USER MANUAL

for
MBV Series
With Mitsubishi M70

Revised: August 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 3 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 8.39kg.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)

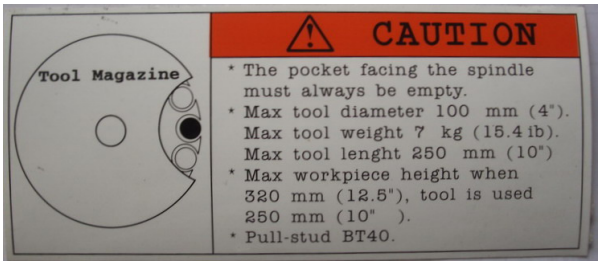
Limited machine functionality is available to the operator whilst the main door is open. The handwheel and jog keys are allowed to move the machine axes at feed rates of 1260mm/min and less. Spindle operation is prohibited whilst the main door is open as the spindle contactor is hard wired through the 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 Z-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 oil for linear rail and ballscrew

Lubrication oil for linear rail and ballscrew are as follow:

Qt'y	Recommended oil
4 liter	FEBIS K68 (ESSO) VACTRA NO.2 (MOBIL) TONNA OIL T68 (SHELL)

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 Cutting fluid

Cutting fluid and mixing ratio with water are recommended by following table. The micro-biological condition should be monitored and controlled via sterilization or replacement of coolant.

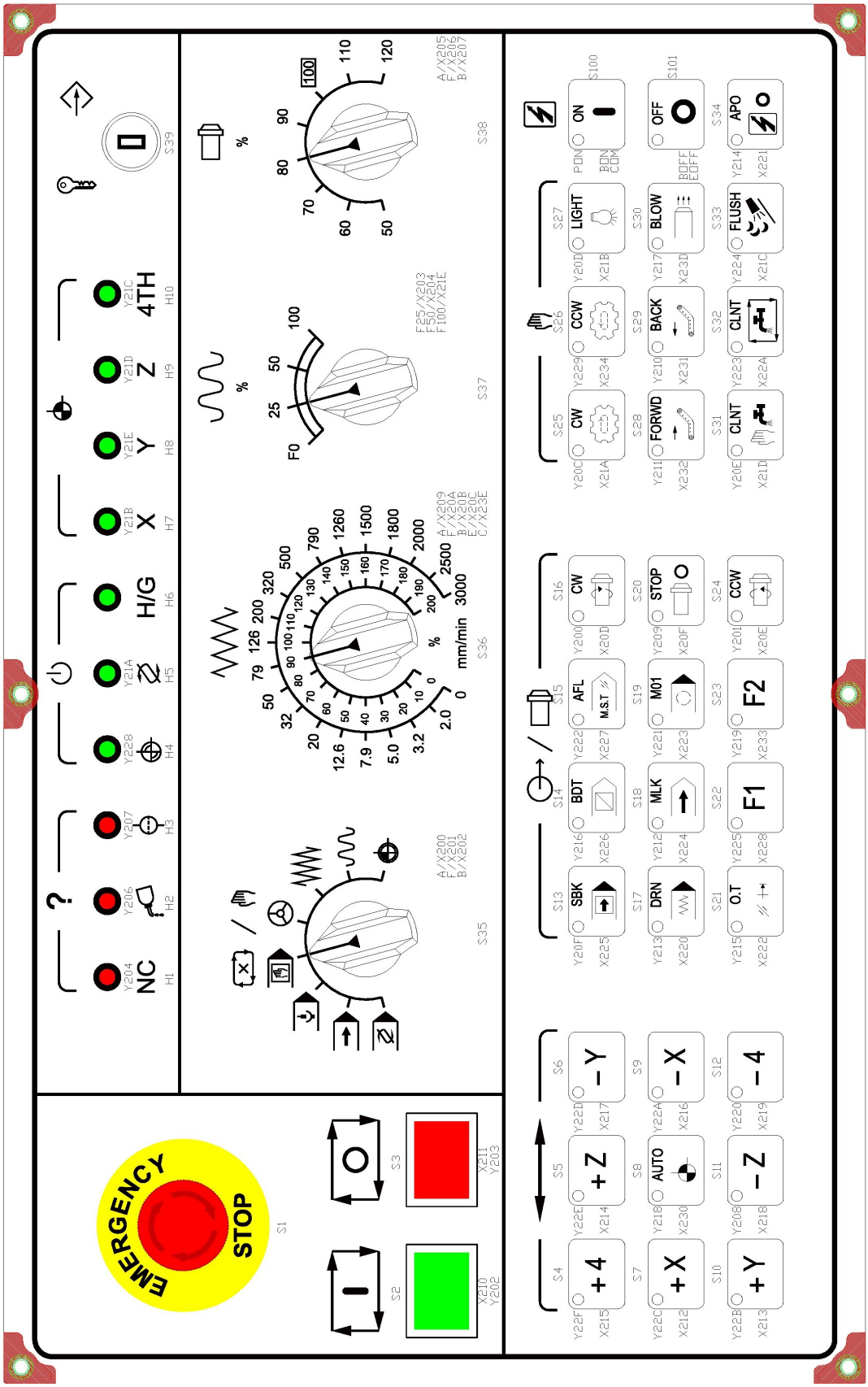
Marker: Castrol			
No.	**Type**	**Application**	**Dilution ratio with water**
1	SYNTIOL-9913	Aluminum cutting only	1:15
2	ALUSBL-B	Aluminum cutting only	1:15
3	HYSOL-X	Various material cutting	1:20

	MBV-6	MBV-8	MBV-10	MBV-12
Tank capacity (L)	220	220	440	520

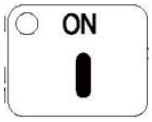
2.1.4 Oil for chiller

Hydraulic oil or lubrication oil with viscosity 4-300cSt. The temperature of the environment should also be taken into consideration. The hotter the weather, a less viscous fluid should be used.

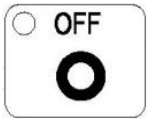
2.2 Operation Panel



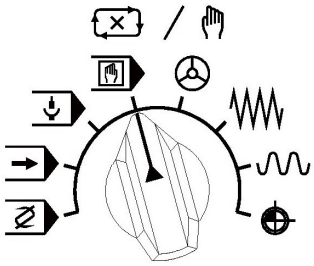
(1) Power ON: Turn ON the power of the controller.



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

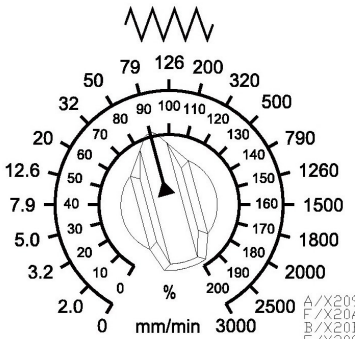


(3) Mode selection: From Left to right, CW.



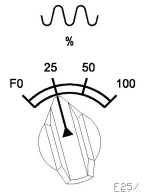
EDIT: Program editing mode.
AUTO: Program execution mode.
DNC: PC connection mode.
MDI: Manual Data Input mode. (single block command, tool offset, etc…)
HANDLE: Axis movement by hand wheel on Remote jog unit.
JOG: Slow movement of axis.
RAPID: Rapid movement of axis
ZERO RETURN: Return to the zero point of each axis.

