ATRUMP
MACHINERY

AL32 / 42

VERTICAL MACHINING CENTER

Operation's & Maintenance Manual

Chapter 1 Safety Instructions

Chapter 2 Machine Specification

Chapter 3 Shipping/Handling and Installation

Chapter 6 Lubrication

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Chapter 1

Machine Safety Regulation

1.1 General Safety

The precautions included in this manual are **NOT** intended to cover all hazards that may occur in this machine. Prevention of accidents requires the constant attention of all personnel in vicinity of this machine to make a safe situation and to provide a safe work environment. A machine and its related equipments are only as safe as its personnel are safety minded. Proper maintenance of machine and use of personal protective equipment will contribute as much towards safety as any of the mechanical or electrical safety devices on this machine.

Using Restriction:

The purpose of these introductions is to advise the customer and the operator on the design, construction, operation and maintenance of VERTICAL MACHINING CENTER. The attached illustrations, drawings and diagrams are intended to show the outstanding features. But are not binding for dimensional accuracy or further details. It provides extremely high machining accuracy. Be careful of rigidity of working material, setting, operation, maintenance and troubleshooting, please reference specification to use suitable workpiece and setting. It is forbidden to use for non-cold metal e.g. wood, plastic or stone, pyroforic materials and working with flammable metal working fluids. This machine was designed for certain applications only. We strongly recommend that this machine **NOT** be modified and/or used for any application other than for which it was designed. If you have any questions relative to its application **DO NOT** use the machine until you have had detail instruction from your dealer.

This machine provides several safety devices to protect operator and machine from injury and damage, but the operator should not only rely on these protective devices in anytime and any place. Before starting to operate this machine, operator should read carefully about "Danger" and "Warning" description of this manual and understand the operation and maintenance of these safety devices completely.

Signal words call attention to the safety sign and designate a degree or level of hazard severity. The signal words for product safety signs are DANGER, WARNING and CAUTION. When no federal, provincial, state or local government code, regulation, standard or guidelines specifies a particular's signal word, selection of the signal word shall be made in accordance with the definitions provided below.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.	 White lettering on Red Background Safety Alert Symbol – White triangle Red exclamation point.
WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.	 Black lettering on Orange Background Safety Alert Symbol – Black triangle Orange exclamation point.
CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices."	 Black lettering on Yellow Background Safety Alert Symbol – Black triangle Yellow exclamation point.

1.1.1 Danger: 

1.1.1.1 Do not touch Control Panel, Transformer, Motor, Connection Box and High Voltage connectors and Joint, otherwise will cause electric shock seriously.

1.1.1.2 Do not touch buttons or switches with wet hands, otherwise will cause electric shock.

1.1.1.3 Grounding all machines. A terminal for the connection of the external ground conductor is provided in the vicinity of the associated phase conductor terminals with marked "PE". It should make sure the "PE" terminal being connection before power supply.

1.1.1.4 All children and visitors should be kept at a safe distance from work area.

1.1.1.5 **SHUT OFF** the power, isolated energy and sure the machine is stationary before leaving the machine, inspection, maintenance, adjustment and cleaning.

1.1.1.6 Repairs should only be carried out by qualified-persons using original spare parts, otherwise this may result in considerable danger to the user.

1.1.1.7 Never attempt to change the settings of all protective devices without consulting **Atrump Machinery Inc.** When the machine out of order while running, shut it down and turn to servicemen for help as soon as possible.

1.1.2 Warning: ⚠ WARNING

1.1.2.1 The floor will become slippery with water and oil and cause danger. So the floor must keep clean and dry to avoid any accident.

1.1.2.2 If a job requires two or more people, every coordinating signal execution must be re-set unless it is a common coordinating signal.

1.1.2.3 Working area must be plenty enough to avoid any danger.

1.1.2.4 Be familiar with the position of emergency stop button. Do not look for its position until it is needed.

1.1.2.5 Do not touch any buttons or switches carelessly.

1.1.2.6 Be sure it is correct before turning on switches.

1.1.2.7 Be sure machine stopped completely and power already been off before changing fuses.

1.1.2.8 Space surrounding working table must be completely secured as to avoid any accidents and to prevent workpieces apart from the table.

1.1.2.9 No loose clothing, neckties, rings bracelets, or other jewelry to get caught in moving parts. Wear protective hair covering to contain long hair.

1.1.2.10 Person(s) who operate the machine must be trained, read and understood to use the safety measures, and possess the ability to obey and execute the regulation stated in this manual.

1.1.2.11 Keep guards in place and functional before starting the machine for each mode of operation.

1.1.2.12 Don't use machines in damp or wet locations or near potentially explosive environment. Keep working area well lighted and ventilation.

1.1.2.13 The workshop of user shall be equipped with the fire extinguisher or other devices in according to the local safety regulations and be deeply careful.

1.1.2.14 If ancillary equipment is removed the original guards or safety devices shall be replaced. The connection of ancillary equipment including any necessary modification of the guarding of the machine shall not afford unprotected access to danger areas of the machine. **Atrump** and our authorized agency are responsible for a future connection of the machine with ancillary equipment only if we ourselves have designed such connection.

1.1.2.15 If opening of a movable guard of the ancillary equipment gives access to a danger area of the machine, this movable guard shall be a guard for the machine of the same type safety-function which are required for this danger area of the machine.

1.1.2.16 Ancillary equipment, the presence of which prevents access to a danger area of the machine and which can be removed without the use of a tool, shall be interlocked with the machine control circuit in the same way as the movable guard for the area concerned. Fixed guard with safety distance need to according with ISO 13857 can be considered also.

1.1.2.17 If the opening of a movable guard of the machine gives access to a danger area of ancillary equipment this guard shall also meet the

requirements specified in the standard applicable for that ancillary equipment (e.g. ISO 10218-1 for robot equipment).

1.1.2.18 Explain the operation of this machine and its safety devices to the operator prior to his/her operating the machine. Use demonstration as a positive means of instruction and be certain that the operator fully understands the machine and is qualified to handle it. It is recommended that you question the operator on the points that were explained to ascertain if he/she has fully understood all the instructions.

1.1.3 Caution: ⚠ CAUTION

1.1.3.1 Turn off no fuse breaker of main power circuit when power supply is insufficient or not stable.

1.1.3.2 Only the recommended or same grade hydraulic oil, lubricant oil and grease are allowed to use on this machine.

1.1.3.3 Only the same specification and same grade fuses are allowed to use on this machine.

1.1.3.4 To prevent from any damage of NC unit, operation panel, electrical control panel...etc., the machine location should avoid electric shock.

1.1.3.5 Please do not change original parameter. If it is necessary, please keep recording the value of original parameter and set the same value after being changed.

1.1.3.6 Do not take away, cover or dirt the "WARNING", "DANGER" and "NOTICE" plates. If they are blur or losing, please contact with us or your local dealer for new plates.

1.1.3.7 Disposing wasted material and wasted lubricating oil shall obey the local regulation and be deeply careful.

1.1.3.8 Only competent, well-trained personnel should be permitted to operate or perform maintenance on this machine.

1.1.3.9 Before operating this machine, be sure that the responsible parties read and understand this operation manual as well as the warning plates on the machine.

1.1.3.10 Please use suitable personal protective equipment e.g. gloves, eye protection…etc. during operation and setting.

1.1.3.11 Keep the machine clean and free from accumulation of hydraulic fluid, oil, grease, water and trimmed flash. It is difficult, if not impossible, to perform maintenance when the machine is covered with dirt and oil.

1.1.3.12 When person stand on the machine accessible areas, take care the risks of slip/falling.

1.1.3.13 It is essential that operator is adequately trained in the safe use, adjustment and operation of the machine. The training of the user operator should be carried out by our authorized agent or service engineer in an oral/practical in site of the ordered press, including protective device explanation, press mechanism, operation/use.

1.2 Safety Description of Lifting and Movement (unpacked)

This vertical machining center is composed of headstock, tool magazine, main column, working table, saddle, bed base, operation panel, pneumatic system, lubrication system, electrical cabinet and CNC unit. Those components are connected with electrical cables and/or pneumatic piping circuit.

During transportation, the machine body and coolant tank are packed separately. The shipping and handling equipment used should be able to lift a gross weight of 6 tons for AL32 & 7 tons for AL42 at least. Due to sizes of the machine, it is recommended to lift this machine with crane and use only the sling frame provided by us. Nevertheless, read the following section carefully before handling the package.

1.2.1 Danger:

1.2.1.1 This machine weight is gross weight of 6 tons for AL32 & 7 tons for AL42, the safety load of the handling equipment must be greater than 7 tons for AL32 & 8 tons for AL42. If you are not sure of the safety load of handling equipment, please confirm it with their supplier. Do not lift or move the machine if you are not sure of their load. It will damage the machine or handling equipment or hurt people.

1.2.1.2 When use the derrick lifting, it is need use exclusive crowfoot to avoid machine was broken, don't use substandard of crowfoot and method, or not maybe to cause movement or machine was damage, more, makes people to die.

1.2.1.3 When lifting machine with wire ropes when machine is packed, be sure that the bearing stress of the wire rope is greater than 7 tons for AL32 & 8 tons for AL42. It will damage the machine or the handling equipment or hurt people if it is not strong enough.

1.2.2 Warning: ⚠ WARNING

1.2.2.1 Check whether the machine is balanced or not before lifting or moving this machine. It is prohibited from lifting or moving the machine unbalance, otherwise it will damage the machine and hurt people around it.

1.2.2.2 Be careful of when lifting or lowering the machine, the speed should not be so fast that may cause any unpredictable vibration or crash. The machine will fall and crash if the lifting position does not balance that will damage the machine and hurt people around it.

1.2.2.3 When machine is lifting, it is prohibited people and car go underneath the machine to avoid any accident.

1.2.2.4 Before the machine was lifting, it is prohibited people and car go up around the machine, also prohibited people to climb the crowfoot and wire ropes, to avoid accidental condition of people happen to fall.

1.2.3 Caution: ⚠ CAUTION

1.2.3.1 When lifting and moving machine, please pay attention whether there are any people or blockage around the machine or in the moving path. Please clean out the blockage and advise people away from the machine and machine moving path before lifting and moving this machine to avoid any danger.

1.2.3.2 The speed should not be too fast when lifting and moving the machine and it should not to stop and brake immediate or the machine will fall down because the inertia is so big that machine will vibrate and lose its balance point.

1.2.3.3 Only certified people are allowed to operate the material handling equipment to lift or to move the machine. It is prohibited unqualified people from lifting and moving the machine to avoid any accident.

1.3 Electrical Safety Description

To assure the safety of NC operation, please note the followings:

1.3.1 Wiring:

1.3.1.1 Ensure that the electrical conductors used is equivalent or superior to the performance rating described in maintenance manual.

1.3.1.2 Only qualified engineer is allowed to connect the power cable.

1.3.1.3 Do not connect power cable which will cause noise on the power panel of this machine such as welding machine and high frequency quench machine.

1.3.1.4 Do not connect the power cable of this machine to the instantaneous voltage drop power source or power panel.

1.3.2 Grounding

The cross-section of incoming supply protective conductor and each phase conductors must be in accordance below table. It is important to identify the voltage of source with machine. The voltage of connecting source terminal is marked **L1**, **L2**, **L3** on the electric cabinet.

A terminal for the connection of the external ground conductor is provided in the vicinity of the associated phase conductor terminals with marked "**PE**".

The cross-section of a grounding wire need more than 10 mm^2 and resistance to ground of less than 100Ω. Gnerally, the NC machine should be grounded to a separately grounding rod. If an independent ground can not be provided for the machine, Please ground as follows:

1.3.2.1 Connect a single conductor to its own grounding terminal. This will avoid some serious accidents resulting from ground currents which might otherwise flow in the NC machine if a peripheral device should malfunction.

1.3.2.2 Be careful of when using concrete reinforcing rods as grounding points. These reinforcing rods are often used to ground equipment because they usually offer a resistance to ground of less than 100Ω. When doing so, make connection as follows: (This also applies to connecting ground ires to regular grounding terminal.)

1.3.2.3 Do not use the same grounding reinforcing rod or grounding terminal for other devices since this could lead to line noise such as that produced by welders or high frequency quenching machines.

1.3.2.4 Use a durable grounding terminal with an adequate electrical performance rating.

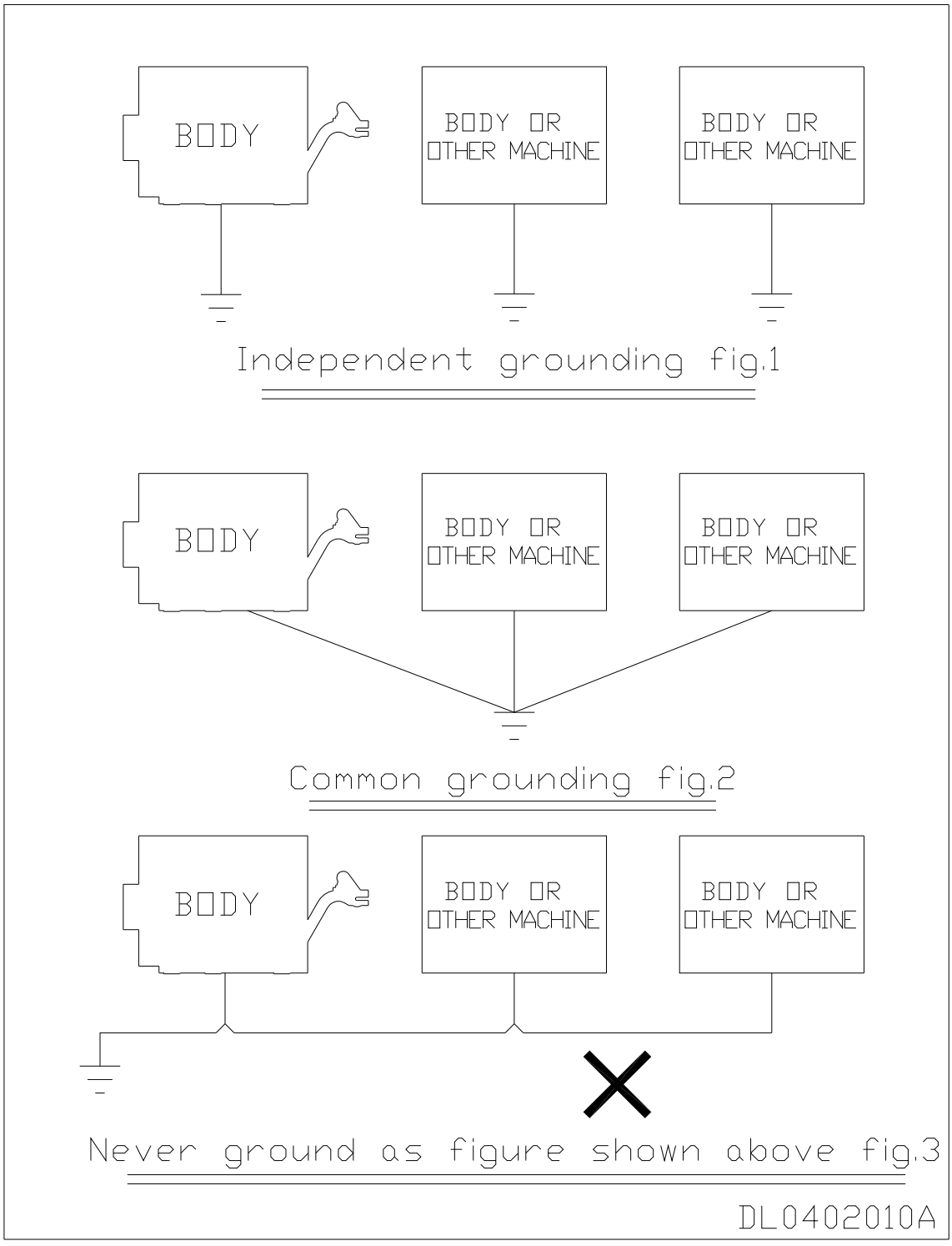
1.3.2.5 Use a separate grounding wire of minimal length.

1.3.2.6 Check the resistance to ground by actual measurement. Be sure of less than 100Ω if the single device is connected to its own grounding rod.

1.3.2.7 Desirable independent grounding: Independent grounding of several equipment please refer to figure 1.

Grounding resistance : Smaller than 100Ω.
Common grounding : Grounding as figure 2.
Grounding resistance : 100Ω

*** NOTE: Never ground equipments as figure 3. ***



1.3.3 Environment condition

Generally the machine should be installed as following conditions.However, these may change over a period of time or in response to seasonal changes.

1.3.3.1 Supply voltage: 0.9 – 1.1 nominal supply voltage.

1.3.3.2 Source frequency: 0.99 - 1.01 of nominal frequency.

1.3.3.3 Surrounding temperature: 5℃~ 40℃

1.3.3.4 Relative humidity: not exceed 50% at 40°C.

1.3.3.5 Altitude: shall be at altitudes up to 1000m above mean sea level

1.3.3.6 Atmosphere: Free from excessive dust, acid fume, corrosive gases and salt.

1.3.3.7 Avoid exposing the machine directly to sunlight or heat which could raise the inside temperature.

1.3.3.8 Avoid exposing the NC machine to abnormal vibration.

1.3.3.9 Electrical equipment shall withstand the effects of transportation and storage temperature within a range of -25°C to 55°C and for short periods not exceeding 24 hours at up to +70°C.

1.3.3.10 Please contact with us or your local dealer if not able to satisfy that mentioned above.

1.4 Machine Safety Description

1.4.1 Note before Operation:

1.4.1.1 Danger:

Before starting to operate this machine, please check and confirm all cables and wire isolation whether they are damaged or not to avoid electric shock.

1.4.1.2 Warning:

1.4.1.2.1 Understand completely every operation procedure and description on the manual.

1.4.1.2.2 Wear safety clothes, oil-proof safety shoes, toggles with side shield and other protective equipment.

1.4.1.2.3 Shut off NC unit, operation panel, electrical control penal and guards.

1.4.1.3 Caution:

1.4.1.3.1 Power supply must be sufficient to keep all equipment and machine running smoothly.

1.4.1.3.2 It must be well protected for cable placed on the ground to avoid contact with chip as to cause shortage.

1.4.1.3.3 When machine is unpacked or has not been used for a period of time (a few days or longer), every sliding part must be cleaned and lubricated and turn on lubricant pump for a while until lubrication oil has lubricated all the parts before operating it again.

1.4.1.3.4 About lubrication oil viscosity, brand and equivalent grade, please refer to indication plates or **Operator's & Maintenance** manual on chapter 3.6.3

1.4.1.3.5 Check all switches, buttons and operation levers can be operated smoothly.

1.4.1.3.6 Please turn on main power as following procedure:
Turn on factory's main power supply → Turn machine's main power no fuse breaker to "ON" or "**I**" → Depress green power push button "ON" on operator's panel to turn on controller and CRT.

1.4.1.3.7 Check oil quantity in oil tank. Fill it to the required indication if necessary.

1.4.1.3.8 Check coolant quantity, fill it if necessary.

1.4.1.3.9 Please check whether the stand-by signal light is on or not after turn on controller.

1.4.2 Inspection

1.4.2.1 Warning:

1.4.2.1.1 Ensure to turn off the main power supply and put warning signs on visible spots before inspecting the belt tension. Do not touch or reach over the pulleys and the belts if the power is still on. Otherwise might result in squeeze to wounded and disabled.

1.4.2.2 Caution:

1.4.2.2.1 Check the pressure readings regularly to make sure all the system pressures setting are normal.

1.4.2.2.2 Observe regularly if there is any abnormal noise arising inside the rotating motors, gearbox and other moving or rotating parts.

1.4.2.2.3 Moving or rotating parts are lubricated properly.

1.4.2.2.4 Ensure all the safety guards and safety equipments are installed properly.

1.4.3 Warming up

According to experience if machine is not warmed up before machining work piece, which has not been run for a period of time, It will damage sliding parts and cause oil leakage because sudden thermal expansion destroys machine accuracy. To prevent from it happening, the machine must be warmed up after not been run for a period of time.

1.4.3.1 Caution:

1.4.3.1.1 Warm up machine under automatic mode and continuously run for 10-20 minutes with spindle speed 500 min^{-1}., X.Y & Z axes rapid traverse 10~15 m/min.

1.4.3.1.2 Check whether machine running is normal or not when warming up the machine in the mean time.

1.4.3.1.3 The door and safety guards must be closed when spindle speed is over to avoid any accident. When spindle starts working, please versify spindle speed limit 10000 min^{-1} and max. speed. Please note that machine must be working below the above limits; otherwise it will result in machine damage or crash and human injury or death.

1.4.3.1.4 All the sliding parts must return to zero in low speed before warming up machine under automatic mode. Confirm program command is correct and sliding parts will be executed in accordance with program command and will not be interfered, or machine will be crashed and damaged.

1.4.3.1.5 When machine stopped to re-set, please return to zero (X.Y.Z.-axis) manually in low speed and confirm.

1.4.4 Preparation

1.4.4.1 Warning: ⚠ WARNING

1.4.4.1.1 Cutting tool's specification should be the same as this machine requirement to avoid any accident.

1.4.4.1.2 Broken tool will cause accident. Please replace it when broken.

1.4.4.1.3 Working area lightening must be sufficient for safety inspection.

1.4.4.1.4 Tools and equipments which surrounding the machine must place in position to keep aisle clean and clear.

1.4.4.1.5 Do not put anything on working surfaces, headstock, saddle, guideway and covers to avoid any accident happened and secure safety of operators and people surrounding the machine.

1.4.4.2 Caution: ⚠ CAUTION

1.4.4.2.1 Feed the grease to all the grease-lubricated parts, such as ballscrews and linear guides of the X, Y and Z-axis, at least every month. Feed it more frequently or even change the grease if the working environment is hostile. Please use the recommended grease as described in the oil guide table. please refer to operator's manual recommended oil on chapter 6.3.

1.4.4.2.2 Use the recommended cutting tools and tool length as described in Chapter Two of the maintenance manual.

1.4.4.2.3 Always try a light-load machining before doing a heavy-load machining.

1.4.4.2.4 After setting up cutting tool, it is a must to do test cutting and confirm it is all right.

1.4.5 Operation

1.4.5.1 Warning: ⚠ WARNING

1.4.5.1.1 Operator's hair should not be too long for avoiding unnecessary accident happened.

1.4.5.1.2 Do not wear gloves to operate the machine, or will cause danger.

1.4.5.1.3 When moving large work pieces, it is required two or more people to move them to avoid dangers happened.

1.4.5.1.4 Only qualified people are allowed to operate Forklift truck, Lifting equipment, Crane and other material handling equipment.

1.4.5.1.5 You must pay attention to prevent crash and damage from surrounding area when operate fork lift truck, crane or other handling equipment.

1.4.5.1.6 The wire rope and lifting equipment must be strong enough to withstand the load.

1.4.5.1.7 Clamp workpiece safely and closely.

1.4.5.1.8 Stop machine before adjust position of coolant nozzle.

1.4.5.1.9 Do not touch rotating machine parts such as work piece, chuck, spindle..etc. by hands.

1.4.5.1.10 Do not take away safety device from the machine.

1.4.5.1.11 Scrape the chips from tool tip by wiper. Do not scrape it directly by hands, or will be cut and hurt.

1.4.5.1.12 Assemble or disassemble cutting tools only when machine is stopped.

1.4.5.1.13 When machining graphite, magnesium alloy or any material with powder chip, operator must wear safety mask or running dust collector. It is prohibited operator explores himself to dusty environment without wearing any protection appliances.

1.4.5.2 Caution: ⚠ CAUTION

1.4.5.2.1 It is prohibited from opening the door during cutting.

1.4.5.2.2 When heavy cutting, please note and prevent from chips piling up too high that chips' temperature will be high and cause fire.

1.4.6 Cutting Interruption

1.4.6.1 Warning ⚠ WARNING

When leaving machine temporarily, please be sure to turn off power on operator's panel and main power no fuse breaker.

1.4.7 Work Finished

1.4.7.1 Caution ⚠ CAUTION

1.4.7.1.1 Before cleaning machine or attachments, please turn off all the power and hang "MAINTENANCE, DO NOT TURN ON THE POWER" warning plate. It is prohibited from cleaning machine and attachments before machine stops running to prevent from people injury.

1.4.7.1.2 After finished work, Clean machine, attachments, chips, guards and windows. It is also required to put antirust oil on machine bed and moving parts to prevent from their rust.

1.4.7.1.3 All the machine parts return to original position.

1.4.7.1.4 Check whether wipers are broken or not. Replace it if broken.

1.4.7.1.5 Check lubricant and hydraulic oil and change them for their dirty or emulsification.

1.4.7.1.6 Check coolant and change it if it is dirty.

1.4.7.1.7 Check quantity of coolant, lubricant oil and hydraulic oil, fill it if it is not sufficient.

1.4.7.1.8 Clean filter of coolant, lubricant and hydraulic oil.

1.4.7.1.9 Be sure that operator's power switch is off and main power no fuse breaker is off also before leaving the machine

1.4.8 Safety Device

1.4.8.1 Fully enclosed guards and coolant splash guards.

1.4.8.2 X .Y. Z-axes over travel limit switches.

1.4.8.3 Pressure switch for chuck clamping force.

1.4.8.4 Machining travel limited by controller's software.

1.4.8.5 Emergency stop push button.

1.4.8.6 Interlock by software to protect spindle, cutting tools and X .Y. Z-axes rotating equipment.

1.4.9 Maintenance Preparation

1.4.9.1 Notice

1.4.9.1.1 Read and understand instruction completely of precaution of operator's manual.

1.4.9.1.2 Do not maintain machine without foreman's instruction.

1.4.9.1.3 Prepare the replacement parts and worn parts (such as: washer, seal, O ring, oil, and grease..etc.).

1.4.9.1.4 Before operation and maintenance, must carefully read and understand all the instructions given in this manual.

1.4.9.1.5 Maintain as instruction and establish maintenance record.

1.4.10 Maintenance

1.4.10.1 Danger

1.4.10.1.1 Before maintenance, must turn off the main power switch and controller panel power switch and hang "MAINTAINING, DO NOT TOUCH ANY POWER SWITCH" plate at obvious place to avoid dangers.

1.4.10.1.2 It is dangerous to do maintenance, service and turn on power of machine. It is better to turn off no fuse breaker before doing maintenance and service.

1.4.10.2 Warning

1.4.10.2.1 Electrical equipment's maintenance must be done by qualified engineers.

1.4.10.2.2 Over travel limit and linkage mechanism including parts should not be moved and changed.

1.4.10.2.3 Use ladder when working at higher place to avoid accident.

1.4.10.2.4 Fuses, Cables...etc. must be supplied from qualified manufacturer.

1.4.11 After maintenance

1.4.11.1 Warning

1.4.11.1.1 Maintenance jobs include working area cleaning and ground dry keeping to offer safety working area.

1.4.11.1.2 The operator is safe, that to need moved components and discard oils out of the machine to suitable place.

1.4.11.2 Caution

1.4.11.2.1 Maintenance people must inspect whether machine operation is safe or not.

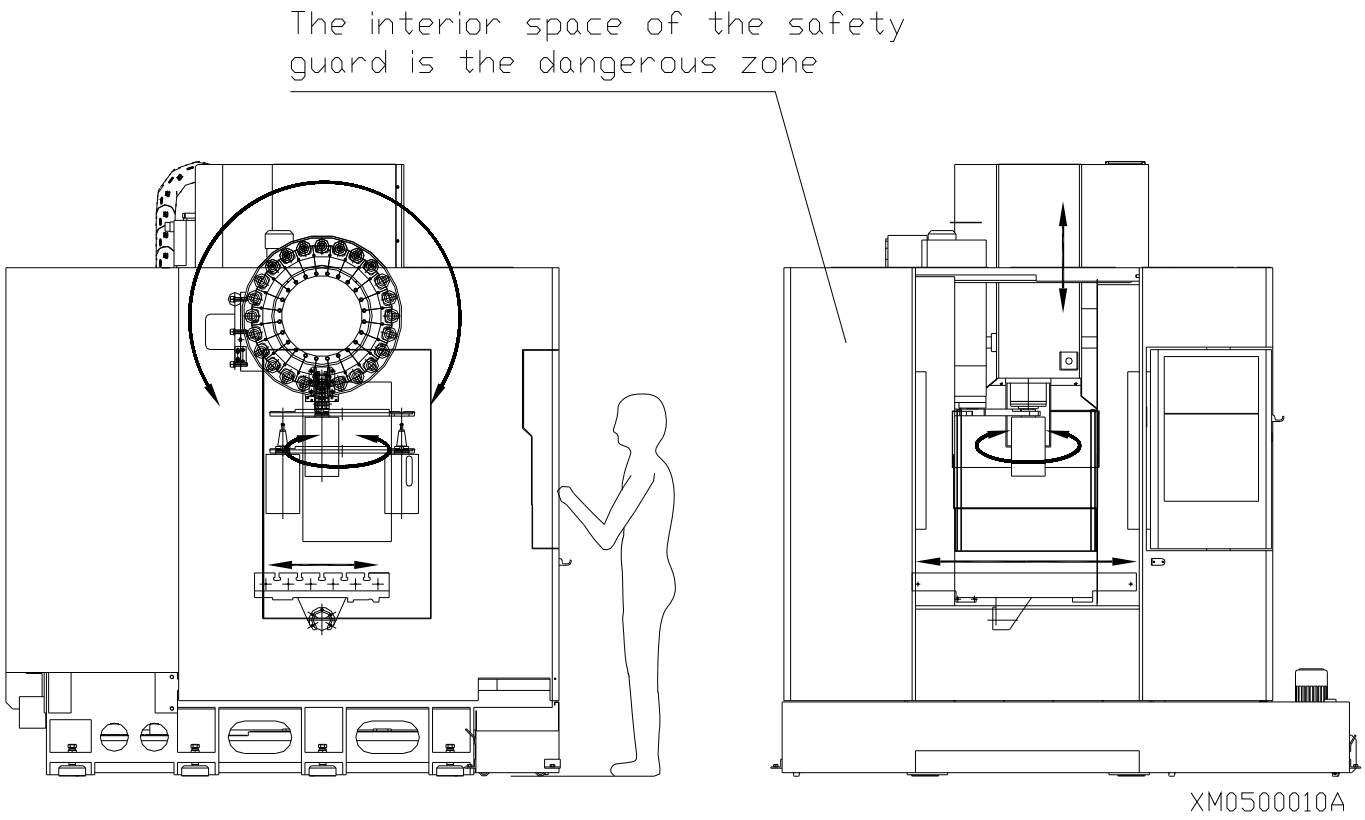
1.4.11.2.2 Keep record of maintenance and inspection data as reference.

