SKT 100/200 CNC TURNING CENTER

INSTALLATION MAINTENANCE MANUAL

(FANUC Oi-TB)

VERSION No.: VOL1.0

HYUNDAI-KIA MACHINE

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PREFACE

This manual provides step by step informations for the operation and standard of SKT 100 & SKT 200.

Always observe this manual to ensure proper operation and to lengthen the lifetime of Machine Tool.

We hope this manual could help users and people concerned with A/S. If you find any mistakes or anything in question, please let us know.

May, 2003

HYUNDAI-KIA MACHINE

- The contents of this manual can be modified without any notice for improving the Performance and in accordance with a design change.

PRINTED IN KIA

Contents

I. INTRODUCTION 1-1

II. SAFETY 2-1

III. SPECIFICATION 3-1

IV. TRANSPORT & INSTALLATION 4-1

V. REPAIR & PRESERVATION 5-1

I

INTRODUCTION

I INTRODUCTION

1. Outline of The MANUAL 1-1

1-1. Symbol and Description.....**1-2**

2. Characteristics 1-3

3. Standard Accessory 1-3

4. Special Accessory 1-4

1. Outline of the Manual

This manual contains the followings for a proper use and overall understanding of this machine.

(1) NC device Operation manual
Contains operating instructions.

(2) Installation & Maintenance Manual
Contains the periodic inspection an the installation and maintenance instructions.

(3) Parameter List
Contains detailed parameters.

(4) Alarm List
Contains detailed alarm informations.

(5) Part List
Contains the details required to purchase the part.

(6) Electric Circuit Diagram
Contains electric circuit diagram.

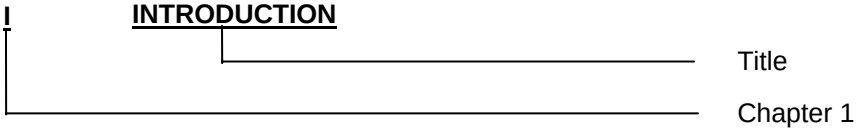
The record of values including the "parameter table" enclosed here should be kept as it is necessary for maintenance and adjustment of machine.

Thank you!

1-1 Symbol and Description

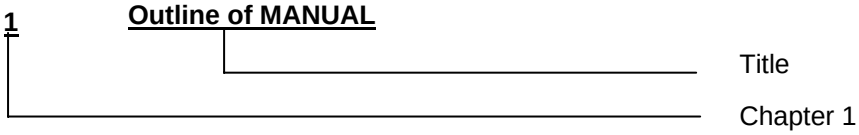
(1) This manual contains 7 chapters shown in the Roman numerals.

Ex) **I** **INTRODUCTION**



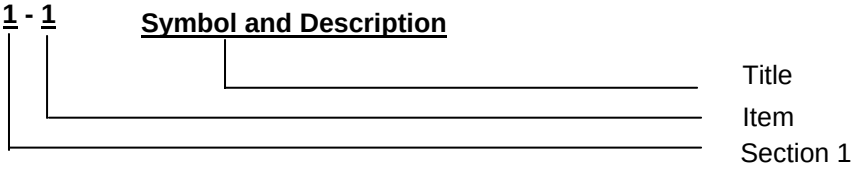
(2) Each chapter contains several sections.

Ex) **1** **Outline of MANUAL**



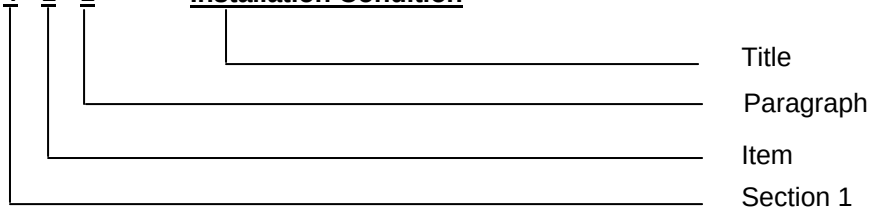
(3) A section contains several items

Ex) **1 - 1** **Symbol and Description**



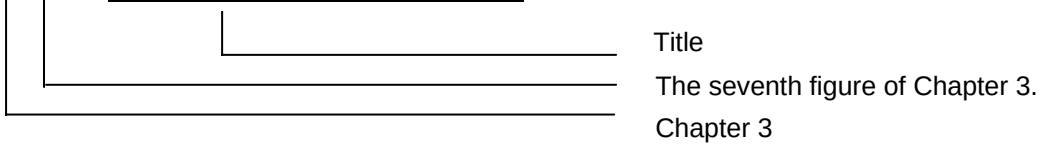
(4) Each item contains several paragraph

Ex) **4 - 1 - 1** **Installation Condition**

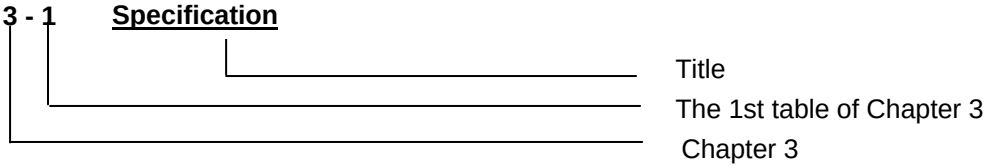


(5) The figure and Table are shown in accordance with each "Chapter"

Ex) **Figure 3 - 7** **Major Dimensions of Head Stock**



Ex) **Table 3 - 1** **Specification**



2. Characteristics

This machine is two axis CNC lathe with drum type turret, and has the following features.

(1) Enables both chuck and center works.
(2) Uses AC built-in motor to directly change the speed in a wide range [5,5/7,5 kW (SKT100), 7,5/11 kW (SKT200)]
(3) Adapts the constant surface speed function as a standard option.
(4) Adapts the permanent set as a standard option, machines a variety of workpieces in the same setting and uses the tool available in the market.
(5) Epoch-making reduction of the tool indexing time and the turret rotation speed by applying the servo motor-driven tool post.
(6) Accurate positioning by using the advanced LM-guide and ball screw.
(7) The greatest feed rate (36m/min) of axis in the world.
(8) Minimized heat displacement in X-axis by double pre-tension structure.
(9) Stable bed structure of 45°.
(10) Ensures rapid and easier operating by applying the FAUNC Oi-TB CNC of 32 bit.
(11) High quality one with a beautiful color and the cover designed somatologically.
(12) Adding special accessories enable to maximize the request for automatization and higher productivity.

3. Standard Accessory

- Ø 165 (6.5") hollow chuck & rotary cylinder (SKT100)
- Ø 210 (8.3") hollow chuck & rotary cylinder (SKT200)
- Leveling seat
- Soft jaw
- Hydraulic unit
- Auto-coolant device
- Auto-lubricant device
- Base holder for Inside (Internal Diameter) tool
- Sectional base holder
- Chuck open/close confirmation device
- Door lock system
- Spanner & wrench
- Spindle override (50 ~ 150%)
- Foot switch (For chuck)
- Test report
- Operation manual
- Chuck open/close M function
- Work Light ON/OFF Switch
- Work Light
- Spindle load meter

4. Special Accessory

- Chip conveyor (both for side and rear)
- Chip box
- Air blow
- Coolant gun
- Jet coolant
- Spindle internal coolant
- Chuck upper coolant
- TR robot
- KN robot
- Chuck open/close confirmation device
- Tail stock For./Ret. foot switch
- Chuck pressure 2nd stage converting device
- Spindle positioning device
- Tail Stock
- Tail stock For./Ret. M function
- Auto door
- Spindle internal stopper
- Spindle rpm meter
- Work counter
- Auto power cut off system
- Integrating timer
- Weekly timer
- Workpiece attachment confirmation device
- Spare tool call function
- Rotary tool post
- Sub spindle
- QCT tool post
- CALL LIGHT (1, 2 or 3 colors)
- Q-setter
- Parts catcher

II

SAFETY

II SAFETY

1. General 2-1

2. General Safety Precautions 2-2

3. Notice When Operating Machine 2-6

4. Notice When Repairing and Checking 2-10

5. Notice on the Electric and NC Device 2-13

6. Safety Device..... 2-15

6-1. Name Plates.....**2-15**

6-2. Safety Device **2-16**

1. General

(1) The purpose of safety notice is to avoid personal injury or damage to the equipment from accidental events.

(2) The expressions DANGER, WARNING or CAUTION used in this manual, have a special meaning, which is stated below:

DANGER	Failure to comply may result in personal death.
WARNING	Failure to comply may result in personal severe injury or lethal damage to the machine.
CAUTION	Failure to comply may result in personal light injury or damage to the machine.

(3) Read and observe instructions of the name plate on the machine. Also, do not change the position of the name plate or damage it. If broken, purchase it with the no. of item shown in Part List.

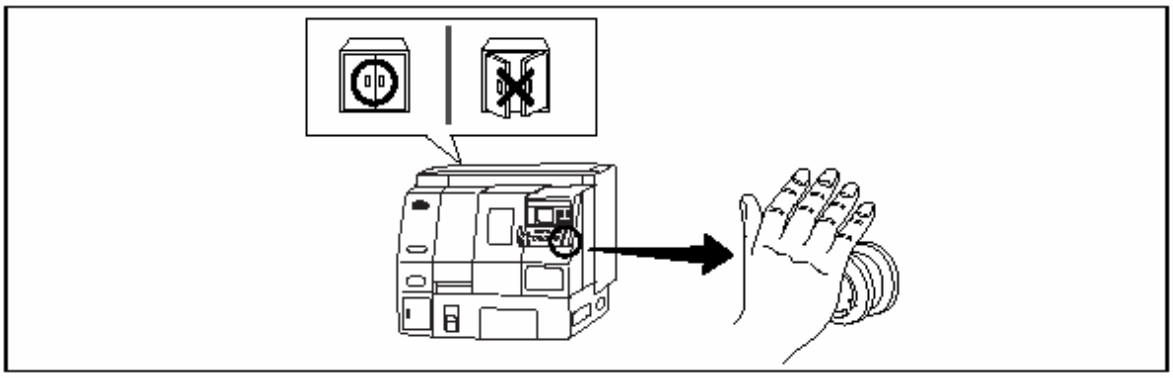
(4) Before Servicing this machine, thoroughly be familiar with this instruction and the notice of nameplate.
We're not responsible for damage due to your careless use.

2. General Safety Precautions

DANGER

(1) Do not touch any device in the Electric Control Panel and Operating Panel and in which the mark is located.

(2) Prior to operating the machine, always close the door and check if safety shield located. If the door opened, immediately turn off the main power.



WARNING

(1) Remember where the Emer-gency stop switch is to operate it anywhere at all times.

(2) Before operating the machine, check if the switches are functioned correctly to avoid malfunction.

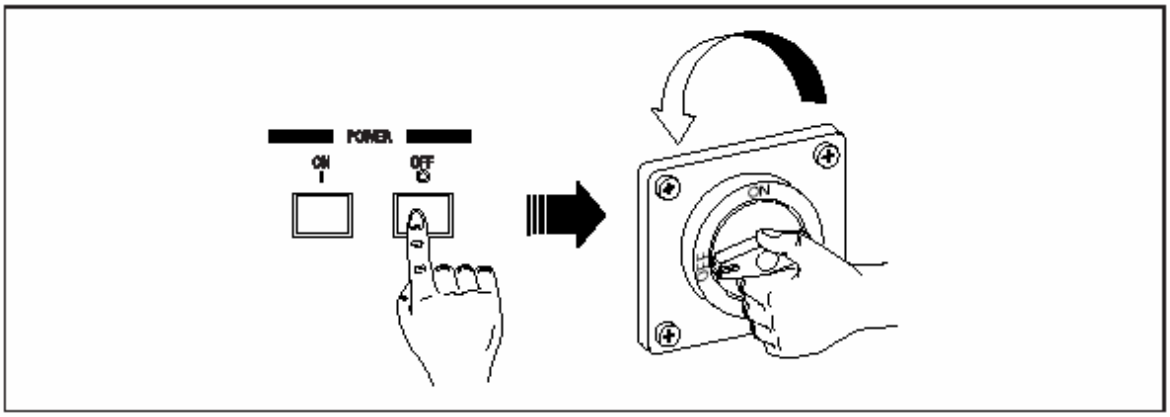
(3) Never touch any rotating part or tool by hands while operating.

(4) Remove oil and water left on the floor to prevent workers from slipping.

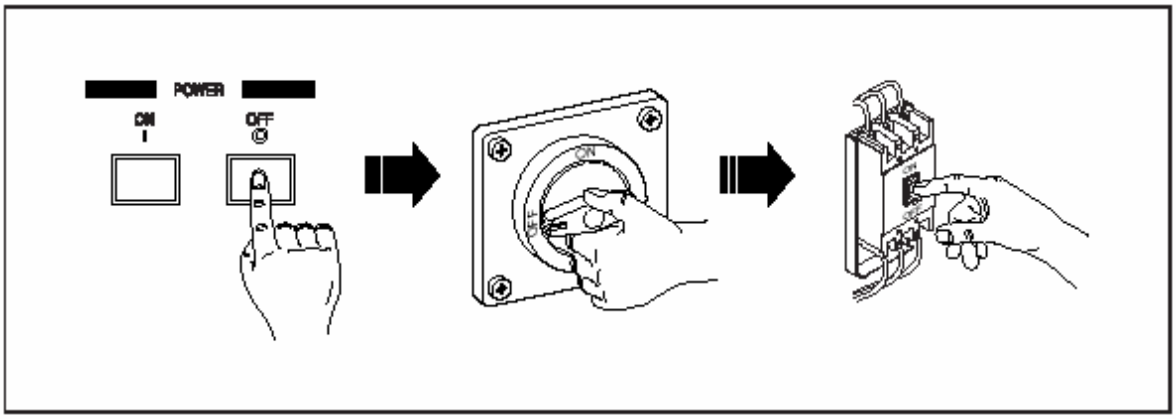
(5) Do not enter the inside of machine except for repairing work.

Figure 2-1. Emergency Stop Switch

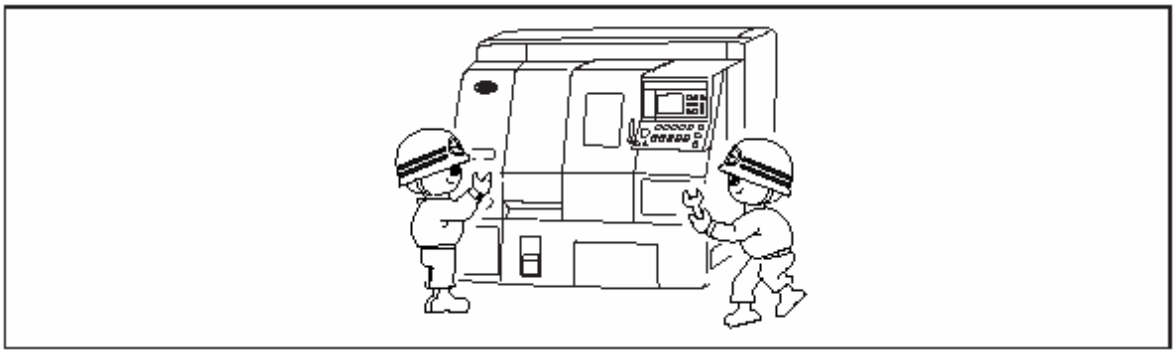
(6) When temporarily stopping a work and leaving the machine, first switch off the Operating Panel and then the main power.



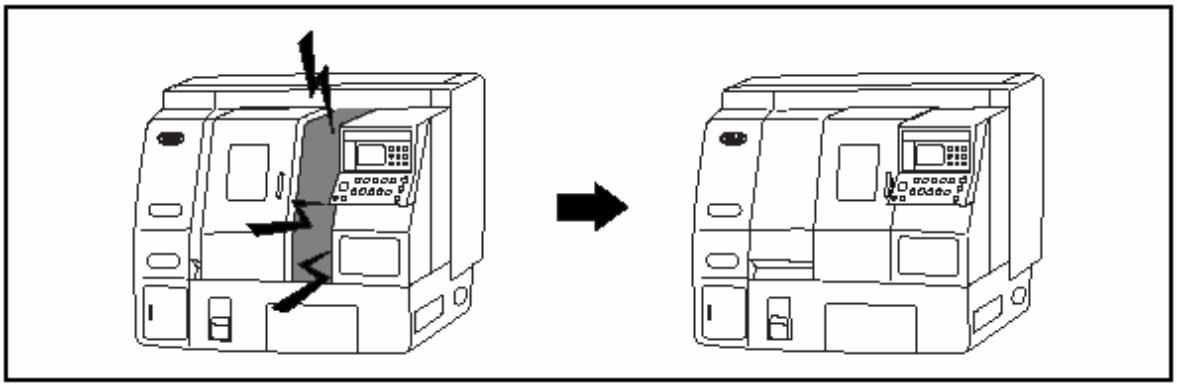
(7) When finishing a daily work and leaving the machine, switch off the Operating Panel, the main power switch, and then the power supply switch at factory.



(8) It is dangerous to operate the machine when being operated or repaired by the other worker. Be careful when more than two people have to work together.



(9) There are potentially dangerous situations inside of the machine such as rotating workpiece, feeding tool post, dispersing coolant and hot chip. Always close the door of machine while operating.