(4) Feed rate override:



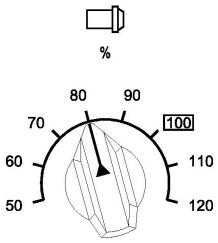
Effective for commands or program in MDI, AUTO or TAPE modes. Override from 0% to 150%. In JOG mode, the axis will move in speed ranging from 0 to 1260mm/min for JOGGING and DRY RUN.

(5) Rapid movement speed override:

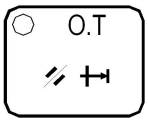


Effective in modes RAPID, ZERO RETURN or the commands G00 in program execution.

(6) Spindle speed override:



(7) Over travel alarm release:

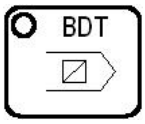


Once the axis moved over travel and machine halted, keep pressing this button and jog the axis away from travel limit. Then zero return the axis.

(8) Single block execution switch:

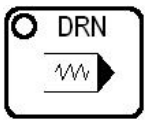
Effective in AUTO mode. Only one block will be executed when the CYCLE START was pressed, if this switch was turned ON.

(9) Ignore marked blocks switch:



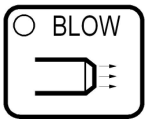
Blocks with "/" marked will be ignored if this switch was ON.

(10) Dry run:



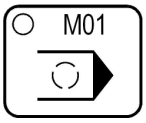
In AUTO, MDI or TAPE modes, the "F" command will be overrided by "Feedrate override knob", if this button was ON.

(11) Air blow (optional):



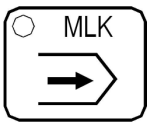
Compressed air will be ON at blowing nozzle, if this button was ON.

(12) Optional program halt:



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

(13) Axis movement lock:

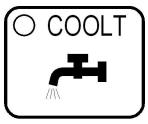


Axis movement will be halted, if this button was ON. Program keeps execution and M, S, T commands were not affected. Machine must be ZERO RETURN after this function.

(14) Automatic power off:

Machine will be automatically powered OFF 20 seconds (setting in diagnostic parameter) after M30 was executed, if this button was ON. In the 20 seconds period, this function can be cancelled if CYCLE START or RESET or this button was pressed.

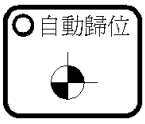
(15) Coolant:



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

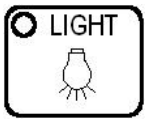
In AUTO mode, coolant pump will be activated by M08 command or stopped by M09 or this button.

(16) Automatic coordinate zero return

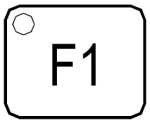


All axes will go home in zero return mode in the order of Z→ X&Y&4.

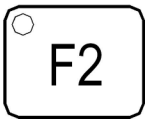
(17) work lamp.



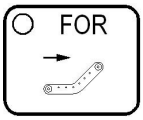
(18) F1 switch:



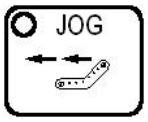
(19) F2 switch:



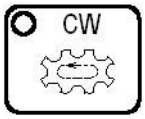
(20) Chip conveyor forward (optional): Effective in AUTO and manual modes.



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

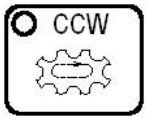


(22) Tool magazine rotation CW:



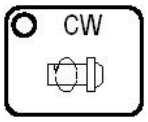
Effective in manual mode.

(23) Tool magazine rotation CCW:



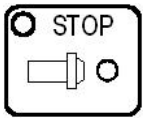
Effective in manual mode.

(24) Spindle CW:

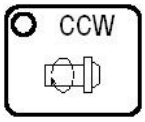


Effective in manual mode.
"S" command must be inputed in AUTO or MDI modes. Then change modes to manual and press this button. Spindle speed override can be used to adjust the spindle speed (50%-120%).

(25) Spindle STOP: Effective in manual mode.

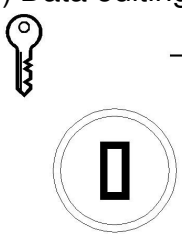


(26) Spindle CCW:



Effective in manual mode.
"S" command must be inputed in AUTO or MDI modes. Then change modes to manual and press this button. Spindle speed override can be used to adjust the spindle speed (50%-120%).

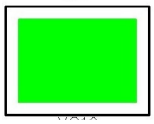
(27) Data editing key switch:



Effective in EDIT and MDI modes.
Program, Tool data, Work coordinate data and diagnostic parameters CANNOT be edited if this switch was turned OFF.

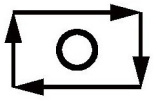
(28) Cycle START:

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

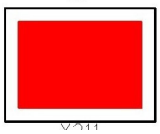


In AUTO mode, press this button to execute the program in memory.
In TAPE mode, press this button to execute the program in memory of external devices. (PC or tape machine)
Resume the program execution which was halted by Feed Hold.

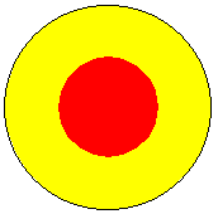
(29) Feed Hold:



Effective in AUTO mode.
Halt the programe execution: Axis movement will be stopped, yet the spindle keeps spinning.



(30) Emergency STOP:



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

(31) +X axis movement:

Effective in JOG mode.
Move X axis in positive direction.

(32) +Y axis movement:

Effective in JOG and ZERO RETURN modes.
Move Y axis in positive direction.

(33) +Z axis movement:

Effective in JOG and ZERO RETURN modes.
Move Z axis in positive direction.

(34) +4 axis movement:

Effective in JOG and ZERO RETURN modes.

Move 4th axis in positive direction.

(35) -X axis movement:

Effective in JOG and ZERO RETURN modes.
Move X axis in negative direction.

(36) -Y axis movement:

Effective in JOG mode.
Move Y axis in negative direction.

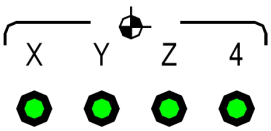
(37) -Z axis movement:

Effective in JOG mode.
Move Z axis in negative direction.

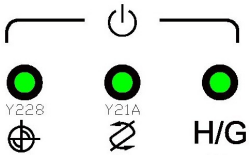
(38) -4 axis movement:

Effective in JOG mode.
Move 4th axis in negative direction.

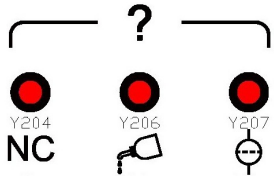
(39) Axis ZERO point indication lamps: Lamp light up when each axis moved to zero point.



(40) Status lamps:
: Light up when ATC is ready.
: Light up if the commands were executed and effective.



(41) Alarm lamps:



Machine abnormal. NC: Program error. Operation error. Over travel.

Controller malfunction.

LUBE: lubrication oil level too low. (only single block execution allowed.)

Pneumatic abnormal. Low pressure of pneumatic system

(42) Status beacon:

Red flashes when machine is abnormal.
Yellow lights up when program end at M02 or M30.
Yellow flashes when program executing M00 or M01.
Green lights up during program execution.

