



USER MANUAL

for
MBH Series
With Fanuc 0iM

Revised: June 2013

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1. Safety

1.1 Intended Use

This machine is a numerically controlled machine tool designed to shape cold metal by the application of rotating cutting tools capable of performing two or more machining processes (e.g. boring, drilling, milling, thread tapping) at one set-up of a workpiece and incorporating automatic facilities to:

Select and change tools from a magazine

Change the position of the workpiece relative to the spindle mounted cutter.

Select and apply spindle speeds and axis feeds

Control ancillary services (e.g. coolant flow)

This machine is intended for use in an industrial environment and must not be used in the residential, commercial and light industrial environment.

Materials to be cut in this machine are: Steel, Iron, Iron casting, Bronze, Brass, Copper, and Aluminium.

Materials not suitable to be cut in this machine are: Graphite, Wood, Plastic, Magnesium alloy.

Consult the agent for the material not listed above.

1.2 Important Safety Notice and Warning

It is the user's responsibility to be acquainted with the legal obligations and requirements in the use and application of the machine.

1.2.1 Safe installation

It is the customer's responsibility to ensure the machine is installed in a safe operating position, with all service pipes and cables clear of the operation area so as not to cause a hazard. Access must be allowed for safe maintenance, swarf and oil disposal including safe stacking of machined and un-machined components.

1.2.2 Machine guarding

This Machine is fitted with completely enclosed guards as standard. In certain cases and tooling applications additional guarding may have to be provided by the user.

The standard machine guarding has special safety interlocks on the guard doors that comply with the Machinery Directive. Guards and interlocks must be kept fully maintained and tested by the customer and shall not be removed.

The guards are made with clear observation windows having high impact resistance to provide operator safety and a clear unobstructed view of the operations in process. The opening of any guard door provides access to potential hazard areas. Opening of the front working area guard doors is not allowed whilst the spindle is rotating but it is still possible to manually initiate axis movements whilst these doors are open albeit at a reduced traverse rate. Extreme care must therefore be used at all times.

1.2.3 Software

Unauthorized changing of machines software or control parameters is hazardous and is not permitted. The machine maker will not accept any liability whatsoever for unauthorized changes in this area.

1.2.4 Authorized personnel and training

Operating, service and maintenance engineers shall be authorized by the 'User Company' and properly trained in the use of the machine.

1.2.5 Safe working practice

Workholding devices, lifting equipment, tooling and their use shall be the responsibility of the user. It is the user's responsibility to protect against the hazards caused by swarf, leaking oil or coolant and their use.

Use of proprietary oil or coolant is the responsibility of the user. Special instructions from the suppliers concerning their use should

be carefully read and understood before use.

To prevent body injury, safe working practices should be employed when operating or servicing the machine.

1.3 Safety Cautions List

It is the user's responsibility to ensure all local regulations and safety instructions are followed.

Users should consult with their own safety representative to ensure that all such regulations are known and acted upon.

DON'T run the machine until you have made clear to your supervisor that you understand the potential hazard of spindle rotation, the throwing of coolant and the throwing of swarf from the cutting process.

DON'T run the machine until you have read and understood all manuals provided with the machine.

DON'T run the machine for the first time without a qualified instructor. Ask your supervisor for help when you need it.

DON'T get caught in moving parts. Remove watches, rings, jewellery, neckties and loose fitting clothes.

KEEP your hair away from moving parts.

PROTECT your eyes. Wear safety glasses with side shields at all times.

PROTECT your head. Wear a safety helmet when working near overhead hazards.

PROTECT your feet. Always wear safety shoes with steel toes and oil resistant soles.

PROTECT your hands. Make sure the spindle is stopped before manually changing a tool.

PROTECT your hands. Make sure the spindle is stopped before manually changing a workpiece.

PROTECT your hands. Make sure the spindle is stopped before manually clearing away swarf or oil. Use a brush or chip scraper. NEVER use you hands.

PROTECT your hands. Make sure the spindle is stopped before

manually adjusting the work piece or fixture or coolant nozzle.

PROTECT your hands. Make sure the spindle is stopped before you take measurements.

PROTECT your hands. Make sure the spindle is stopped before you move a safeguard. Never reach round a safeguard.

PROTECT your hands. Make sure the machine is switched off and electrically isolated before making any mechanical adjustment.

PROTECT your hands. Beware sharp edges of cutting tools when changing and handling tools.

PROTECT your eyes and the machine. Never use a compressed air hose to remove swarf or to clean out air vents.

Gloves are easily caught in moving parts. **TAKE THEM OFF** before you turns on the machine.

Loose objects can become flying projectiles. **REMOVE** all loose items (wrenches, chuck keys, rags etc.) from the machine before starting.

PREVENT objects from flying loose. Securely clamp and locate the work piece.

NEVER operate a machine tool after taking strong medication, using non-prescription drugs, prescription drugs or consume alcohol which may impair concentration.

ALWAYS make sure the working and cutting zone is safeguarded.

KEEP the work area well lighted. Ask for additional lighting if needed.

DON'T slip. Keep your work area clean and dry. Remove swarf, oil and obstacles.

NEVER lean on the machine. Stand away when machine is running.

DON'T get trapped. Avoid pinch points caused between other machines and the machine you are working.

PREVENT cutter breakage. Use correct cutter speed and axis feed rate for the job. Make manual over ride adjustments of axis feed rate or spindle speed if you notice unusual noise or vibration. Ask your supervisor for help if you need it.

PREVENT cutter breakage. Rotate the spindle in a clockwise direction for right handed tools, counter clockwise for left handed tools. Use the correct tool for the job.

PREVENT work piece and cutter damage. Never start the machine when the cutter is in contact with the work piece.

Dull and damaged tools break easily. Inspect tools and tool holders. Keep tools sharp. Keep overhang short.

KEEP all lubrication reservoirs maintained at the correct level. Always keep to the maintenance schedule.

Certain materials such as magnesium are highly flammable in dust and chip form. See your supervisor before working these materials.

PREVENT fire. Keep flammable liquids and materials away from the work area and from hot swarf.

PREVENT the machine from moving unexpectedly. When leaving the machine unattended, not producing, leave switched in the MANUAL mode.

DON'T use the machine in a volatile atmosphere. Electrical devices fitted to the machine are for normal factory use and are not explosion proof.

ALWAYS keep the machine clean and do not let swarf collect.

ALWAYS keep the area around the machine clean and tidy. Opening the guards creates the potential for residual coolant and swarf to fall to the swarf tray and possibly to the floor. Good housekeeping minimizes the potential for trips, slip or fall of all personnel.

INFORM all other personnel who approach the machine about the hazards described in this safety list.

When making adjustments with spanners, always ensure that the required leverage is safely applied. Always avoid slippage. Always apply the leverage by pulling, never by pushing. Always use the correct size spanner. Ensure the spanner is not damaged.

Do not use organic chemical solvents to clean the machine guards or compressed air services equipment.

The windows are manufactured from bulletproof polycarbonate sheet. This material does deteriorate with age, and should be exchanged within the time period described later in this manual.

Any workholding device used in conjunction with this machining centre must fit within the working envelope available. Under no circumstances must any such workholding device be used when it would require the need to override/defeat the safety interlocks fitted

as standard to this machine.

1.4 Safety Devices

1.4.1 Emergency Stop

Make yourself aware of the location of the emergency stop push buttons, which should be well known so that they can be operated at any time without the need to look for them. Test the push buttons periodically for their correct operation.

The emergency stop push buttons is located on the operator panel.

Hard wired over travel switches on both ends of all axes to check whether the axis has traveled beyond the allowed boundary.

Once the Emergency Stop button is pressed or any of the over travel limit switches have been operated, the machine will stop immediately and the power supply to the drives is removed, and go into an Emergency Stop condition

1.4.2 Guard

Machine equipped front door, ATC door, side door and full guard as safety device to protect operator. Doors are not allowed open in any time when machining.

1.4.3 Window

Machine equipped with **6** mm thickness PC safety glass on front and side guard. The window impact resistance capacity is at **520** kg.m. Any crack on the window is not allowable.

1.4.4 Door Interlock

The machine has 1 interlocked main access door at the front. The main door is shot bolted shut and can only be opened once the spindle is stationary and there is no program running.

Power On Safety Circuit (Allows the operator to execute certain tasks whilst the front door is open)

Limited machine functionality is available to the operator whilst the main door is open. The handwheel and jog keys are allowed to move the machine axes at feed rates of 2000 mm/min and less. Spindle operation is prohibited whilst the main door is open as the spindle contactor is hard wired through the door interlock switch. Selection of automatic program running is prohibited until the doors are shut.

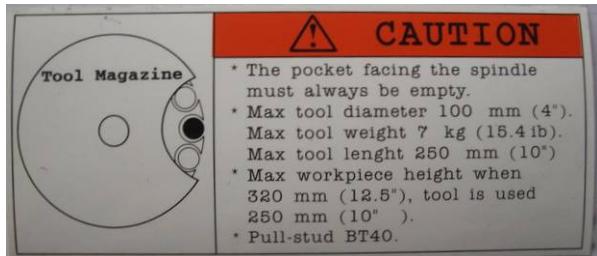
1.4.5 Cabinet door lock and switch

The main power switch of machine must be shut off and turned further CCW to open the cabinet door.



1.5 Warning Labels

Most of the warning labels are self-explained as following:



1.6 Residual Risks

The machine tool has been designed and manufactured to the highest standards, but still, your attention is drawn to the following **RESIDUAL RISKS** existing within the machine.

-
- Always check that the cutting tool product you are using is approved to run at the selected speed.
 - If non suitable cutting conditions are selected, coolant can splash, and swarf can escape over the sides of the guard.
 - Failure of the gravity-affected-axis servo motor brake could allow the head to fall when the power is OFF
 - Do not operate the machine with the side door access panels removed.
 - Isolate the machine before cleaning the machine through the side door access panels

2. Introduction

2.1 Consumption Material

2.1.1 Lubrication grease for linear rail and ballscrew

Qt'y	Recommended grease (brand)
700 c.c./can	LHL-X100-7 (LUBE)

2.1.2 Lubrication oil for pneumatic system

Oil for pneumatic system is recommended to use same specification of ESSO TERESSO 32 or SHELL TELLUS OIL 32. Total quantity oil for machine in every half year need 120 cc.

