

# SUPER X3 CNC MILL

## Manual

Revision 1A

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**Syil America**  
1887 North Bayshore Drive  
Coos Bay, OR 94720  
(541) 266-0635  
(541) 267-0909 Fax  
<http://www.syilamerica.com>

## Initial Setup

Tools needed:

- Tin snips, or tool suitable for cutting metal straps
- Claw hammer
- Philips Screwdriver
- 17 mm end wrench or socket
- Hoist, lift, or friends with big muscles

When you receive your Super X3, it is preferred to place it in an area that is clear around the crate. Once you remove the straps, the crate can be disassembled. Start from the top by prying with the claw hammer. After the top is removed and placed away from your working area, the sides can be removed by lightly tapping on the inside with the hammer.

Underneath the lower skid, there are 4 retainer bolts that hold the mill down. You will need your 17mm end wrench or socket to loosen and remove these bolts.

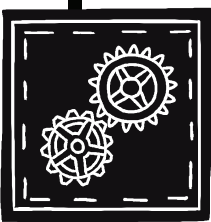
The power supplies, drivers, fan, and PCB boards are located in the black casing to the side. All connections have been made at the factory except two. However, with jarring of transportation, it is possible to loosen other connections. Visually check all connectors in the case and make sure there are not loose. The two remaining connectors are the “Emergency Stop” and power. Emergency stop connection is made on the PCB board labeled “E-Stop”. Only one power connection is required. It is a white four pin connector that connects inside the rear housing. If you do not easily see the mating power connector, it will make it easier to remove the upper inspection plate. This is located at the top of the body.

After connecting power and E-Stop, you can mount the component casing onto the back of the mill. Re-use the 6 screws removed from the lower case plate.

The unit is **heavy**. An engine hoist (cherry picker), if available, is the easiest way of moving these. If not, 2 of your biggest friends will suffice. The working platform of the Super X3 needs to be stout. The heavier the construction the happier you will be with the performance. Noise, smoothness, and safety are all enhanced by a working structure that is sturdy.

***\*Note on electrical connections:** The unit has a 1300 watt motor and 600 watts of available power for it's driver/stepper system. Make sure your breaker that the Super X3 CNC mill is connected to has at least 15 amps available.*

## **Table of Contents**



# Syil CNC Conversion

## Introduction

We at Syil have a passion for seeing something come from nothing. We also share of love of manufacturing. We wanted to share this love with the rest of the world.

Historically, manufacturing in the U.S. was associated with 15,000lb machines that required lifts to move and trained operators monitoring 24/7. These colossal machines, outfitted with high grade ball screws, G-code controlled spindles, and huge motors, run 24/7 because of the need to pay for themselves. Moving these machines not only presents a problem, but the power requirements for such a beast can hinder many shops capacity. These machines cost as much as a house, and demand about the same in maintenance.

Where does that leave the rest of us? A characteristic, small production shop is filled with manual machines dating back to when my great grandfather first ate solid foods. Granted, these machines are true American legends, worthy of much praise. They still fall short on keeping up with competition. To compound the problem even more: U.S. politics and what have you, has “blessed” us with all the protections conceivable. We are well protected, even from ourselves. While this may seem brilliant on the surface, it comes at a price. Labor is costly. What is the byproduct? You have a shop with 4 people running all the machinery with what used to have 16.

Computer numerical control is a godsend to manufacturing. It is part of the answer. However, it is out of reach for most shops. It would also be somewhat unwise to indenture the business, just to pay for the “Zeus” sized VMCs. Some people have kindled that creative spirit and converted their manual machines over to CNC. Some work well. Some, not so much. So we at Syil have tried to come up with a balance. Giving all those great advantages of the more expensive CNC mills to the rest of us. Using some of the best components and some ingenuity, we are proud to offer the first product of our venture together, the **Super X3 CNC machine**.

Finally: consistency in quality, and affordability for the rest of us.

### A note on accuracy:

We have extensively tested our machines with the following results. Although there may be some variation between machines, we try for consistency in every product.

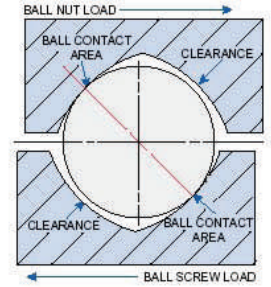
These are some of our findings:

Spindle run out:  $.001'' \pm .001''$   
\*Locking the spindle on the front panel will get you much better results

|               |                    |
|---------------|--------------------|
| X Travel      | $14.4'' \pm .04''$ |
| Y Travel      | $6.3'' \pm .08''$  |
| Z Travel      | $8.1'' \pm .07$    |
| Backlash      | $\leq .004''$      |
| Repeatability | $\pm .0004''$      |

## **Ballscrews:**

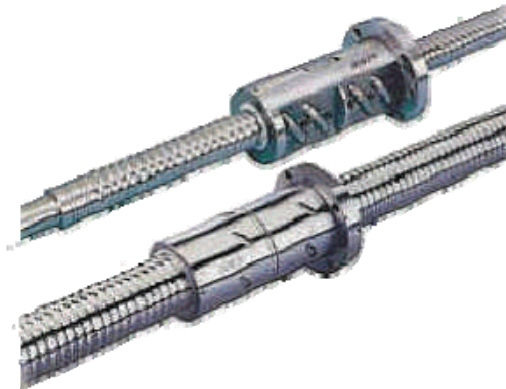
- 5 T.P.I.
- Stainless steel
- Rolled type
- Double nut



*The ballscrews included on the Syil products are made from high quality Italian stainless steel. They will provide a lifetime of precision with very light maintenance.*

### **Maintenance:**

- Every year or 100 hours of operation:
  - Spray a light film of light weight #2 oil (WD-40, etc.) on the screws and run them from throw to throw.



Access to the ball screws can be viewed as a challenge, but is really quite easy. It can be done by the average person.

Z axis:

- Remove the controller assembly
- Remove the black casing cover from the back of the mill

X axis

Remove left end plate  
Remove motor dust cover  
Remove bolts from right end plate  
Slide table off from the left

Y axis

Remove bed  
Remove rear y axis dust cover

*\*Note: Do not run the screw completely out of the nut. If you do, you will have the experience of a hundred ball bearings fall and run about the floor. Then the fun task of re-inserting them.*

# Parallel Interface PCB:

- 4 Axis support
- 4 Axis limit / home support
- Direct support for all common PC controller software (Mach, KCAM, Etc.)
- Support for spindle control (DC power, AC power, frequency conversion)
- Photocoupled input/output protection
- Emergency stop
- 2 Aux inputs/outputs (Coolant, Probe, Tool height, etc.)

