

MAINTENANCE MANUAL

CNC LATHE

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1. PREFACE

This instruction manual is used for the safe operation and maintenance of the CNC Lathes. This instruction manual should be kept close to the machine or the place the operators can easily access to it. The operators should be well trained so that safe operation and maintenance can be assured.

It is very important to be carefully in using of the machine for the instruction for safety operation is important and should be completely followed for avoiding of operators being injured. In case of accident, the reasons should be analyzed to prevent similar accidents from happening again in the future.

Do not modify electrical circuits, machine, electrical components and machine parts without being authorized by our company. Our company shall bear no liability for any hazard, properties loss, and personnel injury in case of arbitrary modification.

All the figures and diagrams in this instructions manual provided most up to date information related to the type of machine the client bought. On receiving the machine, customers are required to make sure the model number on the cover of instructions manual is same as the machine on bought. In the condition of proper usage and maintenance, We_warrantees one-year after-service for new machines failure under the normal working condition. If the damage of the machine is due to improper operation or maintenance or other natural or man-made disaster, then this warranty should be excluded.

Please check all the parts and accessories according to the packing list when you receive the machine. Do not hesitate to contact our local dealers or headquarters .If there is any complaint or service requirement, please directly contact our local distributors.

2. CHECK POINTS FOR SAFE OPERATION

When using your CNC lathe, always make sure the following conditions or operations are in effect. Failure to this will reduce cutting accuracy and may be the cause of accidents.

1. When chucking a workpiece, check both the chucking method and the pressure while considering the rigidity of the workpiece so as not to cause chucking distortion.
2. Make sufficient chucking allowance so that the workpiece cannot jump out from the chuck, either by cutting force or centrifugal force of the spindle. The workpiece may be supported by the tailstock, if necessary.
3. If the workpiece is of an eccentric or irregular shape, so that the center of gravity of the workpiece is outside the center of rotation, this eccentricity will cause the spindle vibrate during rotation, adversely affecting overall cutting accuracy. To counteract this, attach a balancer for the workpiece.
4. If chips are stuck to the workpiece or to the tool, the desired accuracy of cutting face may not be obtained. Select appropriate tools to prevent chips from sticking to the tool and workpiece.
5. Before selecting tools, check the tools thoroughly so as to prevent any interference between the tool and workpiece, chuck, Jaw, tailstock, cover, etc.
6. A wide variety of materials and shapes are used as workpieces to be cut. Always set the appropriate cutting conditions for each material and shape to obtain the desired accuracy of the particular product.
7. At actuation of the machine and before cutting. Warm up the spindle and move the turret and Sideways for a period time to reach proper operating temperature. This is necessary to reduce the influence on the workpiece by thermal displacement.
8. When cutting the bar material using a bar feeder and a hole through spindle, use only absolutely straight bar material since the accuracy of the workpiece is influenced by curve of the bar material.
9. With forged or cast material, the cutting allowance is often uneven. Create the program in anticipation of this uneven allowance or set a constant allowance by preparatory cutting.

3. SAFETY PRACTICES

Each machine is shipped with a variety of built-in safety devices. However, careless handling of the machine may lead to serious accidents.

To prevent such a situation from occurring, all operators must carefully read the manuals supplied by NC unit manufacturer and maker so that they understand the machine before trying to operate it.

Because there are so many “things which cannot be done” and “things which must not be done,” all prohibited information cannot be specified in the instruction Manual. Assume that something is impossible unless the manual specifically states that “it can be done”.

There are three types of manuals provided with your CNC lathe:

- I. Instruction Manual
- II. Programming Manual
- III. NC unit Operating and Maintenance Manuals prepared by the NC unit manufacturer

The following pages describe fundamental safety information.

All the items described must be carefully observed when operating the machine or performing maintenance work. Failure to observe fundamental safety information can lead to serious operator injury and machine damage. All operators must strictly follow the information.

[Signal Word Definitions]

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates an potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damages to the machine.

NOTE

Indicates comments and items for which care should be exercised

3.1 MACHINE INSTALLATION PRECAUTIONS

(1) Installation Site

- (a) Allow space for maintenance.

Install the machine so that the doors of the machine and the NC unit can be opened without interference.

- (b) Do not put things on the floor around the machine.

Keep the floor dry. If coolant or lubricating oil is spilled, wipe it up immediately.

- (c) The machine and the CNC unit must not be subject to direct sunlight. Chips, coolant, and oil must not be splashed on the machine or the NC unit.

The machine and the NC unit must not subject to any excessive vibrations.

Ambient temperature: 0 to 35 C

- (d) Humidity: 75% RH or less (without condensation)

- (e) Make sure that the floor is strong enough to support the machine. The floor must not be sloped or irregular in any way.

- (f) A number of cooling fans are used inside the machine.

Therefore, dust and mist must be kept to a minimum.

- (g) Allow space for easy removal of the chip conveyor and the coolant tank.

(2) Power Supply

- (a) Only an authorized electrical technician should perform work with the power cable connections.

- (b) No electrical noise generating sources, such as electrical welders or electric discharge machines, can be near the machine. Take care to isolate by nearby equipment.

- (c) An excessive voltage drop due to an insufficient power capacity will cause a malfunction of the NC unit. The power cables must be connected directly and independently to the plant power distribution panel.

Allowable values:

Voltage..... $\pm 10\%$ of nominal supply voltage (200/220 VAC)

Frequency.....50/60 Hz + 1Hz

Momentary power failure Less than 10 msec.

Voltage impulse..... Peak value is 200% or less of the effective value (rms value) of the line voltage with pulse duration of 1.5 msec.

(3) Grounding

- (a) The machine must be grounded independently of other Machines.
- (b) The ground wire must be as short as possible and have the same diameter as the input power cable.
Grounding resistance: 100 Ω or less

(4) Air Supply

- (a) Use only clean and dry air.
- (b) Make sure that the air source can supply the specified volume of air.

(5) Installation

- (a) To hoist the machine, be sure to follow the precautions bellow:
 - 1) Only an authorized technician should perform work with the machine hoisting.
 - 2) Use only wires, shackles, and jigs of the dimensions specified in the manual. They must be strong enough to support in the weight of the machine.
 - 3) Before hoisting the machine, make sure that each of the units is fixed securely.
 - 4) Before hoisting the machine, make sure that nothing unnecessary is left on the machine.
 - 5) Be sure that the machine is well balanced both lengthwise and crosswise while hoisting the machine slightly above the floor.
 - 6) When pluralities of workers are in operation, be sure to call attention each other as necessary.
- (b) If rust prevention coating is applied to the slideway surface, it must be removed completely. If any rust prevention coating is left on the slideway when the machine power is turned ON, a servo alarm will occur.

- (c) The saddle and cross slide are fixed in place with transit clamps when the machine is shipped. Also, eyebolts are used to hoist the machine. These clamps and eyebolts must be removed before turning ON the power.
- (d) After installing the machine, the machine must be levered. The machine's crown and distortion values must be adjusted according to the Accuracy Test Results Chart delivered with the machine
- (e) Keep the door interlock switch in the ON position. Remove the key and store it in a safe place.

(6) Before turning on the power after installation. after completing machine installation, check the following points before turning on the power.

- (a) Make sure that all bolts are tightened securely.
- (b) Make sure that all cannon connectors are connected securely.
- (c) Make sure that all hydraulic hoses and air pipes are connected securely.
- (d) If the machine is equipped with any optional external equipment (bar feeder, loader, robot), make sure that each electrical cable and hydraulic/pneumatic pipes are connected correctly.
- (e) Check the input voltage and all the L1/L2/L3 (R/S/T) phases of input power.

(7) After turning on the power after installation

- (a) Never feed the axes right after turning ON the power; manually operate the cycle pump to supply lubricating oil to the slideway surfaces first.
- (b) Check for oil leaks. Make sure that all of the gages indicate the correct values.
- (c) Make sure that any transit clamps left in the machine are removed.
- (d) Repeatedly open and close the chuck to break in the chuck-operating cylinder. Then, break in the spindle.
- (e) To break in the spindle, run the spindle for 20 minutes at a low speed. Increase spindle speed in five steps to the maximum speed, running the spindle for 20 minutes at each break-in spindle speed.

