S M T C L

CAK63 SERIES CNC LATHES

INSTRUCTION BOOK

(For Mechanical Unit)

SHENYANG NO.1 LATHE WORKS
SHENYANG MACHINE TOOL CO., LTD
THE PEOPLE′S REPUBLIC OF CHINA

IT IS NECESSARY FOR YOU TO READ THIS BOOK CAREFULLY AND THOROUGHLY BEFORE OPERATING THE MACHINE

THE CHINESE VERSION OF THIS TECHNICAL DOCUMENT IN ENGLISH IS REGARDED AS FINAL.

MATTERS NEEDING ATTENTION TO OPERATION

It is necessary for you to read this Instruction Book carefully and thoroughly and be acquainted with all details of the Instruction Book before operating the machine, only for this doing you can make the machine completely run safely.

Although this Instruction Book has been checked carefully, if you find there are still a few questionable points, incorrect explanation or omission in it, please get touch with our factory.

Fox explaining concrete detail of the machine, some graphs in this Book were drawn without door, cover or safe guard, etc. therefore, before operating the machine, put on all these covers, safe guards or close the doors according to this Book, otherwise, some troubles may be occur, resulting in the machine's major assembly or other attachments damaged.

In order to transport the machine safely, some devices, like guarding door, etc. were fixed as shown in Fig.1. User must dismount all these fixtures before operation of the machine to avoid damaging the machine.

MATTERS NEEDING ATTENTION TO INSTALLATION

In order to insure the machine running normally, care must be greatly taken to following items during installation of the machine:

1 Wiring Connection

1.1 The performance values of wire used for connecting the electrical parts should be equal to or more than the specified values in this book.

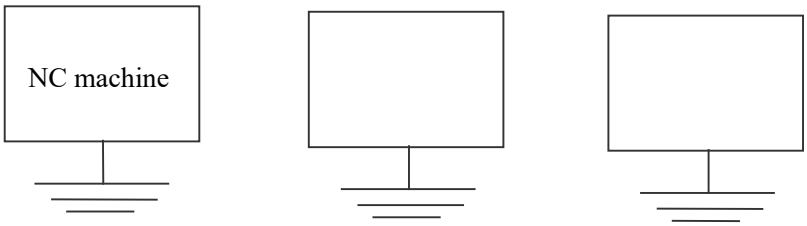
1.2 Never use the common terminal block with the equipment like welding machine or high frequency quencher, etc., which can make noise.

1.3 Skilled electrician should connect the power cable.

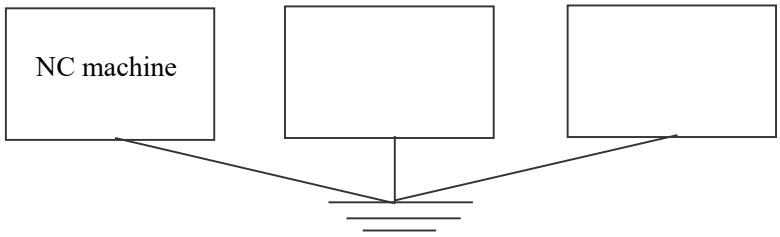
2 Grounding

The cross section and the grounding resistor of used grounding wire as well as matters needing attention to grounding should be in compliance with the standard GB5226.1-2002. The grounding wire shall be connected as shown by the figures given below.

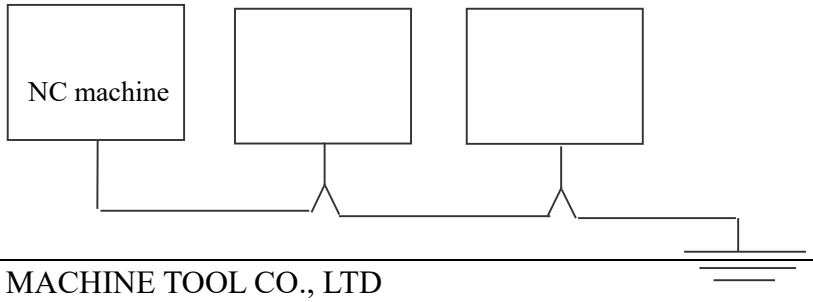
Independent grounding wire



Common grounding wire



Never connected to one grounding rod for some equipments like the figure given below:



NOTICE TO ENVIRONMENTAL PROTECTION

The following stipulations have to be followed when the machine is finally scrapped:

- It is necessary to deliver some harmful or non-degradable waters, including used batteries, electrical elements, rubber components, etc., which cannot be recovered or re-utilized and designated local recovering unit.

- For any waste liquid, such as lubricating oil, coolant, etc., which cannot be recovered or re-utilized and lead to polluting environment, they have to be drained off at designated place in the locality.

CONTENTS

1 PREFACE

1.1 Applicable Range and Purpose of the Instruction Book

Compiled this Instruction Book is available and ready for the CNC lathe which is provided with Japan FANUC 0i-mate, SMTCL NC100, SIEMENS 802D or FAGOR system.

The Chapter 2 in this Instruction Book gives matters needing attention to safety protection. Operator should take it as routine inspection item of operation of the machine.

The Chapter 3 “Handling and Installation” gives installation method and the matters needing during installation.

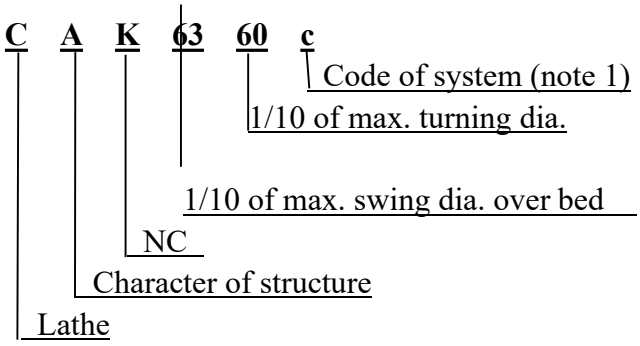
The Chapter 4 “Specifications of the Machine” and the Chapter 5 “Construction of the Machine” specify the content of operation of the machine that should be acquainted with by operator in advance.

The Chapter 6 “Inspection and Maintenance” gives the necessary knowledge for operator to operate and maintain the machine.

The Chapter 7 explains the tool disposition, the turning range of the machine and the tool interfering drawing, etc.

If you find that any trouble which is not mentioned by this Instruction Book, please get in touch with the Marketing Department of after-sales of our factory.

1.2 Meaning of Product Model



Note 1: The symbol should be d when FANUC 0i-mate system is disposed.
The symbol should be b when SMTCL-NC100 system is disposed.
The symbol should be c when SIEMENS 802D system is disposed.
The symbol should be e when SIEMENS 810D system is disposed.
The symbol should be f when FAGOR system is disposed.

1.3 Major Applications of the Machine

The machine of CAK63 series is a mechanical machining lathe of economical type. It can perform roughing and finishing for mechanical parts. It possesses reliable structure and is easy to operate and practical in economy. These machines with comprehensive functions of the control system can meet the needs to all kinds of industries such as auto industry, tractor industry, war industry and Mechanical industry etc. to turn rotary parts in high efficiency, high accuracy and in large batch.

The machine of CAK63 series is also used to turn and machine shaft workpieces, disc workpieces in small batch, also to cut internal/external cylindrical surfaces, taper surface, threads, drilling and reaming and arc faces of gyro-rotors. The turned accuracy can be up to Grade IT7 the surface roughness of the turned workpiece can achieve Ra 1.6.

1.4 Accuracy of the Machine

The accuracy of the machine is in accordance with JB/T8324.1-1996《Accuracy Certificate for Horizontal CNC Lathes》.

1.5 Environment Available for the Machine

Environment available for the machine working should be following:

- Air temperature of the environment: Range of 5°C – 40°C .
- Humidity: Highest temperature: 40°C, relative humidity is not over 50% and the Changing principle of the humidity should not cause condensation.
- Sea level elevation: Less then 1000 m.
- Atmospheric pollution: There is no too much dust, acid gas, corrosive gas and salt component.
- Radiation: The machine should not be directly shining by sun or radiated by heat to prevent the temperature from changing.
- The position for installation of the machine should be away from vibrating source and inflammables and hazard articles.

1.6 Effects of the Machine to Environment

Sound pressure class of dry running noise of the machine is ≤83dB (A). The machine does not exhaust/drain harmful gas or fluid because it uses full protecting structure, therefore, the machine does not give out harmful effects to the environment.

2 MATTERS NEEDING ATTENTION TO SAFETY PROTECTION

The machine is provided with some safeguards to prevent operator from injury or machine from damage. So Before operation of the machine, it is necessary to be acquainted with details on the all safety labels and the following regulations.

2.1 Requirements for the operators and the maintainers

- **The operators who operate the machine should have been trained and gain the certificate to operate the machine. The operators should read carefully the «Instruction Book for Operation» and well understand the content of it, master the skill before operating the machine.**
- **The maintainer who has gained the concerned certificate or has had professional ability should perform maintenance to prevent accidental events.**

2.2 Basic Operation Requirement

Danger：

- **Do not touch some devices; such as control board, transformer, motors, terminal block and other places as well as high voltage terminals, otherwise, it may cause shock.**
- **Never touch any switch with wet hand; it will cause shock, too.**

Warn：

- **Be familiar with the positions of emergency stop buttons so that to touch them immediately whenever they are needed.**
- **It is necessary to cut off the power of the machine before replacing fuse.**
- **Turn off the switch of main circuit immediately as soon as trouble occurs on power supply**
- **When two persons should do a job, every operation step should set a signal for coordination, and next step cannot be done unless the signal specified is given.**

Notice：

- **Recommended hydraulic oil, lubrication oil and grease or the oil having same functions as the recommend ones that are allowed should be used.**
- **The fuse, which has satisfied rated current value, should be used.**
- **Protect the operation panel or electric control panel from being attacked, otherwise, resulting in trouble to make device not work normally.**
- **Don’t change parameter value or other electric devices. If it must be changed, you should register the original value before change, so that it can recover to the original value when needed.**
- **Do not dirty nick or fall down any caution sign label. If the words on it are not clear or it is lost, order new one from our Works. And when you order it, write**

clear the part No. of it, please.

- **Enough working space should be given to avoid accident.**
- **Oil or water can make the floor slipping to cause danger. So, always keep the floor clean and dry.**
- **Confirm the switch you are going to use, don't mistake.**
- **Don't touch switches without any meaning.**
- **The worktable near the machine should be very strong and stable to prevent something from sliding down from it.**

2.3 Requirement prior to Switching on the Power Supply

Danger:

All cables, wires or coils whose insulating covers are damaged will cause current leakage or shock. So, check them carefully before use.

Warn:

- **It is necessary to understand all the details specified in the Instruction Book and Programming Manual, and make clear for every function and operation procedure.**
- **Wear the insulating shoes, overalls and other articles for safeguard.**
- **Close the doors and covers of NC unit, operation panel and electric control panel.**

Notice:

- **The cables used for electrifying switch and main circuit switch fitted for the machine should have enough section to meet the needs of requirements.**
- **The cables set on the floor must have the ability of chip proof to avoid shorts.**
- **After unpacking the wooden cases of the machine and before starting to operate it at first time make the machine to dry run for several hours, and oil the slip parts with new lubrication oil, the lubrication pump should continuously work until the oil seeps from chip scraper.**
- **The oil tank of the machine should be filled to the oil level, and check it, refill it when necessary.**
- **For lubricating point, the kind of oil and relative oil position, please refer to their sign labels.**
- **Every switch and operating lever should be nimble, smooth and their actions should be checked.**
- **When you supply power to the machine, switch on the factory electrifying switch, main circuit switch and power supply switch (make them at Positions "ON") on the operating pendant in turn. ***
- **Check the amount of coolant; add it when necessary.**

2.4 Requirement after Switching on the Power Supply

When the power supply switch in the operating pendant is set to ON (electrifying), (switch on in accordance with item "*") check if the indicator lamp READY (preparation) light or not.

2.5 Normal Inspection

Warn：

Never insert your finger in-between the pulley and belts when you check the tension of the belt.

Notice：

- **Check if the reading on the pressure meter is correct.**
- **Check if there is any abnormal noise comes from motor, gear box or other parts.**
- **Check the lubrication state of slide parts.**
- **Check if the safeguard device or protective cover is under good status.**
- **Check the tension of the belts. If they are too loose, replace them with new matchable ones.**

2.6 Temperature Raising

Notice：

- **When you raise the temperature of the machine, especially for spindle and feed shaft, the machine should run at half or one third of max. speed for 10-20 minutes in Auto mode so that make the machine reach the stable temperature.**
- **Automatic operation program of this machine controls all the actions of the machine, so every action of it should be checked.**
- **If the machine has been stopped for a long time, you would better not to start the machine with actual machining, thus, which damages the slide parts because of the lubrication is not sufficient. For this reason the machine parts may get heat expansion, to affect the machining accuracy. In order to avoid this situation the machine temperature should be raised.**

2.7 Preparation for Operation of the Machine

- **Tooling should accord with the technical parameters, size and type of the machine.**
- **New ones should replace excessively worn tools beforehand.**
- **For the convenience of safe check, the working area should have enough brightness.**
- **Tools or other things around the machine or equipment should be arranged in perfect order and easy to reach, the path is unlocked.**

- **Tools and other things cannot be put on the headstock, the cover of the turret or other similar positions.**
- **If the center hole of a heavy cylindrical workpiece is too small, the workpiece may skip out of the center when it is loaded, so, pay attention to the size and angle of the center hole.**

Notice:

- **The length of workpiece should be limited within the limitation specified range to avoid interference.**
- **When the tools were set, trial running should be performed first.**

2.8 Matters Needing Attention：

Danger:

- **Long hair should be covered with cap when operating the machine.**
- **Workpiece must be chucked tightly.**
- **Workpiece can be unloaded only when the tool and spindle are under stop status.**
- **During machining don't touch workpiece or spindle by hand or by other mode**
- **Do not open the door of machine during automatic machining.**
- **During heavy cutting, the hot chip may cause fire, so prevent the chip from congestion.**

Warn：

- **When operating the machine, operate the switches without gloves to avoid disoperation.**
- **Workpiece can be unloaded only when the tool and spindle are under stop status.**
- **Do not remove chip during machining.**
- **Do not operate the machine before the safeguard devices are not closed well.**

Notice:

- **When moving heavy workpiece, more than two people must work together to ensure safety.**
- **The operators of fork type lifter, crane or other similar equipment must have been professional trained and have gained certificate.**
- **Whenever operating the fork type lifter, crane or other similar equipment, great attention should be paid to avoid collide with other devices.**
- **The steel wire or hook being used for handling must have enough strength to satisfy the requirement of loading, and they must limited within the safe rules.**
- **Do not clean chip on the cutter by bare hand to use brush to clean it.**
- **The work of mounting and dismounting tools should be done only under status**

of the machine stop.