1.4.11.2.3 If machine can not be operated and there is any abnormal condition happened during maintenance and inspection, please contact local agents to eliminate the problems. Do not do it yourself.

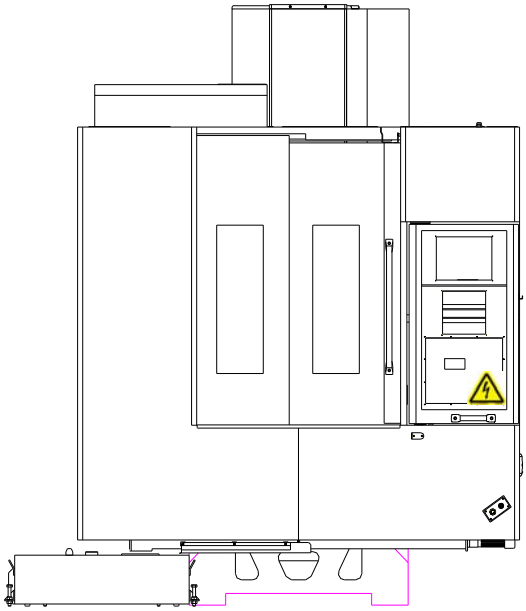
1.5 Potential Danger Area

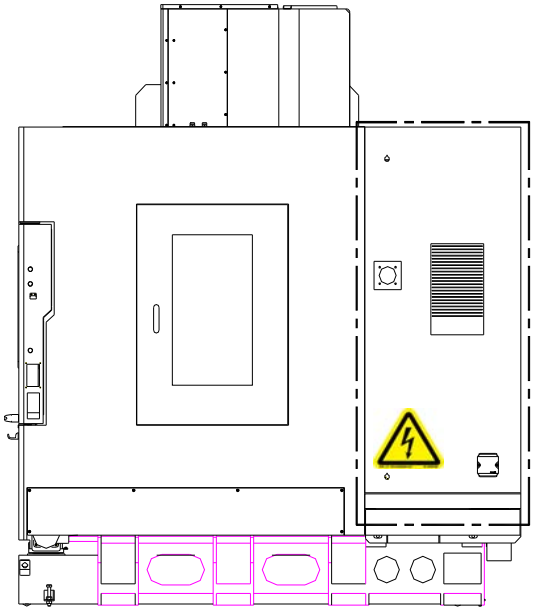
1.5.1 Users must be clearly aware of that moving or rotating parts, especially with high speed, any abnormal operation will cause danger because of machine's mis-movement or mis-rotation. Therefore, this machine's moving and rotating parts have been designed to be protected by guards or covers as possible to avoid user's directly contact with these parts. However, it can not avoid dangers caused by user's abnormal operation. So users and maintenance people must understand operation procedures correctly, be aware of potential dangerous area and warning and dangerous awareness to avoid any injury and accident.

1.5.1.1 Areas marked with" ⇔ " and " ⟲ " are those having high speed moving or rotating machine parts. Be alert when working near those areas.



1.5.1.2 The parts with "⚠" mark as drawings shown below are all high voltage parts. Please be attention that only qualified engineers are allowed to open the box to avoid electrical shock.





1.6 arning Signs on the Machine

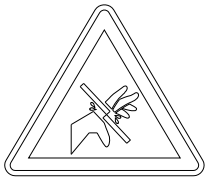
1.6.1 Do not enter hazardous area
authorized personnel only.
(When the machine operations)


ZL12020071

1.6.2 Low clearance.
Be alert.


ZL12020081

1.6.3 Exposed gripping parts or area
can cause severe iniury.
Your hand is out of gripping area
or parts before removing parts or
servicing.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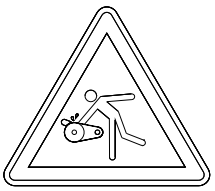
1.6.4 Exposed moving parts can cause
Severe injury.
LOCK OUT POWER
before removing guard.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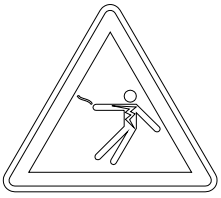
1.6.5 Hazardous voltage will cause severe
Injury or death.
LOCK OUT POWER
before servicing.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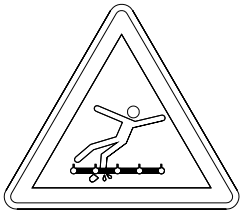
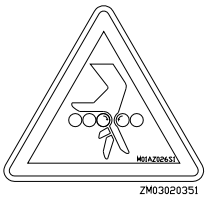
1.6.6 Exposed conveyors and moving parts
can cause severe injury.
LOCK OUT POWER
before removing cover or servicing


ZL12020131

1.6.7 Exposed chucks and moving parts can
caues severe injury.
KEEP DOOR CLOSE
before removing cover or servicing.


ZL12020141

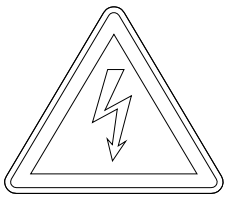
1.6.8 Exposed moving parts can cause
Severe injury.
LOCK OUT POWER
before removing guard or servicing.


ZM03020351

1.6.9 Exposed gripping parts or area can cause
Severe injury.
LOCK OUT POWER
Before removing cover or servicing.


ZL12020191

1.6.10 Riskof accidents caused by electric voltage.
Do not touch exposed parts in the control cabinet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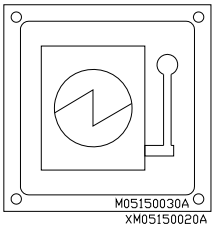
1.6.11 Main electrical switch



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Chapter 2

Machine Specification

2.1 Introduction

2.1.1 AL32/42 is one product of the vertical machining center series. This machine is made up of bed base, headstock, main column, saddle, working table, operation panel, hydraulic and pneumatic systems, lubrication system, chip conveyor, chip collecting equipment, safety guards, CNC controllers, etc. AL32/42 is designed to machine those workpieces that do not generate powder chip, corrosion or flammable substances, such as magnesium alloy. Please contact our local dealer or us if in doubt.

2.1.2 Because AL32/42 can machine the workpiece in an automatic mode, the safety and efficiency of the working process could be increased tremendously. Nevertheless, read all the manuals we provided thoroughly. Do not try to use this machine unless you understand how to operate and stop the machine and all the safety matters concerned. Details about how to operate this machine are followed.

2.2 Noise Level

The noise level of this machine is within 85dBA under the condition of CNS 4600 standard. In real life, the noise level can be higher than 85dBA because actual working conditions (workpiece material, tool performance, cutting coolant) might be different from those of CNS4600 standard. Do not stay in the working area with unpleasant noise level without wearing appropriate protect equipment, such as the earplug. Otherwise might cause hearing hurt or more serious.

2.3 Machine Specification

ITEM		AL32
Table	Dimension	1000mm X 600mm(39.37”X23.62”)
	Working area	860mmX600mm(33.85”X23.62”)
	T-slot	CD100mmX18mmX5(CD3.93”X0.7”X5)
	Max. loading capacity	600 kg(1320lbs)
Travel Range	Max. travel range of X/Y/Z-axis	860mm/600mm/610mm (33.85”X23.62”X24.01”)
	Distance from spindle nose to table surface	120~730mm(4.72”~28.74”)
	Distance from spindle center to column	700mm(27.56”)
Spindle	Spindle taper	ISO No.40
	Spindle nose outer diameter	Ø70mm(Ø2.76”)
	Spindle speed	STD: 80000 min^{-1}; OPT: 10000 min^{-1}
Feedrate	Feedrate of X/Y/Z-axis	1~10000 mm/min (0.04~393.7ipm)
	Slideways of X/Y/Z-axis	Linear Guideway
	Rapid traverse of X/Y/Z-axis	36/36/30 m/min (1417.3/1417.3/1181.1 ipm)
Tool Magazine	Tool capacity	STD:24 pcs.; OPT: 30pcs
	Tool selection	Bi-direction and Shortest path
	Max. adjacent tool diameter x length	Ø 80mm x 300mm(Ø 3.15”X11.81”)
	Max. tool weight	8 kg (17.6lbs)
	Tool shank	BT 40 or CAT 40
Drive Motor	Spindle drive motor	10HP
	Servo motors of X/Y/ Z-axis(Delta)	X、Y：1.8kw Z：3 kw(with brake)
	Coolant motor	1580 W (2.12HP)
	Chip conveyor motor	215 W(1/4HP)
Accuracy	Positioning	±0.005
	Repeatability	±0.003
Miscellaneous	Power requirement	220V/60Hz
	Floor area (L × W)	5518mm×5466mm
	Packing size(L×W×H)	3670mmx2280mmx2510mm (144.48”x89.76”x98.81”)
	Net weight	Machine:5,980kgs(13,156lbs) Accessories:310kgs(684lbs)
	Gross weight	Machine:6,270kgs(13,794lbs) Accessories:390kgs(858lbs)

ITEM		AL42
Table	Dimension	1200mm X 600mm(47.24”X23.62”)
	Working area	1050mmX600mm(41.33”X23.62”)
	T-slot	CD100mmX18mmX5(CD3.93”X0.7”X5)
	Max. loading capacity	800 kg(1760lbs)
Travel Range	Max. travel range of X/Y/Z-axis	1050mm/600mm/610mm (41.33”X23.62”X24.01”)
	Distance from spindle nose to table surface	120~730mm(4.72”~28.74”)
	Distance from spindle center to column	678mm(26.69”)
Spindle	Spindle taper	ISO No.40
	Spindle nose outer diameter	Ø70mm(Ø2.76”)
	Spindle speed	STD: 80000 min^{-1}; OPT: 10000 min^{-1}
Feedrate	Feedrate of X/Y/Z-axis	1~10000 mm/min (0.04~393.7ipm)
	Slideways of X/Y/Z-axis	Linear Guideway
	Rapid traverse of X/Y/Z-axis	36/36/30 m/min (1417.3/1417.3/1181.1 ipm)
Tool Magazine	Tool capacity	STD:24 pcs.; OPT: 30pcs
	Tool selection	Bi-direction and Shortest path
	Max. adjacent tool diameter x length	Ø 80mm x 300mm (Ø 3.15”X11.81”)
	Max. tool weight	8 kg (17.6lbs)
	Tool shank	BT 40 or CAT 40
Drive Motor	Spindle drive motor	15HP
	Servo motors of X/Y/ Z-axis(Delta)	X、Y：1.8kw Z：3 kw(with brake)
	Coolant motor	1580 W (2.12HP)
	Chip conveyor motor	215 W(1/4HP)
Accuracy	Positioning	±0.005
	Repeatability	±0.003
Miscellaneous	Power requirement	220V/60Hz
	Floor area (L × W)	6038mm x 5261mm
	Packing size(L×W×H)	Screw Type Conveyor： 3710mmx2300mmx2510mm Steel belt Chip Conveyor： 2890mmx2300mmx2510mm(Machine) 3670mmx2280mmx2570mm(Accessory)
	Net weight	Screw Type Conveyor：6235kg Steel belt Chip Conveyor：6400kg
	Gross weight	Screw Type Conveyor：6510kg Steel belt Chip Conveyor：6670kg

2.4 Electric Equipment Specification

2.4.1 Power Supply

Power supply voltage: 200 V
Power supply frequency: 60 Hz

2.4.2 Allowable Range of System Parameters

2.4.2.5 Power supply voltage: 85% ~ 110% of 220 V

2.4.2.6 Power supply frequency: 58 ~ 62 Hz

2.4.2.7 Ambient temperature:0˚~45˚C (32˚F to 113˚F)

2.4.2.8 Ambient relative humidity: less than 90% (with no condensation occurred)

2.4.2.9 Other environment requirements are listed below:

2.7.1.1 A constant and smooth ambient temperature and relative humidity.

2.7.1.2 Do not expose the machine or electric equipment under the corrosive or hostile environment.

2.7.1.3 Do not expose the machine or electric equipment in the dusty environment.

2.7.1.4 No influence from the magnetic or static electric field.

2.5 Machine Accessories

2.5.1 Standard

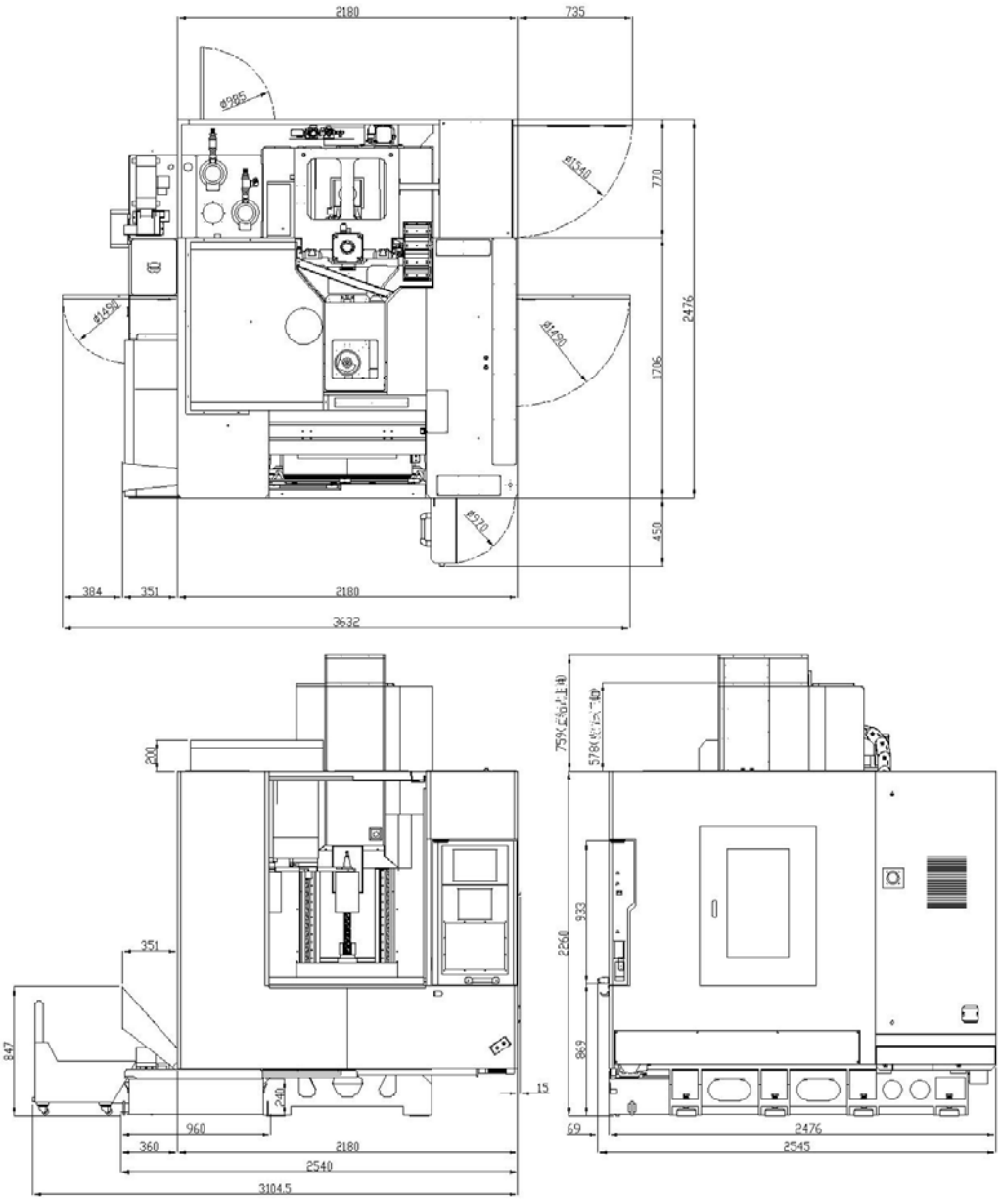
(1) Centroid M400
(2) BT/CAT 40 8000 rpm Spindle
(3) Cutting coolant system
(4) Oil Circulating Cooling System for Spindle
(5) Spindle Taper Cleaner
(6) Arm Type A.T.C 16 Tools
(7) T-Slot Type Table
(8) Heat Exchanger for Electrical Cabinet
(9) Fully Enclosed Splash Guard
(10) Grease Lubrication System
(11) LED Work Lamp
(12) Tool Kit
(13) Tri-color End of program light
(14) Leveling Bolts and Pads
(15) Operator & Maintenance Manual
(16) Programming Manual
(17) Part list

2.6 Machining Accuracy

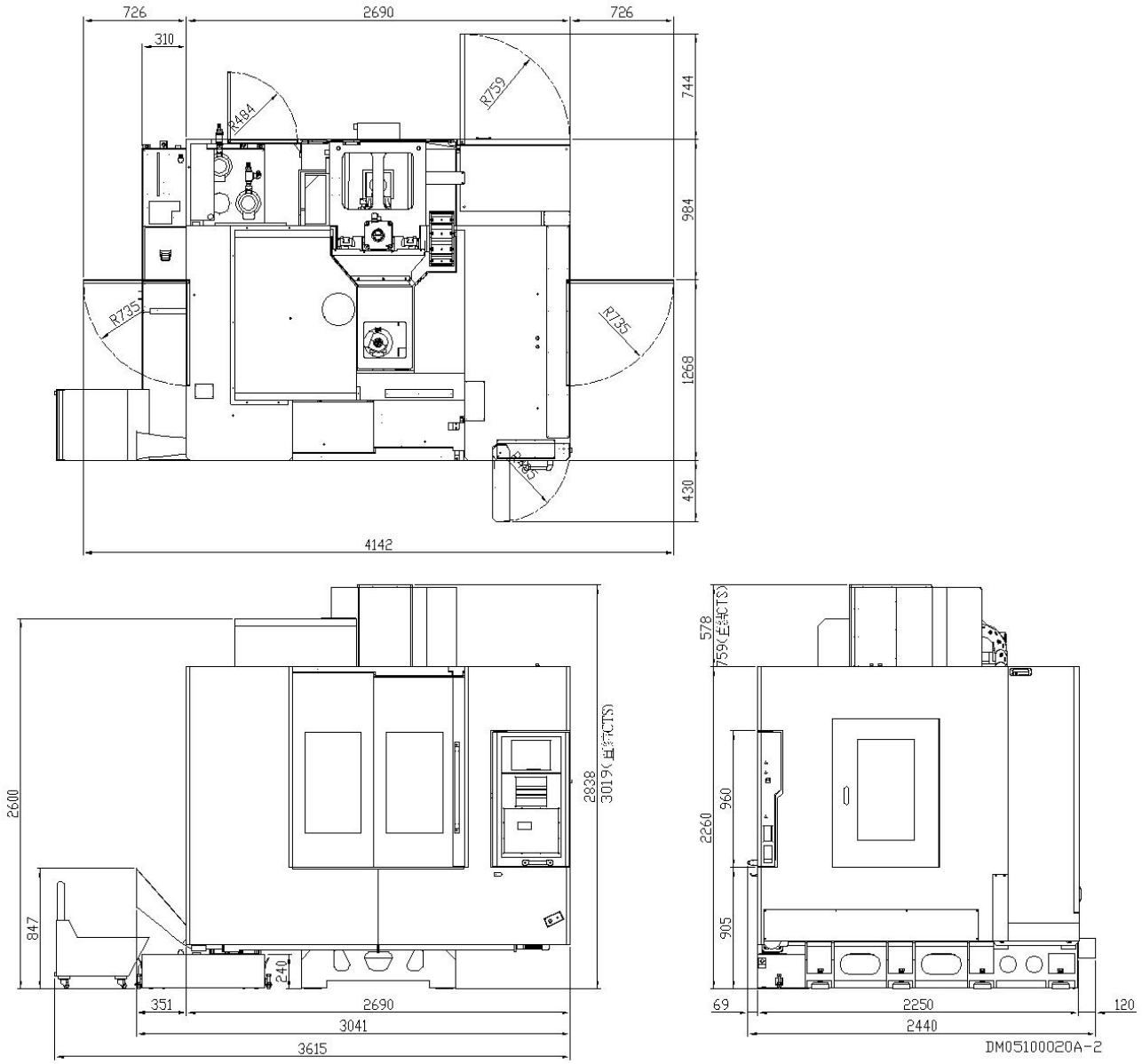
ITEM / MODLE	X'Y'Z-axis	
	Positioning	Repeatability
AL32/42	±0.004	±0.003

2.7 Dimensions

2.7.1.1 AL32



2.7.1.2 AL42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R759
R484
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1268
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R735
4142
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847
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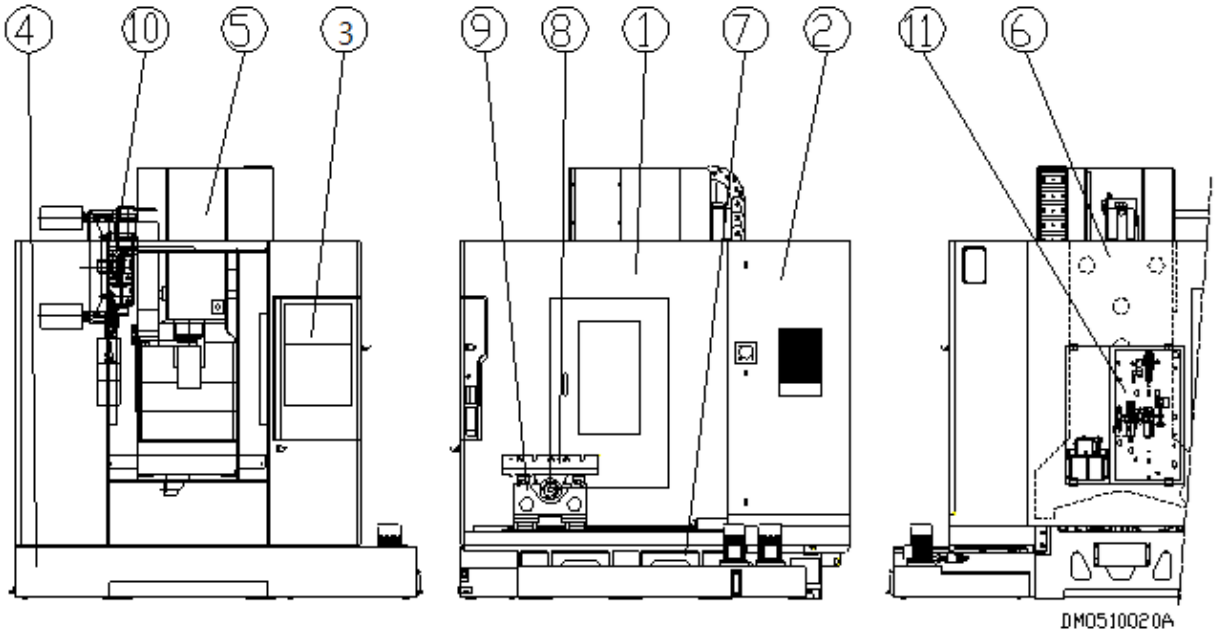
2690
3041
3615
2838
578
960
2260
905
69
2250
2440
120
DM05100020A-2

2.8 Main Parts

Item	**Nomenclature**
1	Shield cover
2	Electrical cabinet
3	Operation panel
4	Coolant tank
5	Headstock
6	Main column
7	Bed base
8	Working table
9	Saddle
10	Tool magazine
11	Pneumatic system



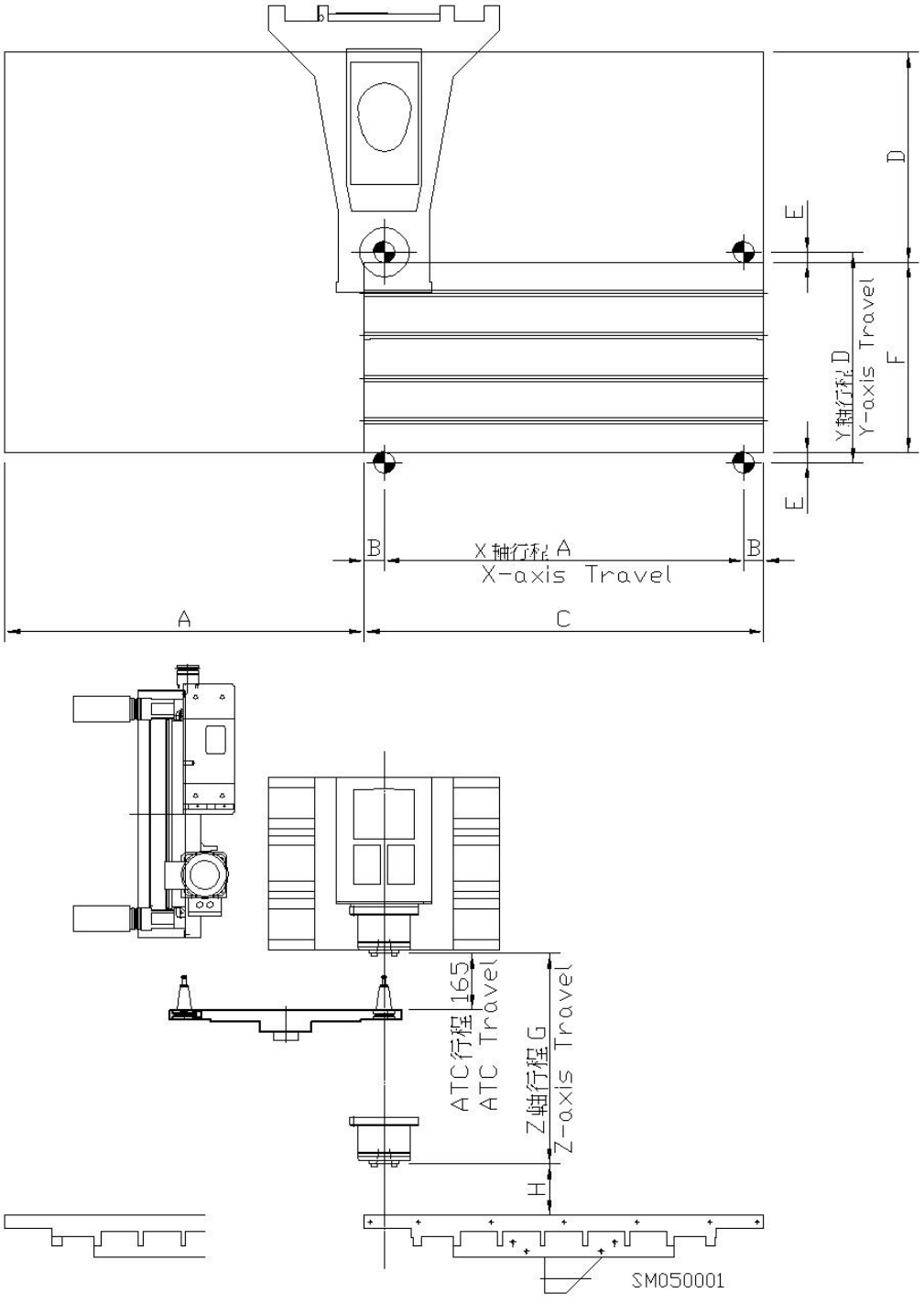
2.9 Working Range and Workpiece Weight

Maximum weight of workpiece:

AL32：600 KG

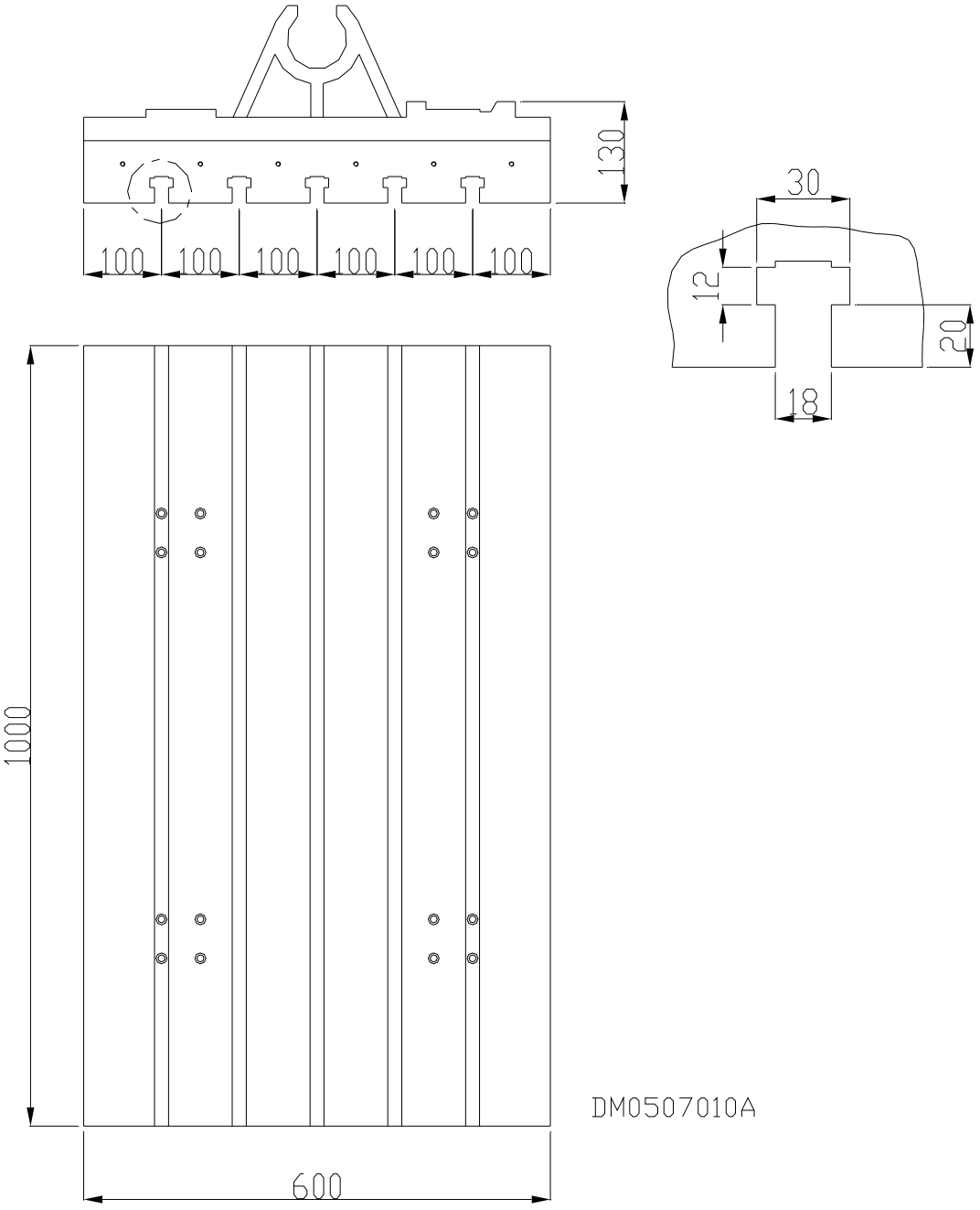
AL42：800 KG

MODEL	A	B	C	D	E	F	G	H
AL32	860	70	1000	600	0	600	610	120
AL42	1050	75	1200	600	0	600	610	120

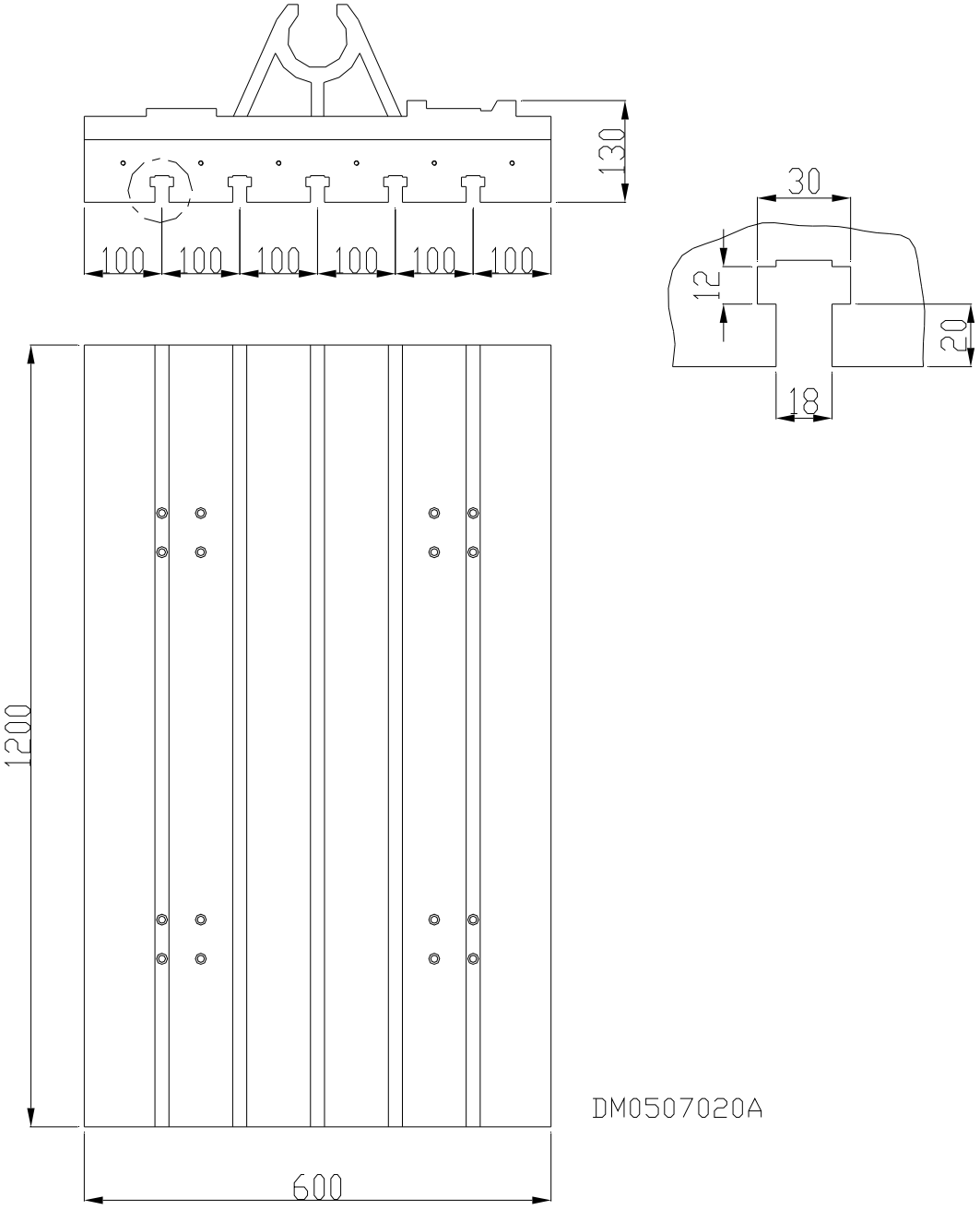


2.10 Dimensions of the Working Table

AL32

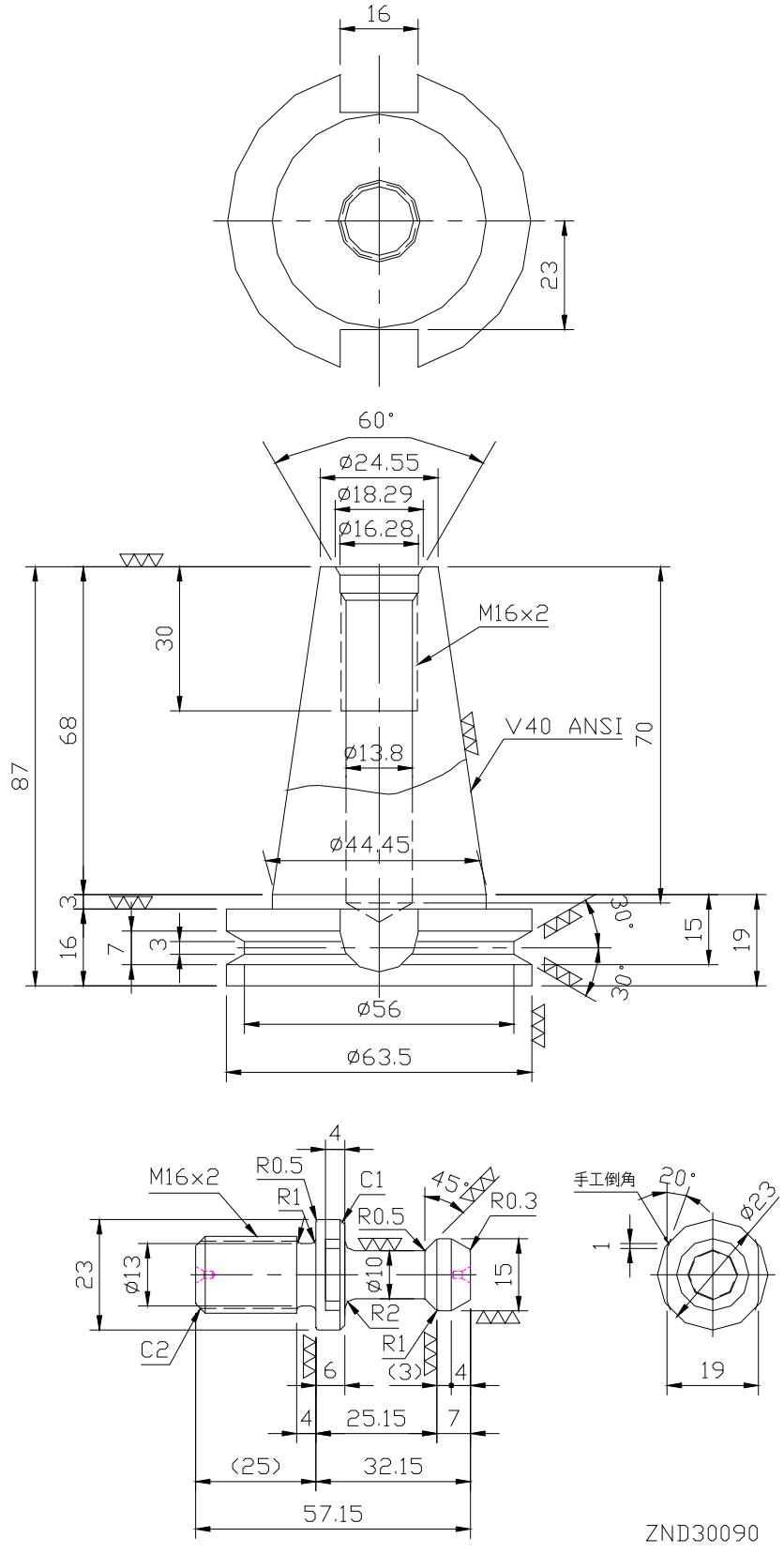


AL42

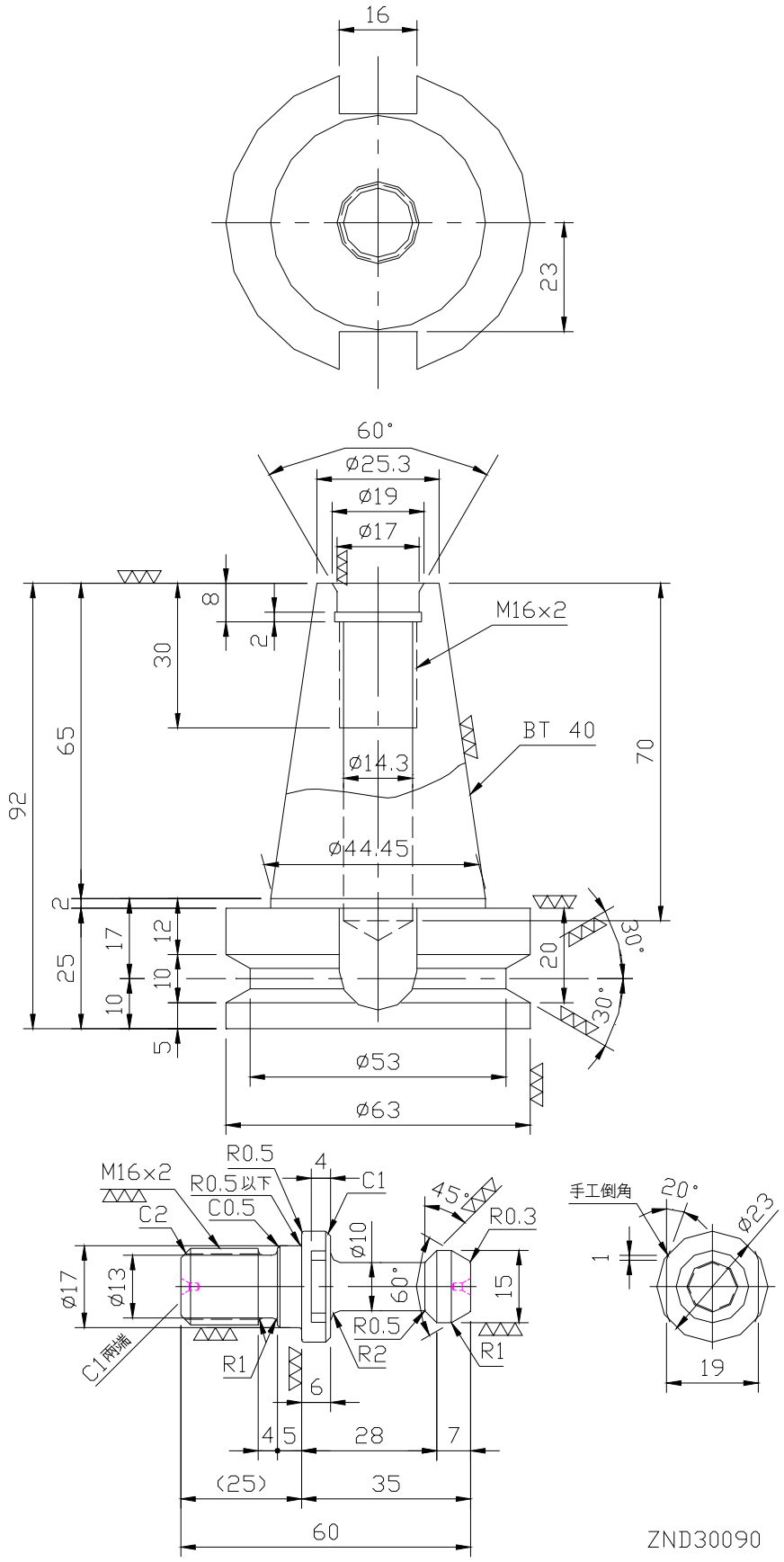


2.11 Dimensions of the Tool Holder

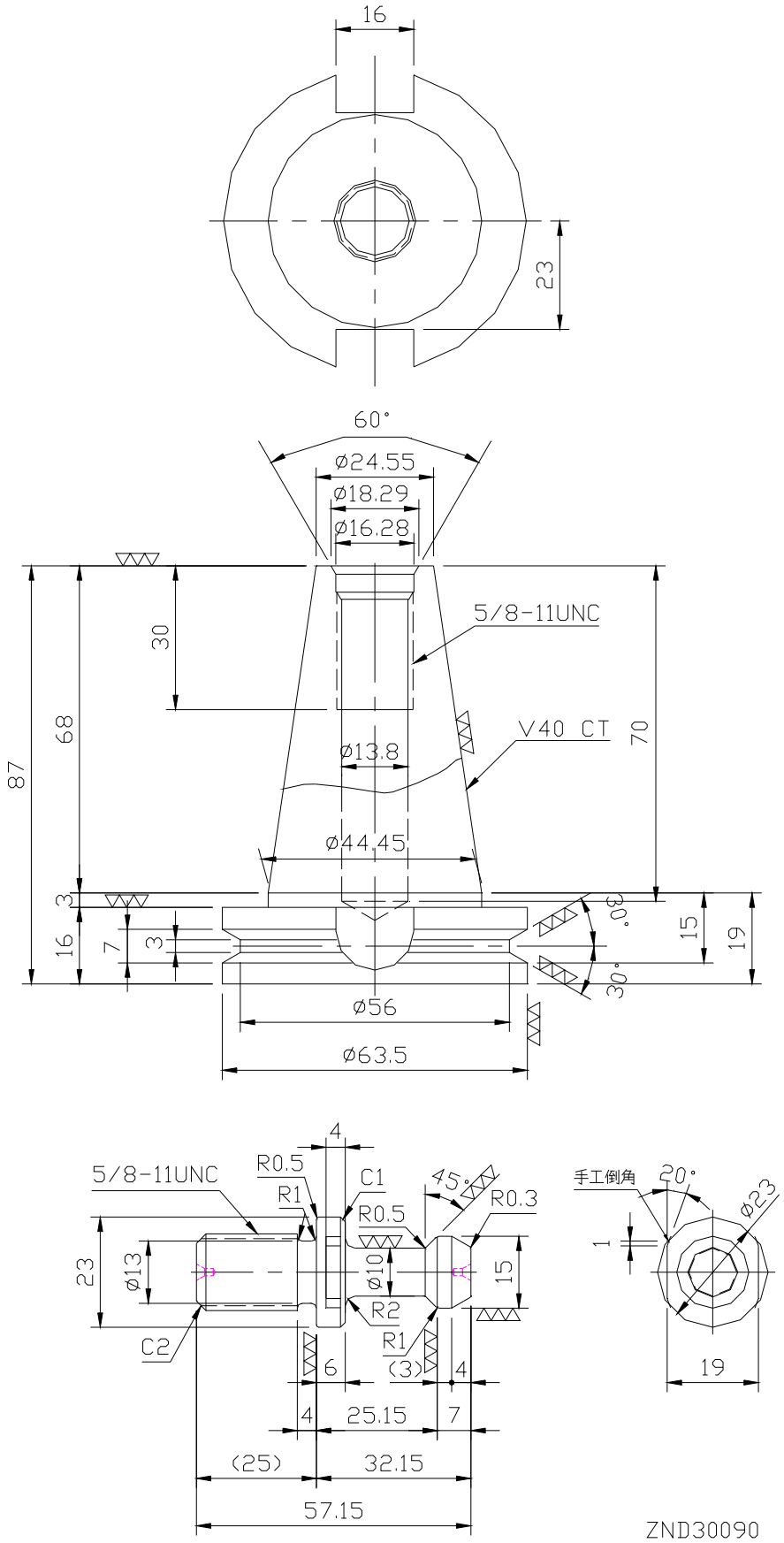
2.11.1 BT-40 JIS Specification



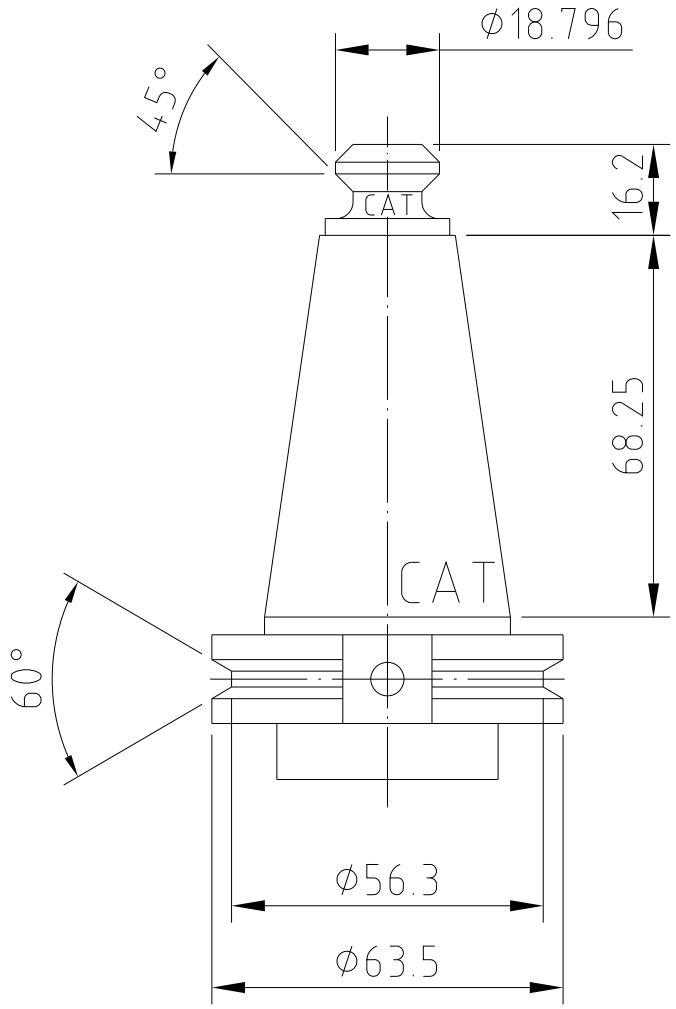
2.11.2 V40 ANSI Specification



2.11.3 V40 CT Specification

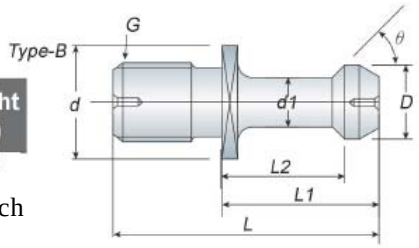


2.11.4 CAT-40 Specification

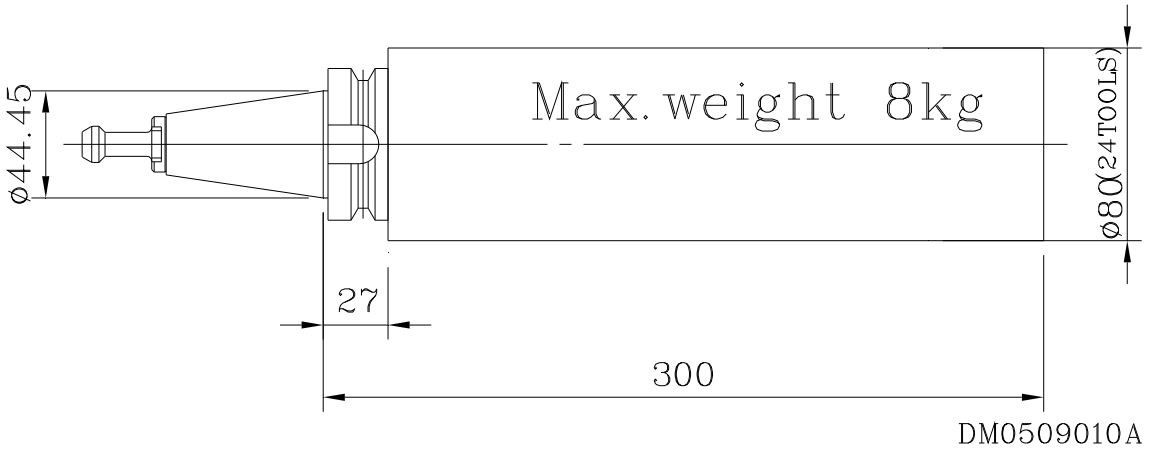


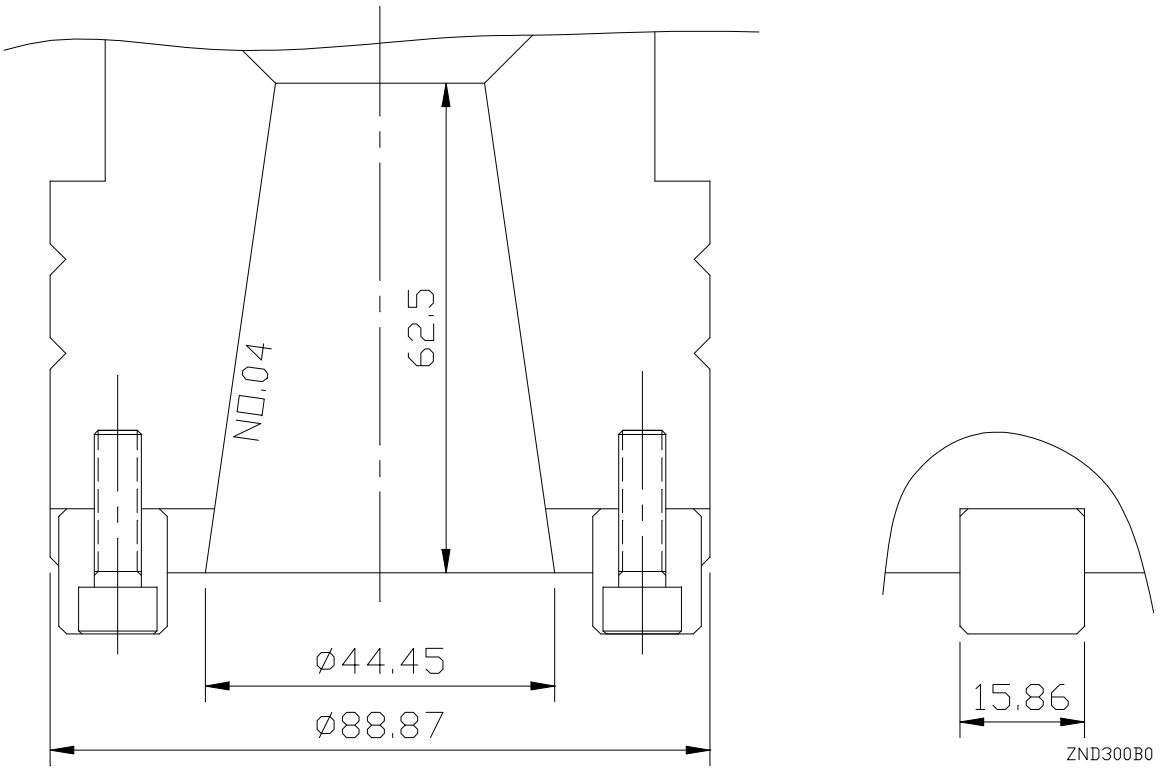
Model No.	Type	L	L1	L2	D	d	d1	G	θ	Weight (kg)
CAT40 45-B	B	2.120	1.266	0.990	0.590	0.905	0.394	5/8"-11	45	0.05

