → Z axis cuts the position Z0 in straight line.

N0002 C-Z SPIRAL_CUT IZ-20, PT1 → The spiral cutting depth of C axis is 20. Pitch=1.

N0003 NG_SPIRAL_MOVE IZ21, PT-1 → Short circuit is without protection (No Guard). Spiral positioning is in reverse direction.

**F. CW_CONST_ROTATE**

Action: This function can be used together with X, Y and Z, or with sway cutting directive. During the process of cutting, C axis will make clockwise constant rotation according to the set speed. Thus, the workpiece can be discharged more even. If the function of C axis rotation speed is added, the rotation is subject to the set speed. If the function of C axis rotation speed is not added, the rotation speed is subject to the default value of 200rpm.

**Note** 1. **After this function is performed, the position of C axis will become a random number. It is necessary to find the origin of C axis.**

**G. CCW_CONST_ROTATE**

Action: This function can be coordinated with X, Y and Z, or with the sway cutting directive. During the cutting process, C axis will make counterclockwise constant rotation according to the set speed. Thus, the workpiece can be machined and discharged more even. If the function of C axis rotation speed is added, the rotation will be subject to the set speed. If the function of C axis rotation is not added, the rotation will be subject to the default value of 200rpm.

**Note** 1. **After this function is performed, the position of C axis will become a random number. It is necessary to find the origin of C axis again.**

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**H. STOP_ROTATE**

Action: When the constant rotation directive is activated, if the function appears, C axis will stop rotation.

**I. C_HOME_FIND**

Action: Find the origin of C axis.

**J. C-X_SIDE_SPIRAL**

Action: If the directive row of the work program has the directive of "C-X_SIDE_SPIRAL ", X in straight line motion will coordinate with C axis rotation to make side spiral.

Directive format: IX* code, Dw* code

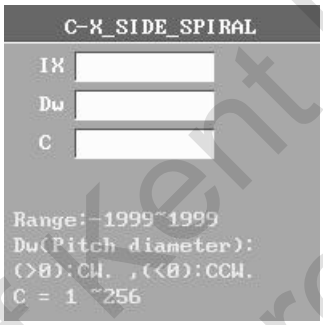


FIG. 9-61 dialogue window of "C-X_SIDE_SPIRAL"

Execution
1. * stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.
2. IX stands for a selection of axial direction.
3. This function with C axis CW or CCW rotation will produce 4 situations as following figure shown.

**Note**

1. **During the work, if【F3】MANUAL is pressed, the tool will return to the start point along the original path, but before the 1st manual action is completed, do not press【F3】MANUAL again.**
2. **If NG spiral positioning is used, the motion should be reverse to the spiral cutting. Error input, if any, will result in damage to the workpiece and the electrode.**

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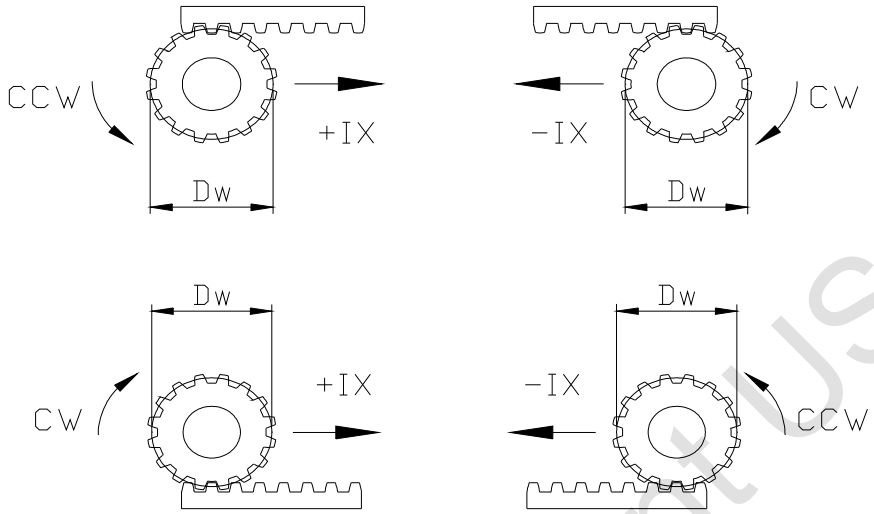


Dw stands for the diameter of the pitch circle of the gear. When Dw >0, C axis makes CW rotation. When Dw <0, C axis makes CCW rotation.

◎ **Work example**

N0001 ABS_LINER_Y_AXIS Y2 B3 C22 → Y axis cuts the position Y2.

N0002 C-X_SIDE_SPIRAL IX-50 Dw20 C20 → C-X side spiral relatively to X-50; the diameter of pitch circle Dw=20; work condition: 20th set

N0003 NG_SPIRAL_MOVE IX50 PT-20 → short circuit no protection (NG) and spiral position in reverse direction (relative position)

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**K. C-Y _SIDE_SPIRAL**

Action: If the directive row of work program has the directive of C-Y SIDE_SPIRAL, Y in straight line motion will coordinate with C axis rotation to make side spiral.

Directive format: IY* code, Dw* code

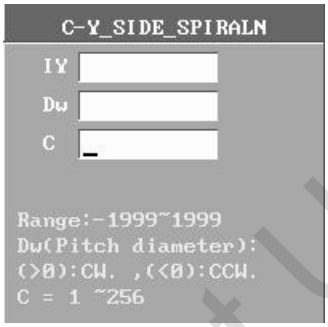
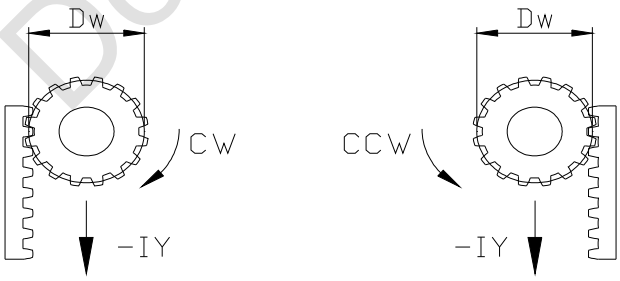



FIG. 9-62 dialogue window of C-Y_SIDE_SPIRAL

Executive
1. * stands for a real number in a reasonable range. Please enter a number according to the cue in the prompt column.
2. IY stands for a selection of axial direction.
3. This function with C axis CW rotation will produce 4 situations as following figure shown.

**Note**
1. **During the work, if【F3】MANUAL is pressed, the tool will return to the start point along original path, but before the 1st manual action is completed, do not press【F3】MANUAL again.**
2. **If NG spiral positioning is used, the motion should be in reverse direction to the spiral cutting. Error input, if any, will result in damage to the workpiece and the electrode.**

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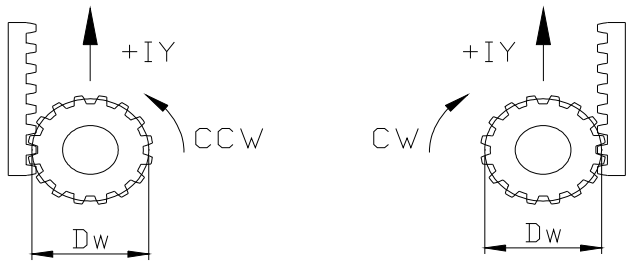


Dw stands for the diameter of pitch circle of the gear. When Dw>0, C axis makes CW rotation. When Dw<0, C axis makes CCW rotation.

◎ **Work example**

N0001 ABS_LINER_X_AXIS X-4 B3 C22 → X axis cuts position X-4.

N0002 C-Y_SIDE_SPIRAL IY-100 Dw25 C20 → C-Y side spiral , relative position IY-100, diameter of pitch circle Dw=25, 20th work condition

N0003 NG_SPIRAL_MOVE IY100 PT-25 → short circuit no protection (NG), spiral positioning in reverse direction (relative positioning)

Examples of various applications：

N0001 HOME XYZ ← Find the origin of XYZ

N0002 POS.SETUP X200 Y150 Z100 ← Coordinate setting ( X200 Y150 Z100)

N0003 ABS_POSITION (X0 Y0 Z0) ← absolute positioning ( X0 Y0 Z0)

N0004 C_HOME_FIND ← Find the origin of C axis.

N0005 C_ROTATE U0 ← The position is set U0 (C axis)

N0006 TOOL_CHANG 1 ← Take tool 1 from the turret.

N0007 ROTATE_SPEED 500 ← Set a constant rotation speed.

N0008 CCW_CONST_ ROTATE ← Start CCW constant rotation.

N0009 POS.SETUP Z0 ← The coordinate is set Z0.

N0010 ABS_LINER_Z_AXIS Z-10 B1 C10 ←Z axis works in straight line till the absolute coordinate is at Z-10. Residue removing (P.P.) mode is B1 with 10th work condition.

N0011 STOP_ROTATE ← Stop rotation.

N0012 NG ABS_POSITION Z20 ← short circuit no protection (NG), the absolute position of Z axis is at Z20.

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N0013 TOOL_CHANG 2 ← Take tool 2 from the turret.
N0014 CW_CONST_ ROTATE ← Start CW constant rotation.
N0015 ABS_POSITION Z0.5 Z← Absolute positioning at the position Z0.5
N0016 ABS_LINER_Z_AXIS Z-10.5 B1 C11 ← Z axis works in straight line till the absolute coordinate is at Z-10.5. Residue removing (P.P.) mode is B1 with 11th work condition.
N0017 STOP_ROTATE ← Stop rotation.
N0018 NG ABS_POSITION Z20 ← short circuit no protection (NG), and absolute positioning of Z axis is at position Z20.
N0019 TOOL_CHANG 3 ← Take tool 3 from the turret.
N0021 ABS_POSITION X50 Y20 ← absolute positioning at position (X50 Y20)
N0020 C_HOME_FIND ← Find the origin of C axis.
N0021 POS.SETUP U0 ← Set the coordinate U0 (C axis)
N0022 C_ROTATE U-90 ←C axis makes CCW rotation to the position of 90°.
N0023 ABS_LINER_Z_AXIS Z-10 B1 C12 ← Z axis works in straight line to the absolute coordinate Z-10. Residue removing (P.P.) mode is B1 with 12th work condition.
N0024 C_ ROTATE _CUT U-180 C13 ←C axis makes CCW rotation till it cuts the position of 180° under 13th work condition.
N0025 NG ABS_POSITION Z20 ← short circuit no protection, and the absolute positioning of Z axis is at position Z20.
N0026 SLEEP_ON ← Sleep is ON after the work is completed.

## 9.2 RE_WRITE

Press【F2】RE_WRITE to change the contents of the program where the curser stays.

## 9.3 COPY

Press【F3】COPY to copy the contents of the program where the curser stays to next line.

## 9.4 DELETE

Press【F4】DELETE or DEL button on the panel to delete the contents of the program where the cursor stays.

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## 9.5 CHANGE_POS.

Switch between the work coordinate and the absolute coordinate.

Press【F5】CHANGE POS. to enter the system mode.

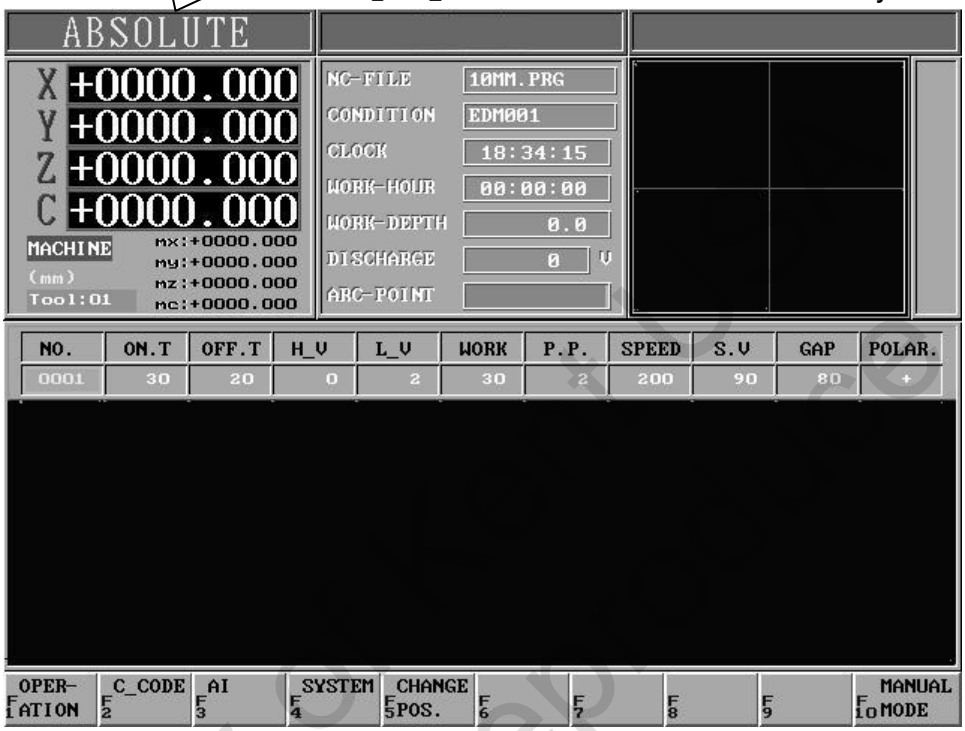


FIG. 9-63 CHANGE POS. mode on the operational screen

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## 9.6 LOAD_FILE and SAVE_AS

Function: [F6] to load the file (and to create a new file), [F7] save new files.
Function Description: These two keys have the function of loading, storing, remove the workpiece program on the main operation page.

Introducing "Load File" and "Save As" o the operation page:
Function menu: press【F6】LOAD_FILE and【F7】SAVE_AS

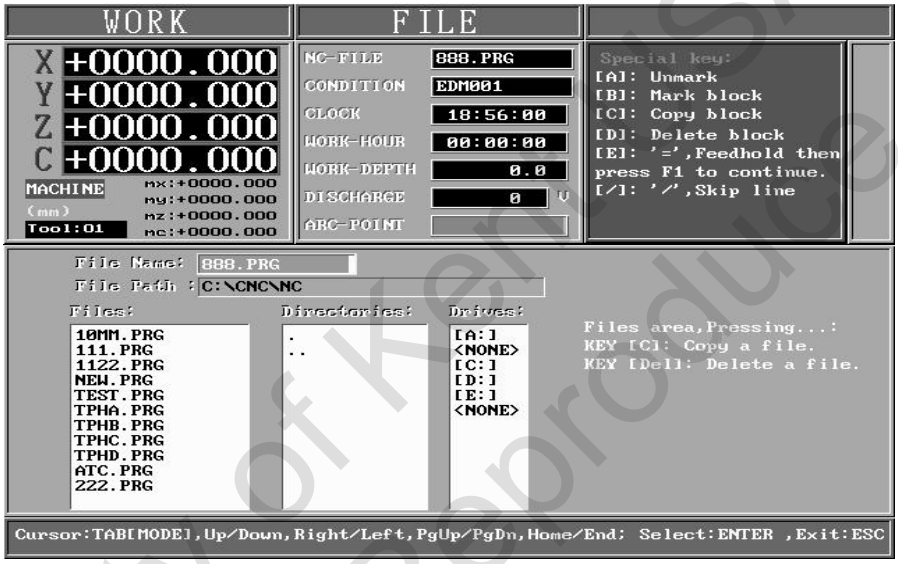


FIG. 9-64 LOAD_FILE and SAVE_AS

User can press [MODE] key to switch sections, and by moving [▲], [▼] key to to choose the options then press [ENTER] to select or press [ESC] to delete the options.

**File name:** When there is a file name in the file name column, press 【ENTER】 to input this file name. If there is no such file name in the file column, it means that a new file is loaded or saved.

※File name can be up to eight characters (not the name of the file type, the default file type is PRG), but the first letter of the file name cannot put “0”.

**File path**：Show the current file path of the file name. If there is no such a file, a new file will be created at that path.

**File**：Show the existed files. Use【▲】, 【▼】,【PgUp】,【PgDn】, 【Home】and【End】buttons to move the cursor.

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◎ Operation introdution

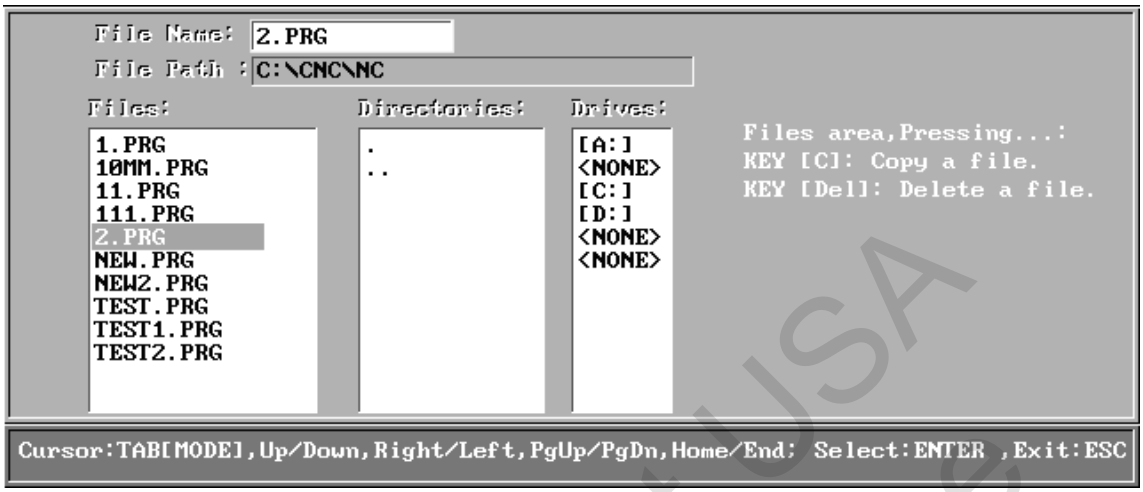


FIG. 9-65

After entering the page, press the arrow keys [▼] or [MODE] key to move the cursor or to switch the sections.

Take 2.PRG above as an example to explain the functions below.

■ Delete File.

Press [Del] , a window will appear asking whether to delete the file or not, as shown below:

FIG. 9-66

■ Copy File.

When press [C] a window will appear asking to input a new file name for the copied files, as shown below:

FIG. 9-67

If the file name exists, the notification will be shown as below.

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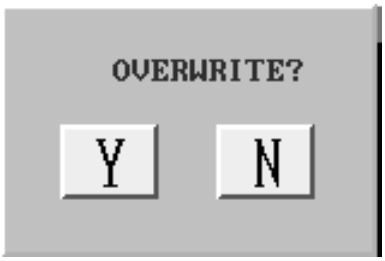


FIG. 9-68

【F7】SVE_AS

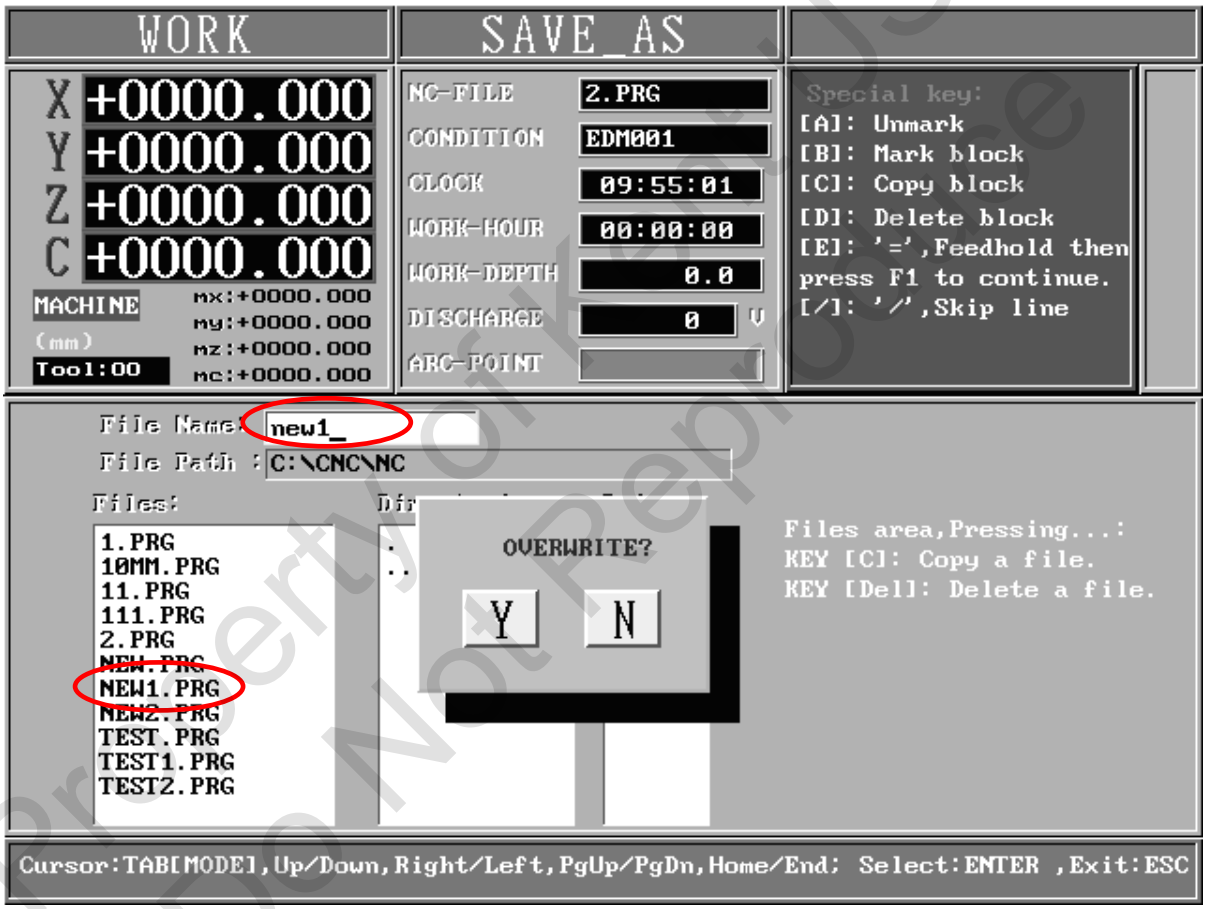


FIG. 9-69

On FIG 9-69, when press [F7] save a new file with a new that has already exist, an overwrite notification will show as above.

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## 9.7 READY_SAVE

Function: This function consists of several major work programs. If this function is activated, the system will show WORK on the screen. There are 10 subfunctions - 【F1】START, 【F2】HOLD, 【F3】MANUAL, 【F7】NON-EQU_ENERGTY 【F8】C-CODE SAVE 【F9】CLEAR_W.HOUR 【F10】Reset. For powder processing machine,

Powder Processing Model：

【F4】METAL_FILTER, 【F5】DUST_ FILTER 【F6】STIR&COOLER subfunctions are added.

Function menu: Press【F9】READY_SAVE in the operational screen as following figure shown.

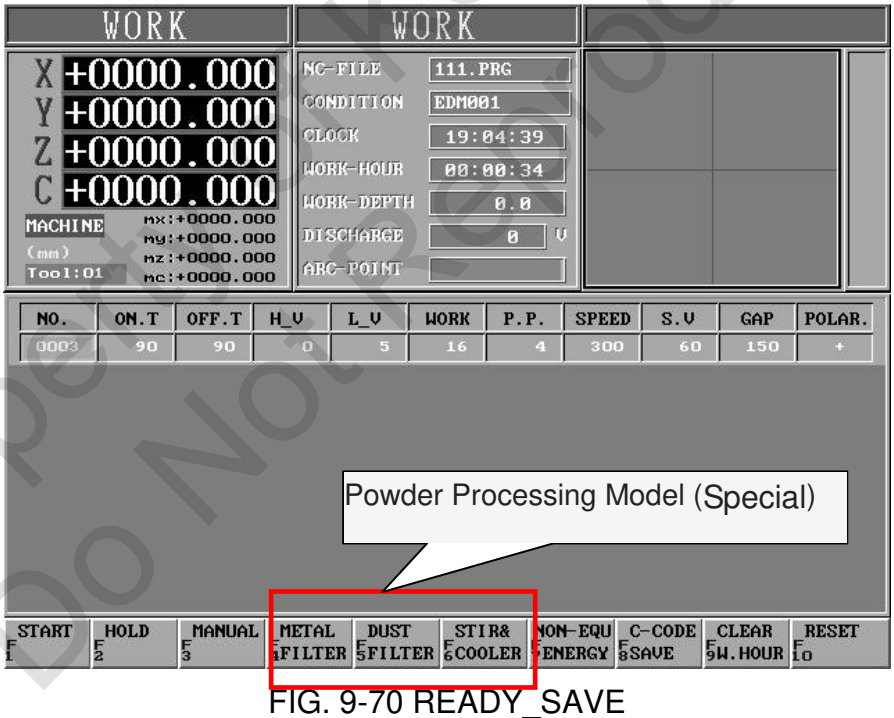


FIG. 9-70 READY_SAVE

【F1】**START :**(system screen→【F1】OPERATION→【F9】READY_SAVE→【F1】START). This function is used to start the work program. At this moment RUN Directive will appear on the upper right hand corner of the screen. The tool path area will show a corresponding icon according to the block of the currently performed program.

【F2】**HOLD**：(system screen→【F1】OPERATION→【F9】READY_SAVE→

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【F2】HOLD) This function is used to hold the running of the workpiece program. At this moment HOLD will appear on the upper right hand corner of the screen. At the same time a reset window will appear to ask you YES or NO. Press【Y】 to reset the work. Press【N】to proceed the work. Please see the following figure.

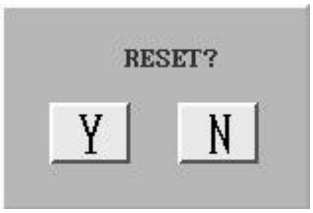


FIG. 9-71

【F3】**MANUAL**：(system screen→【F1】OPERATION→【F9】READY_SAVE→【F3】MANUAL）

This function is used to hold the running of the workpiece program so that you can check the work quality. At this moment MANUAL will appear on the upper right hand corner of the screen. At the same time a reset window will appear to ask you YES or NO. Press【Y】to reset the work. Press【N】to proceed the work. Please see the following figure.

FIG. 9-72

When this function is activated, the system will switch off the discharge power. The tool at discharge point will return to the start coordinate point of the current program block according to the tool retraction method of the program block. Under manual mode, the wire control box can be used to move the tool. Press【N】 to return to the discharge status. The system will switch MANUAL to DISCHARGE automatically. At this moment the tool will move in a straight line to the manual referential point at a fast speed. Then, the tool will retract to the discharge point along the tool retraction path.

For example: The current coordinate unit is mm. The start coordinate of the work program block is（0,0,0）When the manual function is activated, the tool will return to (0,0,0) along the tool retraction path. Use the wire control box to move the tool to (3,3,5). Press【N】button. The tool will move in straight line to the

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manual referential point (0,0,0) , and then return to the discharge point along the tool retraction path. After that the system continues to run the workpiece program.

**Note**

1. **Short circuit is not tested on tool retraction to avoid 2nd discharge, so the system cannot make a judgment according to the program path or the tool shape. Under this situation, there is no collision protection for the tool and the workpiece. However, there is a short circuit test when the tool is moved by wire control box.**
2. **Under discharge status and before returning to the tool retraction point, the operator must note if a short circuit (collision) danger exists when the tool at current position moves in straight line to the manual referential point. Avoid short circuit which may terminate the running of the workpiece program.**

【F3】**MANUAL**：(system screen→【F1】OPERATION→【F9】READY_SAVE→【F7】NON-EQU_ENERGTY)

【F4】**METAL FILTER :** (system screen→【F1】OPERATION→【F9】READY_SAVE→【F4】METAL FILER)When this function is activated, the metal filter will be started. (Display only for S.F. model.)

【F5】**DUST FILTER :**system screen→【F1】OPERATIOIN→【F9】READY_SAVE→【F5】DUST FILTER (silicon powder) When this function is activated, the dust filter will be started. (Display only for S.F. model.)

【F6】**STIR & COOLER :** (system screen→【F1】OPERATION→【F9】READY_SAVE→【F6】STIR & COOLER)When this function is activated, the stir-cooler will start. (Display only for S.F. model.)

