



**Leaderway** *VERTICAL MACHINING CENTER*

# **VERTICAL MACHINING CENTER**

## **INSTRUCTION**

### **VMC-3016**

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# 1-GENERAL

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## Preface

- Safety is the first of all ! We do not product machines but care about you very much.
- We are pleased to know that you have decided to purchase our CNC machine tool center. We are sure this machine, after operating on the production line of your factory, will be able to promote your products of high stability and excellent quality.
- It is our pleasure to introduce the relevant information regarding the safe use of this machine and help you increase the production capability and operating this machine in proper way can not only keep it at high precision and stable condition but also keep you from damage or danger.
- Before using this machine, please be sure to read all of the Operation Manual, Mechanical Manual and the safety regulations very carefully so as to ensure the safety for the people and the machinery.
- Please put Manuals available around for the operator easy to get, do not put them away. Do not damage it and make good use of them to ensure your safety. Therefore, please good use of your experience, common sense and Manuals instruction to remind you. When train your employees always think safety is the first of all for all kinds of industries and job.
- We have put our efforts on offering safety and excellent machinery for our customers in order to restore the normal operation and upgrade the technical standard of our factory. Please feel free and take down what have happened in detail and inform our factory or the nearest agent, service center to handle it for you.



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Be careful, if the dangerous or hazardous things happen will easy to cause personnel death and heavy injury.



Be careful, if the warning things occur might cause people die or heavy injury.



If the dangerous things occur will cause people injured or product damaged.

- Labels : Indicated some special purpose or production examined by Q.C. dep.

Make sure that you can read all warning and instruction labels. Clean or replace these labels if you cannot read the words or see the pictures. By using a cloth, water and soap to clean them. Do not use solvent, gasoline or unknown solution. You must replace new labels if they are broke, missing or cannot be recognized. In addition to the information given on safety labels, there is a variety of other cautionary information which must be observed by operators during machine installation, operating and maintenance.

- Read all safety-related information carefully
- Failure to observe the danger of caution information can lead operators to serious injury or damage to the machine. Always observe this information during machine installation, operation and maintenance
- The health and safety measures applied to the machine are in conformance with the following European standards:
  - EN 292-1
  - EN 292-2
  - EN 294
  - EN 349
  - EN 418
  - EN 1050
  - ENV 1070
- The electrical equipment is in conformance EN 60204 standard.

**Cautions on warning labels**

The warning labels show in the table below are attached to this machine.  
Fully the contents of each warning label and observe the mentioned items.

SAFETY INSTRUCTIONS

1.Read and understand our Instruction Manual and all warning signs before operating.  
Fail to follow these instructions and warnings can result in serious injury or death.

2.This machine starts and moves automatically.  
Never place any part of your body near or on moving parts of this machine.

3.Always stop the spindle completely before touching the workpiece,tool or spindle.

4.Do not operate this machine unless all guards, interlocks and other safety devices are in place and functioning.

5.Always clamp workpiece and cutting tool securely.  
Avoid excessive feedrate and spindle speed.

6.Remove rings, watches, jewelry and loose fitting clothing.  
keep your hair away from moving parts of the machine.

7.Always wear safety glasses, safety shoes and/or hearing protection when operating this machine.

8.Service or installation of this machine must be performed by qualified personnel only, following procedures described in the Instruction Manual. Turn off and lock out the power at main electrical panel before servicing.

It is the responsibility of the user to be sure that this machine is in safety operating condition at all times and the operator follows the safety operating procedures described in the Instruction Manuals and all signs attached to this machine.

Please do not remove or disfigure this sign.

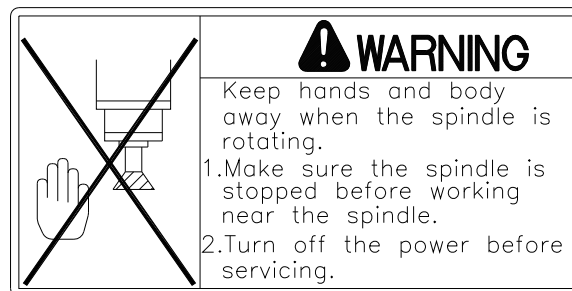
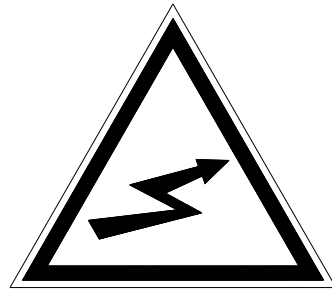
WARNING

SHUT OFF POWER BEFORE ANY  
MAINTENANCE JOB ON ATC UNIT



WARNING

Do not operate  
before shutting  
door.





## Safety

This machine is provided with a number of safety devices to protect personnel and equipment from injury and damage. Operators should not rely solely upon these safety devices but should operate the machine after fully understanding what special precautions to take by reading the following statements thoroughly.

### **Safety precautions**

However, safe operation cannot be ensured if operators use a CNC Machine Center improperly or do not follow safety rules properly. Failure to comply with these rules may result in death, injury or damage to the machine and/or products.

**The basic conditions given below must always be strictly followed.**

- Only qualified or trained personnel are permitted to maintain and/or operate the machine.
- Read the instruction manual thoroughly and make sure the contents completely understood in order to operate a machine efficiently and safely.
- Always keep this safety paragraph and instruction manual at a designated place near the machine so that they can be easily accessed whenever required.
- Use safety shoes, which are not damaged by oil, safety goggles with side covers, safety clothes and other relevant safety protection.
- The key of key-switch must be kept by the senior and qualified personnel.
- Be sure there are no articles or material around the machine.
- A series machine start-up requires a PC with V24 interface for data transfer from/to the control system and an NC card. On the PC, WINPCIN Tool must be used.
- Turn off the power source before going home, checking machine.
- An internal data backup must be carried out whenever the control system is switched off longer than 50 hours.
- The NC card must be plugged or removed only when the PC is turned off.
- All persons concerned with operation and maintenance of this machine must be aware of the emergency stop button and switch location, function and operation.
- In the event of power failure, turn off the main circuit breaker immediately.
- Use the recommended hydraulic oil, lubricants and grease or acceptable equivalents.
- Replacement fuses should have the proper current ratings.
- Protect the NC system, operating panel, etc., from shocks, because of resulting failure or malfunction.
- Do not change parameters, volumes and other electrical settings unnecessarily. If such change is unavoidable, record the values prior to the change so that they can be returned to their original setting if necessary.

- Do not soil, scratch or remove the caution plates.
- Whenever operating forklift truck, crane or similar equipment, special care should be taken to prevent collisions and damage to surroundings.

### **Before of operating machine**

- Check the power source of factory is fit for requirement.
- Check motors and other parts for abnormal noises.
- Check pressure gauge for proper readings.
- Check the lubrication motor, sliding parts for evidence of proper lubricant.
- The first time to operate the machine, after unpacking or keeping the machine idle for a long period each slide way surface must be freshly lubricated. Keep lubrication pump work till oil oozes out from wiper. Contact our service station or agents in connection with what procedure should be taken since it depends on the type of machine.
- Clean machine so that any abnormalities can be found.
- Make sure the lubrication oil pressure; pneumatic pressure and hydraulic pressure indicate the correct values.
- Make sure the lubrication oil is properly supplied to the correct places.
- Check joints or fasteners of pipe, hose, wire and cable there are any leakage or loose.
- Check coolant tank and oil reservoir are filled to indicated level or refill them, if necessary.
- It is safe that all parts, chips and waste oil should be removed by the operator and be placed to assigned storehouse and far from machine.
- Ensure the hoisting rope, transportation blocks and packing stuff are removed completely before starting running the machine.

## Warm up and preparation

- The power cable from the factory feeder switch to the machine main circuit breaker check if there is a sufficient sectional area to handle the electric power usage.
- Warm up the machine include NC unit or PC connection, especially the spindle and feed shaft by running 10- 20 minutes at ball part half or one-third the maximum speed in the automatic operation mode.
- Wire rope or slings should be strong enough to stand the load of lifting and should be conform to the mandatory provisions.
- Tooling should conform to the machine specifications, dimensions and type.
- After installing a tool into spindle, make a trial run.
- Make trial run of ATC system, rate of feed axes, motor rotating and the basic function of operation panel.



## Do not rotate spindle unless the tool holder load into spindle already

### Caution of operating machine

- Always wear helmet, protecting glasses, safety shoes and other protecting equipments as required while operating machine.
- The operations of this machine should not against the instruction of all manuals.
- Do not settle down the machine near high electrical magnetic interference (EMI) machine
- Do not wear loose clothing or jewel that can be caught by moving parts of machine.
- Do not touch the chips and blade tip of the cutter with naked fingers.
- During operation, do not take the chips away or touch the rotating portion parts with naked fingers or other articles.
- When performing heavy-duty machining, prevent carefully chips from being accumulated since hot chips can catch fire.
- Before any rotation parts, moving articles or transmission feed stop completely, do not touch the cutter or work pieces.
- Do not touches or press the buttons and switches with wet hands it might get shock.
- Do not operate switches with gloves on, it will cause malfunction, etc..
- Always remember the location of emergency stop button so that you can press the buttons right away if any unexpected accident is occurred
- Never operate the machine or turn on the power source unless everything is completely set down and inspected all right.
- Do not use fuses other than those specified or change parts for the sake of saving money.

- Pay attention to and keep away from the high voltage devices or isolate with cover.
- Stop machine before maintaining or adjusting the position of coolant hose, cutter or disposing the chips
- Cables, cords or electric wire whose insulation is damaged can produce current leaks and electric shocks. Before using check their condition.
- Do not cut a kind of material, which are easy to catch fire on the machine, such as magnesium, magnesium ally or other material, which lower melting point.
- Do not open the door or remove the covers of chip proof sheet metal, during machine performance.
- Do not open the power cabinet door while the machine is operating. If it's necessary to open it, be sure the machine stops running totally.

### **Operator requirement**

- User's occupation
- Any manufacturing company/factory which does milling, drilling, boring tapping process for metal or non-metal materials.
- Education requirement
- Any person who was graduates from junior high school acknowledges the English capital, has the logic concept of mathematics, and knows how to operate control keys, is qualified to learn and manipulate this machine. Either man or women do for this job

### **Material witch can be processed**

- Metal: Iron, Steel, Aluminum, Titanium, stainless, alloy.
- Non-metal: Plastics, Wood, Fiber, Polymer, Acryl.

## Check before Power On

Please make sure to do every check before operation each time. This can ensure operator's safe usage and machine's normal work.

Before power on machine, please check if the wires and cables are damaged in case of electric accident. Make sure that the wires and cables are not damaged. Otherwise, it may happen electric leakage and cause serious casualties.

### Checking procedure

Check Point	Check Item	Method	Remark
· Filter, Regulator & Lubricator Unit	1. Have water in the filter cup been dried out? 2. Is there enough oil in the oil cup? 3. Is there enough compressible air pressure?	By eye	
· Spindle Oil Cooler	1. Check if there's enough lubricant inside the spindle head. 2. Check if the joints of oil tubes are locked tightly.	By eye By hand	
· Coolant Tank · Chip Conveyor	1. Check if the chips are cleaned. 2. Check if there's enough coolant in the tank. 3. Check if the joints of tubes are locked tightly. 4. Check if the joints of cables are locked tightly.	By eye  By hand By hand	
· Coolant tank of right/left side	1. Check if the chips are cleaned. 2. Check if other items are put inside.	By eyes	
· Telescopic Covers	1. Check if there are chips on it. 2. Check if there is proper quantity of Lubricant on its face.	By eye	
· ATC door	1. Check if the chips are cleaned.	By eye	
· Table	1. Check if the chips are cleaned.	By eye	
· Spindle	1. Check if spindle taper is clean.	By eye	
· Electric Cabinet · Operation Cabinet	1. Check if the controller units and joints are fixed. 2. Check if the door is locked well.	By hand	

Check Point	Check Item	Method	Remark
• Each ground wires.	1. Check if terminal of ground wires are locked tightly.	By hand	
• Junction Box of ATC, Base and Spindle head...etc.	1. Check if terminal screws and joints are locked tightly. 2. Check if the cover of Junction Box is locked tight.	By hand	
• Machine's surroundings	1. Check if the machines' bolts are locked tightly. 2. Is the machine's surrounding clean?	By hand By eye	

### **Check after power on machine**

Check Point	Check Item	Method	Remark
• Motor	1. Is there any strange sound? 2. Does it overheat?	By eye and ear	
• Pneumatic system	1. Press enough(5-7kg/c m <sup>2</sup> ) 2. Do the pipes leak?	By eye	
• Spindle Oil Cooler	1. Is the temperature setting correct?	By eye	
• LCD Screen	1. Does it show alarm message?	By eye	
• Operational Panel	1. Does alarm lamp light?	By eye	
• Chip Conveyor • Chip Auger	1. Clockwise rotate correctly. 2. Counter-clockwise rotate correctly.	By eyes	
• Coolant Pump	1. Pump work normally. 2. Pipes are not leaking.	By eye	

### Check of Manual Operation

Item	Description	Result
1.	Can each axis go positive position? Negative Position?	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal
2.	Does each axis have protection of over-travel? Positive direction? Negative direction?	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal
3.	Does each axis go back to reference positions?	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal
4.	What is the spindle's rotate direction? Can the spindle orientation ? Stop ? Clamp/Unclamp ?	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal
5.	Does Tool Magazine clockwise or Counter-clockwise ?	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal

## Machine life

### Machine life limits

- Under normal operating and with well maintenance. The intended life of this machine. About count by:
  - 8 hours x 5 days x 4 weeks x 12 months x 10years = 19200 hours
- There are many warning signs on the machine, please should be obeyed. In addition to the warning signs, please should be obeyed the safety precautions of the instruction manual.
- Only a skilled person is allowed to operate this machine. Otherwise, the person must be trained until he know how to operate the machine safely and efficiently.

### Guarantee

- One year's life is guarantee for any components in the machine.
  - Key components – one year's life is guarantee
  - Spindle unit and bearing.
  - linear guide ways
  - ball screws and bearing
  - Control unit, main motor and servo motor.
  - ATC unit



## TRANSPOTATION

### PRECAUTION

- Only trained, qualified workers should operate forklift truck, crane or similar equipments and apply slings.
- The wires used to lift should be checked that they are strong enough for the weight of machine center and in good condition. The dimensions of steel ropes specified in manual.
- Be sure that the wires will not run into any delicate parts of machine center.
- Before hoisting machine, make sure all moving units are fixed securely as well as in place.
- Be careful and avoid the hoisting rope contacting with any piping unit, parts and electric cables.
- Check around the site of machine and make it clean, proper to be installed, that is, can keep machine away from jolt during move or transport machines.
- Always inspect slings, chains hoists and other lifting devices prior to us and never work on or stand under a component while it is hanging from an over-crane or other hoisting mechanism.
- The floor of machine located must be firm, in order to ensure vibration free and secure fastening. Should the floor not be firm, a concrete foundation is recommended.
- Keep the machine's center of gravity at the center of the forks.
- Be careful during remove the wooden cage or vacuum package and keep away from damage onto the machine inside or people around will get injured.
- Ensure that there is a little clearance between the back panel of machine and forklift truck or use protective pad.
- Be sure electric cables and wires will not be damaged during hoisting machine from the skid.
- Before hoisting the machine, make sure that each of the units is fixed securely.
- Be careful during remove the machine to proper site and install it.
- Keep clean around the machine and floor.
- Be sure electrical cables and wire will not be damaged during installing machine.
- After installation and clean, connect the wire to the power source and ensure the requirement of power capacity is proper.
- Before using, remove the anti-rusty oil by rags with paraffin or fuel oil.  
Toluene compounds must not be use.

Note: Refer to the drawing following end of book.

## **Environmental requirement**

### **Requirement point**

- Where the machine center avoid exposing to the direct sunlight and/or near to a heat source, etc.. Ambient temperature during operation is 0 to 40°C (32 to 104°F).
- Avoid a location where the humidity is considerable fluctuating and/or it is highly humid. Normally 75% and below in relative humidity.
- Avoid using the machine center under such environment as to be especially dusty or to have a vaporous, organic and corrosive gas highly concentrated.
- Flat and smooth ground without dust or other particles. The required bearing pressure of the floor is at least 5000 kg/m<sup>2</sup>.
- Where there is no vibration source around the factory.
- The machine must be protected from electrical noise sources, such as electric welders and an electric discharge machines.
- Always ground machine independently, the ground resistance is 100 ohms or less and the length of ground cable is as short as possible.
- The sound pressure level at the operator's position is under 80dbs. (According to JIS B6004, 1980; Method of sound measurement for machine tools) It is the policy of the company to remedy the machine if the sound level is over 80 DB while running test.
- Foundation should be constructed of either reinforced or non-reinforced concrete with thickness and consistency compatible to industry for machine weight.
- The 24V DC voltage must be generated as a functional extra low voltage with safe electrical isolation and be grounded by the user.

### **Power supply**

It is recommended that the electrical equipment of a machine only have one power supply connection. When other voltages are required the machine, then these should be supplied by equipment which is part of the machine such as transformer, motor generator and so on.

The current standard voltage values

Republic Of China

- AC-220V±10% (single phase/60Hz).

Europe multitude

- AC-380V ±10% (3 phases/50Hz)
- AC-220V ±10% (single phase)

In States

- AC-230V ±10% (3 phases/60Hz).

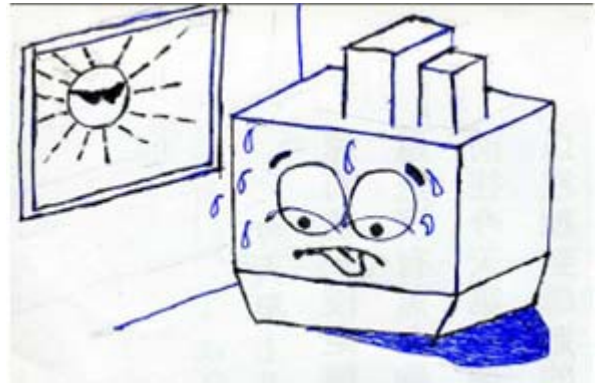
### **Ground connection**

- Don't Cascade parallel connected with other machine in grounding.

- Parallel connection in grounding is OK.
- Voltage need correct by name plate on side of machine.
- Size of electrical wire  $\phi 14 \text{ mm}^2$  diameter(ground wire).
- Ground resistance below  $100 \Omega$ .

### Condition of storage

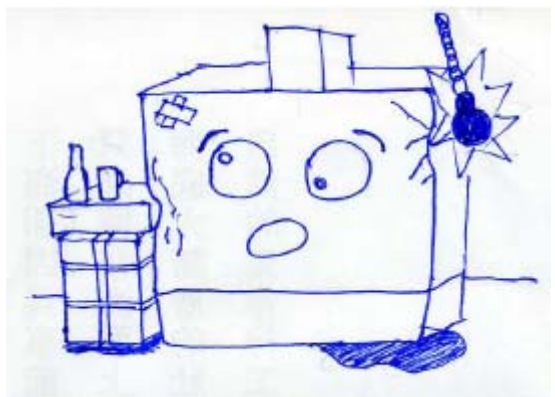
The machine and the NC must not be subject to direct sunlight.