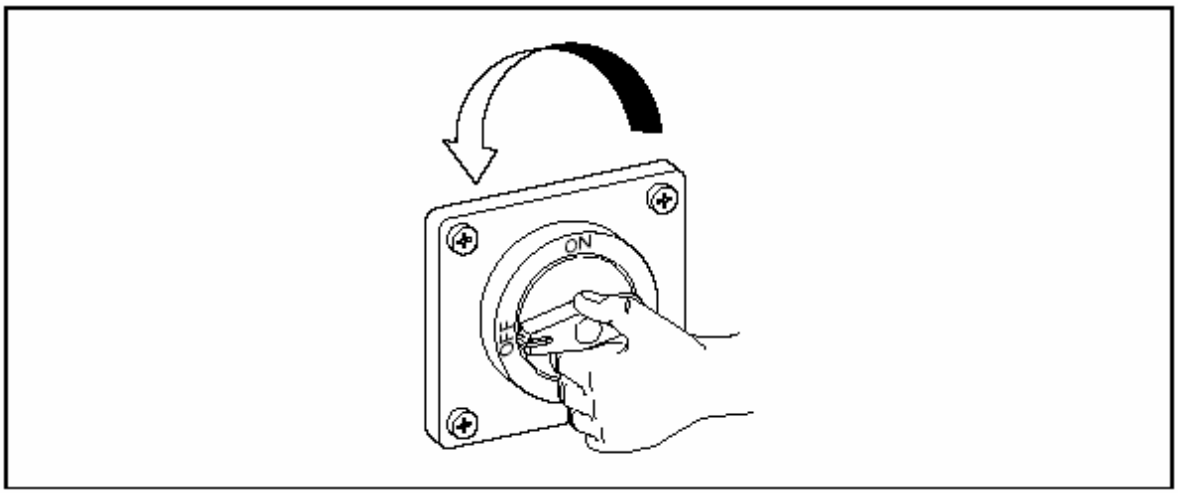
(10) Install the machine in a sufficiently bright, dry and arranged place free from any obstacles.

(11) Do not place device workpiece and other items either on the machine moving part or the machine frame.

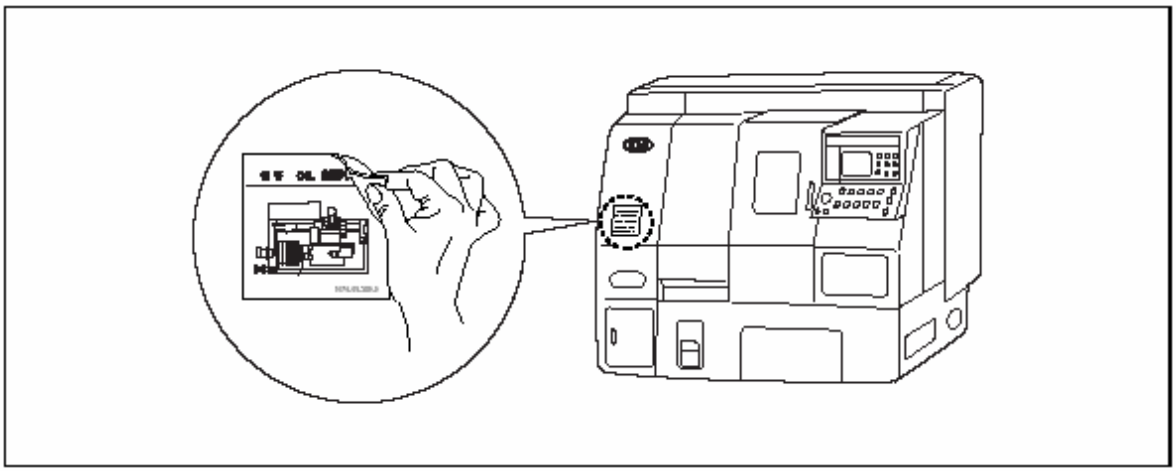
(12) Do not reconstruct the machine without our prior permission.

⚠ CAUTION

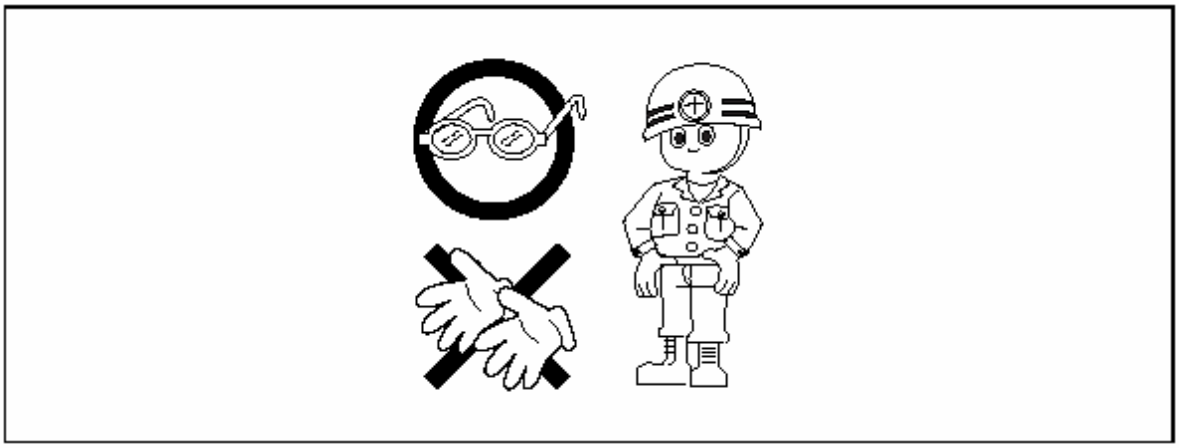
(1) Check the machine regularly according to this manual.
(2) Always close the door during the automatic operation.
(3) Immediately turn off the main power during a service interruption.



(4) Do not change the position of nameplate attached to the machine. If damaged, purchase it with the item No. of Part List or one in the lower right of nameplate.



(5) Always wear protective glasses during working.
(6) Always wear safety shoes.
(7) Wear the safety cap and do not wear your uniforms loosely.
(8) Never operate the machine while wearing gloves.



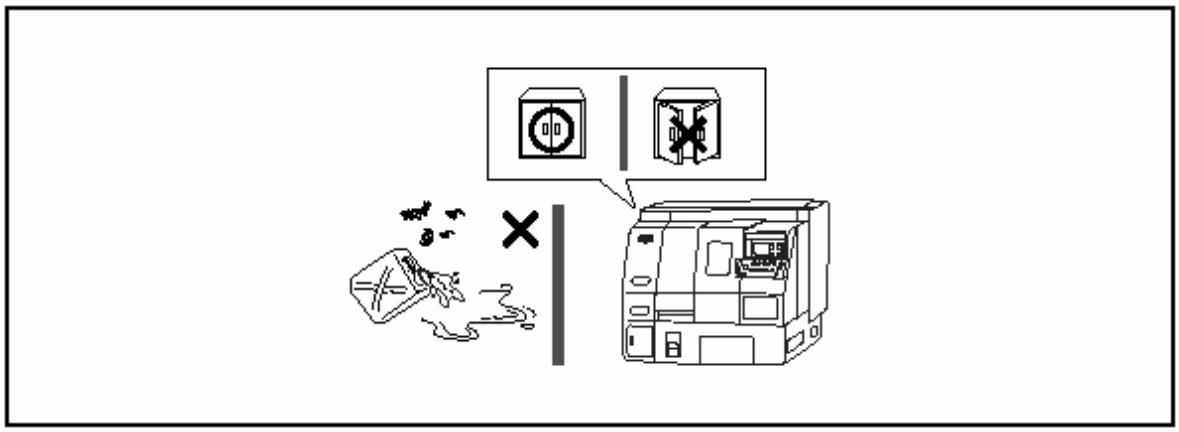
(9) Keep the workbench near the machine enough to be strong and not to be slippery.
(10) Do not operate the machine while drinking of taking a medicine.
(11) Do not operate the machine when feeling a sick or sleepy.
(12) The max. noise of this machine is approximately 76 db. It is recommended to wear earplugs.

3. Notice When operating the Machine.

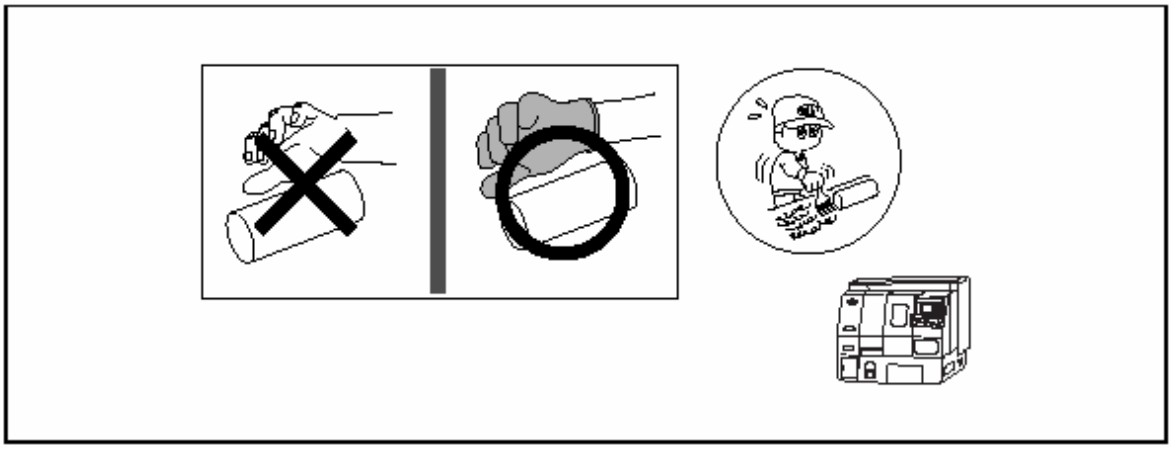
Before operating the machine, make sure the followings.

WARNING

(1) Always close the door of the Electric Control Panel to avoid damage due to water, chip or oil.



(2) It is dangerous to remove the chip attached or dropped to the tool with bare hands. Therefore, stop the machine and wear gloves and then do a job using brush.

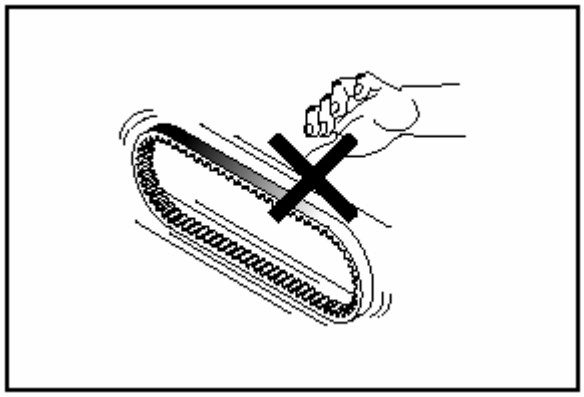


(3) Do not adjust the location of coolant nozzle while operating.

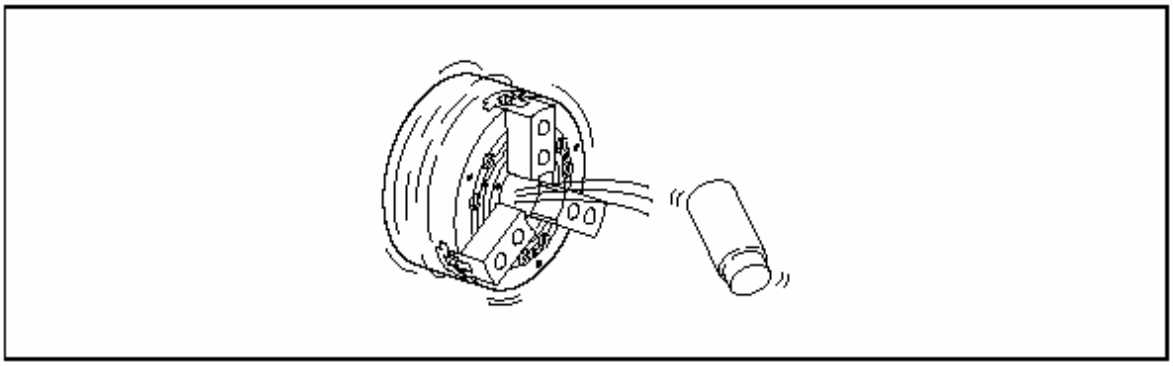
(4) Gradually increase the rpm of spindle to allow sufficient warming-up. Otherwise, it may result in damage of the chuck cylinder (Refer to Repair and Preservation, step 2-9/5-1par. "A. Warm up of spindle").

(5) Do not pull out or modify the instruments or electric circuits installed for a safety such as the stroke limit dog of feed system, the limit switch, the interlock limit switch, and etc.

(6) Check the belt for tension. Make it sure that your hands of fingers are not hold between the belt and the pulley.

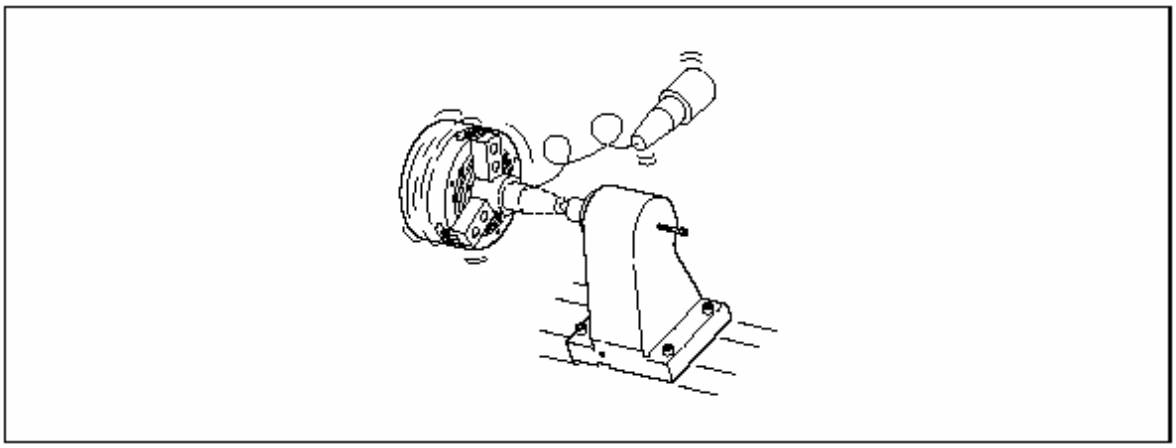


(7) Always clamp the workpiece or the tool exactly. For the cutting depth and feederate, begin form the minimum level.

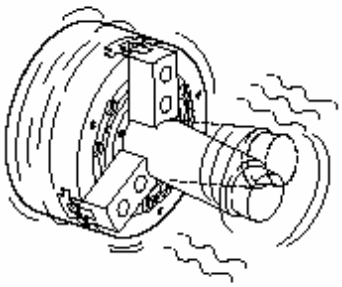


(8) When the machine rotated at a high speed, the clamping force of chuck will be decreased rapidly. Be careful to set up the pressure of chuck and cylinder.

(9) When chucking and centering the center workpiece, take care of its weight, the hole of center, configuration, and thrust of center. If centering and loading through a small hole, the lead-edge of center may be broken and the workpiece sprung out.



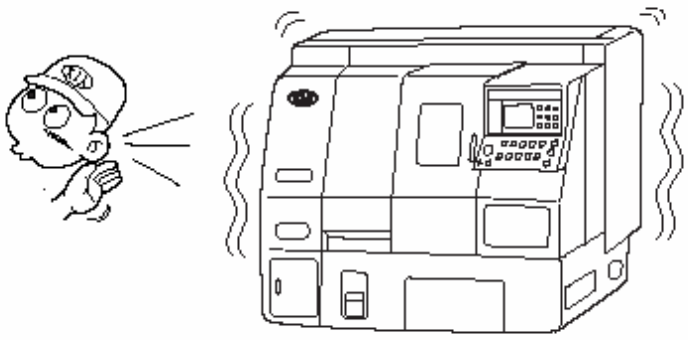
(10) When self Boring of the soft jaw, pay attention to the location of self Boring Ring and configuration of self Boring. After cutting the jaw, clamping the jaw correctly and check the pressure of chuck is proper.



(11) If rotating the spindle when the center is not placed on the center of rotation and being eccentric, it may cause the machine it self vibration and affect its working accuracy. Keep its balance by attaching the balance.

CAUTION

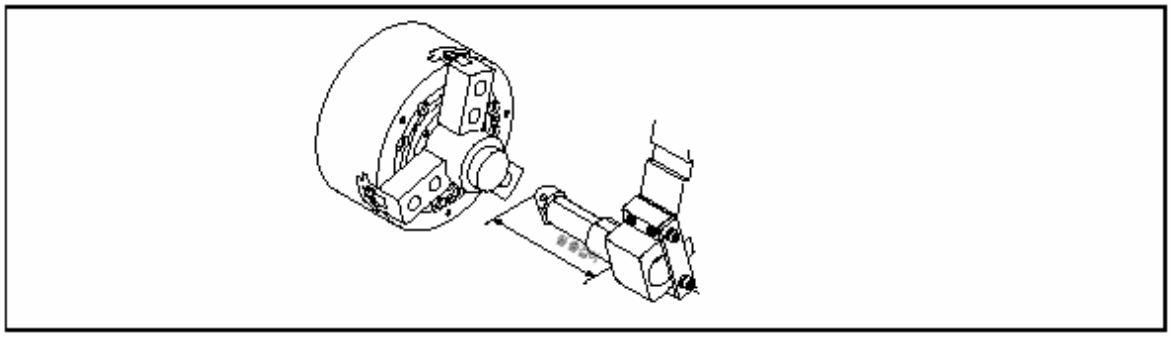
(1) Do not touch kinds of switch with wet hands.
(2) While heavy cutting, a fire can happen due to a hot chip. Make it sure the chip not to be accumulated.
(3) Check each bolt is clamped properly.
(4) Check there is a strange sound from the motor or anywhere else on working.



(5) Warm up the spindle and feed system prior to operating.

(6) When installing the tool, stop the feeding axis and the spindle.

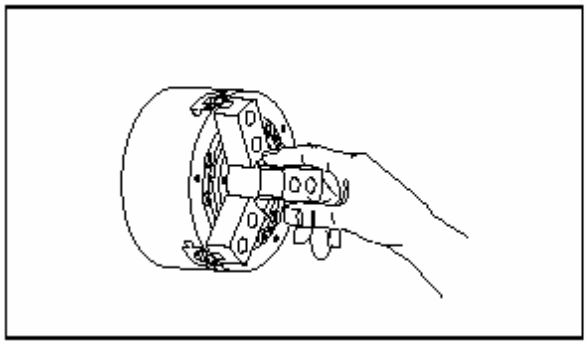
(7) When installing the tool, pay special attention to the edge of tools. Install it not to be protruded over the specified length.

