



User Manual

MV154 V53/MV184/MV194 series

MV154APC series

MV204/MV205 series

MV214/MV215 series

(MV204CPL/MV205CPL series)

MV234/MV235 series

FANUC series

QUASER mill i series

Manual Number: 2521030104

Revised: September 2015

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1. OPERATORS SAFETY

1.1 TO ENSURE SAFE MACHINE OPERATION

1.1.1 Instruction Manual

Each machine is shipped with a variety of built-in safety devices. However, careless handling of the machine can cause serious accidents. To prevent the occurrence of such accidents, all programmers and other personnel that deal with the machine must carefully read the manuals supplied by the NC unit manufacturer, and equipment manufacturers, before attempting to operate, maintain, or program the machine.

Because there are so many "things that cannot be done" and "things that must not be done" when using the machine, that is impossible to cover all of them in the instruction manual. Assume that something is impossible unless the manual specifically states that "it can be done".

1.1.2 Machine Installation Precautions

Installation Site

The machine and the NC must not be subject to direct sunlight. Chips, coolant, and oil must not be splashed on the outside of the machine or the NC unit. The machine and the NC unit must not be subjected to excessive vibrations (limit of 4 mm/s).

Ambient Temperature	0 to 35 Degrees Celsius
Ambient Humidity	75% RH or less (without condensation)

Maintenance space must be secured.

The doors of the machine and the NC unit must be able to be opened without interference.

Allow space for easy removal of the chip conveyor (if fitted) and the coolant tank.

The floor must be strong enough to support the machine and must not be sloped or irregular in any way.

A number of cooling fans are used inside the machine. Therefore, dust and mist must be kept to a minimum.

Do not put things on the floor around the machine. Keep the floor dry. If coolant or lubricating oil is spilled, wipe it up immediately.

For machine with table covers which slide to the right, left, backwards and forwards, carefully check that the covers will not interfere with objects placed around the machine. Be sure there is enough space for safe machine operation.

Power Supply

No electrical noise generating sources, such as electric welders or electric discharge machines, can be near the machine. Take care to isolate the machine from any adverse effects that might be caused by nearby equipment.

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

Only a qualified electrical technician should perform work involving the power cable connections.

Grounding

The machine must be grounded to the ground independently of other machines. Never connect the ground wire of the machine to the plant frame.

The ground wire must be as short as possible and have the same diameter as the input power cable.

Class 3 Ground Grounding Resistance	1 Ohm or Less
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Air Supply

Use only clean and dry air, 5.5 bar (80 psi)(5.6 kg/cm²) or more.
Make sure that the air source can supply the volume of air specified in the Pre Delivery manual. (Note: 1kg/cm² $\doteq$ 0.98 bar $\doteq$ 14.233Psi)

Installation

See Pre Delivery Manual for full installation details.

If the machine is to be lifted by crane, use only the universal lifting frame that is available from QUASER. If the machine is to be lifted by Fork Truck, it should have the capacity stated in the Pre Delivery manual).

If a rust-preventative coating is applied to the slideway surfaces, it must be removed completely. If any rust-preventative coating remains on the slideways when the machine power is turned on a servo alarm will occur.

Transit clamps are used for machine transportation. These transit clamps must be removed before switching machine power on. (Some require the power to be turned on for removal).

After installing the machine, the machine must be leveled. The machines crown and distortion values must be adjusted according to the accuracy of the test results chart delivered with the machine.

1.1.3 Turning ON the Power After Installation

Before Turning ON the Power

After completing the machine installation, check the following points before turning on the power.

Make sure that all bolts are tightened securely.

Make sure that all connectors are connected properly.

Make sure that all hydraulic hoses and air pipes are connected properly.

If the machine is equipped with any optional external equipment (Chip Conveyor, Pallet tool etc), make sure that the electrical cable and hydraulic/pneumatic pipes are connected correctly.

Check the input voltage and the R/S/T (L1/L2/L3) phases of input power.

After turning the Machine Power On.

Never feed the axes right after turning on the power, manually operate the ballscrew lubrication pump to supply lubricating oil to the ballscrew surfaces first.

Check for oil consumption. Make sure that all the gauges indicate the correct value.

Remove any clamps that could not be removed with the power off immediately after turning power on.

To run in the new spindle, follow the thorough warm up procedure given in the Operating Manual.

1.1.4 Caution Labels

Important information is written on caution labels which are attached to the machine at locations where they can be easily seen. Caution labels contain critical information which must be strictly observed by all operators; failure to observe the information can cause serious accidents.

Caution labels are marked DANGER, WARNING, or CAUTION, depending upon the seriousness of the hazard.

DANGER: Imminently hazardous situation – failure to follow the instructions will cause serious injury or death.

WARNING: Potentially hazardous situation – failure to follow the instructions will cause serious injury or death.

CAUTION: Potentially hazardous situation – failure to follow the instructions could cause minor injuries, or damage to the machine.

Keep caution labels clean and free from obstruction so operators can see at all times.

Never remove caution labels. If a label comes off, re-affix it at the original position.

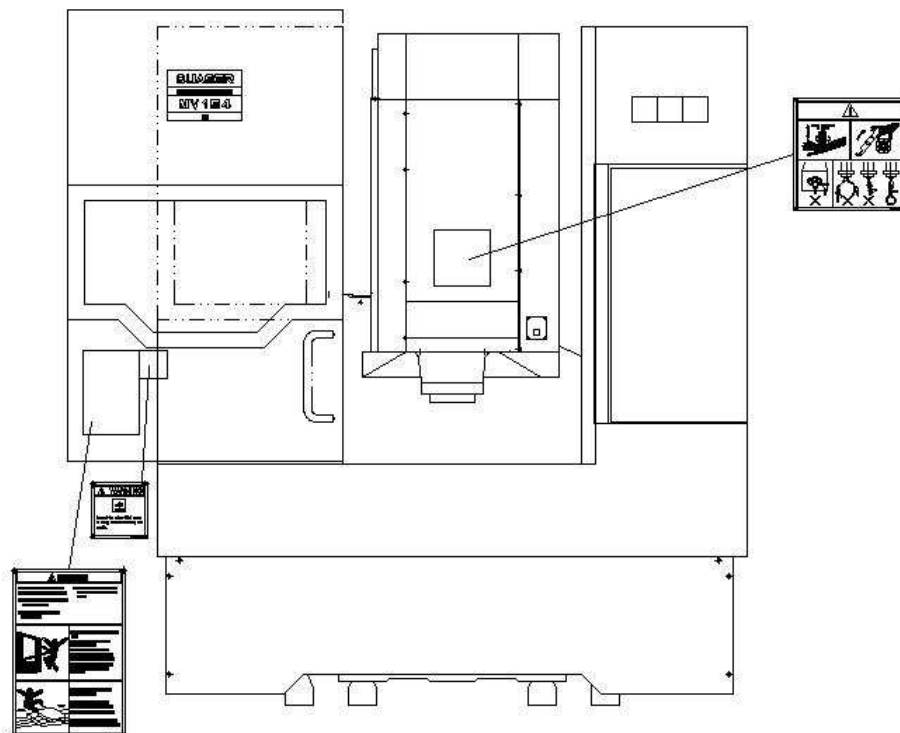
Never fix anything or paint over a caution label.

If any part of a caution label becomes blurred or cannot be easily read then this label must be replaced.

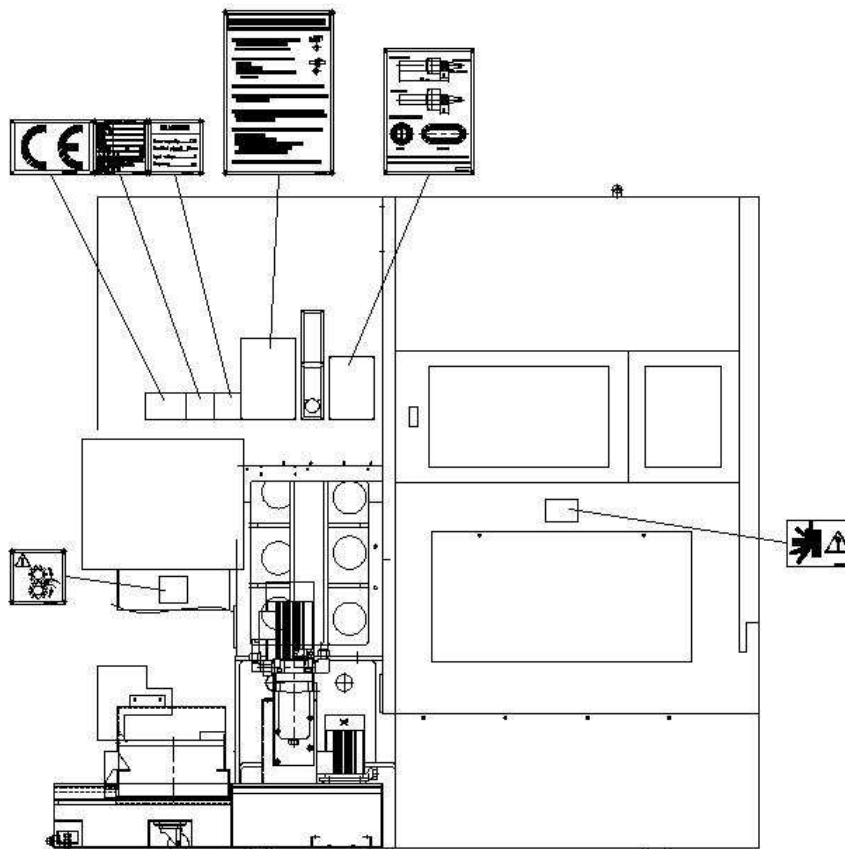
In addition to the information given on caution labels, there is a variety of other cautionary information which must be observed by operators during machine installation, operation and maintenance. This cautionary information appears in this instruction manual. Read all safety information carefully. Failure to observe the warnings and cautions can cause serious injury to the machine operator or personnel in the vicinity, and damage to the machine. Always observe this information during machine operation and maintenance.

1.1.5 Caution label Location

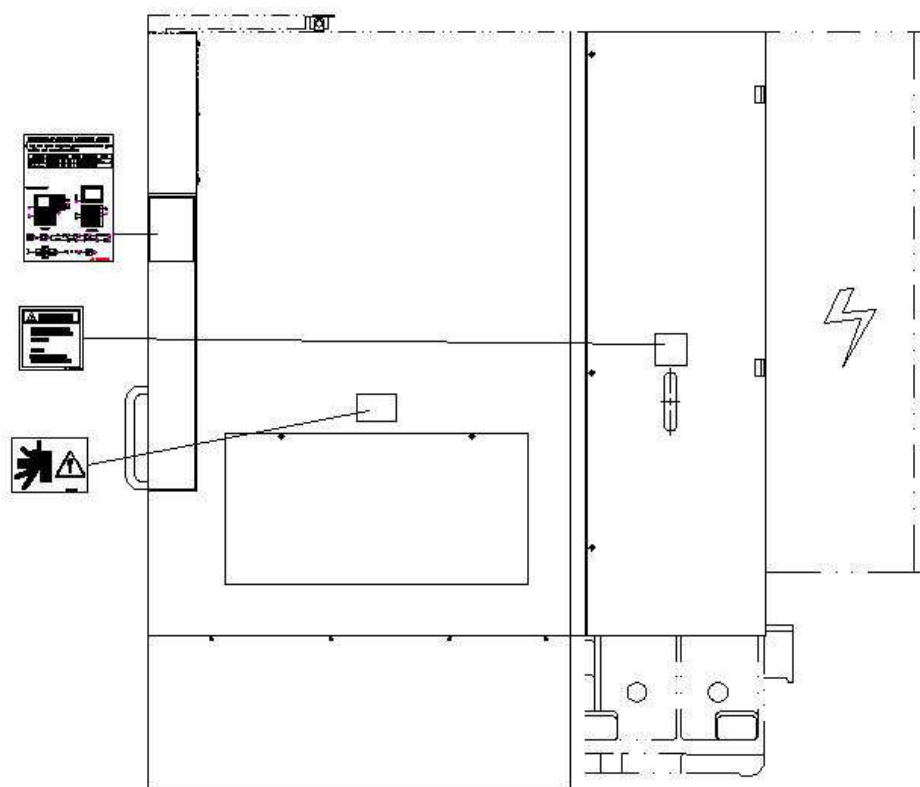
MV154/MV184 Machine front view



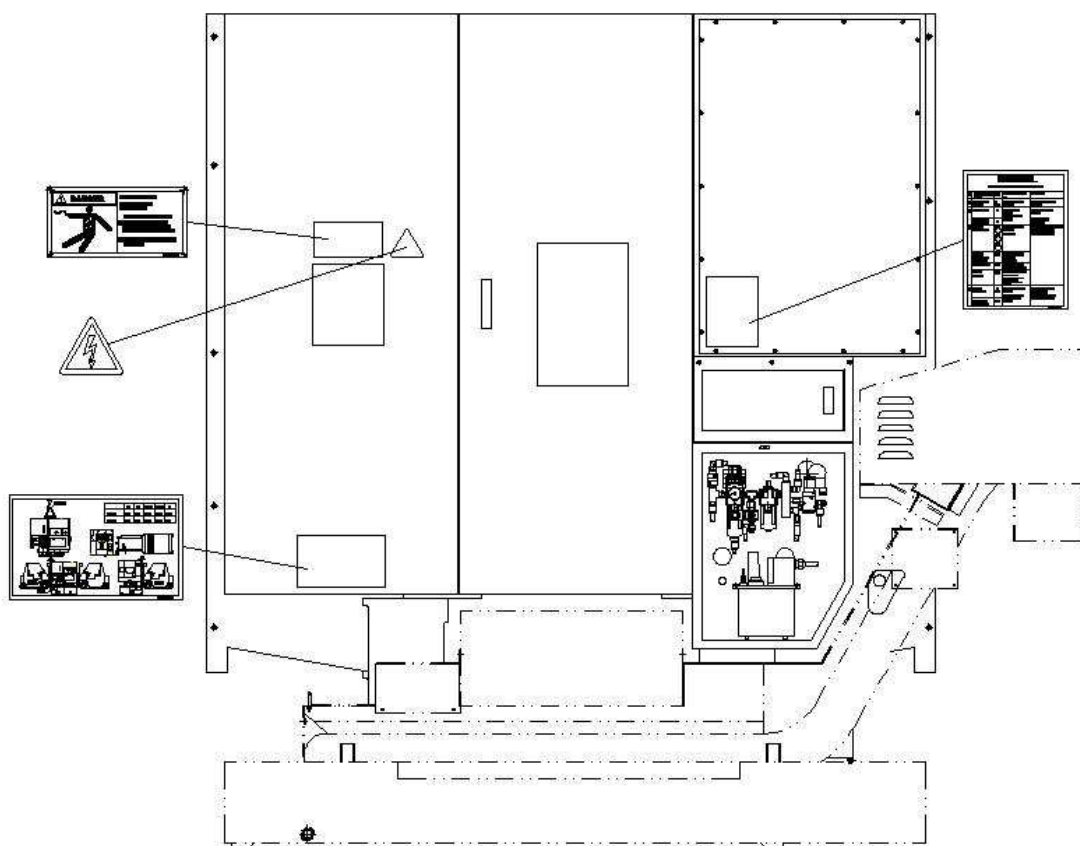
MV154/MV184 Machine left view



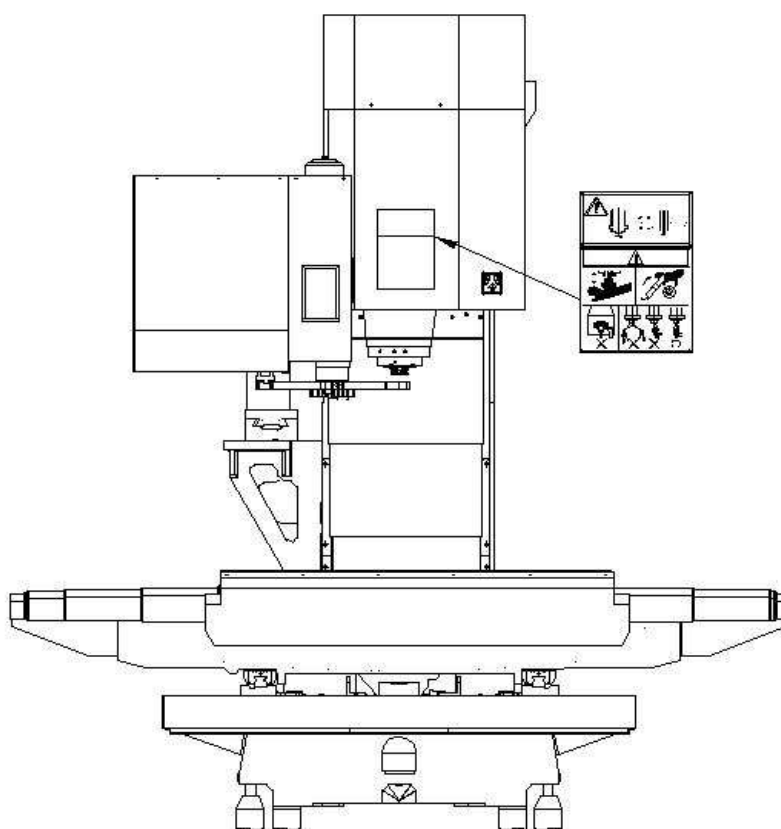
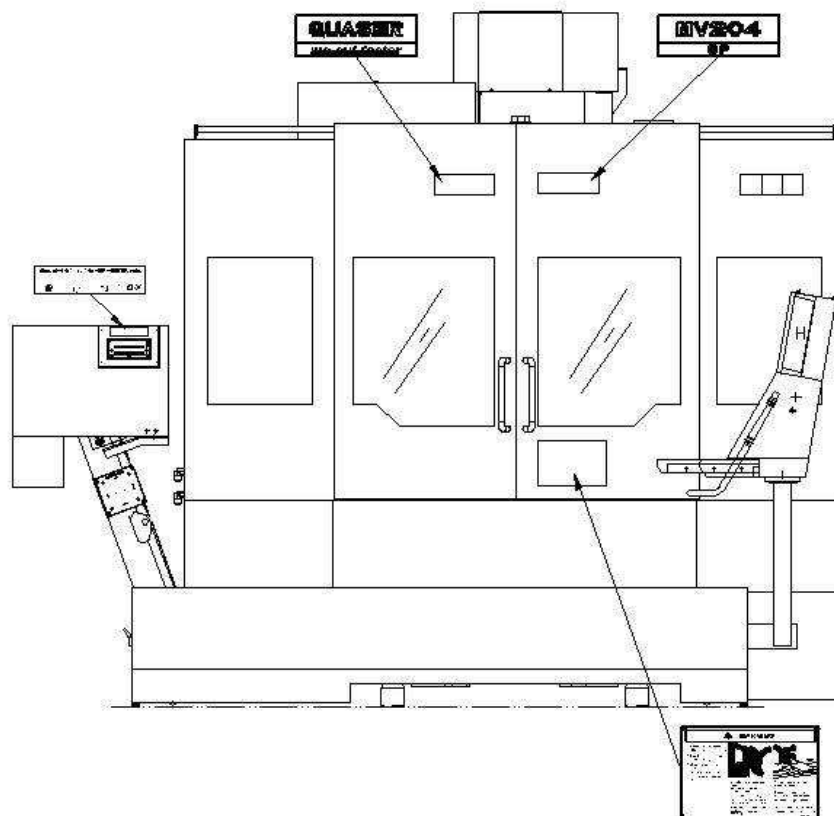
MV154/MV184 Machine right view



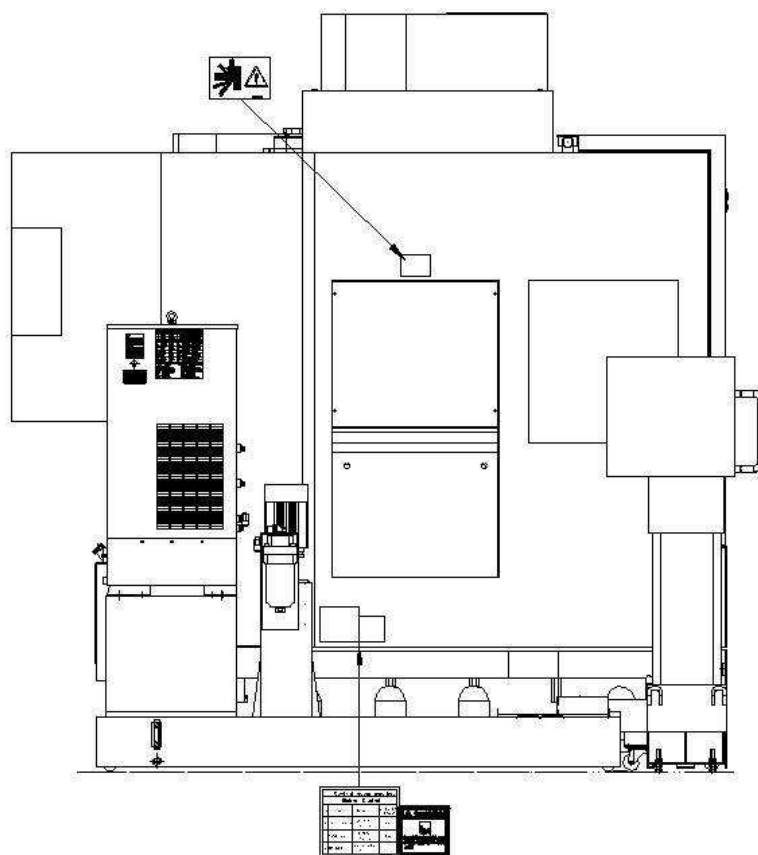
MV154/MV184 Machine rear view



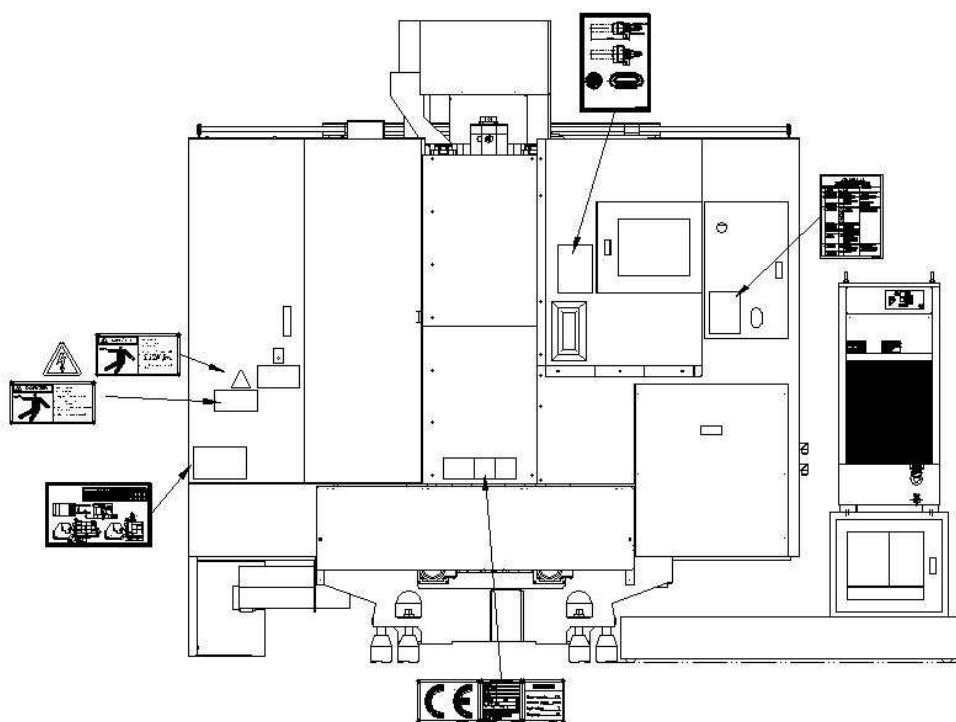
MV204/MV205 Machine front view



MV204/MV205 Machine left view



MV204/MV205 Machine rear view



1.1.6 Built-In Safety Measures

Never operate machine with the protection cover removed or interlocks while any other safety device is inoperative.

All machines are fully equipped with a variety of safety devices to protect both the operator and the machine from unexpected danger. However, these safety devices will function only when they are set correctly – covers can protect the operator from possible danger only when they are set correctly and also interlocks can only work if they are set properly.

Therefore, never operate the machine without the safety devices set correctly.

The door interlock function activates when the door is closed, never remove the key latch from the door, if the key latch is removed the safety of the operator will be jeopardized.

1.1.7 Specification Change and Modification

Machine specifications are set to the optimum conditions before shipment. Never try to change the machine specifications without consulting your machine tool supplier. If only some of the specifications are changed, the other specifications will not match the change and unexpected results will be obtained. In the worst case, specification changes will result in adverse effects.

If, in order to meet special requirements, it becomes necessary to change or modify the specifications, always consult your machine tool supplier.

Never change the parameter settings without consulting your machine tool supplier. If changed inadvertently, some parameters will cancel the interlock settings.

Operate the machine according to its specifications.
Machine installation and repair should be performed only by an authorized technician.

1.1.8 Precautions on Automatic Operation

Machining Centres are usually operated according to programs stored in the NC memory. During automatic operation, the machinery starts suddenly or a machine unit may move unexpectedly, Therefore, never touch the machine's moveable parts or stand close the machine during automatic operation.

Before pressing the cycle start switch (START) to begin automatic operation, check the following points:

- The workpiece is secured

- The tools are set in the magazine

- The machine doors are closed

- Set the override switches (spindle speed, rapid traverse rate, and cutting feedrate) to the proper value.

When running a new program for the first time, check the program number. Never attempt to start a new program in the automatic mode: carefully run the program one block at a time using the single block function.

During automatic mode operation, be careful not to touch any switches inadvertently.

After the completion of a cycle, always check that the cycle start indicator is not lit and that the program has ended before removing a machined workpiece and setting a new workpiece.

1.1.9 Maintenance and Inspection

In order to keep the machine operating safely, it must be maintained and inspected daily.

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

Maintenance

Maintenance requirements and procedures can be found in both the Operators Manual and the Maintenance Manual.

Precautions on Performing Maintenance and Inspection Work

When cleaning the spindle use soft rags to wipe coolant or other foreign matter off housing.

Never use compressed air to clean spindle. If the compressed air is applied to the spindle metal particles may enter the spindle bearings, extremely shortening the service life of the bearings.

Also keep the spindle taper hole clean. Any foreign matter on the tapered hole will deteriorate spindle accuracy or prevent correct operation of the tool clamp collet.

The fan and filters in the electrical cabinet must be kept clean.

The solenoid valves become very hot when the machine is operating. Be careful not to touch them soon after machine operation.

Use only fresh, uncontaminated lubricating oils as specified in the instruction manual. Clean the reservoirs and filters in the lubrication line periodically and check for damage to the lubrication equipment and piping.

Supply or change hydraulic oil and lubricating oil to hydraulic unit and transmission at the intervals specified in the instruction manual.

Periodically clean the tanks and filters of all equipment and inspect the equipment and its piping for damage.

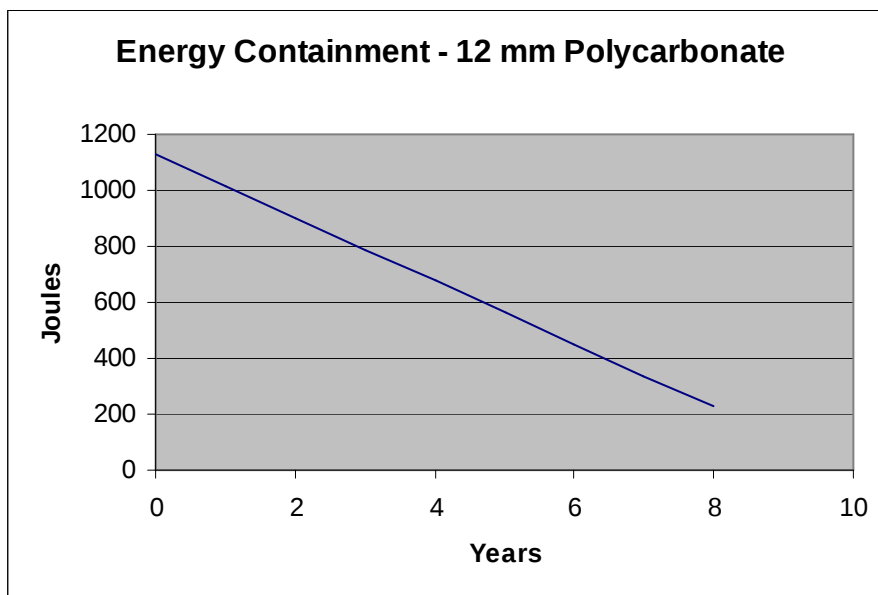
When chips are being discharged with the chip conveyor, never put your hand or foot on the conveyor.

Be very careful if it is necessary to climb on the machine for cleaning or other purpose. Do not climb on the machine unless absolutely necessary. Only qualified personnel should climb on the machine

Carry out daily, monthly, and semi-annual inspections and regular inspections in accordance with the guidelines set out in the Maintenance Manual.

1.1.10 Replacing Door Windows and Covers

The majority of windows fitted to QUASER Machining Centres are manufactured from the GE Plastics LEXAN® range of polycarbonate sheet, with a hardened surface coating called Margard®. The hard coating gives protection against minor scratching. Testing over the past few years has resulted in confirmation that the impact resistance of polycarbonate degrades over time after exposure to the metalworking fluids and lubricants used in the metalworking process. Although the Margard® coating provides some protection against the cutting fluids, the polycarbonate still degrades.



The diagram above is typical for a 12mm thick polycarbonate window, as fitted to a QUASER Machining Centre. Given that a QUASER has a possible maximum cutter of Ø125mm and that the maximum projectile energy that the window is likely to see will be a fractured piece from the periphery of the cutter, then using the projectile mass of 0.1kg (as used in the Safety Standard EN12417), then the impact energy and potential window useable life will be:

Maximum Spindle Speed (rpm)	Projectile Energy (Joules)	Window replacement period (years)
7500	120	9
9000	173	8.1/2
12000	308	7
15000	482	5.1/2

NOTE: 12000RPM following uses the 12mm acrylic.

The chart above is for guidance only and must be used with caution. Life of the window of the machine will also be determined by the use to which the machine is put. The analysis of window life is based upon the predicted maximum cutter used. It can be foreseen that the customer can load a larger cutter than Ø125mm. It is also possible for the cutter to be of a special design,

with a large tip (although it is unlikely this would ever weigh more than 0.1kg). The customer must complete his own risk assessment to determine the potential of exceeding the impact resistance of the windows.

Note: In order to prevent the hazard due to the window is getting maturing. Please replace the acrylic window every 3 years.

Procedure to complete the risk assessment:

1. Determine the following information

Machine installation date	
Date of last window change	
Maximum cutter outside diameter, including manually loaded tools, $d^{\max}$	mm
Maximum tip mass, $m^{\max}$	kg
	If this value is less than 0.1kg, then use 0.1
Maximum spindle speed, $s^{\max}$	rpm

2. Calculate the following

Cutter periphery speed, $v (\pi d^{\max} s^{\max}) / 60000$	m/s
Possible projectile energy, $J 0.5 m^{\max} v^2$	Joules

3. Determine the impact resistance of the window from the previous graph.

As an example, if the machine is 5 years old (or the window was changed 5 years ago) then the impact resistance is just over 563Joules

Impact resistance, J (from the graph)	Joules
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4. Determine the risks.

Compare the calculated energy of the potential projectile against the window impact resistance energy. It is always sensible to allow a safety margin within the comparison. A 30% safety margin should be used as an absolute minimum.

If you have any doubts about your use of this procedure contact your local QUASER representative or Service Department for advice and help. It is important however that the responsible person within the facility make any conclusions as to the safety of the cutting process that the machine is being used.

If a workpiece, fixture etc files out and breaks a window or cover, or if a window or cover is scratched by chips and some of the normal field of view is lost, replace the window or cover as soon as possible. Note that once a window and cover have been subject to a strong impact, their safety can no longer be guaranteed even though they may appear to be unaffected.

When changing a window and cover, be sure to contact your machine tool supplier and use the specified product at the time the order is placed. Your Machine tool supplier cannot accept responsibility for any trouble arising from the use of a window and cover not to specification.

If you operate the machine while a window or cover is damaged, a workpiece, chips or coolant may fly out through the damaged window or cover.

If some of the normal field of view is lost, it will not be possible to properly ascertain the status of the machine during machining and setup work. This could cause accidents involving serious injuries or damage to the machine.

1.2 TURNING THE POWER ON AND OFF

Always turn the power OFF before performing any work inside the machine.

Always turn the power OFF before performing any work inside the electrical cabinet or NC unit.

Never let the machine operate unattended. Stop the machine and turn the power OFF before leaving the machine.

To turn the power OFF, follow the sequence below:
Stop the machine and place in Manual Mode.
Press the power off switch



Press the Emergency Stop switch on the operator's panel.

Turn the main switch (non fused circuit breaker) OFF.

Always check that there are no obstacles or people near the machine's moveable parts before operating the machine.