- **Operator should wear anti-gas mask when machining the workpiece made of magnesium alloy.**

2.9 Machining Interruption

Notice：

After machining, before the operator leave from the machine, turn off the switch of power supply on the pendant and switch off the main circuit switch.

2.10After Turning Job

Notice：

- **Do not do cleaning work before the machine stops.**
- **When the machining is ending, remove the chip and clean the door, window and cover.**
- **Back all parts of the machine to their original positions.**
- **Check the chip scraper; if it is damaged, replace it with a new one.**
- **Check coolant and lubricating oil, if the lubricating oil is very dirty, change it with new oil.**
- **Check the amount of coolant and lubricating oil, add them when necessary.**
- **Clean the oil filter of the water tank.**
- **Before you leave from the machine, turn off the power supply switch on the pendant, also turn off the main circuit switch and main switch of the machine.**

2.11 Safeguard Devices

- **Front and back protection device and coolant protection device.**
- **Overtravel limitation switch**
- **Protection device for chuck, tailstock and tool (NC software is set by user parameters).**
- **Store travel limit (NC software)**
- **Emergency stop button**

2.12 Preparation before Maintenance

Warn:

- **Any maintenance cannot be done without allowance**
- **Replacement of parts, wearing parts (seal, O-type ring, bearing, grease and oil) should be made according to preplan.**
- **Prepare record, preventive measures and correct maintenance method.**

Notice:

- **Carefully read and acquaint the safeguard devices specified in the INSTRUCTION BOOK.**
- **Read the INSTRUCTION BOOK carefully and thoroughly and acquaint the relative principle, structure and notices included in the Book.**

2.13 Maintenance Operation

Danger：

- **During the period of maintenance, anyone who has no relationship with the maintenance should not operate the main circuit switch or the power ON switch on the pendant, therefore a sign plate with "The machine is under maintaining, don't touch the switch" or with words similar to meaning should be hang on the switch or other suitable place. This plate should be easy to see and to pick off but uneasy to fall down.**
- **It's dangerous to maintain the machine with power on, usually the main circuit switch should be turn off during maintenance.**

Warn：

- **A professional maintainer should do the work of electric maintenance and the man should always get in touch with the chief, never make any decision by himself.**
- **Travel limit device, approach switch or interlock devices cannot be dismounted or modified.**
- **In order to ensure the ladder or the lifter used for altitude work must be maintained and controlled every day.**
- **Fuses and cables used for the machine should be certificated products.**

2.14 Handling after Maintenance

Warn:

- **After maintenance is finished, the working place should be cleaned and rearranged, the oil, water on every part should be cleared away to get a good working ambience.**
- **Take the dismounted parts and dirty oil far away from the machine to keep safety.**

Notice：

- **Maintainer should check if the operation of the machine is safe.**
- **Register and keep all the data of maintenance and inspection for later use.**

2.15 Miscellaneous

- **Max allowed loading of the machine:**
  Power： **11 kW**
  Torque： **1047 N.m**
  Cutting force: **4736 N**
- **When the chuck running at high speed, the jaws must clamp a workpiece to avoid being threw off from the chuck!**
- **The maximum speed of the machine is not more than 360r/min when equipped with 4-jaw chuck, face plate or 3-jaw chuck of ϕ500.**

3 HANDLING AND INSTALLATION

3.1 Delivery and Preserve of machine

The protection door should be first fixed when the machine is transported. (On both sides under the protection door there are two screw holes of M6. Make the screws of M6×30 of the dog on the guideway be fixed with the protection door. And the pieces, on the edge of the protection door, used for transportation make the door be connected and fixed with the rear protection position).

Anti-rust obturate package and some relevant anti-shake anti-strike methods have been adopted in packing process of the machine. It can endure the delivery and storage temperature from -25°C to +55°C, and it also can endure the temperature up to 70°C in 24 hours when delivered and stored.

3.2 Handling of Machine

See Fig. 1, Fig. 2 and Fig. 3 for handling the machine.

Notice:

During handling, a great attention should be paid to avoid the NC system and high-pressure switch board to be shocked. Before handling the machine, check if every part is stable or movable, whether there is article, which is not allowed to be put on the machine.

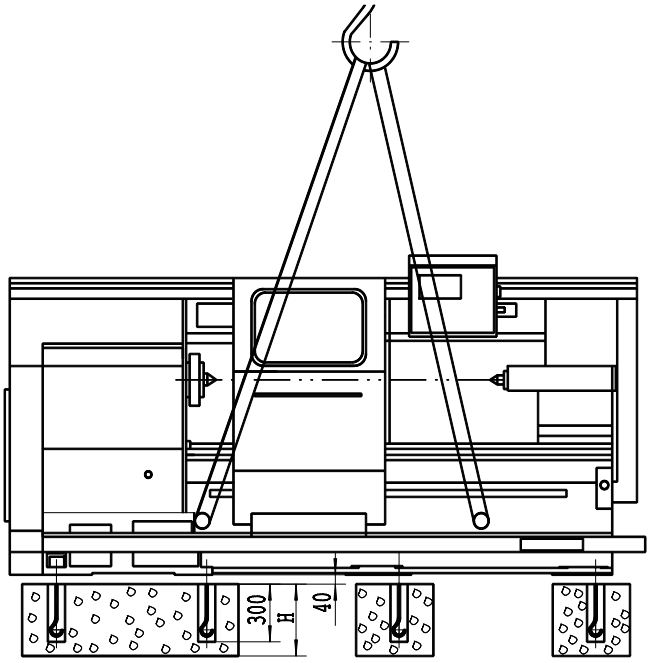
The requirements mentioned below should be followed during handling the machine:

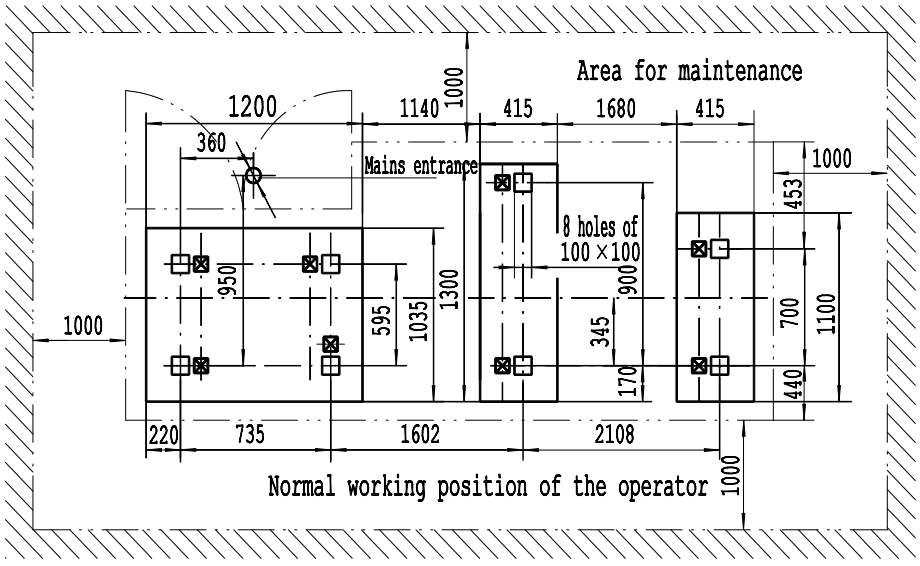
To lift the case with machine inside by a crane, strong steel wire rope should be looped in the rope marks printed on the case. When transporting and unloading the case, protect the bottom and the side surface from bumping and shocking. It is not allowed to slant the case excessively to avoid affecting the accuracy of the machine and cause damage. If rolls are used for the transport of the case, it is important that the inclination of condition of the slips should not exceed 15° and the diameter of the rolling rod should not be more than 70mm. Never place the case on a prismatic body or upside down to avoid accuracy of the machine to be affected.

When the machine is unpacked, first inspect its exterior condition and check attachments and tools according to the “Packing List”

When using a crane lifts the unpacked machine, make the steel wire rope pass through the first and the third rib holes on the front of the bed (see Fig.1, Fig. 2 and Fig. 3) and by the help of the carriage and the tailstock to balance the machine to be lifted. Before the machine is lifted, wooden blocks should be padded between the strong steel wire rope and the machine or the steel wire ropes are slipped with rubber pipes to prevent the machine and the protection plate from scratching.

- The machine should be kept balance in both horizontal and vertical during handling, so, it is just departing from the ground when the machine being handled up that the machine should be kept balance.
- The angle of the handling rope is not more than 60° .
- Whenever more than one person carries out the handling work, signals should be used between each other for coordination.

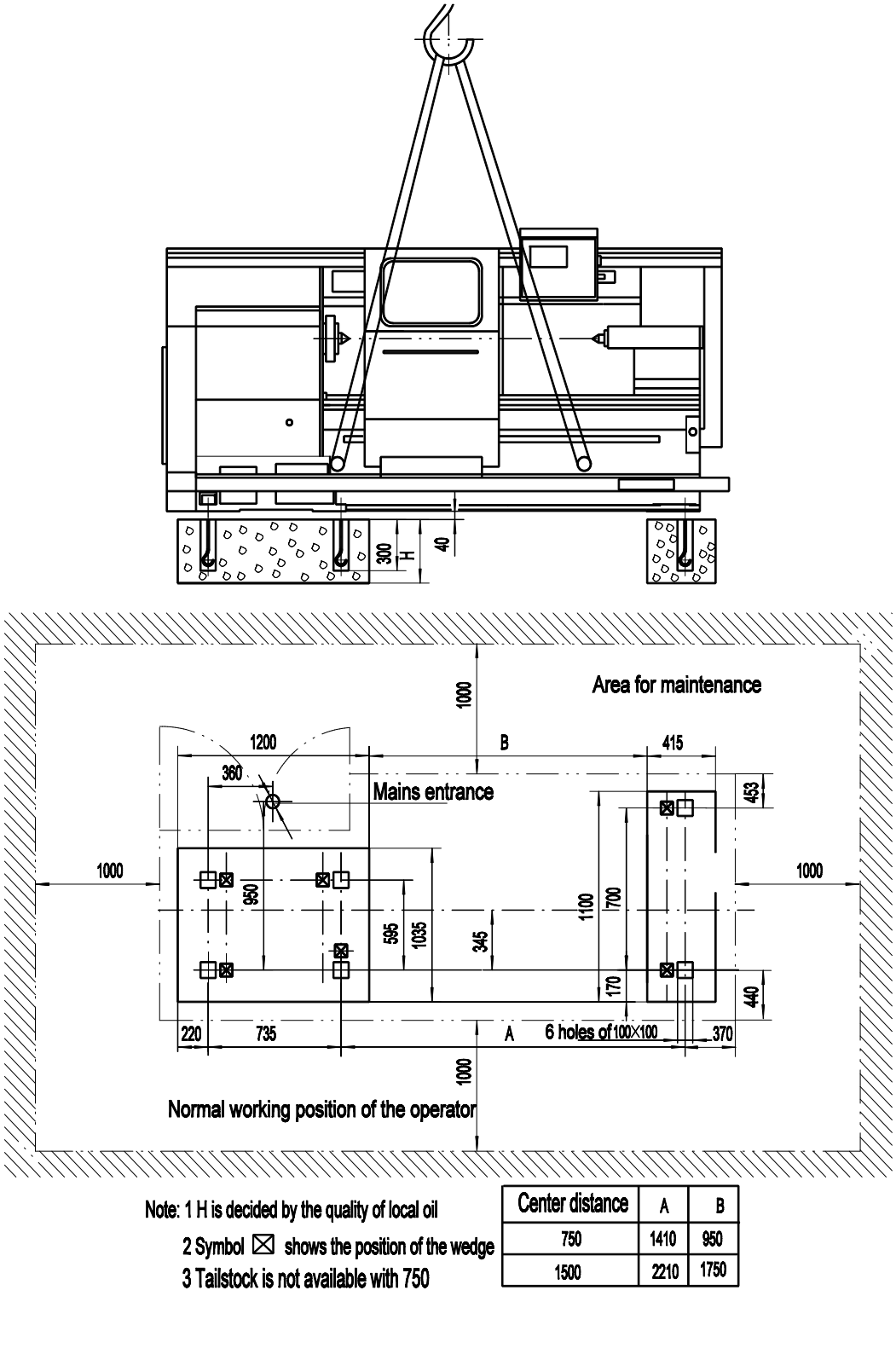




Note: 1. "H" is decided by the quality of the local soil

2. Symbol ⊠ shows the position of wedge

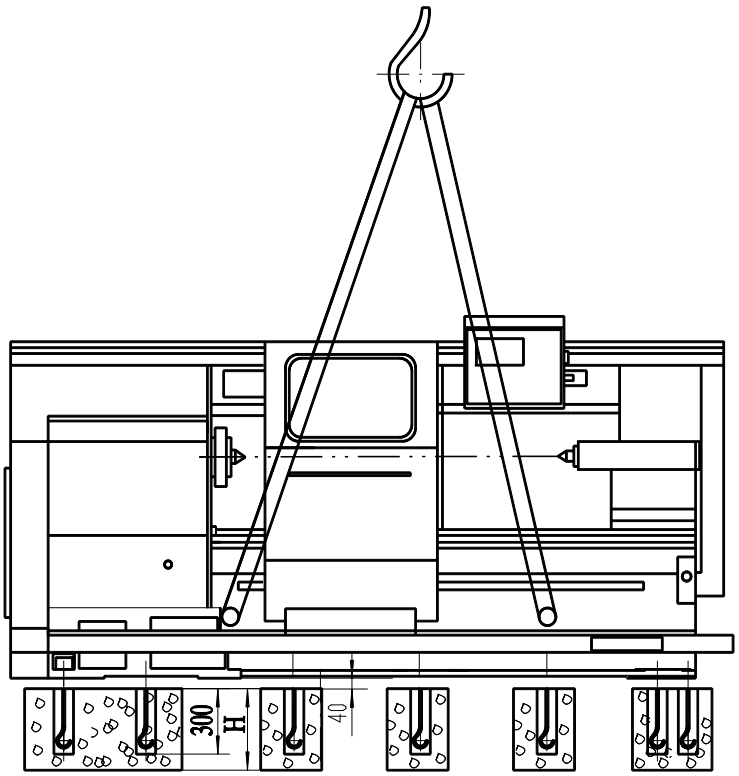
Fig. 1 Foundation plan and handling schematic for the machine of 3000