2.1.3 Lubrication oil for oil-air built-in motor spindle

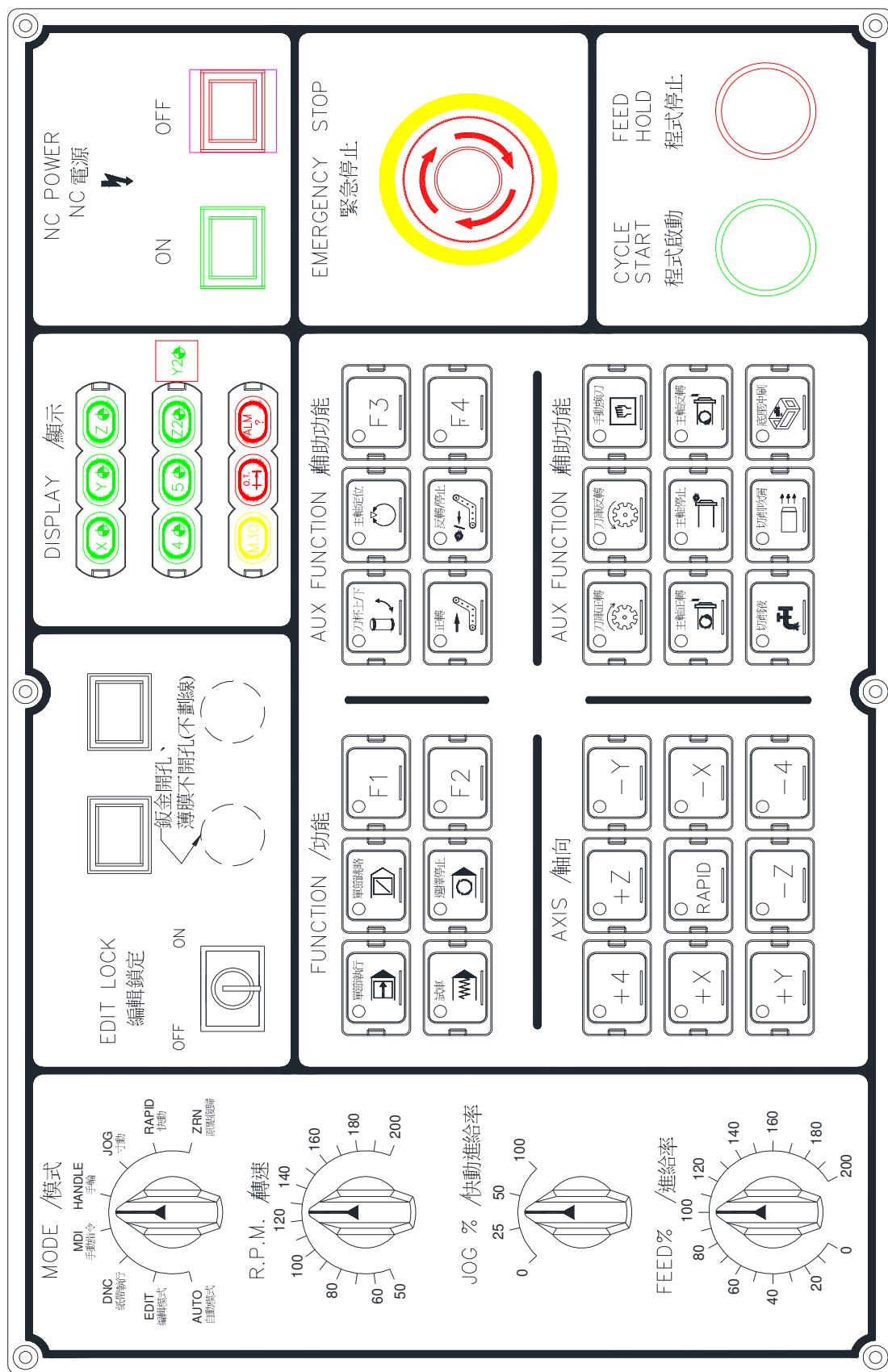
Qt'y	Recommended oil, ISO VG68 (brand)
700 c.c./can	Azolla ZS 68 (Total) DTE oil 16 (MOBIL) Tellus oils 68 (SHELL)

2.1.4 Cutting fluid

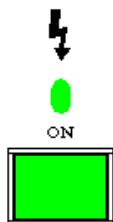
Cutting fluid and mixing ratio with water are recommended by following table.

Marker: Castrol			
No.	Type	Application	Dilution ratio with water
1	SYNTIOL-9913	Aluminum cutting only	1:15
2	ALUSBL-B	Aluminum cutting only	1:15
3	HYSOL-X	Various material cutting	1:20

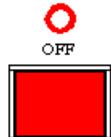
2.2 Operation Panel



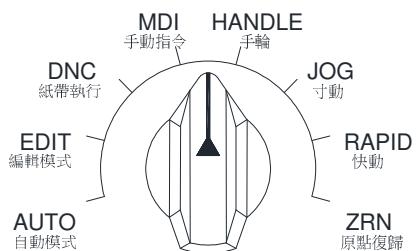
- (1) Power ON: Turn ON the power of the controller.



- (2) Power OFF: Turn OFF the power of controller.



- (3) Mode selection: From Left to right, CW.



AUTO: Program execution mode.

EDIT: Program editing mode.

DNC: PC connection mode.

MDI: Manual Data Input mode. (single block command, tool offset, etc...)

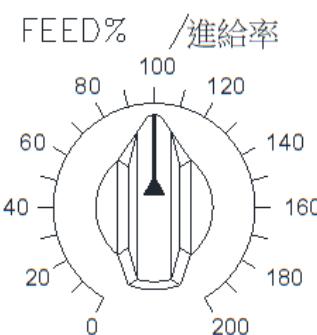
HANDLE: Axis movement by hand wheel on Remote jog unit.

JOG: Slow movement of axis.

RAPID: Rapid moving axis in JOG mode.

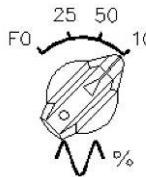
ZERO RETURN: Return to the zero point of each axis.

- (4) Feed rate override:



FEED% / 進給率 Effective for commands or program in MDI, AUTO or DNC modes. Override from 0% to 200%.

(5) Rapid movement speed override:



Effective in modes RAPID, ZERO RETURN or the commands G00 in program execution.

(6) Spindle speed override:



(7) Over travel alarm release:



Once the axis moved over travel and machine halted, keep pressing this button and jog the axis away from travel limit. Then zero return the axis.

(8) Single block execution:



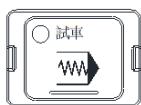
Only one block will be executed when the CYCLE START was pressed, if this switch was turned ON.

(9) Ignore marked blocks:



Blocks with "/" marked will be ignored if this switch was ON.

(10) Dry run:



In AUTO, MDI or DNC modes, the "F" command will be overrided by JOG, if this button was ON. G00 will also be overrided if proper parameter was set.

(11) Air blow (optional):



Compressed air will be ON at blowing nozzle, if this button was ON.

The compressed air will be OFF, if there were commands M06, M00 or M01 in program.

M14 will turn ON the compressed air and M15 will turn it OFF.

(12) Work lamp:



Turn the work lamp ON or OFF.

(13) Optional program halt:



M01 will be effective (program halted) if this button was ON. Need to press CYCLE START to resume program execution.

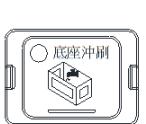
(14) Coolant:



Coolant pump will be activated if this button was ON and vice versa.

In AUTO mode, coolant pump will be activated by M08 command or stopped by M09 or this button.

(15) Chips wash down:

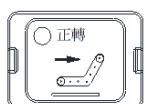


Chips wash down pump will be activated if this button was ON and vice versa.

In AUTO mode, coolant pump will be activated by M13 command or stopped by M16 or this button.

(16) F1 – F4 switches: reserved.

(17) Chip conveyor forward (optional): Effective in AUTO and manual modes.



Chip conveyor will move forward if this button pressed.

(18) Chip conveyor reverse (optional) : Effective in AUTO and manual modes.



Chip conveyor will reverse if this button pressed. Re-pressed this button will stop the chip conveyor.

(19) Manual Tool Change:



Effective in JOG mode. Spindle must be oriented priorly.

(20) Tool magazine CW:



Effective in manual mode.

(21) Tool magazine CCW:



Effective in manual mode.

(22) Spindle CW:

Effective in manual mode.

"S" command must be inputed in AUTO or MDI modes. Then change modes to manual and press this button.

(23) Spindle STOP: Effective in manual mode.**(24) Spindle CCW:**

Effective in manual mode.

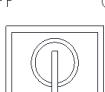
"S" command must be inputed in AUTO or MDI modes. Then change modes to manual and press this button.

(25) Data editing key switch:

EDIT LOCK

編輯鎖定

OFF ON



Effective in EDIT and MDI modes.

Program, Tool data, Work coordinate data and diagnostic

parameters CANNOT be edited if this switch was turned OFF.

(26) Cycle START:

Effective in AUTO mode.



In MDI mode, type in single block command and press this button to execute it.

In AUTO mode, press this button to execute the program in memory.

In DNC mode, press this button to execute the program in memory of external devices. (PC or tape machine)

Resume the program execution which was halted by Feed HOLD.

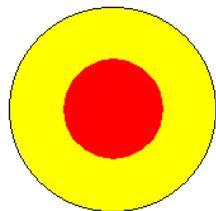
(27) Feed HOLD:

Effective in AUTO mode.



Halt the programme execution: Axis movement will be stopped, yet the spindle keeps spinning.

(28) Emergency STOP:



Any mechanical movement will be stopped. Power of servo system will be cut OFF. Rotate the knob CW to release it.

(29) +X axis movement:



Effective in JOG mode.

Move X axis in positive direction.

(30) +Y axis movement:



Effective in JOG and ZERO RETURN modes.

Move Y axis in positive direction.

(31) +Z axis movement:



Effective in JOG and ZERO RETURN modes.

Move Z axis in positive direction.

(32) +4 axis movement:



Effective in JOG and ZERO RETURN modes.

Move 4th axis in positive direction.

(33) -X axis movement:



Effective in JOG and ZERO RETURN modes.

Move X axis in negative direction.

(34) -Y axis movement:



Effective in JOG mode.

Move Y axis in negative direction.

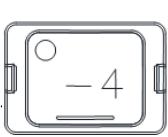
(35) -Z axis movement:



Effective in JOG mode.

Move Z axis in negative direction.

(36) -4 axis movement:



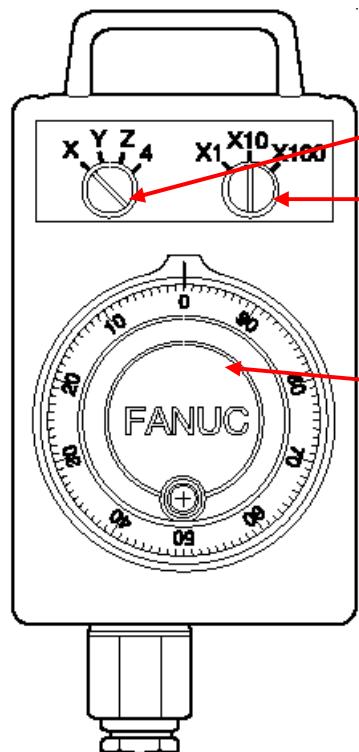
Effective in JOG mode.

Move 4th axis in negative direction.

