

MAINTENANCE MANUAL

for

INTEGREX 100-III/IIIS/IIIST

T: Lower Turret

S: Secondary Spindle

MANUAL No. : E372MA0010E0

Serial No. :

Before using this machine and equipment, fully understand the contents of this manual to ensure proper operation. Should any questions arise, please ask the nearest Technical/Service Center.

IMPORTANT NOTICE

1. Be sure to observe the safety precautions described in this manual and the contents of the safety plates on the machine and equipment. Failure may cause serious personal injury or material damage. Please replace any missing safety plates as soon as possible.
2. No modifications are to be performed that will affect operation safety. If such modifications are required, please contact the nearest Technical/Service Center.
3. For the purpose of explaining the operation of the machine and equipment, some illustrations may not include safety features such as covers, doors, etc. Before operation, make sure all such items are in place.
4. This manual was considered complete and accurate at the time of publication, however, due to our desire to constantly improve the quality and specification of all our products, it is subject to change or modification. If you have any questions, please contact the nearest Technical/Service Center.
5. Always keep this manual near the machinery for immediate use.
6. If a new manual is required, please order from the nearest Technical/Service Center with the manual No. or the machine name, serial No. and manual name.

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CONTENTS

	Page
1 INTRODUCTION	1-1
1-1 List of Manuals to Be Used.....	1-1
1-2 Numbering System for Pages.....	1-1
1-3 Numbering System for Figures and Tables	1-1
1-4 Revision Code	1-2
2 SAFETY PRECAUTIONS.....	2-1
2-1 Rule.....	2-1
2-2 Basic Safety Items.....	2-1
2-3 Clothing and Personal Safety	2-3
2-4 Safety Items Related to Operation	2-4
2-5 Safety Items Related to Gripping Workpiece and Tooling (in Turning).....	2-5
2-6 Safety Considerations Relating to Holding Workpieces and Tooling (in Milling)	2-6
2-7 Safety Items Related to Maintenance.....	2-7
2-8 Safety Items Related to Workplace	2-8
2-9 Safety Items Related to Chip Conveyor.....	2-8
2-10 Safety Equipment	2-9
2-11 Remarks on the Cutting Conditions Recommended by the NC.....	2-10
2-12 Safety Nameplates	2-10
3 REGULAR INSPECTION AND MAINTENANCE	3-1
3-1 General.....	3-1

3-2	Maintenance Inspection Item List	3-2
3-3	Checking the Safety Devices Function	3-4
3-4	Supplying Oil and Water	3-6
3-4-1	INTEGREX 100-III	3-6
3-4-2	INTEGREX 100-IIIS/IIIST	3-7
3-5	List of Consumables	3-8
3-6	Equipment Layout	3-9
3-6-1	INTEGREX 100-III (without tailstock) [20/40-tool magazine]	3-9
3-6-2	INTEGREX 100-III [20/40-tool magazine]	3-10
3-6-3	INTEGREX 100-IIIS [20/40-tool magazine]	3-11
3-6-4	INTEGREX 100-IIIST [20/40-tool magazine]	3-12
3-6-5	Milling head	3-13
3-6-6	ATC and magazine [20/40-tool magazine]	3-13
4	MAINTENANCE OF MAJOR MACHINE UNITS	4-1
4-1	Headstock/Hydraulic Chuck	4-1
4-1-1	Greasing and lubrication	4-1
4-1-2	Adjustment of the chuck clamp/unclamp proximity switches (option)	4-2
4-1-3	Checking the headstock for disturbed accuracy in the event of collision	4-2
4-1-4	Cleaning	4-3
4-2	Milling Head	4-4
4-2-1	Oil level inspection and oil replacement	4-4
4-2-2	Backlash compensation for the B-axis	4-5
4-3	Zero Point Position Adjustment	4-5
4-3-1	Determining zero-point	4-5

4-3-2	Zero point position setting by zero-point return.....	4-11
4-3-3	Backlash compensation	4-11
4-4	ATC	4-13
4-4-1	Oil level inspection and oil replacement	4-13
4-4-2	Registration of reference position for the movable sections.....	4-14
4-4-3	Mutual alignment of units (20/40-tool magazine)	4-15
4-4-4	Adjustment of the ATC door	4-22
4-4-5	Cleaning.....	4-23
4-4-6	Cleaning the oil pan (rear cover) under the magazine	4-24
4-4-7	Cleaning the tool detection sensor	4-25
4-4-8	Cleaning the tool edge, the turret edge, and the magazine shifter pocket	4-26
4-5	Hydraulic Unit	4-27
4-5-1	Construction and specifications.....	4-27
4-5-2	Checkups before starting hydraulic unit.....	4-28
4-5-3	Inspection when starting hydraulic unit.....	4-28
4-5-4	Inspection and maintenance of hydraulic unit.....	4-28
4-6	Lubrication Unit	4-30
4-6-1	B-axis gear, C-axis brake, and ATC mechanical lock lubrication	4-30
4-6-2	Slideway and ball screw lubrication	4-31
4-7	Coolant Unit.....	4-33
4-7-1	Composition and operation	4-33
4-7-2	Inspection.....	4-33
4-7-3	Replenishing coolant.....	4-34
4-7-4	Replacing coolant.....	4-34

4-7-5	Cleaning.....	4-35
4-8	Air Unit.....	4-36
4-8-1	Composition and operation	4-36
4-8-2	Inspection.....	4-36
4-8-3	Replacing the mist separator element	4-37
4-8-4	Adjusting the air pressure.....	4-37
4-9	Milling Head Cooling Unit and Milling Spindle Cooling System	4-38
4-9-1	Composition and operation	4-38
4-9-2	Inspection of coolant	4-38
4-9-3	Replenishing and replacing coolant.....	4-39
4-10	Headstock Cooling Fan	4-41
4-10-1	Composition and operation	4-41
4-10-2	Cleaning.....	4-42
4-11	Secondary Spindle and W-Axis	4-43
4-11-1	Construction and operation	4-43
4-11-2	Principle of zero-point return	4-44
4-12	Secondary Headstock Cooling Fan	4-45
4-12-1	Construction and operation	4-45
4-12-2	Cleaning.....	4-46
4-13	Other Components	4-46
4-13-1	Wipers.....	4-46
4-13-2	Procedure for replacing the proximity sensor	4-49
4-13-3	Resetting the thermal relays.....	4-50
4-13-4	Replacing the bulbs of the fluorescent lamp	4-51

4-13-5	Replacing the batteries of the amplifiers.....	4-55
5	INSTALLATION.....	5-1
5-1	Preparation for Installation.....	5-1
5-1-1	Environmental requirements.....	5-1
5-1-2	Power requirements.....	5-2
5-2	Air Source Requirements.....	5-3
5-3	Machine Installation.....	5-3
5-3-1	Precautions for machine installation.....	5-3
5-3-2	Unpacking, inspection and cleaning.....	5-5
5-3-3	Installation.....	5-5
5-3-4	Removing the transit clamps.....	5-8
5-4	Connecting the Power Supply Cable and Air Supply Hose.....	5-10
5-4-1	Connecting the power supply cable.....	5-10
5-4-2	Grounding.....	5-11
5-4-3	Phase check.....	5-12
5-4-4	Connecting the air hose.....	5-12
5-5	Final Leveling.....	5-13
5-6	Trial Operation.....	5-13
6	TROUBLESHOOTING.....	6-1
6-1	Troubleshooting Procedures.....	6-1
6-1-1	If the tool has come into contact with the workpiece, chucks or other sections.....	6-1
6-1-2	If the source of the trouble cannot be located.....	6-1
6-1-3	GRAPHIC MAINTENANCE display.....	6-2

6-2	Main and Secondary Headstocks.....	6-4
6-3	Chuck	6-5
6-4	Milling Head.....	6-6
6-5	TOOL EYE (Option).....	6-7
6-6	X-, Z-, Yt-, W-, X2- and Z2-Axis.....	6-7
6-7	Tailstock.....	6-7
6-8	Lower Turret (INTEGREX 100-IIIIST)	6-8
6-9	Hydraulic Unit	6-9
6-10	Oil Lubrication Unit	6-10
6-11	Grease Lubrication Unit.....	6-11
6-12	Coolant Unit.....	6-12
6-13	Air Unit.....	6-12
6-14	Headstock Cooling Unit.....	6-12

1 INTRODUCTION

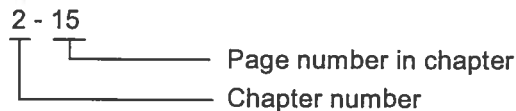
1-1 List of Manuals to Be Used

For this machine, the following manuals are provided.

Manual name	Coverage
Operating manual	All aspects of operation
Maintenance manual	All aspects of maintenance, including inspections and adjustment
Tooling manual	Tooling for turning, rotating tool
Programming manual	All aspects of CNC programming
Parameter list	Detailed description of parameters
Alarm list	Detailed description of alarms regarding to CNC
Parts list	Part procurement
Electrical wiring diagrams	Electrical connections
Operating manual for optional specifications	All aspects of operation

1-2 Numbering System for Pages

1. Normal case

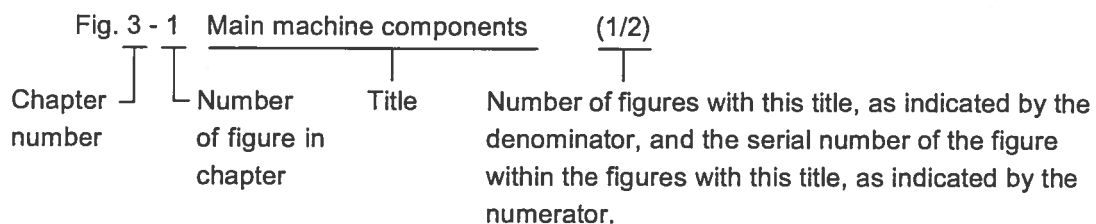


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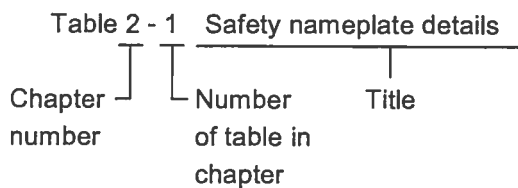


1-3 Numbering System for Figures and Tables

1. Figure number



2. Table number

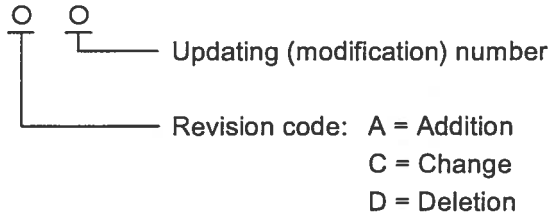


1-4 Revision Code

This manual is revised with each improvement of the product or each modification of its specifications, and the document number of the manual is correspondingly updated.

Revised sections of the manual are denoted by the revision numbers beginning with R, on the CONSTRUCTION page facing the back cover page.

Also, all revisions are coded at one of three levels and these revision codes are given between the corresponding section titles and page numbers on the "Contents" page so that the readers can readily identify which item has been added, changed, or deleted.



Revision codes only denote the previous and/or current revisions, and the revision codes for any revisions preceding the previous ones are crossed out from this manual.

A revision record is given at the end of this manual to denote the history of the manual.

2 SAFETY PRECAUTIONS

The precautions to be observed to ensure safe operation of the machine are described here.

The machine must not be operated until these precautions have been thoroughly understood.

2-1 Rule

1. This section contains the precautions to be observed as to the working methods and states usually expected. Of course, however, unexpected operations and/or unexpected working states may take place at the user site.

During daily operation of the machine, therefore, the user must pay extra careful attention to its own working safety as well as to observe the precautions described below.

2. The meanings of our safety precautions to DANGER, WARNING, and CAUTION are as follows:



DANGER

: Failure to follow these instructions could result in loss of life.



WARNING

: Failure to observe these instructions could result in serious harm to a human life or body.




CAUTION

: Failure to observe these instructions could result in minor injuries or serious machine damage.

2-2 Basic Safety Items



DANGER

- There are high voltage devices on the electrical control panel, transformer, motors, junction boxes, and other equipment (with a battery warning mark  attached).

Do not touch any of them under any circumstances.

- Make sure that all doors and safety covers are fitted before switching on the power. If any door or safety cover is to be removed, first cut off and lock the main power breaker.

- Do not power on the machine, with door/protective cover removed.



- Memorize the position of the EMERGENCY STOP button so that you can press it immediately from any position.
- To prevent incorrect operation of the machine, carefully check the position of the switches before operation.
- Take care not to touch any of the switches accidentally while the machine is in operation.
- Under no circumstances touch a rotating workpiece or the tool with your bare hands or any other object.
- Take care not to catch your fingers in the chuck.
- Whenever you may work inside the machine, be cautious about chips and possible slippage due to coolant.
- Do not enter the machine unless necessary for maintenance.
- Always switch off the power switch on the operation panel and switch off the main power breaker if no machine operation is required.
- Switch off the main power breaker before cleaning the machine or its peripheral equipment(s).
- Switch off and lock the main power breaker before performing maintenance work inside the machine.
- If more than one operator are using the machine, do not proceed to the next step without indicating to the other operator(s) that you are about to do so.
- Do not modify the machine in any way that will affect its safety.
- If in the slightest doubt about a procedure, ask the person in charge.
- Do not enter the machine. If it becomes absolutely necessary to enter, press the emergency stop button or take any other appropriate preventive measure beforehand so that the machine does not operate.



- Do not fail to conduct inspection periodically in accordance with the instruction manual.
- Check and make certain that there is nothing interfering in the home direction.
- Do not open any doors or safety covers while the machine is in automatic operation.
- After a job has been completed, set up each part of the machine so that it is ready to be used for the next series of operations.
- If there is a power failure, switch off the main power breaker immediately.
- Do not subject the CNC unit, the operation panel, or the electrical control panel to strong shocks.
- Do not change the parameter values, volume values, or other electrical setting values without good reason. If it becomes necessary to change a value, first check that it is safe to do so, then make a note of the original value so that it can be reset if necessary.
- Do not paint, soil, damage, modify, or remove any of the safety nameplates. If the details become illegible or if the nameplate is lost, obtain a replacement by sending the part number stamped at the bottom right-hand corner of the nameplate to Mazak and mount the replacement in the original position.

2-3 Clothing and Personal Safety



CAUTION

- Tie back long hair, which could become entangled in drive mechanisms.
- Wear safety equipment (helmet, goggles, safety shoes, etc.) whenever possible.
- Always wear a helmet if there are any overhead obstacles in the work area.
- Always wear a protective mask when machining dust-generating materials.
- Always use safety shoes with steel toecaps and oil-resistant soles.
- Never wear loose or baggy clothing.
- Always completely fasten buttons and hooks on the arms of clothing to avoid the danger of entanglement in drive mechanisms.
- If you should wear a neck tie or necklace and the like, be careful not to let it roll into the machine drives.
- Always use gloves when loading or unloading workpieces or tools and when removing chips from the work area to protect your hands from sharp edges and heat generated during machining.
- Do not operate the machine while under the influence of drugs with powerful effects, unprescribed drugs, or alcohol.
- Do not operate the machine if you suffer from dizziness or fainting spells.

2-4 Safety Items Related to Operation

Do not proceed to operating the machine before completely understanding what is referred to in the instruction manual.



- The use of inflammable lubricant as coolant is not recommended as it is dangerous and may cause a fire. If such use is unavoidable, it is the responsibility of management to ensure a fire extinguisher is readily available as a safety measure. Additionally, if an inflammable lubricant is used, the machine should never perform unmanned operation. An operator must always be present to ensure safety. The same precautions must be taken when machining inflammable materials such as magnesium alloy.
- Close all doors and covers of the CNC unit, operation panel, electrical control panel, and junction boxes to prevent damage from water, chips, and oil.
- Check all electrical cables for damage to prevent accidents due to current leakage or electric shock.
- Check the safety covers regularly to make sure that they are properly fitted and that they are not damaged. Repair or replace any damaged covers immediately.
- If the machine door, the cover, or other glass sections are found to be damaged, immediately stop the machine and replace the damaged sections. Failure to observe this instruction may result in injury due to the possible flyaway of the chuck jaws or tool during machining.
When ordering replacement parts from your MAZAK product distributor, refer to the Parts List and specify the part numbers.
- Do not operate the machine with any of the safety covers removed.
- Do not handle coolant with bare hands since it is liable to cause irritation. Operators with allergies should take special precautions.
- Do not adjust the coolant nozzles while the machine is in operation.
- Always wear gloves and use a brush to clean chips off the tool tip; never use bare hands.
- Stop all machine operations before mounting or removing a tool.
- When loading workpiece blanks onto or unloading products from machines which do not have an automatic workpiece changer, make sure that the tool is as far away as possible from the work area and that it has stopped rotating.
- Do not wipe the workpiece or clear away chips with your hand or with a rag while the tool is rotating; always stop the machine and use a brush.
- Do not remove stop dogs, limit switches, or interlocks, or other safety equipments from the machine, or bypass the interlock or safety circuits.
- Always obtain assistance in handling loads beyond your capacity.
- Do not operate fork lifts or cranes or carry out slinging work unless you have undergone officially approved training.
- When using fork lifts or cranes, make sure that there are no obstructions in the vicinity of these machines.
- Always use wire rope or slings of a standard suitable for the load to be supported.
- Check slings, chains, hoists, and other lifting gear for defects before use. Repair or replace defective gear immediately.
- Do not operate the machine during violent thunderstorms.

**CAUTION**

- Check that the belts have the correct tension before operating the machine.
- Check jigs and others to make certain that their workpiece clamping bolts are not loose.
- Do not operate the switches on the operation panel while wearing gloves as this could lead to incorrect operation or other mistakes.
- Warm up the spindle and all of the axis feed mechanisms before operation.
- Make certain that mounted tools match with the program-entered tool numbers.
- Check the **POSITION** display (or **SET UP** display) for a program number.
- Initially, execute the program with decreased rapid travel in the single-block operation mode to make certain that no interference takes place.
- Check and make certain that no abnormal noise is produced while cutting.
- Do not allow chips to accumulate during heavy-duty cutting since they become hot and may take fire.
- When one series of operations has been completed, switch off the power switch on the CNC operation panel, switch off the main power breaker, then switch off the factory power supply.

2-5 Safety Items Related to Gripping Workpiece and Tooling (in Turning)

**WARNING**

- Always use tools suitable for the work and which conform to the machine specifications.
- Replace tools quickly, since badly worn tools are a cause of accidents or damage.
- Before starting the turning spindle, check that any parts which are bolted or clamped to the chuck or the steady rest are properly secured.
- If the center hole on large bar workpieces is too small, the workpiece could come off when a load is applied. Make sure that the hole is big enough and that it has the correct angle.
- Do not operate a turning spindle on which accessories are mounted at above the rated speed.
- If the chuck or the accessory being used is not a product recommended by MAZAK, check the maximum safe operating speed with the manufacturer.
- Take care not to catch your fingers in the chuck, steady rest and hand.
- Always use the correct lifting gear for heavy chucks, steady rests, hand and workpieces.
- Workpieces heavier than the design data of the machine must not be machined. If an attempt is made to machine a workpiece heavier than the value obtained by subtracting the weights of the chucks and jaws from the maximum supporting capacity of the machine, the workpiece may abruptly fly out to cause a hazardous situation.
- Do not turn power off the machine while the tailstock is holding the workpiece. If the machine is powered off and then left as it is for a long time, there is a danger of the workpiece falling since the tailstock will decrease in workpiece holding force.



- Make sure that the tool length is such that the tool will not interfere with fixtures such as chucks or other objects.
- Perform a test operation after mounting tools and a workpiece.
- After machining soft jaws, check that they grip the workpiece correctly and that the chuck pressure is correct.
- Since the tool holders can be mounted from the left or the right, check that the tool holder is mounted facing the correct direction.
- Do not use a tool measuring device (TOOL EYE or tool length measuring unit) before making certain that there is nothing interfering.

2-6 Safety Considerations Relating to Holding Workpieces and Tooling (in Milling)



- Always use tools which are suitable for the work to be carried out and conform to the machine specifications. Always observe the restrictions on weight of tool insert and tool diameter stipulated in the specifications. [Max. insert weight: 20 gf (0.04 lbs)]
- Replace tools promptly, since badly worn tools can cause accidents and injuries.
- Before starting operation, check that the workpiece is securely mounted and cannot become detached by the cutting forces applied to it during machining.
- Before mounting a cutting tool in the machine, make sure that the tool and its retention bolt are properly secured.
- Do not rotate a cutting tool or holder at speeds greater than the rated speed.
- Check maximum safe operating speeds with the manufacturer.
- Be very careful not to catch your fingers in workpiece holding devices.
- Always use the correct lifting gear for heavy fixtures and workpieces.



- Make sure that cutting tools will not interfere with the workpiece fixture, etc.
- Mount the tool holder in the correct orientation by aligning it with the drive key.
- Occasionally check for looseness after using a milling chuck.
- Make sure that the workpiece is correctly mounted on the workpiece or table.
- Check that vices, fixtures, etc., have no overhang with respect to the table.
- Make sure that the tools are arranged in the tool magazine correctly in accordance with the tool data set in the TOOL LAYOUT screen.
- Check that the lengths of all tools to be used have been measured.
- Move the tool nose to the initial point (X0, Y0) to check the basic coordinate system.
- Perform a test operation after mounting a cutting tool and workpiece.

2-7 Safety Items Related to Maintenance

Do not proceed to a maintenance work before completely understanding what is referred to in the maintenance manual.



- Always switch off the main power breaker and lock it before carrying out any maintenance work. This will eliminate the possibility of the machinery being started inadvertently by someone else.
- After the power has been switched off for a short while, check the voltage with a multimeter or similar instrument to make sure that there is no residual voltage. Also discharge the capacitors.



- Maintenance work for electrical parts must be carried out by qualified personnel.
- Even if the door of the power control panel is open, the power is not cut off. When working inside the power control cabinet or repairing the machine, always switch off the main power breaker and attach a padlock (provided by customers).
- Do not proceed to cleaning the machine and/or its peripherals before locking the main power breaker at the OFF position, with the machine made to completely stop operating.
- Do not proceed to a repair on the machine before shutting off the input air source.
- When carrying out maintenance in high places, always use a suitable ladder or a service platform and always wear a helmet.
- Keep your fingers clear of belts and pulleys as well as chains and sprockets.
- Always switch off the main power breaker and lock it before replacing bulbs or other electrical equipment and use products with the same specifications as the original.
- Do not remove or modify overtravel limit switches, interlock limit switches, proximity switches, or other safety devices.
- Do not start the machine until all of the covers removed for maintenance have been refitted.
- Wipe up any water or oil spills immediately and keep the maintenance area and the workplace clean and tidy at all times.
- Be absolutely certain to use the specified and standardized parts as replacement or consumable parts so as to maintain the as-shipped machine specifications. We take no responsibility for any personal accidents or machine trouble due to inobservance of this warning.



- Maintenance work should be carried out by qualified personnel in accordance with the instructions of the person in charge.
- Read the maintenance manual thoroughly.
- Use only the specified grades of hydraulic oil, lubricating oil, and grease or their equivalents.
- When changing a fuse, check that the new fuse has the correct rating. (Using a fuse with too high a rating could result in damage to the equipment.)
- Follow the instructions indicated on the instruction plate concerning the brands of oil to be used, lubrication points, amount to be used, and oil change intervals.
- If one of the belts in a set has stretched beyond the prescribed limit, change the entire set.
- Do not use compressed air to clean the machine interior. If compressed air is used, sand, dust, chips, or other foreign substances may be entrapped in bearings or sliding sections, resulting in machine trouble.
- Always use gloves when clearing away chips; never touch chips with bare hands.
- Check the results of the maintenance work in the presence of the person in charge.

2-8 Safety Items Related to Workplace



- Immediately remove all water and oil spills from the floor and dry the floor to prevent accidents.
- Keep combustible materials well away from the work area and any other place where there are hot chips.
- Always provide sufficient working space and clear access to the machine and peripheral equipment and store tools and other potential obstacles in a prescribed place away from the machine.
- Always provide sufficient lighting in the work area.
- Use strong service platforms only and make sure that nothing can slip off them.
- Never place tools or other potentially dangerous objects on top of the headstock, turret, or covers.
- Make sure that the nominal cross-sectional area of the power supply cable between the factory power supply switch and the machine main power breaker is such as to enable a stable supply for operation at the maximum output.
- Protect all cables which will run along the floor from being damaged by chips, since this could cause short-circuiting.

2-9 Safety Items Related to Chip Conveyor



- Before carrying out maintenance work or other jobs on the chip conveyor, make sure that the power supply is turned off and that the conveyor itself is placed in the completely stopped status. Failure to observe this precaution causes serious personal injury.
- During the operation of the chip conveyor, keep hands away from and do not insert any region of your body into any sections of the conveyor. Failure to observe this precaution causes serious bodily injury.

2-10 Safety Equipment

This machine is provided with various safety devices to protect the operator and the machines. The safety devices include interlock devices and emergency stop switches as well as doors and covers.



- The machine is provided with various devices for the operator's safety. Never cancel any of the devices. Failure to observe this instruction could result in serious harm to a human life or body.

Table 2-1 Location and function of safety devices

No.	Location	Function
1	Air pressure monitoring	- In the event of an unusual decrease in air pressure, the abnormality is detected to stop the machine.
2	Front door glass	- The glass is strong enough to withstand the insert blades or chuck jaws flung away during machining.
3	Machine outer cover	- This cover secures a safety clearance to protect human bodies.
4	Hydraulic chuck	- For the chucks originally provided, check valves work to prevent the oil pressure from abruptly decreasing.

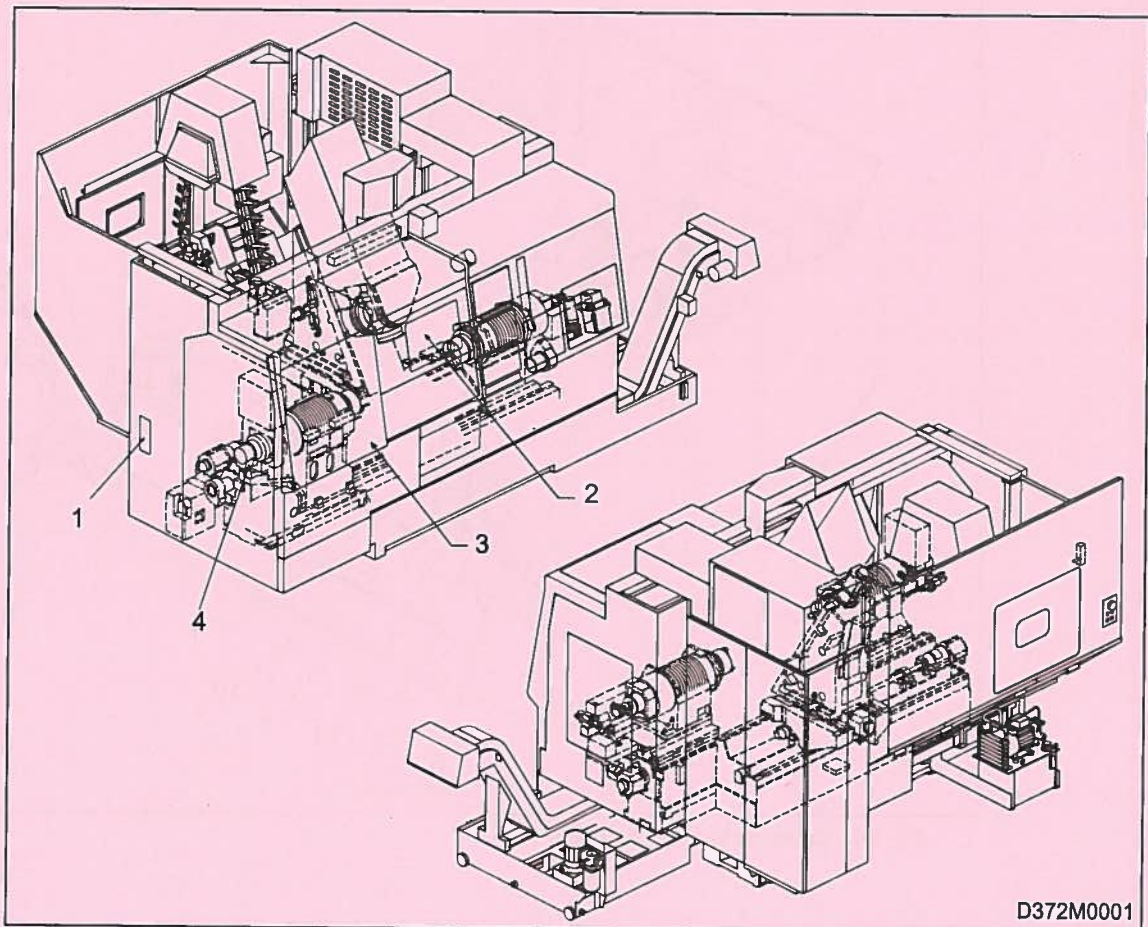


Fig. 2-1 Location of safety devices

2-11 Remarks on the Cutting Conditions Recommended by the NC



- Before using the following cutting conditions:
 - Cutting conditions that are the result of the MAZATROL Automatic Cutting Conditions Determination Function
 - Cutting conditions suggested by the Machining Navigation Function
 - Cutting conditions for tools that are suggested to be used by the Machining Navigation Function
- Confirm that every necessary precaution in regards to safe setup has been taken — especially for workpiece fixturing/clamping and tool setup.
- Confirm that the machine door is securely closed before starting machining.
Failure to confirm safe machine setup may result in serious injury or death.

2-12 Safety Nameplates

Safety nameplates are mounted on the machine to secure the operators and the machine from danger.

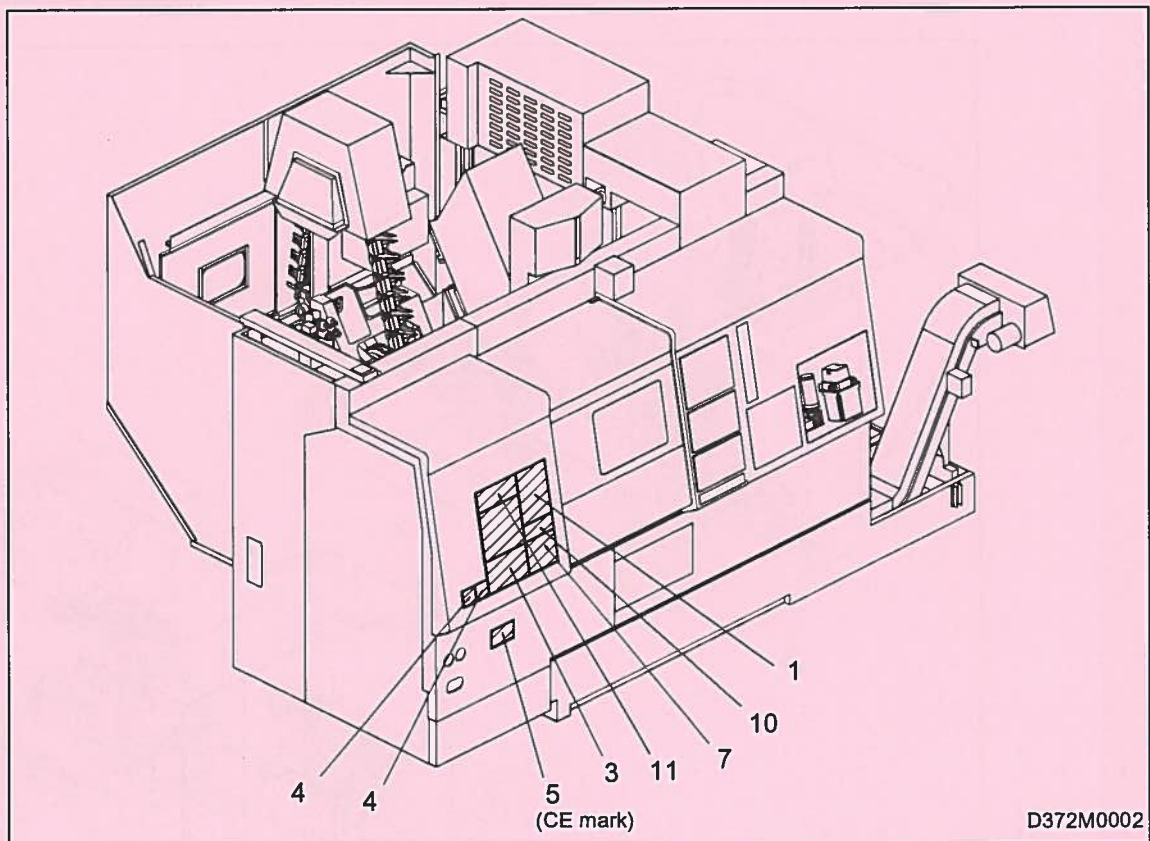


Fig. 2-2 Location of safety nameplates (1/2)

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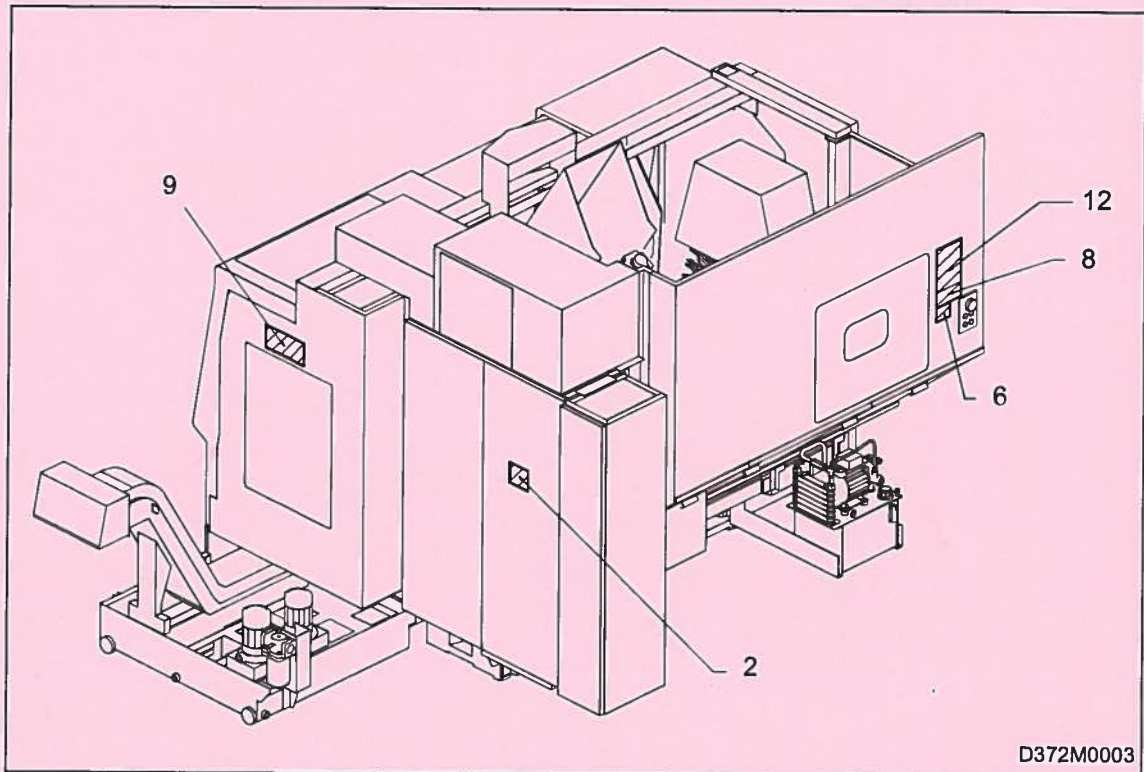


Fig. 2-3 Location of safety nameplates (2/2)

Table 2-2 List of safety nameplates for INTEGREGX 100-III/IIIS/IIIST

No.	Description		Parts No.
1	General safety instructions	—	25626328232
2	Danger sign for terminal box	DANGER	33116228032
3	Warning about each unit	WARNING	23116228142
4	Warning about chuck	WARNING	33116229593
5	CE mark	—	43116229072
6	Warning about rear cover	WARNING	43116228361
7	Integrated warning plate	WARNING	23116228252
8	Warning about magazine	WARNING	35626328353
9	Warning about chip conveyor	WARNING	33116228381
10	Warning about milling spindle speed	WARNING	43736229881
11	Integrated caution plate	CAUTION	33116228712
12	Caution about tool holder	CAUTION	23736229931

* Danger signs for terminal box are attached to the terminal boxes in the following locations:

- A. Control cabinet
(100-III/IIIS: 1 place, 100-IIIST: 2 places)
- B. Terminal box of No. 1 Turret (1 place)
- C. Terminal box of No. 1 Headstock (1 place)
- D. Terminal box of No. 2 Headstock (1 place)
- E. Terminal box of the magazine (1 place)
- F. Circuit breaker (1 place)
- G. Transformer (1 place)

- NOTE -

Item No.	Description	Quantity	Unit
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3 REGULAR INSPECTION AND MAINTENANCE

3-1 General

1. Purpose

By spending a little time on inspection and maintenance intervals, unexpected problems will be eliminated. In addition, regular maintenance ensures high productivity of the machine over a prolonged period and maintains the designed machine performance. Therefore, regular inspection and maintenance should be given highest priority.



- The power is not cut off even when the control panel door is opened.
- During either inspection or repair inside the control panel, lock the main power breaker in the "OFF" position using a padlock, etc. as shown in Fig. 3-1.



- Keep the door to the electrical control panel closed during inspection and maintenance work, unless it is electrically related.
- Do not use compressed air to clean the machine interior. If compressed air is used, sand, dust, chips, or other foreign substances may be entrapped in bearings or sliding sections, resulting in machine trouble.

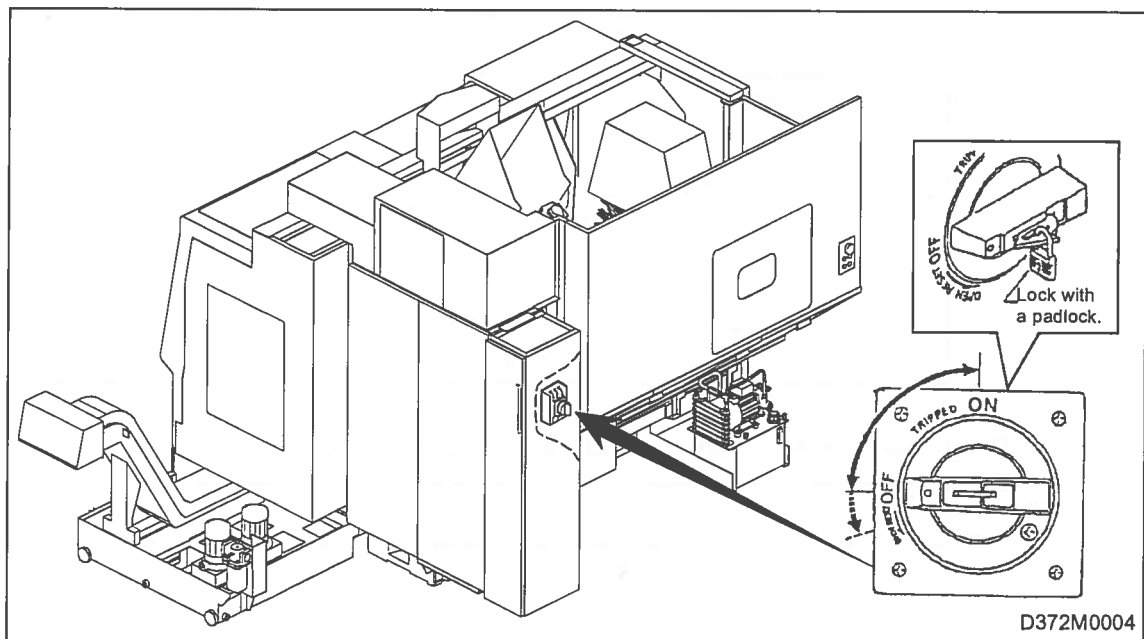


Fig. 3-1 Locking the main power breaker

2. Preparing the machine operation record

To operate the machine according to schedule, a machine operation record and inspection/maintenance record is necessary. To record inspection/maintenance work, use either a machine operation record or prepare a special record for this purpose.