3.2 TURNING THE POWER ON AND OFF

- (1) Always check that there are no obstacles or people nears the machine's movable parts before operating the machine.
- (2) If the machine stops due to a power failure, turn the Main Disconnect Switch OFF immediately.
- (3) The machine cannot operate unless the power is supplied correctly. A momentary power stoppage due to a power failure or lightning can cause an accident. Therefore, stop the machine if abnormal fluctuation of power supply due to lightning, etc. is anticipated.
- (4) Before starting machine operation, make sure that all of the gages (hydraulic pressure, lubricating oil pressure, compressed air pressure, etc.) indicate the correct values Air should always be supplied to a machine equipped with a parts catcher.
- (5) After turning the power ON, make sure that the cycle pump and the fans are operating correctly.
- (6) Never feed the axes right after turning the power ON; manually operate the cycle pump to supply lubricating oil to the slideway surfaces first. Also, break in the spindle for at least 15 minutes. Therefore, dust and mist must be kept to a minimum.
- (7) To turn the power OFF, follow the sequence below,
 - Press the Emergency Stop Button.
 - Press the POWER OFF Switch on the operation panel.
 - Turn the Main Disconnect Switch OFF.

3.3 SAFETY PRACTICES DURING SETUP

- (1) Never touch any switch with wet hands.
- (2) The machine should be operated by one well-trained person only. Injury can occur if more than one person operates the machine. The machine could be started by one operator while the other operator is changing the fixture or chuck jaws. If more than one operator is absolutely necessary, all involved operators must cooperate and be able to communicate.

- (3) Always turn the power OFF before performing setup
- if setup must be performed with the power ON, set the switches on the operation panel to the following positions:
- (a) Mode Selector Switch..... Handle
 - (b) Spindle speed range..... Neutral (only for machines equipped with a transmission)
 - (c) Chuck..... Un-clamp
 - (d) Spindle speed adjusting dial... Lowest position
 - (e) Turret Index Switch.....To the current turret position
 - (f) Override switches (Cutting Feed, Rapid Traverse) Lowest position
 - (g) Machine lock..... ON
- (4) Cover your hair and do not wear loose clothing or jewelry to avoid becoming tangled or caught in the machine. Always wear proper shoes when operating the machine.
- (5) Never stand in front of the rotating unit or the spindle. During setup, the workpiece, cutting tools, or chuck jaws might fly out. Therefore, never stand in front of the chuck.
- (6) When loosening the bolts on tool holders and cutting tools, or loosening the tailstock body clamp bolts, be sure to loosen them gradually.
- (8) When a manual chuck or manual fixture is used, always remove the clamp handle from the chuck or fixture after tightening
- (9) Specify a spindle speed which is permissible for the chuck, cylinder, and fixture. If this condition is not satisfied, the workpiece may come off the spindle, injuring operators and damaging the machine.
- (10) Select the proper chucking pressure and tailstock spindle thrust pressure for the desired type of machining.
- (11) Clamp the workpiece and cutting tools securely. Depth of cut and cutting feed must be selected beginning with small values.

- (12) Carefully check the workpiece chucked conditions and the center pressing conditions for center work operations.
- (13) Make sure that the tool holders, tools, soft jaws, and tailstock are all tightened securely. They should be mounted and well balanced so that they will not interfere with the workpiece or the machine. Be careful not to operate the wrong switch. Visually check the switches on the operation panel before operating them.
- (14) The halogen lamp will be very hot after it has been lit for a long period. Be careful not to touch it.
- (15) Always lower the spindle speed when changing the spindle speed range while the spindle is rotating.
- (16) Before starting or stopping the spindle by manual operation, set the spindle speed-adjusting dial (spindle speed override dial on the operation panel) to the lowest setting.
- (17) Even though the spindle is stopped, it may rotate a little when the spindle speed range is changed. Be careful that this rotation does not cause any interference.
- (18) Always select the most appropriate tool for the material and shape of the workpiece. Selecting a wrong tool will cause the workpiece to fly out of the chuck or will result in poor machining.
- (19) Contact your service representative if any powder-type chip is generated during dry cutting. This may cause serious damage to the machine.
- (20) Whenever mounting a rotary tool holder to the turret head, make sure a rotary tool is fixed in the holder. If a tool is not fixed in the tool holder, the nut may fly off during rotation.

(M, MC type)

3.4 SAFETY PRACTICES DURING MACHINE OPERATION

- (1) Never touch or stand near the moving units of the machine while the machine is operating. Serious injury can occur by being caught in the rotating unit or between the moving parts.
- (2) Never touch any switch with wet hands.
- (3) Do not start the spindle unless the cylinder cover is in place.
- (4) Do not insert bar stock into the spindle while the spindle is rotating.
- (5) The length of the bar stock must be shorter than spindle length. If the bar stock extends from the spindle, it creates a hazardous condition.
- (6) Keep the front door closed while the machine is operating. The area inside the front door contains many sources of potential danger – the spindle rotating at a high speed with a workpiece clamped in it., the turret which rotates and moves in many directions with a number of sharp cutting tools, splashing Coolant, and flying chips.
- (7) Never try to open the front door while the spindle is rotating to remove chips or try to touch the workpiece or cutting tools.
- (8) Never stand in front of the rotating unit or the spindle. During setup, the workpiece, cutting tools, or chuck jaws might fly out. Therefore, never stand in front of the chuck.
- (9) Never remove the covers unless absolutely necessary.
- (10) Never start machine operation without the safety devices in place.
- (11) Cover your hair and do not wear loose clothing to avoid becoming tangled or caught in the machine. Always wear proper shoes when operation the machine.

- (12) Do not lean on the machine while the machine is operating. Leaning on the Covers can be very dangerous.
- (13) Specify a spindle speed which is permissible for the chuck, cylinder, and fixture. If this condition is not satisfied, the workpiece may come off the spindle, injuring operators damaging the machine.
- (14) After the completion of a cycle, before removing a machined workpiece and setting a new workpiece, always check that the Cycle Start Indicator is not lit the Program End Indicator is lit.
- (15) Carefully check the workpiece chucked conditions and center pressing conditions for center work operations.
- (16) Select the proper chucking pressure and tailstock spindle thrust pressure for the desired type of machining.
- (17) Clamp the workpiece and cutting tools securely. Depth of cut and cutting feed must be selected with small values.
- (18) During center-work operation, always set the tailstock spindle interlock to the ON position so that the cycle will not start until the workpiece is held by the tailstock spindle center.
- (19) Always use straight bar stocks. When bar stock is machined using a bar feeder and through-spindle hole, the bend of the bar stock will cause vibration which, in turn, will deteriorate the accuracy of the finished workpiece.
- (20) When machining short bar stock, always use guide bushes.
- (21) When machining bar feeder.
- (22) Before pressing the Cycle start Switch to begin automatic operation, make Sure that the Dry Run Switch is set in the OFF Position and that all other switches, such as the Spindle Override Switch and the Feed rate Override Switch, are set to the proper position.

- (23) When running a new program for the first time, check the program number. Never attempt to start a new program in the automatic mode; carefully run the program one block at a time using the single block function.
- (24) During automatic mode operation, be careful not to touch any switches inadvertently.
- (25) Before starting or stopping the spindle, set the spindle speed-adjusting dial (spindle speed override dial on the operation panel) to the lowest setting.
- (26) Always lower the spindle speed when changing the spindle is rotating.
- (27) If hard over travel alarm occurs, the axis interlock must be released to move the axis. In this case, never move the direction.
- (28) Never put any tools or instruments on the machine operation panel or on any machine part.
- (29) Be careful not to operate the wrong switch.
- (30) A machine with special specifications must be operated in accordance with the specifications.

3.5 SAFETY PRACTICES DURING MAINTENANCE AND INSPECTION

Always turn OFF the power before performing maintenance and inspection. Maintenance and inspection and inside the cover is especially dangerous.

(1) Daily Maintenance

In order to ensure safe operations, the machine must be maintained and inspected daily.

- (a) Clean the machine so that any abnormalities can be round easily.
- (b) During dry cutting or when machining cast workpieces, carefully remove chips from the machining not to accumulate them.

Be aware that any chip accumulated on moving pans, such as the slideway protection covers, will interfere with proper operation and lead to mechanical problems.

(c) Make sure that the gages for hydraulic pressure, air pressure, and lubricating oil pressure indicate the correct values.

(d) Make sure that lubricating oil is properly supplied to the slideways.

(e) Drain the air regulator (for machines equipped with the FRL unit).

(2) Precautions on Performing Maintenance and Inspection:

(a) Wiring work for 200 VAC or higher voltage circuits must be performed only by an authorized electrical technician

(b) Never change the parameter settings without consulting your representative.

If changed inadvertently, some parameters will cancel interlock settings.

(c) Do not climb on the machine unless absolutely necessary.

(d) When chips are being discharged with the chip conveyor, never put your hand or foot on the conveyor.

(e) The drain, provided in the spindle front cover to keep clean and unblocked by foreign matter. When cleaning the machine, do not use compressed air.