(37) Axis ZERO point indication lamps: Lamp light up when each axis moved to zero point.



2.3 Remote Jog



2.4 APC panel

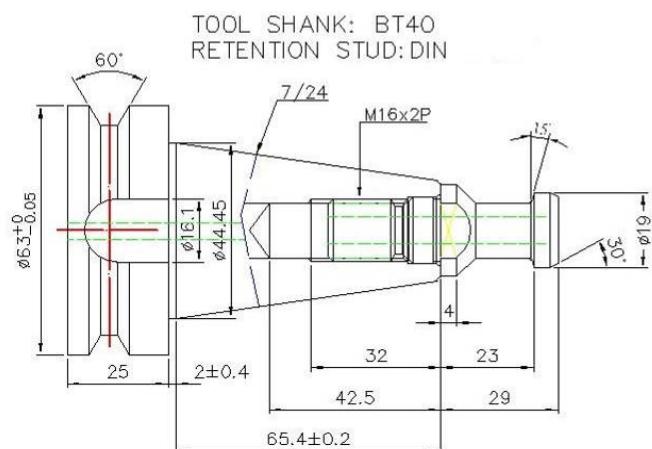
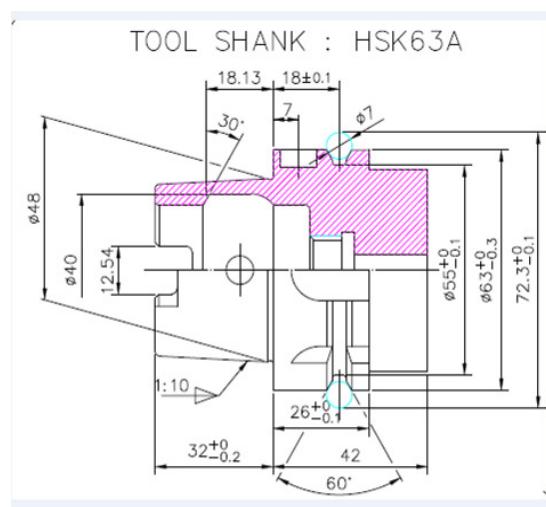
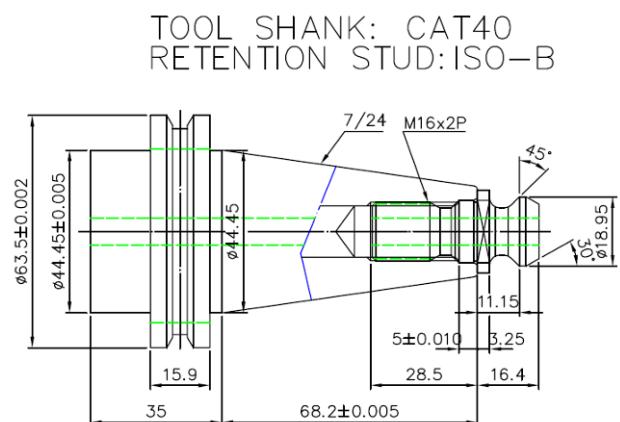
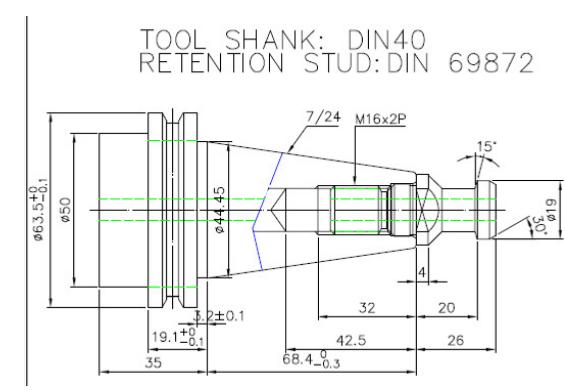
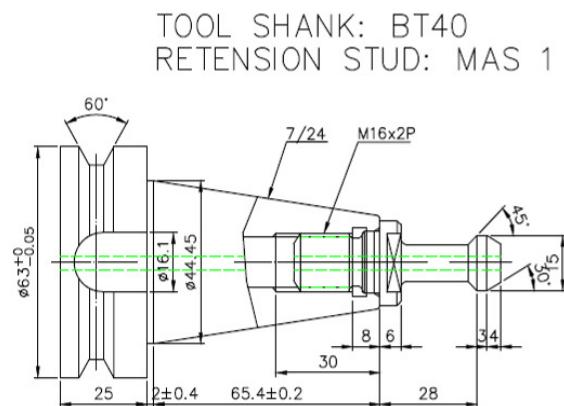
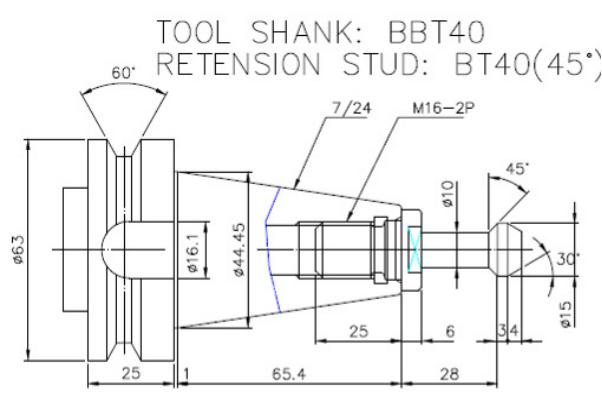


2.5 Spindle Tooling

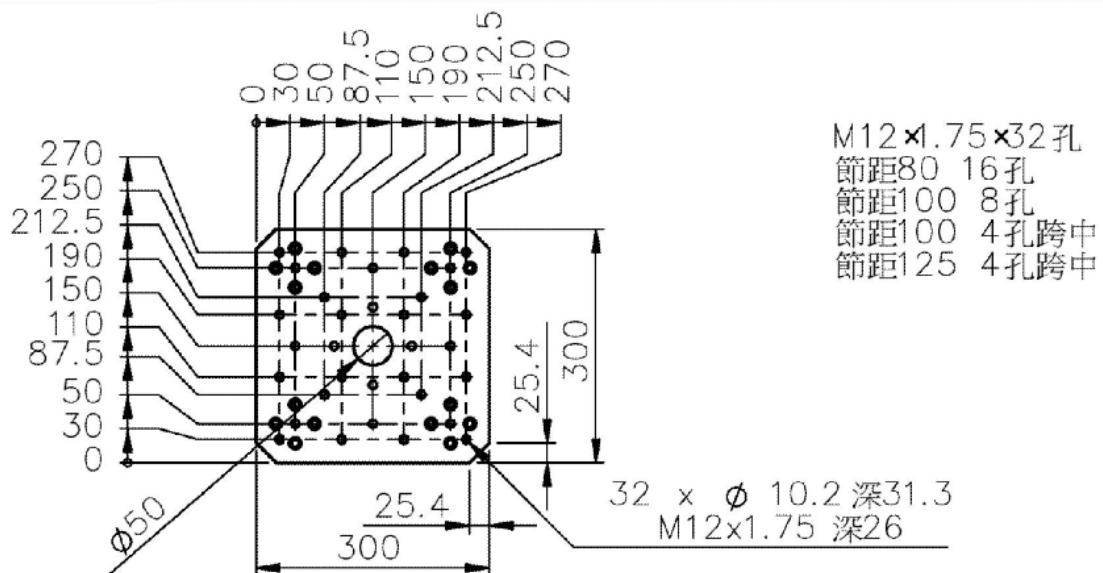
Tooling with a balance level of G2.5 or better should always be used. Failure to do so will reduce spindle life and surface finish and may

invalidate the machine warranty.

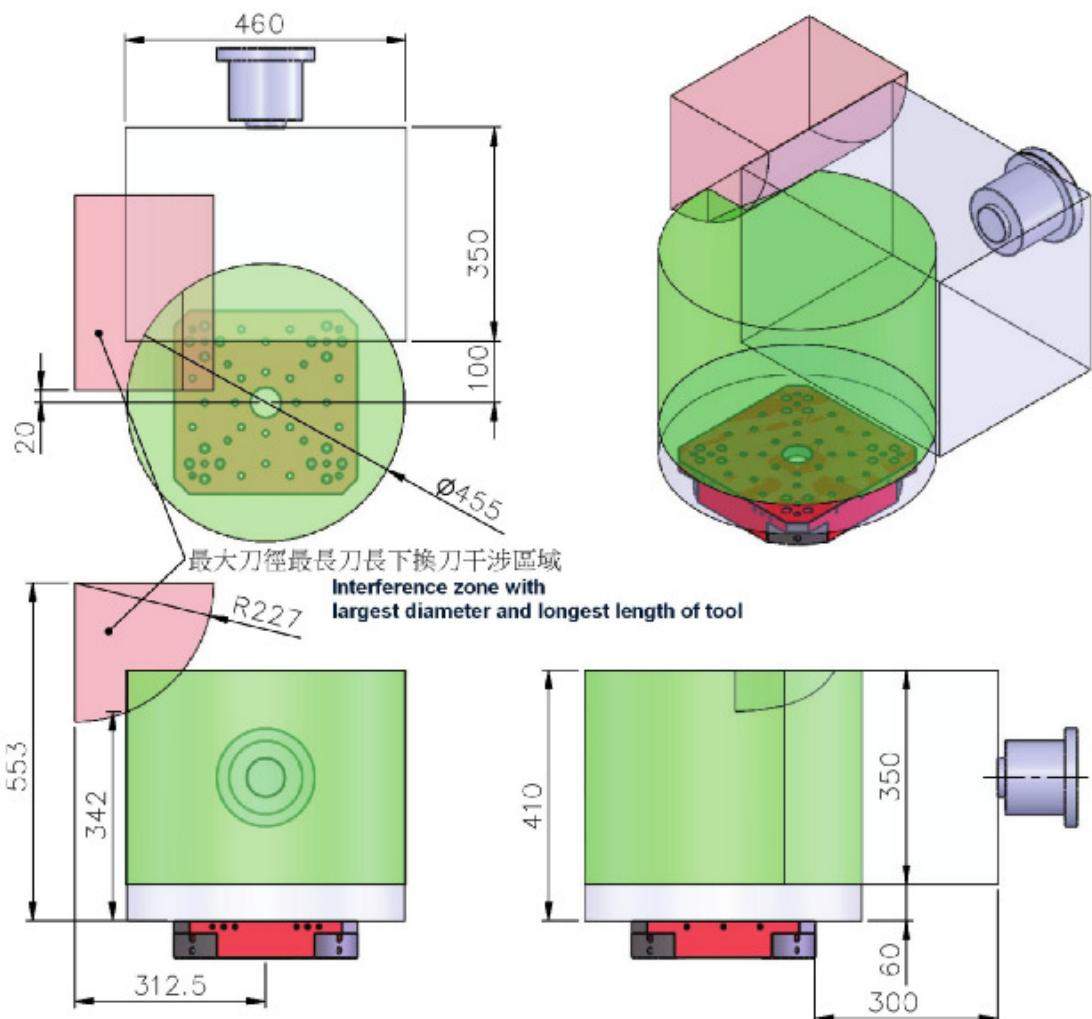
For safe operation, make sure the tool holder and pull stud combination meet the standard below:



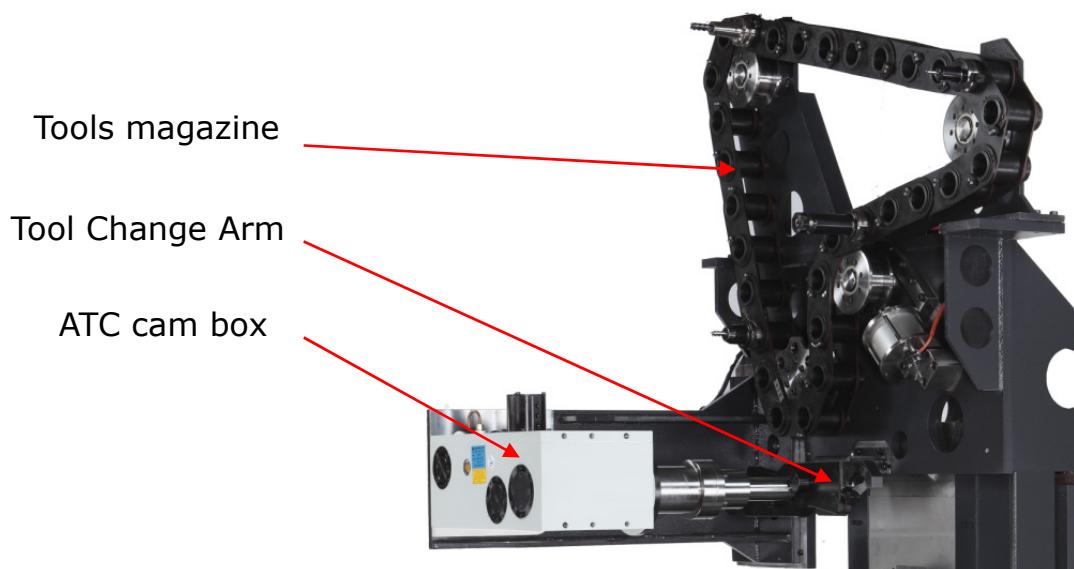
2.6 Dimensions of work table



2.7 Workable zone



2.8 Tool Magazine and ATC



2.9 Chip Removal

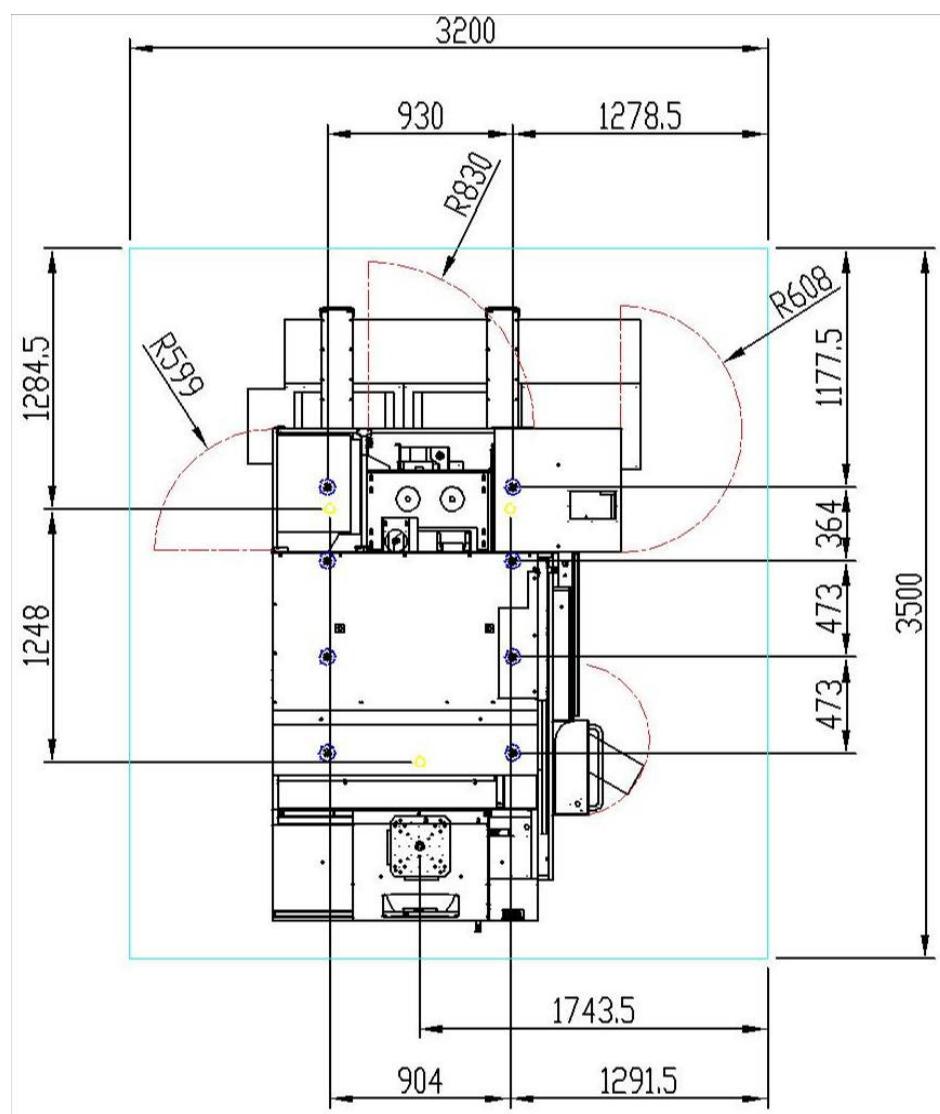
Chips were washed away from the interior of machine and flow into the chute where the chip screw augers or chip conveyor located. Then chips were collected at the exit of screw auger or conveyor.

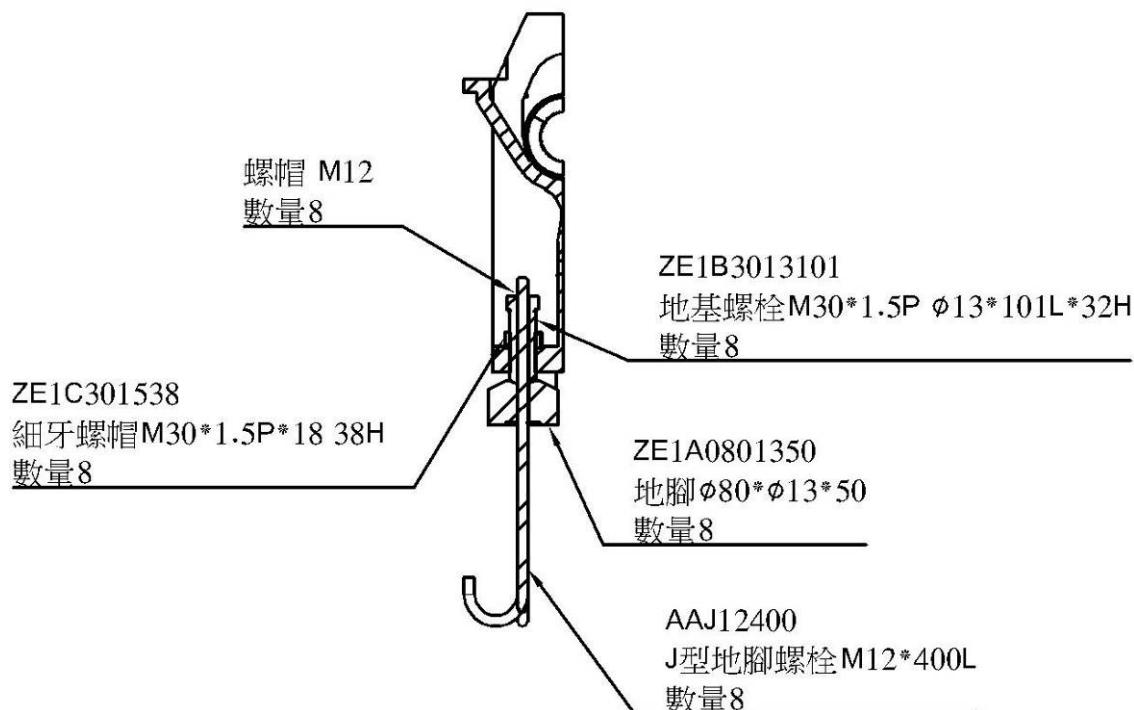
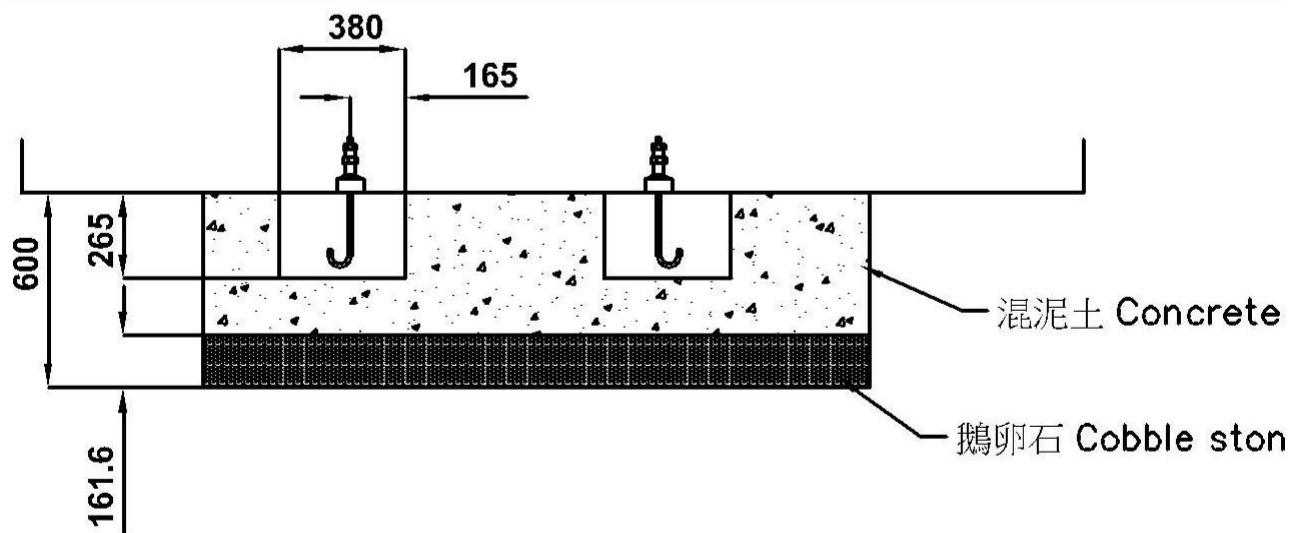
3. Installation

3.1 Foundation Preparation

The machine should be sited on a flat area (maximum fall 3mm in 3 m) free from cracks and expansion joints.