3. Lubrication



- Use only the recommended brands of oil listed in this manual. Use of a lubricating oil which is not recommended could cause machine failure or other problems.

There are number of locations where lubricating oil must be supplied. Never supply too much lubricating oil. To supply the lubricating oil, follow the steps described in this manual.

4. Period of inspection

During regular inspection, checking, oil refilling, machine cleaning and other preventive maintenance items specified in the regular inspection schedule should be carried out daily, weekly, monthly, half-yearly, every year and every two years.

The interval and period of inspection can be checked on the **MAINTENANCE CHECK** display (see the NC Operating Manual).

3-2 Maintenance Inspection Item List

1. Daily inspection

A. Inspection item before operation (before power on)

Item		Reference sections in this manual
1	Checking the oil levels of the centralized lubrication unit	4-6
2	Checking the coolant levels	4-7-2
3	Checking the cooling oil level of the chiller unit	4-9-2
4	Checking for secure mounting of the cutting tools and the holder	—
5	Checking the tailstock body and tailstock spindle or the secondary spindle for smooth forward/backward movement	—
6	Checking the oil leakage of the machine periphery	—
7	Checking the oil level of the hydraulic unit	4-5-2

B. Inspection item during operation (after power on)

Item		Reference sections in this manual
1	Checking for smooth chucking/unchucking	—
2	Checking the air pressure	4-8-2
3	Checking the lubricating parts for appropriate lubrication	4-6-1
4	Checking for appropriate pressure of the hydraulic unit	4-5-3

C. Inspection item after operation

Item		Reference sections in this manual
1	Removing any chips from the inside of the machine, ATC unit and oil pan	4-4-5
2	Cleaning and greasing the chuck unit	4-1-1
3	Cleaning and checking the TOOL EYE (option)	—
4	Removing any chips from the coolant tank and cleaning the filter	4-7-5
5	Arranging the machine periphery in order, cleaning the machine and its periphery (especially, the floor)	—

2. Weekly or 60 hours inspection

Item		Reference sections in this manual
1	Checking the emergency stop button function	—
2	Checking the wiper for every slideway surface	4-13-1
3	Cleaning the front door	—
4	Checking the oil level of oil bath of the milling head and ATC unit	4-2-1, 4-4-1
5	Cleaning the magazine lower part	4-4-6
6	Cleaning the chip conveyor (option)	—
7	Cleaning the chucking cylinder	4-1-4
8	Cleaning the air filter of the hydraulic unit	4-5-4

3. 6-month (semi-annual) or 1500 hours inspection

Item		Reference sections in this manual
1	Checking the safety device function	3-3
2	Replacing and cleaning oil and filter for the hydraulic unit	4-5-4
3	Checking the wiper for every slideway surface and horse for auctioning part	4-13-1
4	Replacing and cleaning the coolant	4-7-4, 4-7-5
5	Replacing and cleaning hydraulic and cooling oil and filter for the hydraulic unit	4-5-4
6	Supplying grease to the linear guide and the ball screw nut of the fixed type work rest	4-6-2

4. Annual or every 3000 hours inspection

Item		Reference sections in this manual
1	Replacing the suction filter of the centralized lubrication unit	4-6-1
2	Replacing the mist-separator element	4-8-3
3	Checking for a grounding resistance of 100 ohms or less	5-4-2
4	Replacing the lubrication oil (oil bath) of the milling head base	4-2-1
5	Replacing the lubrication oil (oil bath) of the ATC unit	4-4-1

3-3 Checking the Safety Devices Function

A. Operator door interlock

1. The operator door cannot be operated as specified.
2. Axis movement, spindle rotation and ATC cannot be performed even though the operator door is closed.

In case of 1, 2, the door lock switch shown below is malfunctioning. In such a case, contact the nearest MAZAK service center.

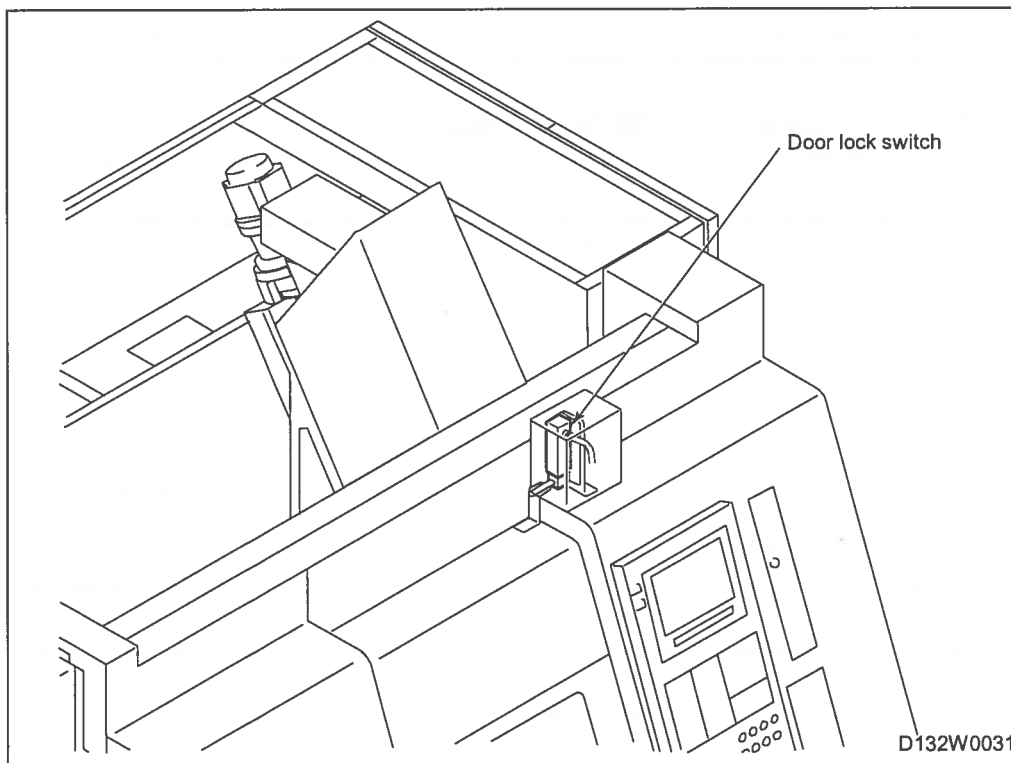


Fig. 3-2 Operator door lock switch

B. Magazine door interlock

If Z-axis movement cannot be performed even though the magazine door is closed, the door lock switch shown below is malfunctioning. In such a case, contact the nearest MAZAK service center.

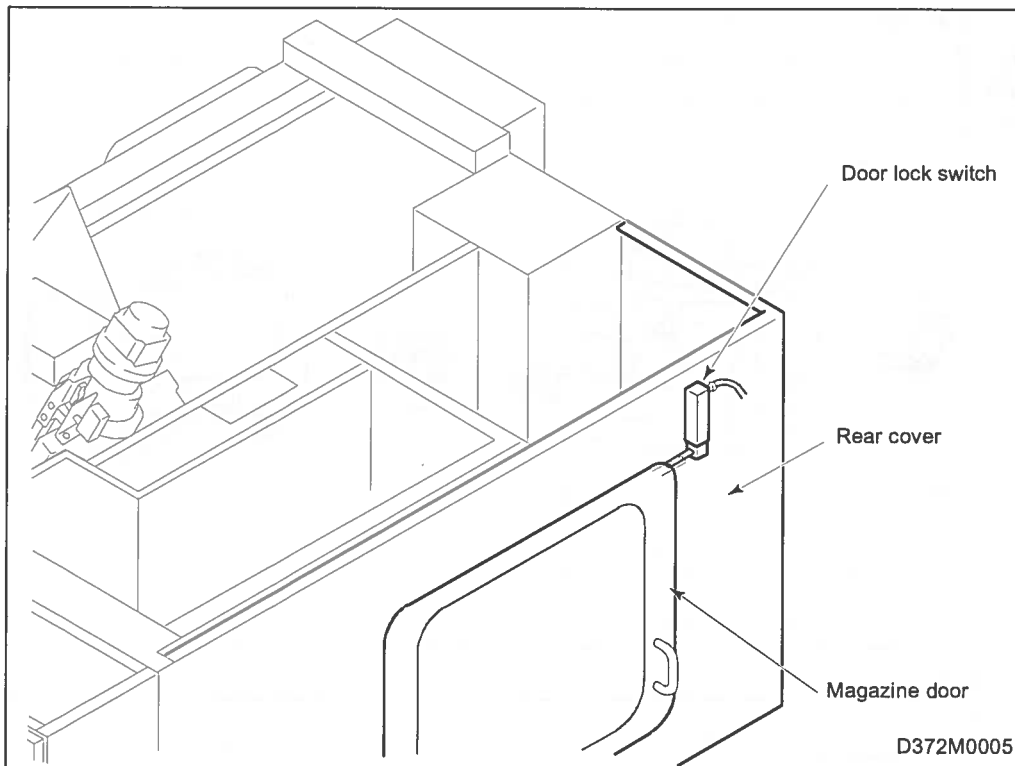


Fig. 3-3 Magazine door lock switch (20/40-tool magazine)

3-4 Supplying Oil and Water

3-4-1 INTEGREGX 100-III



- When supplying or exchanging hydraulic and lubricating oil, use only oil brands recommended in this manual. Use of another brand of oil will cause machine malfunction and will damage the machine.

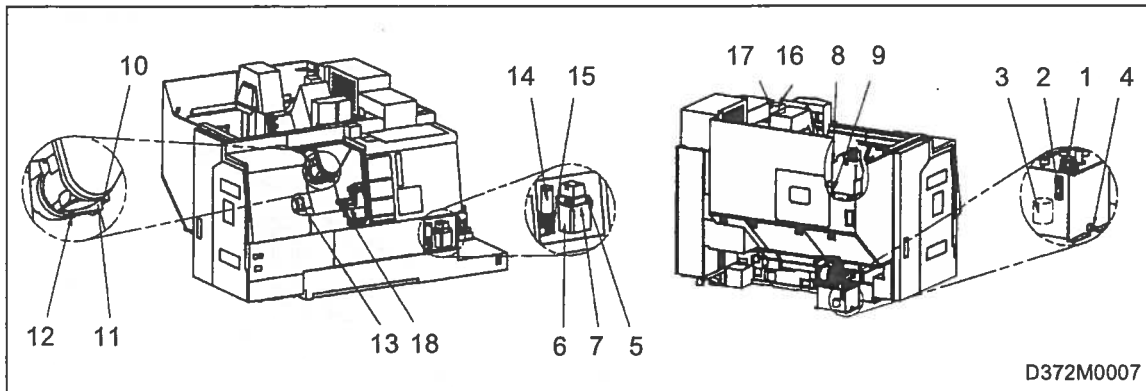


Fig. 3-4 Location of lubricating points (INTEGREGX 100-III)

Table 3-1 Lubricating points

No.	Parts name	Lubricating point	Q'ty	Recommended oil	Remarks
1	Oil filler cap	Hydraulic power unit	20 L (5.28 gal (US))	D. T. E. 24 (Mobil) UNI POWER 32 (Esso) TELLUS OIL 32 (Shell)	- Exchange oil every 6 months, then clean the strainer.
2	Level sight gauge				
3	Strainer				
4	Drain plug				
5	Oil filler cap	C-axis brake	1.8 L (0.48 gal (US))	VACTRA No. 2 (Mobil) FEBIS K68 (Esso) TONNA OIL T68 (Shell)	- Supply upon occasion. - Clean the filter every year.
6	Level sight gauge				
7	Suction filter				
8	Oil filler cap	ATC	6.5 L (1.72 gal (US))		- Exchange oil every year.
9	Drain plug				
10	Level sight gauge	B-axis	1.5 L (0.40 gal (US))	SHC 629 (Mobil)	- Exchange oil every year.
11	Oil filler cap				
12	Drain plug				
13	Grease supply nipple	Chuck	1 - 2 cc	MOLYKOTE EP GREASE (Dow Corning)	- Supply every day.
14	Level sight gauge	Slide way & Feed screw	0.26 L (0.07 gal (US))	BEACON EP1 (Esso) MOBILUX EP1 (Mobil)	- Supply upon occasion.
15	Grease supply nipple				
16	Tank	Turret coolant	3.4 L (0.90 gal (US))	Distilled water or ion exchange water 50% LONG LIFE COOLANT YZ (Mobil) 50%	- Change cooling fluid every 2 years. - Follow the procedures outlined in the maintenance manual.
17	Cap (water supply)				
18	Grease supply nipple	Tailstock feed screw	30 cc	BEACON EP1 (Esso) MOBILUX EP1 (Mobil)	- Supply grease every 6 months in manual operation.

Note: The replacement period is determined on the basis of eight hours operation a day. Delayed replacement or use of any product other than recommended oil may damage the machine.
Check the level sight gauge, only when the machine is in a stopped status.

3-4-2 INTEGREGX 100-IIIS/IIIST



- When supplying or exchanging hydraulic and lubricating oil, use only oil brands recommended in this manual. Use of another brand of oil will cause machine malfunction and will damage the machine.

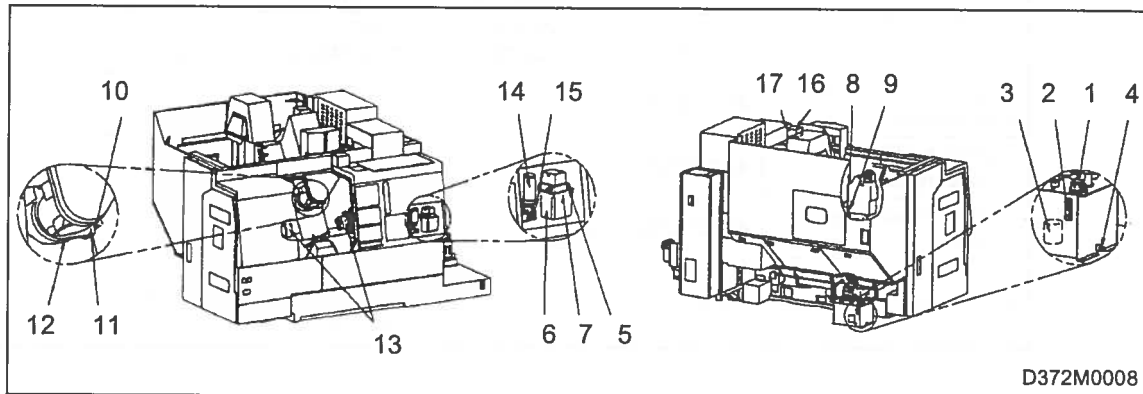


Fig. 3-5 Location of lubricating points (INTEGREGX 100-IIIS/IIIST)

Table 3-2 Lubricating points

No.	Parts name	Lubricating point	Q'ty	Recommended oil	Remarks
1	Oil filler cap	Hydraulic power unit	20 L (5.28 gal (US))	D. T. E. 24 (Mobil) UNI POWER 32 (Esso) TELLUS OIL 32 (Shell)	- Exchange oil every 6 months, then clean the strainer.
2	Level sight gauge				
3	Strainer				
4	Drain plug				
5	Oil filler cap	C-axis brake	1.8 L (0.48 gal (US))	VACTRA No. 2 (Mobil) FEBIS K68 (Esso) TONNA OIL T68 (Shell)	- Supply upon occasion. - Clean the filter every year.
6	Level sight gauge				
7	Suction filter				
8	Oil filler cap	ATC	6.5 L (1.72 gal (US))		- Exchange oil every year.
9	Drain plug				
10	Level sight gauge	B-axis	1.5 L (0.40 gal (US))	SHC 629 (Mobil)	- Exchange oil every year.
11	Oil filler cap				
12	Drain plug				
13	Grease supply nipple	Chuck	1 - 2 cc	MOLYKOTE EP GREASE (Dow Corning)	- Supply every day.
14	Level sight gauge	Slide way & Feed screw	0.26 L (0.07 gal (US))	BEACON EP1 (Esso) MOBILUX EP1 (Mobil)	- Supply upon occasion.
15	Grease supply nipple				
16	Tank	Turret coolant	3.4 L (0.90 gal (US))	Distilled water or ion exchange water 50% LONG LIFE COOLANT YZ (Mobil) 50%	- Change cooling fluid every 2 years. - Follow the procedures outlined in the maintenance manual.
17	Cap (water supply)				

Note: The replacement period is determined on the basis of eight hours operation a day. Delayed replacement or use of any product other than recommended oil may damage the machine.
Check the level sight gauge, only when the machine is in a stopped status.

3-5 List of Consumables

Parts name	Parts No.	Type	Maker	Remarks	Q'ty	
					INTEGREX 100-III	INTEGREX 100-IIIS/IIIST
Fluorescent lamp	R61VS001310	RL70CE- 136/24V-DC	CAPTAIN INDUSTRIES	For machine inside	1	1
	R61VS001420	AWDE118 24V DC	CAPTAIN INDUSTRIES	For machine inside	0	1
Cooling fan filter in the main spindle	43104057620	—	—	—	1	1
Cooling fan filter in the secondary spindle	43104057620	—	—	—	—	1
X-axis slideway leaf spring	43723569930	—	—	—	1	1
Front door glass	Z52ZZ000281	—	NIHON PARKERIZING CO., LTD.	400 × 520	1	1

3-6 Equipment Layout

3-6-1 INTEGREX 100-III (without tailstock) [20/40-tool magazine]

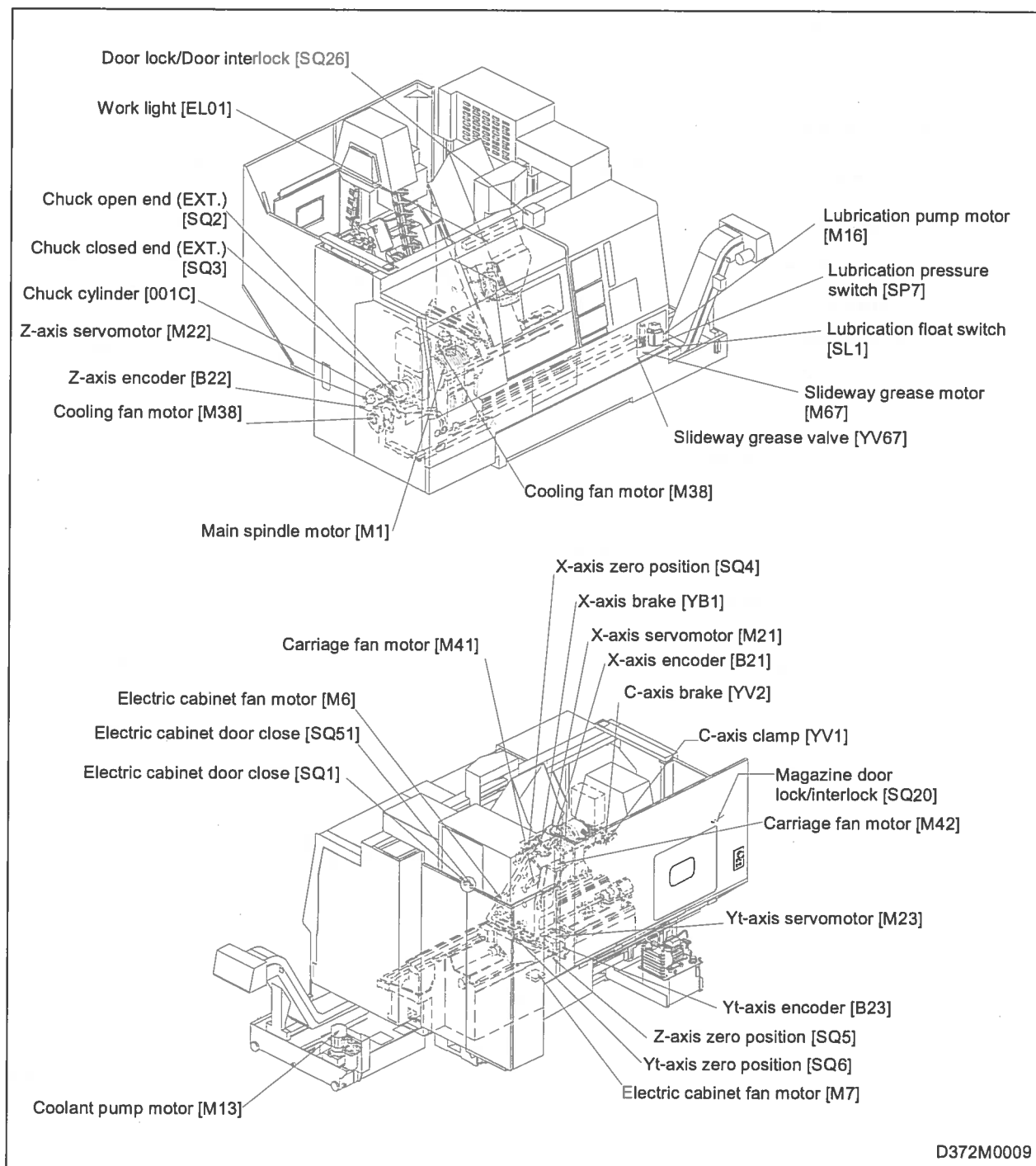


Fig. 3-6 Equipment layout (INTEGREX 100-III – without tailstock –) [20/40-tool magazine]

3-6-2 INTEGREGX 100-III [20/40-tool magazine]

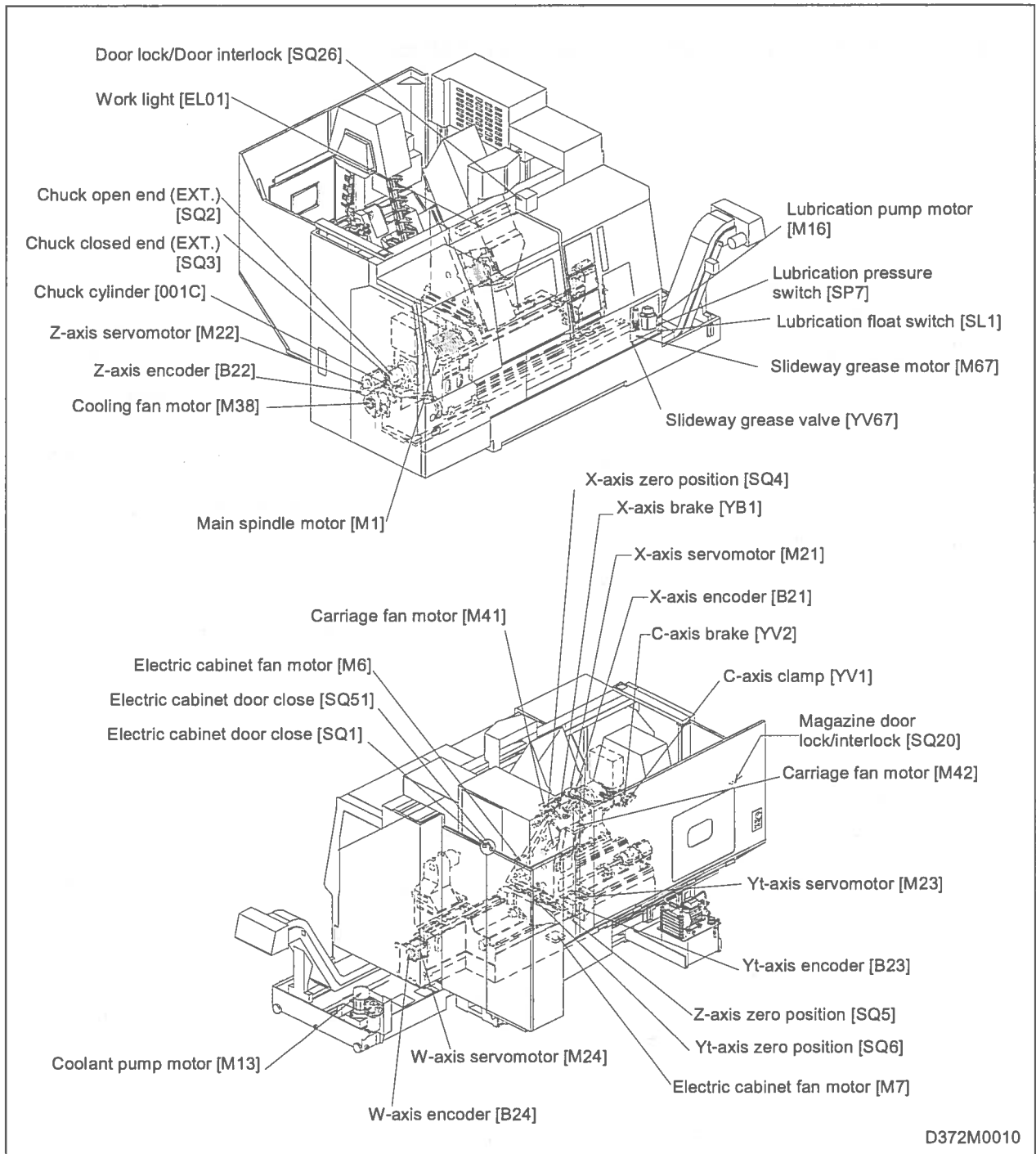


Fig. 3-7 Equipment layout (INTEGREGX 100-III) [20/40-tool magazine]

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3-6-3 INTEGREX 100-III[S] [20/40-tool magazine]

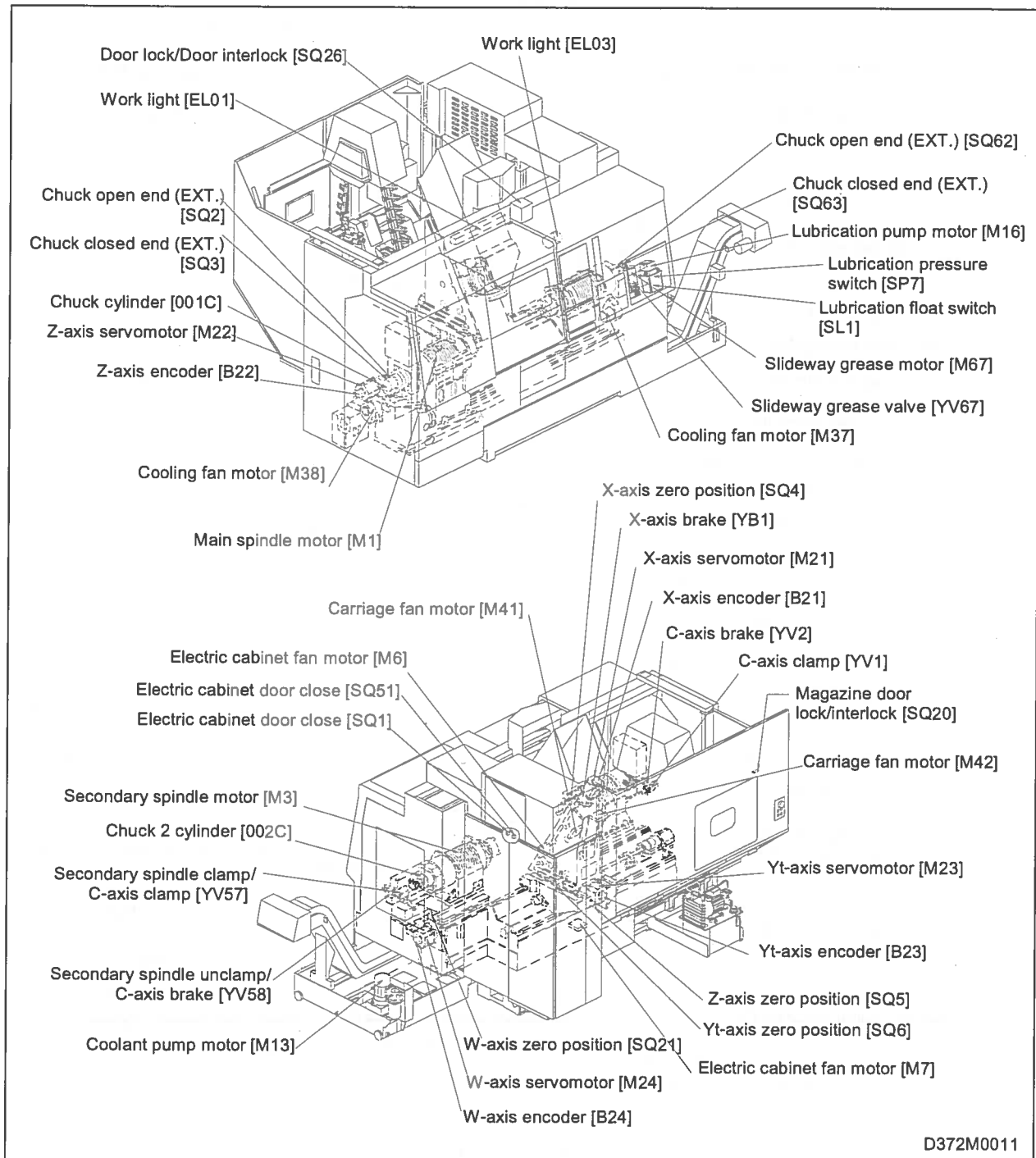
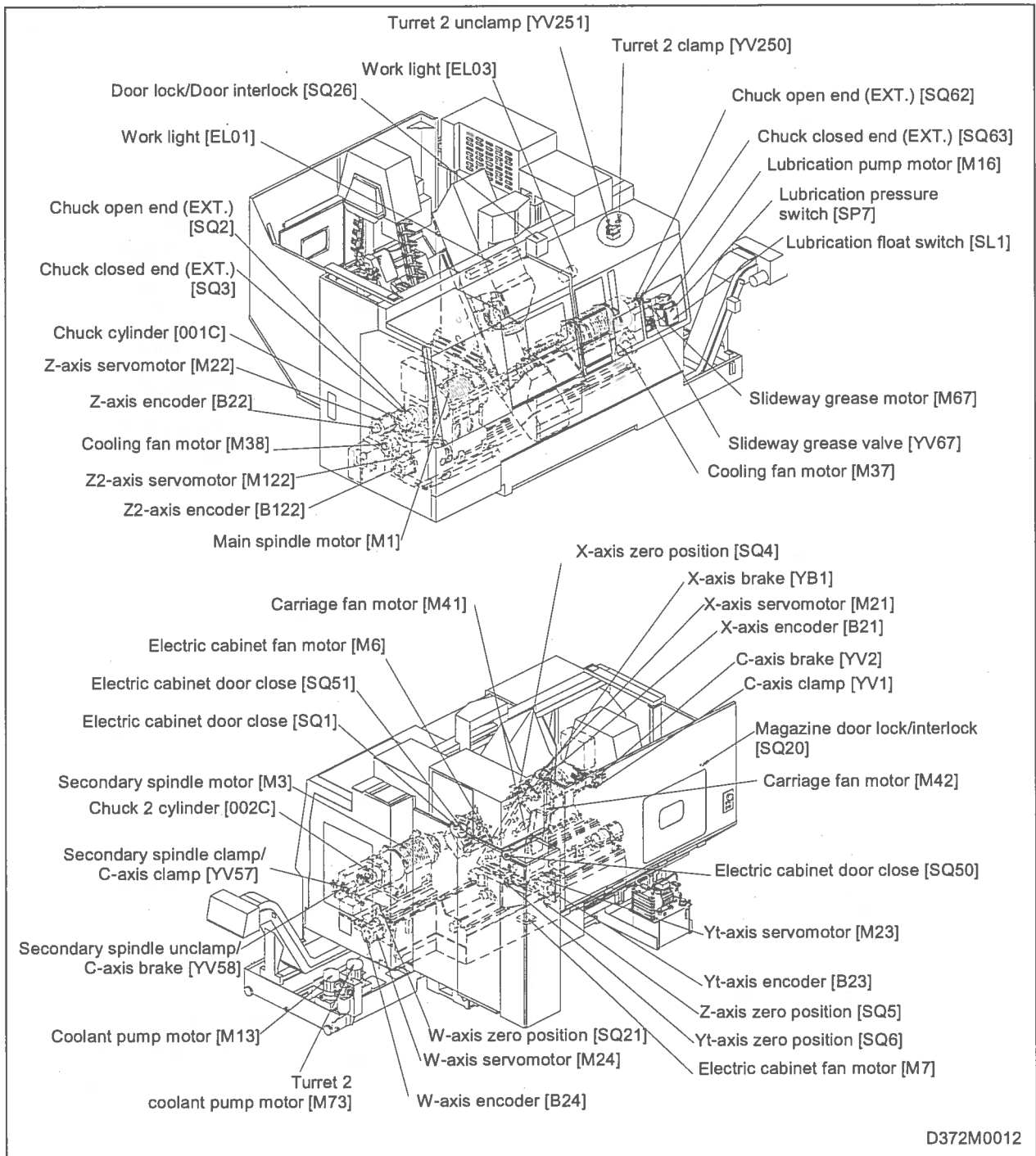


Fig. 3-8 Equipment layout (INTEGREX 100-III[S] [20/40-tool magazine])

3-6-4 INTEGREX 100-III_{ST} [20/40-tool magazine]



D372M0012

Fig. 3-9 Equipment layout (INTEGREX 100-III_{ST}) [20/40-tool magazine]

3-6-5 Milling head

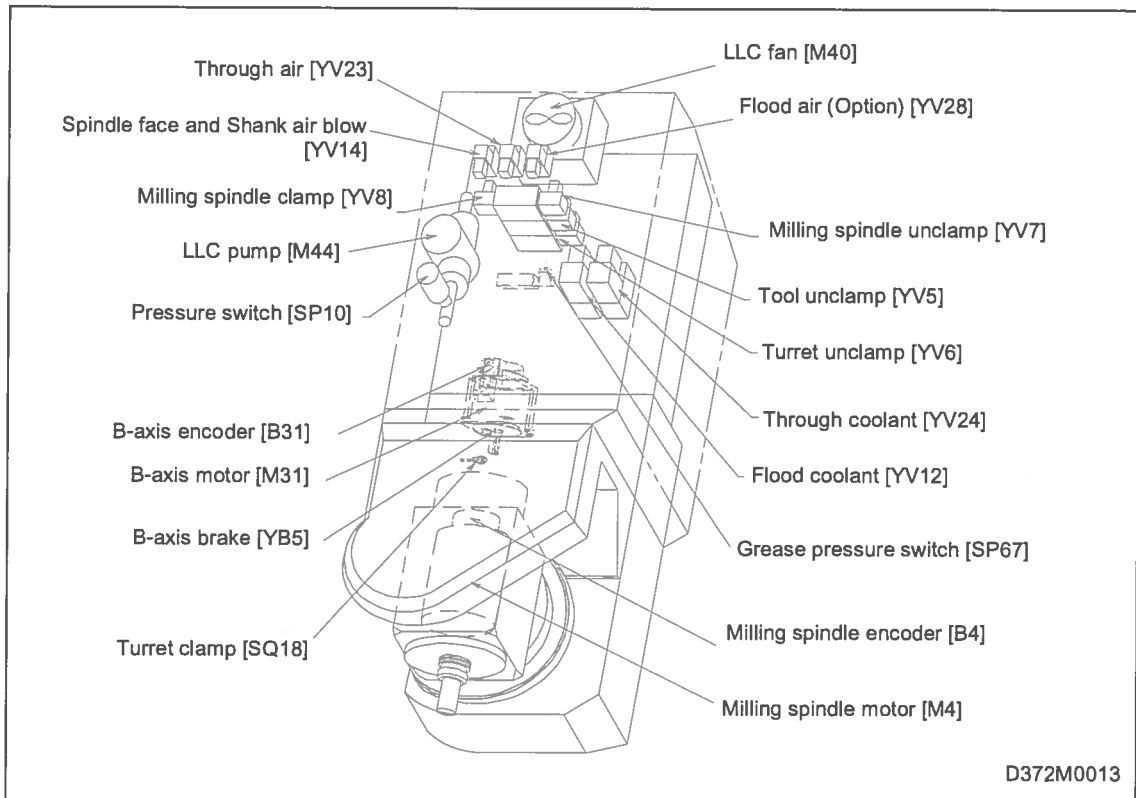


Fig. 3-10 Equipment layout (Milling head)

3-6-6 ATC and magazine [20/40-tool magazine]

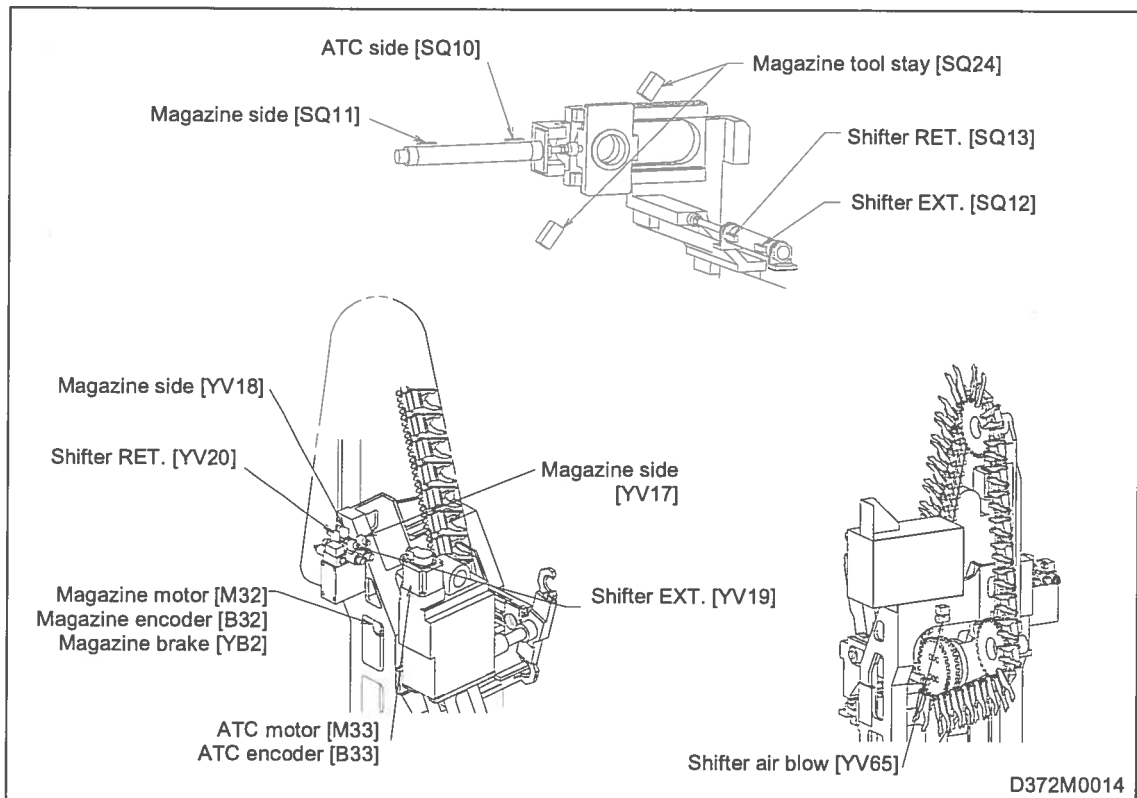


Fig. 3-11 Equipment layout (ATC and magazine) [20/40-tool magazine]

- NOTE -

4 MAINTENANCE OF MAJOR MACHINE UNITS

4-1 Headstock/Hydraulic Chuck

4-1-1 Greasing and lubrication



- Insufficient greasing may deteriorate the gripping force of the chucks and thus cause the workpiece to fly about during machining. Check the chuck jaw action. (Insufficient greasing may cause the jaws to move knocking.)
- The specified grease must be used. Otherwise, it causes malfunction.
- The power must be turned off using the main power breaker before greasing.

* Recommended grease: Recommended grease by chuck manufacturers
MOLYKOTE EP GREASE (manufactured by Dow Corning)

* Amount of greasing per jaw: Approx. 3 g (Approx. 2 strokes of a grease gun)

To operate the chuck in its best condition over a long time, it is important to grease it at the appropriate time. Greasing must be provided correctly and sufficiently. Otherwise, malfunctions at low oil pressure, insufficient gripping force, decreases in gripping accuracy, unusual wear, and/or thermal damage may result. (Increase the frequency of greasing so as to suit the particular operating conditions.)

- (1) Clean the chuck body, however, cleaning using an air gun may cause a malfunction of the machine.
- (2) Supply grease to the chuck jaws from the grease nipples provided on the outer periphery of each master jaw using a grease gun.
- (3) After greasing, repeat no-load chucking several times over full stroke of the jaws.