After turning the power ON, make sure that the slideway lubrication pump and the fans are operating correctly.

Before operating the machine, make sure that the gauges for hydraulic pressure, air pressure, and lubricating oil pressure indicate the correct values.

Also, warm up the spindle, see Spindle warm up procedure.

Do not open the doors of the electrical cabinet, the NC unit, or the operation panel except for maintenance purposes, since it will allow dust, foreign matter, and moisture to enter, causing machine faults.

If power supply is momentarily cut off during machine operation due to a power failure, turn the main switch OFF immediately.

The machine cannot operate correctly unless the specified power is supplied.

If the power supply is momentarily cut off during operation due to a power failure or lightning, the machine may operate in an unexpected manner.

If abnormal malfunctions in the power supply voltage are likely, for example due to lightning, it is advisable to switch the power OFF.

1.3 DOOR INTERLOCK FUNCTION

WARNING

The door interlock function is developed to ensure the operator's safety during machine operation.

Before starting the machine operation, make sure that the door interlock function is valid. When the door interlock function is made valid, machine operation is enabled or disabled in response to the closing or opening of the machine door. Spindle rotation and all automatic operations (including ATC operations) are inhibited when and whilst the door is open. Axes feedrate is limited when the door is open.

Anticipated danger and possible accidents, which exist or will likely occur, are described below. Access to the rotating cutter however, can only be possible if the door interlock is defeated.

The following cases describe possible accident occurring in general vertical machining centers. However, similar accidents will occur in horizontal machining center's or other type of machining centers.

The operator will become entangled with the spindle if the spindle starts while the operator is touching the cutting tool.

The operator will become entangled with the spindle if the operator touches the cutting tool while the spindle is rotating.

The accidents described above, in which the operator becomes entangled with the rotating parts of the machine, will result in serious injury or death.

A workpiece and/or cutting tool will fly out if the cutting tool is hit against the workpiece due to a programming error.

A workpiece will fly out if the machining (automatic operation) is started while the workpiece is not clamped properly.

A workpiece will fly out due to excessively heavy cutting force.

The hazards described above can cause accidents in which the operator or a person near the machine is struck by a flying workpiece or a cutting tool, resulting in serious injury or death.

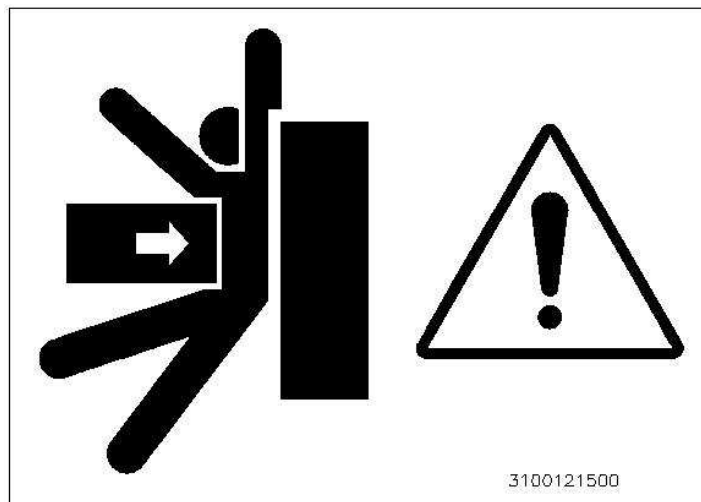
The operator or person standing near the machine will be splashed with chips and coolant during machining, resulting in injury or health problems (particularly if chips or coolant get into the eyes).

The operator will be caught by the table or the column during axis feed, resulting in serious injury or death.

The operator will be injured by touching the cutting tool or tool magazine while the ATC is operating.

The accidents described above, in which the operator is caught by or becomes entangled with the moving parts of the machine, will result in serious injury or death.

1.4 SAFETY DURING MACHINE OPERATION(I)



Keep all the doors closed while operating the machine. The area inside the doors contains many sources of potential danger – the spindle rotating at high speed with a tool clamped in it, the table moving in 2 axes with a number of workpieces, splashing coolant, and flying chips.

Never remove the covers unless it is for maintenance purposes.

Never start the machine operator without the safety devices in place.

The spindle speed must be lower than the allowable speed for the cutting tool. If the spindle is rotated at a speed faster than the allowable speed of the cutting tool, the cutting tool may be broken or fly out, causing machine damage and/or operator injury. For the allowable speed of the cutting tool, consult the tool manufacturer.

The tool balance must be better than G2.5. Out of balance tools may damage the tool or spindle and may cause danger or injury.

Do not run the spindle above 10,000rpm without a tool in the spindle taper. The tool clamp mechanism may cause vibration and affect the spindle life.

1.5 SAFETY DURING MACHINING OPERATION(II)

For the machine with the table that moves to the right, left, forwards and backwards with the covers, always be careful and alert while standing near the table.

Never stand near the moving units of the machine while the machine is operating. Serious injury can occur by being caught in the rotating unit or between the moving parts.

All moving units of the machine are enclosed to ensure safety. There are many moving units all over the machine so exercise caution.

Never touch any rotating part; make sure that the part has stopped rotating before touching it.

Never try to remove chips while the spindle is rotating.

Cover your hair and do not wear loose clothing or jewelry to avoid becoming entangled or caught in the machine. Always wear safety shoes when operating the machine.

Never leave any tools or instruments on the machine operation panel or on any machine part.

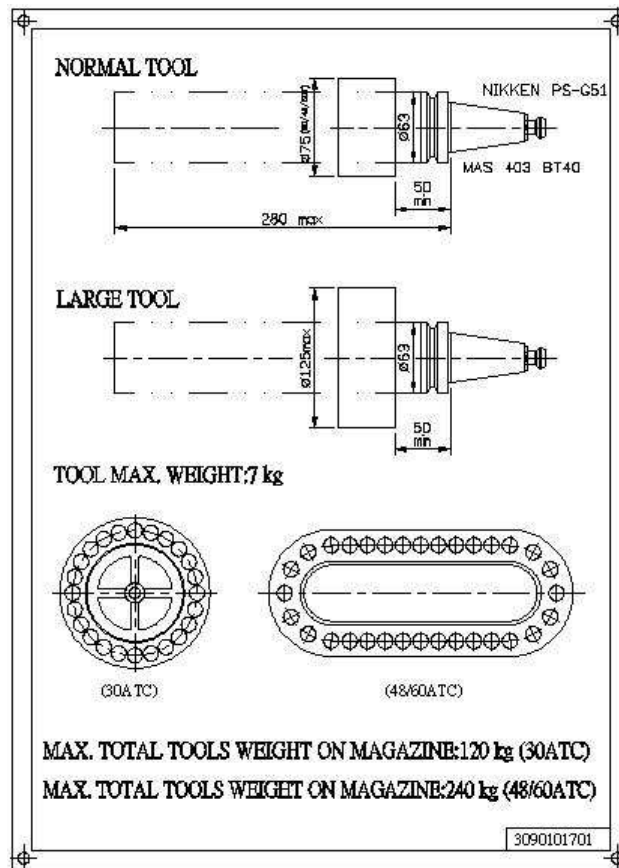
Do not lean against the machine whilst in operation. Leaning on the covers can be very dangerous.

When working or walking beneath the operator panel, be careful not to hit your head on the operator panel.

Never use ladders or platforms to access any parts of the machine, you may fall which could cause an injury

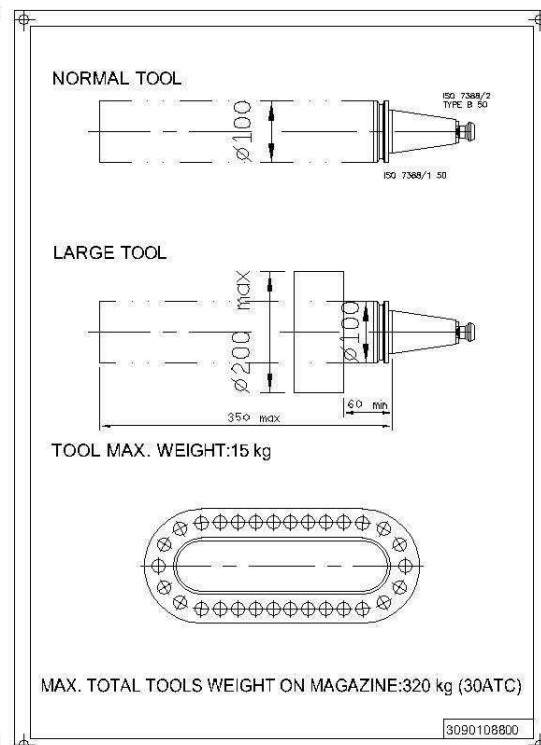
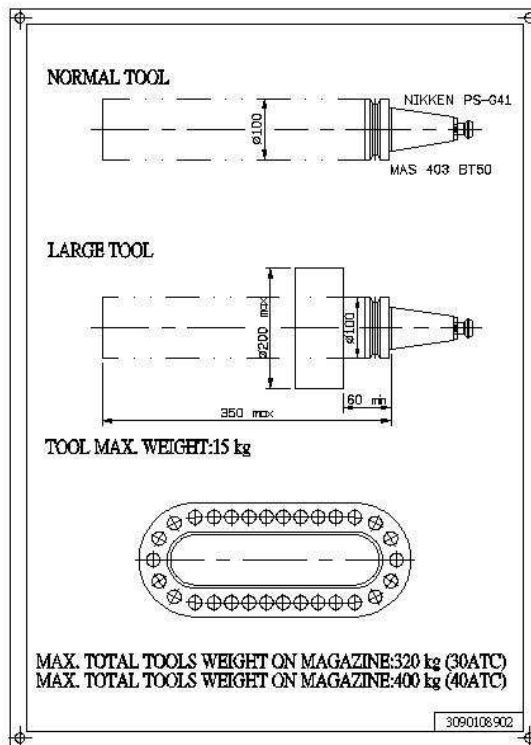
1.6 TOOLING & ATC

MV154/MV184



MV204/MV214(MV204CPL)/MV234

MV205/MV215(MV205CPL)/MV235



Never try to touch the tools in the magazine while the machine is operating. Keep away from the ATC related parts as well.

Clamp the workpiece and cutting tools securely. Depth of cut and cutting feeds must be selected with small values.

Only use cutting tools that are within the limit of individual models. A tool exceeding the limit will interfere with the workpiece, fixture, or cover. Make sure that all cutting tools are within the limit before starting automatic operation.

Before setting cutting tools in the ATC magazine, clean the spindle taper, tool taper shank surface, and magazine pot tapered hole with a clean rag to remove chips and foreign matter.

When fixing a cutting tool such as a face mill in the milling chuck, always use the special fixing tool or vice to fix the tool holder in it, tighten the tool in the tool holder securely.

Never tighten a cutting tool with the milling chuck attached to the spindle.

Never hold the tool holder in the vice, the tool holder taper will be damaged if held in a vice, use the correct tool setting devices.

1.7 WORKPIECE SETTING

When using a manually tightened fixture, always remove the clamp handle or tightening tool from the fixture after tightening.

When clamping a workpiece on the table or in the fixture, take note of the rigidity of the workpiece.

Make sure that the workpiece will not be loosened or distorted due to the clamping force.

Do not leave articles such as tools and rags inside the machine. If the machine is operated with such articles inside it they may become entangled with a tool and thrown out of the machine, and this could cause serious injuries or damage to the machine.

This Machining Centre is designed to machine non-hazardous metals only.

1.8 MAINTENANCE AND INSPECTION INSIDE THE ELECTRICAL CABINET

Even when the main power switch (non - fused circuit breaker) on the electrical cabinet is turned OFF, parts of the cabinet may still have potential and may give an electric shock if accidentally touched. Before attempting maintenance and inspection inside the electrical cabinet, be sure to turn OFF the power at the circuit breaker for the entire plant. It is necessary to conduct maintenance with the power being supplied, confirm the state of power supply by checking the electric wiring diagram and exercise extreme caution.

IMPORTANT NOTICES :

In order to protect NC system if ambient temperature exceed 35°C/95°F, please add cabinet air conditioners.

1.9 PRECAUTIONS ON MANUAL OPERATION AND SETUP

The machine should normally be operated by one, well trained person only.

In cases where more than one operator is essential, the operators must co-operate carefully, communicating as much as possible. If one operator presses buttons on the operation panel or feeds machine axes while another is replacing a workpiece, a fixture, or tool etc, that operator, or some one standing close by, could be entangled in the machine and seriously injured.

Always turn the power OFF before performing setup.

If setup must be performed with the power ON, set the switches on the operation panel to the following positions:

- Select "HAND" mode.
- Remove the tool in the spindle
- Set the override switches (spindle speed, rapid traverse, cutting feedrate) to the lowest value

Make sure that the cutting tool and workpieces are all tightened securely. They should be mounted and well balanced so that the cutting tool will not interfere with the workpiece or the machine.

Make sure that the tools mounted in the magazine are well balanced.

When loosening the bolts on jigs, be sure to loosen them gradually.

Keep your footing stable when loosening bolts.

Do not tighten bolts excessively.

When using a manually tightened fixture, always remove the clamp handle or tightening tool from the fixture after tightening.

Never touch a switch, button, or key with wet hands.

Before using a switch, button, or key, check visually that it is the one you intend to use, and then press or set decisively.

1.10 TO ENSURE HIGH ACCURACY.

When operating a machining centre, the accuracy of the finished product cannot be maintained unless the following points are observed when operating the machine. Failure to observe these points can also cause accidents.

Check Points

When clamping a workpiece on the table or in the fixture, take note of the rigidity of the workpiece.

Make sure that the workpiece will not be loosened or distorted due to the clamping force.

If any chips are entangled on the workpiece or cutting tool, surface roughness will be deteriorated. Select a cutting tool which will not entangle chips.

When starting work and prior to machining, warm up the spindle and each controlled axis. This will minimize the influence of thermal displacement on workpiece accuracy.

Workpiece materials and shapes vary widely among machine users. Select the cutting conditions best suited to each workpiece in order to obtain the required accuracy. If the selected conditions are not the best conditions, an accident may occur.

When forged or cast workpieces are used, the cutting allowance with respect to the finished dimensions varies greatly. Either write a program which takes the variation into consideration or perform pre-machining so that a uniform cutting allowance is left on the workpiece.

Perform periodic leveling of the machine as described in the Maintenance Manual

1.11 PRECAUTIONS WHEN SELECTING COOLANT

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

Choose a coolant suitable for the user's applications by consulting the supplier, taking the following requirements into consideration.

The coolant must be free of constituents with adverse effects (smell, poison, etc).

The coolant must not deteriorate during storage.

The coolant must not cause corrosion on the machine.

The coolant must not peel the coating off the machine.

The coolant must not cause hardening or swelling of chemical parts (rubber parts, synthetic Resin parts, etc)

The coolant must not cause deterioration of accuracy.

Do not use highly viscous coolant. If such coolant is used, specified discharge volume might not be obtained.

Do not use flammable coolant. Heat generated by electrical devices or during cutting might cause a fire.

When adding water-soluble coolant, dilute the coolant first and supply diluted coolant to the coolant tank. If only water is added to the coolant tank, it will cause rusting of the machine.

1.12 INTERLOCK FUNCTIONS THAT ENSURE SAFE OPERATION

This machine features interlock functions to ensure the operators safety. Before starting the machine, always make sure that these functions are valid. Your machine tool supplier is not responsible for accidents that occur as a result of the machine being operated without first validating these interlock functions.

Door Interlock

The door interlock function disables manual operation such as spindle rotation and the cycle start of the automatic operation while the front door is open.

The door interlock function protects the operator from operation errors such as starting the spindle rotation while touching the spindle or a workpiece, and dangers such as being caught by the table if the operator has to carry out operation inside the machine.

Toolchanger Door Interlock (30, 48 & 60 ATC)

The ATC door interlock function disables the manual operation of the ATC magazine and prevents automatic operation of the machine whilst the door is open.

The door interlock function protects the operator by preventing him from the danger of coming into contact with moving cutting tools or being caught by the magazine whilst the magazine is rotating.

Electrical Cabinet Door Interlock

When the electrical cabinet door interlock is valid, power cannot be turned ON while the electrical cabinet door is open.

The electrical cabinet door interlock function protects the operator from receiving an electrical shock caused by touching a live device inside the electrical cabinet by turning off the power while the electrical cabinet door is open.

APC Door Interlock (if fitted)

The APC door is not locked during machine operation, this is to allow pallet loading. Opening the door during the pallet change cycle will stop the cycle. Closing the door and pressing the 'Work Setting Enable' button on the APC operators panel will allow the cycle to finish.

1.13 FOR SAFE OPERATION

This machine is intended for operation by persons who have a basic knowledge of machine tools including cutting theory, tooling and fixtures. Your machine tool supplier cannot accept responsibility for accidents that occur as a result of operation, maintenance, or programming of the machine by personnel who lack this basic knowledge or sufficient training.

Workpiece materials and shapes vary widely among machine users. Your machine tool supplier cannot predict the spindle speed, feedrate, depth of cut, etc that will be required in each case and it is therefore the user's responsibility to determine the appropriate settings.

Each machine is shipped with a variety of built-in safety devices. However, careless handling of the machine can cause serious accidents. To prevent the occurrence of such accidents all programmers and other personnel that deal with the machine must carefully read the manuals supplied by your machine tool dealer, the NC unit manufacturer, and equipment manufacturers, before attempting to operate, maintain, or program the machine.

Because there are so many "things that cannot be done" and "things that must not be done" when using the machine, it is impossible to cover all of them in the instruction manual. Assume that something is impossible unless the manual specifically states that it can be done.

The following manuals are supplied with your machining centre:

- Safety Manual
- Instruction Manual, Installation / Maintenance Manual
- NC Unit operation
- Instruction manuals prepared by ancillary equipment manufacturers

In addition to the instruction manual, Electrical diagrams and Parameter tables are also supplied with the machine to help with electrical maintenance, the documents are contained inside the documents sheet for shipping but it is recommended copies are kept in a safe location by the service department. Fundamental safety information is presented in the following pages.

All cautions on operation must be strictly observed when operating the machine, carrying out maintenance work, or writing programs. Failure to observe fundamental safety information can cause accidents in which the operator or other personnel working near the machine are seriously injured or the machine is damaged.

All personnel that deal with the machine must carefully read and thoroughly understand the information in the instruction manuals before attempting programming or operating the machine.

"Operator", as used in these cautions, means not only the operator who operates or supervises a machine tool to perform machining, but also any person, including maintenance personnel who maintain and inspect a machine tool or safety device or safety measures provided with it, and the programmers who create programs used for machining, who are engaged in operations which deal with a machine tool.

Therefore, all persons engaged in these operations must carefully read these cautions and related materials, and thoroughly understand the contents before attempting to operate the machine.

1.13.1 Safety Clothing

Approved safety glasses and safety shoes should be used at all times when operating or in the vicinity of the machine.

Never wear loose clothing whilst operating the machine as loose clothing may become entangled and you will be severely injured.

Never operate the machine with long hair as long hair may become entangled and you will be severely injured, persons with long hair should use a hair net. Use protective gloves when removing tools or cleaning swarf from the machine, tools and swarf are very sharp and can cause severe injury.

Do not wear gloves when operating the machine control panel as these may interfere with the operation of the controls.

Wear protective gloves and safety glasses when handling coolants or oils.

1.14 CONSIDERATIONS BEFORE OPERATING THE MACHINE

The cautions that must be constantly borne in mind when operating the machine are listed below. These cautions apply to all machine related work (operation, maintenance, inspection, programming etc)

Never touch a switch, button, or key with wet hands.

If it is not properly grounded or is leaking current, you could receive an electrical shock.

Before starting operation, check that there is nobody inside the protective cover or close to rotating or moving parts of the machine. Never touch or stand near the rotating or moving parts of the machine whilst it is operating; you could be seriously injured by being entangled in the rotating parts or crushed by moving parts.

Never operate the machine with the protective cover remove or while interlocks or other safety devices are ineffective. Since the machine could operate in an unexpected manner, causing accidents involving serious injuries. Contact your machine tool supplier, the NC unit manufacturer or relevant equipment manufactures immediately if the protective cover or safety devices are damaged.

Always lock out the power to the machine before carrying out work inside the machine- such as setup work or cleaning the inside of the machine- and before carrying out inspections, repairs, or maintenance work. In addition, set the main switch to the OFF position and lock it, and place" PERSONNEL INSIDE MACHINE" or "UNDER MAINTENANCE" signs around the machine to stop anyone from switching on the power or operation the machine while work is in progress. If work inside the machine or inspection or maintenance work is carried out with the power switched ON, machine elements could be moved, and the personnel carrying out the work could be seriously injured by being entangled in the rotating parts or crushed by the moving parts of the machine.

Always switch off the power before carrying out inspection or maintenance work in the electrical cabinet or on motors and transformers. If work has to be done while the power is switched on, it must be carried out by a qualified electrical engineer, taking the proper precautions; there is a danger of electric shock.

Cover any power cables that are running along the floor with rigid insulated pates to prevent them from being damaged. Damage to the insulation of the power supply cable could causes electric shocks.

Even after the power is turn OFF, some devices will remain charged and the temperature of motor, light etc inside the machine will remain high. Make sure that the charge has been discharged or the temperature has fallen before carry out maintenance work or inspections on these devices. If you touch these devices/units carelessly while they are still charged or while the temperature is still high you could receive an electric shock or be burned.

Check that all cables are properly insulated before using the machine. There is considerable danger of electric shock if damaged cables are used.

Keep the floor areas around the machine tidy and clean; do not leave things lying on it, and clean up spilled water or oil immediately. If you fail to do this, plant personnel may injure themselves by tripping over or slipping on the floor.

Before operating the machine, check the area where you will have to stand and walk to make sure you can operate the machine safely. If you do not check your footing beforehand, you could lose your balance while working and injure yourself by putting your hand in a dangerous place while trying to find support, or by falling over.

Before using a switch, button or key, check visually that it is the one you intend to use, and then press or set decisively. Pressing the wrong switch, button or key by mistake can cause accidents involving serious injuries or damage to the machine.

The parameters are set upon shipment in accordance with the machine specifications; do not change them without first consulting your machine tool supplier. If the parameters are changed without consultation, the machine may operate in an unexpected manner, causing accidents involving serious injuries or damage to the machine.

The machine specifications are set before shipping so that customer's safety is ensured and the machine can deliver its full performance. Never change the settings nor modify the machine in any case. Changing the settings or modifying the machine without consultation may degrade safety assurance or cause accidents involving serious injuries, impaired machine performance, and considerable shortening of the machine service life. If the specifications and/or setting have to be changed, or the machine has to be modified to meet new machining requirement, or due to changes in the operating conditions, consult your machine tool supplier. Your machine tool supplier cannot accept responsibility for accidents that occur as a result of changing the machine specifications.

Before operating or programming the machine, or performing maintenance work, carefully read the instruction manual provided by your machine tool supplier, NC unit manufacturer and the equipment manufacturer so that you fully understand the information that they contain. Keep these instruction manuals safely so that you do not lose them. If you do lose any of these manuals contact the relevant supplier for a replacement. If you attempt to operate the machine without having carefully read the instruction manuals first, you will perform dangerous and erroneous operations which may cause accidents involving serious injuries or damage to the machine.

Always observe the instructions in the caution labels stuck to the machine. Carefully read the Safety Guidelines supplied with the machine so that you fully understand them. If the writing on the labels becomes illegible, or if the labels become damaged or peel off, contact your machine tool supplier for replacement. If you require clarification of any labels please contact your machine tool supplier. If you operate the machine without observing the instructions on the labels, or without understanding them properly, you will perform dangerous and erroneous operations which may cause accidents involving serious injuries or damage to the machine.

Never operate, maintain, or program the machine while under the influence of alcohol, drugs or any type of medication that can affect your judgment or co-ordination. You may operate the machine incorrectly causing accidents

resulting in serious injuries or damage to the machine.

Machine operators and authorized personnel working inside the plant and in the vicinity of the machine must ensure that their clothing and hair cannot become inadvertently entangled in the machine or any of its moving or rotating parts causing serious injuries. Always wear safety shoes, eye protection and a helmet.

The machine is equipped with interlock functions such as the door interlock and electrical cabinet door interlock to ensure the operators safety. All the interlock functions must be ON when operating the machine. If you have to operate the machine with the interlocks released you must recognize that there are many hazards involved and pay particular attention to safety while operating that machine in this condition. After finish the necessary work, you must switch the interlocks back ON.

If the machine is operated with the interlocks released, it may operate in an unexpected manner, causing accidents involving serious injuries or damage to the machine.

The door interlock function serves only to protect the machine operator from accidents that can be prevented by inhibiting manual and automatic operation of the spindle/axis movement and all other operations in automatic operation when the door is opened and while it is open; it will not afford protection against other hazards.

For example, each machine user will machine a variety of workpiece types and use a variety of workpiece holding fixtures, cutting tools, and cutting conditions; you are still responsible for ensuring safety with regard to the hazards that can arise from these specific conditions.

Never attempt to move the machine whilst the machine is in operation.

The machine is not be used in a potentially explosive atmosphere.

If the door interlock function is released, the machine is able to operate with some limitations while the door is open, exposing you to danger.

When aligning the workpiece, measuring the tool offset data, or carrying out other setup work, it may be necessary to release the door interlock function. If you have to carry out work while the interlock function is released, you must recognize that there are many hazards involved and pay particular attention to safety. When the door interlock function is released, the warning lamp blinks in red and a warning buzzer sounds intermittently. You must recognize that the door interlock function is released when the warning lamp is blinking in red

Before operating the machine, memorize the locations of the emergency stop buttons so that you can press one immediately from any location and at any time while operating the machine. The emergency stop buttons are used to stop all operations in the event of an emergency. If there is an obstacle in front of an emergency stop button it will not be possible to press immediately when an emergency occurs and this could cause an accident involving serious injuries damage to the machine.

To prevent hazardous situations, the plant or equipment supervisor must bar entry to the plant or the vicinity of the machine to anyone with insufficient

safety training. Allowing persons without sufficient safety training unhindered into the plant and the vicinity of the machine could cause accidents resulting in serious injuries or damage to the machine.

Because of the inertia of the moving parts of the machine, they may not be stopped instantly when the emergency stop button is pressed. Always confirm that all operations have stopped before going near these parts. If you approach the moving parts of the machine without due care you may be entangled in them and be seriously injured.

Do not leave articles such as tools and rags inside the machine. If the machine is operated with such articles inside it they may become entangled with a tool and thrown out of the machine, and this could cause serious injuries or damage to the machine.

1.15 BLOCKED AXIS MOVEMENT

To prevent the axes from being blocked the inside of the machines working area should be cleaned on a regular basis.

If the axes movement becomes blocked by either swarf or a workpiece, the removal of the object should never be attempted whilst the machine power is on.

If swarf has become entangled around the moving parts of the machine, it must be removed immediately to prevent possible damage.

When removing swarf, never use bare hands, always use protective gloves and wear protective eyewear.

Never use hands when handling swarf, always use a tool designed for removing swarf from the machine.

If a workpiece has moved and has blocked the axes movement, open the front access door and then turn off and isolate the power. Seek assistance in removing the workpiece.

If any damage has been done to the machine, call the service department to inspect the machine, operating a machine that has been damaged may be further damaged and may be dangerous to operate.

1.16 HAZARDOUS MATERIALS

This Machining Centre is designed to machine non-hazardous metals only. Non-hazardous materials such as Tools Steels, Aluminum, and Brass may be machined.

Machining materials such as graphite and resinous materials may be performed but in such cases a special Exhaust/Filter system must be fitted. Some materials produce flammable dusts when machined and particular care should be taken in these circumstances as the machine is not ATEX compliant and an explosion could occur. ATEX compliant extraction systems are available at request.

The Machining Center is not designed to machine any hazardous materials such as Magnesium Alloys, materials containing Lead or Radioactive materials.

Machining of these hazardous materials can result in extremely dangerous gases being produced and attempting to machine Magnesium could result in a fire.

In all cases, if in doubt about the content of the material that you wish to machine, contact the material supplier and/or the COSHH data sheet.

1.17 ENTRAPMENT HAZARD

Warning

Do not climb into the machine guard! You may become entrapped.

Because of the compact size of the QUASER range of machining centres, and the provision of side access doors to allow swarf removal, it is not necessary to climb into the machine guard.

In the unlikely event that this warning is ignored and the main access door is closed, then the door will latch shut and cannot be opened until electrical power is applied to the machine. However, it is always possible to exit unaided through a side access door by manually undoing the fasteners on the inside of the door.

1.18 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.

1. Always check that the cutting tool product you are using is approved to run at the selected speed.
2. If non suitable cutting conditions are selected, coolant can splash, and swarf can escape over the sides of the guard.
3. Failure of the Z-axis servo motor brake could allow the head to fall when the power is OFF
4. Do not operate the machine with the side door access panels removed.
5. Isolate the machine before cleaning the machine through the side door access panels.
6. The guards enclosing the work zone (including the vision panels) are designed to have sufficient impact resistance to protect the operator from the ejection of tips from standard tools, or similar objects. It is important for the operator to be aware that the guards cannot provide comprehensive protection against all possible circumstances, including machine misuse. It can be foreseen that the customer can load a cutter of larger diameter, or of special design with a large tip. Should additional hazards be envisaged then the customer must complete a risk assessment, and take all necessary additional protective measures.
7. The machine tool is supplied with swarf removal systems such as augers or conveyors (as appropriate to the model). These devices must only be used when located in their correct positions beneath the enclosure guard. If these devices are removed for cleaning or maintenance, they must always be isolated electrically; otherwise moving parts may be exposed, which could cause serious injury.

2. PRE DELIVERY & INSTALLATION GUIDE

2.1 INTRODUCTION

The contents of this document have been prepared to help you ensure the best possible installation for your Machining Centre.

IMPORTANT :- Nothing in this document or in accompanying literature, drawings, charts or letters, implies the existence of a contract between yourself and QUASER Machine Tools. The information given is believed to be accurate but you are reminded that no claim for damage, delay or cost incurred from the use of this information will be accepted by QUASER.

If there are items upon which you are unsure, or questions you may have which are not covered within the document, please do not hesitate to contact us.

The telephone number is +886 4 2682 1277. Ask for the Machine Order Department, or contact your local distributor.

Your co-operation in making two telephone calls is sought immediately after installation is completed, so that commissioning of the machine can be concluded without delay, and to arrange for your training. The telephone numbers and contacts are:-

For commissioning: ask for the Service Department +886 4 2682 2429

For training: ask for the Application Department +886 4 2682 2429

You may of course have made alternative arrangements for all or part of the delivery, installation, commissioning and training. If so, we hope that you will still find the information in this document of value.

To assist your planning for the future maintenance of your machine, we have included a chart indicating oils and greases required, together with the coolant system capacity.

Thank you for choosing a QUASER Machining Centre.

Should you require additional clarification to ensure the successful installation of your QUASER Small Bridge Machining Centre, please contact:-

QUASER Machine Tools, INC.,
No.3, Gong 6th Rd.,Youshih Industrial Park
Dajia Township, Taichung County 437, Taiwan
Tel: +886 4 2682 1277
Fax: +886 4 2682 2045

or Your Local Distributor.

2.2 MACHINE DELIVERY

If you have elected to have your machine delivered by QUASER there are a number of points upon which we need information.

NOTE :- If access is difficult, please advise us whereupon you will be contacted in order that arrangements for a visit from a representative of our haulers can be made. They will decide the most appropriate method of accessing your plant.

Please use the following information to assess the suitability of our transport. Do not hesitate to call if in doubt. Telephone number +886 4 2682 1277. Ask for the Machine Order Department.

The machine will be delivered on a crane lorry by our haulers who are contracted to deliver and off-load at the nearest point of access at your premises, and then install the machine inside your premises. The vehicle specification is as follows:-

Overall length including cab	(36ft)	11.0m
Length of deck	(24ft)	7.3m
Width of deck	(8.0ft)	2.4m
Height of deck	(4.5ft)	1.4m
Overall height of crane	(MIN)	4.1m

NOTE :- When operating the vehicle crane, its hydraulic legs will be extended to steady the lift. This will increase the width by an additional (4ft) 1.2m.

To determine the total loaded height of the vehicle, check the above information together with the overall dimensions of your machine illustrated in this document.

It is in everyone's interest to ensure that the off-loading is completely possible. We do urge you to check carefully and to discuss with us areas of doubt. If on arrival our vehicle is unable to off-load the machine, delays and additional charges could arise.