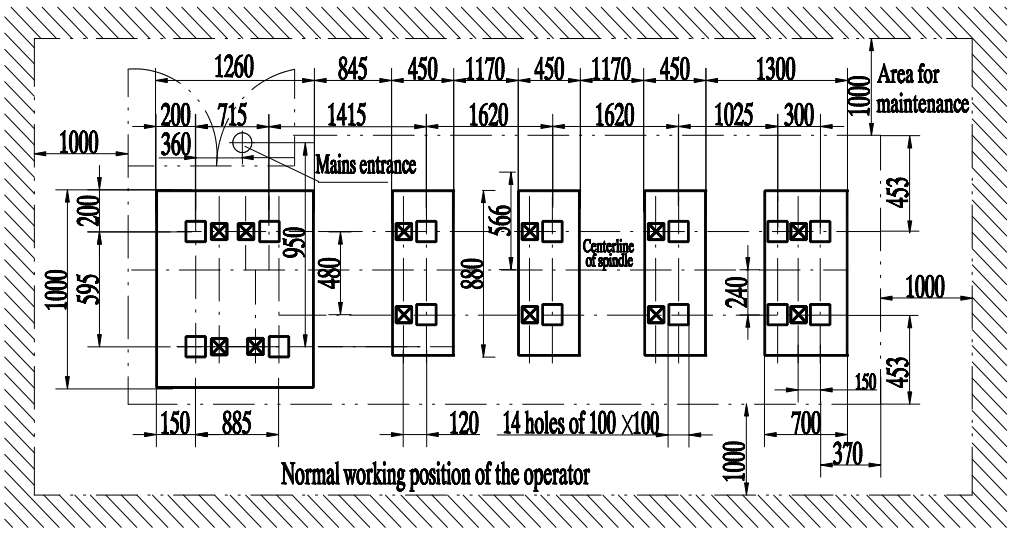


Note: 1 H is decided by the quality of local oil
2 Symbol ⊠ shows the position of the wedge
3 Tailstock is not available with 750

Center distance	A	B
750	1410	950
1500	2210	1750

Fig. 2 Foundation plan and handling schematic for the machine of 750 and 1500





Note: 1 His decided by the quality of local soil

2 Symbol ⊠ shows the position of the wedge

Fig. 3 Foundation plan and handling schematic for the machine of 5000

3.3 How to Install the Machine

The performance of a machine is greatly influenced by the installation way. If the guideway of a machine is precisely machined, the original accuracy cannot be reached due to the reason of bad installation of the machine. And most troubles of the machine were caused by this reason.

Read the installing procedure carefully, and install the machine according to the requirements specified, so that the machine can perform high precision machining.

3.3.1 Preparation for Installation

3.3.1.1 Ambient Requirement (for machine side)

Machine shouldn't be installed in the positions listed below:

- The ambient temperature can obviously change. For example, the machine's installing position is closed to the heat resource or there is a heat resource near the machine.
- Over wet place.
- Too dust, too dirty place.
- Near the vibration resource.

Notice：

- If the machine has to be installed near the position with vibration resource, dig a canal around the machine or make similar measures for anti-vibration.
- If the machine has to be installed on the soft soil, it is necessary to use the pile way or similar measures to increase the force of support of the soil, so that the machine will not sink or incline. The floor for installing the machine is not strong enough or soft.

3.3.1.2 Ambient Requirement (for NC side)

- Ambient temperature: (under working condition) 5~40 ºC
- Humidity: normal relative humidity is lower than 75%

3.3.1.3 Entrance of Power

Terminal block is located inside the front leg of the machine.

3.3.1.4 General Power Supply

Prepare the power supply cable and grounding wire according to main power supply specified by the Parameter List. For the details please refer to 《INSTRUCTION BOOK for Electric Unit》.

3.3.2 Installation

3.3.2.1 Foundation

For machine installation, a plane installation place should be first found, then determine the installation space and prepare the foundation according to the Foundation Plan and ambient requirements.

For floor space of machine itself and machine maintenance, it is specified in Foundation Plan. See Fig. 1, Fig. 2 and Fig. 3.

3.3.2.2 Temporary leveling

- Lift up the machine and put the foundation bolts and pad irons into the boltholes for leveling.
- Put down the machine slowly to make the foundation bolts come into the foundation holes according to the stipulations given by the Foundation plan.
- Beat the wedges into the bottom of the bed for temporary leveling to obtain rough adjustment.
- Fix the foundation bolts with cement after rough adjustment.
- If the anti-vibration wedges are used, they can be directly put on the plane cement made floor.

3.4 Inspection of Inner Devices Connection

After the leveling, the following preparation work should be done before switch on the machine:

- Be sure that grounding wire connected correctly (the installation resistor shall be less than 10Ω).
- Tighten the screws on terminals.
- Check again if couplings are tightly connected.
- Re-check the connection of the each connector and make sure that they are well connected.
- Make sure that the printed wiring boards in NC device are firmly fixed.
- Make sure that input power supply is in correct phase. And if the phase order is wrong, troubles may occur to NC device and AC transition control panel.

3.5 Inspection before Operation

After connection of inside devices, check the mechanical system and electrical system of the machine according to the following rules.

- Cleaning

  Sliding surfaces and metal parts surfaces of the machine were covered with a film of rust preventive and masked with a plastic film for antirust. Some dust, sand or other

dirty things may come into it during transportation, so, before starting the machine, clean out this rust preventive.

Cleaning them with cloth dipped with cleaning oil. After cleaning, cover them with a film of lubrication oil.

- Inspection of Machine:
  - ◆ Check if any part of the machine has been damaged.
  - ◆ Check if any part or attachment has been lost.
  - ◆ Check if every part has been lubricated by lubricating oil or hydraulic oil well.
  - ◆ Check if all the hydraulic pipes have been connected well.
- Check electrical system before / after switch on (Refer to the Section 2 Matters Needing Attention to Safety Protection in this INSTRUCTION BOOK).
- Matters needing attention when the machine is under the condition of stopped for a long term:
- When the machine is started first time after installation or after a long term of unused, starts it with enough lubrication on the slide surfaces.

3.6 Final Adjustment of Bed Level

When the cement in the foundation holes is solidified, adjust the level by leveling bolt and arrange the leveler according to the rule of "temporary level adjustment". For the steps and tolerances of leveling, refer to "Accuracy Testing Certificate" attached with the machine.

Note:
After leveling, leveling nuts and foundation bolts should be firmly tightened to ensure the level accuracy unchanged. The minimum scale of the used leveler is 0.02mm.

3.7 Maintenance and Inspection of Inner Devices Connection after Installation

3.7.1 Maintenance of Primary Period after Installation

For the primary period after the machine installation, the level of the machine bed will change obviously for reasons of unstable solidifying of the surface and the solidification of foundation are not steady, so that the accuracy of the machine will be greatly affected. On the other hand, the machine is very easy to be polluted by primary wear, very easy to result in machine trouble.

Now we describe some measures that should be used for primary period service after installation.

- Trial-run

For first time trial-running, it should be carried out with great care, the time of

trial-run is about 1 hours, and heavy load cannot be used during trial-run.

- Check the bed level in the primary period

  Check the bed level after the machine is installed for six months; check the situation of foundation once a month at least. If any un-normal phenomenon was found, correct it to reach the specified requirement so that the accuracy of the bed level can be ensured.

- After six months, the checking period can be extended according to the situation of practical change. When it reaches to certain steady, the checking period can be set for once or twice a year.

3.7.2 Check the Connection of Inner Devices

Check NC device, main machine, hydraulic device control panel and other devices to make sure that their electric connection is correct.

- Check if connectors are connected tightly.

  Check if electric connectors between devices are tight; tighten them when necessary.

- Check if terminal screws are connected well

  Check machine interface and the terminal screws of electric equipment on control panel, if any of them is loose; tighten them according to the requirement.

- Check if the terminal screws or installing screws on micro-switch are loose, tight them when needed.

3.7.3 Check Electric Control Panel

Before checking the electric control panel, switch off the power supply of the machine. Then check every part of it.

- Terminal screw and welding elements

  Check every terminal screw on electric equipment, tighten them when loosen, softly pull the weld element on relay board to make sure they are welded well.

- Fuse of plug-in type

  Check the cover of fuse, tight it if it is loose.

- Arc-extinguisher

  Check every arc-extinguisher; replace them when their color changed.

- Cleaning

When some dust, chip or other dirty things were inside the electric control panel, clean them out carefully; otherwise, they may cause trouble.

- When the air filter become black that means it was polluted, dismount it and clean it softly with water.

3.8 Floor Space and Foundation Plan

Refer to Fig. 1, Fig. 2 and Fig. 3.

4 SPECIFICATIONS OF THE MACHINE

4.1 Explanation to the Specification

This machine has some different sizes and types. Before reading the manual, make sure which type is your machine.

Table 1 Main Specifications

Type of the machine	CAK63b	CAK63c	CAK63d	CAK63e	CAK63f
Control system of the machine	SMTCL-NC100	SIEMENS 802D	FANUC 0i-mate	SIEMENS 810D	FAGOR
Specifications of the machine	750 1500 3000	750 1500 3000	750 1500 3000 5000	1500 3000	3000
Max. length of workpiece (mm)	750 1500 3000	750 1500 3000	750 1500 3000 5000	1500 3000	3000
Max. turning length (mm)	600 1350 2850	600 1350 2850	600 1350 2850 4850	1350 2850	2850
Max. swing dia over bed (mm)	Φ 630				
Max. turning dia. over slide (mm)	Φ 350 ※				
Type and code of spindle nose	D11 or A_2-11				
Front taper hole of spindle (mm)	Φ 120				
Spindle bore diameter (mm)	Φ 104				
Range of spindle speed (r/min)	17-128；38-278；75-570；170-1000				
Step of spindle speed	4steps; stepless				
Output power of spindle motor (kW)	11				

Type of the machine		CAK63b	CAK63c	CAK63d	CAK63e	CAK63f
Center height	From bed	315				
	From floor	1110				
Type of motor for X-axis		HC202	1FK7083	β12/2000iS	1FK7083	FXM53.20F
Torque of motor for X-axis (N.m)		9.55	8	11.5	8	11.9
Type of motor for Z-axis		HC352	1FK7101	β22/2000iS	1FK7101	FXM73.20F
Torque of motor for Z-axis (N.m)		16.7	27	22	27	20.8
Rapid moving for X-axis (mm/min)		4000				
Rapid moving for Z-axis (mm/min)		8000				
Travel of X-axis (mm)		320				
Min. setting unit for X-axis (mm)		0.0005				
Min. setting unit for Z-axis (mm)		0.001				
Diameter of tailstock sleeve (mm)		100				
Travel of tailstock sleeve (mm)		250				
Taper of tailstock sleeve hole		Morse No. 5				
Form of turret		Vertical 4-station; Vertical 6-station; Horizontal 6-station; Horizontal 8-station				
Index time of turret (s)		3.75;	5.4;	0.4;	0.4	
Size of tool shank (mm)	Outside dia.	32×32				
	Inside dia.	32×32				

Type of the machine	CAK63b	CAK63c	CAK63d	CAK63e	CAK63f
Form of protection	Enclose protection (for machines of 750 and 1500)	Enclose protection (for machines of 1500)	Enclose protection (for machines of 750 and 1500)	Enclose protection (for machines of 1500)	
	Full-protection				

Note: In case the form of the turret is horizontal 8-station or horizontal 6-station, the value with symbol "※" is ϕ 310.