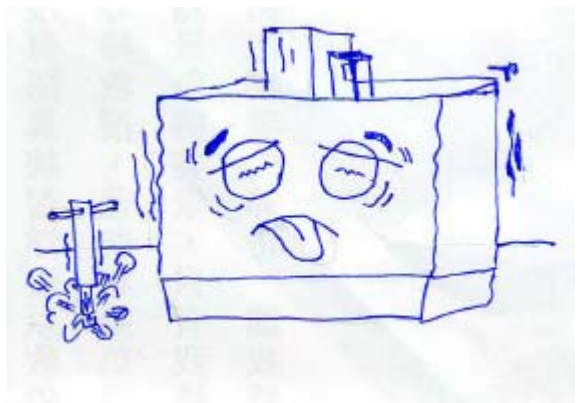
Maintenance space must be secured.

The door must be able to open without interference.

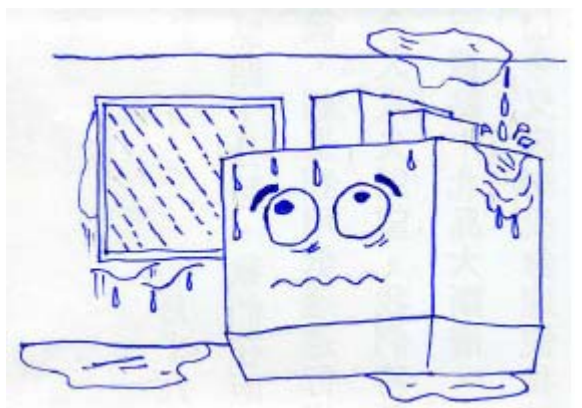
The chip conveyor, chip bucket and coolant tank must be able to pull out from the machine without interference.



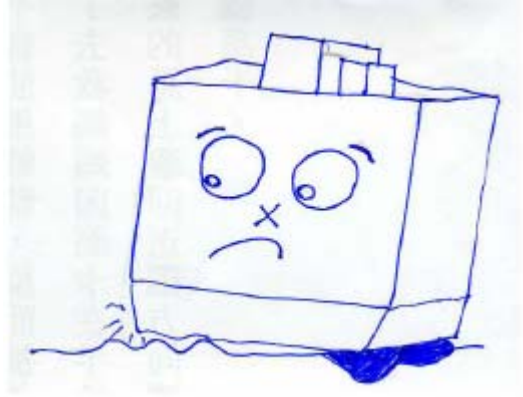
The ground must be capable of absorbing the vibration of other machines, such as presses. If vibration is felt where the machine is installed, measure is magnitude with a micrometer.



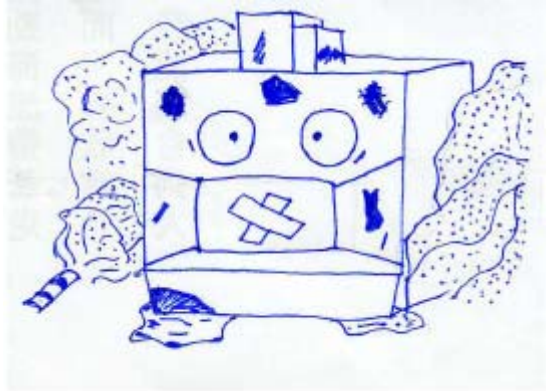
The ambient humidity must be less than 75% and free of condensation. Because many electronic parts are use in the machine and the NC, excessive humidity must be avoided.



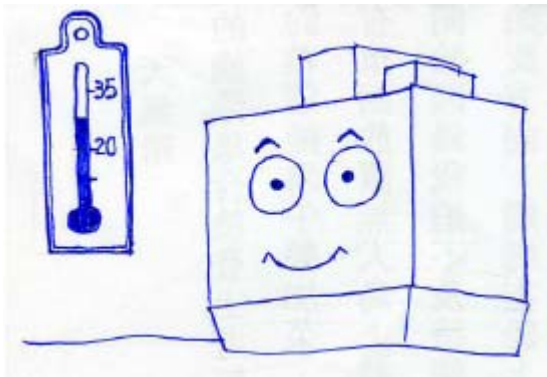
The surface where the machine installed must be smooth and flat.



The machine must not be subject to chips scattered from other machine or airborne dust.



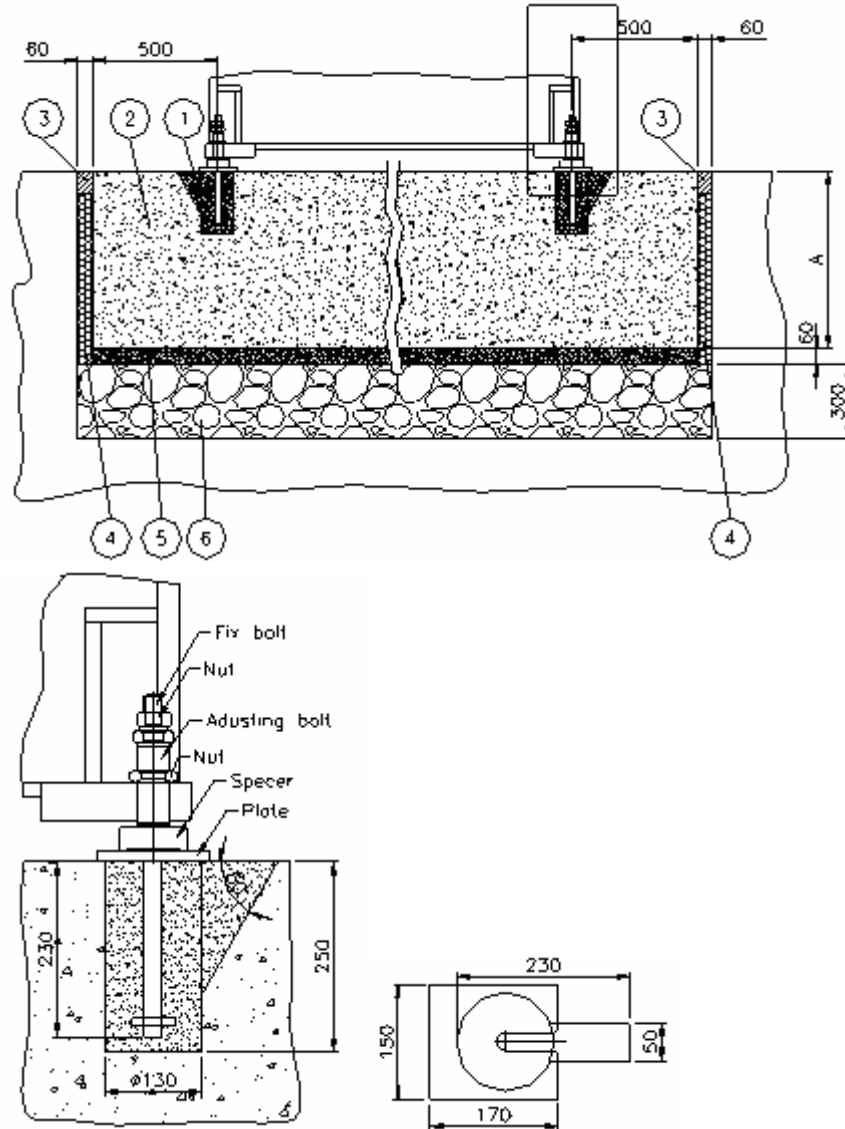
The ambient temperature must be between 0 and 30°C



## Setting the ground

### Ground required

If you want to promote the effective product the best way is set out the ground. The flat and smoothly floor could be good for settling down the machines. Refer to the following drawing for the ground arrangement



A=350(V450/V650/V33i/V42i)

A=500(V1100/MV1100/MV1300)

A=700(LX1610/LX2210/MV1750)

A=1000(LX-B all mode)

[1] Concrete 5000pci

[2] Concrete 3000pci

[3] Anti-oil/heat bronze

[4] Anti-vibration polyurethane

[5] Anti-vibration sand

[6] Round-shapes stone Dia.

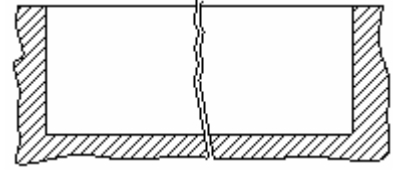
150~300 mm



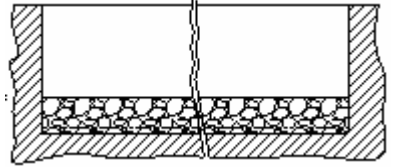
The floor plate must be completed in compliance with the latest valid guidelines and the generally adopted technical regulations. If applicable, contact a renowned engineer specialized in stoical calculation, observe the maximum floor pressure of the local conditions.

## Setting step

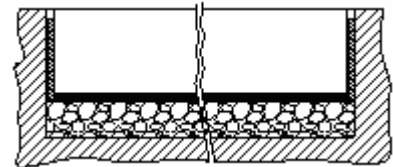
According to foundation drawing set the foundation area.



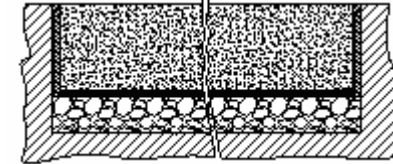
First, put stones on the bottom.  
(Stone dia.150~300 mm)



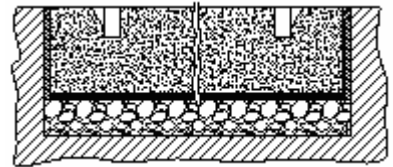
Fill up the sand and poly-foam plate on the other side.



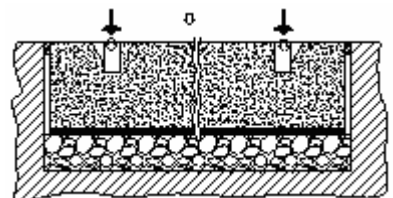
Put the oil-proof and anti-head stripe on the side, then fill up the cement (3000 pci ), harden time about 7~10 days



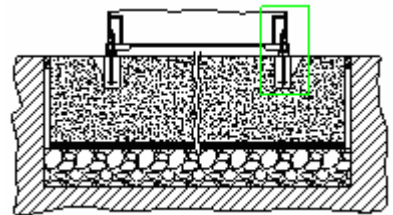
Dig out the hole of anchor bolts.



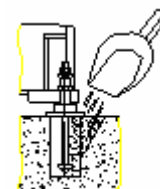
Hoist machine higher and install the anchor bolts.



Put whole machine into the position.



Fill up with 5000 pci cement harden time  
2~4 days



The following drawing showing on the end of book.

## Before power on

- Only the trained, qualified or authorized personnel can remove and settle machine, accessories and so on.
- After transporting machine to the adequate site of factory, remove vacuum package or accessories skid from shipping pallet.
- Remove the shackles, sling and eyebolts. Fixed brackets between table-saddle and saddle-base and hoisting devices from machine.
- All the bare parts of the machine, which have been coated with a rust inhibitor for transportation must be carefully cleaned by rags with paraffin or fuel oil and wrung out. Note: Toluene compounds must not be used.
- Takes away the brackets fixed onto the operation cabinet.



Unless power on, do not move away the fixed bracket under head stock which is the last one to remove.

- Place the cover of the right side base and tighten the screws on it.
- Set down the accessories such as coolant tank with chip collection trough, fixed pump on the plate of coolant tank.
- Set the transformer and chip conveyor to proper places then plug the socket onto the bottom of power cabinet.
- Make sure the main power supplier switch is turned off before the power cable connected to the power source.
- Connect the fasteners or joints of cables, wire and pipe wherever they will be.
- Connect the main cable of machine with the terminal in power source box of factory.
- Check if the power capacity or voltage is fitted on the machine requirement.
- Check if the phrases of motors and pump are correct by phrase-meter.
- After everything being settled down, power on and turn on the main power switches of machine, which is on operation cabinet and power cabinet. Then check there is any abnormal signal or alarm appeared on the CRT or operation panel.
- By using MPG, let the spindle headstock upward a little and take away the supporting block under it.

Note:

If there is no display on the screen of operation panel after power on, please refer to the parameter tables of electric manual to input data and restart again.

## Leveling adjust

### Leveling required

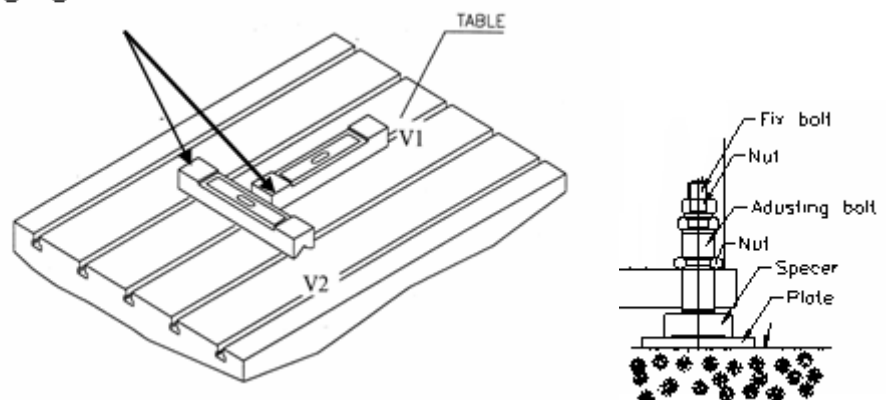
Using leveling gage to check the level of machine. The gage reading must be with 0.01mm/M. The leveling situation is very important to the accuracy of this machine. We must do the following steps.

### Adjust procedure

To complete this procedure follow the next procedure:

- After the processes of installation, the machine level may undergo minor changes with the elapse of time. Make it a point to check the level periodically.
- Move the table and saddle to the center position of machine by programming or manual operating.
- Place the levels on the table to adjust or modify the foundation bolts and nuts by the bubbles of level gauges, which are located on the center of levels, that is, machine reach the static level.
- At first, adjust the front and rear of foundation bolts, then middle ones.
- Tighten the bolts and nuts orderly.
- After static level, move the table along Y-axis direction with three points during the moving of full travel. The bubbles of level should be indicated the movement within one grid of levels and modify bolts and nuts.
- Tighten the foundation nuts after leveling along the Y-axis direction.
- Follow the same steps as step 6 and 7 but along X-axis direction to measure the dynamic level of X axis and the movement must be in half grid of levels' bubbles.

Level gauge



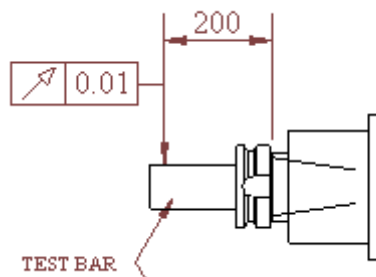


## Tools system

### ISO 40/50

#### Vibration required

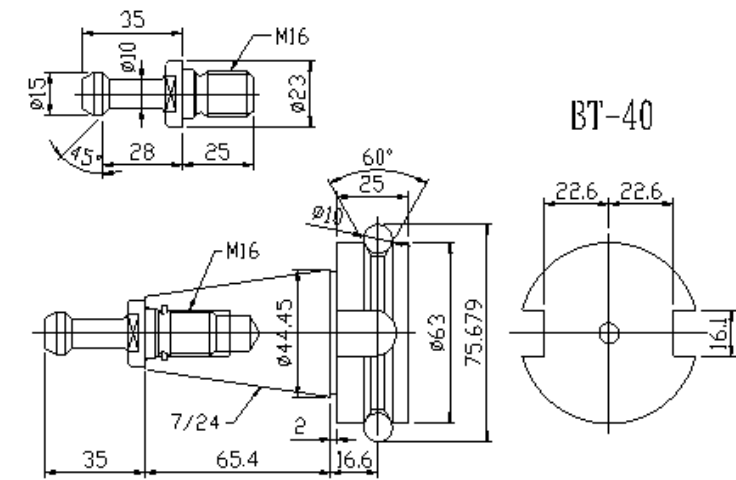
- The tool must have a concentric running. Vibrations caused by radial tool deviation may lead to a tool breakage and put the operating staff into danger!
- Before the tool insertion, the wing surfaces must be cleaned from soiling.
- Even the slightest foreign matters which may have fallen between the wing surface cause radial deviation!
- Check radial deviation at tool holding cone with test bar (see figure)



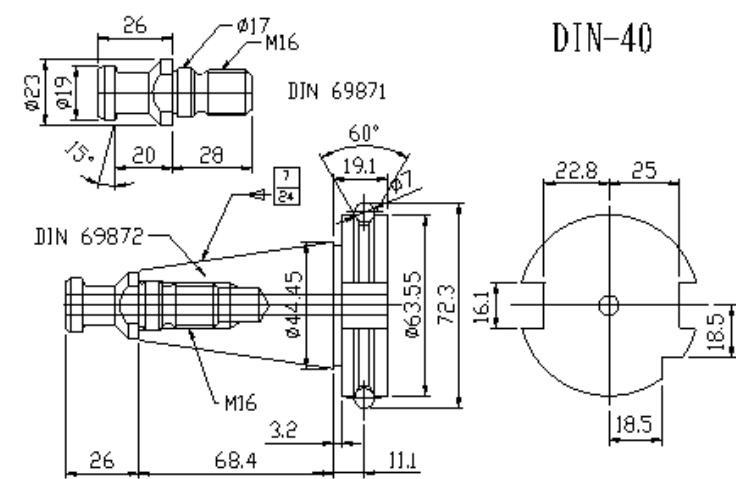
The tool in use must be permitted for the according rotation speed by the tool producer.