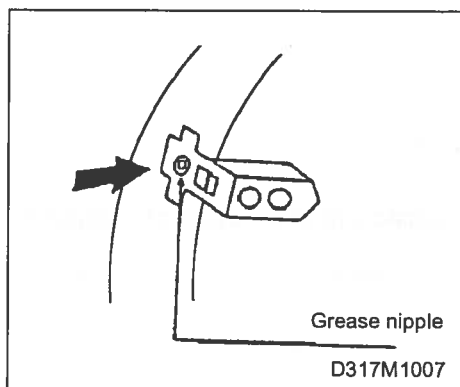


Fig. 4-1 Greasing the chuck jaws

4-1-2 Adjustment of the chuck clamp/unclamp proximity switches (option)

The proximity switches in the chucking cylinder must be adjusted if the chuck clamp or unclamp signal is not input although the chuck has been clamped or unclamped.

- (1) Set the chucking cylinder in the unclamped status.
- (2) With the nut for the detection proximity switch loosened, turn the proximity switch until its head portion comes into contact with the circumference of the detection plate.
- (3) Turn the proximity switch in the reverse direction by one turn and then tighten the nut. The clearance between the proximity switch and the detection plate is set to 0.5 to 1.0 mm (0.020 to 0.039 in.).
- (4) Make sure that the proximity switch lamp is lit when the chucking cylinder is set in the clamped and unclamped status, respectively.

Note: For more details, refer to the instruction manual supplied by the chuck maker.

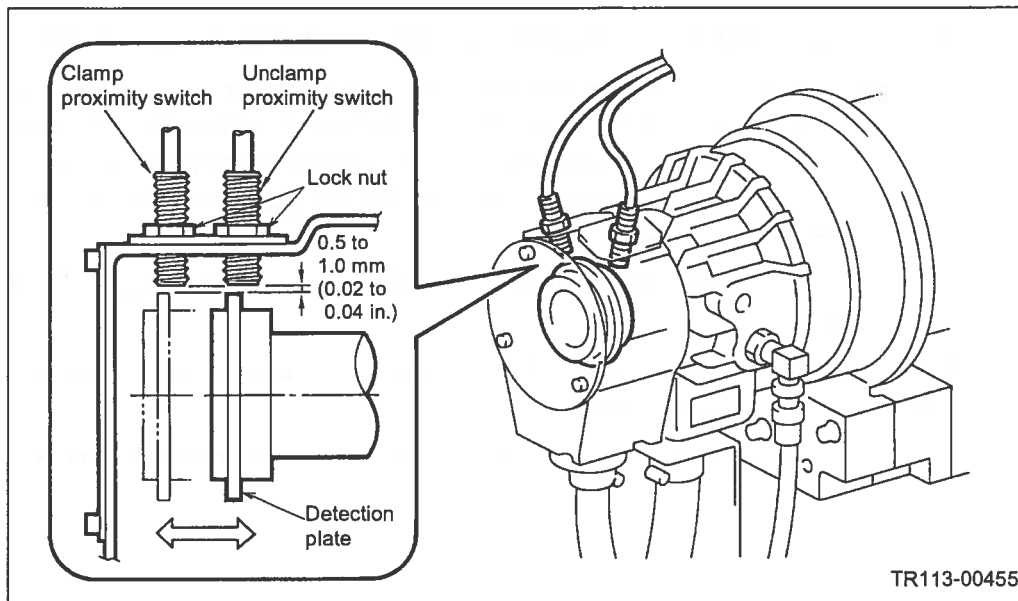


Fig. 4-2 Main spindle chuck clamp/unclamp proximity switches

4-1-3 Checking the headstock for disturbed accuracy in the event of collision

- (1) Prepare a round test workpiece as shown below to check for misalignment existing after collision.

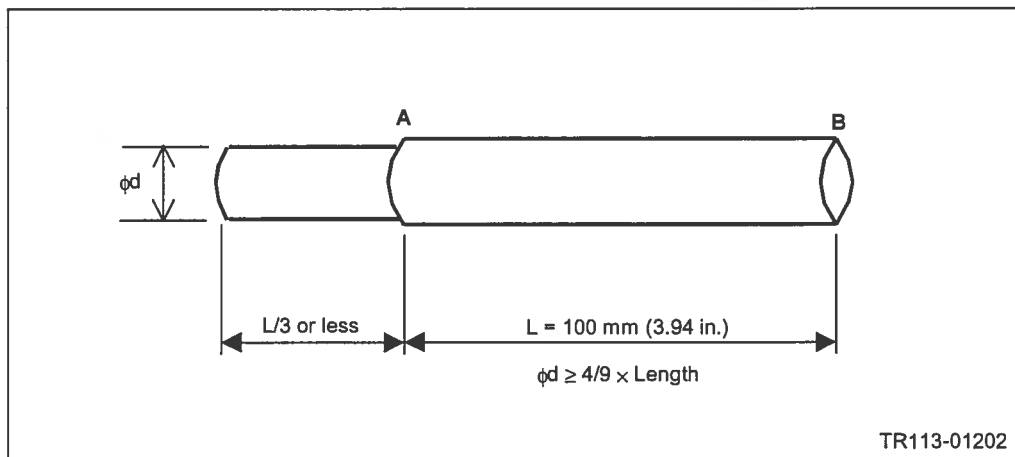


Fig. 4-3 Test workpiece

- (2) After eliminating the cause of collision, clamp a round test workpiece in the chuck and carry out OD turning for the portion A to B.
- (3) Measure the cylindricity of the cut test workpiece using a micrometer.
Measure portions A and B in Fig. 4-3.

At that time, if the cylindricity stays within its tolerance of ± 0.01 mm (0.0004 in.), the headstock is free from misalignment. If the cylindricity oversteps the tolerance, please contact your nearest Mazak service representative.

During the misalignment check described above, also check for unusual operating sounds from the headstock. If they are occurring, please contact your nearest Mazak service representative.

4-1-4 Cleaning

1. Cleaning the chucking cylinder (hollow type)

If coolant overflows from the coolant collector, it will enter the composite oil controller unit (hydraulic unit) through the drain port. Particular care should be taken to prevent clogging with chips because it causes the overflow of coolant in the coolant collector.

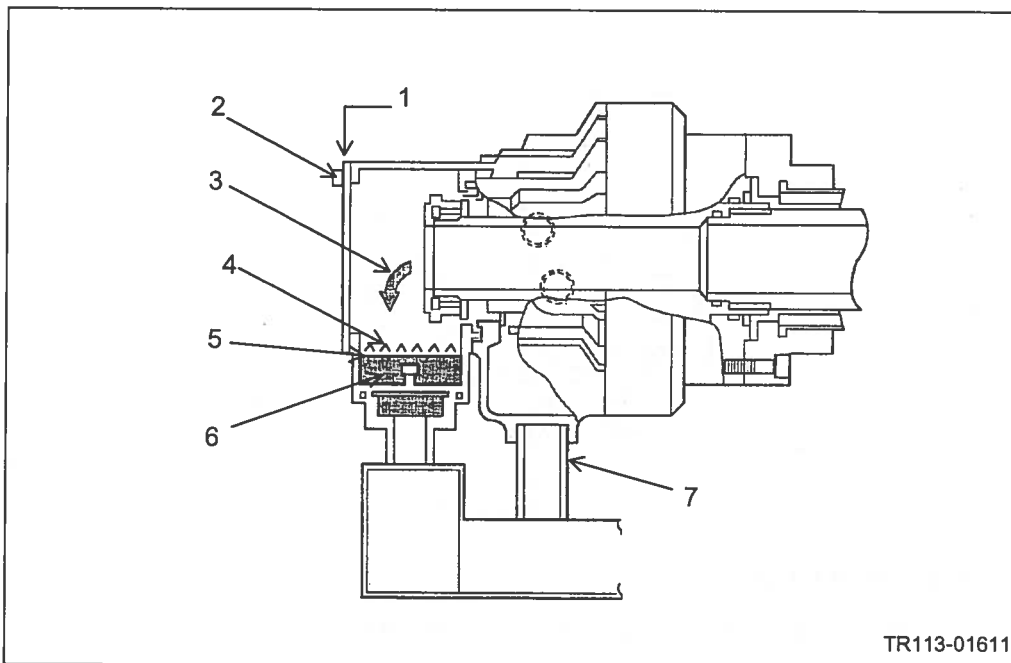


Fig. 4-4 Cleaning the chucking cylinder (hydraulic chuck)

No.	Parts name	No.	Parts name
1	Plate	5	Filter
2	Bolt	6	Coolant collector
3	Coolant	7	Drain port
4	Accumulated chips		

- (1) Remove the three bolts to dismount the plate.
- (2) Remove chips and check the clogging of the filter.
- (3) Remount the plate in the reverse order of the removing.

4-2 Milling Head



- Never forget to set the main power breaker to OFF before inspection and adjustment for the milling head.



- Use a crane, or carry out the job with an assistant, to remove the cover of the milling head.

4-2-1 Oil level inspection and oil replacement

The milling head is indexed by roller gear cam, and the cam follower section is lubricated by oil-bath method to maintain oil film. The amount and quality of lubricating oil must therefore be controlled carefully to prevent the cam follower, shaft support bearing and other components from being damaged.

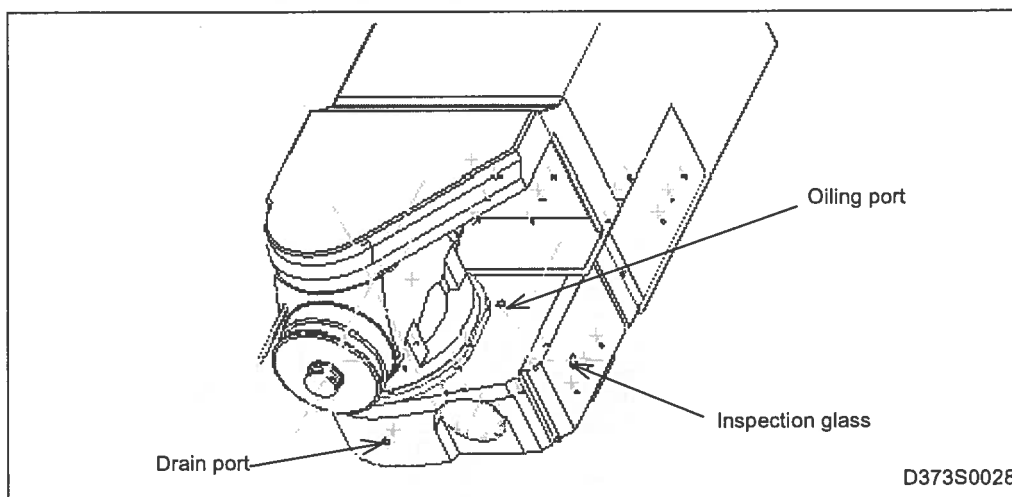


Fig. 4-5 Oil level inspection and oil replacement for the milling head

1. Inspection of oil level

- (1) Check every week by the inspection glass if the oil level is not lower than "L".
- (2) Check the drain plug for looseness if there is no oil visible through the glass.
- (3) Tighten the loosened plug and replenish or replace oil as directed below.
If the loss of oil should have been caused otherwise than by a looseness of the drain plug, please contact your local MAZAK service representative.

2. Replacement of oil

Never fail after the initial 6 months and then once a year to replace the lubricating oil for the milling head.

- (1) Index the milling head on the B-axis to 90° (position V), and set the main power breaker to OFF.
- (2) Remove the plug from both the oiling port and drain port to drain oil entirely.
- (3) Plug the drain port tightly and pour through the oiling port 0.6 L, or 0.16 gal (US), of the recommended lubricant (SHC 629 [Mobil]).
- (4) Check the oil level by the inspection glass (not lower than "L"), and plug the oiling port securely.

4-2-2 Backlash compensation for the B-axis

To maintain the precision in B-axis indexing for a long period of time, it is necessary for the backlash and the relevant parameters respectively to be adjusted and modified by our expert service personnel.

If the precision in B-axis indexing is deteriorated, or an unusual noise occurs because of a collision or a long period of operation, please contact your local MAZAK service representative.

4-3 Zero Point Position Adjustment

The machine origin is the reference point for machining by the NC equipment (MAZATROL). The zero-point return position, therefore, must be accurately determined.

Our machines are shipped after factory adjustment of zero-point return. No further adjustment is required after delivery. Only when the ballscrew is changed, couplings are disconnected or encoder is dismantled, readjustment will become necessary.

4-3-1 Determining zero-point

1. X-axis

Mount a test piece (round bar) in the chuck and turn outside diameter. Measure the diameter accurately after cutting. Let the diameter be D .

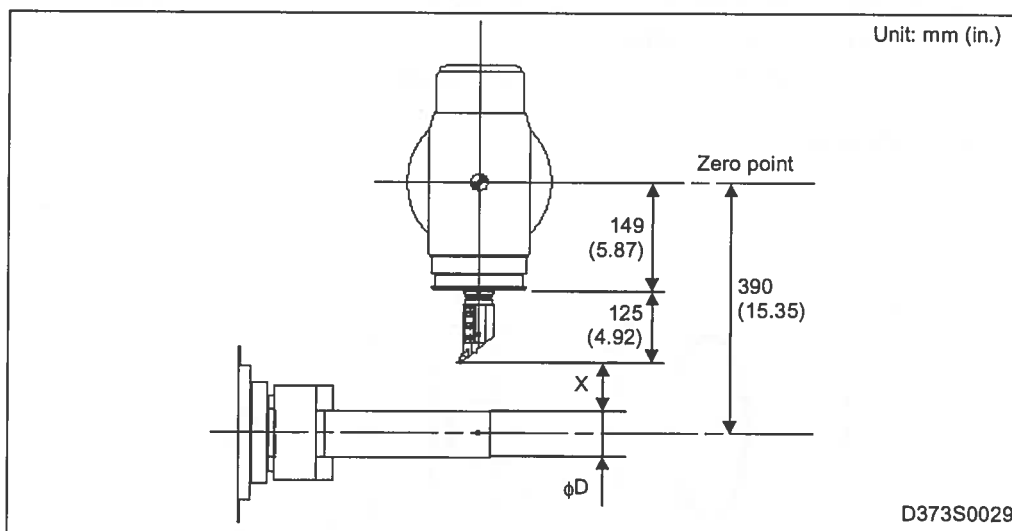


Fig. 4-6 X-axis zero-point return

The X-axis zero-point (with respect to the turret center) is 390 mm (15.35 in.) distant from the spindle center. Therefore, move the X-axis by $390 - [274 + D/2]$ mm ($15.35 - [10.79 + D/2]$ in.) while observing the counter reading. The point reached is the X-axis zero-point position.

Note: The X-axis counter reads the diameter value. A value double the above value should be read on the counter.

2. Z-axis

Mount a test piece in the chuck and perform face turning. Measure the length from the spindle nose to the test piece edge. Let the measurement be L.

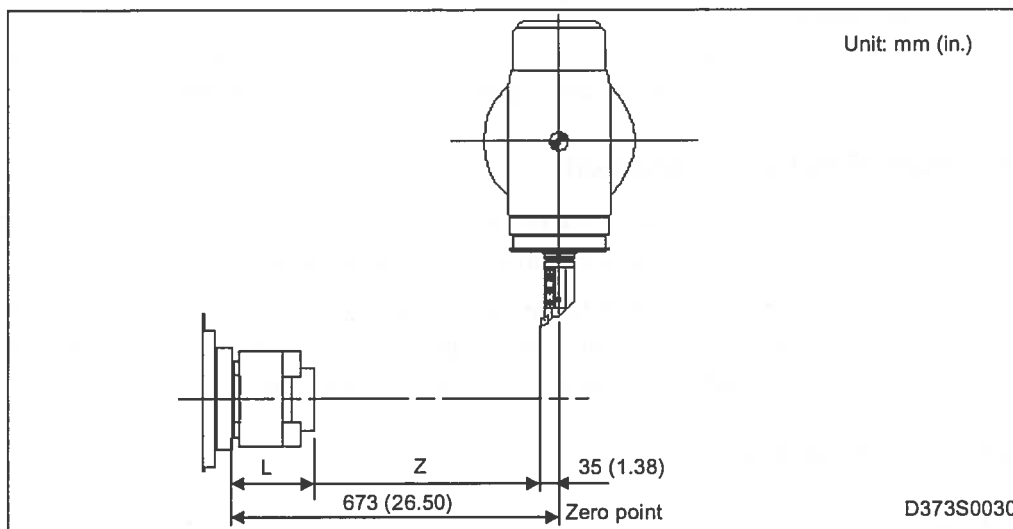


Fig. 4-7 Z-axis zero-point return

The Z-axis zero-point (with respect to the turret center) is 673 mm (26.50 in.) distant from the spindle nose. Therefore move the Z-axis by $[673 - (35 + L)]$ mm $[(26.50 - (1.38 + L))]$ in. while observing the counter reading.

The point reached is the Z-axis zero-point position.

3. Y-axis (Yt-axis)

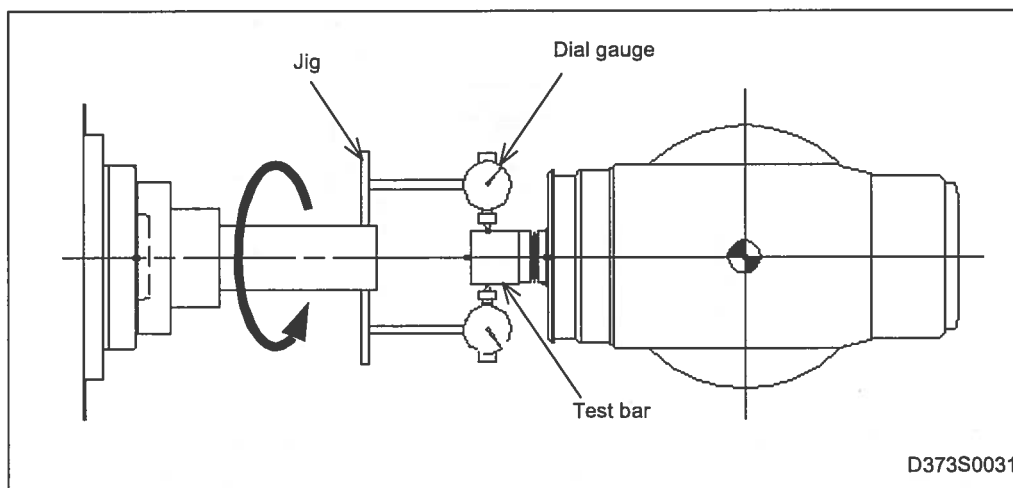


Fig. 4-8 Y-axis zero-point return

Index the milling head to the H position (horizontal). Attach the test bar to the milling head. Attach the dial gauge fixture jig to the spindle taper section (1/16) and set the dial gauge.

As the Y-axis origin is located at the position where the milling spindle center coincides with the spindle center, move the milling head to a position where the test bar center almost coincides with the spindle center. (The X-axis must have been positioned at -390 mm or -15.35 in. from the zero-point.)

Next apply the dial gauge to the end of the test bar, and slowly turn the spindle, and adjust the X-axis and Yt-axis until the deflection of dial gauge disappears to obtain the Y-axis zero-point.

4. W-axis (secondary spindle)

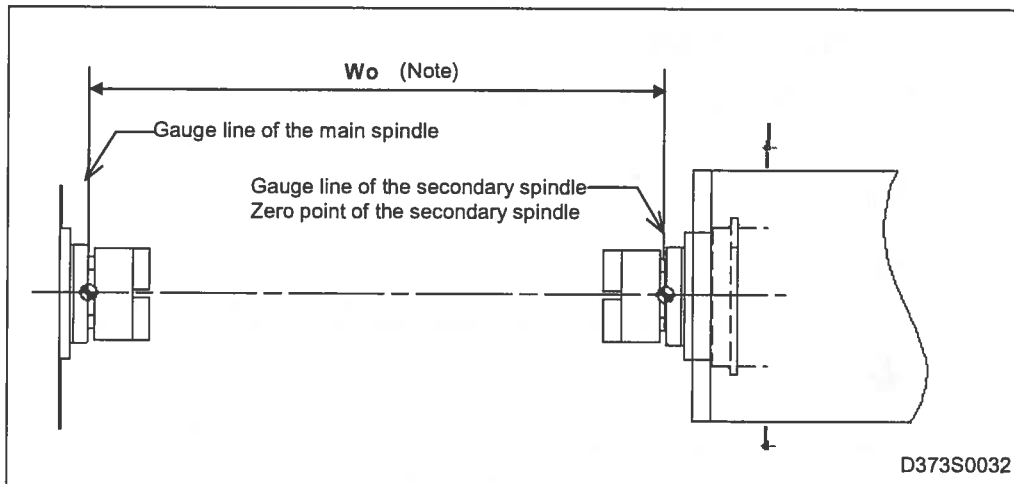


Fig. 4-9 W-axis zero-point return

As shown in the above figure, the W-axis zero point is located at a distance of **Wo** between the gauge lines of the main and secondary spindles. Perform the following operations to move the secondary spindle to the W-axis zero point:

First, mount the standard raw jaws of the manufacturer in the chucks of the main and secondary spindles.

Next, manually move the secondary spindle to the main spindle and when the chuck jaws of the secondary spindle touch the chuck of the main spindle, reset the counter of the W-axis to zero.

Refer to the assembly drawing of the mounted chuck and confirm the distance from the gauge line to the edge of the jaws. Take this distance as A.

Finally, move the secondary spindle through the distance of $[W_o - 2 \cdot A]$ in the direction of its zero point.


The zero point of the W-axis can be obtained by these operations.

The **Wo** dimension in the above figure depends upon the spindle and center distance of the particular model as follows:

- 100-IIIS/IIIST: 1032 mm (40.63 in.)

5. W-axis (tailstock)

The tailstock is driven by a servomotor on the basis of an absolute positioning system. The controller has the factory-set reference position stored in its memory. If the stored data should be lost due to a drop of the battery voltage or if the controller itself has been replaced, set and store the reference position anew by the following procedure:

- (1) Press the MACHINE  key to call up the machine menu.
- (2) Select **[TAIL THRUST]** from the machine menu.
- (3) With the thrust selection menu displayed, press the menu selector key.

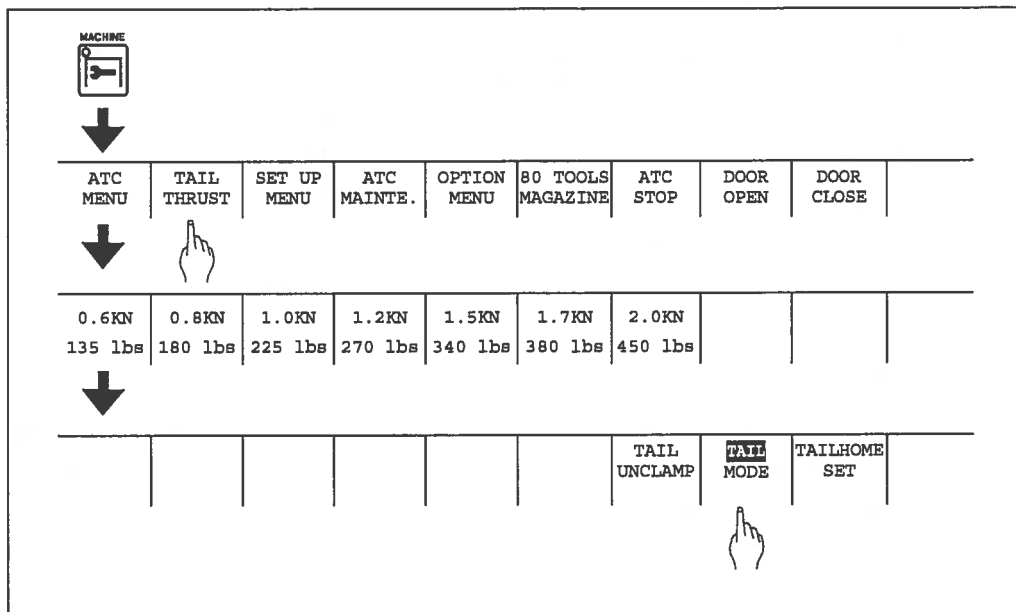


Fig. 4-10 Setting the tailstock reference position

- (4) Select **[TAIL MODE]** while holding down the MF1 key to highlight the menu item display.
- (5) Move the tailstock to its reference position by operating the TAIL SPINDLE switch. (The reference position is preset at the following distance from the spindle nose.)

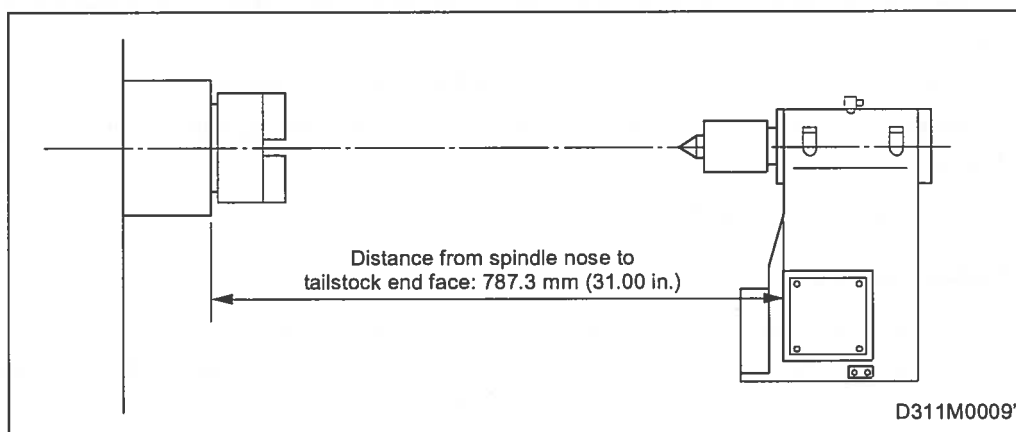


Fig. 4-11 Reference position of the W-axis (tailstock)

- (6) Select **[TAILHOME SET]** from the menu (to blink the menu item display). (This position is the reference position of the tailstock.)
- (7) Move the tailstock forward by operating the TAIL SPINDLE switch. The tailstock will move forward, and when the first grid position is reached, it will stop automatically. Thus, the absolute position coordinates will be established.
- (8) Select the **[TAIL MODE]** menu item anew (by the aid of the auxiliary key) to clear its highlighting.
- (9) Select the **[TAILHOME SET]** menu item once again to clear its highlighting.
- (10) Press the power-off button and then repeat main power breaker off/on operations twice. Finally, turn power back on by pressing the power-on button. The procedure is now complete.

6. B-axis

- (1) Press the menu key for the **[TURRET INCHING]** item in the ATC first menu.
 - ➔ The milling head will be unclamped.
- (2) Select "F/H/0" using the tool select button [44], and press the button.
 - ➔ The direction of the milling head will change to horizontal.
- (3) Press the **[TURRET INCHING]** menu key once again.
 - ➔ The milling head will be clamped to the correct zero-point position by the action of a specially structured coupling.

Remark: If the milling head cannot be clamped automatically, unclamp the milling head temporarily and then after adjusting its position by moving the B-axis using the manual pulse handle feed function, clamp the milling head again.
- (4) Press the **[TURRET HOME POS]** menu key while holding down the MF1 auxiliary key [35].
 - ➔ The menu item will blink.
- (5) Press the **[TURRET HOME POS]** menu key once again.
 - ➔ The menu item will light up.
- (6) Set the tool select button [44] to "R/V/2", and hold down the button until the milling head has stopped rotating automatically.
- (7) Turn power back on.
- (8) Turn power off and back on again.
(Be sure to repeat power-on twice.)

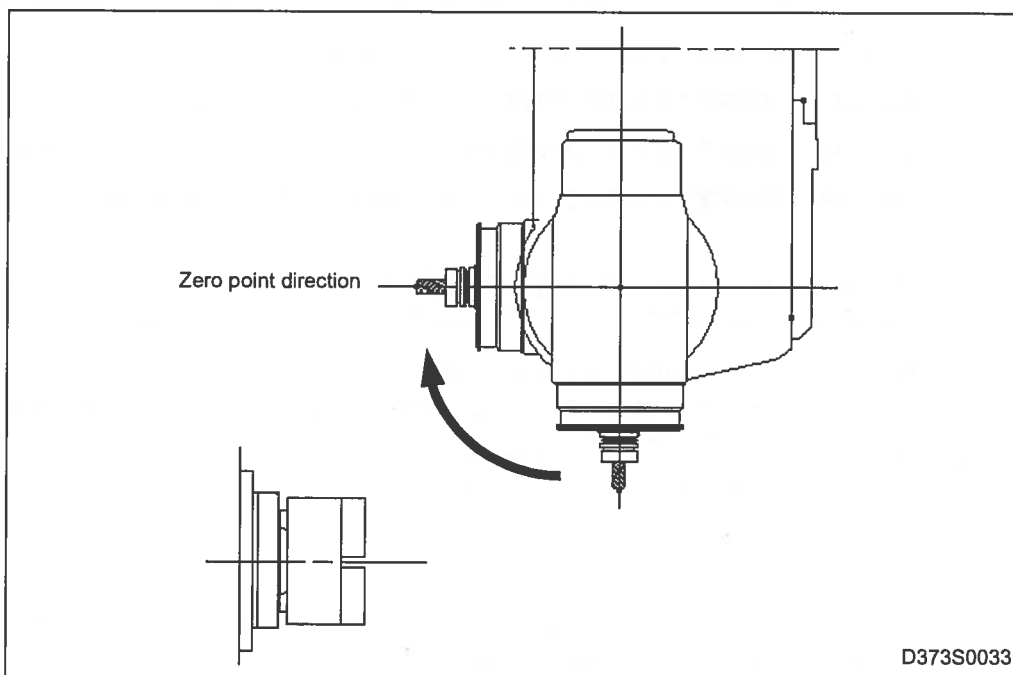



Fig. 4-12 Milling head indexing axis (B-axis)

7. Lower turret

The lower turret head is driven and indexed by a servomotor on the basis of an absolute positioning system. The controller has the factory-set reference position stored in its memory to perform absolute positioning. If the stored data should be lost due to a drop of the battery voltage or of the controller itself has been replaced, set and store the reference position anew by the following procedure:

- (1) Operate the TURRET SELECT switch to select the lower turret.
- (2) Select the **[TURRET 2 UNCLAMP]** menu item in manual operation mode to unclamp the lower turret.
- (3) Press the MACHINE  key and then select **[ATC MENU]** from the resulting machine menu.

ATC MENU	TAIL THRUST	SET UP MENU	ATC MAINTE	OPTION MENU	80 TOOLS MAGAZINE	ATC STOP	DOOR OPEN	DOOR CLOSE	
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- (4) With the following menu displayed, press the menu selector key.

TURRET HOME POS	TURRET INCHING			SHIFTER MAG.SIDE	SHIFTER ATC SIDE	SHIFTER EXIT	SHIFTER RETRACT	MAGAZINE HOME POS	MAGAZINE INCHING
-----------------	----------------	--	--	------------------	------------------	--------------	-----------------	-------------------	------------------

- (5) From the resulting menu shown below, select **[TURRET 2 MODE]** with the aid of the MF1 key to highlight the menu item display.

ATC ARM HOME POS	ATC ARM SWING	ATC ARM CHG POS		ATCSERVO CW	ATCSERVO CCW	ATCSERVO HOME POS	TURRET 2 MODE	TURRET 2 HOME POS	INTERLOC NEG.
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- (6) Using the TOOL SELECT switch, rotate the turret so as to direct the face of tool No. 1 to the axis of revolution of the turning spindle. (This indexing position is the reference one.)
- (7) Select the **[TURRET 2 MODE]** menu item again to clear its highlighting.
- (8) Select the **[TURRET 2 UNCLAMP]** menu item again to clamp the lower turret.
- (9) Select the **[TURRET 2 UNCLAMP]** menu item anew to unclamp the lower turret.
- (10) Select the **[TURRET 2 MODE]** menu item anew (by the aid of the MF1 key) to highlight its display.
- (11) Blink the reverse display of the **[TURRET 2 HOME POS]** menu item by pressing the menu key and operate the TOOL SELECT switch to index the turret in the forward direction.

➔ The turret will slightly turn to stop at the nearest grid point.
The reference position for absolute positioning has now been established.

ATC ARM HOME POS	ATC ARM SWING	ATC ARM CHG POS		ATCSERVO CW	ATCSERVO CCW	ATCSERVO HOME POS	TURRET 2 MODE	TURRET 2 HOME POS	INTERLOC NEG.
------------------	---------------	-----------------	--	-------------	--------------	-------------------	---------------	-------------------	---------------



- (12) Using the TOOL SELECT switch, rotate the turret so as to direct the face of tool No. 1 to the axis of revolution of the turning spindle.
- (13) Select the **[TURRET 2 MODE]** menu item once again to clear its highlighting.
- (14) Select the **[TURRET 2 UNCLAMP]** menu item once again to clamp the lower turret.
- (15) Press the power OFF button [2] to temporarily turn off the NC, and then press the power ON button [1] to complete the reference position setting.

4-3-2 Zero point position setting by zero-point return

To inexperienced persons, zero-point positioning by command entry is not an easy operation.

It is suggested that before performing the following procedure, the operator should seek advice from your MAZAK service representative.

- (1) Set the distance between the proximity sensor and the dog to 1.0 to 1.3 mm (0.04 to 0.05 in.).
- (2) Set the milling head at zero-point as described in the preceding section.
- (3) Set the parameter for zero-point shift amount (**BS13**) to 0, and set the position counter to 0. For the X-axis, attach the dial gauge fixture jig to the carriage and apply the dial gauge to the milling head base. For the Z-, Yt- and W-axis, attach the dial gauge fixture jig to the bed and apply the dial gauge to the carriage.
- (4) Carry out an axis movement through 10 mm [0.39 in.] (X-, Yt- and W-axis in – direction, Z-axis in + direction) from the zero point position to the front. Next, slide and set the dog while watching input address “Xn” on the **DIAGNOSIS** display to ensure that the proximity sensor turns on and off at that position.
- (5) Perform further axis movement through about 50 mm [1.97 in.] in the same direction (X-, Yt- and W-axis in – direction, Z-axis in + direction).
- (6) Turn power on and then turn it back on.
- (7) Perform the zero-point return (with parameter **BS13** = 0).
- (8) Enter the distance from the position obtained to the home position into parameter **BS13**.
- (9) Carry out an axis movement through 6 mm [0.24 in.] for the X- or Z-axis (X-axis in + direction, and Z-axis in – direction), or through 5 mm [0.20 in.] for the Yt- or W-axis (both in – direction). Next, slide and set the dog while watching input address “Xn” on the **DIAGNOSIS** display to ensure that the proximity sensor turns on and off at that position.
- (10) After turning power off again, turning it back on and perform the zero-point return once again. The axis will be returned to its zero-point position.
- (11) Confirm that the dial gauge reading is the same as in step (3) above.

4-3-3 Backlash compensation

The following factors between the position encoder of the feed-axis and the movable sections generate errors between the axis motion command value and the actual movable sections position.

1. The NC has the ability to compensate electronically for errors generated in the mechanical system. This is called the backlash compensation function.
2. The backlash compensation function is factory-set to the optimum condition and will not need further adjustment after installation of the machine. However, if this does not compensate for backlash-caused error during a long period of use, the backlash compensation data may be set again.
3. The backlash compensation data can be set by changing the parameter data stored in the NC.

The procedure for changing a backlash compensation value with the W-axis taken as an example is shown below.

Adjusting procedure:

- (1) Select the MDI mode.
- (2) Feed the No. 2 headstock in the "plus" (+) direction approximately 50 mm (2.0 in.) in rapid feed. (MDI)
- (3) Set the dial indicator in the "plus" (+) side of the secondary headstock and set the reading to "0".

Set the dial indicator on the secondary headstock as shown in Fig. 4-13 for measurement of lost motion.

- (4) Feed the secondary headstock in the "plus" (+) direction by 50 mm (2.0 in.) again in rapid feed. (MDI)
- (5) Return the secondary headstock in the "minus" (-) direction by 50 mm (2.0 in.).
- (6) Read the dial indicator.

The value read by the dial indicator shows the amount of "lost motion" which is the total mechanical system error including backlash.

- (7) Change the parameter settings.

Note: Select the secondary spindle $\square 2^{\text{nd}}$ by using the spindle selector switch on the operating panel and confirm that **SP2** is displayed at the lower part of the **PARAMETER** display.

Parameter **BS14**: Backlash in rapid feed (G00)

Parameter **BS15**: Backlash in cutting feed (G01)

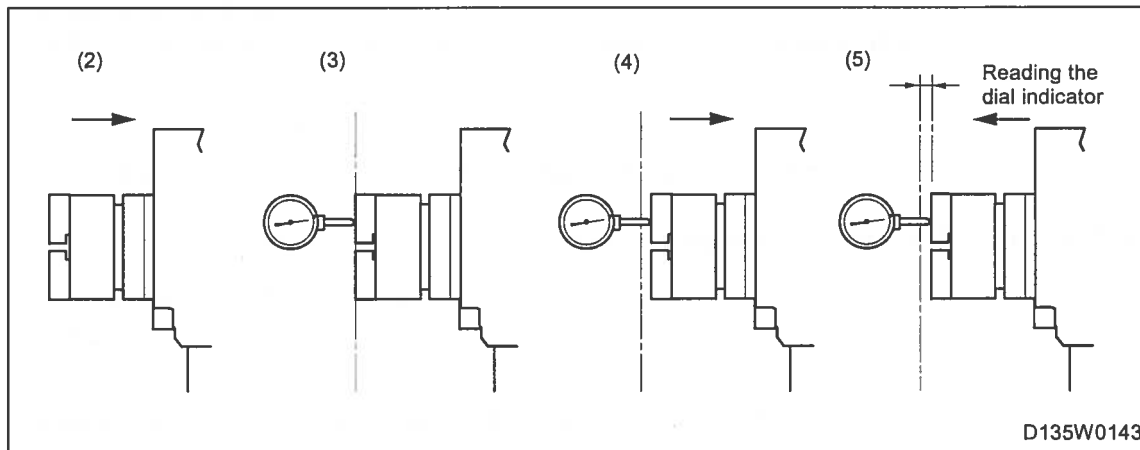


Fig. 4-13 W-axis lost motion measurement

4-4 ATC

4-4-1 Oil level inspection and oil replacement

The ATC arm is rotated by roller gear cam, and the cam follower section is lubricated by oil-bath method to maintain oil film. The amount and quality of lubricating oil must therefore be controlled carefully to prevent the cam follower, shaft support bearing and other components from being damaged.

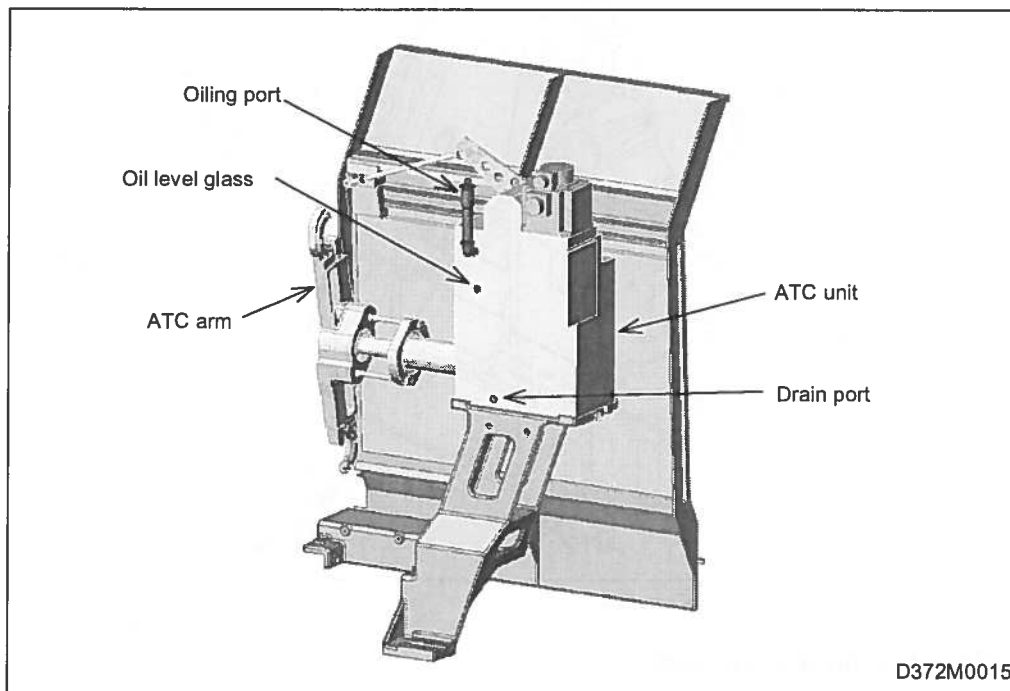


Fig. 4-14 Oil level inspection and oil replacement for the ATC unit

1. Inspection of oil level

- (1) Check every week by the inspection glass if the oil level is not lower than "L".
- (2) Check the drain plug for looseness if there is no oil visible through the glass.
- (3) Tighten the loosened plug and replenish or replace oil as directed below.
If the loss of oil should have been caused otherwise than by a looseness of the drain plug, please contact your local MAZAK service representative.