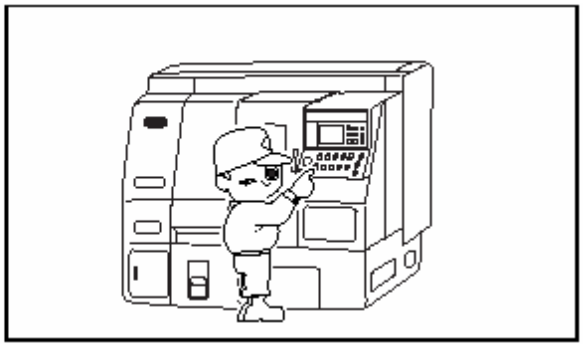


(8) After installing the tool, first perform a test operation.

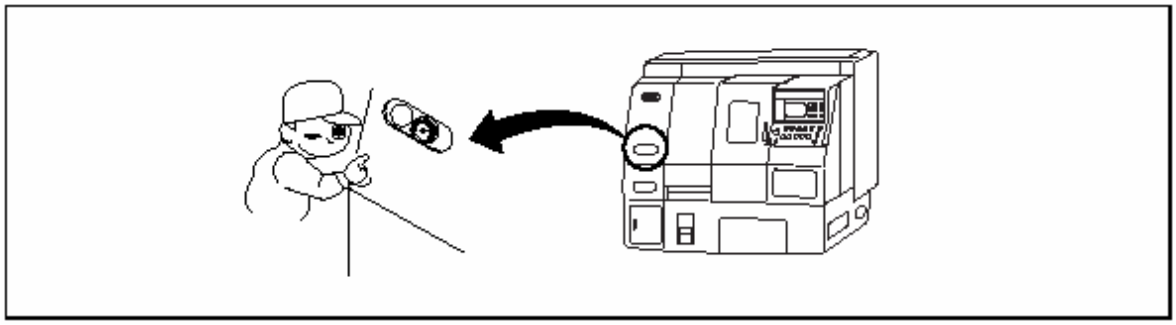
(9) When installing the workpiece on the standard chuck, make the outer circumference of jaw positioned in the external diameter of chuck.

(10) Visually check the switch on the Operating Panel and then operate it correctly.





(11) Check the pressure gage indicates correctly.



(12) For the machine with special accessory, follow the specified instructions.

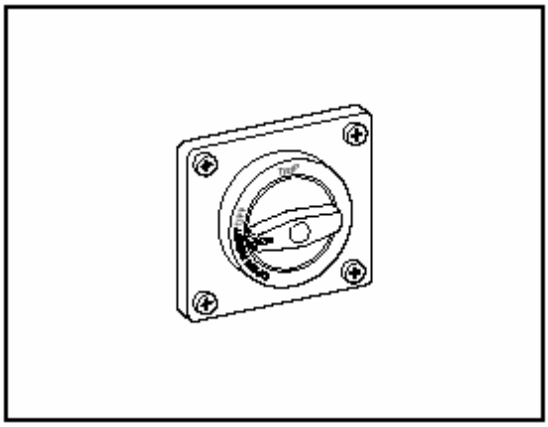
4. Notice When Repairing and Checking

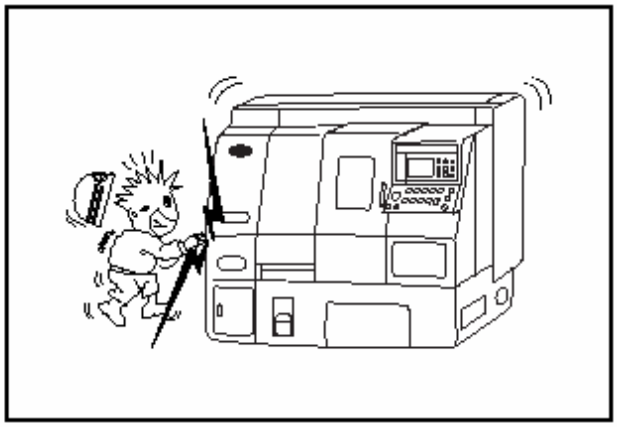
After reading this manual thoroughly, perform the maintenance.

DANGER

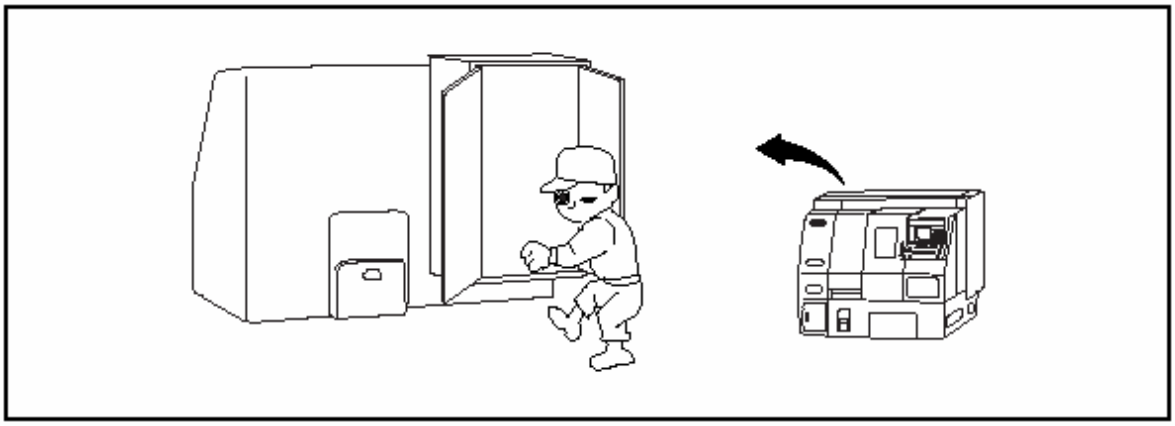
(1) Before repairing the machine, always ensure the main power is off.

(2) For a while even after the power off, always check there is residual current in the Electic Control Panel and the Electric device and then perform the maintenance.





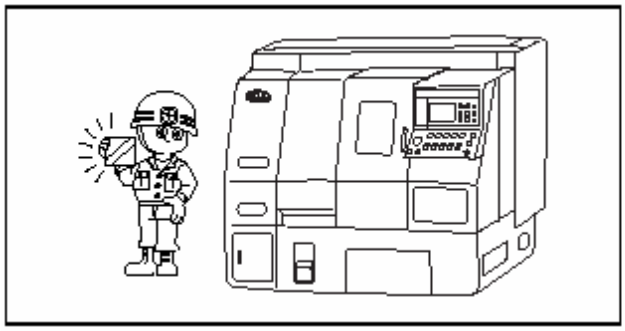
(3) Open the door of the Electric Control Panel only for repairing.

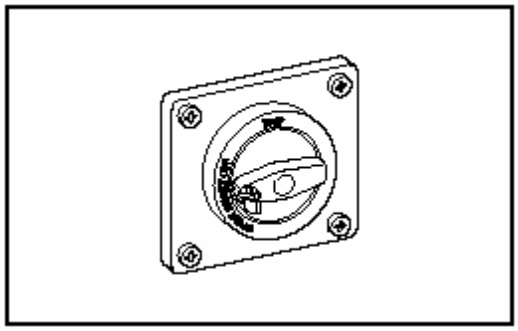


WARNUNG

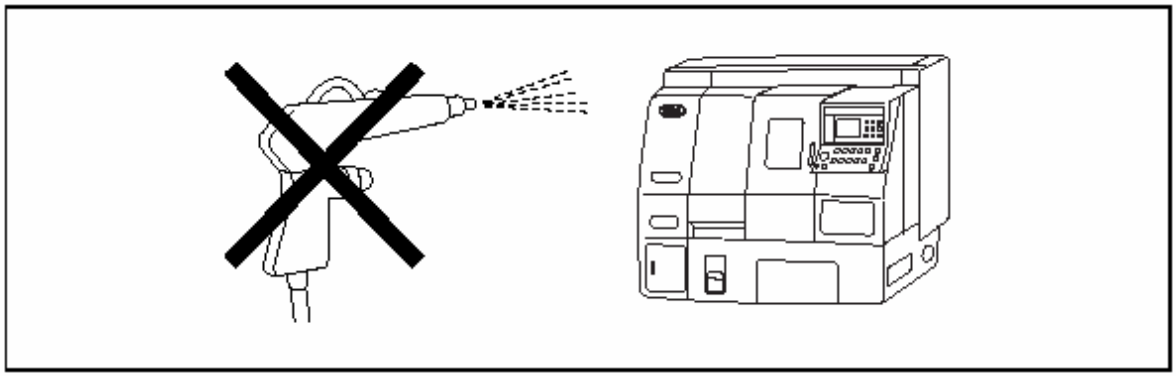
(1) Only the qualified personnel can perform maintenance on the electric device.

(2) When cleaning the machine, always stop its operation turn OFF and then lock the main power.

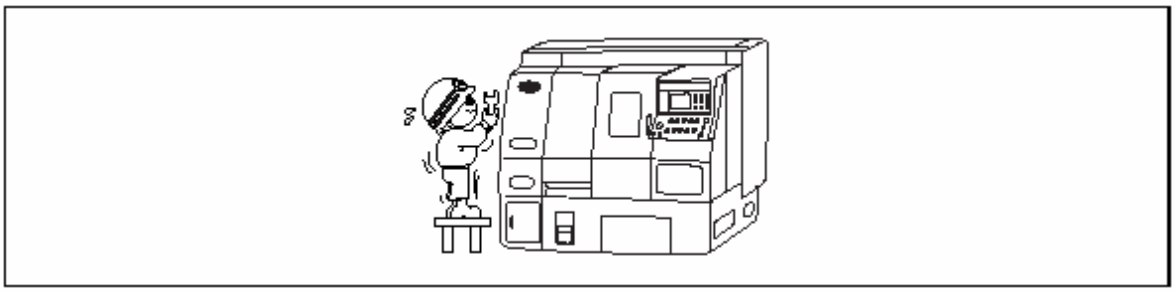




(3) When repairing and cleaning the machine, do not use compressed air.



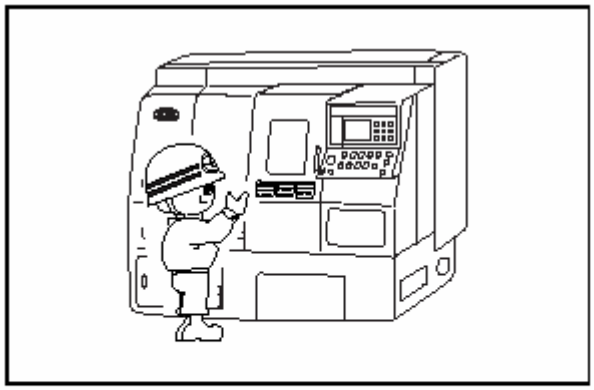
(4) When repairing at a high place, use a proper support or ladder and wear a safety helmet.

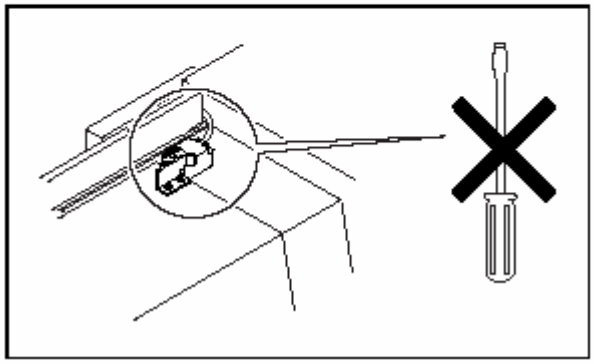


(5) Never operate the machine with the cover removed for repairing.

(6) While repairing or cleaning the machine, keep the floor free from water or oil.

⚠ WARNUNG



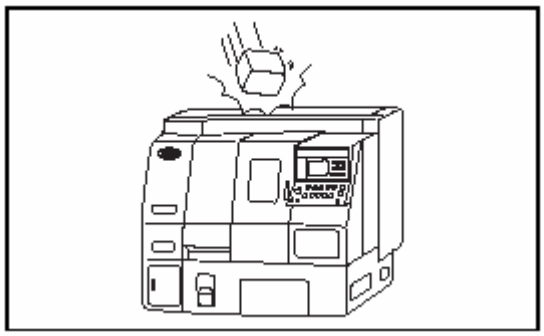


(1) Before repairing, completely read the installation and Maintenance Manual.
(2) Keep enough parts in stock for repairing and replacing.
(3) The person who responsible for maintenance should obey the instructions on the machine.
(4) Clean the machine after a completion of daily work to make it easier to find out anything wrong.
(5) When repairing, record the work.
(6) Do not attempt to remodel the device or electric circuit such as the limit switches for stoke limit, of interlock of the machine.
(7) Check each gage indicates its normal value.
(8) Check the lubricating oil is supplied for each wet moving part.
(9) Only use the specified hydraulic and lubricating oils and greases in this manual.
(10) When cleaning the chip, always wear glove.
(11) Filling and changing oil should be performed periodically according to this manual.
(12) Apply each part with rust-proof oil after a completion of work, especially if using the solvable coolant.
(13) Use the specified spanner or wrench when adjusting and repairing the machine.

5. Notice on the Electric and NC Devices

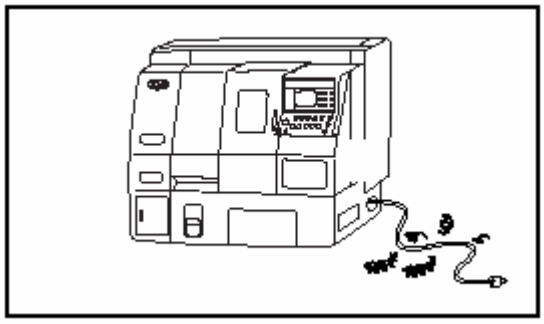
DANGER

(1) Do not give a shock on the NC device and the Electric Control Panel, etc.



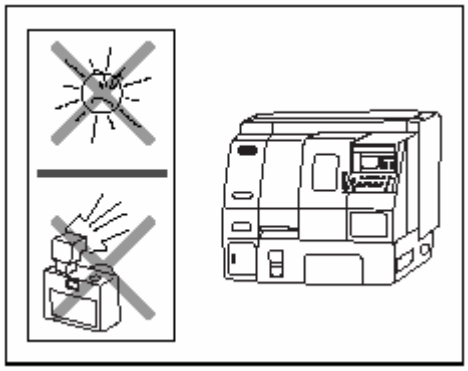
(2) In case of the power cable, use it with the same thickness provided in this manual, and do not use longer cable than needed. When the power cable has to be passed the floor, be sure to prevent it from being damaged by chips.

(3) In case of test operation, check the parameter of NC device is set properly with our instructor attended. Also, do not change any parameters except one for backlash.



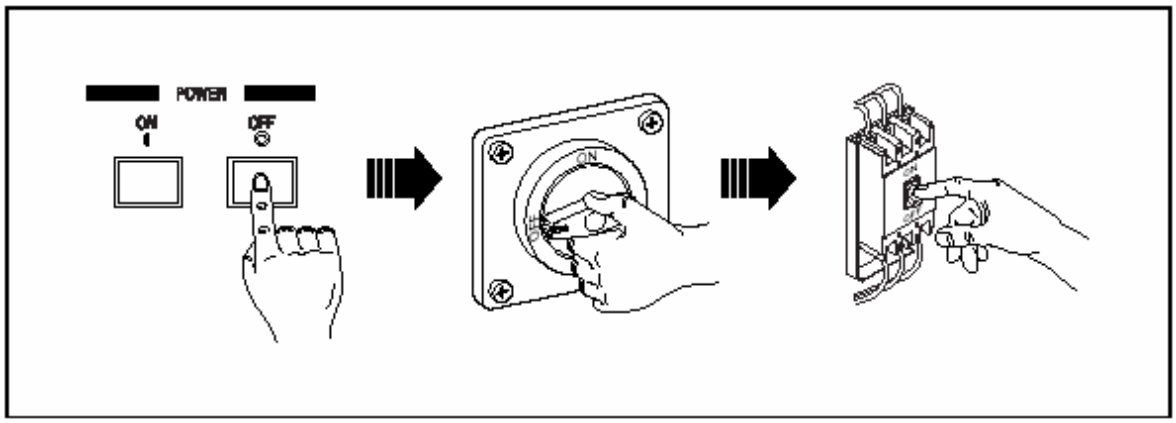
WARNING

(1) The Electric Control Panel is sealed to prevent the ambient air from entering. Do not open the door of Control Panel for long while applying the power. Direct ray of sun or flash of camera may result in damage of the part.



(2) The instruments specified by our company should be used in the Electric Control Panel. Especially use the specified fuse and never use that of great capacity or a copper wire.

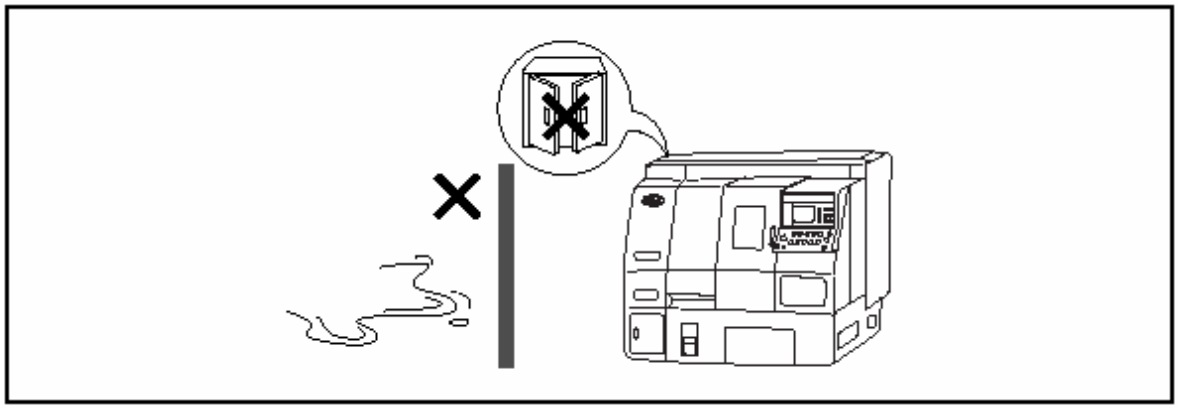
(3) When repairing the electric instrument, switch OFF the power of the Operating Panel. Also switch OFF the Electric Control Panel and then the Power Supply at factory.