(f) When a hollow chuck is used, a coolant drain is provided at the cylinder portion at the rear of the spindle. This drain must also be kept clean and unblocked by foreign matter.

- (g) Disassemble and clean the chuck periodically. Apply grease to the chuck every day.
- (h) The solenoid valves become very hot when the machine is operating. Be very careful not to touch them after the power is turned OFF.
- (i) Supply or change hydraulic oil or lubricating oil as specified in the Instruction Manual.
- (j) Use only fresh, uncontaminated lubricating oil as specified in the Instruction Manual. Clean the reservoirs and filters in the lubrication line periodically and check for damages to the lubrication equipment and piping.
- (k) The fan and filters in the electrocutor cabinet must be kept clean.
- (l) Do not open the doors of the electrical cabinet, the NC unit, or the operation panel unless absolutely necessary. Opening the doors allows dust, foreign matter, and moisture to enter the enclosure and can cause machine malfunctions.
- (m) Before changing the battery for memory back up, make sure that the power is turned ON. the battery is changed with the power OFF, all programs, parameters, and other data stored in memory will be lost.
- (n) The halogen lamp will be very hot after it has been lit for a long period. Be careful not to touch it.
- (o) Inspect the slide seals and oil seals regularly.
- (p) Carry out daily, monthly, and semi-annual inspection as specified in the Instruction Manual.

3.6 TO ENSURE HIGH ACCURACY

When operating a CNC lathe, the accuracy of the finished product cannot be maintained unless the following check points are observed. Failure to observe these check points can also cause to accidents.

Check Points

- (1) Allow a sufficient chucking amount so that the workpiece will not come out of the chuck due to the cutting force or centrifugal force generated by spindle rotation. Depending on the shape of the workpiece, it may need to be supported by the tailstock.
- (2) When chucking a work piece, determine the chucking method and chuck pressure considering the rigidity of the workpiece so that the chuck will not distort the workpiece.
- (3) Machine vibration will result when workpiece with its center of gravity not at the chuck rotating center is rotated in the chuck. This, in turn, will deteriorate the accuracy of the machined workpiece. It is necessary to balance the workpiece with a balance weight.

Careless tooling will cause interference between the tools and the workpiece being cut or the tailstock. Check the tooling carefully to avoid interference.

- (4) Before starting the day's operation, break in the spindle and the Axes. This will minimize the influence of thermal distortion on workpiece accuracy.
- (5) When bar stock is used, its bend has critical influence on the accuracy of the machined workpiece. Use straight workpieces only.
- (6) If any chips are entangled on the workpiece or cutting tool, surface roughness will be deteriorated. Select a cutting tool, which will not entangle chips.

- (7) Workpiece materials and shapes will vary widely.

It is necessary to select the cutting conditions best suited to each workpiece in order to obtain the required accuracy.

- (8) When forged or cast workpieces are used, the cutting allowance varies greatly from the finished dimensions. To avoid this variation, either write a program in which takes the variation into consideration or perform pre-machining so that a uniform cutting allowance is left on the workpiece.

3.7 PRECAUTIONS WHEN SELECTING COOLANT

There are a variety of types of coolant available on the market.

Do not specify the type of coolant to be used. Choose a coolant suitable for the user's applications by consulting the supplier, taking the following requirements into consideration.

- (1) The coolant must be free of constituents with adverse effects (smell, poisoning, etc.) on human beings.
- (2) The coolant must not deteriorate during storage.
- (3) The coolant must not cause corrosion of the machine.
- (4) The coolant must not peel the coating off the machine.
- (5) The coolant must not cause swelling of rubber parts.
- (6) The coolant must not cause deterioration of accuracy.

Note that maker cannot be held responsible for any trouble arising from the use of coolant.

3.8 PRECAUTIONS WHEN OPERATING SPECIAL SPECIFICATION MACHINES

(1) Industrial robot specification

Only properly authorized persons trained and approved in accordance with local regulations may operate the robots.

Unauthorized persons may not operate the robots for any reason, including teaching and inspection. Anyone working with the robot operators must also be properly authorized.

(2) Stacker crane specification

The stacker crane used with the machine has a capacity of less than five tons.

Only properly authorized persons may operate the stacker crane machine.

3.9 FRONT COVER WINDOW GLASS

The front cover window glass will not break when hitting by chips generated during machining. However, there are instances (due to improper operation) where this glass has been broken by a workpiece, soft jaws, or a fixture. In such cases, the customer will be charged for replacing the broken glass.

3.10 PRECAUTIONS WHEN INSTALLING INDUSTRIAL ROBOTS

- (1)** Anyone operating an industrial robot with Match NC machine tools, should carefully observe “local regulations” and “the industrial robot safety standard guideline” (hereafter called “the Guideline”).

<Major precautions>

- (a) Install an industrial robot in a space where safe operation is ensured. Provide emergency stop buttons at easily accessible location.
 - (b) To prevent accidental contact be industrial robot, install a protective cover around operating range of the industrial robot, and an interlocking safety plug to the entrance.
 - (c) Prior to a daily operation, inspect the safety device and the interlock function.
 - (d) For safe operation, the operator must be trained on the operation and trouble shooting over the required period of time.
- (2) Make sure to consult with maker, before installing an industrial robot (a robot or a loader) to NC machine tools. Should an installment be done without prior robot/loader interface is used), the maker will not guarantee any responsibility for the added or modified equipment. Nor is the maker responsible for accidental damage to the machine or injuries caused by NC machine tools as a result of any unauthorized modification to the machine.

<Examples>

- (a) Damage to the machine and injuries caused by accidental contact between the operator and the industrial robot, caused by the safety device failure.
- (b) Damage to the machine caused by an electric circuit failure between the industrial robot and the machine.
- (c) Electric circuit damage in the electric cabinet caused by the power supply from the machine to the industrial robot.
- (d) Electric circuit damage or malfunction of the NC unit caused by a signal failure from the industrial robot.

(e) When hydraulic or pneumatic pressure is supplied from the machine to the industrial robot.

- Malfunction of the machine or the industrial robot

Injuries or machine damage caused by the workpiece or fixture come off the machine because of the reduction in pressure.

(f) Damage and malfunction of the industrial robot, or injuries caused by the machine failure.
The user is responsible for the items shown above

(3) Removing the safety devices and operation check signals from the machine leads to a hazardous situation, since neither the emergency stop function nor the error detectable function is able to work. Never operate the machine in this situation.

(4) If a machine tool with an industrial robot is purchased in Japan and to be operated abroad, observe the local regulations of the country. The maker does not take any responsibility for trouble caused by the user's negligence to these regulations.

3.11 INTERLOCK FUNCTIONS THAT ENSURE SAFE OPERATION

This machine features four interlock functions to ensure the operator's safety. Before starting the machine, always make sure these functions are valid. PRIMERO is not responsible for accidents that occur as a result of the machine being operated without first validating these interlock functions.

(1) Front Door Interlock (for availability, consult the maker)

The front door interlock function prevents the spindle rotation or the cycle from starting while the front door is open.

If a workpiece flies out of the chuck due to improper clamping, or from a programming error, the operator will be safe because starting the spindle rotation while the operator is touching the chuck or workpiece causes the front door.

For some models, the function is now under development.

(2) Chuck Interlock

The chuck interlock function prevents the spindle rotation or the cycle from starting while the chuck is unclamped for chuck work and center work. The workpiece might fly out of the chuck if the spindle rotation is started when the workpiece is not completely clamped in the chuck.

The chuck interlock function prevents the occurrence of such an accident to help ensure the operators safety.

(3) Tailstock Spindle Interlock (for machines with tailstock)

The tailstock spindle interlock function prevents the cycle from starting when the tailstock spindle is in the 'IN' position (inside the tailstock body) or when it is in the while the tailstock spindle interlock is valid.

If an automatic operation is started while a workpiece is not held by the center (tailstock spindle) the workpiece may fly out of the chuck.