2. Replacement of oil

Never fail after the initial 6 months and then once a year to replace the lubricating oil for the milling head.

- (1) Remove the plug from both the oiling port and drain port to drain oil entirely.
- (2) Plug the drain port tightly and pour through the oiling port 6.5 L, or 1.72 gal (US), of the recommended lubricant.
- (3) Check the oil level by the inspection glass (not lower than "L"), and plug the oiling port securely.

4-4-2 Registration of reference position for the movable sections

The procedures for registering the reference positions required for the magazine-to-turret tool transfer units to move to their correct positions are shown below. See the next subsection to obtain the coordinates of each reference position.

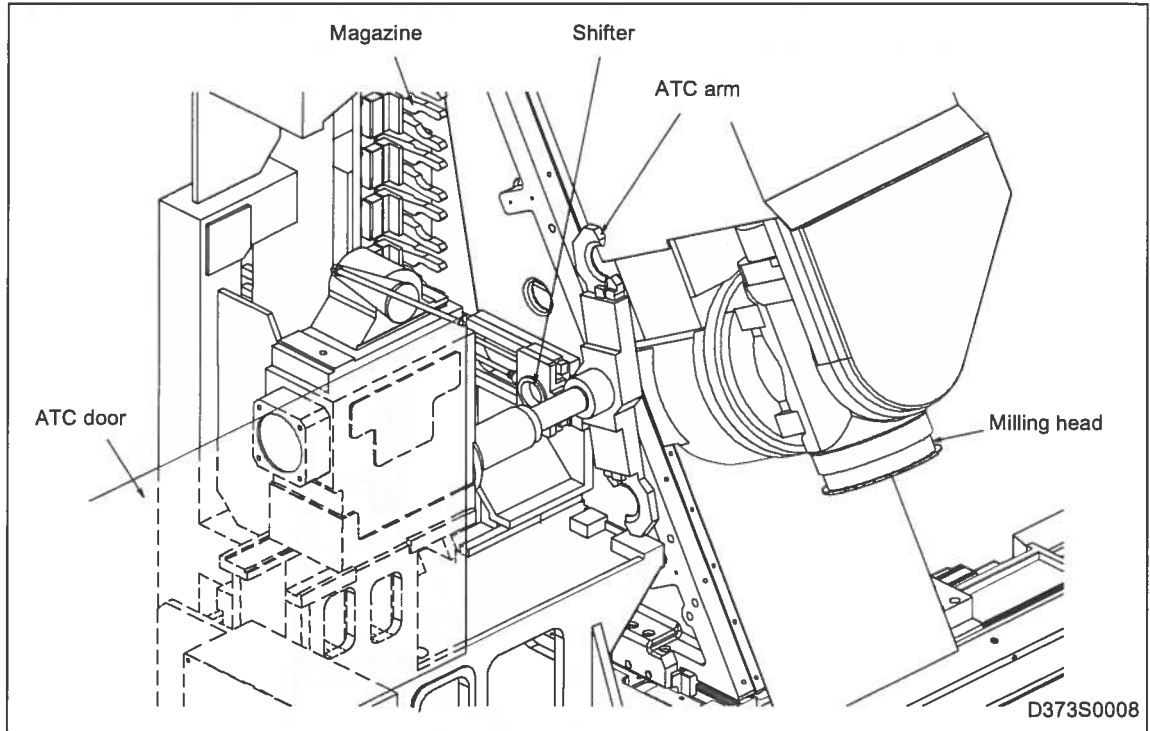


Fig. 4-15 ATC movable sections

1. Menu functions to be used

The following menu functions are used to perform the registering operations. See the Operating Manual for details of the menu functions related to ATC.

A. ATC first menu

The ATC first menu is displayed by pressing the machine menu key [37] and then [ATC MENU] menu key in the manual operation mode.

TURRET HOME POS	TURRET INCHING			SHIFTER MAG.SIDE	SHIFTER ATC SIDE	SHIFTER EXIT	SHIFTER RETRACT	MAGAZINE HOME POS	MAGAZINE INCHING
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B. ATC second menu

The ATC second menu is displayed by pressing the menu selector key after displaying the ATC first menu.

ATC ARM HOME POS	ATC ARM SWING	ATC ARM CHG POS		ATCSERVO CW	ATCSERVO CCW	ATCSERVO HOME POS	TURRET 2 MODE	TURRET 2 HOME POS	INTERLOC NEG.
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C. ATC maintenance menu

The ATC maintenance menu is displayed by pressing the machine menu key [37] and then [MAINTEN. MENU] menu key in the manual operation mode.

TOOL LOAD	TOOL UNLOAD	Yt	AXIS ATC POS		MILL 120 ORIENT	MILLAXIS CLAMP	MILLAXIS UNCLAMP	MILL 0 ORIENT	MILL 180 ORIENT
--------------	----------------	----	-----------------	--	--------------------	-------------------	---------------------	------------------	--------------------

*

* For BT tool spec. only

2. Registering the zero-point position of the magazine

Use ATC first menu.

- (1) Press the **[SHIFTER EXIT]** menu key.
 - ➔ The shifter will move to the left (in the minus direction of the Z-axis).
- (2) Press the **[SHIFTER MAG. SIDE]** menu key.
 - ➔ The shifter will move toward the magazine.
- (3) Press the **[SHIFTER RETRACT]** menu key.
 - ➔ The shifter will move to the right (in the plus direction of the Z-axis).
- (4) Press the **[MAGAZINE INCHING]** menu key.
- (5) Rotate the magazine to its reference position by pressing the **TOOL SELECT FORWARD** or **REVERSE** button on the magazine operating panel.
- (6) Press the **[MAGAZINE HOME POS]** menu key while holding down the MF1 auxiliary key [35].
 - ➔ The menu item will blink.
- (7) Press the **[MAGAZINE HOME POS]** menu key once again.
 - ➔ The menu item will light up.
- (8) Press and hold down the **TOOL SELECT FORWARD** or **REVERSE** button on the magazine operating panel until the magazine has stopped rotating.
- (9) Turn power off and then turn it back on.

3. Registering the zero-point position of the ATC arm

This particular work is to be entrusted to MAZAK service personnel.

4-4-3 Mutual alignment of units (20/40-tool magazine)

Before operating the ATC unit in MDI or automatic mode following transportation of machine, make sure that alignment is established between the ATC unit, the shifter, and the magazine.

1. Preparation

- (1) Perform the zero-point return operation for the X-, Z-, X2-, Z2-, Yt-, B- and W-axis.
 - Note:** Perform the B-axis zero-point return at a feed override from 10 to 25 percent.
- (2) Remove the tool, if present, from the currently indexed magazine pocket.
- (3) Move each axis to the ATC position.
- (4) Orient the milling spindle to the angular position for the ATC operation.
 - 1) Press the **[MILLAXIS UNCLAMP]** menu key.
 - ➔ The milling axis will be unclamped.
 - 2) Press the **[MILL 0 ORIENT]** menu key (or **[MILL 120 ORIENT]** for BT tool spec.).
 - ➔ The milling axis will be oriented to the 0° position.
 - 3) Press the **[MILLAXIS CLAMP]** menu key.
 - ➔ The milling axis will be clamped.

- (5) Move the tool shifter to the position required for the ATC operation.
 - 1) Press the **[SHIFTER EXIT]** menu key.
 - ➔ The shifter will move to the left (in the minus direction of the Z-axis).
 - 2) Press the **[SHIFTER ATC SIDE]** menu key.
 - ➔ The shifter will move toward the ATC unit.
 - 3) Press the **[SHIFTER RETRACT]** menu key.
 - ➔ The shifter will move to the right (in the plus direction of the Z-axis).

Note: The ATC unit usually does not respond to **[ATCSERVO CW]** or **[ATCSERVO CCW]** menu operations since the servomotor is driven, and rotates the cam, at a rotational speed lower than that achieved under normal operating conditions. When performing the following operations, therefore, continue holding down the menu key until the desired machine action has been completed.

2. Aligning the magazine pocket and the tool shifter

This work cannot be done by one person. Ask another person to check the operation of the units from the window of the back cover.

- (1) Set the tool shifter to the "RETRACT" and "MAGAZINE" side position.
- (2) As shown below, mount a tool in the desired pocket of the magazine.

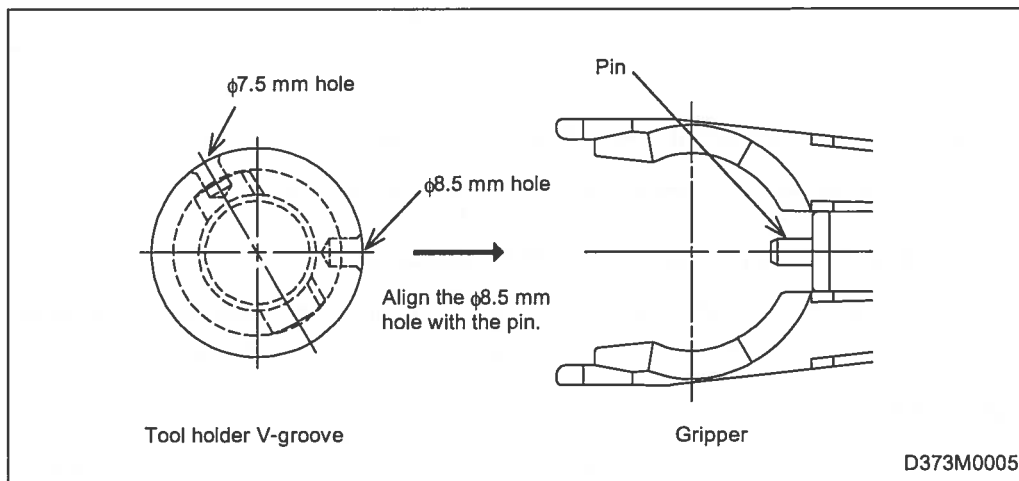


Fig. 4-16 Mounting a tool (KM)

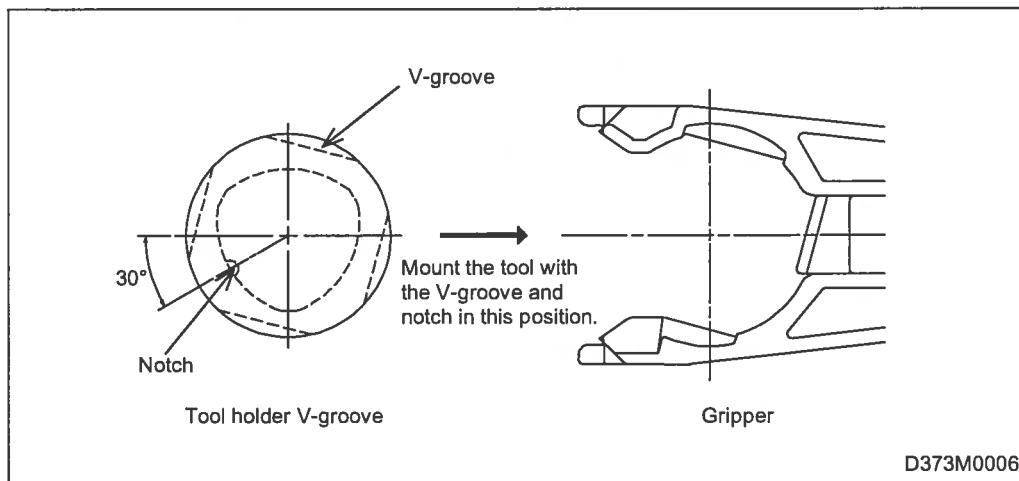


Fig. 4-17 Mounting a tool (CAPTO)

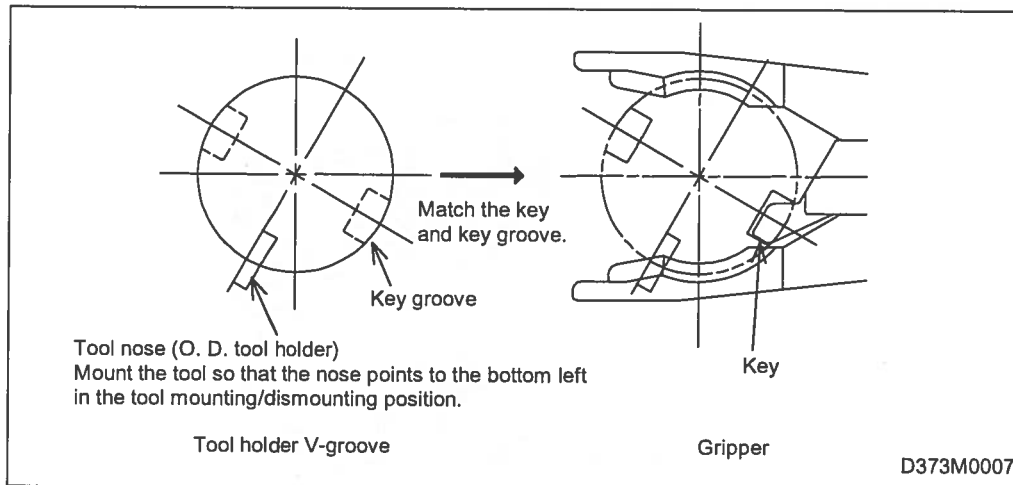


Fig. 4-18 Mounting a tool (MAS)

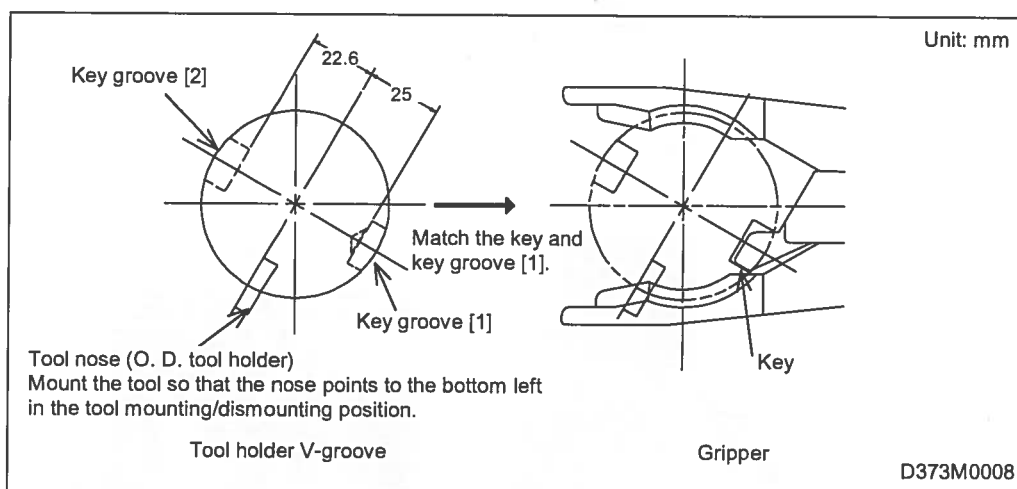


Fig. 4-19 Mounting a tool (CAT)

- (3) Rotate the magazine by operating the TOOL SELECT FORWARD or REVERSE button, and place that pocket in the tool changing position.
 - (4) Machine operator: Alternate the position of the tool shifter between "EXIT" and "RETRACT".
 Checking person: Make sure that the shifter clasps and releases the tool smoothly and that the resulting clearance is appropriate.
 Machine operator: Reciprocate the tool shifter between "ATC" and "MAGAZINE" sides.
 Checking person: Make sure that the tool is set in the gripper and taken out smoothly.
- After that, proceed as follows if necessary:
- (5) Perform vertical adjustment as follows:
 For 20-tool magazine.....Loosen the mounting bolts of the magazine rotating part and use the set screw to perform alignment.
 For 40-tool magazine.....Register the zero-point position of the magazine as described in item 2 of Subsection 4-4-2.
 - (6) For adjustment in the Yt-axis direction, conduct the alignment by adjusting the nut of the hydraulic cylinder mounting section.
 - (7) For adjustment in the Z-axis direction, conduct the alignment by adjusting the nut of the hydraulic cylinder mounting section.

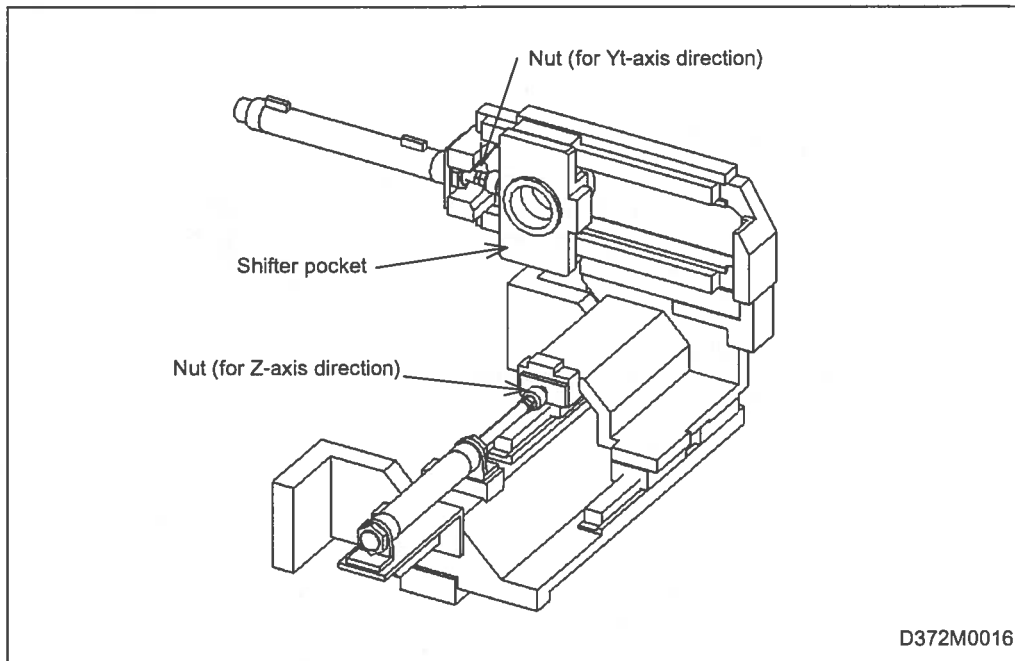


Fig. 4-20 Aligning the magazine and shifter pocket

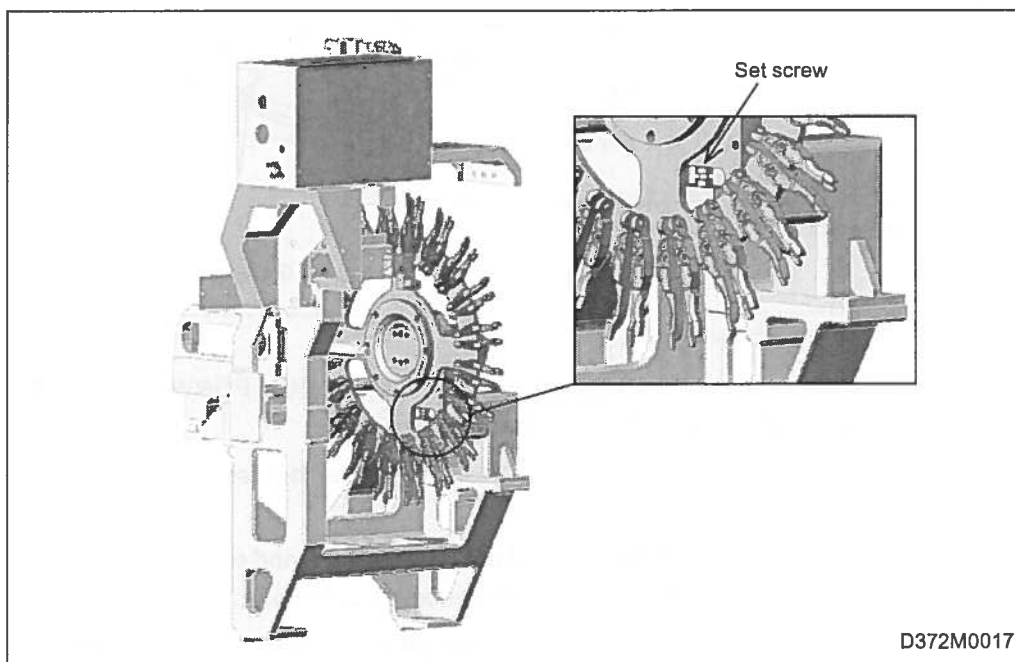


Fig. 4-21 20-tool magazine adjustment

3. Aligning the ATC arm and the tool shifter

This work cannot be done by one person. Ask another person to check the operation of the units from the window of the back cover.

- (1) Set the tool shifter to the "RETRACT" and "MAGAZINE" side position.
- (2) Machine operator: Use the **[ATC SERVO CCW]** menu function to operate the ATC arm so that it removes the tool, rotates through 180 degrees, and inserts another tool into the milling head.

Checking person: - Make sure that the tool is inserted smoothly.
 - Check that the convex section (shaded section) of the ATC arm is fitted into the V-groove of the tool holder correctly.

- (3) Return the ATC arm to its reference position (zero-point position) by pressing the **[ATC SERVO CW]** menu key.

After that, proceed as follows if necessary:

- (4) Perform vertical adjustment by loosening the powered locking bolts that connect the rotational shaft and the ATC arm.
- (5) For adjustment in the Yt-axis direction, conduct the alignment using the stopper bolt.
- (6) For adjustment in the Z-axis direction, loosen the mounting bolts of the ATC cam unit and use the set screw to perform alignment.

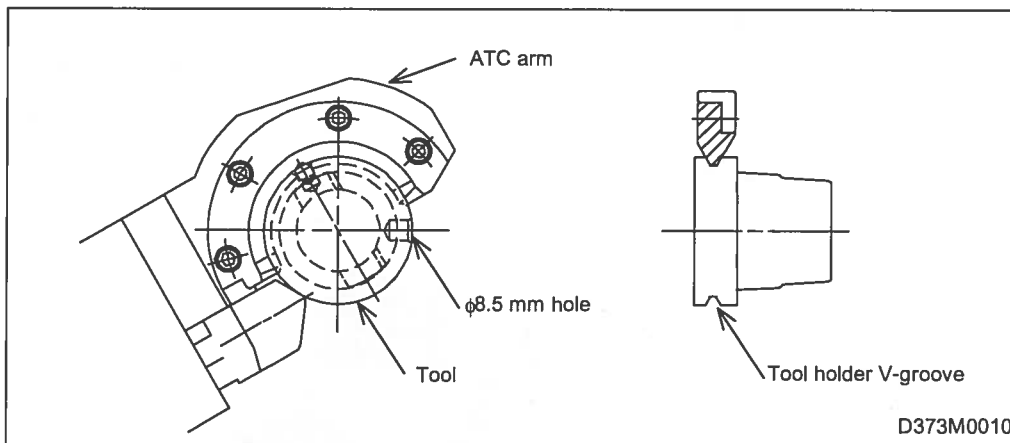


Fig. 4-22 ATC holding a tool (KM)

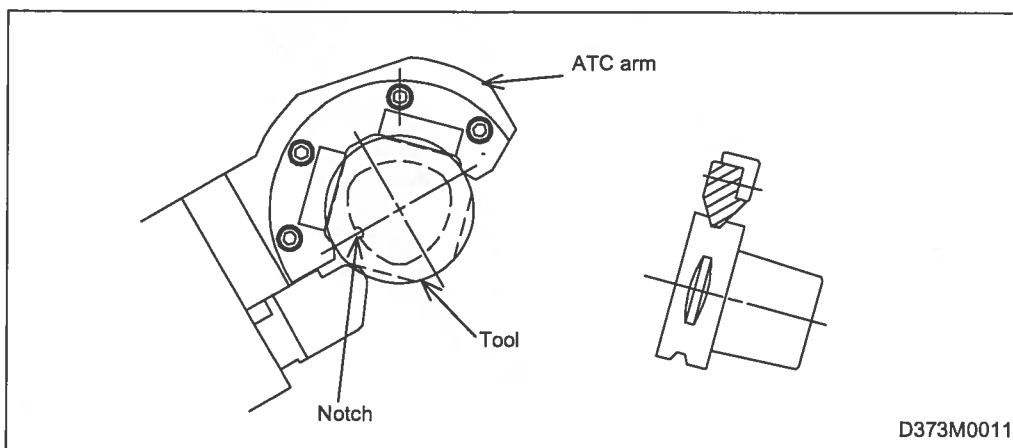


Fig. 4-23 ATC holding a tool (CAPTO)

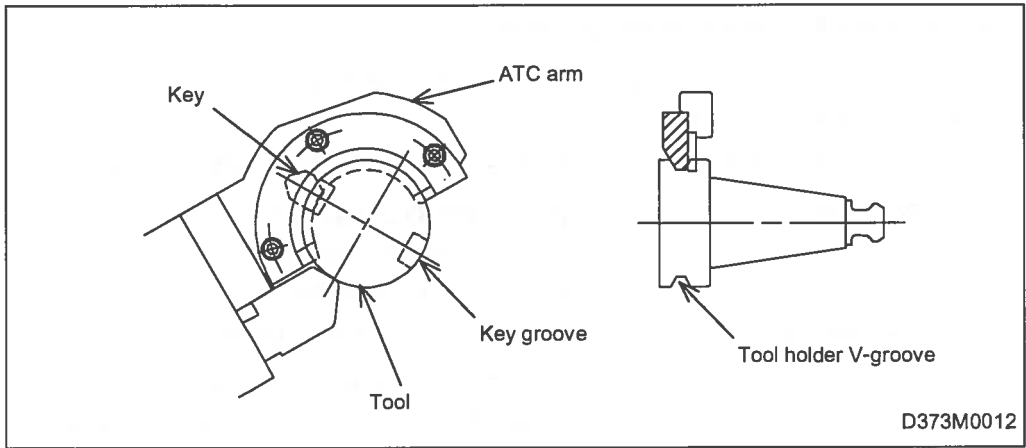


Fig. 4-24 ATC holding a tool (MAS)

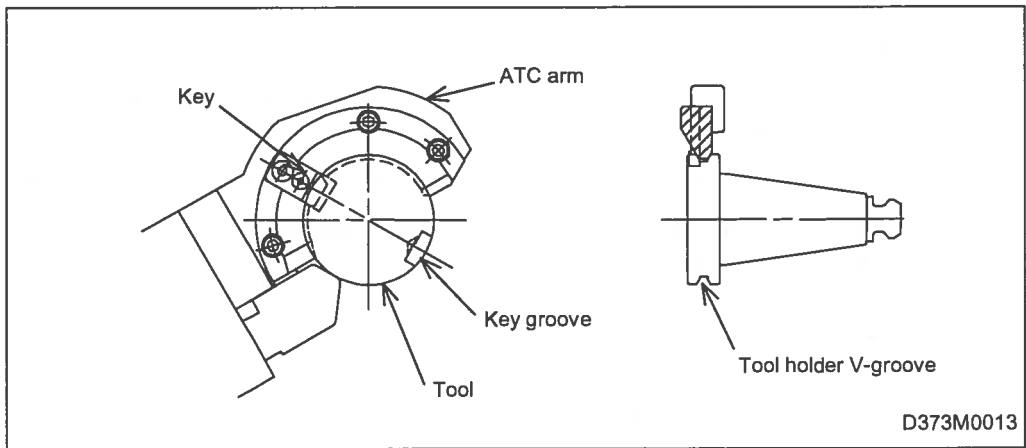


Fig. 4-25 ATC holding a tool (CAT)

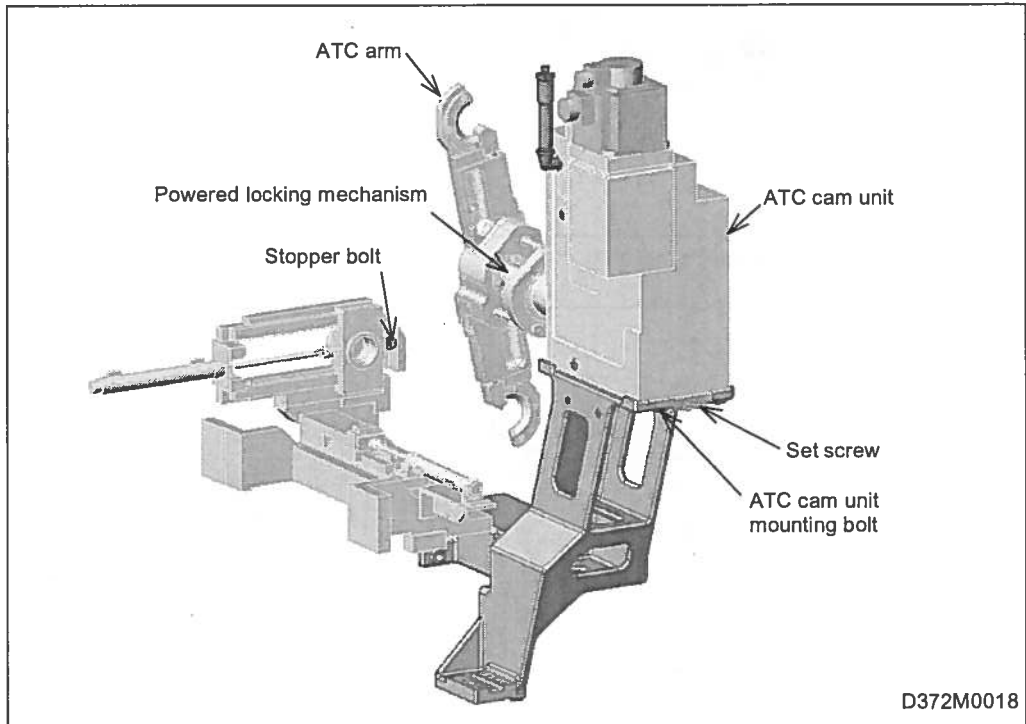


Fig. 4-26 Aligning the ATC arm and shifter pocket

4. Aligning the ATC arm and the milling head

- (1) Mount the desired tool in the milling head.
- (2) Press the **[ATC SERVO CCW]** menu key to swing the ATC arm to the milling head side.
- (3) Check that the convex section (shaded section) of the ATC arm is fitted into the V-groove of the tool holder correctly.
- (4) Return the ATC arm to its reference position (zero-point position) by holding down the **[ATC SERVO CW]** menu key.

If there is a clearance between both, proceed as follows for realignment:

- (5) Perform adjustment in the Z-axis direction using the set screw.
- (6) Press the **[ATC SERVO CCW]** menu key to swing the ATC arm to the milling head side.
- (7) Perform axis movements to move the milling head to a position appropriate to ATC operation, and set the position in the relevant parameters (**RL17** and **RL16** respectively for the X- and Yt-axis).

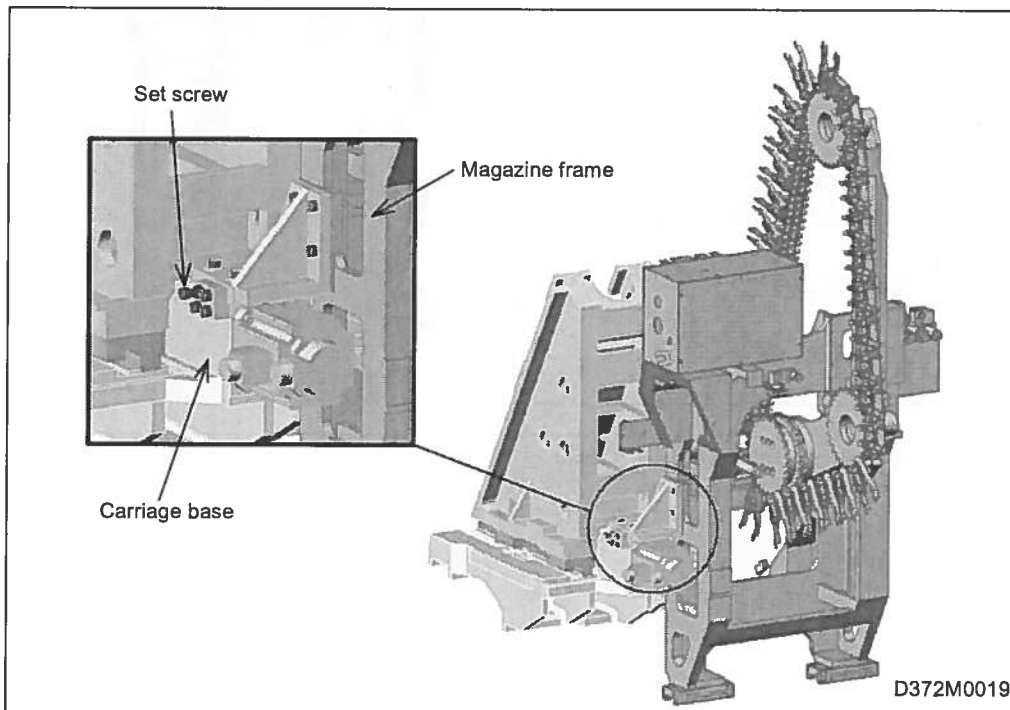


Fig. 4-27 Aligning the ATC arm and the milling head

4-4-4 Adjustment of the ATC door

1. General

The ATC door is opened and closed by a linkage.

The opening and closing of the door is included in the ATC cycle.

2. Adjustment

Adjust the ATC door closing position using the nuts at both ends of the link bar connected with the door. Adjustment of ATC door opening position is not required.

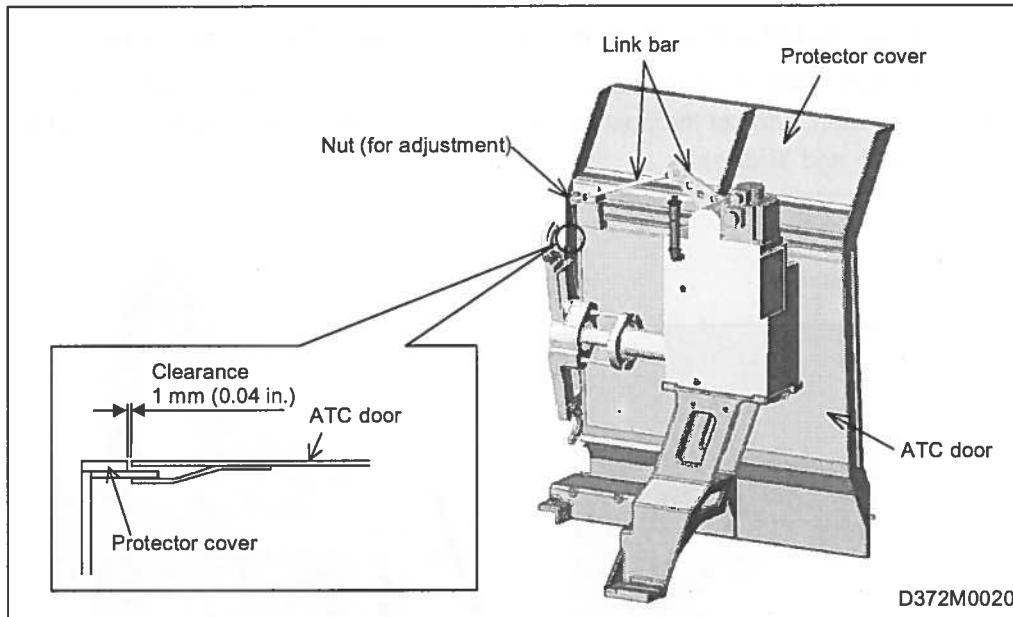


Fig. 4-28 Adjustment of the ATC door

4-4-5 Cleaning

1. Cleaning the periphery of the ATC unit

A cover and an oil pan are provided to separate the ATC unit in order to protect the Z-axis ball screw and linear guide, among others, against coolant and chips scattered during ATC operations.

Coolant and chips scattered during ATC are accumulated first by the ATC cover and oil pan A, guided then through the drain port (3 holes) into oil pan B and then along the inside of the rear cover to the machine bed.

Clear both oil pan sections A and B of residuary chips every day.

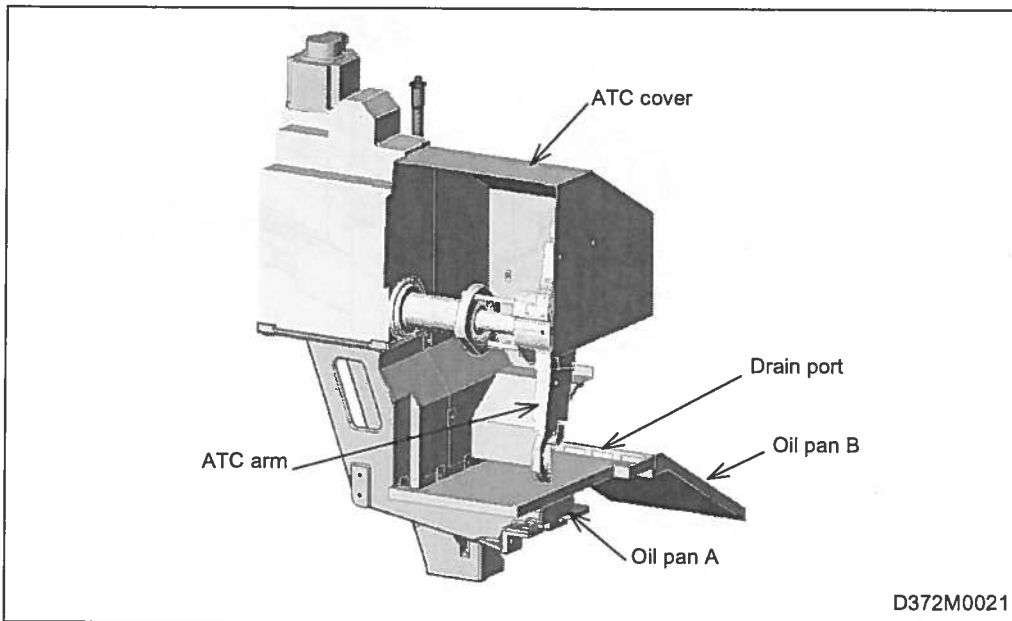


Fig. 4-29 Cleaning the periphery of the ATC unit

Cleaning procedure

- (1) After turning off the main power using the main power breaker with the ATC door open, remove the oil pan, then give all chips away, and return the oil pan.
- (2) Check that the filter is not clogged with chips. If it is clogged, remove chips.

4-4-6 Cleaning the oil pan (rear cover) under the magazine

Check the oil pan under the magazine about once a week. If chips are accumulated in the oil pan through the coolant returning on the bed to the coolant tank, clean the oil pan following the procedure described below.