(4) Do not change a current setting of the overload relay in the Electric Control Panel and any settings of various volumes.

CAUTION

(1) Do not open the door of the Electric Control Panel or the Operating Panel, if possible. The penetration of foreign material or humidity may result in misoperation.



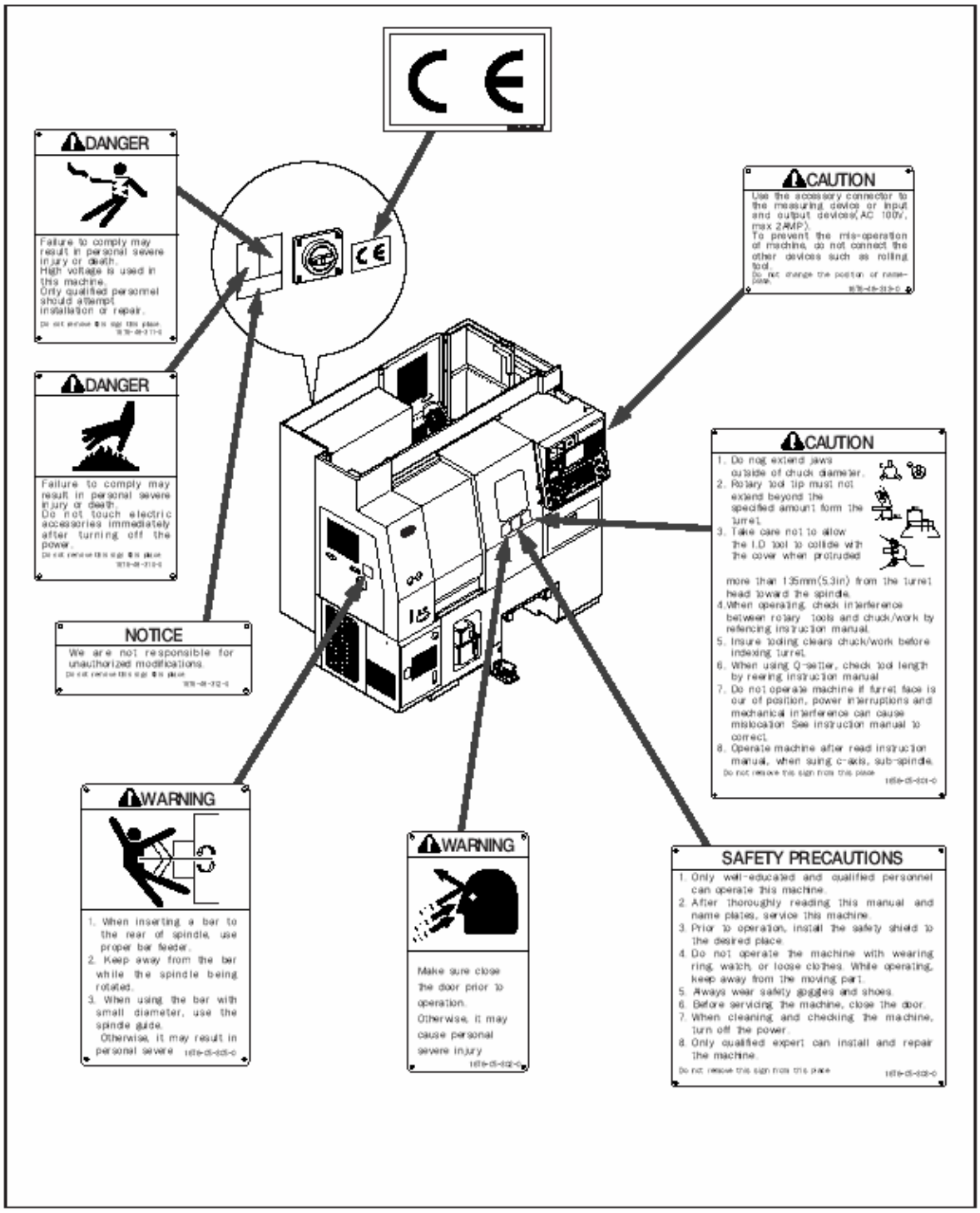
(2) Special care should be taken in handling the electric instrument of the body.

(3) Clean the fan and filter in the Electric Control Panel regularly.

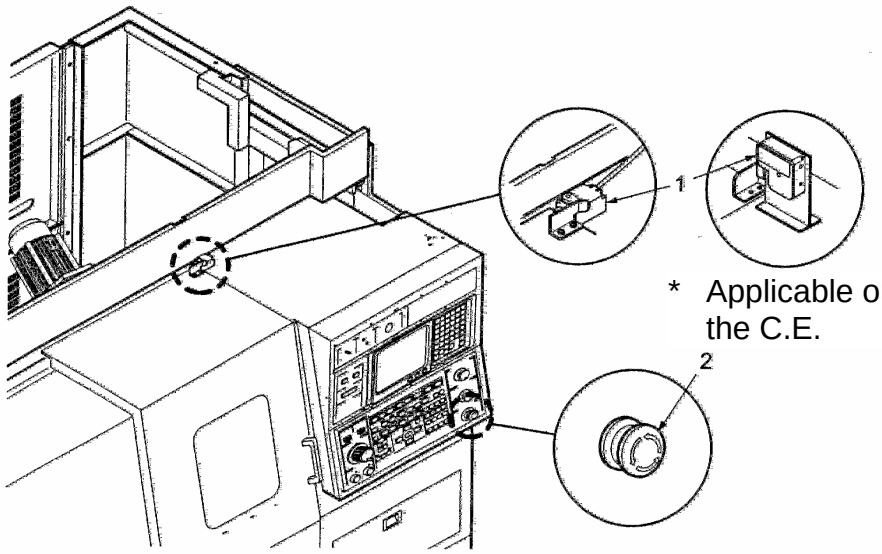
(4) Check the no of program on the screen of the Operating Panel.

6. Safety Device

6-1. Name Plates



6-2. Safety Device

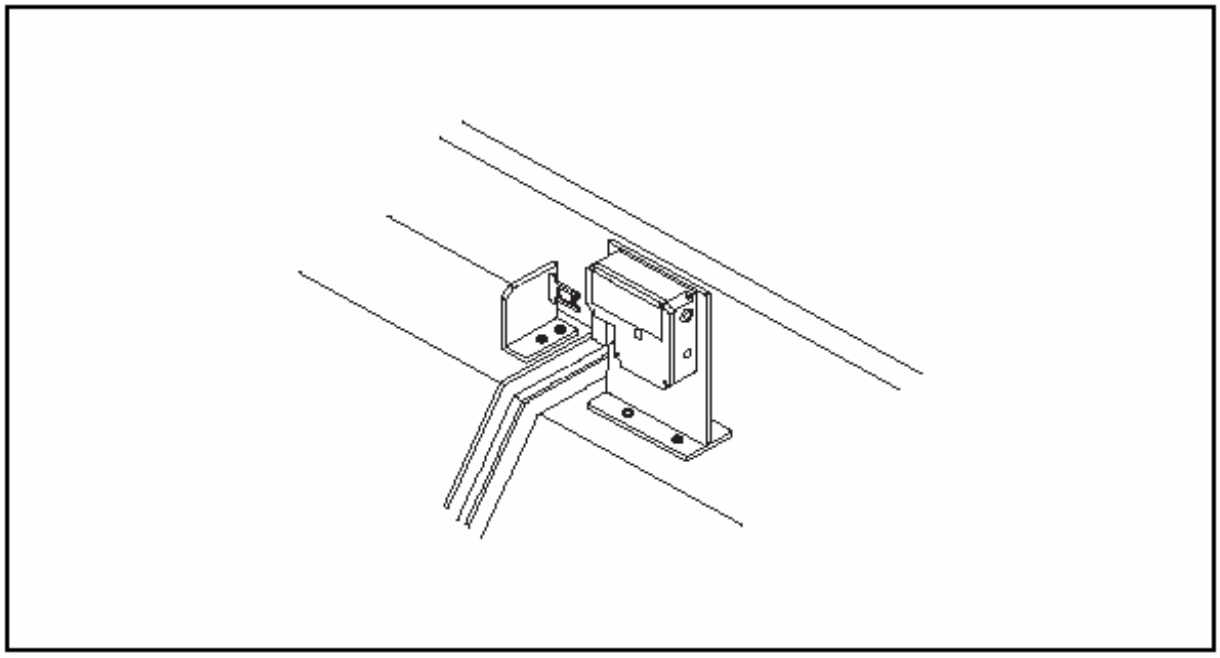


No.	Name	Function
1	Door Lock System	If the door opened while operating the machine, it may be in Emergency Stop sate.
2	Emergency Stop Switch	If Pressing this switch, all operating parts except hydraulic ones will be stopped.

6-2-1. Door Lock System (Applicable only to the C.E)

WARNING

Set the "LOCK / UNLOCK" switch of door lock system to "LOCK" .
If setting it to "UNLOCK" , it may allow the door to be opened while operating and cause serious risks.



If a power failure occurred while operating, turn the lock switch to "UNLOCK" to open door

WARNING

We are not responsible for the accident due to unauthorized modifications of Door Lock System.

III

SPECIFICATION

III SPECIFICATION

1. Introduction 3-1
1-1. Head Stock **3-1**
1-2. Tool Post **3-1**
1-3. Tail Stock **3-1**

2. Specification 3-2
2-1. Spindle Output and Torque Diagram **3-3**

3. NC Device Specification (FANUC Oi-TB) 3-4
3-1. G Function **3-7**
3-2. M Function (Auxiliary) **3-9**

4. Head Stock 3-12
4-1. SUPER KIATURN 100 ..... **3-12**
4-2. SUPER KIATURN 200 ..... **3-13**
4-3. Major dimension of Head Stock **3-14**

5. Chuck and Rotary Cylinder 3-15
5-1. Hollow Chuck Major Dimension **3-15**
5-2. SUPER KIATURN 100 Hollow Chuck **3-16**
5-2-1. Connecting Parts for Rotary Cylinder **3-16**
5-2-2. Major Dimensions **3-17**
5-3. SUPER KIATURN 200 Hollow Chuck **3-17**
5-3-1. Connecting Parts for Rotary Cylinder **3-17**
5-3-2. Major Dimensions **3-18**

6. Tool Post 3-19
6-1. Turret **3-19**
6-2. SUPER KIATURN 100 ..... **3-20**
6-3. SUPER KIATURN 200 ..... **3-21**

1. Introduction

1-1. Head Stock

Ensures the wide-range change in speed by the AC spindle motor as follows:
For SUPER KIATURN 100, between 30 and 6.000 rpm and for SUPER KIATURN 200, between 30 and 4.000 rpm.
Besides, it enables the constant surface speed control by the AC spindle motor.

1-2. Tool Post

Ensures more rapid and accurate indexing work (0,12 sec/surface) by the servo motor and the 3-pice coupling.

1-3. Tail Stock (Option)

Install the taper of MT No. 4 sold as a commercial live center.
The tail stock is set to random position by controlling the key above the support. Also, the thrust can be adjusted between 50 and 450 Kgf (500N and 4.500N) according to the hydraulic adjustment.

2. Specification

Table 3-1 Specification

Item			Unit	SUPER KIATURN 100	SUPER KIATURN 200
Capacity	Swing over Bed		mm (in)	ϕ550 (21.6)	
	Max. machine dia.		mm (in)	ϕ350 (13.8)	
	Chuck size		mm (in)	ϕ 165 (6)	ϕ 210 (8)
	Swing over cross		mm (in)	ϕ350 (13.8)	
	Max. turning length		mm (in)	300 (11.81)	
	Bar capacity		mm (in)	ϕ45 (1.77)	ϕ65 (2.6)
Spindle	Speed		rpm	6,000	4,000
	Speed variation			randomly	
	Spindle dia (Bearing)		mm(in)	ϕ90 (3.54)	ϕ110 (4.3)
	Spindle nose			A2-5	A2-6
	Bearing arrangement			ball bearing	
	Floor-Center height		mm(in)	1,010 (39.76)	
Tool Post	Turret type		sec	12-angle variable arrangement	
	Tool size			□25/Ø32(□1Ø11/4)	□25/Ø40(□1Ø11/2)
	Indexing time (1step/full)		each	0.12/0.24	
	Mechanism		sec	Servo	
Travels	Guide type			LM-Guide	
	Travel	X-axis	mm(in)	210 (8.2)	
		Z-axis	mm(in)	330 (12.99)	
	Traverse	X-axis	m/min(in/min)	36 (1,417)	
		Z-axis	m/min(in/min)	36 (1,417)	
Tail Stock (Option)	Tail stock taper			MT4	
	Tail stock dia.		mm (in)	ϕ56 (2.2)	
	Tail stock travel		mm (in)	80 (3.15)	
	Tail stock thrust		kgf (N)	450 (17.72)	
	Feeding method			manual	
Motor	Spindle		kW (Hp)	5.5/7.5 (7.4/10)	7.5/11 (10/55)
	Feed drives	X-axis	kW (Hp)	1.6 (2.2)	
		Z-axis	kW (Hp)	1.6 (2.2)	
	Coolant		kW (Hp)	0.18 (0.24)	
	Power Capacity		KVA	11.4	14.1
Others	External size (L x W x H)		mm (in)	1,943x1,650x1,820 (76.5x64.96x71.65)	
	Machine weight		kg (N)	3,800 (38,000)	3,900 (39,000)
	controller			FANUC 0i-TB	

* The standard CHUCK & CYL should be attached, otherwise, it might cause serious injury to human body. You should use the approved one by our company.

2-1. Spindle Output and Torque Diagram

- The constant output area and torque to ensure the rated output of machine are shown in the followings.
- SUPER KIATURN 100