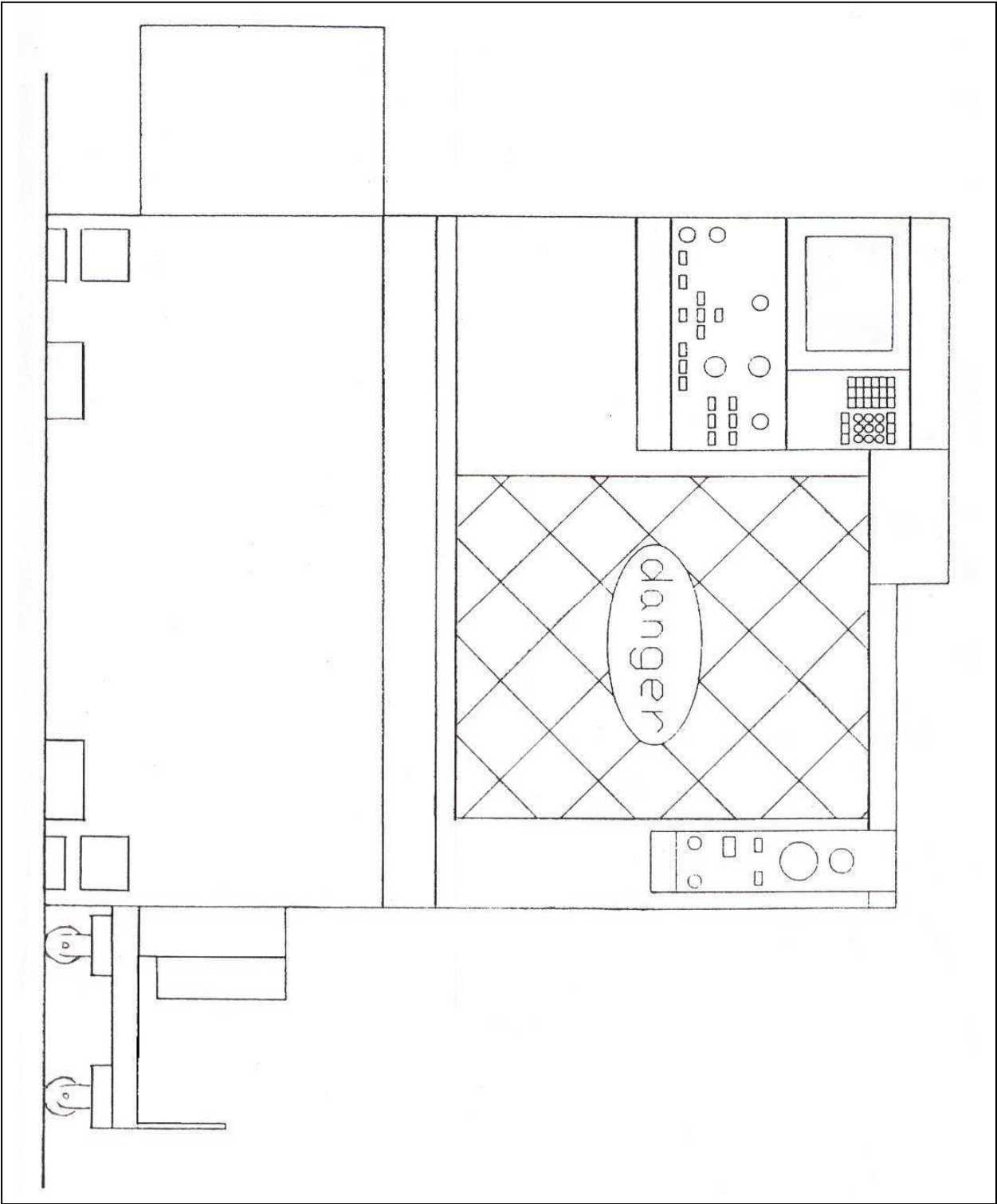
The tailstock spindle interlock function prevents the occurrence of such an accident to help ensure the operators safety.

(4) Electrical Cabinet Door Interlock

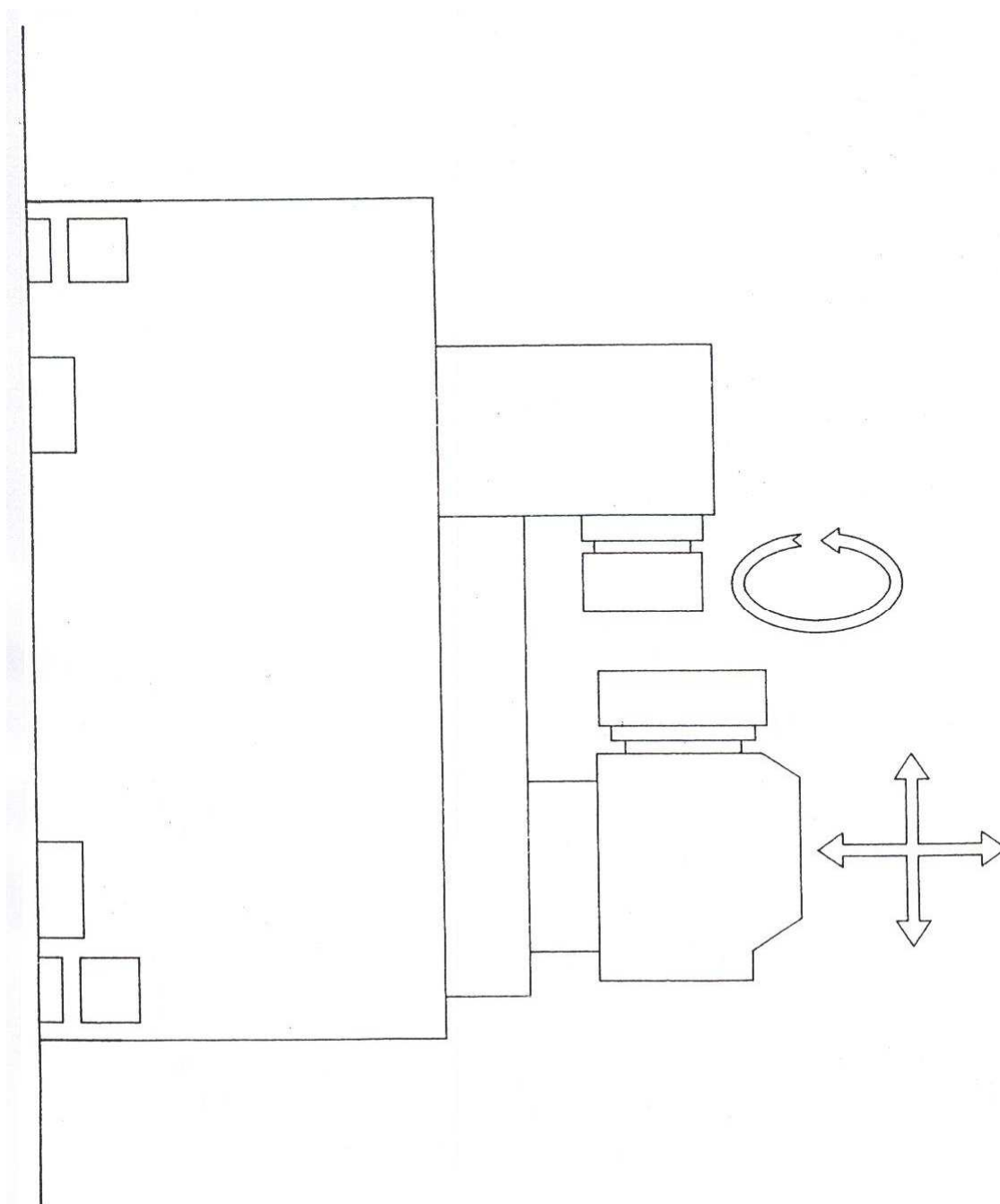
The electrical cabinet door interlock function cuts the power supply to the main switch if the door of the electrical cabinet is opened while the electrical cabinet door interlock is valid.

The electrical cabinet door interlock function protects the operator from receiving an electrical shock caused by touching a live device inside the electrical cabinet. Cutting the power when the door is opened ensures operator safety.

DANGER ZONE



DIRECTION OF MOVEMENT IN THE DANGER AREA



3.12 FUNCTION AND FIELD OF APPLICATION

This type of machine is a computer numerical lathe. It is designed for metal cutting as a machine tool, can be used for turning, drilling, threading and tapping.

It is designed having Automatic mode Handle mode. Any setting or adjusting only can be done under Handle mode or shut off the power source.

It is designed mainly using a hydraulic power chuck system for manually (by foot switch). It is also suit for faceplate or two center holding operation.

It is designed that only a skilled person is allowed to operate this machine. Otherwise he must be trained until he know how to operate it safety.

It is designed that this machine can not be used in the potential explosive environment and can't be used to cut flammable or explosive material (such as magnesium alloy)

NOTE: "KEEP THE INSTRUCTION MANUAL FOR FUTURE REFERENCE"

4. Installation

4.1 CHECK POINT BEFORE DELIVERY

4.1.1 Environmental Requirements

Consider the following requirements with installing the machine.