## Technical:

Power: DC 13-18V, AC 12-16V (50-60Hz)

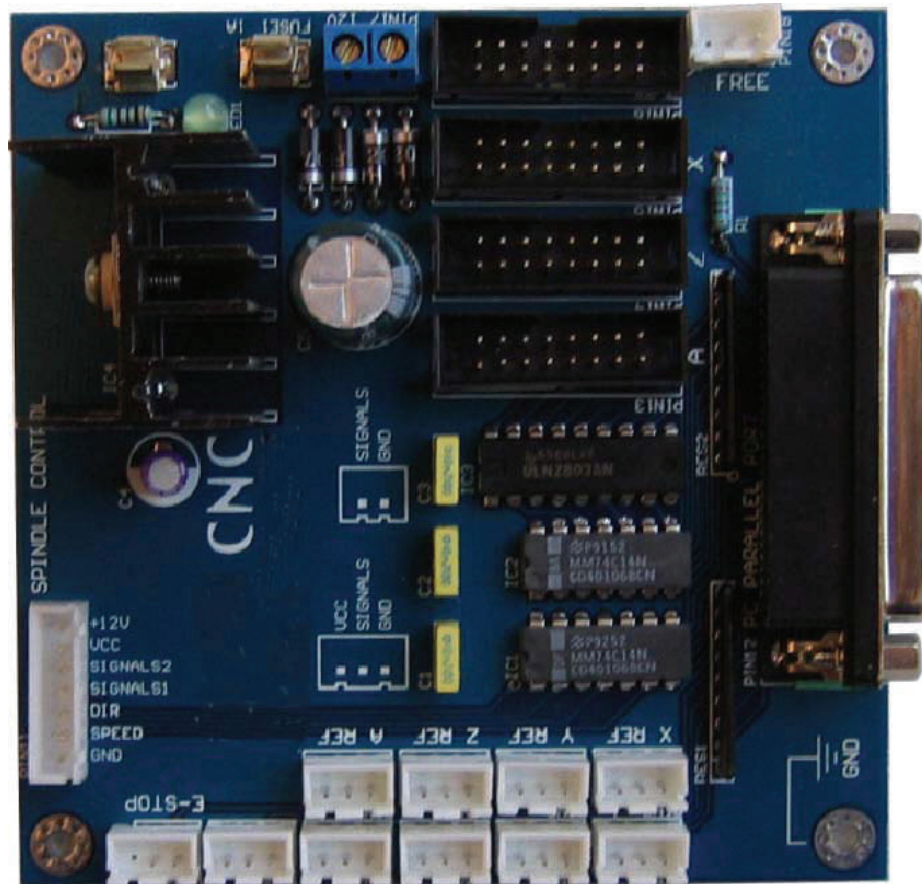
Current at idle: 9mA

Current at full: 100mA

Output drive voltage: 5V

Output current: ~2mA

Input signals: Pull-up resistors



| Pin Name               | Input/Output | Parallel inter-<br>face pin number | Description   |
|------------------------|--------------|------------------------------------|---|
| X axis direc-<br>tion  | OUT          | 2                                  | X axis stepper direction control  |
| X axis pulse           | OUT          | 16                                 | X axis stepper drive  |
| X axis limit           | IN           | 15                                 | X axis origin point detection   |
| Y axis direc-<br>tion  | OUT          | 14                                 | Y axis stepper direction control  |
| Y axis pulse           | OUT          | 5                                  | Y axis stepper drive  |
| Y axis limit           | IN           | 13                                 | Y axis origin detection   |
| Z axis direc-<br>tion  | OUT          | 17                                 | Z axis stepper direction control  |
| Z axis pulse           | OUT          | 6                                  | Z axis stepper drive  |
| Z axis limit           | OUT          | 12                                 | Z axis origin point detection   |
| A axis direc-<br>tion  | IN           | 4                                  | A axis stepper direction control  |
| A axis pulse           | OUT          | 3                                  | A axis stepper drive  |
| A axis limit           | IN           | 11                                 | A axis origin point detection   |
| Spindle direc-<br>tion | OUT          | 8                                  | Spindle direction control   |
| Spindle pulse          | OUT          | 9                                  | Spindle speed control   |
| Aux 1                  | OUT          | 7                                  | Configure software to assign usage  |
| Aux 2                  | OUT          | 1                                  | Configure software to assign usage  |
| E Stop                 | IN           | 10                                 | Emergency stop switch   |
| Digitizing<br>Probe    | IN           | 11                                 | ②correct configure this pin if you are using a tool<br>adjuster, digitizing probe |

# Stepper Driver:

Syil™



## Features

- Power supply from DC 32V to 60V.
- Auto half-current function—that means the output current of the driver will automatically decline to half if the stepper pulse pause over than 0.3s.
- Forced shut down of output current by the E-Stop.
- Driving current can be adjusted from 1.0A to 4.3A.
- Phase origin and malfunction protection indicator.
- All input / output are isolated by photocouplers.
- **2, 4, 5, 10, 20, 25, 50, 100 microstep subdivisions are selectable.**
- Over-heat protection is integrated. When the driver over-heats, it will shut down the output current. And when the temperature returns to normal level, it will reset automatically.
- H bridge structure driver circuits just like a servo system are applied in the driver. This creates performance of this stepper drive system very close to servo systems.
- Protection functions----When the power supply is lower than 30V, or the temperature of the shell is over than 80°C, the driver will shut down automatically and the **fault LED** will light.

Each case is capable of housing 4 drivers. They are powered by a 600 watt power supply.