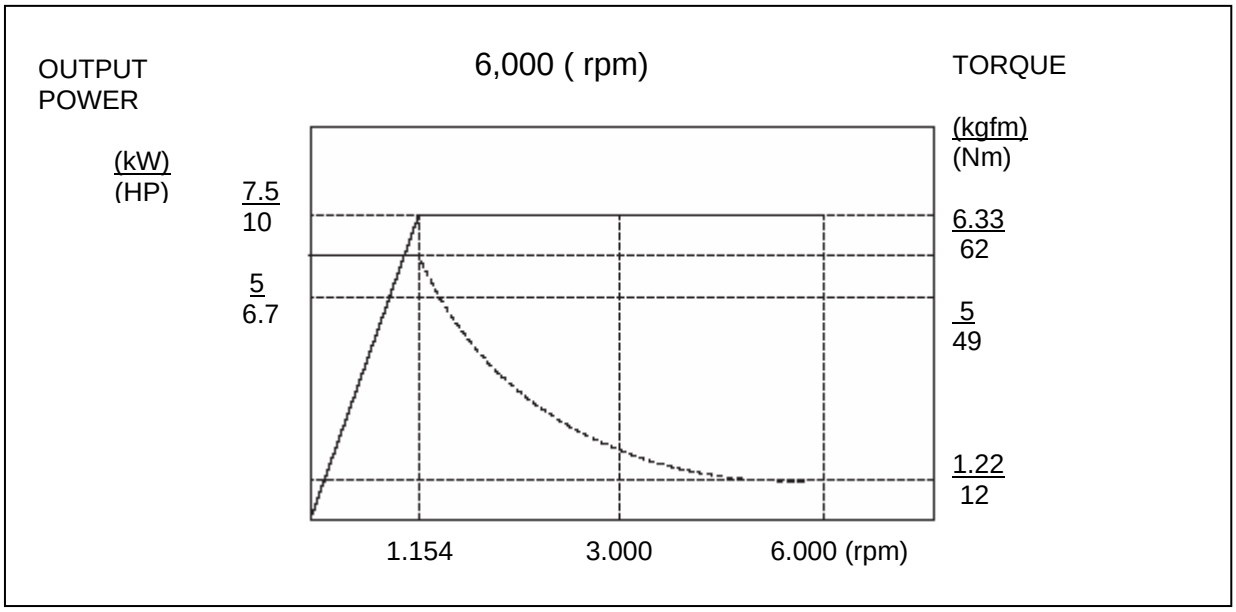


Fig. 3-1 Output and Torque Diagram

- SUPER KIATURN 200

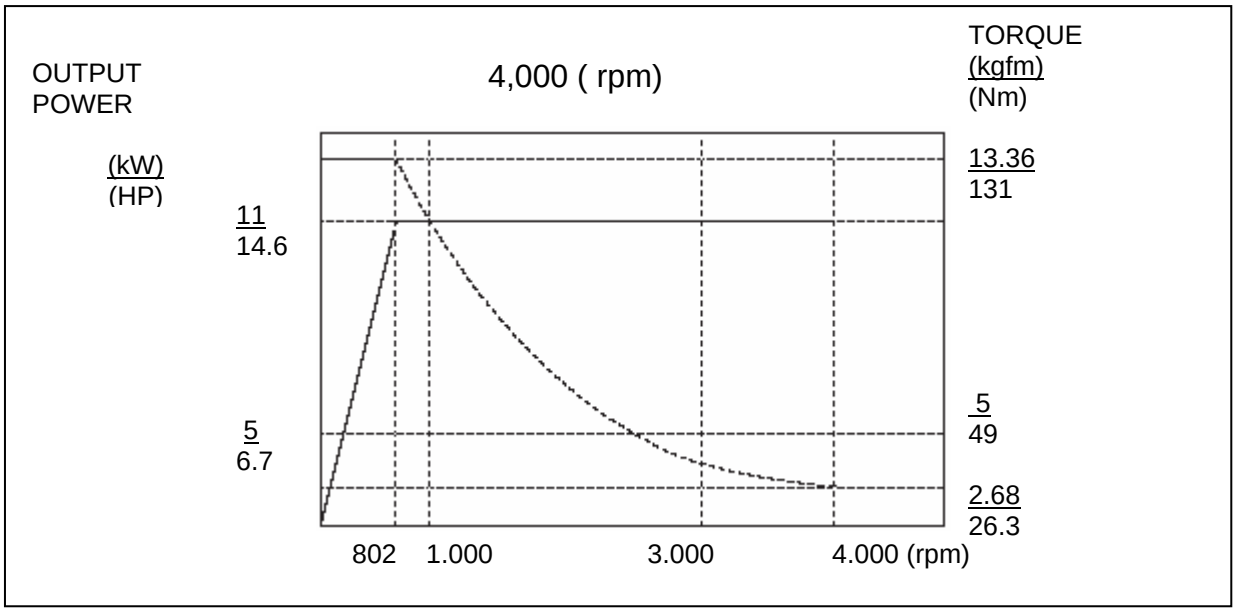


Fig. 3-2 Output and Torque Diagram

3. NC Device Specification (FANUC Oi-TA)

<Standard Specification>

Controlling Axis	X, Z-axis, simultaneous 2-axis.
Interpolation Function	Positioning straight line and arc interpolation.
Command Method	Absolute/Incremental.
Least Input Increment	0,001 mm, 0.001 deg
Tape Code	EIARS244/ISO 840 auto-identification.
M, S, T Function	Preparation G2, 3 digits, Aux. M2 digits, Tool T4 digits
Spindle Speed Command	S code rpm direct command.
Feed Command	F code feed rate direct command.
Feed Rate Override	0 ~ 200% (10% interval)
Rapid Feed Override	1%, 5%, 25/50%, 100%
Manual Feed Function	Rapid feed, Jog feed (0 ~ 2000 mm/min), Handle feed.
Manual Pulse Generator	Multiply x1, x10, x100 three stage exchange
Tool Position Offset	No. of offset : 32
Character Display	9 inch 512 characters (16 x 32)
Tape Memory Edit	320 m
Position Coder	6.000 rpm
Canned Cycle	G90, G92, G94
Thread Cutting Function G32	
Constant Surface Speed Control	G96 S x x x x
Return to Reference	Manual, Auto G27-~ G30
Run Hour display	NC display
Nose R Compensation	Auto calculation (G40 ~ G42)
Spindle Max. Speed Setting	G50 Sx x x x
Auto Coordinate Setting	T code coordinate setting
Workpiece Coordinate Shift	Direct, increase/Decrease measured value G54 (workpiece length)
Manual Absolute	"ON" Fix
Stored Stroke limit	1, 2, 3, G22, G23
Incremental Offset	U, W

Offset Data Tape Reading	G10
Variable-lead Thread Cutting	G34
Program Checking	Dry run + Spindle Stop + Coolant Stop
Input/Output Interface	RS232 * 1
Block Skip	1EA
Arc. Radius R Designation	
Chamfering R	
Memory Lock Key	
Skip Function	G31
Number of registerable Program	200EA
Single Block	
Feed Hold	
Optional Stop	
Dwell	
Decimal Point Input	
Program No. Search	
Sequence No. Search	
Label Skip	
Machine Lock	
Dry Run	
Backlash Compensation	0 ~ 255 pulse
NC Self Diagnostic Function	
Inch/Metric Conversion	G20, G21
Canned Cycle for Drilling	G80, G83, G84, G85, G87, G88, G79
Tool Life Management	
Stored Pitch Error Compensation	
Custom Macro B	Review spec, when using DI/DO
Background editing	

*1. Only interface exists. The cable connected with I/O device is not included.

<Option Specification>

Temporarily Stop of Thread Cutting	(G92, G76)
Multiple Start Thread Cutting	G76
Manual Absolute	Switch exchange type
Program Restart	Review spec. when using DI/DO
Optional Block Skip Addition	Review machine spec.
External Tool Offset	Review machine spec.
External Workpiece No. Search	Review machine spec.
External data Input	Review machine spec.
Auxiliary Function Lock	
Return to the Set Up Point	
Manual Interruption Point	
Manual Interruption Point Return	
Angle Programming for Linear Interpolation	
Multiple Cornering (Beveling & Rounding)	
Skip Function	G31
Internal Toggle Switch	
Spindle Index Function	Review machine spec.
Buffering Function	
Graphic Function	

3-1. G-Function

B. Standard, O: Option

Standard G Code	Group	Function	Type
G00	01	Positioning (rapid traverse)	B
G01		Linear interpolation, (Cutting feed)	B,O
G02		Circular interpolation CW	B
G03		Circular interpolation CCW	B
G04	*	Dwell	B
GO6		Error detecting OFF positioning	B
G10		Tool offset setting	B
G20	05	Inch input	O
G21		Metric input	O
G22	01	Circular interpolation radius R setting CW	O
G23		Circular interpolation radius R setting CCW	O
G27	*	Reference point return check	B
G28		Auto reference point return	B
G29		Return from reference point	B
G30		2nd reference point return	B
G31		Skip function	O
G32	01	Thread cutting, continuous thread cutting, multi thread cutting (Option)	B,O
G34		Variable lead thread cutting	O
G35	*	Tool set error compensation	O
G36	07	The 2nd Stored stroke limit ON	B
G37		The 2nd Stored stroke limit OFF	B
G38	08	The 3rd Stored stroke limit ON	B
G39		The 3rd Stored stroke limit OFF	B
G50	*	Coordinate system setting	B
		Max. spindle speed setting, work coordinate system setting.	O
G51	*	Return of current display value to origin	O
G65		Macro simple call	O
G66	09	Macro modal call	O
G67		Macro modal call cancel	O
G68	10	Programmable mirror image ON	O
G69		Programmable mirror image OFF	O

B:Standard, O: Option

Standard G Code	Group	Function		Type
G70		Finishing cycle	Multiple repetitive cycle	O
G71		Rough turning		O
G72		Rough facing		O
G73		Pattern repeating cycle		O
G74		End face peck drilling cycle		O
G75		Grooving in X-axis		O
G76		Thread cutting cycle		O
G90	01	Turning cycle A		B
G92		Thread cutting cycle		B
G94		Facing cycle B		B
G96	02	Constant surface speed control		B
G97		Constant surface speed control cancel		B
G98	04	Feed per minute (mm/min)		B
G99		Feed per revolution (mm/rev)		B
G122	11	Tool registration start	Tool Life Management	O
G123		Tool registration finish		O
G111	*	Taper multi chamfering/R		O
G112		Circular multi chamfering/R		O
G141	*	Tool nose R left compensation		B
G142		Tool nose R right compensation		B
G150	13	Groove width compensation OFF		B
G151		Groove width compensation ON		B

The G code of group 01-03 is called "modal G code" .

If the G code commanded, it is effective until another G code is done.

Group 01 : Controlling the movement of tool

Group 02 : Controlling the movement of tool

Group 04 : Controlling the movement of tool nose

Group 07 and 08 : Setting enable / disable area of tool

Group 01 : Controlling the groove width compensation

3-2. M Function (Auxiliary)

★: Option

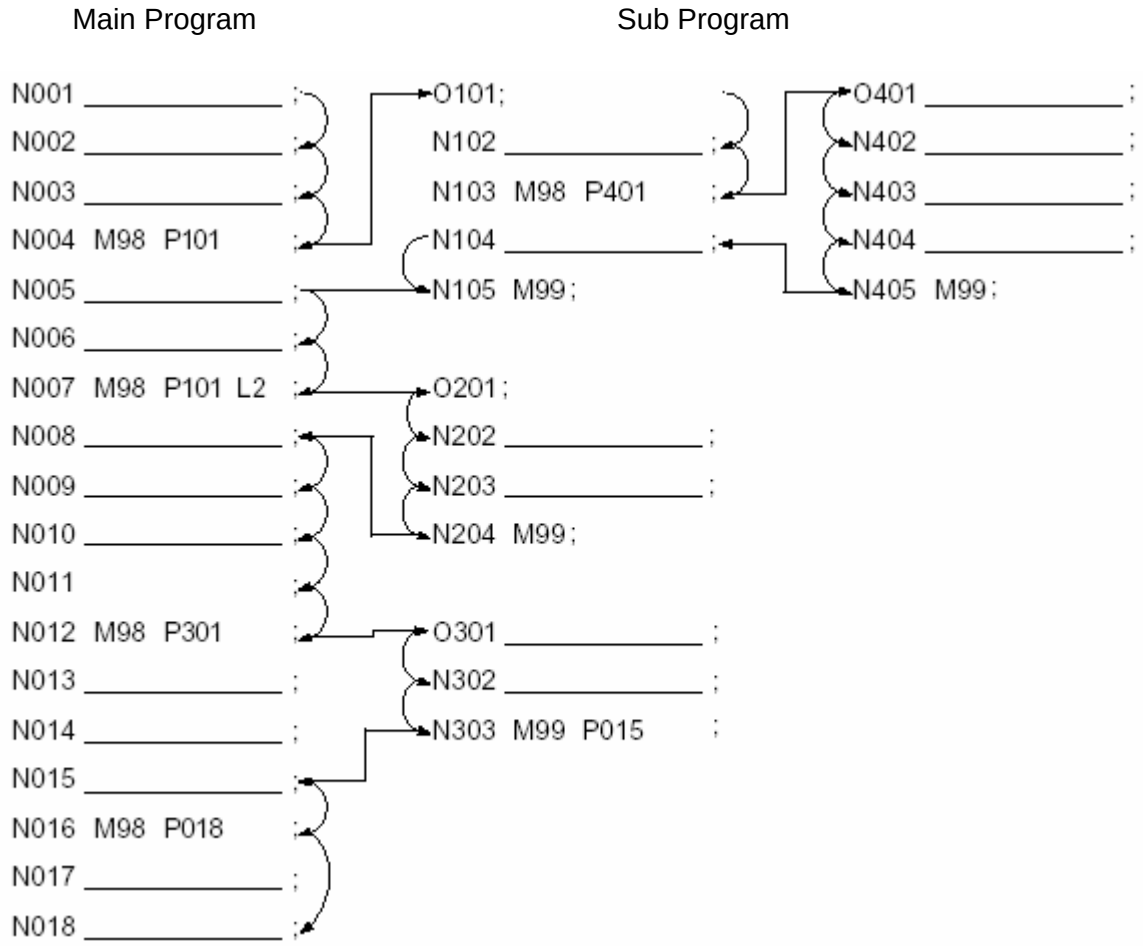
M-code	Function	Remark	M-code	Function	Remark
M00	PROGRAM STOP		M25	CENTER FORWARD	★
M01	OPTIONAL STOP		M26	CENTER RETRACT (TIMER STOP)	★
M02	PROGRAM END		M27		
M03	SPINDLE FORWARD		M28	CENTER RETRACT (TIMER STOP)	★
M04	SPINDLE REVERSE		M29		
M05	SPINDLE STOP		M30	NC RESET & REWIND	
M06			M31	END OF BAR COUNTR UP CHECK	
M07			M32		
M08	COOLANT ON		M33		
M09	COOLANT OFF		M34	LUBRICATION INHIBIT	
M10			M35	LUBRICATION INHIBIT OFF	
M11			M36	AUTO POWER OFF ENABLE	★
M12	COUNTER	★	M37	AUTO POWER OFF DISABLE	★
M13			M38	CENTER AIR BLOW ON	★
M14			M39	CENTER AIR BLOW OFF	★
M15			M40		
M16			M41		
M17			M42		
M18	RELEASE OF THE SPINDLE POSITIONING		M43		
M19	SPINDLE POSITIONING	★	M44	SERVO MODE ON	★
M20			M45	SERVO MODE OFF	★
M21	ERROR DETECT ON		M46	SPINDLE OVERRIDE ENABLE	★
M22	ERROR DETECT OFF		M47	SPINDLE OVERRIDE DISABLE	★
M23	CHAMFERING ON		M48	FEED OVERRIDE ENABLE	
M24	CHAMFERING OFF		M49	FEED OVERRIDE DISABLE	

★: Option

M-code	Function	Remark	M-code	Function	Remark
M50			M75		
M51	SPINDLE AIR BLOW ON	★	M76		
M52	SPINDLE AIR BLOW OFF	★	M77		
M53			M78		
M54			M79		
M55			M80		
M56			M81		
M57			M82		
M58			M83		
M59			M84		
M60			M85		
M61	AUTO DOOR OPEN	★	M86		
M62	AUTO DOOR CLOSE	★	M87		
M63	PART CATCHER UP	★	M88		
M64	PART CATCHER DOWN	★	M89		
M65			M90		
M66	CHUCK PRESSURE LOW	★	M91		
M67	CHUCK PRESSURE HIGH	★	M92		
M68	CHUCK CLAMP		M93		
M69	CHUCK UNCLAMP		M94		
M70	CALL LIGHT ON		M95		
M71			M96		
M72			M97		
M73			M98	SUB PROGRAM CALL	
M74			M99	SUB PROGRAM STOP	

Sub Program Call

(Ex)



4. Head Stock

4-1. SUPER KIA TURN 100

CAUTION

Before operating the machine, sufficient warm up the Head Stock.

- The Head Stock is A2-5

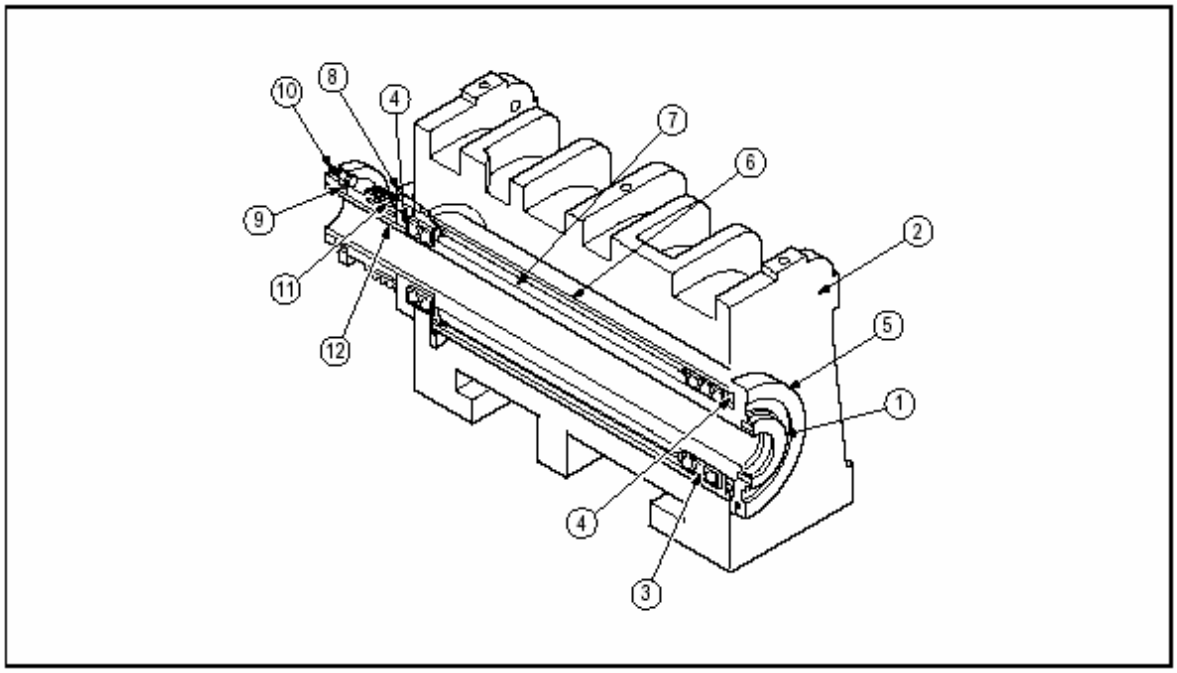


Fig. 3-3 Head Stock (SUPER KIATURN 100)

No.	Part Name	No.	Part Name
1	Spindle	7	Collar "B"
2	Head Body	8	Rear Flange
3	Bearing	9	O-Ring
4	Labyrinth	10	Hex. Bolt
5	Front Flange	11	Spindle Pulley
6	Collar "A"	12	Key