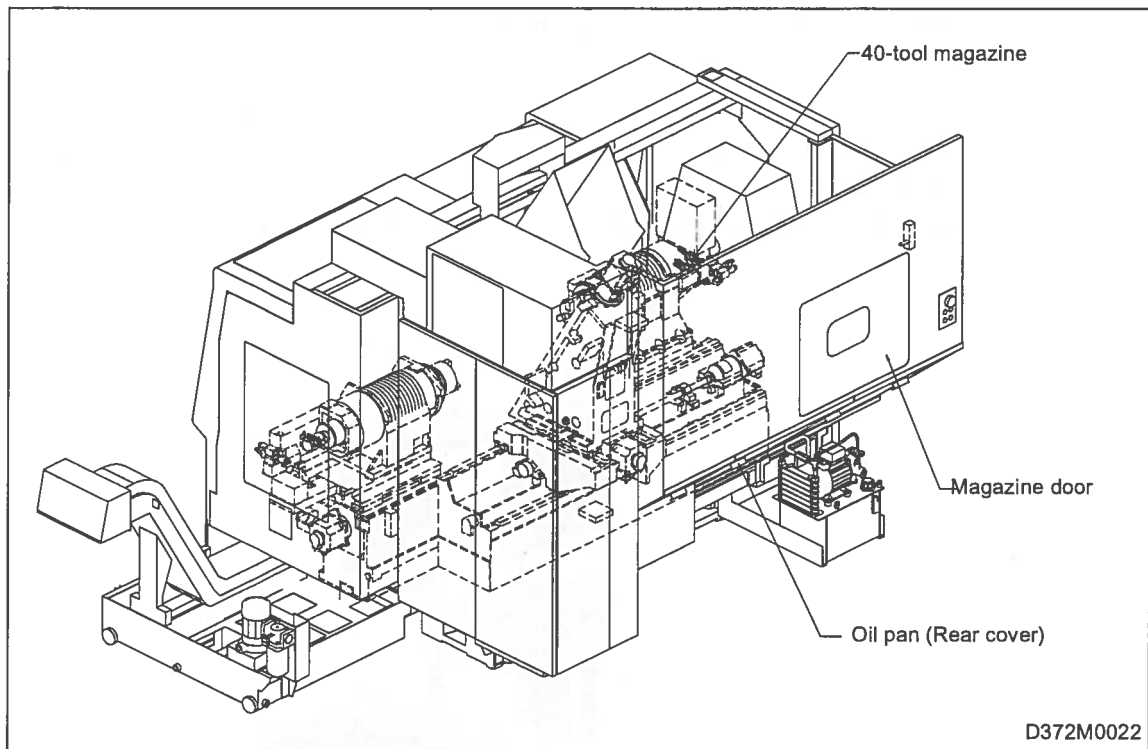


Fig. 4-30 Oil pan under the magazine

- (1) Open the magazine door.
- (2) Set the main power breaker to OFF.
- (3) Remove chips accumulated in the oil pan with a rag.

4-4-7 Cleaning the tool detection sensor

Clean the tool detection sensor at least once a week. Wipe the tool detection surface of the sensor using a waste cloth.

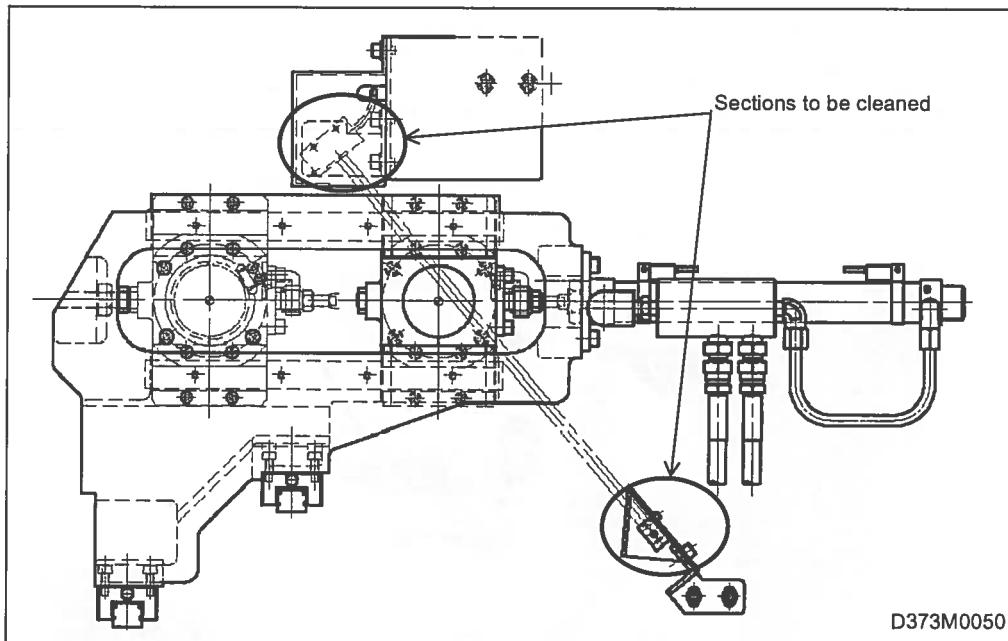


Fig. 4-31 Tool detection sensor (20/40-tool magazine)

4-4-8 Cleaning the tool edge, the turret edge, and the magazine shifter pocket

Sections to be cleaned and the frequency of cleaning

No.	Section to be cleaned	Frequency of cleaning
1	Turret edge	Once a day
2	Tool edge	Once a day
3	Magazine shifter pocket	Once a day

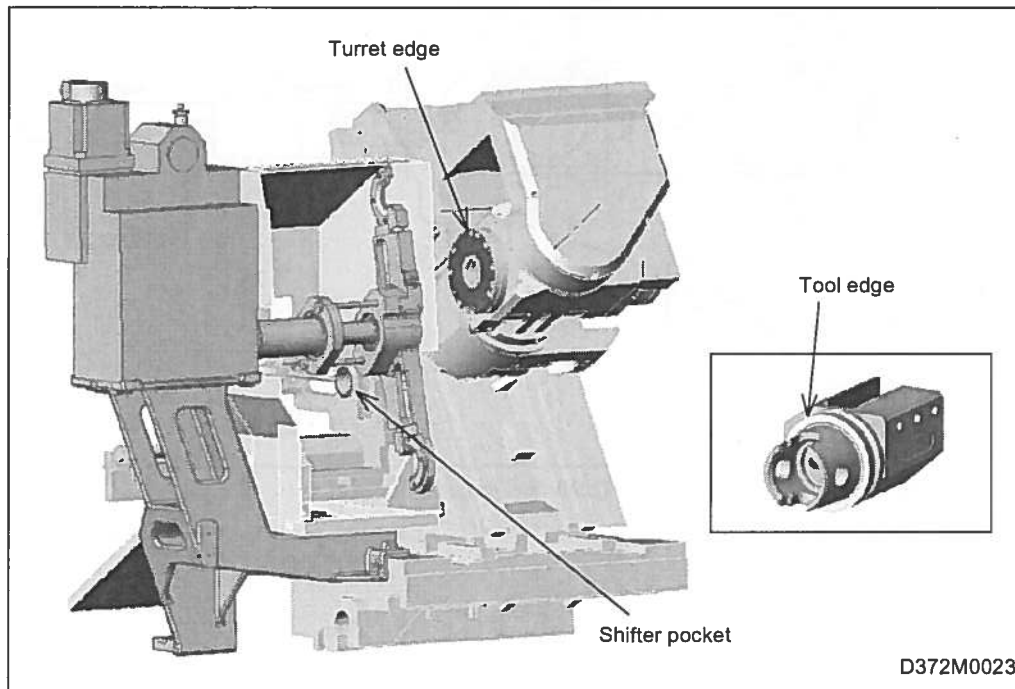


Fig. 4-32 Cleaning the tool edge, the turret edge, and the magazine shifter pocket

Cleaning procedure

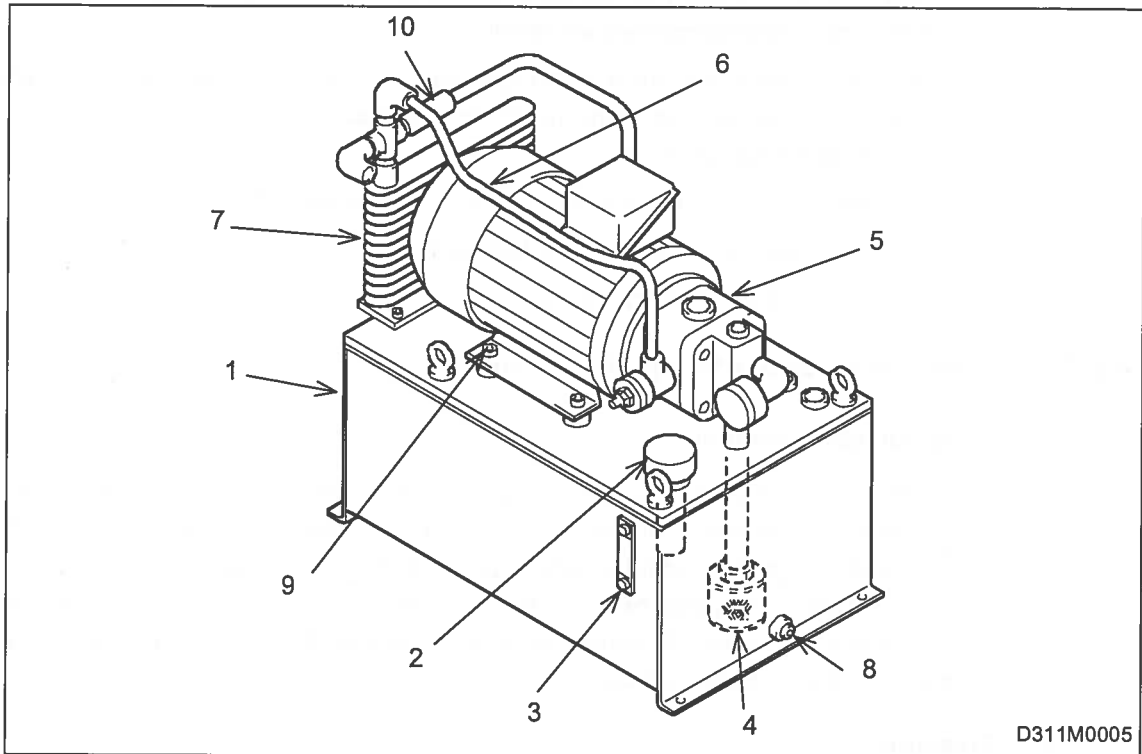
- (1) Move the shifter pocket to its returning end at the ATC side.
- (2) Set the main power breaker to OFF with the ATC door open before cleaning.

4-5 Hydraulic Unit

4-5-1 Construction and specifications

The hydraulic unit employs the motor and hydraulic oil pump of one unit construction, thereby not only eliminating noises and damage of bearing and oil seal caused by misalignment of pump and motor but also providing easiness in maintenance.

The hydraulic pump is of an adjustable discharge pipe type. Since pressure compensation unit is incorporated, the pump delivers hydraulic oil meeting actually required amount. This reduces power loss and prevents the oil temperature rise.



D311M0005

Fig. 4-33 Hydraulic unit composition

No.	Parts name	Type	Q'ty	Maker	Remarks
1	Tank	20 L (5.28 gal (US))	1	IKEYAMA	
2	Oil lubrication port/air breather	FA-35	1	TAISEI	
3	Fluid level gauge	KLA-60A (M10)	1	KYOWA	
4	Strainer	SFT-06-150W	1	TAISEI	
5	Adjustable vane type of unipump	UVN-1A-1A3-15-4-Q01-6063C	1	FUJIKOSHI	
6	Drain hose	N5-1-3/8-340-C1N/LIN	1	NITTA MOOR	
7	Radiator	3A92-001-1050	1	TOYO RADIATOR	
8	Oil drain		1		
9	Rubber vibration isolator	NBR t15	1	IKEYAMA	
10	Check valve	CN-T03-C-7841A	1	FUJIKOSHI	

4-5-2 Checkups before starting hydraulic unit

Before starting the hydraulic unit, check the hydraulic oil level. If the hydraulic oil level is below the correct level, supply oil before turning the power on.

1. Specified level

The upper limit level line of the oil level gage indicates the specified level.

2. Allowable lowest level

The center level of the specified level indicates the allowable lowest level of the hydraulic oil in the tank. Never operate the hydraulic unit while the oil level is lower than that. If the unit is operated, the following troubles will result:

1. The air is apt to be mixed in the hydraulic oil causing various types of malfunctions of the pump such as seizing of the pump, noises, faulty valve operation, and unstable pressure variance during operation.
2. Vibration of the piping runs, which in turn causes oil leakage.
3. The hydraulic oil will be deteriorated rapidly.
4. Other troubles of the hydraulic unit.

4-5-3 Inspection when starting hydraulic unit

1. Pump rotation direction

With the motor started, the pump starts rotation. Check to be sure that the pump rotation direction is as indicated on the legend plates of the motor and pump. The pump rotation direction can be checked at the motor fan side opposite to the motor shaft side.

Once the motor is stopped, never try to start it again immediately. At least one minute motor rest is required in this case. If started again immediately, the motor is overloaded by the residual pressure in the hydraulic circuit.

2. Pressure

Check that the pressure is set to 5.9 MPa (853.8 PSI) by the pressure gauge.

4-5-4 Inspection and maintenance of hydraulic unit



CAUTION

- When replenishing the hydraulic unit with oil, use only the recommended oil. If hydraulic oil other than the recommended oil is used, it will cause malfunction of the machine.

1. Replenishment

Replenish the hydraulic oil when the oil level gauge float is below the center.

- (1) Remove the cap on the supply port of the oil tank.
- (2) Replenish the hydraulic oil through the supply port up to the yellow line of the oil level gauge.
- (3) Fasten the supply port cap securely.

2. Replacing the hydraulic oil and cleaning the strainer

Hydraulic oil replacing interval varies depending on machine operation conditions and ambient conditions: At least, it must be replaced in three months after machine installation for the first time, and in every six months after that.



- Hydraulic oil may be warmed up to high temperature after the continuous operation. Care should be taken not to be get burnt.

- (1) Place a container with a capacity of 30 liters (7.93 gal (US)) or so underneath the drain outlet.
- (2) Remove the drain plug and discharge the hydraulic oil.
- (3) When all hydraulic oil has been discharged, remove the hexagon head bolts and take off the top cover.
- (4) Using a rag, carefully wipe away the dirt and other sediment which have accumulated inside the tank.

Note: Under no circumstances must any metal or other such articles be used to clean inside the tank since they will damage the paint.

- (5) Attach the suction strainer, and fit the tank top cover back into place. At this point, do not wrap sealing tape around the suction strainer.
- (6) Clean the drain plug, wrap new sealing tape around it, and fit it back securely into the drain outlet as far as it will go.
- (7) Pour 20 liters (5.28 gal (US)) of fresh hydraulic oil through the supply port.
- (8) Inspect the oil level gauge and drain outlet, tighten the supply port cap, and finally attach the machine's cover.

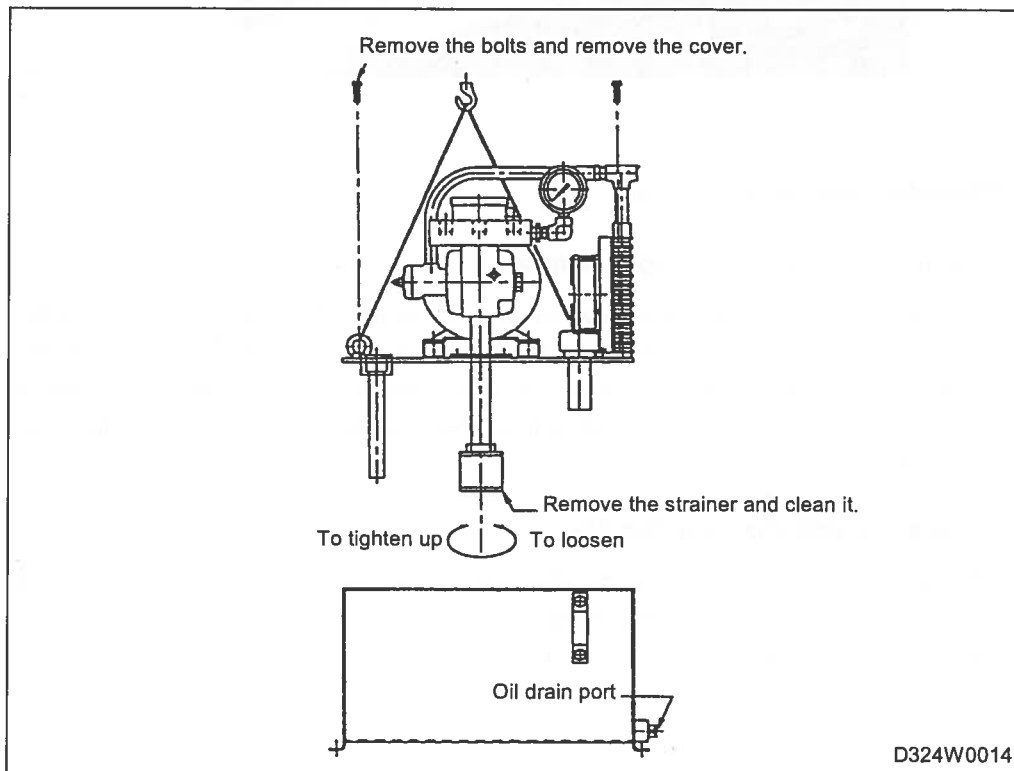


Fig. 4-34 Cleaning the tank and strainer

4-6 Lubrication Unit

4-6-1 B-axis gear, C-axis brake, and ATC mechanical lock lubrication

Lubrication of the B-axis gear, C-axis brake, and ATC mechanical lock is controlled by the centralized automatic lubricator. The cooling air is supplied from the air unit and is mixed with the oil in each section (with the exception of the ATC mechanical lock).

If the supply pressure drops below 0.68 MPa (100 PSI) due to a trouble in the lubricating system, the pressure switch is activated. If lubricating oil runs short, the float switch is activated. In such a case, an alarm message will be displayed on the screen. And the machine will enter in the single block operation mode.

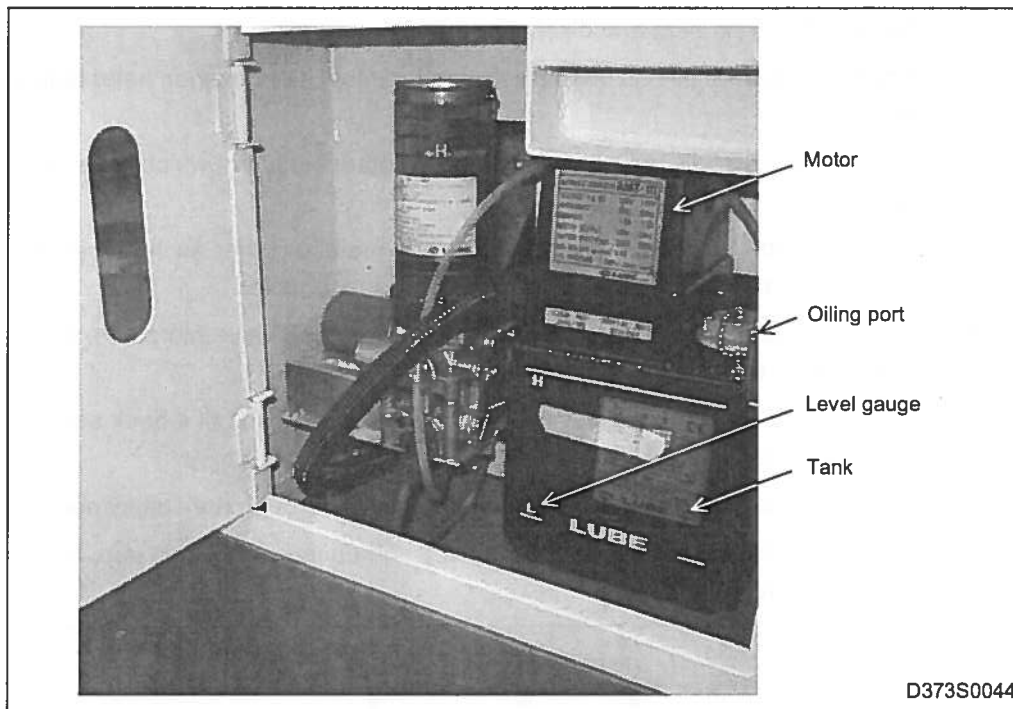


Fig. 4-35 Lubricating oil pump

1. Inspecting the lubrication unit

A. Inspecting the lubricating oil amount

Before starting the machine every day, check that the lubricating oil reserve tank is filled with the specified lubricating oil to the specified level. If the oil level is lower than the center of the upper/lower level line of the level gauge at the tank side, supply the same brand of lubricating oil from the oil filter port on the upper part of the lubrication unit so that the oil level do not exceed the upper limit level line.

B. Cleaning and changing the filter

The suction filter in the automatic intermittent lubricating pump can be removed by taking off the screws of the upper part of the pump. The filter on the oil filler port can be removed in the same manner. Clean the filters once a year.

C. Checking lubricating status

Before starting the day's operation, check every lubricating status of the lubricating parts. Shortage of oil in the lubricating parts causes clogging of the flow unit and oil leakage from the piping route. Entry of foreign particles like chips into the flow unit causes clogging and malfunction of the flow unit. In such a case, replace the flow unit.

4-6-2 Slideway and ball screw lubrication

Lubrication of the slideways (linear guides) and ball screws for axis feed mechanisms is controlled by the centralized automatic lubricator. Always use the recommended brands of lubricating grease.

If a trouble in the lubricating system occurs or the lubricating grease runs short, the pressure switch is activated, and the machine will enter in the single block operation mode.

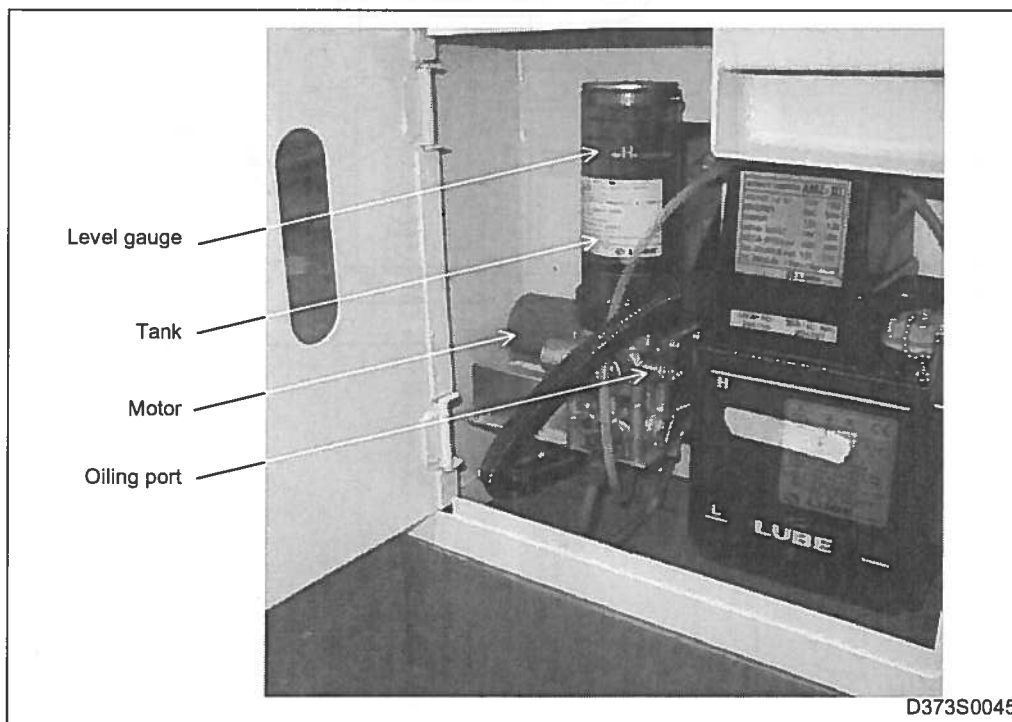


Fig. 4-36 Grease lubrication pump

1. Checking the lubricating grease level and replenishing grease

Although the amount of lubricating oil (grease) will decrease very slowly, check the level in the grease tank at least once a week. Also, be sure to add grease if the lower end of the follow-up plate inside the tank goes down below the lower-limit level marked “- L -”.

When it is necessary to add grease, slowly supply the same brand of grease from the oiling port so that the upper-limit level marking is not exceeded. Also, be extra careful not to allow air or foreign substances to enter during adding grease.

2. Grease to be used

Be sure to use the manufacturer-recommended grease that contains lithium (see Section 3-4). Otherwise, pump trouble or system clogging will occur. Please contact us if it is absolutely necessary to use grease not containing lithium.

3. Operating conditions

Strictly observe the operating conditions specified below.

Operating ambient temperature: 0°C to +40°C (32°F to +104°F)

Operating ambient humidity: 35% to 85% RH

4. Bleeding air

Be absolutely certain to bleed air before piping the product or if air is entrained in the pump.

To bleed air, loosen the air bleeding plug of the pump (rotate the plug through about one full turn in counterclockwise direction) and operate the pump until the grease has begun to flow out and all entrained air has been removed. After the air has been bled, tighten the air bleeding plug.

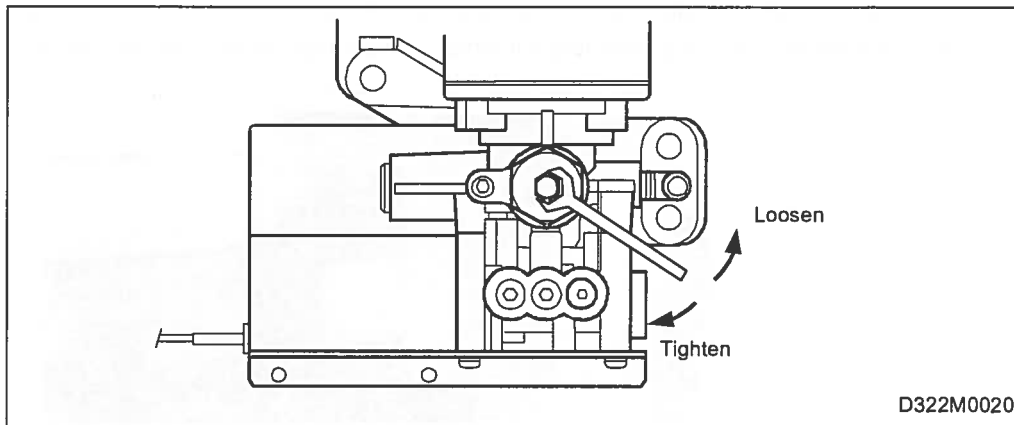


Fig. 4-37 Bleeding air

4-7 Coolant Unit

4-7-1 Composition and operation

The coolant unit consists of a coolant tank, a coolant pump, a chip chute, filters, and a cage filter. On machines equipped with a chip conveyor (option), a cage filter is mounted near the drain hole of the conveyor, and the chip chute is integrated with the conveyor which is fixed on the machine bed, so that it can prevent efficiently chips in the recovered coolant from entering into the tank.

Coolant is pumped up by the coolant pump and fed to the machining spot so as to cool and clean the tool tip and the workpiece. Chips washed away and collected are then separated by the filter from the coolant recovered into the tank.

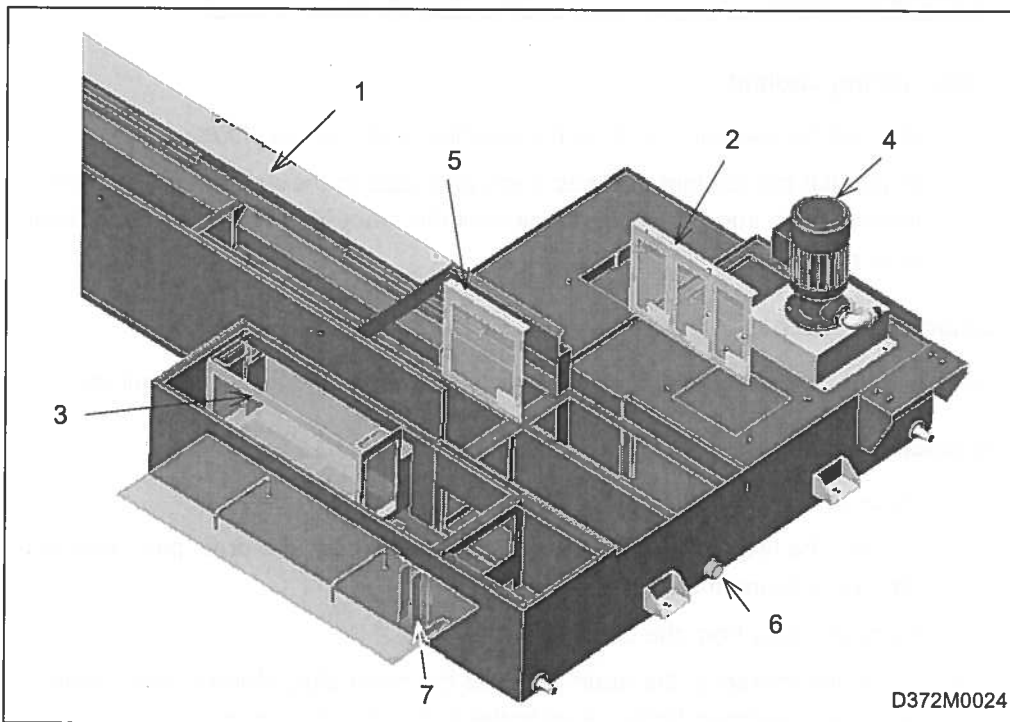


Fig. 4-38 Composition of the coolant unit

No.	Parts name	No.	Parts name
1	Chip chute	5	Primary filter
2	Secondary filter	6	Drain
3	Cage filter (for machines with a chip conveyor)	7	Level gauge
4	Coolant pump		

4-7-2 Inspection

- Check the level gauge on the side of the coolant tank before starting the day's operation.
- If the volume of the coolant supplied from the nozzle becomes low, check if the coolant level is lower than the allowable lower limit.

4-7-3 Replenishing coolant



- When replenishing coolant to the coolant tank, use a rust preventive coolant. Otherwise, corrosion may occur and cause malfunction of the machine.

1. Coolant tank capacity

Model	Coolant tank capacity
INTEGREX 100-III	158 L (41.74 gal (US))
INTEGREX 100-IIIS	205 L (54.16 gal (US))
INTEGREX 100-IIIST	290 L (76.62 gal (US))

2. Replenishing coolant

- (1) Pull out the coolant tank from the machine and remove chips.
- (2) Replenish the coolant that has been arranged to the appropriate density through the chip-filtering plate into the coolant tank until the amount reaches the upper limit level line of the level gauge.

4-7-4 Replacing coolant

Replace the coolant every six months, or whenever it is heavily contaminated.

1. Replacing procedure

- (1) Place the oil drain pan under the drain port.
- (2) Pull out the two filters in the coolant tank and loosen the drain plug. Remove the drain plugs after completing the discharge.
- (3) Remove chips from the coolant tank.
- (4) Clean the thread of the drain port and the drain plug. Wind a new sealing tape around the drain plug and then tighten it up to the end of the drain port.
- (5) Fill the coolant tank up to the top of the drain port and check for leakage from the port.
- (6) Replenish the coolant that has been arranged to the appropriate density beforehand until the amount reaches the upper limit level line of the oil level gauge.

4-7-5 Cleaning

Remove chips from the coolant tank every day after completing the day's work.

1. Cleaning the filter

Clean the filter every day after completing the day's work to maintain sufficient feed amount of coolant.

Note: Clean the secondary filter first to protect entering foreign particles in the coolant pump side.

- (1) Pull out the secondary filter carefully from the coolant tank.
- (2) Clean the filter using an air gun. When using the air gun, wear goggles to protect eyes from flying substances.
- (3) Return the filter carefully in the coolant tank.
- (4) Clean the primary filter in the same manner as that of the secondary one.

2. Cleaning the coolant tank

Clean the inside of the coolant tank when exchanging the coolant.

- (1) Remove the filters and chip receiving plate from the coolant tank.
- (2) After draining all remaining coolant, remove chips by cleaning the inside of the coolant tank with rags.
- (3) Finally, wash the spaces between parts inside the coolant tank.

3. Cleaning the line filter

Clean the line filter each day at the end of the work. If the filter clogs, the amount of coolant emitted will decrease.

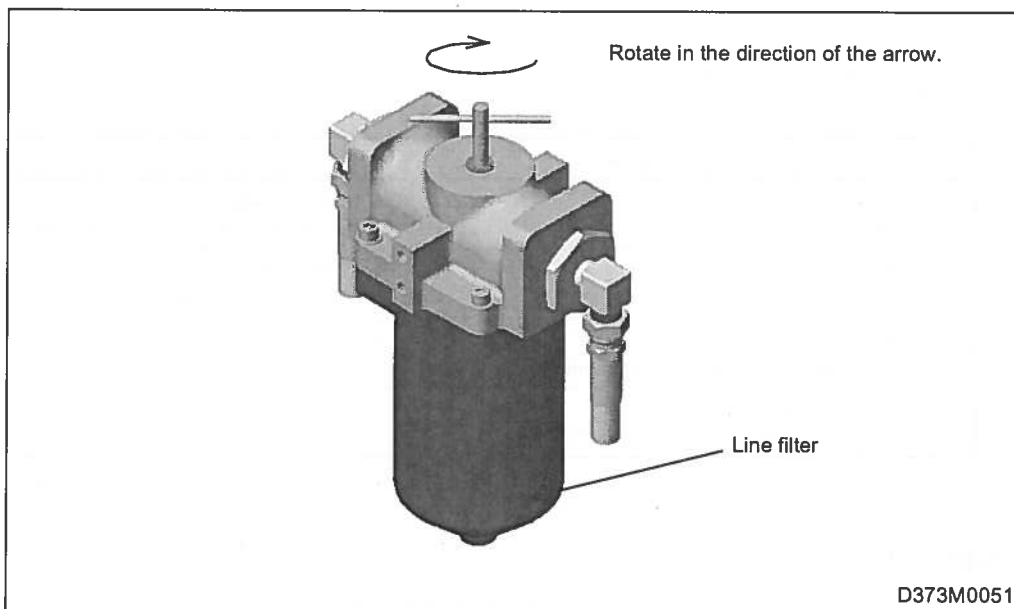


Fig. 4-39

4-8 Air Unit

4-8-1 Composition and operation

The air unit consists of a mist separator and a regulator.

The mist separator removes moisture from the compressed air and the regulator adjusts the pressure.

Note: Moisture in the compressed air causes deterioration and damage to the air actuators used in the machine.

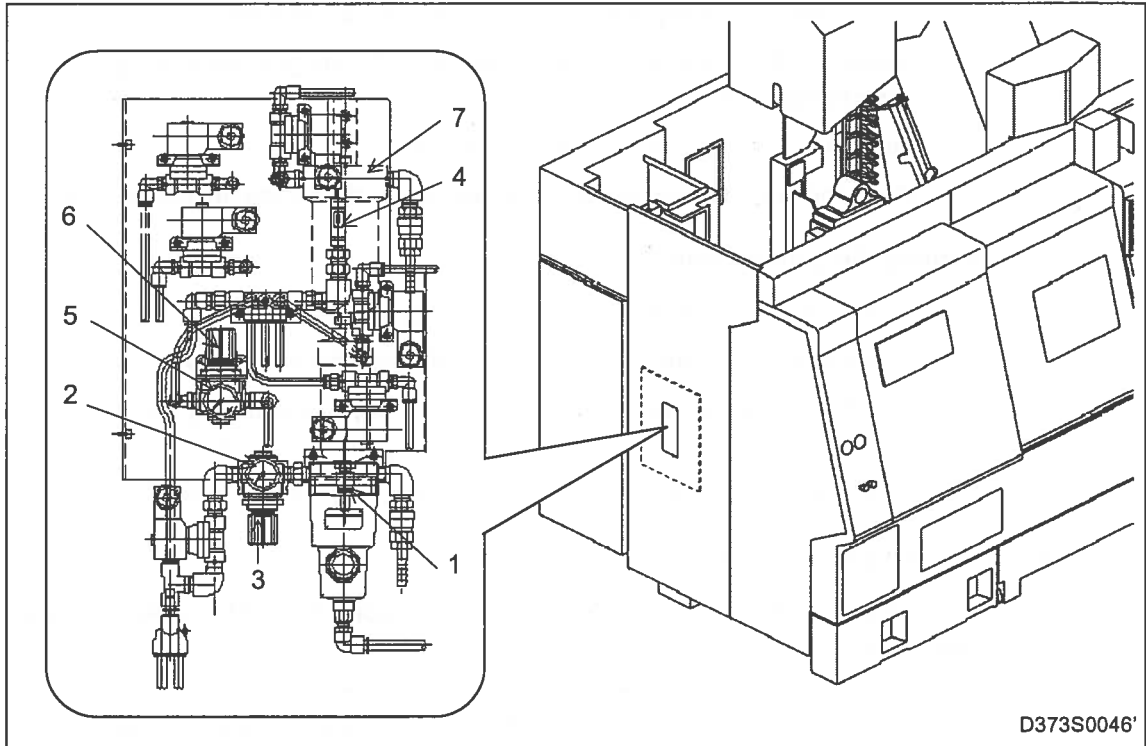


Fig. 4-40 Air unit

No.	Parts name	No.	Parts name
1	Mist separator Auto drain	5	Manometer * Preset pressure: 0.2 MPa (28 PSI)
2	Manometer Preset pressure: 0.5 MPa (71 PSI)	6	Regulator * For purging the scale
3	Regulator for supplied air pressure adjustment	7	Air filter * Automatic drainage
4	Pressure switch Preset pressure: 0.1 MPa (14 PSI)		

* Parts No. 5, 6, and 7 are supplied for scale specifications (optional).

4-8-2 Inspection

Confirm that the manometer No. 2 in the Fig. 4-40 indicates the preset value 0.5 MPa (71 PSI).

4-8-3 Replacing the mist separator element

Replace the filter element at least once a year or every 3000 hours.

- (1) Remove the drain tube from the filter case.
- (2) Take off the screw of the mist separator and remove the filter case.
- (3) Replace the filter element.
- (4) Mount the mist separator element in the reverse order of the dismounting carefully not to hurt the filter case and the seal of the element.

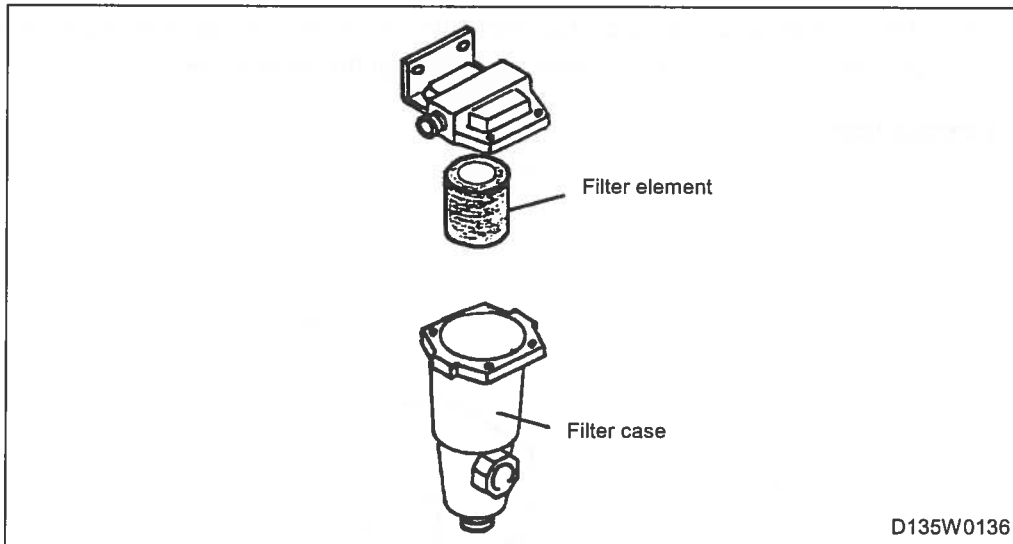


Fig. 4-41 Replacing the mist separator element

4-8-4 Adjusting the air pressure

The air pressure can be increased by pulling the pressure adjust knob of the regulator downward and then rotating the knob clockwise.