## Auto Half Current Set :

This driver contains an auto half current function. The output current of the driver will automatically decline to half, if the stepper pulse pause goes over 0.3s. When the next pulse comes, the current will recover to the original value. This function can depress the thermal value both of the driver and stepper motor. When the drive current is in half state, the moment of force will come down. If this situation is not wanted, it can be disabled.

| Auto Half Current Function | s1  |
|----------------------------|-----|
| Enable                     | OFF |
| Disable                    | ON  |

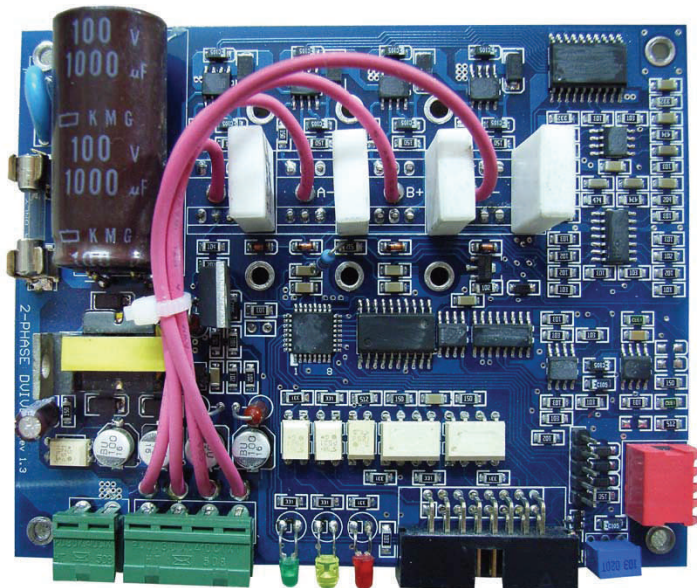
**NOTE:** The auto half current function is a real-time function. So user can set it while the driver is working.

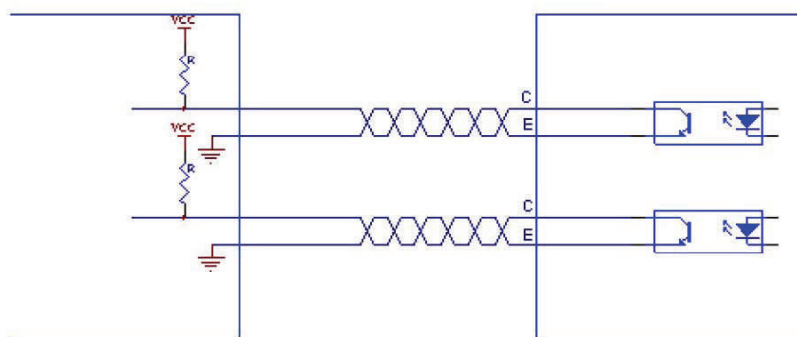
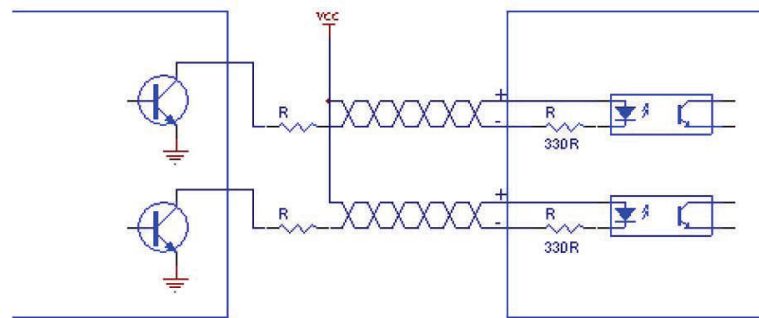
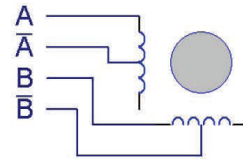
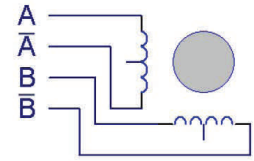
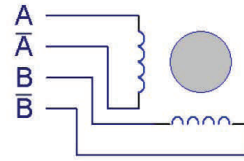
## Drive Current Adjustment:

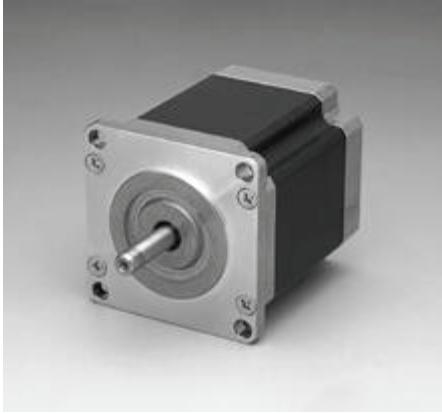
The driving current can be adjusted from 1.0A to 4.3A. The current will go down with clockwise rotation of the pots resistor; and the current will go up when rotated counter-clockwise. Half of the total movement on the pot = 2.6A. Adjust your drive current to approximation. Steppers will generate more heat while they are not moving due to the holding torque. If your stepper is extremely hot (160 degrees or more) after 5 minutes, Then reduce the current by turning counter-clockwise slightly.

### ATTENTION:

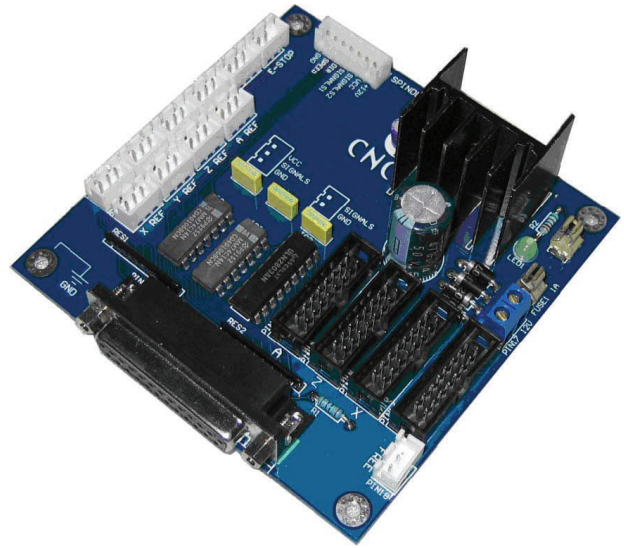
**Do not adjust the current value too high.** High current will increase the holding torque of the stepper motor, but it will bring increase the stepper temperature. Possibly causing a thermal problem. Please adjust the drive current to the stepper motor's specifications.