Tools specification  
ISO 40 serious

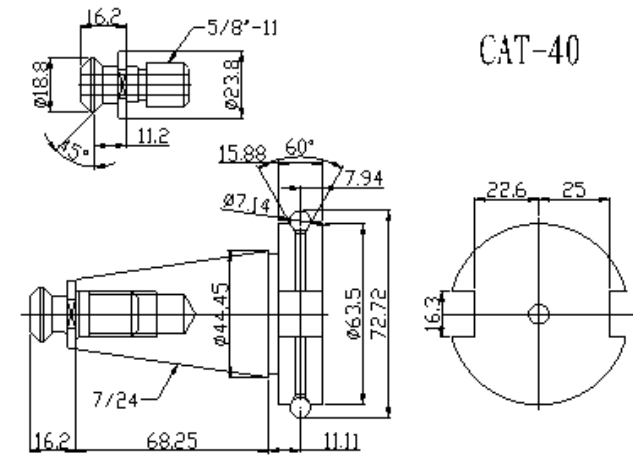
BT-40



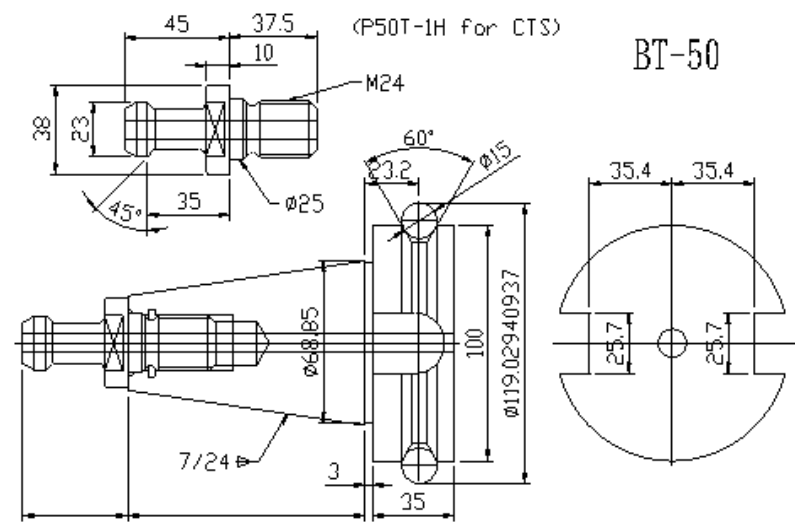
DIN 40



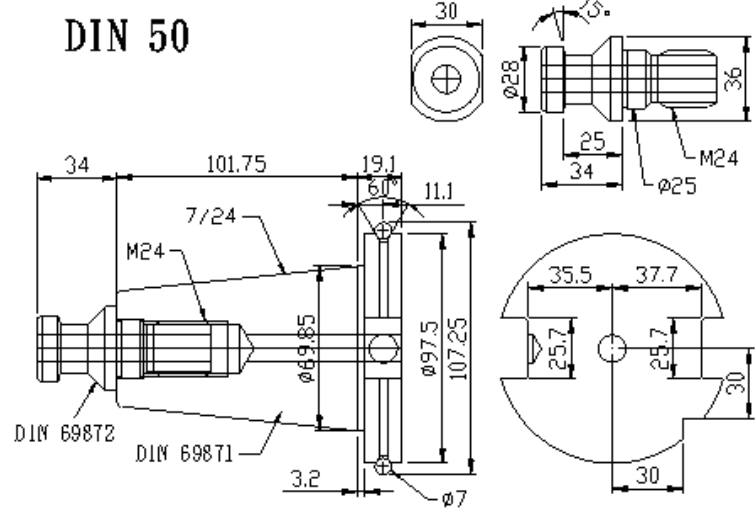
CAT 40



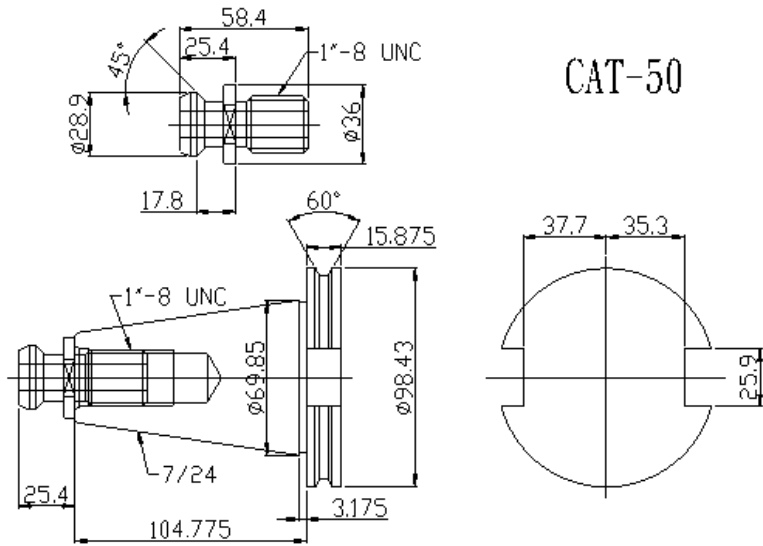
BT 50



DIN 50



CAT 50

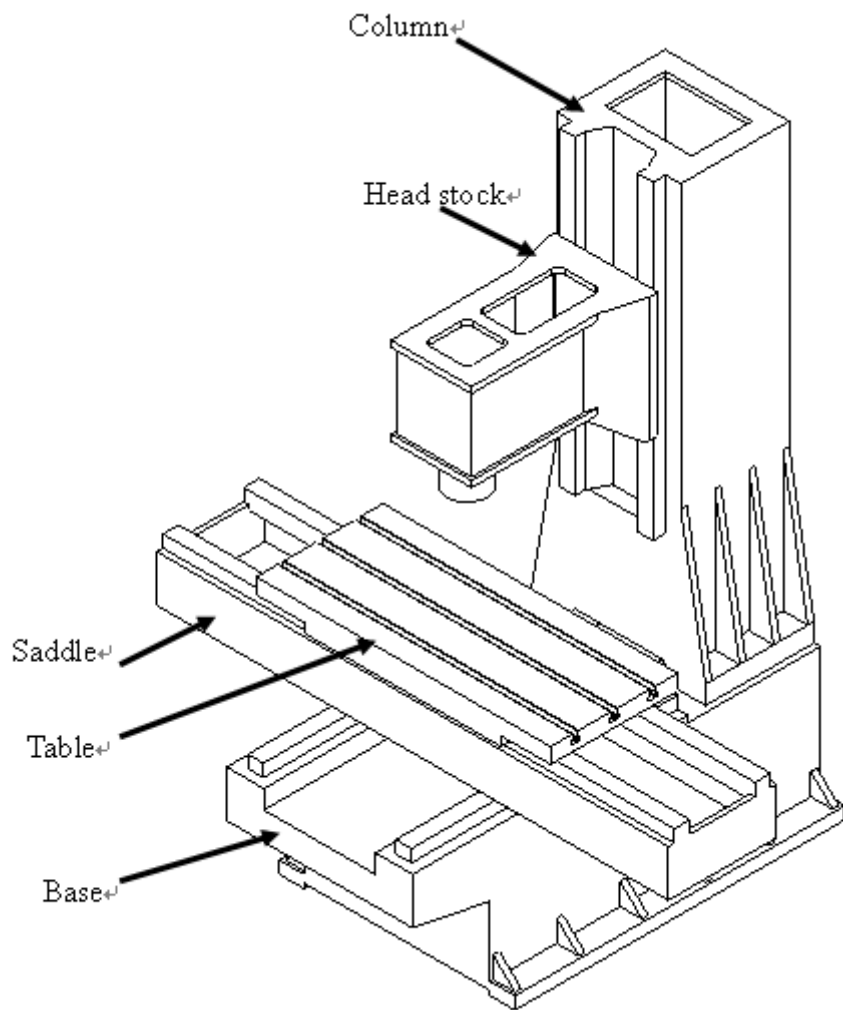


Recommendation label

OIL USAGE RECOMMENDATION							
ITEM \ BRAND	ISO	MOBIL	MOBIL Synthetic oil	SHELL	BP	CPC	CALUBE
Cutting fluids (water soluble)		CUT 232					WCR-F200
Lubricator of pneumatic	VG22	Velocite 10		Tellus 22	Energol CS 22	Spindle oil R22	
Lubricator system (ball screw, slide way)	VG68	Vactra NO. 2		Tonna T68 Tonna S68	Maccurat D 68	Way Lubricant 68	
Oil cooler of spindle	VG22	Velocite 10		Tellus 22	Energol CS 22	Spindle oil R22	
Hydraulic system	VG32	DTE Light	SHC 624	Tellus 32	Energol HP 32	Circulation Oil R32	
Tool release cylinder	VG32	DTE Light	SHC 624	Tellus 32	Energol HP 32	Circulation Oil R32	
Gear box of spindle	VG32	DTE Light	SHC 624	Tellus 32	Energol THP 32	Circulation Oil R32	
Gear of rotary table (Angle head)	VG150	Mobilgear 600xp 150	SHC 629	Oma1a 150	Energol GR-XP 150	E. P Lubricant HD 150	

3990005B0

# Moving direction



Axis	Travel	Direction of travel		Origin
X	Table Left/right	Advance to left	(+) direction	(+) End
		Advance to right	(-) direction	
Y	Saddle/table Forward/backward	Retraction	(+) direction	(+) End
		Advance	(-) direction	
Z	Head stock Up/down	Up	(+) direction	(+) End
		down	(-) direction	

## Coordinate system

The coordinate axes for NC machines are specified in standard specification DIN 66 217. As a generalization, the following applies to linear axes X, Y and Z, and the correlating rotary axes:

### X Axis

The X axis is the principal axis in the positioning plane. It is usually located parallel to the work piece clamping area and runs horizontally in most cases.

### Y Axis

The position and direction of the Y axis results from the specifications for the X axis and Y axis. A right-angled Cartesian coordinate system is used.

### Z Axis

The Z axis is parallel to the axis of the work spindle or coincides with it. For drilling and milling machines, the work spindle carries the tool. The work spindle carries the work piece for lathes. The positive direction of the Z axis runs from the work piece to the tool, or, in the case of lathes, from the work spindle to the work piece.

## Rotation Coordinates

The rotation axes A, B and C are assigned to the X, Y and Z coordinate axes (see next page).

Based on the positive direction of the coordinate axes X, Y, Z, the positive direction for the corresponding rotary axes A, B, C is given by clockwise rotation.

## Direction of Movement

If the tool support is moved, the direction of movement and axis direction are rectified. The positive directions of movement are designated with +X, +Y, +Z, etc.

If the work piece fixture is moved, the direction of movement and axis direction are acting in opposite direction to each other. The positive directions of movement are designated with +X', +Y', +Z', etc.

### Right-Hand Rule:

If you place your thumb in the direction of the positive X axis and your middle finger in the direction of the positive Z axis, the position and direction of the Y axis is determined by your pointer finger

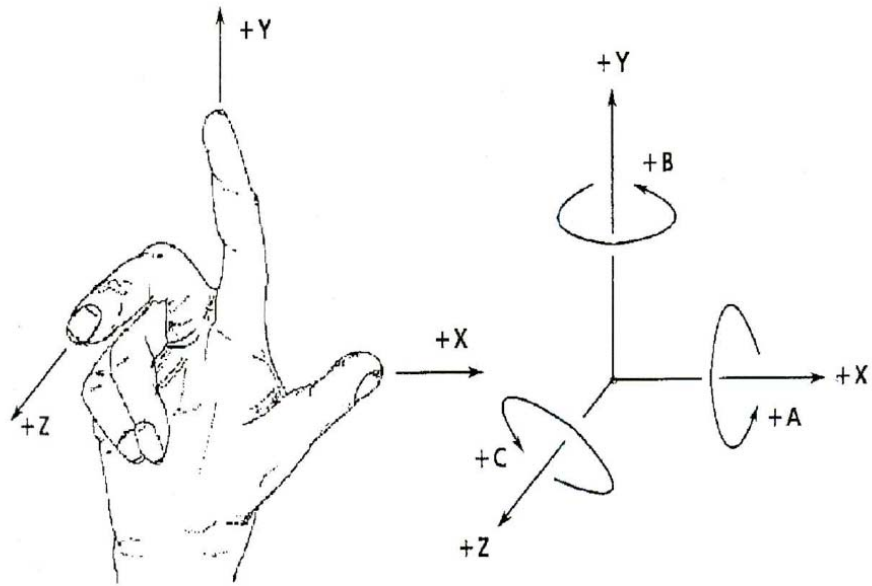


Figure according to DIN 66 217

## Maintenance point table

POINT \ TIME	D	W	M	6 M	Y
Machine body					
Clean the chips on the table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean and lubricate the table	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean the chips on the chip plate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean and lubricate telescopic covers	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean guard and window	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean the chips between slide ways	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean and lubricate slide way	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adjust wedge(box way type)	—	—	—	<input type="checkbox"/>	<input type="checkbox"/>
Check the slide way if it normal	—	—	—	<input type="checkbox"/>	<input type="checkbox"/>
Clean and lubricate ball screw	—	—	—	<input type="checkbox"/>	<input type="checkbox"/>
Check the ball screw if it normal	—	—	—	<input type="checkbox"/>	<input type="checkbox"/>
Check the level and adjust	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antirust foundation bolt	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean the chip in wire conduit	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the wire conduit if it normal	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drain out the recycle oil tank	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spindle					
Clean and lubricate tool hold	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check clamping force	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the tool release gap	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change the motor belt	—	—	—	—	<input type="checkbox"/>
Clean and lubricate tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check and retighten pull stud	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power cylinder					
Check and refill oil tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the solenoid if it normal	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change oil	—	—	—	—	<input type="checkbox"/>
Automatic tool changer unit					
Remove the chip on disk	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean and antirust guide chain	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean and antirust tool holder	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check tool holder if it normal	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean and put antirust to the changer arm	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Add grease on the motion parts	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



POINT \ TIME	D	W	M	6 M	Y
Operation box					
Check the bottom light if it is normal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the switch if it is normal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electric cabinet					
Clean heat exchange fan net	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean and retighten electric parts	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the heat changer if it normal	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check and retighten the locking bolts	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oil cooler unit					
Check and refill oil to the level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the temp. setting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the function key if it is normal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the temp. sensor if it is normal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean the fan net	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change the oil level	—	—	—	—	<input type="checkbox"/>
Pneumatic unit					
Check and adjust pressure	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check and refill oil into lubricate tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check and adjust lubricate cycle	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the pressure switch setting	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the drain vale if it is normal	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change the air filter	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the solenoid if it is normal	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lubricator system					
Check and refill oil to the level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check and adjust pressure	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check if there is any leakage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the pressure switch setting	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean the enter filter	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coolant system					
Check and refill coolant liquid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remove chips and clean filter	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remove the chips from the chip bucket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the chip conveyor if it is normal	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the pump if it is normal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check and add grease driven chain	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change liquid and clean tank	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

POINT \ TIME	D	W	M	6 M	Y
Hydraulic system					
Check and refill oil to the level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check and adjust pressure	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check if there is any leakage	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the pressure switch setting	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check the solenoid if it is normal	—	—	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change the clean filter net	—	—	—	<input type="checkbox"/>	<input type="checkbox"/>
Change oil and clean oil tank	—	—	—	—	<input type="checkbox"/>

# 2-Equipment

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## Spindle unit(Belt type)

### Application

High-speed precise spindle is used on this kind of machine. The parts of spindle are made through precise process and made from stable material. The Angular Ball Bearing is assembled by professional people and technology with constant-temperature environment. This kind of spindle is suitable for high speed/light duty and low speed/heavy duty.

Adopt the Quill Type recurring coolant circuit and cooperate with high efficiently temperature controller. It makes the spindle remains constant-temperature state and create the best working accuracy.

Disk Springs and Draw Bar for clamping are adopted, so that the Spindle can combine with Cutter Arbor tightly. When the machine is executing tool-changing, the air blow holes in the middle of spindle can self-dust. Because of this, it will keep the place that combines the spindle and draw bar clean.

Air purge of spindle nose use low-pressure airflow to bring effect. When spindle is high-speed operating, the mist and dust will not permeate the bearings. By this devise, it can ensure the spindle's life.

The outside dimension and inside construction of spindle, please see the attached documents for reference.

### Specification

Item	unit	Note		
Spindle mode		#40 type I	#40 type II	#50
Cone taper		7/24	7/24	7/24
Housing Dia.	mm	120	150	190
Max. speed	rpm	10,000	10,000	6,000
Bearing inner Dia.	mm	60	70	90
Lubricate		grease	grease	Grease
Clamp force	kgf	500	800	1800
Tool release gap	mm	0.7~0.9	0.7~0.9	0.9~1.2
Transmission		belt	belt	Belt
Air blow		St.	St	St
Air purge		St.	St.	St
Cooler interface		St.	St.	St.
Weight	kg	35	50	95

#40 type I spindle use on : V450/V650/V33I/V42I


#40 type II spindle use on: V1100/MV1100S/MV1300S/MV1750S

#50 type I spindle use on : MV1100D/MV1300D/MV1750D

## Warm up requirement

The spindle designed with high precision, a kind of automatic CNC machine center. For the spindle life, please before operating, follow up the table statements of spindle warming up.

## Warm up table

<div>  <b>CAUTION</b> </div>						
Starting spindle rotating If the spindle has cooled down to room temperature or below after a long period of standstill, it should not be restarted with max. Operating speed, in order to protect the spindle bearing. Increase speed step by step. Follow the warm up sequences in the chart below.						
Daily work	Max. speed RPM					
	■ -12,000		■ 12,000-18,000		■ 20,000-	
	Rev.	time min	Rev.	time min	Rev.	time min
Daily work	25% of Max	5	20% of Max	2	5% of Max	2
	50% of Max	5	40% of Max	3	10% of Max	3
	75% of Max	5	60% of Max	5	15% of Max	5
			80% of Max	5	30% of Max	5
					60% of Max	5
					80% of Max	5
					90% of Max	5
Standstill over 1 months	25% of Max	5	20% of Max	2	5% of Max	2
	0	5	40% of Max	3	10% of Max	3
	50% of Max	5	0	5	15% of Max	5
	0	5	80% of Max	5	0	5
	75% of Max	5	25% of Max	5	30% of Max	5
	Max	5	0	5	60% of Max	5
			Max	5	0	5
					80% of Max	5
					90% of Max	5
					Max	5

### **Caution for operation**

1. Do not rotate spindle unless the tool holder loaded into spindle already.
2. The vibration amplitude of spindle with tool is less than 18 $\mu$ m.
3. Adjust temperature controller on the cooler to the temperature be 3~5°C below room temperature, then make sure the actual operation of oil cooler.
4. Obey the specific statements and do not excess the cutting condition of tool maker.
5. The operation time for over 8000 rpm can not exceed 3 hours in each period of 4 hours.
6. After 4 hours idle time without operating spindle, the spindle speed should be less than half speed of target speed for 5 minutes before raising spindle speed over 8000 rpm.

### **Maintenance**

The spindle contains a draw bar witch clamps and release tool by the release cylinder and the disk spring inside of draw bar. The end of draw bar is made to clump by steel ball or collets chuck. When the tool is to be unclamp, the tool release cylinder push down to the draw bar, meanwhile, the chuck move outward, the tool release from the spindle cone. The disc spring force will supply the draw bar with pull to draw it back to the initial position. On the other hand, during tool clumping, the draw bar is acted downward and clumps the tool by the spring force.

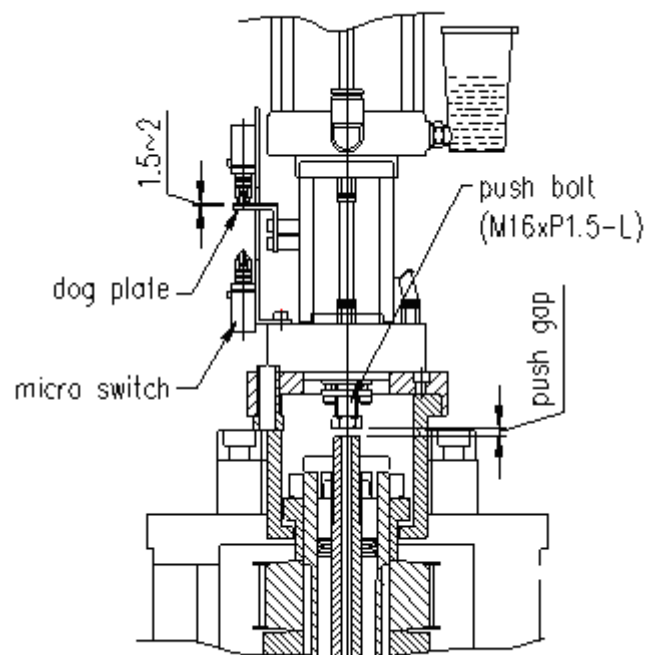
#### **REASONS FOR ADJUSTMENT:**

- During tool exchanging, there are malfunction between the upper micro switches and lower micro switch on the top of tool release cylinder.
- The tools pull hardly out of the spindle cone and cause tools interference.
- During tool changing, it is tool hold for delaying time.