2.3 Remote Jog

Axis selection

Movement of one division (1 or 10 or 100 μm)

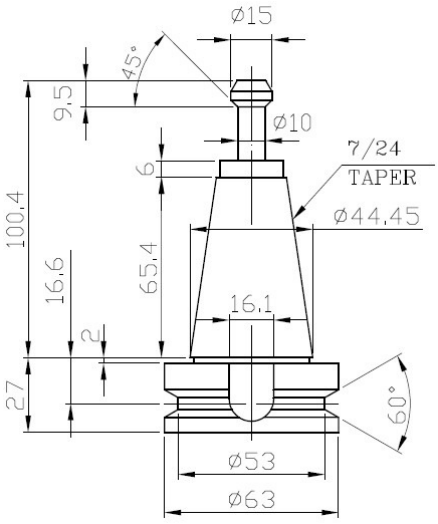
100 divisions/round
CW: positive
CCW: negative

2.4 Spindle Tooling

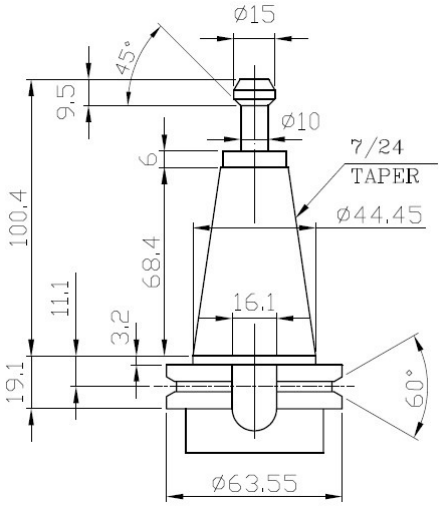
Tooling with a balance level of G2.5 or better should always be used. Failure to do so will reduce spindle life and surface finish and may invalidate the machine warranty.

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

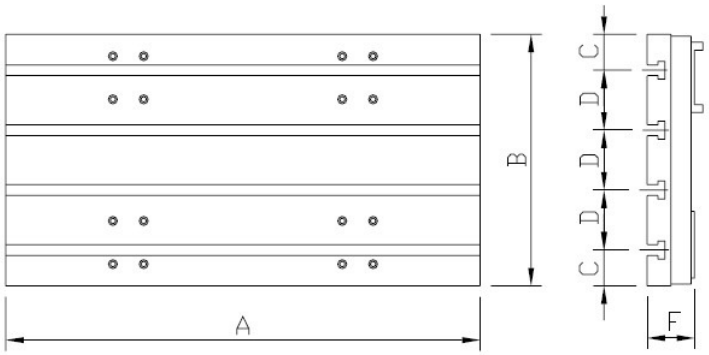
BT-40

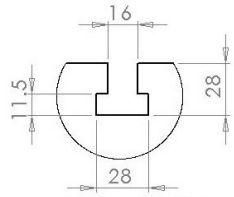


DIN-40 (CAT-40)

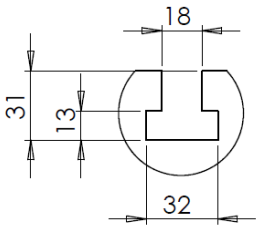


2.5 Dimensions of work table





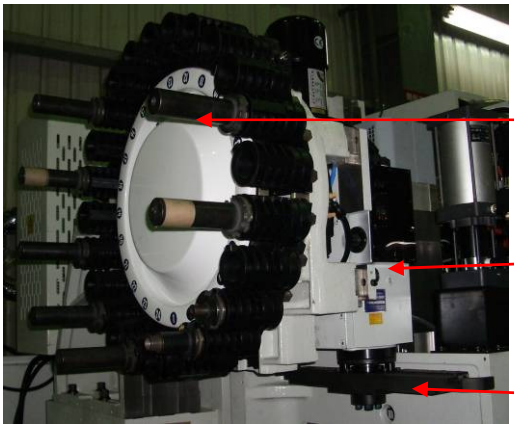
MBV-6, MBV-8



MBV-10, MBV-12

Model	A	B	C	D	F	Number of T slots
MBV-6	700	450	82.5	95	78	4
MBV-8	800	450	82.5	95	102	4
MBV-10	1120	600	100	100	102	5
MBV-12	1320	600	100	100	102	5

2.6 Tool Magazine and ATC



Tools magazine

ATC cam box

Tool Change Arm

2.7 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

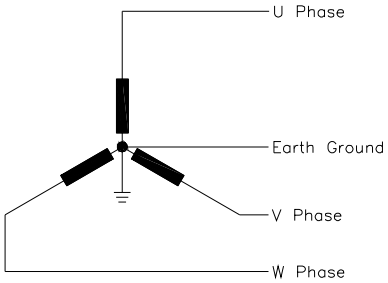
The machine should be sited on a flat area (maximum fall 3mm in 3 m) free from cracks and expansion joints.

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

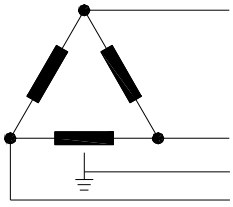
3.2.1 Line Configuration

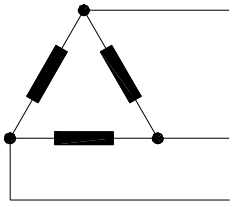
The machine is designed to operate from a 3-phase AC incoming power source with an earth star point, as shown in the right. This incoming line short circuit current must be at least 2kA.

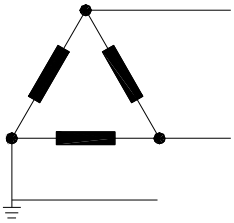


In other cases, such as those examples shown in figures below, an isolating transformer of 15kVA or larger capacity with an earth grounded WYE secondary is required between the incoming lines and the machine. The incoming line short circuit current must again be least 2kA.

Other Incoming Line Configurations







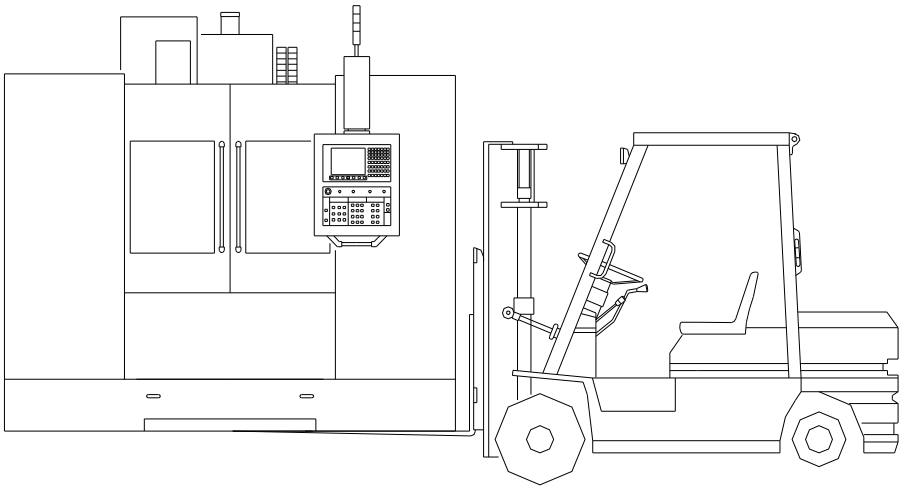
3.3 Unpacking

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

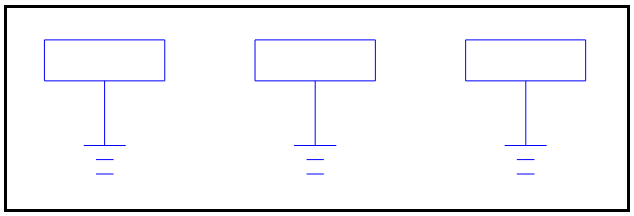
a) The machine must be grounded in order to protect personnel and the machine from electrical hazards. Grounding must be in accordance with the standards for electrical equipment.

b) Ideally, the grounding point should be as close as possible to the machine.