Table 2 Other Specifications

Type of machine	750		1500		3000	5000
Weight of machine (kg)	3750		4000		5000	6500
Load weight (t)	1.5		2		2.5	3
Overall dimensions of machine (mm)	Full protection	Enclose protection	Full protection	Enclose protection	5100×1600×1810	7290×11650×1810
	2800×1690×1740	2890×1693×1715	3600×1690×1740	3890×1693×1715		

5 CONSTRUCTION OF THE MACHINE

5.1 Layout of the Machine

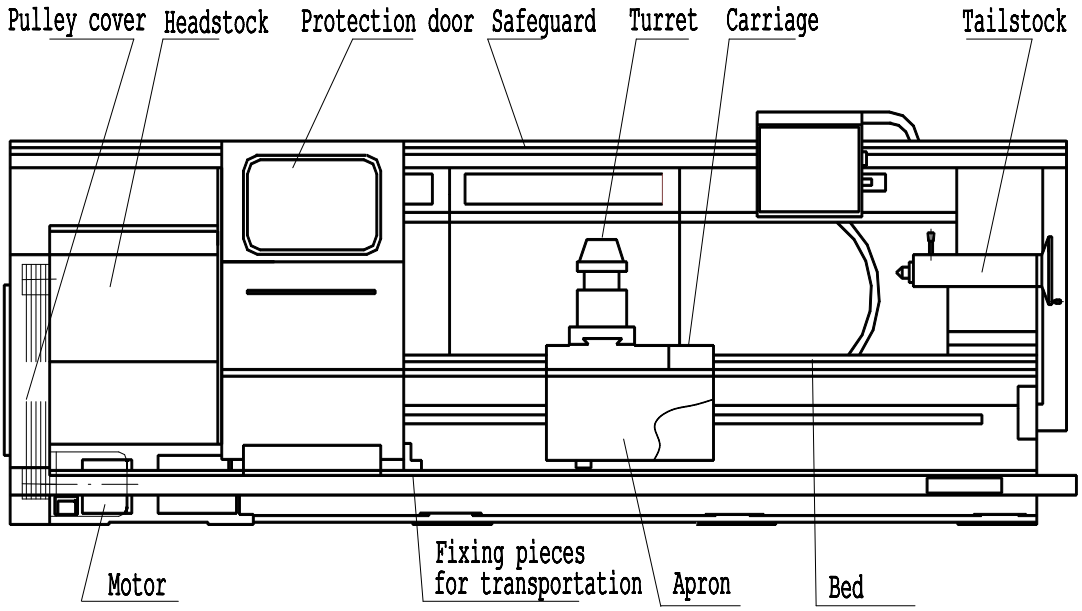


Fig. 4 Layout of machine

5.2 Brief Introduction to Parts of Machine

5.2.1 Headstock (Spindle Box)

- Drawing of main driving system of machine of frequency conversion (See Fig. 5)

  The main driving is transmitted from the gear 1 on shaft I to the gear 3 on shaft II, then, to the gear 7 on shaft III through the gear 5 and to the gear 10 on shaft IV through the gear 9. This driving chain is middle speed;

  The main driving is transmitted from the gear 1 on shaft I to the gear 3 on shaft II, then, to the gear 8 on shaft III through the gear 6 and to the gear 10 on shaft IV through the gear 9. This driving chain is high speed;

  The main driving is transmitted from the gear 2 on shaft I to the gear 4 on shaft II, then, to the gear 7 on shaft III through the gear 5 and to the gear 10 on shaft IV through the gear 9. This driving chain is low speed;

  The main driving is transmitted from the gear 2 on shaft I to the gear 4 on shaft II, then, to the gear 8 on shaft III through the gear 6 and to the gear 10 on shaft IV through the gear 9. This driving chain is middle speed;

  The machine is of 4-step stepless changing speed. The driving calculations of various revolution speeds of each step are calculated as follows：

$$a: 1460 \times \frac{138}{238} \times \frac{41}{55} \times \frac{18}{61} \times \frac{29}{55} = 93 r/\min$$

$$b: 1460 \times \frac{138}{238} \times \frac{41}{55} \times \frac{51}{41} \times \frac{29}{55} = 414 r/\min$$

$$c: 1460 \times \frac{138}{238} \times \frac{24}{72} \times \frac{18}{61} \times \frac{29}{55} = 42 r/\min$$

$$d: 1460 \times \frac{138}{238} \times \frac{24}{72} \times \frac{51}{41} \times \frac{29}{55} = 185 r/\min$$

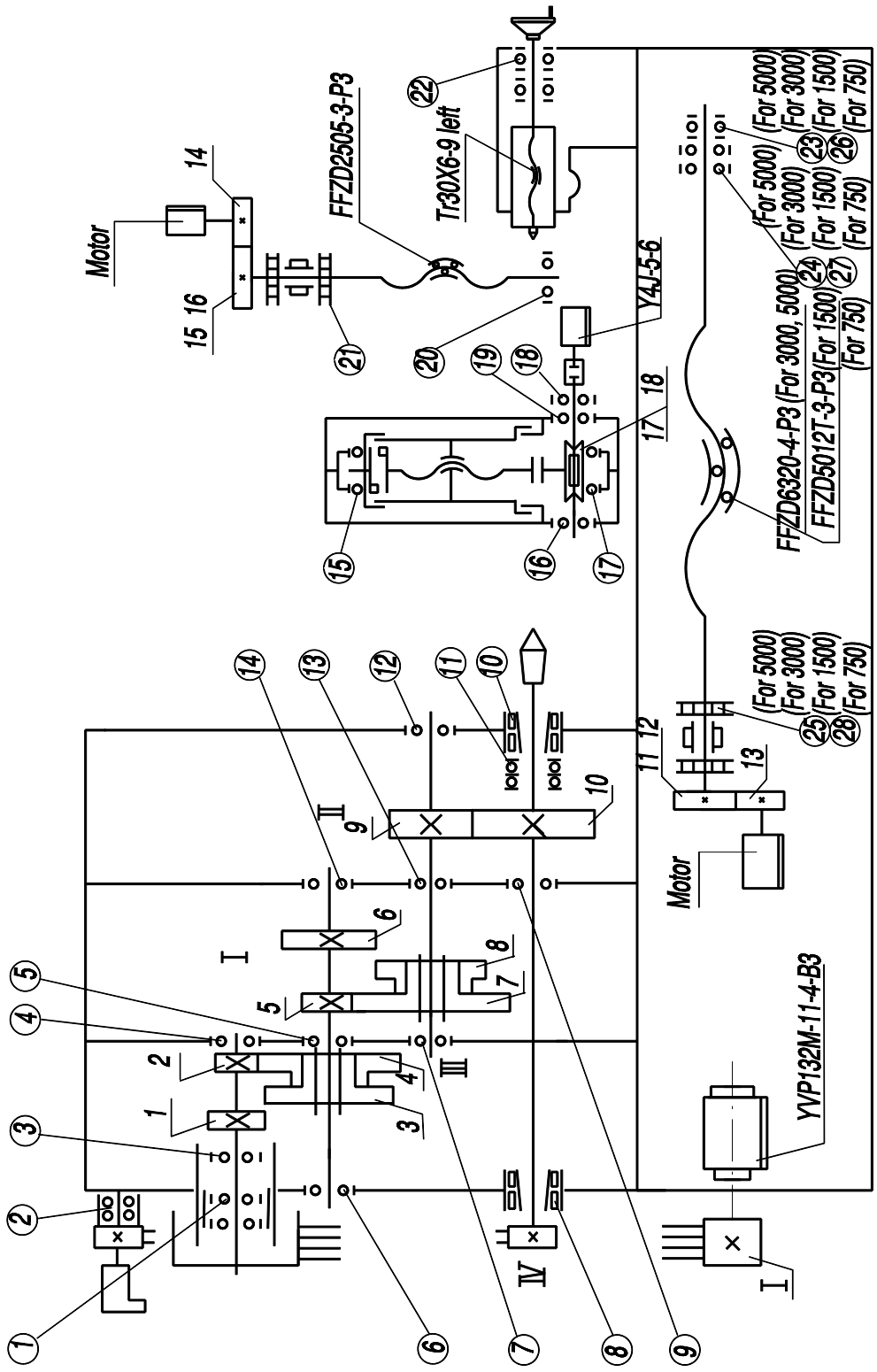


Fig. 5 Main driving system of machine

Table 3 Table of Gears

No.	Number of Teeth	Module	Deflection Coefficient	Part Number
1	41	2.5		A63-02154L
2	24	2.5		A63-02155L
3	55	2.5		A63-02168L
4	72	2.5		A63-02169L
5	18	3.5		A63-02170L2
6	51	3		A63-02171L
7	61	3.5	-0.07	A63-02172L2
8	41	3		A63-02173L
9	29	4.5	0.57	A63-02175L
10	55	4.5		A63-02180L
11	42	2.5		A63-01004L
12	42	2.5		A63-01005L
13	21	2.5		A63-01002L
14	28	2		A63-05005L
15	35	2		A63-05028L
16	35	2		A63-05029L

Table 4 Brake

No.	Type
1	LL10-18-4

Table 5 Table of Bearings

No.	Size and Type		Qty.	No.	Size and Type		Qty.
1	55×90×18	E111	2	15	40×60×13	8108	1
2	30×55×13	E106	2	16	25×47×12	46105	1
3	40×90×23	E308	1	17	45×65×14	8109	1
4	30×72×19	E306	1	18	25×47×12	105	1
5	40×80×18	E208	1	19	25×47×12	46105	1
6	35×80×21	E307	1	20	24×42×12	D246104	2
7	45×100×25	E46309	1	21	25×57×50	ZARN2050TN	1
8	130×200×52	D3182126	1	22	30×52×16	8206K	1
9	140×210×33	E128	1	23	35×62×18	D8207	1
10	160×240×60	C3182132	1	24	40×68×15	D108	2
11	170×215×34	D8134	2	25	40×75×54	ZARN4075TN	1
12	45×100×25	E46309	1	26	30×52×16	D8206	1
13	55×100×21	E46211	1	27	35×62×14	D107	2
14	30×72×19	E306	1	28	35×70×54	ZARN3570TN	1

5.2.2 Chuck

Standard chuck of this machine is manual chuck.

We can offer hydraulic chuck and face plate according to the requirements of the user.

Hydraulic chuck is connected with rotation-oil-cylinder by link rod, the piston inside hydraulic cylinder moves to the direction of chuck and to make the jaws of the chuck release through the wedge type structure, and the jaws will close when the piston returns back, rotation-oil-cylinder is composed of cylinder body, check valve and rotating conjunction. The check valve will keep the constant pressure inside the cylinder when the oil pressure goes down unusually because of the trouble of pressure resource. The structure of the jaws must suit the shape of the workpiece chucked. Some limitations were specified for ensuring the safety, high accuracy and using period of the chuck. Also we give some matters needing attention for operating the chuck correctly, so please refer to Operation Manual for chuck.

Notice: Never run the chuck while there is no workpiece being clamped, and otherwise, the jaws may be thrown out, resulting in personnel injury.

5.2.3 X-axis and Z-axis

The carriage is driven to move along Z direction by Z-axis motor through ball screw rod, the tool post on the carriage is driven to move along X direction of the carriage by X-axis motor through ball screw rod.

Principle of zero point reset

Within the moving area of turret, there is a reference position called zero point of the machine. The coordinate system of the machine set by NC device takes this zero point as a reference point to realize the control of turret moving. The servo system for the two axes adopts encoder for absolute position which has memory function. The machine has go through return to zero point and the mechanical coordinate system for mechanism has been set up which can store the memory by encoder. So the user need not return to zero point every time after switch on the machine. If the reference position has been lost because of the lost of the voltage of the battery or the relative position between the servo motor for X/Z axes and ball screw rod for X/Z axes has been changed when maintaining the machine (mechanical coordinate system has been changed), the reference position should be set up again even if the machine may not give an alarm. For the method of setting up, please refer to INSTRUCTION BOOK for Electrical Unit.

5.2.4 Turret

The turret of the machine is series SLD170 vertical turret that is designed by our factory. It doesn't need to rise up for indexing, the time for indexing is very short and positioning is very accurate. It adopts inner type cooling. And it’s available for both 4-station and 6-station. For details of operation and maintenance, please refer to SLD170-INSTRUCTION BOOK. 04 06

Programming: Stop supplying of coolant when the turret is indexed.

It's also available for 6-station/8-station horizontal turret according to the user's requirements.

5.2.5 Tailstock

The machine's standard disposal is manual tailstock and hydraulic tailstock is optional.

The manual tailstock is the same as the one used in the universal lathes, it is locked to the bed by the principle of eccentricity, and by help of turning handwheel by hand to make the leadscrew drive the tailstock can obtain main shaft advancing and retreating of the tailstock main shaft.

Advancing and retreating of the hydraulic tailstock and pneumatic tailstock are realized according to the principles of hydraulic and pneumatic. The limit switch used by the tailstock base body can prevent the carriage from bump with the tailstock.

5.2.6 Hydraulic System

- The hydraulic system of the machine consists of oil tank, oil pump, operating plate and hydraulic valves, etc. The system is used to control changing speed of oil cylinder of the machine and lubricate the gears and the bearings in the headstock.
- The oil tank is placed within the front bed leg, it is seen when the protecting cover on the rear of the machine is opened. There is a oil lever indicator and filling oil hole on the top of the oil tank and the draining oil hole on the bottom of the tank. The oil tank uses net YA-N46 hydraulic oil; the oil filled should be up-to the highest oil level of the tank when filling oil. The oil level in the tank should regularly be checked to prevent the machine from un-function due to too less oil. After the first work for 3 months renewing oil and cleaning the oil tank and the filter should be done, later, do once every year.
- The oil supply is pumped to the hydraulic control plate placed inside the protection door on the left of headstock by means of the small flowing gear pump CB-B6 (Only is reverse running allowed.) driven by the motor Y802-4. Normal working pressure is of 0.8-1.5Mpa. The plate is provided with two reversing slide valves, one spill valve and pressure meter, etc. by help of the pressure meter you can observe adjusted pressure of the spill valve.
- Pressure oil controlled by the valves flows into the oil cylinder in headstock through oil pipes, which can generate 5 kinds of action, The MRF-02P-1-20 spill valve supplies lubricating oil for headstock. Returning oil is returning into the oil tank through the two nylon pipes front-under headstock.
- For the principle of the whole hydraulic system, refer to the hydraulic principle diagram (Fig. 6).
- It should be remedied on time when trouble occurs in the system. For example, the pressure is low or no pressure, check if the adjustment of the spill valve is proper, the inlet of the oil pump is blocked or air is sucked in as well as the motor is running in correct direction. If the oil cylinder does not work or its peed is too slow by reason

that oil flowing is not fluent or not enough, check if there is leakage or blocking. If automatic cycle cannot be realized in working, check if control signal is correctly sent out or performed and the pressure relay is abnormal or there is other electrical reason and also check if the electromagnet core is blocked by dirt.

- Table 6 Table of Hydraulic Component (Oil tank, pipe line and Control plate)

Name	Type	Specification	Qty.	Remarks
Oil filter	WU 63×100J		1	
Pressure filter	XU-40×200	Pipe type	1	
Gear pump	CB-B6	Reverse rotating	1	
Motor	Y802-4 (B3)	0.75kW	1	
Anti-vibration manometer	Y-60-Z-IV (Axial manometer)	6 MPa	1	
Spill valve	MRF-02P-1-20		1	
Solenoid valve	SWH-G02-C2-D24-20		1	
Solenoid valve	SWH-G02-C7SB-D24-20		1	

- Hydraulic chuck and Hydraulic tailstock (Optional)

  Users can provide the machine with hydraulic chuck and hydraulic tailstock for option.

  Independent hydraulic oil tank takes charge of supplying oil for hydraulic chuck and hydraulic tailstock. The hydraulic control valves are mounted on the cover of the oil tank in overlaid way, having compact in structure and convenient for installation.