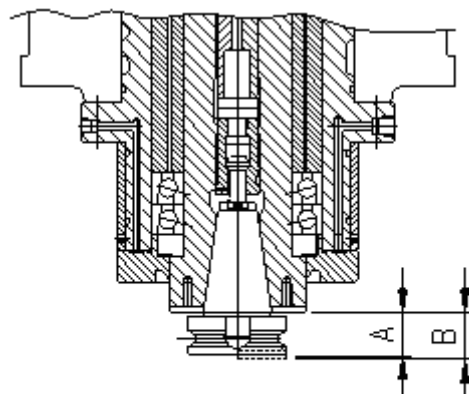
### **Procedure of adjustment**

1. Use the manual mode to clump the tool and measure the distance between spindle nose and flange of tool by micro scale.(refer to the drawing 2)
2. If the distance is not on require, please adjust the push gap by the bolt the bottom of tool release cylinder. Loose the nut and turn the bolt in clockwise to enlarge the gap as long as decrease the gap by turning counterclockwise. (one turn of bolt will move it 1.5 mm.) (refer to the drawing 1)
3. Check if the position is correct between the upper limit switch and the dog plate. Make sure that the limit switch should be Just on the top point on the dog whenever clamping or unclamping operation. The limit switch should have contact space at 1.5~2 mm. it will cause none malfunction or action delay during tool clamping and unclamping. (refer to the drawing 1)



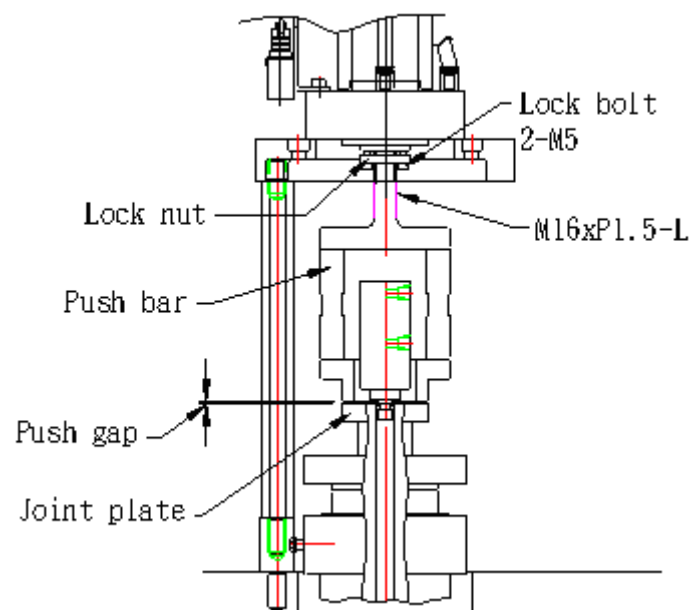


Drawing 1



Drawing 2

$B-A$ =Tool release gap

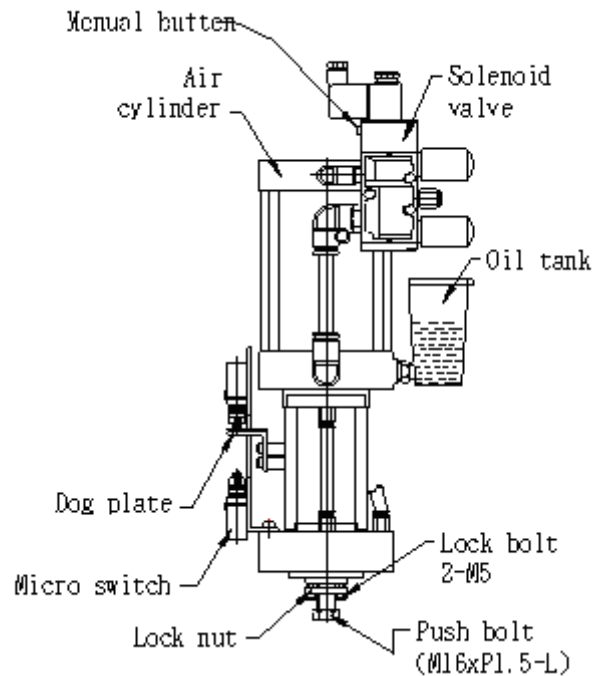


## Tool release cylinder

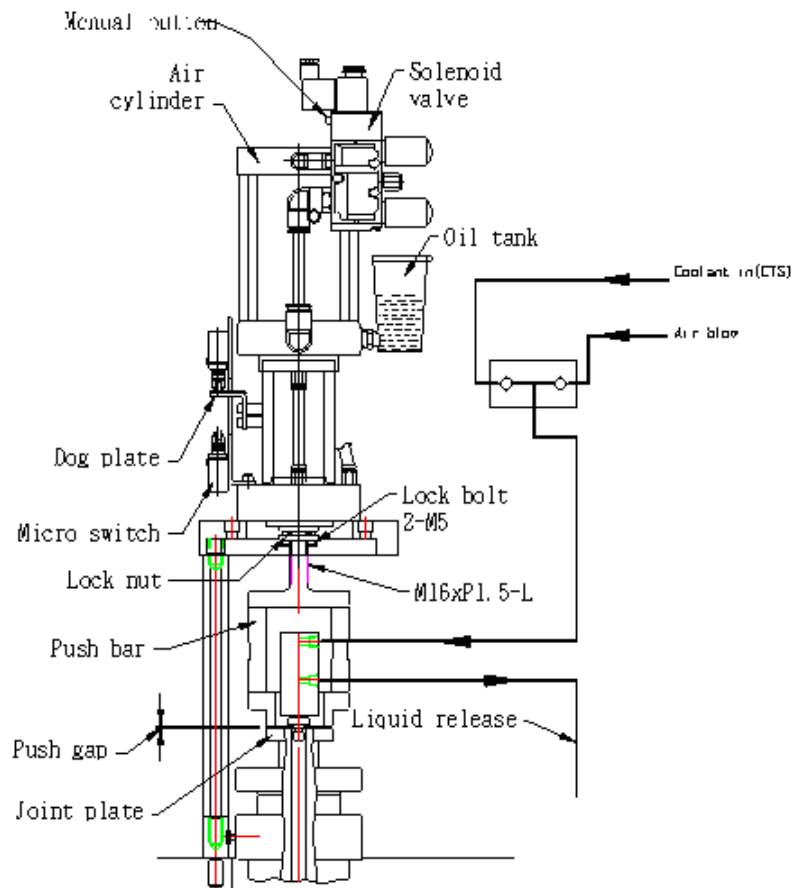
### Application

Ideal way to generate huge hydraulic push force through pneumatic media. This hydraulic pushing force is as for the power source of Spindle tool released.

### Out line (For belt type)



### For coolant through spindle

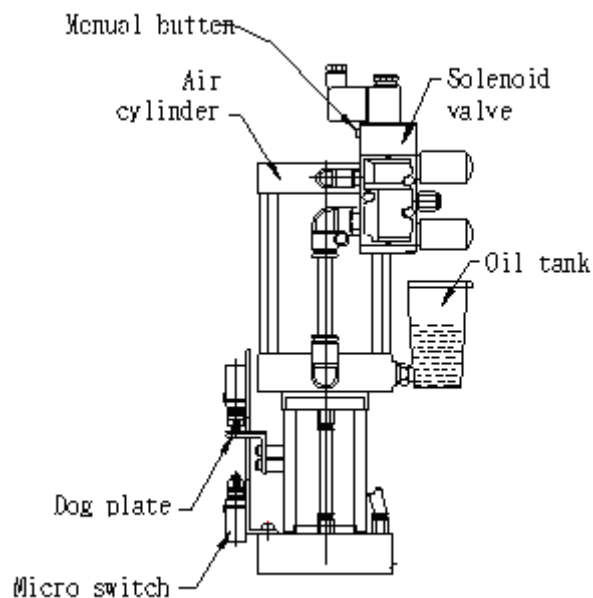


### Specification

		For #40 spindle	For #50 spindle
Item	unit	Note	
Action		Air over oil	
Input air pressure	Kgf/cm <sup>2</sup>	6~7	
Output force	Ton	2.5~3	4~4.5
Push stock	mm	13	17
Oil tank capacity	c.c.	80	
Refrigerant Oil		ISO VG 32	
Boost rate		25	39

Note: Please keep the oil leave of oil tank onto 50% full in tool release state.

### Out line (For direct spindle)

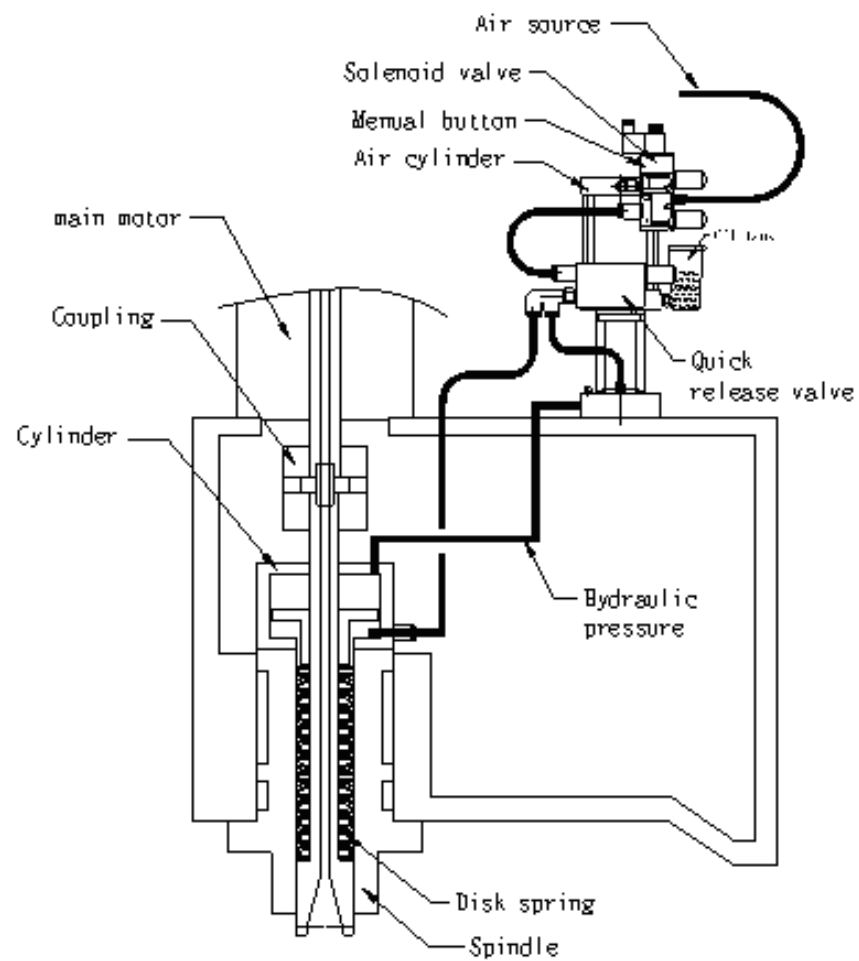


Note: Please keep the oil leave of oil tank onto 50% full in tool release state.

### Specification

		For #40 spindle	For #50 spindle
Item	unit	Note	
Action		Air over oil	
Input air pressure	Kgf/cm <sup>2</sup>	6~7	
Output force	Ton	2.5~3.5	2.5~3.5
Max outlet value	c.c.	70	120
Cylinder DIM	mm	100	100
Oil tank capacity	c.c.	80	
Refrigerant Oil		ISO VG 32	
Boost rate		12.7	12.7

## Sketch drawing



## Maintenance

Daily work	1. Check the oil level.
Weekly work	1. Check the connectors to see any leak or loose.
Monthly work	1. Check the oil level and refill it.
Yearly work	1. Change the oil.

### Trouble shooting

Trouble	Possible reason	Solution
<ul style="list-style-type: none"><li>• Hydraulic-pressure Oil consumed unusually</li></ul>	<ul style="list-style-type: none"><li>• Joint leaking</li><li>• Seal is broken</li><li>• Pressure too low</li></ul>	<ul style="list-style-type: none"><li>• Tighten joint.</li><li>• Change seal.</li><li>• Adjust pressure</li></ul>
<ul style="list-style-type: none"><li>• Tool can not release</li></ul>	<ul style="list-style-type: none"><li>• Joint leaking</li><li>• Seal is broken</li><li>• Oil level too low</li></ul>	<ul style="list-style-type: none"><li>• Tighten joint.</li><li>• Change seal</li><li>• Refill oil</li></ul>
<ul style="list-style-type: none"><li>• Piston can not back</li></ul>	<ul style="list-style-type: none"><li>• Solenoid broken</li></ul>	<ul style="list-style-type: none"><li>• Change solenoid</li></ul>

- Note : First use or re-filling oil may cause the cylinder to have bubbles and become low-pressure.
- Solution:
  - Dismount the tool on the spindle.
  - Press the Manual button on the Magnetic Valve for unclamp and clamp several times. By this step, the bubbles in the tubes can be discharged.
  - Re-assemble the tool and test the function for clamp and unclamp again

## Automatic tool change

### Cam type automatic tool changing system

#### Instruction

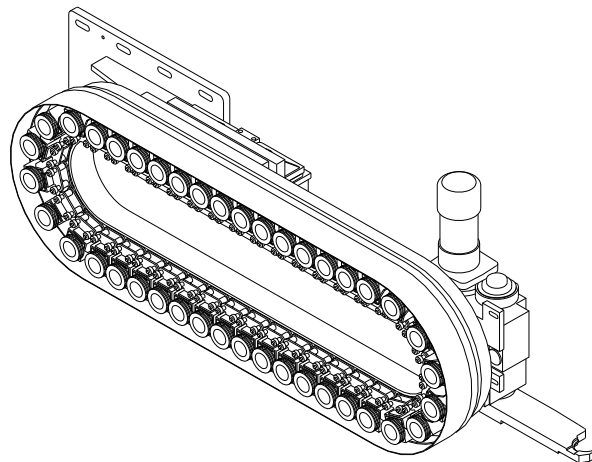
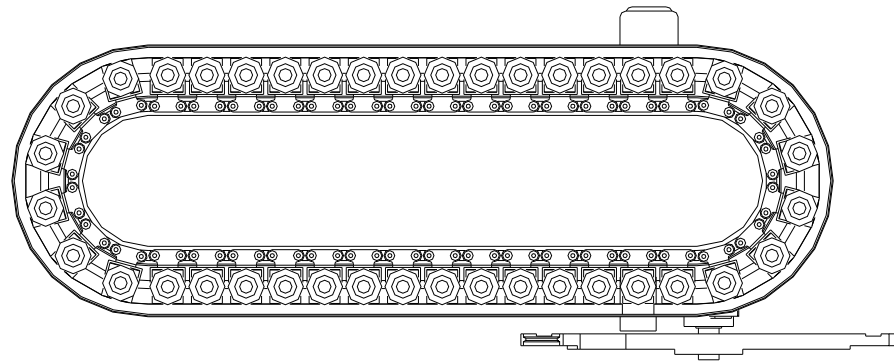
- This system is using cylindrical cam to reduce the speed by gear. The cylindrical cam is driven by a motor, which attached with automatically power-off brake to produce the indexing angle and positioning the tool pocket. When POT is on position, the pneumatic cylinder will drive the flat type cam, to make the clamping jaws goes up and down, the movement of the clamping jaws will also drive the POT to rotate horizontally or upright, and this will make the tool changing to be quick & smoothly.
- Every single rotation cycle of cylindrical cam will drive the POT for one indexing, and in every 360° rotation of the cylindrical cam, there are 270° to be the angle of movement of the cam and 90° to be the angle of non-movement. This design will help the brake motor to stop and positioning. (The rotation angle of the brake motor will be 45°±20°)
- The effective rotate angle for the clamping cam is approximately 100°, 10° plus on both the left and right side to be the angle often movement.
- The motor is 3 phases, 220V 200W. The gear reducing ration is 1:20, the attached automatic power off brake can be rotate either clockwise (CW) or counter clockwise (CCW). For every single indexing, the using time theoretically is 0.7 second, and the complete indexing cycle (24 index) will take 16.8 seconds.
- The travel of clamping cylinder is  $\phi 50\text{mm} \times 100\text{mm}$ , detected by magnetic ring.
- The solenoid valve is 2 phases, 24V, 1/4"PT. (For pneumatic ATC).
- The Proximity Sensors: brand name: BALLUFF (ISO-9001) REG NO: 19279-01 Specification: M12×1, detecting distance 2mm Voltage: 10-30V DC  $\leq 130\text{mA} \leq 800\text{HZ}$  PNP 3 cords.
- The material of the POT is Nylon mixture with 33% glass fiber, one piece forged, with the tolerance of the weight up to 100Kg, and the highest thermo tolerance is 120°C to -20°C.
- The counting and positioning of the rotation is controlled by PLC, through the detection of the proximity sensors, this tooling system can rotate clockwise (CW) or counterclockwise (CCW) .To execute the tool indexing by selecting the nearest path.

- The total weight of the automatic tool changing system, is approximately 140Kg, the clamping arm and cover excluded, (the weight of the body and tool plate is light, but still carry high rigidity, the cylinder and drive motor are located on the back side of tool magazine, to bring the convenience for maintenance & repair.)

### Specification

Tool mode		ISO 40
Exchange arm type		Swim arm
Exchange mode		Random
Tools capacity	No.	40
Tool hold mode		Chain type
Tool exchange time	sec	1.5
Max. tool weight	kg	7
Max. tool length	mm	250

### Out line description



### **Adjust arm to home position**

1. According the following sketch, the tool magazine accuracy is within  $\pm 1^\circ$ .
2. Because of the static angle of motor signal roller, motor needs to turn about 2.5 or 3 revolutions for taking off the conduction range. If the motor brake turns over 2.5 revolutions, it will drive the tool arm. In general the stopping range of motor brake is within half or 1 revolution and the conduction timing of proximity switches set at  $5^\circ$  before returning home position.
3. If motor used quite long time, the brake will be exhausted and extended the stopping range. Eventually the detector extinguished and made a false signal; therefore the NC operating will break down.
4. If there is a lot of similar situations happened neither switch problem nor electric elements broke. After checking tool arm at the tool changing position is OK then it made a conclusion that the brake motor has been exhausted. It should be replace the new one by authority service person.
5. If shrink the distance between sensor and original position of signal conductive roller, the stopping range of brake motor will become so smaller that original position deviate over range and get alarm easily.
6. Because of the varies factors for brake motor, so the supplier suggests that every two years to replace the new one to keep within  $\pm 1^\circ$  of the brake accuracy.