4-2. SUPER KIA TURN 200

- The Head Stock is A2-6

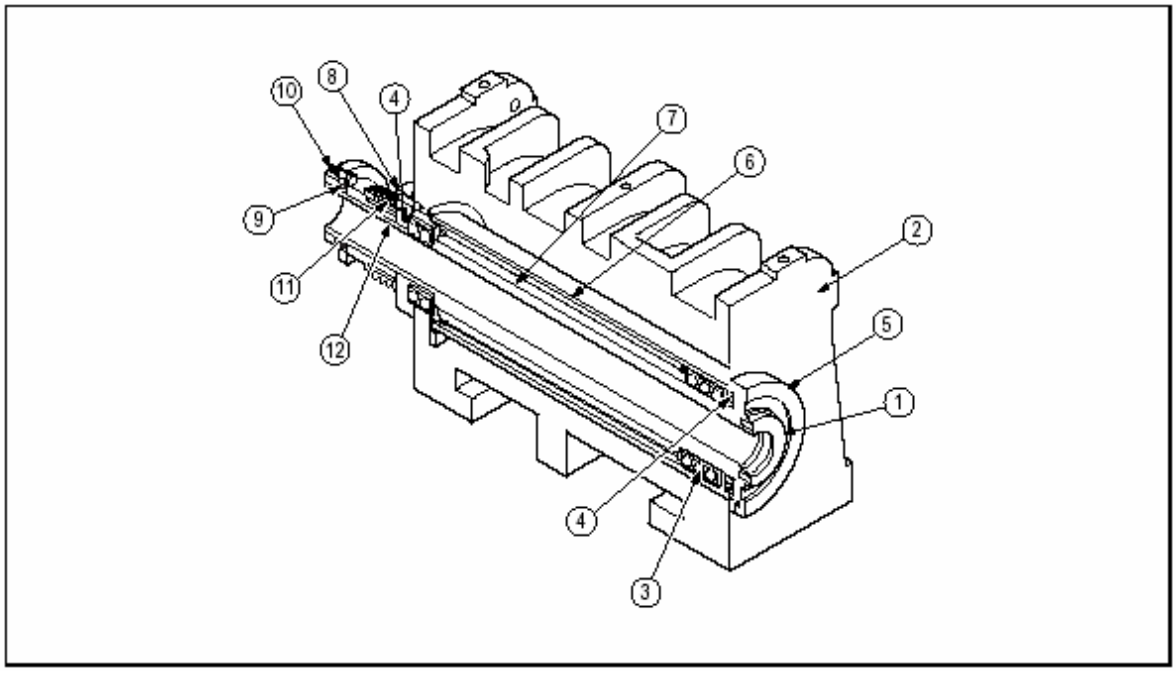


Fig. 3-4 Head Stock (SUPER KIATURN 200)

No.	Part Name	No.	Part Name
1	Spindle	7	Collar "B"
2	Head Body	8	Rear Flange
3	Bearing	9	O-Ring
4	Labyrinth	10	Hex. Bolt
5	Front Flange	11	Spindle Pulley
6	Collar "A"	12	Key

4-3. Major Dimensions of Head Stock

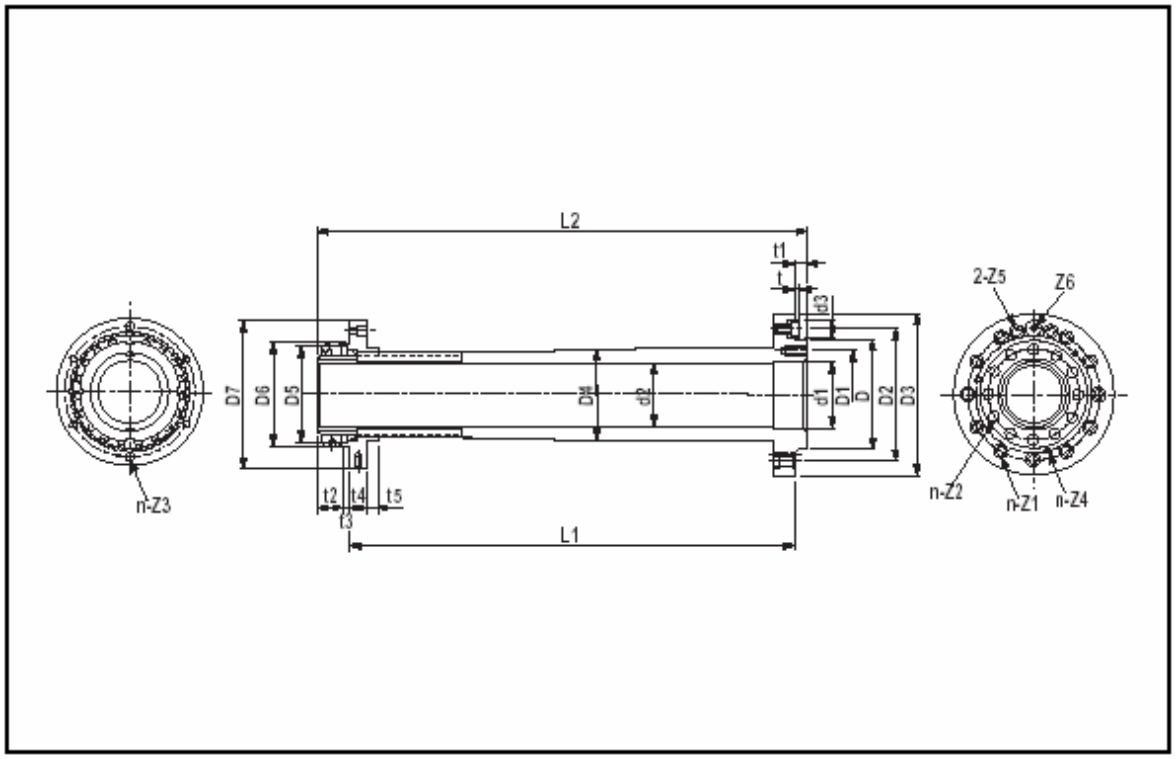


Fig. 3-5 Major Dimensions of Head Stock

mm (in)

No.	SKT 100	SKT 200	No.	SKT 100	SKT 200
D	82.17(3.235)	106.375(4.188)	t2	22.4	21
D1	62(2.56)	90(3.54)	t3	9	5
D2	104.8(4.125)	133.4(5.25)	t4	20	17.5
D3	135(5.31)	210(8.26)	t5	3	18.5
D4	90(3.54)	110(4.33)	L1	474.8	535.1
D5	87(3.43) [100(3.94)]	130(5.12)	L2	519.2	575.4
D6	150(5.91)	145(5.71)	n-Z1	11-M12	11-M12
D7	176(6.93)	190(7.48)	n-Z2	8-M8	8-M6
d1	54(2.13)	78(3.07)	n-Z3	6-M10	6-M10
d2	53(2.09)	78(3.07)	n-Z4	6-M10	3-M8
d3	16(0.63)	19.05(0.75)	Z5	10	10.2
t	4.75(0.187)	4.8(0.189)	Z6	M6	M8
t1	13(5.12)	14.3(0.563)	Z6	50	30

5. Chuck and Rotary Cylinder

5-1. Hollow Chuck Major Dimensions

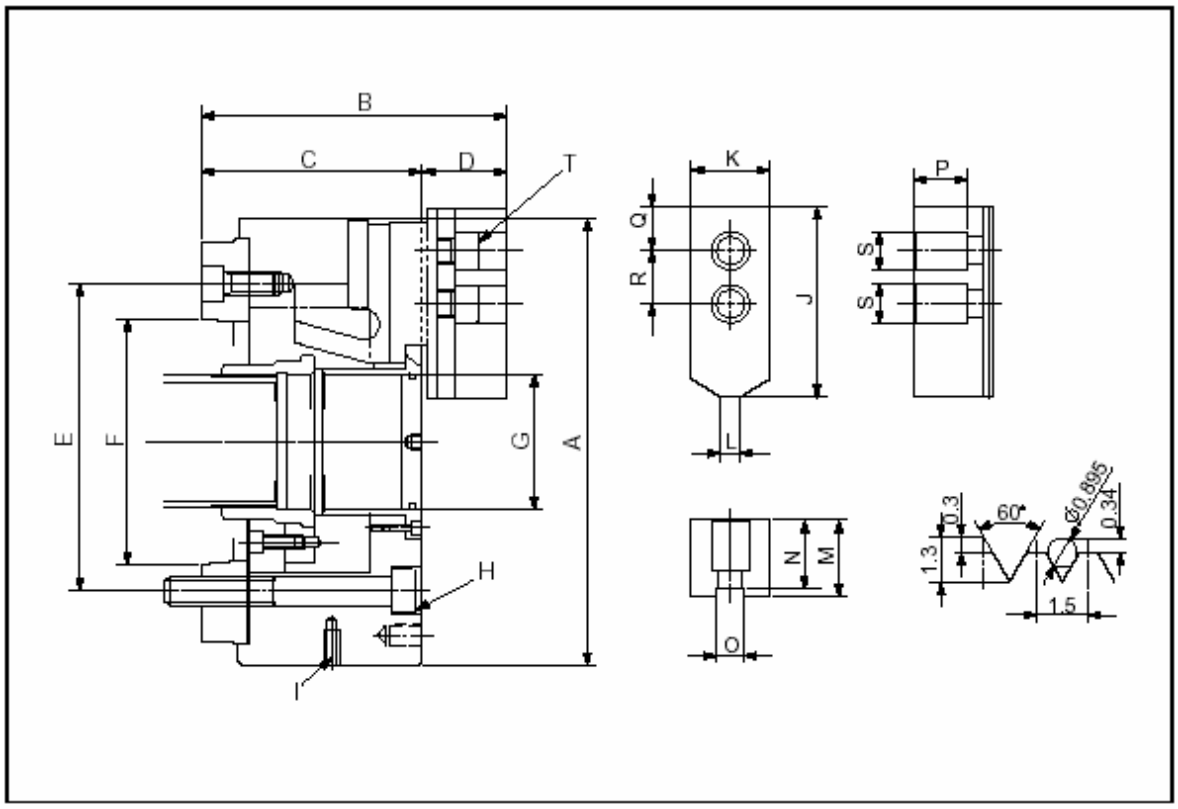


Fig. 3-6 Major Dimensions of Hollow Chuck and Soft Jaw

mm

No.	SKT100				No.	SKT100	SKT200
	SAMCHUNREE	SMI	SAMCHUNREE	SMI		SAMCHUNREE/SMI	SAMCHUNREE/SMI
A	Ø 169		Ø 210		K	35	40
B	123	122	147	146	L	6	8
C	91	90	103	102	M	28	40
D	32		44		N	23	35
E	104.8	110	133.4	140	O	12	16
F	82.56		106.375		P	20	26
G	Ø 46		Ø 52		Q	15	20
H	M10-95L		M12-110L	M12-105L	R	20	25
I	2-M10		2-M10		S	Ø17.5	Ø 20
J	72		85.5		T	M10-32L	M12-32L

5-2. SUPER KIATURN 100 Hollow Chuck (6', 0165)

Name	Manufacturer
Chuck	SAMCHUNREE, SMI
Cylinder	SAMCHUNREE. SMI

5-2-1. Connecting Parts for Rotary Cylinder

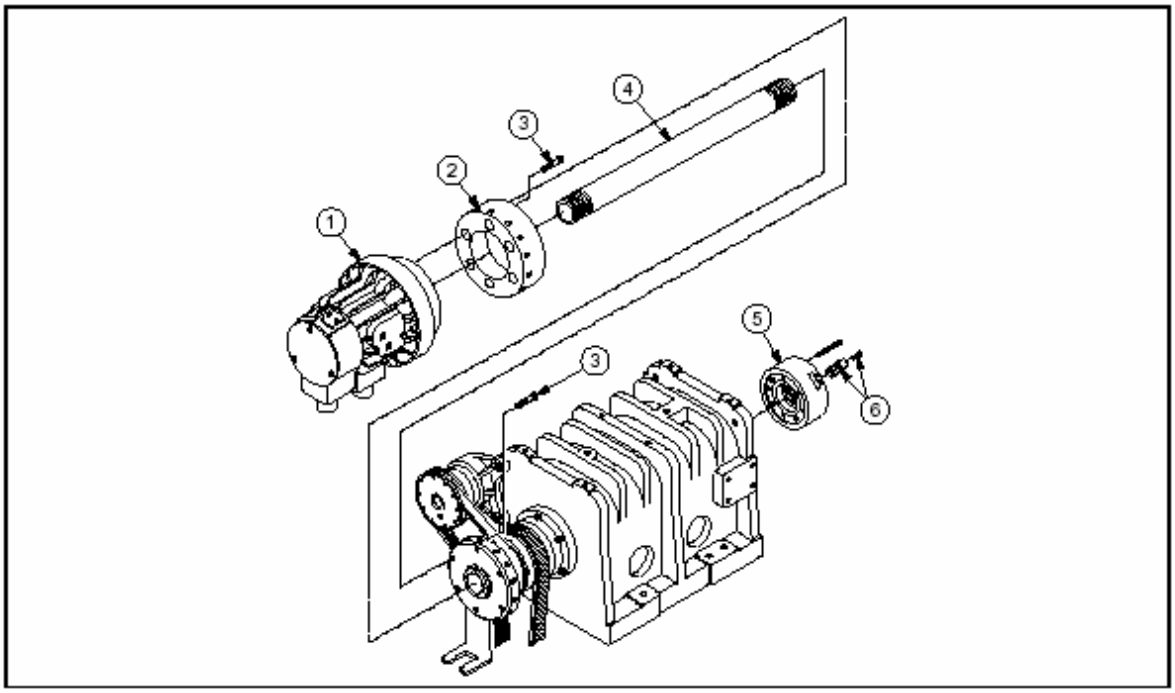


Fig. 3-7 Connecting Parts for Cylinder

No.	Item	Item No.		Qty.	Remarks	
		SAMCHUNREE	SMI		SAMCHUNREE	SMI
1	Hydraulic Cylinder	1680-11-302-0	1344-11-101-3	1	SYH1239	HHH35CA6
2	Cylinder Flange	1680-11-304-0	1344-11-313-0	1		
3	SCREW, HEX S/C	SM1101010030		12	M10 x 30L	
4	Draw Tube	1680-11-303-0	1654-11-306-0	1		
5	Chuck	1680-11-301-0	1344-11-205-1	1	HAS-06	HH037M6
6	Soft Jaw	1674-11-317-0	KK007003	1 SET		

5-2-2. Major Dimension

mm (in)

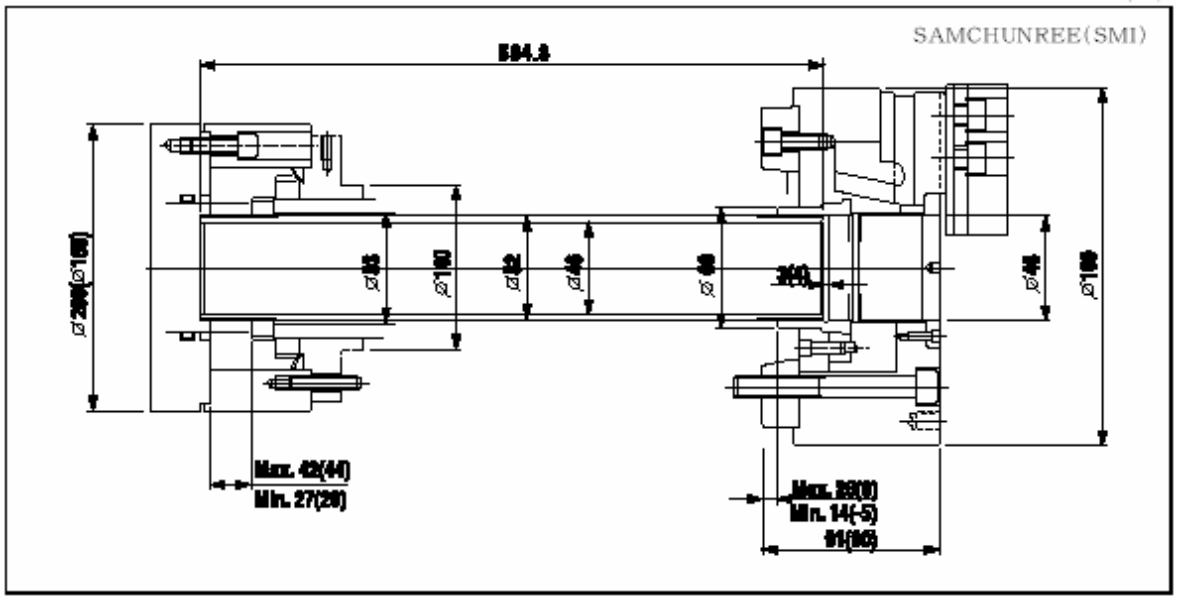


Fig. 3-8 Major Dimensions of Connecting Parts for Cylinder

5-3. SUPER KIATURN 200 Hollow Chuck (8", Ø 210)

Name	Manufacturer
Chuck	SAMCHUNREE, SMI
Cylinder	SAMCHUNREE, SMI

5-3-1. Connecting Parts for Rotary Cylinder

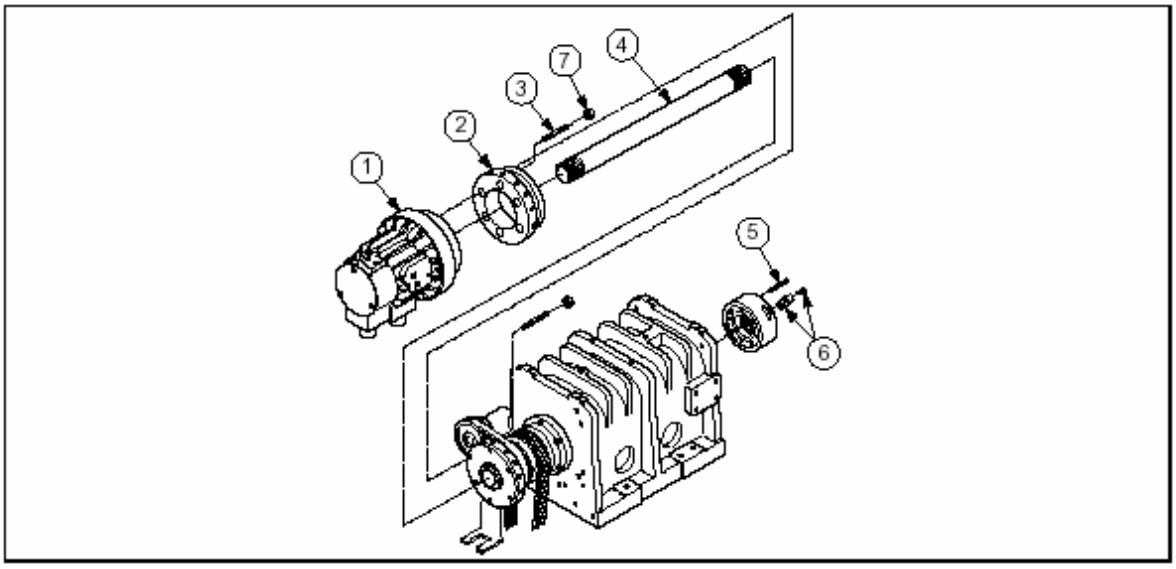


Fig. 3-9 Connecting Parts for Cylinder

No.	Item	Item No.		Qty.	Remarks	
		SAMCHUNREE	Hwacheon		SAMCHUNREE	Hwacheon
1	Hydraulic Cylinder	1742-11-450-1	1742-11-118-1	1	SYH1239	HH36CA8
2	Cylinder Flange	1742-11-447-0	1742-11-202-0		1	
3	Stud bolt	SM 1008010030			4	M10 x 30L
4	Draw Tube	1742-11-432-0			1	
5	Chuck	1742-11-449-0	1742-11-117-0	1	HAS-06	H037M8
6	Soft Jaw	1742-11-454-0	1742-11-443-0	1 SET		
7	Hex. Nut	SM 1201001000		4	M10	