## Spindle Control Board



## **IMPORTANT SAFETY INSTRUCTION**

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**READ ALL INSTRUCTIONS AND WARNINGS BEFORE USING THIS TOOL**

### **Operator**

COMMON SENSE AND CAUTION ARE FACTORS WHICH CANNOT BE BUILT INTO ANY PRODUCT. THESE FACTORS MUST BE SUPPLIED BY THE OPERATOR. PLEASE REMEMBER:

1. When using electric tools, machines or equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and personal injury.
2. Keep work area clean. Cluttered areas invite injuries.
3. Consider work area conditions. Do not use machines or power tools in damp, wet, or poorly lit locations. Do not expose equipment to rain, keep work area well lit. Do not use tools in the presence of flammable gases or liquids.
4. Keep children away. All children should be kept away from the work area.
5. Guard against electric shock. Prevent body contact with grounded surfaces such as pipes, radiators, ranges, and refrigerator enclosures.
6. Stay alert. Never operate if you are tired.
7. Do not operate the product if under the influence of alcohol or drugs. Read warning labels on prescriptions to determine if your judgment or reflexes might be impaired.
8. Do not wear loose clothing or jewelry as they can be caught in moving parts.
9. Wear restrictive hair covering to contain long hair.
10. Use eye and ear protection. Always wear.
11. Keep proper footing and balance at all times.
12. Do not reach over or across running machines.

### **Before operations**

1. Be sure the switch is OFF when not in use and before plugging in.
2. Do not attempt to use inappropriate attachments in an attempt to exceed the tool's capacity. Approved accessories are available from the dealer or machine maker.
3. Check for damaged parts, before using any tool, any part that appears damaged should be carefully checked to determine that it will operate properly and perform its intended function.
4. Check for alignment and binding of all moving parts, broken parts or mounting fixtures and any other condition that may affect proper operation. Any part that is damaged should be properly repaired or replaced by a qualified technician.
5. Do not use the tool if any switch does not turn off and properly

### **Operation**

1. Never force the tool or attachment to do the work of a larger industrial tool. It is designed to do the job better and more safely at the rate for which it was intended.
2. Do not carry the tool by its power cord.
3. Always unplug the cord by the plug. Never yank the cord out of the wall.
4. Always turn off the machine before unplugging.

**IF THERE IS ANY QUESTION ABOUT A CONDITION BEING SAFE OR UNSAFE,  
DO NOT OPERATE THE TOOL!**

## **Grounding Instructions**

This machine has a three-prong plug, the third prong is the ground. Plug this cord only into a three-prong receptacle. Do not attempt to defeat the protection the ground wire provides by cutting off the round prong. Cutting off the ground will result in a safety hazard and void the warranty.

**DO NOT MODIFY THE PLUG IN ANY WAY. IF YOU HAVE ANY DOUBT, CALL A QUALIFIED ELECTRICIAN.**

## **Specification:**

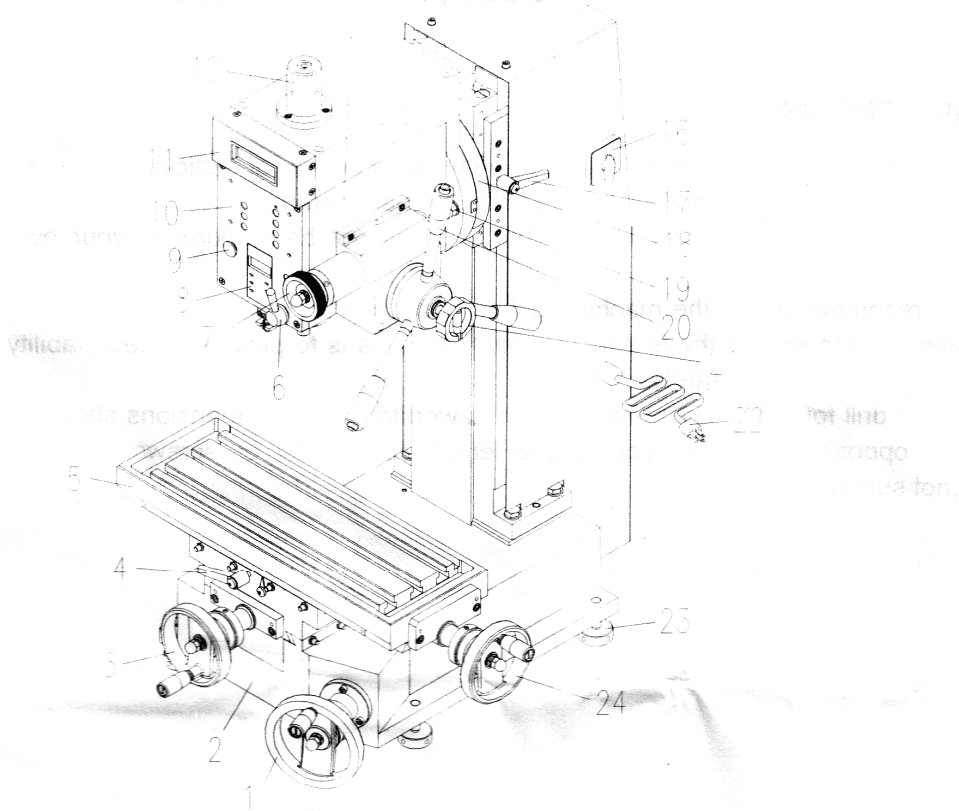
|                                |                         |
|--------------------------------|-------------------------|
| Max. drilling capacity:        | 25 mm                   |
| Max. tapping capacity:         | 12 mm                   |
| End mill capacity              | 25 mm                   |
| Face mill capacity             | 50 mm                   |
| Spindle stroke                 | 80 mm                   |
| Throat                         | 230 mm                  |
| Max. distance spindle to table | 350 mm                  |
| Spindle taper                  | MT#3 or R8              |
| Spindle speed                  | 100-1750 rpm $\pm 10\%$ |
| Table effective size           | 550*160 mm              |
| T-slot size                    | 12 mm                   |
| Table cross travel             | 160 mm                  |
| Table longitudinal travel      | 300 mm                  |
| Motor output power             | 1000 W                  |
| Overall dimension(L*W*H)       | 685*560*830 mm          |
| Weight (Net/Gross)             | 165 / 198 Kg            |
| Packing size (L*W*H)           | 840*820*1040 mm         |

## **Unpacking & Preparing for Use**

Before unpacking you must check the package carefully, to find whether it is damaged and any may have effect on the machine, please connect with the distributor in advance.

Unpacking carefully, check the species of standard accessories and the quantity to find whether it is as same as the packing list in the package.