Unit:inch



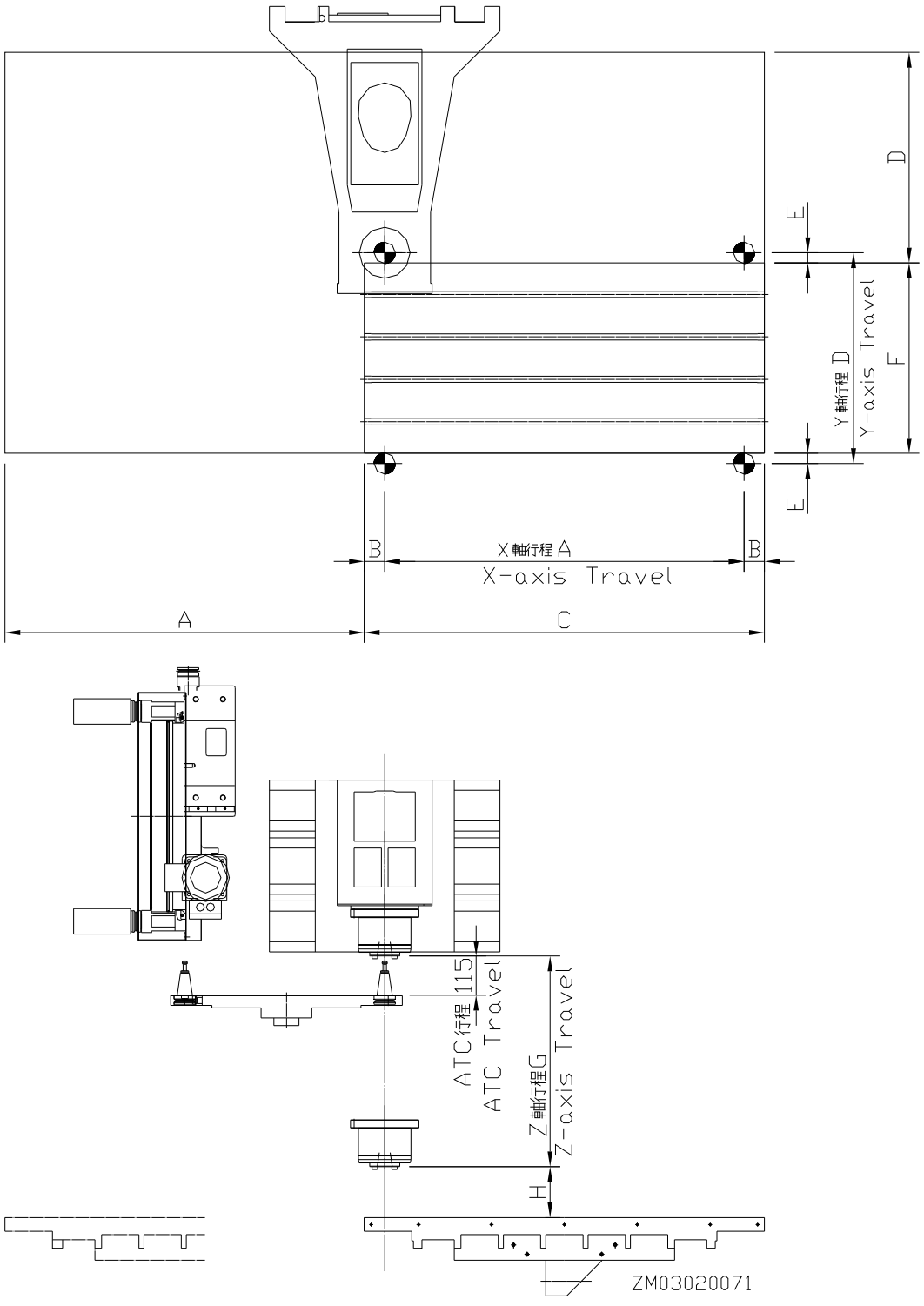
2.12 Specifications of the Tool





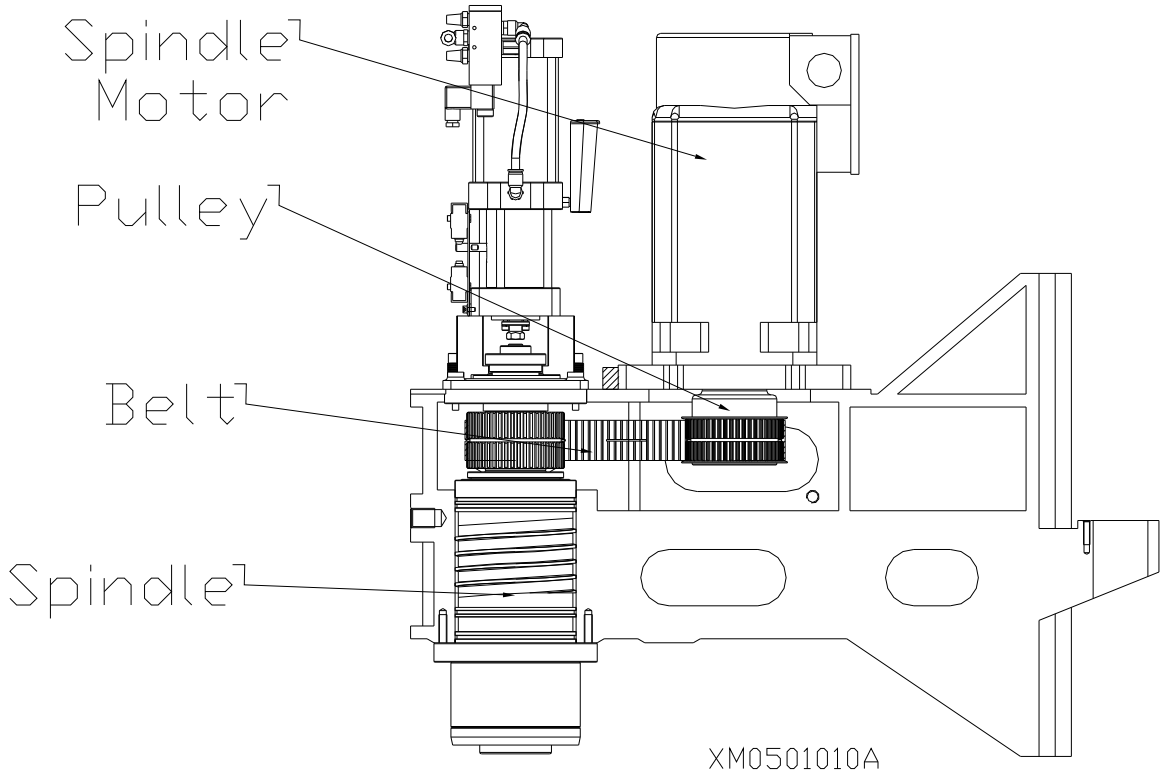
2.13 Stroke Limits for Axes and ATC

MODEL	A	B	C	D	E	F	G	H
AL32	860	70	1000	600	0	600	610	120
AL42	1050	75	1200	600	0	600	610	120



2.14 The Mechanism for Tool Clamping and Unclamping

The tool clamping and unclamping are accomplished through the use of disk spring, drawing bar, and a pneumatic system, as shown below. The tool clamping force applied by the disk spring is approximately 1000 kg.



Chapter 3

Shipping/Handling and Installation

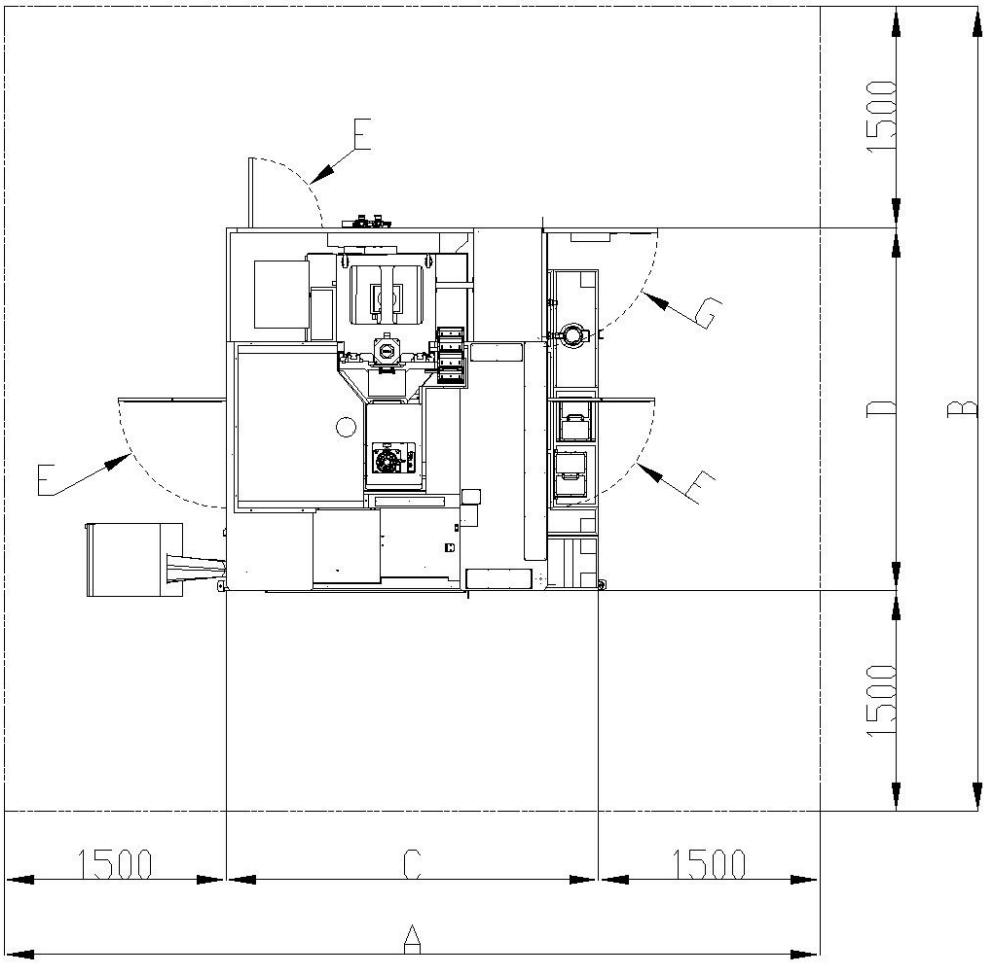
3.1 Preparation

Clear the space and transportation route at the factory 12 days in advance for the machine to move in and install.

3.1.1 Space Requirement

Recommended site space for the machine with standard equipment:

MODEL	A	B	C	D
AL32	5540	5466	2518	2466
AL42	6038	5261	3038	2261



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3.1.1.1 Ensure to reserve space for optional equipment. Please contact us if you have any problem in installing this machine.

3.1.1.2 Ensure the site space and the path width is large enough to install and transport the whole machine at least 30 working days before the arrival of this machine. If under-standard for space, be inform us as possible as early, we will provide the suggestion/ and information service for you.

3.1.2 Foundation Plan

This machine should be placed upon a solid foundation to maintain the machine accuracy for a long run. Dig the planning site to about 85-cm underground. Pave the bottom with a layer of pebble of 20 cm thick, then fill the site with concrete. The foundation surface should be level and flat. Ensure to reserve spaces for the foundation-fixing studs. Please refer to the section of foundation construction plan for details.

Note:

1) The foundation construction should be finished at least 12 days prior to the arrival of this machine.
2) This machine should be placed upon a solid foundation to maintain the machine accuracy for a long run. The foundation surface should be level and flat. Ensure to reserve spaces for the foundation-fixing studs. Please refer to the section of foundation construction plan for details.

3.1.2.1 Foundation Construction

Two plans, as illustrated in section 3.1.2.1.1 and 3.1.2.1.2, could be applied.

3.1.2.1.1 Foundation Construction Plan One

Ensure the foundation construction work is finished at least 12 days prior to the arrival of the machine. Refer to the following foundation construction diagrams for details. The construction procedures are listed as follows:

3.1.2.1.1.1 Dig the foundation site. Pave the site bottom with a layer of pebble stone.

3.1.2.1.1.2 Ensure to reserve 6 spaces for installing the L shape fixing studs and foundation pads before filling up the foundation site with concrete. Ensure those 6 surfaces are level and flat.

3.1.2.1.1.3 After the concrete is dry and solid, place temporary foundation pads on those 6 reserved spaces, then place the machine above the foundation pads. Ensure to leave a space of 60 mm between the machine base bed and ground to install the L shape-fixing stud.

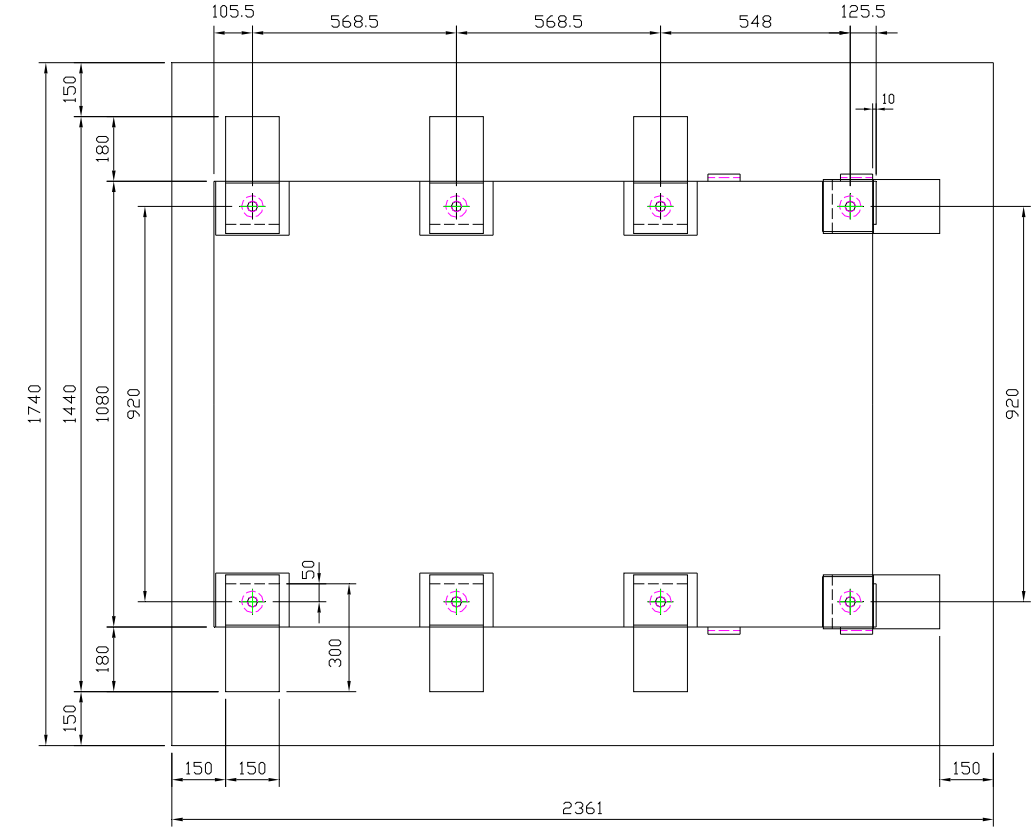
3.1.2.1.1.4 Place foundation pads on those reserved spaces, insert the L-shape fixing stud through the foundation pad and foundation bolt, and then fasten the fixing stud with the nut.

3.1.2.1.1.5 Adjust the L-shape fixing studs based on dimensions shown in the following figures. Fill up those reserved spaces with concrete.

3.1.2.1.1.6 Level the machine after the concrete is dry and solid.

3.1.2.1.2 Foundation Construction Plan Two:

Ensure the ground is rigid enough to place the machine. Place the leveling blocks on the ground, then place the machine upon the leveling blocks. Level the machine accordingly.


105.5
568.5
568.5
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1080
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920
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300
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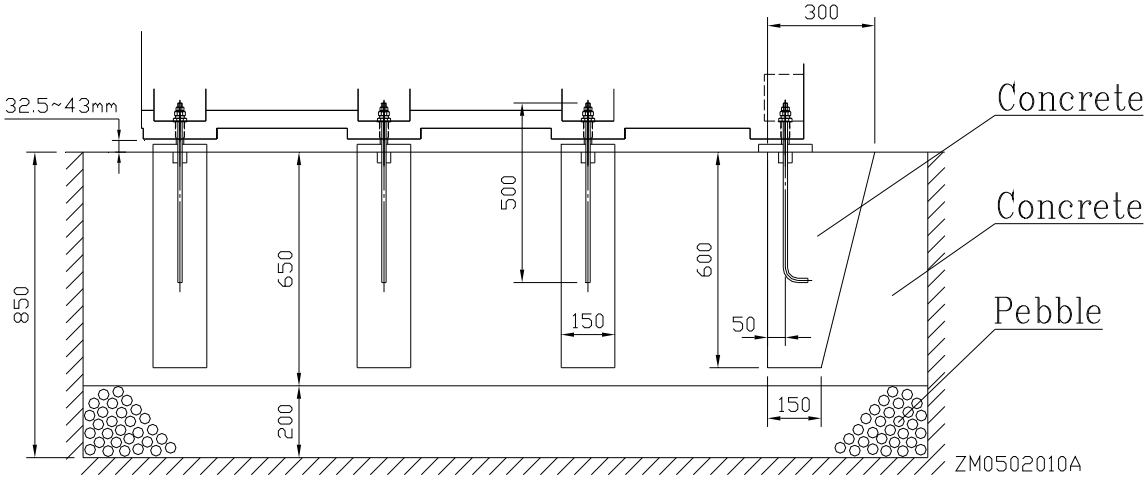
150
2361


300
32.5~43mm
Concrete
Concrete
Pebble
850
650
500
600
150
50
150
200
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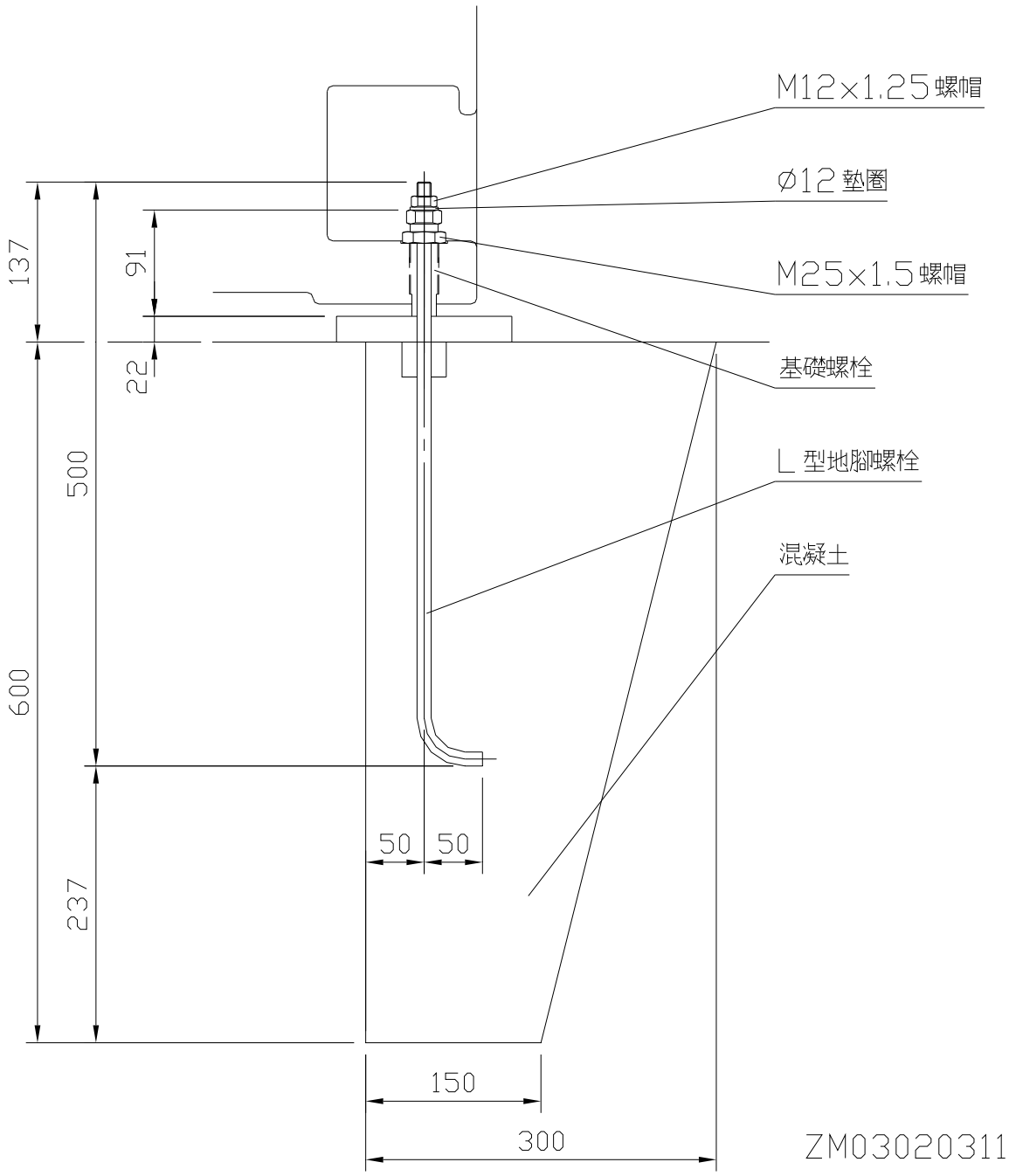
M12×1.25 螺帽
Ø12 墊圈
M25×1.5 螺帽
基礎螺栓
L 型地腳螺栓
混凝土
137
91
22
500
600
237
50
50
150
300
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3.2 Machine Lifting

This AL32/42 vertical machining center is composed of headstock, tool magazine, main column, working table, saddle, bed base, operation panel, pneumatic system, lubrication system, electrical cabinet and CNC unit. Those components are connected with electrical cables and/or pneumatic pipelines.

During transportation, the machine body and coolant tank are packed separately. The shipping and handling equipment used should be able to lift a gross weight AL32 of 6.5 tons [6.8 tons for AL42] at least. Due to weight of the machine, it is recommended to lift this machine with crane, and use only the sling frame provided by us. Nevertheless, read Operator and Maintenance's manuals thoroughly before lifting the machine.

Note: Use only the sling frame provided by us to lift the machine.

3.2.1 Precautions before Lifting the Machine

3.2.1.1 Ensure that strength of the cables can sustain the weight of the machine.

3.2.1.2 Ensure the lifted machinery package is in balance before starting to move it.

3.2.1.3 Abrupt changes in lifting & lowering speed might cause unexpected damage on the machinery package and are therefore prohibited.

3.2.1.4 Use only the sling frame provided by us to lift the machine. Because the sling frame is optional, therefore, please contact our local dealers if it is needed.

3.2.2 Lifting with the Machine Packed

3.2.2.1 Using Fork-lifting Truck

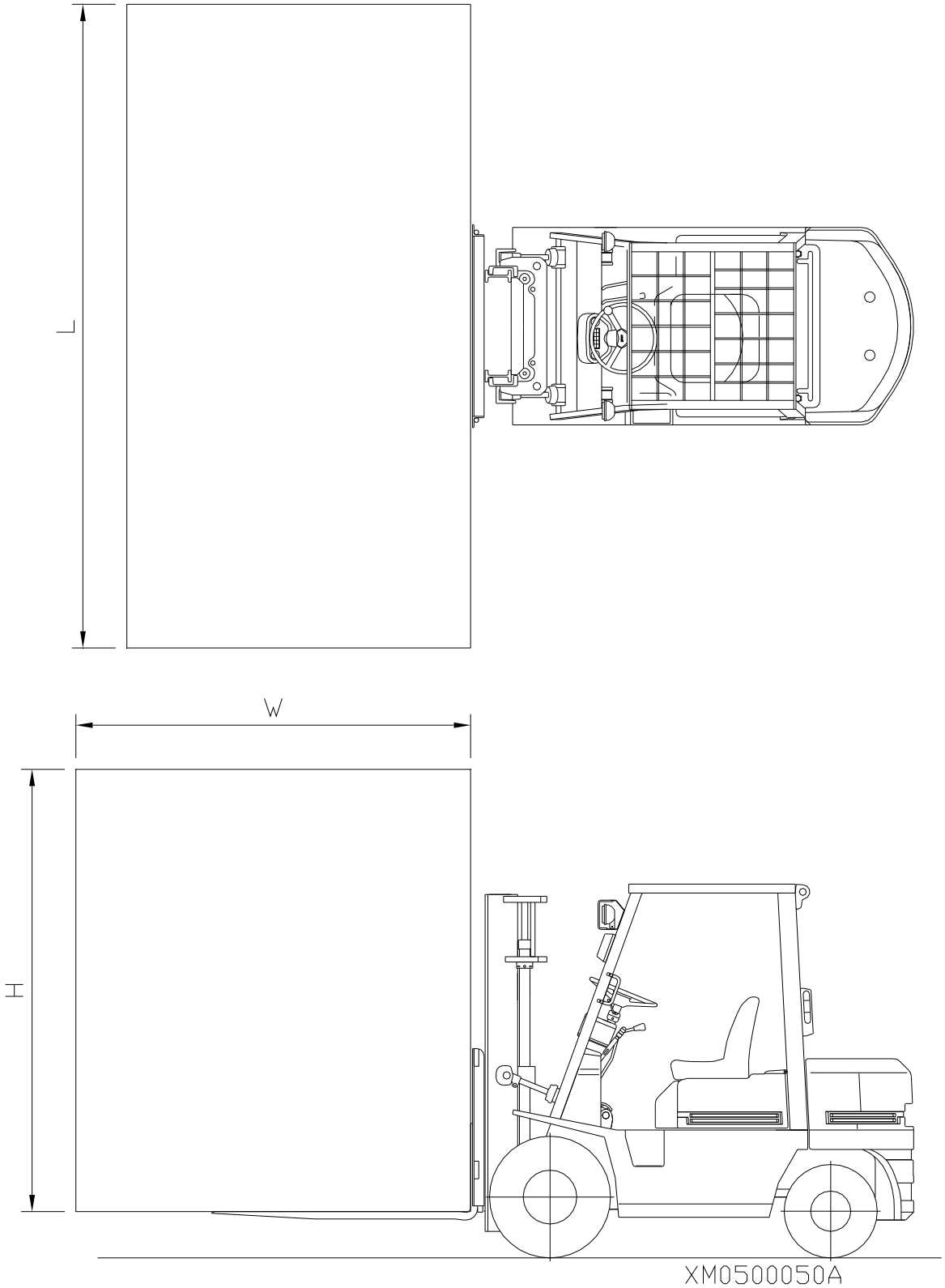
3.2.2.1.2 The loading capacity of the forklift should be at least AL32 of 6.5 tons [6.8 tons for AL42].

3.2.2.1.3 The AL32 packed machine is 367 cm in length, 228 cm in width and 251 cm in height. Ensure nobody is in the way and the path is clear before moving the packed machine.

3.2.2.1.4 Ensure lifting forks are in an appropriate position and the package is in balance before proceeding.

3.2.2.1.5 Beware that the lifting truck might be overturned because of an improper lifting height.

3.2.2.1.6 Always assign a person to guide the way to ensure safety.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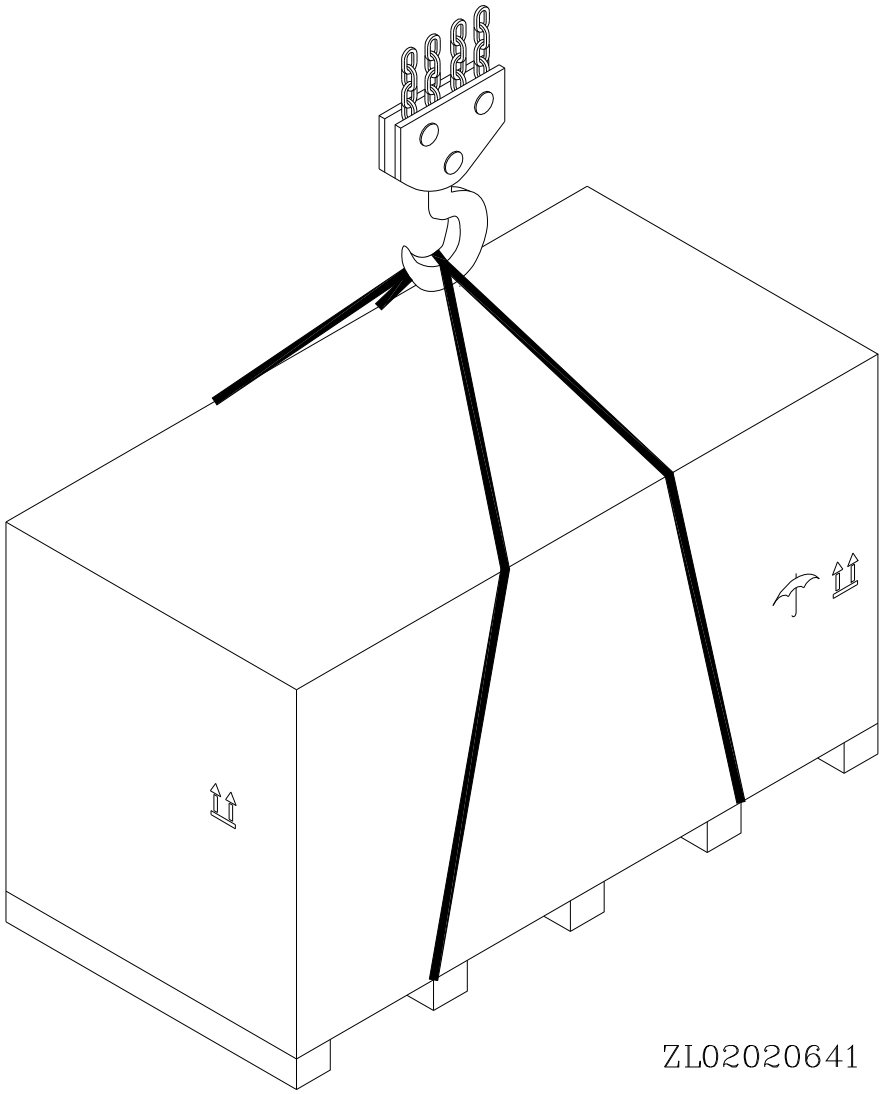
3.2.2.2 Using Crane or Other Lifting Equipment

3.2.2.2.1 The loading capacity of the lifting equipment should be 8 tons AL32 [8.5 tons for AL42]. Wiring cables and chains of the lifting equipment should be able to bear a load of 8 tons AL32 [8.5 tons for AL42]..

3.2.2.2.2 The AL32 packed machine is 367 cm in length, 228 cm in width and 251 cm in height Ensure nobody is in the way and the path is not blocked before moving the packed machine. It could prevent the machine from collision.

3.2.2.2.3 Beware that the lifting truck might be overturned because of an improper lifting height. Otherwise might cause people injury and damage the machine.

