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Chapter 1, Preface

1.1 Preface

Years ago, many engineers found that purchasing high quality CNC precision machinery was a clear advantage, but not everyone could clearly answer the questions: why choose CNC precision machinery over traditional machinery? What is the difference between CNC precision machinery and traditional machinery?

The main reason for the wide application of CNC precision machinery is the fact that users noticed the maturation of electronics in operating machinery. Through the application of electronics, data could be saved in media such as disks, memory cards, or directly manipulated. As all statistical data (or mechanical parameters) could be mass-produced, repeated, and used over and over through the manipulation of programs, the client's required precision could be produced within allowed deviance. Thus, the precision, efficiency, and quality of CNC precision machinery received unanimous acclaim unparalleled by manually operated machinery

As numerical data is useful, the operation of this data was termed "numerical manipulation." Numerical manipulation is a method of operating machinery, which provides basic computation and memory capacity that controls the control mechanism and through the relationship with various parts, links their actions. The control method of CNC precision machinery is as follows: use the control mechanism to execute the control application saved within the computer's memory to operate the tools and other mechanisms to produce a product which meets the expectations of the user.

Thank you for choosing our highly precise, rigid, and exceptional new generation product the **vertical and horizontal dual use milling machine**. Each vertical and horizontal dual use milling machine is tested with highly precise measuring instruments before they are shipped out of our factories so rest assured that the machinery's precision and stability is trustworthy. In the future, we will continue upholding our core values of "innovation and sustainability" and use 20 years of accumulated experience into the research of manufacturing methods to work towards customer satisfaction! We hope that with the help of SHARP Precision Machinery, your organization can continue to excel and build a long-lasting foundation.

The vertical and horizontal dual use milling machine is based off of our KMA-3 (CNC) series and when operating, maintaining, and repairing the machinery, professional machinery training and a full understanding of the control manual is required. The contents of this manual include: chapter 1, preface; chapter 2, safety specifications; chapter 3, machinery characteristics; chapter 4, machinery packaging; chapter 5, machinery installation; chapter 6, machinery installation; chapter 7, power

link; chapter 8, machinery adjustment and replacement; chapter 9, troubleshooting; chapter 10, milling machine controller. For detailed explanations please see the contents of each chapter.

1.2 Usage

Although this manual strives to be clear and precise, we apologize for any content we may have missed. If there are any suggestions or corrections after reading, please let us know.

- This manual is for use with the **KMA-3 CNC**
- This manual is for the controller type: **FANUC Oi-MF**
- This manual contains examples of program design which can be used as reference for beginning programmers.
- This manual is a general purpose manual for the **KMA-3 (CNC)** model series. If there are changes in the structure of the machinery Please go by the actual machine and accessories.
- This manual only contains information on the control panel and actual operation of the machinery. Information pertaining to CRT/MDI operation, program creation, NC alarm messages, and parameter settings can be found in the manual of the controller.

1.3 Environmental Pollution Risks

- Lubricants and cleaning fluids should not be spilled on the floor or into sewer systems.
- Related pollutants should be disposed of according to local laws.
- Used fuels or cleaning fluids should be placed in appropriate containers and disposed of according to law.
- Any disposed oil products, items clogging the filter, lubricants, and cleaning fluids should be disposed of in accordance with local laws.
- Related lubricants or cleaning fluids should be disposed of in accordance to the manufacturer's guidelines and local laws.
- Pollutants caused by maintenance or repair of the machinery, such as: lubricants, waste water, soiled covers, parts, or the machinery should be separated and disposed of in accordance to the regulations of waste disposal organizations to prevent environmental pollution.

- Suppliers should be referenced for the usage of correct cutting fluids. Cutting fluids should be reused when possible to prevent deterioration, extend usage, and reduce industrial pollution.
- Cutting fluids should be concentrated and disposed of, or recycled.
- SHARP adheres to the standards set by international environmental protection organizations to create a green and pollution free environment. Please adhere to local laws and regulations in protecting the Earth.

1.4 Caution

Warning

Before operating the machinery, please read the manual and understand operation and repair procedures!

This manual should be regarded as part of the machinery and kept in close proximity of it for reference!

We have taken every precaution in the structure and design of our products, but improper handling or operation of the machinery will affect safety and possibly cause harm to the operator or the machinery. The employer has the responsibility of informing the operator of the machinery of the product's characteristics, operation method, risk zones, warning labels, and demand that the operator read the complete manual. Correct operation of the machinery is the best way to ensure safety. Please read the warnings below:

- All pictures and diagrams in the manual are for reference and explanation of work procedure only. (Warning: The examples, procedures, part specifications, and weight in this manual may not be to scale.)
- Clients or distributors should complete the installation and calibration of the machinery within 6 months of delivery. Once completed, the warranty is initiated (for a period of 12 months).
- Once the machinery is out of factory it is in warranty. During this time, we offer free repair services. If the machinery cannot be operated due to human error, all fees incurred during service will be charged. Once the warranty expires, all fees related to service and repair will be charged according to standards set by SHARP.

- If there are stability issues or irregular circumstances during operation, please contact us or our overseas distributors and we will service you as soon as possible.

Chapter 2 , Safety Specifications

Warning

Before operating the machinery, please read the manual and understand operation and repair procedures!

This manual should be regarded as part of the machinery and kept in close proximity of it for reference!

This manual explains how to install, operate, maintain, and perform simple repairs on the machinery. This manual can help you safely and correctly operate the machinery to ensure proper execution of tasks.

To avoid serious bodily injury, the employer must provide the operator of the machinery with the safety precautions related to normal and special operations along with complete educational training and strict monitoring. Oversights may result in serious injury of operating personnel or the machinery! When using CNC precision machinery, it is critical that the safety regulations, machinery safety regulations, and electrical safety regulations detailed in this chapter are followed. If you have any questions, please contact us at:

ADDRESS: 3501 Challenger Street, Torrance, CA 90503

TEL: (310) 370-5990

FAX: (310) 542-6162

2.1 Safety Regulations

- Products manufactured by SHARP contain various safety precautions and warning labels which are installed during manufacturing of the machinery. Before operating this machinery, the operating personnel must understand the various safety mechanisms and warning labels.

- Incorrect operation of the machinery will result in serious injury to the operator. In order to avoid error during operation, all personnel must read the manuals for the device and machinery before actual operation.
- The operation manual should be placed in close proximity to the machinery for ease of reference. If the contents of the manual cannot be read, please contact SHARP or our overseas distributors and we will assist you as soon as possible.
- Please record the model and model number of the machinery to assist us in quickly and efficiently servicing you during maintenance and repair.
- Wear safety shoes, safety goggles, and safety covering when operating the machinery. Do not wear loose fitting covers (cuffs should not be loose) in order to avoid risks related to foreign objects being drawn into the machinery.
- Work stations (work carts) near the machinery are required to be sufficient in strength in order to avoid collapse and falling objects affecting the operation of the machinery and safety of personnel.
- Tools, parts, and other non-necessary items should not be placed within the activity area of the machinery. Objects should not be placed in areas in which the machinery's moving parts may travel through in order to maintain normal operation of machinery.
- Operation personnel leaving their work stations after completion of their tasks should turn off the main power of the machinery and clean the area to execute the daily maintenance of the machinery.

2.2 Machinery Safety Regulations

This product is a CNC precision machinery suitable for the cutting of various types of metals and should not be used for purposes other than the intended usage of this machinery. If you have any questions, please contact our service department to ensure the safety of your operating personnel. If there are concerns about the safety of the machinery, please contact SHARP immediately. Our machinery safety regulations are as below:

- Parameter data of the machinery is located on the parameter backup disk shipped along with the machinery. Please safely store this disk to facilitate future repair of the machinery. The parameter data on the disk can be printed and altered. It is suggested that when changing this data, you should backup the data for your own records.

- When changing the parameters of the machinery you should understand the implications of your changes and be sure that the data entered is correct. Data should be recorded both before and after changes.
- The operating personnel in charge of operation, maintenance, and repair should be familiar with the location and function of the emergency stop button.
- Do not wear gloves when operating the buttons of the machinery to avoid errors and unexpected operating actions from the machinery, which could lead to danger. When operating any button, please ensure that the target button is correct and be wary of the machinery's operational safety area. Do not press any buttons without checking the above to avoid dangerous situations.
- Do not expose your body within the movement area of the machinery. If you must get close, turn off all power and confirm that the operator who is within safe area of the machinery.
- Do not touch the cutting tools or byproduct shards from operation with bare hands to avoid cutting or injury to limbs. Do not in any way attempt to touch any spinning or moving parts of the machinery, including tools and the spindle to avoid parts of the machinery from shattering and endangering workers and the machinery itself.
- When changing or adjusting the workpiece, clamps, tools, or cutting water flow please confirm that the spindle and the machinery is in a state of complete inactivity. If two or more people are operating the machinery simultaneously, ensure that all personnel understand the risks involved in following steps before proceeding.
- To ensure smooth operation and precision, please run the machinery's spindle at 1500 rpm at a speed of 25% for 10~20 minutes before use. (For newly installed machines please see chapter 6, power connection).
- Workpieces should be clamped appropriately during work to avoid the workpiece coming loose and injuring the machinery, tools, the workpiece, and personnel.
- When the machinery is removed from the box or has been inactive for a period of time, all movable parts should be lubricated before use and let the lubricant pump run until shards are expelled. If you are unclear, please ask our service department.
- Do not scrape (remove) the marked or warning labels on the machinery and regularly check the plate positions as per the manual. If any warning labels are lost or unclear, please contact SHARP or our overseas distributors for a replacement.
- Cutting fluids should be chosen specifically for the task. Please check the cutting fluid catalogue for the appropriate cutting fluid (Warning! Using inappropriate cutting fluid can

cause damage to the machinery. Cutting fluids can be dangerous for your health, please choose wisely).

- The machinery should be lubricated with the specified lubricant. Do not use other lubricants as they may affect normal operations of the machinery and cause damage to parts, reducing the expectancy of the product (see chapter 8 for the specified lubricant for regular maintenance).
- Turning on the work light for an extended period of time can make the surface of the work light extremely hot. Do not touch with bare hands.
- When doing heavy cutting with the machinery, the byproduct shards can expel with extremely high heat. Please be wary of the expelled shards as to avoid injury to personnel or equipment.

2.3 Electrical Safety Regulations

Products manufactured by SHARP contain various safety precautions implemented through design but users should not heavily rely on the safety of the device and neglect to observe the necessary safety precautions. Especially watch for: After reading the safety precautions listed in this chapter, the user should confirm understanding of all regulations before operating the machinery to prevent malfunction of safety leading to injury to personnel or the machinery. The electrical safety regulations are as below:

- Before turning on the power, please be sure that the user fully understands the content described in the user manual and controller manual while ensuring that no personnel or obstacles are in the danger zone of the work place.
- Electrical repair and maintenance should only be performed by experienced personnel who have a clear understanding of safety standards and official regulations.
- Repair of the electrical system should be conducted by professionally certified personnel. Regular users should not change or dissect the machinery. When diagnosing electrical equipment the power of the CNC controller, high voltage control panel and main power source should be turned off and locked in the off position to prevent accidental triggering of the power system which can lead to danger.
- When abnormalities occur in external power sources, immediately shut down the main power source to protect the precision electrical components in the machinery. When the machinery is shut down through irregular means or through the emergency stop button, execute the three axis calibration tool before resuming use of the machinery.

- Please familiarize yourself with the position of the emergency stop button to ensure that when emergencies arise, the operating and other related personnel can quickly press this button to avoid dangerous situations.
- The plan switch, proximity switch, and mutual lock mechanism and other related parts have been precisionally calibrated and should not be switched, moved, or altered.
- To ensure the safety and precision of the machinery, do not knock or hit the machine, especially avoiding impact on the electrical box, adaptor, control box and other precision control components.
- When replacing the fuse and other electrical components, please shut off the main power and confirm that the fuse are of the correct specification.
- Cable used should adhere to the specifications listed in the manual. Do not use cable that is too long or thin. The area in which the cable is attached should be maintained to avoid electrical shorts caused by damaged cable due to shards, which can cause injury to personnel or the machinery. Faults with the grounding mechanism of the cable can cause electrical leaks and shocks. Please examine the electrical equipment before use.
- The control box, adapter, motor, transfer box, and other electrical components contain high voltage. Do not touch these components when the machinery is powered to avoid electrical shocks.
- Do not touch any electrical switches with damp body parts to avoid electrical shock.
- Ground operations should be reliable and assured to ensure the safety of personnel and machinery (for information about ground operations please see chapter 6).
- If you encounter any situations that are not described within the manual, please ask SHARP, our overseas distributors, and our service centers for assistance.