## FEATURE



|    |                        |    |                          |
|----|------------------------|----|--------------------------|
| 1  | Lifting handwheel      | 13 | Spindle box              |
| 2  | Base                   | 14 | Fuselage                 |
| 3  | Cross feed handwheel   | 15 | Cover for fuselage       |
| 4  | Lock handle            | 16 | Power switch             |
| 5  | Worktable              | 17 | Lock handle              |
| 6  | Spindle lock handle    | 18 | Rotate connect plate     |
| 7  | Fine feeding handwheel | 19 | Lock bolt                |
| 8  | Depth display          | 20 | With tapping handle      |
| 9  | Emergency stop switch  | 21 | Fine feeding lock handle |
| 10 | Touch Switch panel     | 22 | Power plug               |
| 11 | Rotate speed display   | 23 | Adjust bolt              |
| 12 | Protective cover       | 24 | Longitudinal handwheel   |



## Installation

### CAUTION!

DO NOT ATTEMPT TO USE THE MACHINE UNTIL INSTALLTION IS COMPLETED, AND ALL PRELIMINARY CHECKS HAVE BEEN MADE IN ACCORDANCE WITH THIS MANUAL.

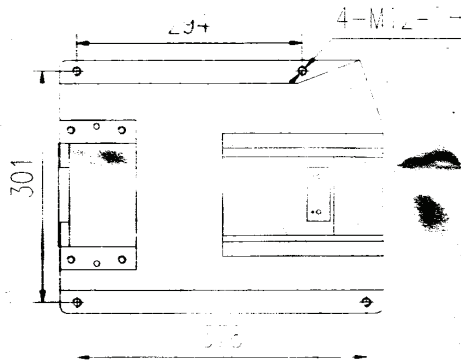
## MOUNTING THE MACHINE

The machine should be mounted on a strong, heavy workbench, of sufficient height so that you do not need to bend your back to perform normal operations.

Ensure the location is adequately lit and that you will not be working in your own shadow.

We strongly recommend that the machine bolted firmly to strong workbench using the tapped holes used to secure the feet to the machine. This is to provide added stability and consequently, additional safety.

To do this, first drill four M12 clearance holes in a worktop, at the dimensions shown in the diagram opposite, and with appropriate length M12 bolts, or screws, with flat washers. (not supply).



## Application

This small mill machine is both for milling or drilling and tapping, widely used in different places. Fine exterior, wide range of speed and easy to use.

Designed for industrial usage milling, drilling, tapping, reaming, steps and mill plane with metal and other material.

## Operation

1. Before starts to use this machine, operator should go through the instructions carefully so as to acquaint with the construction of the machines, the functions of the various controls and also the driving systems.



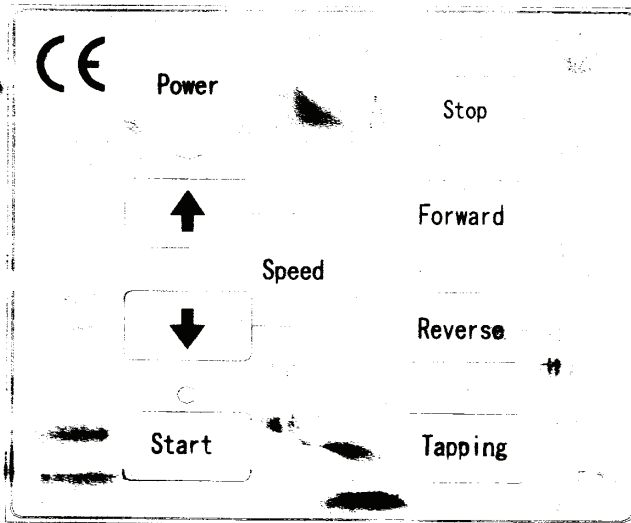
2. This machine uses touching button (see operation panel below), operating steps refer to the flow chart.

Spindle speed readout →

0000

### Operation panel

### Spindle depth readout



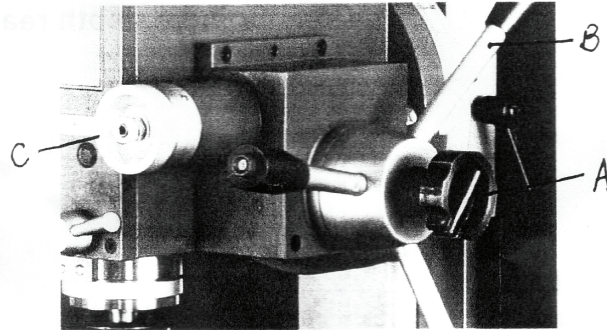
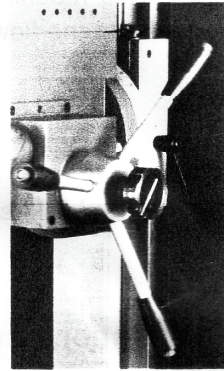
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### Operating steps

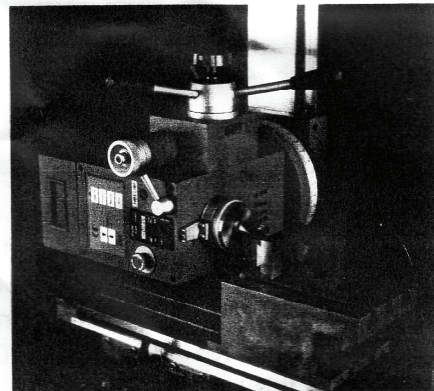
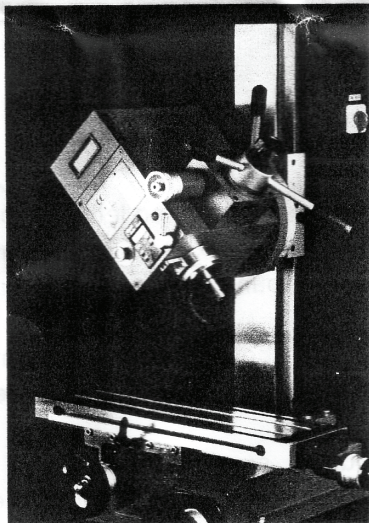
1. Insert the electric plug into its socket. Turn the power switch (on left) to 'I' position, the power indicator lights (green, in front of the spindle box).
2. Release the Emergency stop switch by turning the round head of the switch, the Spindle speed readout shows '0000'.
3. Press 'Start' button on the touching panel, the light above 'Start' button lights, spindle speed readout shows '0100 FORWARD'. Notice: '0100' is the lowest speed of this machine.
4. Press '↑' button, speed increase, press '↓' button, speed decrease.
5. Press 'Stop' button, spindle stop running, if press 'Start' button now, spindle runs to the speed last setting automatically.
6. Press the "Tapping" button, the light above the 'Tapping' button lights. This means now is the 'Tapping mode', 'Forward' and 'Reverse' buttons are unavailable

7. Taping: the highest speed under 'Tapping mode' is 500rpm.  
Press the button end of the handle the first is "forward" when press again it change to "reverse".