3.2.2.2.4 Always assign a person to guide the way to ensure safety.



3.2.3 Lifting the Bare Machine

3.2.3.1 Using Forklift

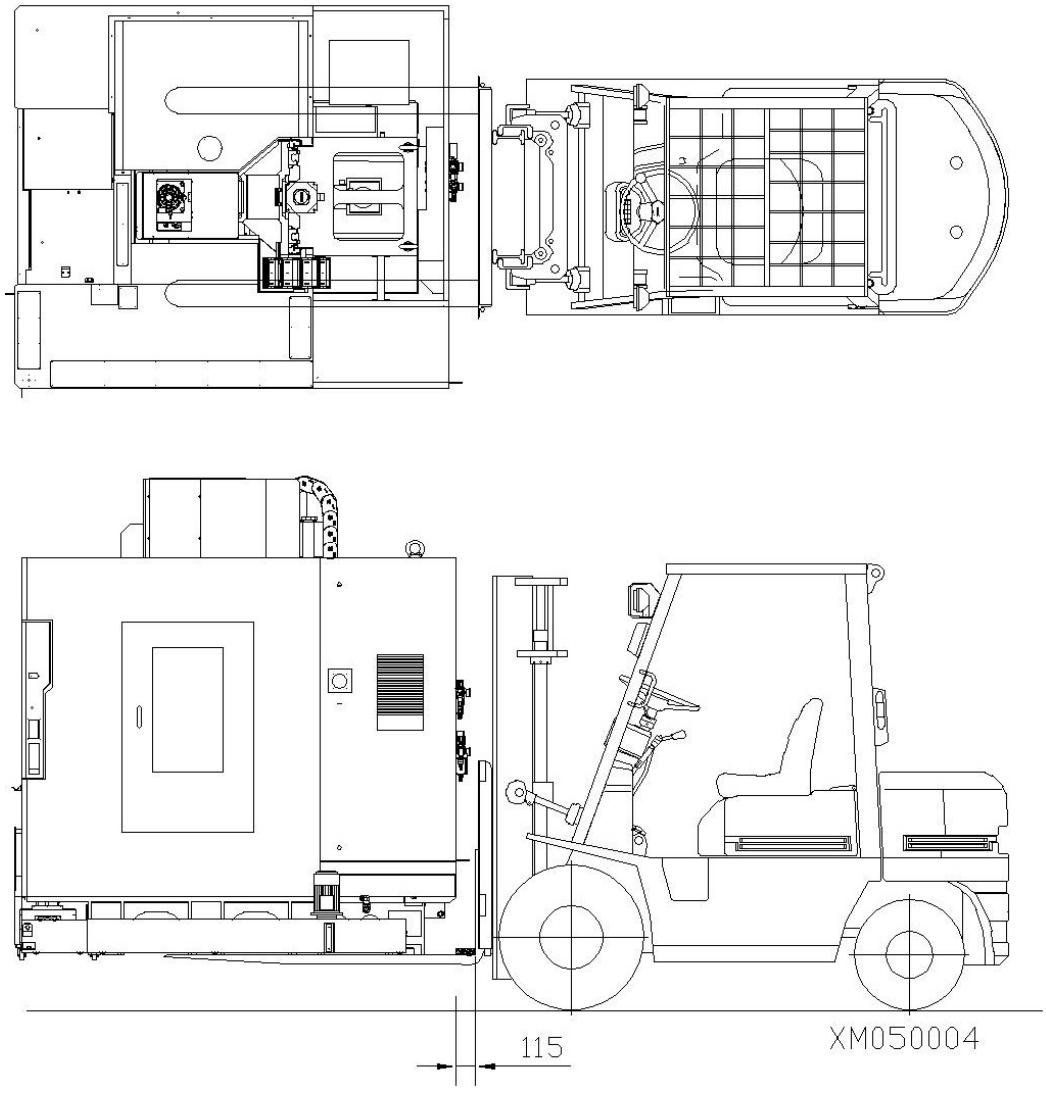
3.2.3.1.1 The loading capacity of the forklift should be at least 8 tons AL32 [8.5 tons for AL42].

3.2.3.1.2 AL32 is 367 cm in length, 228 cm in width and 251 cm in height [338x231x255 cm for AL42]. Ensure nobody is in the way and the path is clear before starting to move this machine. Otherwise might cause people injury and damage the machine.

3.2.3.1.3 Ensure lifting forks are in an appropriate position and the object is in balance before proceeding. Keep any part of the machine at least 10.5 cm away from masts of the forklift. Place two wood blocks of 115 mm in length between the machine and masts, as shown below.

3.2.3.1.4 Beware that the lifting might be overturned because of an improper lifting height. Otherwise might cause people injury and damage the machine.

3.2.3.1.5 Always assign a person to guide the way to ensure safety.



3.2.3.2 Using Crane or Other Lifting Equipment

3.2.3.2.1 The loading capacity of the lifting equipment should be 8 tons AL32 [8.5 tons for AL42] at least. The loading capacity below 8 tons AL-32 [8.5 tons for AL42] is prohibited.

3.2.3.2.2 Wire cables and chains of the lifting equipment should be able to bear a load of 10 tons AL32 [8.5 tons for AL42] at least.

3.2.3.2.3 Use only the sling frame provided to lift the machine. Other fixture or rope is prohibited.

3.2.3.2.4 AL32 is 367 cm in length, 228 cm in width and 251 cm in height [338x231x255 cm for AL42]. Ensure nobody is in the way and the path is clear before commencing to move the machine. Otherwise might cause collision on the machine.

3.2.3.2.5 Beware that the lifting truck might be overturned because of an improper lifting height. Otherwise might cause people injury and damage the machine.

3.2.3.2.6 Always assign a person to guide the way to ensure safety.

3.2.4 Notice

3.2.4.1 How to Fix Machine Components during Transportation

3.2.4.1.1 Counterbalance weight:

To prevent the counterbalance weight from swing, put a steel rod (ϕ32mm) through its center hole from two holes on the main column wall reserved for fastening the counterbalance weight.

3.2.4.1.2 Headstock:

Move the working table to the middle and move the saddle to the main column as close as possible. Place a wooden block on top of the table, then lower the headstock slowly until it rests on the wooden block.

3.2.4.1.3 Tool Magazine:

Place wooden blocks under the tool magazine stand and tool magazine‘s pivot to support the tool magazine.

3.2.4.1.4 Operation Panel:

Install a support plate under the panel‘s pivot to support the operation panel.

3.2.4.1.5 Power Cabinet:

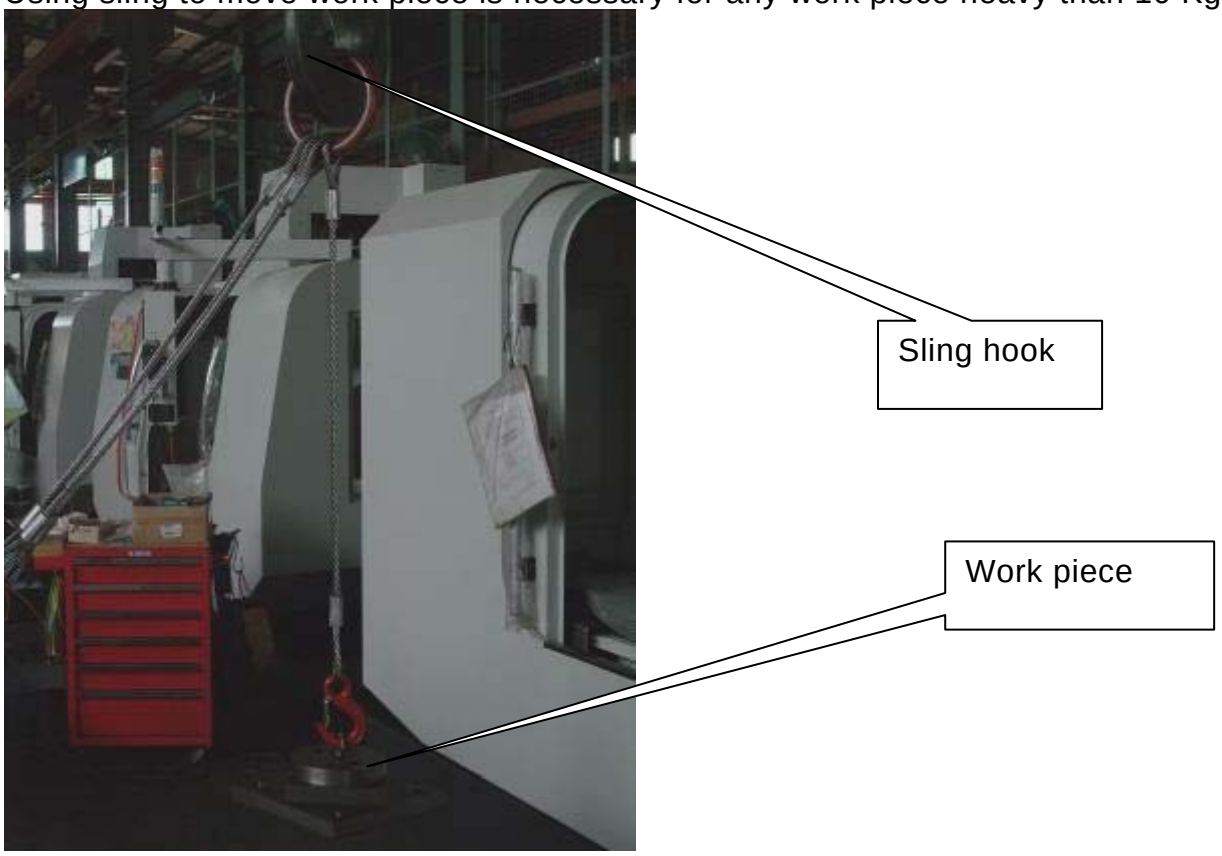
Place wooden blocks under the power cabinet to support the power cabinet.

3.2.4.1.6 Miscellaneous:

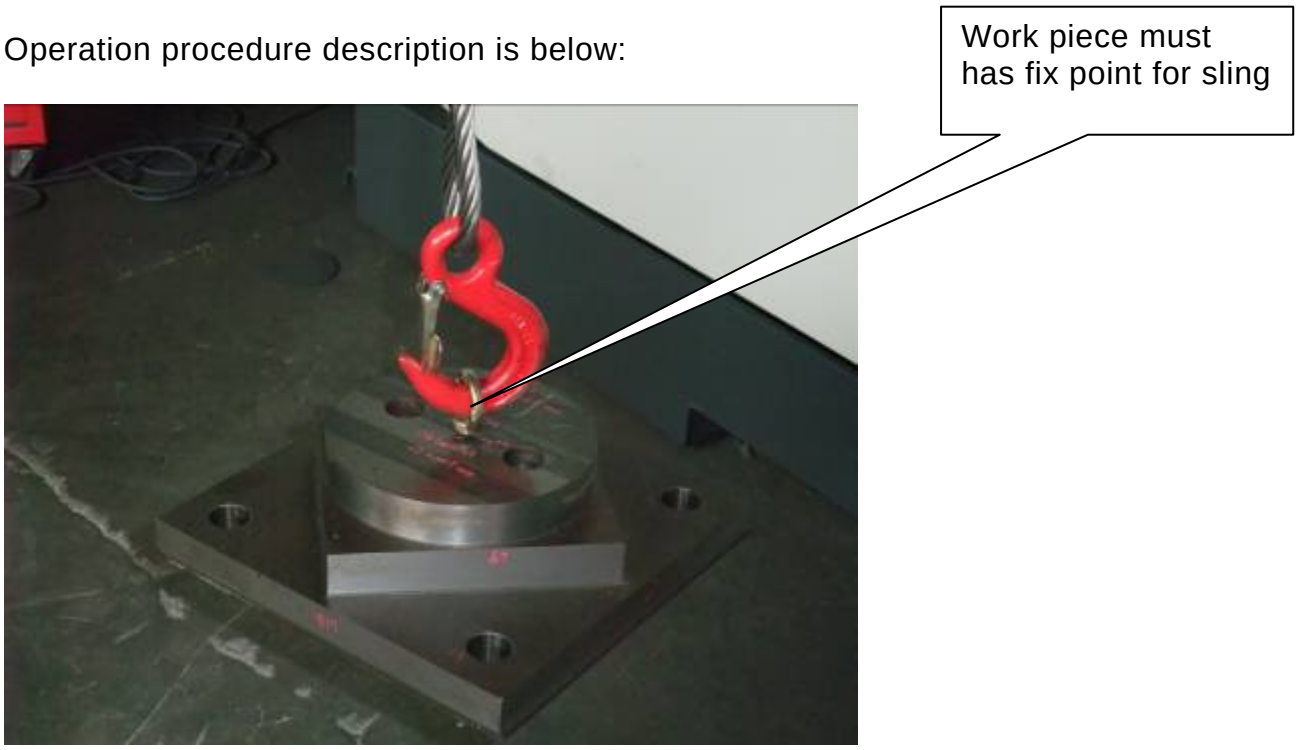
Ensure to fasten all the loosen parts firmly inside the crate.

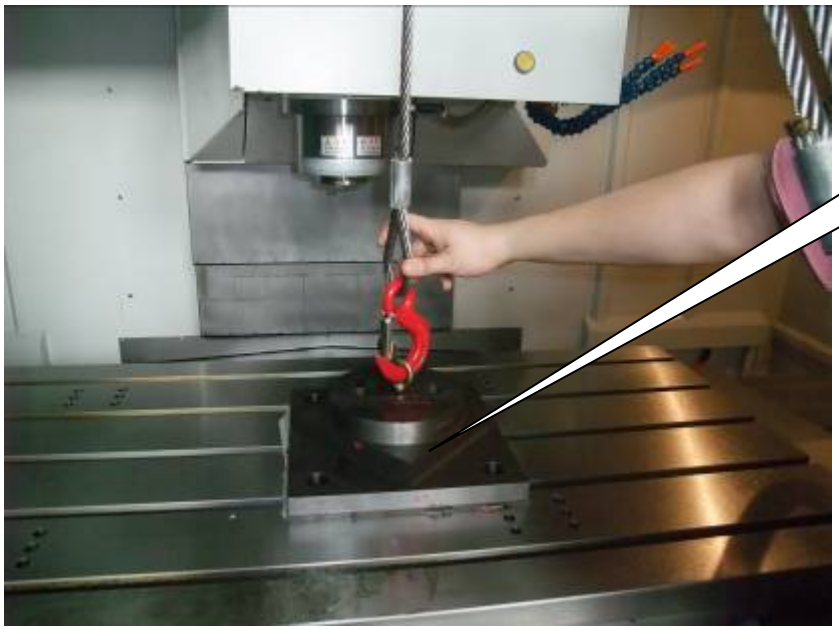
3.2.4.2 How to move work piece

Using sling to move work piece is necessary for any work piece heavy than 10 Kgs



Operation procedure description is below:





Move work piece to table

Lock the bolt and positioning block.

3.2.5 Fixture (sling frame) Remove

Ensure to remove all the fixtures listed below before operating the machine:

3.2.5.1 Remove the fixed plate under the three-axis.

3.2.5.2 Remove the fixed plate under the operation box.

3.2.5.3 Remove the fixed plate of the sliding doors.

3.3 Storage

3.3.1 Storage with the Machine Packed

3.3.2.1 Ensure to fasten all the loose parts and have an anti-rust treatment of the machine.

3.3.2.2 Ensure to fix the machine firmly inside the crate to prevent the machine move from falling.

3.3.2.3 Ensure to enclose the machine with a waterproof cover to keep this machine from moisture or corrosive substance. It prevents the mechanical and electrical parts from damage.

3.3.2.4 Ensure to put anti-moisture substance inside the crate.

3.3.2.5 Do not place the whole packing directly under the sunlight or near any other heat source. Keep away from any corrosive substance or any equipment causing abnormal vibration. The ambient temperature and moisture should be moderate and kept as constant and smooth as possible.

3.3.2 Storage of the Bare Machine

3.3.2.1 Ensure to fasten all the loose parts and have an anti-rust treatment of the machine.

3.3.2.2 Ensure to fasten all the sliding guards and doors to prevent form move, even falling.

3.3.2.3 Ensure to enclose the machine with a waterproof cover to keep this machine from moisture or corrosive substance. Otherwise might cause the mechanical and electrical parts damage.

3.3.2.4 Ensure to put anti-moisture substance inside the electric cabinet, operating panel, and any other enclosure of this machine.

3.3.2.5 Do not place the machine directly under the sunlight or any other heat source. Keep away from any corrosive substance or any equipment causing abnormal vibration. The ambient temperature and moisture should be moderate and kept as constant and smooth as possible. Otherwise might cause the mechanical and electrical parts damage.

3.3.2.6 Ensure all the power supplies are off and the main power supply cables are taken off before to put the pack in store.

3.4 Installation

3.4.1 Power Supply

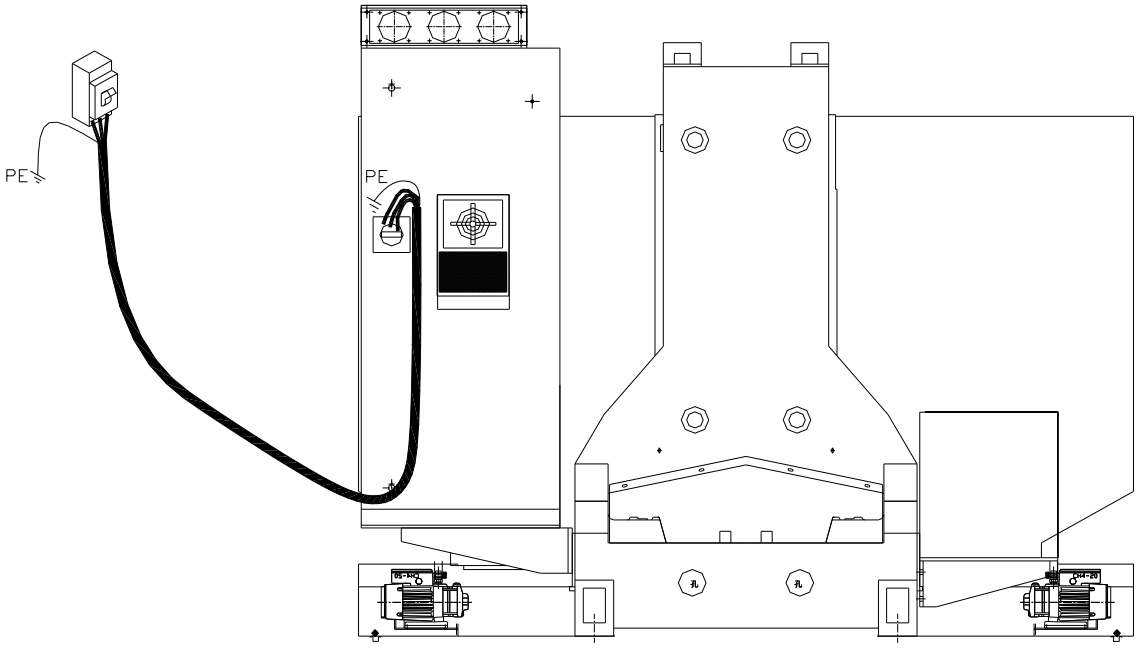
3.4.1.1 The main power supply of this machine is rated as 60 Hz, 220 Volts, alternating, and 21~30Kva. Ensure all the associated connections and wiring are appropriate, that is, connections and wiring should conform with the local safety rules at least.

3.4.1.2 Ensure to install a 50-mA current-fault breaker prior to the power supply switch or transformer of this machine.

3.4.1.3 Thread the power supply cable through the cable inlet positioned at the lower right side of the machine, rest the cable upon the electric cabinet frame, then connect the cable to the main power supply switch of this machine.

3.4.1.4 Connect the connector marked with "PE" inside the electric cabinet to the external grounding conductor. If it is no “PE” wiring on the external power supply system, please prepare one ground wire and set a grounding copper rod under the ground, then connect the “PE” connector on the electric cabinet and the ground rod with the ground wire.

DO NOT connect the grounding cable of this machine in series with that of other machine.



3.4.1.5 Remove all the anti-moisture substances placed inside the cabinets or panels.

3.4.1.6 Ensure to turn off all the power supplies and place "Under Installation High Voltage Equipment. Do not turn on the Power" warning signs in front of the main power supply switch before connecting the power supply.

DANGER: Only qualified engineers are allowed to install or maintain the electrical equipment of this machine. Fail to do so will result in serious accident.

3.5 Cleaning

3.5.1 Ensure to clean up the anti-rust treatment with the kerosene or the diesel on the contact surfaces of the moving machine parts. Don‘t clean up the anti-rust solvent on other places than where mentioned above.

3.5.2 Do not clean the machine with organic solvent.

3.5.3 Do not use compressed air to remove the dust on the machine, which might damage surfaces among sliding parts.

3.5.4 Remove all the anti-moisture substances placed inside the enclosures.

3.6 Leveling

3.6.1 Place the temporary foundation pads (see section 3.4.2.1) or leveling blocks (see section 3.4.2.2) on the foundation.

3.6.2 In the first case, insert the L-shape fixing stud through the pad and foundation bolt, and then fasten the fixing stud with the nut, as shown in the foundation construction diagrams.

3.6.3 Place two horizontal levels on the working table orthogonally; level the machine until differences between levels in both directions are within 0.02 mm.

3.6.4 Adjust foundation bolts until the space between the base bed and foundation pad is 6 mm (approx.) long.

3.6.4.1 Adjust the L-shape fixing stud until the distance between the top of the fixing stud and foundation bolt is about the size of two and a half times nut length.

3.6.4.2 Fasten the setup nuts for the foundation pads.

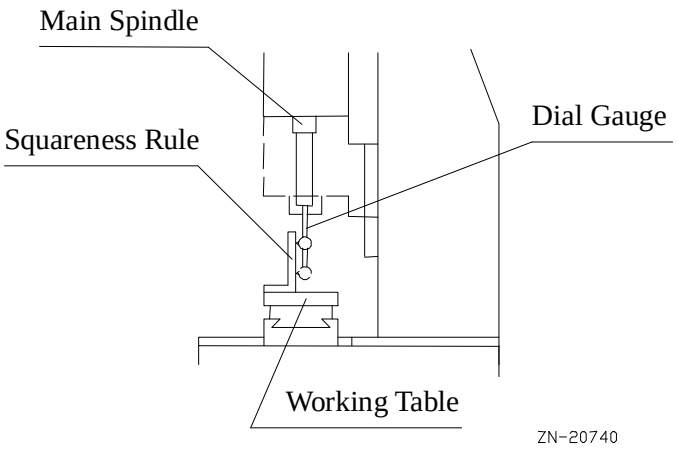
3.6.4.3 Fasten nuts for the L shape-fixing studs.

3.6.4.4 Fill up the foundation with concrete.

3.6.4.5 Wait for about seven days until the concrete is dry and solid.

3.6.5 Place two 200-mm long horizontal levels on the working table orthogonally, level the machine until difference between levels in both directions is within 0.02 mm per meter.

3.6.6 Adjust the squareness between the Y and Z directions.

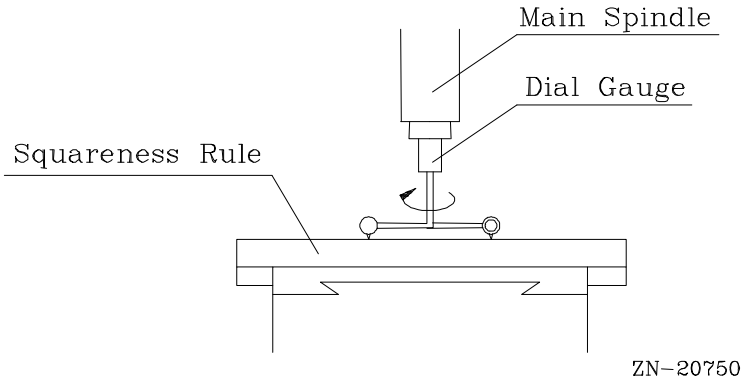


3.6.6.1 Arrange the granite squareness rule and the dial gauge set, as shown in the attached figure.

3.6.6.2 Ensure to place the squareness rule along the centerline of the working table. The dial gauge set should be held directly under the spindle.

3.6.6.3 Move the headstock along the Z direction, then level the machine by adjusting the rear two foundation bolts until the squareness meets the requirements.

3.6.7 Adjust the squareness between the spindle centerline and the working table surface.



3.6.7.1 Hold the dial gauge set directly under the spindle.

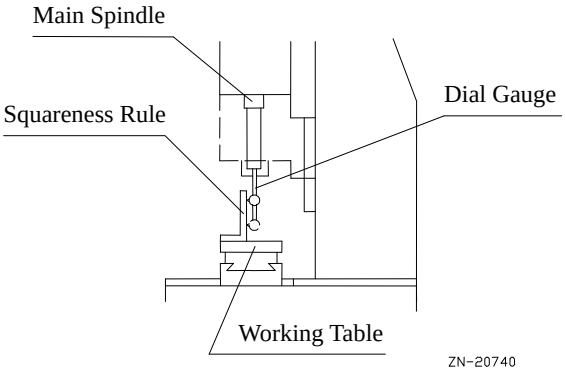
3.6.7.2 Ensure the distance between the dial gauge probe and spindle centerline is around 155 mm radically.

3.6.7.3 Move the headstock along the Z direction until the dial gauge probe touches the working table surface.

3.6.7.4 Rotate the spindle, and level the machine based on the reading.

3.6.7.5 Ensure the angle between the spindle centerline and working table on the operator's side should be less than 90 degrees.

3.6.8 Adjust the squareness among three orthogonal directions



3.6.8.1 Prepare the dial gauge set and granite squareness rule.

3.6.8.2 Place the granite squareness rule on the working table.

3.6.8.3 Hold the dial gauge set directly under the spindle.

3.6.8.4 In each of the three directions, move either the headstock or working table along some distances, then level the machine until readings at both ends are the same.

3.6.8.5 Ensure moving or rotating parts do not interfere with the sheet metal construction.

3.6.8.6 Ensure positions of ballscrews and bearings do not shift.

3.6.9 Spindle Bearing Clearance Adjustment

3.6.9.1 Remove the spindle side guide.

3.6.9.2 Arrange the dial gauge set as before. Adjust the adjust-nut until radial readings of the rotating spindle are constant.

3.6.9.3 Ensure adjust nuts are tight.

3.7 Inspection

3.7.1 Before Power Start-Up

3.7.1.1 Ensure the power supply specification is correct.

3.7.1.2 Ensure electric cables and connectors are appropriate based on the local safety regulations.

3.7.1.3 Ensure connections between the machine and grounding terminals are correct.

3.7.1.4 Ensure the current-fault breaker required by the local safety regulations is installed on the power supply side.

3.7.1.5 Ensure all the temporary fastening equipment used during the transportation process is removed.

3.7.1.6 Ensure there is no loose part on the working table.

3.7.1.7 Ensure there is no loose part on the folding guard.

3.7.1.8 Ensure all the fixing studs are fastened properly.

3.7.1.9 Secure nuts, bolts, locks, and other parts needed to be secured.

3.7.1.10 Ensure the hydraulic, pneumatic, and cutting coolant systems are connected properly.

3.7.1.11 After rotating the control panel chest to align the hole on the outer ring and the hole on the rotation shaft, fasten the 2 fix screws by Hex Key driver. This will prevent the control panel from rotation.

3.7.1.12 Ensure safety-guarding shields and doors are in a good condition.

3.7.1.13 Ensure the hydraulic oil, lubricant, and cutting coolant are filled up to the required level.

3.7.1.14 Ensure all the over-travel limit switch are working.

3.7.1.15 Ensure tension of the spindle driver's belt is appropriate.

3.7.1.16 Ensure there is no unexpected person or substance around the machine before starting up the machine.

3.7.1.17 Read manuals carefully and ensure you understand all the safety instructions and operating procedures before starting up the machine.

3.7.2 After Power Start-up

3.7.2.1 Ensure functions of the power supply switches are normal.

3.7.2.2 Ensure the hydraulic pump and cutting coolant pump work normally. Stop the machine immediately if the pressure indication is abnormal. Check the power supply wiring connection if necessary.

3.7.2.3 Ensure the emergency stop switch work.

3.7.2.4 Ensure the lubrication pump work and all the machine parts are lubricated properly.

3.7.2.5 Ensure the stroke-limiting functions specified by the NC programming codes and over-travel limit switch work.

3.7.2.6 Run the test program to ensure the machine is in a normal condition.

3.8 Polycarbonate panes

Note: We recommend making a replacement the polycarbonate panes every three years.

3.9 Installation of the optional accessories

3.9.1 Chip conveyor

This machine has chip conveyor to drive away the chips from working area into chip bucket outside the machine. Please put chip conveyor on the top of coolant tank, and then insert them to the tunnel at the rear of bed or right side of machine. Connect the power plug of motor onto the socket on the machine, then you can control the operation of this device from the operator panel.
During cutting, operator should start the chip conveyor frequently, to remove the chips while they are few instead of large quantity to prevent blockage. In the later condition, the remove rate will be down.

3.9.2 Oil mist collector (options)

When there is oil/mist or toxic vapor occurred during cutting, oil/mist collector is highly recommended. This device usually is installed prior to shipment. Just start this device during operation to have clean air in the environment and offer no harm to health.
During operation, the operator should clean the net filter frequently to keep high filtration.
If the customer wants to install oil mist collector by himself, please break the reserved hole on the top of machine, and then mount it, or contact us if there is any question. Salvation, please refer to the manual of bar feeder.