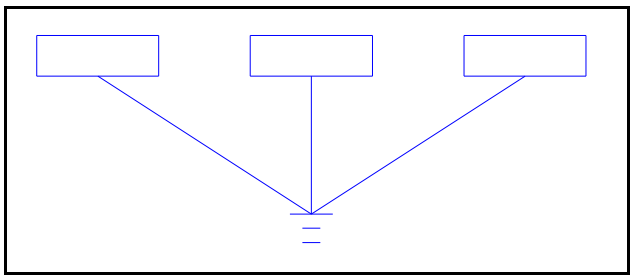
c) A qualified electrician must carry out the grounding work, otherwise serious injury, death, or accidents involving machine damage could result.

d) The machine must be grounded in one of the following ways:

1) Independent grounding

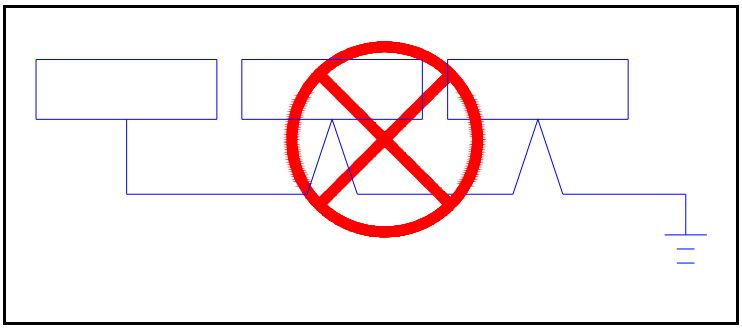


2) Common grounding



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.

3.6.2 Power connection

ON NO ACCOUNT MUST YOU SWITCH ON THE MACHINE. WE PREFER YOU TO REMOVE YOUR ISOLATOR FUSES OR TRIP CIRCUIT BREAKERS.

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.

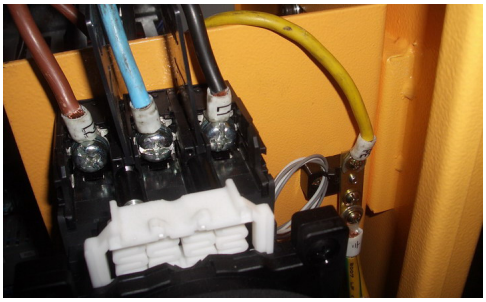
In the event of power failure, turn off the main circuit breaker

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. Negligence of these procedures might void the warranty of the spindle.

4. Operation

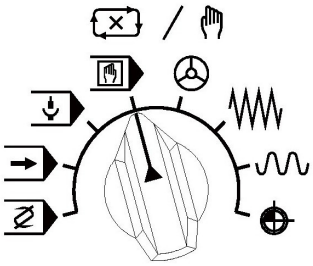
4.1 Power ON/OFF

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.

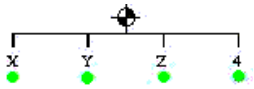
Turn the machine on at the isolator.

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

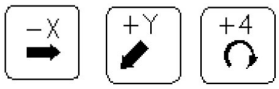
4.2 Reference (or “ZERO RETURN” or “HOME”) the Machine



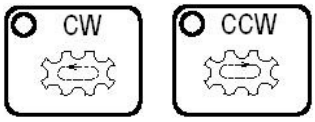
1) Turn the mode selection switch to ZERO RETURN.
2) Press +Z button, Z axis should move upward until the ZERO POINT INDICATION LAMP light up.



3) Press –X, +Y, +4 buttons. Axes will move until the ZERO POINT INDICATION LAMP light up.



4) Press magazine forward or backward to make the tool magazine go to home position.



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.

4.3 Machine Warm-up

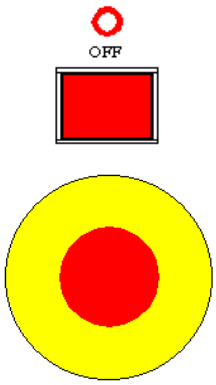
*** If the machine is used to produce components immediately after being started, following a long idle period, sliding parts may be worn due to lack of oil and thermal expansion of the machine can jeopardize machining accuracy. To prevent this condition, always warm the machine up. ***

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.

4.4 Spindle Warm-up

In case that the spindle will continue running for a long time once start working, it is recommended to warm up the spindle with the spindle run-in procedures as described in the Appendix..

4.5 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.

4.6 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.

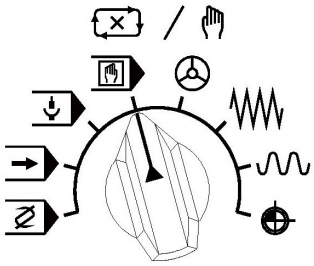
Check coolants, hydraulic oils and lubricants for level & contamination. Change them if you suspect they are contaminated.

Clean the filter on the top of the coolant tank.

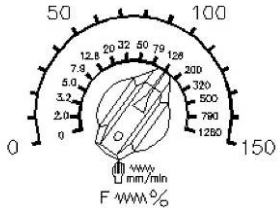
Turn off the power first on the control panel with the emergency stop button and then at the main isolator before leaving the machine at end of the shift.

4.7 Jog Axis

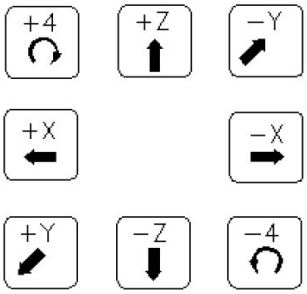
To manually jog an axis, first turn the mode selection switch to JOG mode.



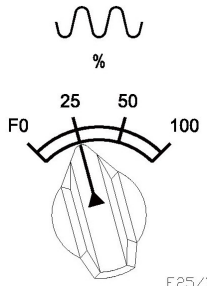
Turn the axis movement override to desired speed.
(0-1260mm/min)



Press the button corresponding to the desired axis and direction.

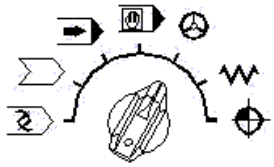


For rapid movement, turn the MODE SELECTOR to Rapid mode, press the button of desired axis.
The feed rate of RAPID JOG can be overrided by RAPID MOVEMENT SPEED override. (F0% and 100% are set in parameters)



4.8 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.



4.9 Tool Loading/Unloading

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.

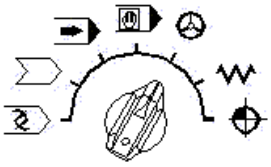
4.10 Large Tool management

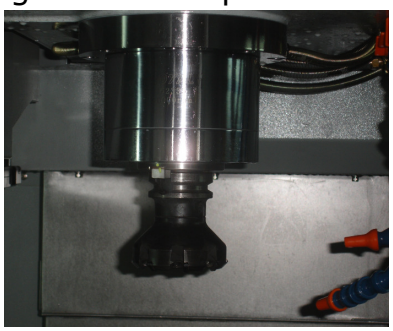
Large tool is the tool with diameter larger than the allowable diameter as described on the label near tool magazine. This kind of tool can be used, providing the adjacent tool pots are empty.
For arm type tool changer, the tool number is independent to the pot number of magazine. Therefore a carefully management of the tool number of large tool is necessary.
In this machine, the usable tool numbers are

Standard tools:	1 through 50. (unique number)
Large tools:	51 through 98 (unique number)
Separator tool:	99 (virtual tools in the adjacent pots of large tool)
No tool:	0

Procedure to input the tool information:

1) In HANDLE mode, load large tool into spindle.