2.4 Standard Warnings and Labels

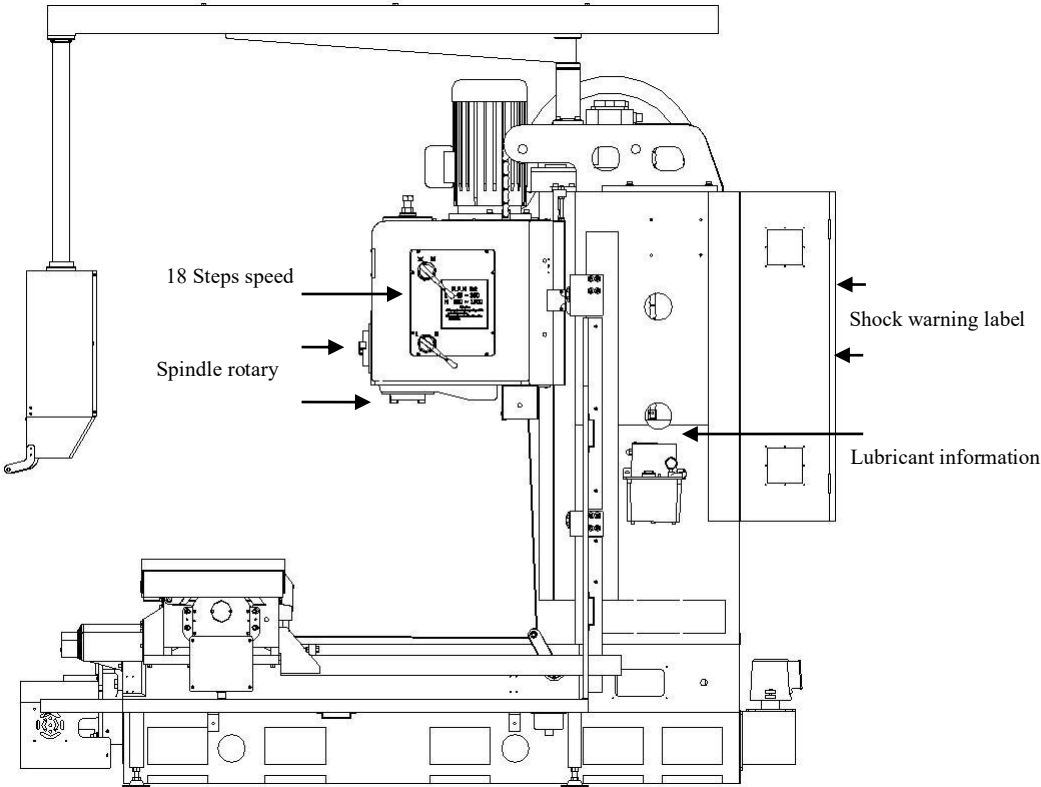


Diagram 1 、 Left side of machinery

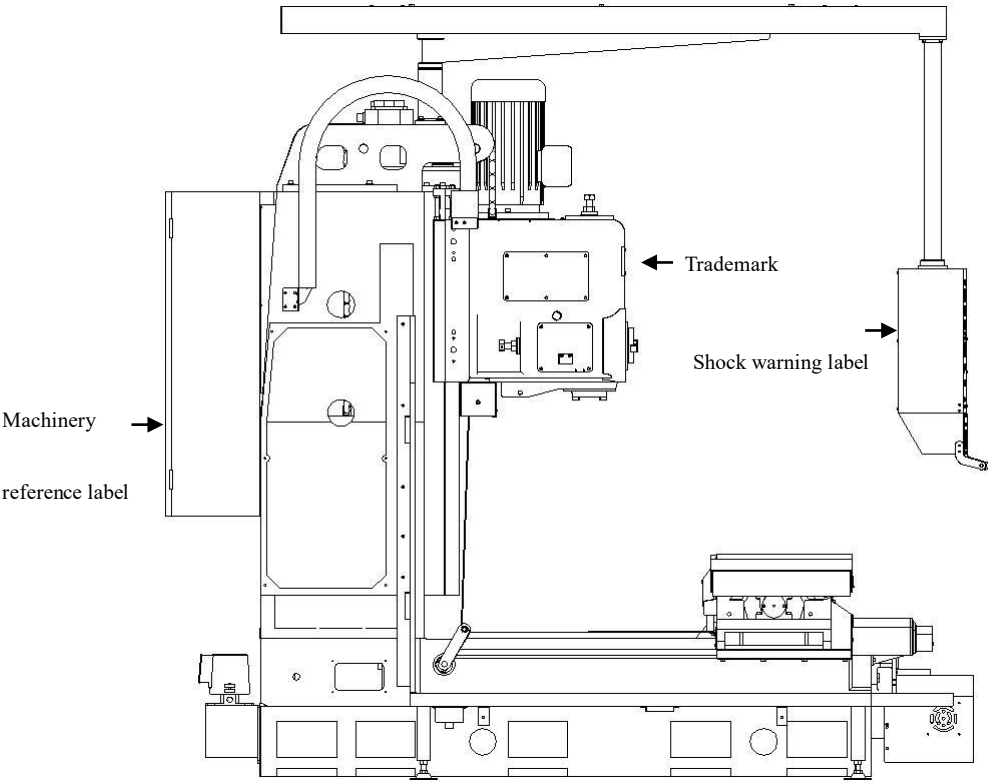


Diagram 2 、 Right side of machinery

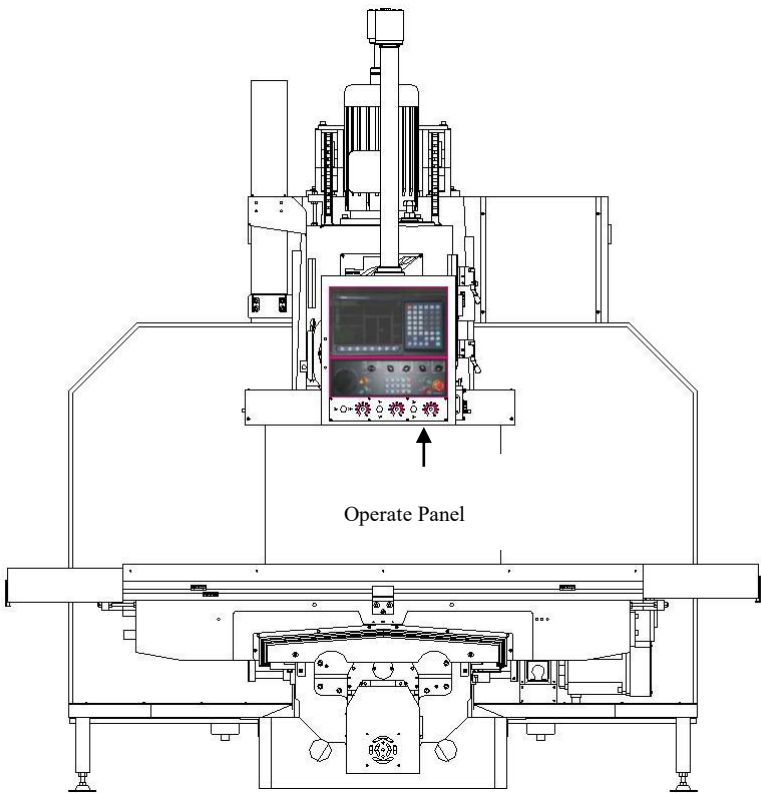


Diagram 3 、 Front side of machinery



Diagram 4 、 Control panel layout



Diagram 5、SHARP’s Trademark

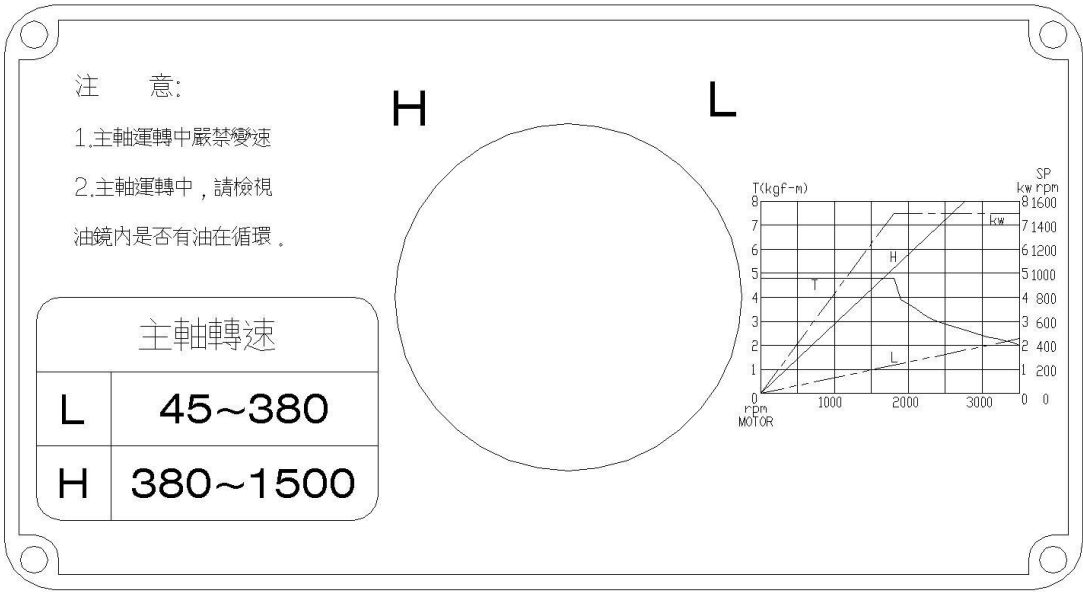


Diagram 6、Spindle high and low gear RPM, torque

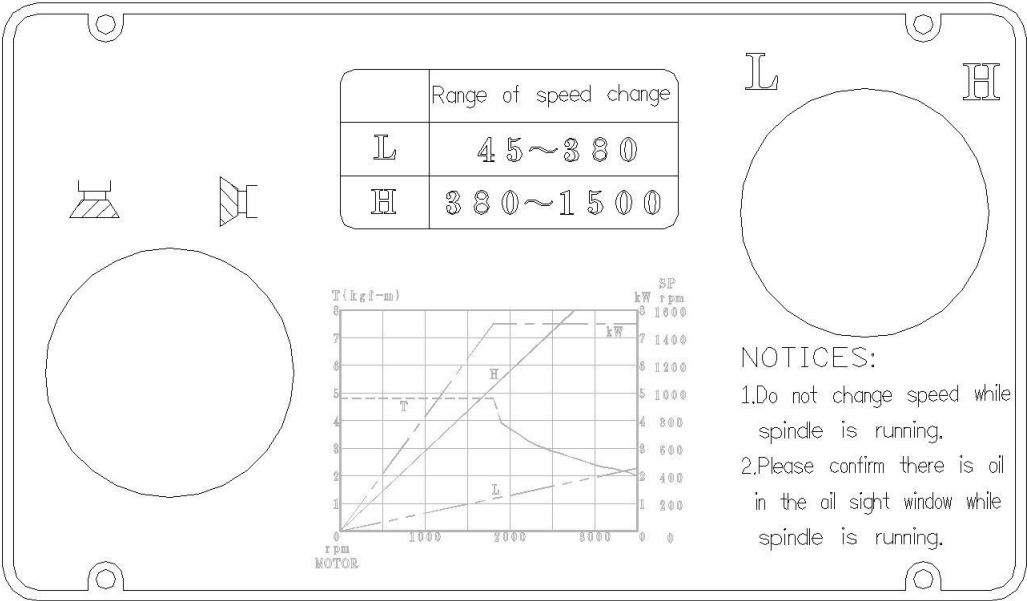


Diagram 7 、 Vertical spindle RPM, torque

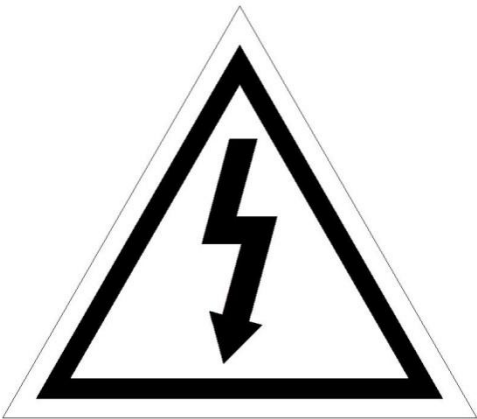


Diagram 8 、 Danger, electricity

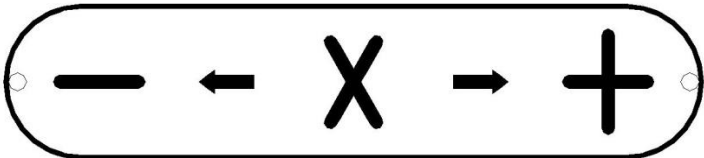


Diagram 9 、 X-axis positive and negative label

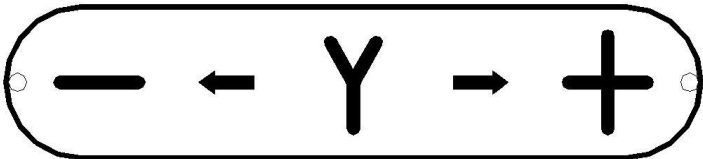


Diagram 10 、Y-axis positive and negative label

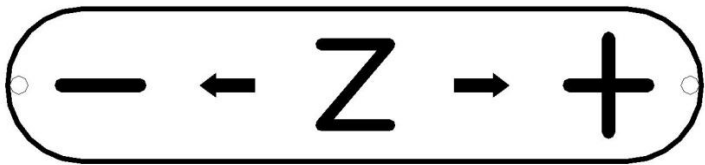


Diagram 11 、Z-axis positive and negative label

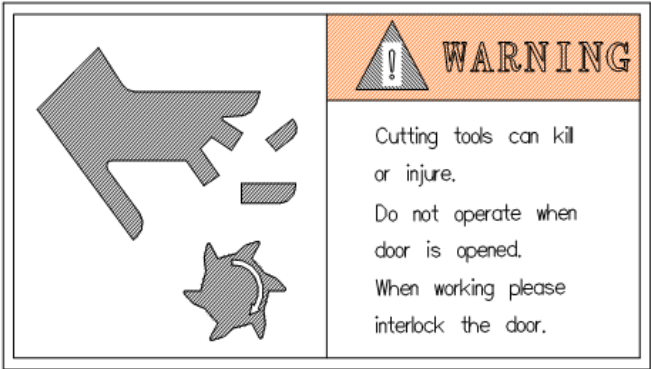


Diagram 12 、Spindle spinning warning label



Diagram 13 、Shock warning label



Diagram 14 、Mechanical danger label

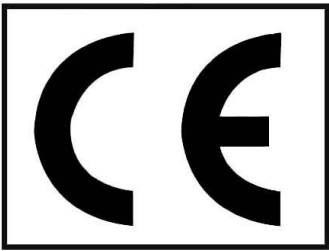


Diagram 15 、Machine safety label （CE）

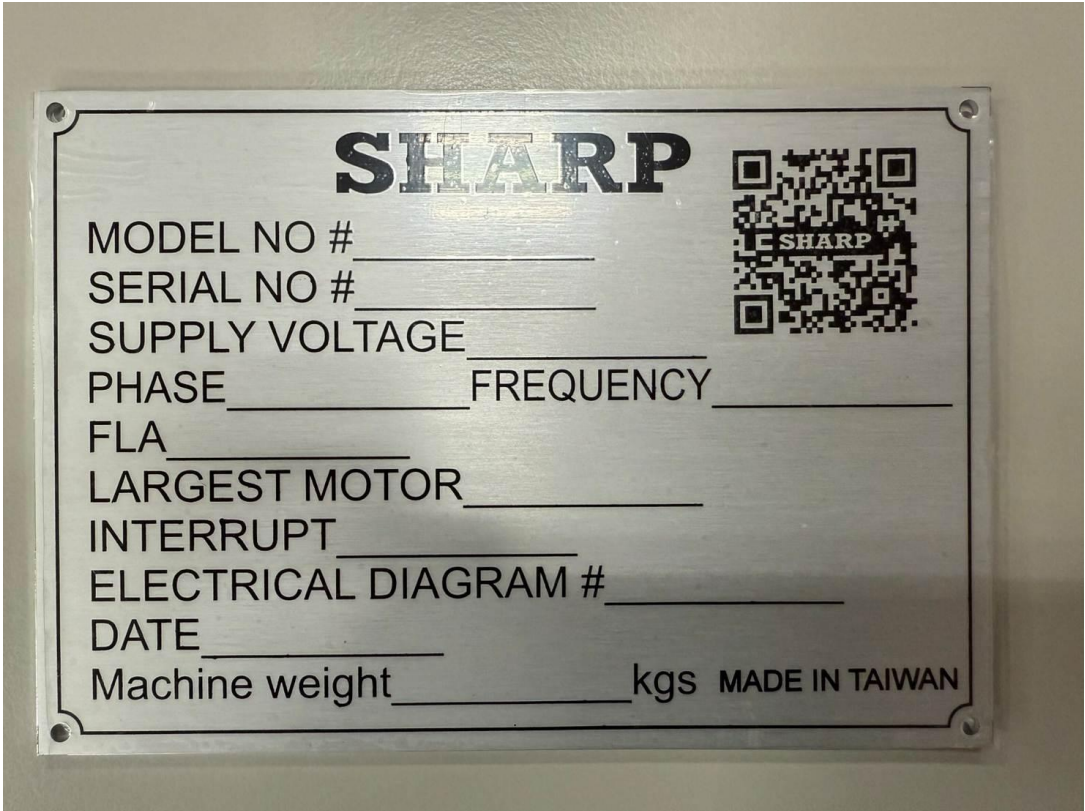


Diagram 16 、SHARP CNC precision machinery reference label

潤滑須知 LUBRICATION NOTICE			
潤滑部位 LUBRICATION POSITION	油品廠牌及番號 OIL BRAND	給(換)油周期 LUBRICATION FREQUENCY	所需數量 AMOUNT
主軸頭部 SPINDLE HEAD	中國石油 R68 循環機油 MOBIL DTE HEAVY MEDIUM	新機械使用六個月後更換,以後每 十二月更換一次 FOR A NEW MACHINE,REPLACE OIL AFTER 6 MONTHS,THAN REPLACE OIL AFTER EVERY 12 MONYHS	十五加崙 7 GALLONS
軸向傳動齒輪 AXIAL TRANSMISSION GEAR BOX	ESSO TERESSO 68 SHELL TURBO 68		十加崙 10 GALLONS
滑道面及傳動螺桿 SLIDEWAYS AND TRANSMISSION SHAFTS	中國石油 滑道機油 #68 MOBIL VECTRA NO.2 CASTROL MAGNA BD 68 ESSO FEEEBISK K68	每日操作機械前及操作機械工作 期間 BEFORE AND WHILE THE MACHINE RUNNING EVERYDAY	二公升 2L
注意事項: 1.更換主軸頭部份潤滑機油前,請先以中速度(500RPM~800RPM)運轉三十分鐘後,方可洩除舊機油並加入新機油. 2.更換主軸頭部潤滑機油時,請清洗油箱上方之磁石濾油器,以維持更換後新油之過濾清潔能力 3.機械在運轉操作時,自動潤滑機應隨時注意及保持油機內滑道油存量. REMARK: 1.Start spindle head running about 30 minutes at middle speed (500RPM~800RPM) before replacing oil. Which will allow deposited dust to flow and fill the new oil. 2.Clean the magnet oil filter on the oil box before replacing oil which will keep the clean funtion for filtering 3.Be attention and keep the lubrication oil into the lubricator while the machine is running.			
			4#

Diagram 17、Lubricant information



Diagram 18、SHARP Product Series Label

Chapter 3 、 Machinery Characteristics

3.1 Machinery Characteristics Description

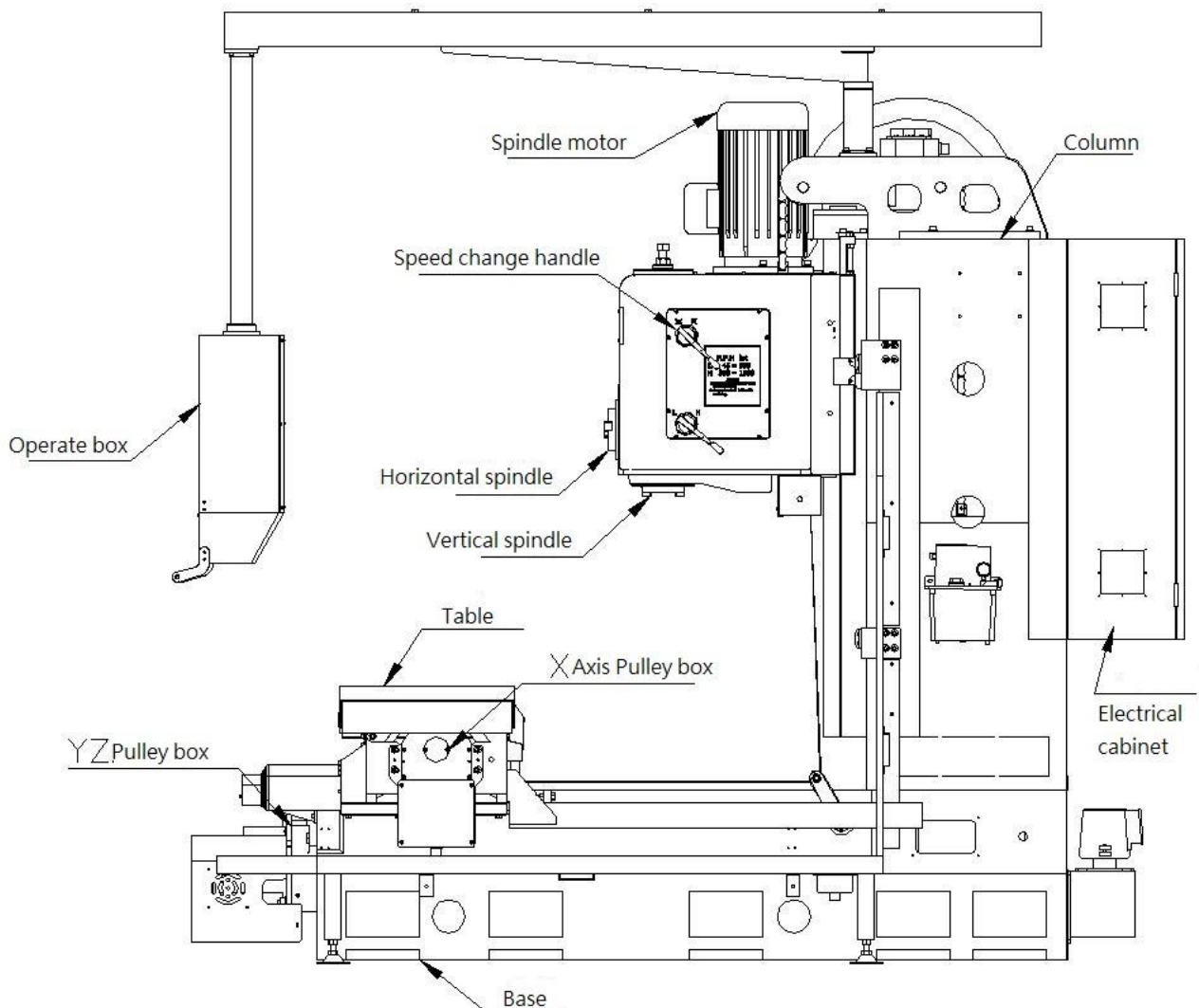


Diagram 19 、 Machinery exterior description

Note : According to machinery series, the standard equipment and components are different. If special components (mechanisms) are needed, please clearly state in the contract.

The **KMA-3 (CNC)** series machinery's structure, tri-axis mechanism, spindle system, components, and others are the result of 20 years of research and development, assembly techniques, and the newest technologies. This machinery is highly rigid, precise, and stable apart from excelling in other aspects. The **KMA-3 (CNC)** series has the characteristics listed below:

The main structure of the machinery uses a box structure design which can improve on cutting rigidity and operational precision to create a CNC precision machine that has a strong structure and high stability.

The power generated during cutting is mainly absorbed by the spindle and head casting which is why the z-axis of the machine is designed on a rail to support the head cast with a wide contact surface to absorb the cutting power. This not only effective in absorbing vibrations during cutting, but can only ensure the stability of the vertical up and down movements.

The slide surface has a high frequency heat treatment and hardness HRC56-62. The slide surface is covered with a durable abrasion film Teflon (TURCITE-B) which has low friction which can overcome the sluggish movement which can occur when the machine moves at low speeds. This ensures the vertical stability of the machine. The slide surface uses precision scraping to ensure that the axis can move with high precision.