3.9.3 Oil & water separator (Options)

It is possible that the cutting fluid could be polluted by lubricant oil during the cycling process. This can be prevented by the oil & water separator. This device will be mounted on the machine prior to shipping. The impurities can be removed by starting up this device during machining work.
If the customer wants to add such device, he can break the reserved hole on the top of coolant tank, and then mount this device by themselves, or contact with directly.

Chapter 6

Lubrication

6.1 Importance of Lubrication

Running conditions of this machine depend heavily on the lubrication management. Ensure to check the lubrication system frequently to keep this machine in a good service condition. The followings describe how to lubricate various machine parts properly. Recommended lubrication oil used in the pneumatic system, lubrication grease and cutting coolant are listed in the oil guide table.

6.1.1 Lubrication and Cooling of Spindle System

6.1.1.1 Grease is used to lubricate spindle bearings. The recommended grease (Kluber Isoflex Nbu 15) could be used in high working temperature conditions. It has a good abrasive property, and needs no change.

6.1.1.2 Oil is used to lubricate the gearbox.

6.1.1.3 Ensure to maintain an adequate lubrication/cooling oil tank level. Fill it up if necessary.

6.1.1.4 Oil from the lubrication/cooling oil tank is used to cool the spindle bearing to prevent the spindle system from thermal deformation.

6.1.1.5 A fan-type cooler is used to cool the cooling or lubrication oil of the spindle system. This fan-type cooler is standard equipment.

6.1.1.6 Instead of using the fan-type cooler, a refrigerator-type cooler will be used to cool the cooling or lubrication oil of the spindle system upon request. This refrigerator-type cooler is optional equipment.

6.1.2 Grease Lubrication for the X-axis, Y-axis and Z-axis Ballscrews

The working table, saddle, and headstock are traveled along the X, Y, and Z directions respectively. Either the X-axis, Y-axis or Z-axis movement is driven by an AC servomotor via the connection of a coupling and a ballscrew. All the ballscrews are pre-tensioned and lubricated with proper grease to avoid positioning error resulting from thermal deformation.

6.1.2.1 Grease is used to lubricate bearings of X-axis, Y-axis or Z-axis. The recommended grease (Kluber Isoflex Nbu 15) could be used in high working temperature conditions. It has a good abrasive property, and needs no change.

6.1.2.2 Ensure to check the grease lubrication system monthly at least, and fill up the tank if necessary. Recommended lubrication grease is listed in the oil guide table.

6.1.2.3 Instead of the grease lubrication system, a centralized lubrication system could be used. This centralized lubrication system is optional equipment.

NOTICE: MOVE ALL THE AXES MANUALLY BEFORE RUNNING THE MACHINE TO MAKE SURE ALL THE SLIDEWAYS ARE LUBRICATED PROPERLY.

6.1.3 Warning System for the Slideway Lubrication System

A warning system is designed to notify users of checking and filling up the slideway lubrication system:

6.1.3.1 Counter starts to count when the machine is running a program.

6.1.3.2 The warning alarm will be continuing if the warning status is not released even though the power is turned off/on.

6.1.3.3 Fill the oil to release the warning status.

6.1.3.4 The Parameter 178 is using for lubrication timer setting.

Five digits can be set in the Parameter 178. The first, second and third digits are counting time(minute).

The fourth and fifth digits are lubrication pumping time(second).

<<Example>>:

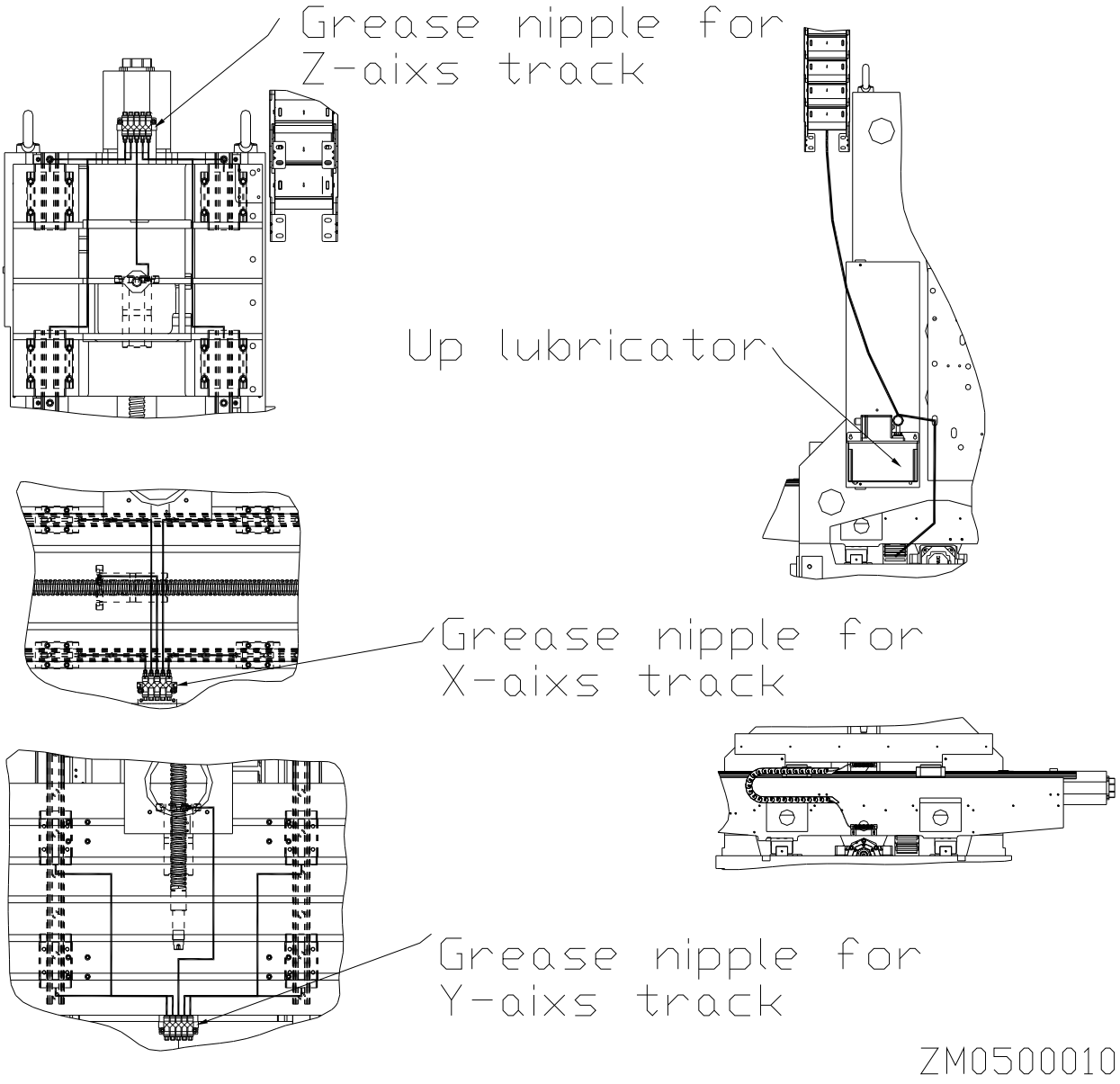
Parameter 178 = 3010. It means the lubrication pump 10 seconds after every 30 minutes.

Parameter 178 = 2005. It means the lubrication pump 5 seconds after every 20 minutes.

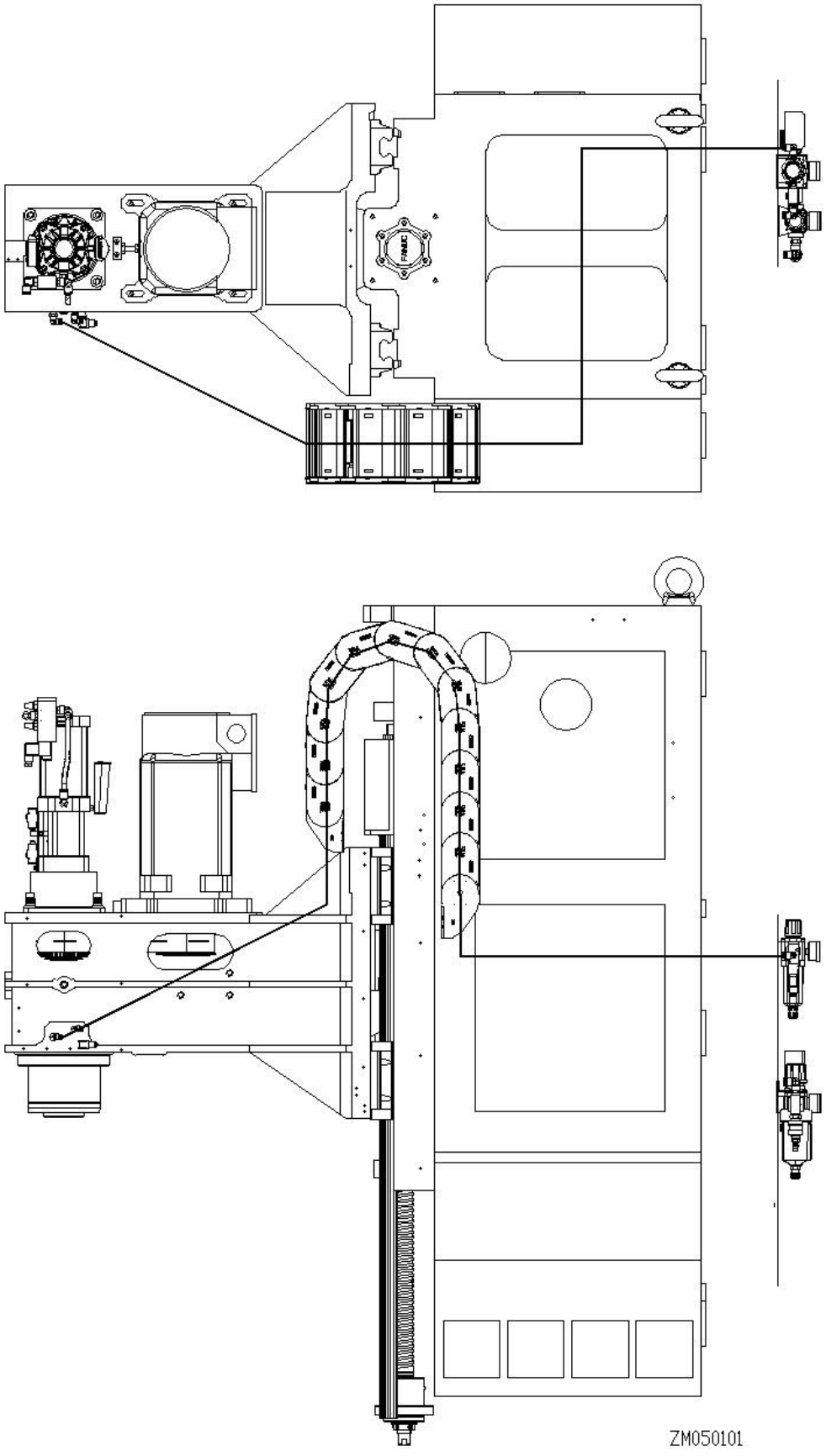
Parameter 178 = 20005. It means the lubrication pump 5 seconds after every 200 minutes.

6.2 Lubrication System Diagram

6.2.1 Grease Lubrication System Diagram



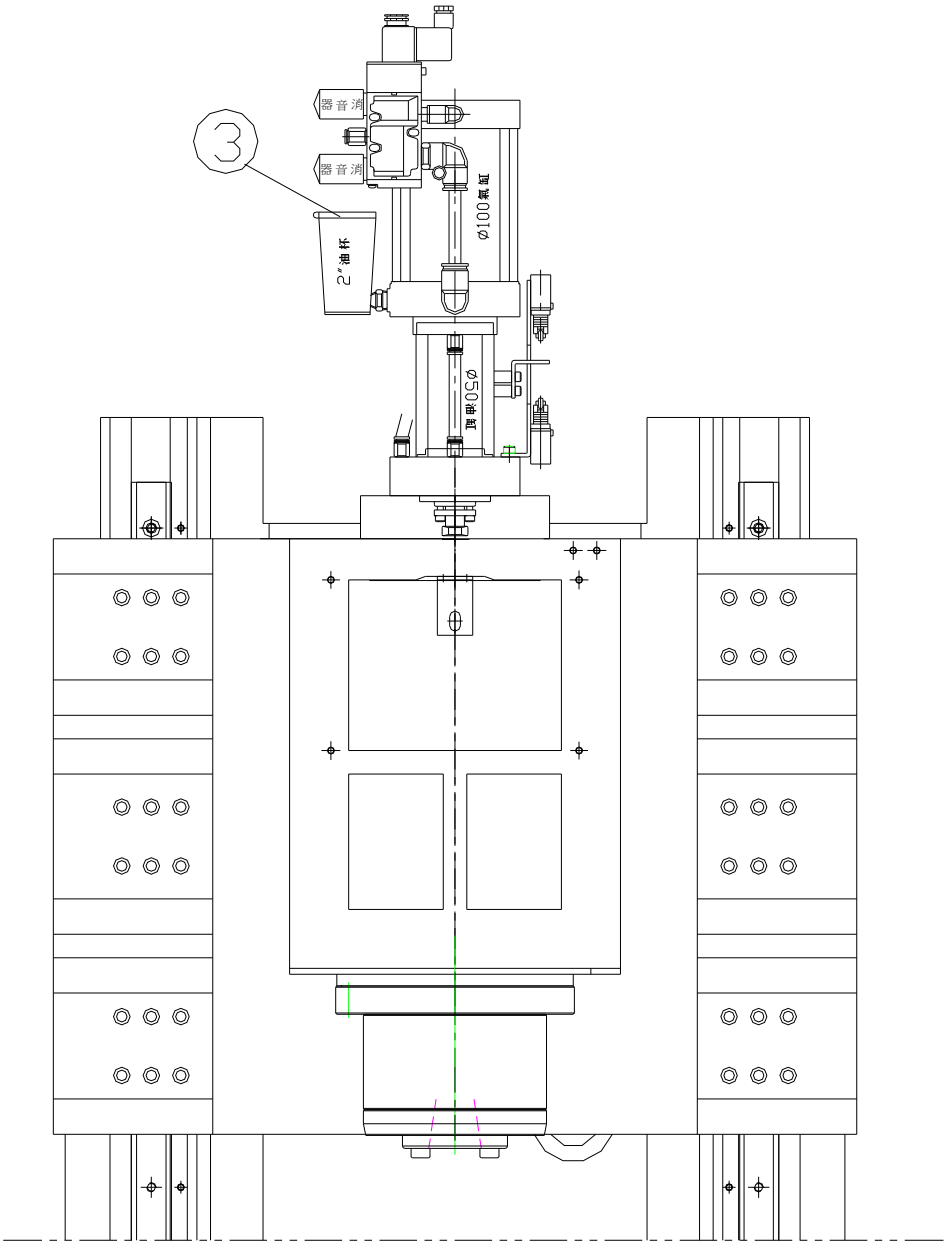
6.2.2 Oil lubrication/Cooling Diagram



6.2.3 Grease Lubrication Points

6.2.3.1 Fill the R68 lubricate from oil-orifice if the optional centralized lubrication system is used instead.

6.2.3.2 Move the headstock down to the end point. Fill the R68 lubricant to oil-orifice ③. The lubricant checking frequency is 12 months.



6.3 The Oil Guide Table

Lubricant Position	Track and Ballscrew (Optional)	Track and Ballscrew (Standard)	Cutting Coolant
Lubricant Characteristic	Grease	1)Viscosity :ISO VG68 2)Anti-wear, Anti-pressure	1)Good Heat conduction 2)Good lubricant performance
Lubrication Method	Oil gun	Centralized Lub.	Circulating Lub.
Oil Change Period	As needed	12 months	As needed
Tank Capacity		4 L	AL32：285L AL42：385L
Recommended Grade of Oil	1)Kluber Lubrication Isoflex Nbu 15 2)Shell Alvania No.2	1)B.P Energol NT 68 2)Mobil Vactra No.2 3)Esso Febis K68 4)Shell Tonna T68 5)Chevron Way Lubrica NT68	1)CPC Cutting Oil 31C 2)Mobile Esultran 3)Esso Pennex 44 or Kulwell 30 or Dortan 32 4)Shell Dromus B or Macron 32

Lubricant Position	Spindle Refrigeration and Gear Box Lubrication	F.R.L. combination	Pressure Cylinder
Lubricant Characteristic	1)Viscosity :ISO VG32 2)Viscosity index :above 95 3)Anti-rust, anti-oxidation 4)Good Stability		1)Viscosity :ISO VG32 2)Anti-rust, anti-oxidation 3)Good Stability
Lubrication Method	Circulating Lub.	Oil feeder	
Oil Change Period	Every year (3 months for new machine)	As needed	Every year
Tank Capacity			
Recommended Grade of Oil	1)CPC Circulation R32 2)Mobil DTE Light 3)Daphne Super Multi 68 4)Shell Turbo T32 or Tellus 32 5)Esso Auto A32		1)B.P Energol HLP 32 AW 2)Mobil DTE 13 3)Esso AutoA32 4)Shell Tellus 32 5)Chevron Ed Hydraulic 32

For the circulation oil for spindle oil cooler from KAUKAN, CPC circulation R10 can get better performance than R32. We fill up R22 while machine is shipped out.

Notes:

1) If the oil becomes milky white, separate the oil and the water, then refill with some fresh oil.
2) Replace oil that becomes less viscous.
3) Ensure that the inlet of the pumps are cleaned and cleared through periodic inspection.
4) Change the oil seal or the packing after some time, since this causes leakage.
5) Expel the air inside the loops through any bore to avoid noise or vibration generated by hydraulic motion.

Chapter 7

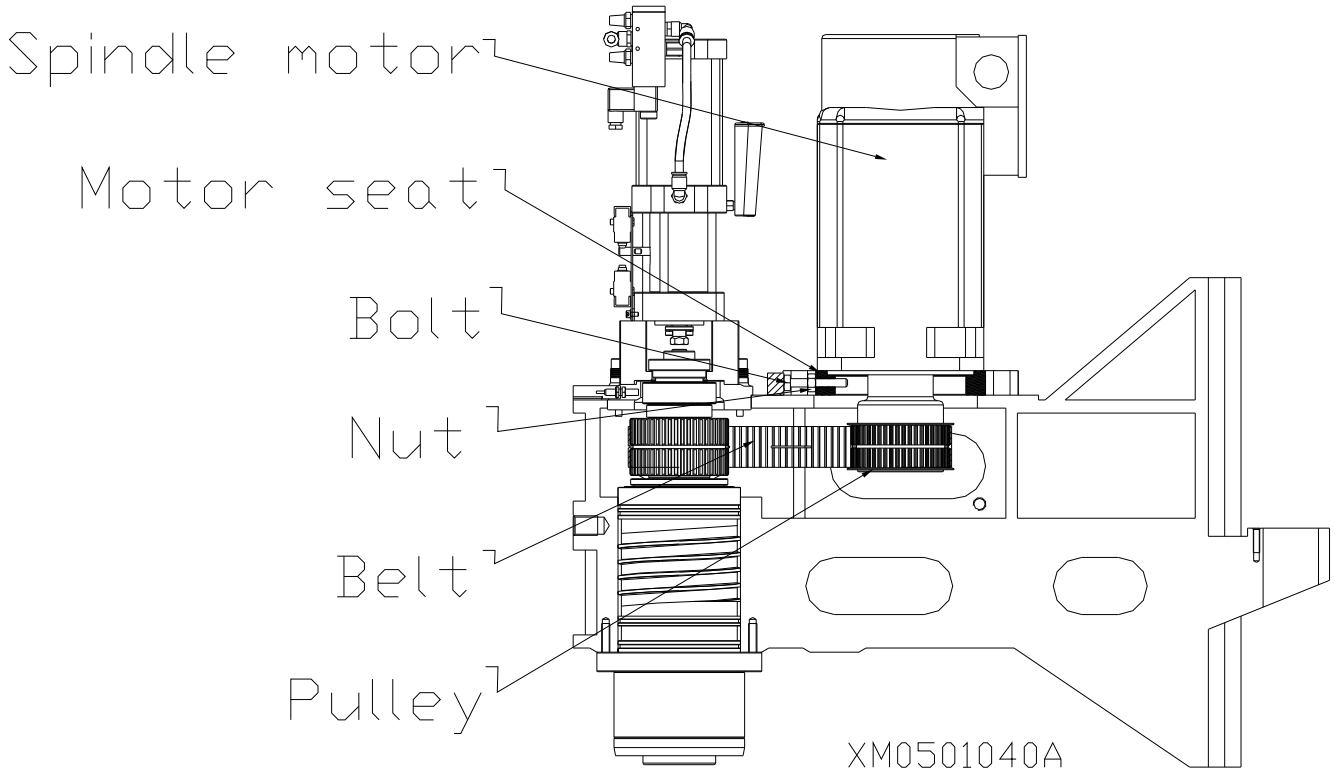
Mechanism

7.1 Headstock System

7.1.1 Power Transmission Mechanism

The spindle is driven by the spindle motor through belts and pulleys. The maximum spindle rotating speed is 10000 /min.

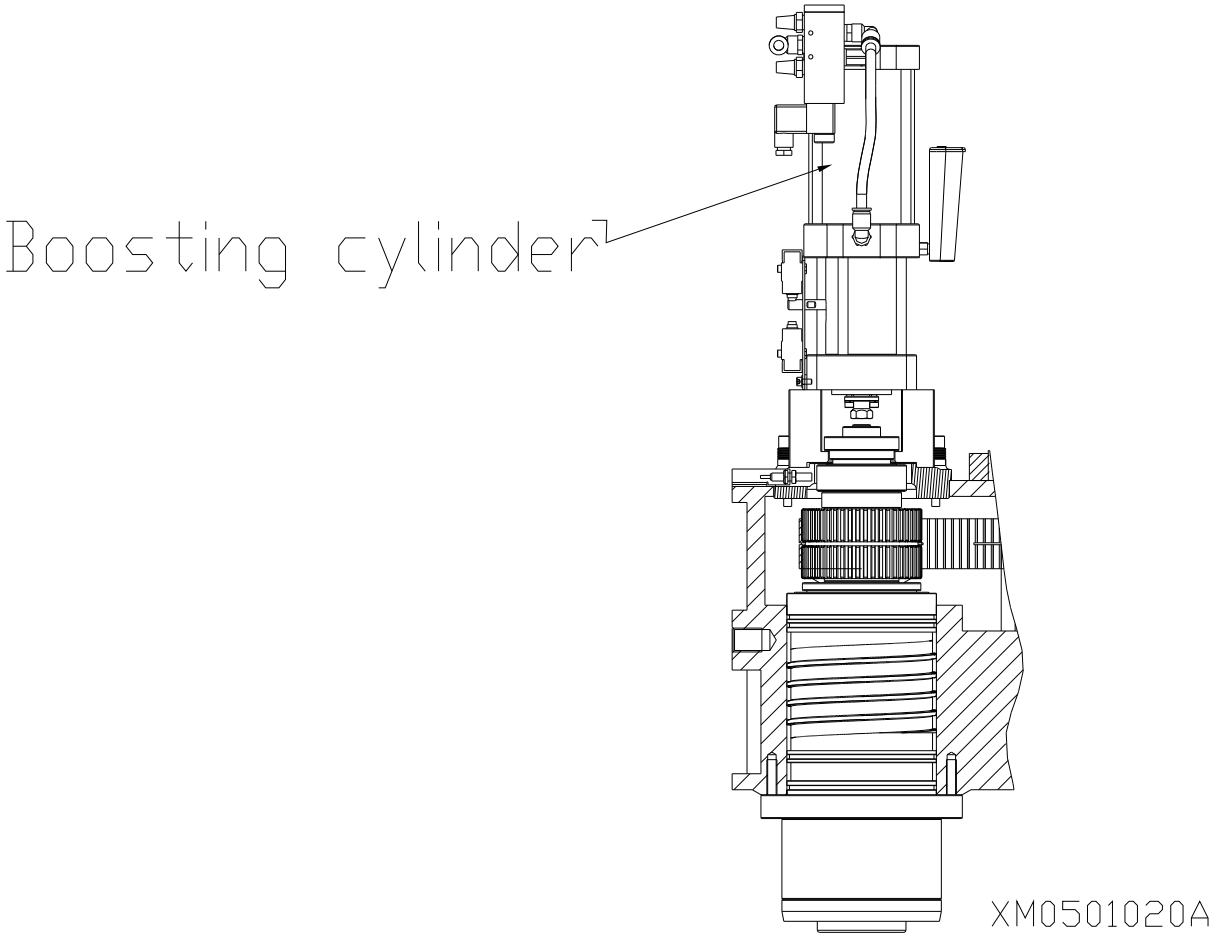
The tool clamping and unclasping are accomplished through the use of disk spring, draw bar, and a pneumatic system, as shown below. The tool clamping force applied by the disk spring is approximately 1000 kg.



7.1.2 Tool Clamping and Unclasping Mechanism

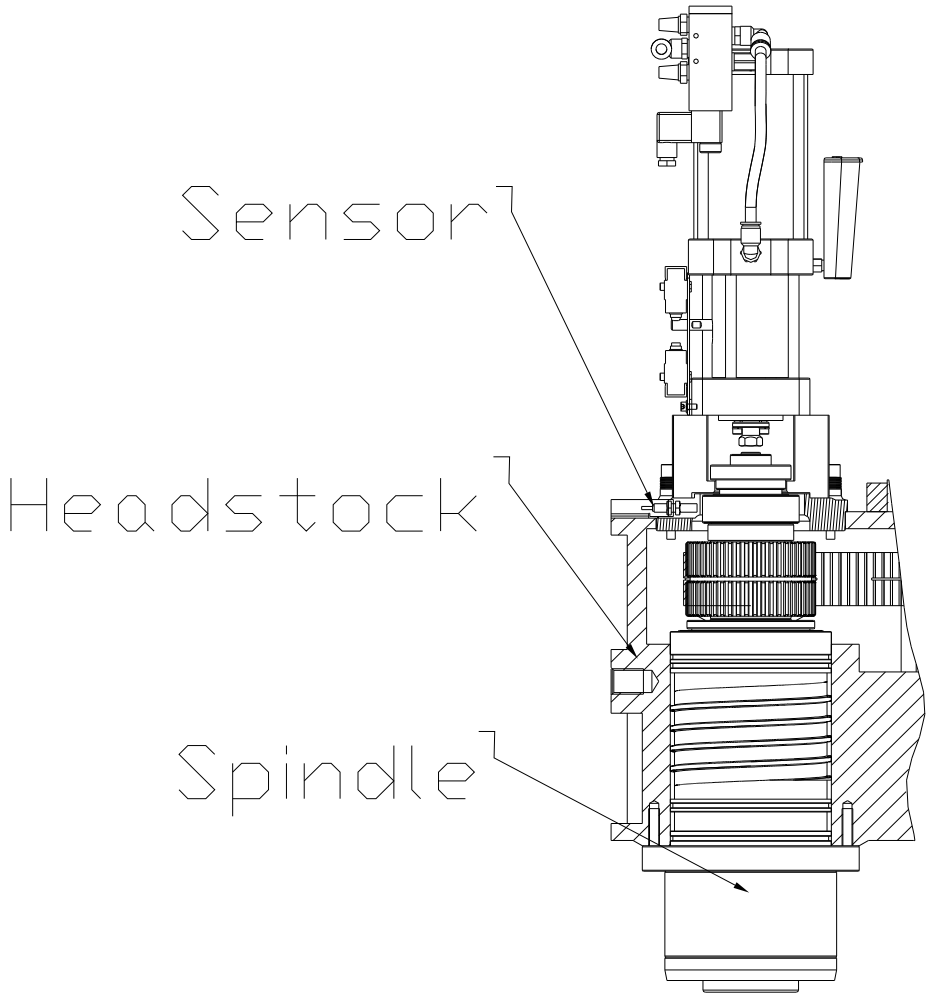
To grip the tool holder, the draw bar will be pulled up by the disk spring set to close the collet chuck.

To release the tool holder, the collet chuck is pushed off by the pneumatic piston through the draw bar. A stream of compressed air will blow through to clean the taper hole and tool holder.



7.1.3 Spindle Positioning Mechanism

The sensor tracks the spindle rotation motion and feeds the positioning signal to the spindle drive motor's controller to control the spindle position precisely.