**【F7】NON-EQU_ENERGY:**

After 2011 we update the FPGA(2.2F) program from the Pilse & Gap board and named as TURBO Skipping ARC Control. This function is used to increase the efficiency for the first cut when cutting on a workpiece where the ARC occurs frequently.

**【F8】C-CODE SAVE :** During the work, the work conditions can be changed anytime. Just press【F8】 to save the current work condition to the code set.

**【F9】CLEAR_W.HOUR**：Just press 【F9】 to reset the work time column.

**【F10】Reset**：Just press【F10】to return to the previous page.

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◎Example for editing program

Program editing (creating new files):

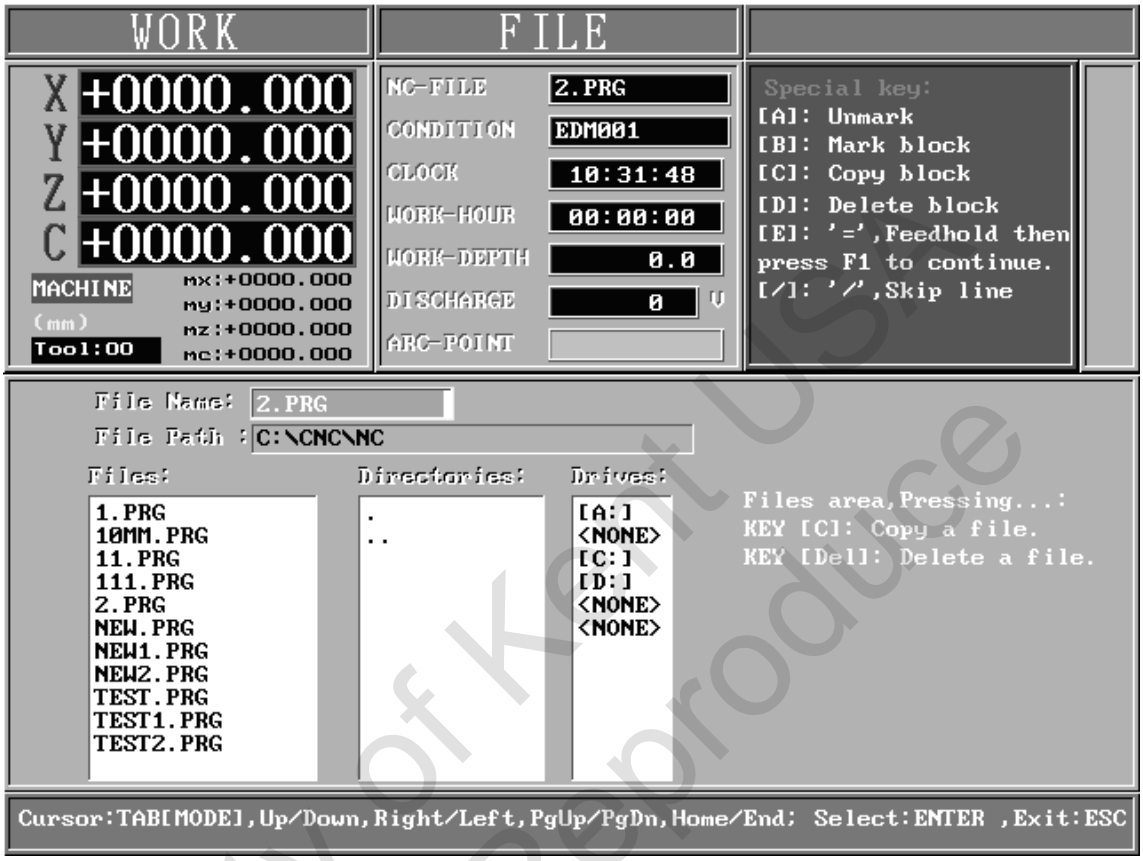


FIG. 9-73

Press [Enter] key on the file name, the cursor will start to flicker. Input the filename put "new2" as an example (the system regards any letter as capital), then press [Enter] key.

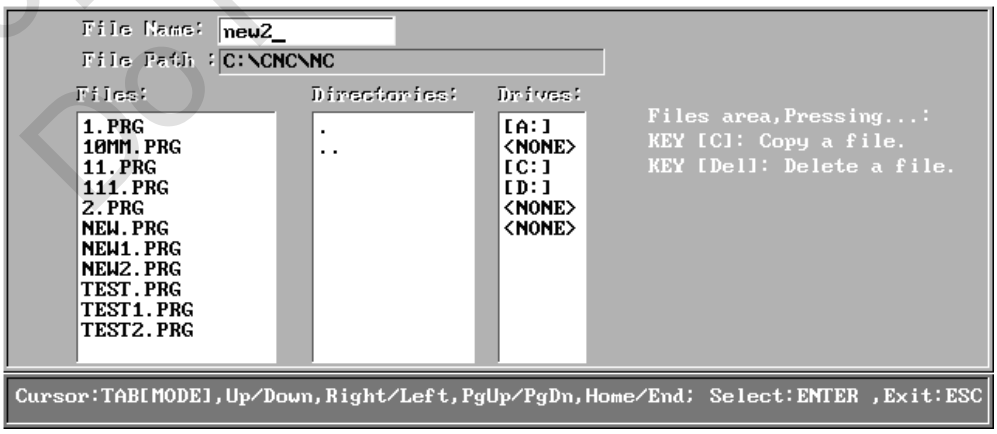


FIG. 9-74

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Back to the "Program Edit" page the file name “NEW2.PRG” appears as shown in

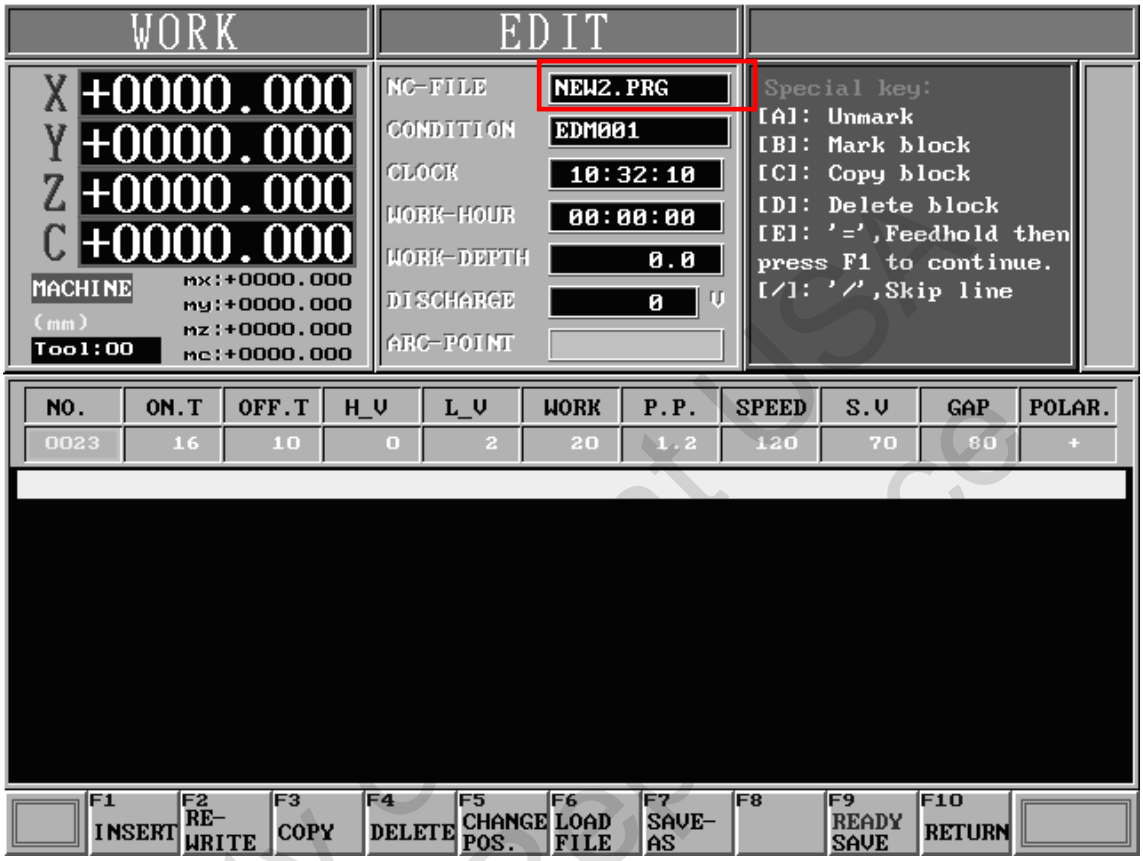


FIG. 9-75

Press the [F1] to insert and choose the command (Please refer to 8-4 the tree diagram of the function keys)

FIG. 9-76

On FIGselect "SHIFT" command and press the arrow keys【→】to select absolute positioning.

FIG. 9-77

Press [Enter] to select the command

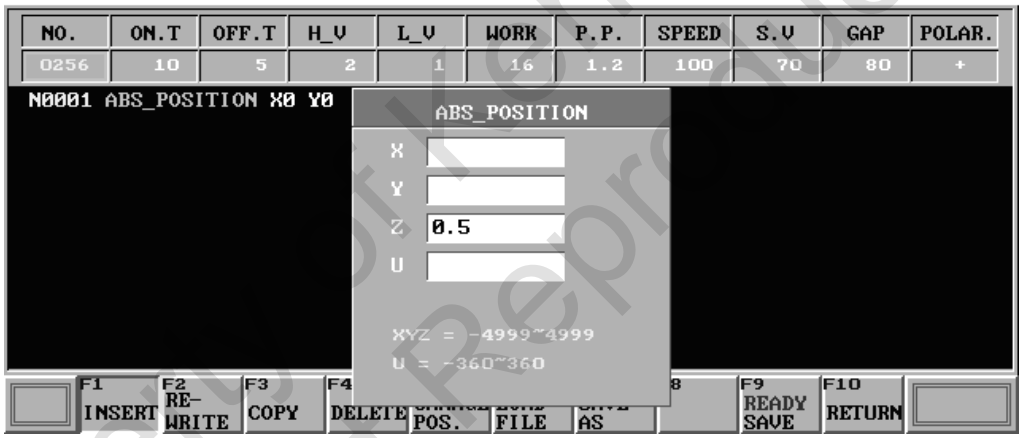


FIG. 9-78

After selecting the command, a string “N0001” appears, press [F1] to insert then select the "Cutting" command

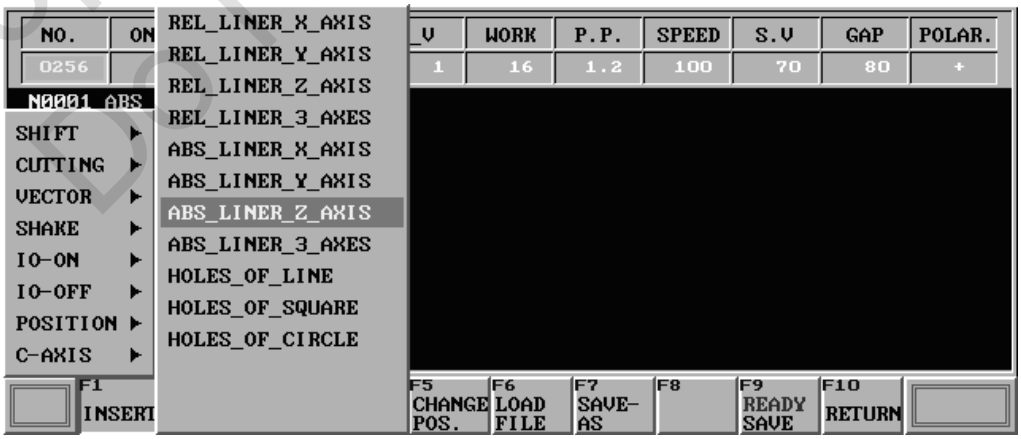


FIG. 9-79

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After inputting the value on Z-axis, B (slagging mode), C (group code), N0002will appear

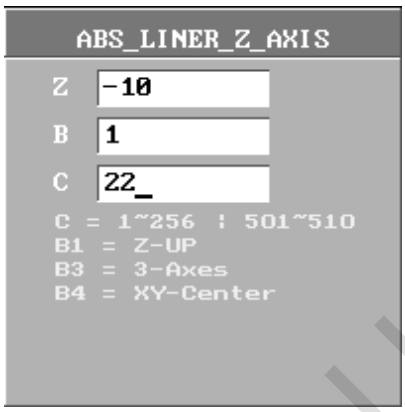


FIG. 9-80

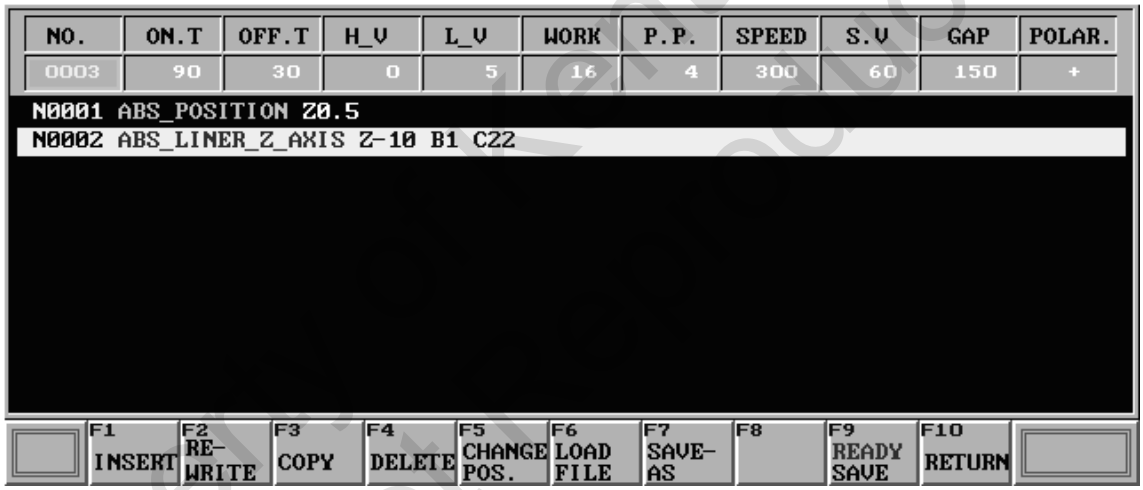


FIG. 9-81

Press [F2] to be modified Z, C & B value. (FIG9-82)

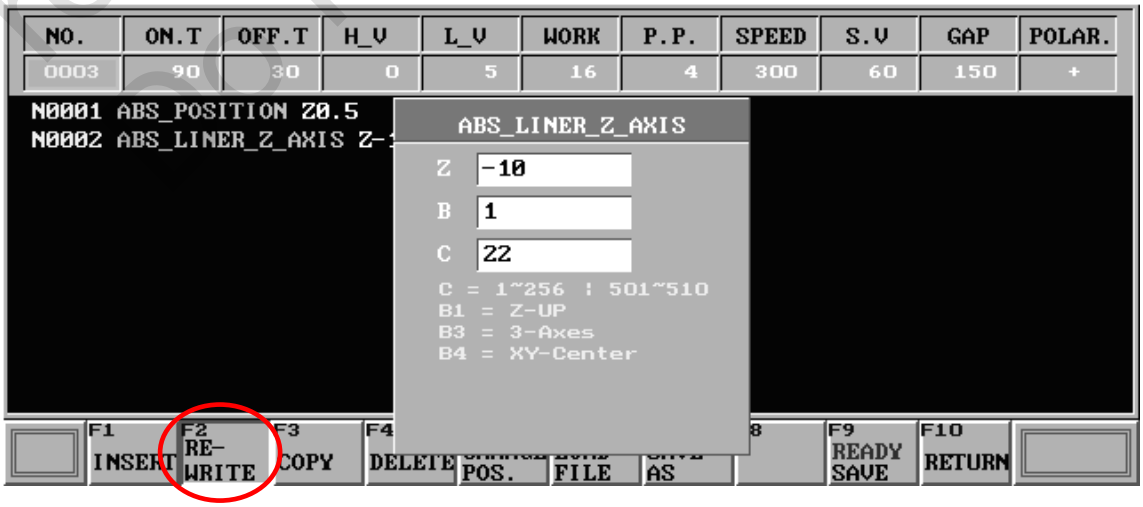


FIG. 9-82

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Sequentially insert the commands to complete the program.

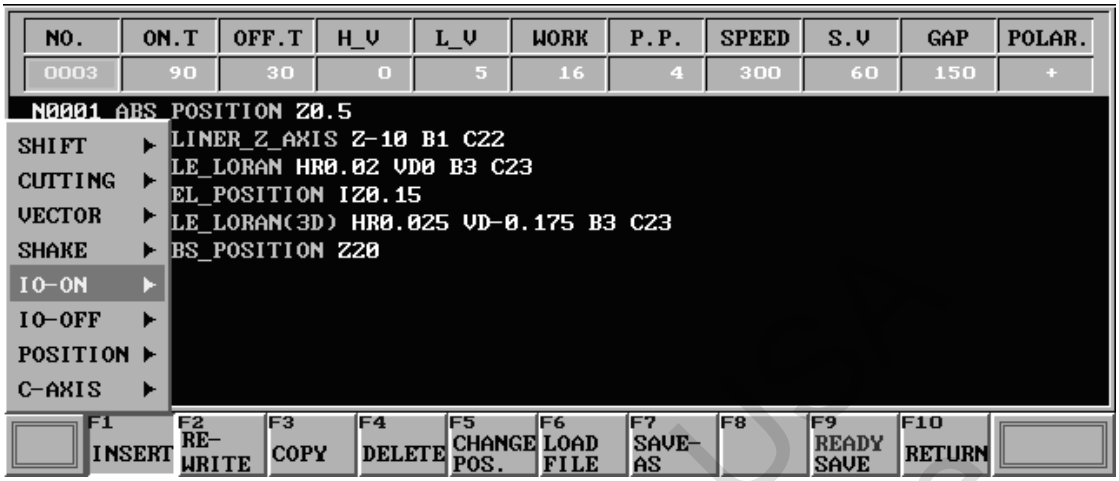


FIG. 9-83

Press [F9] to save, press [ESC] to go back to the edit page.

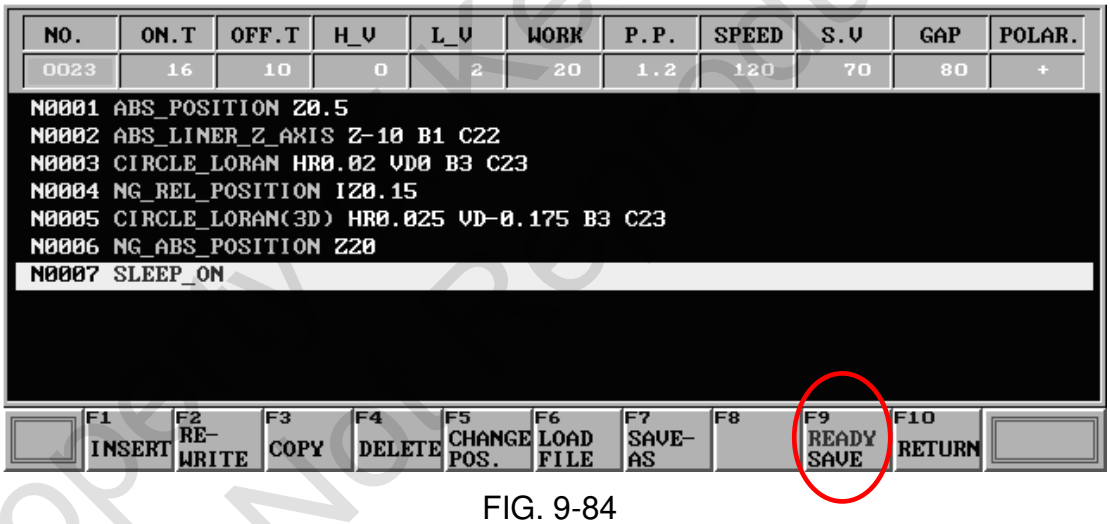


FIG. 9-84

On FIG9-84 the Z-axis machining and shake trimming paradigm, user can adjust the command based on the user's need.

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# 10. C_CODE

This chapter introduces code mode so as to provide the users with an environment for editing work parameter file. After entering this mode, the screen will be as follow:

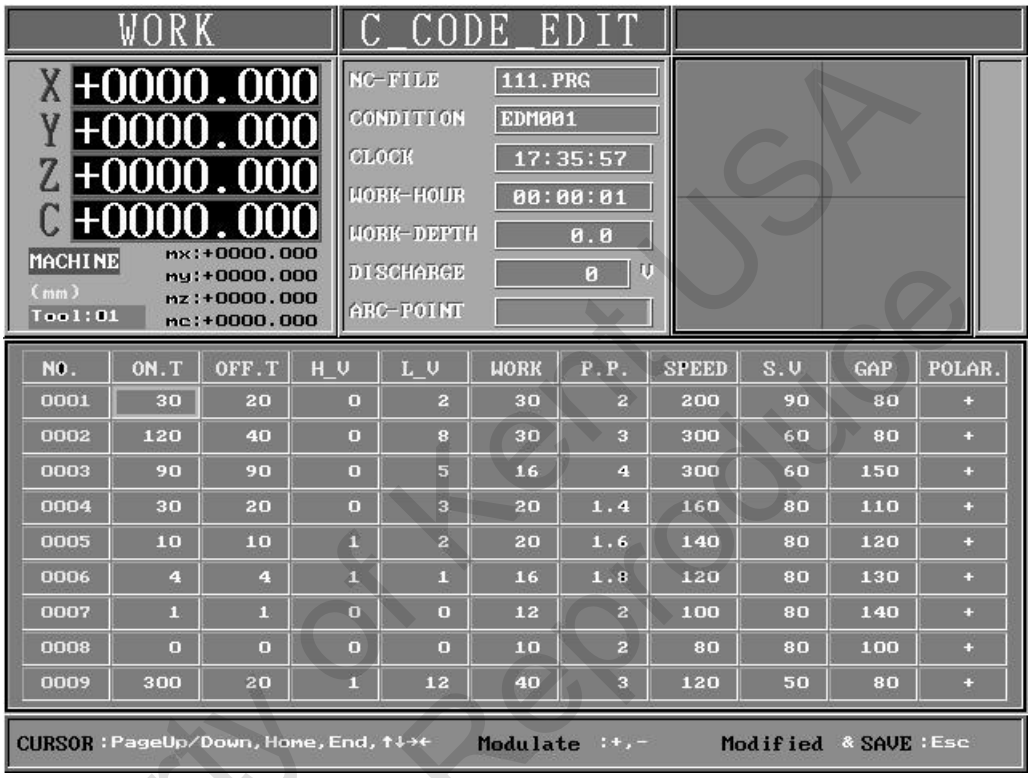


FIG. 10-1 the screen of C_CODE mode

As above figure shown, the operational buttons on the editing screen are shown below:

【＋】: Add one section to the data where the curser is on. (The display value is the actual value.)

【－】: Deduct one section to the data where the curser is on.

【▲】,【▼】,【◄】,【►】: Move the curser to the parameter which you want to change.

【PgUp】,【PgDn】: Switch the screen to previous page or next page.

【Home】,【End】: The curser jumps to the first line of the first page and the first line of the last page.

【ESC】: Upgrade and save the data. Then, leave the code mode.

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## The meaning of each work parameter:

**Pulse width (ON. T) :** The unit of the time of discharge pulse is microsecond (μS).

**OFF Time:** The unit of the interval of discharge pulse is microsecond (μS).

**Low Voltage（L_V）**: It is the current of low voltage discharge, and the unit is ampere (A). The current varies depending on the specifications of the electric control box. For example, the current for EB600L-60A is 0 ~ 60A.

**High Voltage（H_V**: HV is used for large mold, deep depth discharge, difficult flushing and hard material. With HV, can increase the efficiency but also increased the electrode wear. (Normally no use)

**WORK:** It is the discharge time of periodical residue removal jump. The unit is second. (Range: 0 ~ 2000)

**(P.P.) :** Periodically remove residue. The unit of jump distance is mm. (Range: 0 ~ 100)

**SPEED:** The percentage of feed speed during residue removal or shaking. (Range: 0 ~ 100)

**Servo (S.V):** It is the sensitivity of the servo. Its value is in form of percentage. The bigger the value, the stronger the servo sensitivity. (Range: 2 ~ 200)

**GAP:** The unit of the gap voltage between the electrode and the workpiece is Volt.

**POLAR:** 1. the discharge polar of the electrode
2. Powder machining model: For mirror finish, the speed is from step 1 ~ step 8. he pulse width, OFF TIME, HV and LV are all preset in the system.
T It is unnecessary to make adjustment.

| POLAR | ON. T | OFF. T | HV | LV | OFF. T 2 | Output current |
|---|---|---|---|---|---|---|
| 8 | X | X | X | X | X | 0.5A |
| 7 | X | X | X | X | X | 0.45A |
| 6 | X | X | X | X | X | 0.4A |
| 5 | X | X | X | X | X | 0.35A |
| 4 | X | X | X | X | X | 0.30A |
| 3 | X | X | X | X | X | 0.25A |
| 2 | X | X | X | X | X | 0.2A |
| 1 | X | X | X | X | X | 0.15A |

**HV2:** There are 2 stages of arc high voltage. 0 is for 200V, and 1 is for 300V.

**ARC.T:** It is the OFF Time when the carbon is accumulated. The unit is microsecond (μS).

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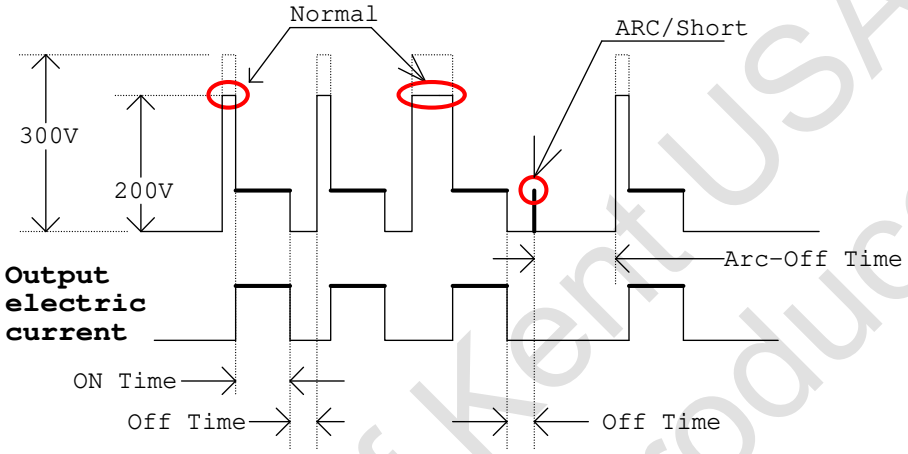
The diagram illustrates Pulse width (ON Time), OFF Time, Output current (HV/LV), Arc HV (200V), HV2 (300V) and Arc OFF Time:

Explanation: under normal discharge, the order of discharge pulse is Arc 200V (or 300V)→On Time→Off Time→ Repeat this order.

However, if ARC/Short happens, it will become “Arc-off Time”. The time of current ON will be delayed so that the servo has a tool retraction action. It is to protect the electrode and the workpiece from being damaged.