8. Fine feeding function: When lock the Lock small handwheel (A), then the control handle (B) can not useable. Turn the fine feeding handwheel (C) the spindle will micro remove.



9. The Mill machine have a big feature: It can do angle milling and horizontal milling. You need purpose a optional accessories the worktable. See below pictures.

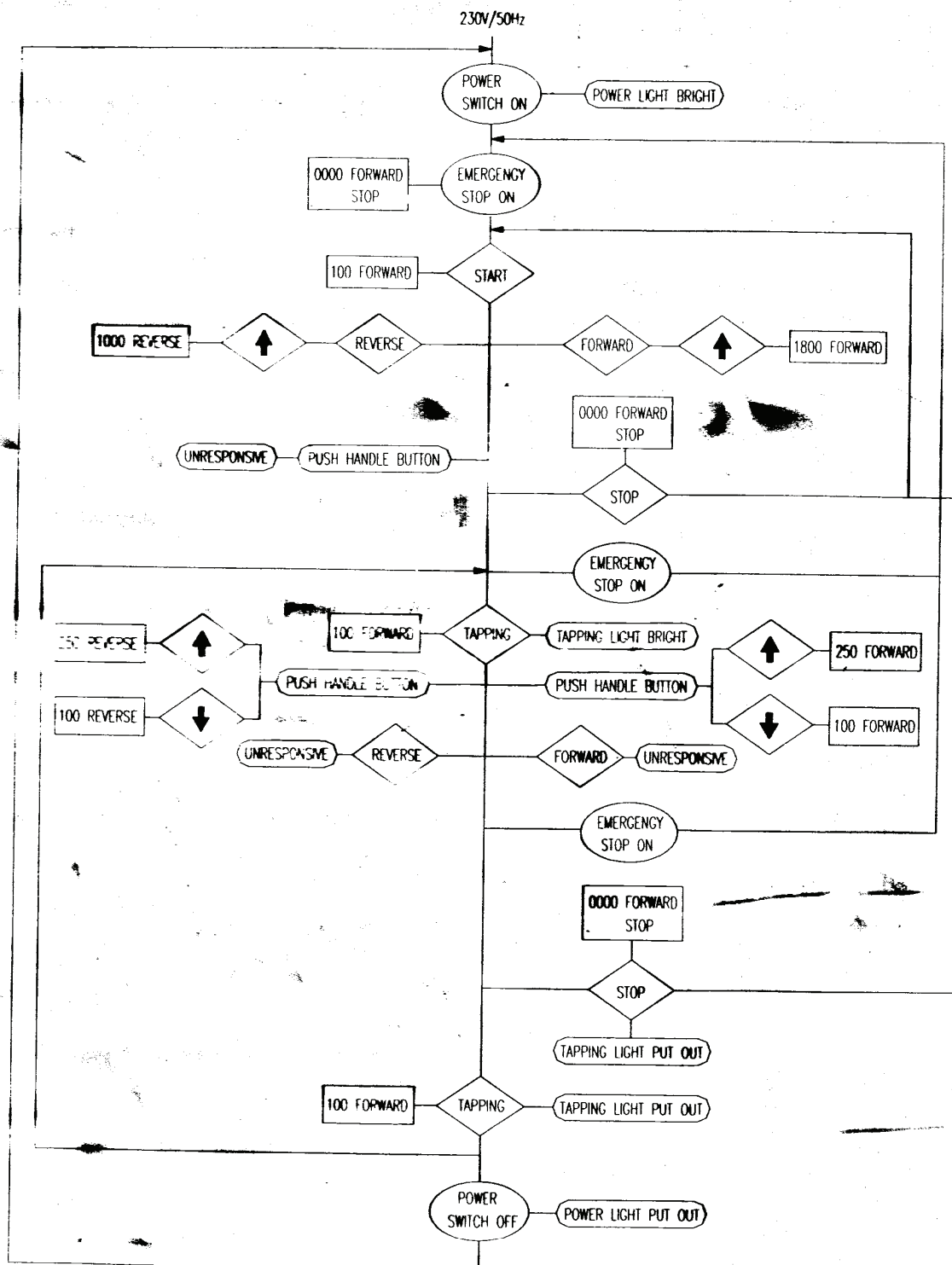


**Notice:**

The highest spindle speed in REVERSE direction is a half of when in FORWARD direction.

After using should turn the power switch to position '0' and pull out the plug from socket.