Lifting Equipment

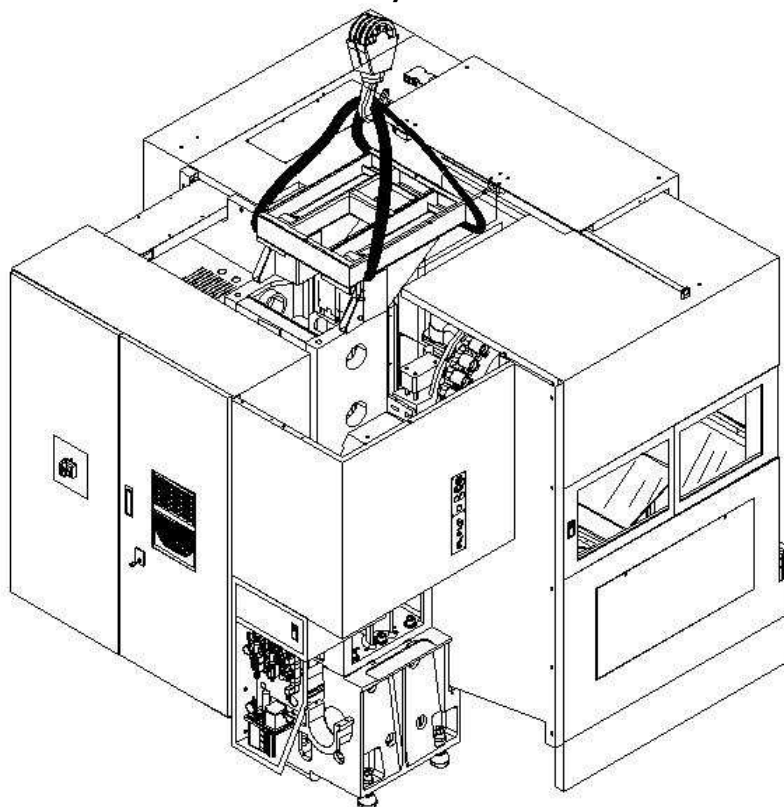
If the machine is to be lifted by crane use the universal lifting frame for your machine which is available from QUASER.

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

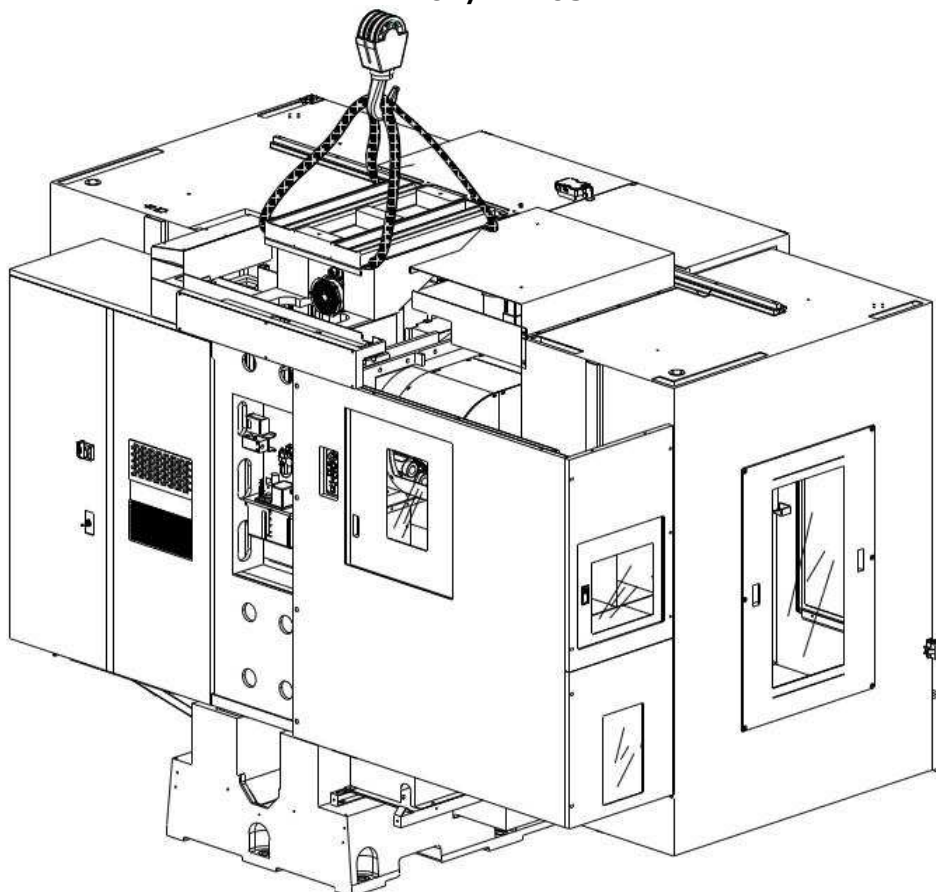
If the machine is to be lifted by Fork Truck it is recommended that the minimum capacity be 15,000kg with a minimum tine length of 2,000mm.

Crane Lifting

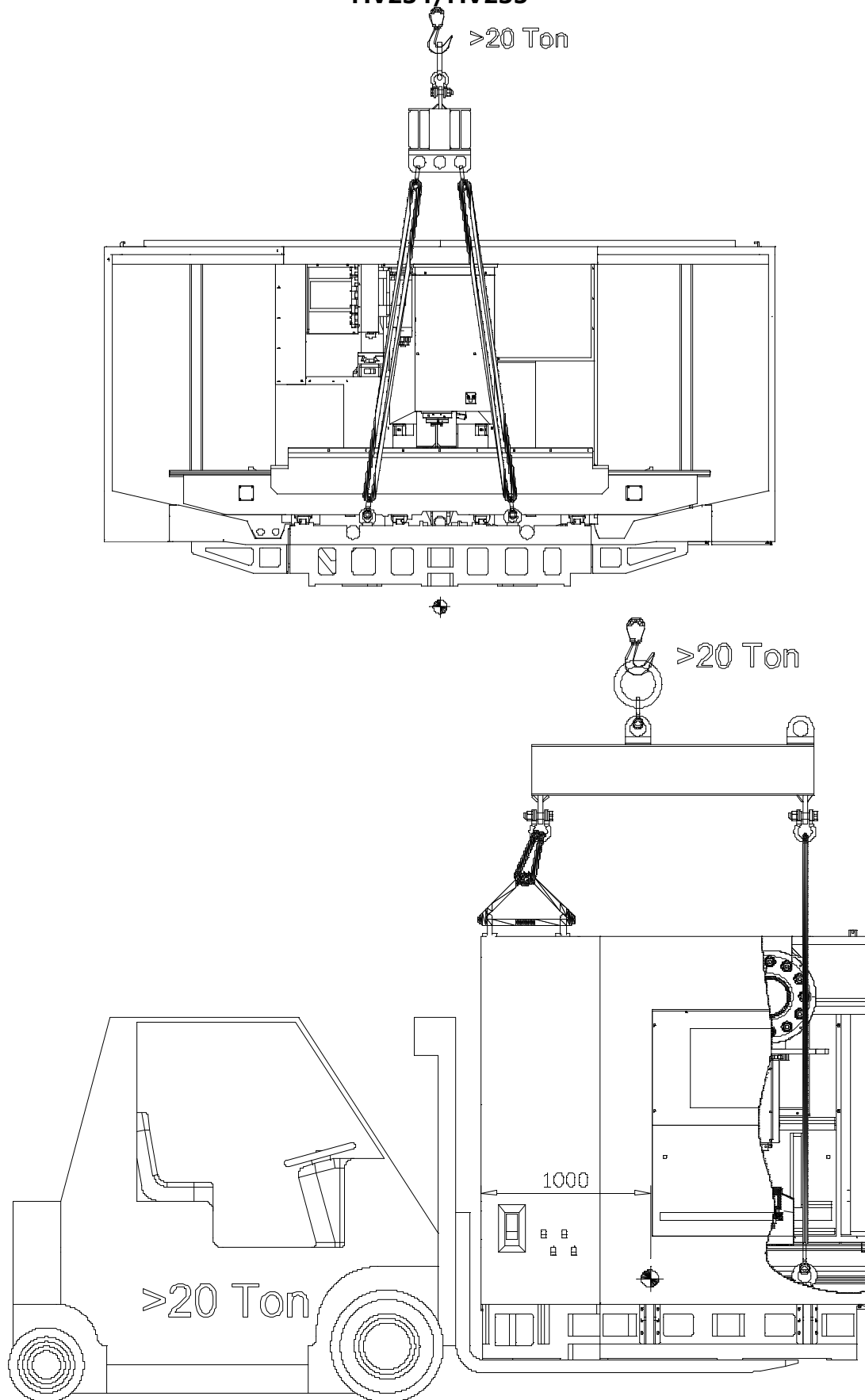
MV154/MV184



MV204/MV205

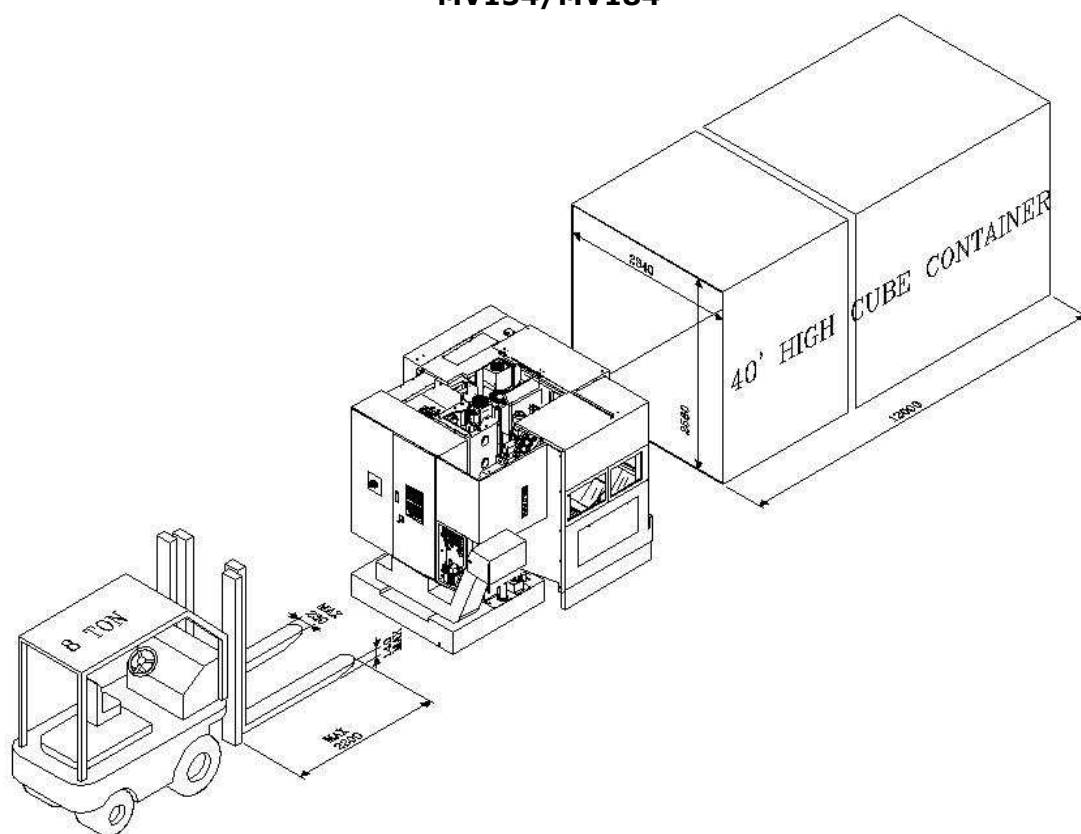


MV234/MV235

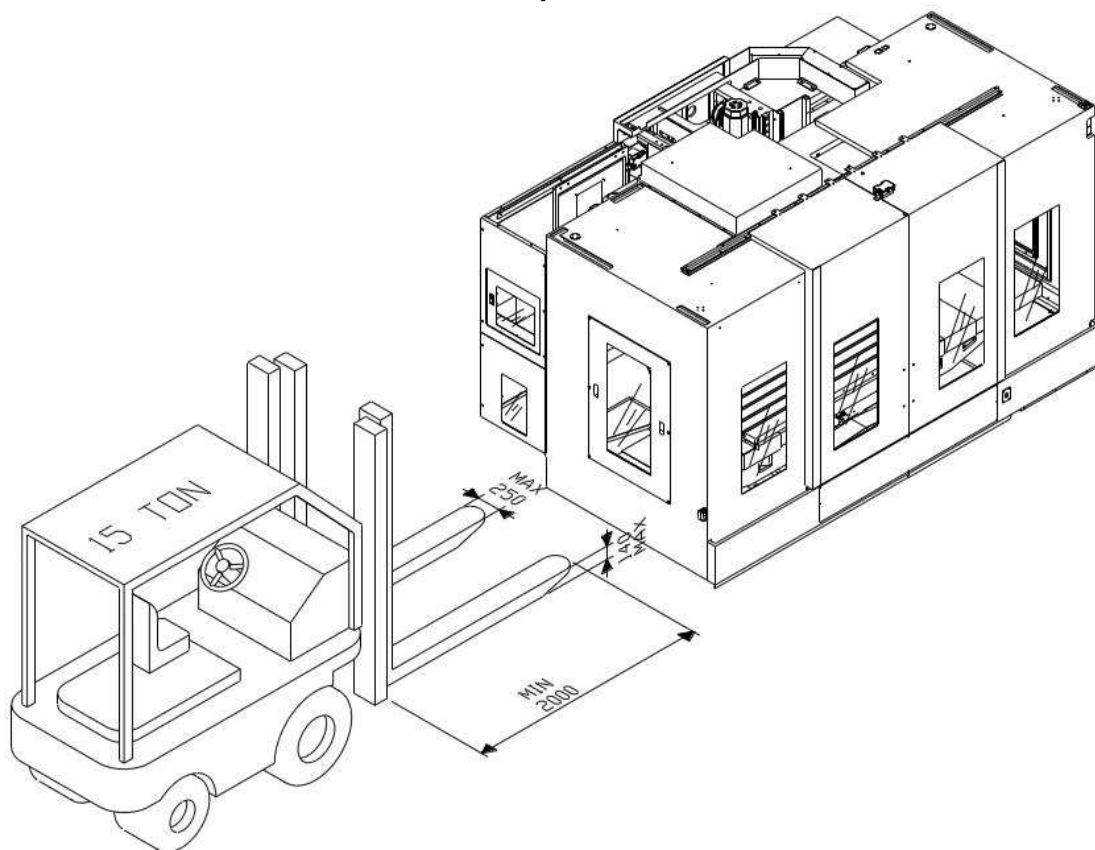


Fork Lifting

MV154/MV184



MV204/MV205



2.3 INSTALLATION

To assist you the following points should be carefully considered.

Check the packing list as soon as you are able to ensure that all items have been delivered. If there are shortages call us on +886 4 2682 1277 and ask for the Machine Order Department.

The following information is provided for your guidance.

2.3.1 Foundation Requirements

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

The composition of the floor and sub-structure should be of suitable construction to bear the weight of the machine (see machine weights page 54). Any friable areas should be made good using recognised building construction techniques. If doubt exists we recommend you consult your building architect.

It is strongly recommended that the machine is bolted down to the floor to provide the best levels of surface finish and reliability of accuracy. Details are shown on page 61 for 'J' bolts cast into the foundation block and a drilling template (11309909900 \ 114299A0010 \ 23209909920) is available for loan from QUASER to accurately position all the studs.

Where an existing floor is to be utilised, plain holes can be drilled and resin or chemical bolts inserted. Please consult a structural engineer for advice on your specific installation.

Do not locate the machine near equipment that causes vibration. Poor cutting or damage to the control may result from vibration transmitted to the machine.

2.3.2 Uncrating (where necessary)

Carefully remove the outer casing, internal braces and skids so that the machine is not damaged in any way. Should damage have occurred in transit inform:

- i) the haulage contractor
- ii) the railways and/or shippers, or
- iii) local agent and state the full extent of the damage. Retain all the packing materials until the Insurance Company's assessor has inspected the machine.

2.3.3 Leveling Procedure

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 over the foundation bolts on the floor. 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 top face of the floor pad.

c) If you use skates to position the machine over the foundation bolts then use suitable support packing and jacks to raise the machine high enough to clear the bolts and then remove the skates before finally set onto the floor pads.

2.3.4 Supply Connection

The connection of the electrical supply to the machine must comply with all the relevant local regulations of the country where the machine is being installed.

A qualified electrician must carry out the connection of the mains electrical supply to the machine.

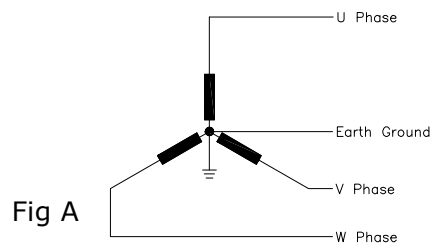
Due to the type of drive systems employed in the machine, it is not possible to use Earth Leakage Circuit Breakers in the machine's electrical supply. The reason for this limitation is that Earth Leakage Circuit Breakers monitor the Earth Leakage by checking that the sum of all supply phases totals zero. In the case of our drive systems, during the operation of the machine there is regeneration of power back to the supply, and the sum zero is not maintained, causing the ELCB to trip.

Where Earth Leakage Circuit Breakers are in use an additional arrangement must be supplied, and this will be at extra cost. Details of the electrical supply should be supplied to the Technical Department at QUASER Machine Tools for further advice.

Line Configuration

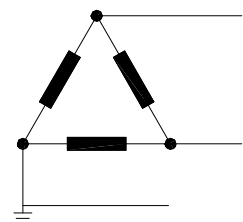
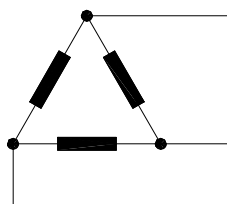
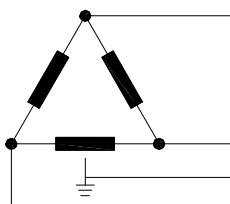
The MV model range is designed to operate from a 3-phase AC incoming power source with an earth star point, as shown in Fig A. This incoming line short circuit current must be at least 2kA.

Recommended Line Configuration



In other cases, such as those examples shown in figures B, C & D, an isolating transformer of 40kVA or 45 kVA 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 at least 2kA.

Other Incoming Line Configurations

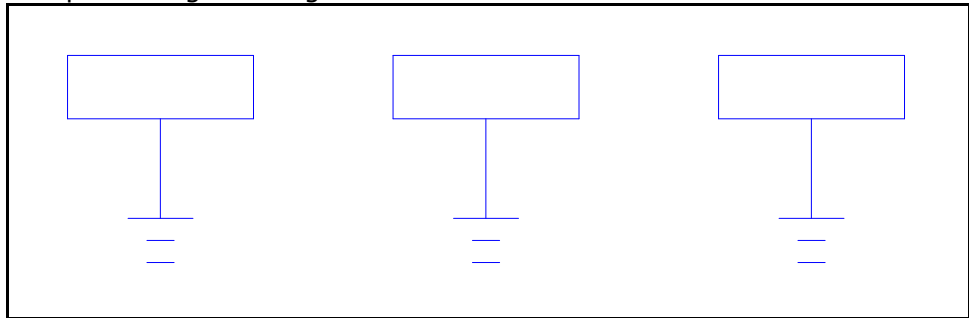


If you have any doubts concerning your supply suitability please discuss this with your QUASER Service Engineer.

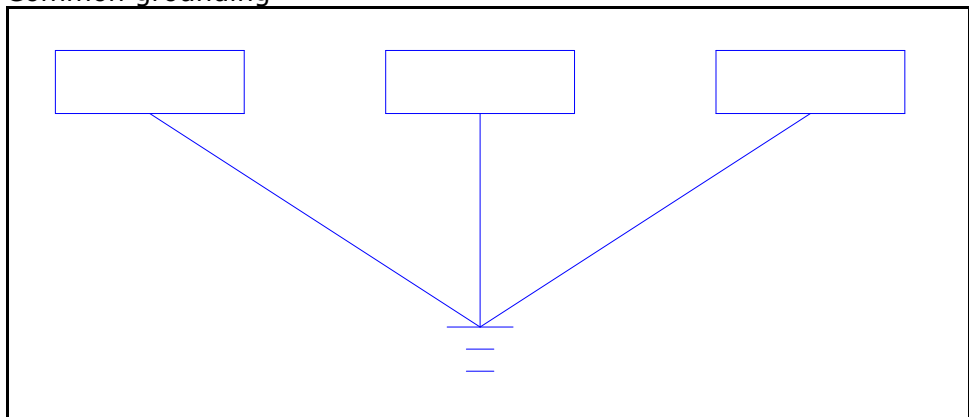
Grounding

- a) All MV machines 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

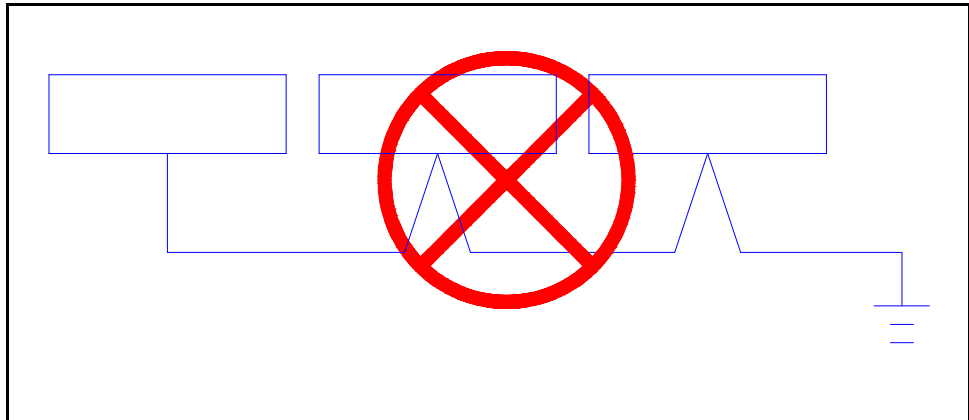


2) Common grounding



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.

NOTE:- We are unable to assist with electrical cable selection as this depends upon your particular site. Your qualified electrical engineer will be able to calculate the correct needs from the chart.

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.

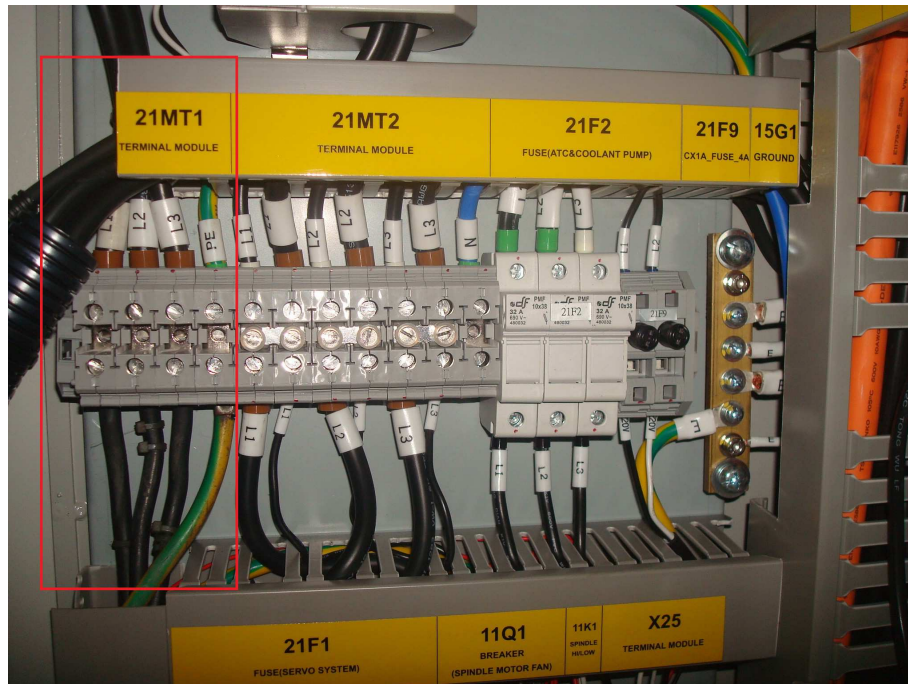
POWER SUPPLY REQUIREMENTS

Machine Type : MV SERIES

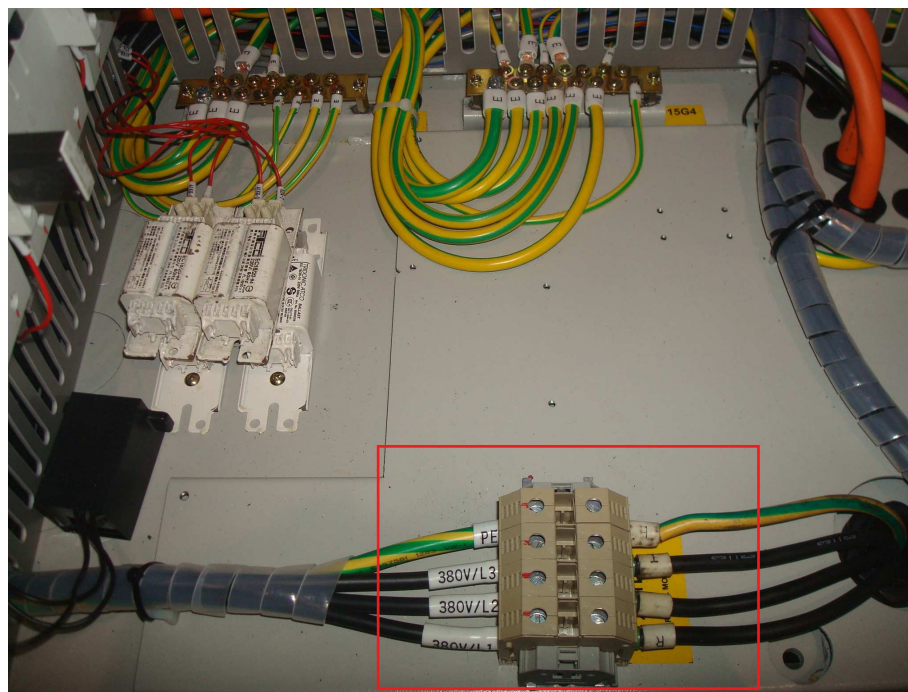
Model	Control	Motor	Drive	KVA	400V Full Load Current	200V
MV154C MV184C	FANUC	β 12	Coupling	16	40A	60A
MV154E MV184E	FANUC	α 12	Belt	20	50A	63A
MV154P MV184P	FANUC	α 15	Belt	25	50A	80A
MV154P MV184P	FANUC	α T 15	Coupling	35	80A	100A
MV154APC	FANUC	α 15	Belt	35	50A	100A
MV154APC	FANUC	α T 15	Coupling	32.5	58A	106A
MV204E MV204V	FANUC	α 15	Belt	30	58A	106A
MV214E(MV204CPL)						
MV234E MV204P	FANUC	α 15	Belt	35	65A	117A
MV214P(MV204CPL)	FANUC	α 22	Belt	35	55A	100A
MV234P MV204P	FANUC	α 22	Belt	40	61A	111A
MV214P(MV204CPL)	FANUC	α T 15	Coupling	33	58A	105A
MV204P MV214P(MV204CPL)	FANUC	α L26	Coupling	45	66A	120A
MV235E MV205P	FANUC	α 22	Belt	45	69A	124A
MV215P(MV205CPL)	FANUC	α 22	Gearbox	40	63A	115A
MV235P	FANUC	α 22	Gearbox	45	68A	124A

Connecting the power cable to main power terminal block 21MT1.

**Ensure the sign rotation of L1,L2,L3,PE phases.
MV154 V53, MV184,MV154APC Type.**



**Ensure the sign rotation of L1,L2,L3,PE phases.
MV204C,MV205C Type.**



2.4 TRAINING

Please telephone the Application Department +886 4 2682 1277,
For details of courses, delegates fees, hotel reservations etc.

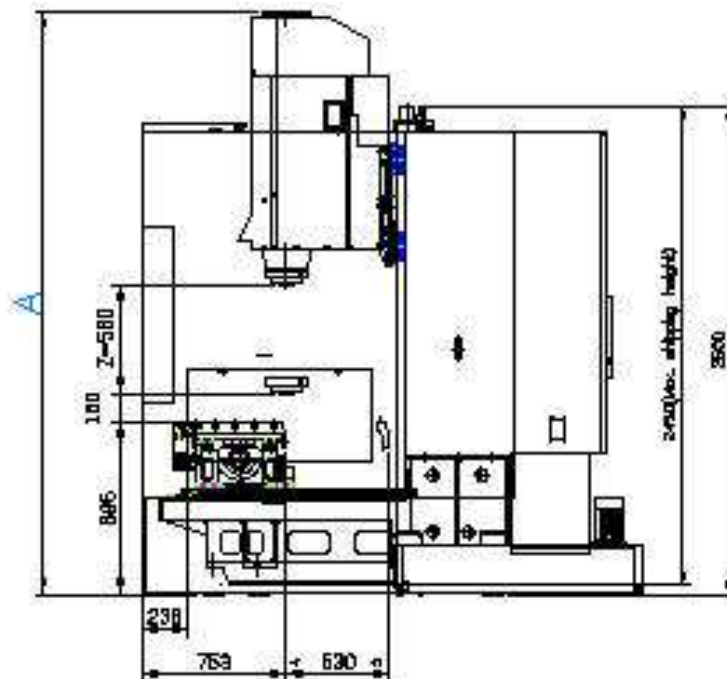
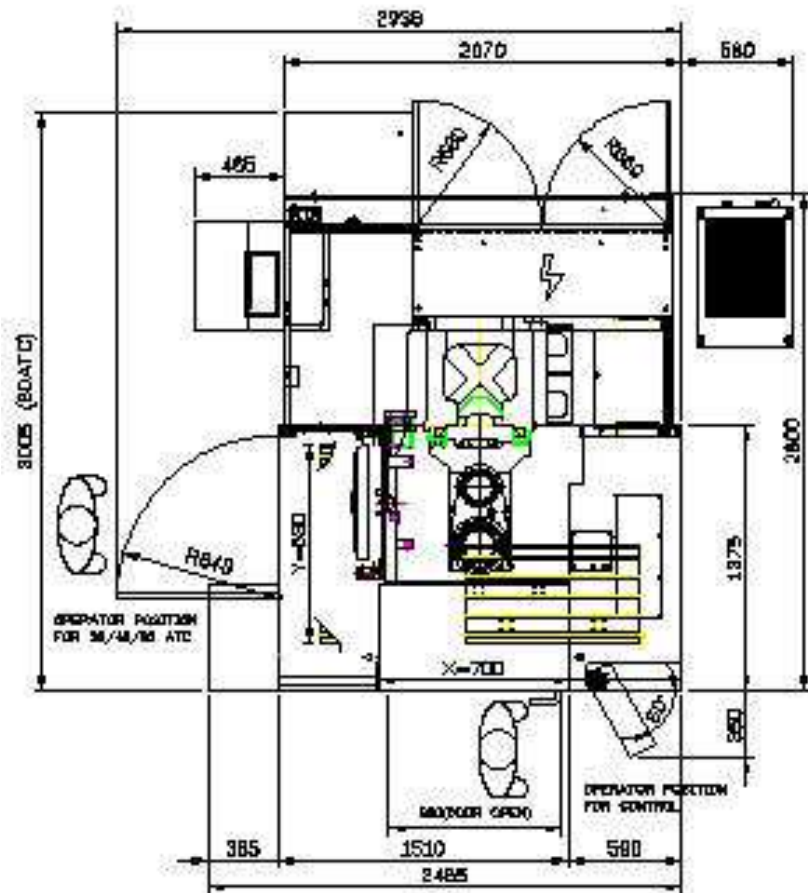
Your earliest attention to this matter is requested as places on our training courses
are limited.

Full joining instructions for delegates will be forwarded prior to the course date.