The composition of the floor and sub-structure should be of suitable construction to bear the weight of the machine. Any friable areas should be made good using recognized building construction techniques. If doubt exists we recommend you consult your building architect.

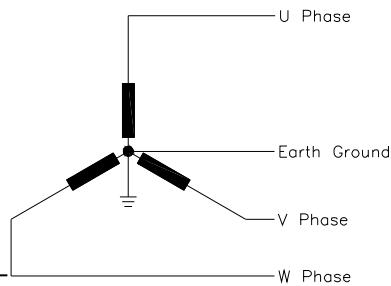




3.2 Power Preparation

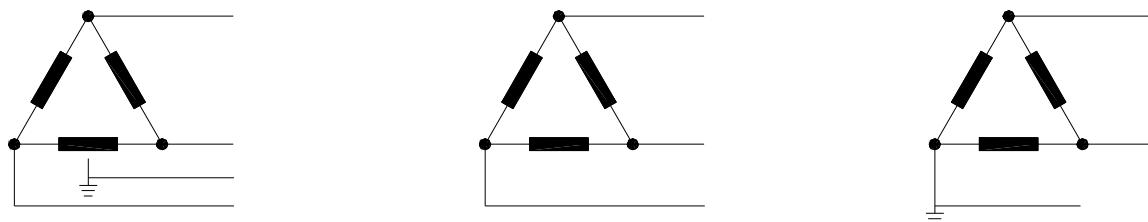
3.2.1 Line Configuration

The machine is designed to operate from a 3-phase AC incoming power source with an earth star point, as shown in the right. This incoming line short circuit current must be at least 2kA.



In other cases, such as those examples shown in figures below, an isolating transformer of 15kVA or larger capacity with an earth grounded WYE secondary is required between the incoming lines and the machine. The incoming line short circuit current must again be least 2kA.

Other Incoming Line Configurations

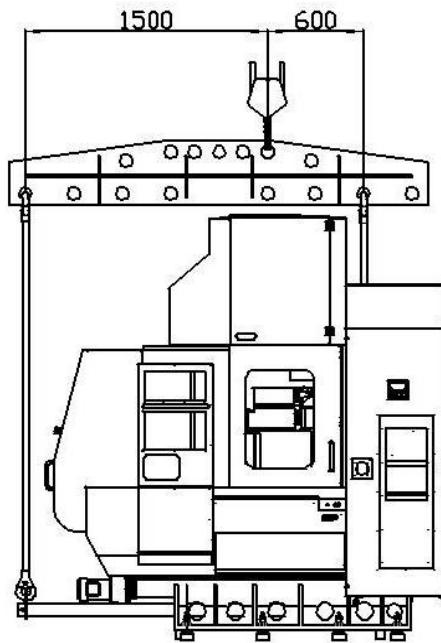
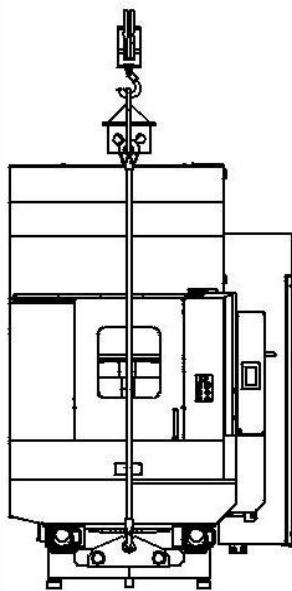
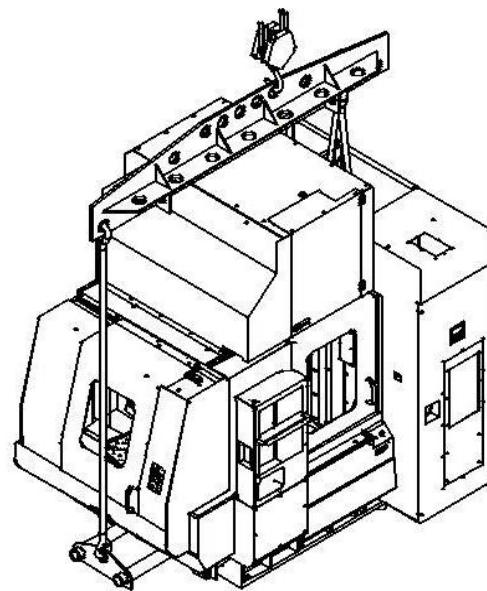
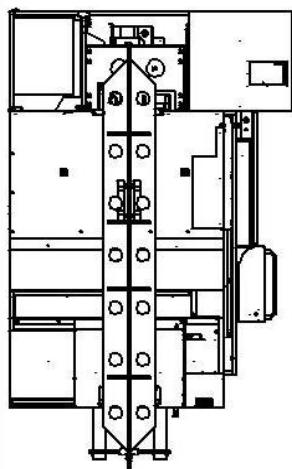


3.3 Unpacking

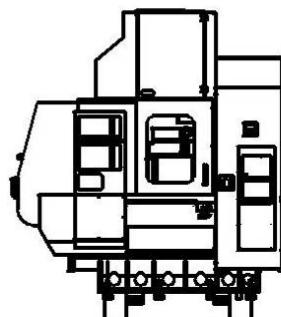
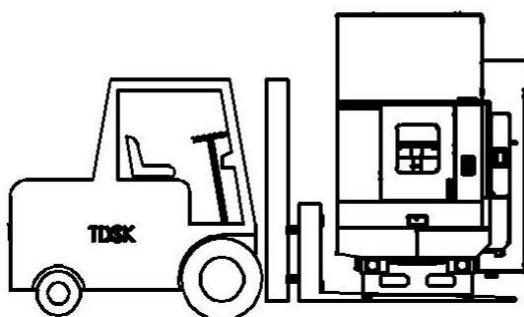
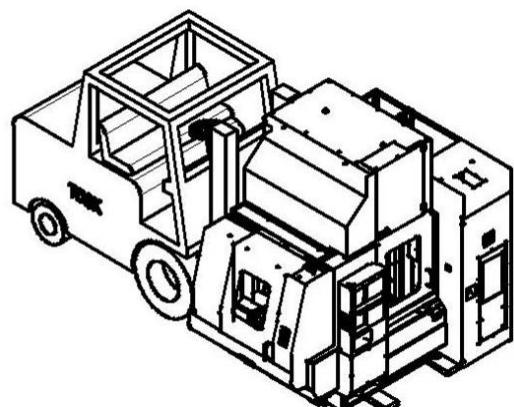
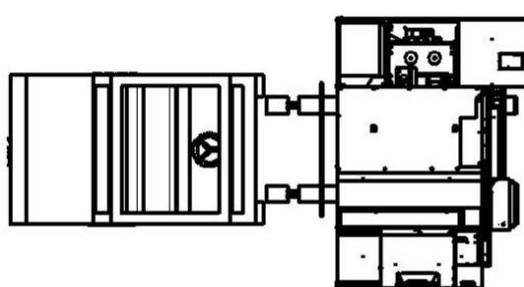
The machine was fixed on a skid during which could be pulled to the opening of container and then moved by a fork lifter. Select a chain according to the weight of the machine. Tie the chain to the skid and make sure the connection is secured. Slowly pull the machine and monitor the gap between the machine and the wall of the container.

3.4 Machine Lifting

Any lifting cables and slings must be rated to take the machine's weight.



If the machine is to be lifted by Fork Truck, the minimum capacity should be 120% of the machine weight and with a minimum tine length of 2,000mm.



3.5 Leveling of Machine

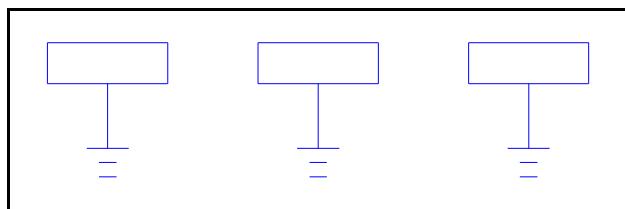
- a) Make sure the location of the machine is exactly where you need it to be. Ensure allowance for access for operation, cleaning and maintenance is provided. See the installation dimensional drawing for minimum clearances.
- b) Locate the floor pads which are packed with the associate kit and position them on the floor under each jack bolt. When satisfied lower the machine gently onto the pre-located pads. Ensure jack bolts are screwed down to provide a 10 to 15mm gap from the underside of the base casting to the floor.
- c) If you use skates then employ the jack bolts with suitable support packing to raise the machine enough to remove the skates and finally set onto the floor pads.

3.6 Before Power ON

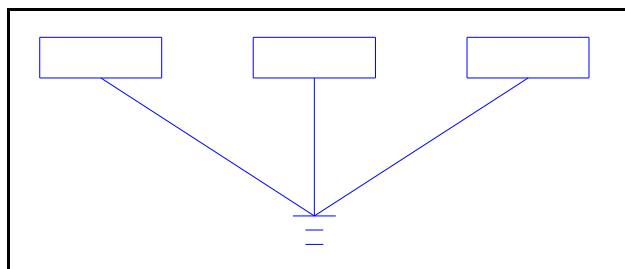
3.6.1 Grounding

- a) The machine must be grounded in order to protect personnel

- and the machine from electrical hazards. Grounding must be in accordance with the standards for electrical equipment.
- b) Ideally, the grounding point should be as close as possible to the machine.
 - c) A qualified electrician must carry out the grounding work, otherwise serious injury, death, or accidents involving machine damage could result.
 - d) The machine must be grounded in one of the following ways:
 - 1) Independent grounding

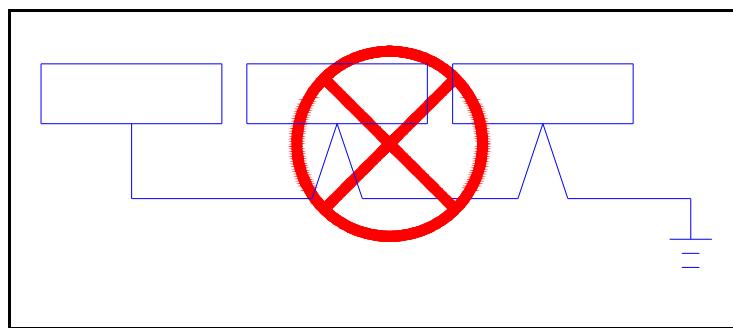


2) Common grounding



Regardless of the type of grounding system used, the earth loop impedance of the supply, which connects the machine to ground/earth, must not exceed 1 ohm.

- e) Never ground the machine in the manner shown in the illustration below.



No more than one grounding conductor wire can be connected to a single terminal. If the grounding conductors are connected in the manner shown in the illustration above, a faulty connection at one of the terminals could cause grounding current to be fed back to the

machine, resulting in serious accidents.