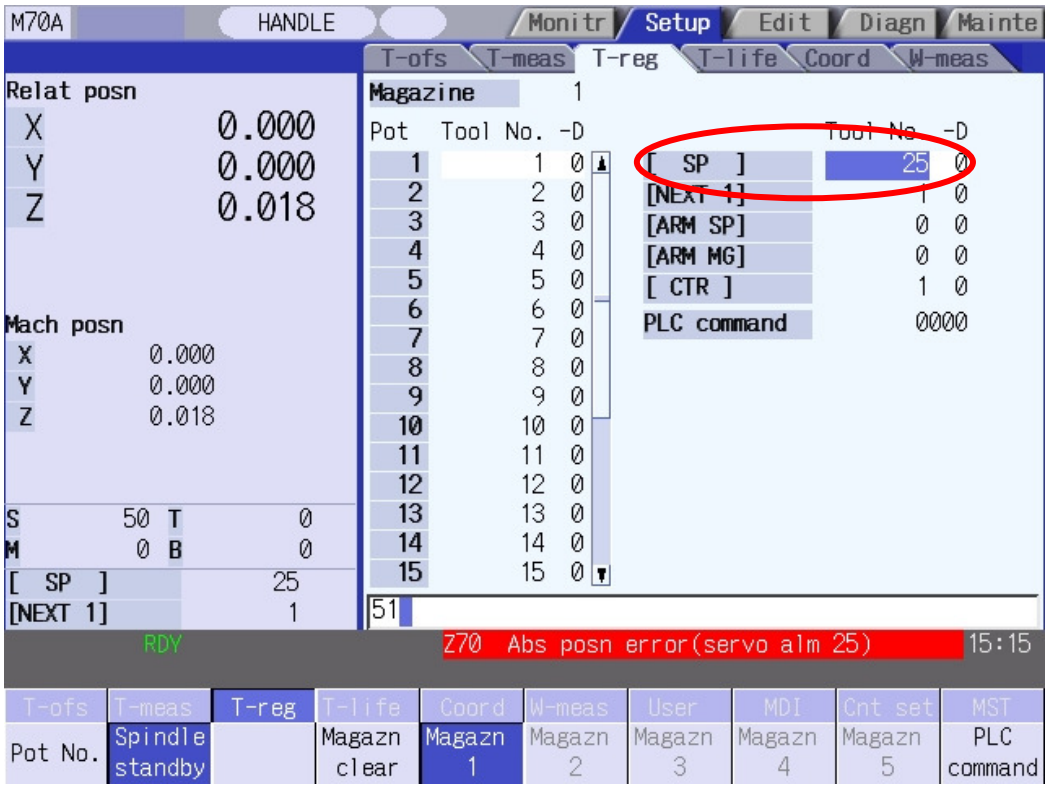




2) Set tool number into 51 with pressing buttons 

then 

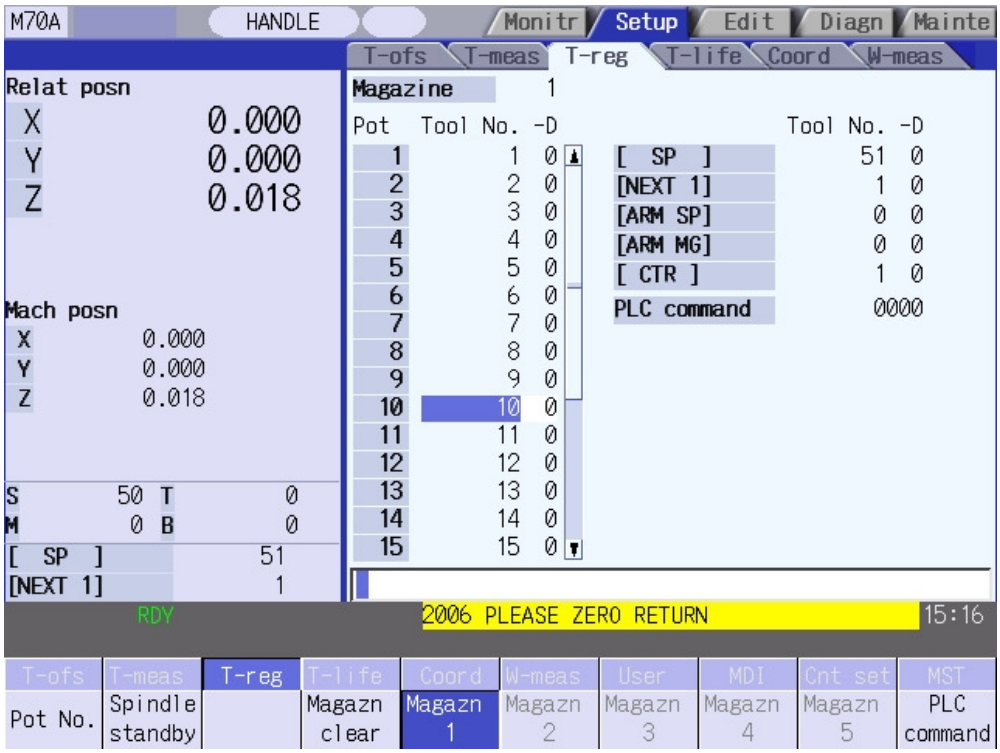
then Spindle standby.



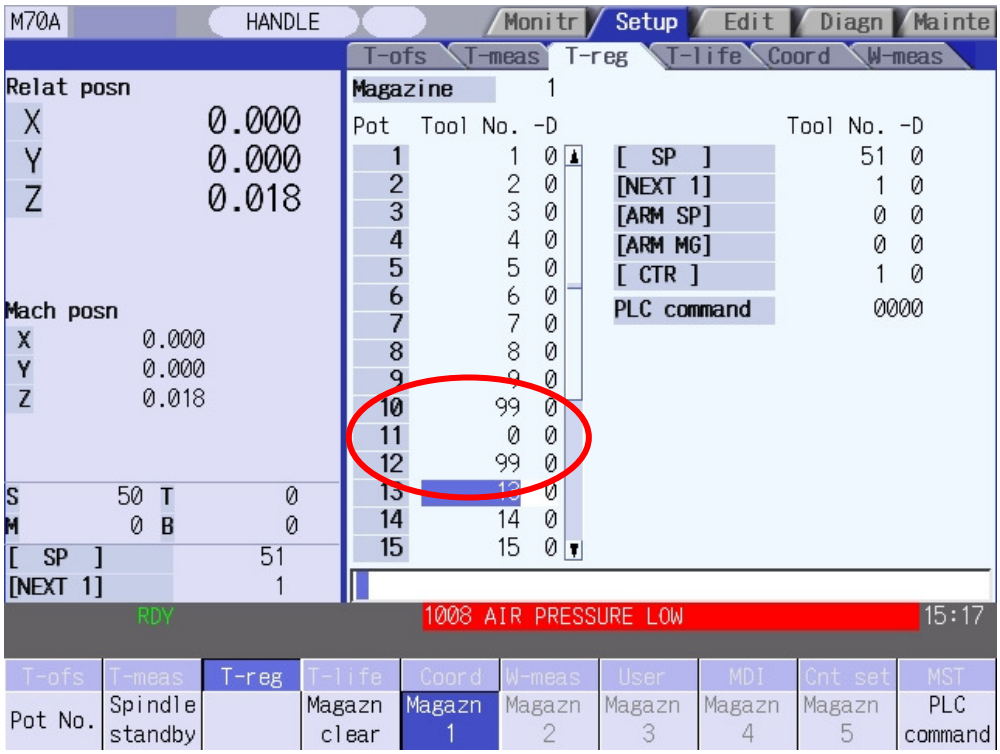
3) Find 3 empty pots in magazine. (For example: 10, 11, 12 in the

photo, and we would like to put the large tool 51 into pot 11)

4) Press Spindle standby then move cursor to Pot 10.