Please refer to the following drawing

### **Modifying procedures of tool arm**

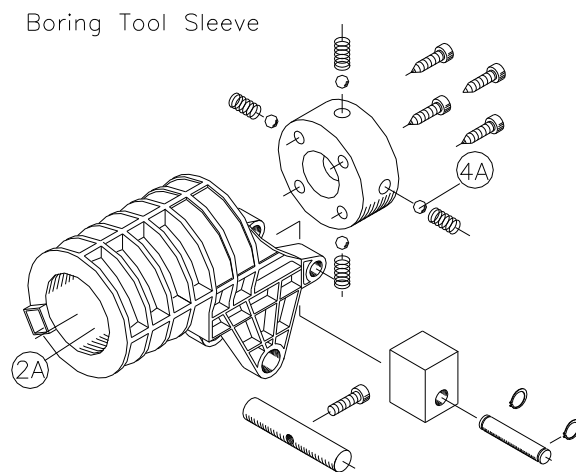
- Pull down the clutch lever.
- Turn the tool arm to the position of tool holding angle by turning motor with the wrench.
- Adjust the tool arm to hold the tool.
- Tighten the setscrews of tool arm.

Please refer to the following drawing



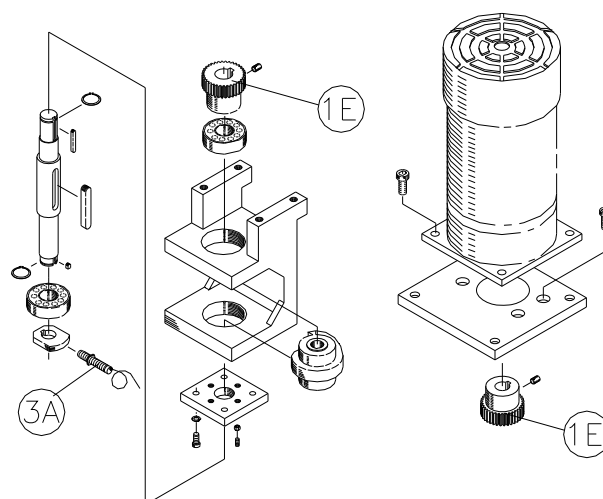
## Assembly drawing

### Boring tool sleeve



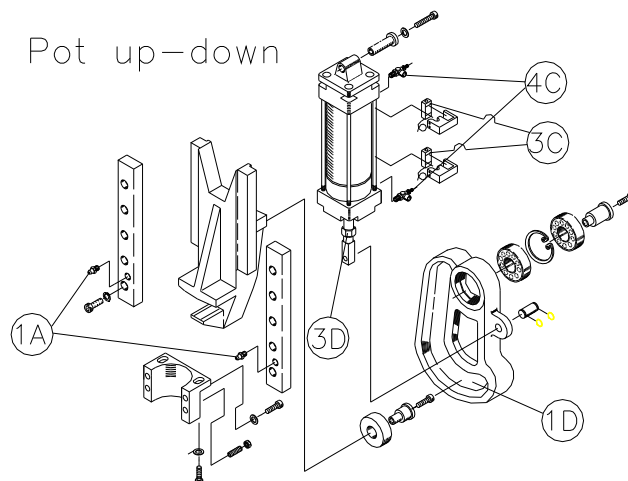
## Motor drive

Motor Cam

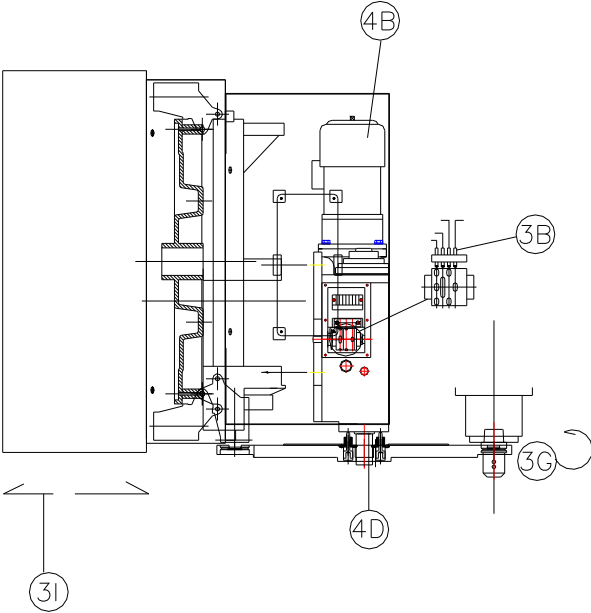


## Pot down/up cam

Pot up-down

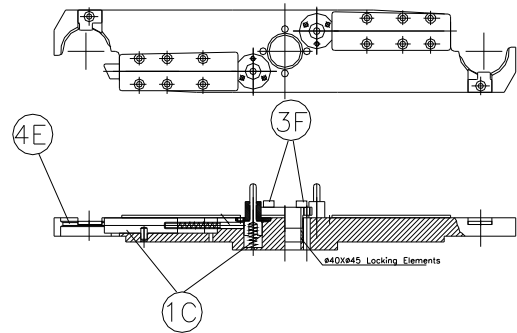


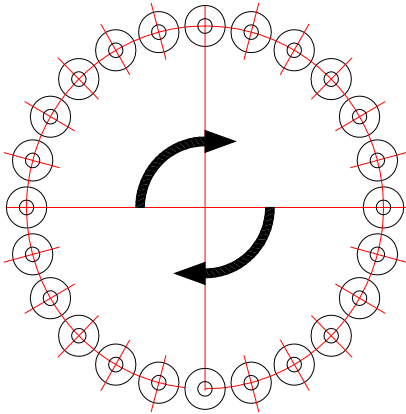
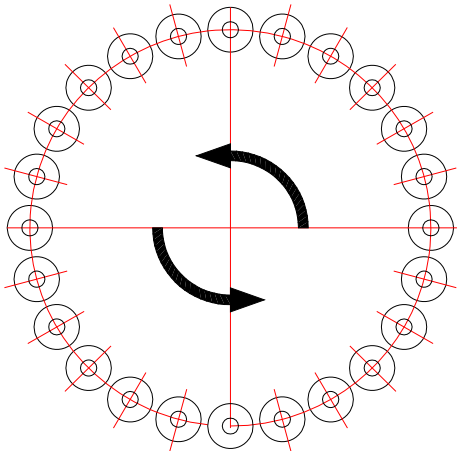
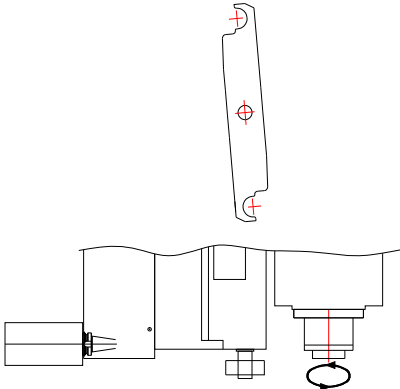
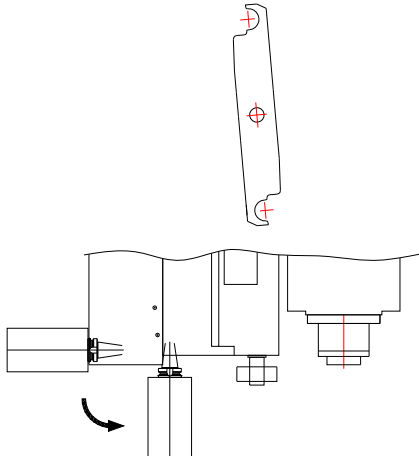
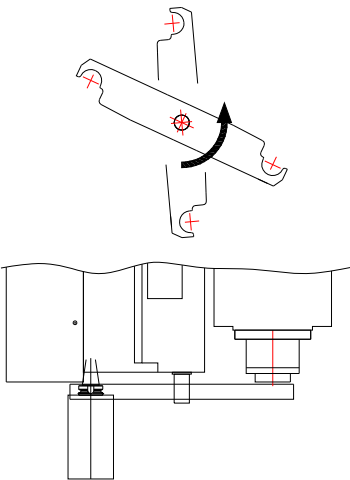
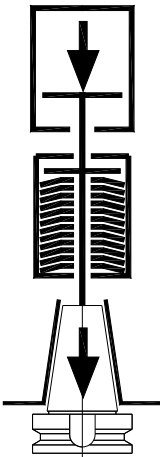
**Position sensor**

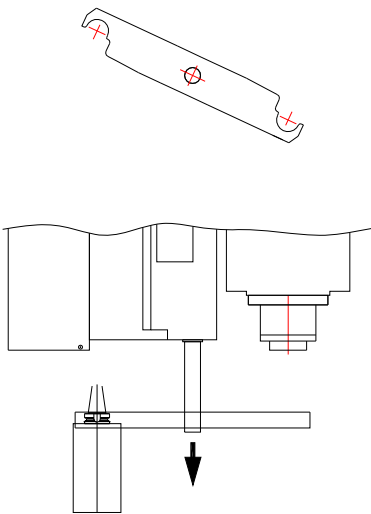
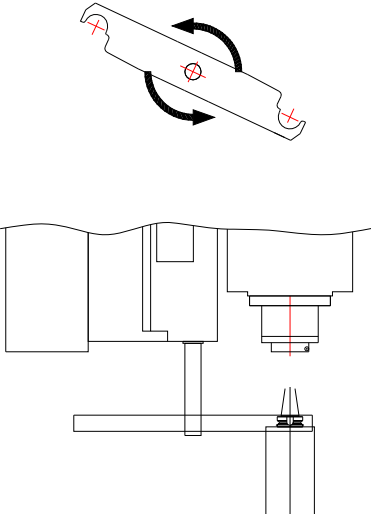
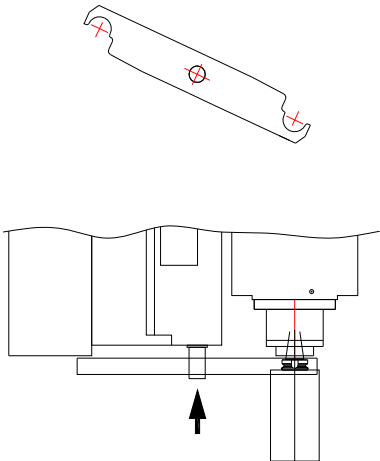
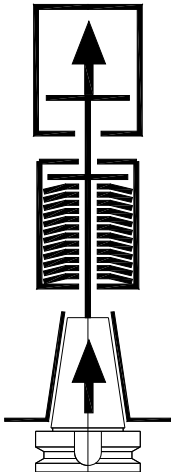
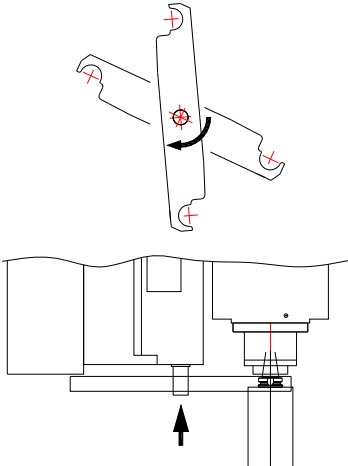
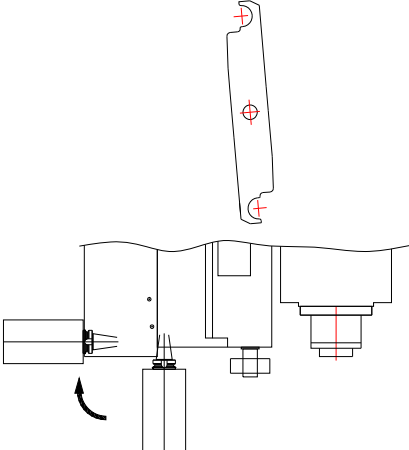


**Tool change arm**

Tool Arm



	<b>Cycle command</b>	
	M6 T code Tool change cycle	
	MDI mode commend	
	[M21] Disk turning clockwise	[M22] Disk turning count clockwise
		
	MDI mode commend	
	[M19] Spindle rotation to original	[M23] Tool hold to lower position
		
	MDI mode commend	
		[M26] Tool release
		

	MDI mode commend	
		
	MDI mode commend	
		[M25] Tool clamping
		
	MDI mode commend	
		[M24] Tool hold to upper position
		

### Trouble Shooting

Trouble	• Tool disk stops without positioning
Reason	1. Brake fail to work or overload 2. Sensor switch with far distance
solution	1. Please check electronic brake wiring in- correct connection or not? If the part fail to work 2. Move sensor switch closer to sensor
Trouble	• Tool disk non-stop rotating
Reason	1. Sensor switch break down 2. Sensor switch with far distance
solution	1. Replace sensor switch 2. Move sensor switch Closer to sensor
Trouble	• Pot break
Reason	1. Tool disk rotated while tool clamping
solution	1. Replace new tool pot & adjust arm Clamping position again
Trouble	• Shake during tool clamp & returning
Reason	1. Cam out lubrication 2. Cylinder speed out of balance
solution	1. Fill lubricant oil 2. Adjust cylinder pressure & speed valve.
Trouble	• Tool pot is not positioning(loosen)
Reason	1. Bolt of positioning bolt or pot bolt are loosen
solution	1. Adjust it to normal & tighten
Trouble	• Tool disk dose not work during tool selection
Reason	1. Induction switch dose not work 2. Induction switch break down 3. Motor break down 4. Electronic break bread down
solution	1. Adjust reed switch to normal position 2. Replace reed switch 3. Repair motor 4. Check wiring or sensor switch & replace

Trouble	• Cylinder does not work during tool change
Reason	<ol style="list-style-type: none"> <li>1. Proximity switch for tool counter positioning is break down</li> <li>2. Tool disk is not positioning</li> <li>3. Cylinder has no pneumatic air</li> <li>4. ATC arm does not home</li> </ol>
solution	<ol style="list-style-type: none"> <li>1. Replace proximity switch</li> <li>2. Tool disk positioning</li> <li>3. Check cylinder air, solenoid valve works or not?</li> <li>4. Rotating motor bolt manually to let ATC arm back to original position</li> <li>5. Check reed induction switch</li> </ol>
Trouble	• ATC fail to work during tool change
Reason	<ol style="list-style-type: none"> <li>1. Tool clamp positioning reed switch fail to work</li> <li>2. Induction switch break down</li> </ol>
solution	<ol style="list-style-type: none"> <li>1. Adjust reed switch to proper position</li> <li>2. Replace new reed induction switch</li> </ol>
Trouble	• ATC motor over-heat
Reason	<ol style="list-style-type: none"> <li>1. Brake is not released</li> <li>2. Brake is break down</li> <li>3. Commentator is break down</li> </ol>
solution	<ol style="list-style-type: none"> <li>1. Check commentator to electrify or not?</li> <li>2. Replace brake</li> <li>3. Replace commentator</li> </ol>
Trouble	<ul style="list-style-type: none"> <li>• ATC fail to work after tool clamping;</li> <li>• ATC fail to work after 180° degrees tool change;</li> <li>• ATC home stop &amp; home</li> <li>• Sensor switch does not work</li> </ul>
Reason	<ol style="list-style-type: none"> <li>1. Sensor is in wrong position</li> <li>2. Sensor switch is break down</li> </ol>
solution	<ol style="list-style-type: none"> <li>1. Adjust sensor to proper position</li> <li>2. Replace sensor switch</li> </ol>
Trouble	• ATC stop position out of
Reason	<ol style="list-style-type: none"> <li>1. Sensor is in wrong position</li> <li>2. Positioning ring of sensor switch is in wrong angle</li> </ol>
solution	<ol style="list-style-type: none"> <li>1. Adjust 3 sensor at the same time to proper angle</li> <li>2. Rotate set ring, adjust 3 sensor switch to proper angle</li> </ol>
Trouble	• ATC tool clamping position out of accuracy
Reason	1. Arm & ATC spindle are not aligned
solution	1. Loosen taper ring key & align it again

### **Motor of magazine replacement**

1. Power off.
2. Wire off the wiring connect box of motor.
3. Take off M16 bolts (4pcs) on motor seat, and then disassembly the motor.
4. Disassembly the S18 ring & M6 bolt from damage motor & re-assembly those parts onto new motor.
5. Please make sure the motor specification is correct before you replace it.

### **Cylinder replacement**

1. Turn off the power & cylinder.
2. Take off Ø8 pipe.
3. Take off induction switch & mark original position before remove it.
4. Take off M8 bolt on cylinder.
5. Please take care to replace correct specification of cylinder before you fit it on, and then get back the induction switch to original position.

### **Induction switch replacement**

Power off.

Disassembly the wires of induction switch in the electric box.

Please loosen the seat of reed switch & take it out.

Replace new part & take care of the sensor position, push it to upward & downward until to end of both sides.

### **Proximity switch of tool magazine replacement method**

1. Power off.
2. Take off the front cover & outer sheet metal cover.
3. Take off the wires of proximity switch in the wire box.
4. Take off the M12 bolt on proximity switch.
5. Replace new part & make sure the sensitive distance is 4mm.

**Note**

1. Please use standard tool during maintenance & repair.
2. We suggest you replace part, which is bought from original supplier.
3. Please take care of the part specification before replacement. You can get the specification from the part list.
4. Please make sure the sensitive distance during replace proximity switch & reed switch.
5. Please take care the wire numbers & location in case you have to replace the wire connecting.
6. In any case of abnormal or damage condition on the product, there should be someone checking the product. We strongly ask the service man has to be well trained & qualified engineer or expert come to check or repair the problem. This is to ensure safety of operator & engineer.
7. Before disassembly the product, please make sure there are enough human beings to support the load. If there are not enough human beings, please use lifter, crank or any other carrier to support the weight.



## Pneumatic system

### Application

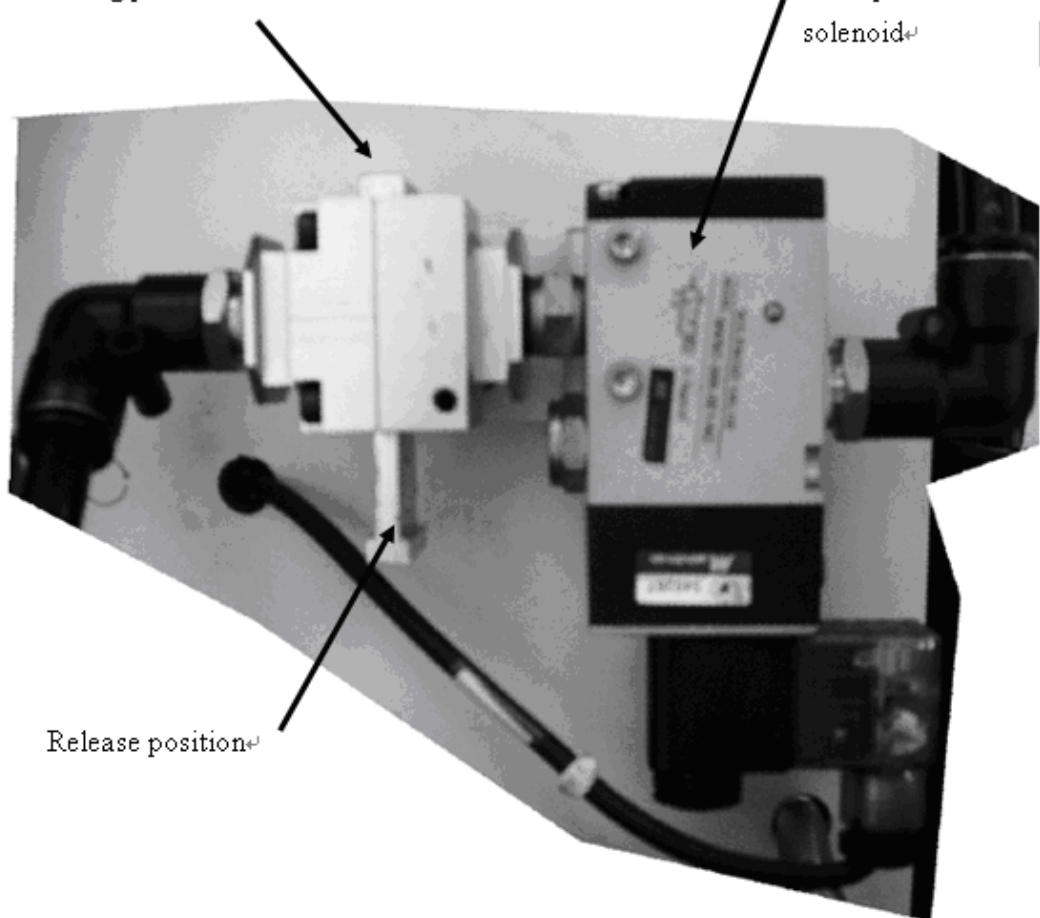
Air Pressure Unit is the source of power to drive the air-pressure equipments, such as spindle unclamp, tool pocket motions and air blowing...etc.