Once the electrical and air supplies are provided make the connection to the machine. The delivery dimensional drawing gives details of input locations.

ON NO ACCOUNT MUST YOU SWITCH ON THE MACHINE.

WE PREFER YOU TO REMOVE YOUR ISOLATOR FUSES OR TRIP CIRCUIT BREAKERS.

3.6.2 Power connection

A qualified electrician should only carry out connection of the power lead to the machine.

Cables, cords or electric wires of which insulation is damaged can produce current leaks and electric shocks. Check their condition before connecting.

Ensure the power cable to the machine main isolator has sufficient current carrying capacity to handle the electric power used.

Cables which must be laid on the floor, must be protected against chips, oil and coolants penetration, which might cause damage.

In the event of power failure, turn off the main circuit breaker immediately.

Fuses and circuit breakers should be replaced only with suitably rated alternatives. Safety devices should be replaced only with the machine manufacturers recommended parts.

Protect the CNC unit, operating panel, and electric cabinet etc from shocks which could cause a failure of malfunction.

Connect the power cable to main power terminal block. Ensure the



sign rotation of R, S, T phases.

Connect the ground cable to the Earth bar.

3.6.3 Misc.

Check the condition of the warning labels. If they are missing or become illegible, order replacements from your distributor according to the part number on the label plate. Do not remove warning labels.

After unpacking the machine clean all rust preventatives from the machine with a non-volatile cleaning fluid. Lightly lubricate each sliding part before trying to operate the machine. Manually operate the lubricating oil pump until oil oozes out from the slide way wipers.

Oil volume should be filled to the indicated level. Check and top up if necessary.

Use recommended oil brands and appropriate levels for all lubricating systems. See the instruction plate at the rear of the machine.

The coolant system comprises of a separate tank which houses the coolant pumps and is located beneath the front and left sides of the machine.

3.7 First Time Power ON

3.7.1 Rotation Direction of Motors

The rotation of 3-phase motors of pumps, chips removal and fans might be reversed due to the different phase sequence of city power U, V and W. Please confirm the rotation of all the coolant pumps and cooling fans.

3.7.2 Spindle Run-in

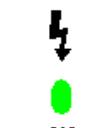
The grease inside the bearings of spindle might be concentrated by gravity due to temperature variation during the transportation and storage. It is a **MUST** to run the spindle following the procedures described in Appendix.

4. Operation

4.1 Power ON/OFF

Never turn off power during automatic operation or with the spindle or axes running unless an emergency occurs. It is better to interrupt the program by pressing the "Cycle Stop" push button.

Ensure that all Emergency Stop Buttons are unlocked.



Turn the machine on at the isolator.

Press the power ON button on the control panel and the machine will take a few moments to boot up.



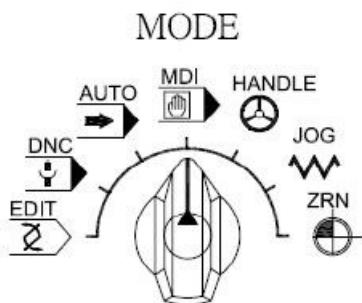
4.2 Automatic Power OFF

Find the software switch in "offset" screen. Turn the switch ON and the control will shut power OFF once M30 was executed in CNC program.

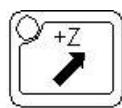


4.3 Reference (or "ZERO RETURN" or "HOME") the Machine

- 1) Turn the mode selection switch to ZERO RETURN.



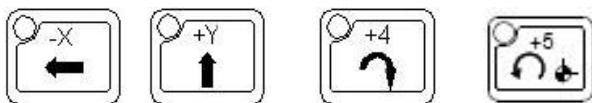
- 2) Press +Z button, Z axis should move upward until the ZERO POINT INDICATION LAMP light up.



- 3) Press -X, +Y, +4, +5 buttons. Axes will



move until the ZERO POINT INDICATION LAMP light up.



Note: If any of the Machine axes are already over the referencing point, it may be necessary to manually move the axis away in jog mode before beginning the reference procedure.

4.4 Machine Warm-up

*** If the machine is used to produce components immediately after being started, following a long idle period, sliding parts may be worn due to lack of oil and thermal expansion of the machine can jeopardize machining accuracy. To prevent this condition, always warm the machine up. ***

We recommend that the machine is 'Warmed up' prior to operation by running all axes for 20 minutes at the speed of actual cutting in the automatic operation mode. The spindle speed should be gradually increased up to actual cutting speed.

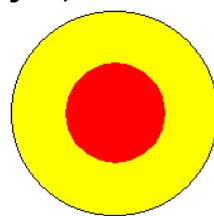
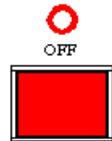
4.5 Spindle Warm-up

If the following procedures are not followed, spindle life will be reduced significantly. Follow the speed and running time duration in the table for each type of spindle. Please note that the duration is either in minutes (m) or in seconds (s).

	Spindle speed (% of max. speed)	Duration (minutes)
Daily	20%	10
Spindle stopped more than 72 hours	20%	10
	50%	10
Spindle stopped more than 2 weeks	20%	15
	40%	15
	60%	30
	80%	30
	100%	40

4.6 Interrupting Operation

When leaving the machine temporarily after completing a job, turn off the power on the operator panel with the Emergency Stop button and turn off the main isolator.



4.7 Jobs Finished

Always clean the machine and supporting equipment down after use. Remove and dispose of chips and clean the covers and windows etc.

Return each machine component to its initial condition.

Check wipers for damage and replace if necessary.

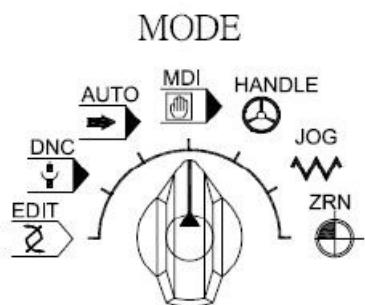
Check coolants, hydraulic oils and lubricants for level & contamination. Change them if you suspect they are contaminated.

Clean the filter on the top of the coolant tank.

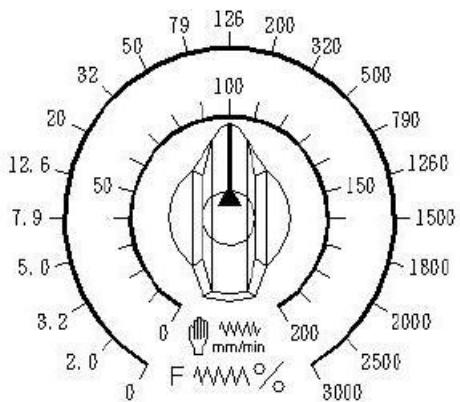
Turn off the power first on the control panel with the emergency stop button and then at the main isolator before leaving the machine at end of the shift.

4.8 Jog Axis

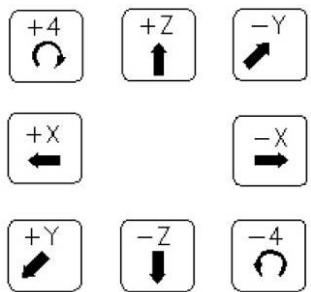
To manually jog an axis, first turn the mode selection switch to JOG mode.



Turn the axis movement override to desired speed.
(0-3000mm/min)



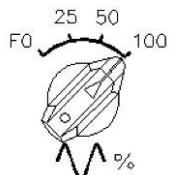
Press the button corresponding to the desired axis and direction.



For rapid movement, press the RAPID MOVEMENT button together with button of desired axis and direction.

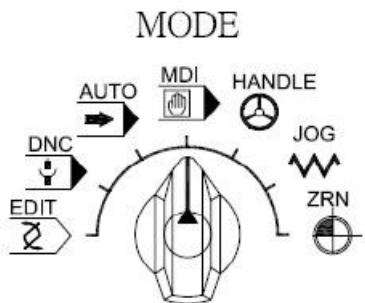


The feed rate of RAPID JOG can be overrided by RAPID MOVEMENT SPEED override. (F0% and 100% are set in parameters)



4.9 Jog Axis by MPG

To manually move axis using the Handwheel, first turn the mode selection switch to HANDLE mode. Then use the knobs and MPG on remote jog box.



4.10 Tool Loading/Unloading

Switch to JOG or HANDLE mode.

Open guard door of machine.

While holding the tool, press and hold the clamp/unclamp button on the machine head to release the tool (See illustration). Replace tool and release the button to clamp.



Close guard door of machine.

Using AUTO or MDI, load the correct tool number into the Magazine.

4.11 Large Tool management

Large tool is the tool with diameter larger than the allowable diameter as described on the label near tool magazine. This kind of tool can be used, providing the adjacent tool pots are empty.

For arm type tool changer, the tool number is independent to the pot number of magazine. Therefore a careful management of the tool number of large tool is necessary.

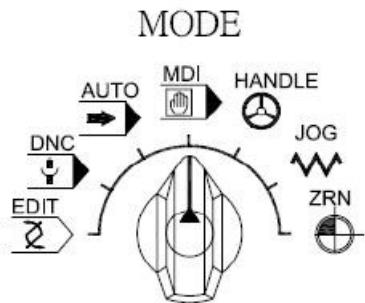
In this machine, the large tools are set prior to standard tools and are fixed in pots with least pot number.

All the user has to do is to determine the number of large tools need

to be used and set this number in D63.

Procedure to input the tool information:

- 1) Switch to HANDLE mode.



- 2) Refer to the section "Parameters editing" in Appendix to enter the parameters editing screen.
- 3) DATA EDITING KEY must be turned ON.

- 4) Press 
- 5) Press  to next page.
- 6) Press softkey [**PMCMNT**]
- 7) Press  to next page.
- 8) Press softkey [**DATA**]
- 9) Enter the tool information to related address.

Example:

Address	data	Meaning
D63	0	No large tools
D63	1	One large tool (#1) and stored at Pot #2.
D63	2	Two large tools (#1) and stored at Pot #2, #4
D63	3	Three large tools (#1) and stored at Pot #2, #4, #6

Note: The maximum large tools number is half of the pots number in the magazine.

5. Maintenance

DANGER!

Before carrying out any maintenance work, ensure that the machinery is switched off and disconnected from the main power supply. Also ensure that the necessary warning signs and /or locks are appointed to stop any unauthorized persons from switching the power on to the machine until the work is complete and the machinery is safe to operate.

The above warning signs or indications should be secured by a semi-permanent means with the printing clearly visible.

Only qualified and competent maintenance engineers should carry out machinery maintenance work. Working on live electrical equipment must be carried out by only suitably qualified electricians.

WARNING!

Over travel limit switches, proximity switches and interlock mechanisms including all functional parts should **not** be removed or modified.

When working in high places, use steps or a ladder which are maintained daily for safety.

Use only fuses, cable's etc. from reputable recognized manufacturers.

CAUTION!