The servo motor axis used in this machine is more efficient than other motors to provide more power to the axis during heavy cutting.

The tri-axis ball-screw uses a direct drive design (using a high torque coupling device) which can reduce noise and temperatures while providing high stability and superior cutting. When coupled with the ball-bar circle measurement, laser inspection, and parameter adjustments, the optimum axis movement precision can be achieved.

The tri-axis ball screw support uses a wide angle screw bearings design to improve precision, rigidity, and lifespan and is the optimal component for the long-term maintenance of the machine in terms of cutting precision and durability. **TheKMA-3 (CNC)series** X、Y axis uses an adjustable cap which can effectively prevent metal scraps or foreign objects from entering the machinery and damaging components)。

The spindle uses a bearing specifically for precision spindle to ensure structure rigidity and precision. The long-nosed spindle system have superior contact to components so shorter tools can be used for strong cutting power. This is especially apparent when working on ladder workpieces.

The **KMA-3series** combines vertical and horizontal milling with a rotating work surface which can simultaneously clamp five workpieces. This is especially useful for reducing working time and increasing production.

This machine is equipped with a center lubrication system and automatic lubrication system which regularly lubricates the contact surfaces of all three axis to effectively increase the lifespan of the machinery. Used lubricants should be appropriately disposed of to avoid environmental pollution (recycled lubricants are polluted with foreign substances and

should not be re-used to avoid damage to the precision and structure of the machine).

This machine is equipped with a cutting coolant system (Patent name: Taiwan new series – lubricant and cooling cycle mechanisms for mechanical tools, patent number: 98204910).

The internal wiring of this machine uses standard electrical components which provides a clean design and facilitates ease in repair. The electrical circuit design has additional components structured into the electrical circuit ladder diagram, providing an easy method of adding additional functions in the future.

The control panel and monitor are equipped with complete indicator lights, warning lights, and statuses of spindle RPM and load to clearly indicate the operating status of the machine (the error warning signal is displayed on the controller monitor for easy troubleshooting).

The tri-axis movement restrictions includes a restriction toggle for great safety.

This machine is equipped with a traditional weight stack for smooth movement and precision while preventing a downward slide of the spindle when power is suddenly shut down.

The machine is equipped with a separate hand wheel to facilitate workpiece measurement and test cutting.

3.2KMA-3 (CNC)Series Mechanical Specifications Table

3.2.1 KMA-3 (CNC) Mechanical Specifications Table:

Table 1 、KMA-3 (CNC) Mechanical Specifications Table

Working Platform	Working Platform Size	2200 × 600	mm	Standard Accessories	FANUC Controller
	T slot	20 × 5 × 125	mm		Automatic Lubrication System
	Maximum Load	2000	kg		Cooling System
Movement	Maximum Travel Distance	1700 × 800 × 600	mm		Air Pressure Lock System
	Distance from center of horizontal axis to working platform	NA	mm		Adjustable Guard
	Distance from center of spindle to working platform	150~750	mm		Slide surface coated with Teflon
	Sliding surface from center of spindle to vertical pillar	850	mm		Toolbox (with 7 tools)
Spindle	Spindle Cone N.S.T	NT50			Spindle Screw Rod (vertical/horizontal 1 each)
	Horizontal Spindle	NT50	mm		Level Pads
	Spindle RPM (60HZ)	45~1500 (18 speeds)	rpm		Level Adjustment Screws
Quick Movement	Tri-Axis Slide	Hard Rail			Work Lights
	Tri-Axis Quick Movement Rate	30~6000	mm/min		Dual Color Indicator
	Tri-Axis Cutting Speed Rate	30~6000	mm/min		RS232 Interface
Drive Motor	Spindle Drive Motor	15HP-4P	HP	Special Accessories	X.Y.Z. Optical Ruler
	X,Y,Z Drive Motor	XYZ:3KW	kw		Rotating Working Platform (15°45°90°)
	X,Y,Z Ball Screw	Ø50xPitch10	mm		Magnet
	Cutting Water Motor	1/4HP	HP	Due to research and development needs, we reserve the right to alter specifications and sizes without notification.	
Standard Specifications	Area (L, W, H)		mm		
	Machine Bed Package Size (L, W, H)		mm		
	Net Weight	7500	kg		
	GW	8500	kg		

Diagram 20 、KMA-3 (CNC) External Size Diagram

Motor Specifications :

➤ Motor 15HP4P(*25HP 4P)

➤ Server Motor FANUC α22(3HP)

18 Speed Specifications : (Variable speed is optional)

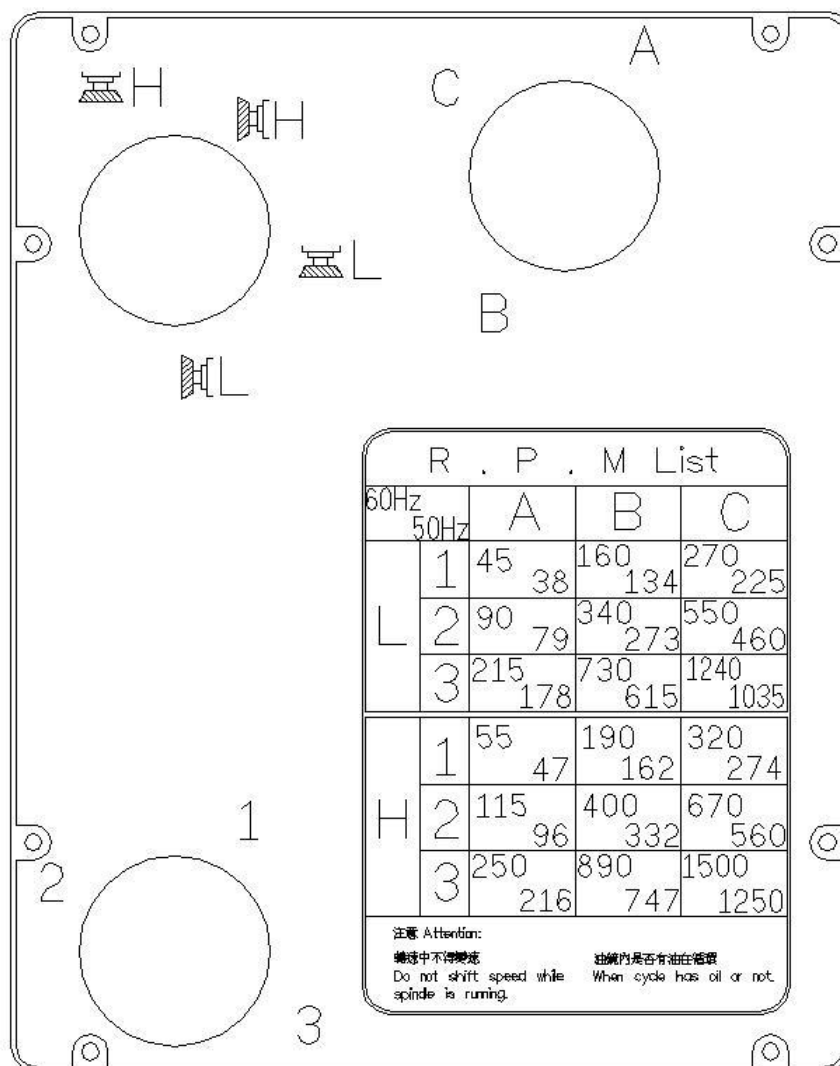


Diagram 21 、 Vertical and Horizontal 18 Speed Table

Ball Screw Specifications :

➤ X-Axis Ball Screw **R50-10K5-FDC-2042-2401-C3**

➤ Y-Axis Ball Screw **R50-10K5-FDC-1549-1851-C3**

➤ Z-Axis Ball Screw **R50-10K6-FDC-1319-1631-C3**

Note: Due to research and development needs, we reserve the right to alter specifications and sizes without notification.

Chapter 4 、 Machinery Packaging**4.1 Machinery Packaging**

- Please adhere to the contract for packaging methods. SHARP's machinery are packaged with wooden boxes for ease of transport.
- Machinery packaging methods will vary by country or region in accordance with legal regulations in the case of special packaging methods.
- If sold locally, machine will be shipped with shrink wrapped

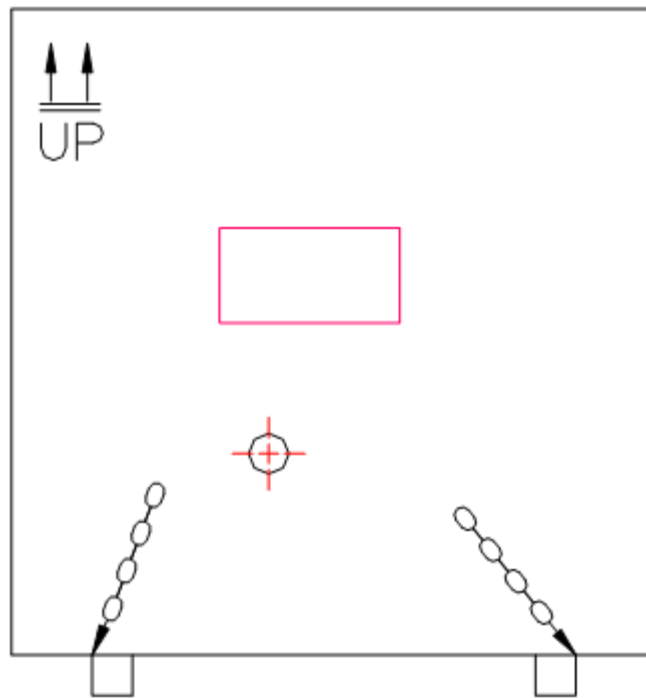
4.2 Wooden Box Labeling

Diagram 22 、 Wooden Box Label Contents (1/2)

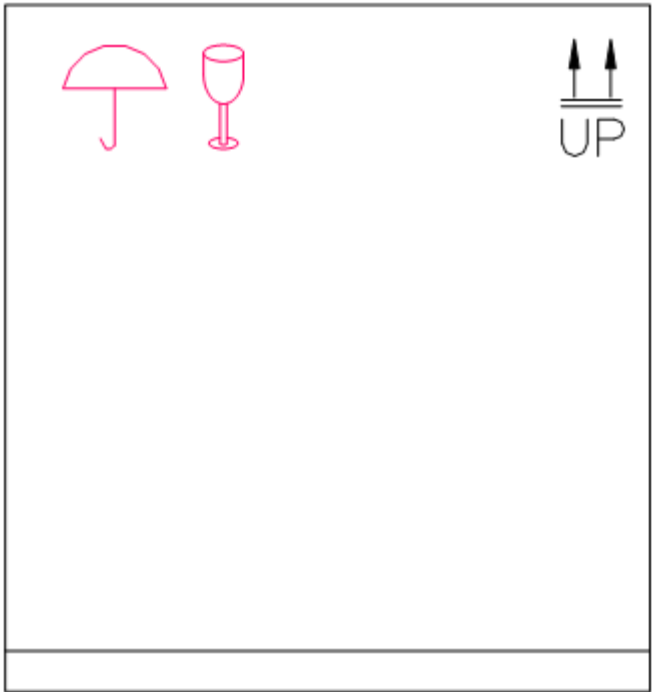


Diagram 23 、 Wooden Box Label Contents （ 2/2 ）

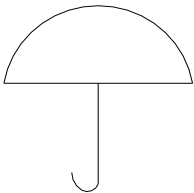


Diagram 24 、 Avoid Humidity

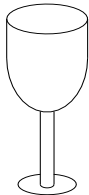


Diagram 27 、 Avoid Impact: Precision Machinery
(Fragile)

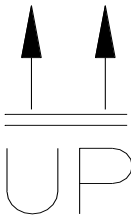


Diagram 25 、 This Side Up

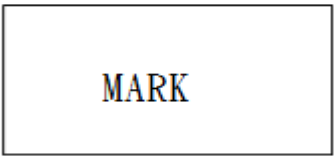


Diagram 28 、 Machine Label As Per Client's
customs Needs

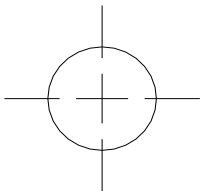


Diagram 26 、 Machine Adjustment Center



Diagram 29 、 Machine Adjustment Chain
Position

4.3 Transportation After Packaging

- This is a high precision machine. During transport, safety precautions should be especially observed.
- During transport or movement (un-packaging), avoid pressure or violent impact.
- Safety inspections should be performed after packaging for transportation and hanging.
- Personnel and items should not be under the machine during the transportation process after packaging.
- Refer to the label on the box for the hanging position of the machine after packaging (secure the chains on the designated positions on the wooden box during hanging).
- Take special care of the completeness of the wooden box during transportation as a damaged wooden box will affect the rigidity and safety of the wooden box during transportation.
- Do not overload suspension or transportation equipment.
- Before suspension or transportation, confirm that the balance is correct.
- Ensure that there are ample personnel during transportation to watch all corners and constantly communicate transportation status.

Table 2 、KMA-3 (CNC) Series Crane (Forklift) Transportation Abilities

Model	Transportation Ability	Model	Transportation Ability
KMA-3 (CNC)	8500 KG	-	-

Note: The machine series weight listed above are for standard models. If a non-standard model has been ordered, please contact SHARP or our distributors.

4.3.1 Forklift Transportation (Wooden Box)

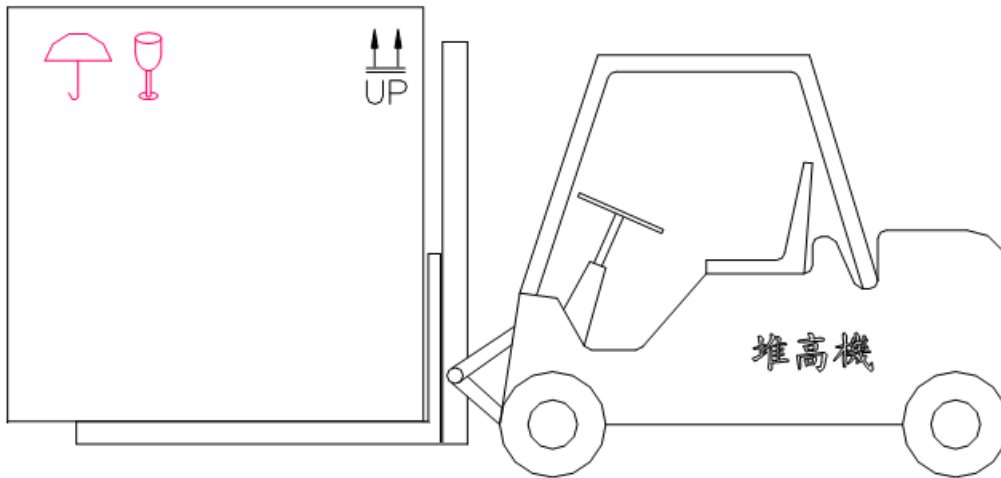


Diagram 30 、 Transportation After Packaging (Fork Lift)

- Operation of the forklift should adhere to related laws and safety regulations.
- The lift position of the forklift should be operated on the center of gravity of the wooden box.
- When lifting with a forklift, slowly lift and then assess whether the load is appropriate.
- The load capabilities of the forklift should follow the weight indicated in the label or model catalogue.
- The operating personnel of the forklift should be certified and experienced.
- Check if the desired travel path has personnel or obstacles prior to transportation.
- When transporting, move slowly and be wary of the machine's balance.

4.3.2 Transportation with Cranes (Wooden Box)

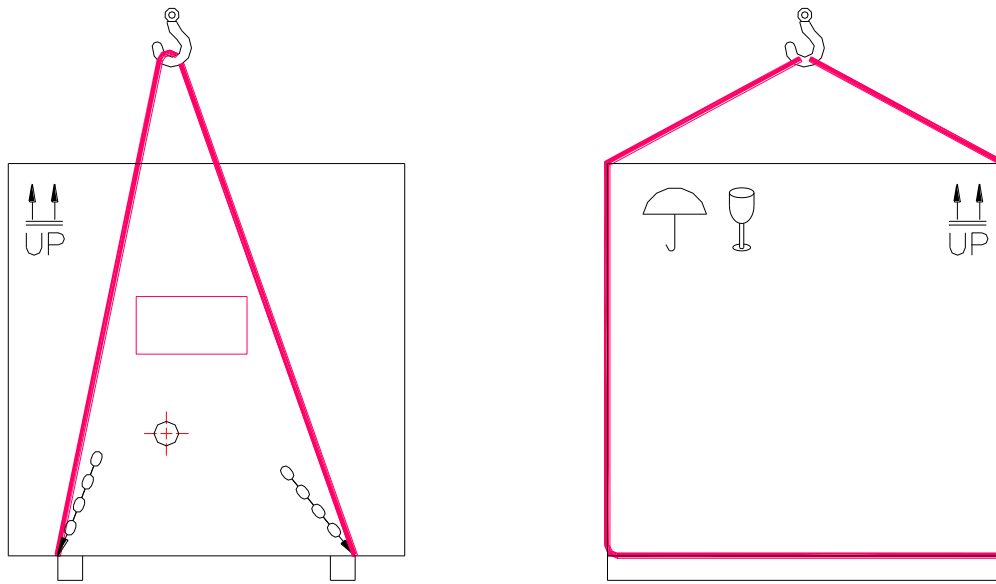


Diagram 31 、 Transportation after Packaging (Crane)

- Operation of the crane should adhere to related laws and safety regulations.
- Refer to the lift positions on the wooden box when lifting with a crane.
- When lifting with a crane, lift slowly and assess whether the crane or the transportation equipment is appropriate.
- The load capabilities of the crane should follow the weight indicated in the label or model catalogue.
- The operating personnel of the crane should be certified and experienced.
- Check if the desired travel path has personnel or obstacles prior to transportation.
- When transporting, move slowly and be wary of the machine's balance.

Chapter 5 、 Machinery Installation

The precision of machinery is reliant on whether it is properly installed. Even if the machinery is capable of precision operation, a slight miscalculation during installation can lead to inferior results. Therefore, prior to installation please read the related warnings in this chapter.

In order to achieve optimal results when cutting, be wary of temperature, dust, vibrations, and other external elements that may affect the performance of the machine (see 5.1 machine installation requirements in this chapter). For machinery transportation, foundation and other related instructions please see chapter 5.2 machine transportation and 5.3 KMA-3 series foundation related instructions in this chapter.