In the factory, the device that providing air pressure needs the functions of pressurization, dust-sweeping, water-sweeping...etc., so that they can raise the reliability of long-term operation for machine devices.

### Safety control(CE request)

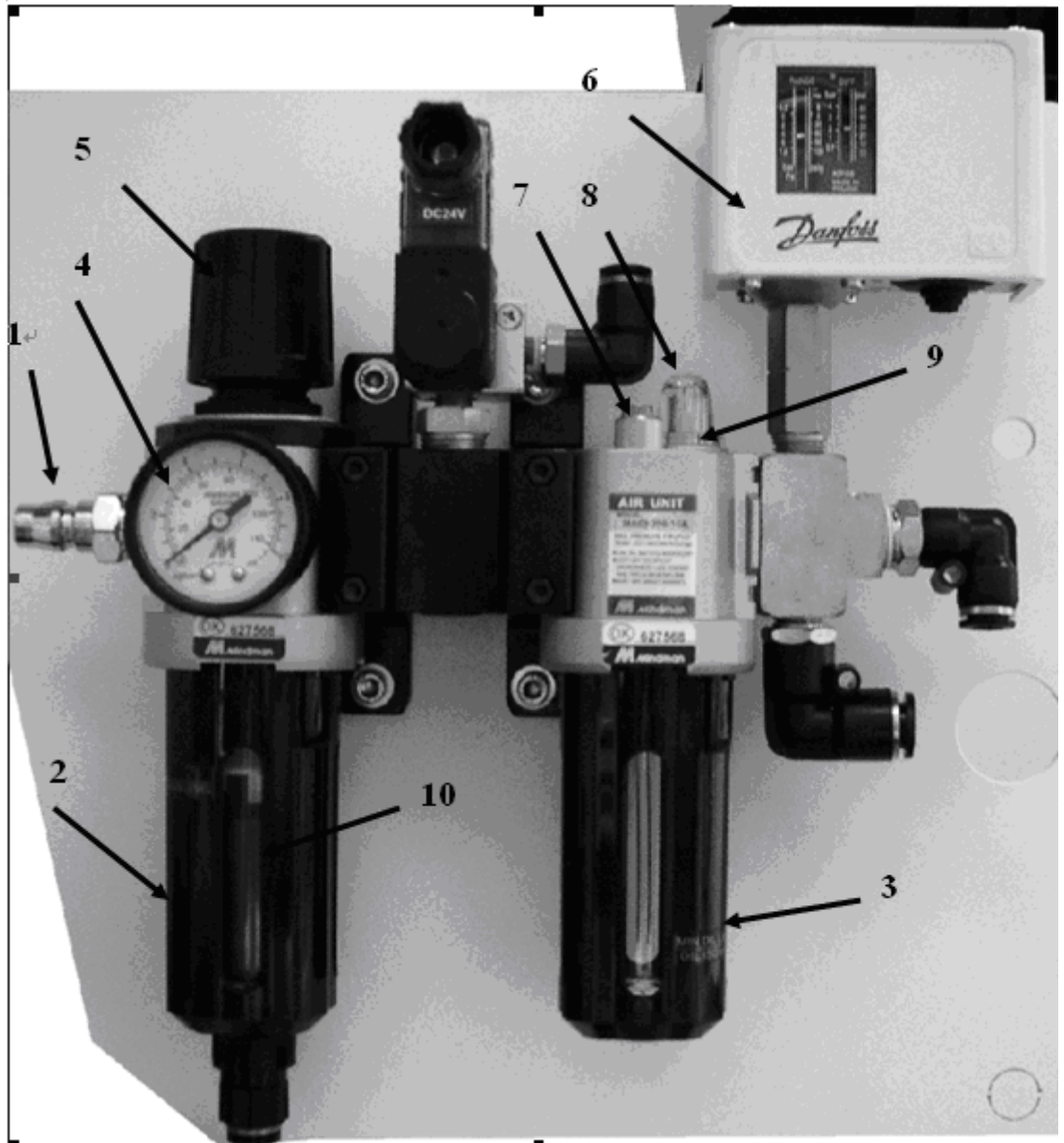
Loading position↙

Main pressure control  
solenoid↘



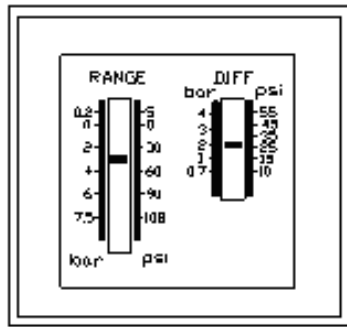
- Push the air pressure release valve to release position before to do any service work.

## FRL unit out line



NO	Name	Unit	Regulation
1	Pneumatic source entrance	kgf/cm <sup>2</sup>	6~7
2	Air fillter	u	5 micro
3	Lubrication oil tank	c.c	50-ISO/VG22
4	Pressure gauge	kgf/cm <sup>2</sup>	6~7
5	Adjust knob		
6	Pressure control switch		
7	Oil flow adjust knob		
8	Oil floe watch view	l/min	60
9	Oil entrance		
10	Auto drain valves		automatic

## Pressure control switch adjusting



Pressure switch

Range setup: 4~4.5 bar

Diff setup: around 2 bar

### Check point before operation

1. Check pressure supply before adjusting and check the air pressure gauge.
2. Adjust as necessary, what with watch the pressure gauge and clockwise rotation of the knob results in a pressure increase or counterclockwise turn will reduce the pressure.
3. Check the lubricator tank oil level and refill it.
4. Check the pressure switch setting is on factory setting.



- The pressure setting between 6~7 kg/cm<sup>2</sup>.
- Air pressure required: 8 bar before regulator, 6 bar after regulator, 400 l/min momentary.
- Push the air pressure release valve to release position before to do any service work.

### Maintenance

Daily work	2. Check the pressure and adjust pressure.
Weekly work	1. Check pipe and connectors to see is there any leak or loose. 2. Check the oil level and re-fill the oil
Monthly work	1. Check the filter
Half year work	1. Change the filter

Note:

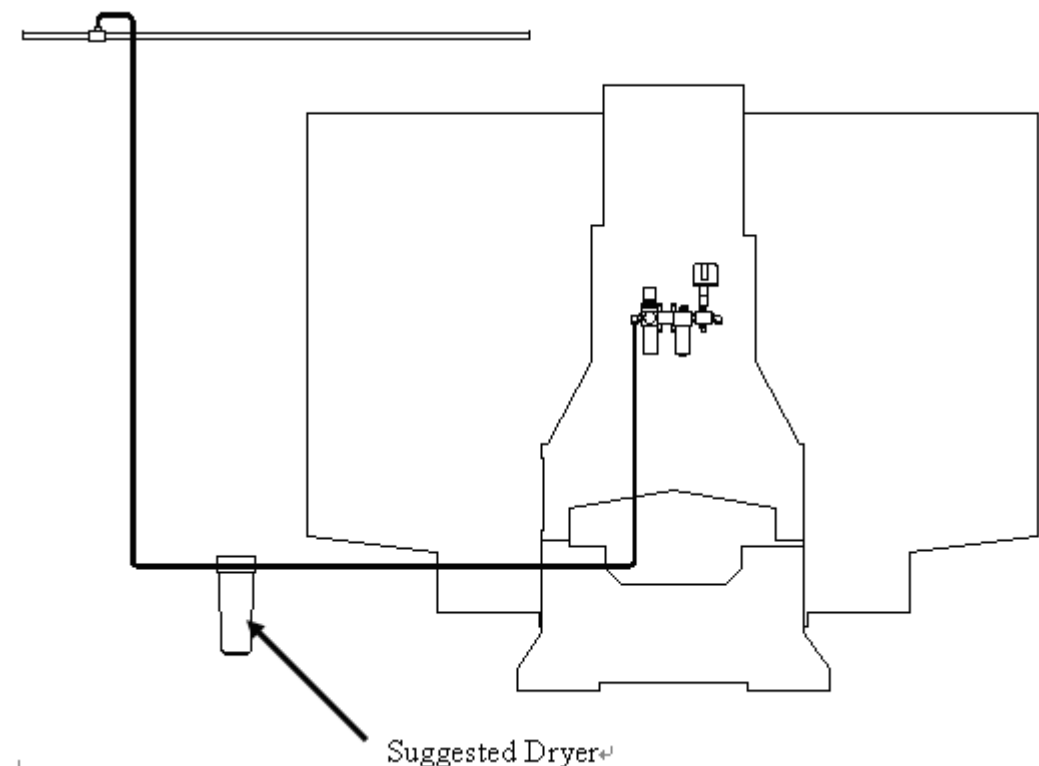
From the main air supply line attach a 10 mm air supply line for machine. The distance from the air compressor and number of machines attached should be taken into consideration when determining the size of piping for the main air supply line.

Piping may consist of one or more of the following: galvanized pip, PVC pipe or high pressure hose. Do not use quick disconnects; quick disconnects will restrict air flow.

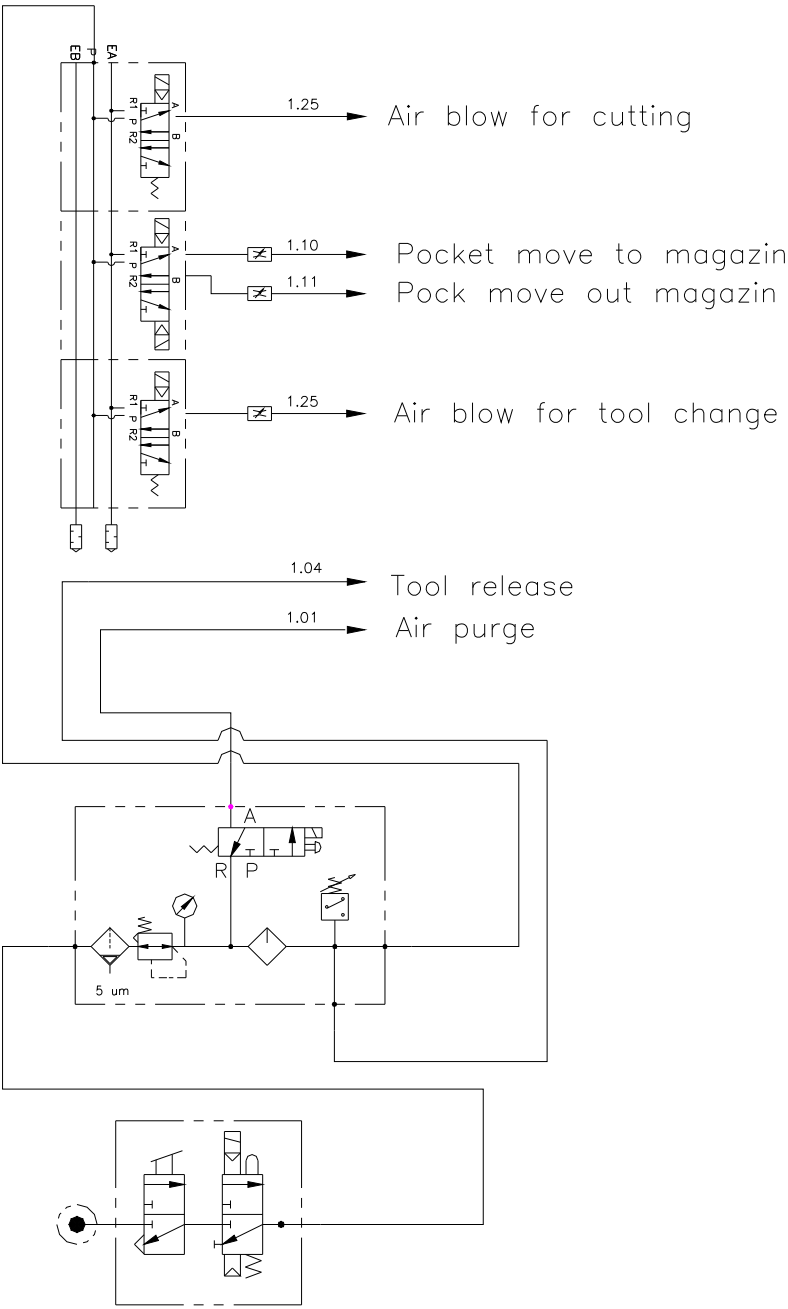
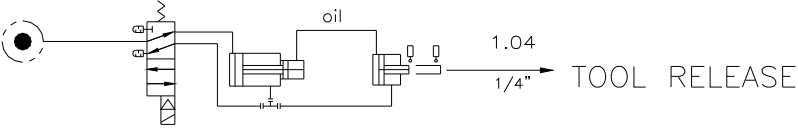
A "T" riser should be used to connect the main air supply line with the air supply line to machine.

To prevent moisture from entering the machine air system, attach a drain to the lowest point of the air supply line. The drain could be a self-relieving moisture separator, a simple petcock, or a gate valve opened occasionally to release the water build-up. An air dryer is preferred where higher moisture levels exist.

To help prevent contaminants from entering the air system on the machine, place a filter in-line on the main air supply line.



The route sketch drawings following the end of book.

	<b>The sketch of pneumatic system</b>
	V serious
	
	<b>Power cylinder for tool release</b>
	

Lubrication system

Application

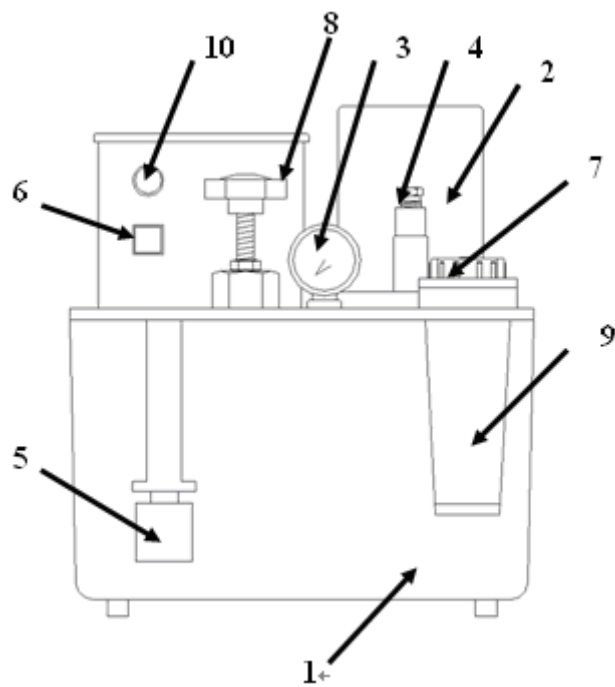
The slide way and liner way of machine are in headstock and table, saddle and the X,Y, Z axis ball screw, those areas need to be lubricated and all supplied by the lubricating pump located at the rear side of this machine.

When we turn on the machine power the auto lube will be started automatically and it will pump the lubricant to the areas mentioned above every 15 minutes. Every shot of oil will last 30 seconds. It can be adjusted if necessary, please refer to the operation manual.

Specification

Item	Unit	Note
Discharge capacity	Cc/min	0~200
Discharge pressure	Bar	0~20
Pump power	KW	0.25
Volt		3 phase/220V
Oil mode		ISO VG 68
Setting pressure	Bar	10~12
Pressure protection device		yes

Outside appearance



NO	Name	NO	Name
1	Oil tank	6	Push button
2	Pump	7	Oil inlet
3	Pressure gauge	8	Adjust value
4	Entrance	9	fillter
5	Oil level gauge	10	Lamp light

### Check point before operation

- Always sure proper, fresh lubricant and similar to viscosity(32-68 cST/40° C)
- The oil reservoir should always preserve clean lubricant and does not use recycle oil.

### Caution for operation

- The indicated lamp will light on if lubrication system operating normal.
- Turn the adjustable valve with CW to increase pressure and with CCW turn to decrease pressure.

### Maintenance

Daily work	3. Check the oil level and re-fill the oil 4. Check the pressure(push the button)
Weekly work	1. Check oil pipe and connectors to see is there any leak or loose.
Monthly work	1. Clean the filter



When we have the following situation please hold on the push button for 10~15 seconds, this action should repeat 3 times, because for a long time no operation, the lubrication is very little.

When

1. The machine is first time set up
2. Long time no operation.
3. Everyday before operation.

We should do this lubricating operation, go around and begin again 3 times when hand off the pump will stop automatically.

We should re-fill from the oil entrance every day. When the oil level goes down to 1/4, the operation panel will show “LUBE ALUMN”

### Trouble shooting

Situation	Cause	Remedy
Pump can not work	1. There is some foreign particles in 2. The viscosity of oil either too high or too low.	1. Disassemble the pump and take away the foreign particle 2. Use suitable viscosity oil
Pressure to lower	1. The pressure not setting 2. The joint or pipe leaking.	1. Adjust pressure 2. Tighten joint or change pipe.



The control lubricator system is always has strong influence to the machine accuracy and life of operation, so please take good can of operation and maintenance.