5-3-2. Major Dimension

mm (in)

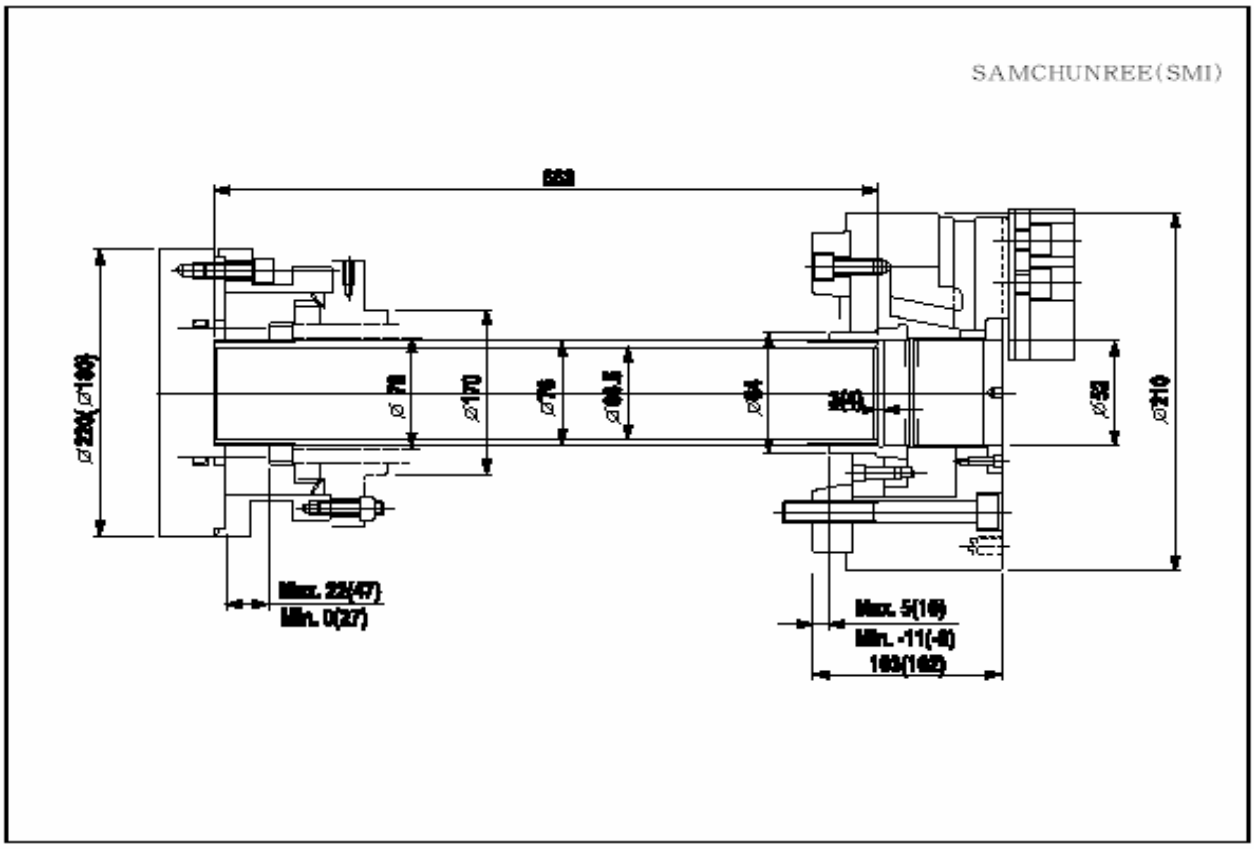


Fig. 3-10 Major Dimensions of Connecting Parts for Cylinder

6. Tool Post

6-1. Turret

mm (in)

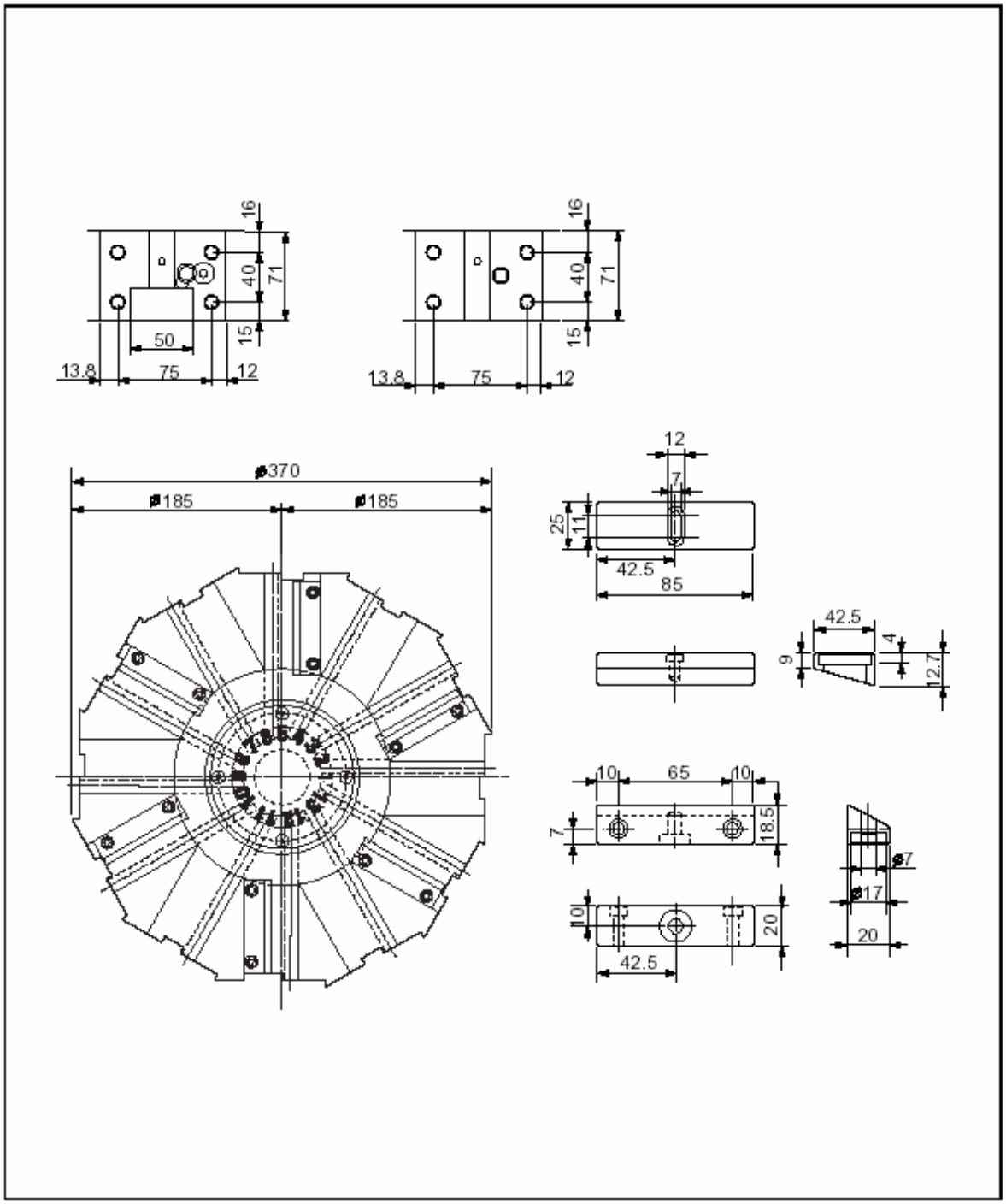


Fig. 3-11 Turret (SUPER KIATURN 100/200)

6-2. SUPER KIATURN 100

- **Base Holder**

mm (in)

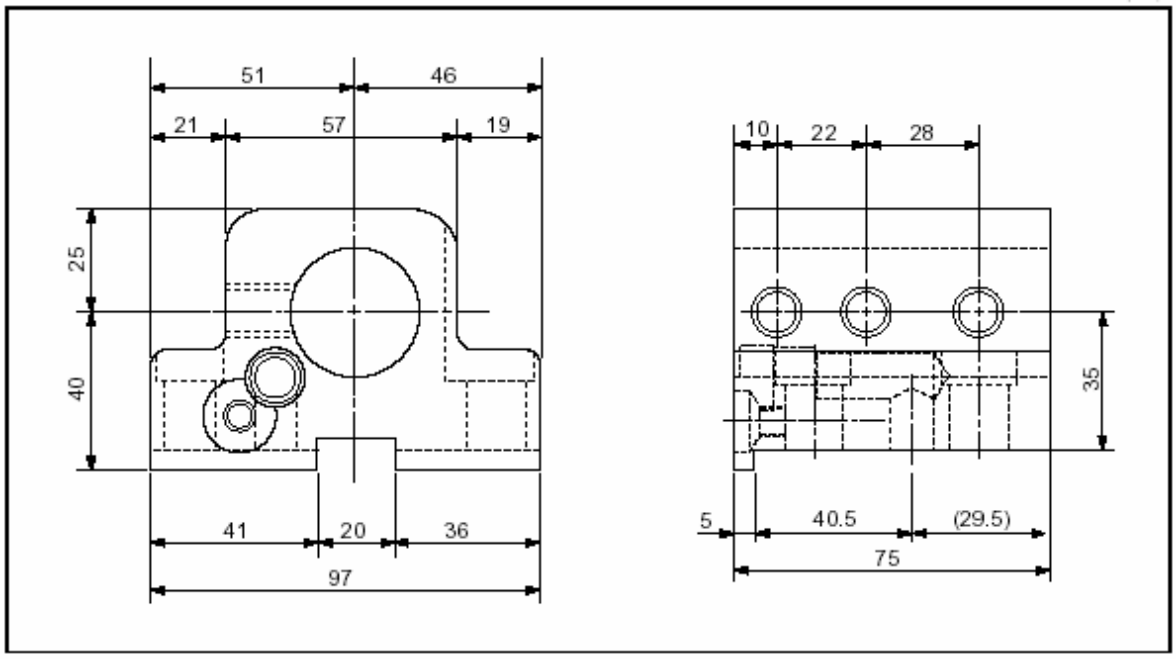


Fig. 3-12 Base Holder

mm (in)

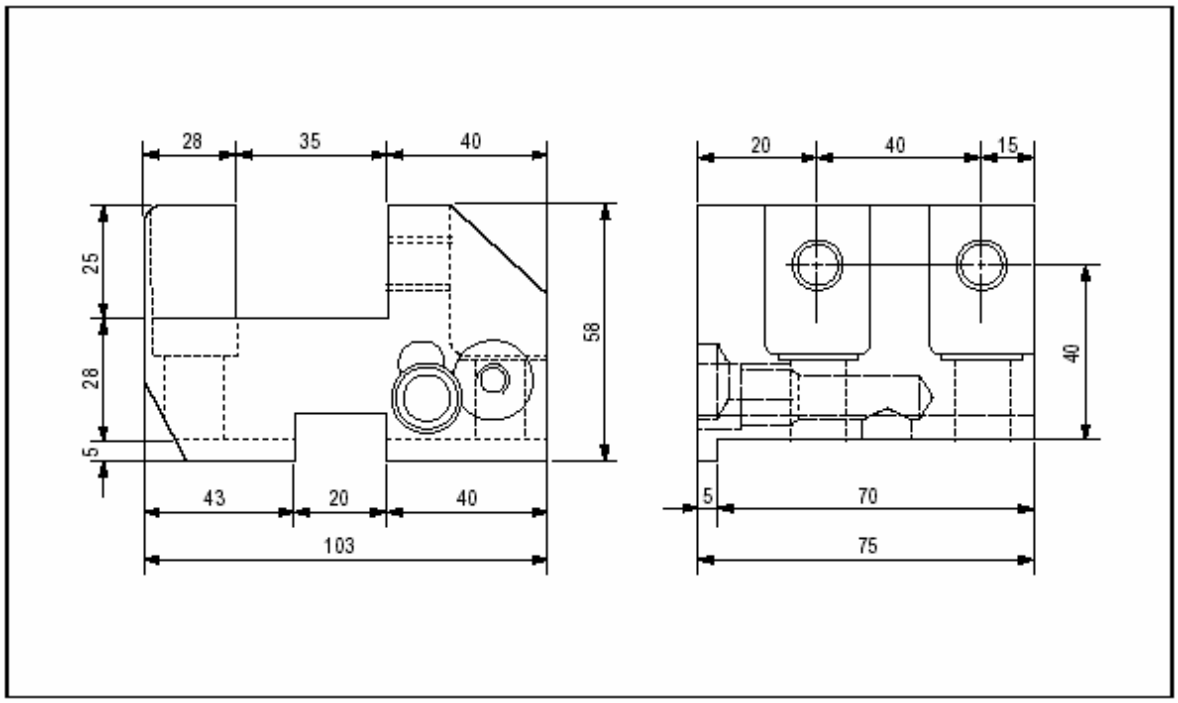


Fig. 3-13 Face Grooving Base Holder

6-3. SUPER K1ATURN 200

- **Base Holder**

mm (in)

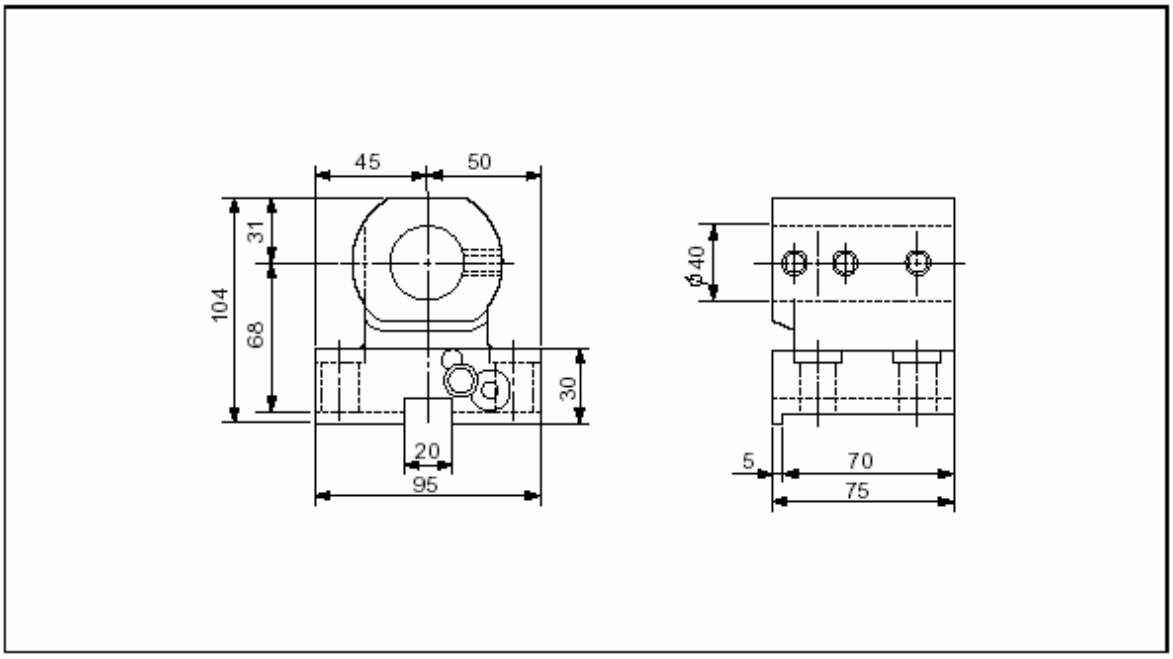


Fig. 3-14 I.D. Base Holder

mm (in)