5.1 Machine Installation Requirements

5.1.1 Machine Installation Requirements

- The ideal installation position of the machinery should not be exposed to direct sunlight, have low temperature fluctuations, be away from heat sources and vibrations, and be in a spot with good ventilation (if the machine is installed in an area with high temperature fluctuation, precision will be highly affected).
- An appropriate installation position must be carefully chosen to avoid direct sunlight and heat sources. Ex: Heat exchangers, etc. (ventilation around the machinery is equally important).
- Vibrations will affect the machinery's precision, so install away from vibrating objects or machinery.
- The installation location must be separated from other machinery with lots of distance. Installation location should provide lots of space for maintenance. When installing, please take in account the space needed for manipulation of the electric door.
- As there are many fans within the machine, the installation location should be kept clean to reduce dirt and dust to a minimum.
- The floor area surrounding the machine should be kept dry. If coolant or lubricant fluid are spilled on the floor, they should be cleaned immediately to avoid risk and injury to personnel and machinery.

- When installing, be wary of the environment the parameter controller is exposed in. Keep the controller and components clean and protected from coolants, lubricants and metal shards as to avoid invasion or damage to the precision components (dust and moisture will damage the precision components in the digital control device).
- If the machine must be installed in a damp or heavily polluted environment, take special care in making sure that the machine's slide and electrical components are clean to avoid precision components (tubing) being subject to corrosion or abrasion (the sliding rail and electrical components are easily damaged in the environment types listed above).
- If the factory contains electric welding or EDM machinery with high voltage, when connecting the ground wire to the steel frame of the factory, install an additional grounding copper rod on the ground. (For grounding information see chapter 6, power connection in the control manual).
- Avoid installing the machine in areas with direct sunlight, damp or stuffy environments. The machine should be installed in a well ventilated area with low temperature fluctuations. If there are other heavy machinery in proximity and there is a need to prevent vibrations from affecting the machinery, leave a buffer zone for a shock absorbent gutter filled with sand to absorb vibrations (refer to the blueprints provided during foundation work to leave ample thickness and depth (leave base screws, concrete depth should be above 500mm); if time allows, installation should be performed 2 weeks after pouring concrete (to ensure a solid and firm foundation) for optimal precision).

5.1.2 Machinery Installation Environment Requirements

Temperature :

- During Operation : $0^{\circ}\text{C} \sim 45^{\circ}\text{C}$
- Storage or Transportation : $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$

Temperature Fluctuations :

- Maximum Temperature Fluctuation : $1.1^{\circ}\text{C}/\text{min}$

Humidity :

- Normal (Relative Humidity) : 75%
- Short-Term (Within 1 Month) : Maximum 95%

Vibrations :

➤ During Operation : 0.5G

Power :

➤ Power will vary according to local voltage, the equation is :

$$A = \frac{1000 \times KW(\text{Total Power})}{1.73 \times V(\text{voltage}) \times \text{Power Factor}(0.8)}$$

Voltage :

➤ 220V ±10%

➤ 60HZ ±1HZ

➤ If local voltage is not 220V, an adapter is needed (exported machinery from SHARP contain complimentary adapters).

➤ Regulators should be installed in areas with unstable voltage.

Table 3 、KMA-3 (CNC) Model Series 、Power Table

Model	Total Power	Model	Total Power
KMA-3 (CNC)	28.75KVA	KMA-3 (CNC) 25HP	35 KVA

5.1.3 Installation and Unpacking Method

After removing the box and successfully removing parts from under the bottom board, the unpacking method below should be followed to avoid unnecessary damage due to improper unpacking methods:

Remove the fixed weighted bolts: Open the back panel of the vertical pillar and remove the fixed M16 weighted bolt with a 14mm hexagonal wrench (the position of the bolt should be above the automatic lubrication machine)

Check Lubrication: Check if the automatic lubrication machine contains lubricants, and manually send the oil more than ten times (repeat this step every day or every time before operating the machine to extend the machinery's precision and lifespan. When the machine is in operation, take special care in observing whether there is lubricant stored in the automatic lubrication machine)

Remove the fixed wooden plank: Release the handbrake at the side of the machine and manually raise the head of the machine to remove the fixed wooden board underneath.

Move the machine's saddle: After removing the wooden plank, release the handbrake on either side of the saddle and manually move the saddle back with the general rule that when the head of the machine lowers, it will not make contact with the working surface.

Remove the support rods of the fixed weight: After moving back the saddle, gently lower the machine head manually (take care in the movement of the chains) to loosen the supporting metal rod and remove it. (The support rod of the fixed weight is on the side of the vertical pillar).

After removing the wooden plank and M16 bolts please store in a safe place for use during future transportation of the machine.

5.2 Transportation of Machinery

After removing the packing material, confirm the completeness of the wooden box. Check any damage (if they are damaged, contact SHARP or distributors). Once the box is removed and parts are found to be damaged, if SHARP or our distributors are unable to travel to you for confirmation, please take photos and send them via mail or e-mail to ensure quick assistance.

If the machine must be moved after installation, follow the steps below:

Move the working platform to the center position of the saddle.

Move the saddle (Y-axis direction) to the back (making sure the machine head does not make contact when lowering).

Move the head of the machine downwards to overlap the fixed weight to the two holes on both sides of the vertical pillar. Use Ø35mm ×1500mm metal rod to penetrate the holes and secure the fixed weight.

Manually raise the machine head (must be higher than the working platform) and manually move the saddle to the vertical pillar (do not make impact).

Insert the wooden plank under the machine head. The wooden plank should be completely and tightly placed with the working platform and machine head (be careful of the plank's position, as machinery produced by SHARP contain aluminum oil pans under the machine head).

Table 4 、KMA-3 (CNC) Series Crane (Forklift) Transportation Abilities

Model	Transportation Ability	Model	Transportation Ability
KMA-3 (CNC)	8500 KG	-	-

Note: The machine series weight listed above are for standard models. If a non-standard model has been ordered, please contact SHARP or our distributors.

5.2.1 Forklift Transportation Method

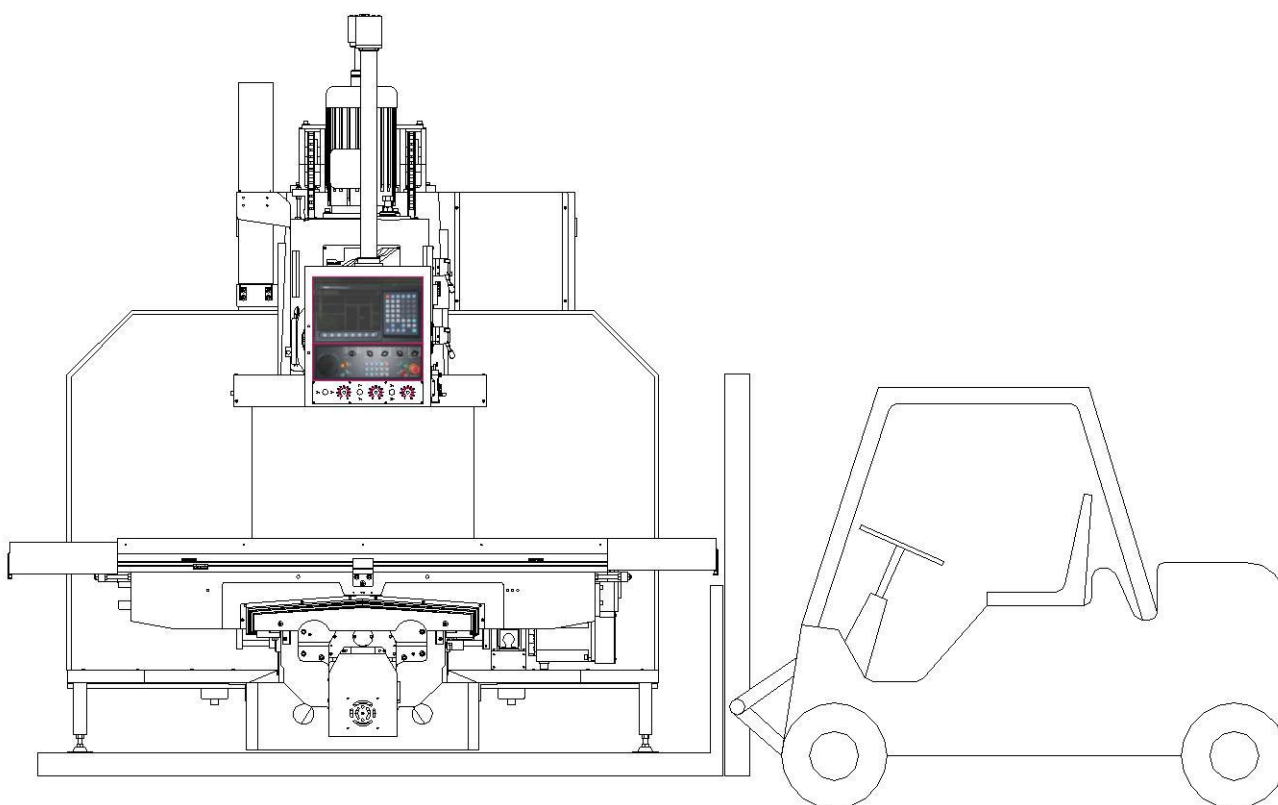


Diagram 32 、Transportation After Unpacking (Forklift)

- Operation of the forklift should adhere to related laws and safety regulations.
- The lift position of the forklift should be operated on the center of gravity of the wooden box.
- When lifting with a forklift, slowly lift and then assess whether the load is appropriate.
- The load capabilities of the forklift should follow the weight indicated in the label or model catalogue.
- The operating personnel of the forklift should be certified and experienced.
- Check if the desired travel path has personnel or obstacles prior to transportation.

- When transporting, move slowly and be wary of the machine's balance.
- When the machinery is completely fixed, use a forklift capable of carrying loads above the machinery and enter from the sides of the machinery to lift from the center position.

5.2.2 Transportation Method of Cranes

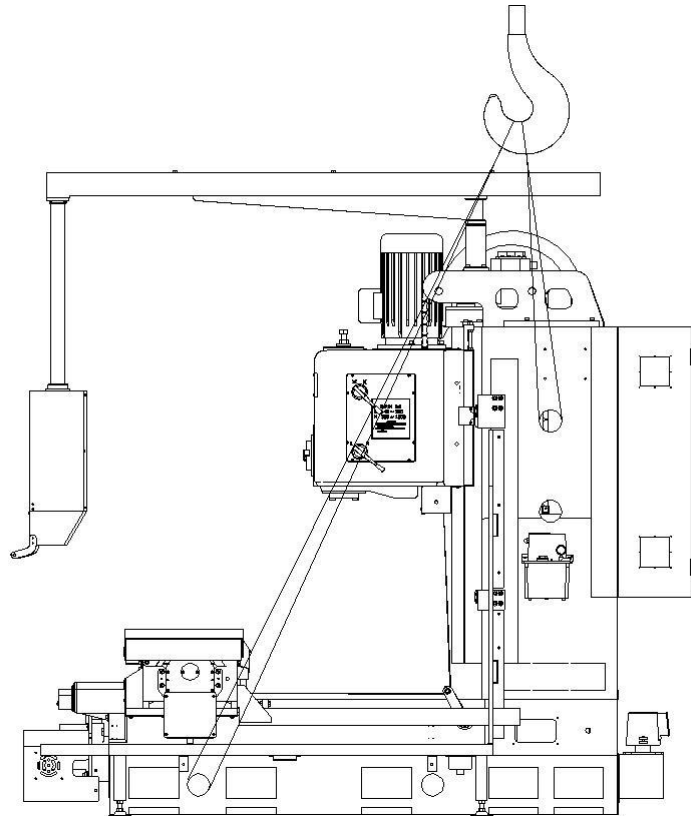


Diagram 33 、 Transportation After Unpacking (Crane)

- Operation of the crane should adhere to related laws and safety regulations.
- Refer to the lift positions on the wooden box when lifting with a crane.
- When lifting with a crane, lift slowly and assess whether the crane or the transportation equipment is appropriate.
- The load capabilities of the crane should follow the weight indicated in the label or model catalogue.
- The operating personnel of the crane should be certified and experienced.
- Check if the desired travel path has personnel or obstacles prior to transportation.
- When transporting, move slowly and be wary of the machine's balance

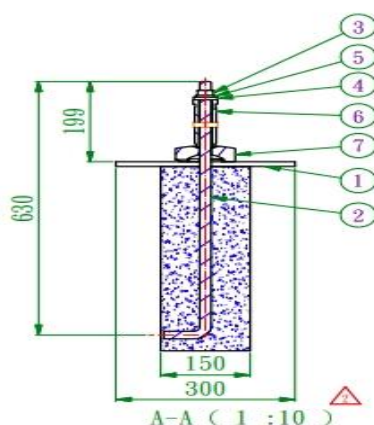
- When the machinery is fixed, use a crane and steel cables capable of loads above the machinery to lift the machinery from positions as directed on the crane lift label (see 5.3 KMA-3 series foundation related information). Use cardboard or other soft materials to wrap the areas of contact between the crane and machinery to preserve the aesthetics of the machine.

5.3 KMA (series) Foundation Related Information

- A suitable installation process is required for the machine to reach full potential.
- The machine's slide rail is currently very smooth and highly precise, but improper installation will cause the machine to be unable to reach the necessary precision.
- The machine's precision is completely reliant on whether proper installation is executed.
- Certain users doubt the precision of CNC precision machines, and their doubt usually stems from improper installation. Please assess your installation process and re-calibrate precision.
- Refer to the foundation size chart when choosing a suitable location for a foundation.

5.3.1 Machine Size and Foundation Size Chart

Diagram 34 、 Foundation Screw Size Chart



件號/ITEM	名稱/DESCRIPTION	數量/Q'TY
1	Iron Plate	10
2	L-Type foundation screw	10
3	Hex Nut	10
4	Washer	10

5	Spring washer	10
6	Level screw	10
7	Level pad	10

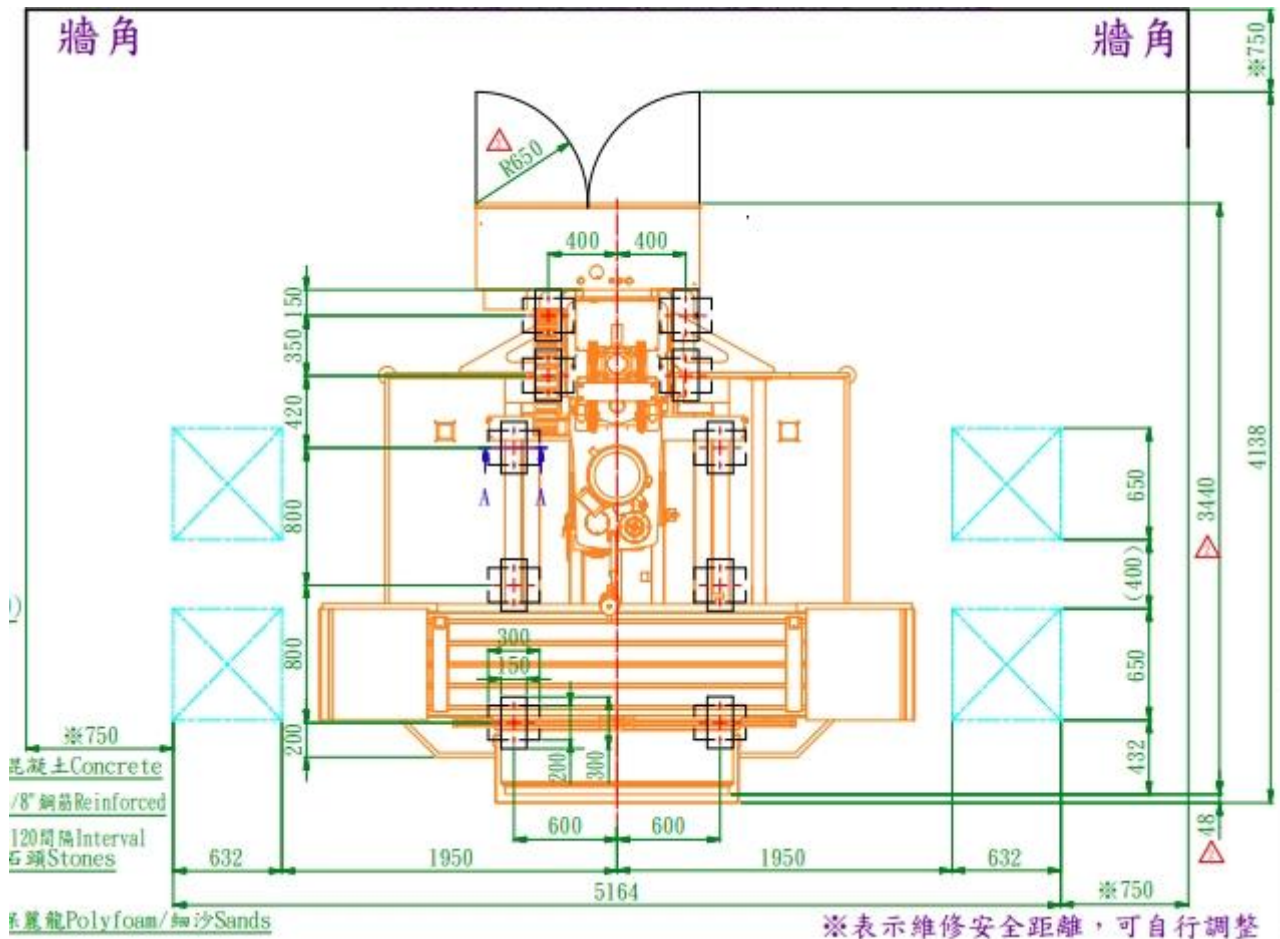


Diagram 35、KMA-3 (CNC) Foundation Size Chart (Area Needed)

5.3.2 Foundation Construction Method

The optimal installation method is to fix the machine onto a concrete foundation. When constructing a foundation, watch for the below:

The basic floor pressure caused by the machinery is more than 5 tons/ m². If the foundation is loose and cannot support 5 tons/ m², stilts must be installed in the ground.

Construction of the foundation should be executed at least 4 weeks prior to machine installation.

Digging of the site should be carried out as diagrammed in the foundation chart of each model. Digging depth should be 150~200mm deeper than the foundation diagram to facilitate the placement of large cobblestones approximately 150~200mm in size.

The foundation's concrete should be mixed with the ratio: 「Concrete : Sand : Stones = 1 : 2 : 4」, the surface deviation of the foundation should be less than 15mm. The ground surface of the foundation should be kept damp for a few days after filling with concrete.

Reference the foundation screw size diagram for the machine's foundation size diagram.

The foundation bolts should be placed in the positions diagrammed in the foundation diagram. Please install the foundation bolts during machine installation.