The maintenance person should check that the machine operates safely after the work is completed. Maintenance and inspection data should be recorded and kept for reference.

5.1 Routine Inspection

5.1.1 Daily

1. Check pressure gauges for proper reading. Air pressure 5.5bar (80psi). Hydraulic pressure 68bar (986psi)
2. Check that there is sufficient oil in the air lubricator.
3. Check motors and other parts for abnormal noises.
4. Check the lubrication of sliding parts for evidence of proper lubrication.
5. Check safety covers and safety devices for proper operation.
6. Check coolant level and fill as necessary.
7. Clean dirt and chips from the axes and empty the swarf trays.

5.1.2 Weekly (In addition to daily routine)

1. Clean chips and dirt from the entire machine and wipe down.
2. Check the air filter at the rear of the electrical cabinet. Replace the filter element if it is contaminated.
3. Check all polycarbonate vision panels for signs of damage – crazing, cracking etc. or reduced visibility and replace if necessary. Contact your distributor for details.
4. Check the spindle cooler/chiller is running properly and the coolant temperature is near the temperature setting.
5. Check the spindle front draining hole from labyrinth is not jammed by dirt.
6. Check the air purging at the spindle nose. Run the spindle for 10 seconds and stop. Listen or feel the air flowing from the gap between the spindle shaft and housing.

5.1.3 Yearly (In addition to weekly routine)

1. Remove the filter from the air filter bottle and clean/replace.
2. Check spindle drive belt condition and tension.
3. Check lost motion.
4. Check the condition of the linear rail wipers.
5. Check the integrity of the electrical connections and inspect the condition of the insulation.
6. Check condition of coolant filters and replace if necessary.

5.2 Lubrication

5.2.1 FRL unit

FRL unit offer air cleaning and air lubricating function. The lubricating oil discharge rate could be adjusted by a knob on FRL unit.

5.3 Cleaning

5.3.1 Machine Interior:

Chip might spatter and accumulated inside of MAGAZINE guard or somewhere that washdown coolant can't reach after machining. Oil/coolant condensation might be accumulated inside of HeadStock and effect machine operating in good condition. It needs to be check or clean out.

6. Trouble shooting

6.1 ATC system:

1. Tools falling down when arm rotating:

Tool can not be clamped well due to arm grip or stop pin is seized or arm and spindle are not aligned.

2. Arm not stopped at home position (for example: Emergency Stop Button was pressed during tool changing):

- 1) Change to JOG mode.
- 2) Press the button Manual Tool Change for 3 seconds, the lamp of CYCLE START button will start flashing.
- 3) Press the CYCLE START button, the arm will move forward a little bit.
- 4) Keep pressing CYCLE START button until the arm reach home position. Pay attention to any potential interferences along the path of arm swinging.
- 5) Press RESET to clear all alarms.
- 6) Confirm the tool number registered to actual tools in magazine.



6.2 APC system:

1. Arm not stopped at home position (for example: Emergency Stop Button was pressed during tool changing):

- 1) Confirm no potential interference.
- 2) Conform the front door closed and lock pin inserted.
- 3) Change to JOG mode.
- 4) Press the button READY at the APC panel for 3 seconds, the lamp of READY button and CYCLE START button will start flashing.
- 5) Press the CYCLE START button, the APC will finish the movement.
- 6) Confirm the pallets are located in right position and well locked.
- 7) Press RESET to clear all alarms.
- 8) Confirm the pallet number is correct.

6.3 Cooling, Coolant and lubrication system.

1. Lubrication oil level too low

Refill lubrication oil into tank

2. Lubrication pressure too low

Refill lubrication oil or replace whole lubricator unit.

3. Coolant pumps noise.

Pump sealing is break down or chip materials invade into pump.

6.4 Door switch system

1. Front door is opened

Close front door or replace interlock switch

6.5 Alarm messages and remedies

Alarm No.	Alarm Message	Cause	Remedy
1001	SAFETY DOOR NEED CLOSE!	Door not close Key not inserted into switch properly Safety switch malfunction	Close the door Re-align the key with safety switch Replace safety switch
1003	SPINDLE ALARM!		Check the alarm number from controller or from the inverter and contact the service of controller
1004	SP GEAR SHIFT ALARM!		
1005	ATC NOT READY!		
1007	TF<= 0 COMMAND ERROR!	Tool number smaller than 0!	Press RESET and correct the T code.
1008	TF IS NOTHING IN TOOL BOX	Tool number not registered in tool table!	Press RESET and correct the T code.
1009	MAG PMM SERVO ALARM!		Turn the machine power OFF and ON. If the problem still existed, contact the service of controller.
1010	MAG PMM BATTERY ALARM!		Contact the service of controller.
1011	MAG (C0) SETTING ERROR!		
1012	YZ IN DANGER AREA!		
1013	MAG NOT READY!		See troubleshooting.
1014	SP.ORI ALARM!	NC parameters (No. 4000-4099) not corrected.	Correct the parameters and press RESET.
1015	MOTOR OVERLOAD!	Motors of the following tripped overload contactor or fuse burned. Coolant (-F213) Chip conveyor (-F217, -F218) Lube unit (-A204)	Check any debris jammed in the transmission. Clear the debris, reset the overload contactor or replace the fuse. Then press RESET.

Alarm No.	Alarm Message	Cause	Remedy
		CTS (-F237) Chip wash down (-F232)	
1017	AXIS OIL MATIC ALARM!		
1019	M6 SWAP POSITION MISSED!		
1020	SPINDLE OIL MATIC ALARM!	Oil level in spindle oil cooler too low.	Refill the spindle oil cooler. Then press RESET.
1021	TOOL MEASURE ALARM!		
1022	TOOL LIFE EXHAUST!		
1026	JIG NEED CLAMP!		
1027	AIR PRESSURE FAILED!		
1028	ATC (D52) SETTING ERROR!		
1029	SP TOOL CLAMPING FAILED!	Spindle clamping sensor not adjusted properly. Poor wire connection to spindle clamping sensor. Spindle clamping sensor malfunction.	Adjust the sensor conforming to the clamping/unclamping stroke. Improve the wiring. Replace the sensors.
1030	MAG (D51) SETTING ERROR!		
1032	AUTO DOOR CLOSE FAILED!		
1034	SP TOOLS OVERLOAD!		
1035	WORKPIECE MESUREMENT ERRO		
1036	OIL AIR LUBE ERROR!		
1037	DC24V POWER SUPPLY ERROR!		
1038	OVER CYCLE ALARM!		
1039	BIG TOOL RESET		
1040	SP MIST OIL AIR PRESSURE LOW!		
1041	B AXIS CLAMP/UNCLAMP ERROR!		
1046	WORKPIECE PROBE LOW BATTE		

Alarm No.	Alarm Message	Cause	Remedy
1058	ATC DOOR NOT CLOSE!		
1059	ATLM COVER NOT OPEN		
1061	ATC CYCLE FAILED		
1063	ARM POSITION NOT HOME!		
1065	NONE TF COMMAND!		
1084	APC (D53) SETTING ERROR!		
1089	APC PMM SERVO ALARM!		Turn the machine power OFF and ON. If the problem still existed, contact the service of controller.
1090	APC PMM BATTERY ALARM!		
1091	WORK TABLE NOT UNCLAMP!		
1092	APC TABLE NOT UNCLAMP!		
1093	APC CHANGE ERROR!		
1094	APC CHANGE TIME OVER		
1095	WORK TABLE AIRTIGHT ERROR!	Air pressure not enough. Pressure sensor not set properly. Work table was not laid down properly.	Check air pressure. Adjust the pressure sensor. Check any debris interfering between work table and cones.
1096	APC CHANGE ARM AIRTIGHT AL!		
2000	GEAR NEUTER!		
2001	NOT ON TOOL CHANGE POINT!		
2002	CHANGE GEAR CROSSPIECE FA		
2003	LUBE OIL LEVEL TOOL LOW!		
2004	LUBE PRESSURE TOOL LOW!		
2005	PLEASE CLOSE MAG DOOR!		
2006	APC SAFETY DOOR NOT REDAY		



Alarm No.	Alarm Message	Cause	Remedy
2008	PARTS COUNT ARRIVE!		
2016	MAG DOOR NOT CLOSE!		
2017	SPINDLE OIL LEVEL LOW!		
2022	CTS OUT PRESSURE SWITCH!		
2023	CTS OUT FILTER OBSTRUC!		
2024	CTS AUXILIARY LEVEL LOW!		
2031	PLEASE CHECK AB TABLE POSITION!		
2032	APC TABLE NOT READY!		Press the READY button on APC panel.
2033	APC TABLE ROT NOT 0 DEG	The lock pin not inserted properly at pallet at pre-zone.	Insert the lock pin properly and then press RESET.
2034	APC DOOR NOT CLOSE	The lock pin not inserted properly at pallet at pre-zone.	Insert the lock pin properly and then press RESET.
2036	WORK TABLE UNCLAMP		
2040	MACHINE GUARD IS OPEN!		

7. Appendix

7.1 Power requirements: 45 kVA

7.2 Pneumatic requirements

	Unit	Value
Pressure	bar	> 5.5
Flow rate	Litre/min	> 400
Dew point (at ATM. Pressure)	°C	-17 or lower

Note: The air supply must be clean (40micron particulate size) and dry.
 Do not connect direct to a compressor with a short pipe as water/oil may condense out and cause a potential seizure of the spindle bearings through the air purge circuit.
 An air drier unit is recommended.