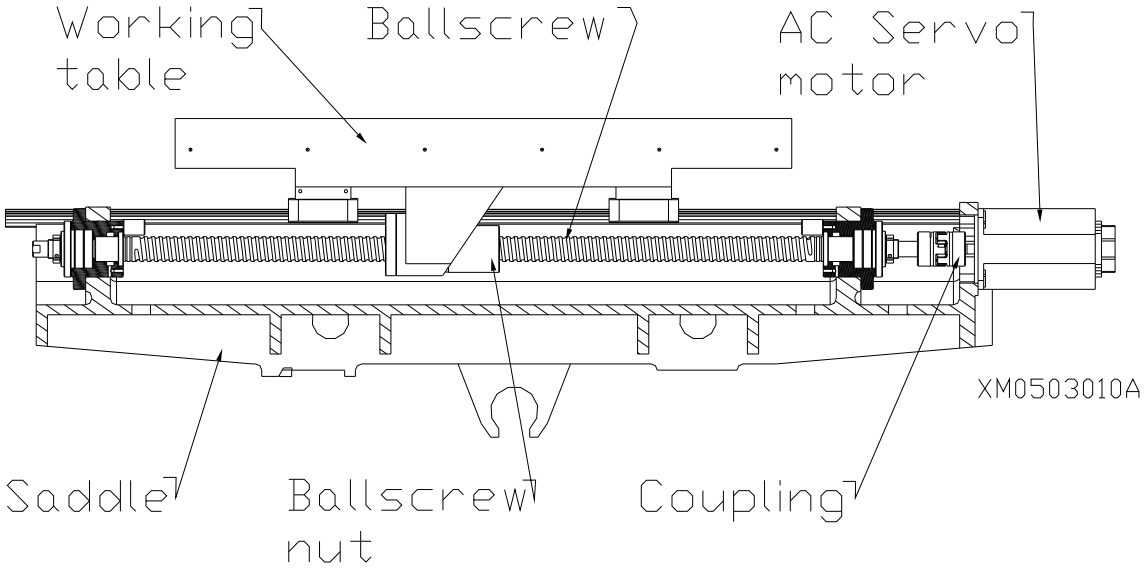
7.2 Feed-Motion Transmission Mechanism

7.2.1 X Direction

7.2.1.1 Transmission Mechanism

7.2.1.1.1 The working table is seated on guide rails of the saddle and driven by the AC servomotor via the connection of a coupling and a ballscrew.

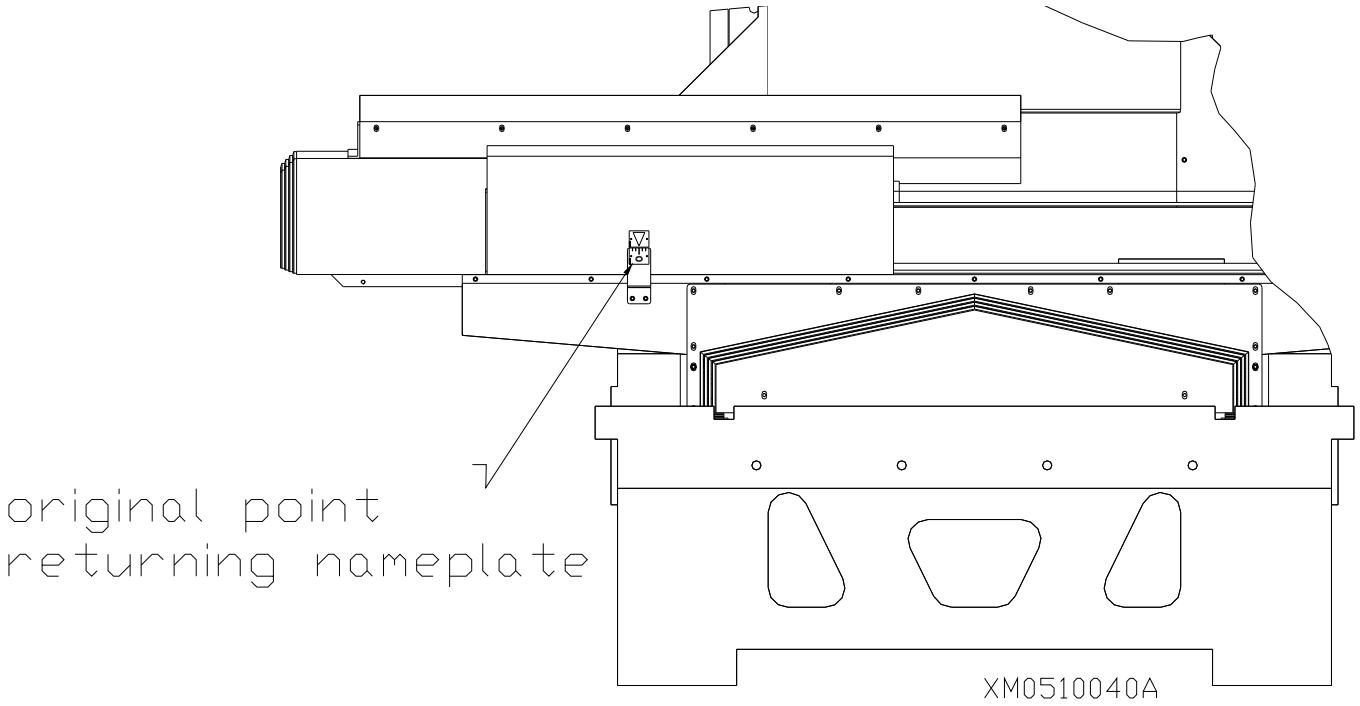
7.2.1.1.2 Because the AC servomotor is directly connected to the ballscrew through a coupling, alignment problems can be reduced to minimum.



7.2.1.2 Feed-Motion Positioning Mechanism

7.2.1.3 This machine features the absolute type positioning system. So it is not necessary to do zero return after power on machine.

7.2.1.4 If the position of 3 axes is out of position, please align the arrow symbol with the zero position label on the Y-axis to do original point returning.



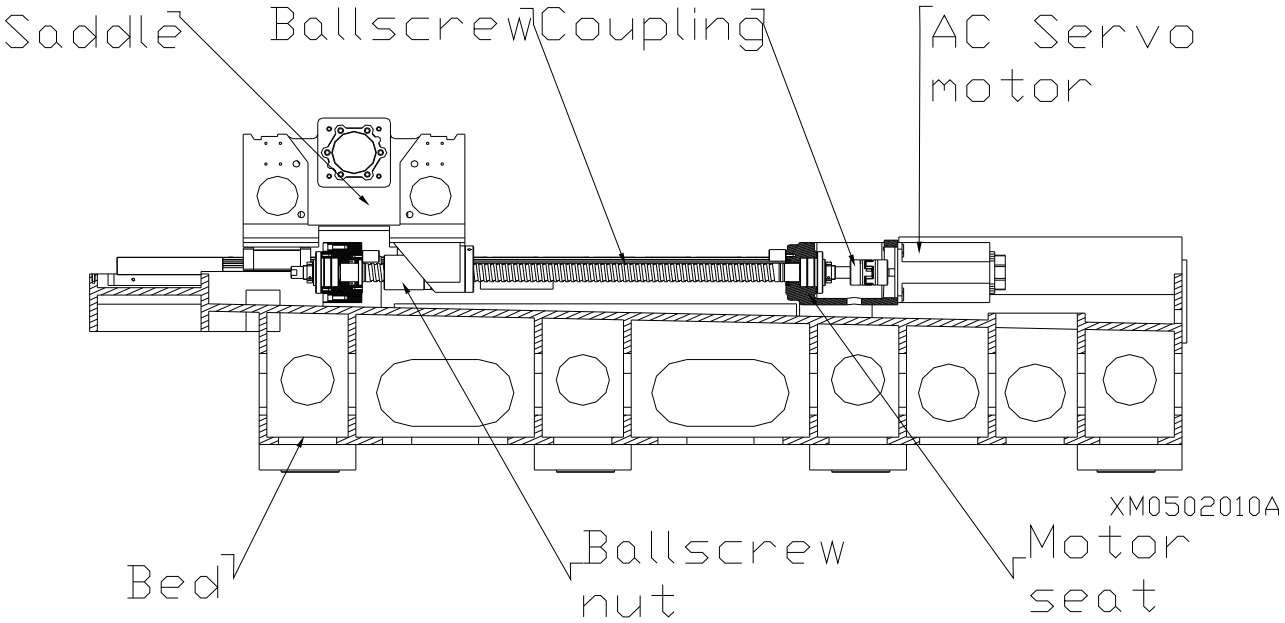
Note: Ensure to do the zeroing point return after starting up the machine.

7.2.2 Y Direction

7.2.2.1 Transmission Mechanism

7.2.2.1.1 The saddle is seated on guide rails of the bed base and driven by the AC servomotor via the connection of a coupling and a ballscrew.

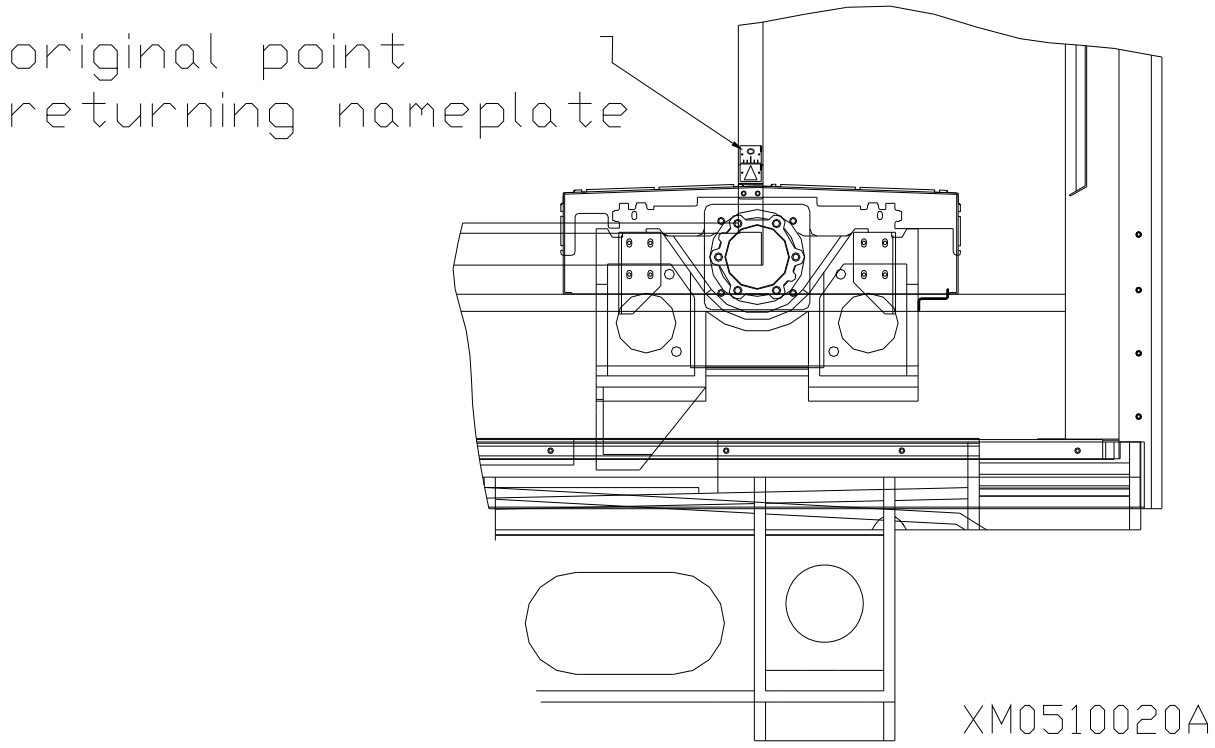
7.2.2.1.2 Because the AC servomotor is directly connected to the ballscrew through a coupling, alignment problems can be reduced to minimum.



7.2.2.2 Feed-Motion Positioning Mechanism

7.2.2.2.1 This machine features the absolute type positioning system. So it is not necessary to do zero return after power on machine

7.2.2.2.2 If the position of 3 axes is out of position, please align the arrow symbol with the zero position label on the Y-axis to do original point returning.

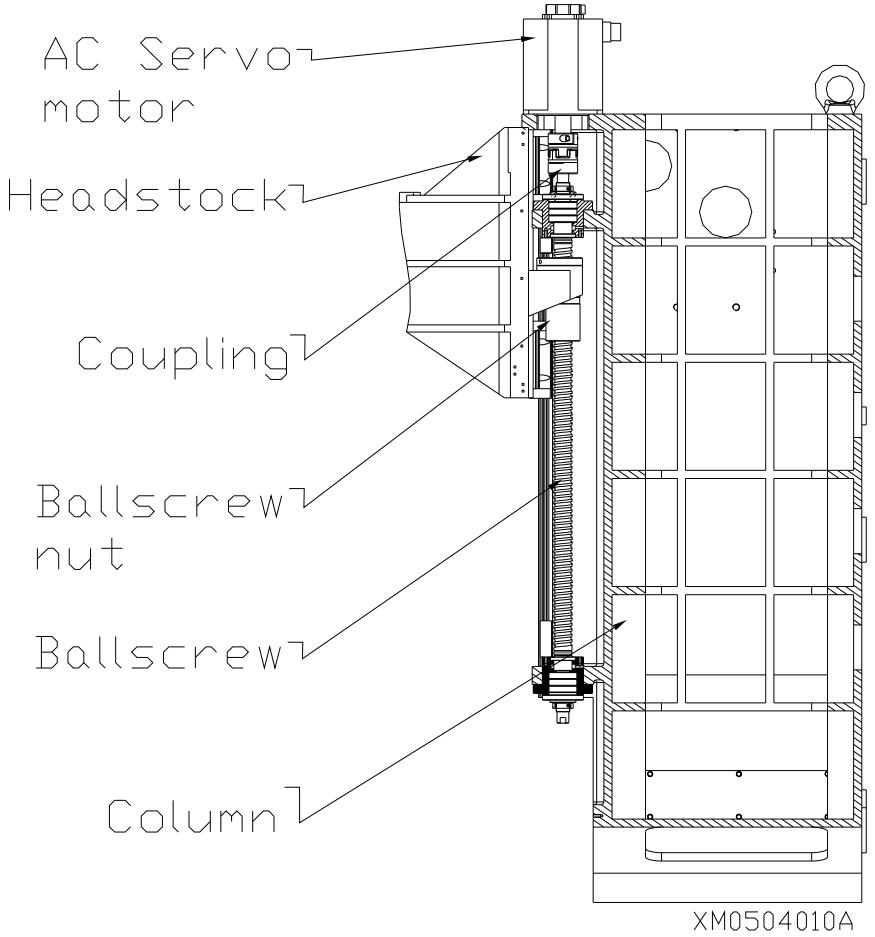


7.2.3 Z Direction

7.2.3.1 Transmission Mechanism

7.2.3.1.1 The headstock is seated on guide rails of the main column and driven by the AC servomotor via the connection of a coupling and a ballscrew.

7.2.3.1.2 Because the AC servo motor is directly connected to the ballscrew only through a coupling, alignment problems can be reduced to minimum.

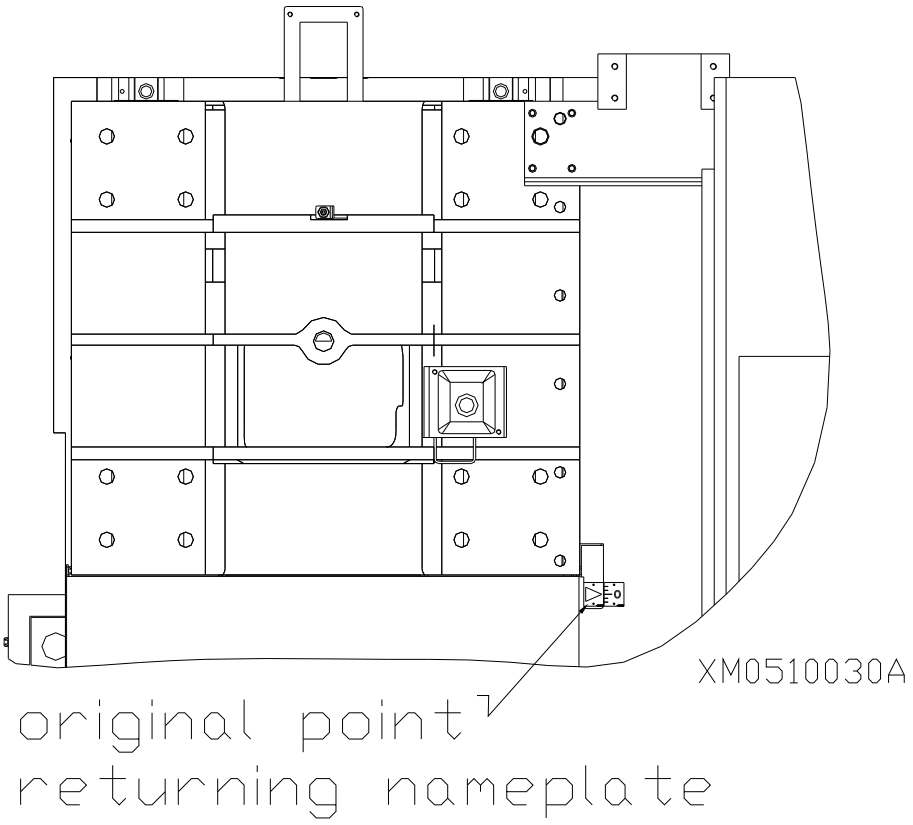


7.2.3.2 Feed-Motion Positioning Mechanism

7.2.3.2.1 This machine features the absolute type positioning system. So it is not necessary to do zero return after power on machine.

7.2.3.2.2 If the position of 3 axes is out of position, please align the arrow symbol with the zero position label on the Y-axis to do original point returning.

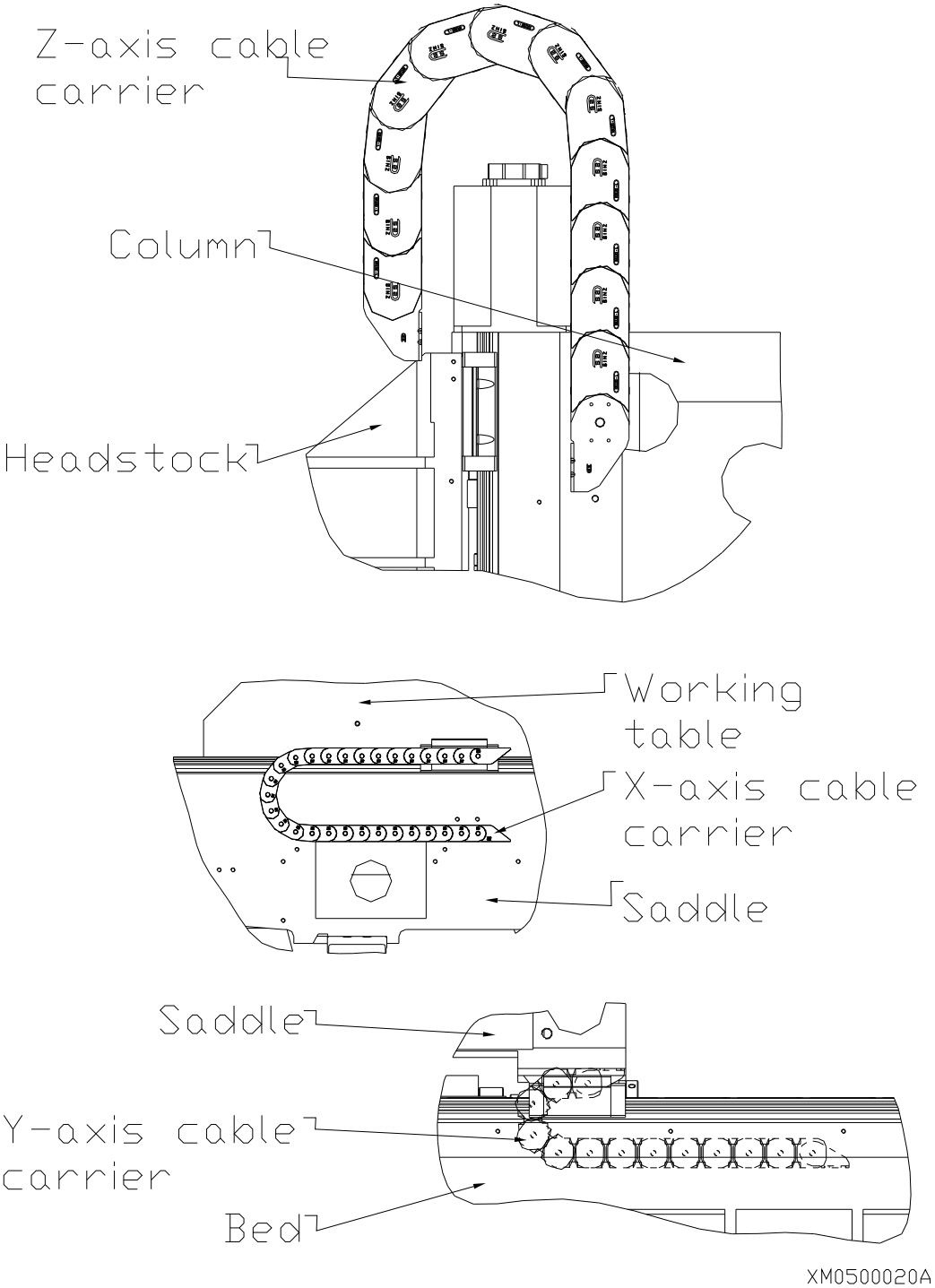
7.2.3.2.3



Note: Ensure to move the headstock to the machine zero point before exchanging the tool.

7.2.4 X,Y and Z Axis Cable Carrier

All the electrical wires and oil hoses connecting between the saddle and base bed start from connectors on the base bed, pass through the base bed to the Y-axis cable carrier, then connect to connectors located on the saddle. And all the electrical wires, air hoses and oil hoses connecting between the headstock and main column start from the electrical cabinet to the Y-axis cable carrier then connect to connectors located on the headstock.



7.3 Tool Magazine

7.3.1 Transmission / Positioning Mechanism

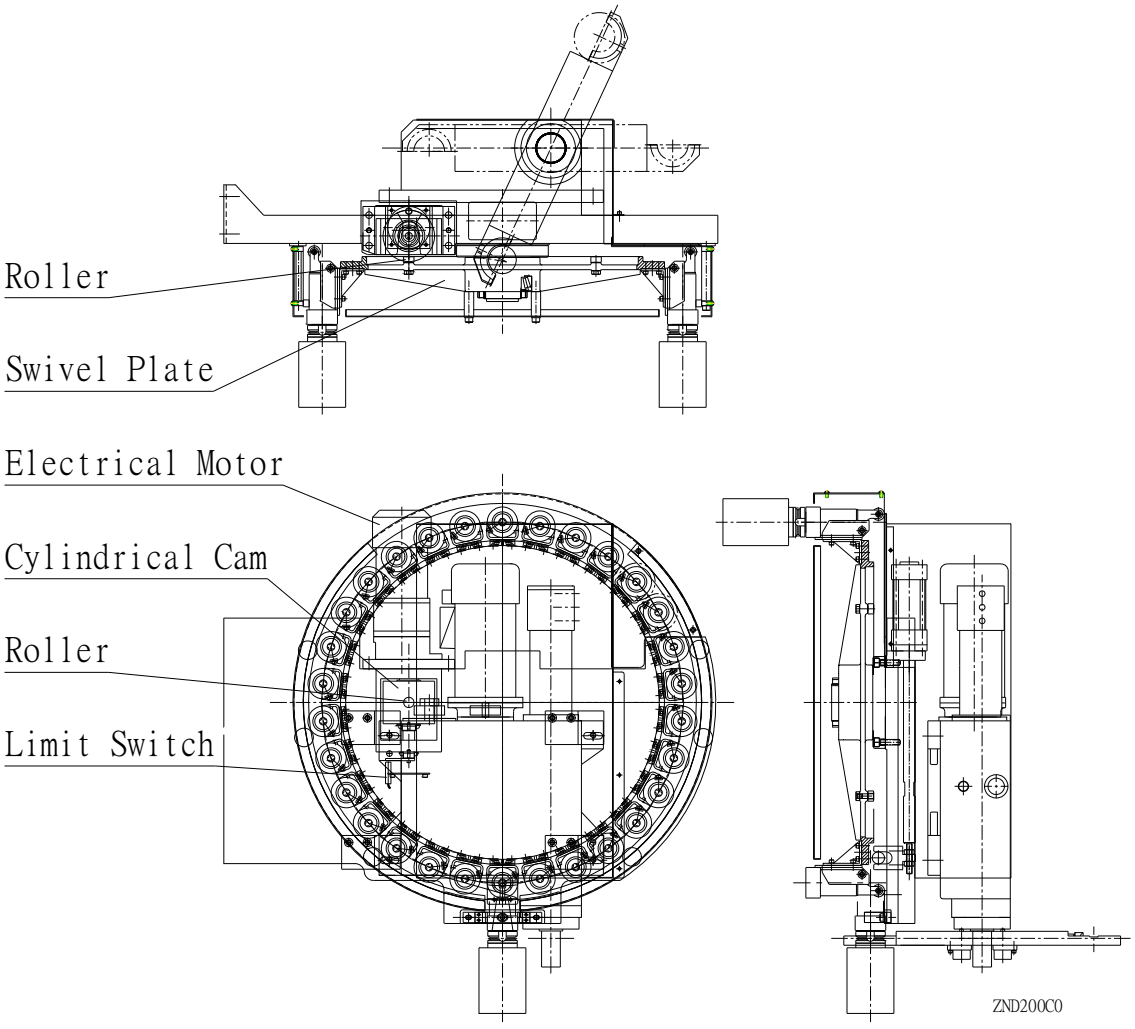
7.3.1.1 The tool magazine is driven by an electrical motor through the cylindrical cam to drive the roller on the swivel disk and make the swivel disk rotate. The cylindrical cam both has the transmission and positioning functions.

7.3.1.2 The tool selection is accomplished by using the pneumatic system and proximity switch.

7.3.1.3 As the tool exchange command is issued, the swivel disk will be rotated to the selected tool position according to NC or manual commands. A proximity switch is used with the electrical motor to control the magazine's positioning. When the selected tool reaches the target location, the electrical motor and cylindrical cam stops immediately. The cylindrical cam will then lock the tool magazine to prevent the tool magazine from further traveling.

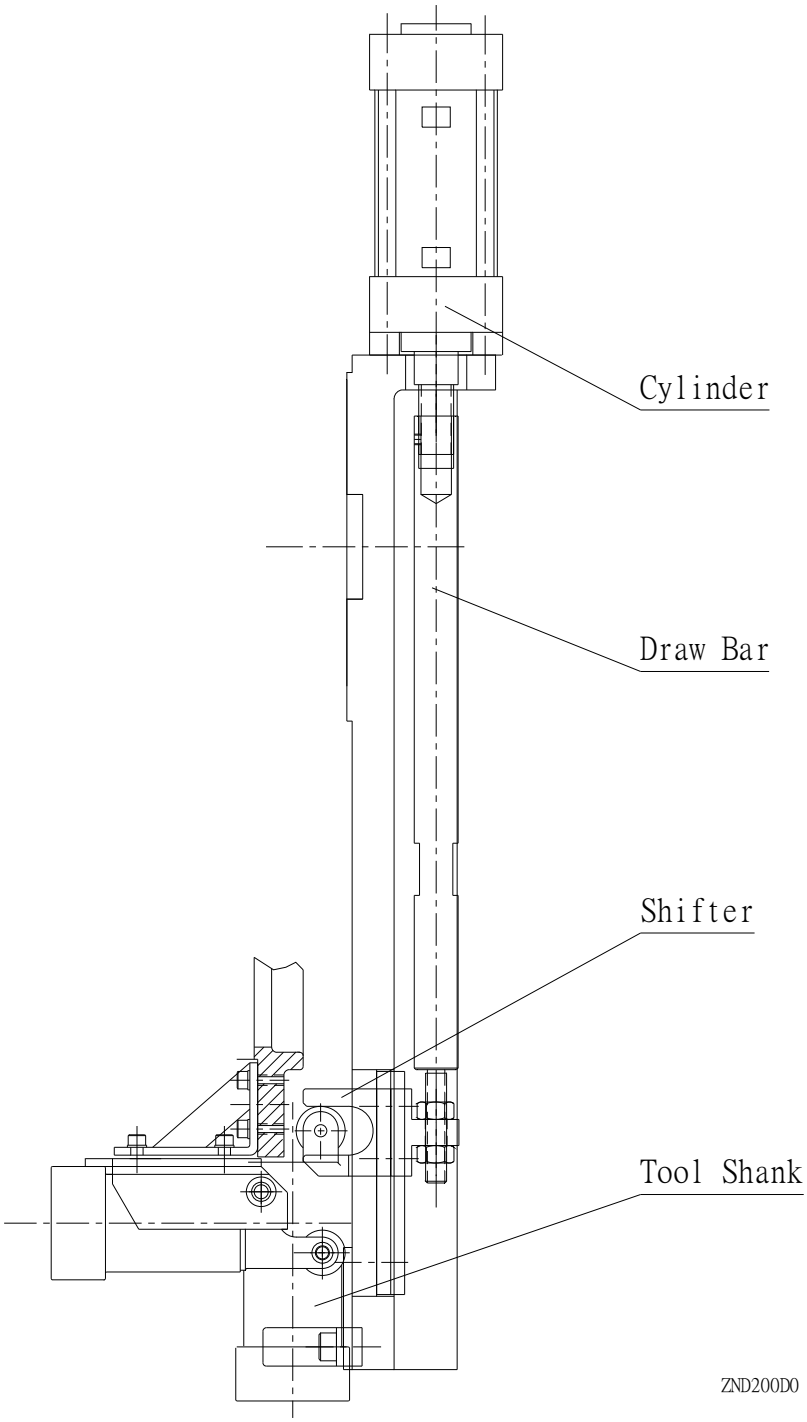
7.3.1.4 The rotation direction could be either clockwise or counterclockwise

7.3.1.5 The tool is selected randomly based on the shortest path to minimize the tool selection time.



7.3.2 Tool Shank Adapter Swivel Mechanism

After tool selection locating process, the cylinder activates the draw bar and shifter to make the tool shank adapter rotate 90°, then tool changing is possible. After the tool changing process, the cylinder activates the tool shank adapter to return for the next tool selection process.