Preset supply air pressure.....0.5 MPa (71 PSI)

For purging the scale (option)0.2 MPa (28 PSI)

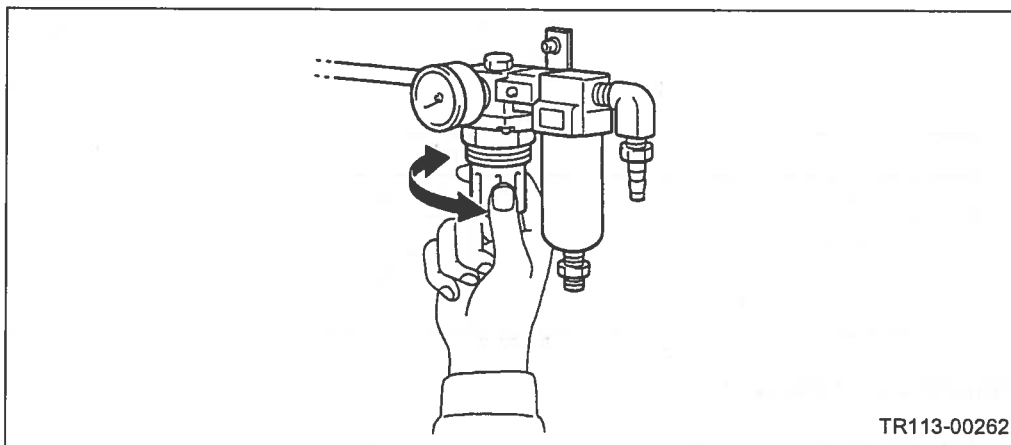


Fig. 4-42 Adjusting the air pressure

4-9 Milling Head Cooling Unit and Milling Spindle Cooling System

4-9-1 Composition and operation

The milling head cooling unit is installed in the integrated form with the milling head.

The milling head is cooled as follows:

1. Cooling water is supplied to the milling head by the centrifugal pump from the milling head cooling unit tank and the milling head is cooled.
2. The cooling water warmed while circulating inside the milling head is cooled by the radiator and the cooling fan and returned to the tank of the cooling unit.

1. Composition

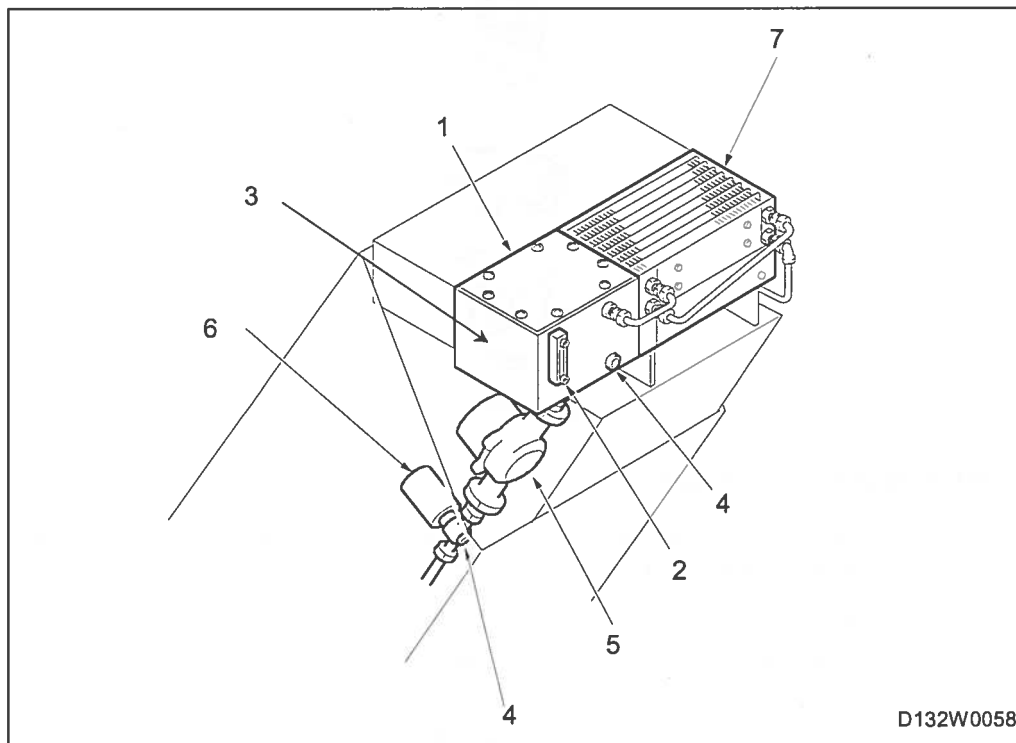


Fig. 4-43 Composition of milling head cooling unit

No.	Parts name	No.	Parts name
1	Replenishing port	5	Centrifugal pump motor
2	Level gauge	6	Pressure switch
3	Cooling water tank	7	Radiator
4	Drain		

4-9-2 Inspection of coolant

The coolant level can be checked at the level gauge.

Center to upper limit: Proper

Lower than center level: Replenish coolant immediately.

Note: If the coolant level is lower than the center mark of the level sight gauge, the milling head cannot be cooled satisfactorily, causing overheating of the milling head and machine malfunction. Replenish the coolant occasionally so that the coolant level is maintained correctly.

4-9-3 Replenishing and replacing coolant

1. Replenishing/discharging coolant



WARNING

- When replenishing coolant, use only the recommended coolant. If coolant other than the recommended ones is used, it will cause malfunction of the machine.

A. Replenishing coolant

Remove the replenishing port cap and replenish the coolant.

Recommended coolant

Distilled water or ion exchanged water	50%	} Mixed
Long life coolant (Mobile)	50%	

Exchange coolant every 2 years. When exchanging coolant, clean the inside of the reserve tank at the same time.

B. Discharging coolant



CAUTION

- The temperature of coolant may rise because of the continuous operation. Take care not to be get burnt.

- (1) Place the oil drain pan under the drain port.
- (2) Loosen the drain port cap.
 - Coolant is drained.

2. Changing the coolant

Milling head coolant must be replaced quickly without interruption. If the milling head is left drained of coolant or becomes filled with distilled water, corrosion may occur. Waste coolant must be disposed of legally.

Replace milling head coolant in accordance with the following procedure, depending on coolant consumption rate (discoloration).

A. When coolant is not remarkably deteriorated or discolored

- (1) After turning off the power, remove all remaining coolant by blowing air through the pipe using an air compressor.
- (2) Sufficiently stir previously diluted coolant (50% dilution) and fill the tank.
- (3) Rotate the milling spindle for about 10 minutes to circulate coolant throughout the entire cooling system. Confirm that the coolant has been spread throughout the system sufficiently as indicated by the lowered level of coolant in the tank. If the circulation is not sufficient, turn the knob on the top of the centrifugal pump motor for air bleed.

B. When coolant is considerably deteriorated or discolored

- (1) After turning off the power, remove all remaining coolant by blowing air through the pipe using an air compressor.
- (2) Pour distilled water or ion exchanged water into tank and circulate to clean for about 15 minutes.
- (3) Drain water for cleaning using the same procedure as in (1).
- (4) Immediately pour new coolant previously diluted to 50% density into tank after stirring the coolant.
- (5) Rotate the milling spindle for about 10 minutes to circulate coolant throughout the entire cooling system. Confirm that the coolant has been spread throughout the system sufficiently as indicated by the lowered level of coolant in the tank. If the circulation is not sufficient, turn the knob on the top of the centrifugal pump motor for air bleed.

C. When coolant is excessively deteriorated or discolored and the strainer is clogged by dirt and red rust in the coolant

- (1) Check that recommended coolant was used.
- (2) Check if oil or foreign matter was mixed into coolant in the tank.

Thorough cleaning is required in this case. After checking the above conditions, contact the nearest MAZAK distributor.

4-10 Headstock Cooling Fan

4-10-1 Composition and operation

The headstock is air-cooled by a cooling fan. This fan, located underneath the headstock, takes air in from the machine exterior through an intake duct, then cools the entire headstock efficiently, and lets the air out to the machine exterior. A filter is provided at the end of the intake duct to prevent foreign substances, such as dust and chips, from being taken into the machine.

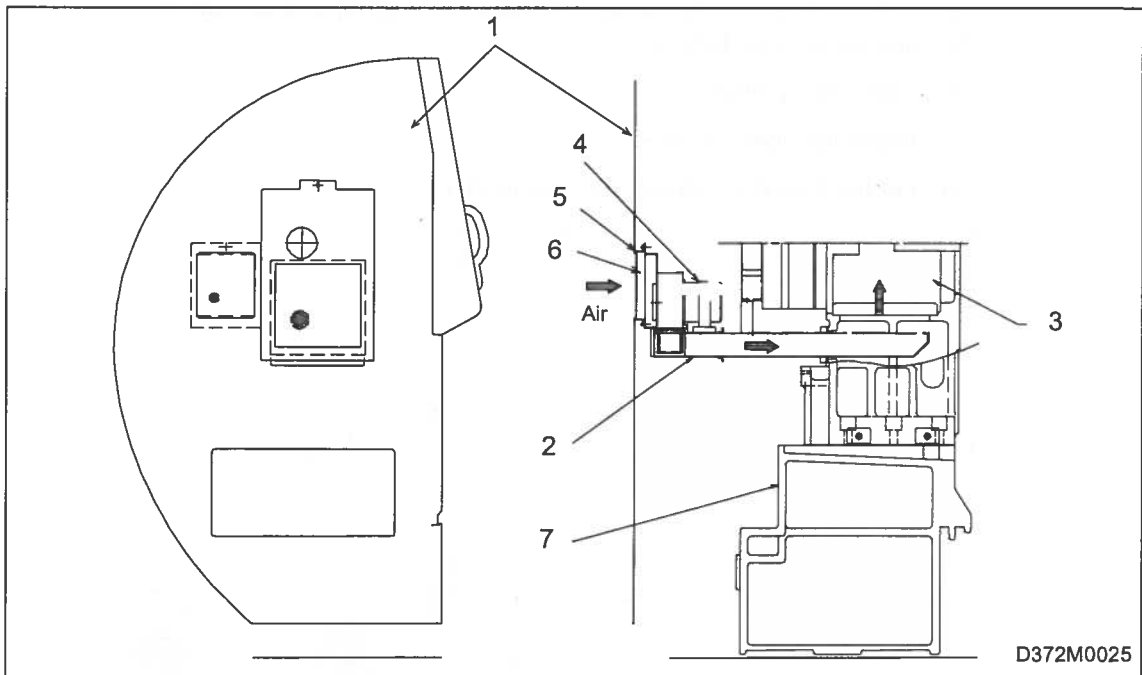


Fig. 4-44 Composition of the headstock cooling fan

No.	Parts name	No.	Parts name
1	Left side cover	5	Filter cover
2	Duct	6	Filter
3	Headstock	7	Bed
4	Fan		

4-10-2 Cleaning



- Before remounting the filter, be sure to allow it to dry well.
- Be absolutely certain to operate the machine with the filter mounted and clean the filter about once a month. (The interval for cleaning varies according to the circumferential conditions.) Otherwise, spindle motor damage may result.

1. Cleaning the air filter

When the air filter is dirty, remove it and wash it lightly in clean water.

The procedure is as follows:

- (1) Remove the filter.
- (2) Wash the filter in water.
- (3) Let the filter dry well and then remount it.

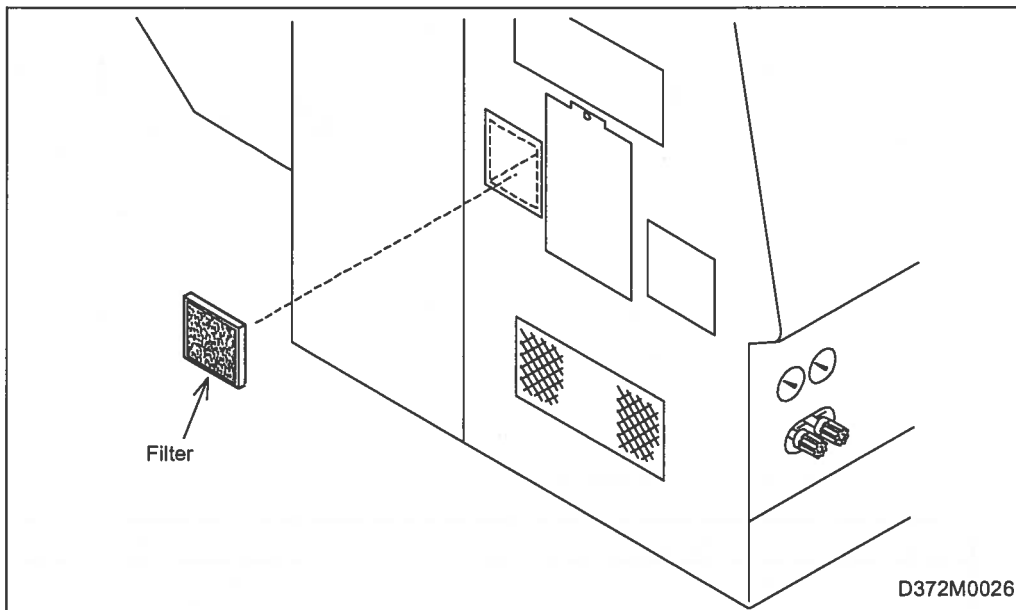


Fig. 4-45 Cleaning the air filter

4-11 Secondary Spindle and W-Axis

4-11-1 Construction and operation

1. Secondary spindle

As with the main spindle, the secondary spindle is also driven directly by a built-in motor. Built-in motor construction converts motor output into machining power without mechanical loss. During manual operation, the spindle speed is directly input to the NC in units of 10 min^{-1} (rpm). During automatic operation, the spindle speed is controlled with the constant cutting surface speed mode. The spindle is cooled with air.

The secondary spindle is indexed in $1/1000$ degree intervals.

2. W-axis

The secondary headstock is driven by the W-axis AC servomotor via the ball screw in the Z-axis direction on the slideway.

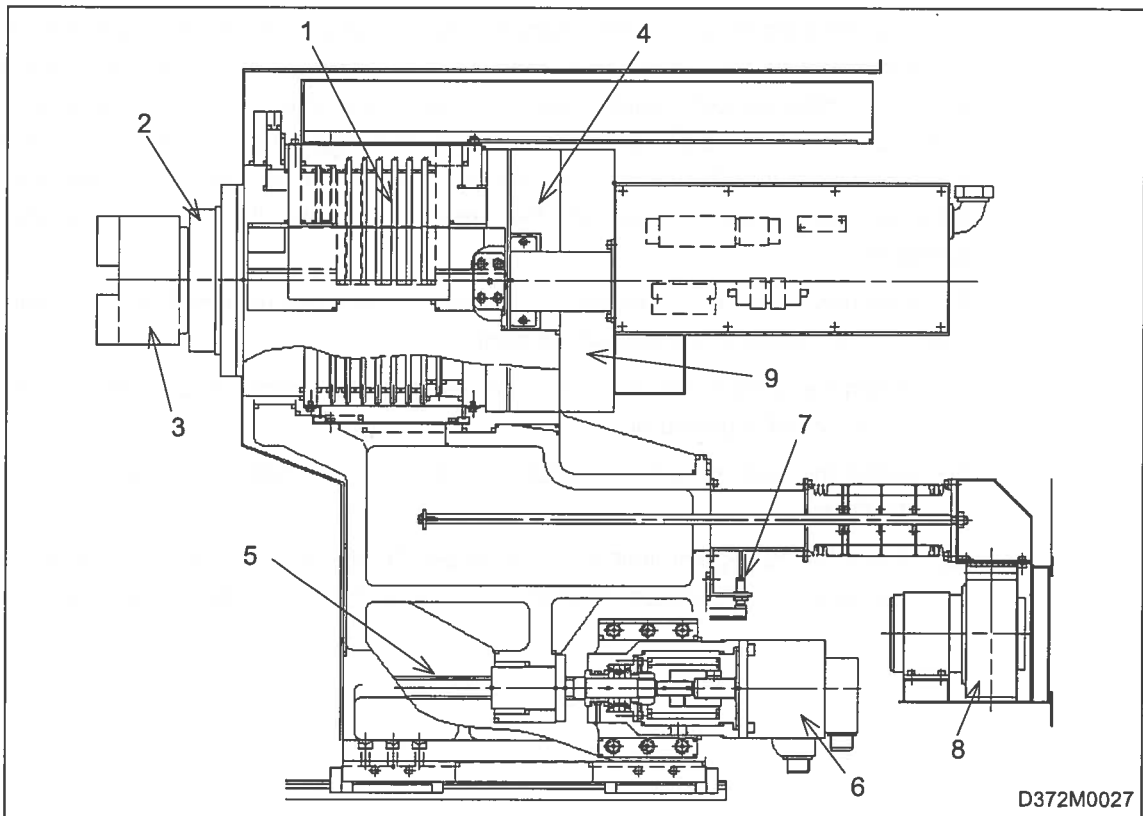


Fig. 4-46 Construction of W-axis

No.	Parts name	No.	Parts name
1	Secondary headstock	6	W-axis AC servomotor
2	Secondary spindle	7	W-axis zero point proximity switch
3	Chuck	8	Secondary spindle cooling fan
4	Indexing encoder	9	Brake
5	W-axis ball screw		

3. Chuck

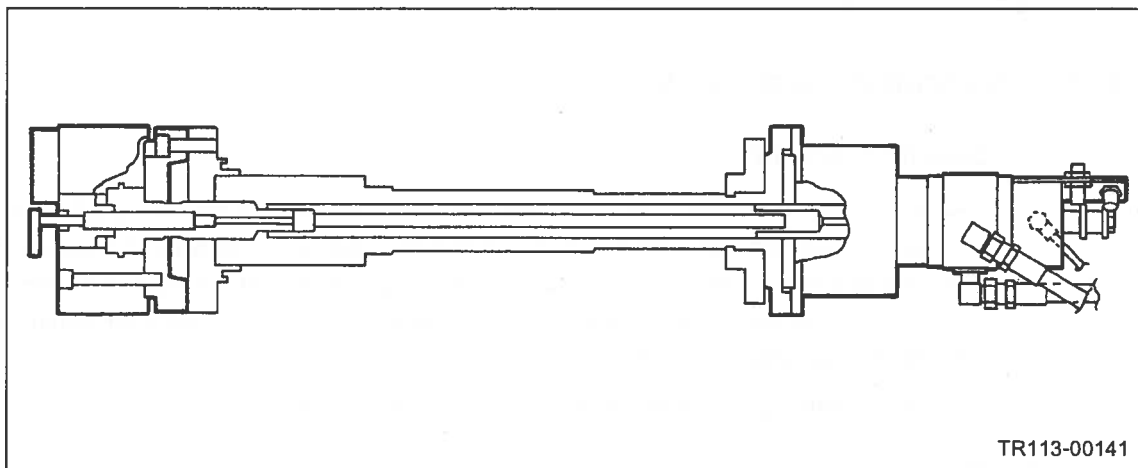


Fig. 4-47 Composition of chuck (Secondary spindle)

4-11-2 Principle of zero-point return

The reference point of the secondary headstock, called "machine zero-point", is located within the secondary headstock travel range. The NC establishes the machine coordinate system in which the machine zero-point is taken as the origin of the coordinate system. The secondary headstock position is controlled in reference to the origin of the machine coordinate system. Just after the power supply has been turned on, the NC has no data of the machine zero-point. To establish the zero-point, perform the zero-point return operation before starting automatic operation.

By performing the zero-point return operation, the predetermined point is established as the machine zero-point in the following manner.

- (1) When the zero-point return key on the operation panel is pressed, the zero-point return mode signal is turned on.
- (2) Using the axis movement switches, move the secondary headstock in the "+" direction of the W-axis.
- (3) When the zero-point limit switch is tripped by the dog, the deceleration signal is turned on, the secondary headstock motion is decelerated, and moves at constant feedrate.

4-12 Secondary Headstock Cooling Fan

4-12-1 Construction and operation

The secondary headstock is air-cooled by a cooling fan. This fan, located underneath the headstock, takes air in from the machine exterior through an intake duct, then cools the entire headstock efficiently, and lets the air out to the machine exterior. A filter is provided at the end of the intake duct to prevent foreign substances, such as dust and chips, from being taken into the machine.

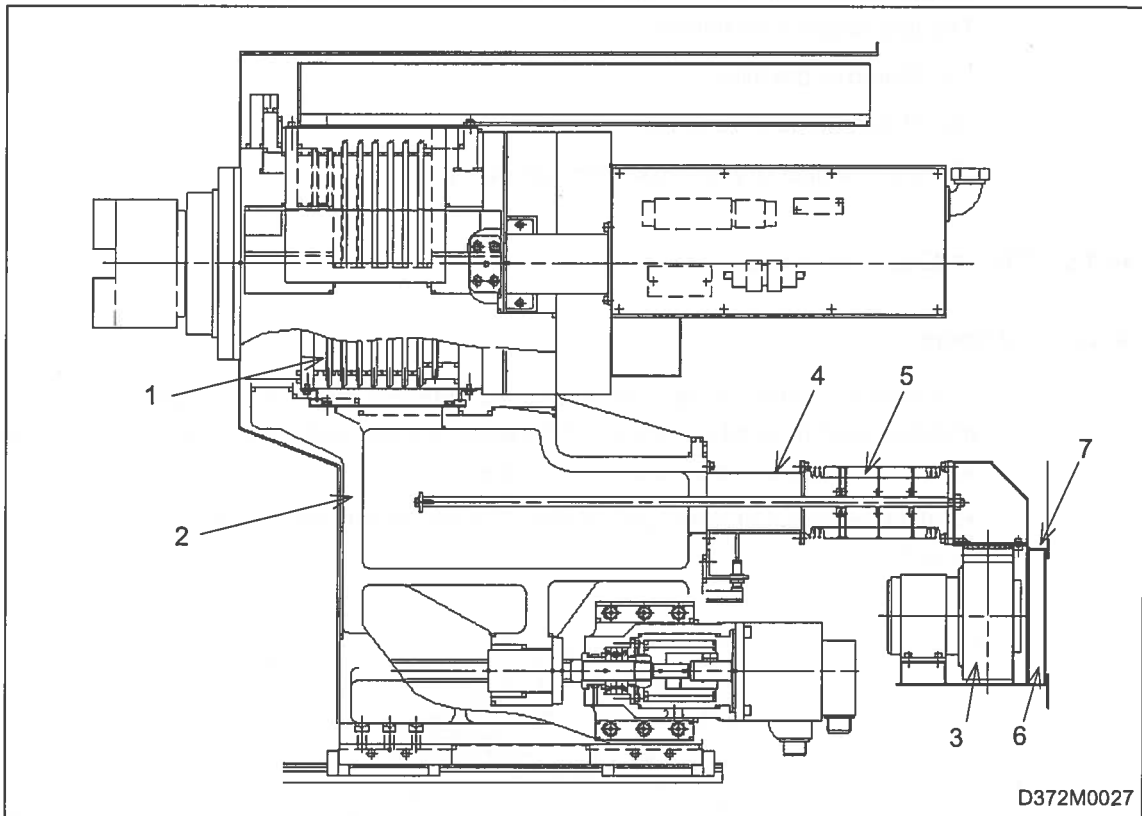


Fig. 4-48 Construction of the secondary headstock cooling fan

No.	Parts name	No.	Parts name
1	Secondary headstock	5	Bellows duct
2	Slide base	6	Filter
3	Headstock cooling fan	7	Filter cover
4	Intake duct		

4-12-2 Cleaning



- Before remounting the filter, be sure to allow it to dry well.
- Be absolutely certain to operate the machine with the filter mounted and clean the filter about once a month. (The interval for cleaning varies according to the circumferential conditions.) Otherwise, spindle motor damage may result.

1. Cleaning the air filter

When the air filter is dirty, remove it and wash it lightly in clean water.

The procedure is as follows:

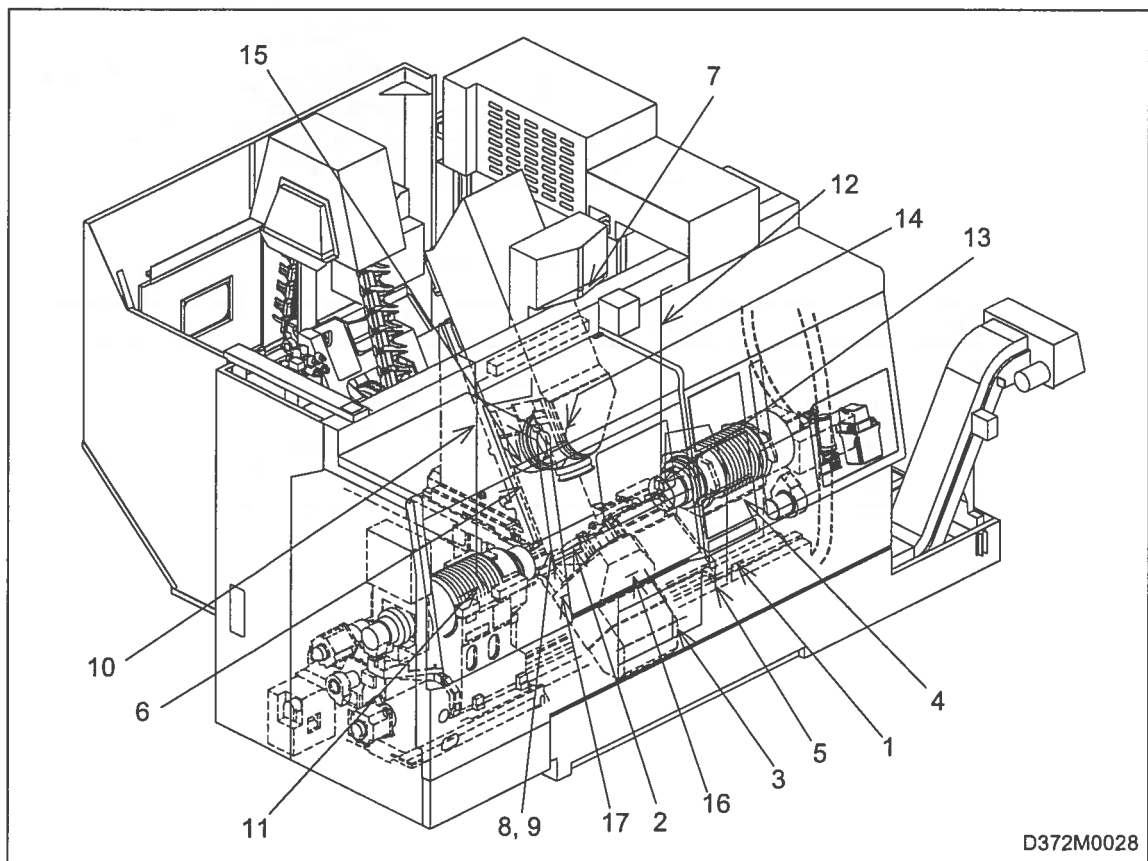
- (1) Remove the filter.
- (2) Wash the filter in water.
- (3) Let the filter dry well and then remount it.

4-13 Other Components

4-13-1 Wipers

The wipers located on each sliding surface prevent chips from entering the sliding surfaces and maintain a uniform oil membrane. Therefore, always watch out for unusual wear on the lips of the wipers and for wiper damage due to chips.

Replace worn-out or damaged wipers. (Please refer to the relevant Parts List and place an order to us.)



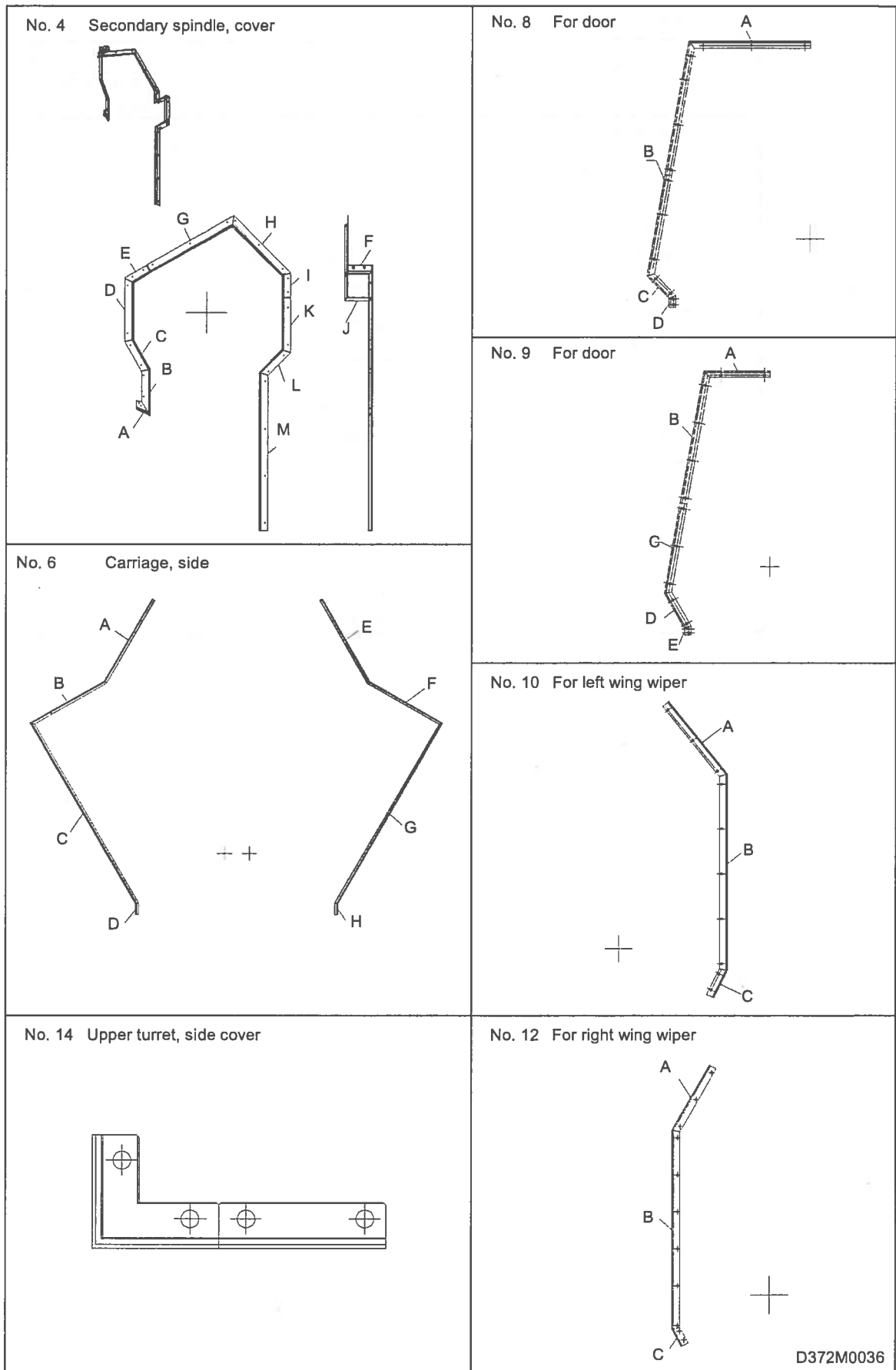
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Fig. 4-49 Wipers for sliding surface, hoses for movable sections or cable conveyors

Table 4-1 List of wipers

No.	Parts No.	Name	Maker	Remarks	Quantity		
					INTEGREX 100-III	INTEGREX 100-IIIS	INTEGREX 100-IIIST
1	33735090060	Wiper	NITTA	Lower turret, duct			1
2	43725507371			Lower turret, upper face			1
3	33725506631			Lower turret, lower			1
4	13725506061			Secondary spindle, cover*		1	1
5	43725506790			Secondary spindle, bottom			1
6	13725507200			Carriage, side*	1	1	1
7	33725507390			For Y-axis	1	1	1
8	23725506281			For door*			
9	23725510541			For door*	1	1	1
10	33725506220			For left wing wiper*	1	1	1
11	43725506240			Left face cover, lower	1	1	1
12	23725506330			For right wing wiper*		1	1
13	43725506350			Right face cover, lower		1	1
14	43721696181			Upper turret, side cover*		1	1
15	43721696101			Upper turret, lower		1	1
16	43721695120			Lower turret, bottom			1
17	43721695130			Lower turret, bottom			1

* The corresponding section consists of multiple parts. See Fig. 4-50.



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Fig. 4-50 Wiper consisting of multiple parts

4-13-2 Procedure for replacing the proximity sensor

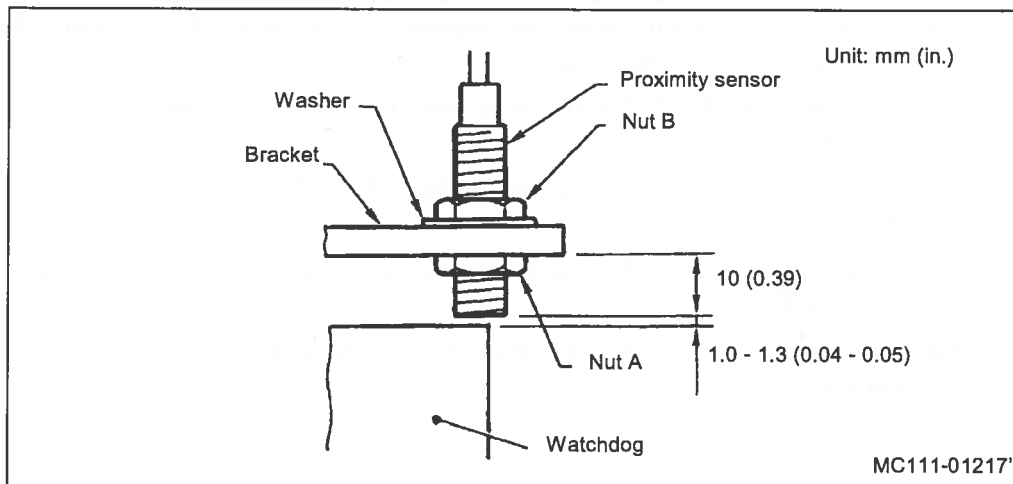


Fig. 4-51 Replacing the proximity sensor

- (1) Remove nuts A and B and remove the sensor.
- (2) Insert a new sensor into the hole of the bracket.
- (3) Hand-tighten nuts A and B.
 - The tightening torque is shown below. Tighten the nuts so that the permissible torque is not exceeded. Overtightening causes damage.
 - Tightening torque: 3 kgf·m (21.7 ft·lbs)
- (4) Measure the clearance between the front end of the sensor and the watchdog. Use a feeler gauge to measure the clearance.
- (5) Perform adjustments for a clearance of 1.0 - 1.3 mm (0.04 - 0.05 in.) between the front end of the sensor and the watchdog. Since the thread of the sensor is pitched at 1 mm (0.04 in.), rotation of the nut through one turn moves the sensor through 1 mm (0.04 in.).
 - A. To move the sensor forward through 1 mm (0.04 in.):
 - Rotate (loosen) nut B through one counterclockwise turn.
 - Rotate (tighten) nut A through one clockwise turn.
 - B. To move the sensor backward through 1 mm (0.04 in.):
 - Rotate (loosen) nut A through one counterclockwise turn.
 - Rotate (tighten) nut B through one clockwise turn.
- (6) Retighten the nuts (be sure to tighten nut A).
- (7) After adjustment, operate the machine and check that the LED of the sensor correctly turns on and off.

Remark: Sensor on/off can also be checked on the **DIAGNOSTIC** display. Refer to the relevant electrical drawings and the NC Operating Manual.

4-13-3 Resetting the thermal relays

If the alarm **264 THERMAL TRIP (SINGLE BLOCK)** is displayed, this indicates that one or more of the thermal relays listed below have tripped. Overloading of the corresponding motor is the likely cause of tripping of the relays.

- Thermal relay FR11 (for hydraulic unit pump motor) at the bottom of electromagnetic switch KM11.
- Thermal relay FR13 (for coolant pump motor) at the bottom of electromagnetic switch KM13
- Thermal relay FR14 (for chip conveyor motor (option)) at the bottom of electromagnetic switch KM14

After removing the cause of overloading of the corresponding motor, reset the thermal relays as shown below.

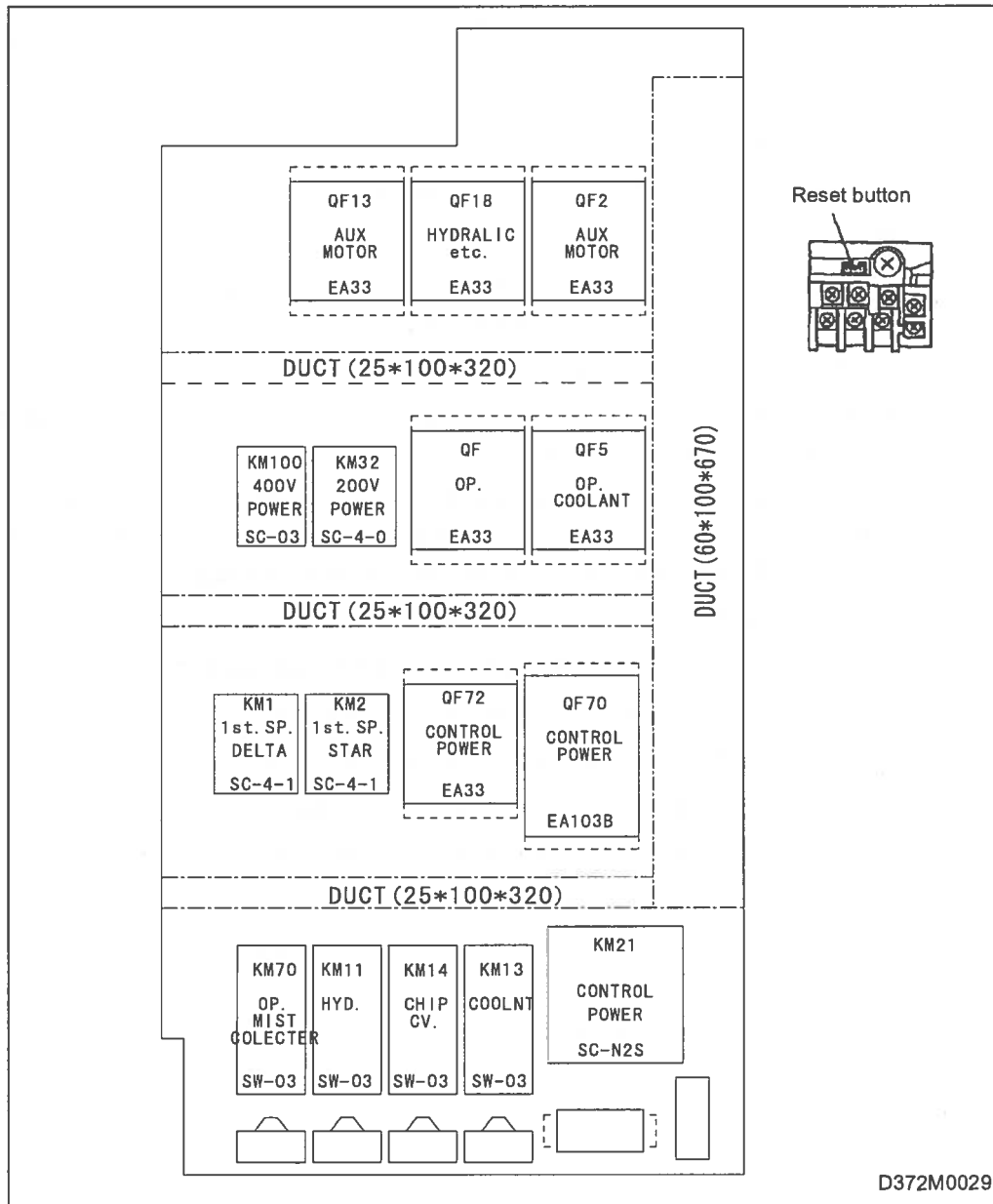


Fig. 4-52 Disposition of the breakers in the electric control cabinet

4-13-4 Replacing the bulbs of the fluorescent lamp



- Before replacing the bulbs of the fluorescent lamp, be absolutely certain to set the main power breaker to OFF and turn off the fluorescent lamp.
- Ask an officially qualified "electrical technician" to replace the bulbs.

The fluorescent lamps are located in the upper section of the machine as shown below.