New software features added depends on the user’s demand (software versions that are later than V1.23F4):

During "L_V" adjustment, the other parameters (including pulse, stop, high pressure processing, slag ... etc) change automatically base on the same L_V value that matches the current changed value from index199~244.

| NO. | ON.T | OFF.T | H_V | L_V | WORK | P.P. | SPEED | S.V | GAP | POLAR. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0100 | 400 | 20 | 0 | 12 | 16 | 2 | 160 | 60 | 80 | + |
| 0101 | 200 | 20 | 0 | 8 | 14 | 1.8 | 180 | 60 | 80 | + |
| 0102 | 120 | 20 | 0 | 6 | 14 | 1.8 | 180 | 60 | 80 | + |
| 0103 | 80 | 20 | 0 | 4 | 12 | 1.8 | 180 | 60 | 80 | + |
| 0104 | 10 | 10 | 1 | 2 | 30 | 1.4 | 120 | 70 | 110 | + |
| 0105 | 4 | 5 | 2 | 1 | 30 | 1.4 | 110 | 60 | 120 | + |
| 0106 | 0 | 0 | 0 | 0 | 30 | 1.4 | 100 | 50 | 100 | + |
| 0107 | 5 | 1 | 3 | 0 | 30 | 1.4 | 80 | 50 | 150 | - |
| 0108 | 0 | 0 | 0 | 0 | 10 | 2 | 60 | 50 | 100 | + |

(>199) Unlock: [F2], CURSOR:PageUp/Down,Home,End,↑↓→←,Modulate:+,- Modified&SAVE:Esc

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Index Description:
Numbers 199 to 244 are locked as index reference (low pressure began descending down from 30A to 0A), While setting the “L_V” on line 1~198, the system will match and bring in the data from the index reference.

| NO. | ON.T | OFF.T | H_V | L_V | WORK | P.P. | SPEED | S.V | GAP | POLAR. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0199 | 900 | 30 | 0 | 30 | 16 | 1.6 | 120 | 70 | 70 | + |
| 0200 | 800 | 30 | 0 | 28 | 16 | 1.6 | 120 | 70 | 70 | + |
| 0201 | 800 | 30 | 0 | 26 | 16 | 1.6 | 120 | 70 | 70 | + |
| 0202 | 800 | 30 | 0 | 24 | 16 | 1.6 | 120 | 70 | 70 | + |
| 0203 | 700 | 30 | 0 | 22 | 16 | 1.6 | 120 | 70 | 70 | + |
| 0204 | 600 | 30 | 0 | 20 | 16 | 1.6 | 120 | 70 | 75 | + |
| 0205 | 500 | 30 | 0 | 19 | 16 | 1.6 | 120 | 70 | 75 | + |
| 0206 | 500 | 30 | 0 | 18 | 16 | 1.6 | 120 | 70 | 75 | + |
| 0207 | 450 | 30 | 0 | 17 | 16 | 1.6 | 120 | 70 | 75 | + |

(>199) Unlock: [F2], CURSOR:PageUp/Down,Home,End,↑↓→←,Modulate:+,- Modified&SAVE:Esc

For instance, while set the “L_V” in line 1 as 30, the system will match and brings in the index parameter from line 199. Another example to this is when set the “L_V” to 20, the system will brings in the parameters from line 204. As the “L_V” is set, you can start to adjust other parameters. However if you change the “L_V” after adjusting the other parameters, the parameters from the index reference will bring in and replace the parameters that you just set. In other words, set the “L_V” first before changing other parameters.

※ If the user wants to adjust the index database 199 ~244, you must press [F2] to unlock before adjustment.

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# 11. AUTO INDEX

This chapter introduces the AUTO INDEX mode. This mode automatically helps the users to select the most suitable parameter group codes for the work depending on the electrode, the workpiece, machining depth and other conditions. These group codes are from rough machining to final work. It saves the setting time of work parameter for the users. After entering the AUTO INDEX mode, the screen is shown below -

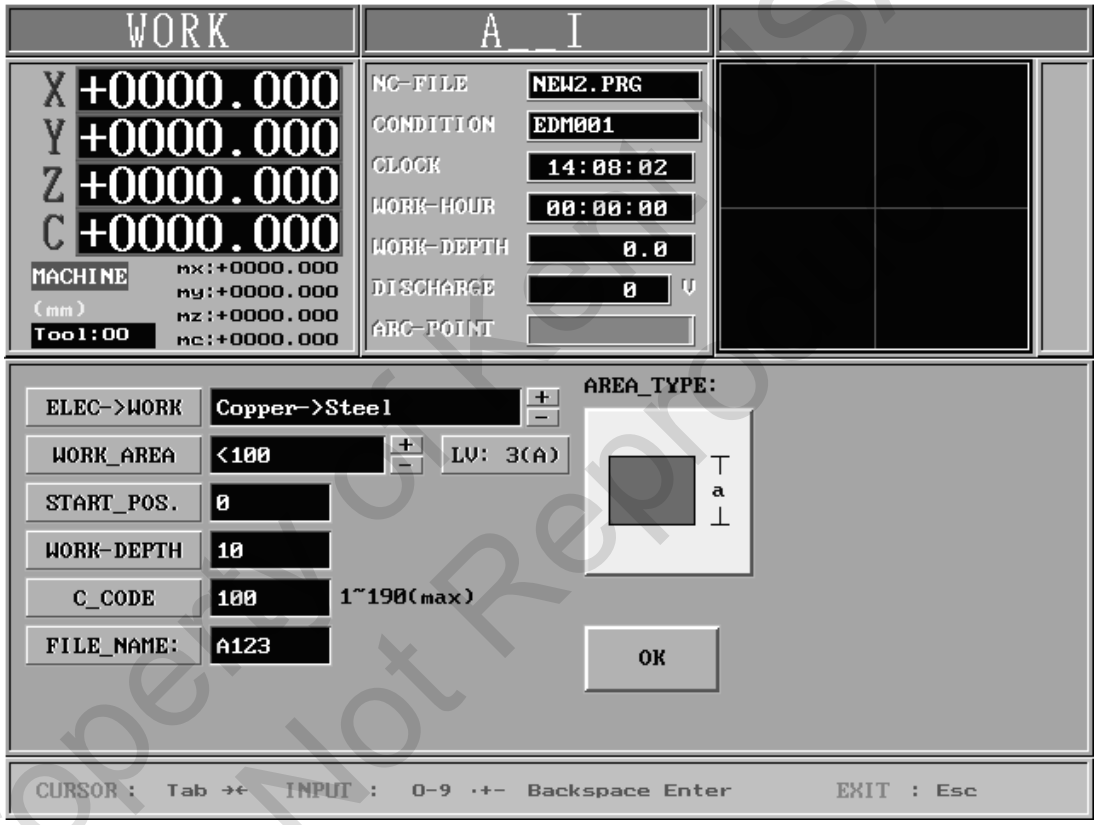


FIG.11-1 AUTO INDEX Screen

## FIELDS:

**1. ELEC→WORK**: Select the electrode and the material of the workpiece. They are copper→ steel, copper(thin) → steel, copper(taper) → steel graphite → steel, graphite(thin) →steel, graphite(taper) → steel, copper→ copper, steel → steel.

**2.WORK_AREA**：Set the area of the work electrode.

**3.START_POS.:** 1. If the start position is 0, the absolute coordinate will automatically edit the program. 2. If the start position<0 or >0, the relative coordinate will automatically edit the program.

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**4. WORK_DEPTH:** Set the work depth.

**5. C_CODE:** After the index reference is set, place the sparaking parameter in line 1~190(default is 100).

**6. FILE NAME:** The default file is named A123.PRG, users can rename by themselves.

**7. OK:** input button to confirm the setting

**OPERATION:**

1. 【MODE】: Press this button to switch the filed.
2. 【＋】,【－】: electrode → workpiece and the surface roughness, a selection from the two fields.
3. 【0】~【9】: input buttons of the field setting value for the start position, the work area and the work depth.
5. 【▲】【▼】: the select buttons for setting the fields for electrode → workpiece, surface roughness, area type, work area and the work depth
6. 【ENTER】: input button to confirm the setting
7. 【ESC】: Leave the AUTO INDEX mode.

※ Pressing【ENTER】at the field whose setting is completed indicates that the setting is confirmed. At this moment the screen will be switched to the editing screen of the OPERATION MODE.

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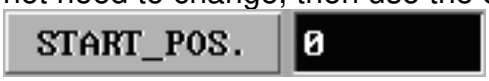
◎ operating paradigm

First select the type of electrode→ workpiece. For example choose copper→steel).

Second, press the arrow keys [ ↓ ] to select "processing area" then press [+], [-] Key to select the initial processing current. .

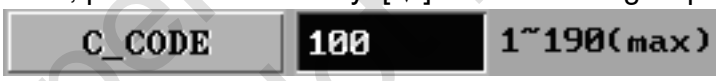
Press the arrow keys[ ↓ ] to input the starting position. If the position does not need to change, then use the default Z = 0.




Press [ ↓ ] arrow keys to select the depth of processing

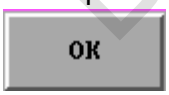
Press the backspace key [←] and change the depth into 5mm.

Next, press the arrow keys[ ↓ ] to select the group code placement.




Press [ ↓ ] arrow keys and input the file name.

Then press the arrow keys[ ↓ ] to [OK] button.

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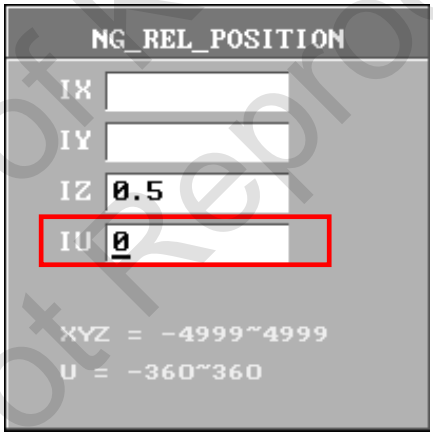
Press [Enter] key, and the completion of AUTO INDEX and list processing program.

| NO. | ON.T | OFF.T | H_V | L_V | WORK | P.P. | SPEED | S.V | GAP | POLAR. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0023 | 16 | 10 | 0 | 2 | 20 | 1.2 | 120 | 70 | 80 | + |

```
N0001 OIL_PUMP_ON
N0002 NG_REL_POSITION IZ0.5 IU0
N0003 ABS_LINER_Z_AXIS Z0 B1 C101
N0004 ABS_LINER_Z_AXIS Z-4.77 B1 C100
N0005 ABS_LINER_Z_AXIS Z-4.87 B1 C101
N0006 ABS_LINER_Z_AXIS Z-4.93 B1 C102
N0007 ABS_LINER_Z_AXIS Z-4.97 B1 C103
N0008 NG_REL_POSITION IZ15 IU0
N0009 SLEEP_ON
```

| F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 |
|---|---|---|---|---|---|---|---|---|---|
| INSERT | RE-WRITE | COPY | DELETE | CHANGE POS. | LOAD FILE | SAVE-AS | | READY SAVE | RETURN |

The first line of the IU0 N0008 and N0002 for the C-axis more options, the user can move the cursor without notice or the line, press [F2] to modify the value column of the elimination of IU.




After the completion of the following.

| NO. | ON.T | OFF.T | H_V | L_V | WORK | P.P. | SPEED | S.V | GAP | POLAR. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0103 | 80 | 20 | 0 | 4 | 12 | 1.6 | 140 | 70 | 60 | + |

```
N0001 OIL_PUMP_ON
N0002 NG_REL_POSITION IZ0.5
N0003 ABS_LINER_Z_AXIS Z0 B1 C101
N0004 ABS_LINER_Z_AXIS Z-4.77 B1 C100
N0005 ABS_LINER_Z_AXIS Z-4.87 B1 C101
N0006 ABS_LINER_Z_AXIS Z-4.93 B1 C102
N0007 ABS_LINER_Z_AXIS Z-4.97 B1 C103
N0008 NG_REL_POSITION IZ15
N0009 SLEEP_ON
```

| F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 |
|---|---|---|---|---|---|---|---|---|---|
| INSERT | RE-WRITE | COPY | DELETE | CHANGE POS. | LOAD FILE | SAVE-AS | | READY SAVE | RETURN |

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Group C code choreographed position, the system in accordance with the previously selected user group code = 100 began to display, modify, if necessary, the user can enter the group code to make changes to the edit page.

| NO. | ON.T | OFF.T | H_V | L_V | WORK | P.P. | SPEED | S.V | GAP | POLAR. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0100 | 400 | 20 | 0 | 12 | 14 | 1.8 | 200 | 100 | 70 | + |
| 0101 | 200 | 20 | 0 | 8 | 12 | 1.6 | 180 | 90 | 60 | + |
| 0102 | 120 | 20 | 0 | 6 | 12 | 1.6 | 160 | 80 | 60 | + |
| 0103 | 80 | 20 | 0 | 4 | 12 | 1.6 | 140 | 70 | 60 | + |
| 0104 | 10 | 10 | 1 | 2 | 30 | 1.4 | 120 | 70 | 110 | + |
| 0105 | 4 | 5 | 2 | 1 | 30 | 1.4 | 110 | 60 | 120 | + |
| 0106 | 0 | 0 | 0 | 0 | 30 | 1.4 | 100 | 50 | 100 | + |
| 0107 | 5 | 1 | 3 | 0 | 30 | 1.4 | 80 | 50 | 150 | - |
| 0108 | 0 | 0 | 0 | 0 | 10 | 2 | 60 | 50 | 100 | + |

<(>199)
Unlock: [F2], CURSOR:PageUp/Down,Home,End,↑↓→←,Modulate:+,- Modified&SAVE:Esc

※ If you use AUTO INDEX function again, the previous set condition will be covered, please note!

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# 12 SYSTEM

This chapter introduces system mode, and provides the users with the planning of machine characters, the operational habit on the set system and other simple functions advantageous to the service.

This mode has sub-functions of【F1】PARA,【F2】TIME SET,【F3】IN/OUT,【F4】MESSAGE, 【F5】DP-RAM, 【F6】USUAL, 【F7】ATC _POS.(for ATC model) and 【F9】CLEAR LAG. Among them, in/out points, message and DP-RAM just display information for reference. The rest sub-functions can be operated and changed.

Enter the system, the screen is shown below -

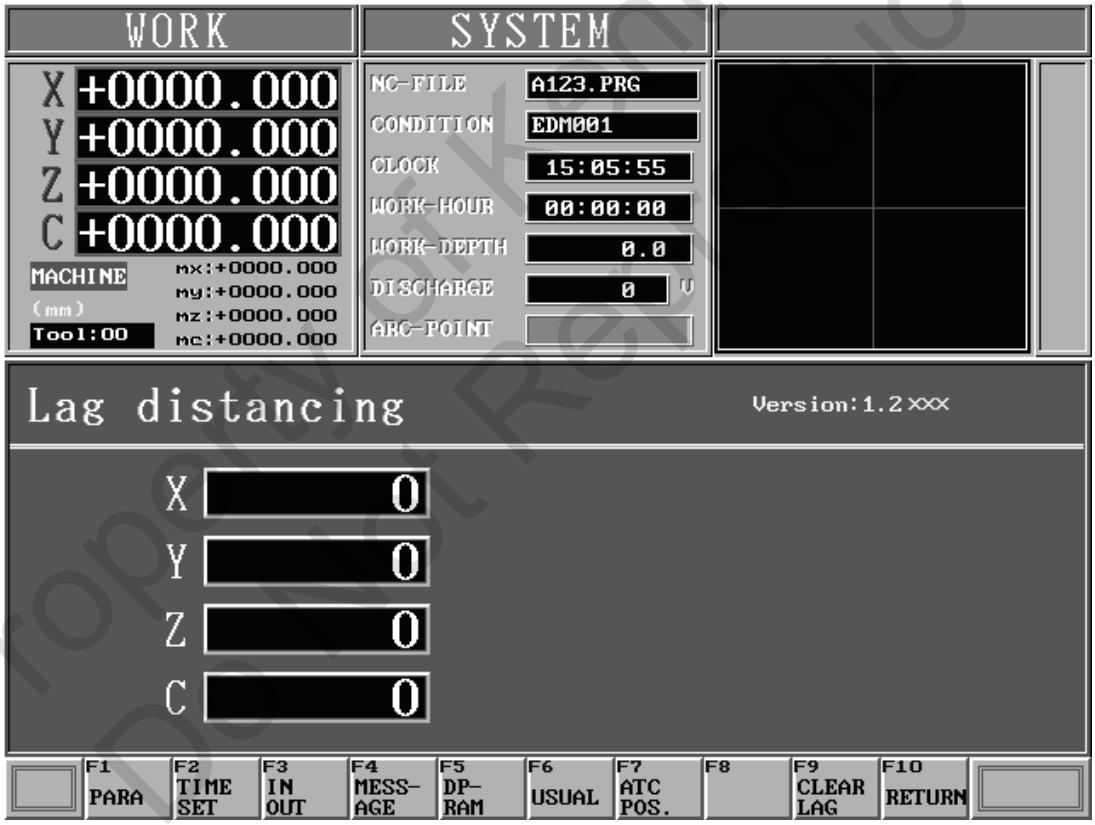


FIG. 12-1 screen of system mode

Display Lag distancing: It displays the servo lag values of the current X, Y and Z axes. When this value is too big, the system will send a warning message. When there is a LAG value, press【F9】CLEAR LAG to restore the LAG to 0.

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## 12.1 PARA

FUNCTION: This function provides the users with parameters to set system machine and servo. The users can view the parameter setting, but only the authorized users (with passwords) can change the parameters.

Operation: Press【F1】parameter to enter the sub-function. Before entering, it is necessary to input a password as shown below -

Save before exit.

Before the password is entered, the alarm column will show “No Change”. Then, the system enters the parameter screen as following figure shown.

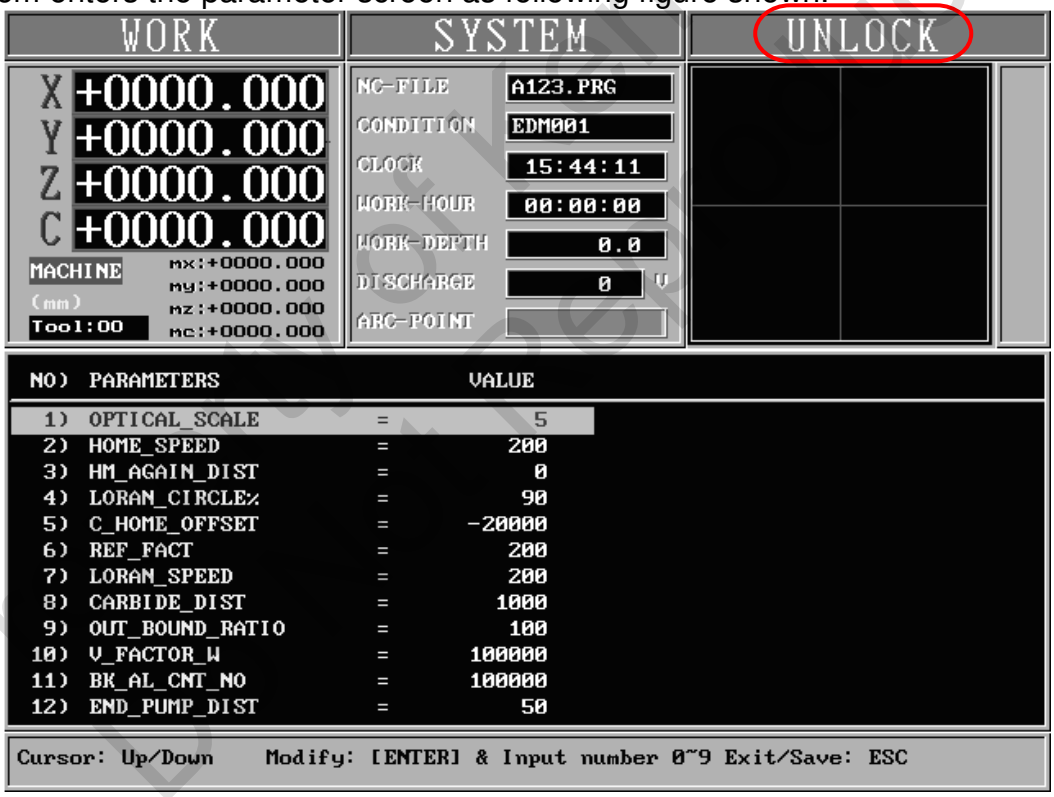


FIG. 12-2 screen of parameter setting

The change method is as follows -

【PgUp】,【PgDn】: Press these buttons to switch to previous or next page.

【▲】,【▼】 :Press these buttons to select items vertically.

【ENTER】 : Press this button to confirm the input.

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【0】~【9】 : Press the number buttons to enter parameter values.

【ESC】 : Press this button to leave the parameter setting and save the file.

## 12.2 TIME SET

Function: Set the time of the system.

Operation: Press【F2】Time Setting to enter the sub-function as following screen shown.

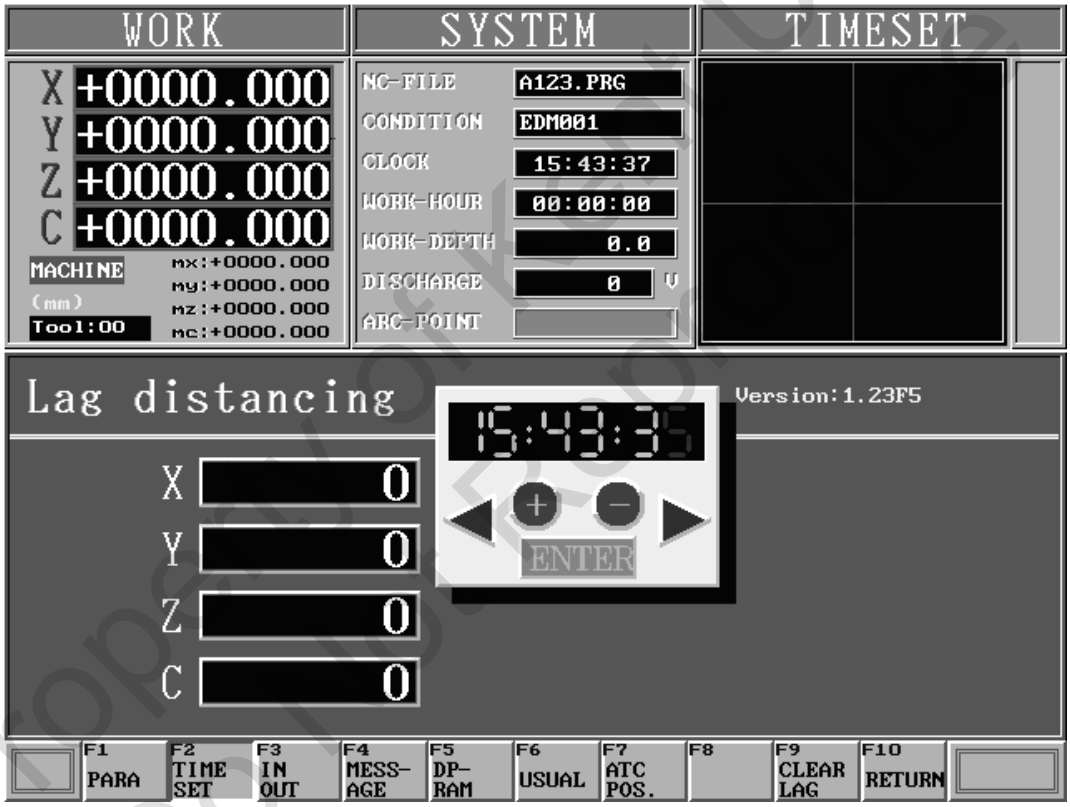


FIG. 12-3 the screen of time setting

The change method is as follows -

【◄】,【►】 : Press these buttons to move the selective items of hour, minute and second.

【＋】,【－】 : Press these buttons to adjust the values of hour, minute and second.

【ENTER】 :Press this button to confirm the input.

【ESC】 :Press this button to leave the parameter setting and save the file.

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## 12.3 IN/OUT

Function: It displays I/O status of the system for the convenience of maintaining the system.

Operation: Press【F3】In/Out point to enter the sub-function as following screen shown.

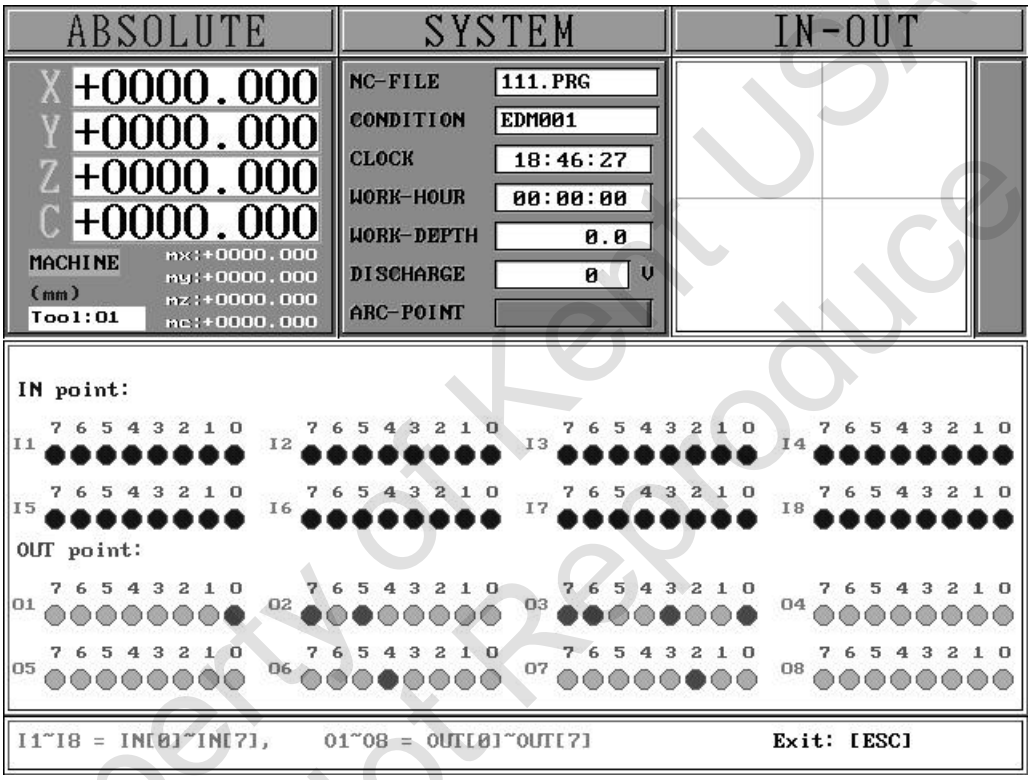


FIG. 12-4 the screen of in/out points

Above figure shows the screen of I/O status. ○ stands for OFF ● stands for ON.

This function is for servicemen's reference only. The users just need to know the existence of this function.

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## 12.4 MESSAGE

Function: This function displays the system error messages occurred in the past.

Operation: Press【F4】message to enter the sub-function as following screen shown.

FIG. 12-5 Screen of message display

Above figure is the screen of the message which helps the users and the servicemen to understand the current warning, and further assists them to solve the error during the work or the troubles with the machine.

**Warning messages and troubleshooting**

| Code | Messages | Troubleshooting |
|---|---|---|
| 0201 | （X＋）limit activated | Press【JOG】or【INCJOG】 to move The machine to –X axis. |
| 0202 | （X－）limit activated | Press【JOG】or【INCJOG】 to move The machine to +X axis. |
| 0203 | （Y＋）limit activated | Press【JOG】or【INCJOG】 to move The machine to –Y axis. |
| 0204 | （Y－）limit activated | Press【JOG】or【INCJOG】 to move The machine to +Y axis. |

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| | | |
|---|---|---|
| 0205 | （Z＋）limit activated | Press【JOG】or【INCJOG】 to move The machine to –Z axis. |
| 0206 | （Z－）limit activated | Press【JOG】or【INCJOG】 to move The machine to +Z axis. |
| 0217 | Servo of X axis is error. | （1）Switch off the machine. Check if the wire between DP-RAM and the Diver slips off or breaks.<br>（2）Replace DP-RAM. |
| 0218 | Servo of Y axis is error. | - ditto - |
| 0219 | Servo of Z axis is error. | - ditto - |
| 0220 | Servo of C axis is error. | - ditto - |
| 0221 | LAG reading of X axis is too big and under protection. | （1）Check if there is any collision, and if the driver functions well.<br>（2）Check if the reading of the linear scale is normal. |
| 0222 | LAG reading of Y axis is too big and under protection. | - ditto - |
| 0223 | LAG reading of Z axis is too big and under protection. | - ditto - |
| 0224 | LAG reading of C axis is too big and under protection. | - ditto - |
| 0229 | Servo_communication_error ! | Check the connection between motion card and backplane slot or the motion card is malfunction. |
| 0231 | “Find Origin” is not completed (X). | Please practically complete the finding of origin. |
| 0232 | “Find Origin” is not completed (Y). | - ditto - |
| 0233 | “Find Origin” is not completed (Z). | - ditto - |
| 0234 | “Find Origin” is not completed (C). | - ditto - |
| 0237 | prompt on the error of X axis offset | Adjust the offset value of DP-RAM. |
| 0238 | prompt on the error of Y axis offset | - ditto - |

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| | | |
|---|---|---|
| 0239 | prompt on the error of Z axis offset | - ditto - |
| 0240 | prompt on the error of C axis offset | - ditto - |
| 0302 | Short circuit during the work (or the driver is error) ! | Check the cause of short circuit, and shoot it. Restart to work. |
| 0303 | Emergency Stop Button is not released. | 1. Please pull up 【E.STOP】button.<br>2. Switch on the temperature control switch of the PC board. |
| 0304 | Hi voltage invalid! | Please pull up 【E.STOP】button. |
| 0305 | The work is completed (Sleep ON) ! | Press any button to restart the motor power. |
| 0306 | Fire alarm is activated. | Eliminate the cause of fire, and press the switch of quartz lamp. |
| 0307 | Servo circle is not ended! | Press any button to clear this message. If it is unable to clear, please restart the machine. |
| 0308 | Warning on low liquid level! | Press any button to perform the program again. If the liquid level detection button is OFF, the system can continue to perform the program. |
| 0315 | UNCLAMP_SWITCH_ON! | Please don't press the unclamp button while machining. |
| 0316 | OVER_OF_THE_SHORT_TIME ! | Recheck the electrode and the workpiece, and adjust the working conditions properly, such as shortening the "processing" extended "slag" distance. |

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## 12.5 DP-RAM

Function: This function displays the status between the system and the DP-RAM for the convenience of maintaining the system.