<Check list>

- 1) The machine and the NC must not be subject to direct sunlight.
- 2) The ambient temperature must be 10 to 35°C.
- 3) The ambient humidity must be less than 75% and free of condensation.
- 4) Maintenance space must be secured. The doors must be able to be opened without interference.
- 5) The chip bucket and coolant tank must be able to be pulled out from the machine without interference.
- 6) The ground must be capable of absorbing the vibration of other machines, such as presses. If vibration is felt where the machine is installed, measure its magnitude with a vibrometer.
- 7) The vibration level must be lower than 0.5G at the area where the machine is installed
- 8) The surface where the machine is installed must be smooth and flat.
- 9) If the surface is not smooth and flat, the coolant tank and peripheral equipment cannot be properly leveled.
- 10) The machine must not be subject to chips scattered from other machine or airborne dust.

4.1.2 POWER REQUIREMENTS

DANGER: Authorized electrical engineers should only perform electrical work.

<Check list>

- 1) The machine must be protected from electrical noise sources such as electric welders and an electrical noise will cause the machine to malfunction.
- 2) There must be sufficient power capacity. The machine must be free of adverse effects of other machines.

If power capacity is insufficient a voltage drop will occur during machine operation causing the machine to malfunction.

Power requirement data

1. Allowable voltage fluctuation: $\pm 10\%$ of nominal voltage (200/220 VAC)
2. Allowable voltage drop: Within 15% of nominal voltage for 0.5 seconds
3. Allowable frequency fluctuation: ± 1 Hz (50/60Hz)
4. Allowable momentary power loss: Less than 10 msec
5. Allowable voltage impulse:
Peak value: 200% or less of effective
value (rms value) of line voltage
Duration: 1.5 or less msec
6. Allowable waveform distortion of AC voltage: 7% or less.
7. Allowable imbalance of line voltages: 5%

- 3) Connect the power cable directly the shop transformer independent of other machines.
- 4) Use a leak breaker for the AC inverter. If another type of breaker is used for the AC inverter. It will be actuated by the high-frequency leak current specific to AC inverters.

Obtain the breaker capacity with the following formula:

$$A = P / 1.732V$$

Where, A: input current (A)

P: Power capacity (Kva*1000)

V: input voltage (V)

4.1.3 GROUNDING

DANGER: The machine must be grounded to prevent leaks and electric noises.

<Check list>

- 1) Use a ground cable of required minimum length. The diameter of the ground cable must be the same as the diameter of the power cable.

JIS class 3 ground: Ground resistance 100Ω or less

- 2) Always ground machines independently. If the ground cables electric welders or electric discharge machines are connected to the steel frame of the shop building. Please note that do not ground the PL lathe to the frame.

4.1.4 COMPRESSED AIR SUPPLY

When the machine is equipped with pneumatically-actuated equipment, such as a parts catcher, bar feeder, or automatic door, check the following.

<Check list>

- 1) The compressed air supplied to the machine must be clean and dry. Humid or contaminated compressed air will shorten the service life of pneumatically-actuated equipment. If the air is not clean and dry, use a line filter, dryer, or other similar equipment in the pneumatic line between the compressor and the supply port so that the compressed air is clean and dry.
- 2) Use a pressure gage to make sure that the pressure of the compressed air is the set pressure.
 5 kgf/cm^2
- 3) Make sure that the supply volume of the compressed air is larger than the required volume.

NOTE: For a rough estimation, a 1HP compressor will supply approximately 90 NL/min.

CAUTION: Before starting machine operation, supply compressed air to the machine.

4.1.5 FOUNDATION WORK

If the ground at the machine installation site does not have sufficient strength as in the APPENDIX 1 FOUNDATION DIAGRAM, the ground must be reinforced with piles.

Consult a civil engineer to determine the size and the number of piles needed.

<Materials required for foundation work>

Concrete

Strength (28 days after placing concrete): 210 kgf/cm^2

Slump value: 8

Ballast: Approx. 25mm

NOTE: The slump value represents fluidity of concrete: the larger the value, the softer the concrete.

2) Rubble

Pieces of hard stone broken a size of 50 to 150 mm

3) Filling ballast

Approximately 25 mm of ballast

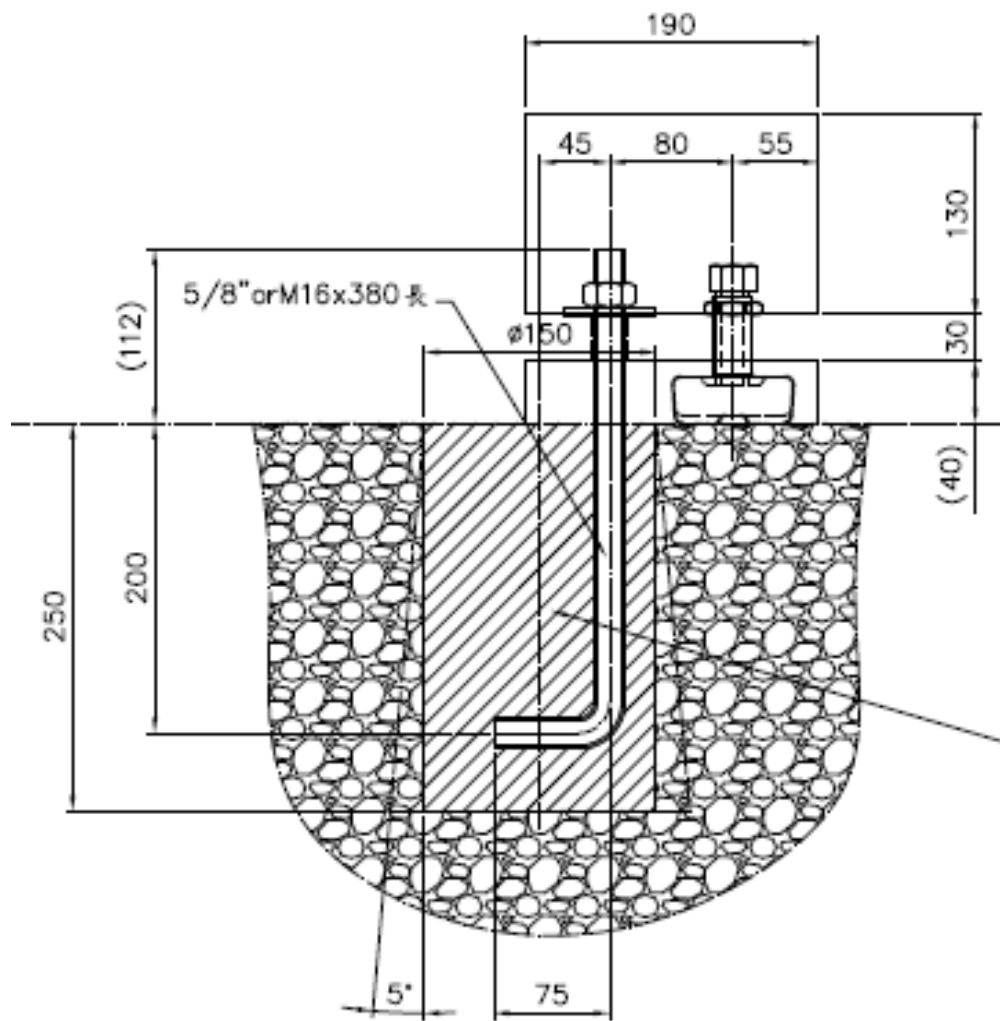
4) Foundation bolt box

The foundation bolt box shown in the diagram is a hard cardboard tube (made by Fuji Void or 3K void) called avoid which an Elastic Felloe (sponge-like material made by Toyo Shoi) is fastened with wire or gummed cloth tape to prevent the void from being extracted.

5) Styrofoam

6) Reinforcing bars (13 to 19 mm dia.)