2.5 MACHINE DIMENSIONS

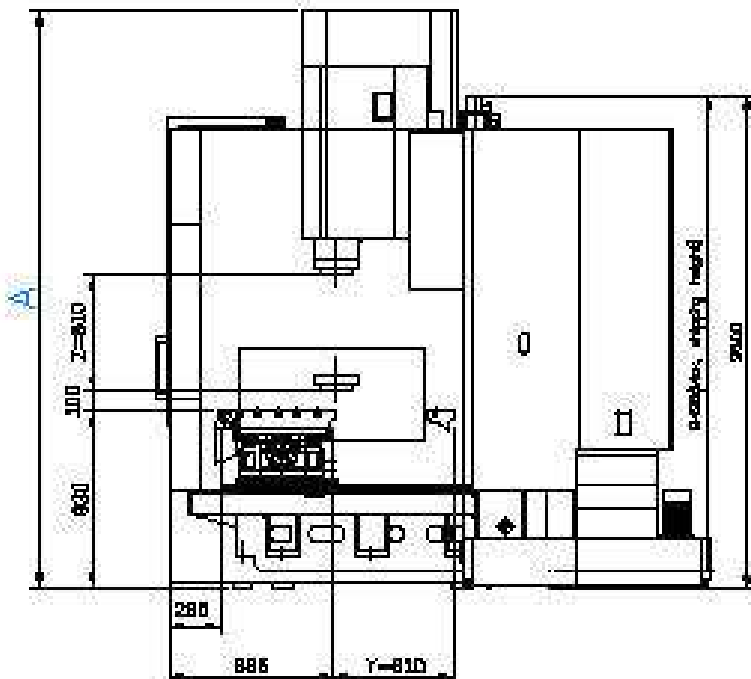
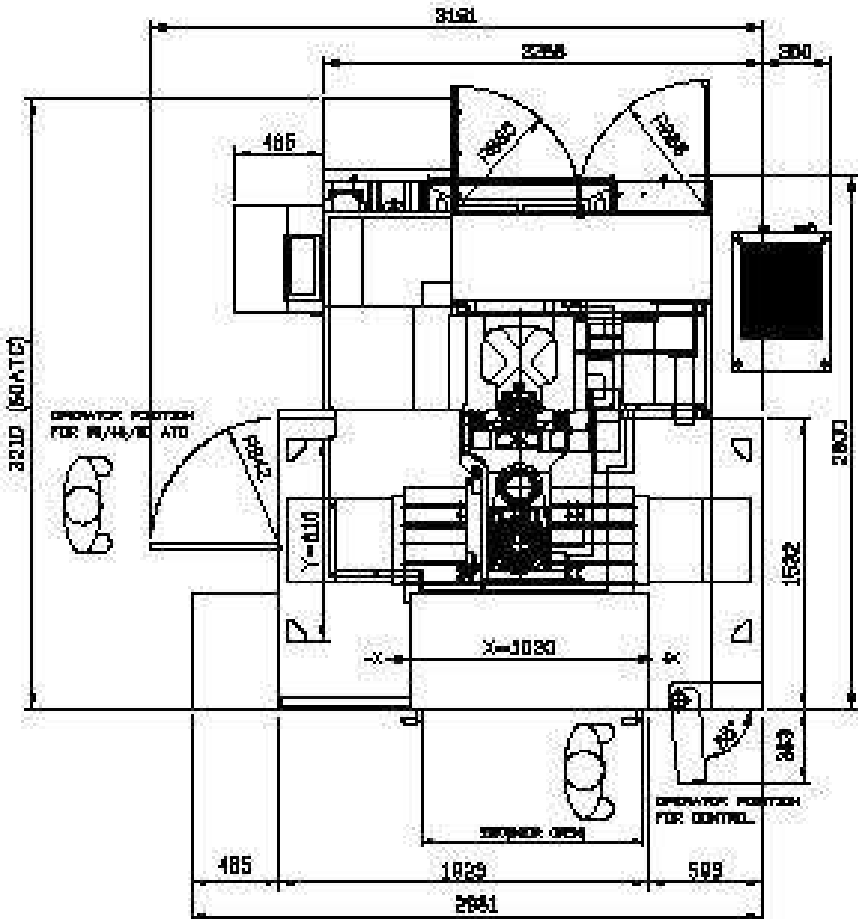
MV154 series

A	6C/10C/12C	3000
	9B/12B	2930
	15C	3030



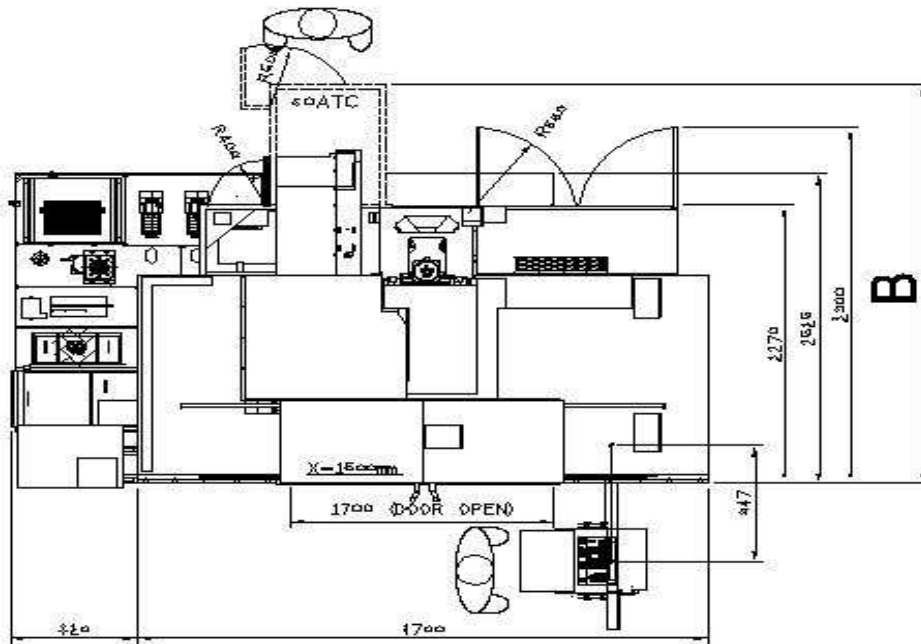
MV184 series

A	8C/10C/12C	2880
	9B/12B	2880
	15C	3065

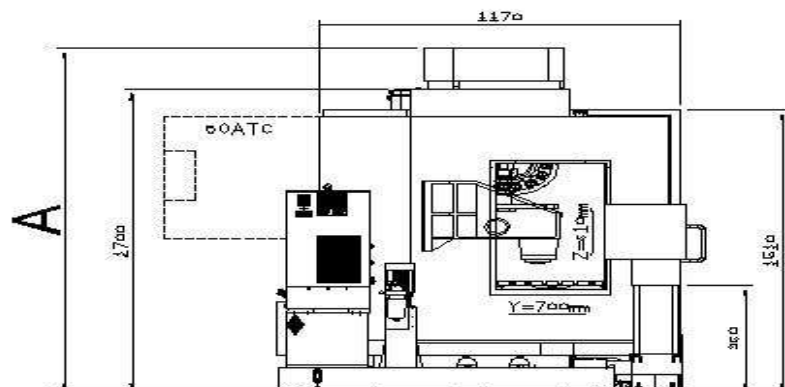


MV204/MV205 series

MV204C.205C	B	40T _{capor}		50T _{capor}	
		40ATC	2,510	40ATC	3,050
		40ATC	2,670	40ATC	3,550
MV214(MV204CPL) MV215(MV205CPL)	B	40T _{capor}		50T _{capor}	
		40ATC	2,670	40ATC	3,050
		60ATC	3,250	40ATC	3,550

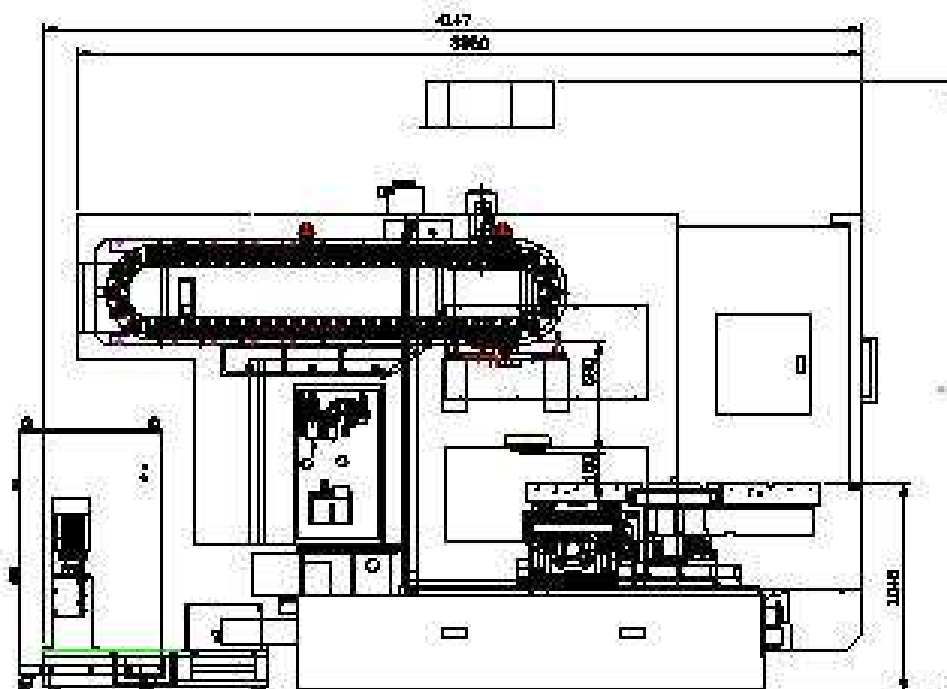
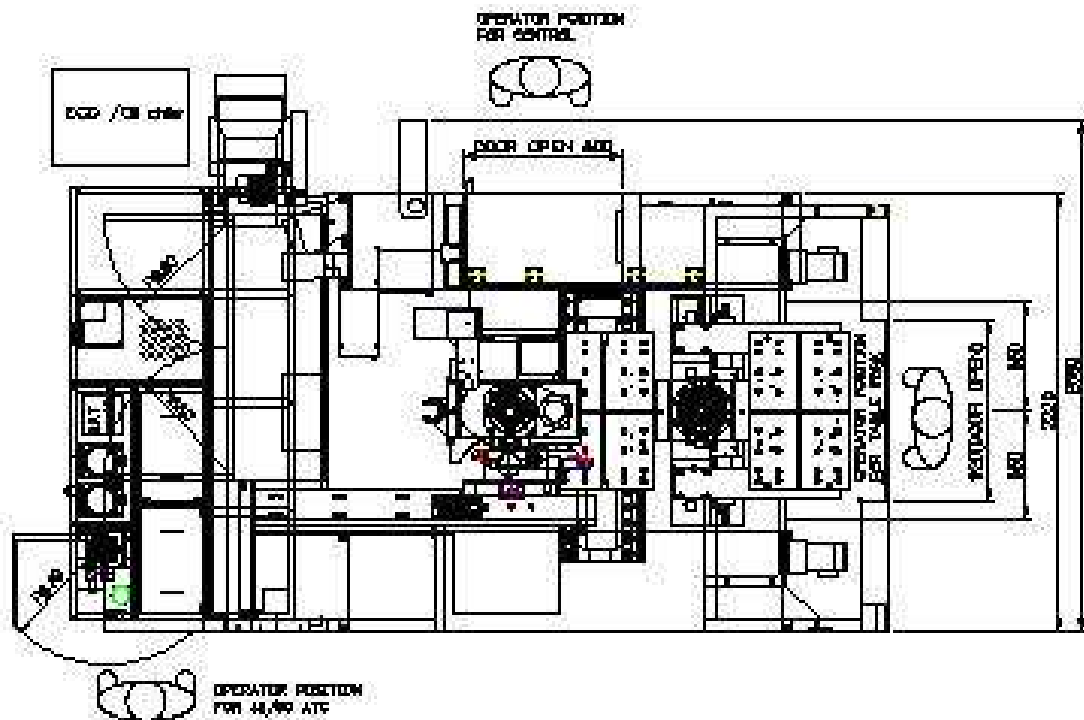


MV204C.205C	A	P	E&V	9B/12B/15B	3050
				9B	
				12B	
				15B	
				15C\15D	
MV214(MV204CPL) MV215(MV205CPL)	A	PL		7.5B	3,400
				9B	
				12B	
				15B	
				15C\15D	
				7.5B	3,120
				9B	
				12B	
				15B	
				15C\15D	

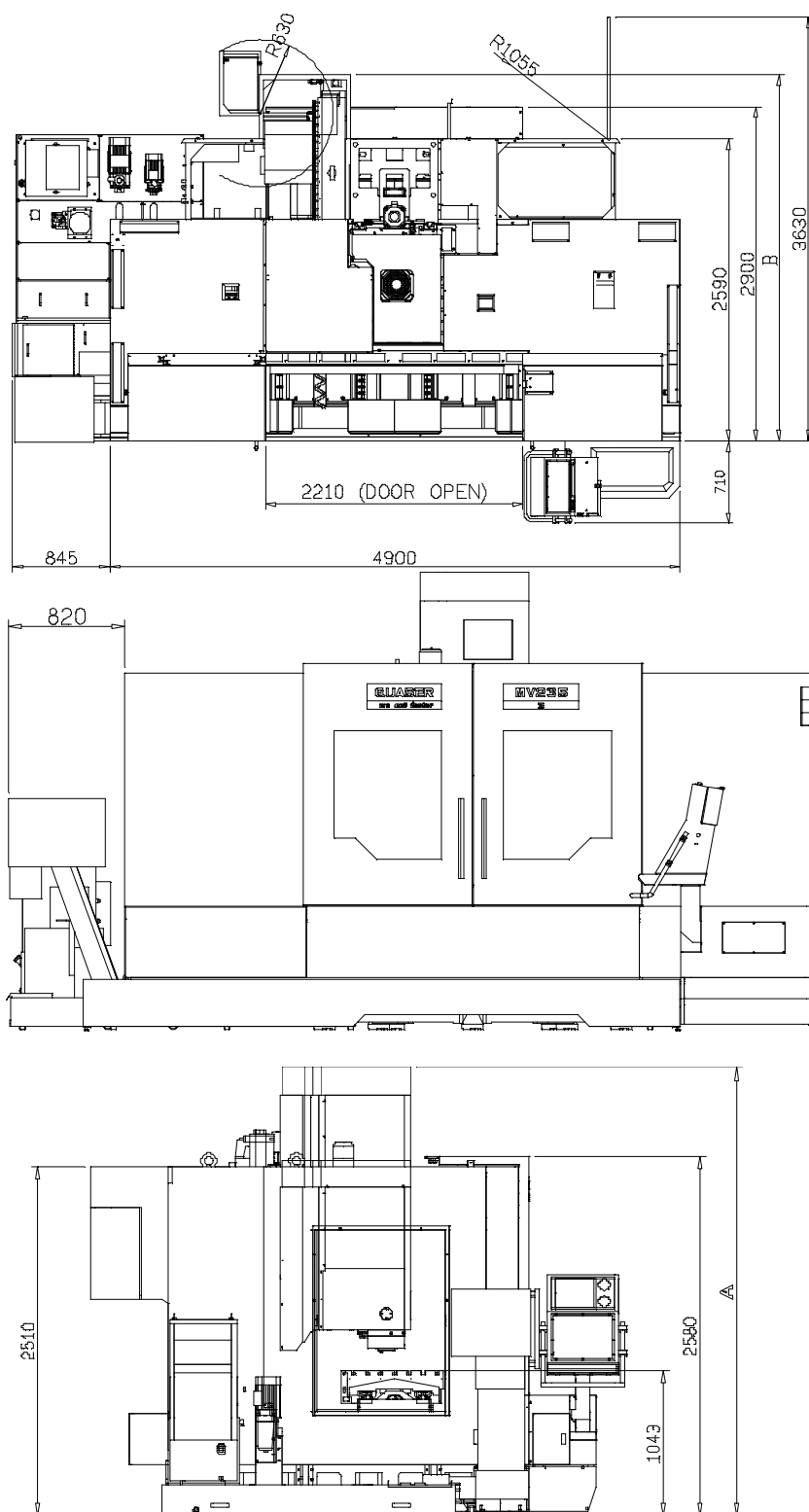


MV154APC series

	A
MV154APC /E	3080
MV154APC /P	3080
MV154APC /HS	3150



MV234/235 series



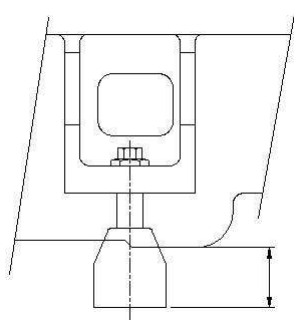
MV234	A	E	9B/12B	3,150
		P	9B/12B	
MV235		E	15C	3,380
	P	6B	3,220	
		7.5B		

MV234	B	40Taper	48ATC	2,990
			60ATC	3,390
MV235		50Taper	30ATC	3,170
			40ATC	3,790

Jacking Screws

Jacking screw detail (all machines)

12 off M36 jacking screws with 30 A/F screw & 55 A/F locknut



MV154 :

Min 60mm
Max 65mm

MV184 :

Min 85mm
Max 90mm

MV204/MV205 :

Min 85mm
Max 90mm

MV154APC :

Min 95mm
Max 100mm

MV234/235:

Min 45mm
Max 50mm

Machine gross weights

Model	Gross weight (kg)
MV154C	6,300
MV154E/MV154P	6,400
MV184C	7,290
MV184E/MV184P	7,390
MV154APC	8,500
MV204C/E/P (30T)	9,500
MV214/MV215(MV204/205CPL)	11,000
MV234	13,700
MV205	10,000
MV235	14,000

Machine sizes

Model	Max Height (mm)	Shipping Height Z motor fitted (mm)	Shipping Height Z motor removed (mm)
MV154C	3,000	2,375	-
MV154E	2,930	2,450	-
MV154P	2,930(Belt) 3,030(Coupling)	2,450	-
MV184C	2,860	2,350	-
MV184E	2860	2,425	-
MV184P	2,860(Belt) 3065(Coupling)	2425	-
MV154APC	3,080	2,680	-
MV204E/V/P	3,050(Belt)	2,584	
MV204P	3,280(Coupling)	2,584	
MV214(MV204CPL)	3,120(Belt)	2,740	
	3,350(Coupling)		
MV234	3,150(Belt)	2,770	
MV205	3,400	2,584	
MV215(MV205CPL)	3,470	2,740	
MV235	3,220	2,770	

2.6 MACHINE SERVICES

Coolant tank capacity.

Coolant tank capacity	300 Litres	(MV154/MV184)
	600 Litres	(MV204/205/214(MV204CPL)/215(MV205CPL))
	300 Litres	(MV154APC)
	710 Litres	(MV234/235)

Pneumatic connection.

	Unit	Value
Pressure	bar	> 5.5
Pressure	psi	> 80
Pressure	kg/cm ²	> 5.6
Flow rate (w/o scale)	Litre/min	> 500
Flow rate (w scale)		> 600
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.		

***Note: 1kg/cm² $\approx$ 0.98 bar $\approx$ 14.233Psi

Oil type & Capacity.

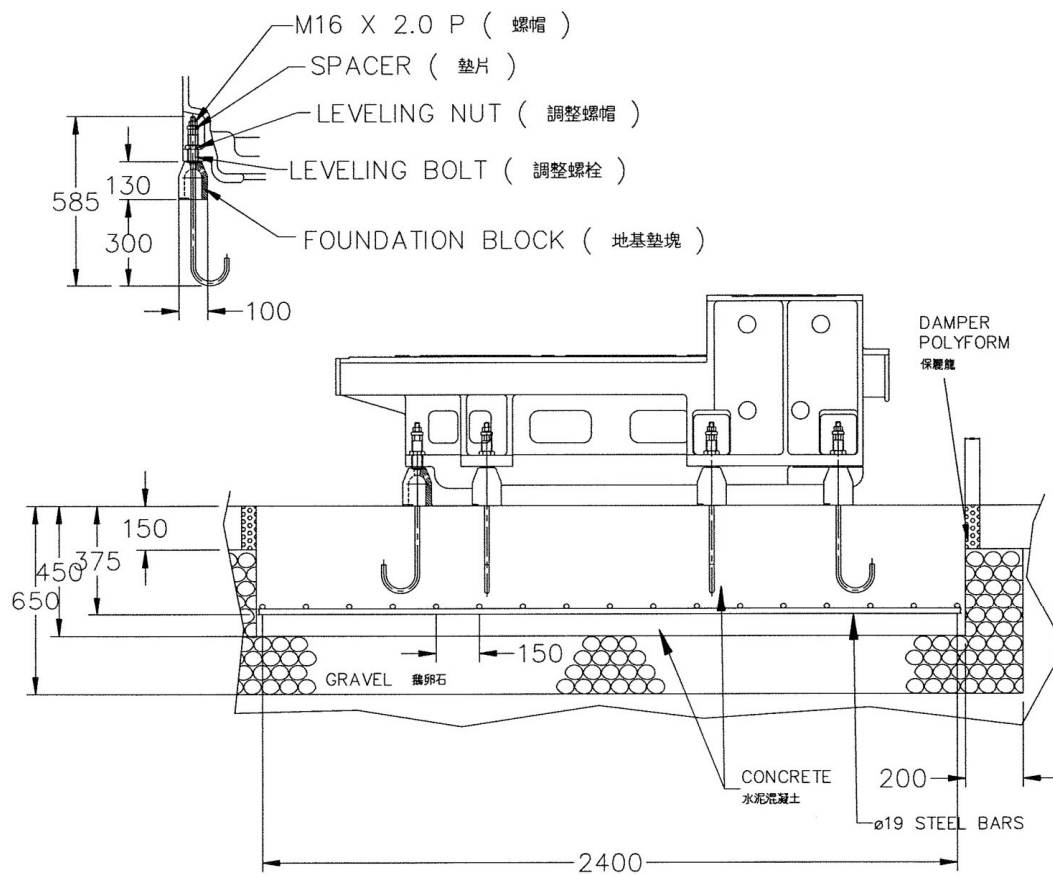
	MOBIL	ESSO	SHELL	Qty
Ballscrew Lubrication unit (1)	VACTRA No.2	FEBIS K68	TONNA oil T68	2L 4L
Spindle Oil chiller (2)	VELOCITE OIL NO.3	SPINESSO 10	TELLUS oil C10	20L 36L
Spindle Eco cooler (3)	VELOCITE OIL NO.3	SPINESSO 10	TELLUS oil C10	100L 160L
Air booster -Tool unclamp -Rotary table	DTE OIL LIGHT	TERESSO 32	TELLUS OIL 32	300cc
Rotary table	Gear 629	Spartan EP 150	Omala oil 100	1.2L
Pneumatic lubricator	DTE OIL LIGHT	TERESSO 32	TELLUS OIL 32	150cc
Grease for ATC	M-TEMP 78			150cc

Note: These fluids are not provided with the machine and must be supplied by the customer. Once filled, do not mix fluids from different suppliers.

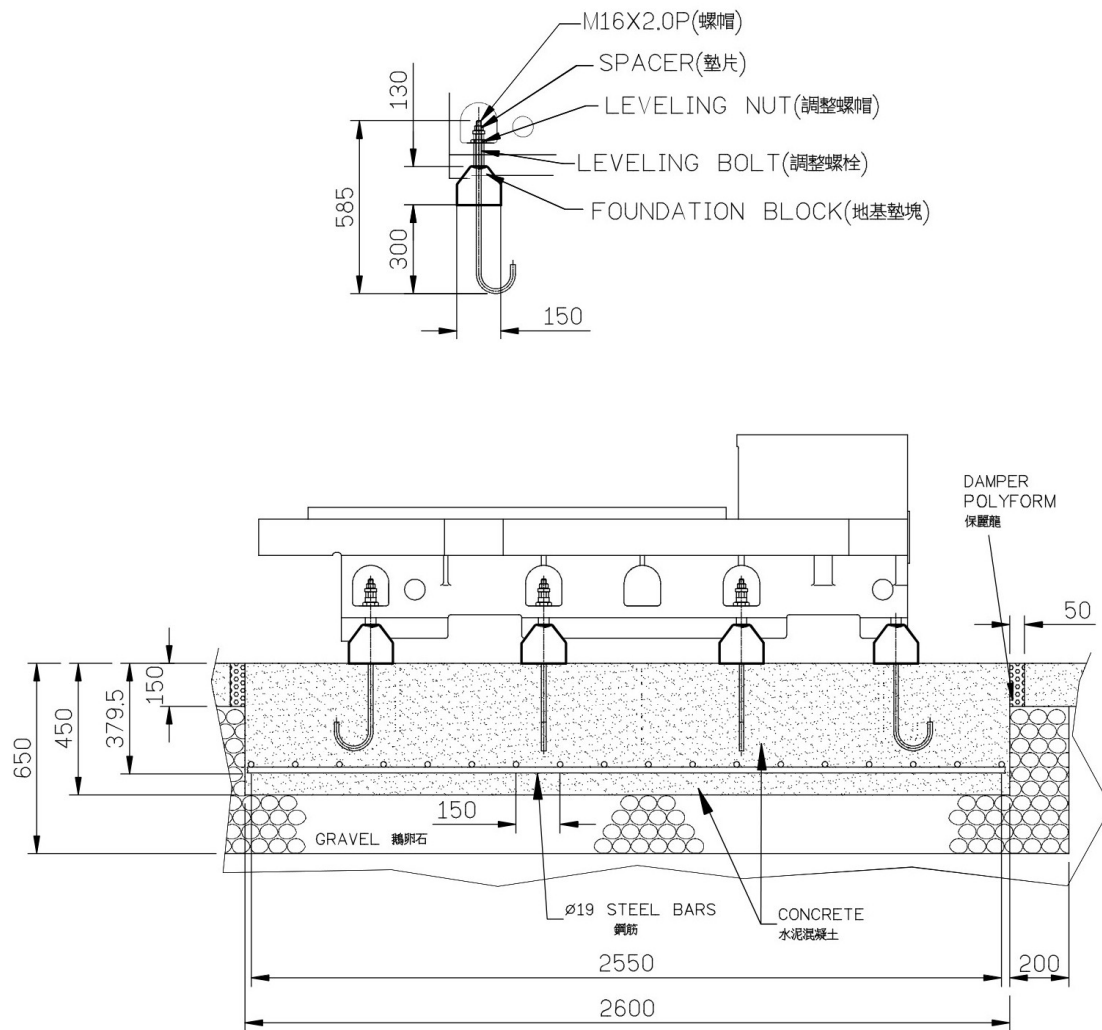
- (1) MV154/MV184/MV154APC use 2L , MV204/MV205 use 4L.
- (2) Standard with 15,000 rpm spindles. Optional for 9,000 rpm and 12,000 rpm spindles. Optional for 8,000 rpm 、 10,000 rpm and 12,000 rpm Coupling spindles.
- (3) Standard with 9,000 rpm 、 10,000rpm and 12,000 rpm spindles.
MV154/MV184 Qty 100L, MV204/MV205/MV154APC Qty 160L.

2.7 OPTIONAL FOUNDATION REQUIREMENTS

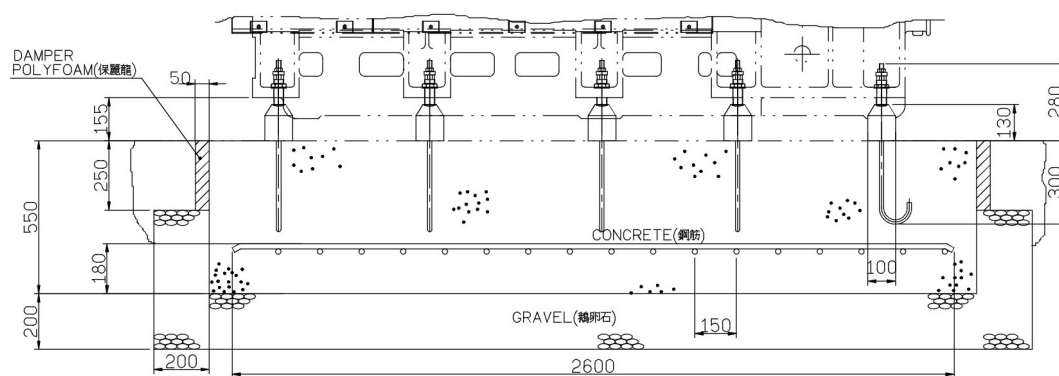
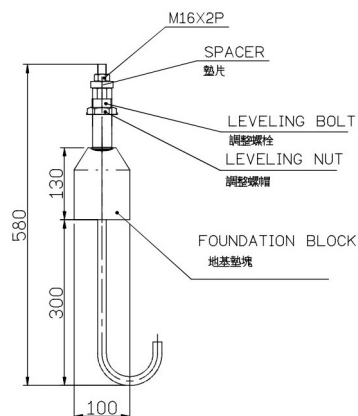
The MV series of machines have been designed to give high acceleration/decelerations and high feed rates both in rapid and cutting feed. A good foundation is important to ensure the machine performance. Bolting the machine on a rigid floor will provide reliability of accuracy and the best levels of surface finish.



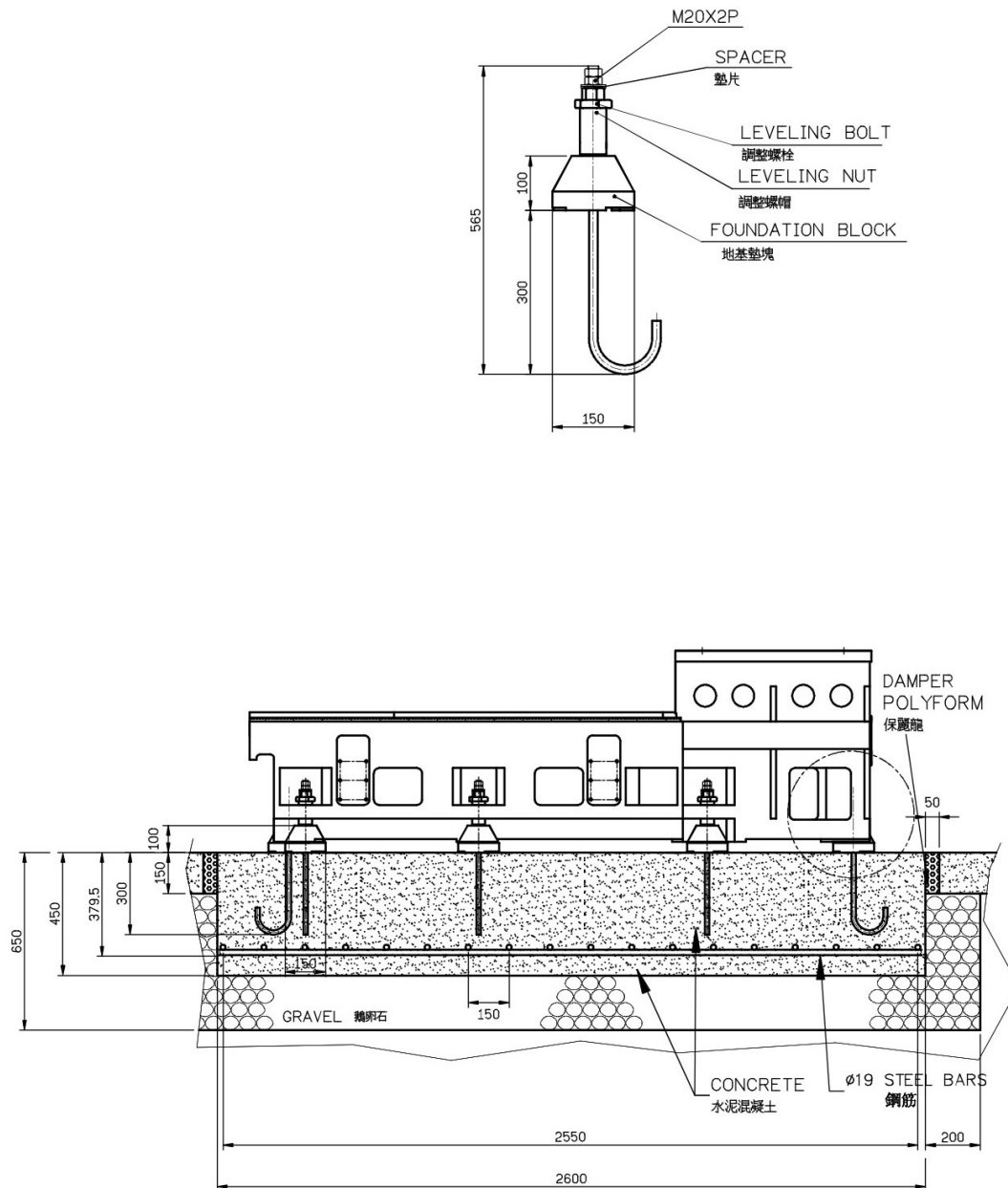
MV154/MV184 machines



MV204/MV205 machines



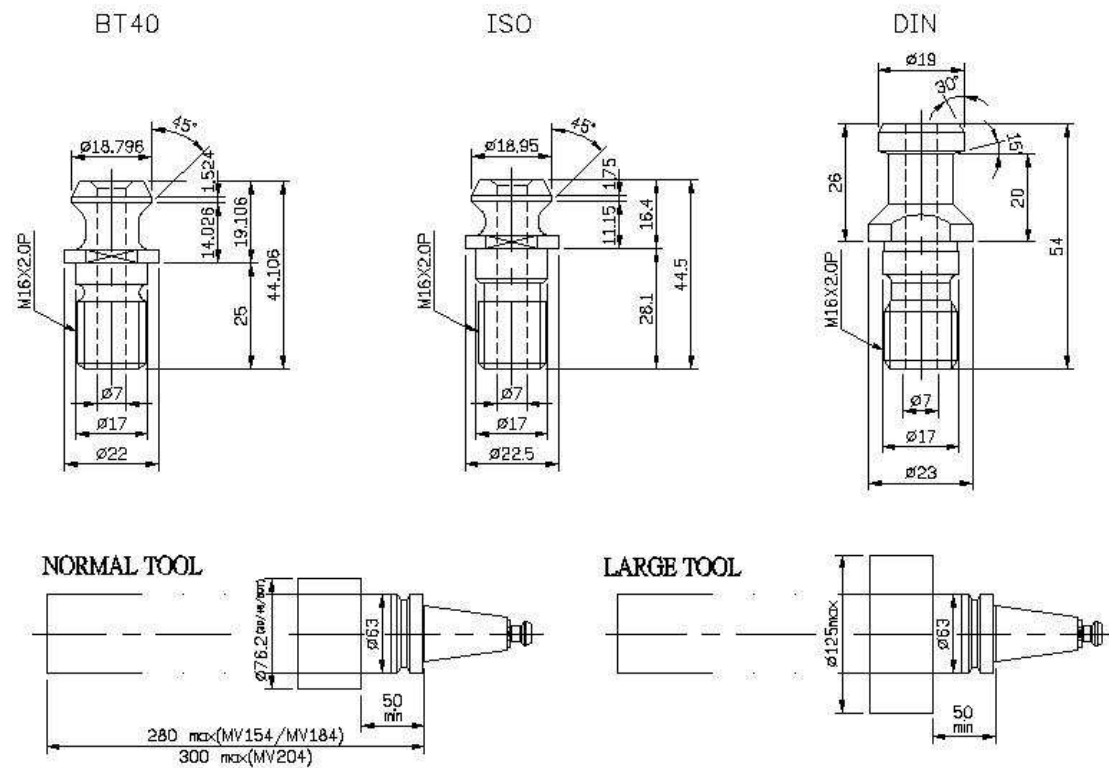
MV154APC machines



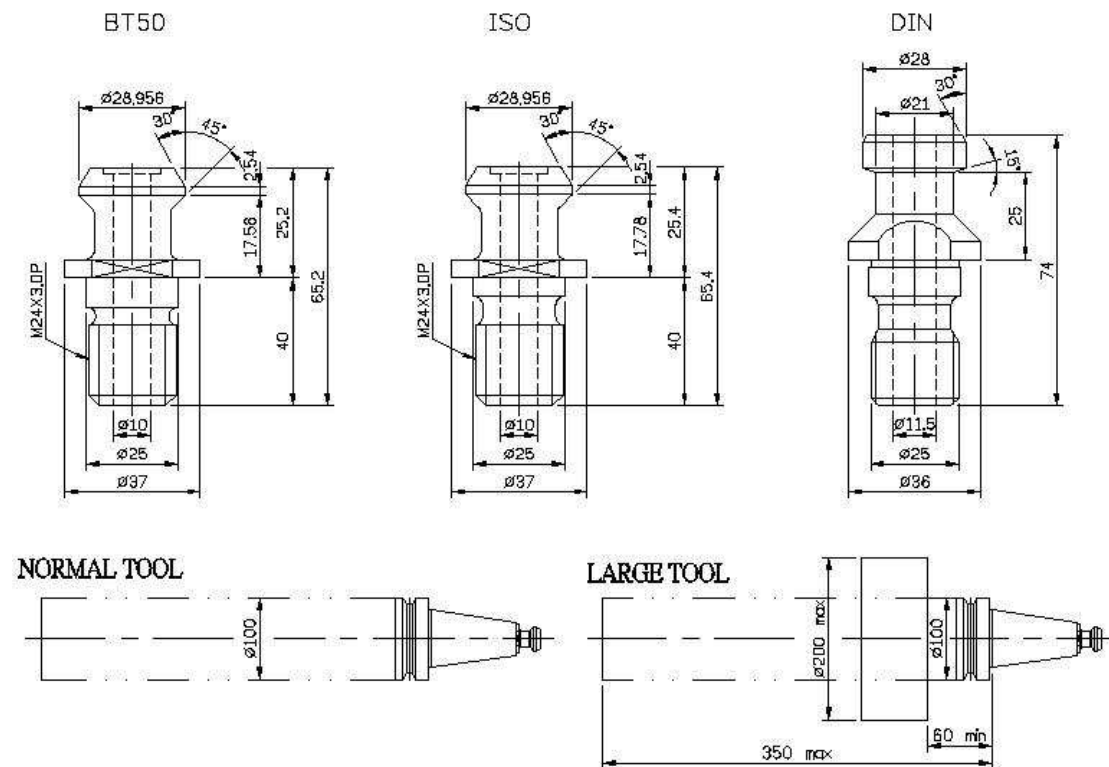
MV234/MV235 machines

2.8 TOOLING SYSTEM

SK40 taper



SK50 taper



2.9 MACHINE NOISE LEVELS

The following statements of airborne noise emissions by the machinery are included as required by EN292-2 Para 1.7.4.f. Tests were to EN ISO 11202 and the values given are on the basis of measurements made on typical samples of each machine type. An appropriate noise meter was used to measure the A and C weighted SPL and peak noise at eight points around the machine at a height of 1.6m and a distance of 1m.