  ◆ Major specifications of hydraulic system

  Hydraulic motor： Y90L－4（B5） 1.5kW 1500 r/min

  Hydraulic pump： VPVC－F20－A2－02 Discharge capacity: 11ml/r

  Range of pressure adjustment： 1.4～3.5MPa

  Volume of oil tank： 90L

  Pressure of hydraulic system： 2.5MPa

  Overall dimension of oil tank： 600 mm × 460 mm × 800 mm

  ◆ Hydraulic transmission principle

  Hydraulic chuck and hydraulic tailstock are equipped, refer to the Principle diagram Fig. 7. For hydraulic chuck, refer to Fig. 8, and hydraulic tailstock, refer to Fig. 9.

  ◆ Oil resource

  The hydraulic system adopts VPVC conversion blade pump made by Taiwan

Northman Company. This kind of pump is characterized by low noise and stable performance. Practical flow rate of the pump can be adjusted according to speed of the chuck. The rated pressure of the pump is 3.5 Mpa and the working pressure is 2.0-3.0 Mpa. The pump uses HL46 hydraulic oil.

◆ Return of the chuck

The circuit of the chuck is consists of check valve, relief valve, solenoid valve and pressure relay. The check valve MC-02P prevents the clamping circuit from interference with other circuits.

The relief valve MPR-02P is used for adjusting the clamping pressure according to requirements of work. The normal adjusting range is of 1.2-2.5Mpa. The electromagnet YV1 energizing, the chuck is chucking and YV2 energizing, the chuck is un-chucking.

After workpiece is clamped, the pressure relay sends signal. Refer to the Action table of the principle diagram. During turning if the pressure gets down due to reason of the system's trouble, the pressure relay is going to send an alarm signal, the machine stop working.

◆ Return

The circuit of the tailstock is consists of relief valve, two-way restrictor and one check valve, electromagnetic reversing valve and pressure relay. The relief valve is used to adjust the pressure of tailstock and its pressure is depending on the need of work and its adjusting pressure range is of 1.0-2.0MPa. The tightening speed is adjusted by the restrictor MT－02W, when the electromagnet YV3 is energizing, the tailstock is tightening, then, the pressure relay sends a signal of the tailstock tightening. When YV4 energizing, the tailstock is returning. Refer to the Table of action of the principle diagram. During turning, if the pressure gets down due to reason of the system's trouble, the pressure relay is going to send an alarm signal, the machine stops working.

● Maintenance of the hydraulic system

◆ The hydraulic system uses HL46 hydraulic oil, and the oil should be periodically changed according to the usage.

◆ Check often the oil inside oil tank, and add it when it's lower than the oil level.

◆ When adding the oil into the oil tank, the oil must go through the air filter.

◆ Check and change the oil suck filter periodically inside the oil tank.

◆ If abnormal noise or vibration occurs from the hydraulic system, inspection and maintenance must be done at once.

- Table 7 Adjusting value of hydraulic system parameter (Chuck, Tailstock)

Name	Adjusted Element	Adjusted Value
System pressure	Pump VPVC－F20－A2－02	2.0 MPa (2.0～2.5 MPa)
Chuck clamping Pressure	Relief valve MPR－02A－K－1－20	1.5 MPa (1.2～2.5 MPa)
Clamping signal	Pressure relay PS－70 (SP1)	Same as the relief valve of the chuck
Tightening pressure of the tailstock	Relief valve MPR－02P－K－0－20	1.0 MPa-2.5 MPa
Tightening signal	Pressure relay PS－70 (SP3)	Same as the relief valve of the tailstock
Chuck speed	Max. flow quantity of the pump	Depending on need
Tailstock speed	Restrictor MT－02W－K－20	Depending on need

- Table 8 Hydraulic elements (Chuck, Tailstock)

Name	Type	Remarks	Manufacturer
Hydraulic pump	VPVC－F20－A2－02		Taiwan Northman Company
Check valve	CI－T－03－05－10		Taiwan Northman Company
Check valve	MC－02P－05－0－20		Taiwan Northman Company
Relief valve	MPR－02P－K－0－20		Taiwan Northman Company
Restrictor	MT－02W－K－20		Taiwan Northman Company
Magnetic valve	SWH－G02－D2－D24－20		Taiwan Northman Company
Pressure relay	PS－70		Taiwan Northman Company
Air filter	AB－1163		Taiwan Northman Company
Pressure gauge	Y－60－Z (Ⅲ) 6 MPa		Taiwan Northman Company