When placing the machine, ensure that the machine is above the foundation screws and place them into the corresponding holes of the leveling mat and machine.

One or two days before filling the foundation screw holes with concrete, fill with water to keep damp. After one or two days clear out the water and impurities, then fill with concrete.

The concrete ratio of the foundation screw holes should be as : 「Concrete : Sand : Stones = 1 : 1.5 : 1.5」.

After filling with concrete, the foundation screw holes need at least two weeks before rough adjustments can be made to the machine's level.

5.3.3 Rough Adjustment Method of Machine Level

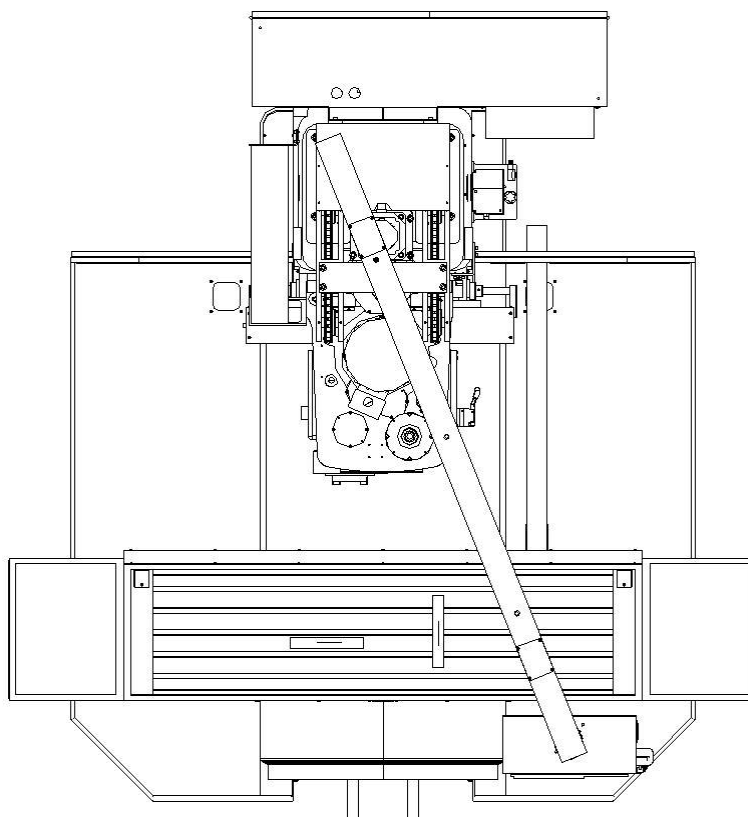


Diagram 36 、 Placement of leveling equipment on machine

Rough Adjustment Method : Place two 300mm × 50mm leveling equipment (precision : 0.02/1000mm) , on the working platform and roughly adjust the level within 0.05/1000mm. The suggested personnel for this task is two.

Before rough adjustment, make sure to keep all hollow foundation screw holes in the middle position so that after filling with concrete, the machine's level can still be calibrated or adjusted.

When the task above is complete, pour the correct ratio concrete into the foundation screw holes and pack down tight. Once filled, the area of the cement should be slightly higher than ground level (as cement shrinks after drying). When pouring concrete, be extra careful to not alter the roughly adjusted level of the machine. Reconfirm after pouring concrete, as if the concrete is too high and wraps around the bottom of the stand, it can lead to an inability to adjust level in the future.

When the concrete is completely dry (ideal wait time is 2 weeks), use a light solvent cleaning machine to apply oil on all sliding surfaces, rails, and bolts to prevent rust. Clean the areas listed above and reapply lubricant. While wiping sliding surfaces do not let cleaning fluids enter the film wipers.

The non spray-painted areas of the machine should be covered in anti-rust oils to prevent rusting. Use a cover applied with cleaning oils to wipe the surface.

All models of machines should be fixed on level ground or shock absorbent boards to prevent vibration and movement.

5.3.4 Adjustment Method of Spindle Center Line and Working Platform Right Angle (4 Points)

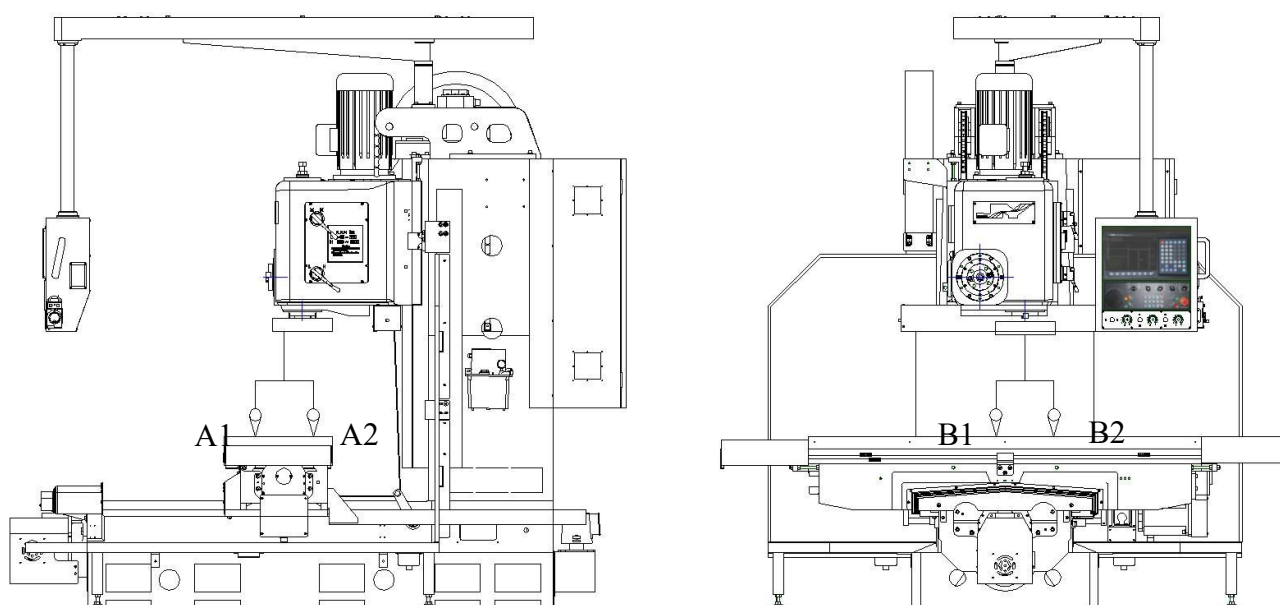


Diagram 37 、 Spindle Center Line and Working Platform Right Angle Adjustment

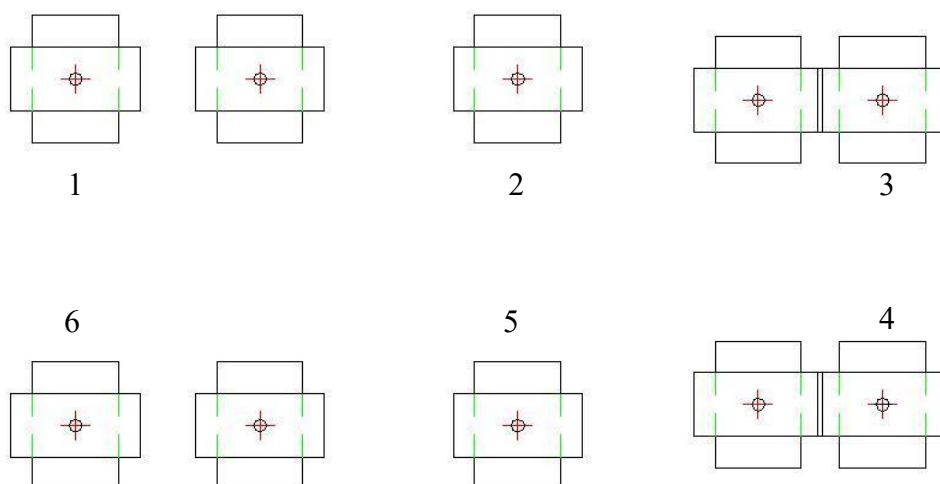


Diagram 38 、 Leveling Bolt Position

Normally, the machine is calibrated prior to being shipped out of the factory and the right angle is naturally formed. Due to the rigidity of the machine, the right angle must be re-calibrated, and this is especially apparent in large machines. The adjustment method of the Spindle Center Line and Working Platform Right Angle (4 points) is as listed below:

Place a scale magnetic base onto the spindle and spin it to obtain values for the back (A) and the right and left sides (B).

In terms of the back, if the A1 value is greater than A2, it means the vertical pillar is leaning forward. Lower the level of 3, 4 and raise the level of 2, 5. The amount raised should be $\frac{1}{2}$ of the amount raised in 3, 4.

If the A2 value is greater than A1, it means the vertical pillar is leaning backward. Raise the level of 3, 4 and also raise the level of 2, 5. The amount raised should be $\frac{1}{2}$ or the amount raised in 3, 4.

In terms of left and right, if the B1 reading is greater than B2, it means the vertical pillar is leaning left: raise the level of 2, 3 and lower the level of 4, 5 in the same amount.

If the value of B2 is greater than B1, it means the vertical pillar is leaning right: lower the level of 2, 3 and raise the level of 4, 5 in the same amount.

5.4 Machine Uninstallation Method

After removing the box and successfully removing parts from under the bottom board, the unpacking method below should be followed to avoid unnecessary damage due to improper unpacking methods:

Remove the fixed weighted bolts: Open the back panel of the vertical pillar and remove the

fixed M16 weighted bolt with a 14mm hexagonal wrench (the position of the bolt should be above the automatic lubrication machine).

Check Lubrication: Check if the automatic lubrication machine contains lubricants, and manually send the oil more than ten times (repeat this step every day or every time before operating the machine to extend the machinery's precision and lifespan. When the machine is in operation, take special care in observing whether there is lubricant stored in the automatic lubrication machine).

Remove the fixed wooden plank: Release the handbrake at the side of the machine and manually raise the head of the machine to remove the fixed wooden board underneath.

Move the machine's saddle: After removing the wooden plank, release the handbrake on either side of the saddle and manually move the saddle back with the general rule that when the head of the machine lowers, it will not make contact with the working surface.

Remove the support rods of the fixed weight: After moving back the saddle, gently lower the machine head manually (take care in the movement of the chains) to loosen the supporting metal rod and remove it. (The support rod of the fixed weight is on the side of the vertical pillar).

After removing the wooden plank and M16 bolts please store in a safe place for use during future transportation of the machine.

Chapter 6 、 Power Connection

Power Connection Warnings:

- Only certified and approved electronics or electrical engineers can connect the power of the machine.
- Before connecting power, the engineer must test the stability of the voltage.
- Take special care in the connection method of power, as neglect can cause damage to the controller and possibly affect the electrical circuit or safety of personnel.
- The mechanical and electrical regulations of the electrical circuit should adhere to local laws. The power specifications and regulations of each country is different.

External Power Source Warnings:

- The external power source of the machine should be only used by the machine and not shared with other machines.
- The stability of the external power source must meet the regulations set forth in the machine environment requirements section, as the machine is controlled by precision electronics and unstable voltage will cause damage or side effects.
- Power regulators must be installed in areas with unstable voltage to maintain machine precision and lifespan.
- Lack of power caused by an unstable voltage will cause the controller to be unusable.
- The power connection cable of the machine must be independent and connected onto the power source.
- The grounding of the power source and machine must be suitable to prevent damage during unstable voltage or when struck by thunder.
- Sources of electronic noise such as electric welders and dischargers cannot be in close proximity to the machine.

6.1 Machine Grounding

When grounding, watch out for the below:

- Cables planted into the ground should remain loose to prevent tearing if the ground is moved.

- Planted cables that have not been grounded should not have connectors. If this cannot be avoided be sure to weld, braze, or crimp the connectors to prevent loosening and corrosion. Tap connectors must be crimped.
- The grounding system of the shielding layer in the power cable should be connected to other power sources in the main hole, hand hole, and machine room. Using a negative electrode protection or shielding layer connector is not restricted by the above.
- Use grounding metals that are appropriate for direct contact with concrete or sand soil.
- The grounding cable should be copper or any other metal or material which is suitable for use (low corrosion rate) in the expected environment.
- The grounding cable should not have a connector but when unavoidable use connectors that prevent corrosion and lesser than ground resistance.
- No switches should be installed anywhere along the grounding cable, unless the switch can also switch off the power source.
- The grounding wire should use suitable connectors and connection methods which are unaffected by daily examination, operation, and maintenance.
- Grounding mechanisms should be permanent power source systems. Grounding of the cable shield layer and power facilities can share a grounding or grounding system.
- Grounding cable should be made of metals that are not easily corroded and planted deep into the ground. The exterior should not contain paints or other grounding materials.
- The surface of grounding cables should be clean of enamel, rust, or oil contamination and all non-conductive materials. Cables should be connected via the methods below: clamping, brazing, or welding onto the copper grounding bolt.

Grounding cable capacity as per regulations:

- The continuous current of a single grounding system cannot be lower than the maximum load current of the power adaptor or other power source.
- The current capacity of multi-grounding systems should be more than 1/5 or the current capacity of the conductors.
- The grounding cable of a measurement transformer cannot have a surface area lesser than 5.5 square mm copper wire or other material with similar function.
- Equipment, conductor lines, cables, hanging wire, feeder cable, shielding wire.

- If the path connecting the conductor tubing to the exterior of the machine contains continuous and ample voltage, this path should be used for grounding.

Shielding and Protecting Grounding Wires:

- The shielding of the grounding wire should be exposed. The height of the shielding should be at least 25 mm from the ground or the grounding wire at the working platform.

Grounding materials specifications and type:

- The first type of grounding rods cannot be shorter than 24 cm and should be notched. If the tip of the rod does not have suitable protection, it must be level or lower than the ground. If electrical resistance needs to be decreased, use longer or two or more grounding rods. The distance between rods cannot be less than 18 cm and if there are obstacles on the bottom, the grounding rod must be buried at a depth of less than 24 cm or use another method for grounding. Metal and steel grounding rods cannot have diameters of less than 1.6 cm. Grounding rods covered in copper or stainless steel cannot have a diameter of less than 1.3 cm.
- The second type of buried naked cable need to have a diameter greater than 0.4 cm and be a metal certified by electrical regulations. Buried depth cannot be less than 30 cm and total length is determined by actual circumstances. The naked cable can be arranged in a straight line or palisading.
- The third type is vertically buried metal boards which cannot be exposed for more than 18 cm from the surface with burying depth of more than 1.5 meters. Iron based metallic materials cannot have a thickness of less than 6.4 mm while copper materials cannot have a thickness of less than 0.7 mm.
- The fourth type is a vertically buried metal strip which cannot be less than 3 meters in length. The exposed area of the strips cannot be less than 0.45 square meters while buried depth cannot be less than 45 cm. Iron based metal strips cannot have a thickness of less than 6.4 mm while non-iron metallic strips cannot have a thickness of less than 1.5 mm. Buried under the ground in direct contact with the soil, the bare concentric neutral cable, 30 meters in length, and its concentric neutral wire can be used as earth electrodes. The concentric cables are also available as a semiconductor skin; however, the radiation resistivity of the skin should not exceed 100 ohms meters.

The size of the grounding resistance per regulations:

- 「Single Grounding System」 or 「△ System」 should have grounding resistivity under 25 ohms. If difficulties occur, use two or more grounding to connect them.

- Multiple grounding systems should have a concentric line with ample current capacity. A grounding agent should be placed on cables and adapters in intervals of 400 meters to avoid restrictions on the resistivity values at all grounding locations.
- The external shell, pressure (flow) control, side protection nets, protection cables, and iron bolts and other areas cannot have electric resistivity of more than 100 ohms. When iron bolts and iron towers have electric resistivity of under 100 ohms, no grounding cable is required.

6.2 Machine Power On/Off

In order to ensure the safety of personnel and the machine, execute the steps below before turning on and after turning off the machine to maintain machine precision and lifespan.

6.2.1 Powering on the Machine for the First Time

- Confirm whether the power source is correct.
- Confirm that the power content, voltage, position, frequency, and usage is identical to the values listed on the label.
- Ensure that the power connector cables adhere to the standards and regulations set forth by electrical laws in your local area.
- Confirm that the electrical wiring of the machine and electrical box are not damaged.
Damage in the wiring may lead to an electric short, so replace the damaged wiring before turning on power.
- Before powering on for the first time after installation, use the hand-wheel to slowly move all axes and examine whether the protective restriction switches are in effect. When powering on do not return to original point, as it can easily lead to damage of the machine.
- Confirm that the screws in the foundation are tight, in excellent condition, and level before turning on the machine.
- Check for obstacles that may impede movement of the machine.
- Close the circuit box prior to turning on power to prevent accident or injury.
- After turning on power of the machine, clean the sliding surface and confirm that the lubrication system is functioning correctly and whether lubrication of all 3 axes are appropriate.

- If the machine has anti-rust oils or paints on the sliding surface, clean thoroughly as it may affect performance of the machine.
- When powering on, movement can trigger a Sever Alarm.
- After installation and before powering on, reconfirm that all screws are tight, electric connectors are connected, and that all oil and air pressure circuits are correctly installed.
- Prior to operating the machine, check that all oil pressure, air pressure, and lubricant indicators are in the correct position.

6.2.2 Checks Before Powering On

Check whether external cables and wiring are in good shape. (If there is damage, contact SHARP or distributors)

Check if external power connectors are correct and properly connected.

Check if external grounding is properly connected.

Check if transportation-stabilizing components have been removed.

Check if all foundational screws are tightly installed and level.

Check if all wiring is connected.

Check if the safety shield and door are in good condition.

Check if there is ample lubricant, and manually inject lubricant a few times.

Check if all limit switches and stopping blocks are in good condition.

Check for obstacles around the machine.

Check if input current, position, and frequency are identical to the specifications of the label.

Check for obstacles around the machine and control system that might impede operating personnel.

Check if there are ample oils and whether the electrical box is closed tightly.

Toggle all speed settings to lowest before powering on, and make sure all switches are in the OFF position. Set the speed of the head to the lowest setting.

After checking for all the above and finding no problems, connect the power cable to the power source (the power source's fuse-less switch needs to be greater than 50 amps and used solely for the machine). When power is connected, connect the grounding wire to prevent poor weather from damaging electric equipment.

6.2.3 Checks After Powering On

Turn on the second power switch and the power of the high-pressure control panel. The power light of the control panel will light up.

Turn the emergency power switch $\frac{1}{4}$ circle clockwise to make the button pop up and press the power button of the controls (the power button of the controls will light up) and press the spindle button to check whether the direction is correct (the spindle button is on the right side of the electrical box, the button should be turning clockwise). If the rotating direction is opposite, switch any two cables at the power source.