MV SERIES

The continuous A-weighted sound pressure level did not exceed 80 dB(A), therefore it is not necessary to declare the sound power level. Ref Annex 1 EHSR 1.7.4.2(u) para 3 of the Machinery Directive 2006/42/EC.

The continuous A-weighted sound pressure level did exceed 70 dB(A), therefore it is necessary to declare the actual values measured at the following positions:

1) 72.2 dB(A), 2) 71.8 dB(A), 3) 73.2 dB(A), 4) 71.4 dB(A)

Ref Annex 1 EHSR 1.7.4.2(u) para 1 of the Machinery Directive 2006/42/EC.

The peak C-weighted instantaneous sound pressure level did not exceed 130dB(C). It is therefore not necessary to declare this value. Ref Annex 1 EHSR 1.7.4.2(u) para 2 of the Machinery Directive 2006/42/EC.

Equivalent A-weighted Sound pressure level according to EN ISO 3746:
72.58 dB(A).

Uncertainty, KA, in decibels: 4.0 dB(A) according to EN ISO 4871.

3. OPERATING MANUAL

3.1 INTENDED USE

This machining centre 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)

3.2 IMPORTANT SAFETY NOTICE WARNING!

It is the user's responsibility to be acquainted with the legal obligations and requirements in the use and application of the machine, particularly under the Health and Safety at Work Act 1974 and those under the British Standard Code of Practice for the Safety of Machinery BS5304 1988.

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.

MACHINE GUARDING

The QUASER Machining Centre 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.

SOFTWARE

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

AUTHORISED PERSONNEL AND TRAINING

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

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 bodily injury, safe working practices should be employed when operating or servicing the machine.

3.3 SAFETY LIST ALL COUNTRIES

- 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.
- Additional safety notices may exist for certain specific countries for which QUASER may be able to advise. Please ask.
- **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 until you have read and understood all the machine and control keys.
- **DON'T** run the machine for the first time without a qualified instructor. Ask your supervisor for help when you need it.
- **PROTECT** your eyes. Wear safety glasses with side shields at all times.
- **DON'T** get caught in moving parts. Remove watches, rings, jewellery, neckties and loose fitting clothes.
- **PROTECT** your head. Wear a safety helmet when working near overhead hazards.
- **KEEP** your hair away from moving parts.
- **PROTECT** your feet. Always wear safety shoes with steel toes and oil resistant soles.
- Gloves are easily caught in moving parts. TAKE THEM OFF before you turn on the machine.
- Loose objects can become flying projectiles. REMOVE all loose items (wrenches, chuck keys, rags etc.) from the machine before starting.
- **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.
- **PROTECT** your hands. Make sure the spindle is stopped before manually changing a tool or 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 your 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 hands. Beware of sharp edges on newly machined components wear gloves when unloading.
- **PROTECT** your eyes and the machine. Never use a compressed air hose to remove swarf or to clean out air vents.
- **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** objects from flying loose. Securely clamp and locate the work piece.

SAFETY LIST ALL COUNTRIES (Cont.)

- **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 minimises the potential for trips, slip or fall of all personnel.
- This machine tool is a machining centre, and is intended for the use in machining materials with the work piece fixed to the table, and the cutting tool rotating in the spindle. The machine should not be used for any other purpose.
- **DON'T** reach into any control or power case, unless electrical power is OFF.
- **DON'T** touch electrical equipment when hands are wet or when standing on a wet surface.
- **ASCERTAIN AND CORRECT** the cause of a shutdown caused by overload heaters before restarting the machine.
- This machine tool is a machining center, and is intended for the use in machining materials with the work piece fixed to the table, and the cutting tool rotating in the spindle. The machine should not be used for any other purpose.
- **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.
- This machine is intended for use in an industrial environment and must not be used in the residential, commercial and light industrial environment.
- The windows fitted to QUASER Machining Centres 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.

3.4 GUARD WINDOW SAFETY

The majority of windows fitted to QUASER Machining Centres are manufactured from the GE Plastics LEXAN® range of polycarbonate sheet, with a hardened surface coating called Margard®. The hard coating gives protection against minor scratching. Testing over the past few years has resulted in confirmation that the impact resistance of polycarbonate degrades over time after exposure to the metalworking fluids and lubricants used in the metalworking process. Although the Margard® coating provides some protection against the cutting fluids, the polycarbonate still degrades.

Guidance on the replacement of windows is given in the Operators Safety Manual, section 1.7

3.5 BEFORE SWITCHING ON

Training on all aspects of this machine tool is available from QUASER Machine Tools Limited. Please contact your QUASER representative for further details.

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

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

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.

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

After unpacking the machine clean all rust preventative 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.

3.6 ROUTINE INSPECTION

WARRANTY

As quoted in QUASER's terms and conditions. "QUASER warrants to the original purchaser only that all products manufactured by it will be free from defects in materials or workmanship, such warranty to remain in effect if and only if such products are used in accordance with all instructions as to maintenance and operations set forth in manuals and instruction sheets furnished by QUASER."

The schedules below are based on single shift operations using coolant at all times.

Daily

1. Check pressure gauge reading.
Air pressure 5.5bar (80psi) (5.6kg/cm²)
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.

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 QUASER representative for details.

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.

3.7 MAINTENANCE PROCEDURE

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.

3.8 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 first operation by running all axes for 10 to 20 minutes at about half or one third the maximum speed in the automatic operation mode before actual cutting.

This automatic operation program should cause each machine component to operate. During this cycle check the correct function of these operations.

3.9 SPINDLE WARM UP

In order to prolong the life of the spindle it is essential to follow a warm up procedure after the machine has been idle for an extended period of time.

When the spindle has not been used for more than 8 hours (but less than one week), run the program for your maximum spindle speed:

20000 rpm		15000 rpm		12000 rpm		10000 rpm		9000 rpm	
Speed (rpm)	Time	Speed (rpm)	Time	Speed (rpm)	Time	Speed (rpm)	Time	Speed (rpm)	Time
1000	5 m	1000	5 m	1000	5 m	1000	5 m	1000	5 m
5000	3 s	5000	3 s	5000	3 s	5000	3 s	5000	3 s
2000	5 m	2000	5 m	2000	5 m	2000	5 m	2000	5 m
10000	3 s	10000	3 s	10000	3 s	10000	3 s	9000	3 s
3000	5 m	3000	5 m	3000	5 m	3000	5 m	3000	5 m
15000	3 s	15000	3 s	12000	3 s	--	--	--	--
4000	5 m	4000	5 m	4000	5 m	4000	5 m	4000	5 m
20000	3 s	--	--	--	--	--	--	--	--
5000	5 m	5000	5 m	5000	5 m	5000	5 m	5000	5 m
--	--	--	--	--	--	--	--	--	--
6000	5 m	6000	5 m	6000	5 m	6000	5 m	6000	5 m
--	--	--	--	--	--	--	--	--	--
7000	5 m	7000	5 m	7000	5 m	7000	5 m	7000	5 m
8000	5 m	8000	5 m	8000	5 m	8000	5 m	8000	5 m
9000	5 m	9000	5 m	9000	5 m	9000	5 m	9000	5 m
10000	5 m	10000	5 m	10000	5 m	10000	5 m		
11000	15 m	11000	15 m	11000	15 m				
12000	15 m	12000	15 m	12000	15 m				
13000	15 m	13000	15 m						
14000	15 m	14000	15 m						
15000	15 m	15000	15 m						
16000	15 m								
17000	15 m								
18000	15 m								
19000	15 m								
20000	15 m								

3.10 SPINDLE OPERATING CONDITIONS

It is recommended that the spindle is not run continuously at high speed (above 10000 rpm) for more than 12 hours. Instead reduce the speed to 500 rpm for 5 minutes before resuming high speed operation.

Use coolant appropriate to the cutting process. Do not aim coolant directly at the spindle nose, or submerge the spindle nose in coolant

The spindle is provided with an air purge system. Continue to run the air purge for 15 to 30 minutes after the spindle has stopped. Only then should the emergency stop button be pressed.

3.11 SPINDLE MAINTENANCE

Daily Maintenance.

Clean the front nose of the spindle but do not use compressed air.
Check the taper for dirt. If necessary, use a cleaning arbor.
Check coolant level in spindle cooler and top up if necessary.
Check air supply.

Monthly Maintenance.

Test tool change function.
Check the spindle knock out distance. Activate the tool un-clamp pushbutton to check that the knock out distance is around 0.5~0.8mm
Note: prior to inserting a tool holder, ensure that the spindle taper is clean.

3.12 SPINDLE TOOLING

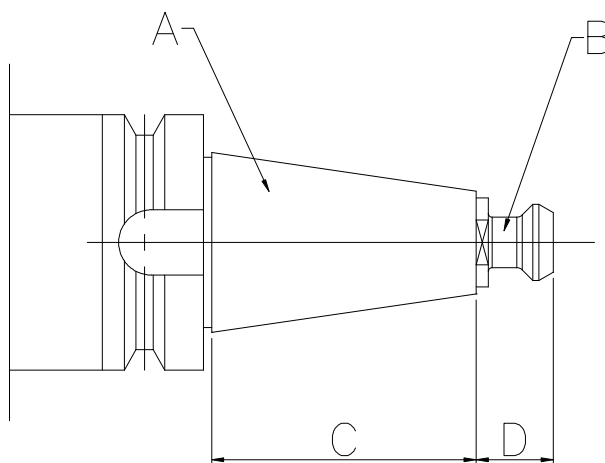
Tooling with a balance level of G2.5 or better should always be used. Failure to do so will reduce spindle life and surface finish and may invalidate the machine warranty.

Do not use broken or worn tools

Avoid chatter and excessive vibration (do not exceed 4 mm/s)

If using a tool with a length to diameter ratio of more than 5:1, limit the speed so that the vibration level does not exceed 1mm/s

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



For	A	B	C	D
BT-40	MAS 403 BT-40	Nikken PS-G51	65.4 mm	19.1 mm
ISO-40	ISO/DIS 7388 1 / 40	ISO/DIS 7388 2 Type B 40	68.4 mm	16.4 mm
BT-50	MAS 406 BT-50	Nikken PS-G41	101.8 mm	25.2 mm
ISO-50	ISO/DIS 7388 1/50	ISO/DIS 7388 2 Type B 50	101.75 mm	25.55 mm

3.13 INTERRUPTING MACHINING

WARNING!

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.

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.

3.14 COMPLETING A JOB.

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.

3.15 SAFETY DEVICES

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 are located on the operator panel, toolchanger carousel panel, chip conveyor & remote hand wheel (if fitted).

Further safety devices are located at the following points around the machine:

The front door and rear door have safety interlocked switches.

Over travel limit switches are present at each end of each axis stroke.

Stored stroke limit. (Parameter setting). The control system will recognize when a move is requested that will take the motion beyond the end of the machine stroke. This move will not be allowed to start.

Oil chiller unit - Certain alarms within the oil chiller will protect the machine from further damage.

Functional Explanation

Emergency Stop Circuit

A dual channel monitoring safety relay is fitted in the machine through which the Emergency Stop Buttons are wired. In addition to this are hard wired over travel switches on both ends of all 3 axes to check whether the axis has traveled beyond the allowed boundary. If any one of Emergency Stop buttons are pressed, the machine will stop immediately and go into an Emergency Stop condition.

CAUTION!

Once the emergency condition has been safely resolved and the emergency stop buttons are released, the "Power On" button on the operator panel must be pressed to reset the safety relay into its normal condition. The "CE" button should then be pressed to clear any error messages within the control system.

Servo & Spindle Power Disconnect

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

Door Safety Circuit

The machine has 2 interlocked doors, the main access door at the front of the machine and the tool changer carousel door at the rear. The main door is shot bolted shut and can only be opened once the spindle is stationary and there is no program running. The tool changer carousel door can only be opened after pressing the soft key on the control panel. Once this has been done the operator must then press the magazine unlock key at the carousel load position which will then allow the door to open. At this time the carousel will not rotate.

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. This is achieved by turning the key switch to position "1". This then allows the hand wheel and jog keys to move the machine axes at feed rates of 2m/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.

Door Interlock of Electrical Cabinet Safety Circuit

When door interlock switch is in the '0' position and the cabinet doors are open, the power to the machine will be turned OFF. When door interlock switch is in the '1' position and the cabinet doors are open, the power to the machine will be kept ON

WARNING: Only trained, skilled personnel should use this functionality.

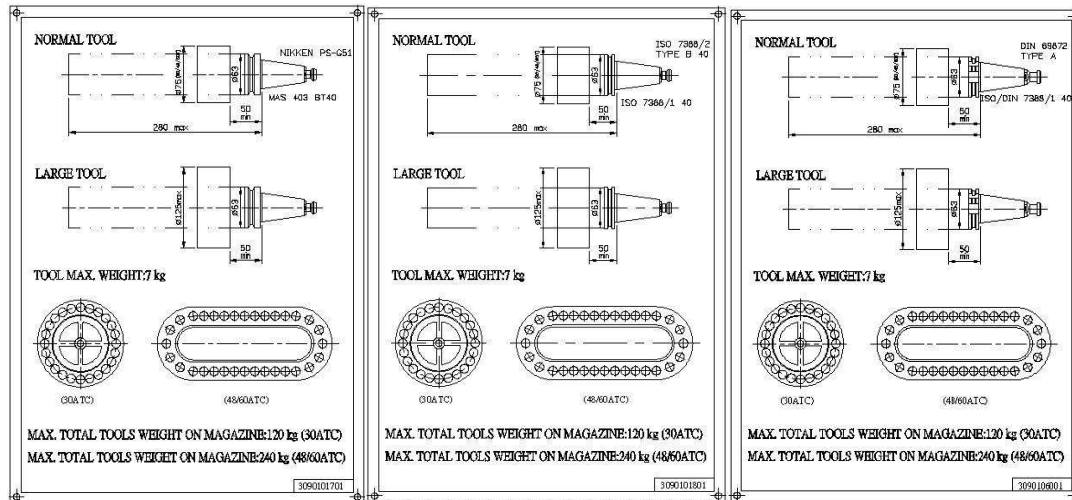
3.16 WARNING LABELS

The label location is identified in the Operators Safety Manual.

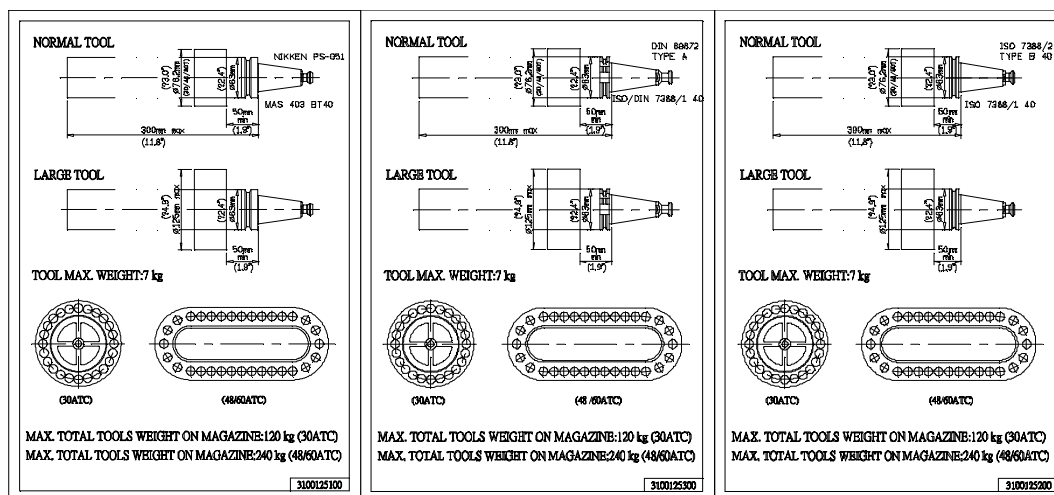
OIL SUPPLY (BASED ON SINGLE SHIFT OPERATION)				
NO.	LUBRICATION POINT	Q'TY	RECOMMENDED OIL	REMARKS
1	LINEAR WAY (Rexroth)	6 c.c.	NCA-15 GREASE (KLÜBER)	LUBRICATE EVERY 2 YEARS
	LINEAR WAY (THK) (HIWIN)	6 c.c.	ALVANIA GREASE RL2 (SHELL)	
	BALL SCREW LINEAR WAY	2L	VACTRA NO.2 (MOBIL)	CHECK OIL LEVEL WEEKLY CLEAN FILTER ANNUALLY
		4L	TONNA OIL T 68 (SHELL)	
	LINEAR WAY (Rexroth) (THK) (HIWIN)	1 c.c.	LHL-X700 (LUBE)	EXCHANGE OIL CARTRIDGE WHEN OIL LEVEL IS LOW,PAY ATTENTION THAT AIR ARE NOT GETTING INSIDE
2	SPINDLE OIL CHILLER	20L 85L  	MOBIL VELOCITE OIL NO.3 (ISO VG2)	EXCHANGE OIL / WATER AND CLEAN FILTER EVERY 12 MONTHS
		36L 100L  		
	ECO-COOLER	50L 160L  		
	SPINDLE OIL CHILLER (GEAR BOX)	45L 	MOBIL VELOCITE OIL NO.10 (ISO VG32)	
	WATER CHILLER	75L 	DISTILLED WATER USE MOTOREX COOLANT-F PROTECT PLUS ADDITIVE. CONCENTRATION 5% pH8.4-8.6	
3	AIR/OIL CYLINDER	80 c.c.	DTE OIL LIGHT 32 (MOBIL) SHC 624 (MOBIL) TELLUS OIL 32 (SHELL)	CHECK MONTHLY , REPLACE OIL AND CLEAN FILTER EVERY 6 MONTHS.
		120 c.c.		
	HYDRAULIC POWER UNIT	80L		

3100122402

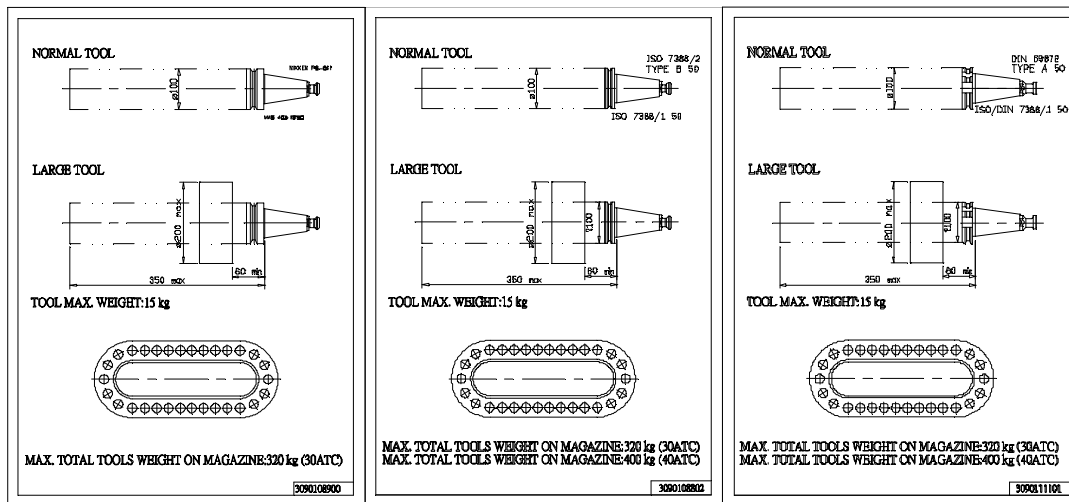
MV154/MV184/MV154APC SK40 taper



MV204/MV214(MV204CPL)/MV234 SK40 taper



MV205/MV215(MV205CPL)/MV235 **SK40 taper**



WARNING LABELS (Cont.)

 WARNING	
1. Avoid accidentally controls while the machine is running. 2. Know function of each switch before operating. 3. Close chip guard before running part.	4. Do not open door when machine is in automatic mode.
	Do not operate before shutting door. Keep off machine when in automatic mode. Can cause severe injury. Set control in manual mode before standing on machine. Turn off and lock out power at electrical panel before servicing.
	Keep off machine when in automatic mode. Can cause severe injury. Set control in manual mode before standing on machine. Turn off and lock out power at electrical panel before servicing.

3D9D1139DD

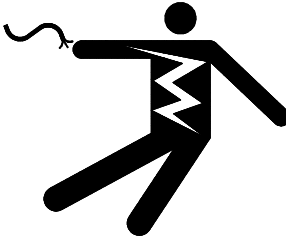
QUASER	
Power capacity	_____ KVA
Electrical phase	3 Phase
Input voltage	_____ V
Frequency	_____ HZ

QS P12062E2130

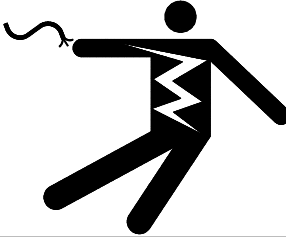
MODEL	_____	
SER. NO	_____	
N/C	_____	
DATA	_____	
WEIGHT	KG	LBS
L x W x H	CM	

QUASER MACHINE TOOLS, INC.
No.3 Gong 6th Rd., Youshih Industrial Park,
Dajia Township, Taichung County 437, Taiwan
TEL : +886 4 2682 1277
FAX : +886 4 2682 2045

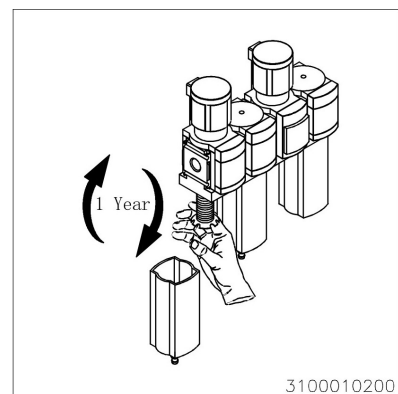
MADE IN TAIWAN QS P12062E2121

 DANGER	Hazardous voltage. Will cause severe injury or death. SAFETY INSTRUCTION 1. Verify power in lock out before servicing. 2. Resident voltage-check components with multimeter before touching. 3. Refer to maintenance manual for fuse replacement procedures.
	

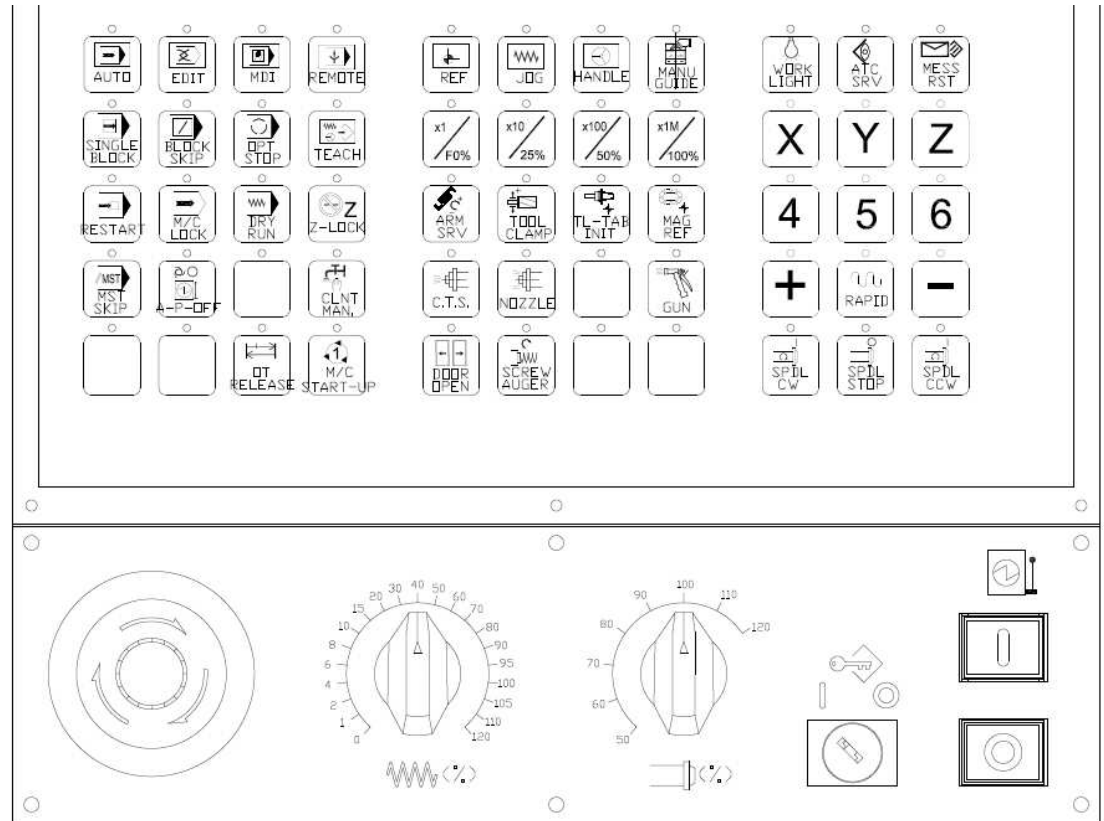
QS P12062E2011

 DANGER	Hazardous voltage. Will cause severe injury or death. SAFETY INSTRUCTION 1. Turn off lock out power at electrical panel before opening panel or servicing. 2. Do not touch switches with wet hands.
	

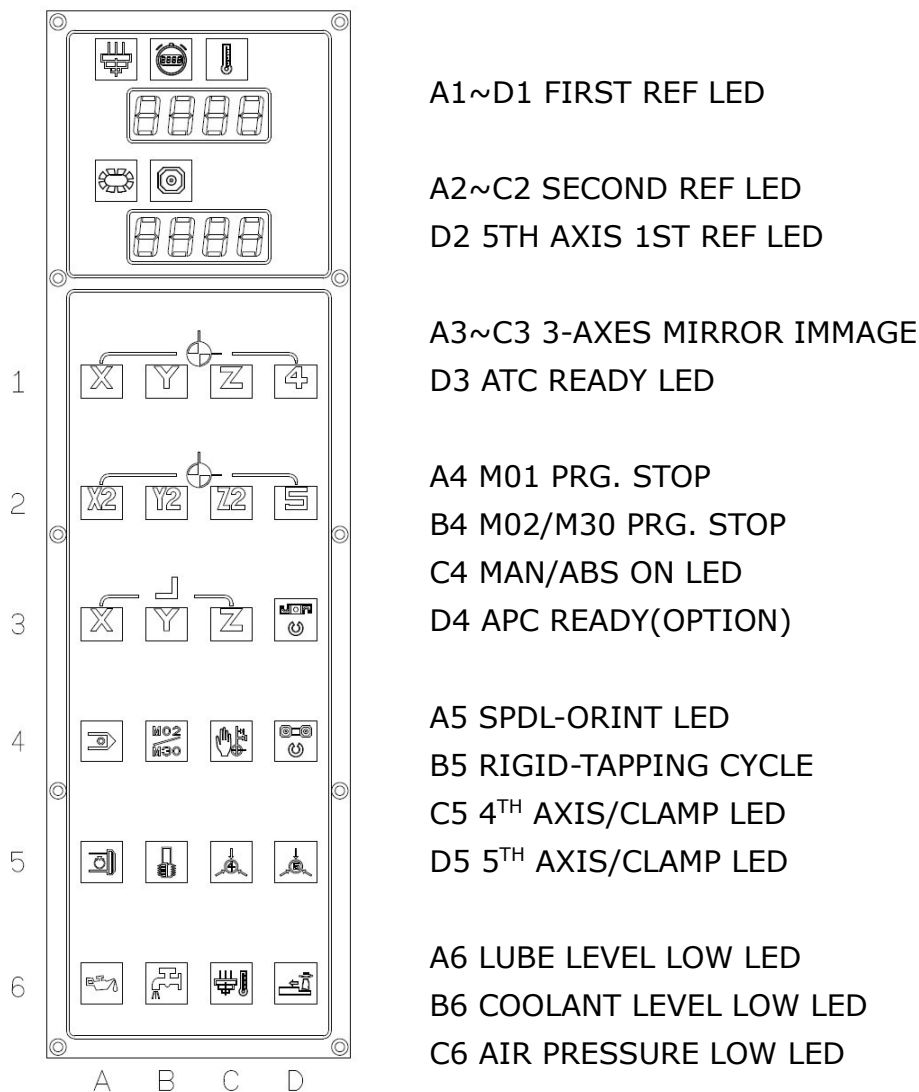
QS P12062E2030



3.17 OPERATION



3.18 SPINDLE T-NO.DISPLAY



3.19 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.

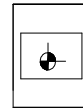
Turn the machine on at the isolator.

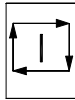
Press the power button  the machine will take a few moments to boot up.

Power up the machine by pressing the button  for a couple of seconds.

3.20 Reference the Machine

Press the Reference position Return Button



Press the Cycle Start Button  to begin referencing procedure

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.

3.21 Worklight ON/OFF

After machine power on, work light could be turned on by push this



button. If work light can't activate, check 220 V fuse in the cabinet is jumped out or not.