Operation: Press【F5】DP-RAM to enter the sub-function as following screen shown.

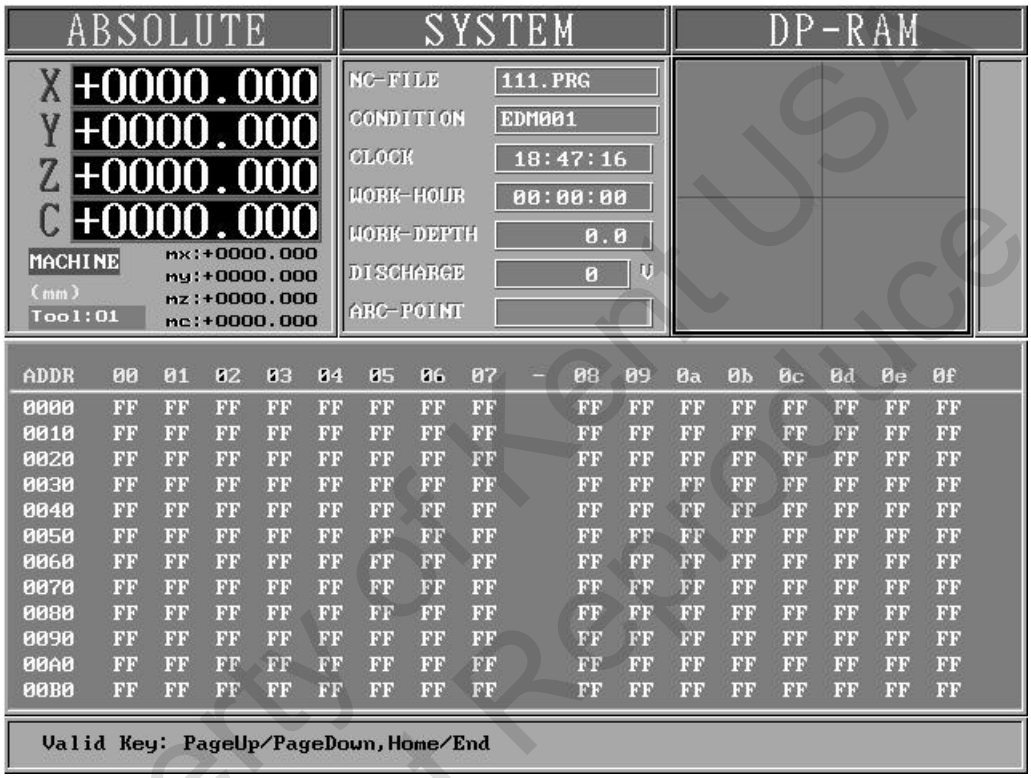


FIG.12-6 The Screen showing the status of DP-RAM

The above figure is the screen showing the status of the DP-RAM so that the servicemen can understand the current status of the servo, and the servicemen can repair the servo according to this message.

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## 12.6 USUAL

Function: This function provides the users with an usual action to set the system operation.
Operation: Press【F6】USUAL to enter the sub-function as following screen shown.

| NO. | PARAMETERS | | VALUE |
|---|---|---|---|
| (1) | WORK_PATH | = | C:\CNC\NC |
| (2) | WORK_FILE | = | TEMP.PRG |
| (3) | CONDIATIONS_FILE | = | EDM001 |
| (4) | LANGUAGE | = | Chinese |
| (5) | UNIT | = | mm |
| (6) | COORDINATES | = | Relative |
| (7) | PP_1 | = | ON |
| (8) | PULSE_WITH | = | 100 |
| (9) | AI_INDEX(%) | = | 80 |
| (10) | BUTTON_BEEP | = | 0 |
| (11) | LAST_POSITION | = | 1 |
| (12) | SECOND_PP_WORK | = | 1 |

Cursor: Up/Down  Varify/Input: [ENTER],'+' or '-'  Exit/Save: ESC

FIG. 12-7 The screen of USUAL

The above figure shows the usual screen of the system. The user may change depending on his usual work habit for work convenience. The change method is shown below -

【＋】,【－】 : Increase/decrease the value of the parameter.

【▲】,【▼】 : Press this button to select items vertically.

【ENTER】 : Press this button to confirm the input.

【0】~【9】 : Press the number buttons to input parameter values.

【ESC】 : Press this button to leave the parameter setting and save the file.

Parameters:

① WORK_PATH : Set the directory for the current work files saved.

② WORK_FILE : Preset the loaded files while booting.

③ CONDIATIONS_FILE : Set files to save the work parameters. The default value is＜EDM001＞. The user may save the work

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parameter in another file under DATA\DIRECTORY depending on his work habit. Then enter a file name for this parameter item.

④ LANGUAGE : Set the language for the system. Chinese → Chinese characters；English→ English words

⑤ UNIT : Set the unit for the coordinate. mm→ metric system；inch→ British execution

⑥ COORDINATES : Set the coordinate system during booting. Relative→ work coordinate；Absolute→ referential coordinate

⑦ PP1 : Refer you to Chapter 6 P.P. mode (residue removing)

⑧ PULSE_WITH : carbon sensitivity – the smaller, the more sensitive (unchangeable)

⑨ AUTO_INDEX(%) : Set the fall rate at each stage of current in AUTO INDEX function.
e.g. Set 60%. In AUTO INDEX system, select the 1st stage of discharge current 12A. Then, the 2nd stage will be set as 12A×60%=7A.

⑩ SPARK_SPEED : not to use

⑪ LAST_POSITION : Set the coordinate system to show 0 or original coordinate under re-booting. 0→ zero return；1→ original coordinate

※ Note: This setting is valid only under normal shutting down. Under abnormal shutting down, the coordinate saved last time will appear if the machine is restarted.

**12.7 ATC (ATC model only):** This function is suitable only for the machine with ATC model. The users just need to know the existence of this function.

**12.8 CLEAR LAG** : When there is a LAG value, press【F9】LAG clear to make LAG value to be 0.

**12.9 RETURN:** Return to previous page.

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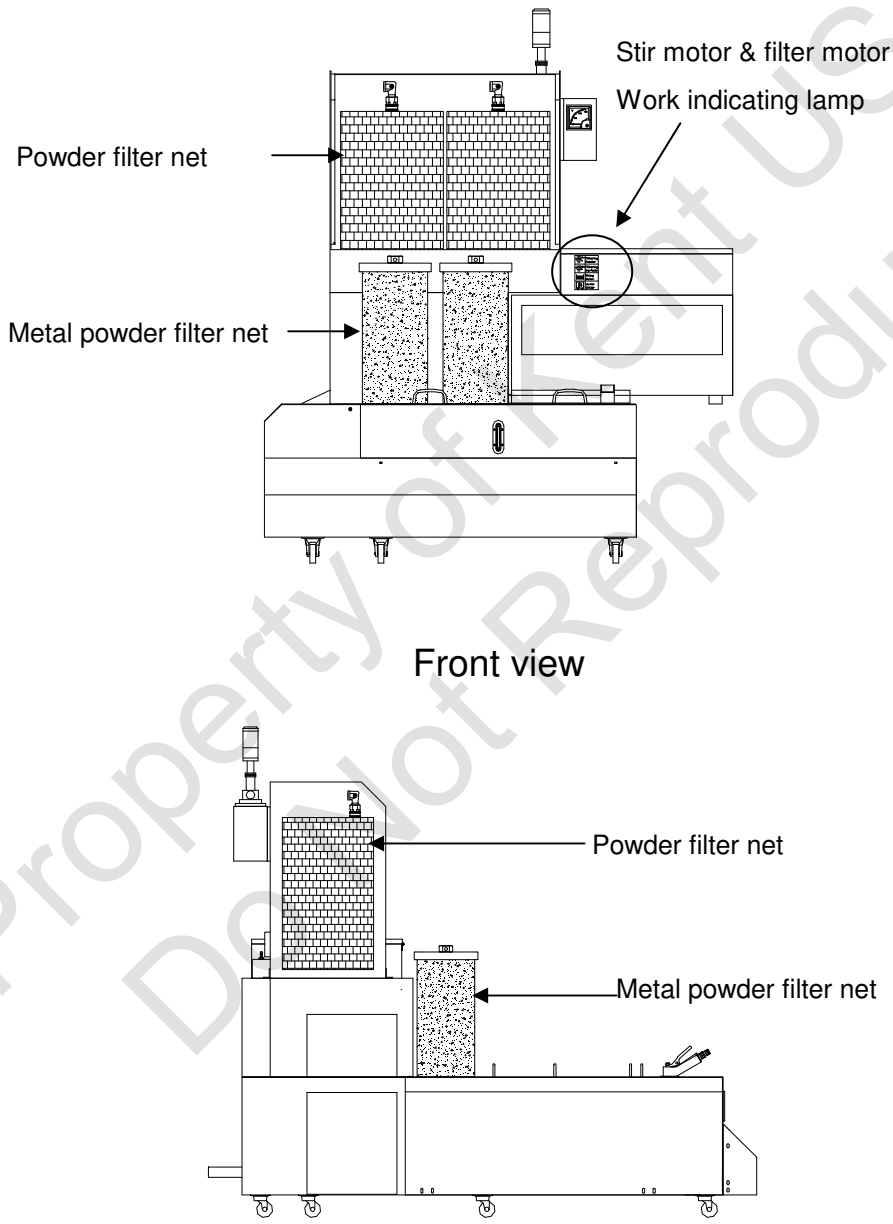
# 13 Operation of dust stir

The structure of dust stir: KEB-CNC EDM with additional dust stir function is to replace the ordinary oil tank with a special oil tank which accepts dust, allows dust to be mixed and can filter dust and metal dust respectively.

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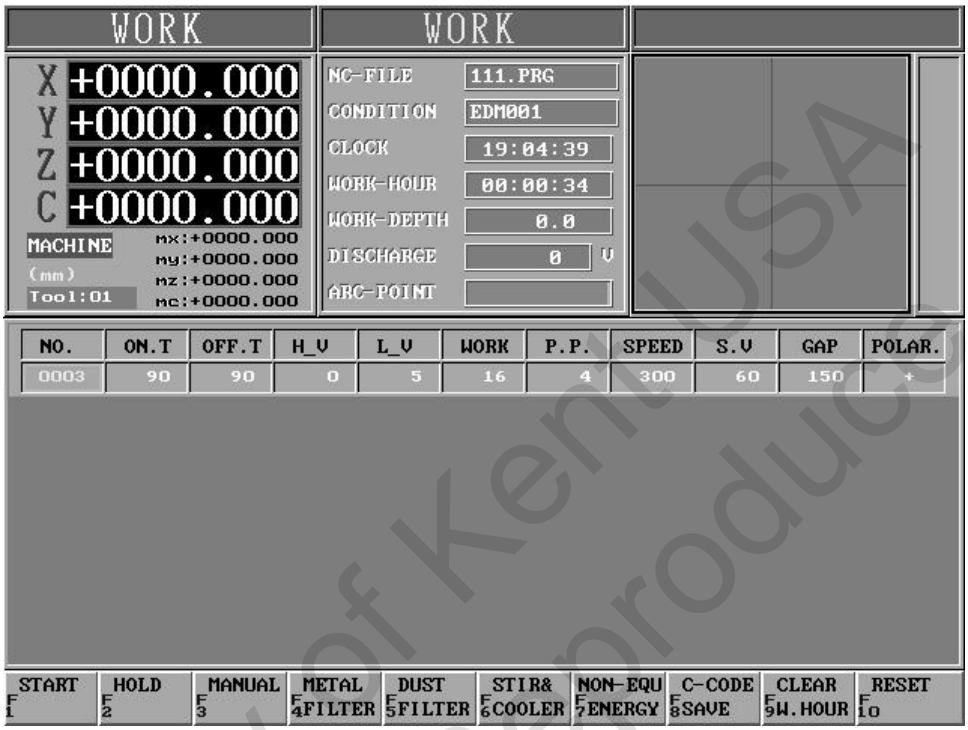
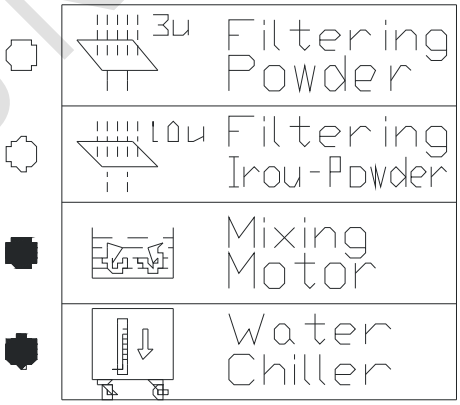
## 13.1 Start dust stir system manually

Enter the system screen. Press【F1 OPERATION】→【F9 WORK/SAVE】Enter following screen -




① Press 【F6 Stir & Cooler】to start the dust stir and the cooler. Press it again to switch off the function. When Stir & Cooler function is started, the work indicating lamp on the oil tank lights as shown below -

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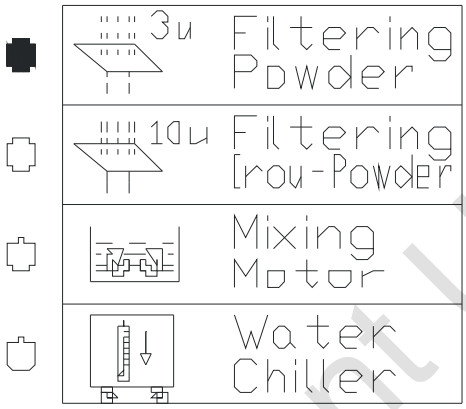
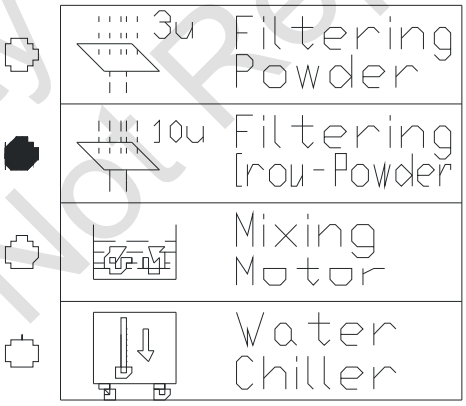
② Press【F5 Dust Filter】to start Dust Filter. Press it again to switch off this function. When this function is switched on, the work indicating lamp on the oil tank will light as following figure shown.




③ Press【F4 Metal Filter】to start Metal Filter. Press it again to switch off the function. When this function is switched on, the work indicating lamp on the oil tank will light as following figure shown.

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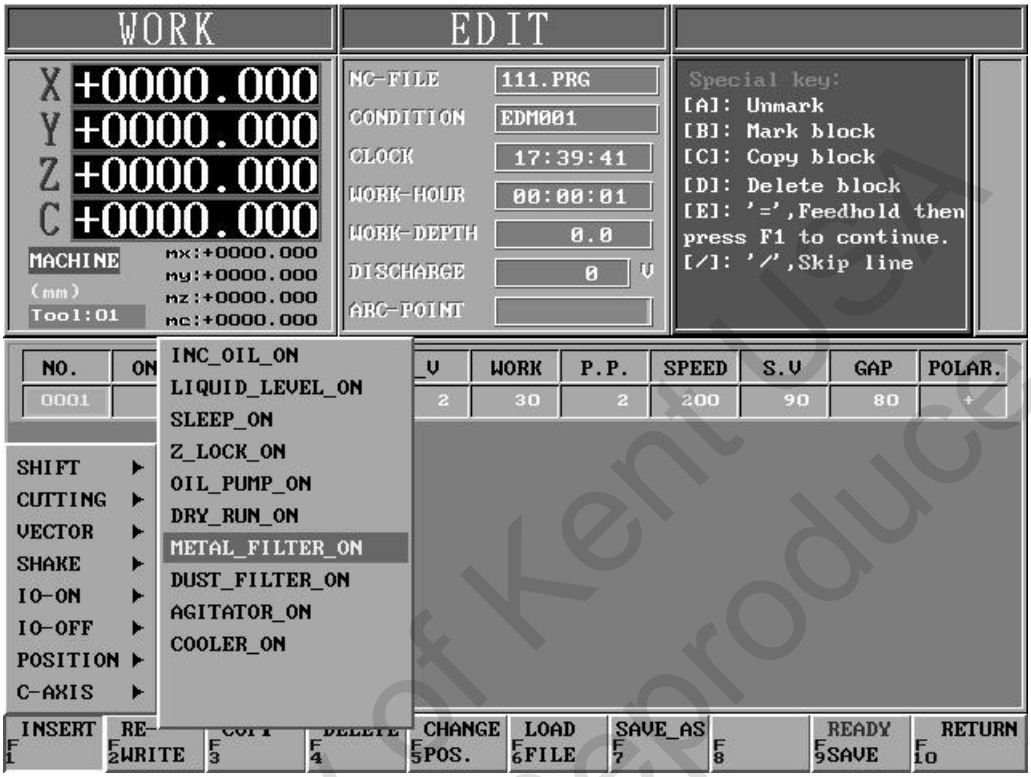
## 13.2 Start the program of dust stir system

Switch on: Enter the system screen. Press【F1 OPERATION】→【F1 INSERT】→【IO-ON】→【▸】Enter the screen as shown below.




You have following options.

【AGITATOR_ON】：Start stir function.

【COOLER_ON】：Start cooler function.

【DUST_FILTER_ON】：Start dust filter function.

【METAL_FILTER_ON】：Start metal powder function.

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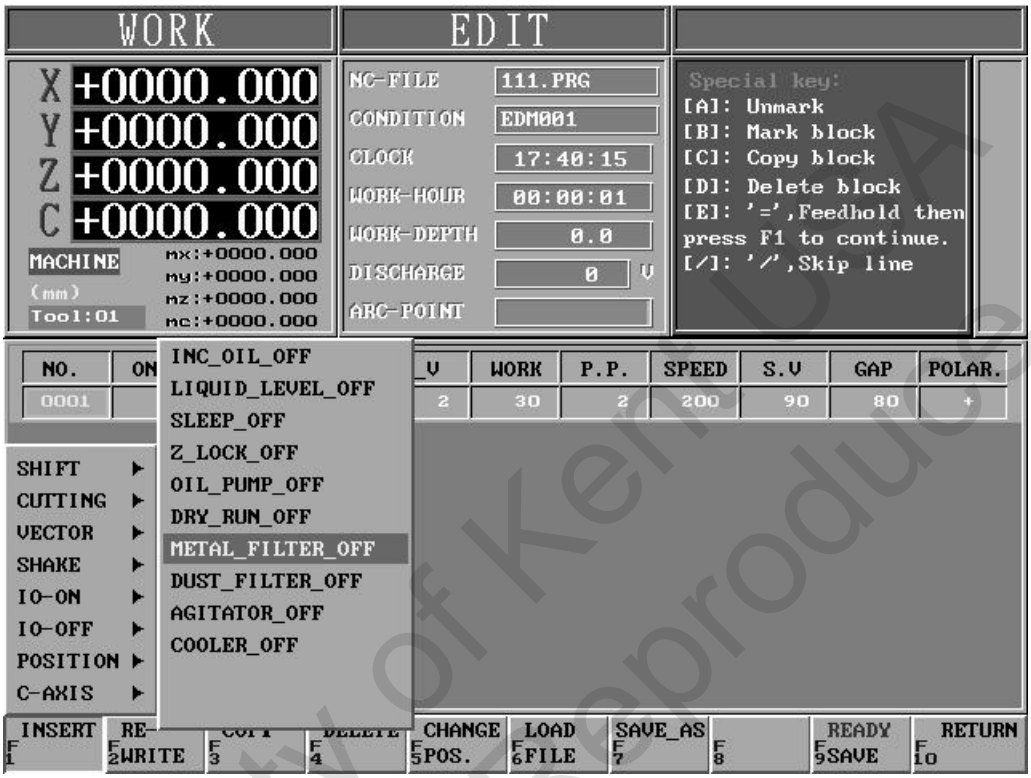
## Switch off:

Enter the system screen. Press【F1 OPERATION】→【F1 INSERT】→【I-O_OFF】→【 ▸ 】Enter the screen as shown below.




You have following options -

【AGITATOR_OFF】：Switch off the stir motor.

【COOLER_OFF】：Switch off the cooler.

【DUST_FILTER_OFF】：Switch off the dust filter.

【METAL_FILTER_OFF】：Switch off the metal filter.

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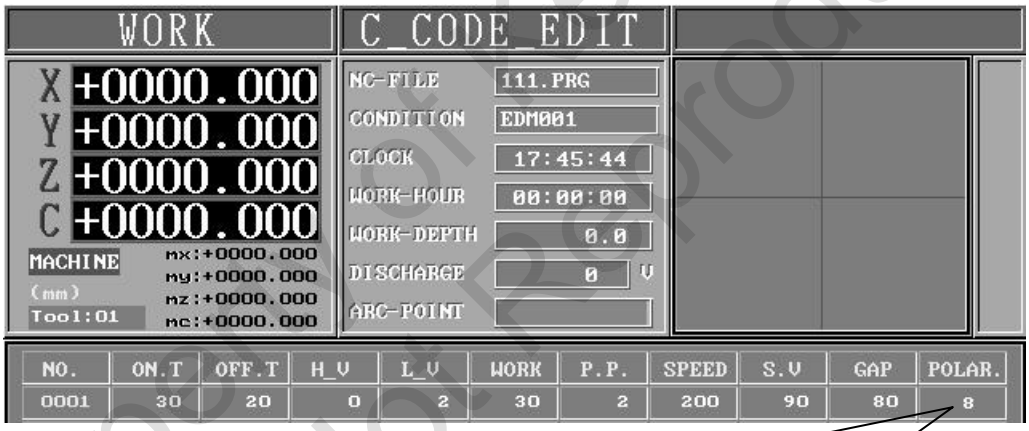
※ **Set a polarity for mirror work:** The bigger the setting value, the bigger the current. Therefore, the setting value should vary depending on the area of the electrode. For the electrode Φ=80mm, the setting value should be over 6. In this example, the setting value is 8. （After test, this value can obtain the optimum effect.）

※ When the depth is deeper than 30mm, the residue removing height (P.P.) at each section should be over 2.5mm. It will affect all the work time.

※ During the work, try to allow the liquid surface over the surface of the workpiece surface, then pour oil in counterclockwise direction so that the work liquid can produce whirlpool to obtain a better discharge effect.

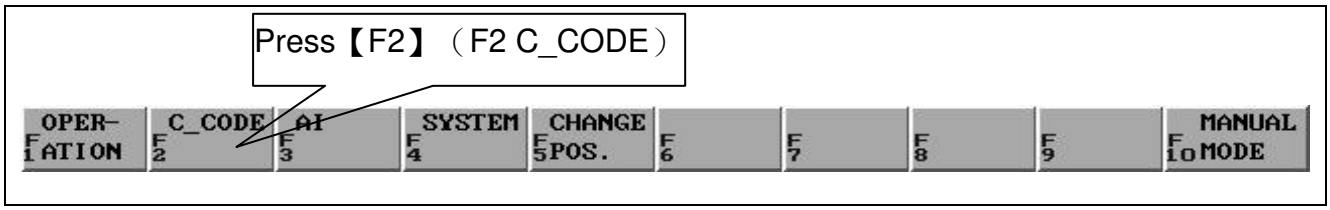
※ Adjust the parameters for mirror fine machining (mirror function) as below -

① Adjust the parameters in work screen as follows -




∗ Adjust the parameter of mirror fine machining in Polarity field.
∗ Press【◀】or【▶】to select the polarity field.
Press【＋】or【－】to adjust the parameter value.

② Make adjustment in the group code screen as shown below -
In the main system screen, press【F2】（F2 C_CODE）to enter the screen of group code.

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※ Mirror machining without dust stir

（1）Hints during mirror machining

① Use 2 electrodes.

② At the 2nd stage of machining, oil flush shouldn't be too strong.

| NO. | ON.T | OFF.T | H_V | L_V | WORK | P.P. | SPEED | S.V | GAP | POLAR. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0001 | 30 | 20 | 0 | 2 | 30 | 2 | 200 | 90 | 80 | + |
| 0002 | 120 | 40 | 0 | 8 | 30 | 3 | 300 | 60 | 80 | + |
| 0003 | 90 | 90 | 0 | 5 | 16 | 4 | 300 | 60 | 150 | + |
| 0004 | 30 | 20 | 0 | 3 | 20 | 1.4 | 160 | 80 | 110 | + |
| 0005 | 10 | 10 | 1 | 2 | 20 | 1.6 | 140 | 80 | 120 | + |
| 0006 | 4 | 4 | 1 | 1 | 16 | 1.8 | 120 | 80 | 130 | + |
| 0007 | 1 | 1 | 0 | 0 | 12 | 2 | 100 | 80 | 140 | + |
| 0008 | 0 | 0 | 0 | 0 | 10 | 2 | 80 | 80 | 100 | + |
| 0009 | 300 | 20 | 1 | 12 | 40 | 3 | 120 | 50 | 80 | + |

CURSOR :PageUp/Down,Home,End,↑↓→← Modulate :+,- Modified & SAVE :Esc

＊ Adjust the parameter of mirror machining in the polarity field.

＊ Press【◀】,【▶】,【▲】or【▼】to select the polarity field.
Press【＋】or【－】to adjust the parameter value.

③ At the 3rd stage of machining, just drip oil.

④ Before the 3rd stage of machining, use fine abrasive paper to clean the electrode.

⑤ Before the 3rd stage of machining, verify that the surface at the2nd stage is evenly machined.

（2）Use graphite to set the pulse width for the electrode.
Pulse width ＝25× low voltage, e.g. 25×10（low voltage）＝250（pulse width）
While the graphite is used for discharge, the pulse width should be larger than the copper electrode so as to avoid big consumption.

（3）Parameter setting for the mirror machining without dust stir:

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（4） Hints on dust stir

① Add dust in a ratio of 50 gallon discharge oil to 500 gram dust (Namely, 1 gallon: 10g)

② When the total work time is about to reach 200 hours, it is necessary to replace or add dust. Under non-machining status, feed discharge oil in the work tank. If the dust concentration is not enough, the mirror effect of the workpiece will be low. It is necessary to add dust, too.

※densitometer value drops to 50KΩ.

※Concentration is about equal to the discharge oil at 100mm depth in the oil tank. The bottom of the oil tank shouldn't be visible.

※ If the concentration is too low, the mirror discharge effect is not good.

※ If the concentration is too high, the mirror has water stains.

③ The suitable time to filter dust: Replace with new dust, or clean the work tank.

④ The suitable time to filter metal powder: The total machining time about 50 hours, or too many impurities in the discharge oil.

※ After the metal powder filter is switched on for 20 minutes, some of the dust will be filtered. If you feel the dust is insufficient, please add dust.

⑤ Add dust: The dust belongs to consuming material. Please contract us for the purchase.