APPENDIX 1 FOUNDATION DIAGRAM



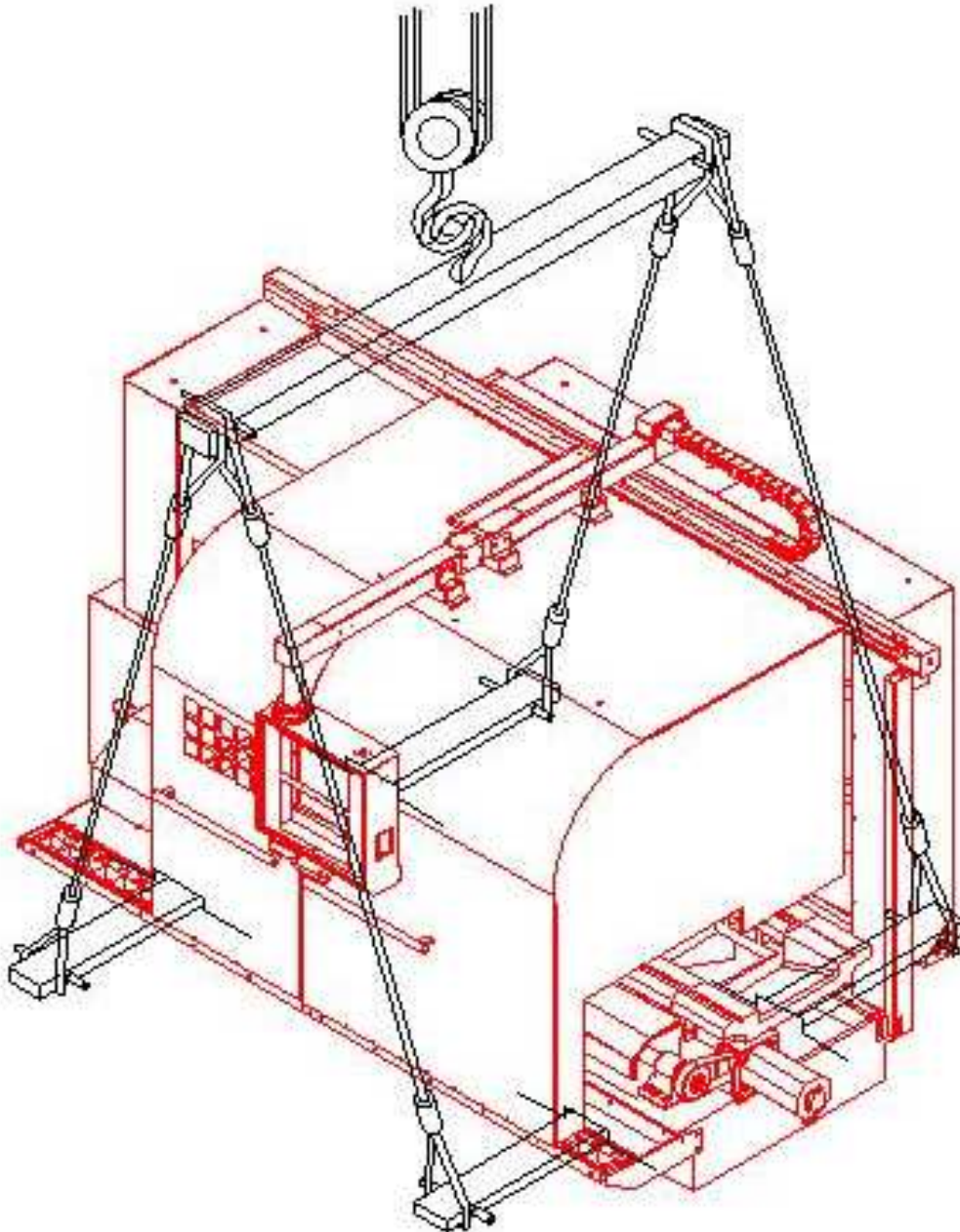
4.2 CARRYING THE MACHINE TO CHANGE FLOOR LAYOUT

When the machine is delivered to your shop, the agent's service technicians will install the machine at the designated place. The information described below should be used when the machine is moved after initial installation due to such as floor layout change.

4.2.1 Preparation

- 1) Before turning off the power, move the turret to the position where it should be fixed.
- 2) Turn off the power.
- 3) Disconnect the power cable and the ground cable.
- 4) Fix the saddle and turret with the transit clamps.
- 5) Fix the front cover.
- 6) Fix the operation panel.
- 7) Disconnect the coolant motor cables.
- 8) Remove the coolant tank from the machine.
- 9) Drain the coolant from coolant tank.
- 10) Remove the anchor bolts.

4.2.2 Moving the Machine with a Crane

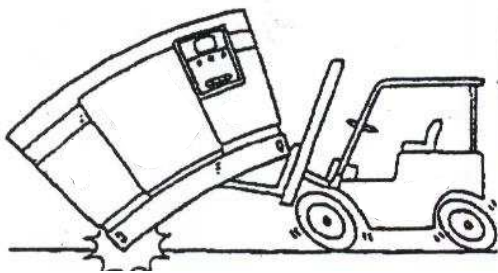


- 1) Only an authorized crane operator should hoist the machine with a crane.
- 2) Use the specified wires, shackles, and hoisting jig with sufficient strength to support the weight of the machine.
- 3) Before hoisting the machine, make sure all moving units are fixed in place.
- 4) Make sure that there are no service tools, waste cloth, or other unnecessary something are inside the machine.
- 5) Slightly hoist the machine to make sure that the machine is balanced well.
- 6) When two or more workers are carrying out hoisting operations, be sure everyone is aware of what others are doing. All workers must be able to communicate.

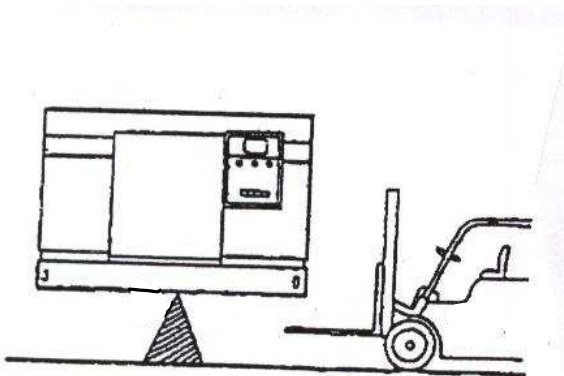
4.2.3 Moving the Machine with a Forklift



- 1) Only an authorized forklift operator should use the forklift.

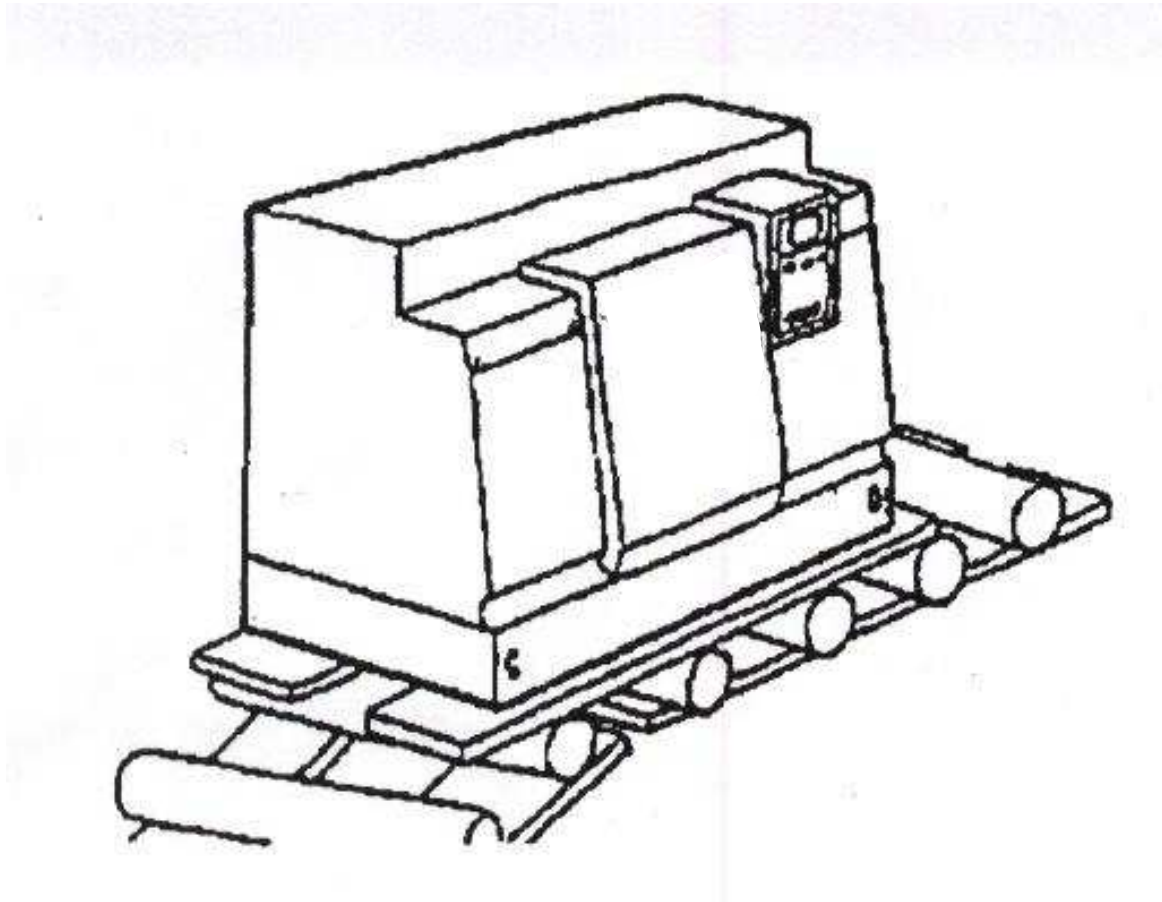


- 2) Take the machine weight into consideration to determine forklift capacity.