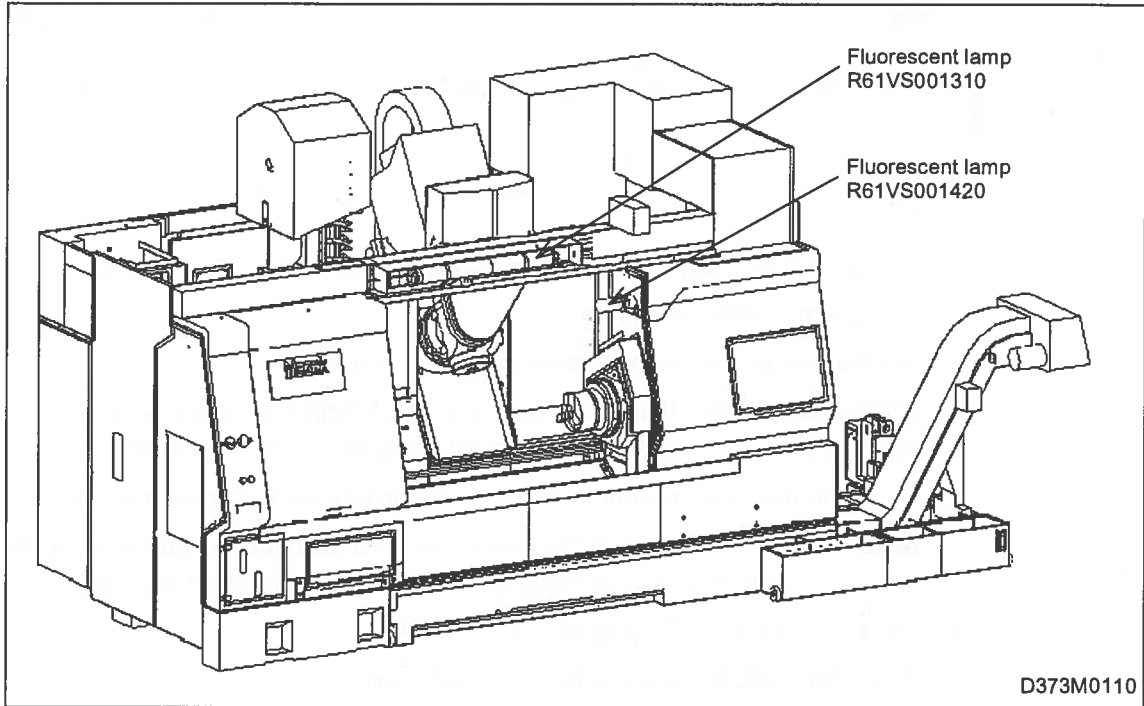


Fig. 4-53

Replacement parts of the machine top fluorescent lamp (R61VS001310)

No.	Parts name	Type	Parts No.
1	Fluorescent bulb	DURUXL 36W/21-840	R61ZZ001340
2	Lamp glass	—	R61VS00131C

Replacement parts of the chuck top fluorescent lamp (R61VS001420)

No.	Parts name	Type	Parts No.
1	Fluorescent bulb	TC-DEL 18W	R61VS00142A
2	Lamp glass	—	R61VS00142C

1. Procedure for replacing the bulb of the machine top fluorescent light (R61VS001310)

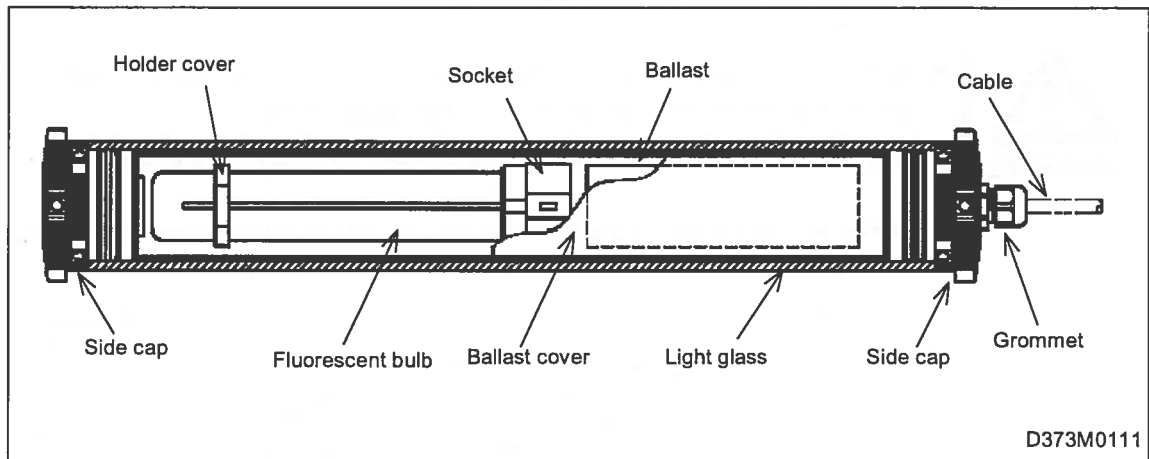


Fig. 4-54

- (1) Loosen the side cap located at the grommet, and remove the cap and the light unit.
- (2) Remove the ballast cover.
- (3) Pry the side of the holder and remove the holder cover.
- (4) While holding down the socket with one hand, hold the front end of the bulb with the other hand, and remove the bulb pulling it out in the direction of the front end.
- (5) Insert the end of a new bulb into the socket in parallel to the body of the fluorescent bulb.

Note: At this time, insert the end of the bulb fully into the socket until you have heard a "click" sound, and make sure that the bulb has been set in the socket properly.
- (6) Mount the holder cover properly on the holder.
- (7) Mount the ballast cover and insert the light unit.
- (8) Match the guide plate of the side cap to the woodruff-shaped space and insert the side cap. Insert a 6 mm-diameter (0.24 in.-diameter) round rod or screwdriver into the hole of the side cap and then while pressing the round rod or the screwdriver against the glass tube, fasten the side cap until the O-ring has come into tight contact with the entire periphery of the glass tube with a width of 2 - 3 mm (0.079 - 0.12 in.). Replacement is now complete.

2. Procedure for replacing the bulb of the chuck top fluorescent light (R61VS001420)

- (1) Rotate the lamp glass and remove it. After this, pull the reflecting plate (or the parabolic louver) out downward and remove it.

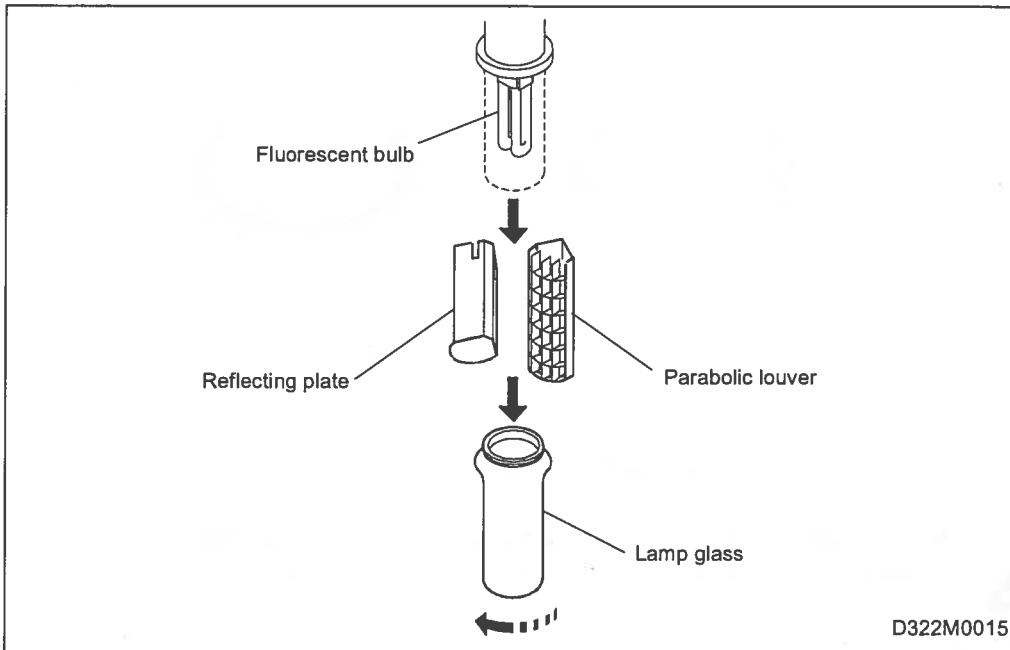


Fig. 4-55 Fluorescent bulb replacement (1/3)

- (2) Flare both wire clips outward. Next after pulling out the fluorescent bulbs downward, remove the bulbs and mount new ones.

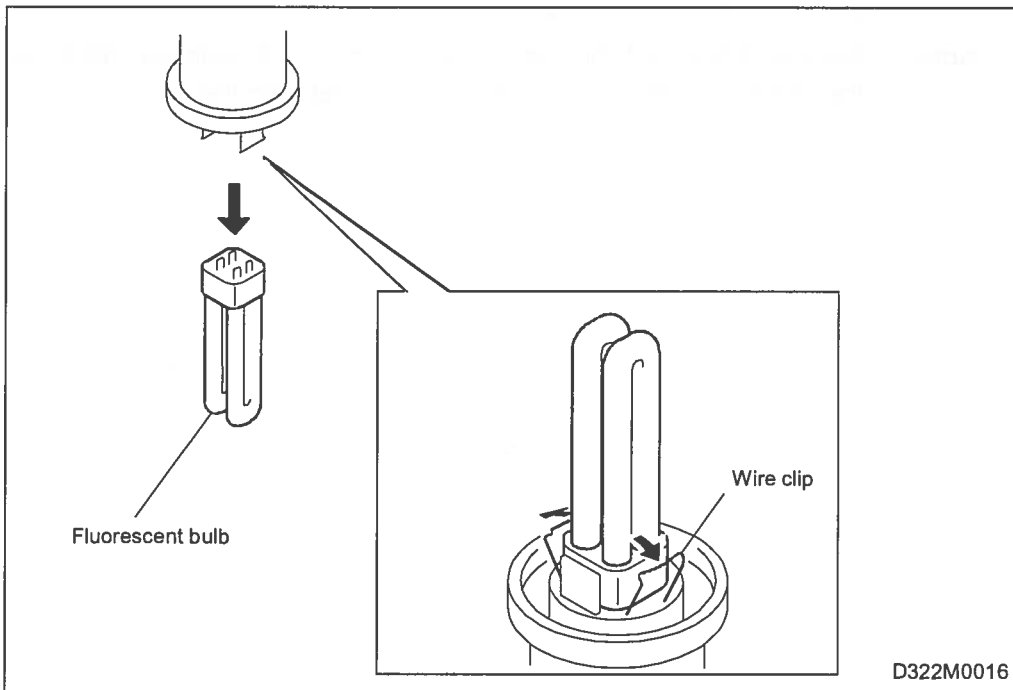


Fig. 4-56 Fluorescent bulb replacement (2/3)

- (3) Mount the light glass in the housing and then fully fasten the glass until the entire surface of a sealing line has been made visible.

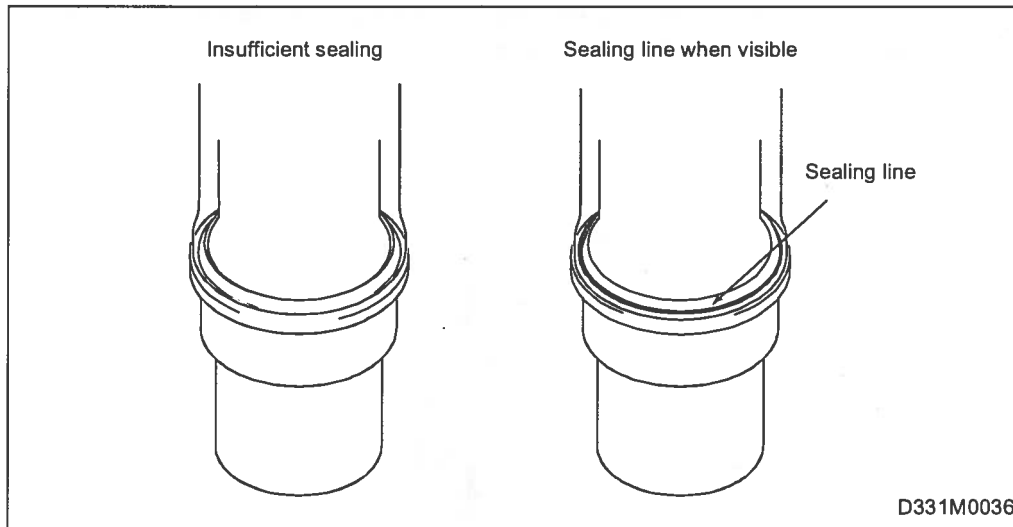


Fig. 4-57 Fluorescent bulb replacement (3/3)



- The bulbs of the fluorescent lamp are to be replaced under its machine-mounted status. Be extra careful not to get injured during the replacement.

Note 1: Use only the manufacturer-designated replacement parts.

Note 2: To clean the lamp glass, use a cloth dampened with a household detergent. Before using a detergent, however, make sure that it does not damage the coated surface or plastic sections of the lamp glass.

Note 3: Make sure that the light glass in the housing is fully fastened until the entire surface of the sealing line has been made visible, and refasten the glass.

4-13-5 Replacing the batteries of the amplifiers

The motor for driving the tailstock, the motor for rotating the ATC unit, and the motor for rotating the magazine each uses the Mitsubishi MR-J2 amplifier. The MR-J2 amplifiers are arranged inside the electrical cabinet. Each amplifier having a built-in battery retains absolute home position data, even after the machine has been powered off. The retained home position data, however, will be lost if the built-in battery runs down. In this case, it is necessary to replace the battery of the amplifier and reset the home position.

The term of battery storage is about five years.

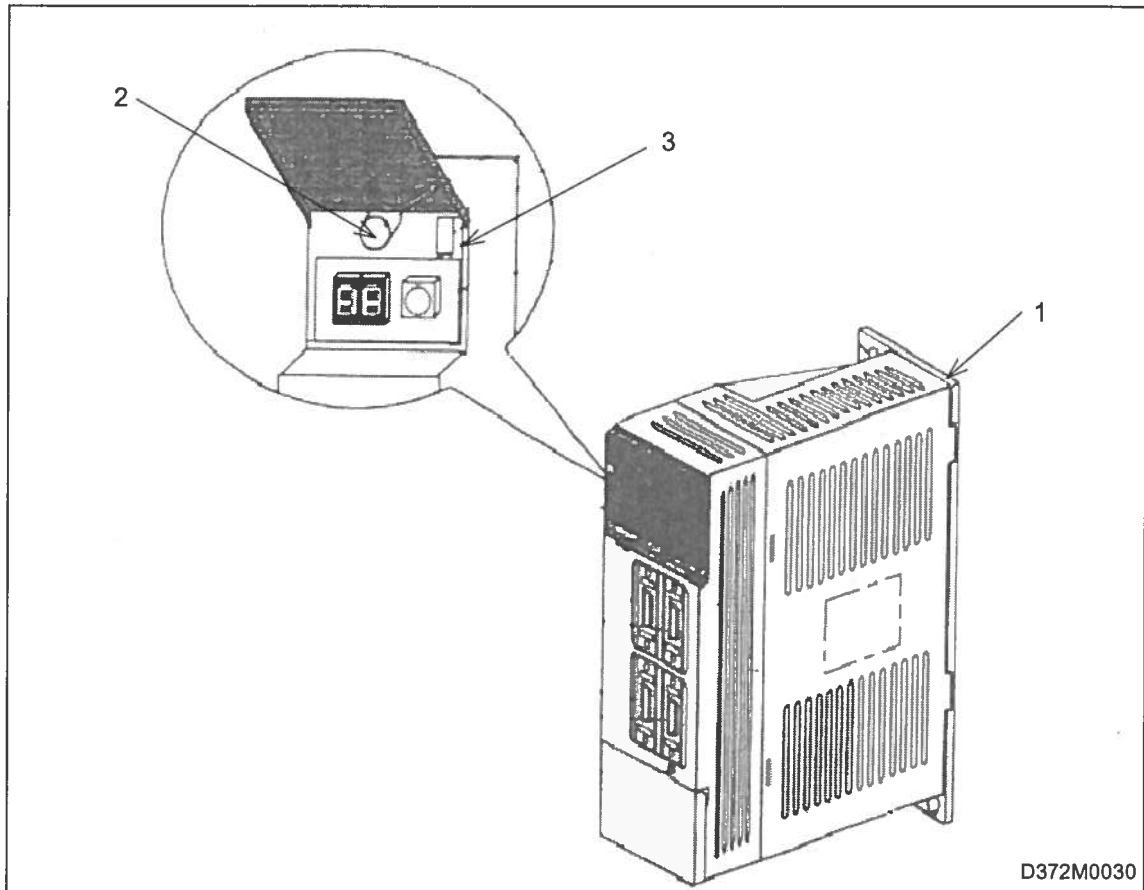


Fig. 4-58 Construction of MR-J2 amplifier

No.	Name	Type (Maker)	Parts No.
1	Amplifier	MR-J2 (Mitsubishi)	—
2	MDS amplifier battery	MR-BAT (Mitsubishi)	D80MA008490
3	Battery connector	—	—

- NOTE -

5 INSTALLATION

5-1 Preparation for Installation

5-1-1 Environmental requirements

1. Machine

Avoid the following places when choosing the installation site for the machine:

- Places subject to direct sunlight, near heat sources, or subject to excessive temperature change
- Humid places
- Dusty places
- Places near vibration generating equipment
- Weak soil

Note 1: If the machine is to be installed near vibration generating equipment, a vibration-proof drain should be provided around the machine foundation.

Note 2: If the soil is weak, reinforce it by driving piles into the soil to avoid settlement and inclination of the soil after machine installation.

2. NC

A. Ambient temperature

During machine operation: 5° to 40°C (41° to 104°F)

Note: When power is turned on, if the thermal sensor detects an ambient temperature under 5°C, the hard disk warm-up status indicator lamp will light up and the NC unit will not start operating at once. After automatic heating of the hard disk by its internal heater, the lamp will go out and the NC unit will start. It takes about 20 minutes for temperature to increase from 0 to 5°C in order to avoid condensation due to sudden changes in temperature.

B. Relative humidity

During machine operation: 30 to 75 % (without bedewing)

Note: As humidity increases, insulation deteriorates causing electrical component parts to deteriorate quickly.

C. Vibration

During operation: Less than 5 m/s² (0.5 G)
During transportation: Less than 35 m/s² (3.5 G)

D. Environment

If the machine must be installed in a dusty place or in an environment where organic, corrosive gas concentration is high, consult Mazak for proper measures.

Note: MAZATROL uses a memory back up battery (lithium battery) to maintain important data stored in memory even after power supply is turned off. However, since the back-up data may be lost due to expiration of battery life or misoperation or unexpected trouble, to ensure safety of important data, it is advisable to store the data such as machining programs, tool data and parameters with external device.

5-1-2 Power requirements



- To connect power supply cables, grounding with grounding resistance 100 Ω or less must be performed.
- When an earth leakage breaker is used, select one with a trip current of 200 mA. One with a trip current of 30 mA cannot be used for this machine equipped with inverters.
- Use an AC inverter-use circuit breaker as the main power breaker of the factory. If an AC inverter-use circuit breaker is not used, the breaker may be tripped by the characteristic high-frequency leakage current of the AC inverter.

If power capacity in your shop is insufficient for the machine, it will cause unexpected troubles on machine functions and, further, result in shorter service life of electricals. In addition to those problems, insufficient power capacity might result in hazardous conditions of machine operation. Therefore, great care should be taken on power facilities in your shop so that the machine can be operated under rated power conditions.

1. Power requirement

Voltage : AC200/220V 3-phase
 Permissible fluctuation : -10 to +10%
 Frequency : 50/60 Hz ±1 Hz

No.	Item	100-III	100-IIIS	100-IIIST
1	Main motor	16.10 kVA	27.30 kVA	29.31 kVA
2	Control circuits	1.0 kVA		
3	NC unit	0.2 kVA		
4	Others	4.43 kVA		4.67 kVA
	Total (half-hourly rating)	21.73 kVA (27.10 kVA)	32.93 kVA (43.43 kVA)	35.18 kVA (44.74 kVA)

2. Electrical installation (200 V)

	100-III	100-IIIS	100-IIIST
Primary incoming cable	Min. 50 mm ² (0.08 in ²)		
Main grounding cable	Min. 38 mm ² (0.06 in ²)		

3. Primary side breaker (200 V)

100-III, 100-IIIST, 100-IIIT Breaker with a trip current of 225 A

5-2 Air Source Requirements

If the discharge pressure of a compressor becomes less than the minimum required discharge pressure 0.5 MPa (71.12 PSI), the malfunction of air unit occurs. Use a compressor of sufficient capacity.

Pressure 0.5 MPa (71.15 PSI) or more

Discharge Standard: 500 L/min (ANR)(17.65 ft³/min)

Recommended compressor capacity: 3.5 kW (5 HP) or more

Model with GL: 700 L/min (ANR) (24.5 ft³/min)

Recommended compressor capacity: 5.63 kW (7.5 HP) or more

Note: If the air has a high moisture content or if hot air is used, damage to the air actuators and equipment could result. In such cases, use an air dryer or similar equipment. The machine with a lower turret (100-IIIIST) requires an additional airflow rate of 100 L/min (ANR) (3.53 ft³/min). That is, the total air supply capacity required of the machine is 600 L/min (ANR) (21.18 ft³/min).

5-3 Machine Installation

For machine tools, machining accuracy of them is greatly influenced by the installation conditions: However, how precisely the slideway surfaces have been finished, machining accuracy will be poor if the machine is not correctly installed. Some users will have an experience that newly purchased machine cannot provide the expected accuracy. Among many possible causes of unsatisfactory finish, many such cases are resulted from poor machine installation.

Please read the following machine installation instructions carefully to install the machine as it was assembled in our factory; it provides you with expected high accuracy of machining.

5-3-1 Precautions for machine installation



WARNING

- Two or more workers are necessary to handle heavy objects.
- Only authorized workers should use a forklift or crane, or lift the machine using wire ropes.
- When operating a forklift or crane, care should be taken not to hit other objects.
- Use wire rope or a sling that can tolerate the weight to be lifted.
- Check the wire rope or sling, hoist, or other lifting equipment before using them. Never use defective wire rope/slings or lifting equipment.



CAUTION

- The machine must be lifted properly. Lift the machine slightly from the floor to check if it is well balanced.
- The angle made by the wire rope or sling must be less than 60°.
- When two or more workers are working together to lift the machine, they should cooperate carefully using signals.
- When lifting the machine, great care should be taken not to shock the machine, NC unit, or electrical control cabinet.
- Before lifting the machine, check that each machine unit is fixed in position and that there are no tools or other things on the machine.

*The coolant unit will be delivered separately.

1. Procedure to lift the machine

- (1) The machine is fitted with three hooks on the bed for lifting.
- (2) Place the wire ropes on the crane hook.
Place wood blocks or pads between the machine and wire ropes so that the machine will not be damaged.
- (3) Lift the machine with crane.

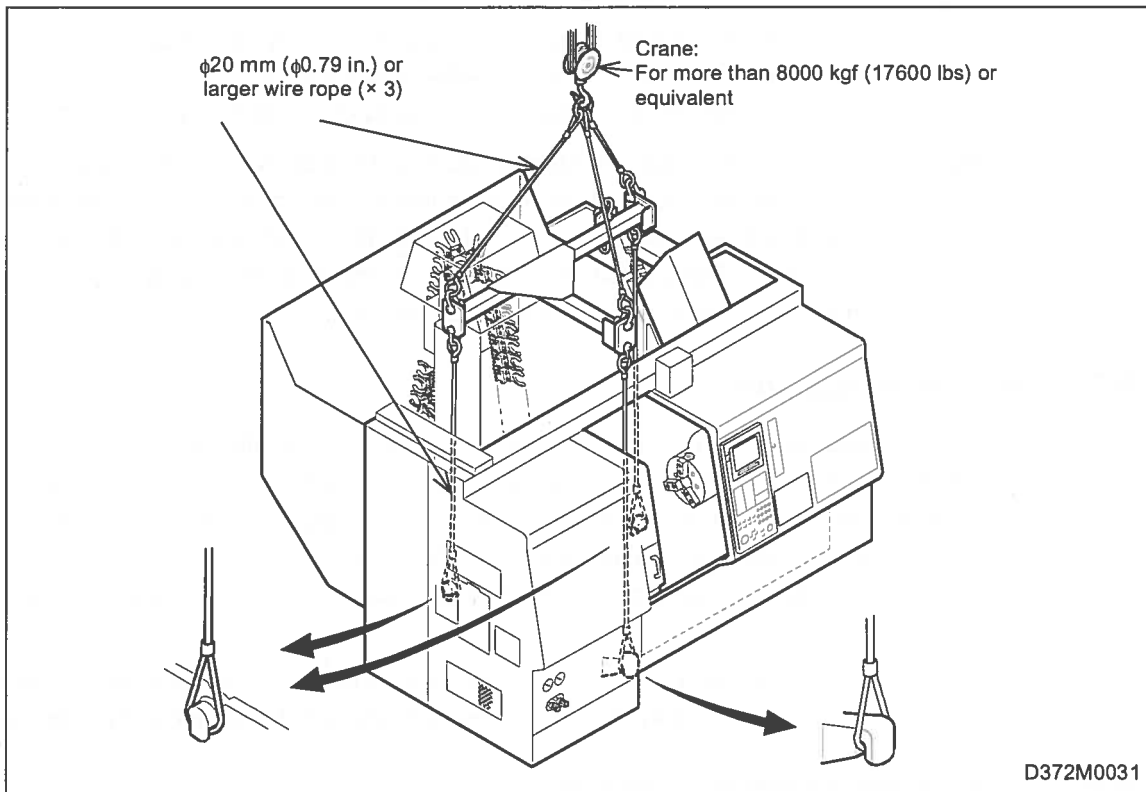


Fig. 5-1 Lifting the machine

Item	Weight [Unit: kgf (lbs)]			
	INTEGREX 100-III (without tailstock)	INTEGREX 100-III	INTEGREX 100-IIIS	INTEGREX 100-IIIST
Machine proper (with 40-tool magazine)	6200 (13640)	6500 (14300)	7000 (15400)	7500 (16500)
Coolant tank	130 (286)		135 (297)	160 (352)
Chip conveyor	190 (418)		220 (484)	300 (660)

Machine dimensions

Refer to the overall view for the machine dimensions during transportation of the machine.

Note: The figures indicated on the machine plates shall be applied if different from the manual.

5-3-2 Unpacking, inspection and cleaning

1. Removing the transit clamps

The machine is shipped with transit clamps so that the machine units will not move during transportation. After installing the machine, remove all of the transit clamps. Store the transit plates and clamps in a suitable place to allow for reuse during movement or transport in the future.

2. Installing the covers

Install the covers and other parts, which are supplied in separate packages.

3. Cleaning

After having placed the machine on the base, remove the rust preventive coating from the slideway surfaces and machined surfaces using rags and cleaning oil. Never try to operate any section of the machine before cleaning since the rust preventive coating is apt to have been contaminated with dusts and other foreign particles during machine transportation.

After having completely removed the rust preventive coating, apply the specified lubricant to the slideway surfaces.

Note 1: When removing the rust preventive coating with cleaning oil, great care should be taken so that the cleaning oil does not enter into the slideway surfaces passing the wiper.

Note 2: Used rags should be disposed of at a predetermined place.

5-3-3 Installation

1. Foundation

If the soil of the machine installation site is too soft and too weak, the ground of that place may subside or incline. The ground of the installation site, therefore, must be made hard enough by casting concrete.

Note 1: To ensure appropriate machine maintenance, as shown in the foundation drawing, the appropriate floor space including the maintenance space is required in addition to the machine projection area.

Note 2: Initially after the machine has been installed, changes in the ground of the foundation, the instability of its hardening, and other factors may significantly change the level of the machine bed and affect machine accuracy. At the same time, accidents may become prone to occur. The greatest possible care must therefore be taken during the operation of the machine.

2. Installation method

A. Using a foundation plate

Before installing the machine, put a foundation plate under the corresponding jack bolt and install the machine on it.

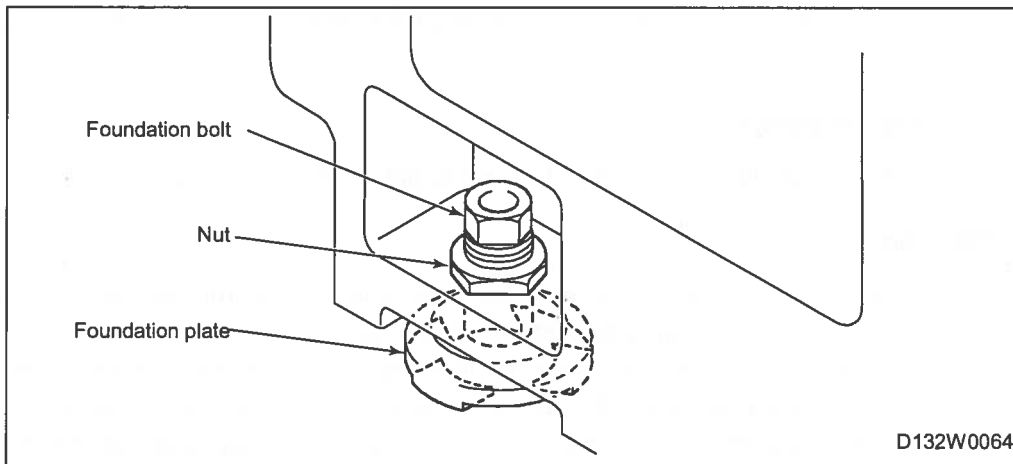


Fig. 5-2 Foundation parts

B. Using anchor bolts

- (1) Make sure that there is a hole in the sections where the anchor bolt is to be driven.
- (2) Place a wedge plate near the anchor bolt driving hole on the floor so that the machine can be installed horizontally at the required height.
- (3) Install the machine so that the L-section of the jack bolt is positioned in the anchor bolt driving hole.

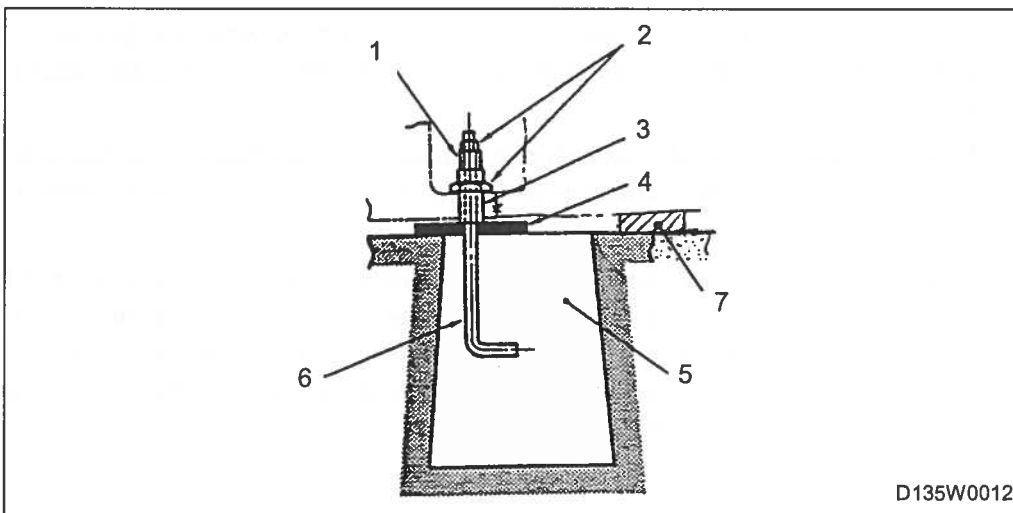


Fig. 5-3 Installation method — using anchor bolts

As shown in the figure above, assemble one anchor bolt set on one jack bolt.

No.	Parts name	No.	Parts name
1	Lock nut	5	Anchor bolt driving hole
2	Nut	6	Anchor bolt
3	Jack bolt	7	Wedge plate
4	Floor plate		

(4) Cast concrete into the anchor bolt driving hole.

Note: Machine body - coolant tank clearance adjustment

Set the jack bolts so that the clearance between the body of the machine and the coolant tank becomes about 10 mm (0.39 in.) for the prevention of water leakage. Also, the machine body should be horizontal or the headstock side should be slightly upward.

Failure to observe these instructions causes water leakage.

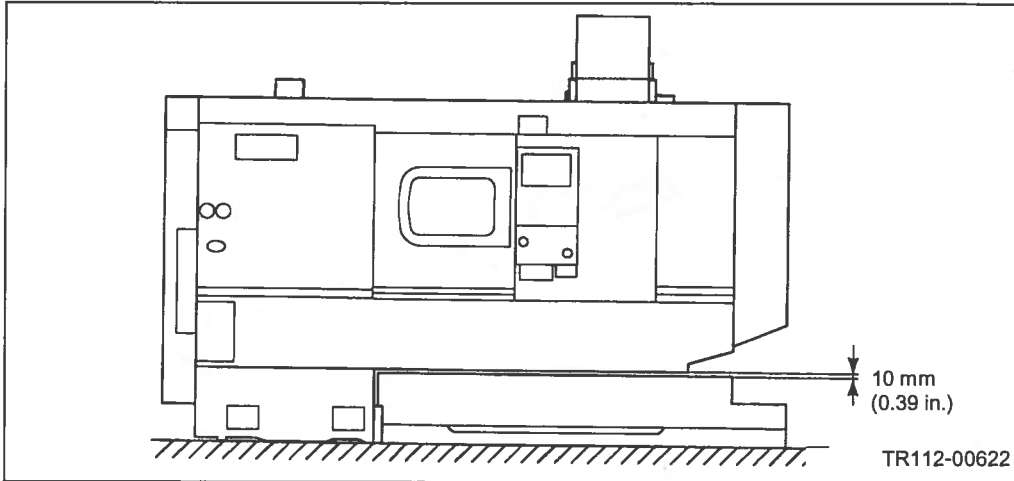


Fig. 5-4 Adjusting the clearance between the body of the machine and the coolant tank

C. Leveling

Accurately level the machine using the jack bolts accompanying the machine bed, control cabinet base and the hydraulic unit.

5-3-4 Removing the transit clamps

The machine is shipped with its movable sections fixed using the shipping brackets shown below. When machine installation is completed, remove these shipping brackets and store them in a suitable place to allow for reuse during movement or transport of the machine in the future.

1. X-axis

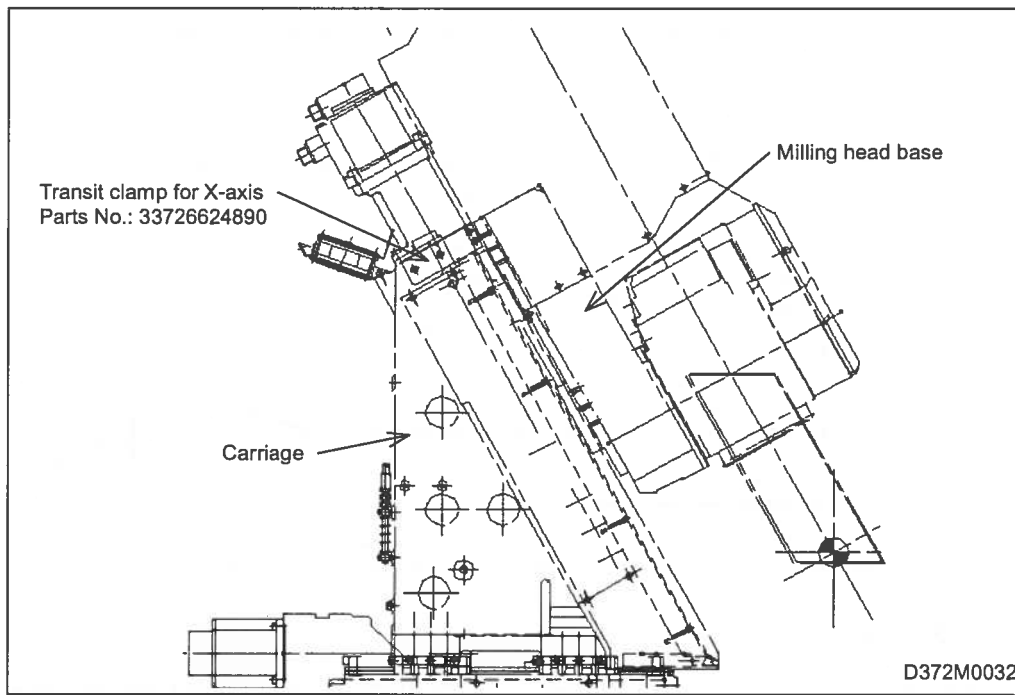


Fig. 5-5 Details for transit clamp location – X-axis

2. Yt-axis and Z-axis

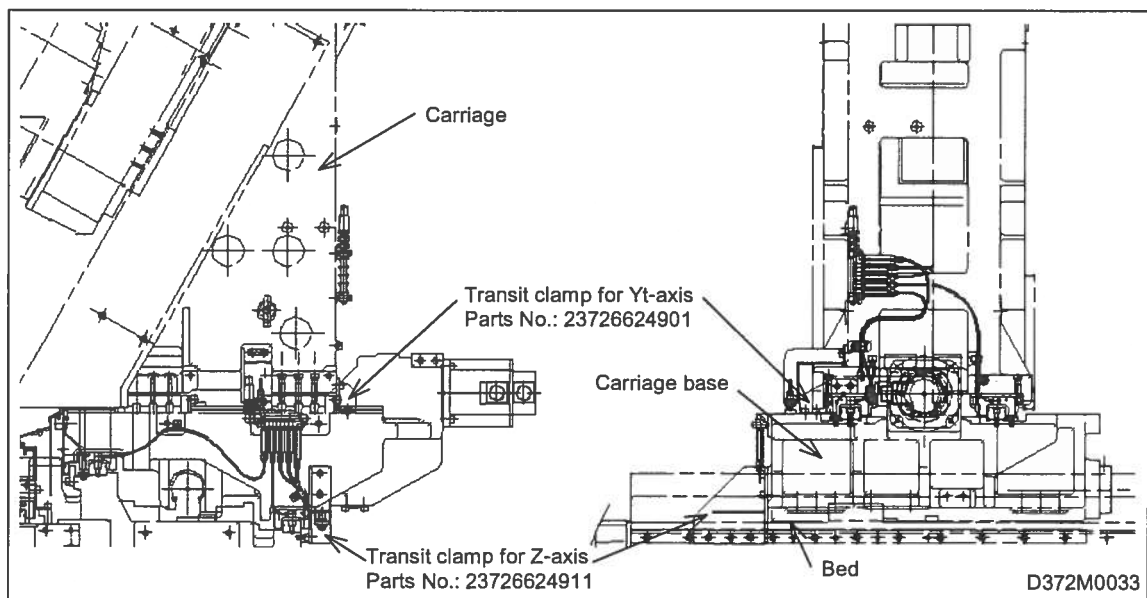


Fig. 5-6 Details for each transit clamps location – Yt- and Z-axis

3. Tailstock

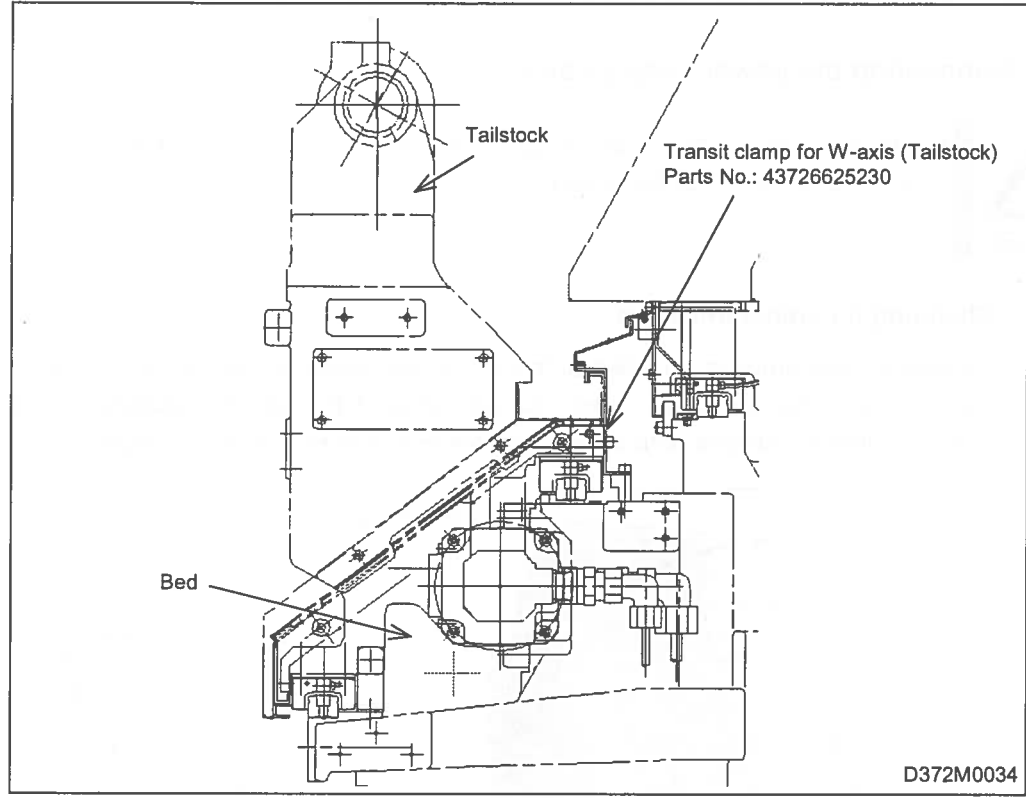


Fig. 5-7 Details for transit clamp location – Tailstock

4. W-axis and Lower turret

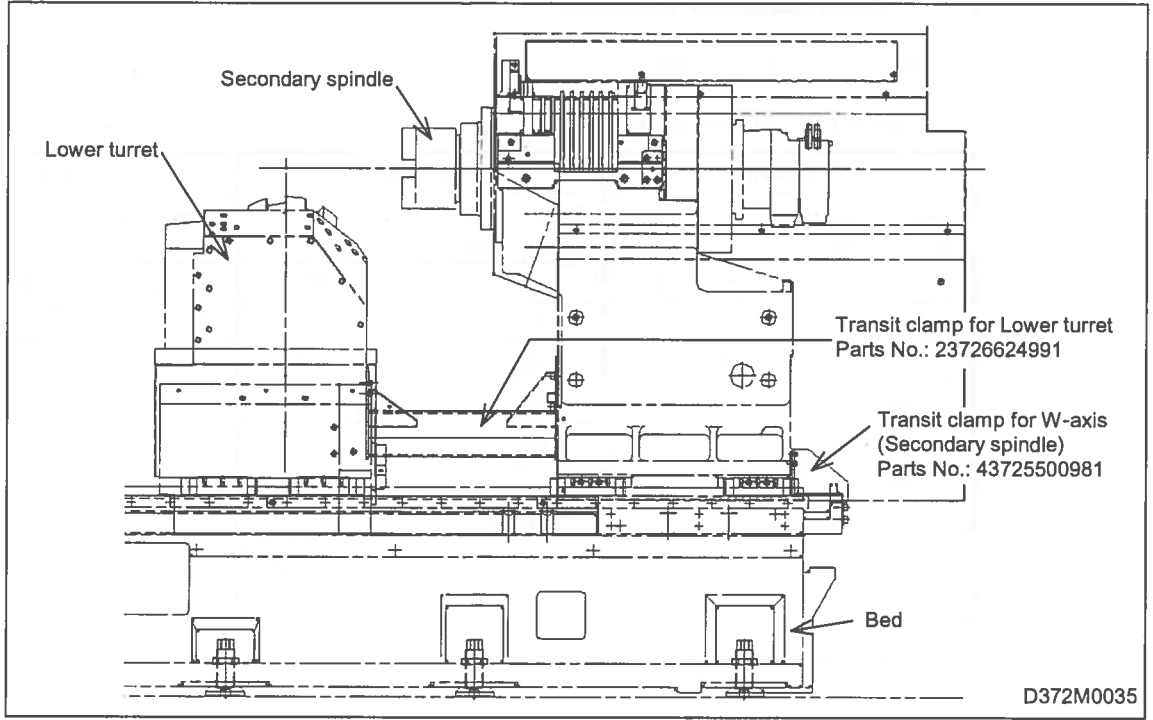


Fig. 5-8 Details for transit clamp location – Lower turret and Secondary spindle

5-4 Connecting the Power Supply Cable and Air Supply Hose

5-4-1 Connecting the power supply cable



- Do not connect the power supply cable to the factory power distribution board until all installation work has been completed.