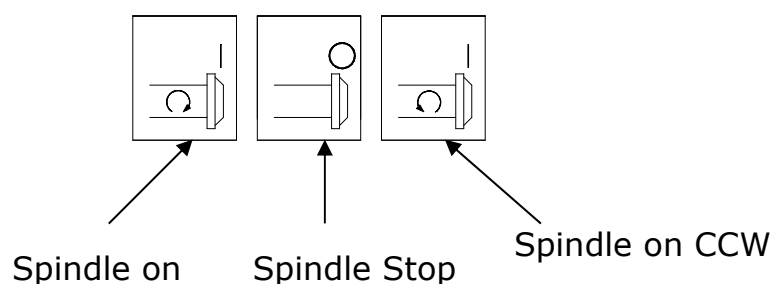
3.22 Machine Warm-up

*** 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 first operation by running all axes for 10 to 20 minutes at about half or one third the maximum speed in the automatic operation mode before actual cutting.

3.23 Spindle Operation

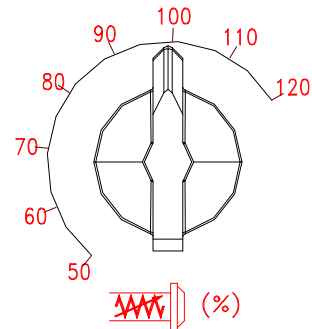
Spindle Control Buttons:



Note: The above buttons only allow spindle operation in MPG or Jog mode. To activate the spindle, an S value must be programmed in Auto or MDI mode first.

Spindle Speed Override Dial:

In all modes, the override dial allows the programmed spindle rpm to be manually adjusted from 50 - 120%. When adjusting the spindle rpm during program run, there may be a slight feed hold to allow the machine to achieve the new spindle speed before continuing.



3.24 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).

3.25 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.

3.26 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.

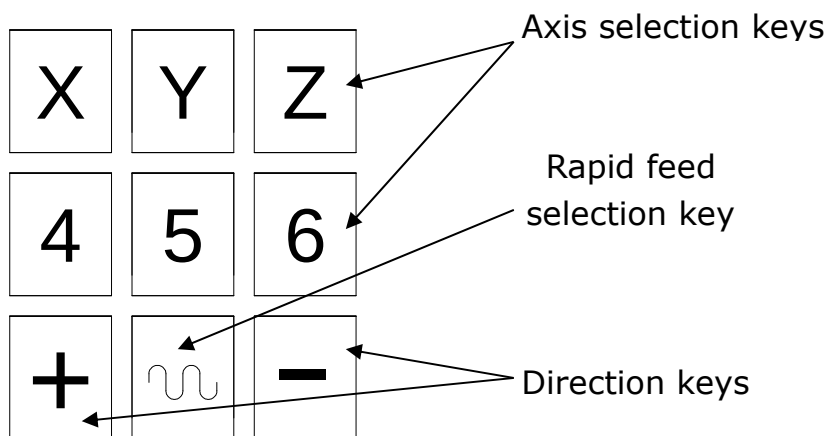
Turn off the power first on the control panel with the emergency stop button and then at the main isolator before leaving the machine at end of the shift.

3.27 Jog Axis

To manually jog an axis, first select Jog mode by pressing



In Jog mode, the following buttons can be used to manually move an axis:



To move an axis:

Select the desired axis by pressing the corresponding selection key. The key will illuminate.

Press the direction key corresponding to the required movement direction.

The feedrate can be controlled using the feed override dial. For rapid feed press the rapid feed selection key.

Note: To move an axis in jog mode with the guard door open, the door safety selector switch must be set to '1'. Set the switch back to '0' when the operation is completed. With the guard door open, the jog feed rate is reduced.

3.28 Jog Axis by MPG

To manually move axis using the Handwheel, first select MPG mode by pressing



Movement factor
selection switch

Axis selection
switch

Handwheel

Movement Factor:

x1: 0.001 mm per division
x10: 0.010 mm per division
x100: 0.1 mm per division

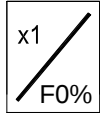
To move an axis:

Select the desired axis using the axis selection switch.
Select the required movement factor using the switch
Rotate the handwheel in the required direction.

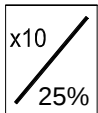
Note: To move an axis in MPG mode with the guard door open, the door safety selector switch must be set to '1'. Set the switch back to '0' when the operation is completed. With the guard door open, the x100 movement factor is not available

3.29 Axis Feedrate Override

The maximum feed rate of the machine can be limited using the below buttons. This function is active in both Jog, and Auto/MDI modes.

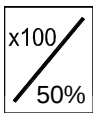


F0%: The maximum rapid feed will be limited to 500mm/min for X,Y,Z axes and 200 °/min for rotary axes (where fitted).

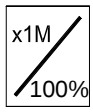


F25%: The maximum rapid feed will be limited to 25% of the machine maximum feedrate.

Note: The maximum rapid feed will automatically be set to 25% when the guard door is opened.



F50%: The maximum rapid feed will be limited to 50% of the machine maximum feedrate.

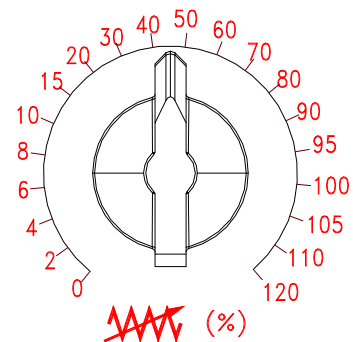


F100%: The maximum rapid feed will be not being limited.

Feedrate override dial:

This dial allows adjustment of the programmed feedrate from 0 - 120% in Auto/MDI and Jog modes.

Note: Fine control of rapid (G00) moves is not possible using this dial. The override keys above should be used to control rapid movement.



3.30 Tool Length Setting



NC supply 99 groupies geometry and wear compensation for tools length and radius setting by push OFFSET button on operation panel and choice offset soft key on screen.

[OFFSET] Tool offset values, tools length offset values and cutter compensation values are specified by D code or H code in a program. Compensation value corresponding to D code or H code are displayed or set on the screen.

3.31 Work Coordinate Setting

Besides the six workpiece coordinate systems (standard workpiece coordinate systems) selectable with G54 to G59, 48 additional workpiece coordinate systems can be used. Alternatively, up to 300 additional workpiece coordinate systems can be use.

3.32 Door Interlock Overriding

To unlock the guard door press the button.



The guard door will automatically lock when it is closed.

It is not possible to unlock the guard door when the machine is in motion.



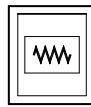
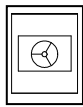
Guard door
safety switch

In addition, the machine is fitted with a guard door safety switch to allow the machine axes to be manually moved when setting etc.

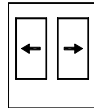
With the switch set to '1' it is possible to move the machine in Jog and MPG modes with the door open. Once the setting operation has been completed, it is necessary to set the switch back to '0' to enable full sequence auto operation.

3.33 Tool Loading/Unloading

Using AUTO or MDI, load the correct tool number into the Spindle



Press or to enter Jog or MPG mode.

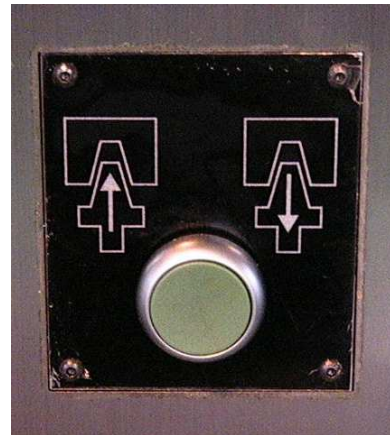


Press to unlock the guard door.

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.



3.34 ATC Operation



Arm rotation: In ATC service mode, choice this function would enable arm rotating CW or CCW direction



Tool clamp/unclamp: In ATC service mode, choice this function would enable tools clamp and unclamp



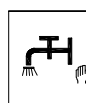
MAG Home button: MAG will be rotated on CW direction to its initial position when this button is pressed.



Tools initial button: All tool number on data table will be changed into in sequence.

3.35 Coolant Operation

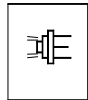
Note: Please check the coolant level before operating the coolant system



Manual Coolant: When pressed during program run, the operator has manual control of the coolant using the keys below, and all coolant is switched off. Pressing the button again returns the all coolants to their previous status.



Coolant through Spindle: In manual mode, the coolant through spindle can be activated/deactivated by pressing this key.



Flood Coolant: In manual mode, the flood coolant can be activated/deactivated by pressing this key.



Coolant Wash down Gun: In manual mode, the coolant wash gun can be activated by pressing the button. Pressing the button again will de-activate the coolant wash gun.



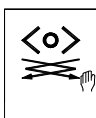
Roof wash down: This is function for MV154APC machine. Roof wash down would be activated with Coolant wash down together by auto or manual mode.

3.36 Chip Removal Operation



Chip auger rotation: In manual mode, the chip auger can be activated by pressing the button. Pressing the button again will de-activate the chip auger. Be sure to de-activated chip auger when front doors are opened.

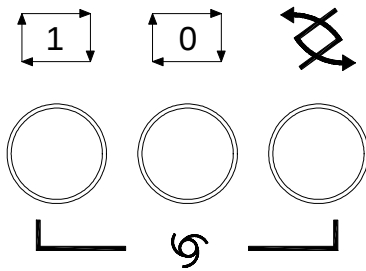
3.37 Auto Pallet Change System



Pallet change MAN: There is a button on operation panel for machine equipped with pallet change system. Normally, pallet change system keeping in auto change mode after machine power on. Push this button for pallet changing in manual mode.

Note: Before change pallet in manual mode, x, y and axes have to return into reference position make sure all the door on machine are closed already.

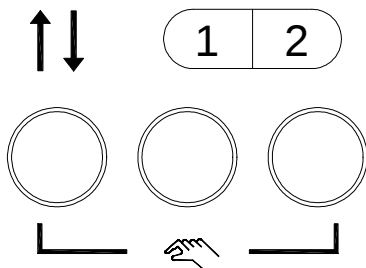
Auto operation:



This panel is used for cycle start, feed hold and work setting for APC system under auto operation mode. Alarm would show up for M60 code be executed without press work setting button.

Note: Make sure APC system keeping in auto operation mode by **APC MAN** button **LED** light off.

Manual operation



This panel is used for pallet up/ down, move table No. 1 or 2 into machining area. It would be operating in JOG mode and keep **LED** light is on of **APC MAN** button.

Note: Move 3 axes return to reference point before operating pallet change.

Note: Front door and side door should be closed before pallet change.

3.38 TROUBLE SHOOTING

3.39 ATC system

1. Magazine is not imposition:

Brake fail to work or sensor switch with far distance.

2. Magazine running time-out:

Counting sensor is break down or too far distance.

3. Tool pot up/down is not imposition:

Pot up/down cylinder fail to work or imposition sensor break down.

4. ATC ARM is not imposition(0°, 60° or 180°)

Arm imposition sensor in Cam Box is break down.

5. ATC motor overloads or overheats:

Motor break is not released or break down. Commutator is break down.

6. No confirm of tools clamp or unclamp:

Air pressure low, air booster oil leaky or clamp/unclamp sensor is break down.

7. 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.

8. ATC service process is as Appendix 7.4

3.40 Cooling, Coolant and lubrication system

1. Coolant level low:

Coolant water level too low or level detective sensor is break down.

2. Coolant filter alarm:

Filter element is seized or pressure detective sensor is break down.

3. Lubrication oil level too low:

Refill lubrication oil into tank.

4. Lubrication pressure too low:

Refill lubrication oil or replace whole lubricator unit.

5. Coolant pump overload:

Wrong phase supplying or improperly power connecting. Water is too low.

6. Coolant pumps noise:

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

7. Oil chiller alarm:

Check and release oil chiller alarm follow with manufacturer manual.

3.41 Door switch system

1. Cabinet door is opened:

Close cabinet door or replace door prox. Switch.

2. Front door is opened:

Close front door or replace interlock switch.

3. Side door is opened:

Close spindle headstock side door, readjust position of door prox. switch or replace it off.

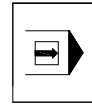
4. No confirmed of ATC door open/close:

Readjust ATC door interlock switch position or replace if off.

3.42 APPENDIX

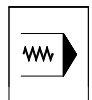
3.42.1 Functions of operation panel

Single Block: Only 1 NC block of the active program is executed each time the 'Cycle Start' key is pressed.

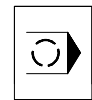


Note: Single block mode is automatically selected when the enable key is set to '1'

Dry Run: All moves carried out at a fixed feed rate. Used for 'fresh air' program proving.



Optional Stop: NC program will stop then this function is active and the program contains an 'M01'. The NC program can then be resumed by pressing the 'Cycle Start' Button.



M.S.T. Lock: When this function is activated, all M, S and T commands within the NC program will be ignored. Used for 'fresh air' program proving.



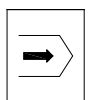
Block Delete: All NC blocks with a forward slash "/" symbol at the start will be ignored.



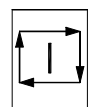
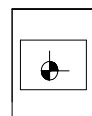
Z Axis Inhibit: Z axis movement will be inhibited when this key is active. Used for program proving. After using this function it is recommended that a manual reference position return is performed.



Machine Lock: All axis movement will be inhibited when this key is active. Used for program proving. After using this function it is recommended that a manual reference position return is performed.



Machine Reference position return: All axes return reference position. This function must be performed a powering on the machine.

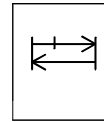


Program Restart: Allows the operator to specify a specific

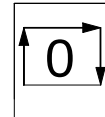


block number to start the NC program from a specified block sequence number.

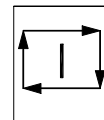
Machine Over travel Release: Used to recover the machine from over travel if the axis limit switch has been triggered. Hold the O/T release button down and recover the axis using the Jog or MPG function.



Feed Hold: Allows the operator to stop all axes and spindle motion when in Auto or MDI mode. Operation can be resumed by pressing the 'Cycle Start' button.



Cycle Start: Allows the operator to execute the active program in Auto and MDI modes. Program execution can be stopped by pressing 'Feed Hold', 'Reset' or the Emergency stop buttons.



Note: The Cycle Start key will not function if the machine guard door is open.

Protect Key: When turned to '1', it will not be possible to edit the following:

NC program

Data tables

Offset values

Work co-ordinates

Macro values

To enable editing of the above, turn the key to '0'.



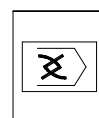
Edit Mode: In this mode, the operator will be able to:

Create, edit and delete NC programs.

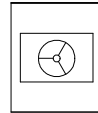
Search for a program number.

Read in parameters, offsets, programs and macro variables from an external device.

Punch out parameters, offsets, programs and macro variables to an external device.

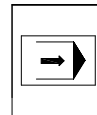


MPG Mode: Allows manual movement of the machine axes via the Electronic Handwheel. (Manual Pulse Generator.)



Note: To move an axis in MPG mode with the guard door open, the door safety selector switch must be set to '1'. Set the switch back to '0' when the operation is completed.

Auto Mode: Allows the execution of the current active program.



Program Execution:

Ensure that the desired program is selected and debugged.

Ensure that all tools and work offsets are set.

Check that all coolants are at an acceptable level.

Ensure all guard doors are closed.

Select 'Auto' mode.

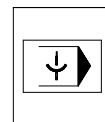
Press 'Cycle Start' button to begin program run.

Jog Mode: In Jog Mode, selecting a feed axis and pressing the desired direction button will move the selected axis. The feedrate can be adjusted using the override dial on the operator's panel.



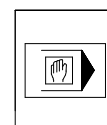
Note: To move an axis in jog mode with the guard door open, the door safety selector switch must be set to '1'. Set the switch back to '0' when the operation is completed.

Remote Control: This function allows 'DNC' operation via the RS232 connection.



Note: This mode cannot be selected if the guard door is open.

MDI Mode: Allows the operator to input and execute a short, temporary program such as individual M codes or a co-ordinate system select. This program will not be stored in program memory, and will be deleted after execution.



3.43 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	Standard coolant ON
M09	All coolants OFF
M10	Washdown coolant ON
M11	Through-spindle coolant ON
M12	Work piece blasting ON
M13	Spindle CW & standard coolant ON
M14	Spindle CCW & standard coolant ON
M15	Spindle Tool Clamp
M16	Spindle Tool Unclamp
M19	Spindle orientation/stop
M21	Magazine pin in
M22	Magazine pin out
M23	Tool pocket up
M24	Tool pocket down
M25	Arm turn to 0 degree position
M26	Arm to 60 degree position
M27	Arm turn 0 degree to 180 degree (CW)
M28	Arm turn 180 degree to 0 degree (CCW)
M29	Rigid-Tap mode preparation(M29S_____)
M30	End of program, spindle & coolant, reset & rewind program
M32	Work piece air blast OFF
M37	OIL MIST OFF
M39	Test run Function ON

	Function Description
M41	Work piece clamp
M42	Work piece unclamp
M43	4 th axis clamp
M44	4 th axis unclamp
M45	5 th axis clamp
M46	5 th axis unclamp
M47	Auto tools length measure blast ON
M48	Auto tools length measure blast OFF
M49	T-command Finish pocket up/down set
M50	APC down
M51	APC up
M52	2APC POS1 (CW)
M53	2APC POS2 (CCW)
M54	Switch Probe to MP10/12
M55	Switch Probe to TS27R
M59	Work set setting up by pass
M60	APC Change
M61	Pallet 1 to machining area
M62	Pallet 2 to machining area.
M71	MIRROR IMIAGE X ON
M72	MIRROR IMIAGE Y ON
M73	MIRROR IMIAGE Z ON
M74	MIRROR IMIAGE C ON
M75	MIRROR IMIAGE A ON
M76	MIRROR IMIAGE X OFF
M77	MIRROR IMIAGE Y OFF
M78	MIRROR IMIAGE Z OFF
M79	MIRROR IMIAGE C OFF
M80	MIRROR IMIAGE A OFF

	Function Description
M90	M91, M92 code cancel
M91	Setting current program to pallet No.1
M92	Setting current program to pallet No.2
M18	Switch on air through spindle (option)
M180	Switch off air through spindle (option)

3.44 Timer table

NO	ADDRESS	DATA	DISCRIPTION
01	T00	10000 ms	AUTO-POWER-OFF DELAY TIME
02	T02	60000 ms	LUBE LEVEL LOW DELAY1 -> SBK
03	T04	60000 ms	LUBE LEVEL LOW DELAY2 -> FHD.
04	T06	60000 ms	WASH GUN AUTO OFF
05	T08	2000 ms	CTS OFF BLAST ON
09	T16	300 ms	SIDE DOOR ALARM DELAY
10	T18	500 ms	ARM BREAK FORCE ON TIME (FOR BIG TOOL)
14	T26	5000 ms	NO CONF. OF C CMP/UCMP
15	T28	5000 ms	NO CONF. OF U CMP/UCMP
16	T30	5000 ms	LUBE DISCHARGE TIME
17	T32	5000 ms	LUBE PRE. ALM
18	T34	5000 ms	AIR PRESSURE ALM
19	T36	3000 ms	HYDR. PRESSURE ALARM DELAY
26	T50	30000 ms	COOLANT LEVEL LOW->PUMP STOP
36	T70	30000 ms	WASH DOWN OFF TIMER
37	T72	30000 ms	WASH DOWN ON TIMER

3.45 Keep Relay list

ADD.	STAND	DEFAULT	DISCRIPTION
K00.0	0	0	0:MANUAL TOOL UNCLAMP WITHOUT AIR BLASTER ° 1:MANUAL TOOL UNCLAMP WITH AIR BLASTER °
K00.2	0	0	0:ALARM LAMP FLICKER ° 1:ALARM LAMP NOT FLICKER °
K00.3	0	0	0:RAPID KEY HOLD ON TYPE ° 1:RAPID KEY SWITCH TYPE °
K00.4	0	0	0: When Back Door Open EMG. Stop (Hardware) ° 1: EMG. Stop (Software-G8.4) °
K00.5	0	0	0:SPDL BLAST ALWAYS ON ° 1:SPDL BALST CTRL BY SPDL ROT. °
K00.7	0	0	0: THE FRONT DOOR MUST BE OPEN. MANUAL TOOL UNCLAMP EFFECTIVE ° 1: THE FRONT DOOR SOLENOID ON. MANUAL TOOL UNCLAMP EFFECTIVE °
K0.6 = 0 , K0.1 = 0			Ctrl By OFF-Timer 36 , ON-Timer 37. Start By Cycle-Start °
K0.6 = 0 , K0.1 = 1			Ctrl By OFF-Timer 36, ON-Timer 37 Start By Cycle-Start. + Spindle ON/OFF Signal °
K0.6 = 1 , K0.1 = 1			Ctrl By Push Button ° (See K3.0)
K01.0	0	0	1: X AT 1ST REF. FOR ATC °
K01.1	0	0	1: Y AT 1ST REF. FOR ATC °
K01.2	0	0	0:Z AXIS AT 1ST ZERO POINT FOR ATC ° 1:Z AXIS AT 2ND ZERO POINT FOR ATC °
K01.3	0	0	0:COOLANT EFFECTIVE DON'T CARE THE SPINDLE ° 1:SPINDLE ON ,COOLANT EFFECTIVE °
K01.4	0	0	0: T-CMD FIN. POT AT MAG. SIDE ° 1: T-CMD FIN. POT AT SPINDLE SIDE °
K01.5	0	0	0:M07,M08,M11 COOLANT AUTO MODE ON ° 1:M07,M08,M11 COOLANT MODE SAME AS PREVIOUS MODE °

ADD.	STAND	DEFAULT	DISCRIPTION
K01.6	0	0	0:During program running, Press reset key,->cycle start inhibit ° Resume : switch edit mode & press reset again °
K01.7	0	0	1:5 Axis Manual Machinery Enable °
K02.0	0	0	0:In JOG & MPG Mode -> 4 & 5 Axis Auto Unclamp °
K02.1	0	0	0:Workset Function , front door must be open & close °
K02.2	0	0	0: PRG. START SCREW-AUGER AUTO ON EFFECTIVE ° 1: PRG. START SCREW-AUGER AUTO ON INEFFECTIVE °
K02.3	0	0	1:Handle Interrupt By Key (18MC) °
K02.4	0	0	1:MPG Feed x 10 °
K02.5	0	0	1: Front Door Open, ATC Rotate Enable. (MK70) °
K02.6	0	0	0:Chip Auger & Chip Conveyor Always ON In Auto Mode ° 1:Control By Push Button °
K02.7	0	0	0: Z Go To 1st Ref. Pos. Before ATC ° (MK70) 1:During ATC , Y & Z Axis Move At The Same Time °
K03.0	0	0	1:X44.2->WASH DOWN, X44.6->WORKPIECE AIR BLAST, X44.7->MIST °
K03.1	0	0	1:Workset Auto C-ST FLAG ON (6APC) °
K03.2	0	0	1:AIR THROUGH SPINDLE EFFECTIVE °
K03.3	0	0	1:Door open stop chip conveyor Bypass °
K03.4	0	0	1: Screw-Auger ctrl. By Timer (Timer42 ON,Timer43 OFF) °
K03.5	0	0	1: Chip-Conveyor ctrl. By Timer (Timer46 ON, Timer47 OFF) °
K03.6=0 , K13.6=0			After ATC Cycle , X & Z Move to Center °
K03.6=0 , K13.6=1			After ATC Cycle , Z Move to Home position °
K03.6=1 , K13.6=0			After ATC Cycle , ARM back to 0 Degree & M6 finish °
K03.7	0	0	1:PMC AXIS CTRL FOR ATC °
K04.0	0	0	1:C-ST & FD-HD Push Button 2 °
K04.1	0	0	1:MAG. 24T E-Type °

ADD.	STAND	DEFAULT	DISCRIPTION
K04.2	0	0	1:With Pressure Accumulator => ARM Swing Continuously °
K04.3	0	0	1:over travel protect for 4 axis °
K04.4	0	0	1:TS27R Installed °
K04.5	0	0	1:MP10/12 Installed °
K04.6	0	0	0:Perform M47 , PLC will check X4.7 Signal , if EQ 0 =>Alarm °
K04.7	0	0	0:BLUM(ATLM Device) ° 1:RENISHAW(TS27R Device) °
K05.0	0	0	0:SPINDLE WITHOUT HI/LOW SPEED CONTROL ° 1:SPINDLE WITH HI/LOW SPEED CONTROL °
K05.1	0	0	0:WITH OIL CHILLER ° 1:WITHOUT OIL CHILLER °
K05.2	0	0	0:4 TH AXIS CLAMP/UNCLAMP VALVE ON -> 4 TH AXIS CLAMP ° 1: 4 TH AXIS CLAMP/UNCLAMP VALVE ON -> 4 TH AXIS UNCLAMP °
K05.3	0	0	0:5 TH AXIS CLAMP/UNCLAMP VALVE ON -> 5 TH AXIS CLAMP ° 1: 5 TH AXIS CLAMP/UNCLAMP VALVE ON -> 5 TH AXIS UNCLAMP °
K05.4	0	0	0: LUBRICATION CTRL. BY MACHINE READY ° 1: LUBRICATION CTRL. BY TRAVEL CALCULATE °
K05.5	0	0	0:ATC-ARM With 4 Sensor °
K05.6	0	0	1:NONE CE REGULATION,ENABLE KEY & PUSH_BUTTON BYPASS °
K05.7	0	0	1:Double ATLM System °
K06.0	0	0	1:Hi Speed ATC-ARM (CAM Rate 1:7 or 1:8) °
K06.1	0	0	1:Cutting Area Door Limit Switch Type,
K06.2	0	0	0:MV204 With Side Door °
K06.3	0	0	0:MAG. CTRL PANRL WITH AUT/MAN SW ° 1:MAG. CTRL PANEL WITH DOOR OPEN PB °
K06.4	0	0	0:WITHOUT AIR CONDITION ALARM DETECT ° 1: WITH AIR CONDITION ALARM DETECT °
K06.5	0	0	0:WITHOUT MIST OIL TANK LEVEL DETECT ° 1:WITH MIST OIL TANK LEVEL DETECT °

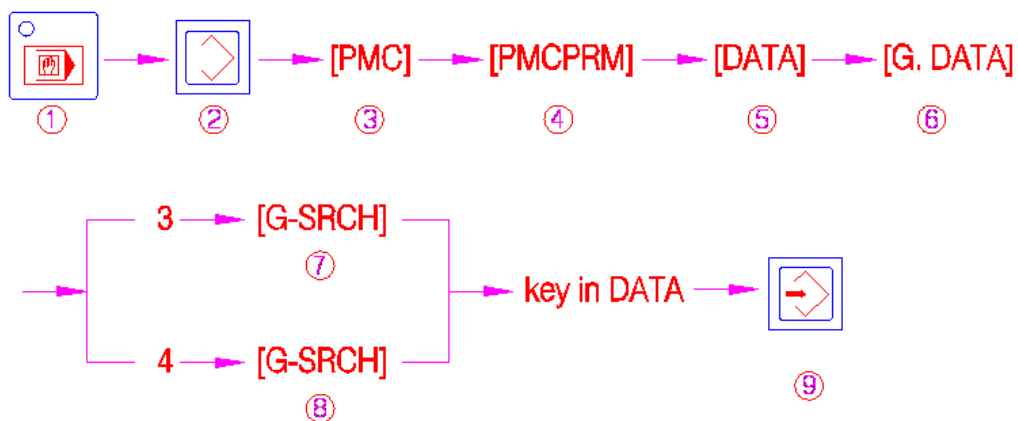
ADD.	STAND	DEFAULT	DISCRIPTION
K06.6	0	0	0:WHEN SIGNAL = 0 , CABINET DOOR OPEN & AUTO-POWER-OFF FUNCTION EFFECTIVE .
K06.7	0	0	0:WHEN SIGNAL = 0 , SPDL HEAD COVER OPEN ALARM .
K07.0	0	0	0:WHEN SIGNAL = 0 , COOLANT LEVEL LOW ALARM .
K07.1	0	0	0:WHEN SIGNAL = 0 , COOLANT FILTER ALARM .
K07.2	0	0	0:WHEN SIGNAL = 0 , LUBRICATION LEVEL LOW ALARM .
K07.3	0	0	0:WHEN SIGNAL = 0 , LUBRICATION PRESSURE LOW ALARM .
K07.4	0	0	0:WHEN SIGNAL = 0 , AIR PRESSURE ALARM .
K07.5	0	0	0:WHEN SIGNAL = 0 , OIL CHILLER ALARM .
K07.6	0	0	0:WHEN SIGNAL = 1 , OIL CHILLER OVERLOAD ALARM . 1:with ECO coolant.
K07.7	0	0	0:WHEN SIGNAL = 0 , CABINET DOOR OPEN ALARM .
K8.4 =1 , K8.3=0			MV154 .
K10.0	0	0	1:ATC POSITION ADJUSTMENT .
K10.1	0	0	1:6APC Fork Pos. Adjustment .
K10.2	0	0	1:Force Tilting Axis + Dir ZRN .
K10.4			1: AXES ZRN MEM. BYPASS .
K10.5	0	0	1:ATC SERVICE MODE ENABLE .
K10.6	0	0	1:2APC SERVICE MODE ENABLE .
K10.7	0	0	1:6APC SERVICE MODE ENABLE .
K11.0	0	0	1:ATC SINGLE BLOCK ON .
K11.1	0	0	1:2APC SIG-BLK ON .
K11.2	0	0	1:6APC SIG-BLK ON .
K11.3	0	0	1:6APC Data Initial Enable .
K11.4	0	0	1:Spindle With Hi/Low Gear Change .

ADD.	STAND	DEFAULT	DISCRIPTION
K11.5	0	0	1:MACHINE WITH PAPER FILTER °
K11.6	0	0	1:CTS ON , DIRTY TANK TO CLEAN TANK PUMP ON, EVEN CLEAN TANK HI LEVEL REACH °
K11.7	0	0	1: Auto Set Order No. Enable °
K12.0	0	0	1:Gain Switching function, Parameter modify enable °
K12.1	0	0	1:Spindle power control circuit loop with side door °
K12.2	0	0	1:Cycle start can not cancel AUTO-POWER-OFF function °
K12.3	0	0	1:Chip Conveyor Torque Detect Disable °
K12.4	0	0	1:Chip Alarm Function Disable °
K12.5	0	0	0:4 th axis with clamp & unclamp sensor ° 1:4 th axis with unclamp sensor °
K12.6	0	0	0:4 th axis with clamp & unclamp sensor ° 1:4 th axis with clamp sensor °
K13.7	0	0	1: copy spindle tool NO. (D0) to #1032 °
K14.0	0	0	0:40 Taper Pocket ° 1:50 Taper pocket °
K14.4	0	0	0:Tool Broken detect sensor NC type ° (TAIWAN) 1:Tool Broken detect sensor NO type °
K14.5	0	0	1:Oil Skimmer Control By Timer (Timer44 ON , Timer45 OFF) °
K14.6	0	0	1:When Coolant Level Low, Machine Stop & SBK ON °
K14.7	0	0	1:BLOCK DELETE AUTO SELECT, WHEN POWER ON °
K15.0	0	0	1:MV series , ATC With door °
K15.5	0	0	1: FOR 4 th axis Index table.
K24.0	0	0	1:cancel "coolant high level stop nozzle pump" ,when machine with recycle pump
K29.0	0	0	1:Oil Mist Collection function enable °
K29.6	0	0	1:The 4 th axis A fixture function enable
K29.7	0	0	1: The 4 th axis B fixture function enables.

ADD.	STAND	DEFAULT	DISCRIPTION
K35.0	0	0	1:9000rpm warm-up program selected ° (Weiss spindle)
K35.1	0	0	1:15000rpm warm-up program selected ° (Weiss spindle)
K35.2	0	0	1: WB40R LUBCON system 1 on ° (Weiss spindle)
K35.3	0	0	1: 12000rpm warm-up program selected ° (Weiss spindle)
K35.4	0	0	1: WB40R LUBCON system 2 on ° (Weiss spindle)
K36.7	0	0	Whether use NC ready or servo ready signal to break time calculation : 0 : servo ready signal ° 1 : NC ready signal °

3.46 Data table

Operation process:



NO.	ADDR.	PARA.	TYP.	NO. OF DATA	NO.	ADDR.	PARA.	TYP.	NO. OF DATA
1	D0	00000000	1	25	2	D50	00000000	0	50
D0	Spindle tool number				D50	Spindle tool type			
D6	Tool No. of Arm gripe No.1				D53	Tool type of Arm gripe No.1			
D8	Tool No. of Arm gripe No.2				D54	Tool type of Arm gripe No.2			
D20	Total pot No. on MAG				D60				
D22	Current Pot No. on MAG				D61				
	0->1BYTE, 1->2BYTE, 2->4BYTE								

Tools data setting

EX: 舉例說明

⑦ Tool NO. register (刀號指示)

⑧ Tool type setting (刀具形式設定)

NO.	ADDRESS	DATA	NO.	ADDRESS	DATA
0	D100	NONE UASED	0	D500	NONE UASED
1	D102	1	1	D501	2 — (一般刀)
2	D104	2	2	D502	1 — (大刀保留刀套)
3	D106	3	3	D503	4 — (大刀)
4	D108	4	4	D504	1 — (大刀保留刀套)
5	D110	5	5	D505	8 — (固定刀具位址)
6	D112	6	6	D506	16 — (破損刀套)

↑ ↑ POCKET NO. (刀套號碼)

Setting explanation:

D100 is address for spindle tool number

D102 ~ D148 are address for tool number on 24 pot Magazine.