⑥ Add dust as following figure shown -

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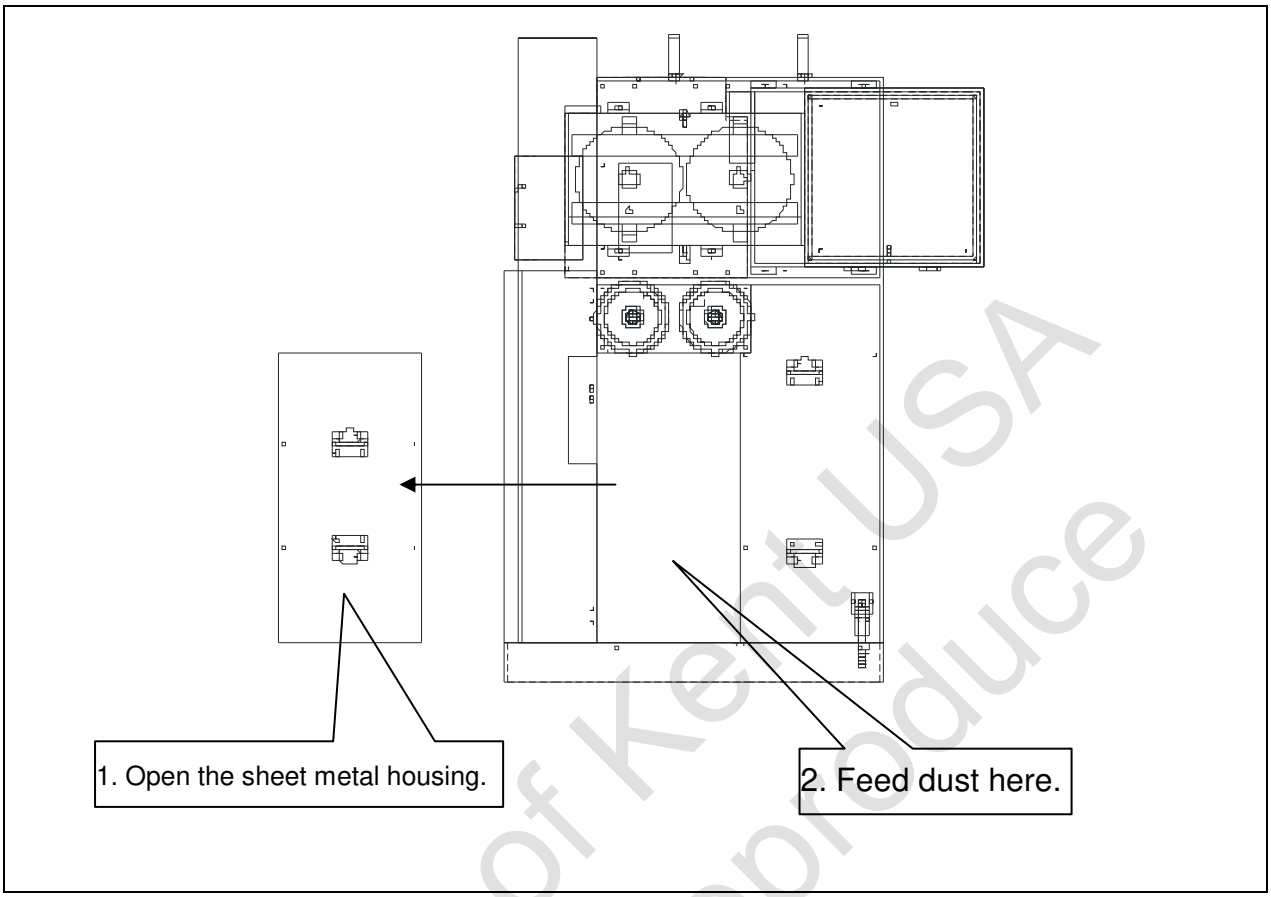


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# 14 Graphite processing

Provides the user in view of the graphite processing, the edition、the deposit as well as
the execution work piece program introduce.
It's setting position is in the processing parameter list "HV2" , following figure.

| NO. | HV2 | ARC.T | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0001 | 0 | 300 | | | | | | | | |

In "HV2", namely the second section of high voltage discharge used in fine finish working,
the setting may divide into 0, 1, 2, 3 and so on four sections.
Use 【+】or 【-】key to make the "HV2" column setting. It's explanation as

"0" : The electric circuit of the second section of high voltage discharge, "OFF".
"1" : The electric circuit of the second section of high voltage discharge, "ON".
"2" : The electric circuit of the second section of high voltage discharge, "OFF"
The electric circuit of the graphite processing,"ON"
"3" : The electric circuit of the second section of high voltage discharge, "ON"
The electric circuit of graphite processing,"ON"

Example 1 : When use graphite electrode in rough processing, "HV2" will suppose "2". Simultaneously the controller reads the setting data, will establish the electric circuit of graphite processing automatically and carries out the processing.

Example2 : When use graphite electrode in rough processing, "HV2" will suppose "0". Simultaneously the controller reads the setting data, will establish the normal electric circuit and carries out the processing.

! Note

1. When the execution graphite discharges, "HV2" if has not supposed "2" or "3", easy to
produce the arc light and carbon deposition.
2. When the execution copper discharges, "HV2" if has not supposed "0" or "1", the discharging efficiency will reduce, and easy to consume.

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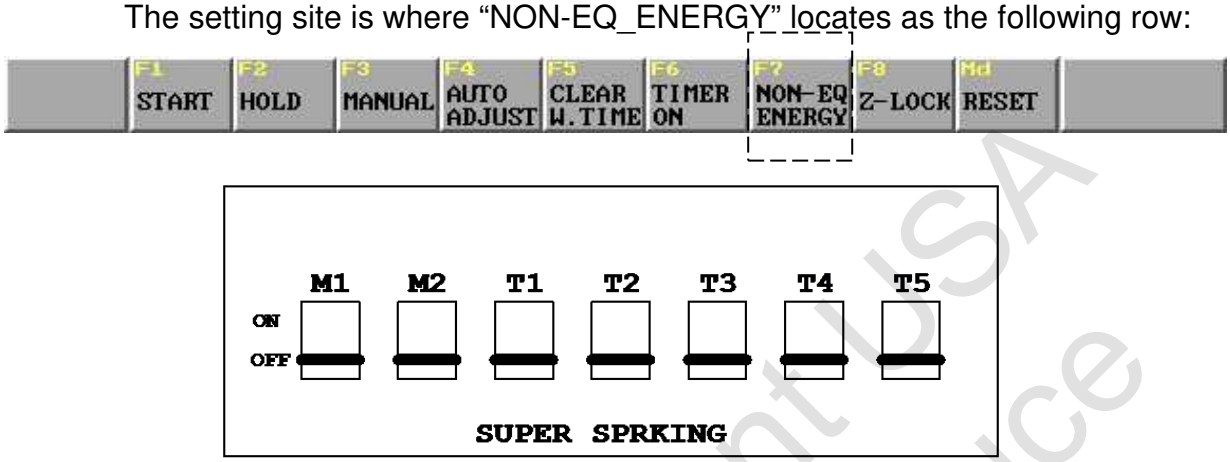
# 15 Super Sparking (Optional)

The introduction for user to process the program especially on work piece made of Tungsten Carbide or the other materials in the same hardness.

The setting site is where “NON-EQ_ENERGY” locates as the following row:




1. For discharging with “Super Sparking”, you must activate the “NON-EQ_ENERGY” function of the discharging screen; you can only discharge with “Super Sparking” when either of M1 and M2 is ON.
   To back to the normal discharging function, which you just need to call “NON-EQ ENERGY” off and set all the switches OFF.

2. Setting of M1 and M2:
   A. When M1 & M2 are both ON: Discharging Speed is fast, but consumption of Electrode is also huge.
   B. When M1 is OFF and M2 is ON: Discharging Speed is moderate, and consumption of Electrode is lighter.
   C. When M1 is ON and M2 is OFF: Discharging Speed is slow, and consumption of Electrode is littlest.

3. Setting of T1~T5: you only have to switch on T1when the hardness of material is tender, and switch on T2~T5 one by one based on the diversity of hardness for different materials.

4. Setting of Discharging Condition: the collocation of Electric Current and Pulse Width would vary with different materials.
   For example of Tungsten Carbide (HRC60):
   Best Setting: Electric Current *6~7= Pulse Width

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**Silicon powder stir system: work condition under manual mode mobile phone discharge parameter**

| NO. | ON.T | OFF.T | HV | LV | Work | P.P. | Speed | Servo | Gap | Pol | HV2 | Arc.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 200 | 20 | 0 | 9 | 30 | 2 | 160 | 80 | 80 | + | 0 | 40 |
| 11 | 120 | 20 | 0 | 6 | 30 | 2 | 160 | 80 | 80 | + | 0 | 40 |
| 12 | 60 | 20 | 1 | 4 | 30 | 2 | 140 | 80 | 80 | + | 0 | 40 |
| 13 | 30 | 20 | 1 | 3 | 30 | 2 | 120 | 70 | 80 | + | 0 | 40 |
| 14 | 10 | 10 | 1 | 2 | 30 | 2 | 100 | 60 | 80 | + | 0 | 20 |
| 15 | 5 | 10 | 2 | 1 | 30 | 3 | 90 | 50 | 80 | + | 0 | 20 |
| 16 | 4 | 1 | 1 | 1 | 30 | 4 | 80 | 50 | 90 | - | 0 | 5 |
| 17 | 0 | 0 | 0 | 0 | 30 | 4 | 80 | 50 | 90 | 8 | 0 | 10 |
| 18 | 0 | 0 | 0 | 8 | 25 | 4 | 80 | 50 | 90 | 6 | 0 | 10 |

1st electrode (work time: about 8 hours)

```
N001    ABS_POSITION  Z2
N002    ABS_POSITION  X0   Y0
N003    AGITATOR_ON
N004    COOLER_ON
N005    ABS_LINER_Z_AXIS  Z-7.45   B1   C10 ;   B=(residue removing mode,
                                                     P.P.),
                                                  C= (group code)
N006    ABS_LINER_Z_AXIS  Z-7.55   B1   C11
N007    ABS_LINER_Z_AXIS  Z-7.6    B1   C12
N008    NG REL_POSITION   Z0.15    ; (NG= No Guard, no stopping under short
                                     circuit condition) relative positioning
N009    CIRCLE _LORAN   HR0.06     VD-0.18   B4   C12    ; HR=(radius),
                                                          VD=(depth),
                                                          B= (P.P. mode)
N010    NG REL_POSITION Z0.15
N011    CIRCLE _LORAN   HR0.08     VD-0.18   B4   C13
N012    NG ABS_POSITION   Z20
```

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**2nd electrode (outer diameter is bigger than it of the 1st electrode by 0.2mm)**
(work time about 16 hours)

```
N001    ABS_POSITION  Z2
N002    ABS_POSITION  X0   Y0
N003    AGITATOR_ON
N004    COOLER_ON
N005    ABS_LINER_Z_AXIS   Z-7.68  B1   C14 ;  B=(P.P. mode),C=(group code)
N006    NG REL_POSITION Z0.15;   (NG= No Guard, no stopping under short
                                  circuit condition) relative positioning
N007    CIRCLE _LORAN   HR0.035   VD-0.165   B4   C14,   HR=(radius),
                                                         VD=( depth),
                                                         B=(P. P. mode)
N008    NG REL_POSITION   Z0.15
N009    CIRCLE _LORAN   HR0.045   VD-0.16   B4   C15
N010    NG REL_POSITION   Z0.15
N011    MACHINE_BY_TIME  B90
N012    CIRCLE _LORAN   HR0.06    VD-0.17   B4   C16
N013    NG REL_POSITION   Z0.15
N014    MACHINE_BY_TIME  B200
N015    CIRCLE _LORAN   HR0.075   VD-0.17   B4   C17
N016    NG REL_POSITION   Z0.15
N017    MACHINE_BY_TIME  B240
N018    CIRCLE _LORAN   HR0.075   VD-0.17   B4   C18
N019    NG ABS_POSITION   Z20
```

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# ※ EB(CNC) series Discharge parameter operating instructions

## 1. Parameter definition

A. ON. T In processing pulse time; unit is microsecond (μs).

B. OFF. T In processing pulse time interval; unit is microsecond (μs).

C. H-V High voltage discharge current; unit is ampere (A).

D. L-V High voltage discharge current; unit is ampere (A).

E. WORK The spindle(Z axis) downward contact work piece time，unit is 0.1 second (sec).

F. P. P In processing spindle(Z axis) upward unload dregs distance; unit is millimeter (mm).

G. SPEED In processing spindle(Z axis) reciprocated speed.

H. S.V Controls the spindle(Z axis) in the processing between the electrode and work piece downward the discharge velocity.

I. GAP In processing between electrode with work piece distance.

J. POLAR Electrode's electric discharge polarity.

K. HV2 The second section of high voltage，unit is voltage (V).

L. ARC. T The second section of discharge stops the time interval，unit is microsecond(μs).

## 2. Parameter setting

A. ON. T
1.) ON.T is higher ⇒ processing more fast; electrode waste less; surface more rough.
2.) ON.T is lower ⇒ processing more slow; electrode waste more; surface more smooth.
3.) ON.T setting may depend on the work piece material degree of hardness to have difference.
   a. Below HRC50° to match "L.V" about ×20 times.
   b. Above HRC50° to match "L.V" about ×25~30 times.

B. OFF. T
1.) OFF.T is higher ⇒ processing more slow; electrode waste less.
2.) OFF.T is lower⇒ processing more fast; electrode waste more; easy to have carbon deposition (ARC).

C. H-V
1.) Suitable to bigger size electrode or the material hardness higher than HRC50° and more depth processing.
2.) Use "H.V", the discharge amperage is higher, the processing more fast, but the work piece surface is more rough, the electrode easy to consume, mold's gap will be bigger.

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3.) Sometime suggestion may set “1A” or “2A” is small influence to the work piece.

D. L-V
1.) When normal processing use amperage, with “ON.T” matching approximately is 20~30 times. May depend on the work piece degree of hardness to change.
2.) Example: “ L_V” setting is 6A, then “ON.T” setting between 120~150. By this setting method, can have the most effective processing speed.

E. WORK Electrode contact work piece releasing current time, unit is 0.1 second. Its value supposes the rule to refer to the actual processing condition to decide. Usually by does not have the carbon deposition(ARC) situation primarily.(“WORK” setting the control very obvious influence to the processing speed.

F. P. P In processing spindle(Z axis) upward unload dregs distance. May depend on the working depth to set its value. Unit is millimeter （㎜）.

G. SPEED In processing spindle(Z axis) reciprocated speed. The value may depend on electrode’s size to set.
1.) Bigger electrode may set the value small (40~100).
2.) Smaller electrode may set the value big (100~200).
3.) When the electrode is specially small, then the value must suppose again is small (bellow 40).

H. GAP In processing between electrode with work piece distance. Its value is bigger, the distance is bigger; otherwise is smaller.
1.) Setting is bigger (100V~150V), Skin-cutting processing speed slow not easy carbon deposition.
2.) Setting is smaller (70V~80V), Rough-cutting processing speed fast, but easy carbon deposition.

I HV2 When process the computer detection has the carbon deposition situation, the controller automatically adjust Gap-voltage to high, with aim of removing the “ARC” situation. If non-carbon deposition(ARC), then this setting will not work.
1.) Setting is “1” → Enable
2.) Setting is “0” → Disable.
3.) The suggestion is normal processing when may suppose “1”.
4.) Setting is “2” → Graphite discharging circuit will be active.

J. ARC.T
1.) In normal processing , the machine work in the “OFF.T” setting value.
2.) When process the computer detection has the carbon deposition situation, the machine automatically work in “ARC.T” setting value.
3.) After carbon deposition(ARC) situation automatic removing , the machine restore to “OFF.T” setting value.
4.) “ARC.T” the value usually must set is bigger than “OFF.T” value 2~3 times can display its function.

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K. S.V 1.) Setting is higher, in processing on machine dial gauge swinging much more.
2.) Setting is lower, in processing on machine dial gauge swinging a little bit.
3.) Note:
a. It is better to adjust the value of S.V as machine processing, and make indicator's shaking do not be bigger than when 0.02mm.
b. The setting value will effect very obviously the processing efficiency, especially will work as the work piece to be specially big or to be specially small.

## 3. "LV"setting rule（In view of rough cutting） : Must depend on processing area of electrode

A. The area smaller than 400 ㎟→ "L_V" the setting value may suppose about 6A~12A or lower.
B. The area is between 400~1600 ㎟ → "L_V" the setting value may suppose about 10A~20A.
C. The area is between 1600~3600 ㎟ → "L_V" the setting value may suppose about 18A~30A.
D. The area is bigger than 6400 ㎟ → "L_V" the setting value may suppose above 30A.
E. "L_V" setting value can effect the processing speed and the surface roughness, therefore its setting is important , the user understands its characteristic first by all means must, only then can display machine's function.
F. When the work piece has made pre-mill , then must note the actual between the work piece and the electrode contacted area to make the setting → "L_V".

## 4. Processing size control

※The parameters will affect to size the work piece completed:

A. L-V Increase 1A, then its gap value approximately increase 0.012~0.015mm.
B. ON. T Increase 20μm, then its gap value approximately increase 0.003~0.004mm。
C. GAP Increase 10V, then its gap value approximately increase 0.003~0.004mm。
D. H-V Increase 1A, then its gap value approximately increase 0.007~0.010mm。

## 5. Each section of "L_V" reservation quantity setting:

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A. May refer to the gap value which the above 4TH item of institute shows to make the setting.
B. When the electrode is bigger, the reservation quantity may be smaller, otherwise may be bigger.
C. When electrode for taper shape, then suppose the reservation quantity to enhance.

## 6. The work piece pattern (surface roughness) control : Is by "L_V"、"ON.T" 、electrode control.

### ※ Actual processing examples

Foreword: The processing parameter's setting is suitable or not, and between each section of "L_V" reservation quantity, is affects the processing efficiency two main factors.

1. Processing parameter

May refer to the definition of processing parameterto make the suitable setting in processing. Once it is easy to occur carbon deposition(ARC) situation, do following instructions to remove it.

A. Reduce the "WORK" setting value.
B. Increase "P. P" setting value.
C. Increase "GAP" setting value.
D. Increase "H_V" 1A or 2A. Above all instructions may remove the carbon deposition(ARC) situation.

2. Between "L_V" reservation quantity Its meaning is refer to when makes rough – middle rough – skin three sections of processing , between each section of "L_V" reservation quantity.

A. "L_V" setting value must proceed in an orderly way , decrease progressively in order, cannot a change be too more , cause the processing efficiency to reduce.
B. Each section of "L_V" reservation quantity, may refer to the parameter definition to setting.
C. The reservation quantity too many , cause the process period elongate；The reservation quantity too few, will produce between each section of "L_V" setting value matches is not suitable.

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# Processing sample (copper to steel)

**Example 1-A：(Only 1 electrode)**

Processing Material：copper → steel

Processing Area：400 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 0.85 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.8 | 90 | 20 | 0 | 6 | 16 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 2 | -9.865 | 60 | 20 | 0 | 4 | 16 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 3 | -9.905 | 30 | 20 | 0 | 3 | 16 | 2 | 140 | 80 | 70 | + | 0 | 40 |
| 4 | -9.935 | 10 | 10 | 1 | 2 | 12 | 2 | 140 | 80 | 70 | + | 1 | 40 |
| 5 | -9.955 | 5 | 5 | 1 | 1 | 12 | 2 | 120 | 60 | 70 | + | 1 | 20 |
| 6 | -9.97 | 0 | 0 | 0 | 0 | 12 | 2 | 120 | 60 | 70 | + | 1 | 1 |

**Example 1-B：(By 2 electrodes)**

Processing Material：copper → steel

Processing Area：400 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 0.65 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.72 | 200 | 20 | 0 | 8 | 16 | 1 | 160 | 80 | 70 | + | 0 | 40 |
| 2 | -9.8 | 120 | 20 | 0 | 6 | 16 | 1 | 160 | 80 | 70 | + | 0 | 40 |
| 3 | -9.86 | 60 | 20 | 0 | 4 | 16 | 1 | 140 | 80 | 70 | + | 0 | 40 |
| Change 2nd electrode | | | | | | | | | | | | | |
| 4 | -9.91 | 30 | 20 | 0 | 3 | 12 | 2 | 120 | 80 | 70 | + | 0 | 40 |
| 5 | -9.94 | 10 | 10 | 1 | 2 | 12 | 2 | 120 | 80 | 70 | + | 0 | 40 |
| 6 | -9.96 | 5 | 5 | 1 | 1 | 12 | 2 | 120 | 80 | 70 | + | 1 | 10 |
| 7 | -9.975 | 0 | 0 | 0 | 0 | 12 | 2 | 100 | 80 | 80 | + | 1 | 1 |

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**Example 2-A：(Only 1 electrode)**

Processing Material：copper → steel

Processing Area：1000 (㎟)

Processing depth：10 (mm)

Finish surface roughness 1.75 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.7 | 200 | 20 | 0 | 9 | 16 | 1.6 | 180 | 80 | 70 | + | 0 | 40 |
| 2 | -9.8 | 90 | 20 | 0 | 6 | 16 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 3 | -9.87 | 60 | 20 | 0 | 4 | 16 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 4 | -9.92 | 30 | 20 | 1 | 3 | 16 | 2 | 140 | 80 | 70 | + | 1 | 40 |
| 5 | -9.95 | 10 | 10 | 1 | 2 | 16 | 2 | 120 | 80 | 70 | + | 1 | 40 |

**Example 2-B：(By 2 electrodes)**

Processing Material：copper → steel

Processing Area：1000 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 1.5 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.55 | 300 | 20 | 0 | 15 | 16 | 1.6 | 180 | 80 | 70 | + | 0 | 40 |
| 2 | -9.7 | 200 | 20 | 0 | 9 | 16 | 1.6 | 180 | 80 | 70 | + | 0 | 40 |
| 3 | -9.8 | 90 | 20 | 0 | 6 | 16 | 1.6 | 160 | 80 | 70 | + | 0 | 40 |
| Change 2nd electrode | | | | | | | | | | | | | |
| 4 | -9.87 | 60 | 20 | 0 | 4 | 12 | 2 | 140 | 80 | 70 | + | 0 | 40 |
| 5 | -9.92 | 30 | 20 | 0 | 3 | 12 | 2 | 140 | 80 | 70 | + | 1 | 40 |
| 6 | -9.95 | 10 | 10 | 1 | 2 | 12 | 2 | 120 | 80 | 70 | + | 1 | 40 |

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**Example 3-A：(Only 1 electrode)**

Processing Material：copper → steel

Processing Area：2000 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 2.45 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.6 | 300 | 20 | 0 | 12 | 16 | 2 | 180 | 80 | 70 | + | 0 | 40 |
| 2 | -9.75 | 200 | 20 | 0 | 9 | 16 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 3 | -9.85 | 120 | 20 | 0 | 6 | 16 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 4 | -9.9 | 60 | 20 | 1 | 4 | 16 | 2 | 140 | 80 | 70 | + | 0 | 40 |
| 5 | -9.94 | 30 | 20 | 1 | 3 | 12 | 2 | 120 | 80 | 70 | + | 1 | 40 |

**Example 3-B：(By 2 electrodes)**

Processing Material：copper → steel

Processing Area：2000 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 2.1 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.55 | 400 | 20 | 0 | 18 | 16 | 1.6 | 180 | 80 | 70 | + | 0 | 40 |
| 2 | -9.69 | 200 | 20 | 0 | 12 | 16 | 1.6 | 180 | 80 | 70 | + | 0 | 40 |
| 3 | -9.79 | 120 | 20 | 0 | 6 | 16 | 1.6 | 180 | 80 | 70 | + | 0 | 40 |
| Change 2nd electrode | | | | | | | | | | | | | |
| 4 | -9.85 | 90 | 20 | 0 | 5 | 12 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 5 | -9.9 | 60 | 20 | 1 | 4 | 12 | 2 | 140 | 80 | 70 | + | 1 | 40 |
| 6 | -9.94 | 30 | 20 | 1 | 3 | 12 | 2 | 140 | 80 | 70 | + | 1 | 40 |

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**Example 4-A：(Only 1 electrode)**

Processing Material：copper → steel

Processing Area：5000 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 3.05 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.6 | 400 | 20 | 1 | 16 | 16 | 2 | 160 | 80 | 70 | + | 0 | 40 |
| 2 | -9.76 | 200 | 20 | 1 | 10 | 16 | 2 | 140 | 80 | 70 | + | 0 | 40 |
| 3 | -9.88 | 90 | 20 | 1 | 6 | 12 | 2 | 120 | 80 | 70 | + | 1 | 40 |
| 4 | -9.93 | 60 | 20 | 1 | 4 | 12 | 3 | 100 | 60 | 80 | + | 1 | 40 |

**Example 4-B：(By 2 electrodes)**

Processing Material：copper → steel

Processing Area：5000 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 2.7 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.5 | 400 | 20 | 1 | 20 | 16 | 2 | 180 | 80 | 70 | + | 0 | 40 |
| 2 | -9.64 | 300 | 20 | 1 | 12 | 16 | 2 | 180 | 80 | 70 | + | 0 | 40 |
| 3 | -9.74 | 200 | 20 | 1 | 8 | 16 | 2 | 180 | 80 | 70 | + | 0 | 40 |
| Change 2nd electrode | | | | | | | | | | | | | |
| 4 | -9.82 | 150 | 20 | 1 | 6 | 16 | 2 | 160 | 80 | 70 | + | 1 | 40 |
| 5 | -9.88 | 90 | 20 | 1 | 5 | 12 | 2 | 140 | 80 | 70 | + | 1 | 40 |
| 6 | -9.93 | 60 | 20 | 1 | 4 | 12 | 2 | 120 | 60 | 70 | + | 1 | 40 |

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**Example 5-A：(Only 1 electrode)**

Processing Material：copper → steel

Processing Area：12000 (㎟)

Processing depth：10 (mm)

Finish surface roughness Ra 3.75 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.5 | 400 | 20 | 1 | 20 | 16 | 2 | 100 | 60 | 70 | + | 1 | 40 |
| 2 | -9.68 | 300 | 20 | 1 | 12 | 16 | 2 | 100 | 60 | 70 | + | 1 | 40 |
| 3 | -9.8 | 200 | 20 | 2 | 8 | 16 | 2 | 80 | 40 | 70 | + | 1 | 40 |
| 4 | -9.88 | 100 | 20 | 2 | 6 | 12 | 3 | 80 | 40 | 70 | + | 1 | 40 |
| 5 | -9.93 | 60 | 20 | 3 | 4 | 12 | 3 | 60 | 40 | 80 | + | 1 | 40 |

**Example 5-B：(By 2 electrodes)**

Processing Material：copper → steel

Processing Area：12000 (㎟)

Processing depth：10 (  mm)

Finish surface roughness Ra 3.3 (μm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.3 | 600 | 20 | 1 | 30 | 20 | 2 | 100 | 60 | 70 | + | 1 | 40 |
| 2 | -9.55 | 400 | 20 | 1 | 20 | 20 | 2 | 100 | 60 | 70 | + | 1 | 40 |
| 3 | -9.7 | 200 | 20 | 1 | 12 | 20 | 2 | 100 | 60 | 70 | + | 1 | 40 |
| Change 2nd electrode | | | | | | | | | | | | | |
| 4 | -9.8 | 120 | 20 | 1 | 8 | 16 | 2 | 80 | 40 | 70 | + | 1 | 40 |
| 5 | -9.87 | 90 | 20 | 2 | 6 | 16 | 2 | 60 | 40 | 70 | + | 1 | 40 |
| 6 | -9.92 | 60 | 20 | 2 | 4 | 12 | 2 | 60 | 40 | 80 | + | 1 | 40 |

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**Example 6-A：(Slice processing)**

Processing Material：copper → steel

Processing area：length 20(mm) × width 1 (mm)

Processing depth：30 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10 | 150 | 30 | 1 | 6 | 25 | 1.6 | 180 | 50 | 70 | + | 1 | 40 |
| 2 | -15 | 150 | 30 | 1 | 6 | 20 | 2 | 180 | 50 | 70 | + | 1 | 40 |
| 3 | -20 | 150 | 30 | 1 | 6 | 12 | 3 | 180 | 50 | 70 | + | 1 | 40 |
| 4 | -25 | 150 | 30 | 1 | 6 | 12 | 4 | 180 | 50 | 70 | + | 1 | 80 |
| 5 | -30 | 150 | 30 | 1 | 6 | 10 | 4 | 160 | 50 | 80 | + | 1 | 80 |

**Example 6-B：(Slice processing)**

Processing Material：copper → steel

Processing area：length 50(mm) × width 1 (mm)

Processing depth：30 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10 | 200 | 30 | 1 | 9 | 20 | 1.6 | 180 | 80 | 70 | + | 1 | 40 |
| 2 | -15 | 200 | 30 | 1 | 9 | 16 | 2 | 180 | 80 | 70 | + | 1 | 40 |
| 3 | -20 | 200 | 30 | 1 | 9 | 12 | 3 | 180 | 80 | 70 | + | 1 | 40 |
| 4 | -25 | 200 | 30 | 1 | 9 | 12 | 4 | 180 | 80 | 80 | + | 1 | 80 |
| 5 | -30 | 200 | 30 | 1 | 9 | 10 | 4 | 160 | 80 | 80 | + | 1 | 80 |

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**Example 6-C：(Slice processing)**

Processing Material：copper → steel

Processing area：length 80(mm) × width 1 (mm)

Processing depth：30 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10 | 300 | 30 | 2 | 12 | 20 | 1.6 | 180 | 80 | 70 | + | 1 | 40 |
| 2 | -15 | 300 | 30 | 2 | 12 | 16 | 2 | 180 | 80 | 70 | + | 1 | 40 |
| 3 | -20 | 300 | 30 | 2 | 12 | 12 | 3 | 180 | 80 | 80 | + | 1 | 40 |
| 4 | -25 | 300 | 30 | 2 | 12 | 12 | 4 | 180 | 80 | 80 | + | 1 | 80 |
| 5 | -30 | 300 | 30 | 2 | 12 | 10 | 4 | 160 | 80 | 80 | + | 1 | 80 |

Note：

(1) Make attention on flushing oil.
(2) Suitable “WORK” value and “P.P” value.