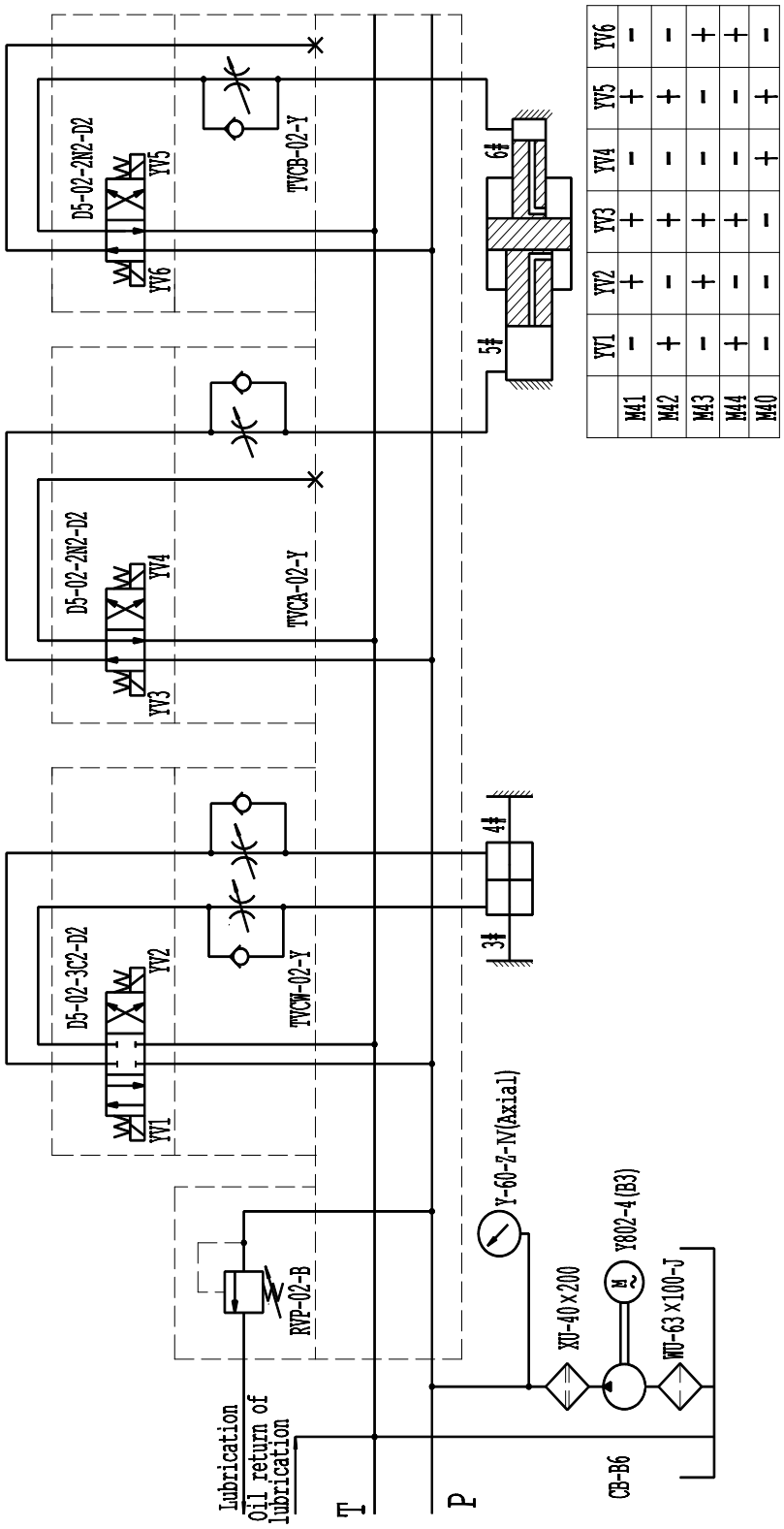


Fig. 6 Change speed of spindle and lubricating principle

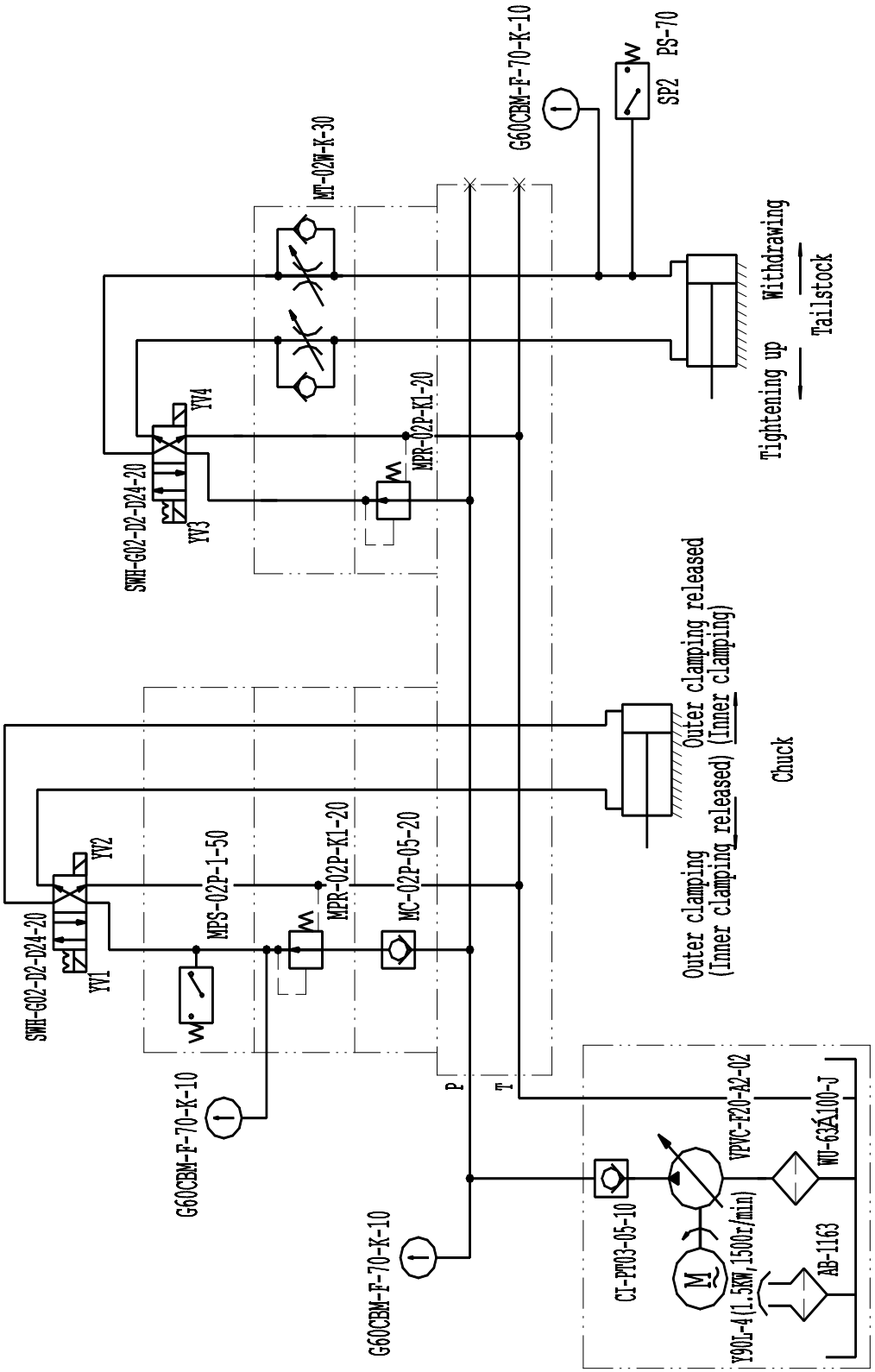


Fig. 7 Principle of hydraulic chuck and tailstock

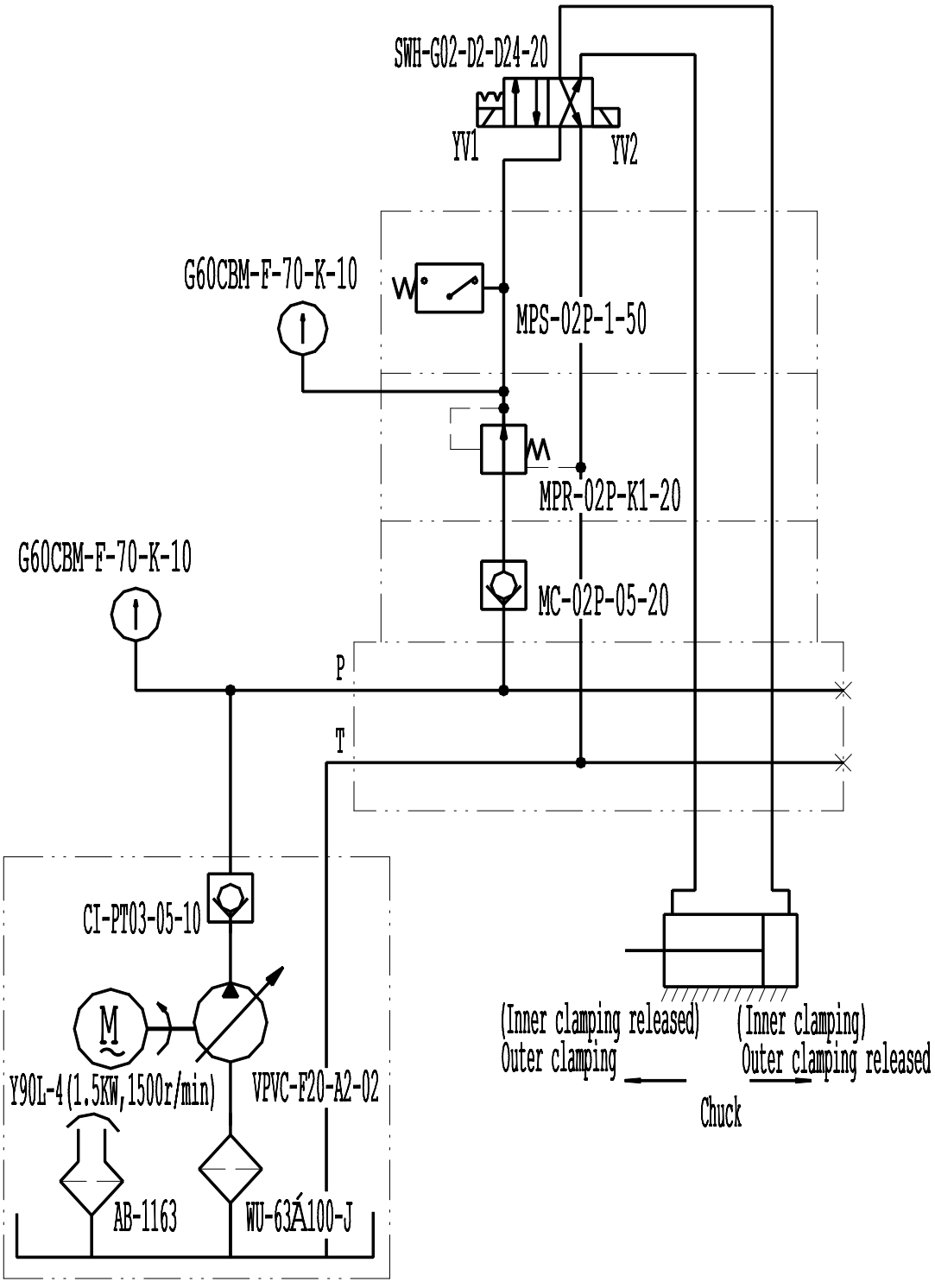


Fig. 8 Principle of hydraulic chuck

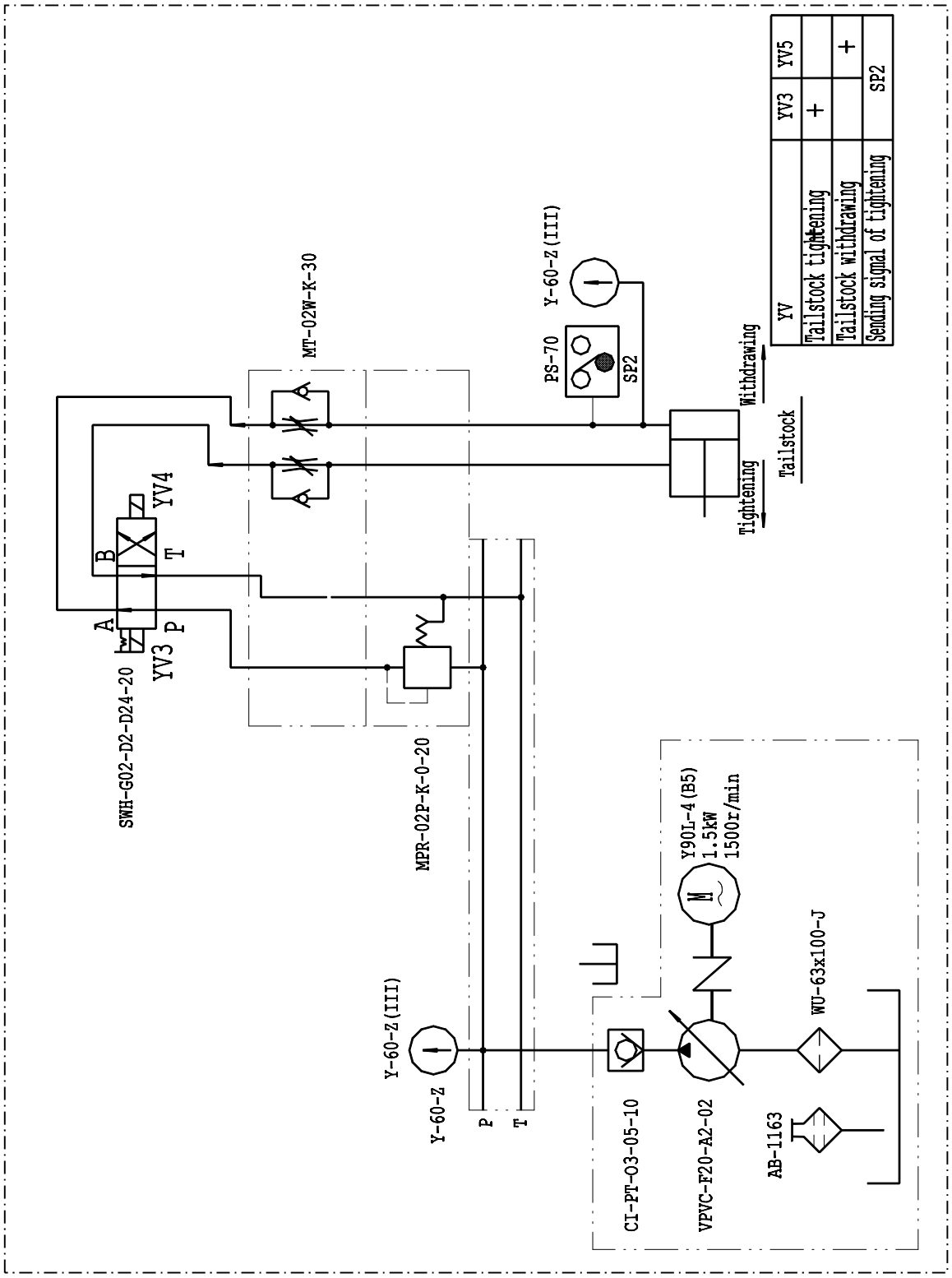


Fig. 9 Principle of hydraulic tailstock

This machine has two kinds of hydraulic system: One is that the hydraulic system is provided with hydraulic chuck and hydraulic tailstock, the other one only has hydraulic chuck. For the machine without hydraulic tailstock, only the overlaid circuit of tailstock was removed, all other parts are remained the same.

This section only explains the circuit and principle of the hydraulic chuck, all the other parts are the same as the description above.

- Return of the Chuck

The circuit of the chuck is consists of check valve, relief valve, magnetic reversing valve and pressure relay. Check valve MC—02P prevents clamping circuit from interference with other circuits. The relief valve MPR—02A is used to adjust clamping pressure of the chuck and the adjusting range of the clamping force are 1.2～2.5 Mpa according to the need of the workpiece to be cut. When electromagnet YV1 is energizing, the chuck clamps on, the electromagnet YV2 is energizing, the chuck is unclamping.

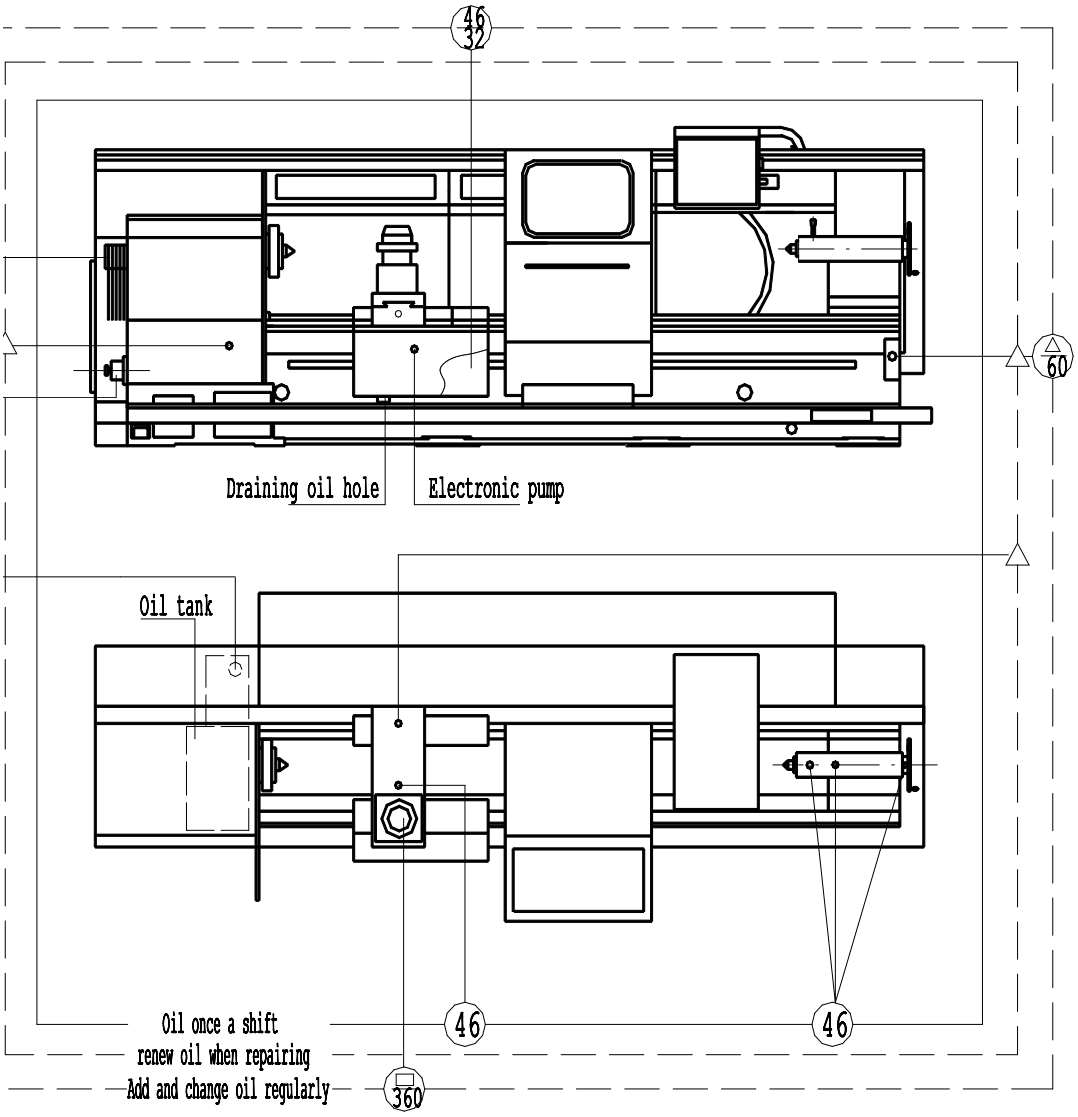
After the workpiece is clamped, the pressure relay PS—70（SP1）sends a ready signal, during machining if the pressure gets down due to reason of system's trouble, SP1 would send a alarm signal, the machine stops working.

- Hydraulic circuit of headstock with frequency conversion

The headstock with frequency conversion has four kinds of changing speed. Pressure of CB-B6 gear pump is adjusted by the spill valve MRF-02P-1 and its adjusting range is of 0.8-1.0 Mpa.

5.2.7 Lubrication System

As shown by Fig. 10.



46	HL46 Hydraulic oil	I	HL46 Hydraulic oil
—	The molecule shows the king of oil; the denominator shows the intervals (days) for two shift work		
II	4# Molykote	□ 2#Ca-base grease	△ 3#Common Li-base grease

Fig. 10 Lubrication chart

6 INSPECTION AND MAINTENANCE

6.1 Routine Inspection

Routine Inspection			
No.	**Checked Position**	**Checked Object**	**Remarks**
1	Oil gauge for lubricating position	● Check if it has enough oil. ● Check if the oil is polluted obviously.	Add oil when it is not enough
2	Surface of coolant	● Check if level of the coolant is proper. ● Check if the coolant is obviously polluted. ● Check if the filter of the oil pan is blocked.	Add it when necessary Change it when necessary Clean it when necessary
3	Guideways	● Check if the lubricant is enough. ● Check if the scraper is damaged.	
4	Pressure gauge	● Check if the pressure is enough.	See 5.2.6 Hydraulic system
5	V-belt	● Check if the tension is suitable. ● Check if the surface of the v-belt has any break or scratch.	
6	Pipe and appearance of the machine	● Check if there is any oil leakage. ● Check if there is any coolant leakage.	
7	Movable parts	● Check if there is any noise or vibration. ● Check if it moves smoothly and normally.	
8	Operating panel	● Check if the functions of the lever an switch is normal. ● Check if it shows alarm.	
9	Safe devices	● Check if it works normally.	
10	Cooling fan	● Check if the funs on the cabinet and operating panel work normally.	
11	Outside wires and cables	● Check if there is any wire broken. ● Check if any bushing has been damaged.	
12	Motor gear box and other rotating parts	● Check if there is any noise or vibration. ● Check if there is any abnormal heating.	
13	Cleaning	● Clean the surface of chuck, cover of turret guideway and chip apron.	Clean them after work
14	Lubrication of the chuck	● Lubricate around the jaws.	Once a week
15	Machining of the machine	● Check if the machining accuracy is kept within the requirements specified.	

6.2 Periodic Inspection

No.	Checked Position		Maintained Object	Period
1	Hydraulic system	Hydraulic unit Pipe union	● Change hydraulic oil and Clean the filter ● Leakage inspection	6 months
2	Lubrication system	Lubrication unit Pipe line	● Clean oil filter ● Check if there is any leakage, blockage or breakage	1 year 6months
3	Cooling devices	Filter Chip	● Clean the chip pan ● Change coolant, clean the filter and water tank	When it's necessary
4	Air	Air filter	● Clean or change the filter	1 year
5	V-belt	Belt Pulley	● Appearance inspection, check the tension of belt ● Clean the pulley	6 months
6	Spindle motor	Noise, vibration temperature, insulance	● Check the abnormal noise of the bearings and other places as well as ● clean the pulley	6 months
7	Servo motors of X and Z-axes	Noise, temperature	● Check the abnormal noise and temperature raise of the bearings and other places	1month
8	Chuck	Chuck Cylinder swing	● Remove it and clean out the chip inside it ● Turn the cylinder to check leakage	1 year 3 months
9	Operating panel	Electric unit wiring screw	● Check if there is any abnormal smell or colour, if the contact surfaces had worn or the screw has been loosen ● Clean out dirty things	6 months 1 month
10	Connection of inside units	Cabinet, electric connections between the units of the machine	● Check and tighten the wiring screws ● Check and tighten the screws of terminals	6 months
11	Electric units	Limit switch Sensors Solenoid valve	● Check and tighten the installing screws and wiring screws ● Check their functions and actions by proper operation	6 months 1 month
12	X, Z axes	Clearance	● Measure the clearance with micrometer	6 months
13	Base	Bed level	● Check the level of the bed with level, and adjust it when necessary	1 year

6.3 Lubrication and Cooling

6.3.1 Hydraulic device

Major items of maintenance of hydraulic are to change / renew and supply hydraulic oil, inspect and clean oil filter.