- 3) Keep the machine's center of gravity at the center of the forks.

4.2.4 Moving the Machine with Rollers



- 1) Determine the number and type of roller that can support the weight of the machine.
- 2) Use a skid that can Support the weight of the machine.
- 3) Use a leading board that can support the weight of the machine.

4.3 TURNING ON THE POWER

4.3.1 Before Turning On the Power

<Check list>

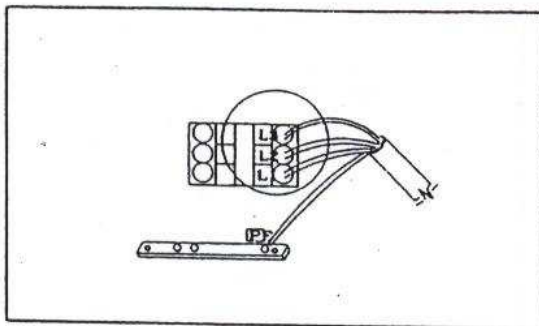
- 1) Make sure that all transit clamps have been removed.
- 2) Completely remove the rust preventive coating from the slideways. If any rust preventive coating remains on the slideways, a servo alarm wilt occur when the power is turned on.

- 3) Make sure that all bolts are tightened securely.
- 4) Make sure that the X-axis servo motor connector is tightened securely.
- 5) Make sure that the Z-axis servo motor connector is tightened securely.
- 6) Make sure that the C axis servo motor connector is tightened securely.
- 7) Make sure that hydraulic pipe joints on the right side of the machine are tightened securely.
- 8) Make sure hydraulic pipe joints at the rear of the machine are tightened securely.

4.3.2 Connecting the Power Cable

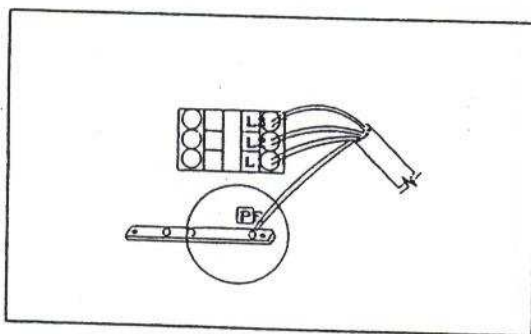
Only authorized electrical engineers should carry out electrical work.

<Procedure >



- 1) Connect the power cable from the shop power distribution board to terminal blocks L1 L2 and L3 of main switch.

NOTE: 1 check the input power supply.
2 check the phases.

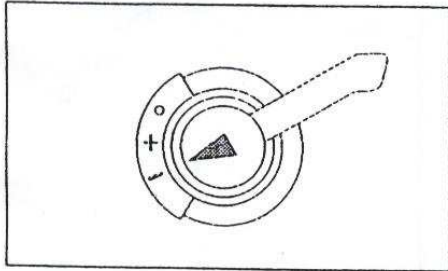


- 2) Connect the ground cable to terminal block E in electrical cabinet to ground the machine.

NOTE: Check grounding resistance.

4.3.3 Turning On the Power

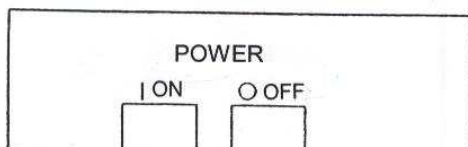
<Procedure >



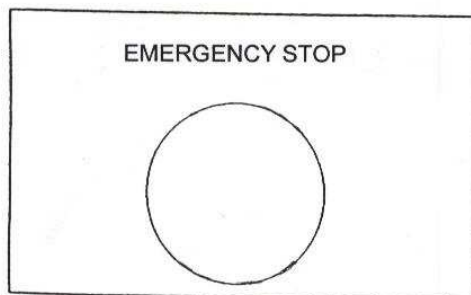
1) Turn on the breaker on the stop power distribution board.

2) Make sure the POWER SOURCE lamp is light.

3) Turn the main switch on while the electrical cabinet door is closed.



4) Press the POWER switch [ON]



5) Turn the EMERGENCY STOP button on the NC operation panel clockwise to clear the emergency stop state.

6) Make sure that something is displayed on the CRT or LCD.

4.3.4 After Turning On the Power

<Check list>

- 1) Fully open the reducing valve and check the main pressure by chucking pressure gage.
Pressure: 35 kgf/cm²

After checking the main pressure close the reducing valve at original position.

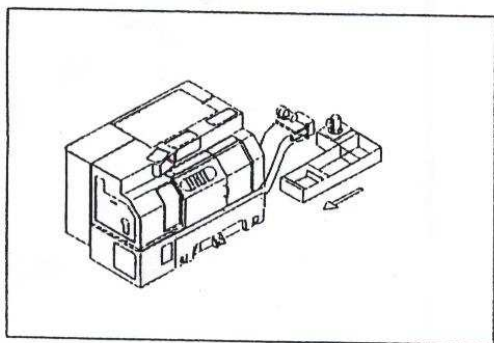
- 2) Make sure that no oil is leaking from the hydraulic piping on the left side of the machine.
- 3) Make sure that no oil is leaking from the hydraulic piping on the rear Side of the machine.
- 4) Manually operation the slideway lubrication pump to make sure that lubrication oil is supplied to the
- 5) Check the operation of each machine unit.
- 6) Carry out warm up operation for the spindle.

4.3.5 Final Assembly

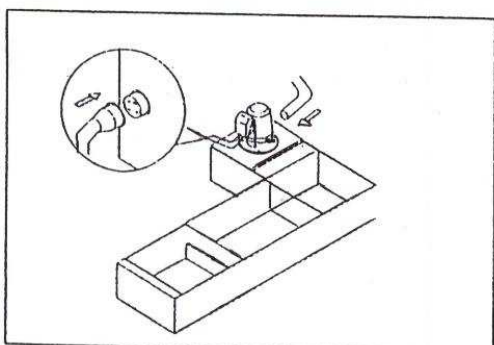
After the test cutting, install the peripheral equipment in the following procedure.

<Procedure>

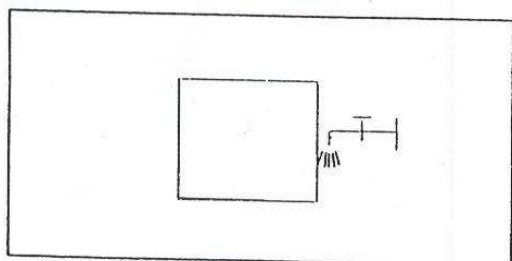
- 1) Install the coolant tank.



- 2) Connect the cables for the coolant pump motor.



- 3) Press the [COOLANT] switch to make sure that coolant is discharged.



4.4 LEVEL ADJUSTMENT

CAUTION: If the machine level is not adjusted correctly, the machine will be tilted or twisted after installation. This will result in uneven wear of the slideway surfaces and deteriorate machining accuracy.

- 1) Machine vibration
- 2) Deteriorated roundness of finished workpieces
- 3) Deteriorated cylindroids of workpieces
- 4) Deteriorated straightness of workpieces
- 5) Chattering
- 6) Feed marks

< Necessary tools >

- 1) Leveling base
- 2) Precision level: 0.02 mm/m per graduation
- 3) Power jack appropriate to hold machine weight
- 4) 32 mm wrench 32 mm

5. Daily inspection

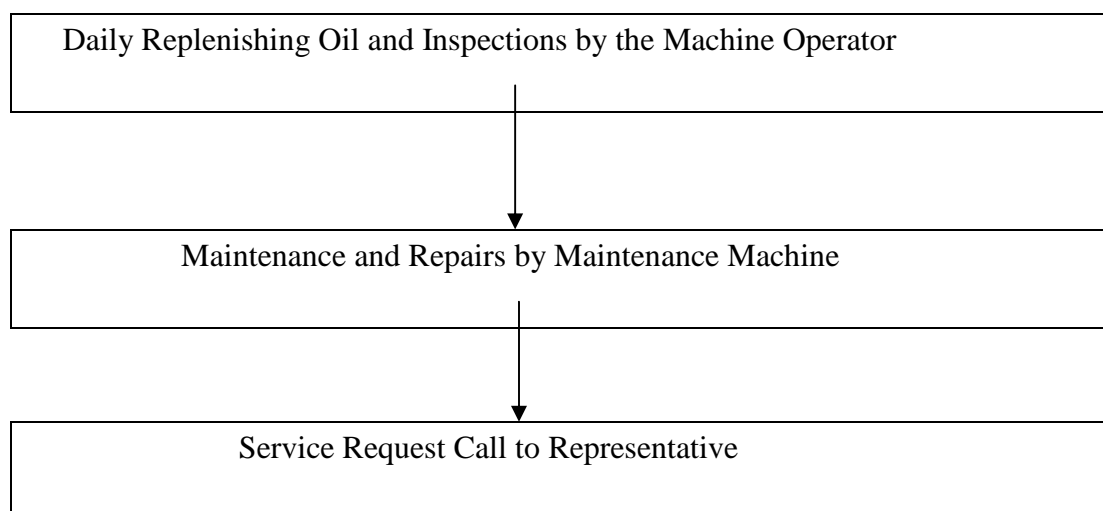
5.1 THE IMPORTANCE OF DAILY INSPECTION

In order to operate the machine correctly and make the most of machine's functions and performance, all operators must thoroughly understand the machine.