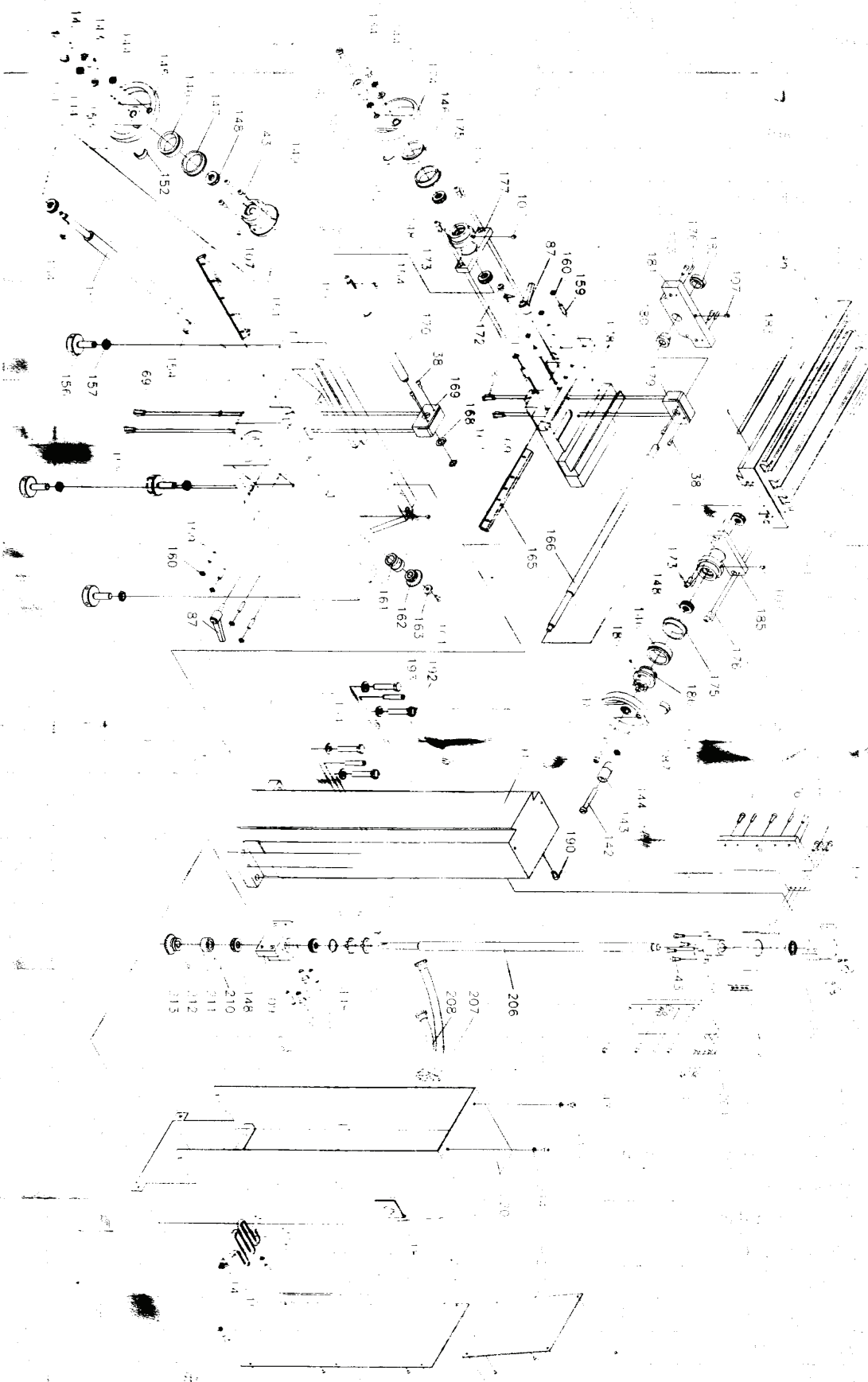
# Flow chart



SECRET



# Parts drawing ( II





## Parts list

| No. | Description                      | Q'ty | No. | Description                    | Q'ty |
|-----|----------------------------------|------|-----|--------------------------------|------|
| 1   | Taper shank                      | 1    | 40  | Check ring 65                  | 1    |
| 2   | Spindle                          | 1    | 41  | Bearing 80107                  | 1    |
| 3   | Under oil seal I                 | 1    | 42  | bearing seat                   | 1    |
| 4   | Taper bearing 32907              | 1    | 43  | Screw M5*16                    | 21   |
| 5   | Under oil seal II                | 1    | 44  | Synchronization pulley         | 1    |
| 6   | Nut M5                           | 2    | 45  | lock bolt                      | 1    |
| 7   | Screw M3*8                       | 4    | 46  | Taper pin 3*18                 | 1    |
| 8   | Display fixed bracket            | 1    | 47  | Screw M10*16                   | 1    |
| 9   | Square screw                     | 1    | 48  | Screw M4*6                     | 6    |
| 10  | Spindle sleeve                   | 1    | 49  | Cover                          | 1    |
| 11  | Sleeve limit pad                 | 1    | 50  | Block piece                    | 1    |
| 12  | Bearing 8106                     | 1    | 51  | Rotate speed display           | 1    |
| 13  | Upper washer II                  | 1    | 52  | Spindle box cover              | 1    |
| 14  | Bearing 80106                    | 1    | 53  | Screw M6*40                    | 4    |
| 15  | Upper washer I                   | 1    | 54  | Dustproof cover I for spindle  | 1    |
| 16  | Small round nut M27*1.5          | 2    | 55  | Screw M4*10                    | 1    |
| 17  | Spindle sleeve brake sleeve II   | 1    | 56  | Dustproof cover II for spindle | 1    |
| 18  | Spindle sleeve brake sleeve I    | 1    | 57  | Timing belt                    | 1    |
| 19  | Deep washer                      | 1    | 58  | Screw M6*16                    | 1    |
| 20  | Lock bolt                        | 1    | 59  | Pin 3*10                       | 1    |
| 21  | Spring round pin 3*8             | 3    | 60  | Washer                         | 1    |
| 22  | Screw M3*8                       | 4    | 61  | Motor timing pulley            | 1    |
| 23  | Switch panel                     | 1    | 62  | Screw M6*20                    | 1    |
| 24  | Screw M4*16                      | 7    | 63  | Washer 6                       | 1    |
| 25  | Indicator light                  | 1    | 64  | Nut M5                         | 1    |
| 26  | Emergency stop switch            | 1    | 65  | Bolt M5*25                     | 1    |
| 27  | Touch panel                      | 1    | 66  | Motor support plate            | 1    |
| 28  | PC Board                         | 1    | 67  | Key 5*25                       | 1    |
| 29  | Electron display                 | 1    | 68  | brushless motor                | 1    |
| 30  | Small handle                     | 1    | 69  | Screw M5*20                    | 8    |
| 31  | Screw M3*10                      | 2    | 70  | Screw M4*35                    | 2    |
| 32  | Spindle sleeve orientation shaft | 1    | 71  | Spindle box paneling           | 1    |
| 33  | Spindle box                      | 1    | 72  | Orientation steel sleeve       | 2    |
| 34  | Left support flange              | 1    | 73  | Rub circle                     | 1    |
| 35  | Check ring 16                    | 1    | 74  | Compress spring 1*6*20         | 6    |
| 36  | Check spring cover               | 1    | 75  | Vertical slide                 | 1    |
| 37  | Clockwork spring                 | 1    | 76  | Tilted wedge                   | 1    |
| 38  | Screw M4*12                      | 10   | 77  | Adjusting screw                | 1    |
| 39  | Check ring 35                    | 1    | 78  | orientation small gear shaft   | 1    |