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# Processing sample (graphite to steel)

**Example 1-A：(Only 1 electrode)**

Processing Material：graphite → steel

Processing Area：400 (㎟)

Processing depth：10 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.940 | 90 | 20 | 0 | 6 | 16 | 2 | 160 | 80 | 60 | + | 2 | 40 |

**Example 1-B：(Only 1 electrode)**

Processing Material：graphite → steel

Processing Area：1000 (㎟)

Processing depth：10 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.900 | 150 | 20 | 0 | 9 | 16 | 2 | 180 | 80 | 60 | + | 2 | 40 |

**Example 1-C：(Only 1 electrode)**

Processing Material：graphite → steel

Processing Area：2000 (㎟)

Processing depth：10 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.880 | 200 | 20 | 0 | 12 | 16 | 2 | 180 | 80 | 60 | + | 2 | 40 |

**Example 1-D：(Only 1 electrode)**

Processing Material：graphite → steel

Processing Area：5000 (㎟)

Processing depth：10 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.850 | 250 | 20 | 1 | 16 | 16 | 2 | 180 | 80 | 60 | + | 0 | 40 |

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**Example 1-E：(Only 1 electrode)**

Processing Material：graphite → steel

Processing Area：12000 (㎟)

Processing depth：10 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.850 | 300 | 20 | 0 | 20 | 16 | 2 | 120 | 60 | 60 | + | 2 | 40 |

**Example 1-F：(Only 1 electrode)**

Processing Material：graphite → steel

Processing Area：20000 (㎟)

Processing depth：10 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -9.800 | 400 | 20 | 0 | 30 | 16 | 2 | 120 | 50 | 70 | + | 2 | 40 |

**Example 2-A：(Slice processing)**

Processing Material：graphite → steel

Processing area：length 20(mm) × width 1 (mm)

Processing depth：30 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10 | 90 | 20 | 0 | 6 | 20 | 1.6 | 180 | 80 | 60 | + | 2 | 40 |
| 2 | -15 | 90 | 20 | 0 | 6 | 20 | 2 | 180 | 80 | 60 | + | 2 | 40 |
| 3 | -20 | 90 | 20 | 0 | 6 | 12 | 3 | 180 | 80 | 60 | + | 2 | 40 |
| 4 | -25 | 90 | 20 | 0 | 6 | 12 | 4 | 180 | 80 | 60 | + | 2 | 40 |
| 5 | -30 | 90 | 20 | 0 | 6 | 10 | 4 | 160 | 80 | 70 | + | 2 | 40 |

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**Example 2-B：(Slice processing)**

Processing Material：graphite → steel

Processing area：length 50(mm) × width 1 (mm)

Processing depth：30 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10 | 120 | 20 | 0 | 9 | 20 | 1.6 | 180 | 80 | 60 | + | 2 | 40 |
| 2 | -15 | 120 | 20 | 0 | 9 | 16 | 2 | 180 | 80 | 60 | + | 2 | 40 |
| 3 | -20 | 120 | 20 | 0 | 9 | 12 | 3 | 180 | 80 | 60 | + | 2 | 40 |
| 4 | -25 | 120 | 20 | 0 | 9 | 12 | 3 | 180 | 80 | 70 | + | 2 | 40 |
| 5 | -30 | 120 | 20 | 0 | 9 | 10 | 3 | 160 | 80 | 70 | + | 2 | 40 |

**Example 2-C：(Slice processing)**

Processing Material：graphite → steel

Processing area：length 80(mm) × width 1 (mm)

Processing depth：30 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10 | 200 | 20 | 0 | 12 | 20 | 1.6 | 180 | 80 | 60 | + | 2 | 40 |
| 2 | -15 | 200 | 20 | 0 | 12 | 16 | 2 | 180 | 80 | 60 | + | 2 | 40 |
| 3 | -20 | 200 | 20 | 0 | 12 | 12 | 3 | 180 | 80 | 60 | + | 2 | 40 |
| 4 | -25 | 200 | 20 | 0 | 12 | 12 | 4 | 180 | 80 | 60 | + | 2 | 40 |
| 5 | -30 | 200 | 20 | 0 | 12 | 10 | 4 | 160 | 80 | 60 | + | 2 | 40 |

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**Example 2-D：(Slice processing)**

Processing Material：graphite → steel

Processing area：length 120(mm) × width 1 (mm)

Processing depth：30 (mm)

| NO | DEEP | ON.T | OFF.T | H_V | L_V | WORK | P.P | SPEED | S.V | GAP | POLAR | HV2 | ARC.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -10 | 300 | 20 | 0 | 20 | 20 | 1.6 | 180 | 80 | 60 | + | 2 | 40 |
| 2 | -15 | 300 | 20 | 0 | 20 | 16 | 2 | 180 | 80 | 60 | + | 2 | 40 |
| 3 | -20 | 300 | 20 | 0 | 20 | 12 | 3 | 180 | 80 | 60 | + | 2 | 40 |
| 4 | -25 | 300 | 20 | 0 | 20 | 12 | 4 | 180 | 80 | 60 | + | 2 | 40 |
| 5 | -30 | 300 | 20 | 0 | 20 | 10 | 4 | 160 | 80 | 60 | + | 2 | 40 |

Note：

(1) Make attention on flushing oil.
(2) Suitable “WORK” value and “P.P” value.

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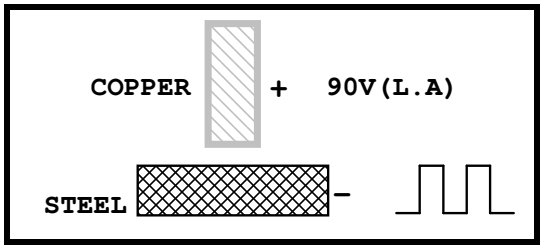
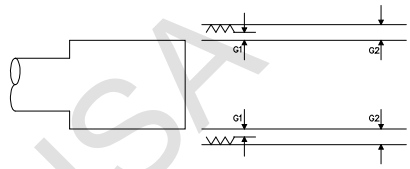
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 1 | 5 | 1 | 1 | 100 | 0.93 | 12 | 0.137 | 0.015 | 0.031 |
| 2 | 5 | 1 | 1 | 100 | 1.01 | 12 | 0.211 | 0.018 | 0.038 |
| 4 | 5 | 1 | 1 | 100 | 1.06 | 8 | 0.226 | 0.020 | 0.042 |
| 6 | 5 | 1 | 1 | 100 | 1.12 | 8 | 0.250 | 0.023 | 0.045 |
| 8 | 10 | 1 | 1 | 100 | 1.14 | 6 | 0.277 | 0.026 | 0.050 |
| 10 | 10 | 1 | 1 | 100 | 1.16 | 6 | 0.280 | 0.028 | 0.052 |
| 15 | 10 | 1 | 1 | 100 | 1.16 | 6 | 0.290 | 0.032 | 0.054 |
| 20 | 10 | 1 | 1 | 100 | 1.19 | 2 | 0.292 | 0.035 | 0.057 |
| 30 | 10 | 1 | 1 | 100 | 1.21 | 2 | 0.226 | 0.040 | 0.060 |
| 40 | 20 | 1 | 1 | 100 | 1.25 | — | 0.183 | 0.042 | 0.066 |
| | | | | | | | | | |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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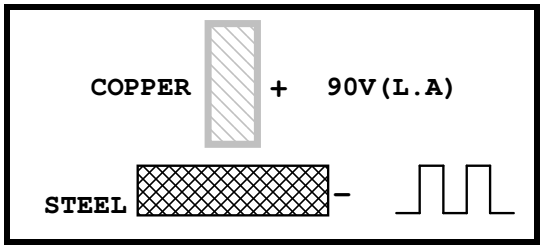
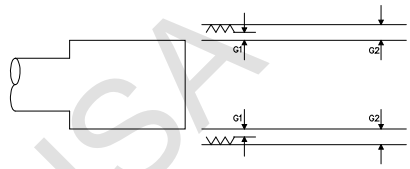
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 1 | 5 | 0 | 2 | 90 | 0.91 | 28 | 0.153 | 0.016 | 0.034 |
| 2 | 5 | 0 | 2 | 90 | 0.99 | 12 | 0.220 | 0.020 | 0.040 |
| 4 | 5 | 0 | 2 | 90 | 1.19 | 6 | 0.237 | 0.025 | 0.049 |
| 8 | 5 | 0 | 2 | 90 | 1.30 | 6 | 0.245 | 0.028 | 0.052 |
| 10 | 10 | 0 | 2 | 90 | 1.33 | 6 | 0.262 | 0.030 | 0.056 |
| 15 | 10 | 0 | 2 | 90 | 1.42 | 4 | 0.273 | 0.032 | 0.060 |
| 20 | 10 | 0 | 2 | 90 | 1.42 | — | 0.311 | 0.034 | 0.062 |
| 30 | 10 | 0 | 2 | 90 | 1.41 | — | 0.333 | 0.038 | 0.066 |
| 40 | 20 | 0 | 2 | 90 | 1.43 | — | 0.342 | 0.042 | 0.074 |
| 60 | 20 | 0 | 2 | 90 | 1.43 | — | 0.372 | 0.050 | 0.082 |
| | | | | | | | | | |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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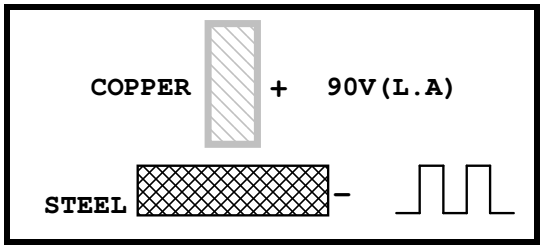
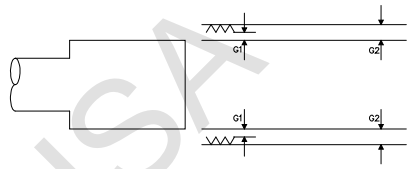
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 5 | 20 | 0 | 3 | 80 | 1.80 | 12 | 0.506 | 0.026 | 0.056 |
| 10 | 20 | 0 | 3 | 80 | 2.02 | 6 | 0.775 | 0.030 | 0.062 |
| 20 | 20 | 0 | 3 | 80 | 2.30 | 2 | 1.321 | 0.033 | 0.070 |
| 30 | 20 | 0 | 3 | 80 | 2.33 | 2 | 1.519 | 0.040 | 0.078 |
| 40 | 20 | 0 | 3 | 80 | 2.27 | 1 | 1.617 | 0.048 | 0.080 |
| 50 | 20 | 0 | 3 | 80 | 2.23 | 1 | 1.519 | 0.052 | 0.094 |
| 60 | 20 | 0 | 3 | 80 | 2.29 | 0.5 | 1.333 | 0.058 | 0.102 |
| 80 | 20 | 0 | 3 | 80 | 2.26 | 0.5 | 1.288 | 0.066 | 0.108 |
| 100 | 20 | 0 | 3 | 80 | 2.20 | 0.5 | 1.205 | 0.072 | 0.112 |
| 120 | 20 | 0 | 3 | 80 | 2.01 | — | 1.197 | 0.076 | 0.116 |
| | | | | | | | | | |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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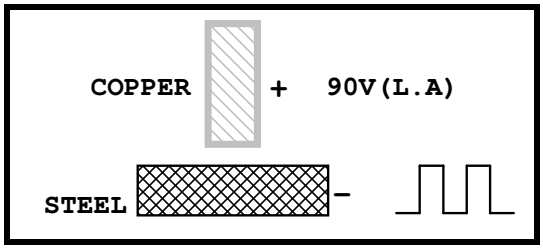
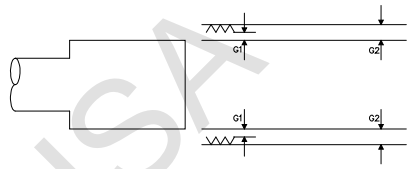
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 5 | 20 | 0 | 4 | 80 | 1.91 | 9 | 0.704 | 0.030 | 0.058 |
| 10 | 20 | 0 | 4 | 80 | 2.45 | 5 | 0.968 | 0.032 | 0.066 |
| 20 | 20 | 0 | 4 | 80 | 2.82 | 3 | 1.831 | 0.036 | 0.078 |
| 30 | 20 | 0 | 4 | 80 | 3.02 | 2 | 2.520 | 0.044 | 0.088 |
| 40 | 20 | 0 | 4 | 80 | 3.13 | 0.67 | 2.561 | 0.052 | 0.106 |
| 50 | 20 | 0 | 4 | 80 | 3.38 | 0.67 | 2.850 | 0.056 | 0.108 |
| 60 | 20 | 0 | 4 | 80 | 3.32 | 0.33 | 2.851 | 0.060 | 0.110 |
| 90 | 20 | 0 | 4 | 80 | 3.39 | 0.33 | 3.352 | 0.070 | 0.122 |
| 120 | 20 | 0 | 4 | 80 | 3.26 | — | 3.080 | 0.078 | 0.134 |
| 150 | 20 | 0 | 4 | 80 | 3.07 | — | 3.000 | 0.086 | 0.138 |
| | | | | | | | | | |
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| | | | | | | | | | |

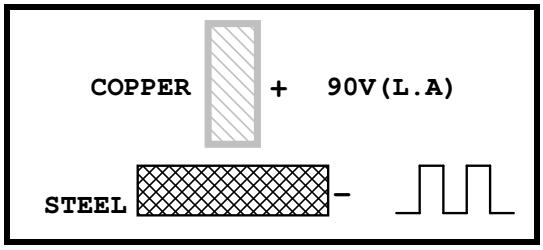
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

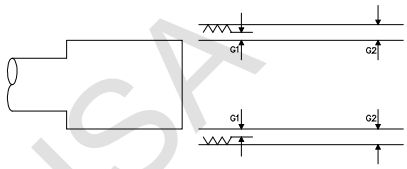
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 10 | 20 | 0 | 5 | 70 | 2.65 | 5.3 | 2.054 | 0.035 | 0.075 |
| 20 | 20 | 0 | 5 | 70 | 2.98 | 2.7 | 3.081 | 0.040 | 0.090 |
| 30 | 20 | 0 | 5 | 70 | 3.13 | 2 | 3.737 | 0.050 | 0.100 |
| 40 | 20 | 0 | 5 | 70 | 3.52 | 1.3 | 4.559 | 0.055 | 0.105 |
| 50 | 20 | 0 | 5 | 70 | 3.95 | 0.8 | 5.670 | 0.055 | 0.110 |
| 60 | 20 | 0 | 5 | 70 | 4.01 | 0.8 | 6.229 | 0.060 | 0.120 |
| 90 | 20 | 0 | 5 | 70 | 4.16 | 0.6 | 6.441 | 0.070 | 0.130 |
| 120 | 20 | 0 | 5 | 70 | 4.33 | 0.4 | 5.428 | 0.080 | 0.135 |
| 150 | 20 | 0 | 5 | 70 | 3.88 | — | 5.366 | 0.090 | 0.150 |
| 200 | 20 | 0 | 5 | 70 | 3.42 | — | 4.656 | 0.105 | 0.160 |
| | | | | | | | | | |
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| | | | | | | | | | |

※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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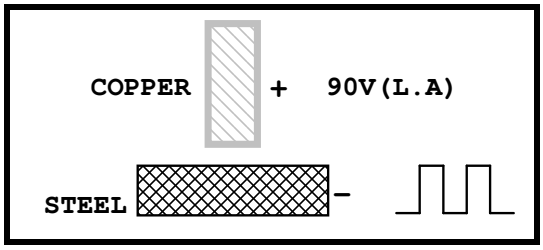
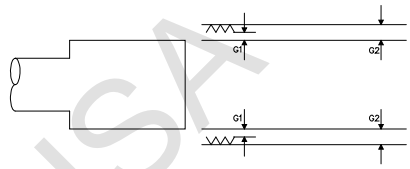
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 10 | 20 | 0 | 6 | 70 | 2.70 | 6 | 3.089 | 0.040 | 0.080 |
| 20 | 20 | 0 | 6 | 70 | 3.21 | 3.3 | 4.809 | 0.045 | 0.095 |
| 30 | 20 | 0 | 6 | 70 | 3.65 | 2 | 5.587 | 0.050 | 0.105 |
| 60 | 20 | 0 | 6 | 70 | 4.27 | 0.7 | 5.875 | 0.060 | 0.120 |
| 90 | 20 | 0 | 6 | 70 | 4.46 | 0.4 | 6.249 | 0.075 | 0.135 |
| 120 | 20 | 0 | 6 | 70 | 4.84 | 0.4 | 8.118 | 0.090 | 0.155 |
| 150 | 20 | 0 | 6 | 70 | 4.92 | — | 6.908 | 0.100 | 0.165 |
| 180 | 20 | 0 | 6 | 70 | 4.50 | — | 6.188 | 0.110 | 0.170 |
| 240 | 20 | 0 | 6 | 70 | 4.42 | — | 6.009 | 0.120 | 0.185 |
| 300 | 20 | 0 | 6 | 70 | 4.38 | — | 5.671 | 0.135 | 0.200 |
| | | | | | | | | | |
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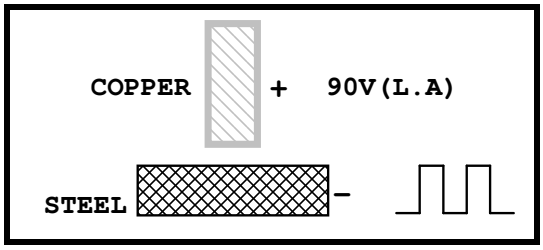
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

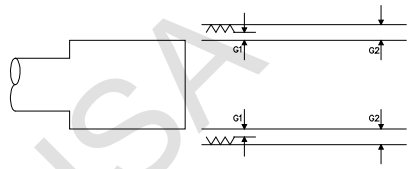
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 20 | 20 | 0 | 7 | 70 | 3.47 | 2.4 | 6.440 | 0.050 | 0.100 |
| 40 | 20 | 0 | 7 | 70 | 4.26 | 1.6 | 8.635 | 0.060 | 0.115 |
| 60 | 20 | 0 | 7 | 70 | 5.02 | 0.6 | 11.175 | 0.070 | 0.140 |
| 80 | 20 | 0 | 7 | 70 | 5.40 | 0.6 | 11.341 | 0.080 | 0.150 |
| 100 | 20 | 0 | 7 | 70 | 5.48 | 0.6 | 11.554 | 0.090 | 0.160 |
| 120 | 20 | 0 | 7 | 70 | 5.53 | 0.4 | 11.000 | 0.100 | 0.170 |
| 150 | 20 | 0 | 7 | 70 | 5.86 | — | 10.554 | 0.115 | 0.185 |
| 180 | 20 | 0 | 7 | 70 | 5.45 | — | 10.131 | 0.130 | 0.200 |
| 240 | 20 | 0 | 7 | 70 | 5.28 | — | 9.358 | 0.140 | 0.210 |
| 300 | 20 | 0 | 7 | 70 | 5.07 | — | 6.725 | 0.155 | 0.225 |
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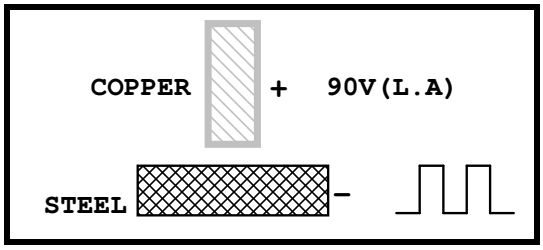
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

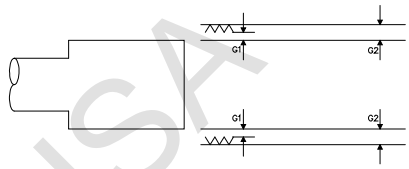
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 30 | 20 | 0 | 8 | 70 | 4.16 | 2 | 10.554 | 0.065 | 0.120 |
| 50 | 20 | 0 | 8 | 70 | 5.17 | 1.2 | 12.457 | 0.080 | 0.130 |
| 70 | 20 | 0 | 8 | 70 | 5.48 | 0.6 | 13.569 | 0.090 | 0.150 |
| 90 | 20 | 0 | 8 | 70 | 5.73 | 0.4 | 13.766 | 0.095 | 0.160 |
| 120 | 20 | 0 | 8 | 70 | 6.16 | 0.4 | 13.473 | 0.100 | 0.175 |
| 150 | 20 | 0 | 8 | 70 | 6.66 | — | 12.457 | 0.115 | 0.180 |
| 180 | 20 | 0 | 8 | 70 | 6.24 | — | 12.256 | 0.130 | 0.195 |
| 210 | 20 | 0 | 8 | 70 | 6.01 | — | 12.139 | 0.140 | 0.205 |
| 240 | 20 | 0 | 8 | 70 | 5.70 | — | 12.062 | 0.150 | 0.215 |
| 300 | 20 | 0 | 8 | 70 | 5.55 | — | 11.799 | 0.160 | 0.230 |
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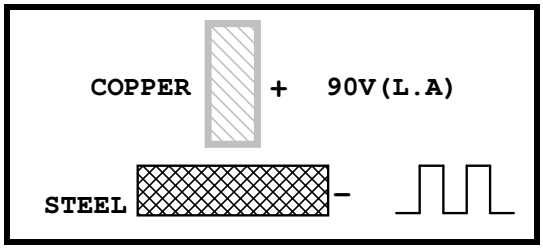
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

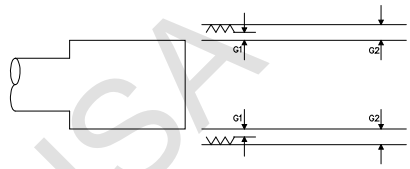
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 30 | 20 | 0 | 9 | 70 | 4.71 | 2 | 13.101 | 0.075 | 0.135 |
| 60 | 20 | 0 | 9 | 70 | 6.17 | 1 | 16.377 | 0.080 | 0.160 |
| 90 | 20 | 0 | 9 | 70 | 6.22 | 0.4 | 19.189 | 0.090 | 0.170 |
| 120 | 20 | 0 | 9 | 70 | 6.55 | 0.4 | 19.999 | 0.100 | 0.185 |
| 150 | 20 | 0 | 9 | 70 | 7.03 | — | 18.537 | 0.120 | 0.190 |
| 180 | 20 | 0 | 9 | 70 | 6.73 | — | 18.444 | 0.130 | 0.195 |
| 200 | 20 | 0 | 9 | 70 | 6.45 | — | 17.428 | 0.140 | 0.200 |
| 240 | 20 | 0 | 9 | 70 | 6.32 | — | 15.177 | 0.155 | 0.215 |
| 300 | 20 | 0 | 9 | 70 | 6.02 | — | 14.613 | 0.170 | 0.220 |
| 400 | 20 | 0 | 9 | 70 | 6.73 | — | 12.336 | 0.180 | 0.240 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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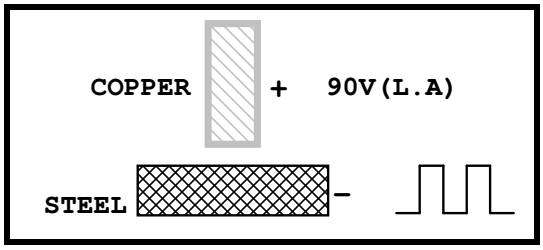
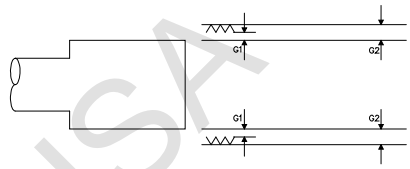
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 10 | 70 | 5.27 | 1.2 | 15.320 | 0.080 | 0.145 |
| 60 | 20 | 0 | 10 | 70 | 6.25 | 0.8 | 16.519 | 0.090 | 0.165 |
| 90 | 20 | 0 | 10 | 70 | 6.68 | 0.4 | 21.345 | 0.100 | 0.180 |
| 120 | 20 | 0 | 10 | 70 | 6.89 | 0.4 | 24.047 | 0.110 | 0.195 |
| 150 | 20 | 0 | 10 | 70 | 7.28 | — | 19.189 | 0.125 | 0.205 |
| 200 | 20 | 0 | 10 | 70 | 7.54 | — | 18.997 | 0.145 | 0.220 |
| 240 | 20 | 0 | 10 | 70 | 7.49 | — | 18.007 | 0.160 | 0.235 |
| 300 | 20 | 0 | 10 | 70 | 6.70 | — | 16.377 | 0.170 | 0.240 |
| 400 | 20 | 0 | 10 | 70 | 7.26 | — | 14.841 | 0.180 | 0.245 |
| 500 | 20 | 0 | 10 | 70 | 5.42 | — | 13.473 | 0.190 | 0.260 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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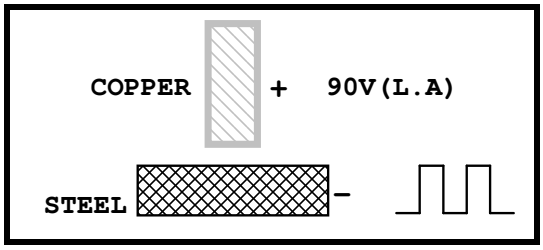
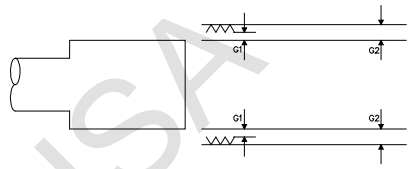
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 20 | 0 | 12 | 70 | 6.75 | 1.1 | 28.144 | 0.105 | 0.170 |
| 90 | 20 | 0 | 12 | 70 | 7.58 | 0.4 | 32.434 | 0.120 | 0.180 |
| 120 | 20 | 0 | 12 | 70 | 8.04 | 0.1 | 34.994 | 0.130 | 0.200 |
| 150 | 20 | 0 | 12 | 70 | 8.38 | 0.1 | 37.994 | 0.140 | 0.220 |
| 180 | 20 | 0 | 12 | 70 | 8.75 | — | 34.237 | 0.150 | 0.230 |
| 200 | 20 | 0 | 12 | 70 | 9.09 | — | 33.666 | 0.160 | 0.240 |
| 240 | 20 | 0 | 12 | 70 | 8.80 | — | 29.883 | 0.170 | 0.255 |
| 300 | 20 | 0 | 12 | 70 | 8.74 | — | 29.226 | 0.180 | 0.270 |
| 400 | 20 | 0 | 12 | 70 | 8.76 | — | 26.280 | 0.195 | 0.285 |
| 500 | 20 | 0 | 12 | 70 | 8.58 | — | 26.463 | 0.210 | 0.305 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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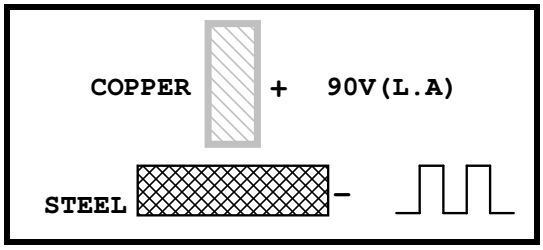
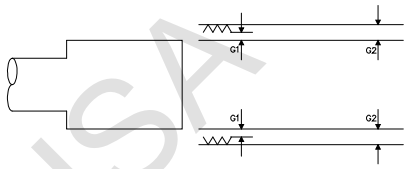
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 20 | 0 | 14 | 70 | 6.90 | 1.1 | 35.226 | 0.115 | 0.180 |
| 90 | 20 | 0 | 14 | 70 | 7.71 | 0.7 | 44.326 | 0.130 | 0.190 |
| 120 | 20 | 0 | 14 | 70 | 8.28 | 0.1 | 46.254 | 0.140 | 0.205 |
| 150 | 20 | 0 | 14 | 70 | 8.71 | 0.1 | 44.326 | 0.150 | 0.220 |
| 180 | 20 | 0 | 14 | 70 | 9.26 | — | 39.401 | 0.160 | 0.240 |
| 200 | 20 | 0 | 14 | 70 | 9.57 | — | 41.556 | 0.170 | 0.250 |
| 240 | 20 | 0 | 14 | 70 | 9.82 | — | 38.545 | 0.175 | 0.265 |
| 300 | 20 | 0 | 14 | 70 | 9.24 | — | 35.699 | 0.185 | 0.280 |
| 400 | 20 | 0 | 14 | 70 | 9.36 | — | 34.994 | 0.200 | 0.300 |
| 500 | 20 | 0 | 14 | 70 | 9.40 | — | 30.430 | 0.220 | 0.320 |
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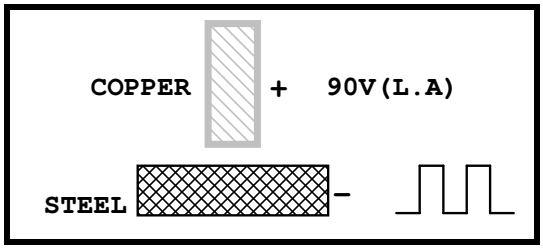
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