Check if the emergency stop button is functioning.

Check if the power ON and OFF functions are working as intended.

Check if all power switches are working as intended.

Slowly move all axes and check if lubricant application is normal.

Slowly move all axes and check if the limiters are functioning properly.

Check if the return to home function is working properly.

Check if spindle rotation is functioning properly.

Check if all programming controls are functioning properly.

Check if there is an oil leak.

6.2.4 Powering the Machine On and Off

Powering ON the machine:

Switch the power supply on.

Turn on the power switch on the machine (located within the electrical box or on top of the electrical box).

Turn all switches to the OFF position and toggle all switches to the lowest setting.

Press the power button on the panel.

Turn on the emergency stop button on the panel.

Pull (press) the lubrication system and manually lubricate 5~10 times then move all axes to lubricate the sliding surfaces.

Use the MPG hand-wheel controls to slowly move all axes front and back, left and right, then

up and down to check if overall travels are smooth.

When power is turned on, return all axes to their home positions (necessary step).

Powering OFF the Machine:

When turning off the machine, watch the positions of the tools. The optimal method is to move all axes away from the workpiece once work has reached a certain stage or completed.

Clean the machine and apply anti-rust oils on the spindle and working platform.

Move all axes to their center positions to maintain machine balance.

Press the emergency stop button and let the machine power down for 15 minutes (do not immediately turn off the main power source as to let lubricant from the spindle return to the oil box. This is highly important and failure to do this can cause oil leaks in the spindle).

Press the power OFF button on the panel.

Turn off the power switch on the machine.

Turn off the switch of the power source.

Note: When powering off, use the function button on the panel to initialize settings. Change the mode to manual, set spindle speeds to the lowest setting, and turn the G00 or G01 rotating button to the lowest setting.

6.3 Confirmation of Structural Elements

Itinerary Confirmation:

- After powering on and encountering no problems in movement, toggle the control mode to MPG (hand-wheel mode) and make sure the overall travels are smooth.
- Check if there are obstacles or tools in the movement path of the machine.
- Once no problems are found, check if the return to home function is functioning properly.
- When powering on daily, confirm that the axes are in their home positions as many safety mechanisms are generated when the axes are in this position. Failure to do this step will cause many functions to be unusable.
- After installation, the level must be calibrated as a machine that is not calibrated will have affected precision.

Critical Function Confirmation:

- After powering on, check if the emergency stop button is functioning properly as this switch is critical during emergency circumstances.
- If the machine has not been operated for an extended period of time and is transported in harsh environments, lubricate the machine for 30 seconds after powering on and slowly move all axes to check if lubrication systems are functioning properly.
- Refer to the parameters table shipped with the machine and check if values in the control monitor are identical.

Mechanical Structure Confirmation:

- Check if stabilizing components have been removed before powering on. Components that have not been removed can cause danger after powering on.
- Each component of the machine should be correctly installed prior to powering on (unless the component must be installed after powering on).
- Motor components of the machine should be checked and adjusted after installation. Components that have not been checked before powering on can be dangerous.
- Motor components, stabilizing components, and rotating components are certified and tested before shipping. However, during transportation damage can occur so it is necessary to check these components after installation to avoid danger.
- Refer to the precision table when checking the precision of all components. If there is deviation, it is necessary to recalibrate.

Spindle Confirmation:

- As weather and other conditions can be different from the manufacturing country during transportation, it is necessary to properly check and warm up the spindle after installation.
- As this is an automated machine, please check the spindle according to our regulations when powering on to extend the precision and lifespan of the spindle.
- Before the tools are installed on the spindle, do not rotate (the lever uses a four claw design). The installed tools on the spindle are dynamically balanced and calibrated as different tools will affect the machine's precision during operation.

- The arbor of the tool used on the spindle must adhere to the specifications set forth in the highest RPM settings of the machine. If these specifications are not met, do not install the tools on the machine as low quality tools can damage the machinery.
- Take special care in the spindle when warming up the machine, as high temperature fluctuation can cause damage to the spindle. When testing the spindle, if temperature exceeds 20°C, turn spindle RPM to 800rpm until spindle temperature is only 5 degrees above temperature within the facility, then warm up the machine according to the thermometer of the spindle.
- After powering on the machine, check if the spindle is rotating properly.

Table 5 、 Spindle Temperature/Time Table

Item	Spindle Warm Up Status	Spindle RPM	Time	Checklist
1	Daily Use	20% of highest RPM	10m	1. Temperature rise less than 20°C 2. Vibrations 3. Excessive Noise
2	Spindle inactive for 72 hours	20% of highest RPM 50% of highest RPM	10m	1. Temperature rise less than 20°C 2. Vibrations 3. Excessive Noise
3	Spindle inactive for more than two weeks	20% of highest RPM 40% of highest RPM 60% of highest RPM 80% of highest RPM 100% of highest RPM	15m 15m *30m *30m *40m	1. Temperature rise less than 20°C 2. Vibrations 3. Excessive Noise Items with * should execute the next warm up program once temperatures are stable

Chapter 7 、 Machinery Adjustment and Replacement

7.1 Gib Adjustment

The gib will see wear and tear after extended periods of usage. In order to adjust to the wear associated with usage the three axes must adjust to the gib to maintain precision and stability.

Steps for Gib Adjustment :

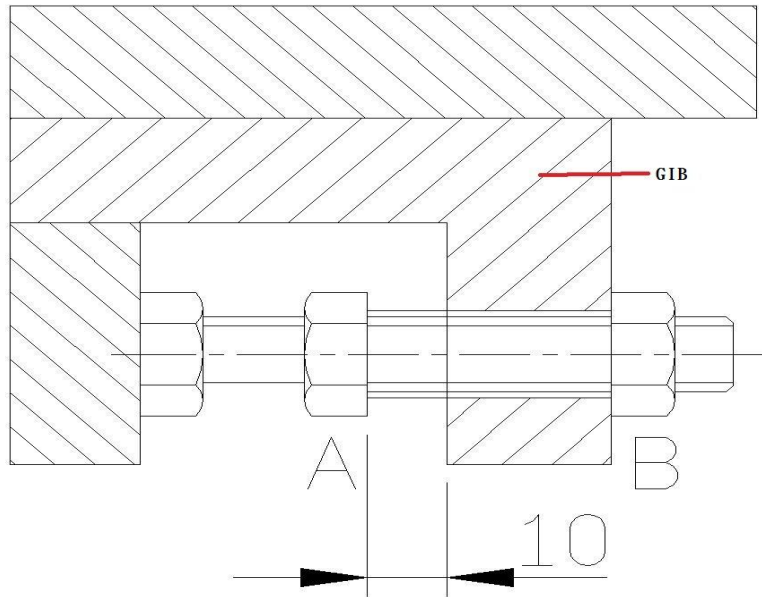


Diagram 39 、 Gib Adjustment Step 1

Turn the A screw clockwise to create distance between the A screw and gib (about 10mm).

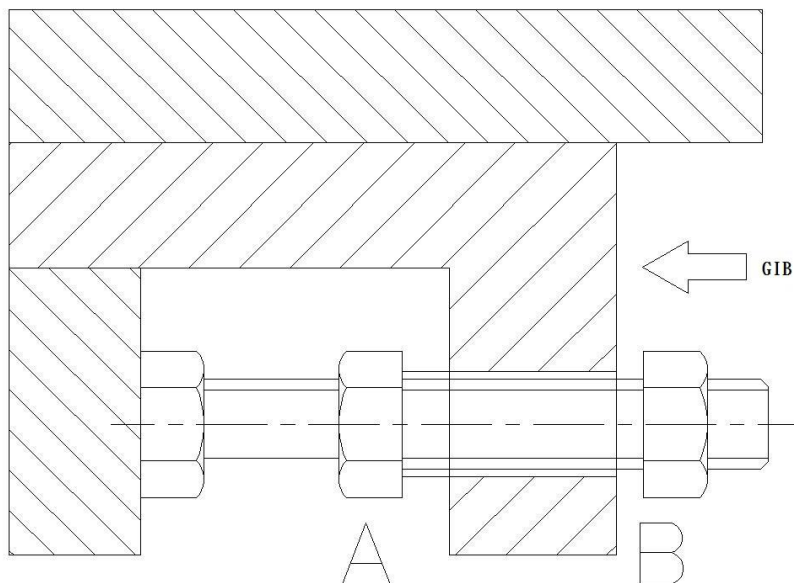


Diagram 40 、 Gib Adjustment Step 2

Use your thumb to press the gib to ensure tight contact between the gib and sliding surface.

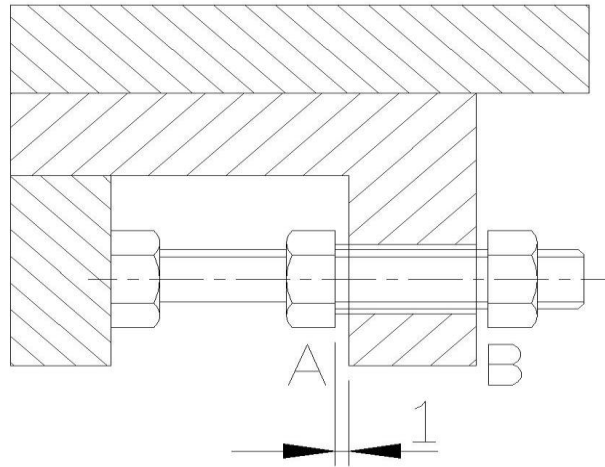


Diagram 41 、Gib Adjustment Step 3

Turn the A screw counter clockwise until 1mm from the gib, then turn the B screw clockwise so it is tight with the gib.

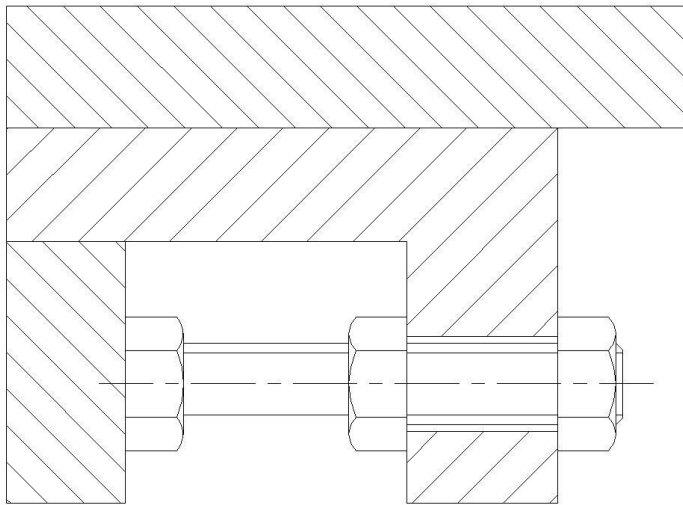


Diagram 42 、Gib Adjustment Step 4

Complete

Note: When adjusting the gib, do not adjust too tightly as it may lead to a loss in lubricant and create excessive wear to the gib.

7.1.2 Head Gib Adjustment (Z-Axis)

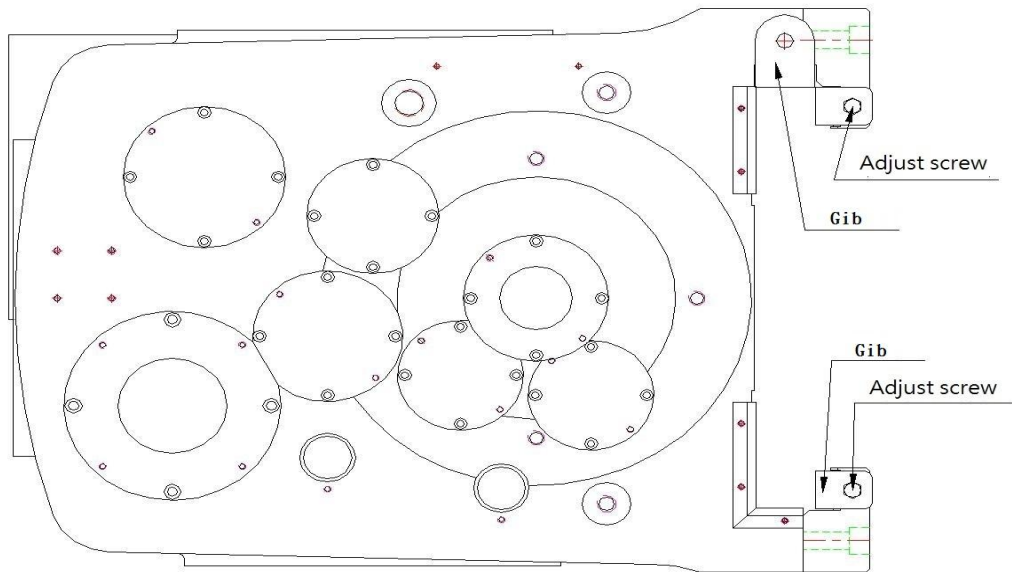


Diagram 43 、 Head Gib Adjustment Top View

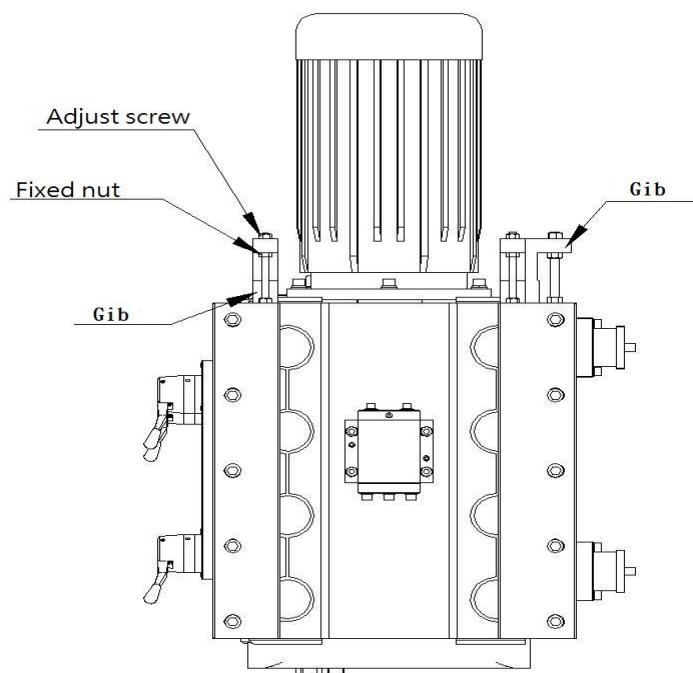


Diagram 44 、 Head Gib Adjustment Front View

- Prior to adjustment check the controller to see if the axis is in negative load. This value is an important value after adjusting the gib.
- The head gib is a main factor in the precision of the spindle, which is why ideal adjustment will lead to superior and stable cutting.

- The gib adjustment in the spindle consists of 3 gibs which can be adjusted by the following steps: loosen the stabilizing bolt on the bottom 2 or 3 rounds, then completely tighten the top screw bolt, and then lock in the screw bolt (see chapter 7.1.1).
- Check that the adjustment bolt (wire) and fixed bolt (wire) are screwed tight, as a loosely screwed bolt will cause the machine to stall.
- After adjusting the machine's gib, check the negative load status on the controller. This value should be roughly 2%~3% higher than previously.

7.1.3 Saddle Gib Adjustment (Y-Axis)

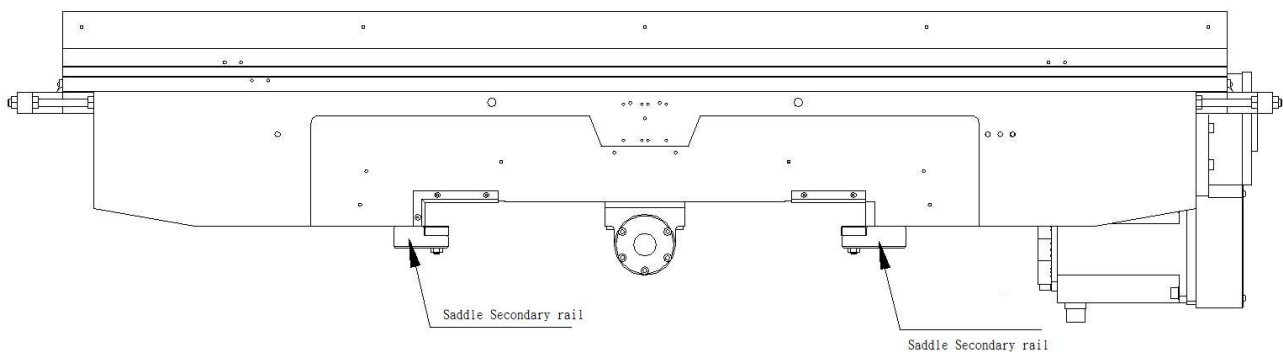


Diagram 45 、 Saddle Gib Adjustment

Saddle Gib:

- Prior to adjustment check the controller to see if the axis is in negative load. This value is an important value after adjusting the gib.
- The saddle gib is a main factor in controlling the machine's vertical precision, which is why ideal adjustment will lead to superior and stable cutting.
- The saddle gib adjustment consists of one gib, which is adjusted by the following steps: loosen the stabilizing bolt on the bottom 2 or 3 rounds, then completely tighten the top screw bolt, and then lock in the screw bolt (see chapter 7.1.1).
- Check that the adjustment bolt (wire) and fixed bolt (wire) are screwed tight, as a loosely screwed bolt will cause the machine to stall.
- After adjusting the machine's gib, check the negative load status on the controller. This value should be roughly 2%~3% higher than previously.