| No. | Description                | Q'ty | No. | Description              | Q'ty |
|-----|----------------------------|------|-----|--------------------------|------|
| 79  | Key 4*12                   | 1    | 119 | Assistant small handle   | 1    |
| 80  | Compress spring 0.7*4.7*25 | 1    | 120 | Worm wheel lock handle   | 1    |
| 81  | Cover board                | 1    | 121 | lock small shaft         | 1    |
| 82  | Screw M4*10                | 3    | 122 | Steel ball 8             | 3    |
| 83  | Center orientation shaft   | 1    | 123 | Adjust mat               | 1    |
| 84  | Screw M6*8                 | 1    | 124 | Screw M3*6               | 2    |
| 85  | Small gear shaft           | 1    | 125 | Touch fastness fight     | 1    |
| 86  | Inlay shaft                | 1    | 126 | Guide electricity bar    | 1    |
| 87  | Small handle assembly      | 3    | 127 | Screw M3*6               | 1    |
| 88  | Taper pin 3*10             | 1    | 128 | Worm                     | 1    |
| 89  | Scutcheon rivet            | 4    | 129 | Worm adjust mat          | 1    |
| 90  | Indication brand           | 1    | 130 | Worm left support flange | 1    |
| 91  | Adjust screw               | 1    | 131 | Worm handwheel           | 1    |
| 92  | Staff guage                | 1    | 132 | Washer 8                 | 1    |
| 93  | Pin 5*20                   | 2    | 133 | Nut M8                   | 1    |
| 94  | T screw                    | 2    | 134 | Cup nut M8               | 3    |
| 95  | Washer 10                  | 2    | 135 | Key 4*10                 | 1    |
| 96  | T screw                    | 2    | 136 | Screw M5*12              | 5    |
| 97  | Check ring 20              | 3    | 137 | Right support flange I   | 1    |
| 98  | Tilted gear                | 1    | 138 | Key 6*8                  | 3    |
| 99  | Fastness sleeve            | 1    | 139 | Gear shaft               | 1    |
| 100 | Screw M4*16                | 3    | 140 | Spindle box below cover  | 1    |
| 101 | Washer I                   | 1    | 141 | Screw M4*10              | 4    |
| 102 | Guide electricity assembly | 1    | 142 | Screw M8*55              | 3    |
| 103 | Worm support box           | 1    | 143 | Handle sleeve            | 3    |
| 104 | Bearing 8101               | 2    | 144 | Nut M8                   | 5    |
| 105 | Worm right support flange  | 1    | 145 | Handle wheel             | 1    |
| 106 | Screw M4*10                | 6    | 146 | Dial                     | 3    |
| 107 | Cup oil 6                  | 7    | 147 | Inlay circle             | 1    |
| 108 | Screw 6*20                 | 1    | 148 | Bearing 51101            | 8    |
| 109 | Screw M5*16                | 2    | 149 | Support flange           | 1    |
| 110 | Screw M5*20                | 2    | 150 | Base                     | 1    |
| 111 | Right support flange II    | 1    | 151 | Cross wedge              | 1    |
| 112 | Joy stick                  | 3    | 152 | Reed                     | 3    |
| 113 | Compress 0.7*6*25          | 3    | 153 | Washer 8                 | 2    |
| 114 | Handle assembly            | 3    | 154 | Key 4*16                 | 3    |
| 115 | Check ring 4               | 3    | 155 | Rotate shaft             | 1    |
| 116 | Big handle seat            | 1    | 156 | Adjust bolt              | 1    |
| 117 | Small magnetism block      | 1    | 157 | Nut M12                  | 1    |
| 118 | Pin 3*14                   | 1    | 158 | Taper pin 3*20           | 4    |

### Parts list ( III )

| No. | Description                     | Q'ty | No. | Description               | Q'ty |
|-----|---------------------------------|------|-----|---------------------------|------|
| 159 | Screw M6*25                     | 8    | 199 | Upper bearing seat        | 1    |
| 160 | Nut M6                          | 8    | 200 | Screw M8*20               | 1    |
| 161 | Shaft sleeve                    | 1    | 201 | Taper pin 6*30            | 1    |
| 162 | Taper gear                      | 1    | 202 | Bearing 80101             | 1    |
| 163 | Washer                          | 1    | 203 | Support flange            | 1    |
| 164 | Screw M5*14                     | 1    | 204 | Side support plate I      | 1    |
| 165 | Portrait wedge                  | 1    | 205 | Verticality leadscrew nut | 1    |
| 166 | Portrait leadscrew              | 1    | 206 | Verticality leadscrew     | 1    |
| 167 | Check ring 12                   | 1    | 207 | Tube connector            | 1    |
| 168 | Washer                          | 1    | 208 | Tube                      | 2    |
| 169 | Cross leadscrew nut             | 1    | 209 | Below bearing seat        | 1    |
| 170 | Cross leadscrew                 | 1    | 210 | Taper pin 4*26            | 1    |
| 171 | Finger                          | 1    | 211 | Limit sleeve              | 1    |
| 172 | Screw M6*6                      | 1    | 212 | Set screw M5*8            | 1    |
| 173 | Screw M6*16                     | 6    | 213 | Taper gear II             | 1    |
| 174 | Handwheel                       | 1    | 214 | Washer 5                  | 1    |
| 175 | Inlay circle                    | 2    | 215 | Screw M5*8                | 1    |
| 176 | Taper pin 4*20                  | 14   | 216 | Power line                | 1    |
| 177 | Bearing Seat                    | 1    | 217 | PC Board                  | 1    |
| 178 | Saddle                          | 1    | 218 | Power switch              | 1    |
| 179 | Portrait leadscrew nut          | 1    | 219 | Cover II                  | 1    |
| 180 | Left bearing sleeve             | 1    | 220 | Back cover                | 1    |
| 181 | Left support                    | 1    | 221 | Cover II                  | 1    |
| 182 | Left support stop up            | 1    | 222 | Screw M4*5                | 10   |
| 183 | Staff guage                     | 1    |     |                           |      |
| 184 | Work table                      | 1    |     |                           |      |
| 185 | Portrait leadscrew bearing seat | 1    |     |                           |      |
| 186 | Leadscrew clutch                | 1    |     |                           |      |
| 187 | Handwheel                       | 1    |     |                           |      |
| 188 | Washer                          | 1    |     |                           |      |
| 189 | Pin 4*28                        | 1    |     |                           |      |
| 190 | Screw M6*10                     | 1    |     |                           |      |
| 191 | Verticality lead rail           | 1    |     |                           |      |
| 192 | Bolt M10*50                     | 1    |     |                           |      |
| 193 | Taper pin 6*40                  | 2    |     |                           |      |
| 194 | Washer 10                       | 1    |     |                           |      |
| 195 | Washer                          | 1    |     |                           |      |
| 196 | Small round nut M16*1.5         | 2    |     |                           |      |
| 197 | Key 4*20                        | 1    |     |                           |      |
| 198 | Side support plate II           | 1    |     |                           |      |