5) Set pot 11 into 0 (Attention: only one 0 in the T-reg table allowed) and pots 10 and 12 into 99. Ignore the alarm message "Exists in magazine 1. Set? (Y/N)" and press INPUT.



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 safety 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. Clean the air filter at the rear of the electrical cabinet.
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 the condition of the linear rail wipers.
4. Check the integrity of the electrical connections and inspect the condition of the insulation.
5. Check condition of coolant filters and replace if necessary.

5.2 Lubrication

5.2.1 Automatic Lubrication System

Lubricator supply 1cc oil to lubricate ballscrew once time every 15 minutes. Oil discharge volume can be adjusted by a handle and illustration on the oil tank.

5.2.2 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. Emergency Stop Button was pressed during tool changing:

1) Release the Emergency Stop Button.
2) Change the mode to HANDLE
3) Release the brake of ATC arm motor.
4) Press 

, the tool arm will jog toward home position. Keep doing this until arm reaching home position.
5) Press RESET to clear the alarm.
6) Check the tool number in tool table. Correct them if needed.

6.2 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.

6.3 Door switch system

1. Front door is opened
Close front door or replace interlock switch

6.4 Motors overload

1. Check any debris within mechanical movement system. Clear them if found.
2. Check the rotation direction of motor. If wrong, re-wiring to get correct rotation direction.
3. Check the overload contactor setting. Setting = 1.05 * rating amp
4. Check any loose wiring. Tightening them if found.

6.5 Alarm messages and remedies

Alarm No.	Alarm Message	Cause	Remedy
AL1001	HYDRAULIC PUMP OVERLOAD	See “motor overload”	
AL1002	COOLANT MOTOR OVERLOAD	See “motor overload”	
AL1003	CHIP CONVEYOR MOTOR OVERLOAD	See “motor overload”	
AL1004	SPINDLE FAN MOTOR OVERLOAD	See “motor overload”	
AL1005	HYDRAULIC PRESSURE DOWN	See “motor overload” Low oil level	 Add oil
AL1006	ATC ARM NOT IN STAND-BY		
AL1008	AIR PRESSURE LOW		
AL1009	MAGAZINE POSITION ERROR		Press RESET. Make magazine home return.
AL1013	SPINDLE ALARM		
AL1014	ZERO RETURN MISSED		
AL1017	MAGAZINE NOT ZERO RETURN		Press RESET. Make magazine home return.
AL1019	MAGAZINE COUNTER ERROR		Same as above.
AL1020	SPINDLE COOLER ALARM		
AL1022	T COMMAND ERROR		
AL1023	BATTERY ALARM		
AL1024	MAG. ROTATION TIME OVER		
AL1027	TOOL ARM MOTOR OVERLOAD	See “motor overload”	
AL1028	SPINDLE LIMIT SW. FAILURE		
AL1029	SPINDLE IS ROTATING		
AL1030	EMERGENCY STOP/OVERTRAVEL		
AL1031	TOOL SETTER ALARM		

Alarm No.	Alarm Message	Cause	Remedy
AL1032	MAGAZINE MOTOR OVERLOAD	See “motor overload”	
AL1033	SPINDLE NOT CLAMP		
AL1034	SERVO RESISTOR OVERHEAT		
AL1035	4TH AXIS SW. ERROR		
AL1036	4TH AXIS CLAMP/UNCLAMP TIME OVER		
AL1038	SPINDLE NOT ROTATE	Door not closed	
AL1039	SPINDLE ROTATION COMMAND ERROR		
AL1040	CHANGE SPINDLE DIRECTION		
AL1042	CHIP FLUSH MOTOR OVERLOAD	See “motor overload”	
AL1043	SPINDLE CLAMP/UNCLAMP TIME OVER		
AL1045	WATER GUN MOTOR OVERLOAD	See “motor overload”	
AL1055	DOOR NOT CLOSE		
AL1061	ATC ARM ACTIVE TIME OVER		
AL1062	SPECIFIED POT NOT INDEX		
AL1063	FORBIDDEN POT		
AL1064	MAGAZINE POT SW. ERROR		
AL1066	IMPROPER AXES POSITION		
AL1067	MAGAZINE POT ACTIVE TIME OVER		
AL1068	SPINDLE TOOL NO. NEED SETTING		
AL1070	NO EMPTY POT IN MAGAZINE		
AL1071	ATC CYCLE TIME OVER		
AL1072	T CODE NOT SPECIFIED		

Alarm No.	Alarm Message	Cause	Remedy
AL1073	CTS. NO WATER		
AL1074	CHECK TOOL NUMBER		

7. Appendix

7.1 Power requirements: 15 kVA

(For more accurate information, refer to the number on nameplate on machines)

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

Max. Spindle Speed					
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
M08	Coolant ON
M09	M7/M8/M17/M18/M37M38 OFF
M10	4th axis clamp
M11	4th axis unclamp
M13	Spindle CW & coolant ON
M14	Spindle CCW & coolant ON
M15	Spindle STOP and coolant OFF
M17	TOOL SETTER AIR BLOWER ON
M19	Spindle orientation ON
M20	Spindle orientation OFF
M30	End of program, spindle & coolant, reset & rewind program
M31	TOOL TABLE RESET
M32	WATER GUN
M37	B.T.S ON
M38	CHIP FLUSH ON
M48	Override cancel ON
M49	Override cancel OFF
M50	CHIP CONVEYOR OFF
M51	CHIP CONVEYOR ON
M57	X MIRROR ON
M58	Y MIRROR ON
M59	MIRROR FOR X,Y,OFF

	Function Description
M67	OIL MIST COLLECTOR ON
M95	PARTS COUNT
M98	CALLING OF SUBPROGRAM
M99	END OF SUBPROGRAM

7.5 User Definable Parameters

7.5.1 Timer table

Timer NO	ADDRESS	DATA (ms)	DISCRIPTION
Timer 6	**16006**		Max. time allowed for ATC operation
Timer 10	**16010**		Aux. time for brake of tool changer
Timer 11	**16011**		Delay time for servo ready
Timer 12	**16012**		Max. time for magazine to find tool
Timer 13	**16013**		Max. time for magazine to index
Timer 14	**16014**		Max. time for tool pot operation
Timer 15	**16015**		Air blow time during spindle unclamping
Timer 16	**16016**		Time for checking of lubrication pressure
Timer 17	**16017**		Time for checking of lubrication pressure release
Timer 18	**16018**		Air blow time after CTS stopped
Timer 19	**16019**		Delay time after spindle clamped
Timer 20	**16020**		Delay time after spindle unclamped
Timer 21	**16021**		Delay time after tool pot up
Timer 22	**16022**		Delay time after tool pot down
Timer 28	**16028**		Delay time after tool arm at tool unclamped
Timer 29	**16029**		Delay time after tool arm at tool clamped
Timer 30	**16030**		Delay time after pressure low
Timer 33	**16033**		Delay time after tool magazine CW
Timer 34	**16034**		Delay time after tool magazine CCW
Timer 35	**16035**		Delay time after 4^{th} axis unclamped
Timer 36	**16036**		Delay time after 4^{th} axis clamped
Timer 37	**16037**		Delay time after tool arm down
Timer 40	**16040**		Delay time after 5^{th} axis unclamped
Timer 41	**16041**		Delay time after 5^{th} axis clamped