To keep the machine operating at its highest level, it must be inspected every day with the OILING CHART provided in this chapter.

If an abnormality is discovered during daily inspection, it must be reported to the supervisor and the person responsible for machine maintenance.

Quick action should be taken. For problems that cannot be repaired by the user or those for which the cause cannot be isolated, contact your service representative.



5.2 LUBRICATING AND HYDRAULIC OIL

Always use the types of oil specified by maker.

Do not mix the oil of different brands even if they are indicated as the “equivalent oil”.

Maker will not be responsible for any problem arising from the use of oil not specified by maker.

5.2.1 Storing Oil

- 1) Store the oil in a place where it will not be subject to direct sunlight or rain.
- 2) Keep the oil clean. No foreign matter and water should be allowed to enter the oil storage tank.
- 3) Never use degraded oil or oil with foreign matter or water.
- 4) If a middle tank is used, remove foreign matter and water from the tank at least once a year.

5.2.2 Cautions When Replenishing oil

Always use the same oil jug for the same oil. Never use a jug used for different brand oil.

- 1) Never remove the filter from the filter port when-supplying oil.

CAUTION: If oil other than specified is used mistakenly or different brands of oil are mixed, clear the tank and piping run immediately.

5.2.3 Disposing Waste oil

Disposing factory waste without legal permission is not allowed.

Always ask the service company when disposing.

5.3 OILING CHART

	Oil Point	Oil Type (used when shipping the machine)	
1	Slideway lubricating oil tank	Mobil vacetra oil NO.2 T68 Shell Tonnaoil T68 Diamond slideway 68 68Uniway 68 A-R68Showa A-R68 Kyoseki slidus 68	
2	Coolant tank	Decide coolant referring to 3.7 “PERCAUTIONS WHEN SELECTING COOLANT”.	

5.4 SUPPLYING OIL

Supply the specified oil to the oiling points as indicated in 3, OILING CHART

5.4.1 Supplying Oil to the Slideway Lubricating Oil Tank

- 1) Check the lubricating oil tank volume with the oil level gage installed on the lubricating oil tank.
- 2) Open the cover and remove the cap on the oil supply port.
- 3) Supply the specified lubricating oil from the oil jug while checking the oil level with the oil level gage. Amount: 4.6 L

5.4.2 Supplying Coolant to the Coolant tank

- 1) Press the [COOLANT] switch to stop coolant supply.
- 2) Check the coolant tank volume with the oil level gage.
- 3) Supply coolant from the top of the coolant tank.

5.4.3 Greasing the Chuck Master Jaws

- 1) Stop the spindle.
- 2) Supply grease from the three grease cups around the chuck.

CAUTION: Coolant splashed on the chuck will wash away the grease. Therefore, supply grease as soon as possible.

5.5 CHECKS BEFORE DAILY OPERATION

5.5.1 Before Turning On the Power

< Check list >

- 1) Make sure that there are no abnormalities.
 - A) External piping
 - B) Cables and coating intact
 - C) All doors closed
- 2) Check the shop floor around the machine for the following hazards.
 - A) Coolant
 - B) Hydraulic oil
 - C) Lubricating oil
 - D) Obstacles
- 3) Make sure that the turret is not at the travel end in the X-axis direction (lower end)
- 4) Make sure that the hydraulic pressure gage is at "0".
- 5) Make sure that the compressed air pressure gage is at "0" when compressed air supply is stopped.

Applied only to the machine using the pneumatically-actuated equipment.

5.5.2 After Turning On the Power

1) Listen to the sound of the hydraulic unit when it is operating.

2) Fully open the reducing valve and check the main pressure by chucking pressure gage.

Pressure: 35 kgt/cm²

NOTE: After checking the main pressure, close the reducing valve at original position.

3) Chuck the chucking pressure.

4) Chuck the pressure of the compressed air to be supplied.

Pressure 5 kgf/cm²

NOTE: Applied only to the machine using the pneumatically actuated equipment.

5) Make sure that the coolant fans in the NC electrical cabinet at the right and left sides of the machine are operating.

6) Make sure that the switch and indicators on the operation panel operate correctly.

7) Check the screen display no alarm should be indicated..

5.6 CHECKS BEFORE STARTING AUTOMATIC OPERATION

- 1) Make sure that the tool holders are mounted securely.
- 2) Make sure that the necessary cutting tools are mounted to the tool holders correctly.
- 3) Make sure that the tool tips are mounted correctly.
- 4) Make sure that the chuck top jaws are mounted correctly.
- 5) Make sure that the fixture is clamped securely.
- 6) Make sure that there is lubricating oil on the slideway surface.
- 7) Make sure that the wipers and slide seals are not broken.

5.7 CHECKS DURING AUTOMATIC OPERATION

- 1) Make sure that the spindle is rotating without generating any abnormal noise or vibration.
- 2) Make sure that the spindle drive motor is not generating any abnormal noise.
.
- 3) Make sure that the machine is operating smoothly without vibration
- 4) Check the SPINDLE LOAD meter; make sure that the spindle drive motor is not overloaded.
- 5) Make sure that the workpieces are finished to the required accuracy.

5.8 CHECKS AFTER DAILY OPERATION

CAUTION: Never use compressed air to remove chips or clean the outside of the machine.

- 1) Clean the inside of the machine.
- 2) Dispose of chips from inside of the machine.

5.9 CLEANING INSIDE THE MACHINE

5.9.1 Cleaning the Front Cover of the Spindle

Dust and foreign matter will accumulate in the coolant holes on the front cover of the spindle allowing coolant to enter the bearings. This will cause the bearings to seize.

CAUTION: Do not use compressed air to remove dust and foreign matter from the coolant holes.
If compressed air is used, dust and foreign matter will enter the bearings.

5.9.2 Cleaning the Slideway Protection Covers

During dry cutting or when machining cast workpieces, carefully remove chips from the machine not to accumulate them.

Be aware that any chip accumulated on moving parts. Such as that slideway protection covers, will interfere with proper operation and lead to mechanical problems.

5.9.3 Cleaning the Front Door Rail

It chips accumulate on the front door rail, the door will not open/close smoothly. Always clean the front rail.

< Cleaning interval > Every 50 hours of operation

- 1) Turn off the power.
- 2) Remove the side cover at the front door of the machine inside.
- 3) Remove the chips that have accumulated on the front door rail.
- 4) Mount the side cover at the front door.

5.9.4 Cleaning the Rear of the Cylinder (Hollow Chuck)

Coolant and chips flow to coolant pan at the rear of the cylinder via the through hole in the draw pipe.

The coolant returns to the coolant tank via drain hose.

Chips accumulate on the punched-metal sheet at the rear of the cylinder.

Remove chips from the punched-metal sheet every day. If chips are left to accumulate, coolant will overflow and spill on the shop floor.

CAUTION: Coolant will flow into the hydraulic oil tank via the cylinder drain, inhibiting proper machine operation.

< Procedure >

- 1) Turn off the power
- 2) Open the cylinder cover at the left side of the machine.
- 3) Remove chips from the punched-metal sheet at the rear of the cylinder.
- 4) Mount the side cover at the front door.

5.10 PRECAUTIONS WHEN SELECTION COOLANT

There are a variety of types of coolant available on the used. Choose a coolant suitable for the user's applications by consulting the supplier, taking the following requirements into consideration.

- 1) The coolant must be free of constituents with adverse effects (smell, poisoning, etc.) on human beings.
- 2) The coolant must not deteriorate during storage.
- 3) The coolant must not cause corrosion of the machine.
- 4) The coolant must not peel the coating off the machine.
- 5) The coolant must not cause swelling of rubber parts.
- 6) The coolant must not cause deterioration of accuracy.

NOTE: The maker cannot be hold responsible for any trouble arising from the use of coolant.