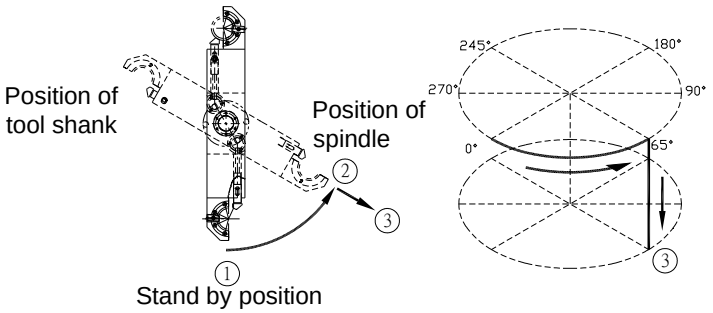
7.3.3 Tool Exchange Sequences

7.3.3.1 Mechanism

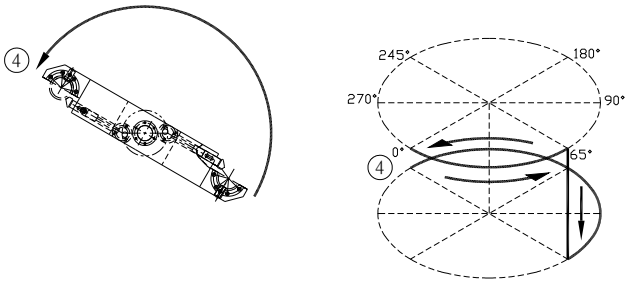
1. The tool magazine makes the swivel disk rotate and makes the tool shank adapter rotate 90°
2. ATC executes the tool exchange.

7.3.3.2 Procedures

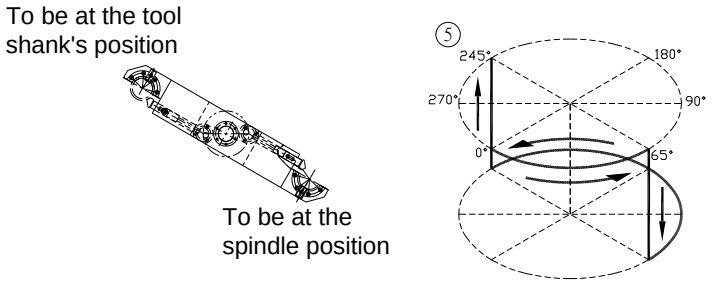
1. Tool arm at standby position. Z-axis headstock moves to the tool exchange origin.
2. Tool arm rotates 65º at CCW direction to clamp tools.
3. After spindle release the tool holder, the tool arm moves downward for 115mm to pullout tools.



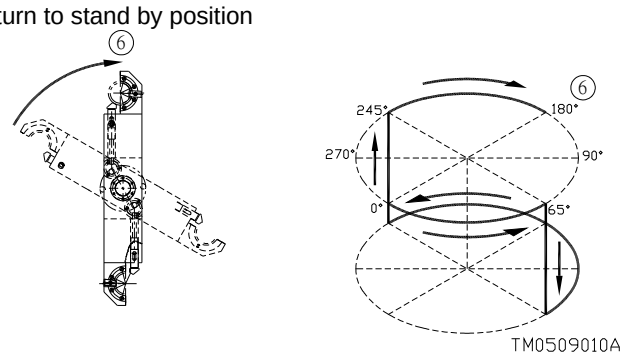
4. Tool arm rotates 180º at CCW direction to change tools.



5. Tool arm moves upward for 115mm.



6. After spindle grips the tool holder, the tool arm rotates 65º at CW direction to back to the standby position.



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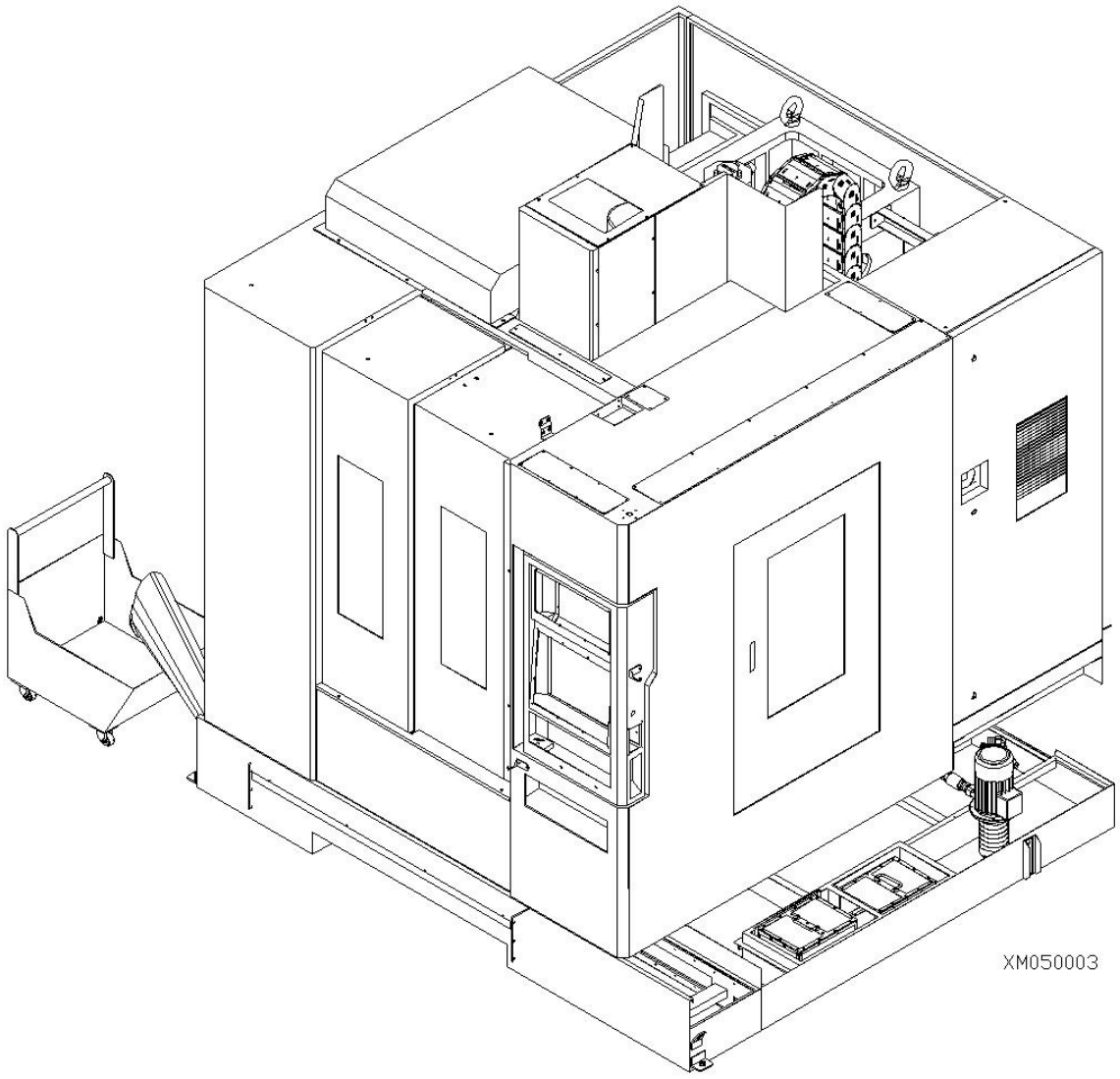
7.4 The Fully-Enclosed Splash-Guarding Enclosure

A fully-enclosed sheet metal enclosure is designed to isolate the running machine and the cutting coolant and flying chips it generates from the operator. Chips are conveyed to the chip-collecting bucket through the chip conveying tunnel. The circulating cutting coolant is pumped through the coolant filters to the coolant distributors. Ensure to clean the coolant filters frequently. The sheet metal enclosure is designed to have a 2-pieces front door so that you can inspect the machine or install the workpiece easily.

Note: Ensure to close the 2-pieces front door before starting up the machine. The running machine will be stopped if the front door is opened in order to protect the operator from flying chips, spraying cutting coolant and running machine. Nevertheless, make sure the machine is fully stopped before entering inside the sheet metal enclosure.



7.5 Mechanism Adjustment

7.5.1 Spindle Transmission Belt Tension

Check the main drive belt tension frequently. Follow steps below to adjust the belt tension:

1) Loosen the four fastening screws on the gear box or motor stand (without gear box) and the nut of adjust bolt.
2) Adjust the belt tension by tightening the adjust belt.
3) Tighten the nut of adjust bolt.
4) Tighten the fastening screws on the gear box or motor stand.

Note: Ensure to have a proper tension value for the spindle transmission belt.

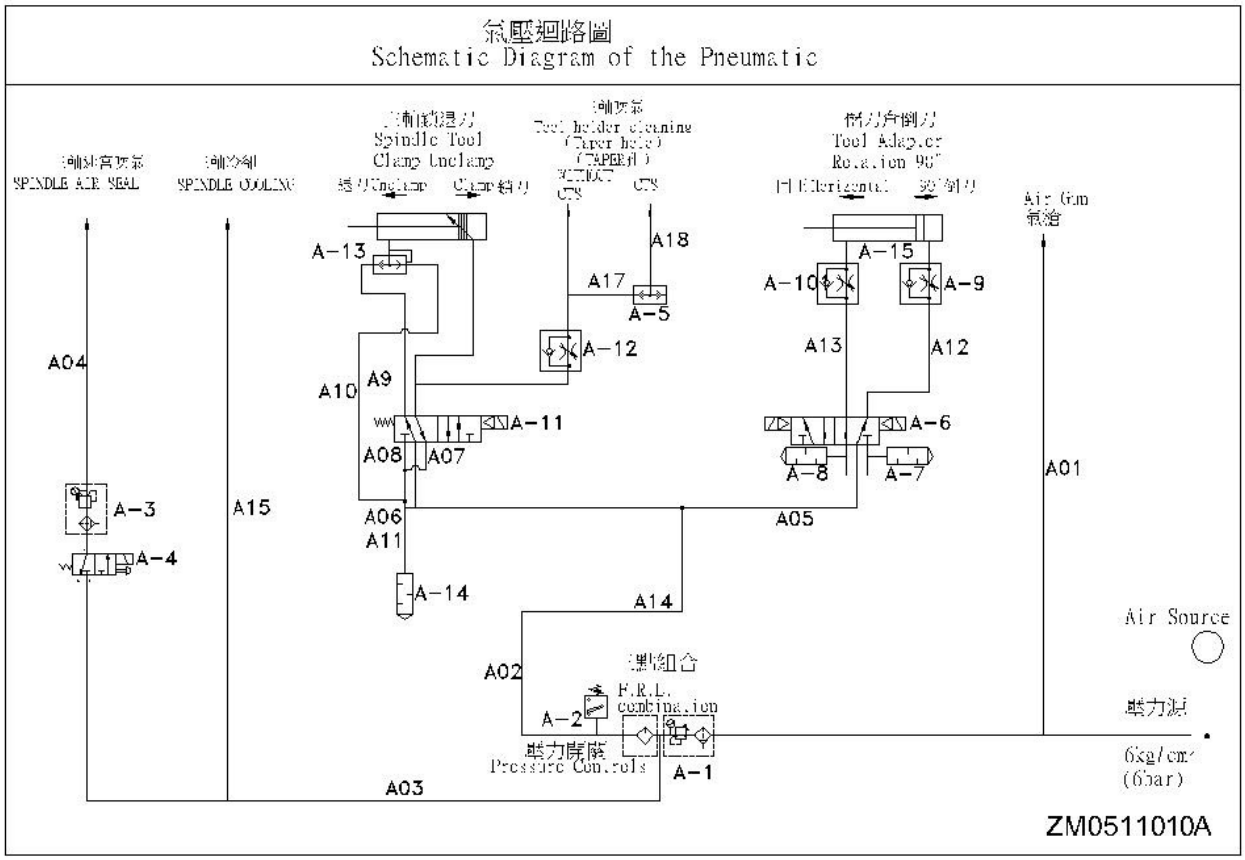
Recommended belt deflection and tension values are listed as follows:
1) With gear box
   Deflection = 4.2 mm
   Tension = 4.85 to 6.22 kg
2) Without gear box
   Deflection = 4.2 mm
   Tension = 4.85 to 6.22 kg

Chapter 8

Pneumatic & Coolant Systems

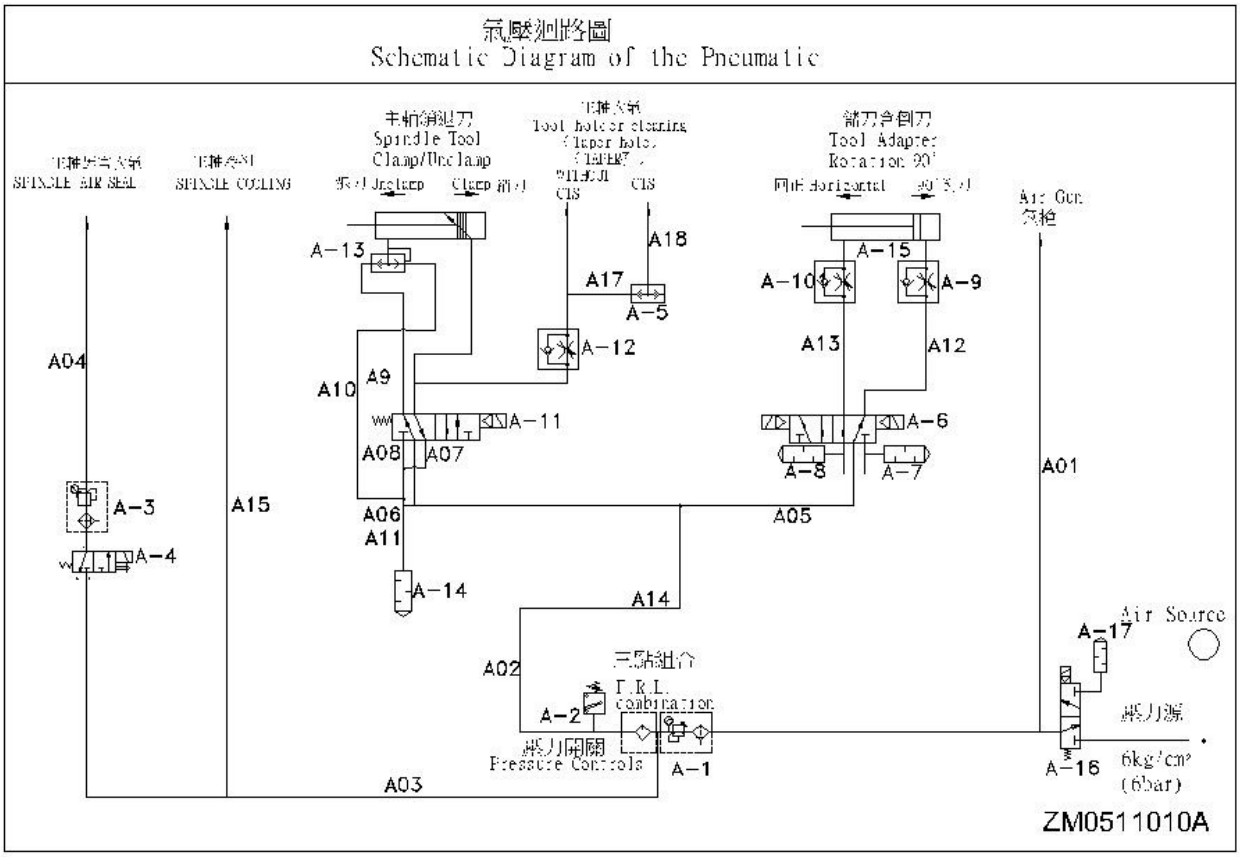
8.1 Schematic Diagram of the Pneumatic System

8.1.1 STD.



編號 NUMBER	名稱 DESCRIPTION	規格 SPECIFICATION	
A-1	三點組合 AIR ADJUST ASSM	MACP401-10A	金器 Mindman
A-2(-SQP8.2)	壓力力開關 PRESSURE CONTROLS	KP-35	丹佛斯 Danfoss
A-3	過濾調壓器自排 MIST / MICROMIST FILTER	MAFR300L-8AD-05(¼)	金器 Mindman
A-4(-Y1)	三口二位電磁閥 SOLENOID VALVE	MVDC-220-3E1	金器 Mindman
A-5 CTS中心給水	防逆閥 INLINE CHECK VALVES	CV-03T	佳王 CHIA WANG
A-6(-Y2.0,-Y2.1)	五口二位電磁閥 SOLENOID VALVE	MVSC-260-4E2	金器 Mindman
A-7,A-8	銅消音器 SILENCER	MSL-B-01	金器 Mindman
A-9,A-10	流量調整閥 FLOW ADJUSTMENT VALVE	JSC8-02	金器 Mindman
A-11(-Y5.3)	五口二位電磁閥 SOLENOID VALVE	4V310-10	亞德客 AIRTAC
A-12	排氣節流閥 AIR THROTTLE	ASL8-01	亞德客 AIRTAC
A-13	梭動閥 SHUTTLE VALVE	JQE-10	亞德客 AIRTAC
A-14	消音器 SILENCER	MSR-03-B(3/8)	金器 Mindman
A-15	氣壓缸 AIR CYLINDER	MCQV-11-63-110-特3+CA	金器 Mindman

8.1.2 for CE



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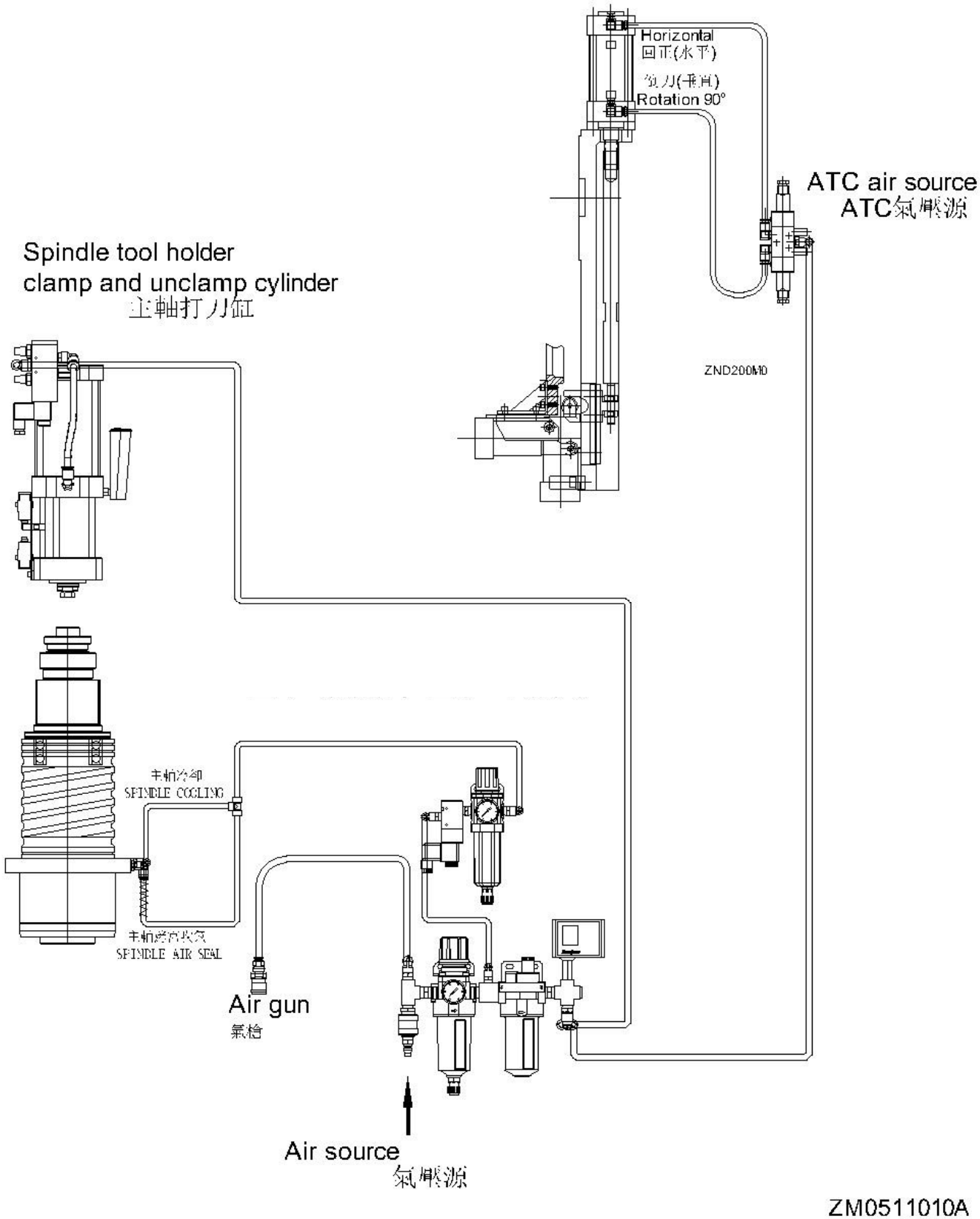
A-5 CTS中心給水	防逆閥 INLINE CHECK VALVES	CV-03T	佳王 CHIA WANG
A-6(-Y2.0,-Y2.1)	五口二位電磁閥 SOLENOID VALVE	MVSC-260-4E2	金器 Mindman
A-7,A-8	銅消音器 SILENCER	MSL-B-01	金器 Mindman
A-9,A-10	流量調整閥 FLOW ADJUSTMENT VALVE	JSC8-02	金器 Mindman
A-11(-Y5.3)	五口二位電磁閥 SOLENOID VALVE	4V310-10	亞德客 AIRTAC
A-12	排氣節流閥 AIR THROTTLE	ASL8-01	亞德客 AIRTAC
A-13	梭動閥 SHUTTLE VALVE	JQE-10	亞德客 AIRTAC
A-14	消音器 SILENCER	MSR-03-B(3/8)	金器 Mindman
A-15	氣壓缸 AIR CYLINDER	MCQV-11-63-110-特3+CA	金器 Mindman
A-16(-Y2)	三口二位電磁閥 SOLENOID VALVE	MVSC-300-3E1-NC-AC110	金器 Mindman
A-17	銅消音器 SILENCER	SL-03	金器 Mindman

8.2 Schematic Diagram of the Pneumatic Piping System .



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8.3 Pneumatic System

The compressed air passing through the F.R.L. (air filter, air regulator, and air lubricator) combination is used to clean the tool holder and spindle taper hole. The compressed air pressure is regulated under 5 bar. The air pipe lines and solenoid valves are also lubricated by these mixture of oil and air. The following examples illustrate how the system works:

8.3.1 Purge the V-Groove of the Tool Holder

After the tool exchange command has been issued, the solenoid valve is turned on to open the air flow to purge the V-groove of the tool holder so that all foreign matter adheres to the V-groove could be blown away. Meanwhile, the spindle is rotating slowly to the tool exchange position. The solenoid valve will be turned off after the spindle has reached the tool exchange position.

8.3.2 Purge the Tool Holder

As the pneumatic cylinder for the tool clamping/Unclasping reaches its stroke end and touches the associated limit switch during the tool Unclasp process, the solenoid valve will be turned on to open the air flow to purge the tool holder. The solenoid valve will be turned off as the above limit switch is released.

Note: To ensure that the push switch is in “on” position, otherwise compression air can‘t enter the pneumatic system. The pressure switch should be actuated by compression air, too.

Chapter 9

Preventive Maintenance

To keep the machine in good service conditions, please follow the procedures below to maintain the machine:

9.1 Daily Maintenance

9.1.1 Check the oil level frequently. Fill up or refill the oil tank if necessary.

9.1.2 Check the spindle taper bore after finishing the machining. Clean up the spindle taper bore with the spindle taper bore cleaner, as illustrated in the following chapter.

9.1.3 Clean up the machine and working area after finishing the work. Ensure to put a layer of rust-prevent oil on those exposed sliding surfaces.

9.1.4 Stop the machine immediately and find out sources of the problems if any part of the machine is overheated.

9.1.5 Stop the machine immediately and fix the problems before resuming the machine if any electrical part, such as the connector, switch, electrical socket and electrical wire, is out of order.

9.2 Weekly Maintenance

9.2.1 Clean up the air filter with soap water.

9.2.2 Ensure the tool holder could be clamped onto and released from the spindle chuck smoothly.

9.2.3 Ensure there is no abnormal noise occurs when the machine is running .

9.2.4 Ensure all the pumps work well.

9.2.5 Ensure the tool exchange system could be operated smoothly.

9.2.6 Ensure the swivel disk of the tool magazine could be rotated smoothly.

9.3 Semi-annual Maintenance

9.3.1 Ensure the spindle run out and bearing clearance are within the specified precision’s.

9.3.2 Ensure there are no loose nuts and screws.

9.3.3 Ensure all the electrical parts, such as connectors, switches, cables, are in normal service conditions.

9.3.4 Check out all the insulation resistors. Ensure to keep an record.

9.3.5 Ensure the tool exchanger do not interfere with the spindle.

9.4 Annual Maintenance

9.4.1 Ensure the push buttons and switches on the control panels work properly.

9.4.2 Remove all the carbon deposited on the electrical relay points, then clean all the electrical relay points with alcohol liquid.

9.4.3 Check if the balance chains are in good service conditions.

9.4.4 Clean up the cutting oil tank, then fill up the tank with recommended oil.

9.4.5 Clean up the including the oil tank, and refill the oil tank. Ensure all the setting pressure are normal.

9.4.6 Level the machine.

9.5 Cutting Coolant Reservoir

Since the constant machining produces a lot of chips and other matter which may pile up inside the reservoir, therefore it must be cleaned frequently.

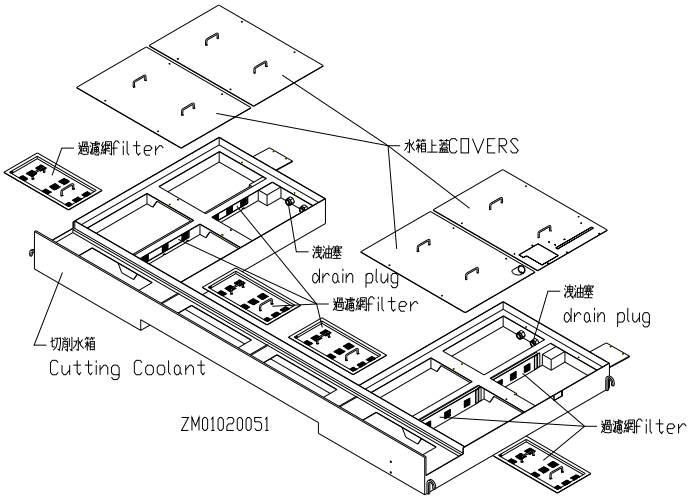
NOTE: Fill up the coolant water from the side In the guard shield

NOTE: Pour in coolant water up to the upper index mark (H-L). Do not allow the water level to fall below the lower index mark (L).

The cleaning procedures of coolant tank are described as below:

1) Turn the ball valve to OFF position and disconnect the hose (Please disconnect the wire connectors below the control cabinet if with the Chip Conveyor accessory).
2) Pull out the reservoir, remove the chip conveyor, disassemble the covers and filter.
3) Loose the drain plug and drain out the cutting coolant. Then remove the residuals in the tank and clean the filter.
4) After reassembling the filter, fastening the drain plug and installing the chip conveyor, push the coolant reservoir to the middle position of the base.
5) Reassemble the disassembled parts back in the order and turn the ball valve to ON position. Connect the wire connectors. Fill up the cutting coolant and assemble the coolant cover.

Note: Please clean the cutting coolant at least once a day, and notice turn OFF the main power before cleaning the coolant tank to avoid any danger.



9.6 Notice

9.6.1 Ensure to use the recommended fluids as listed in the oil guide table.

9.6.2 Do not power on the machine if the PCBs of the NC equipment have been taken out for maintenance.

9.6.3 High parts of the machine which must be accessible for maintenance or trouble shooting, please use movable ladders which in accordance with ISO 14122 standard and supports for safety belt

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