D501 ~ D524 are address for tool type setting on 24 pot Magazine.

1. is number for empty pot beside of large tools setting

2. is number regular tool setting

4. is number for large tools setting

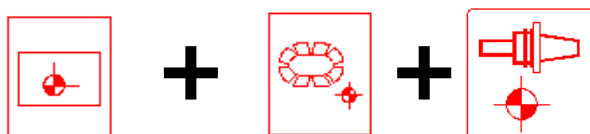
8. is number for setting the pot to specified tools.

16. is number for damaged pot setting.

Tool initial

Tool table alarm would show up with tool changing stop by power drop down or crash happened. After ATC trouble shooting is done, correct relative tool table data follow with current status or initial tool table to release ATC alarm.

Step 1



Step 2



Press Reference, Magazine Reference button and push tools Reference twice time quickly. At this time, **PLUS** button on operation panel would flashing quickly. Magazine would return to reference position after **PLUS** button pressed.

NOTE: Large Tool should be placed in the same the pot with number EXACTLY the same as the tool number assigned.

3.47 ATC service operation

When tools change stopped by power drop down, emergency stop for Arm crash and so on, ATC need to release alarm and readjusted again. Service procedure is as following description as reference.

3.47.1 ATC emergency stop

- Release emergency stop button
- Push M/C start-up button for machine ready.
- Push ATC SRV  button , Release following Alarm one by one.

Alarm 1172: press SRV key -> Arm CCW to 0 degree.

Alarm 1173: press SRV key -> Spindle orientation.

Alarm 1174: press SRV key -> Spindle tool clamp.

Alarm 1175: press SRV key -> spindle tool unclamp.

Alarm 1176: press SRV key -> Arm CW to bottom.

Alarm 1177: press SRV key -> Arm CCW to bottom.

When Alarm message 1179 C-ST -> continue ATC cycle show up, press program start button to finish tool change.

3.47.2 Tool change interrupted due to power failure

- Power on machine.
- Press **FEED HOLD** and **RESET** button same time for over 2 second, previous tools change command would be erased off.
- Turn enable key into position 1 to keep in single block mode.
- Keep machine at JOG mode.
- Press **FEED HOLD** and push **MINUS** button twice times quickly. **PLUS** and **MINUS** button LED light would flashing mutually. At this moment, Alarm 2007 for ATC into SRV-MOD warning will show up and ATC service function is enable.



Press Arm rotation button to keep Arm rotating enable function is ON.
Push PLUS or MINUS button to compel Arm CW or CCW rotating.



Press tools clamp and unclamp button to keep clamping/ unclamping enable function is ON. Push PLUS or MINUS button to compel tool unclamping.

Warning: ATC service enable function can be executed when spindle is not at orientation.

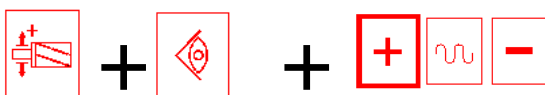
3.47.3 Tools change interrupted due to crash

And if the arm is not at 0 degree and Z axis is not at tool change position.

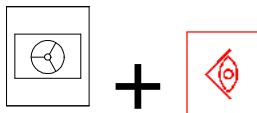
Procedure is same to power drop down step 1 to 4. When Z axis is not at tool change position, Service mode step 5 as above descriptions is not allowed to execute. Please do following step.

Press **FEED HOLD** and push **MINUS** button twice times quickly. **PLUS** and **MINUS** button LED light would flashing mutually. At this moment, Alarm 2007 for ATC into SRV-MOD warning will show up and ATC service function is enable.

Press tools clamp, ATC SRV and PLUS button together to compile tools unclamping.



Press and hold MPG and ATC SRV button together. Move Z axis up forward by MPG



After Z axis move up to a safety distance to tool or arm, use SRV mode to finish tool change.

3.48 MV154APC service operation

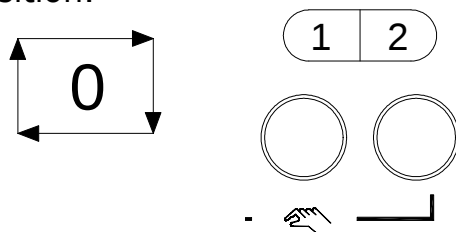
APC service function is used for pallet change stopped by cycle stop, power drop down.

WARNING: WITH SKILL SERVICE EXPERIENCED ENGINEER, IS ALLOW TO ACCESS THIS "APC SERVICE" MODE.

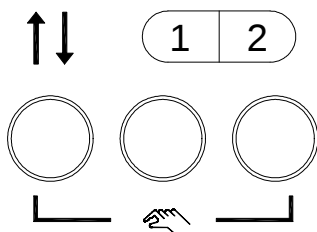
When Pallet change stopped by cycle stop. Push cycle start button again to finish pallet change command.

APC manual service mode

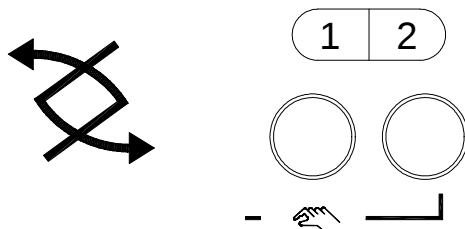
By machine select to JOG mode and APC-MAN. Turn enable key to 1 position.



Press Feed Hold button and push Pallet No.2 button twice time quickly, alarm 2023 would showed up and APC service function is enable.



Push up / down button to compile pallet up or down function enable. Choice No. 1 or 2 button for pallet upward or downward moving.



Push change button to compile pallet change rotating function enable. Choice No.1 or No.2 button to run APC in CW or CCW direction.

4. MAINTENANCE MANUAL

4.1 FOREWORD

This maintenance manual describes inspection procedures. Since the daily and regular inspections to be carried out by machine operators are very important in maintaining machine accuracy, operators are required to carry out proper inspection and maintenance in accordance with the details given in this manual.

The illustrations in this manual are used as example. Depending on the machines, shapes of systems may differ from the illustrations in this manual.

Assumed machine operation methods;
Machining Centres are machine tools intended to cut blank workpieces of a machinable material in a shop or plant which is suitable for the cutting operation. Use of the machining centre under criteria other than those stated above is considered inappropriate.

The machine manufacturer is not responsible for any danger or damage arising from improper operation of the machine. Some examples of improper use are listed below.

- 1) Adding to or modifying the machine without consulting.
- 2) Operating the machine outside the machining range.
- 3) Improper use of a work piece holding device or peripheral.
- 4) Using the machine with interlocks or protection covers removed.
- 5) Carrying out machine operation, programming or maintenance and inspection work without thoroughly understanding the caution information, i.e. without having read the instruction manuals carefully.

4.2 PROTECTION FOR MACHINE OPERATORS

4.2.1 Machine operators are responsible for the following:

Carry out machine operation, programming, maintenance and inspection work in accordance with the details in the instruction manuals supplied with the machine.

Only operators who have received proper training and have sufficient understanding of the caution information are allowed to operate or program a machine tool or carry out inspection and maintenance work on it. With regard to safety related measures, operators must receive training at least once a year.

Develop a thorough understanding of, and strictly observe the local regulations relating to the prevention of accidents and environmental conservation.

4.2.2 Disposing of Industrial Wastes

Operation of the machine generates various industrial wastes such as chips, waste oil and coolant.

Legal permission is required to dispose of such industrial wastes. Disposal of these wastes at locations other than approved sites will pollute the environment, cause environmental destruction, and adversely affect the plant and animal life in the area.

Follow the local regulations when disposing of industrial wastes.

Examples of industrial waste processing methods are given below:

Waste oil & coolant: Entrust the disposal of waste oil and coolant to a party qualified to dispose of industrial wastes or a service station with the appropriate facilities.

Chips: Entrust the disposal of chips to a party qualified to dispose of industrial wastes or a party capable of metallic waste recycling.

4.3 SIGNAL WORD DEFINITION

Various symbols are used to indicate different types of warning information and advice.

Learn the meanings of these symbols and read the explanation to ensure safe operation while using this manual.

SYMBOLS RELATED TO WARNINGS

The warning information is classified into three groups
“**DANGER**”, “**WARNING**” and “**CAUTION**”.

The following symbols are used to indicate the level of danger.

	Indicates <u>an imminently hazardous situation</u> which, if not avoided will result in death or serious injury. The information described in the DANGER frame must be strictly observed.
---	--

	Indicates <u>a potentially hazardous situation</u> which, if not avoided will result in death or serious injury.
---	--

	Indicates <u>an potentially hazardous situation</u> which, if not avoided could result in minor or moderate damage to the machine.
---	--

Other symbols:



indicates the items that must be taken into consideration

4.4 THE IMPORTANCE OF REGULAR INSPECTIONS.

Scheduled regular inspection and proper repair of the machine operated by a maintenance person is the key to long lasting machine accuracy.

Take proper action to obey the operators who are In charge of daily inspection.

Feel free to contact the representative if you have any questions on the instruction manual, circuit diagrams or maintenance manual.

4.4.1 Before beginning maintenance

Listen to the operator in charge of the machine operation to understand the problem accurately.

Study the actual condition and plan the repair range and steps.

Study the specification, construction and functions of the machine portion to be repaired

If more than two maintenance technicians must work on the machine, or if cooperation with other people in other sections is necessary, discuss the repair procedure with these people so that everyone understands what to do.

Prepare spare parts and consumables to be used.



When changing parts, be sure to use only genuine parts specified by the authorized distributor. The distributor cannot be responsible for any trouble arising from the use of parts not specified by the distributor. Using parts that are not specified may not only impair the performance of the machine, it could also make the machine unsafe and could cause accidents involving serious injuries or damage to the machine.

4.5 CAUTIONS TO BE OBSERVED BY TECHNICIANS



- 1) Electrical wiring work should only be done by qualified electrical engineers. If a person with no knowledge of safe practices during electrical work undertakes wiring work he/she could receive an electrical shock.**
- 2) Always isolate the machine power before carrying out inspections, repairs or maintenance. In addition set the isolator switch on the Control Cabinet to the OFF position and lock it, and place "UNDER MAINTENANCE" signs around the machine. If inspection or maintenance work is carried out on the machine with the power on machine elements could be moved and the inspection, maintenance personnel could be seriously injured.**
- 3) Never touch a switch, button or key with wet hands.**
- 4) If it is not properly grounded or is leaking current, you could receive an electric shock.**



- 1) Machine operators and authorized personnel working inside the plant and in the vicinity of the machine must put their clothing and hair in order so that there is no danger they will be entangled in the machine. If you have uncontrolled long hair or loose clothing and it gets caught in the machine, you will be seriously injured. Always wear safety shoes and eye protection.**
- 2) The parameters are set on shipment in accordance with the machine specifications, do not change them without first consulting the machine distributor. If the parameters are changed without consultation, the machine may operate in an unexpected manner, causing accidents involving serious injuries or damage to the machine.**
- 3) The machine specifications are set before shipping so that the machine can deliver it's full performance. Changing the settings without consultation may lead to accidents involving serious injuries, impaired machine performance and a considerable shortening of the machine service life. If the settings and or specifications have been changed or the machine has to be modified to meet the new machining requirements or due to changes in the operating conditions, consult the machine distributor.**



- 4) When two or more people are involved in Maintenance work, they must cooperate carefully and communicate as fully as possible. If one worker moves the machine without noticing another worker is inside or near the machine, they could be seriously injured.**
- 5) When changing parts, be sure to use genuine parts specified by the distributor, the distributor cannot be responsible for any trouble arising from the use of such parts. Using parts that are not specified will not only impair the performance of the machine, it could also make the machine unsafe to operate and could lead to serious injuries or damage to the machine.**
- 6) When using equipment such as wires, ropes and cranes, make sure that they can bear the mass to be hoisted.**



- 1) Use service tools appropriate for the intended work. If the tools are not appropriate, parts could be broken or bolts not tightened properly, leading to machine failure.**
- 2) Do not place service tools or parts directly on the slideways this could cause scratches or other damage to the slideways, adversely affecting the machines life.**
- 3) Do not climb on top of the machine, if you loose your balance, you could fall off and injure yourself. Use a ladder or service platform when you have to work in high places**
- 4) When moving a heavy object, always carry it with the help of at least one other person or use a crane. If you attempt to carry a heavy object by yourself, you could be injured.**

4.6 REGULAR INSPECTION LIST

The schedule below is based on single shift operation using coolant at all times.
Adjust the inspection and maintenance intervals to suit actual machine usage.

Inspection Item	Inspection Interval	Refer To Page
Checking Safety Circuits	Daily Inspection	122
Slideway Lubrication Grease	2000 Hours or one Year	127
Ballscrew Oil System	Weekly	129
Air/Oil Booster - Oil Level	Monthly	130
Adjusting Air Pressure	50 Hours	132
Electrical cabinet air filter cleaning	50 Hours	133
Front Door Rail Cleaning	50 Hours	134
Cleaning inside the Electrical cabinet	500 Hours	135
Spindle Cooler Filter Cleaning	50 Hours	137
Filling the Spindle Cooler	As Required	138
Servo Motor Connections	1000 Hours	141
Keyboard and Monitor cleaning	Weekly	142
Leveling the Machine	3 Months	145

4.7 CHECKING THE FUNCTION OF THE SAFETY CIRCUIT

The Function of the Safety Circuit components should be checked after the machine is turned on and in normal operating condition.

Below is a list of the Safety Circuit Components and their function

Safety Component	Intended Function	Test Procedure and Result
Main Isolator Located on the center of Electrical Cabinet.	To isolate main power to the machine	With the machine in normal operating mode and worklight on, first press the Emergency Stop Switch on the Operating Panel and then shut down the machine by turning the main isolator anti clockwise. NORMAL RESULT: All power to the machine has been removed and the worklight is OFF.
Emergency Stop There are Emergency Stop device on the Remote Jog, Swarf Conveyor, Magazine operation station	The Emergency Stop function is to disable the Servo Motors, Spindle Motor and ATC , thus disabling all the Axes, Automatic and Manual functions	With the machine in normal operating mode, press the Emergency Stop Device. NORMAL RESULT: All Axes feeds will be disabled. The NC and VDU will still be ON. The message " EMERGENCY STOP" will be displayed
Axes Limits	To stop over travel of the x, y and z axis in both + and -directions	Place the machine in MANUAL MODE with all the doors closed. Use the Axes Jog Keys to run each Axes one at a time at MAXIMUM feedrate to the end of the Axes travel. NORMAL RESULT: The Axes will stop before hitting the "Hard Stop"



If any of the Safety Devices are not functioning normally do not attempt to operate the machine.

Door Interlock (Front Sliding Doors)	a) When the interlock is open (guard open) the maximum Axes speeds are limited	With the moveable guard open and the feedrate override set to maximum press one by one each of the axes jog keys NORMAL RESULT: The Axes speed will be no more than 2000 mm/minute as displayed on the VDU
	b) When the interlock is open (guard open) the spindle is disabled. No rotation is allowed	With the moveable guard open press the Spindle CW or CCW keys. NORMAL RESULT: The Spindle will not start.
	c) When the interlock is open (guard open) no automatic cycle can be started.	Attempt to run an automatic cycle including an MDI tool change with the guard open. NORMAL RESULT: There will be no machine movement
	d) When the guard is closed (interlock is closed) it is not possible to open the guard during an automatic cycle. After an automatic cycle is complete it is only possible to open the guard by first pressing the interlock release switch.	Close the guard and start an automatic cycle. NORMAL RESULT: The interlock should be locked and it should not be possible to open the door until the program is stopped, all axes motion (including spindle) has stopped and the interlock release switch is pressed.



If any of the Safety Devices are not functioning normally do not attempt to operate the machine.

4.8 COMPONENT LUBRICATION

The machine utilises grease packed linear rails whereas the ballscrews are fed with oil from the lubrication pump.

4.8.1 Grease recommendations

CAUTION



**Use only the greases listed below or equivalent.
Never mix grease from different manufactures**

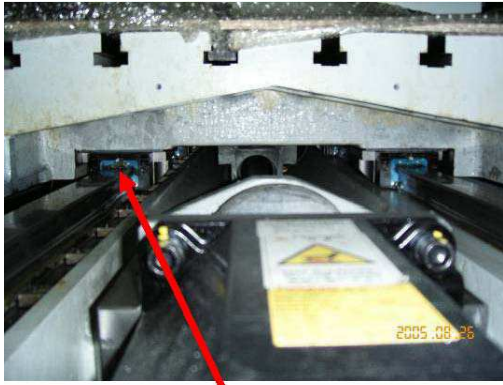
Grease Point	Refill Period	Method	Recommended Grease	Grease Quantity
X/Y/Z axis linear rail (STAR)	One year or 2000 hours	Use grease gun	KLUBER NCA-15	X 2.2cc Y 4.7cc Z 4.7cc
X/Y/Z axis linear rail (THK)(HIWIN)	One year or 2000 hours	Use grease gun	SHELL Alvania Grease RL2	X 2.2cc Y 4.7cc Z 4.7cc
Chip conveyor	3 months	Use grease gun	SHELL Alvania Grease RL2	5 cc

4.8.2 Greasing the X axis Linear Guide ways

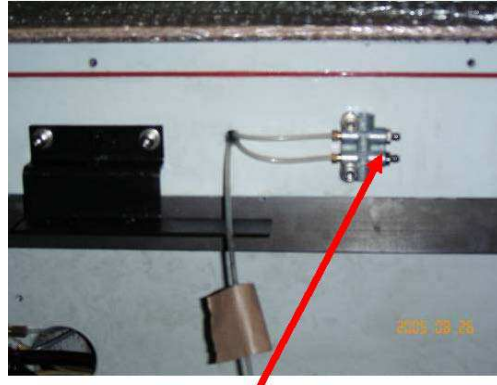
To access the X axis grease points, remove the X axis telescopic covers from both ends. The grease points are located on each runner block. Clean the grease point and apply the correct amount of grease as shown above.



X Axis Telescopic Cover



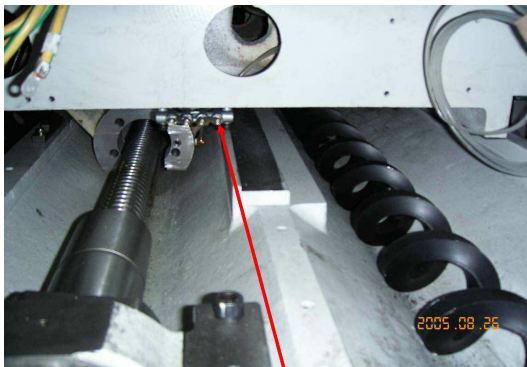
X Axis Runner BLCOK;
MV154/MV184 X Axis Grease
Points



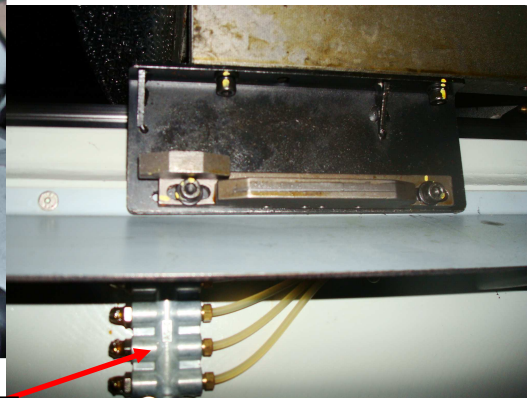
MV204/MV205 X Axis Grease
Points

4.8.3 Greasing the Y axis Linear Guideways

The grease points are centralised on the left hand side of the saddle. Clean the grease points and apply the correct amount of grease.

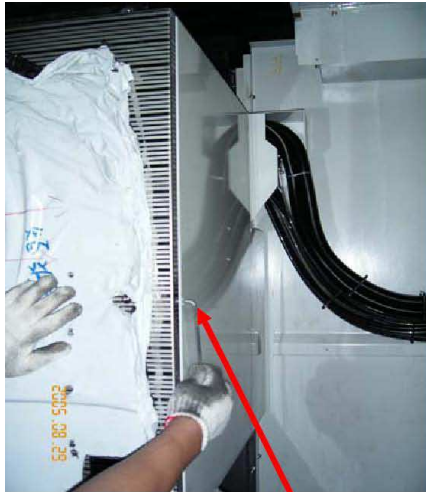


Y Axis Grease Points

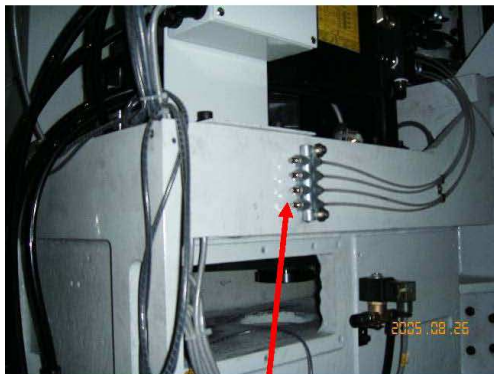


4.8.4 Grease the Z axes Linear Guideways.

Open the spindle head cover. The grease points are centralised on the right hand side of the head. Clean the grease points and apply the correct amount of grease as below.



Open the head cover



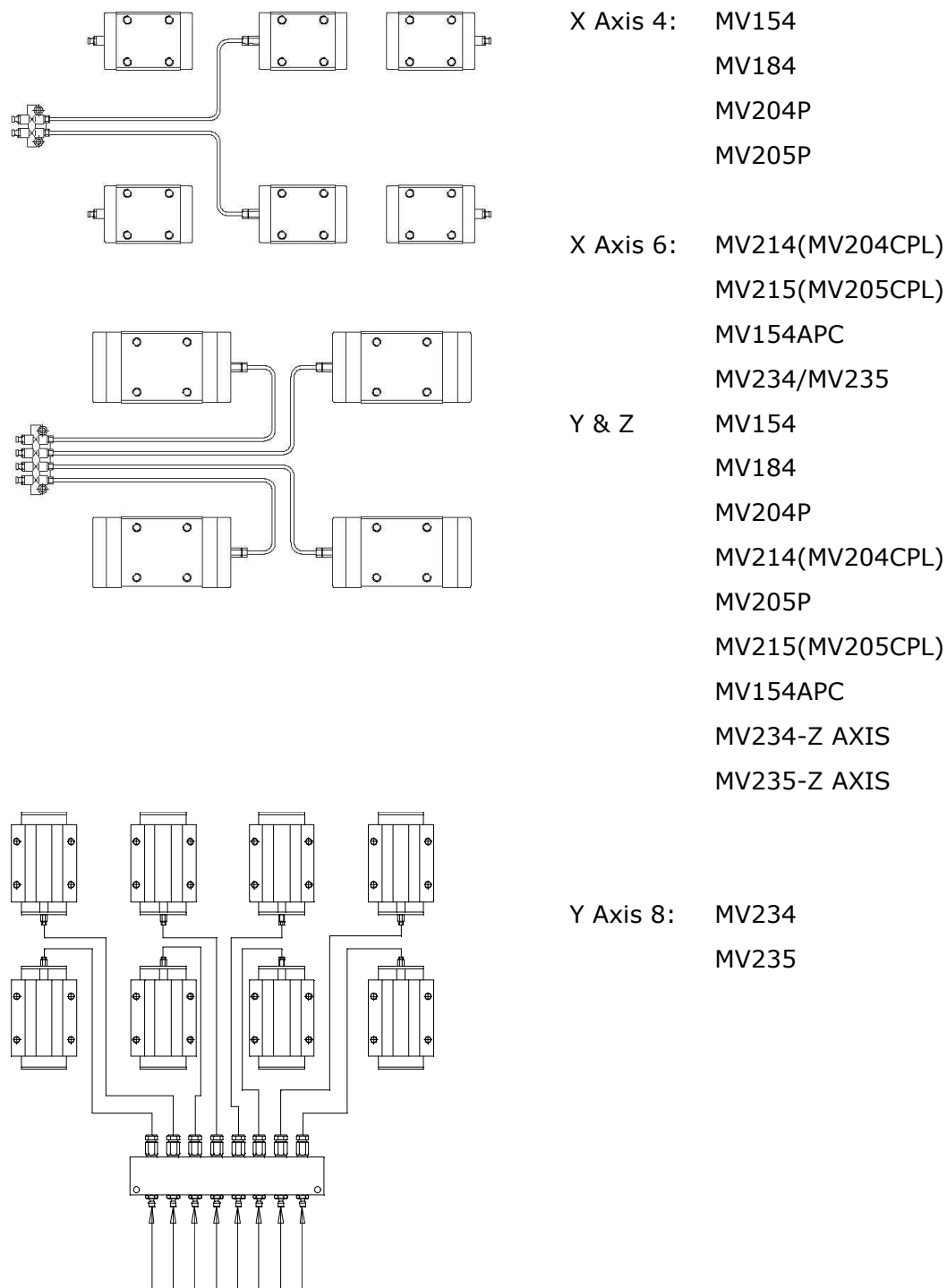
Z Axis Grease Points



4.8.5 Slideway (FEED AXES) lubrication diagram

The lubrication system is used to form a film of oil/grease on the slideways, ball guides, ballscrews and bearings to ensure smooth operation and prevent wear.

The lubrication system consists of grease points, distributors and piping parts.
Lubricating grease is fed from the grease point directly to each individual bearing, guideway and ballscrew.

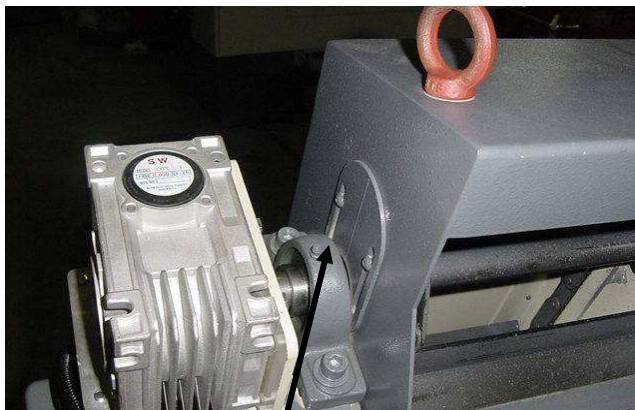


4.8.6 Greasing the chip conveyor

Remove the safety cover and apply the correct amount of grease as shown for each bearing housing.



Remove the cover



Chip conveyor bearing
housing #1



Chip conveyor bearing
housing #2

4.8.7 Lubrication oil recommendations

The centralised auto Lube system is used for all axis ballscrew ballnut lubrication.

Check the oil tank weekly and re-fill the oil as below.

OIL SUPPLY (BASED ON SINGLE SHIFT OPERATION)				
NO.	LUBRICATION POINT	Q'TY	RECOMMENDED OIL	REMARKS
1	LINEAR WAY (Rexroth)	6 c.c.	NCA-15 GREASE (KLÜBER)	LUBRICATE EVERY 2 YEARS
	LINEAR WAY (THK) (HIWIN)	6 c.c.	ALVANIA GREASE RL2 (SHELL)	
	BALL SCREW LINEAR WAY	2L	VACTRA NO.2 (MOBIL)	CHECK OIL LEVEL WEEKLY CLEAN FILTER ANNUALLY
		4L	TONNA OIL T 68 (SHELL)	
	LINEAR WAY (Rexroth) (THK) (HIWIN)	1 c.c.	LHL-X700 (LUBE)	EXCHANGE OIL CARTRIDGE WHEN OIL LEVEL IS LOW,PAY ATTENTION THAT AIR ARE NOT GETTING INSIDE
2	SPINDLE OIL CHILLER	20L 85L	MOBIL VELOCITE OIL NO.3 (ISO VG2)	EXCHANGE OIL / WATER AND CLEAN FILTER EVERY 12 MONTHS
		36L 100L		
		50L 160L		
	ECO-COOLER			
	SPINDLE OIL CHILLER (GEAR BOX)	45L	MOBIL VELOCITE OIL NO.10 (ISO VG32)	
	WATER CHILLER	75L	DISTILLED WATER USE MOTOREX COOLANT-F PROTECT PLUS ADDITIVE. CONCENTRATION 5% pH8.4-8.6	
3	AIR/OIL CYLINDER	80 c.c.	DTE OIL LIGHT 32 (MOBIL)	CHECK MONTHLY , REPLACE OIL AND CLEAN FILTER EVERY 6 MONTHS.
		120 c.c.	SHC 624 (MOBIL)	
	HYDRAULIC POWER UNIT	80L	TELLUS OIL 32 (SHELL)	

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4.8.8 Air/Oil Booster - Oil Level



Open the side head cover by removing the 4 screws.

Remove the lid of the oil bottle taking care not to dislodge the bottle itself. Top up with oil and replace the lid. Operate the drawbar several times and repeat the filing process taking care not to let the oil level fall below the bottom of the bottle. The process is complete once the oil level remains constant during the drawbar operation.

Booster bottle oil reservoir & lid



OIL SUPPLY				
(BASED ON SINGLE SHIFT OPERATION)				
NO.	LUBRICATION POINT	QTY	RECOMMENDED OIL	REMARKS
1	LINEAR WAY (Rexroth)	6 c.c.	NCA-15 GREASE (KLÜBER)	LUBRICATE EVERY 2 YEARS
	LINEAR WAY (THK) (HIWIN)	6 c.c.	ALVANIA GREASE RL2 (SHELL)	
	BALL SCREW	2L	VACTRA NO.2 (MOBIL)	CHECK OIL LEVEL WEEKLY CLEAN FILTER ANNUALLY
	LINEAR WAY	4L	TONNA OIL T 68 (SHELL)	
	LINEAR WAY (Rexroth) (THK) (HIWIN)	1 c.c.	LHL-X700 (LUBE)	EXCHANGE OIL CARTRIDGE WHEN OIL LEVEL IS LOW,PAY ATTENTION THAT AIR ARE NOT GETTING INSIDE
2	SPINDLE OIL CHILLER	20L 85L	MOBIL VELOCITE OIL NO.3 (ISO VG2)	EXCHANGE OIL / WATER AND CLEAN FILTER EVERY 12 MONTHS
		36L 100L		
	ECO-COOLER	50L 160L		
	SPINDLE OIL CHILLER (GEAR BOX)	45L	MOBIL VELOCITE OIL NO.10 (ISO VG32)	
	WATER CHILLER	75L	DISTILLED WATER USE MOTOREX COOLANT-F PROTECT PLUS ADDITIVE. CONCENTRATION 5% pH8.4-8.6	
3	AIR/OIL CYLINDER	80 c.c.	DTE OIL LIGHT 32 (MOBIL)	CHECK MONTHLY , REPLACE OIL AND CLEAN FILTER EVERY 6 MONTHS.
		120 c.c.	SHC 624 (MOBIL)	
	HYDRAULIC POWER UNIT	80L	TELLUS OIL 32 (SHELL)	

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4.9 SPINDLE GREASE REPLENISHMENT UNITS

Machines with the Weiss belt driven WB40R spindles (9000rpm, 12000rpm and 15000rpm), are fitted with 2 LUBCON grease replenishment units. One feeds the four angular contact bearings at the front of the spindle, and has black grease lines. The second feeds the rear roller bearing and has a blue grease line. These units are designed to replenish the bearings for a minimum of 3 years of continuous machine operation.

When the units have reached the end of their life the message "SP GREASE EMPTY" is displayed on the CNC screen. Replacement units are available from QUASER, and should be fitted as soon as possible after the message is first seen.

4.9.1 Changing the LUBCON units

1. Lower the spindle head.
2. Open the head cover.
3. Turn OFF the power at the Main Isolator (located on the electrical cabinet)
4. Disconnect the power connector of the LUBCON units
5. Disconnect the grease tubes
6. Unclip the LUBCON units and replace by new units
7. Cut 15mm off the connecting end of each feed tube, and make sure that they are full of grease.
8. Reconnect the grease tubes (Please follow the colour code)
9. Connect the power supplies to both units
10. Power on the machine and run the spindle at 100rpm continuously for more than 30 min. This will prime the supply circuit
11. Complete the running in procedure below.

4.9.2 Spindle running-in cycle

This cycle should be run once after new LUBCON units have been fitted.