7.3 Spindle run-in procedures

12000 rpm		10000 rpm		8000 rpm	
Speed (rpm)	Time	Speed (rpm)	Time	Speed (rpm)	Time
1000	5 m	1000	5 m	1000	5 m
5000	3 s	5000	3 s	5000	3 s
2000	5 m	2000	5 m	2000	5 m
10000	3 s	10000	3 s	9000	3 s
3000	5 m	3000	5 m	3000	5 m
12000	3 s	--	--	--	--
4000	5 m	4000	5 m	4000	5 m
5000	5 m	5000	5 m	5000	5 m
6000	5 m	6000	5 m	6000	5 m
7000	5 m	7000	5 m	7000	5 m
8000	5 m	8000	5 m	8000	5 m
9000	5 m	9000	5 m		
10000	5 m	10000	5 m		
11000	15 m				
12000	15 m				

7.4 M-function Codes

	Function Description
M00	Program stop, spindle & coolant.
M01	Optional Program stop, spindle & coolant.
M02	End of program, spindle & coolant.
M03	Spindle run CW
M04	Spindle run CCW
M05	Spindle stop
M06	Tool change
M07	Oil mist ON
M08	Coolant ON
M09	Oil mist and all coolants OFF
M10	Auto door open
M11	Auto door close
M12	CTS ON
M13	Chip wash down ON
M14	Air blow ON
M15	Air blow OFF
M16	Chip wash down OFF
M17	Tool probe ON/Parts probe OFF
M18	Tool probe OFF/Parts probe ON
M19	Spindle orientation
M20	Tool probe air purge ON
M21	Tool probe air purge OFF
M23	4 th axis clamp
M24	4 th axis unclamp
M25	5 th axis clamp
M26	5 th axis unclamp
M29	Rigid-Tapping
M30	End of program, spindle & coolant, reset & rewind program
M34	Tool number re-organize (for machine builder only)
M35	Pallet number re-organize (for machine builder only)

	Function Description
M41	Chip conveyor forward
M43	Chip conveyor stopped
M44	Chip wash down ON
M45	Chip wash down OFF
M50	Spindle air purge ON
M51	Spindle air purge OFF
M52	Fixture #1 clamp
M53	Fixture #1 unclamp
M54	Fixture #2 clamp
M55	Fixture #2 unclamp
M56	Fixture #3 clamp
M57	Fixture #3 unclamp
M58	Fixture #4 clamp
M59	Fixture #4 unclamp
M77	Tool magazine door open
M78	Tool magazine door close
M94	Mirror cancellation
M95	Mirror along X axis
M96	Mirror along Y axis
M97	Mirror along Z axis
M98	CALLING OF SUBPROGRAM
M99	END OF SUBPROGRAM
M101	Automatic tool length measurement
M119	Multiple spindle orientation
M123	Pallet at pre-zone UP
M124	Pallet at pre-zone DOWN
M125	Pallet at working zone UP
M126	Pallet at working zone DOWN
M127	A pallet exchange

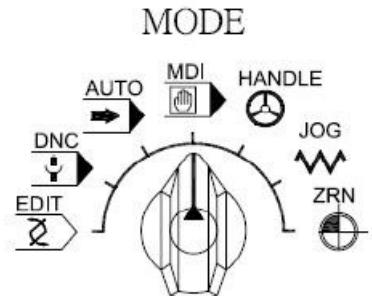
	Function Description
M128	B pallet exchange
M130	A/B pallet exchange
M131	Automatic feed control (AFC) ON
M132	Pallet change air blow (light load)
M133	Pallet change air blow (heavy load)
M140	Pallet air seal ON
M141	Pallet air seal OFF
M198	CALLING OF SUBPROGRAM in memory card or data server

7.5 User Definable Parameters

7.5.1 Parameters editing

NOTE: Do not change the parameters that you do not fully understand. The warranty may be void if parameters were set incorrectly and damage the machine.

- 1) Turn the mode selection to MDI mode.

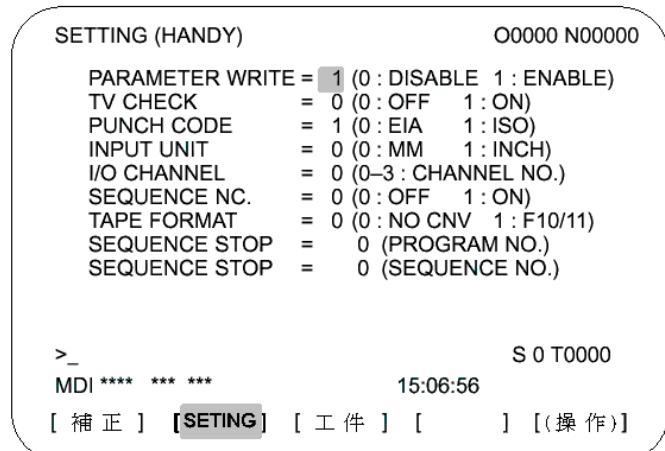


- 2) Press key

- 3) Press soft key [**SETTING**]

- 4) Move cursor to "PARAMETER WRITE=" and type "1", then press

- 5) An alarm message "**100 P/S ALARM**" showing up, which means the parameters editing mode was ON.



Note:

- 1) To remove the "**100 P/S ALARM**" message, press and simultaneously.
- 2) The DATA EDITING KEY must be turned ON while editing PMC parameters.
- 3) If the message "**000 P/S ALARM**" showed up after editing parameters, the power must be cycled OFF and ON to make the modification effective.

7.5.2 Timer table

Timer NO	ADDRESS	DATA (ms)	DISCRIPTION
1	T0	480000	Oil air lubrication OFF time
2	T2	60000	Spindle oil cooler OFF time
3	T4	300000	Axis lubrication ON time (5 minutes)
4	T6	1200	Axis lubrication OFF time (4 hours)
7	T12	1968	Delay time before alarm of auto door completion
8	T14	1968	Delay time before M52 completion
9	T16	2000	Delay time before M53 completion
10	T18	2000	Delay time before M54 completion
11	T20	2000	Delay time before M55 completion
12	T22	2000	Delay time before M56 completion
13	T24	2000	Delay time before M57 completion
18	T34	200	Delay time before confirmation of 4th axis clamped
19	T36	200	Delay time before confirmation of 5th axis clamped
20	T38	1000	Delay time before confirmation of release of brake of gravity axis
22	T42	8000	Oil air lubrication ON time
25	T48	200	Delay time before spindle air blast during tool change
26	T50	2000	Spindle air blast ON time during tool change
27	T52	2000	Air blast ON time after shut down of CTS
28	T54	200	Delay time before air blast after shut down of CTS
29	T56	496	Delay time before confirmation of spindle unclamp
30	T58	0	Delay time before confirmation of spindle clamp
41	T80	100	M41 chip conveyor ON time
42	T82	1000	M43 chip conveyor OFF time
43	T84	10000	Delay time before APC continuously change
45	T88	3000	Delay time for exterior pallet #1 air blow ON
46	T90	1496	Delay time for exterior pallet #1 air blow OFF
47	T92	6496	Delay time for exterior pallet #2 air blow ON
48	T94	2496	Delay time for exterior pallet #2 air blow OFF
49	T96	2496	Delay time before confirmation of APC arm rise to air seal location
50	T98	5000	Time to confirm APC arm with air seal
157	T314	0	Delay time to move PMC axis
158	T316	1000	Delay time before confirmation of PMC axis movement

7.5.3 Keep Relay list

Address	DESCRIPTION
K00.0	0: Status beacon not activated when program finished with M00/M01. 1: Status beacon activated when program finished with M00/M01.
K00.1	0: Spindle orientation reset after tool change. 1: Spindle orientation NOT reset after tool change.
K00.2	0: The smallest unit of jog wheel NOT multiplied by 10 1: The smallest unit of jog wheel multiplied by 10
K00.3	0: No message after parts counter reached preset value 1: Show message after parts counter reached preset value
K00.4	0: Spindle stopped at M00/M01 1: Spindle NOT stopped at M00/M01
K00.5	0: Oil Mist (M07)/Coolant(M08)/Air blow(M14)/CTS(M12)/Chip wash down(M13) stopped at M00/M01 1: Oil Mist (M07)/Coolant(M08)/Air blow(M14)/CTS(M12)/Chip wash down(M13) NOT stopped at M00/M01
K01.2	0: Chip wash down activated independently 1: Chip wash down activated together with CTS and Coolant
K01.3	0: Oil Mist (M07)/Coolant(M08)/Air blow(M14)/CTS(M12)/Chip wash down(M13) stopped at Spindle stopped (M05) 1: Oil Mist (M07)/Coolant(M08)/Air blow(M14)/CTS(M12)/Chip wash down(M13) NOT stopped at Spindle stopped (M05)
K01.4	0: Check the signal from pressure sensor of CTS 1: Ignore the signal from pressure sensor of CTS
K01.6	0: Spindle stopped if ALM1034 existed. 1: Spindle NOT stopped even ALM1034 existed.
K02.0	0: Check air pressure signal 1: Ignore air pressure signal
K02.4	0: Press RESET, the NC program will NOT return to beginning during program execution. 1: Press RESET, the NC program will return to beginning even during program execution.
K02.5	0: Chip conveyor can only be turned ON and OFF during AUTO mode 1: Chip conveyor can be turned ON and OFF in any mode
K02.6	0: Chip conveyor can NOT be activated with M code during AUTO mode. 1: Chip conveyor can be activated with M code during AUTO mode.
K02.7	0: Chip conveyor activated continuously. 1: Chip conveyor activated by timer settings.
K03.0	0: With spindle oil cooler 1: Without spindle oil cooler
K03.1	0: Pressure signal is NO type. 1: Pressure signal is NC type..
K04.5	0: Gravity axis NOT need of calibration first 1: Gravity axis calibration first

Address	DESCRIPTION
K04.7	0: Turn ON machine self-protection. 1: Turn OFF machine self-protection. (reset to 0 once power ON)
K05.7	0: Spindle air purge time determined with default value in PLC 1: Spindle air purge time determined with T23 and T24
K06.0	0: Using APC ready key 1: NOT using APC ready key
K06.1	0: APC arm air seal detection. 1: APC arm air seal NOT detection
K06.2	0: Pallet cone flush ON. 1: Pallet cone flush OFF.
K06.3	0: Normal pallet change 1: pallet at working zone move up and down one more time after the pallet change
K06.5	0: Arm down brake controlled by external timer 1: Arm down brake controlled by PLC
K06.6	0: Chip wash down NOT activated together with spindle ON/OFF. 1: Chip wash down activated together with spindle ON/OFF.
K06.7	0: Air seal checked only during pallet change 1: Air seal checked all the time.
K07.1	0: Reverse the chip auger by pressing reverse button. 1: Reverse the chip auger by pressing forward button first, then reverse button.
K09.2	0: Not using RENISHOW MP11 parts probe 1: Using RENISHOW MP11 parts probe
K10.0	0: 5 th axis is NOT a index table 1: 5 th axis is a index table
K10.1	0: 4 th axis normally clamped 1: 4 th axis normally unclamped
K11.0	0: Not using PMC axis control 1: Using PMC axis control
K11.1	0: Spindle MUST with orientation before spindle unclamp 1: Spindle no need of orientation before spindle unclamp
K11.2	0: Not using tool number display macro 1: Using tool number display macro
K11.6	0: The pallet on 4 th axis will clamp/unclamp automatically during JOG mode. 1: The pallet on 4 th axis will NOT clamp/unclamp automatically during JOG mode.
K12.6	0: 5 th axis will unclamp automatically during Jog 1: 5 th axis can only be unclamp with M code

Address	DESCRIPTION
K12.7	0: 5 th axis will unclamp automatically during operation of Remote Jog 1: 5 th axis can only be unclamp with M code
K13.0	0: Hi/Lo speed change with gears 1: Hi/Lo speed change with motor coil connections
K14.0	0: Ignore signals from sensors for X, Z and B axis of the pallet change position. 1: Check signals from sensors for X, Z and B axis of the pallet change position.
K14.2	0: Check signal from safety interlock of pallet change door 1: Ignore the signal from safety interlock of pallet change door
K14.3	0: Check signal from safety interlock of magazine door 1: Ignore the safety interlock of magazine door.

7.6 Machine floor space

7.6.1 MBH-3