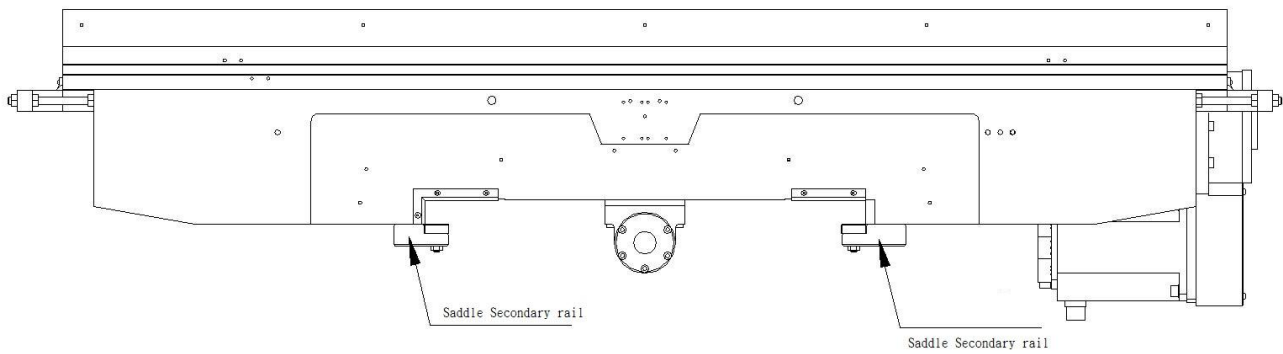


Diagram 46 、 Saddle Guard Rail Adjustment

Saddle Guard Rail:

- When removing the saddle guard rail, you must first get a feel of the necessary grinding capacity.
- Adjusting the saddle guard rail requires its removal. Prior to removing the saddle guard rail, remove the limiting switches and oil tubing. The removed guard rail should be calibrated before grinding. Once calibration is complete, grinding can be resumed (if incorrectly calibrated, it will lead to imprecise movement of the machine).
- When grinding the guard rail, use the estimated value obtained previously for grinding. Do not use a greater grinding value as too much grinding will lead to a heavier load during axis movement.
- For guard rail grinding position, please refer to saddle and guard rail contact surface for grinding.

7.1.4 Working Platform Gib Adjustment (X-Axis)

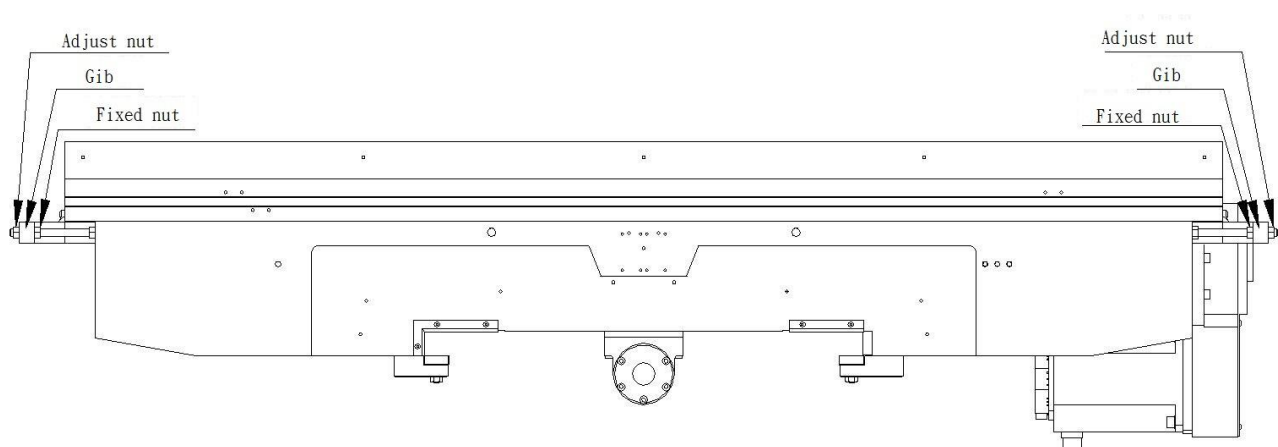


Diagram 47 、 Working Platform Gib Adjustment

- Prior to adjustment check the controller to see if the axis is in load. This value is an important value after adjusting the gib.
- The working platform gib is a main factor in controlling the machine's right angle precision and level, which is why ideal adjustment will lead to superior and stable cutting.
- The working platform gib adjustment consists of two gibs, which is adjusted by the following steps: loosen the stabilizing bolt on the bottom 2 or 3 rounds, then completely tighten the top screw bolt, and then lock in the screw bolt (see chapter 7.1.1).
- Check that the adjustment bolt (wire) and fixed bolt (wire) are screwed tight, as a loosely screwed bolt will cause the machine to stall.
- After adjusting the machine's gib, check the load status on the controller. This value should be roughly 2%~3% higher than previously.

7.2 Replacing the Tight Canvas Spring

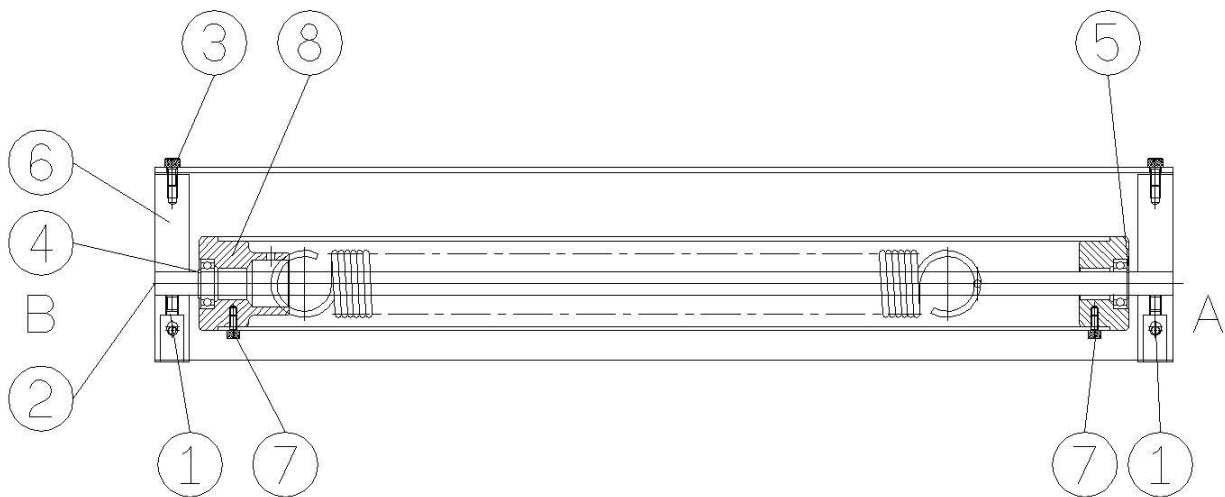


Diagram 48 、 Replacing the Tight Canvas Spring

Loosen 2 No.1 bolt screws.

Remove the dust cover.

Remove every No. 3 bolt screw on the cover of the No. 6 dust cover ◦

Remove the entire roll.

Remove all No. 7 screws on both sides.

Remove the snap-ring on No. 4 and No. 5 (press down on the shaft to keep from popping out).

Remove the center axis and No. 8 hanging accessories from point A to point B.

Check the spring within the roll for damage or if it's loosened.

When you are done, reverse the steps above to install the spring in the roll while applying oil to the spring.

Use a hexagonal wrench to tighten No. 2 screws onto the dust cover (automatic extending) and stabilize the No. 1 bolt (be careful during this step as the spring may pop and cause injury to personnel).

Chapter 8 、 Regular Maintenance

Effective maintenance needs to be carried out with a timetable and strictly executed. When maintenance plans clash with production plans, the maintenance scheduling must take priority in order to extend the lifespan of the machine. When executing any form of maintenance, all actions relating to the controller or parameters must be recorded to help give a better understanding of the lifespan of all components and be beneficial for future machine development and component replacement.

The maintenance detailed in this manual focus on maintaining the precision of the machine. If there are special circumstances not detailed in the manual, the basic maintenance procedure should be executed. For any questions that are not detailed in the manual, please contact SHARP or our distributors.

8.1 Regular Maintenance

8.1.1 Daily Maintenance

- Clean the working platform, bottom stand, and machine of all metal scraps, dust, and foreign items. Keep the area around the machine clean.
- Clean all oils, cutting fluids, and metal scraps off the surface of the machine.
- Clear all items from the sliding surface.
- Clean the way cover and canvas on the sliding surface of all metal scraps and foreign items.
- Clean the tapered cavity of the spindle with a dustless cloth (do not use air to clean).
- Clean the limiting switches and blocks of all 3 axis and check if their wiring has been damaged (if damage is found, stop use of the machine and contact SHARP for repairs).
- Check the 3 points for ample spindle oil. If there is not enough, add more and clean the steam in the 3 point.
- Check the oil level in the automatic lubricant system, spindle oil recycling box, and gearbox. If oil amounts are low, add more.

8.1.2 Weekly Maintenance

- Check all items in the daily maintenance checklist.
- Clean or replace air filter in the controller, heat exchanger, and electrical box.
- Clean the interior of the electrical control box.

- Check if the air pressure controls are functioning properly, and adjust or replace as necessary.
- Check the origin points of all 3 axes.

8.1.3 Monthly Maintenance

- Check the lubricant status of the X, Y, and Z axes.
- Check and clean proximity switches.
- Refer to the manual and check whether indicator and warning plates on the machine are clear and legible.
- Clean the water tank filter.

8.1.4 Seasonal Maintenance

- Check all items in the weekly maintenance checklist.
- Clean the filter in the automatic lubrication system.
- Check the rail and ball screw lubrication status of X, Y, and Z axes. Lubrication of the rails and ball screws should be good (if any of these checks come back abnormal, stop use of the machine for repairs).
- Check all proximity switches.
- Check all indicator plates and whether the machine has been cleaned and maintained as per instruction.
- Clean film wipers on all three axes and replace if necessary.
- Check if the power connectors are loose or have faulty connections.
- Eject and clean the cutting fluid, or replace cutting fluid (depending on circumstances).
- Check if the CNC controller is functioning properly.

8.1.5 Half Year Maintenance

- Check all items in the weekly and monthly maintenance checklist.
- Clean the magnetic filter in the recycling oil box of the spindle.
- Check the level and precision of the machine.

8.1.6 Annual Maintenance

- Check all items in the weekly and monthly maintenance checklist.
- Check if the gibs of all three axes are damaged. If damaged, adjust accordingly.
- Replace the recycling oil box of the spindle, clean out the oil from the gearbox and within the spindle, then check if the lubricant tube is connected appropriately and if there is any damage or oil leaks (for detailed instructions, please see the chapter on machine lubrication).
- Measure the rear gap of the ball screw and adjust.
- Examine the motor's brush.

8.2 Machine Lubrication and Oil Use

Keeping the machine well lubricated can extend its precision and lifespan. Please make a habit of daily checks on the oil amount and quality. Be ready to carry out appropriate lubrication maintenance to ensure smooth operation of the machine. Before operating the machine, thoroughly clean all sliding surfaces, spindle, spindle cavities, the ring ruler, and other indicators.

Note: Neglecting regular lubrication maintenance can cause serious effects to the machine!
Lubrication maintenance and repair is critical.

8.2.1 Machine Lubrication

- The lubrication settings in the machine inject oil at intervals of 5min, 10min, or 15min depending on settings. Different types of lubricants are used according to machine model. Please adhere to the oil replacement and injection rules set by the manufacturer. Changing of the oil should be carried out during regular maintenance.
- The lubrication of the slide uses a central lubrication system. When it is insufficient an indicator will light up on the panel. Regularly check oil levels to see if they are ample and pay attention to whether the spiral oil injection timer is working correctly within the machine (working after the machine is powered).
- The central lubrication system prohibits the use of any additives. After adding oil into the system, confirm that the pump is locked tight. The oil filter cup should be cleaned every three months to avoid clogs or microscopic impurities from entering the machine and damaging components and affecting precision.
- Containers used for pouring oil should be kept clean to avoid microscopic impurities from clogging tubes and damaging important components.

- When the machine head is in operation, observe whether the oil nozzle is injecting oil from the sides or top (if no oil is injected, immediately stop use to avoid damage to important components).
- In principle, the oils used by the machine should be of the quality supplied by CPC (Taiwan) or if overseas, oil of similar quality should be used.
- If the machine is inactive for an extended period of time (several days or more), anti-rust oil should be applied to the exterior working surfaces of the machine such as the guiding surface, screws, working platform, and other locations easily prone to rusting.
- After unpacking, initial operation, and periods of inactivity, all moving components must be lubricated and let run until lubricant seeps out from the film wipers (manually inject oil ten or more times).
- Designated oils are necessary for the machine's lubrication (see chapter 7.2.2 for regulation oils). Do not use other oils that may impede normal operation of the machine, as improper choice of oils may damage important components.
- Lubrication injection system should be checked if it is functioning properly. Manually apply oil to each sliding surface (automatic lubrication system). Furthermore, if the color of oils become dark it is time to replace with new oil (this action only applies to used machines, as all machines fresh from the factory contain new oil).

Other Notes:

- Cutting fluids should be chosen according to cutting needs. Refer to the cutting fluid manufacturer's catalogue for the appropriate cutting fluid (when choosing cutting fluids please note that improper choice may cause damage to the machine).
- Used fluids (including cutting fluids, lubricants) should be disposed of according to local laws and regulations.
- If the machine is equipped with an air pneumatic lock knife, pay attention to the oil levels of the anchor and the water vapor collected within the three point combination.

8.2.2 Oils Use Standards

Table 6 、 Oil Use Standards

Component	Oil Use Method	Oil Type	Amount	Use Period
Air Pneumatic Knife Three Point Combination	1. Fill a clean container with premium morlina oil.	CPC Premium Morlina Oil R32	According to the capacity of oil cups	Check regularly and add accordingly.
	2. Pour into the oil cups of all 3 points	Oil chart in table 9		
Circulating oils within the spindle	1. Before changing oils, run the machine head at mid speed for 30 minutes to circulate the accumulated material within the machine head before you change oil (this step must be properly performed to remove all impurities before adding oil).	CPC R68# Circulating Oil R68# Oil chart in table 7	Approximately 5 gallons (see the oil meter next to the spindle, the level should be between H-L).	Oil should be replaced after 1500 hours of use (approx.. half year) for new machines. Subsequent oil changes should occur every 3000 hours of use to reduce the risk of damage to internal components and increase lifespan.
	2. The drain hole is located under the circulating oil box, open this drain with a wrench.			
	3. Drain the old oil before filling with the new oil. Secure the bolt of the tank tightly.			
	4. The tank door is located on top of the machine head (when opening the door, be careful not to let impurities enter the tank to prevent damage to internal components).			
Gearbox Lubrication	1. Drain the old oil before adding diesel into H, then manually run the system for 5 minutes to circulate impurities between the gears, then drain the old oil. The drain is located at the bottom most position and can be removed with a wrench.	CPC R68# Circulating Oil R68# Oil chart in table 7	Approximately 5 gallons (see the oil meter next to the spindle, the level should be between H-L).	Oil should be replaced after 1500 hours of use (approx.. half year) for new machines. Subsequent oil changes should occur every 3000 hours of use to reduce the risk of

	2. The oil injection door is on the top of the gearbox. Take care to screw the drain tightly before adding oil to prevent leaks (take care to not let impurities enter the tank when adding oil to prevent damage to the machine).			damage to internal components and increase lifespan.
Sliding Surface and Drive Rod Lubrication	1. Before operation ample oil should be added and injected manually.	MOBIL VACTRA OIL NO2 (Slide Oil 220#) Oil chart in table 8	2 Liters	Depends on circumstances, but the automatic lubrication system should never be out of oil. The oil levels must be checked before and during machine operation.

Table 7 、 Head and Gearbox Oils

Brand	Oil Name and Spec	ISO Spec	Viscosity cst@40	Note
CPC	Premium Circulating Oil R68	VG 68	68	
Mobil	DTE Heavy Medium	VG 68	68	
ESSO	Turbo 68	VG 68	68	
SHELL	Turbo 68	VG 68	68	

Table 8 、 Sliding Surface Oils

Brand	Oil Name and Spec	ISO Spec	Viscosity cst@40	Note
CPC	Way Lubricant Way 68	VG 68	68	
Mobil	Vectra NO.2	VG 68	68	
Castrol	MAGNA BD 68	VG 68	68	
FINA	APTAC EP 68 HYDRAN CIN 68	VG 68	68	
FUCHS	RENEP 2	VG 68	68	
TEXACO	WAY Lubricant 68 Wetex Oil W-68	VG 68	68	
TOTAL	Drosera 68	VG 68	68	
ESSO	FEBIS K 68	VG 68	68	
SHELL	Tonna Oel T 68	VG 68	68	

Agip	EXIDA 68	VG 68	68	
ARAL	Deganit B 68	VG 68	68	

Table 9 、 Three Point Combination Oils

Brand	Oil Name and Spec	ISO Spec	Viscosity cst@40
CPC	Premium Circulating Oil R32	CB 32	32
SHELL	SHELL.TELLES.OIL C32	CB 32	32
MOBIL	MOBIL DTE OIL LIGHT	CB 32	32
ESSO	TERESSO 32	CB 32	32

8.2.3 Lubrication Error

- This machine is automatic and equipped with floating switches and an automatic alarm system. When oil levels are low, the light will automatically light up to indicate that oil should be added. The controller is also notified when oil levels are low and restrict the activation of automatic mode and show a warning.
- Clean the filter at least once a year.
- Check daily whether oil levels are appropriate and troubleshoot problems with the lubrication system when they occur, or the machine will not function.
- Check lubricant nozzles periodically to see if they are functioning normally.

Table 10 、 Lubrication Troubleshooting

Item	Error	Reason	Solution
1	Oil nozzles do not expel oil	<ol style="list-style-type: none"> 1. Clogged tubing. 2. Lubricant viscosity too high. 3. The filter is clogged. 4. Oil levels are too low 5. Floating switch malfunctioned. 6. Check valve is clogged. 7. Pump malfunction. 8. Damaged tubing. 	<ol style="list-style-type: none"> 1. Clean or replace tubing. 2. Replace with regulation oils. 3. Clean the filter. 4. Add oils. 5. Replace. 6. Clean the check valve. 7. Inspect and repair. 8. Replace tubing.
2	Warnings Display	<ol style="list-style-type: none"> 1. Pressure switch short circuit. 2. Damaged Tubing. 3. Inadequate pump 	<ol style="list-style-type: none"> 1. Changing pressure switch or circuit. 2. Replace tubing. 3. Repair the pump.

		pressure.	4. Replace the pump.
3	Fluctuating Oil Levels	1. Damage to components. 2. Oil seal not tight.	1. Replace machine. 2. Replace.

8.3 Three Point Combination Maintenance

- If the machine has a three point combination, be careful of the use of morlina oil and periodically release the water vapor collected.
- Aside from external air pressure, the three point combination allows for the pressure adjustment.
- The pressure displayed by the three point combination is $6\sim 7\text{kg/cm}^2$, if this pressure cannot be reached, the three point combination or the air pressure source must be adjusted
- Refer to the air pressure supply for the air pressure source used by this machine.
- The pressure of the three point combination can be adjusted by pulling the pressure bolt and turning it to increase pressure.
- For the lubricant used by the three point combination system, refer to lubricant information. Oil levels should be checked daily to see if more oil is needed, as lack of oil when using the spindle blowing mechanism for cleaning will cause the spindle cone to rust.
- Too much airflow will decrease the lifespan of components, and inadequate airflow will cause all actions to become slow and unstable. Tighten the screw bolt after adjusting flow.