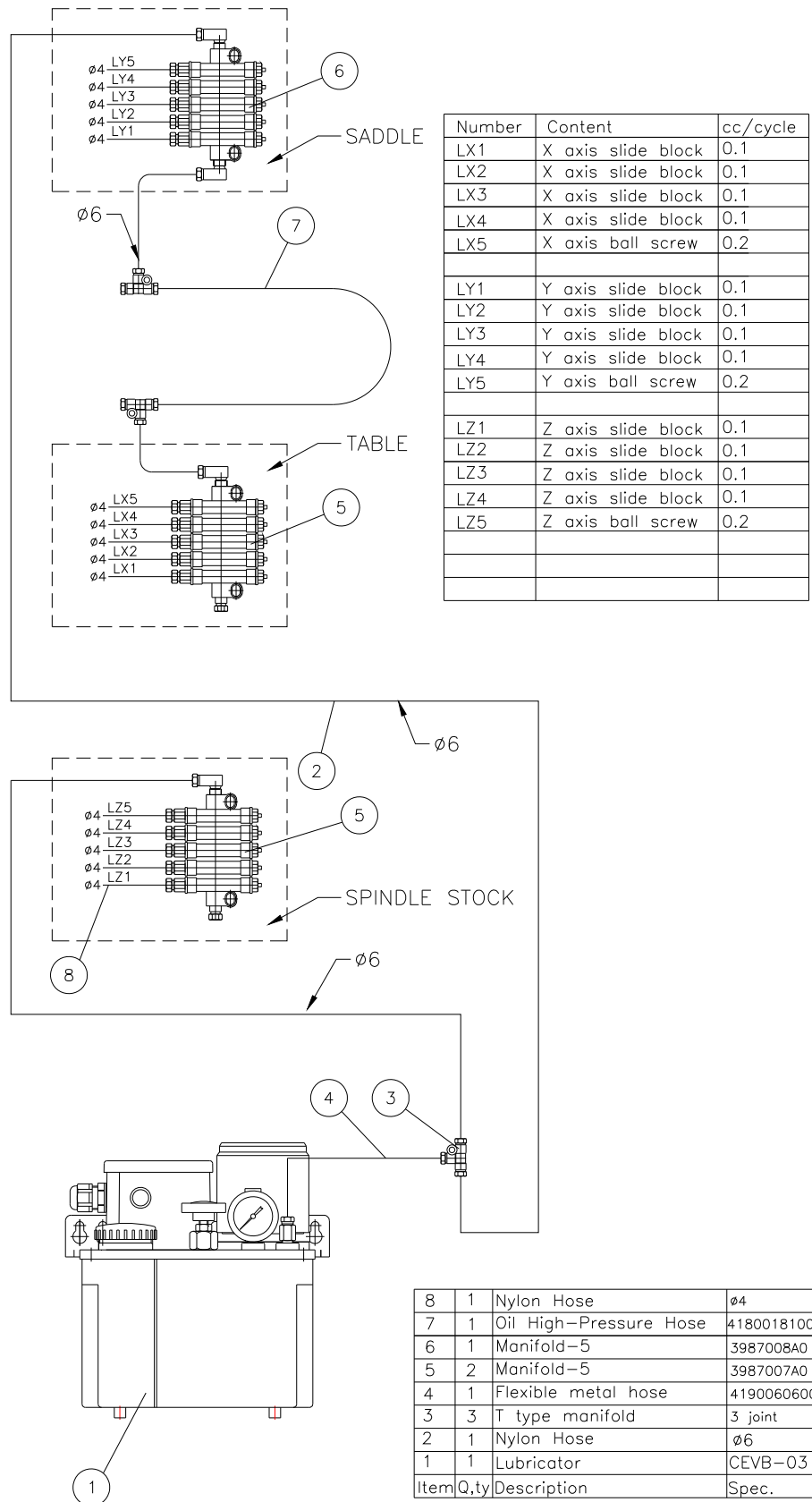
The normal working condition is in the temperature of surrounding at 5-60° please do not over it or below it and please do not let the sun shine impinge on the machine directly.

Max. Operating pressure should not over 12 kgf/cm<sup>2</sup> (170 PSI)

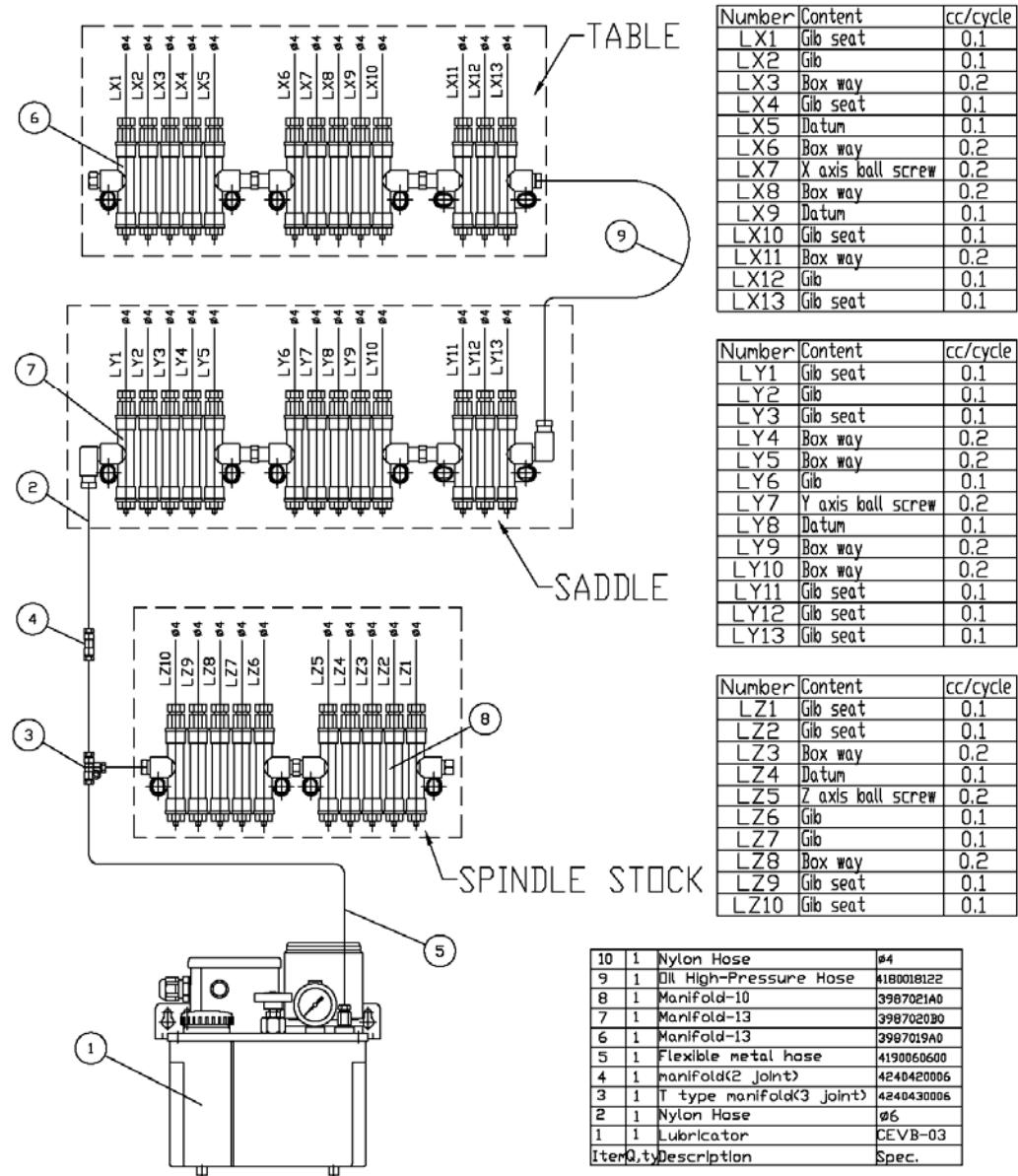
The route sketch drawings following the end of book.



**The sketch of lubrication system**  
**V 450/V 650/V 33i/V 42i/V 1100**



MV 1750S/D



## Cooler system

### Application

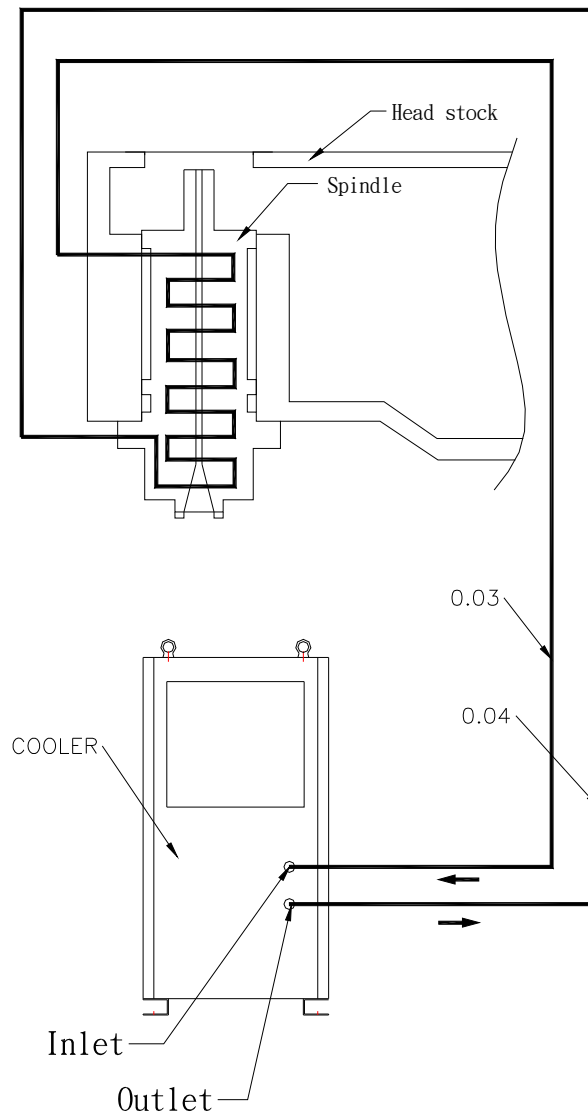
This cooler series is designed specifically to remove heat generated in the spindle and gear box of CNC machine centers.

The following charts indicate the operating oil/liquid temperature for various ambient room temperatures in order that precision of the finished work piece is obtained.

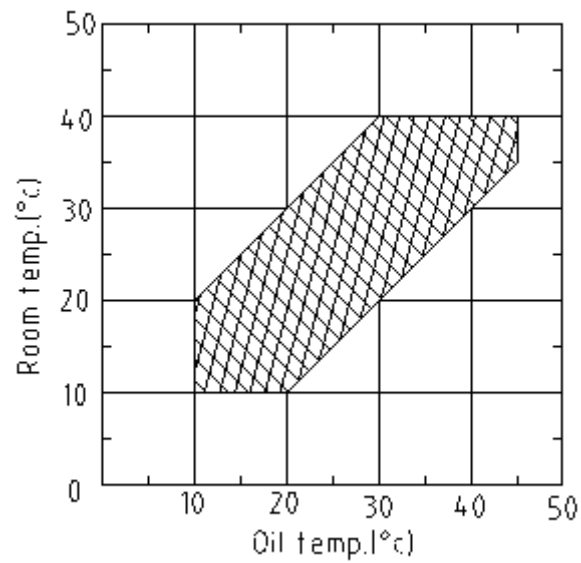
The cooler is designed with built in protection for compressor and electrical part while the voltage tolerance  $\pm 10\%$  °

Frequency tolerance  $\pm 1^\circ\text{C}$

### The sketch of cooler system



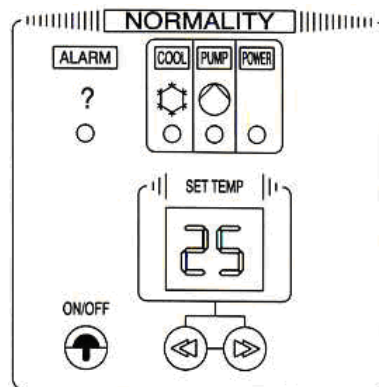
## Effect area drawing









## SPECIFICATION

Item	unit	specification
Cooling capacity	BTU/hr Kcal/hr	4000 1000
Power source	V	AC 220V/380V 3 $\phi$ 50/60 Hz
Oil pump power	HP/KW	0.25/0.19
Total current	A	3.8
Inlet and outlet bore size		1/2"x1/2"
Oil pump flow rate	Litter/min	4.5
Refrigerant		R-134a
Oil tank capacity	Litter	20L
Refrigerant Oil		ISO VG 32
Temp setting range	°C	+9.9~-9.9

## Monitor display control panel



## Operation and function of control panel

NO.	ITEM		OUTLINE	OPERATION&FUNCTION
1	Set keys	ON/OFF SWITCH		Run/Stop Switch.touch type
2		SET TEMPERATURE		Usually display liquid temp,after pressing the temp setting key, monitor will twinkle and display the setting temp. In the mean time,use setting key to set temp.
3	Working keys	POWER ----green lamp		Power Source lamp Show the cooler is with electricity
4		PUMP ----green lamp		Pump is running normally
5		COOL ----green lamp		Compressor is running normally
6	ALARM	BREAKDOWN ALARM LAMP		Cooler is unusual

## Board setting function

1. When ALARM LED lights up, it indicates pump overload switch 、 flow switch 、 pressure switch or compressor overload switch is unusual. Please check if the switch is turnoff, to reset it and refer remedy method from manual, to clean the filter, etc. To avoid ALARM again.
2. When ALARM LED lights up and RE is displayed, it indicates power phase is error. Please check the wiring connections. If you are using a single phase power source, please adjust the “3” of S4 DIP-SW to the position OFF on the electric board.
3. When ALARM LED lights up and O.S. is displayed, which mean oil/water (SENSOR) is unusual.
4. When ALARM LED lights up and R.S. is displayed, which mean room temperature (SENSOR) is unusual.

## Check point before operation

1. When the power source is turned on , check to the power lamp is light up.
2. Push the ON/OFF key to light up the power lamp.
3. Check that the oil level is at lease at 80% level of the oil tank.
4. Check that the outlet and inlet of the oil tank is tightly secured.

## Caution for operation

1. Avoid running the pump without oil.
2. When the pump is run in, the compressor shell run in about 30 seconds later.
3. Do not turn ON/OFF the cooler repeatedly. Otherwise, that would cause cooler stop, and the overload switch may trip. When this happens, it is necessary to take 2-3 minute break then the compressor start again.

### Caution for temperature setting



1. We set the differential temp. between  $-3\sim-5^{\circ}\text{C}$ . Do not over  $-7^{\circ}\text{C}$ .
2. Setting protection for low temp. is  $23^{\circ}\text{C}$ , the compressor will stop running when liquid temp. Low the setting value.
3. Please raise the setting temperature while the water congealed from pipe or spindle out flange.

### Maintenance

Daily work	<ol style="list-style-type: none"><li>1. Check the oil level.</li><li>2. Check the temperature setting</li></ol>
Weekly work	<ol style="list-style-type: none"><li>1. Clean the filter by brush or compressed air.</li><li>2. Check oil pipe and connectors to see is there any leak or loose.</li></ol>
Monthly work	<ol style="list-style-type: none"><li>1. Wash the filter.</li><li>2. Clean up the dirt on radiator of oil cooler with compressive air.</li></ol>
Yearly work	<ol style="list-style-type: none"><li>1. Change the oil.</li></ol>

### Trouble shooting

Situation	<ol style="list-style-type: none"><li>1. Power lamp is off</li></ol>
Cause	<ol style="list-style-type: none"><li>1. LED burnt.</li><li>2. PCB board fuse blown</li><li>3. Transformer burnt</li><li>4. Wire 18,19 loose connection</li></ol>
Remedy	<ol style="list-style-type: none"><li>1. Replace PC board</li><li>2. Replace fuse</li><li>3. Replace transformer</li><li>4. Reconnect wire 18 &amp; 19</li></ol>
Situation	REV is lighted
Cause	<ol style="list-style-type: none"><li>1. 3 phase power reverse</li><li>2. Pressure reduction and differential value of 3 phase is above <math>\pm 10\%</math></li></ol>
Remedy	<ol style="list-style-type: none"><li>1. Switch any 2 of the R.S.T wires</li><li>2. Stability power source</li></ol>
Situation	OPS is lighted
Cause	<ol style="list-style-type: none"><li>1. Inlet oil pipe is clogged or loosened</li><li>2. Inlet &amp; outlet are reversed</li><li>3. Pump motor runs reverse</li><li>4. Pump can not run</li><li>5. Circulation oil is not enough</li></ol>

	6. Oil filter is dirty 7. Oil pressure switch breakdown
Remedy	1. Check, clean and lock pipe 2. Correct position of in/outlet 3. Check over-relay of 51p red and white lines 4. Replace oil pump 5. Supply circulation oil 6. Replace new filter 7. Adjust oil pressure switch DIFF, 0.3 kgf/cm <sup>2</sup> , range 0.5~0.8 cmHg
Situation	PUMP is lighted
Cause	1. Overload relay is off 2. Pump switch is off 3. Inlet pipe is
Remedy	1. Reset switch 2. Reset pump switch 3. Clean pipe and
Situation	HP is lighted
Cause	1. Condenser is too dirty 2. Air filter is not clean 3. Cooling fan doesn't run or blades fall off 4. Cooling medium pressure switch breakdown 5. Cooling medium is leaking
Remedy	1. Use compress air to clean fins and restart cooler 2. Clean filter 3. Lock fan blades tightly or replace fan motor 4. Replace cooling medium pressure switch 5. Irrigate cooling medium.
Situation	RA is lighted
Cause	1. Room temp. Sensor breakdown
Remedy	1. Replace RA sensor
Situation	RO is lighted
Cause	1. Oil temp. Sensor breakdown
Remedy	1. Replace RO sensor
Situation	OT is lighted
Cause	1. Oil temp. is too high 2. Temp. sensor blown Checking cooling medium is enough or not
Remedy	1. Stop running cooler until oil temp. Returns to normal range. Start again 2. Replace temp. sensor

	Supply cooling medium
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Lack of cooling medium (the refrigerant)

The following condition is caused by lack of cooling medium:

No alarm information but the motors keep running, cooler can not reach to the setting temperature and working machine's spindle is hot.



If the avoid situation occurred, please call us or find the professional technician at local market for repair service.

## Coolant system

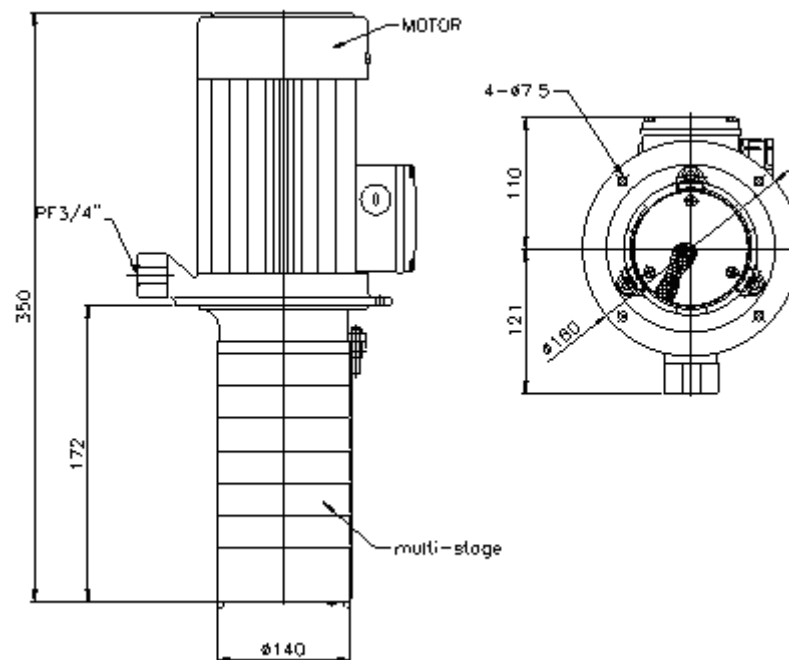
### TPHK4T 3-2

The system circulates the coolant with low-pressure pump. It cools the heat when tool is cutting and provides lubricant from coolant's additive for cutting. It also enhances the accuracy of work piece.