- Changing of hydraulic oil

  Although change/ renewal of hydraulic oil is dependent on using frequency of machine, basically, first changing time of hydraulic oil should be when the machine works for three months, and whole hydraulic oil should be completely changed, after this, changing oil every six months is OK!

- Cleaning of oil filter

  It is necessary to inspect and clean the oil filter when doing operating of changing the oil. First, dismount sucking oil pipe, further, take the oil filter out from oil tank. In general, the oil filter should be changed every year.

6.3.2 Lubricating Device

Major items of inspection and repair of lubricating device are as follows ：

6.3.2.1 Filling Oil

Filling oil should be done according to related regulation.

6.3.2.2 Cleaning or Changing of oil filter

- Cleaning of oil filter

  Cleaning or changing the oil filter in apron should be done once a year. The oil filter can be seen after the oil pump is taken out from apron. Don’t forget to clean the inside of apron after taking the oil pump out.

- Cleaning or changing

  Cleaning or changing the oil filter in headstock should be done once every six months. When doing cleaning or changing job, first, take the oil filter and copper net out from upper part of the left endface of headstock, then, do cleaning job. Change it if necessary.

- Inspection of lubricating condition of lubricating parts

  In order to make sure that every lubricating element can be lubricated, it is necessary to check every lubricating point of every element. If a element is not lubricated, the reason may be there is leakaging oil in the lubricating oil pipes or some pipe or some pipe joint is blocked. Blocked pipe joint is not allowed to use again, it is necessary to change it with a new one.

6.3.3 Cooling Device

Items of inspection and repair of cooling device are as follows.

- Check if the cooling pump is normal.

- Change coolant.

  You should check coolant level in the coolant tank (chip plate) as soon as coolant being jetted from the coolant jet decreases. If coolant is not enough, add it more and make its level be over the sucking mouth of the cooling pump. If coolant is too dirty, change it in the coolant tank completely. At the same time, also clean inside of the chip plate.

- Cleaning of coolant filter

  Take the coolant filter out to wash it or change it.

6.4 Adjustment and Maintenance of the Machine

6.4.1 Adjustment of V-belts

The V-belts and bearings may reduce their serving life if tension of V-belts is more than allowable value. Conversely, the tension is too small, the V-belts has not enough force to transfer rated power.

With the motor base moving up or down tension of the V-belts can be adjusted. Proper tension of the V-belts should be determined through flexibility resulting from loading the V-belts.

Adjust tension of the V-belts according to steps given below. The first adjusting time should be after the V-belts are used for 3 months, later on, adjust them once every six months.

Steps：

- Pull the belt up at the direction vertical to the belt by hand. Applied force must be at middle of the two pulleys.
- Loosen the screws for fixing the expanding wheel support and move the expanding wheel support to make it rotate around the spindle.
- Use the expanding wheel to press on the belt and adjust the tightness of the belt to a proper degree and tight the expanding wheel support. Then all of the adjusting job is finished.
- Cleaning grooves of the pulleys

  If there is oil, dirty matter, dust or similar foreign matter in the grooves of the pulleys the belts may slip to reduce serving life of the belts.

6.4.2 Headstock

The spindle of the machine employs rolling bearings (see Fig. 11). The nut 4 is used to adjust rolling clearance of two axial positioning bearings. The match of the nut 2 and the nut 3 is used to adjust diametrical rolling clearance of two double raw ball bearings and rolling clearance of the double raw ball bearings on the rear supporting point of spindle is adjusted by the nut 4.

Too large or too small clearance of spindle bearings can directly affect machining

accuracy and normal use of the machine. If the radial run-out and the axial slip of the spindle are found not to meet the requirement given by of the Test Certificate, do adjustment according to the description mentioned above. If the requirement is not still obtained, check if the bearings and concerned component have been damaged.

After adjustment is finished, the machine should be tested by run-idle, running time of speed of 1000r/min should not be less than one hour. Temperature raising of the spindle during running should not exceed 40^0C and it is necessary to observe changing of temperature raising. If there is abnormality, stop the machine at once and then the machine must be checked and adjusted by special personal.

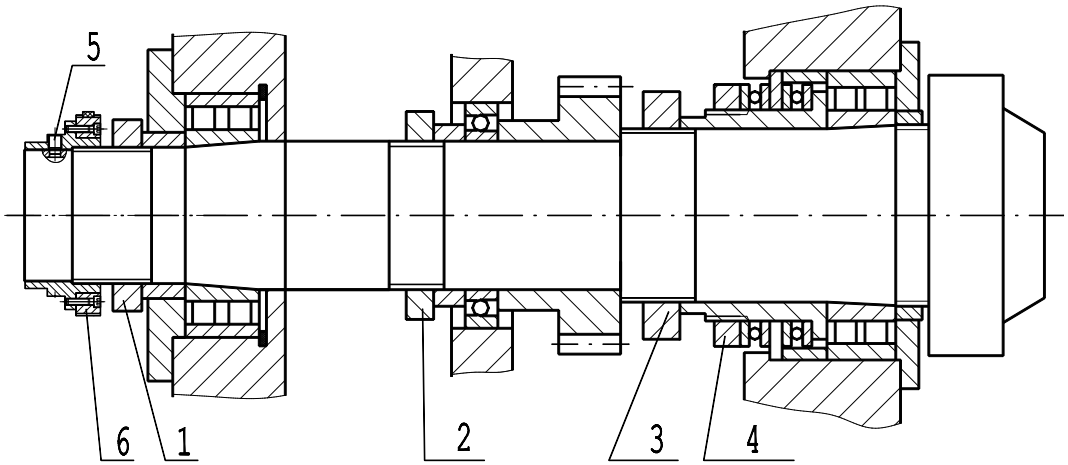


Fig. 11 Spindle structure

Tightening screw 5 is used to fix the gear 6. This gear can send signal to the spindle encode. Pay attention to check whether the tightening screw is loose if turned threads is not exact.

The front bearing and the rear bearing of the spindle all employ 3# high speed machine spindle grease for lubrication.

6.4.3 Chuck

Hydraulic chuck is used for long time, there may be accumulated fine chip inside the chuck, which can result in trouble, and so the chuck should be dismounted and cleaned once every six months.

6.4.4 Clearance

The longitudinal and traverse feed motion of the machine are obtained by servo motor through retarding of the first class gears to drive ball leadscrew, the ball leadscrew and the nuts on it to make rotation become straight movement for realizing feed on different direction.

In order to eliminate clearance generated by two gears during feed, driven gears 19, 20

and 22, 23 employ the elimination clearance structure shown by Fig. 12. If you want to reduce the clearance you may loose the locking nuts 46 first, then, two locking screws 47, in this case, the two gears can rotate at different directions under the action of the spring 48 to make the clearance be reduced, then, retighten the screws and the nuts.

The expansion sleeve 49 is used to fix the gears and the motor shaft. When dismounting or locking then, you may loosen and screw down the screws uniformly.

If feed is found not exact, check if every screw and nut mentioned above is loosen, if the clearance of bearings is too large and if the expansion sleeve is slip.

It is not allowed to dismount the nut body of the ball leadscrew, and if there is trouble, please contact with the manufacturer.

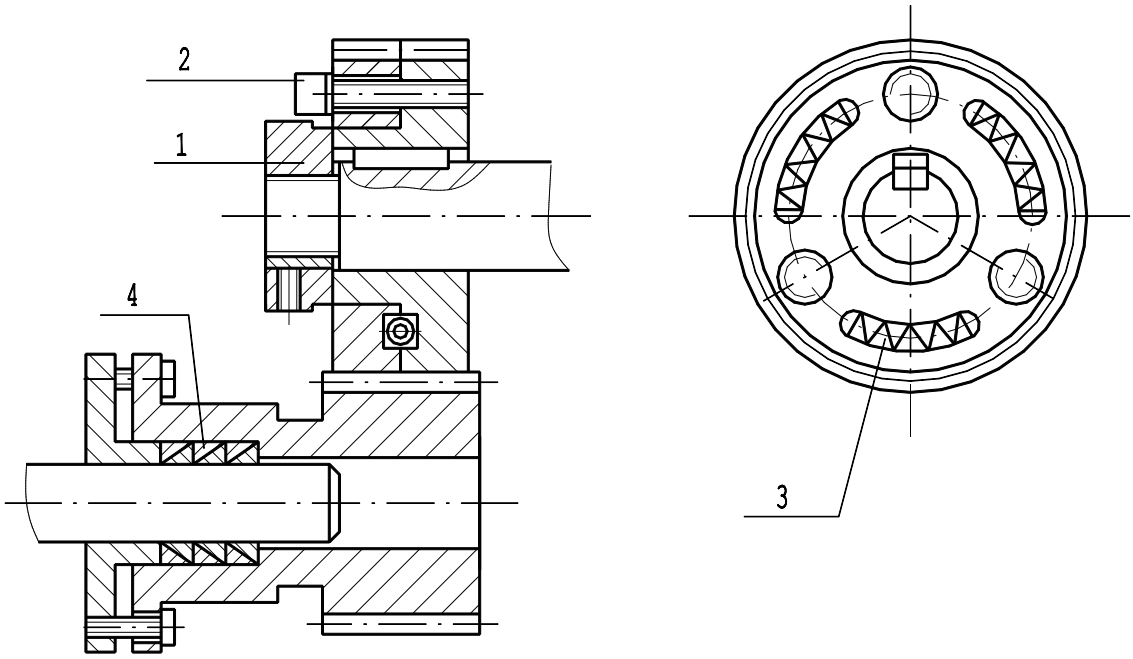


Fig. 12 Adjustment of clearance

7 TOOL DISPOSITION

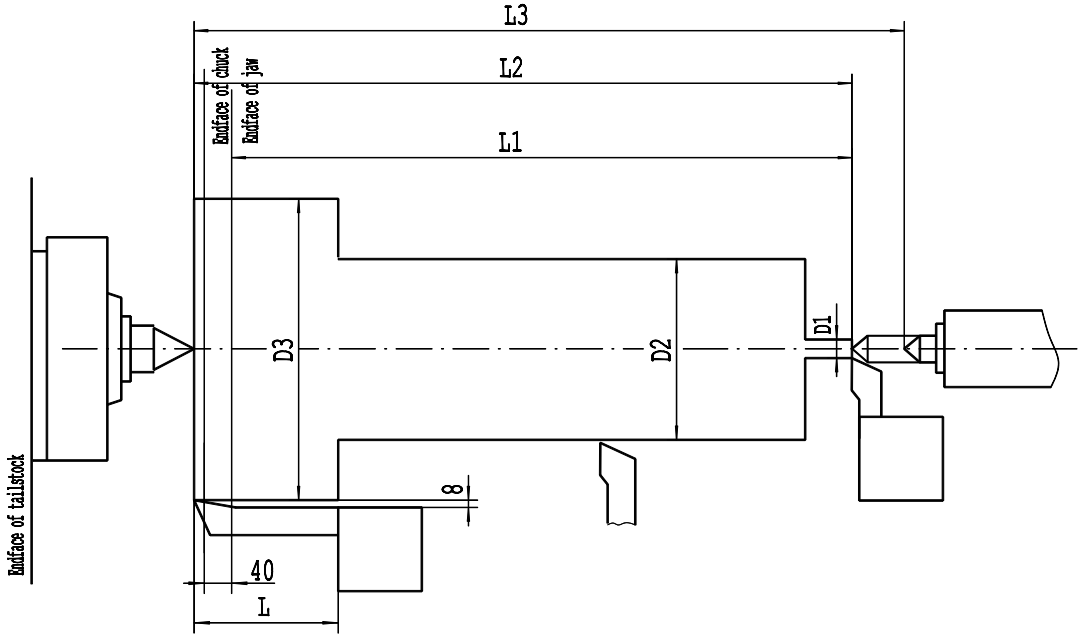


Fig. 13 Turning limitation size of 4-station turret

Mark	Description	Size mm	Remarks
D1	Min. turned dia. when normal extension of tool	ϕ40	
D2	Max. swing dia. of workpiece over carriage	ϕ350	
D3	Max. swing dia. of workpiece over bed	ϕ630	
L	Max. turning length in the case of D3.	Extension length of tool rod	Pay attention to change position of tool.