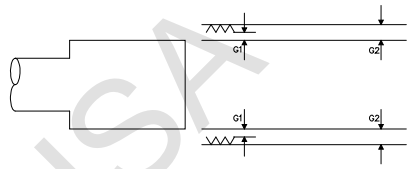
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 20 | 0 | 16 | 70 | 7.29 | 1.7 | 36.939 | 0.130 | 0.185 |
| 90 | 20 | 0 | 16 | 70 | 8.53 | 0.9 | 47.920 | 0.140 | 0.200 |
| 120 | 20 | 0 | 16 | 70 | 9.12 | 0.1 | 53.191 | 0.150 | 0.215 |
| 150 | 20 | 0 | 16 | 70 | 9.53 | 0.1 | 53.191 | 0.165 | 0.235 |
| 180 | 20 | 0 | 16 | 70 | 9.95 | — | 49.855 | 0.180 | 0.250 |
| 200 | 20 | 0 | 16 | 70 | 10.43 | — | 48.356 | 0.188 | 0.265 |
| 240 | 20 | 0 | 16 | 70 | 10.14 | — | 45.078 | 0.195 | 0.280 |
| 300 | 20 | 0 | 16 | 70 | 10.09 | — | 41.556 | 0.205 | 0.295 |
| 400 | 20 | 0 | 16 | 70 | 10.11 | — | 39.111 | 0.215 | 0.315 |
| 500 | 20 | 0 | 16 | 70 | 10.03 | — | 39.111 | 0.230 | 0.340 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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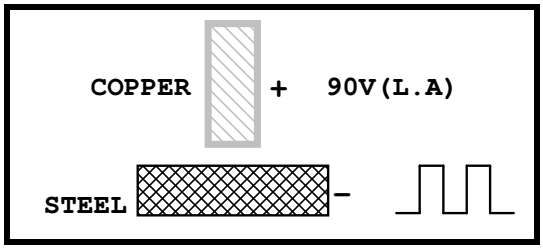
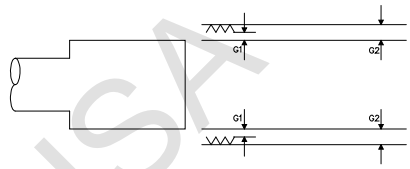
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 20 | 0 | 18 | 70 | 7.46 | 2.5 | 61.281 | 0.135 | 0.195 |
| 90 | 20 | 0 | 18 | 70 | 8.69 | 1 | 69.395 | 0.150 | 0.210 |
| 150 | 20 | 0 | 18 | 70 | 9.68 | 0.2 | 80.838 | 0.180 | 0.240 |
| 200 | 20 | 0 | 18 | 70 | 10.85 | 0.2 | 95.884 | 0.190 | 0.260 |
| 240 | 20 | 0 | 18 | 70 | 11.09 | 0.1 | 91.003 | 0.208 | 0.280 |
| 300 | 20 | 0 | 18 | 70 | 11.68 | — | 90.868 | 0.220 | 0.300 |
| 400 | 20 | 0 | 18 | 70 | 11.22 | — | 89.397 | 0.235 | 0.320 |
| 500 | 20 | 0 | 18 | 70 | 11.16 | — | 74.589 | 0.250 | 0.350 |
| 600 | 20 | 0 | 18 | 70 | 11.18 | — | 63.456 | 0.265 | 0.370 |
| 700 | 20 | 0 | 18 | 70 | 10.97 | — | 50.658 | 0.285 | 0.390 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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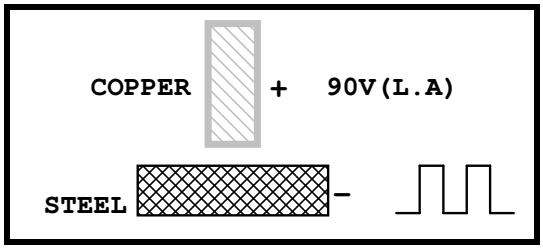
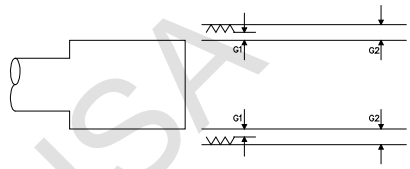
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 20 | 0 | 20 | 70 | 7.74 | 3.5 | 67.545 | 0.140 | 0.205 |
| 90 | 20 | 0 | 20 | 70 | 8.81 | 1.2 | 82.149 | 0.150 | 0.230 |
| 150 | 20 | 0 | 20 | 70 | 10.09 | 0.2 | 101.317 | 0.180 | 0.260 |
| 200 | 20 | 0 | 20 | 70 | 11.57 | 0.1 | 112.159 | 0.200 | 0.290 |
| 240 | 20 | 0 | 20 | 70 | 11.89 | — | 116.931 | 0.210 | 0.305 |
| 300 | 20 | 0 | 20 | 70 | 12.55 | — | 114.699 | 0.220 | 0.320 |
| 400 | 20 | 0 | 20 | 70 | 12.85 | — | 113.905 | 0.240 | 0.340 |
| 500 | 20 | 0 | 20 | 70 | 12.58 | — | 107.130 | 0.250 | 0.360 |
| 600 | 20 | 0 | 20 | 70 | 12.52 | — | 94.395 | 0.270 | 0.390 |
| 700 | 20 | 0 | 20 | 70 | 12.46 | — | 81.928 | 0.290 | 0.410 |
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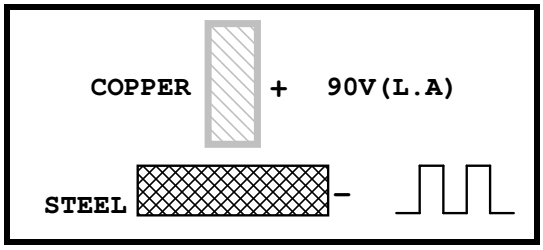
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

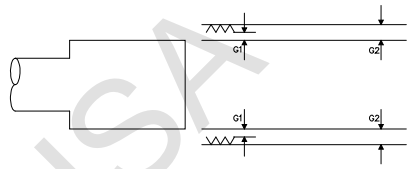
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 20 | 0 | 22 | 70 | 7.80 | 4.5 | 70.359 | 0.150 | 0.215 |
| 90 | 20 | 0 | 22 | 70 | 9.14 | 1.8 | 88.358 | 0.160 | 0.240 |
| 150 | 20 | 0 | 22 | 70 | 10.44 | 0.4 | 108.554 | 0.185 | 0.265 |
| 200 | 20 | 0 | 22 | 70 | 12.19 | 0.2 | 118.731 | 0.205 | 0.295 |
| 240 | 20 | 0 | 22 | 70 | 12.52 | 0.1 | 122.561 | 0.215 | 0.310 |
| 300 | 20 | 0 | 22 | 70 | 13.21 | — | 126.121 | 0.225 | 0.335 |
| 400 | 20 | 0 | 22 | 70 | 14.01 | — | 136.915 | 0.245 | 0.360 |
| 500 | 20 | 0 | 22 | 70 | 13.79 | — | 133.036 | 0.260 | 0.380 |
| 600 | 20 | 0 | 22 | 70 | 13.73 | — | 105.907 | 0.280 | 0.405 |
| 800 | 20 | 0 | 22 | 70 | 13.57 | — | 95.283 | 0.295 | 0.425 |
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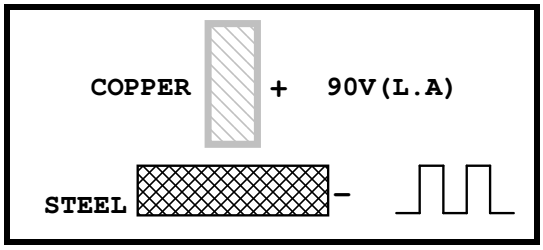
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

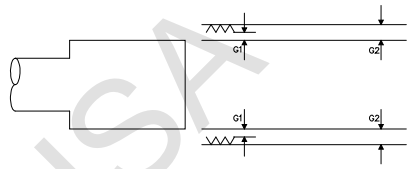
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 20 | 0 | 24 | 70 | 8.22 | 7.5 | 71.017 | 0.160 | 0.225 |
| 90 | 20 | 0 | 24 | 70 | 9.53 | 2.6 | 90.462 | 0.170 | 0.250 |
| 150 | 20 | 0 | 24 | 70 | 11.21 | 0.6 | 115.133 | 0.190 | 0.275 |
| 200 | 20 | 0 | 24 | 70 | 12.61 | 0.6 | 133.900 | 0.210 | 0.300 |
| 240 | 20 | 0 | 24 | 70 | 13.12 | 0.3 | 135.693 | 0.220 | 0.320 |
| 300 | 20 | 0 | 24 | 70 | 14.23 | 0.1 | 138.160 | 0.235 | 0.340 |
| 400 | 20 | 0 | 24 | 70 | 14.74 | — | 153.511 | 0.250 | 0.370 |
| 500 | 20 | 0 | 24 | 70 | 15.07 | — | 155.873 | 0.270 | 0.405 |
| 600 | 20 | 0 | 24 | 70 | 15.32 | — | 126.647 | 0.290 | 0.430 |
| 800 | 20 | 0 | 24 | 70 | 14.91 | — | 116.234 | 0.305 | 0.460 |
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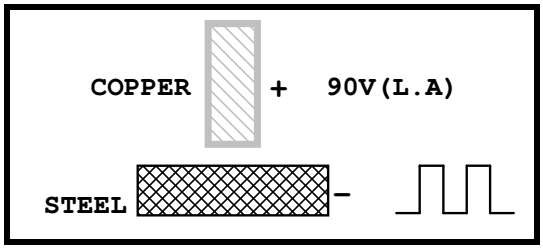
※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

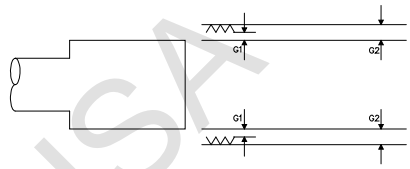
2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 120 | 20 | 0 | 30 | 70 | 10.97 | 1.8 | 142.018 | 0.190 | 0.285 |
| 150 | 20 | 0 | 30 | 70 | 11.89 | 1.1 | 163.754 | 0.205 | 0.300 |
| 200 | 20 | 0 | 30 | 70 | 13.19 | 0.6 | 179.535 | 0.215 | 0.320 |
| 240 | 20 | 0 | 30 | 70 | 14.20 | 0.4 | 197.076 | 0.235 | 0.340 |
| 300 | 20 | 0 | 30 | 70 | 15.85 | 0.1 | 203.535 | 0.245 | 0.355 |
| 400 | 20 | 0 | 30 | 70 | 17.13 | — | 204.984 | 0.260 | 0.390 |
| 500 | 20 | 0 | 30 | 70 | 18.04 | — | 209.675 | 0.280 | 0.425 |
| 600 | 20 | 0 | 30 | 70 | 18.71 | — | 219.181 | 0.290 | 0.450 |
| 700 | 20 | 0 | 30 | 70 | 18.40 | — | 211.981 | 0.300 | 0.480 |
| 800 | 20 | 0 | 30 | 70 | 18.14 | — | 210.993 | 0.315 | 0.490 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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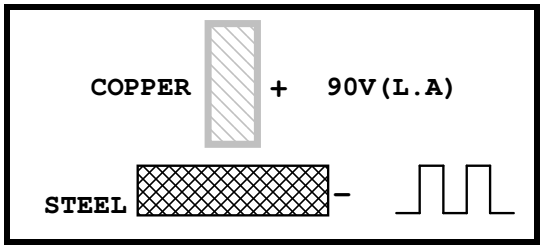
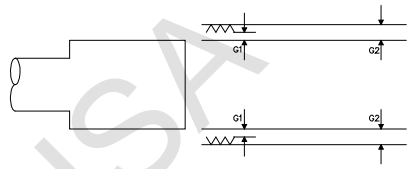
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 150 | 20 | 0 | 40 | 70 | 12.69 | 2.1 | 203.797 | 0.225 | 0.310 |
| 200 | 20 | 0 | 40 | 70 | 14.20 | 1.3 | 249.174 | 0.240 | 0.335 |
| 240 | 20 | 0 | 40 | 70 | 15.95 | 0.9 | 257.271 | 0.250 | 0.350 |
| 300 | 20 | 0 | 40 | 70 | 17.44 | 0.4 | 278.540 | 0.260 | 0.380 |
| 400 | 20 | 0 | 40 | 70 | 19.06 | — | 287.126 | 0.275 | 0.420 |
| 500 | 20 | 0 | 40 | 70 | 21.66 | — | 292.699 | 0.295 | 0.450 |
| 600 | 20 | 0 | 40 | 70 | 21.95 | — | 297.931 | 0.310 | 0.500 |
| 700 | 20 | 0 | 40 | 70 | 22.15 | — | 289.488 | 0.325 | 0.530 |
| 800 | 20 | 0 | 40 | 70 | 21.89 | — | 284.547 | 0.340 | 0.550 |
| 900 | 20 | 0 | 40 | 70 | 22.04 | — | 285.059 | 0.355 | 0.570 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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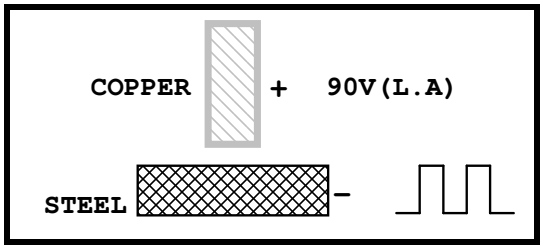
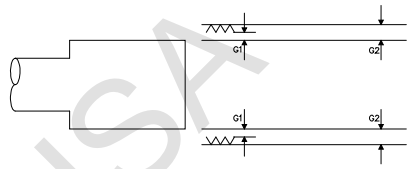
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 180 | 20 | 0 | 50 | 70 | 15.12 | 3.3 | 249.764 | 0.250 | 0.340 |
| 240 | 20 | 0 | 50 | 70 | 17.49 | 2.1 | 287.387 | 0.270 | 0.375 |
| 300 | 20 | 0 | 50 | 70 | 18.80 | 1.2 | 293.513 | 0.280 | 0.410 |
| 400 | 20 | 0 | 50 | 70 | 20.93 | 0.2 | 308.374 | 0.295 | 0.450 |
| 500 | 20 | 0 | 50 | 70 | 24.14 | — | 331.971 | 0.320 | 0.490 |
| 600 | 20 | 0 | 50 | 70 | 25.88 | — | 377.473 | 0.340 | 0.530 |
| 700 | 20 | 0 | 50 | 70 | 25.90 | — | 357.450 | 0.355 | 0.565 |
| 800 | 20 | 0 | 50 | 70 | 25.52 | — | 349.559 | 0.370 | 0.590 |
| 900 | 20 | 0 | 50 | 70 | 25.50 | — | 345.743 | 0.385 | 0.605 |
| 1000 | 20 | 0 | 50 | 70 | 25.43 | — | 344.240 | 0.400 | 0.630 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。

2. Setting P.P.＝1。

3. Turn Servo sensitivity adjust knob about to 1/2。

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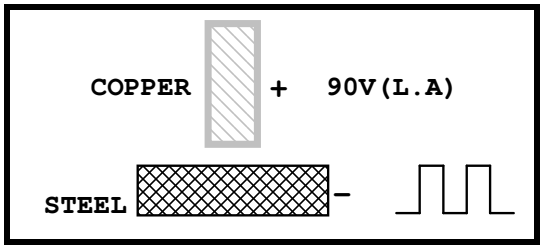
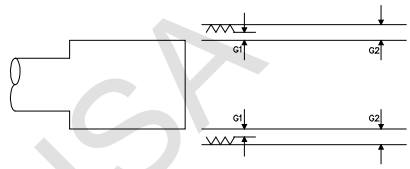
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 200 | 20 | 0 | 60 | 70 | 16.92 | 2.8 | 311.713 | 0.260 | 0.380 |
| 300 | 20 | 0 | 60 | 70 | 19.13 | 2 | 410.766 | 0.285 | 0.435 |
| 400 | 20 | 0 | 60 | 70 | 21.52 | 1.3 | 429.133 | 0.300 | 0.460 |
| 500 | 20 | 0 | 60 | 70 | 24.84 | 0.2 | 463.012 | 0.325 | 0.500 |
| 600 | 20 | 0 | 60 | 70 | 26.49 | — | 502.700 | 0.340 | 0.545 |
| 700 | 20 | 0 | 60 | 70 | 27.94 | — | 515.798 | 0.360 | 0.585 |
| 800 | 20 | 0 | 60 | 70 | 27.22 | — | 485.737 | 0.380 | 0.610 |
| 900 | 20 | 0 | 60 | 70 | 26.67 | — | 484.251 | 0.395 | 0.645 |
| 1000 | 20 | 0 | 60 | 70 | 25.94 | — | 458.986 | 0.415 | 0.670 |
| 1200 | 20 | 0 | 60 | 70 | 26.02 | — | 455.029 | 0.440 | 0.710 |
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※ P.S：1. TEST AREA＝Φ20 mm＊1/2。
2. Setting P.P.＝1。
3. Turn Servo sensitivity adjust knob about to 1/2。

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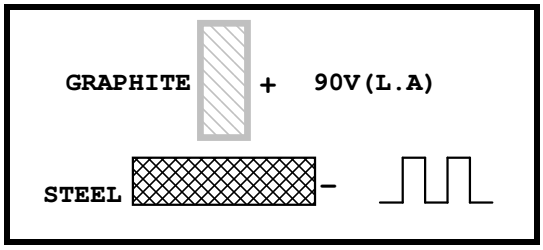
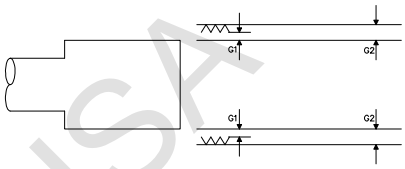
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 6 | 20 | 0 | 5 | 90 | 2.40 | 27.2 | 1.815 | 0.035 | 0.073 |
| 10 | 20 | 0 | 5 | 90 | 2.59 | 20.8 | 2.110 | 0.040 | 0.080 |
| 20 | 20 | 0 | 5 | 90 | 3.06 | 15.2 | 3.175 | 0.045 | 0.095 |
| 30 | 20 | 0 | 5 | 90 | 3.21 | 11.6 | 3.390 | 0.050 | 0.100 |
| 40 | 20 | 0 | 5 | 90 | 3.32 | 7.8 | 3.597 | 0.055 | 0.107 |
| 50 | 20 | 0 | 5 | 90 | 3.72 | 4.6 | 3.003 | 0.060 | 0.114 |
| 60 | 20 | 0 | 5 | 90 | 3.97 | 2.4 | 2.801 | 0.062 | 0.122 |
| 90 | 20 | 0 | 5 | 90 | 3.88 | — | 2.786 | 0.070 | 0.130 |
| 120 | 20 | 0 | 5 | 90 | 3.38 | — | 2.770 | 0.080 | 0.136 |
| 150 | 20 | 0 | 5 | 90 | 3.29 | — | 2.688 | 0.090 | 0.154 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

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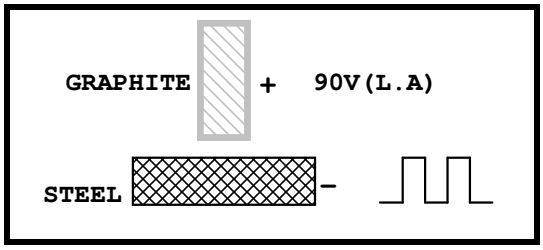
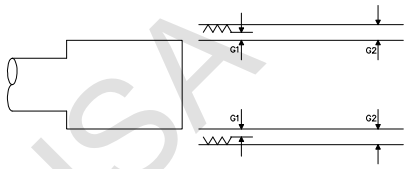
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 6 | 20 | 0 | 6 | 90 | 2.74 | 22.4 | 2.545 | 0.040 | 0.082 |
| 10 | 20 | 0 | 6 | 90 | 2.82 | 17.6 | 3.115 | 0.045 | 0.089 |
| 20 | 20 | 0 | 6 | 90 | 3.18 | 12.0 | 3.521 | 0.050 | 0.102 |
| 30 | 20 | 0 | 6 | 90 | 3.37 | 7.2 | 3.817 | 0.054 | 0.106 |
| 40 | 20 | 0 | 6 | 90 | 3.73 | 6.8 | 4.762 | 0.062 | 0.118 |
| 50 | 20 | 0 | 6 | 90 | 4.20 | 4.0 | 4.739 | 0.070 | 0.132 |
| 60 | 20 | 0 | 6 | 90 | 4.29 | 0.8 | 4.237 | 0.075 | 0.130 |
| 90 | 20 | 0 | 6 | 90 | 3.87 | — | 3.731 | 0.085 | 0.144 |
| 120 | 20 | 0 | 6 | 90 | 3.78 | — | 3.534 | 0.100 | 0.160 |
| 150 | 20 | 0 | 6 | 90 | 3.26 | — | 3.185 | 0.110 | 0.172 |
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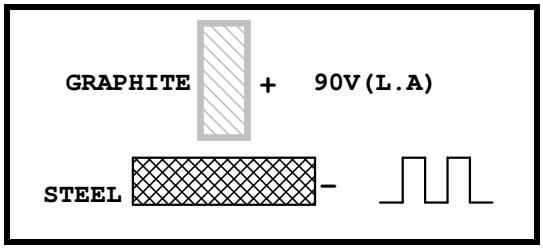
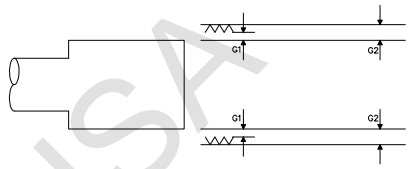
※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 10 | 20 | 0 | 7 | 80 | 2.98 | 18.6 | 3.724 | 0.050 | 0.094 |
| 20 | 20 | 0 | 7 | 80 | 3.35 | 10.8 | 4.415 | 0.060 | 0.106 |
| 30 | 20 | 0 | 7 | 80 | 4.08 | 6.0 | 5.089 | 0.065 | 0.119 |
| 40 | 20 | 0 | 7 | 80 | 4.17 | 3.6 | 5.540 | 0.072 | 0.128 |
| 50 | 20 | 0 | 7 | 80 | 4.33 | 3.2 | 6.042 | 0.079 | 0.141 |
| 60 | 20 | 0 | 7 | 80 | 5.18 | 3.2 | 7.576 | 0.085 | 0.153 |
| 90 | 20 | 0 | 7 | 80 | 5.42 | 3.0 | 7.299 | 0.100 | 0.170 |
| 120 | 20 | 0 | 7 | 80 | 5.06 | — | 6.689 | 0.110 | 0.176 |
| 150 | 20 | 0 | 7 | 80 | 4.66 | — | 5.900 | 0.125 | 0.191 |
| 200 | 20 | 0 | 7 | 80 | 4.37 | — | 5.510 | 0.135 | 0.207 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

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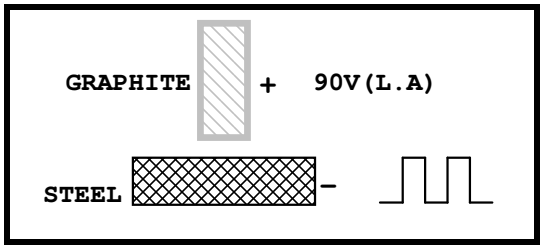
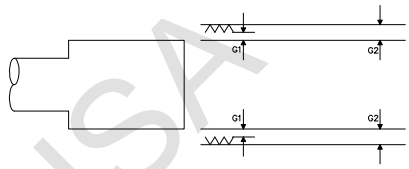
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 10 | 20 | 0 | 8 | 80 | 3.03 | 20.2 | 3.929 | 0.055 | 0.105 |
| 20 | 20 | 0 | 8 | 80 | 3.62 | 11.4 | 4.515 | 0.060 | 0.114 |
| 30 | 20 | 0 | 8 | 80 | 4.16 | 6.2 | 5.236 | 0.070 | 0.130 |
| 40 | 20 | 0 | 8 | 80 | 4.50 | 4.0 | 5.970 | 0.078 | 0.138 |
| 50 | 20 | 0 | 8 | 80 | 5.18 | 3.8 | 6.557 | 0.088 | 0.154 |
| 60 | 20 | 0 | 8 | 80 | 5.40 | 2.8 | 8.000 | 0.095 | 0.161 |
| 90 | 20 | 0 | 8 | 80 | 5.56 | 1.6 | 7.843 | 0.105 | 0.173 |
| 120 | 20 | 0 | 8 | 80 | 5.25 | — | 7.380 | 0.115 | 0.189 |
| 150 | 20 | 0 | 8 | 80 | 5.03 | — | 6.826 | 0.130 | 0.192 |
| 200 | 20 | 0 | 8 | 80 | 4.88 | — | 6.211 | 0.140 | 0.210 |
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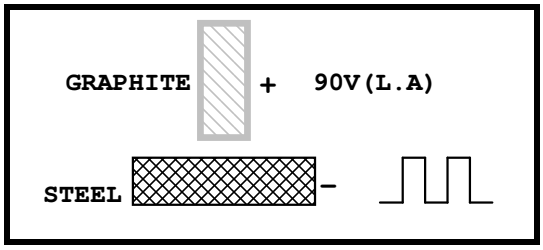
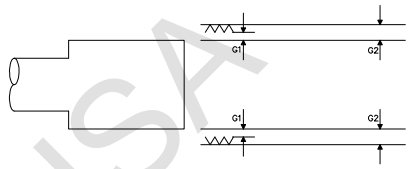
※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 10 | 20 | 0 | 9 | 70 | 4.55 | 21.0 | 3.960 | 0.060 | 0.108 |
| 20 | 20 | 0 | 9 | 70 | 5.57 | 12.6 | 6.390 | 0.070 | 0.124 |
| 30 | 20 | 0 | 9 | 70 | 5.92 | 9.0 | 8.734 | 0.085 | 0.145 |
| 60 | 20 | 0 | 9 | 70 | 6.30 | 2.4 | 9.901 | 0.100 | 0.170 |
| 90 | 20 | 0 | 9 | 70 | 6.06 | 0.4 | 9.804 | 0.110 | 0.184 |
| 120 | 20 | 0 | 9 | 70 | 5.84 | — | 9.709 | 0.120 | 0.199 |
| 150 | 20 | 0 | 9 | 70 | 4.79 | — | 9.050 | 0.135 | 0.195 |
| 200 | 20 | 0 | 9 | 70 | 4.32 | — | 8.097 | 0.150 | 0.207 |
| 240 | 20 | 0 | 9 | 70 | 3.18 | — | 7.463 | 0.155 | 0.211 |
| 300 | 20 | 0 | 9 | 70 | 3.74 | — | 6.993 | 0.160 | 0.230 |
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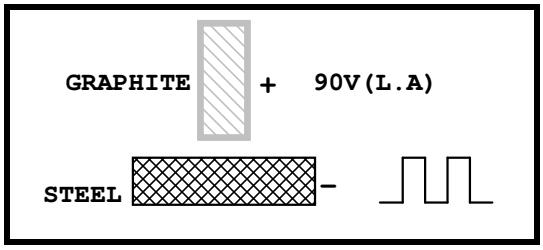
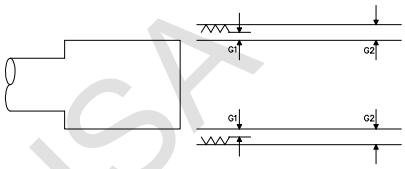
※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