Pump of Coolant B provides flowing water for chip cleaning.

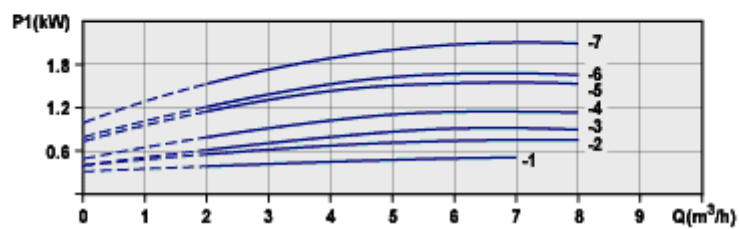
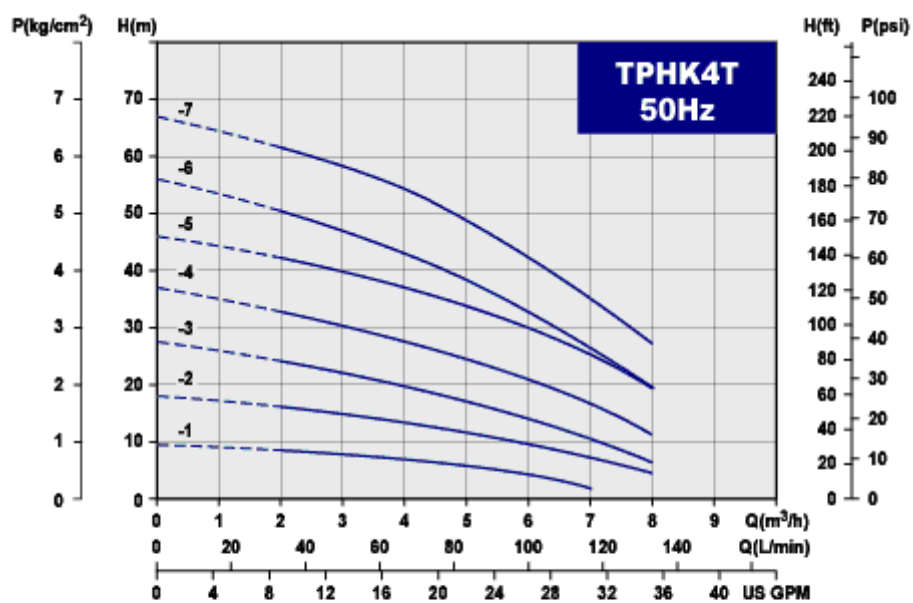
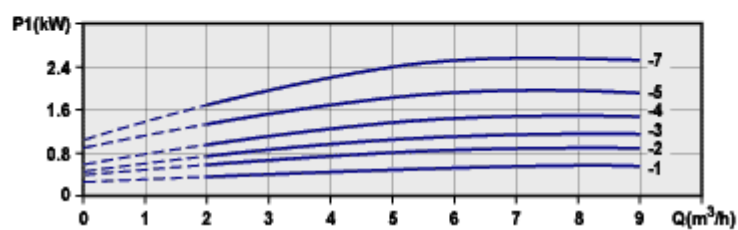
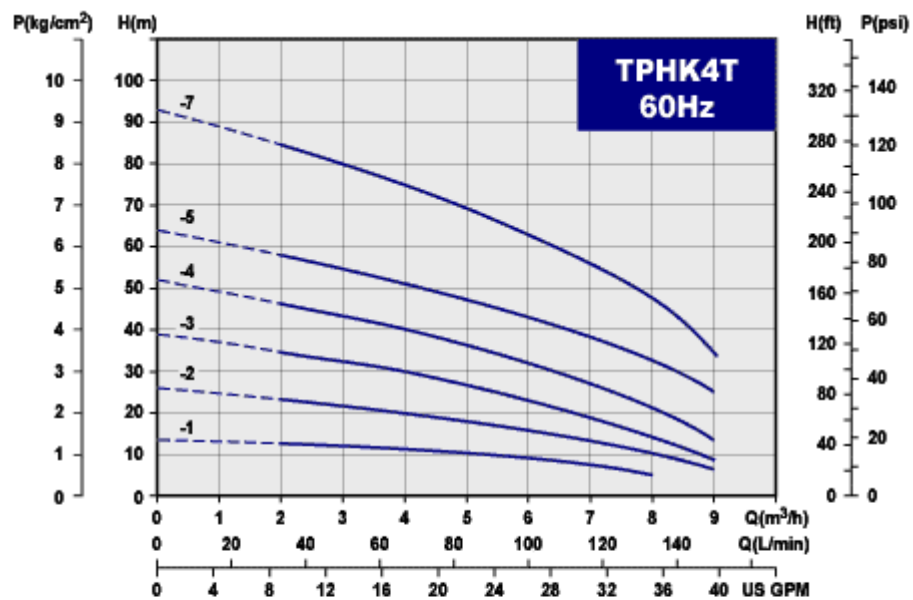
About the Coolant's Additive, please follow the instruction of Additive's supplier to mix the additive with appointed percentage.

### Out line



### Performance curves





**Pump specification**

Item	Unit	Description
Motor		TPHK4T 3-2
Nominal speed	rpm	3500/2900
Frequency range	Hz	60/50
Standard voltages	V	220/380
Protection class		IP54
Insulation class		F
Pump		
Flow rate max.	L/min	185
Head high max.	M	90
Max. pressure	kg/cm <sup>2</sup>	10

**Maintenance**

Daily work	5. Clean the chip filter
Weekly work	2. Check the level and re-fill the oil
Monthly work	2. Clean the chips on the chip tank 3. Change the liquids.

**NOTE:**

- Do not start the pump at first time using until it has been filled with coolant.
- Every connection are made as shown on the inside of the terminal box cover.
- The pump should rotate counter 0 clockwise when viewed from the motor end and arrows on the motor fan's cover indicated the correct direction of rotation.
- To reverse the direction of rotation, switch off the power supply and interchange any two of inputting supply wire.

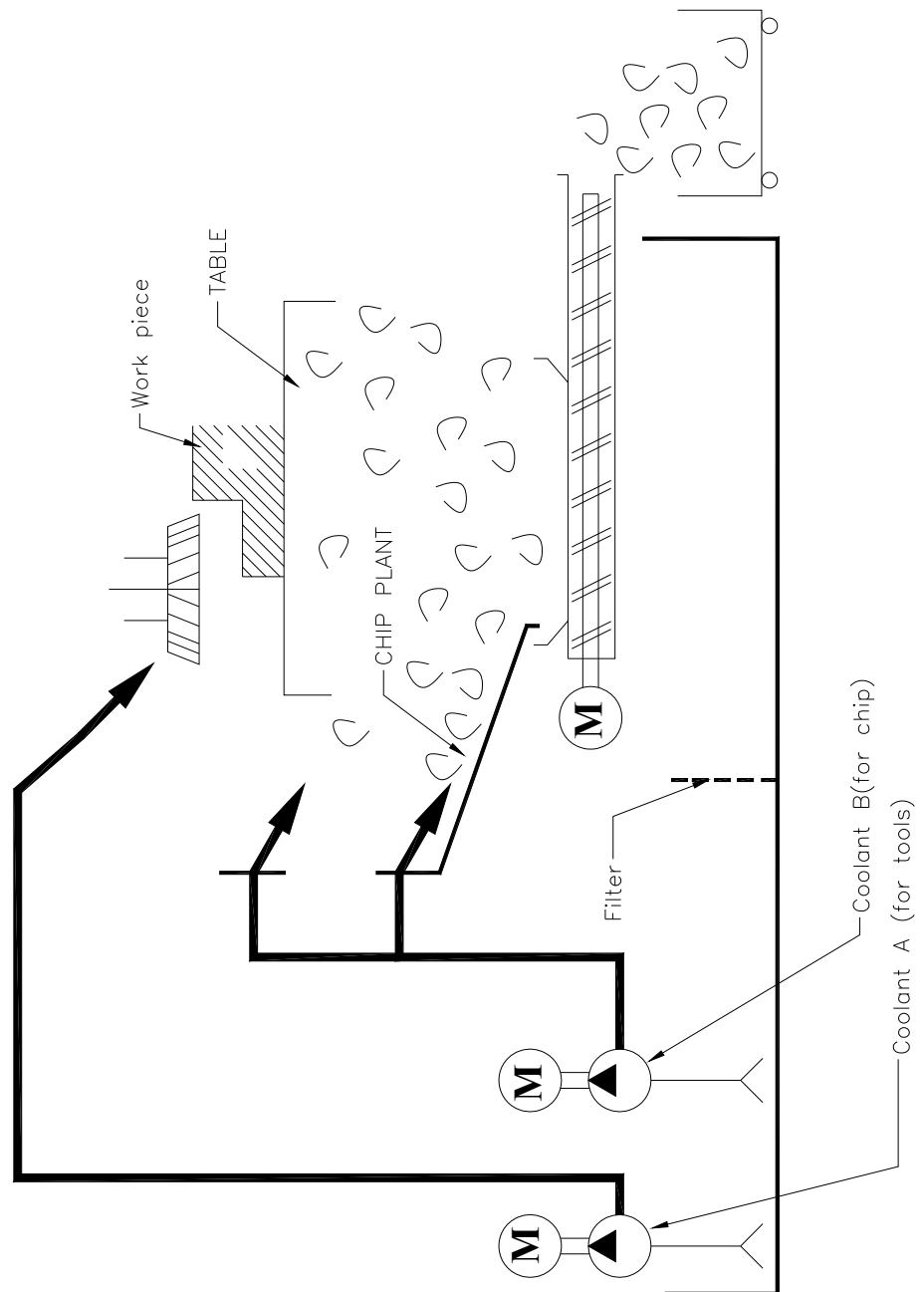
**Trouble shooting**

<b>FAULT</b>	<b>CAUSE</b>
Pump does not work	Power supply failure. Control circuit has cut out or is defective. Motor is defective or overload. Pump is blocked by impurities.
Pump runs but deliver no coolant	Pump is not filled with coolant in advance. Suction or discharge pipe is blocked by impurities. There is leakage in suction pipe. Foot or check valve is blocked or suction head beyond requirement.
Pump runs but reduced capacity	There is wrong direction of revolution (Three-phase). Suction head is lifted too great. Suction or discharge pipe is blocked. Pump is blocked by impurities. Foot or check valve is partly blocked.
Pump stops during operating	Thermal overload switch in motor or external motor protection cuts out. Control circuit is failure or cuts out.

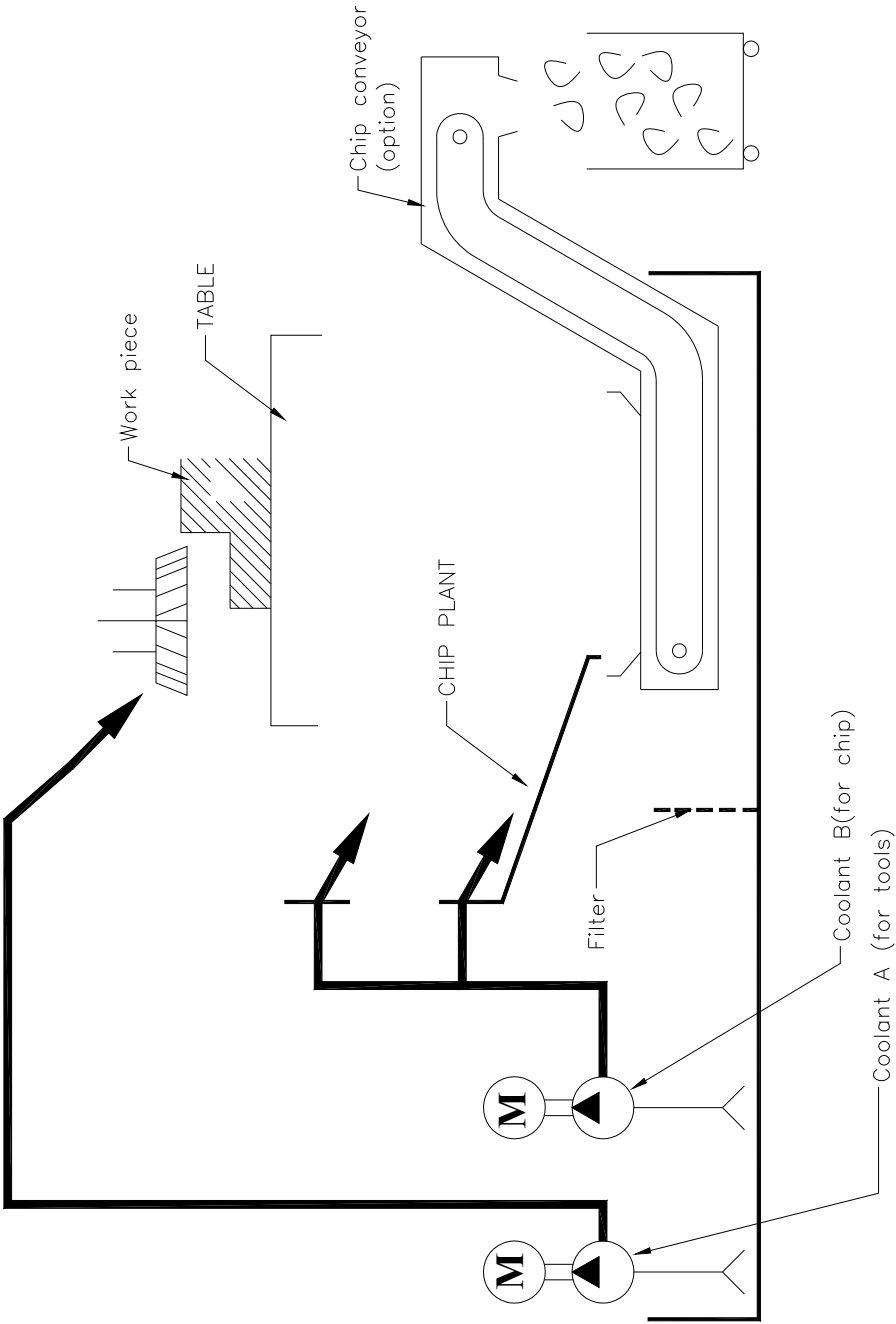
Refer to the drawings following the end of book

## The sketch of coolant system

### Screw conveyor



Chip conveyor



## Transition Coupling

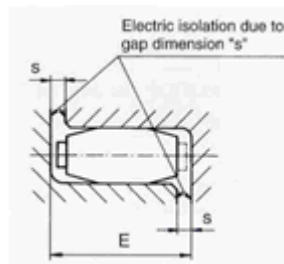
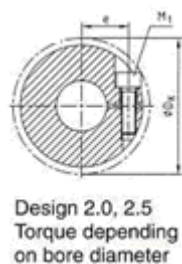
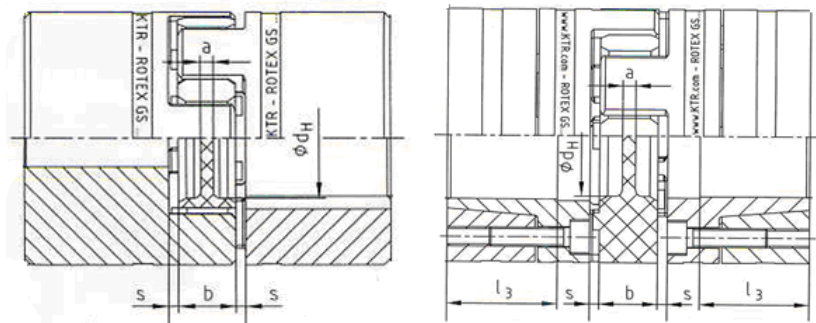
### Application

The hub claws and the nylon teeth are chamfered to allow for a “blind assembly”. The ends of the teeth have pegs arranged reciprocally to limit the axial positioning. The plug-in force varies depending on the Shore hardness and priestess of the spider.

By observing the gap dimension “S” the electrical isolation is ensured, as well as a high service lift of the coupling. This fact is gaining more and more importance, due to the increasing precision of shaft encoders and the existing demand for electro-magnetic compatibility.

### Adjusting Data

ROTEX GS-P TYPE(Hub and clamping ring material-steel) For direct type spindle		
Coupling size	Gap S(mm)	Tightening torque of clamping screw Ta(N/m)
GS42-P	3	35
GS48-P	3.5	69
GS55-P	4	69
ROTEX GS TYPE(Hub material-Aluminum) For ball screw		
GS24-	2	10.5(M6).
GS28-	2.5	25(M8)
GS38-	3.0	25(M8)



## Wedges Adjustment

### Application

Because the wedges will be abraded after a long time use, the axis with box way will cause chinks. It is a normal situation and it can be solved by wedges adjustment.

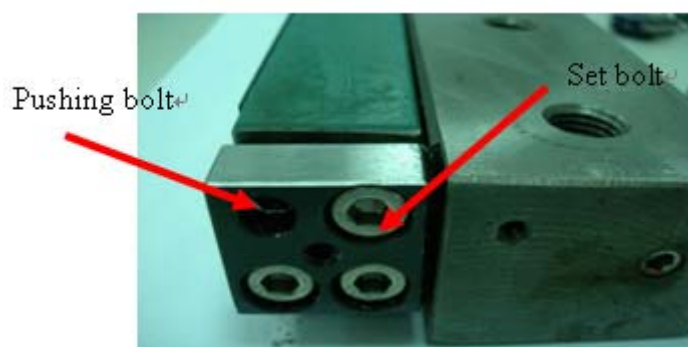
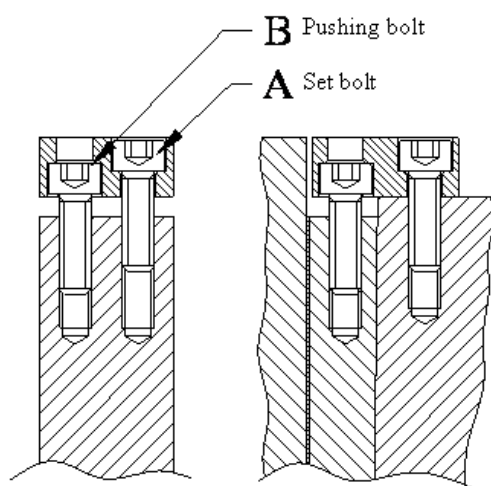
Since the gib adjustment is important to keep a good static accuracy on each axis, it is recommended to contact with our Technical Service before touching to this portion.

### How to adjusting

In order to increase the pre-load, loosen the tension bolt, and then turn the pushing bolt CW for pushing. Apply the torque of 0.9 N-cm(10kgf.cm) to the pushing bolt.

In order to decrease the pre-load, loosen the pushing bolt, and then turn the tension bolt CW.

After setting the proper re-load, make sure that the tension bolt and pushing bolt are locked firmly.



### Maintenance

#### NOTE

- After machine installation.
- Maintain one time after the new machine operates three months.
- Then, maintain the machine six months a time.