Size of the Machine	750	1500	3000	5000
L1	600	1350	2850	4850
L2	750	1500	3000	5000
L3	750	1500	3000	5000

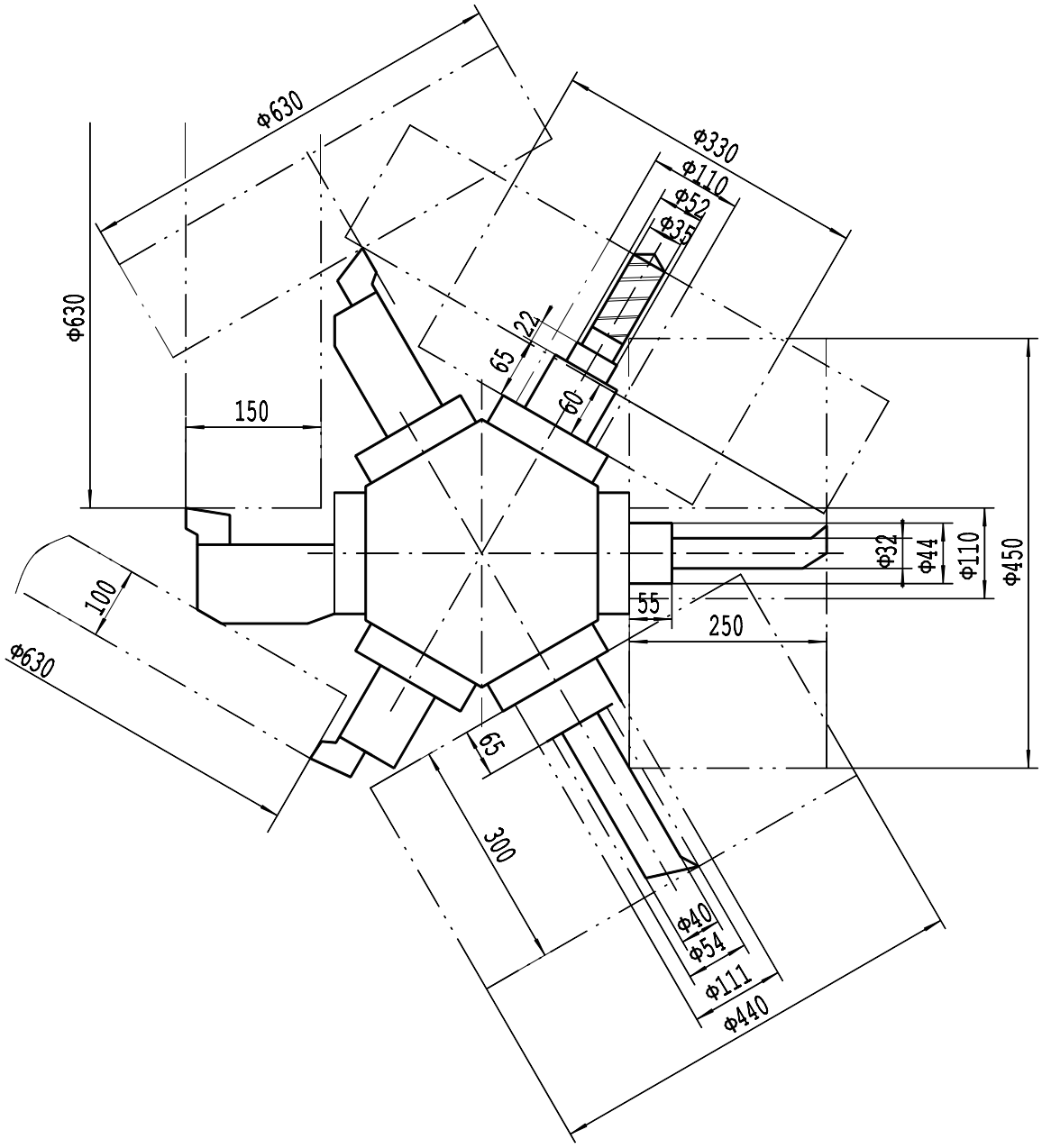


Fig. 14 Turning area of standard tools for vertical 6-station turret

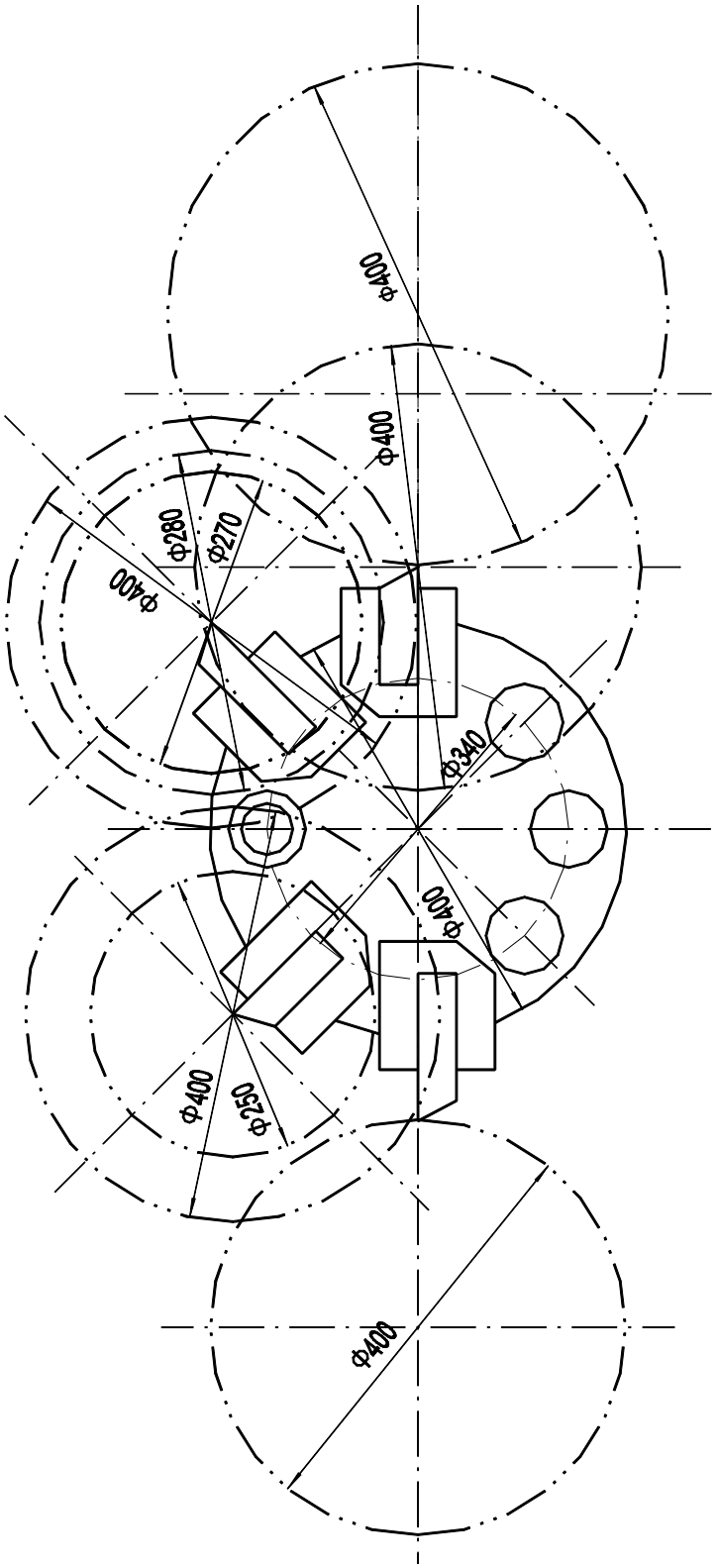


Fig. 15 Turning area of tools for horizontal 8-station turret

8 WEARING PARTS

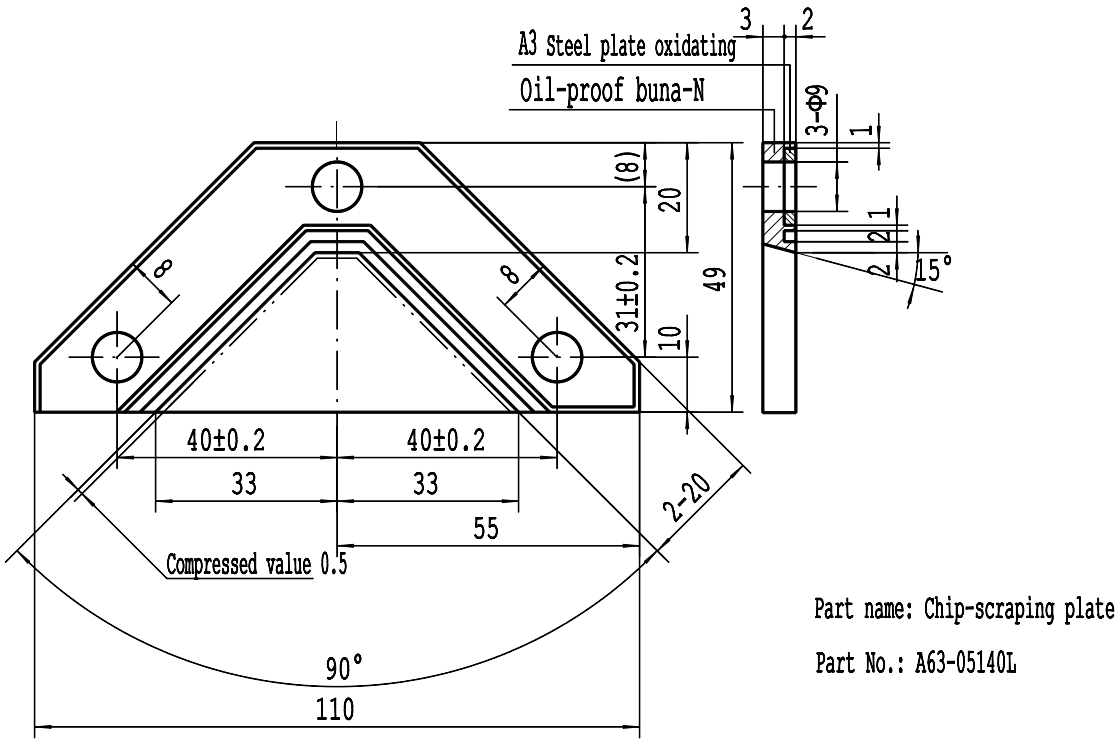


Fig. 16

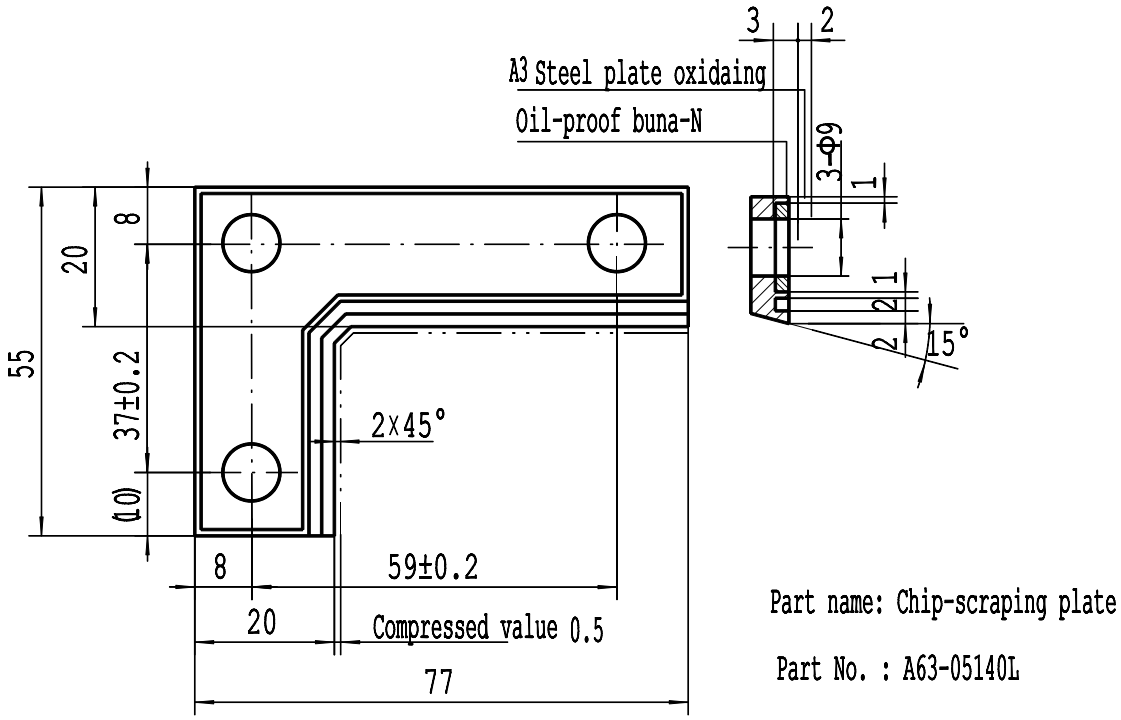


Fig. 17

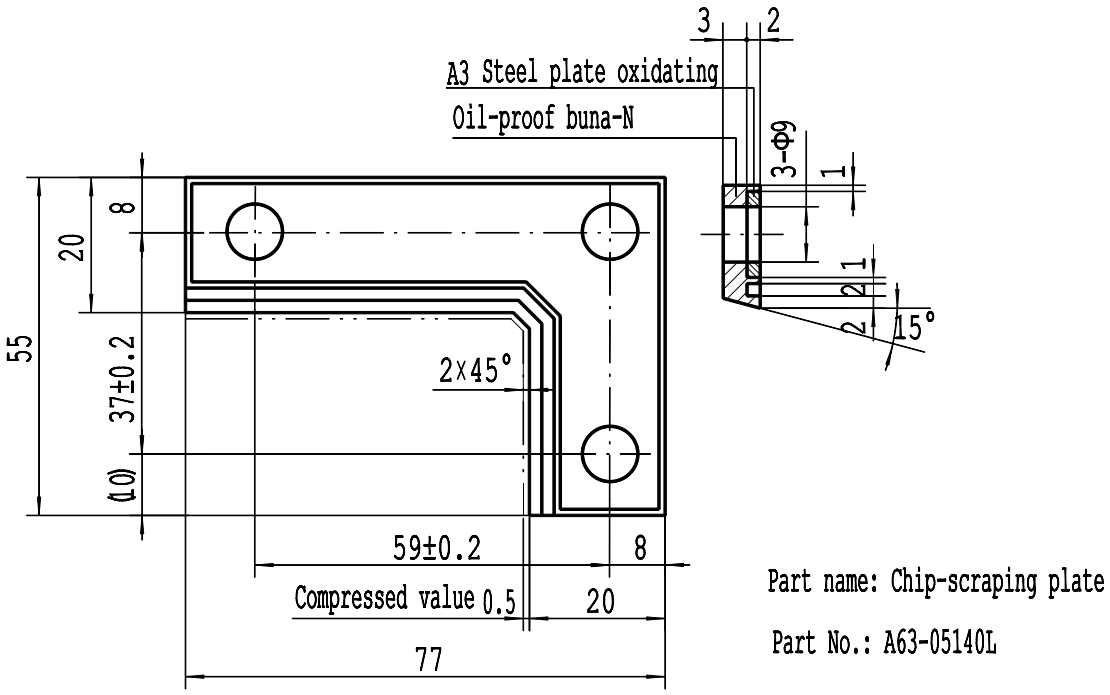

3
2
A3 Steel plate oxidating
Oil-proof buna-N
3-Φ9
1
2
1
2
15°
8
20
55
37±0.2
(10)
2×45°
59±0.2
8
Compressed value 0.5
20
77
Part name: Chip-scraping plate
Part No.: A63-05140L

Fig. 18