100 rpm CW 10 sec, 100 rpm CCW 10 sec, continuously repeated 5 times	
200 rpm 2 min	
400 rpm 2 min	
25% 5 min	
1000 rpm 5 min	
3000 rpm 5 min	
5000 rpm 5 min	check that Oil Chiller cooling oil temperature difference is no more than 3°C
7500 rpm 5 min	
8000 rpm 5 min	
9000 rpm 5 min	End of 9000 rpm cycle
9600 rpm 5 min	
10000 rpm 5 min	
11000 rpm 5 min	
12000 rpm 5 min	End of 12000 rpm cycle
13000 rpm 5 min	
14000 rpm 5 min	
15000 rpm 5 min	End of 15000 rpm cycle

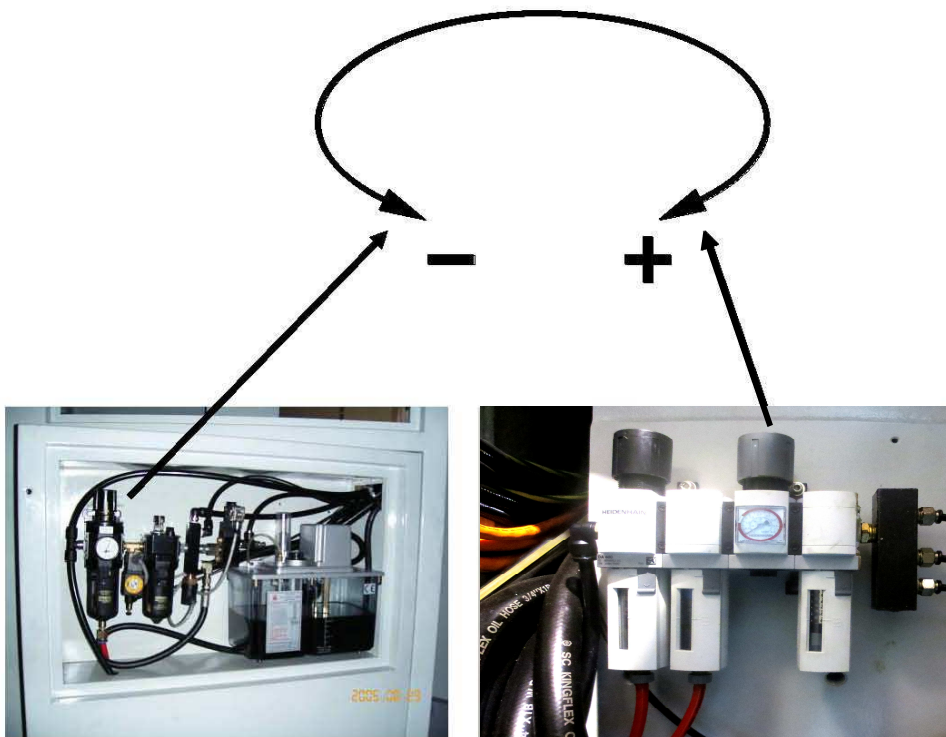
4.10 ADJUSTING THE AIR PRESSURE.

The main air pressure regulator, which is mounted in the right hand side of the machine, can be adjusted and should be set at 6kg/cm².

The second air pressure regulator for linear scales (if fitted) should be set at 2kg/cm². This is located at the left hand side of the machine.

4.10.1 Adjusting procedure

- 1) Turn on the air supply
- 2) Lift the pressure adjusting knob and turn it clockwise to increase the pressure and anti-clockwise to decrease the pressure (direction when looking down at the pressure regulator).
- 3) Push the adjusting knob down again to lock in position.

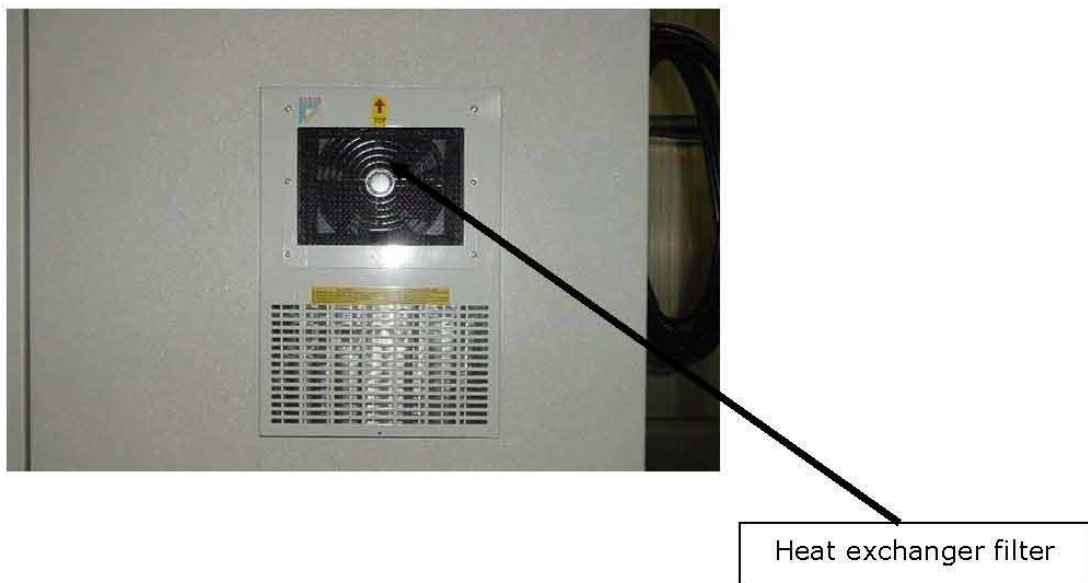


4.11 CLEANING THE ELECTRICAL CABINET FILTER

The electric cabinet heat exchanger unit is located in cabinet door. To maintain the cabinet temperature clean the filter after every 50 hours of running to ensure the cooling efficiently.

4.11.1 Cleaning Procedure

- 1) Turn the power OFF.
- 2) Remove the filter
- 3) Apply compressed air to the filter or wash with warm soapy water and dry.



4.12 CLEANING THE DOOR RAILS.

The upper and lower door rails should be cleaned every 50 hours to prevent a build up of contaminants in the door rail bearings.

4.12.1 Cleaning Procedure

- 1) Fully open the front door and turn the power OFF.
- 2) Wipe thoroughly the top and bottom door rails with a soft cloth.
- 3) Open and close the doors several times, each time wiping the rail until clean.
- 4) Apply a thin film of oil to the door rail.
- 5) When complete, turn the power ON.



Upper door rail



Lower door rail

4.13 CLEANING THE INSIDE OF THE ELECTRICAL CABINET

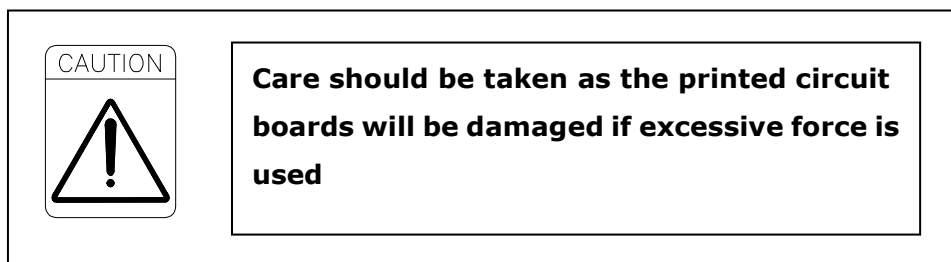
Although the electrical cabinet is constructed to prevent foreign materials from entering the cabinet, matter such as dust and dirt can build up over time.

Accumulation of foreign matter on the printed circuit boards or other electrical components may cause the machine to malfunction.

Clean the inside of the electrical cabinet every 500 hours.

4.13.1 Cleaning Procedure

- 1) Turn OFF and isolate the main power.
- 2) Open the electrical cabinet doors.
- 3) Use a vacuum cleaner to remove dust and dirt from the cabinet taking care not to touch any of the components. A small soft brush may be used to dust of the printed circuit boards.



- 4) Close the electrical cabinet door.
- 5) Turn the power ON.

4.14 SPINDLE COOLER - OIL CHILLER.

The spindle oil chiller is located in the left rear side of the machine.

4.14.1 Spindle cooler recommendations.

OIL SUPPLY (BASED ON SINGLE SHIFT OPERATION)				
NO.	LUBRICATION POINT	Q'TY	RECOMMENDED OIL	REMARKS
1	LINEAR WAY (Rexroth)	6 c.c.	NCA-15 GREASE (KLÜBER)	LUBRICATE EVERY 2 YEARS
	LINEAR WAY (THK) (HIWIN)	6 c.c.	ALVANIA GREASE RL2 (SHELL)	
	BALL SCREW LINEAR WAY	2L	VACTRA NO.2 (MOBIL)	CHECK OIL LEVEL WEEKLY CLEAN FILTER ANNUALLY
		4L	TONNA OIL T 68 (SHELL)	
	LINEAR WAY (Rexroth) (THK) (HIWIN)	1 c.c.	LHL-X700 (LUBE)	EXCHANGE OIL CARTRIDGE WHEN OIL LEVEL IS LOW,PAY ATTENTION THAT AIR ARE NOT GETTING INSIDE
2	SPINDLE OIL CHILLER	20L 85L	MOBIL VELOCITE OIL NO.3 (ISO VG2)	EXCHANGE OIL / WATER AND CLEAN FILTER EVERY 12 MONTHS
		 		
		36L 100L		
		 		
	ECO-COOLER	50L 160L		
		 		
	SPINDLE OIL CHILLER (GEAR BOX)	45L 	MOBIL VELOCITE OIL NO.10 (ISO VG32)	
	WATER CHILLER	75L 	DISTILLED WATER USE MOTOREX COOLANT-F PROTECT PLUS ADDITIVE. CONCENTRATION 5% pH8.4-8.6	
3	AIR/OIL CYLINDER	80 c.c.	DTE OIL LIGHT 32 (MOBIL)	CHECK MONTHLY , REPLACE OIL AND CLEAN FILTER EVERY 6 MONTHS.
		120 c.c.	SHC 624 (MOBIL)	
	HYDRAULIC POWER UNIT	80L	TELLUS OIL 32 (SHELL)	

3100122402

4.14.2 Cleaning the Spindle Oil Chiller Filter

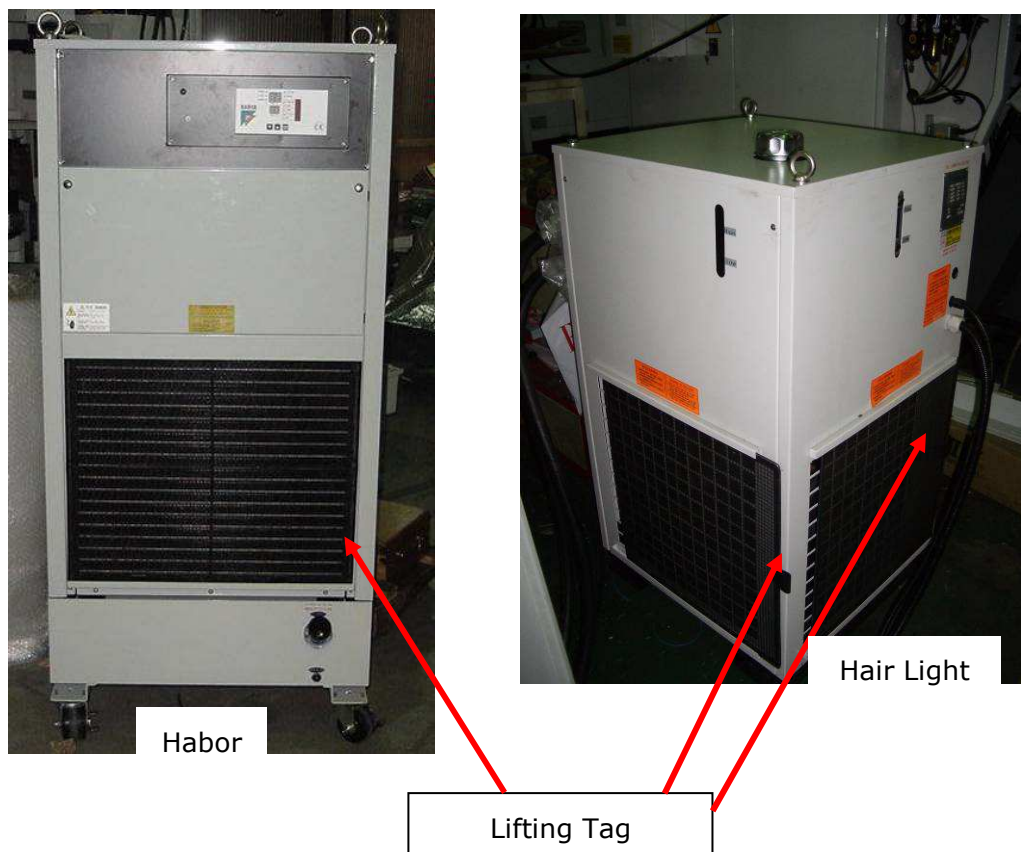
The Spindle Cooler Air Filter requires a constant flow of air in order to work efficiently. If the filter becomes blocked, the air flow will be reduced and over-heating may occur.

The cleaning interval will depend largely on the plant environment, the more dirt and dust particles in the air, the more regularly the filter will require cleaning.

On average cleaning of the filter should be performed at least once every 50 hours.

4.14.3 Cleaning Procedure

- 1) Turn the power OFF to the Spindle cooler by pressing the Emergency Stop button.
- 2) Remove the filter by lifting up on the tag located on the front bottom of the filter.
- 3) Clean the filter either by compressed air or in warm soapy water.
- 4) Dry the filter and return it to the cooler unit.
- 5) Turn the servo power ON to resume normal operation.



4.14.4 Filling the Spindle Oil Chiller

Check the oil level daily and fill it if required.

To fill the Coolant tank remove the nylon Tank Plug located on the front of the cooler, rotate anti clockwise to remove. Fill the tank to the top of the sight gauge and replace the nylon Tank Plug. Clean any spilt liquid.



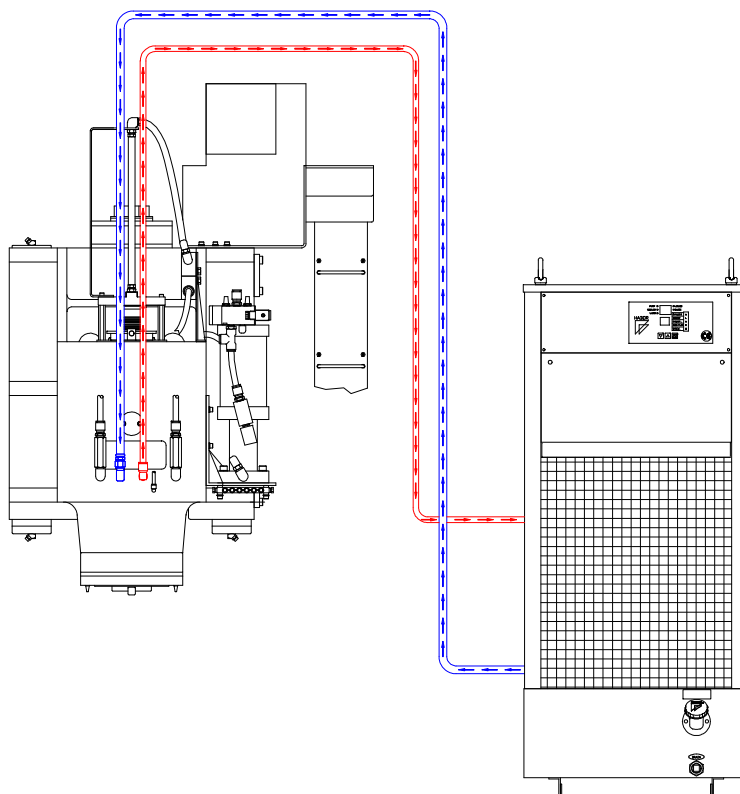
Habor



Sight gauge

Hair Light

4.14.5 Spindle Oil Chiller Circuit



4.14.6 Mist collector Installation Notes

1. installation should pay attention to ventilation tube length is correct.



2. mist collector mounting height above the instructions needed markings.



3. installation support columns need to be fixed on the ground.



4.15 CHECKING THE SERVO MOTOR CONNECTIONS

There are two connections on each servo motor. One for the motor power and the other for the encoder feedback.

These connections are tight when the machine is installed but they should be checked every 1000 hours to ensure they remain tight.

LOCATION

There are three servo feed motors, x axis, y axis and z axis. The z axis motor is located on top of the column, the y axis is located at the back of the y axis assembly beneath the y axis sliding cover and the x axis is located at the right hand side of the x axis assembly beneath the x axis sliding cover.

4.15.1 Adjusting procedure



It is not necessary to remove the axis covers to check the connections. Do not use tools when tightening the connections, finger tight is sufficient.

- 1) Turn the machine power OFF.
- 2) Locate the connections on the z axis feed motor and check for tightness.
- 3) Locate the y axis connections which may be found under the sliding y axis cover assembly at the back of the machine and check for tightness.
- 4) Locate the x axis connections which may be found under the sliding x axis cover assembly and check for tightness.
- 5) Turn the machine power ON.

4.16 KEYBOARD AND MONITOR CLEANING

Regular cleaning of the monitor and keyboard every 50 hours will help prevent a build up of dust and dirt and extend the life of the components.

Never use solvents, caustic or acidic solutions to clean the keyboard or monitor. The use of such chemicals could cause severe damage.

Do not use compressed air to clean the keyboard and monitor, the air pressure could force particles of dirt or metal into the keypad causing damage.

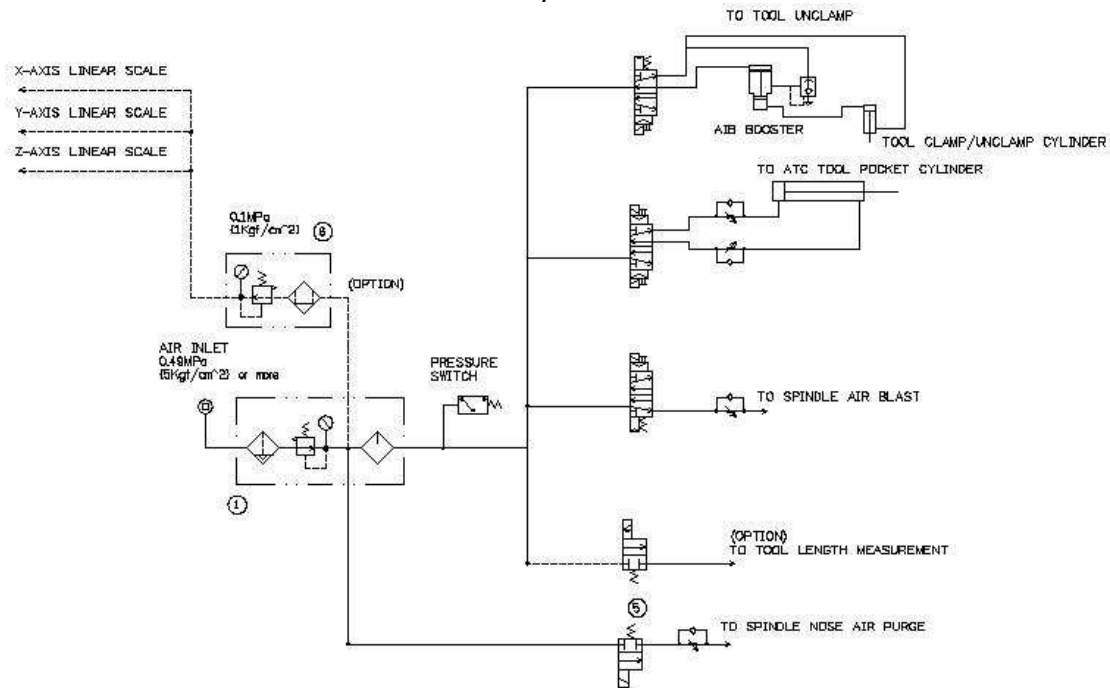
4.16.1 Cleaning Procedure

Turn the electrical power OFF.

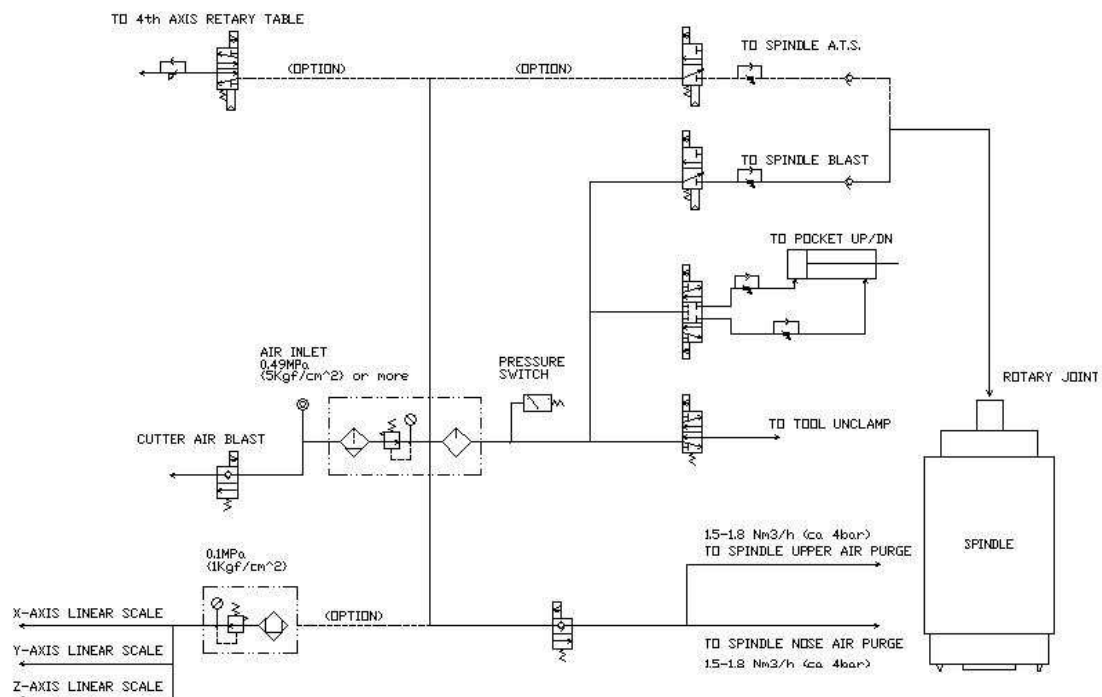
Use a lint free cloth moistened with warm soapy water to wipe over the keyboard and monitor. When dry, turn the electrical power ON.

4.17 PNEUMATIC CIRCUIT DIAGRAM & PARTS LIST

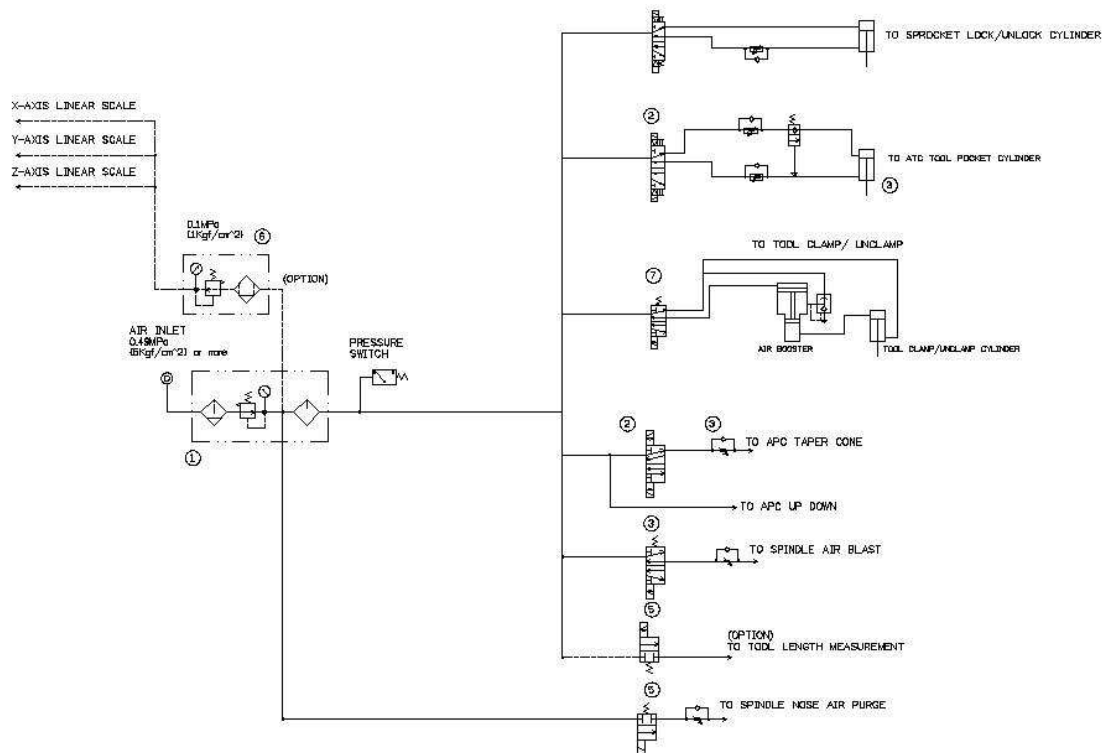
MV154/MV184



MV204/MV214(MV204CPL)/MV234 MV205/MV215(MV205CPL)/MV235



MV154APC



4.18 ADJUSTING MACHINE LEVEL

Pre-levelling:

Remove the coolant tank and chip conveyor.

Set the machine table in the middle of the X and Y axis travel.

Set the two levelling gauges in the centre of the machine table, one in the X direction and other in the Y direction.

The 3/4 point leveling process uses the foundation bolt (A) for X/Y direction, the bolt (B) should be free at this point.

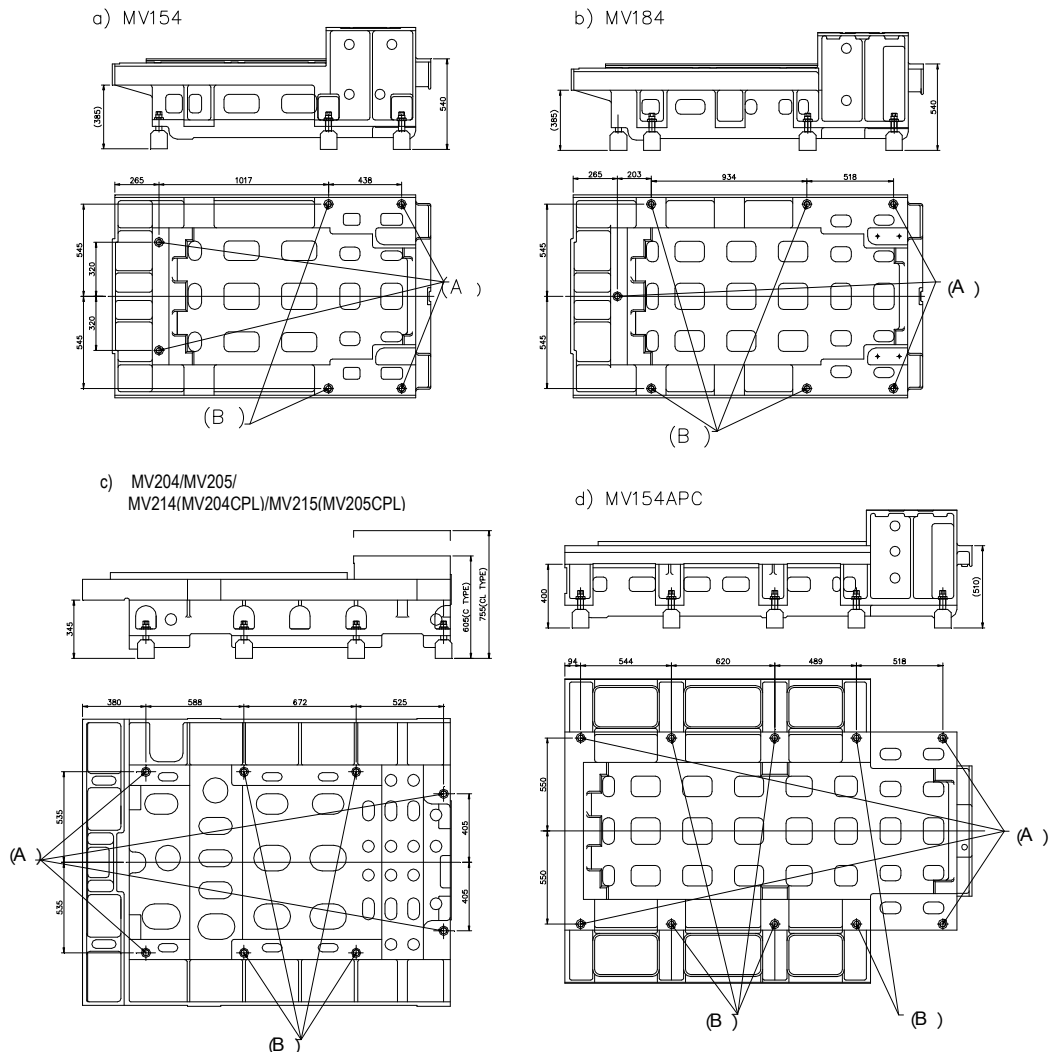
Make sure the height of machine base is sufficient to get the coolant tank and chip conveyor beneath.

Final levelling:

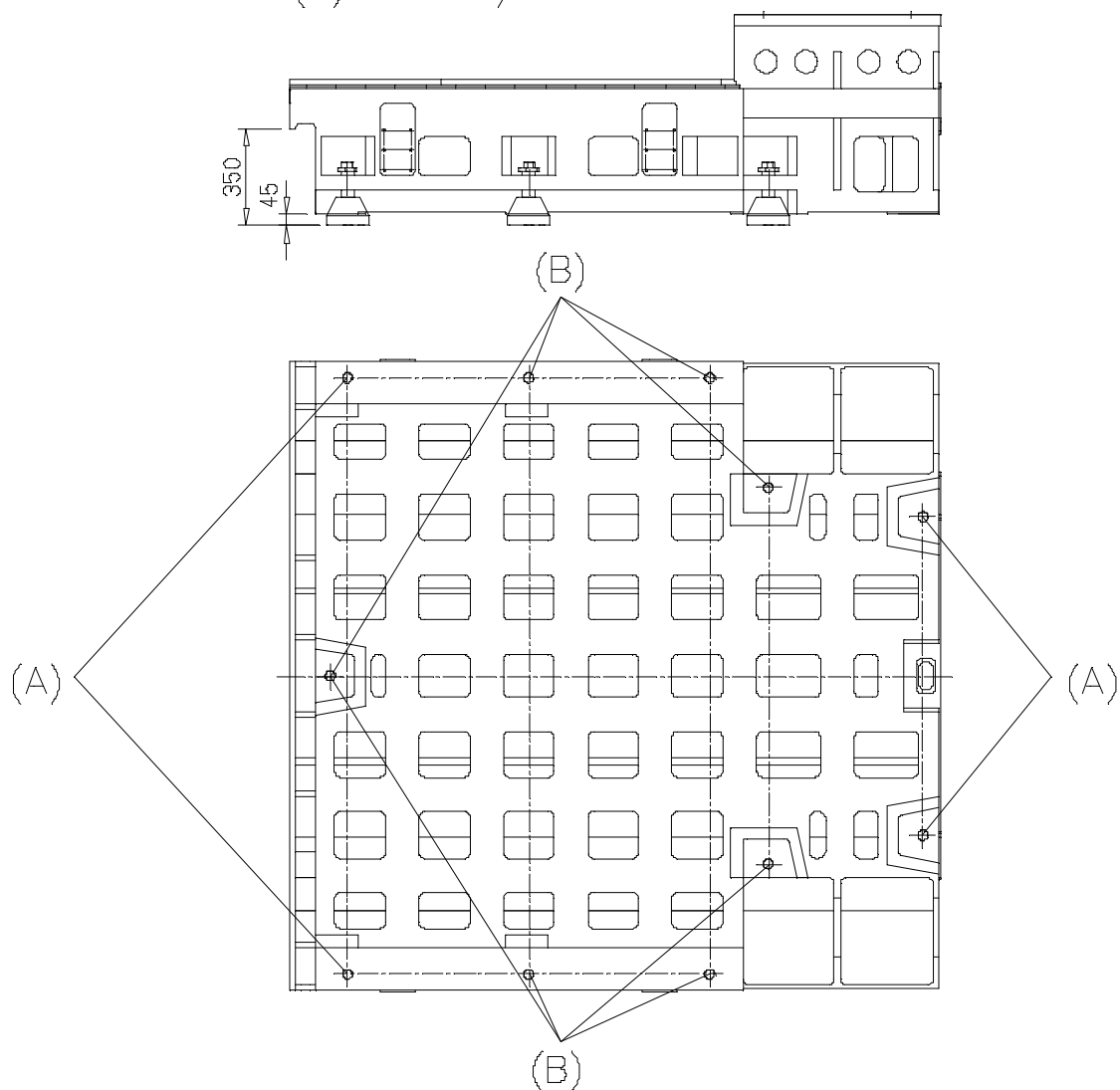
Tighten the foundation bolts (B) by hand.

Move the machine table in Y direction and using fine adjustment, keep the movement of two level gauges within 0.04mm/meter.

Reconfirm the squareness in the X-Z and Y-Z plane..



(E) MV234/MV235



4.19 YEARLY INSPECTION AND REPLACEMENT

4.19.1 Yearly (In addition to weekly routine)

1. Remove the filter from the CTS filter/air filter bottle and clean/replace.
(6 Months)
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.
7. Do not direct shoot the gap between telescopic cover and machine base of Y axis.
8. It need to sweep up regular in Y axis telescopic cover.

4.20 NOTICE

The contents of this manual are subject to change without prior notice due to improvements to the machine or in order to improve the manual.

Consequently, please bear in mind that there may be slight discrepancies between the contents of this manual and the actual machine. Changes to the instruction manual are made in revised editions which are distinguished from each other by updating the instruction manual issue date.

Should you discover any discrepancies between the contents of the manual and the actual machine, or if any part of the manual is unclear, please contact the representative and clarify these points before using the machine. The representative will not be liable for any damages occurring as a direct or indirect consequence of using the machine without clarifying these points.

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