7.5.2 Keep Relay list

Address	DISCRIPTION
P6401.0	1: Chip conveyor and chip wash down NOT stopped after RESET.
P6401.2	1: 4th axis is clamped when the solenoid valve is ON.
P6401.3	1: Air blow, Coolant and CTS can be ON at the same time.
P6401.6	1: CTS button is effective.
P6401.7	1: Coolant Auto button is effective
P6402.0	1: The signal is 0, when the oil level of oil mist lubrication is low.
P6402.1	1: Air blow NOT activated when CTS stopped
P6402.2	1: Chip wash down ON continuously.
P6402.3	1: Spindle NOT stopped when M00/M01.
P6402.4	1: Chip wash down NOT ON automatically when CNC program start execution.
P6402.6	1: Chip conveyor NOT ON automatically when CNC program starts execution.
P6402.7	1: Interlock NOT released automatically when M00/M01/M30.
P6403.0	1: Pressure low alarm NOT effective
P6403.1	1: Oil lubricator was set with external timer.
P6403.2	1: Signal of pressure switch of oil lubricator is 0 if pressure OK.
P6403.3	1: Signal of level switch of oil lubricator is 0 if level OK.
P6403.4	1: Signal of tool magazine counter/brake is 0 when activated
P6403.5	1: Chip conveyor ON continuously
P6403.6	1: NO tool magazine home position sensor.
P6403.7	1: Axes stop moving if JOG override at F0 during CNC program execution.
P6404.0	1: ATC operation at 1st home position of Z axis.
P6404.1	1: Polarity of pneumatic pressure switch for linear scales.
P6404.2	1: NO interlock at axes, when the SKIP signal of tool length measurement activated.
P6404.4	1: Shut down hydraulic pump when pressure OK.
P6404.5	1: NO hydraulic system.
P6404.6	1: Servo will be OFF when 4th axis clamped.
P6404.7	1: Timer of air blow during spindle unclamp is effective.
P6405.0	1: Signal is 0 when hydraulic pressure is OK
P6405.1	1: Level switch of spindle oil lubricator is effective.
P6405.2	1: NOT CE compliance
P6405.3	1: Spindle unclamped via hydraulic

Address	DISCRIPTION
P6405.4	1: The CNC program block will NOT be finished once oil lubricator alarm
P6405.5	1: 4th axis will NOT be unclamped automatically during HANDLE mode
P6405.6	1: 2nd type of layout of jog buttons
P6406.0	1: Signal is 0 when CTS pressure OK.
P6406.1	1: Oil lubricator keeps working even level NOT enough
P6406.2	1: Oil lubricator keeps working even after axes stopped
P6406.3	1: No pressure switch at oil lubricator
P6406.4	1: There is chip conveyor stop button on panel
P6406.5	1: 2nd door safety switch is effective
P6406.7	1: Tool arm operation NOT waiting for spindle unclamp/clamp signal
P6407.0	1: The alarm signal from tool length measurement is effective
P6407.2	1: Servo motor encoder is incremental.
P6407.4	1: Only one solenoid valve for both pot up and down
P6407.5	1: There are 4 sensors for tool arm operation
P6407.6	1: The signal of tool arm in-position is 1
P6407.7	1: Tool pot automatically go down after T code execution
P6408.0	1: Spindle oil chiller alarm NOT effective
P6408.1	1: Axes oil chiller alarm NOT effective
P6408.3	1: Over travel signal effective
P6408.4	1: There is NO edit protection lock key switch on the panel
P6408.7	1: NO need to home calibration after machine locked
P6409.0	1: Tool magazine calibration sensor effective
P6409.1	1: Signal is 0 when tool magazine calibrated.
P6409.2	1: Tool arm pre-unclamp is effective
P6409.4	1: Tool magazine counter 2 NOT effective
P6409.6	1: NOT checking spindle speed
P6410.0	1: Spindle pre-unclamp solenoid valve effective
P6410.2	1: Reverse spindle motor rotation direction
P6410.3	1: Ignore signal of spindle with tool
P6410.4	1: Ignore signal of tool magazine door
P6410.5	1: Ignore signal of spindle clamped
P6410.6	1: Spindle NO need of warming up
P6410.7	1: Tool magazine need calibration when power ON
P6412.4	1. The Plug & Play function of 4th and 5th axis was NOT activated.

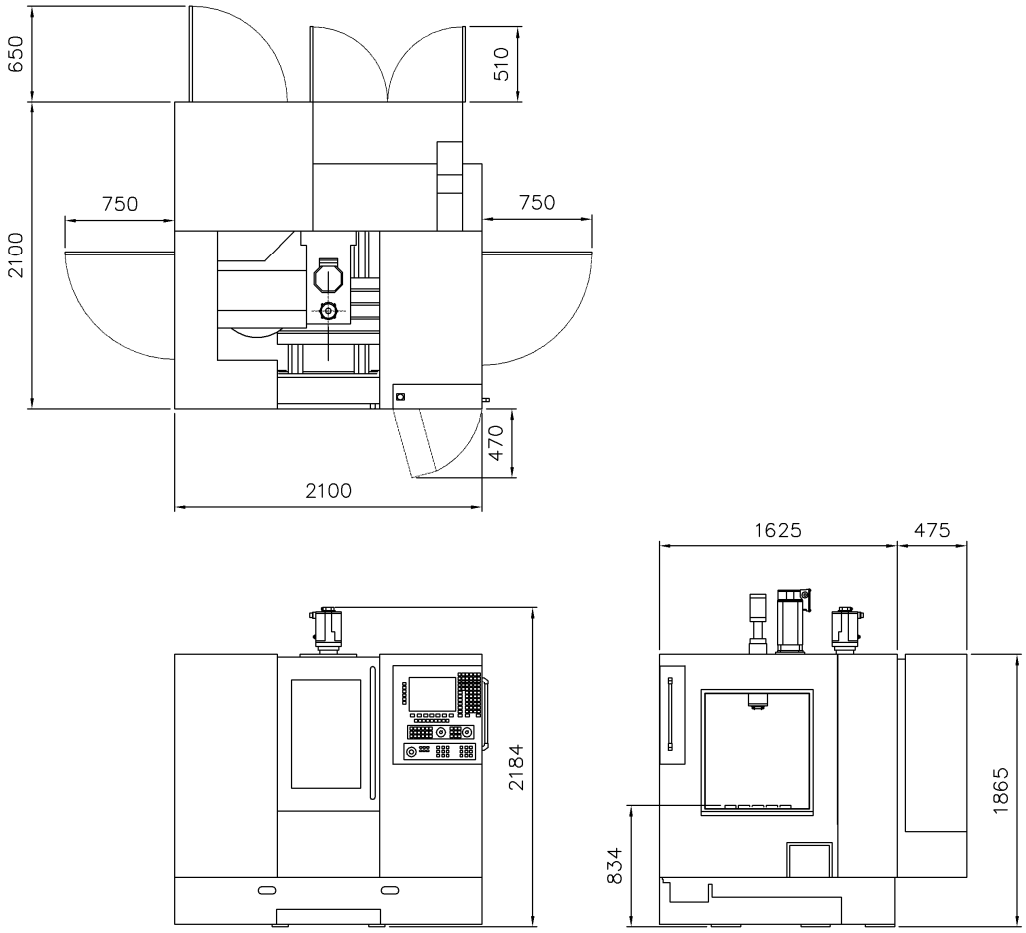
Address	DISCRIPTION
P6415.0	1: X axis must be at 2nd home position during tool change
P6415.1	1: Y axis must be at 2nd home position during tool change
P6415.2	1: JOG feed can only max. be at 50%
P6415.4	1: AUTO HOME button NOT effective
P6415.6	1: Check tool magazine counter 1 and 2 when the signal of counter 1 activated
P6416.3	1: Ignore alarm of tool pot up/down sensor
P6417.6	1: The axis movement NOT control by tool change sub-program during tool change.