1. Changing the transformer tap

A power transformer is provided at the top of the control panel. Change/set the transformer tap according to the particular power requirements of the factory equipment. A transformer tap setting table is provided both in the transformer box and near the transformer unit.

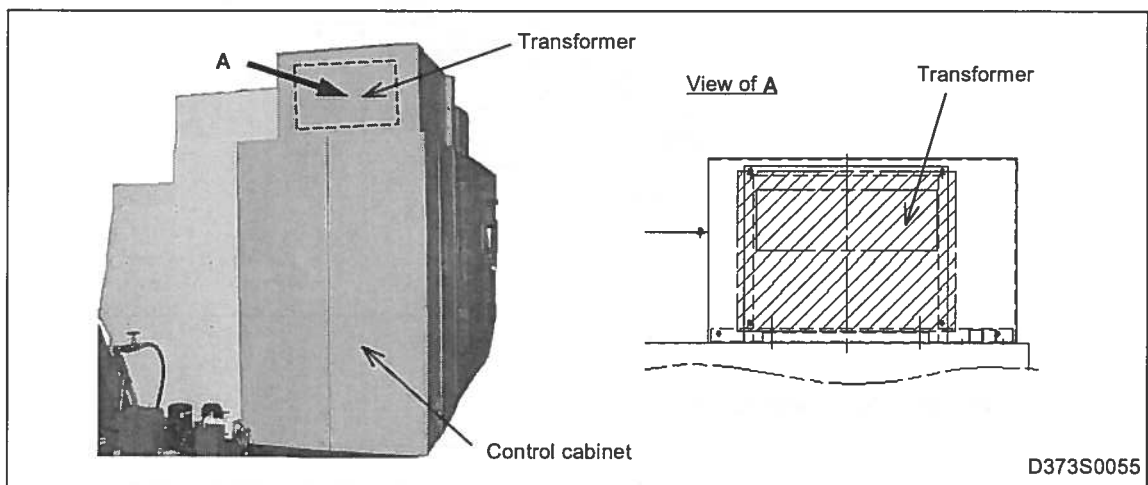


Fig. 5-9 Transformer location

Table 5-1 Transformer tap setting

For Japan		For USA		For Europe	
Factory power supply voltage	Connection	Factory power supply voltage	Connection	Factory power supply voltage	Connection
200 V	1-5/1-5/1-5	200 V	1-4/1-4/1-4	380 V	R0-11/S0-21/T0-31
220 V	2-5/2-5/2-5	220 V	2-4/2-4/2-4	400 V	R0-12/S0-22/T0-32
230 V		230 V		415 V	
240 V		240 V			
380 V	3-5/3-5/3-5	440 V	3-4/3-4/3-4	/	
400 V		460 V			
415 V		480 V			
440 V	4-5/4-5/4-5	/			
460 V					
480 V					

2. Connecting the machine with the factory power supply

- (1) Remove the cover of the main power breaker located at the bottom right of the machine when seen toward the machine rear, by loosening the screws and setting the main power breaker to the OPEN RESET position.
- (2) Connect the wires of the cable as shown below.

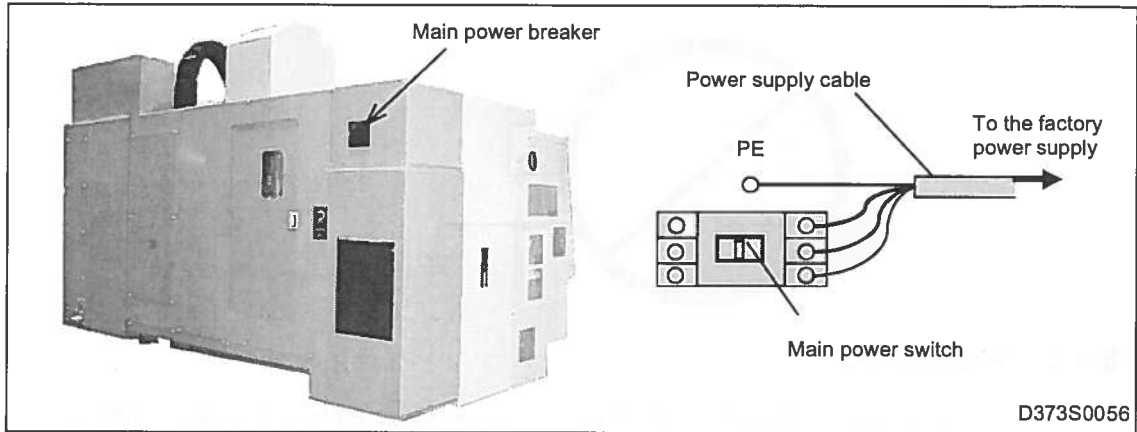


Fig. 5-10 Connecting the power supply cable

5-4-2 Grounding

1. All electrical devices must be grounded in order to protect personnel and machines from electrical hazards. Grounding must be performed after the machine has been installed in accordance with the standards for electrical equipment.
2. The grounding point should be as close as possible to the machine.
3. The work must be performed by personnel with publicly recognized qualifications.

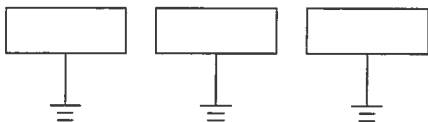
Grounding resistance: 100 Ω max.
 Cross-sectional area of wires: At least half of cross-sectional area of primary incoming cable.
 100-III..... Min. 38 mm² (0.06 in²)
 100-IIIS/IIIST Min. 50 mm² (0.08 in²)
 Measuring equipment: 500 V megger



- The grounding work must be entrusted to an electrical engineer with publicly recognized qualifications. If the work is done by an unqualified person, it could result in serious injury, death, or damage to the machine.

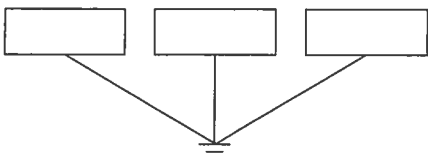
4. The connections between the machines and ground should be made as indicated below.

<Independent connections>



Each grounding resistance = 100 Ω max.

<Common connection>



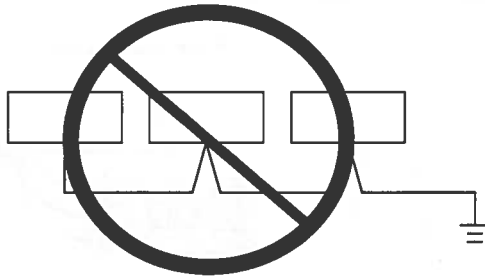
* The wires from the grounding terminal should be directly connected to each of the machines.

$$\text{Grounding resistance} = \frac{100}{\text{Number of machines}} \Omega$$

5. Never perform grounding as shown below.



- When the grounding work is performed, no more than one wire should be connected to any terminal. The reason for this is to prevent a serious accident. For example, if a wiring plan like the one shown below is used, a faulty connection at one of the terminals could cause short-circuited current from another terminal to be fed back to the machine, resulting in serious damage.



5-4-3 Phase check

Do not fail to check for correct power phase, since an incorrect power phase causes not only NC unit malfunctions or AC converter circuit faults, but also blown fuses, a non-controllable machine status, or other trouble.

- (1) Make sure that the main power breaker is set to the OFF position.
- (2) After connecting terminals U, V, and W of the transformer to terminals R, S, and T, respectively, of a phase meter, and then check that the needle of the phase meter rotates clockwise.

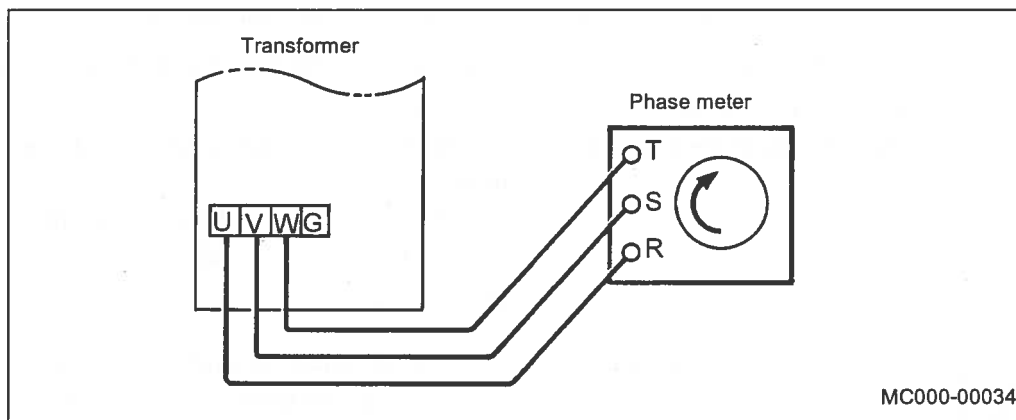


Fig. 5-11 Phase check

5-4-4 Connecting the air hose

Connect the air supply hose to the air hose connecting port located inside the left side cover. (See the Fig. 4-40.)

5-5 Final Leveling

After the mortar has cured, adjust the machine level using leveling bolts. For details on the procedure to adjust the machine level and allowable leveling error, refer to the attached accuracy table.

Note: During final leveling, accurate levelness must be achieved with both the foundation bolts and the leveling nuts correctly tightened.

5-6 Trial Operation

After connecting the power supply cables and air supply hose to the machine, check the following points before starting trial operation.

- The machine and machine parts are all free from damages.
- There are no missing parts and accessories.
- Each part of the machine is lubricated with the specified lubricating oil.
- The hydraulic pipes and hoses are securely connected.
- The air supply hose is securely connected.
- The coolant tank is mounted at the correct position.
- The lifting jigs and the shipping brackets for each axis are removed.
- The grounding is provided.
- The electrical phase matches.

- NOTE -

6 TROUBLESHOOTING

6-1 Troubleshooting Procedures

6-1-1 If the tool has come into contact with the workpiece, chucks or other sections

- (1) Immediately press the EMERGENCY STOP push-button.
- (2) Check the tool, the workpiece, the chuck, etc.
- (3) Reset the EMERGENCY STOP push-button.
- (4) If the operation ready indicator lamp of the NC unit is off or an alarm number is displayed, see the tables on troubleshooting and alarm display.
- (5) If the states mentioned in step (4) above are not occurring, move the tool in the direction that it does not interfere with the workpiece, chuck or other sections.
- (6) Replace the tool, workpiece, chuck, etc. if they have been damaged or become defective.
- (7) Before restarting the machine, perform visual and audible checks for damage and unusual operating sounds. If any trouble is found, please contact our Mazak user service representative.
- (8) If the machine is not damaged, machine a test piece(s) and check for normal machining and for sufficient accuracy.
- (9) If accuracy and/or machining is abnormal, perform chuck, headstock, and tailstock alignment adjustments.

6-1-2 If the source of the trouble cannot be located

When the machine has any trouble, check the following points first and then inspect and maintain the machine according to the instructions of this chapter.

Check of following points helps you when you inquire of our service center about machine trouble.

1. If the machine is equipped with the **GRAPHIC MAINTENANCE** display, check the parts name where the alarm has occurred on this display.
2. When the alarm message concerning the machining navigation function is displayed, follow its instruction.
3. Check the whole alarm history with the **DIAGNOSIS (ALARM)** display.
For details of the **DIAGNOSIS (ALARM)** display, refer to the Operating Manual of the NC unit.
4. Check to see whether the same trouble was recorded in the alarm history or not.
5. Check to see whether the ambient temperature meets the specifications or not.
6. Check to see if there was momentary power failure before the machine trouble or not.
7. Check to see if the supply voltage is constantly normal or not. (Does supply voltage sharply change by time?)
8. Check to see if there is a difference between spindle normal rotation and reverse rotation or not.
9. Check to see if the trouble occurs in a certain operational condition or not.
10. How frequently does the same trouble occur?
11. How many years has the machine worked?

12. Did you take any emergency measure against the trouble?
13. In case of the alarm related to the spindle and servomotor, check the number displayed on the LCD of each drive unit.

6-1-3 GRAPHIC MAINTENANCE display

1. Outline

If a PC-related alarm occurs, the name of the part where the alarm has occurred will be displayed in reverse status on a layout diagram of the corresponding section, which is very useful for early machine recovery.

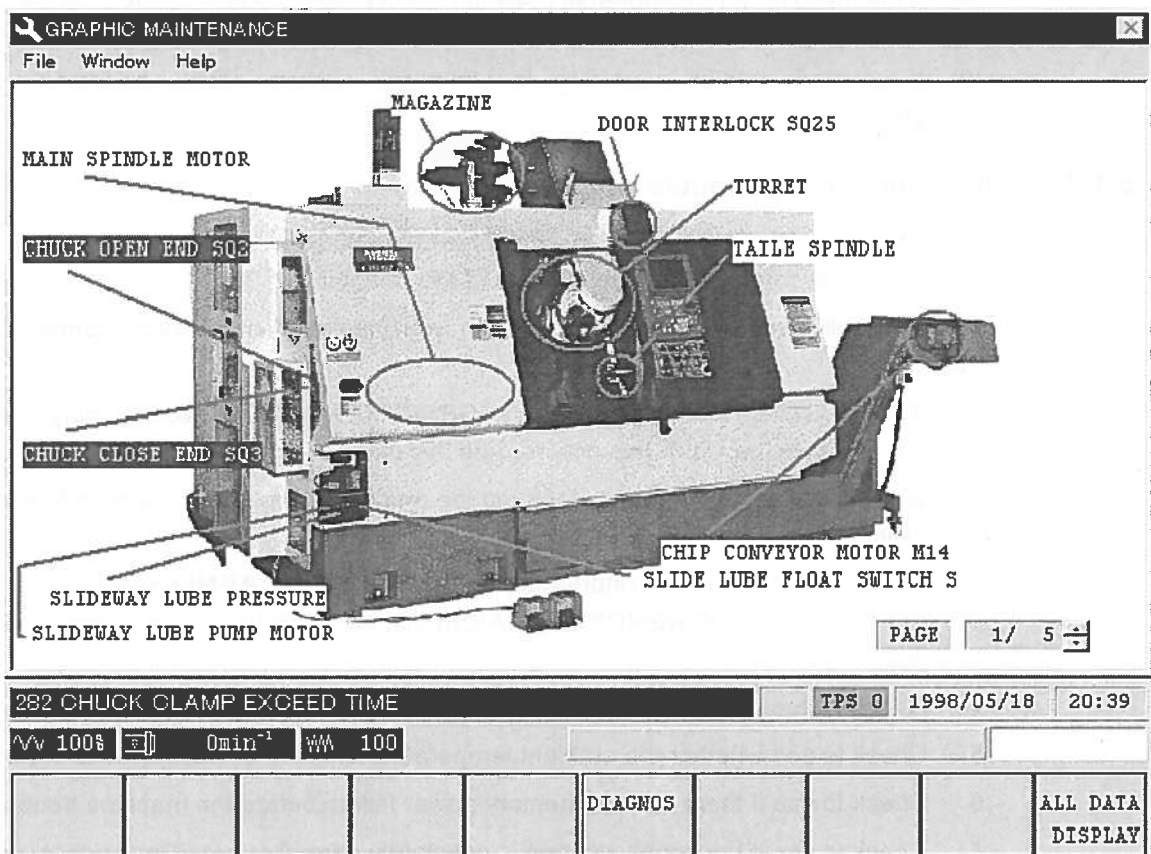
The layout diagram consists of the overall view and of sectional views provided for major components such as headstock, milling head, magazine, etc., with their various sensors and valves.

The sectional views vary depending on the specifications of the machine.

PC: A unit that controls the operation of the movable components of the machine (except axial operation).

2. Operation

If a PC-related alarm occurs, the following display will appear on the display unit:

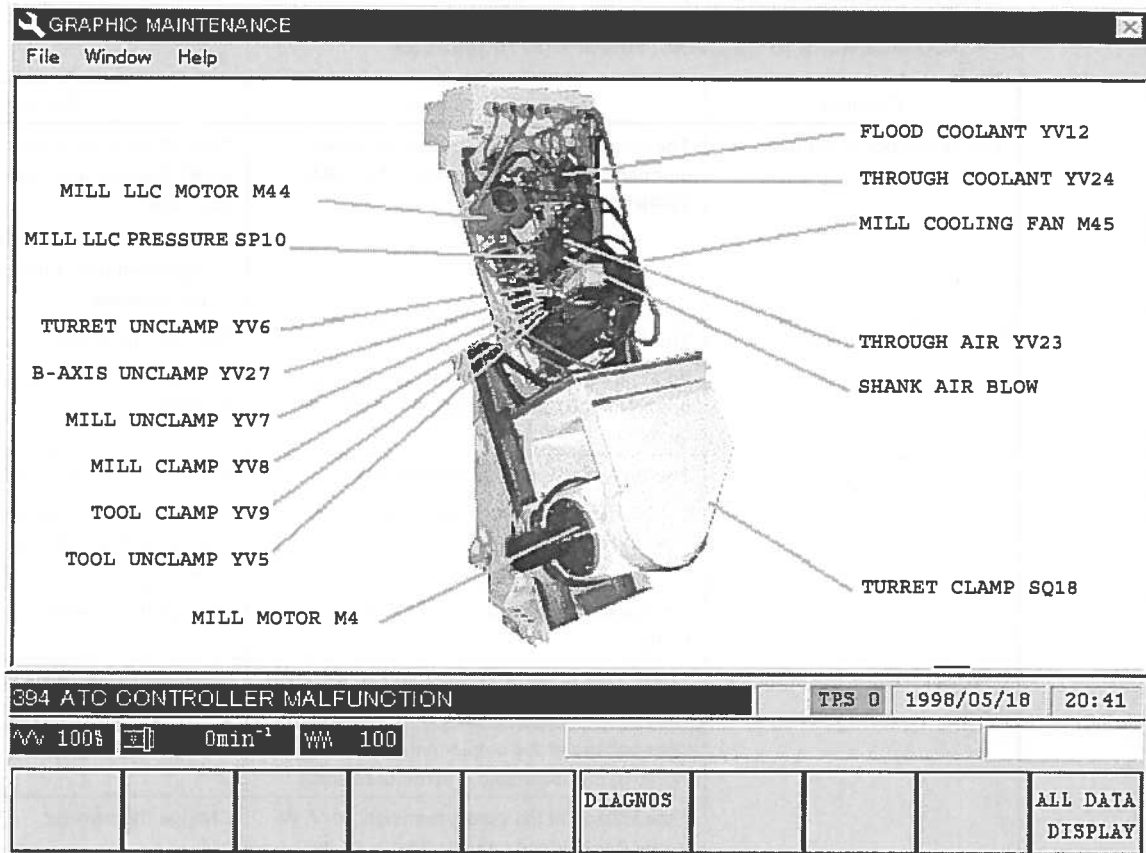


D135W0016E

Note: The above display is shown for reference only.

- (1) Change the display over using the page keys   to identify the source of the alarm.

When a layout diagram of the corresponding section is displayed, the display status of the section where the alarm has occurred will reverse in that diagram to identify the source of the alarm.



D132W0069E

Note: The above display is shown for reference only.

3. Page keys and [ALL DATA DISPLAY] menu item

< When [ALL DATA DISPLAY] is reversed >

By using the page keys, all the layout diagrams can be displayed in succession.

< When [ALL DATA DISPLAY] is not reversed >

By using the page keys, only alarm-related layout diagrams can be displayed selectively.

4. Parameter

Parameters related to this display are as follows:

- If **P106** (bit 6) = 1:

The current display will always be replaced by the **GRAPHIC MAINTENANCE** display upon the request of the PC.

- If **P106** (bit 6) = 0:

The request of the PC will not forcibly select the **GRAPHIC MAINTENANCE** display.

6-2 Main and Secondary Headstocks

If a problem occurs with the spindle, check the LED indication at the spindle unit in the electrical control cabinet and contact your local MAZAK service representative.

* See and the electrical diagrams.

Tools/devices to be used: Tester and multimeter

Problem	Inspection point	Remedy
The headstock is overheated.	The spindle cooling fan motor has been stopped by overheating. (Alarm No. 264: THERMAL TRIP)	Turn off the main power using the main power breaker and leave the machine to cool down. * Contact your local MAZAK service representative if the problem cannot be removed.
Motor does not rotate.	The power switch is off. If the power switch is not off, the no-fuse breaker (ELB) or the magnet contactor is faulty.	Turn ON the power. Change the no-fuse breaker or the magnet contactor.
	The 3-phase voltage is imbalanced. * If it is balanced, the motor is overloaded or faulty, or the wiring is faulty.	Balance the 3-phase voltage. * Decrease the machine side load, change the motor, or check the wiring.
	If the power lamp is not lit, the inverter is faulty.	Change the inverter.
The motor hums but does not rotate.	Heavy load or short acceleration time setting.	Decrease the machine side load, or increase the acceleration time setting.
	If the voltage at the output terminals (U-V, V-W, W-U) is imbalanced, the motor is faulty.	Change the motor.
	If the voltage at the output terminals (U-V, W-V, W-U) is balanced, the inverter is faulty.	Change the inverter.
The motor is overheated.	Check if the motor is overloaded.	Decrease the machine side load.
	If the voltage at the output terminals (U-V, W-V, W-U) is imbalanced, the inverter is faulty.	Change the inverter.
	Check if motor cooling is obstructed. * If not obstructed, the motor is faulty.	Remove the obstacles. * Change the motor.
	Check the command frequency for start and stop of spindle rotation.	Reduce the frequency.
The motor does not rotate smoothly.	Check if the motor is overloaded.	Decrease the machine side load.
	Check if the output voltage changes during acceleration/deceleration. If it changes, the inverter is faulty.	Change the inverter.
	If the voltage at output terminals (U-V, W-V, W-U) is imbalanced, the inverter is faulty.	Change the inverter.
	The load varies.	Reduce load variation.
	If the inverter has been used 5 to 10 years, the inverter output voltage smoothing capacitor is faulty. * If the inverter is new, it is faulty.	Change the inverter output voltage smoothing capacitor. * Change the inverter.
	Check if the connection for the speed detector is satisfactory at the connector.	Establish the connection correctly.
	Use a tester to check if the connection for the speed detector is satisfactory at the cable.	Replace the (broken) cable.
	Check if the grounding is correct.	Ground the machine correctly.

6-3 Chuck

* Refer to the instruction manual supplied by the chuck maker.

Problem	Inspection point	Remedy
The chuck does not operate.	Chuck component part is damaged.	Disassemble the chuck and replace the broken parts.
	The rotary hydraulic cylinder does not rotate.	Check the hydraulic system.
	The sliding portion is seized.	Disassemble the chuck and remove or correct the seized portion. If necessary replace.
Master jaw stroke is not sufficient.	Large volume of chips are accumulated inside the chuck.	Disassemble and clean the chuck.
	Draw pipe is loosened.	Remove and clean the draw pipe.
Workpiece slips in the chuck.	Master jaw stroke is insufficient.	Adjust master jaw stroke.
	Chuck clamping force is insufficient.	Set the hydraulic pressure correctly.
	Top jaws are not shaped correctly to the workpiece diameter.	Shape the top jaws correctly.
	Cutting force is too high.	Calculate cutting force; change cutting conditions.
	Master jaw and other sliding parts are not lubricated correctly.	Grease them.
	Spindle speed is too high.	Lower the spindle speed.
Accuracy is not high.	The chuck is shaking.	If the chuck is shaking, retighten the bolts.
	Foreign matter on serration of master and chuck jaws.	Remove the top jaws and clean the serration.
	Top jaw clamping bolts are loose.	Tighten the bolts to the specified torque.
	Top jaws are not shaped correctly.	Shape them correctly.
	Top jaws are too high causing deformation, or top jaw clamping bolts are loose.	Lower the top jaws.
	The workpiece is deformed due to excessively high gripping force.	Lower the gripping force.

6-4 Milling Head

Problem	Inspection point	Remedy
The milling head is not indexed at all, or not correctly.	Check if the motion is not obstructed.	Remove the obstacles.
	The indexing servomotor is faulty.	Contact your local MAZAK service representative.
	The indexing mechanism is faulty.	
Clamping and unclamping of the milling head is not completed.	The check sensor concerned is faulty or not correctly installed. (The sensor is not activated in spite of normal operation.)	The sensor must be adjusted or replaced. Contact your local MAZAK service representative.
	The solenoid valve concerned is faulty or clogged. (No operation takes place.)	Contact your local MAZAK service representative.
	The hydraulic cylinder is faulty. (No problem with the solenoid valve.)	
Abnormal noise occurs during milling head indexing.	The driving mechanism is faulty. (For example: Bearing is damaged.)	Contact your local MAZAK service representative.
Milling head positioning accuracy is not steady.	Check if the fixing bolts are not loosened.	Tighten the bolts.
	The detector built in the servomotor is faulty.	Contact your local MAZAK service representative.
The milling spindle does not start rotating, or is stopped by an alarm.	The ambient temperature of the milling spindle drive unit is too high (40°C or 104°F).	Decrease the ambient temperature of the machine.
	Check if the motor is overloaded.	Decrease the load.
	The milling spindle drive unit is faulty.	Contact your local MAZAK service representative.
The orientation of the milling spindle is not completed. The milling spindle cannot be released from the oriented state.	The milling spindle drive unit is faulty.	Contact your local MAZAK service representative.
Abnormal noise or vibration occurs during milling spindle rotation.	The milling spindle is operated at too high a speed to rotate an unbalanced tool.	Replace the tool with a well-balanced one.
	The milling spindle driving mechanism is faulty. (For example: Bearing is damaged.)	Contact your local MAZAK service representative.
The milling head is excessively overheated.	Check if the cooling water is not short.	Replenish the cooling water.
	Check if the radiator fan is rotating.	Replace the radiator fan.
	Check if the air-cooling filter for the milling head is not clogged.	Clean or replace the filter.
Alarm 261 HEAD LUBRICATION ALARM is displayed.	Check if the cooling water is not short.	Replenish the cooling water.
	The pressure switch is faulty.	Replace the pressure switch.
	Check if the trochoid pump is operating normally.	Contact your local MAZAK service representative if the pump is faulty.
Clamping and unclamping of the tool is not completed.	The hydraulic valve concerned is faulty or clogged. (No operation takes place.)	Contact your local MAZAK service representative.
	The cylinder concerned is faulty. (No problem with the hydraulic valve.)	
Clamping and unclamping of the milling spindle is not completed. (Clamping for turning) (Unclamping for milling)	The hydraulic valve concerned is faulty or clogged. (No operation takes place.)	Contact your local MAZAK service representative.
	The cylinder concerned is faulty. (No problem with the hydraulic valve.)	

6-5 TOOL EYE (Option)

Problem	Inspection point	Remedy
The TOOL EYE does not operate. * The following alarm message is displayed. 231 TOOL EYE POSITION SENSOR MALF.	The proximity switch (SQ7 or SQ8) is faulty.	Adjust or replace the proximity switch (SQ7, SQ8).
	Wiring is broken or socket is loose.	Replace the wiring.

6-6 X-, Z-, Yt-, W-, X2- and Z2-Axis

Problem	Inspection point	Remedy
Positioning is not accurate.	The slideway surfaces are not lubricated properly.	Contact your local MAZAK service representative.
	Bolts, taper pins and/or nuts are loose.	Tighten them.
	Coupling is loose.	Retighten the coupling.
The zero point is not fixed (the variation is less than 10 mm (0.394 in.)).	Mounting bolt for zero point limit switch is loose.	Contact your local MAZAK service representative.
The zero point is not fixed (the variation is larger than 10 mm (0.394 in.)).	The zero point dog is not adjusted.	Contact your local MAZAK service representative.

6-7 Tailstock

Problem	Inspection point	Remedy
Noise from the live center	The tail spindle thrust power is excessively high.	Adjust the thrust power.
The tail spindle does not move forward and/or backward.	The selected thrust value is too small.	Select the appropriate thrust value.
	The electromagnetic brake is not functioning properly.	Check or replace the electromagnetic brake.
	The sliding surface is dry (too large in friction).	Provide forced lubrication.
	The spindle is clogged with chips.	Select the maximum usable thrust value. Select tailstock mode (TAIL MODE).
The tail spindle does not move backward.	The spindle has become caught at the workpiece.	Select the maximum usable thrust value.
		Select tailstock mode (TAIL MODE).
	Stored reference position data is lost.	Set the reference position again.

6-8 Lower Turret (INTEGREX 100-IIIST)

Problem	Inspection point	Remedy
The turret is not clamped or unclamped.	The clamp control solenoid valve is not operating correctly.	Check the solenoid valve or change it.
The turret does not rotate although it is unclamped.	The [TURRET UNCLAMP] menu is set.	Make the [TURRET UNCLAMP] menu ineffective.
	The index coupling teeth do not engage correctly.	Contact your local MAZAK service representative.
	The bolts fixing the turret are loose.	Retighten the bolts.
	Hydraulic piping is incorrect.	Check the hydraulic piping.
The turret keeps rotating without positioning.	The turret position detection encoder is faulty.	Check the position detection encoder or change it.
	The clamp control solenoid valve is not operating correctly.	Check the valve or change it.
	The valve is clogged.	Clean the valve or change it.
The turret rotates but stops halfway.	The index coupling teeth do not engage correctly.	Contact your local MAZAK service representative.
	The clamp control solenoid valve is faulty.	Check the solenoid valve or change it.
	The turret position detection encoder is faulty.	Check the position detection encoder or change it.
The turret rotates but does not index correctly.	The index coupling teeth do not engage correctly.	Contact your local MAZAK service representative.
	The turret is not mounted correctly.	
	The encoder is not mounted correctly.	
	Tooling is not balanced.	Balance the tooling.
	Play in drive mechanism is excessive.	Contact your local MAZAK service representative.

6-9 Hydraulic Unit

Problem	Inspection point	Remedy
Oil is not discharged.	The pump does not rotate.	Check the connection of the power cable.
	The pump is rotating in the reverse direction.	Check the polarity of the power supply.
	Suction pipe is clogged.	Check the suction pipe.
	Strainer is clogged.	Clean the strainer.
	Leak in suction pipe	Check the suction pipe and its joint.
	Suction filter is not completely immersed in oil.	Replenish the hydraulic oil with the same grade up to the reference line in the level sight gauge.
	Discharge volume adjusting sleeve is tightened excessively.	Turn the sleeve counterclockwise.
	Hydraulic oil viscosity is too high.	Replace the oil entirely with oil of correct viscosity. * Warm the oil using a heater as temporary measures.
Although oil is discharged, pressure is not built up.	The relief valve is not operating correctly.	Disassemble and check the relief valve.
	Load is not applied in the hydraulic circuit.	Check the circuit and apply the load.
	Leak in the hydraulic system.	Check the piping and repair the leak.
Oil is not discharged or volumetric efficiency lowers when pressure is built up.	Seals inside the pump are broken.	Contact your local Mazak representative.
	Slide portions are worn abnormally due to dust and foreign matter.	
Noise is excessively large.	Strainer is clogged.	Clean the strainer.
	Air is sucked from the suction pipe or other portion.	Check the point where air is sucked by applying oil on the suspected portions.
	Bubbles inside the reserve tank.	Check the return pipe and prevent generation of bubbles.
	Bubbles trapped inside the piping.	Repeat inching of the pump to discharge the bubbles.
	Low oil level	Supply the specified grade of the hydraulic oil up to the reference line in the level sight gauge.
	Pump mount base is not rigid.	Use rigid base; check loose bolts as well.
	Pump sliding portions exhibit wear	If the wear is abnormal, check for oil contamination, water in the oil, oil viscosity, and oil temperature during pump operation.
Pump generates heat.	Heat generation due to improper volumetric efficiency.	If the pump surface temperature rises excessively, stop pump operation immediately.
	Seizure on sliding portions	

6-10 Oil Lubrication Unit

Problem	Inspection point	Remedy
The alarm message 267 BALL SCREW LUBRICATION ALARM is displayed on the screen.	Lubricating oil is insufficient.	Add lubricating oil.
	Leak from the lubrication pipe.	Retighten the pipe.
	Lubrication pipe is clogged.	Clean the pipe.
The alarm message 260 SLIDEWAY LUBRICATION ALARM is displayed on the screen.	Lubricating grease is insufficient.	Add lubricating grease.
	Leak from the lubrication pipe.	Retighten the pipe.
	Lubrication pipe is clogged.	Clean the pipe.
	The pressure switch is faulty.	Contact your local MAZAK service representative.

6-11 Grease Lubrication Unit

Problem	Inspection point	Remedy
Grease is not supplied from the pump.	The amount of grease in the tank is not sufficient.	Add, or replace with, grease of the same brand/same grade as that of the current grease.
	Air is entrained in the pump.	Bleed the air.
	The pump is not running.	Check the electrical connection of the motor, and if the connection is defective, reconnect the pump properly. Replace the pump if the life span of the motor has expired.
The main pipe pressure does not increase.	Grease is not supplied from the pump for either of the above reasons.	Take the appropriate corrective measure.
	Air is entrained in the piping.	Remove the closer plug from the distributor at the end of the piping (for a large system, the distributor is provided in several places), and bleed the air by operating the pump.
	Foreign matter is entrained in the ball seat of the relief valve.	* Disassemble and clean the relief valve.
	The pressure of the relief valve is not set properly.	* Set the correct value (8.0 MPa or 1160 PSI).
	Grease is leaking from pipe connections because of insufficient tightening or overtightening.	Tighten with the appropriate torque or provide re-piping.
	The piping is damaged.	Replace the damaged piping.
	The depressurizing unit is not functioning properly.	Check for defects in electrical connection, and if the connection is defective, perform reconnections properly.
Air is entrained.	Air is entrained by either of the above-listed events causing air to be entrained.	Take the appropriate corrective measure.
	Air is entrained in the pump since the amount of grease in the tank is not sufficient.	Add, or replace with, grease of the same brand/same grade as that of the current grease, and then bleed the air.
Grease is not supplied from the valve.	The valve is clogged.	Replace the valve.
	The branch piping is not filled with grease.	Fill with grease during initial installation.
	The depressurizing unit is not functioning properly.	Check for defects in electrical connection, and if the connection is defective, perform reconnections properly.
The main pipe pressure does not increase.	The section to be greased and the valve are clogged.	Disassemble, check, and/or replace the valve. Replace the components of the section to be greased.
	The piping is damaged.	Replace the piping.
	The penetration of the grease is not appropriate.	Adjust the penetration and temperature.

Note: Ask the manufacturer for the corrective measures marked "*" in the above table.

6-12 Coolant Unit

Problem	Inspection point	Remedy
Coolant is not supplied.	Filter is clogged.	Clean the filter.
	Coolant is insufficient.	Refill the coolant.
	The electromagnetic switch (KM13) is tripped. * If the electromagnetic switch (KM13) is not tripped, the coolant pump is faulty.	Reset the electromagnetic switch (KM13). * When the coolant pump fails, contact your local MAZAK service representative.

6-13 Air Unit

Problem	Inspection point	Remedy
Air flow volume decreases due to high air flow resistance.	Element is clogged.	Change the element.
An excessive volume of water is found in the pipe downstream from the element.	Water has accumulated.	Discharge the water.
Pressure adjustment is not possible.	Air flow direction is reversed.	Reinstall the air unit.
	Pressure adjusting spring is broken.	Change the adjusting spring.
	Valve spring is broken.	Change the valve spring.
	Foreign matter is caught in the valve seat.	Clean the seat.
	Rubber lining of the valve is damaged.	Change the valve.
	Diaphragm is broken.	Change the diaphragm (whole ASSY).
Air leak through bowl-mounting screw	Bowl-mounting screw is not tightened correctly.	Retighten it.
	Diaphragm is broken.	Change the diaphragm (whole ASSY).
Pressure cannot be set to "0" even when the pressure adjusting knob is tightened.	Foreign matter is caught in the valve seat.	Clean the valve and seat.
	Rubber lining of the valve is damaged.	Change the valve.
	Valve spring is broken.	Change the valve spring.
Air leak through a small hole in the bowl.	Diaphragm is broken.	Change the diaphragm (whole ASSY).

6-14 Headstock Cooling Unit

If a trouble occurs in the headstock cooling unit, the alarm message **261 HEAD LUBRICATION ALARM** is displayed on the screen.

Refer to the Alarm List.

Problem	Inspection point	Remedy
The alarm message 261 HEAD LUBRICATION ALARM is displayed on the monitor.	Coolant is insufficient.	Replenish the coolant.
	The pressure switch is faulty. (SP25, SP26)	Change the pressure switch.

Revision Record

Revision No.	Revision date	Manual No.	Revision code (A#, C# or D#)
R0	06. 2004	E372MA0010E0	
R1			
R2			
R3			
R4			
R5			

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