Property of Kent USA
Do Not Reproduce

# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 10 | 20 | 0 | 10 | 70 | 5.38 | 22.5 | 6.042 | 0.070 | 0.116 |
| 20 | 20 | 0 | 10 | 70 | 6.42 | 14.5 | 9.479 | 0.080 | 0.128 |
| 40 | 20 | 0 | 10 | 70 | 6.89 | 8.0 | 10.695 | 0.090 | 0.162 |
| 60 | 20 | 0 | 10 | 70 | 6.72 | 4.2 | 13.699 | 0.100 | 0.176 |
| 90 | 20 | 0 | 10 | 70 | 6.66 | 1.2 | 12.422 | 0.110 | 0.192 |
| 120 | 20 | 0 | 10 | 70 | 6.45 | 0.2 | 12.048 | 0.120 | 0.202 |
| 150 | 20 | 0 | 10 | 70 | 5.48 | — | 11.111 | 0.135 | 0.214 |
| 200 | 20 | 0 | 10 | 70 | 5.42 | — | 10.152 | 0.150 | 0.226 |
| 240 | 20 | 0 | 10 | 70 | 3.34 | — | 9.217 | 0.160 | 0.235 |
| 300 | 20 | 0 | 10 | 70 | 3.89 | — | 8.696 | 0.170 | 0.250 |
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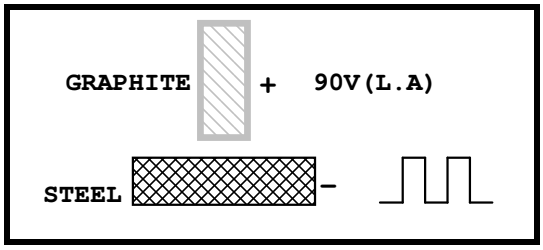
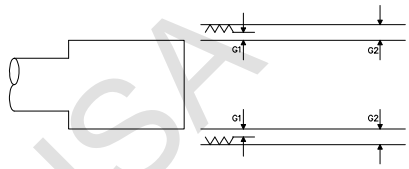
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 12 | 70 | 5.69 | 7.0 | 17.094 | 0.100 | 0.168 |
| 60 | 20 | 0 | 12 | 70 | 6.96 | 4.1 | 20.202 | 0.110 | 0.178 |
| 90 | 20 | 0 | 12 | 70 | 7.48 | 0.9 | 19.139 | 0.124 | 0.202 |
| 120 | 20 | 0 | 12 | 70 | 7.66 | — | 18.957 | 0.138 | 0.210 |
| 150 | 20 | 0 | 12 | 70 | 8.17 | — | 18.519 | 0.150 | 0.232 |
| 180 | 20 | 0 | 12 | 70 | 8.27 | — | 18.182 | 0.160 | 0.250 |
| 240 | 20 | 0 | 12 | 70 | 8.36 | — | 17.621 | 0.174 | 0.276 |
| 300 | 20 | 0 | 12 | 70 | 8.12 | — | 15.038 | 0.188 | 0.288 |
| 400 | 20 | 0 | 12 | 70 | 7.50 | — | 11.594 | 0.206 | 0.304 |
| 500 | 20 | 0 | 12 | 70 | 7.22 | — | 9.346 | 0.214 | 0.320 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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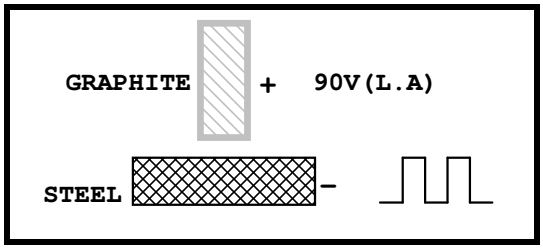
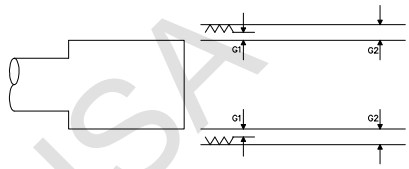
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 14 | 70 | 5.84 | 5.9 | 24.390 | 0.110 | 0.172 |
| 60 | 20 | 0 | 14 | 70 | 6.82 | 3.2 | 28.369 | 0.120 | 0.184 |
| 90 | 20 | 0 | 14 | 70 | 7.56 | 0.7 | 23.669 | 0.132 | 0.196 |
| 120 | 20 | 0 | 14 | 70 | 7.95 | — | 23.392 | 0.144 | 0.214 |
| 150 | 20 | 0 | 14 | 70 | 8.47 | — | 22.857 | 0.156 | 0.236 |
| 200 | 20 | 0 | 14 | 70 | 8.83 | — | 22.346 | 0.168 | 0.258 |
| 240 | 20 | 0 | 14 | 70 | 8.51 | — | 22.099 | 0.180 | 0.280 |
| 300 | 20 | 0 | 14 | 70 | 7.96 | — | 16.949 | 0.192 | 0.294 |
| 400 | 20 | 0 | 14 | 70 | 7.66 | — | 13.115 | 0.208 | 0.310 |
| 500 | 20 | 0 | 14 | 70 | 7.43 | — | 12.012 | 0.220 | 0.332 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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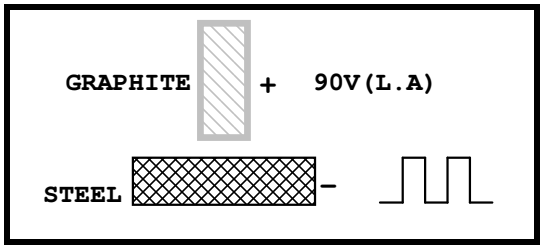
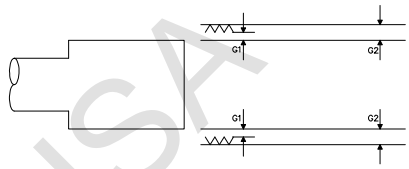
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 16 | 70 | 6.22 | 5.6 | 28.777 | 0.124 | 0.180 |
| 60 | 20 | 0 | 16 | 70 | 7.08 | 2.9 | 31.746 | 0.136 | 0.192 |
| 90 | 20 | 0 | 16 | 70 | 8.40 | 0.5 | 29.197 | 0.150 | 0.208 |
| 120 | 20 | 0 | 16 | 70 | 8.86 | — | 27.027 | 0.162 | 0.224 |
| 150 | 20 | 0 | 16 | 70 | 9.13 | — | 27.027 | 0.170 | 0.240 |
| 180 | 20 | 0 | 16 | 70 | 9.49 | — | 27.397 | 0.184 | 0.260 |
| 240 | 20 | 0 | 16 | 70 | 9.28 | — | 26.846 | 0.198 | 0.280 |
| 300 | 20 | 0 | 16 | 70 | 8.76 | — | 25.806 | 0.210 | 0.302 |
| 400 | 20 | 0 | 16 | 70 | 8.27 | — | 22.346 | 0.230 | 0.320 |
| 500 | 20 | 0 | 16 | 70 | 7.90 | — | 20.202 | 0.246 | 0.340 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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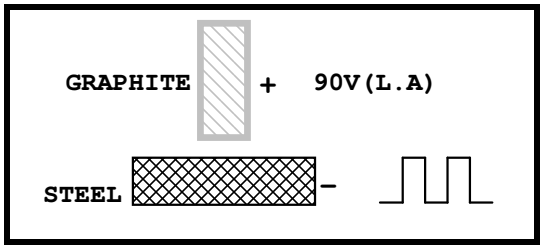
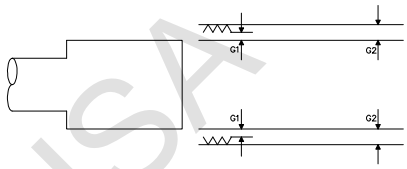
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 18 | 70 | 6.56 | 4.9 | 36.036 | 0.130 | 0.194 |
| 60 | 20 | 0 | 18 | 70 | 7.30 | 2.1 | 37.736 | 0.140 | 0.206 |
| 90 | 20 | 0 | 18 | 70 | 8.68 | 0.2 | 34.483 | 0.155 | 0.220 |
| 120 | 20 | 0 | 18 | 70 | 9.22 | — | 35.088 | 0.170 | 0.238 |
| 150 | 20 | 0 | 18 | 70 | 9.60 | — | 35.088 | 0.190 | 0.250 |
| 180 | 20 | 0 | 18 | 70 | 9.93 | — | 34.783 | 0.205 | 0.270 |
| 240 | 20 | 0 | 18 | 70 | 10.05 | — | 34.188 | 0.220 | 0.290 |
| 300 | 20 | 0 | 18 | 70 | 9.88 | — | 33.058 | 0.230 | 0.316 |
| 400 | 20 | 0 | 18 | 70 | 9.41 | — | 28.369 | 0.245 | 0.336 |
| 500 | 20 | 0 | 18 | 70 | 8.95 | — | 26.144 | 0.260 | 0.358 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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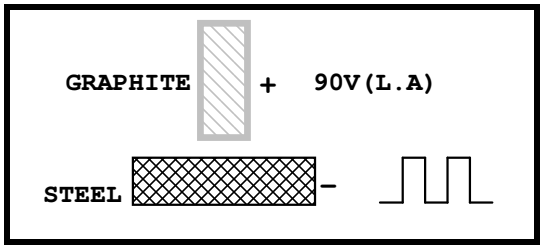
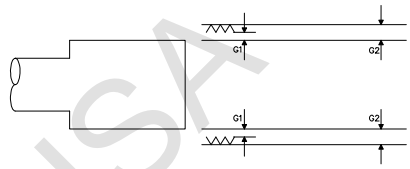



| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 20 | 80 | 6.67 | 2.3 | 36.810 | 0.132 | 0.200 |
| 60 | 20 | 0 | 20 | 80 | 7.42 | 1.1 | 41.958 | 0.140 | 0.210 |
| 90 | 20 | 0 | 20 | 80 | 8.72 | 0.2 | 43.478 | 0.154 | 0.240 |
| 120 | 20 | 0 | 20 | 80 | 9.33 | — | 40.268 | 0.180 | 0.255 |
| 150 | 20 | 0 | 20 | 80 | 9.88 | — | 40.268 | 0.195 | 0.270 |
| 180 | 20 | 0 | 20 | 80 | 10.14 | — | 39.216 | 0.210 | 0.285 |
| 240 | 20 | 0 | 20 | 80 | 10.43 | — | 37.500 | 0.225 | 0.310 |
| 300 | 20 | 0 | 20 | 80 | 10.01 | — | 36.585 | 0.235 | 0.330 |
| 400 | 20 | 0 | 20 | 80 | 9.67 | — | 32.787 | 0.250 | 0.360 |
| 500 | 20 | 0 | 20 | 80 | 9.42 | — | 31.250 | 0.270 | 0.390 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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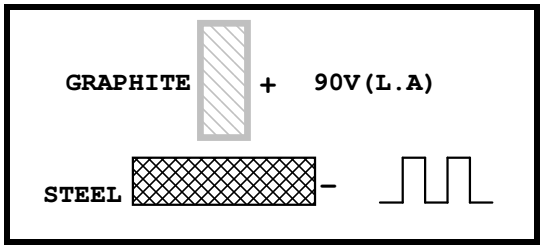
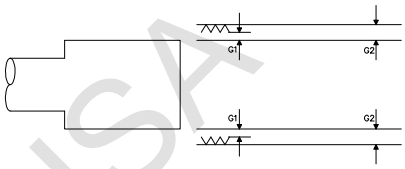



| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 22 | 80 | 6.96 | 2.2 | 40.816 | 0.138 | 0.210 |
| 60 | 20 | 0 | 22 | 80 | 7.62 | 0.8 | 53.097 | 0.150 | 0.225 |
| 90 | 20 | 0 | 22 | 80 | 8.97 | 0.1 | 58.252 | 0.160 | 0.250 |
| 120 | 20 | 0 | 22 | 80 | 9.44 | — | 55.046 | 0.185 | 0.270 |
| 150 | 20 | 0 | 22 | 80 | 10.13 | — | 54.054 | 0.195 | 0.285 |
| 180 | 20 | 0 | 22 | 80 | 10.60 | — | 48.000 | 0.210 | 0.305 |
| 240 | 20 | 0 | 22 | 80 | 10.68 | — | 43.796 | 0.230 | 0.320 |
| 300 | 20 | 0 | 22 | 80 | 11.11 | — | 41.958 | 0.245 | 0.345 |
| 400 | 20 | 0 | 22 | 80 | 10.86 | — | 37.500 | 0.265 | 0.365 |
| 500 | 20 | 0 | 22 | 80 | 10.52 | — | 34.884 | 0.285 | 0.395 |
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2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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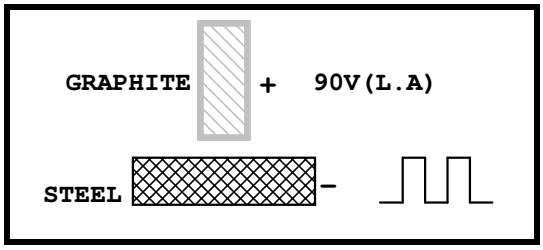
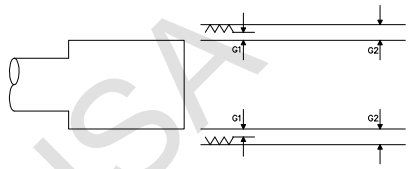



| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 24 | 80 | 7.20 | 2.0 | 44.776 | 0.145 | 0.220 |
| 60 | 20 | 0 | 24 | 80 | 8.38 | 0.7 | 58.824 | 0.155 | 0.230 |
| 90 | 20 | 0 | 24 | 80 | 9.32 | 0.1 | 61.224 | 0.170 | 0.260 |
| 120 | 20 | 0 | 24 | 80 | 9.74 | — | 59.406 | 0.185 | 0.280 |
| 150 | 20 | 0 | 24 | 80 | 10.47 | — | 57.143 | 0.205 | 0.295 |
| 180 | 20 | 0 | 24 | 80 | 11.08 | — | 55.556 | 0.215 | 0.310 |
| 240 | 20 | 0 | 24 | 80 | 11.20 | — | 53.571 | 0.235 | 0.330 |
| 300 | 20 | 0 | 24 | 80 | 11.42 | — | 50.847 | 0.250 | 0.350 |
| 400 | 20 | 0 | 24 | 80 | 11.40 | — | 46.154 | 0.270 | 0.380 |
| 500 | 20 | 0 | 24 | 80 | 10.13 | — | 44.776 | 0.300 | 0.410 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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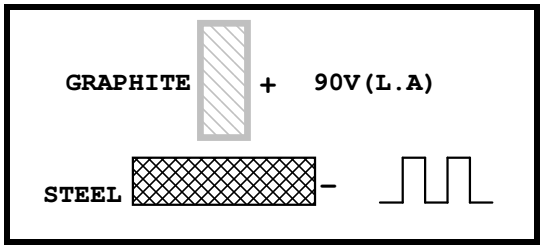


| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | | |
| 40 | 20 | 0 | 26 | 80 | 7.63 | 1.6 | 57.143 | 0.150 | 0.225 |
| 60 | 20 | 0 | 26 | 80 | 8.51 | 0.5 | 56.604 | 0.160 | 0.240 |
| 90 | 20 | 0 | 26 | 80 | 9.54 | 0.1 | 62.500 | 0.175 | 0.265 |
| 120 | 20 | 0 | 26 | 80 | 9.95 | — | 59.406 | 0.190 | 0.290 |
| 150 | 20 | 0 | 26 | 80 | 10.89 | — | 58.824 | 0.210 | 0.305 |
| 180 | 20 | 0 | 26 | 80 | 11.44 | — | 55.556 | 0.225 | 0.315 |
| 240 | 20 | 0 | 26 | 80 | 11.75 | — | 54.545 | 0.245 | 0.340 |
| 300 | 20 | 0 | 26 | 80 | 12.15 | — | 51.282 | 0.260 | 0.360 |
| 400 | 20 | 0 | 26 | 80 | 11.53 | — | 48.397 | 0.285 | 0.400 |
| 500 | 20 | 0 | 26 | 80 | 11.07 | — | 46.875 | 0.310 | 0.430 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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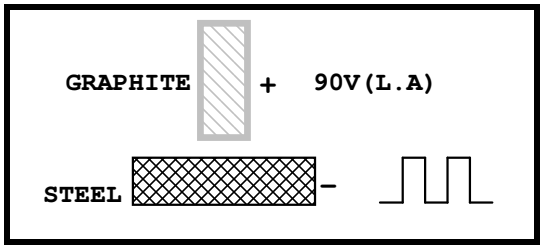
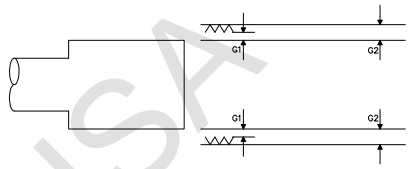
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 40 | 20 | 0 | 28 | 80 | 7.89 | 1.5 | 61.224 | 0.160 | 0.230 |
| 60 | 20 | 0 | 28 | 80 | 8.81 | 0.5 | 65.217 | 0.170 | 0.250 |
| 90 | 20 | 0 | 28 | 80 | 9.85 | 0.1 | 67.416 | 0.190 | 0.280 |
| 120 | 20 | 0 | 28 | 80 | 10.53 | — | 65.217 | 0.205 | 0.300 |
| 150 | 20 | 0 | 28 | 80 | 11.41 | — | 61.856 | 0.220 | 0.315 |
| 180 | 20 | 0 | 28 | 80 | 12.05 | — | 60.000 | 0.240 | 0.330 |
| 240 | 20 | 0 | 28 | 80 | 12.34 | — | 56.075 | 0.260 | 0.355 |
| 300 | 20 | 0 | 28 | 80 | 12.50 | — | 53.571 | 0.275 | 0.380 |
| 400 | 20 | 0 | 28 | 80 | 11.63 | — | 50.847 | 0.295 | 0.410 |
| 500 | 20 | 0 | 28 | 80 | 11.40 | — | 48.000 | 0.320 | 0.440 |
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※ P.S：1. TEST AREA＝10 mm×20 mm。
2. Setting P.P.＝1，WORK=3。
3. Turn Servo sensitivity adjust knob about to 1/2。

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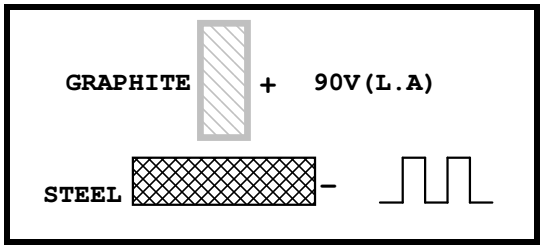
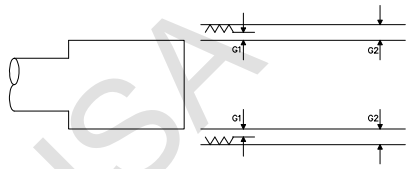
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 40 | 0 | 30 | 90 | 8.90 | 1.5 | 31.765 | 0.175 | 0.260 |
| 90 | 40 | 0 | 30 | 90 | 9.96 | 0.7 | 42.857 | 0.195 | 0.290 |
| 120 | 40 | 0 | 30 | 90 | 10.72 | 0.3 | 43.902 | 0.210 | 0.305 |
| 150 | 40 | 0 | 30 | 90 | 11.50 | 0.1 | 45.000 | 0.220 | 0.325 |
| 200 | 40 | 0 | 30 | 90 | 13.23 | — | 52.427 | 0.245 | 0.350 |
| 300 | 40 | 0 | 30 | 90 | 15.46 | — | 60.674 | 0.275 | 0.390 |
| 400 | 40 | 0 | 30 | 90 | 15.76 | — | 70.130 | 0.300 | 0.420 |
| 500 | 40 | 0 | 30 | 90 | 16.81 | — | 71.053 | 0.320 | 0.450 |
| 600 | 40 | 0 | 30 | 90 | 17.02 | — | 66.667 | 0.335 | 0.470 |
| 700 | 40 | 0 | 30 | 90 | 17.08 | — | 64.286 | 0.350 | 0.500 |
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※ P.S：1. TEST AREA＝40 mm×45 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

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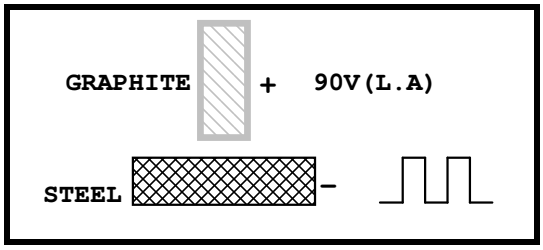
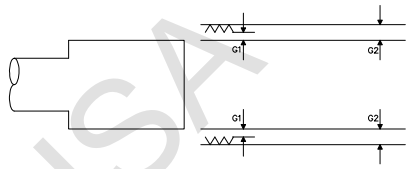
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 60 | 40 | 0 | 40 | 90 | 10.13 | 1.3 | 52.427 | 0.185 | 0.270 |
| 90 | 40 | 0 | 40 | 90 | 10.68 | 0.4 | 60.674 | 0.200 | 0.295 |
| 150 | 40 | 0 | 40 | 90 | 12.32 | 0.1 | 78.261 | 0.230 | 0.340 |
| 200 | 40 | 0 | 40 | 90 | 14.70 | — | 85.714 | 0.260 | 0.370 |
| 300 | 40 | 0 | 40 | 90 | 16.73 | — | 88.525 | 0.288 | 0.405 |
| 400 | 40 | 0 | 40 | 90 | 17.32 | — | 93.103 | 0.320 | 0.435 |
| 500 | 40 | 0 | 40 | 90 | 18.16 | — | 100.000 | 0.340 | 0.470 |
| 600 | 40 | 0 | 40 | 90 | 18.50 | — | 99.083 | 0.355 | 0.505 |
| 700 | 40 | 0 | 40 | 90 | 18.57 | — | 98.182 | 0.370 | 0.535 |
| 800 | 40 | 0 | 40 | 90 | 18.48 | — | 98.182 | 0.390 | 0.555 |
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※ P.S：1. TEST AREA＝40 mm×45 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

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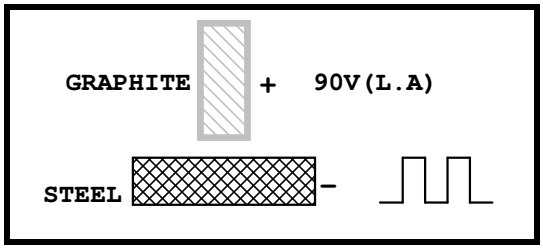
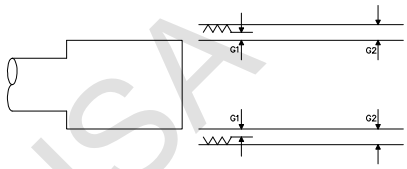
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 90 | 40 | 0 | 50 | 90 | 11.52 | 0.3 | 84.375 | 0.215 | 0.310 |
| 150 | 40 | 0 | 50 | 90 | 13.51 | 0.1 | 94.737 | 0.240 | 0.380 |
| 200 | 40 | 0 | 50 | 90 | 15.17 | — | 108.000 | 0.275 | 0.400 |
| 300 | 40 | 0 | 50 | 90 | 17.57 | — | 117.391 | 0.310 | 0.450 |
| 400 | 40 | 0 | 50 | 90 | 18.42 | — | 138.462 | 0.340 | 0.480 |
| 500 | 40 | 0 | 50 | 90 | 20.86 | — | 142.105 | 0.365 | 0.510 |
| 600 | 40 | 0 | 50 | 90 | 21.72 | — | 150.000 | 0.390 | 0.535 |
| 700 | 40 | 0 | 50 | 90 | 22.80 | — | 145.946 | 0.420 | 0.570 |
| 800 | 40 | 0 | 50 | 90 | 22.93 | — | 135.000 | 0.440 | 0.590 |
| 1000 | 40 | 0 | 50 | 90 | 22.01 | — | 125.581 | 0.470 | 0.645 |
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※ P.S：1. TEST AREA＝40 mm×45 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

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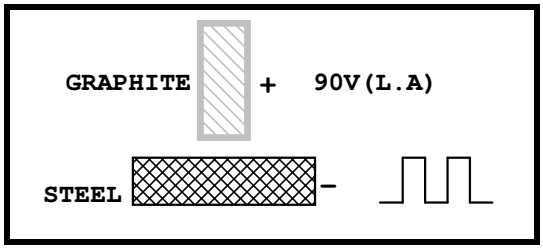
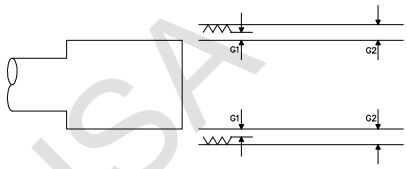
# KEB-CNC Machine Data Sheet




| SET CONDITION | | | | | SURFACE FINISH | ELECTRODE WEAR RATE | PROCESSING SPEED |  | |
|---|---|---|---|---|---|---|---|---|---|
| ON.T | OFF.T | H.V | L.V | GAP (V) | (μM) | (%) | (mm³/min) | FINE GAP mm 2 × G1 | ROUGH GAP mm 2 × G2 |
| 90 | 40 | 0 | 60 | 90 | 11.93 | 0.3 | 114.894 | 0.225 | 0.330 |
| 150 | 40 | 0 | 60 | 90 | 14.32 | 0.1 | 128.571 | 0.265 | 0.415 |
| 200 | 40 | 0 | 60 | 90 | 15.46 | — | 135.000 | 0.300 | 0.450 |
| 300 | 40 | 0 | 60 | 90 | 18.25 | — | 145.946 | 0.340 | 0.480 |
| 400 | 40 | 0 | 60 | 90 | 19.36 | — | 163.636 | 0.360 | 0.535 |
| 500 | 40 | 0 | 60 | 90 | 22.33 | — | 168.750 | 0.380 | 0.570 |
| 600 | 40 | 0 | 60 | 90 | 24.65 | — | 168.750 | 0.400 | 0.610 |
| 800 | 40 | 0 | 60 | 90 | 25.50 | — | 166.154 | 0.430 | 0.645 |
| 1000 | 40 | 0 | 60 | 90 | 23.31 | — | 163.636 | 0.470 | 0.680 |
| 1200 | 40 | 0 | 60 | 90 | 24.90 | — | 154.286 | 0.500 | 0.720 |
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※ P.S：1. TEST AREA＝40 mm×45 mm。
2. Setting P.P.＝1，WORK=2。
3. Turn Servo sensitivity adjust knob about to 1/2。

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