7.5.3 Counter list

Address	DISCRIPTION
P17200	Oil lubricator PAUSE time (during CNC program execution)
P17201	Oil lubricator PAUSE time (NOT during CNC program execution)
P17202	Oil lubricator ON time
P17204	Chip conveyor ON time
P17205	Chip conveyor PAUSE time
P17206	Chip wash down ON time
P17207	Chip wash down PAUSE time
P17209	Times to press button to enter maintenance mode
P17219	Aux. time

7.6 Machine floor space

MBV-6/MBV8



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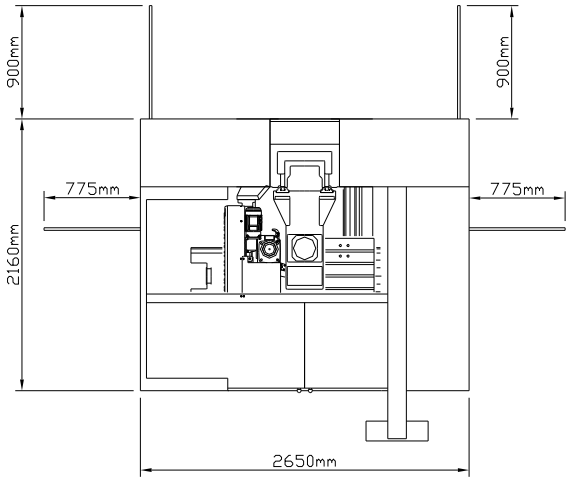
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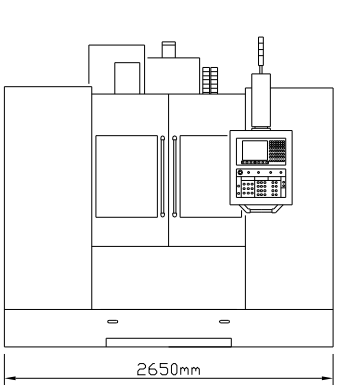
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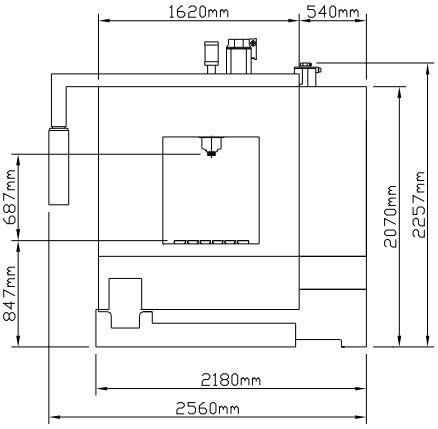
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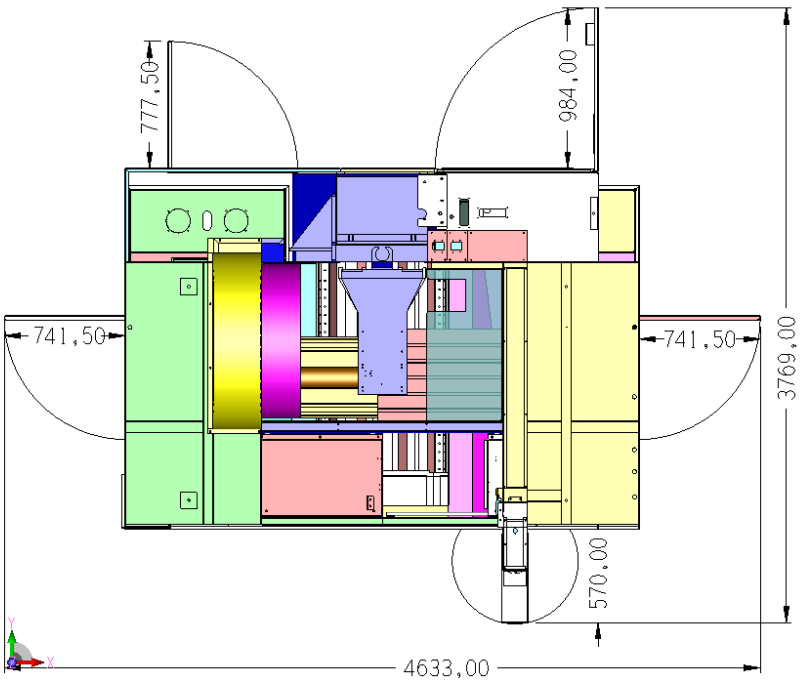
MBV-12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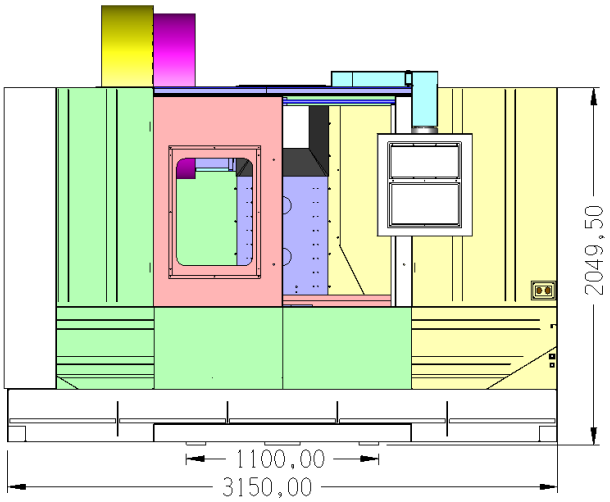
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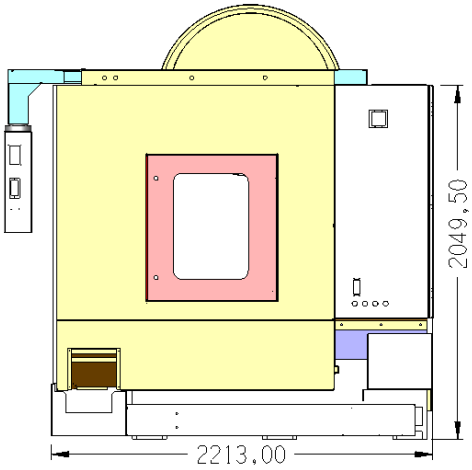
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