8.4 Cutting Fluid Maintenance

- Cutting fluids should be chosen according to cutting needs. Refer to the cutting fluid manufacturer's catalogue for an appropriate cutting fluid.
- Choose the correct cutting fluid, as improper cutting fluids may cause damage.
- Used industrial waste fluids (including cutting fluids, lubricants) should be disposed of in accordance to local laws and regulations.
- Make sure no impurities or metal shards are in the cutting fluid. Clean the water box and filter weekly and clean the cutting fluid box of metal shards. Cutting fluid that has not been used for an extended period of time should be replaced.
- Check the oil meters for the current level of cutting fluid. If the amount is lower than the indicator line, add fluid.

- Choose cutting fluid that is not toxic, does not chemically react with plastic components, and does not easily change in terms of quality.

Chapter 9 、 Troubleshooting

9.1 Troubleshooting

Table 11 、 Troubleshooting Chart (1/2)

Problem	Reason	Solution
Vertical spindle oil leak	Oil seal broken.	1-1. Replace spindle oil seal spec 148 × 128 × 10
Spindle stops during milling	1. Spindle overload (too much voltage)	1-1. Turn off the main power switch and wait 1 minute before restarting.
	2. Spindle warning light (too much voltage).	
Power control cannot be started	1. Input power abnormality	1-1. Change the switch of the power source. 1-2. Change power line.
	2. The emergency stop button has not been released.	2-1. Turn the emergency stop button ¼ circle until it pops up.
	3. Check if fuse is burnt.=	3-1. Replace the fuse in the electrical box.
	4. Safety switch in the electrical box is broken?	4-1. Check the electrical box and see if the switch is broken. 4-2. Open the electrical box and turn it off.
Spindle will not operate	1. Is control panel power on?	1-1. Turn on control power.
	2. Is the adapter's power functioning normally?	2-1. Check if input is functioning normally 2-2. Check if the magnetic switch MC1 is damaged
	3. Power relay is damaged?	3-1. Check CR1, CR2. If damaged, replace (see specifications in electrical spec table).
	4. RPM button is set at zero.	4-1. Turn the RPM adjustment knob.
Three axes will not operate	1. Abnormal axis	1-1. Turn off main power, wait one minute before restarting.
	2. Power input 220V abnormal.\	2-1. Check the power source voltage. 2-2. Electromagnetic switch MC1 may be damaged.
	3. Damaged fuse.	3-1. Replace the fuse.
	4. RPM button is set at zero.	4-1. Turn the RPM adjustment knob.

Table 12 、 Troubleshooting Chart (2/2)

Problem	Reason	Solution
Left and right	1. Poor contact between	1-1. Take off, replace and apply fresh seal.

retractable covers leaking	working platform and protective cover	
Sliding Rail Abnormality	1. Low oil levels in the automatic lubrication system	1-1. Add more lubricant
Uneven milling surface	1. Workpiece clamped incorrectly	1-1. Change clamping method
	2. The ground is too soft	2-1. Reconstruct the foundation. 2-2. Add pillars in the ground to stabilize the machine.
	3. Machine level moved	3-1. Adjust level (see precision level adjusting and four point adjustment method)
Front and rear right angle imprecision or abnormal gib damage	1. Gib damage	1-1. Adjust the gib
	2. Lack of lubricant on slide	2-1. Add lubricant 2-2. Check oil tubes for leaks
X、Y、Z axis cannot operate	1. Foreign object damaging or blocking limiting switch	1-1. Clean limiting switch 1-2. Replace limiting switch
	2. Electromagnetic valve not operating	2-1. Change electromagnetic valve
	3. Power relay damaged	3-1. Replace power relay
	4. Power controls malfunction	4-1. Refer to the power control malfunction troubleshooting
	5. Damaged motor	5-1. Check if the motor is running. Use the electric circuit box's circuitry to check if circuit is damaged or torn.
	6. RPM button is set at zero.	6-1. Turn the RPM adjustment knob.
Cannot get desired sizes	1. Load too heavy causing transformation	1-1. Reduce the amount of tools
	2. Metal shards from cutting workpiece may have gibd into the machine, causing uneven level	2-1. Change direction of oil flow to make it hard for shards to get stuck. 2-2. Clean metal shards when clamping the workpiece.
Tools prematurely dulling	1. Cutting load too big	1-1. Reduce the amount of tools.
		2-1. Add mixed oils into lubricant

Chapter 10 、Milling Machine Controller

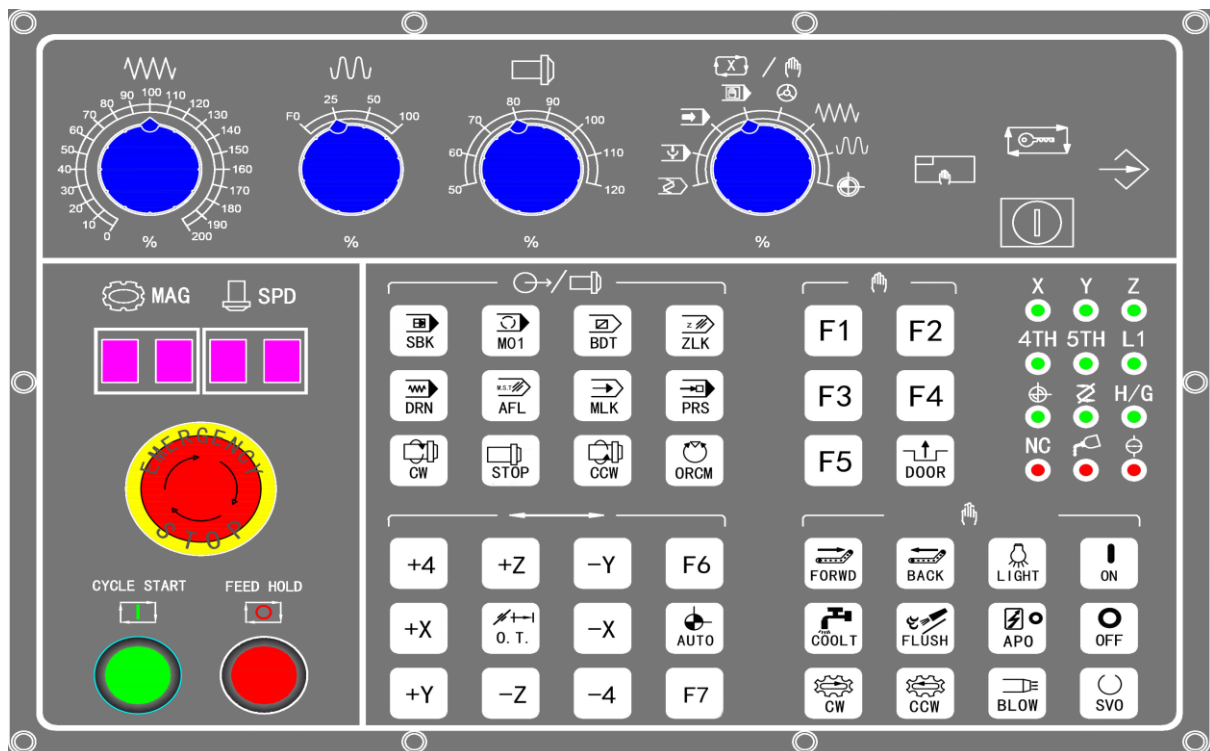
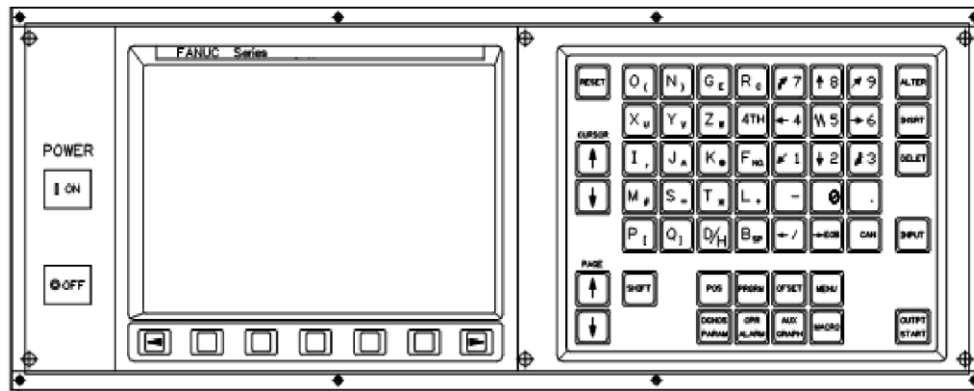


Diagram 49 、Milling Machine Controller

Milling Machine Controller (H4CL-M) Characteristics :

- MACRO commands , $+$ $-$ \times \div calculations , user settings from 1~9999 , specific sub application commands , automatic G code setting 、specific commands available to M CODE and writing.
- Program capacity 512k-byte, can simultaneously work and send.
- Flash Rom structure allows quick updates, PLC and display screen.
- Wiring is easily connected.

- Frequency spindle or server spindle.
- Can attach external USB device.
- For detailed information on controls, please see the control manual.

10.1 Machine Control Panel

10.1.1 Choosing Control Mode


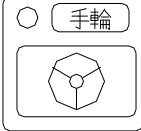


Diagram 50 、 Choosing Control Mode

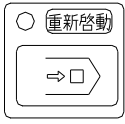

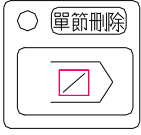
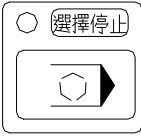
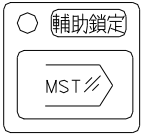

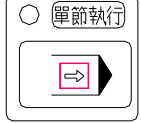
Table 13 、 Control Mode Operation



10-1-2 MODES DESCRIPTION

	<p>(AUTO MODE)press this key for executing automatic operation mode.</p>
	<p>(EDIT MODE)this mode is used for modifying or increasing machining programs. For detailed instructions, refer to program input instructions given in the operation manual.</p>
	<p>(DNC MODE)This mode is used for transferring data, machining programs or for DNC transfer. For detailed instructions, refer to program input instructions given in the operation manual.</p>
	<p>(MDI MODE)This mode is used for specifying or editing the temporary working commands. For detailed instructions, refer to the programming instruction manual. A single block can be input and executed through this MDI mode.</p>
	<p>(ZERO POSITION MODE)Press this key and any manual control key, then the corresponding axis will return to its reference position. When this mode is selected, press the axis moving direction key, then the</p>

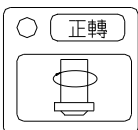
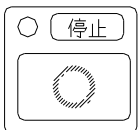
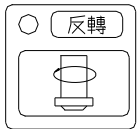
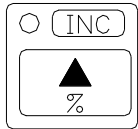
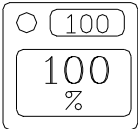
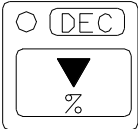
	machine will return to its machine reference position with the speed of 25% of G00(first reference position). The axis travel speed will slow down when approaching to the reference position. When the reference position indication lamp lights on, it means the axis has returned to its reference position.
	(JOG MODE)Press this key for moving each axis by using manual control key.
	(HANDLE MODE)Press this key, then you may use MPG handle to move each axis. The axis direction and magnification are shown on the handle panel.

10-1-3 FUNCTIONS DESCRIPTION

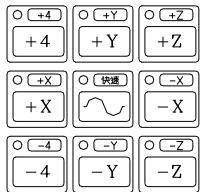
	Not available.
	Turn on this switch for execution programs pre-play, however the F command set in the program is ineffective. Feed rate will be determined by the G01 regulator, located on the main panel.
	When a single block is marked with (/) at the head end, it will be ineffective during automatic operation. When this key is pressed on, any single block marked with (/) will not be executed. When this key is pressed off, any command with or without (/) marking will be executed.
	When this key is in On condition, during automatic operation, any single block containing M01 command will cause automatic operation stop. When this occurs, press the program start key to continue execution, When this key is in OFF condition, M01 is ineffective.
	When this key is pressed, during executing programs, any of M, S, T, command cannot be executed.
	When this switch is turned on, then any axis can not be moved.
	When this key is pressed, in automatic operation mode, the machine executes only a single block then stop. When this key is in ON condition and in automatic operation mode, only a single block can be

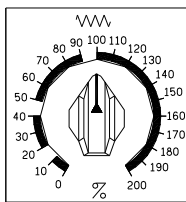
	executed. If you need to execute the next single block, press the program start key.
	When the mode selection switch is set at reference position mode, and this key is pressed, the Z-axis will return to its reference position at first, then X,Y-axis simultaneously return to their reference positions.
	Press this key for turning on the work light, however it is effective only when the switch on the work light also been turned on. Press this key again for light off.

10-1-4 SPINDLE CONTROL FUNCTIONS DESCRIPTION

	Under jog or MPG handle mode, when this key is pressed, the spindle starts running clockwise.
	Under any mode condition, when this key is pressed, the spindle stops.
	Under jog or MPG handle mode, when this key is pressed, the spindle starts running counter-clockwisely.
	Press this key for increasing 10% of spindle speed. Maximum increase of spindle speed is of up to 120%.
	Press this key for returning spindle speed to 100%.
	Press this key for decreasing 10% of spindle speed. Minimum decrease of spindle speed is 50%.

10-1-5 FEED FUNCTION DESCRIPTION

	Under jog mode, press any key on this area, then the axis will move according to the speed set on the regulator knob for G01. If the rapid traverse key is pressed, the axis will move with the speed set on the regulator knob for G00.
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The regulator knob is used for adjusting the G01 value during jog or automatic operation mode. The adjustment range for G01 is 0-1260 mm/mm. or 0% -150 %. Another adjustment range 0% -200% is available depending on the type of controller.


10-1-6 RAPID TRAVERSE DESCRIPTION

	<p>Under jog mode, press any key on this area, then the axis will move according to the speed set on the regulator knob for G01. If the rapid traverse key is pressed, the axis will move with the speed set on the regulator knob for G00.</p>
	<p>This regulator knob is used for adjusting the G01 value during jog or automatic operation mode. The adjustment range for G01 is 0 – 1260 mm/mm or 0% - 150%. Another adjustment range 0%-200% is available depending on the type of controller.</p>
	<p>When the operation mode is set at jog mode</p>
	<p>During rapid traverse, you may adjust speed by turning this regulator knob. Speed adjustment range is F0%, F25%, F50%and F100%.</p>




10-1-7 EMERGENCY STOP FUNCTION DESCRTPTION








1. This emergency stop switch should be use d when an emergency condition occurs, such as abnormal machine motion that may damage operator or machine.
2. When the emergency stop switch is pressed, all motor powers are cut off, but the main power source is not cut off.
3. Releasing this switch by turning it clock wisely or pulling it upward. (Releasing method may be varied with the type of emergency stop switch)
4. When the emergency stop switch has been pressed, all commands and machine conditions will have been cleaned. To restart the machine, you need to use the normal starting procedures to continues, and also reference points return should be made.

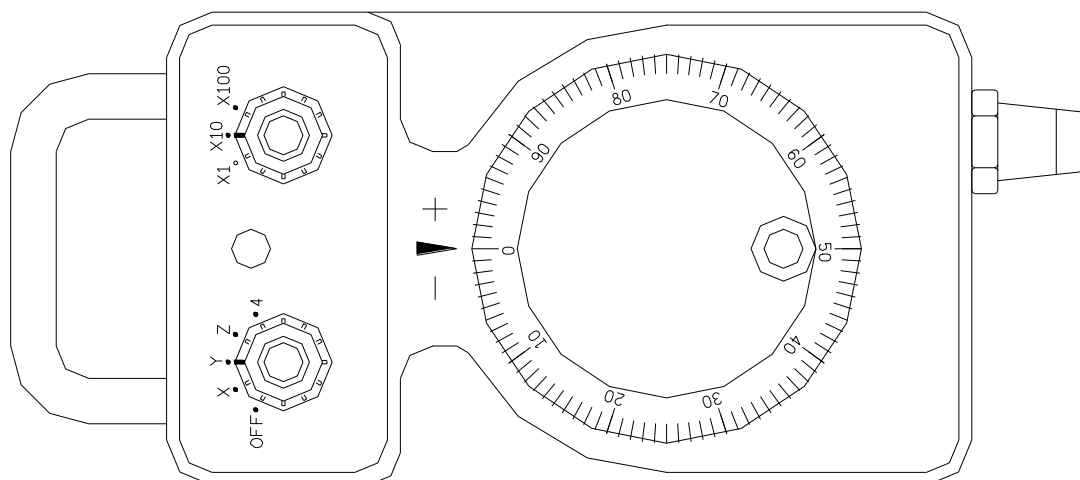
<div>O.T. REL.</div> 	<p>This key is operated together with handle feed or manual feed control key. This key is used only when an over-travel occurs.</p>
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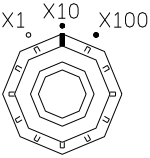
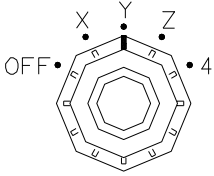
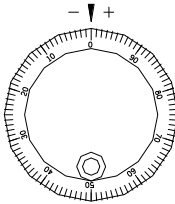
10-1-8 CUTTING FLUID FUNCTIONS

<div>○ 手動</div> 	<p>When this key is pressed, the cutting fluid pump can be controlled manually.</p>
<div>○ 停止</div> 	<p>Press this key is to stop program execution automatically.</p>
<div>○ 自動</div> 	<p>Press this key for stopping automatic program execution.</p>

10-1-9 OTHER FUNCTIONS AND INDICATIONS DESCRIPTION

<div>○ 衝屑</div> 	<p>Flushing device starting (optional)</p>
<div>○ 門鎖</div> 	<p>Press this key for opening splash guard door (optional)</p>
<div>○ LUB</div> 	<p>When this key is pressed, the automatic lubricator shots oil. Release this key, oil shot stops.</p>
<div>START</div> 	<p>Press this key for starting automatic program execution.</p>
<div>STOP</div> 	<p>Press this key for stopping automatic program execution.</p>



	<p>Magnification selection knob</p> <p>X1 : 0.001mm</p> <p>X10 : 0.01mm</p> <p>X100 : 0.1mm</p>
	<p>Axis direction selection knob</p> <p>OFF : handle off</p> <p>X : For moving X-axis</p> <p>Y : For moving Y-axis</p> <p>Z : For moving Z-axis</p> <p>4 : For moving 4th axis</p>
	<p>Turn the hand wheel clockwise for increasing value. Turn it counter-clockwisely for decreasing value.</p>