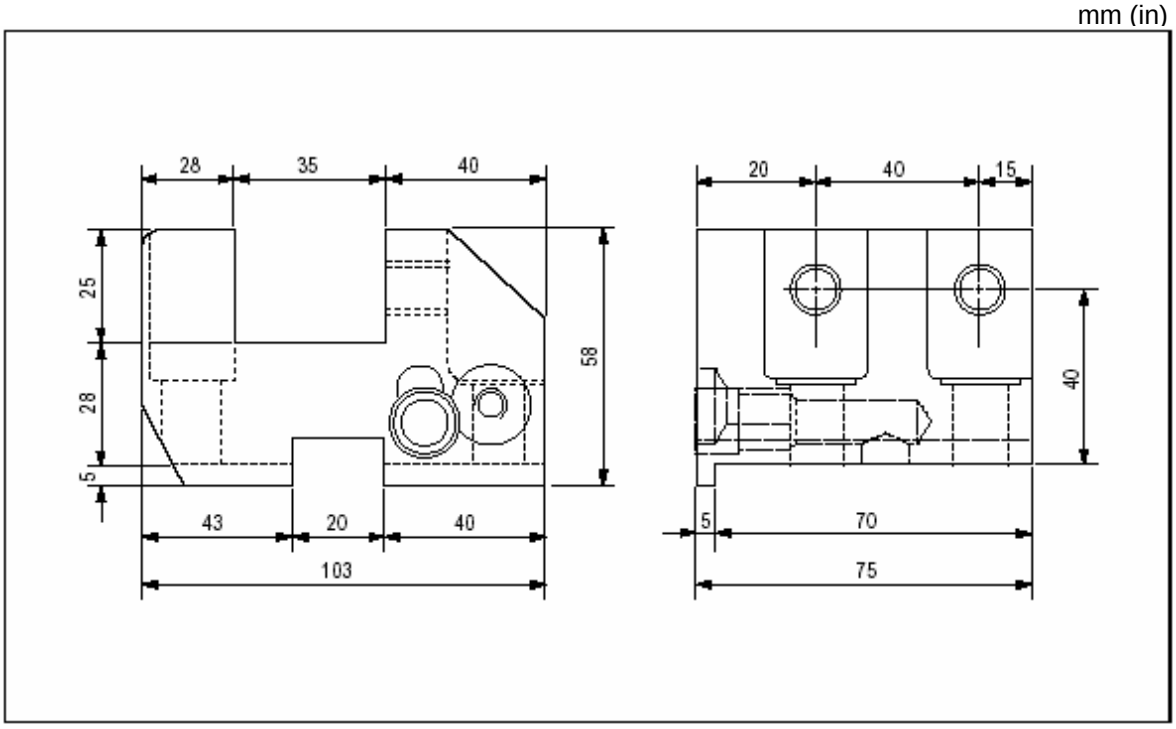


Fig. 3-15 Face Grooving Base Holder

IV

TRANSPORT & INSTALLATION

IV TRANSPORT & INSTALLATION

1. General 4-1

2. Layout of Machine 4-1

3. Transporter 4-2

3-1. Crane **4-3**

3-2. Fork Lift **4-5**

4. Installation 4-6

4-1. Preparation to Install 4-6

4-1-1 Installation Condition **4-6**

4-1-2. Foundation Work **4-7**

4-2. Foundation Work 4-8

4-2-1. Without Using Foundation Bolt **4-9**

4-2-2. Using Foundation Bolt (Optional) **4-9**

5. Adjustment of Level 4-10

6. Cleaning 4-12

7. Lubrication & Oiling **4-13**

7-1. Hydraulic Oil **4-13**

7-2. Oiling Wet Moving Part in the X-and Z-axes **4-13**

7-3. Oiling Hydraulic Chuck **4-14**

8. Coolant 4-15

9. Electric Power and Wiring 4-16

9-1. Power Switch **4-17**

9-2. Wiring to Machine from Power Switch **4-17**

9-3. Changing Electric Units According to Voltage and Frequency **4-18**

9-3-1. Tab Changing for Controlling Transformer **4-18**

9-3-2. External Transformer **4-19**

9-4. Grounding **4-19**

10. Disassembling and Cleaning Shipment Fixture 4-21

11. Check Before Test Working 4-22

12. Required Before Test Working 4-22

12-1. Tool Moving Range **..... 4-22**

12-2. Tool Interference Diagram **..... 4-23**

1. General

(1) This CNC lathe contains three major elements - Body of machine, the Electric Control Panel, Hydraulic Unit, and etc. and each of them is connected with wires and hydraulic pipes.

(2) Sine all devices are attached to the body of machine, you can move it as necessary without overhauling the machine.

(3) There are 2 methods of moving by crane or fork lift.

(4) To achieve the desired working, you should follow the installation procedures given in this manual.

2. Layout of Machine

Figure 4-1 shows the dimension concerned when attaching special accessories, ie. the chip box and chip conveyor to the body of machine.

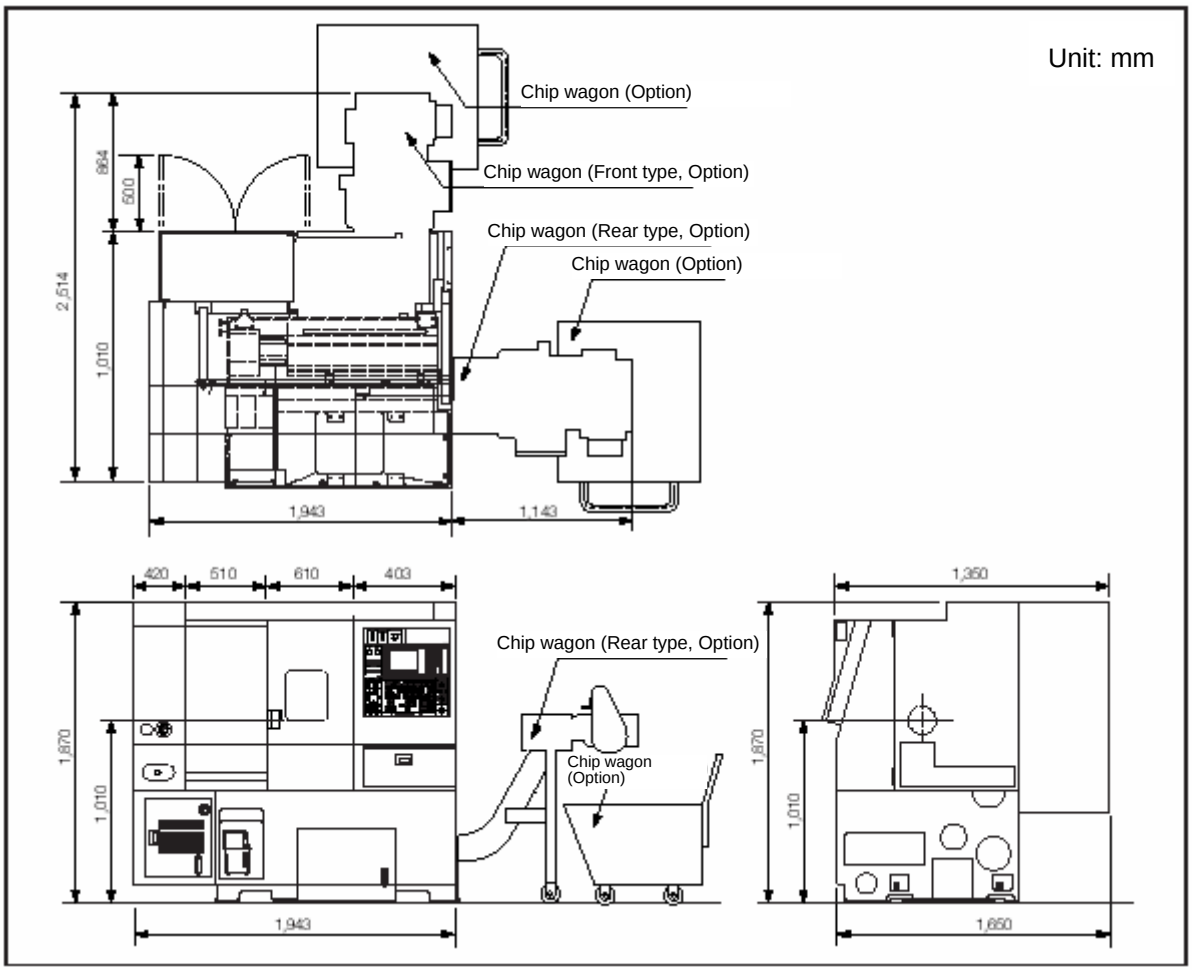


Fig. 4-1 Layout of Machine

3. Transporter

(1) There a 2 transporting methods by means of crane or forklift.

⚠ WARNING

1. When transporting the machine, be careful not to crash with other objects.
2. Never stand or walk under high-lifted machine.

⚠ CAUTION

1. Prior to transporting the machine, check each part of the machine is properly fixed to each other.
2. When lifting the machine, slowly do a job, ensuring a full balance.
3. Be careful not to give a shock to the body of machine, t he Electric Control Panel and other electric devices.
4. Transport the coolant tank after removing it from the body of machine.

3-1. Crane

Name	Weight
SUPER KIATURN 100	3,800 Kgf (38000N)
SUPER KIATURN 200	3,900 Kgf (39000N)

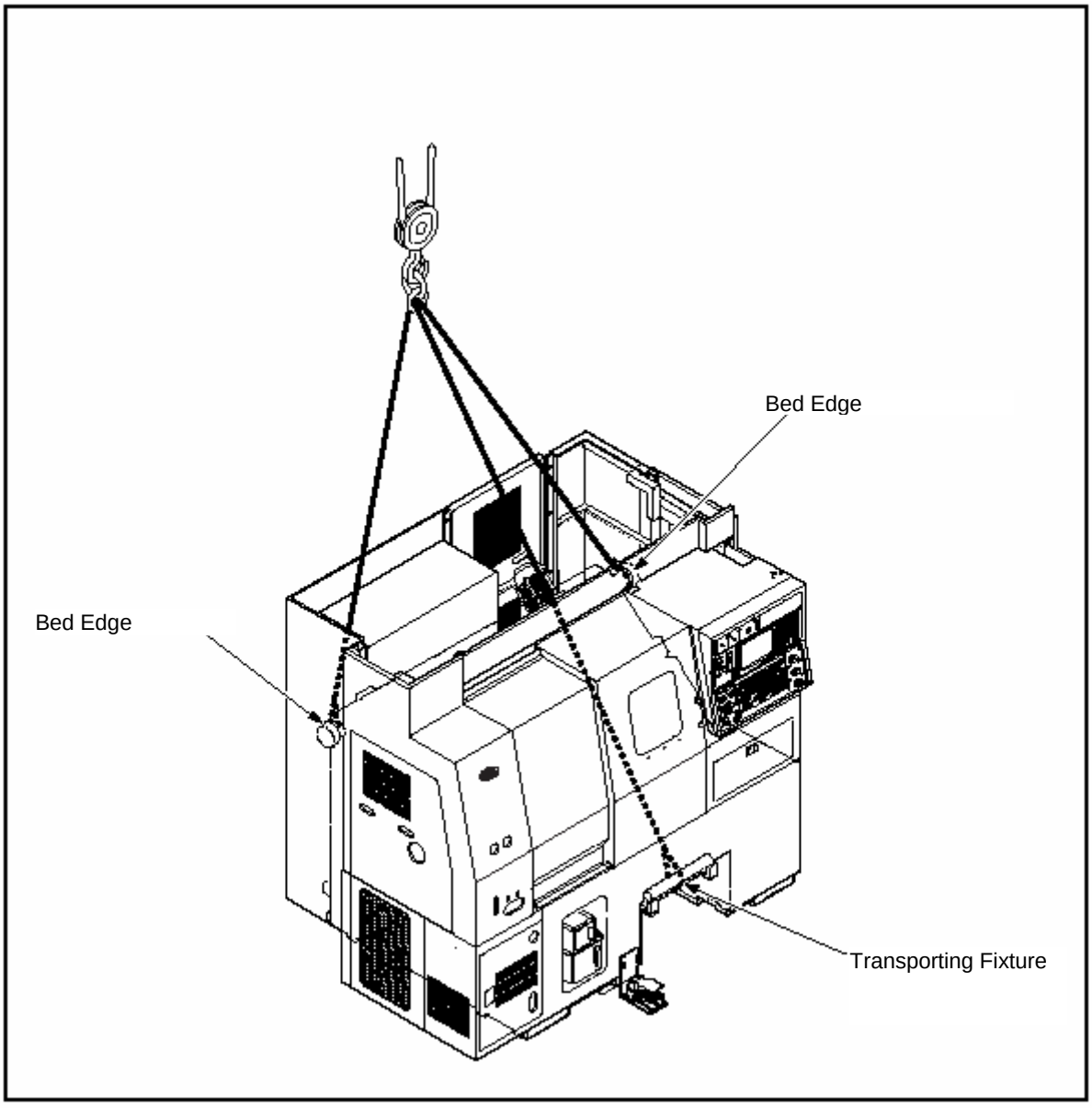


Fig. 4-2 Transport by Crane

(1) The crane-working method is shown in Figure 4-2.

(2) When transporting by crane, ensure the followings.

1) Adjust the center by moving the saddle and cross slide so that they are loaded at the center of hanged angle.

2) Set the angle of wire rope within 90° and to 60° if possible.

3) The capacities of wire rope and crane are as follows.

① Wire rope ... over 16mm in diameter

② Crane ..... over 5ton in load

4) Place where the wire rope is to be attached.

① Both edges of bed

② Fixture for transporting

⚠ CAUTION

1. With the machine lifted slightly, check all sides for balance and the rope is reached to the cover or other parts.
2. When more than 2 persons have to lift the machine, they should work together, communicating each other.
3. Do not use rusty or shorted wire ropes.
4. When lifting the machine, slowly do a job. If the wire rope is tightened, temporarily stop and check an eye bolt is clamped and then lift up to the desired height.
5. When pulling down, also do it slowly. Just before reached the floor, stop it and check the position and then pull down completely.
6. Only the experienced-personnel should perform a crane work.

3-2. Fork Lift

⚠ CAUTION

1. Only who has the forklift driver* s license can convey the machine by forklift.
2. To avoid damage around the protruded part of machine, the task should be performed by two persons, of which one is a supervisor.
3. Put down the machine slowly not to give a shock on the floor.
4. Hold wood between the forklift and the machine for lifting.

- Insert the fork into guide slot in the lower front of the machine.

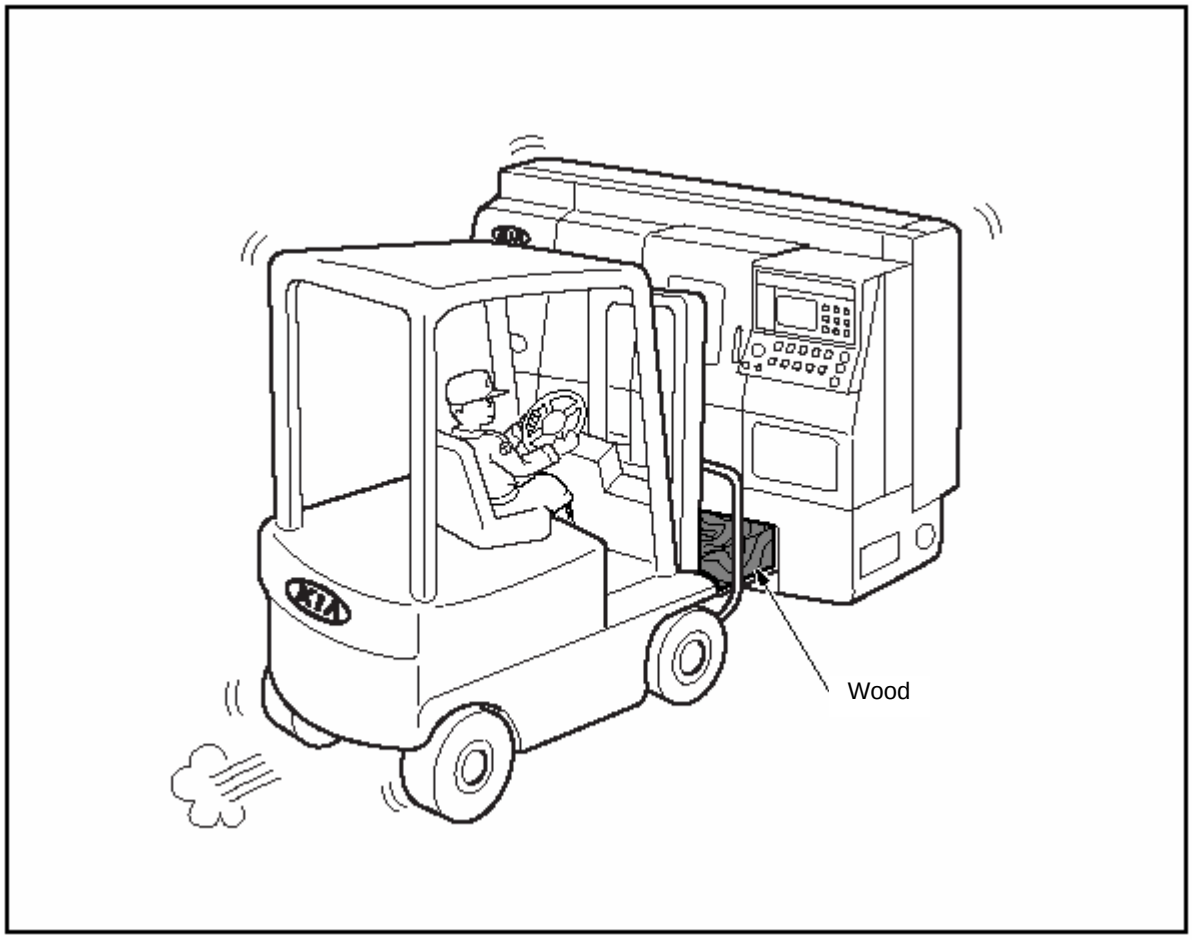


Fig. 4-3 Transport by Fork Lift

4. Installation

⚠ WARNING

1. Before installing the machine, read and understand the safety notice thoroughly in this manual.
2. While installing, there should be no oil or water on the floor to prevent the workers from slipping.
3. Before working, check again it is installed at a proper place.

4-1. Preparation to Install 4-1-1. Installation Condition

- When installing the machine, avoid places as below.

  a. Under direct ray of sun and near by heating elements and where the indoor temp.
  b. Heavy dust and high humidity area.
  c. Near the vibrating machine.
  d. Where foundation is weak.
  e. Where ground uneven or inclined.

⚠ CAUTION

1. If you have to install the machine around vibrating objects, install the suck absorbing pad around it.
2. It is required to prepare space for maintenance, if optional accessory was attached (See Fig. 4-1).

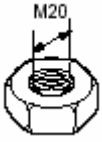
4-1-2. Foundation Work

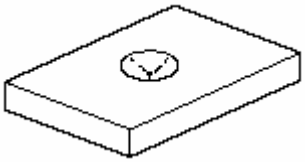
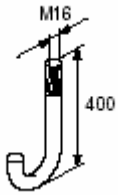
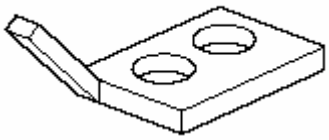
When installing the machine tool, the foundation should be solid. This ensures the best integrity of cutting in the machine. But, it greatly depends on the nature of ground where the factory is located, for example whether it is rocky or filled-in. Observe the general knowledge of machine tool and the related notice.

⚠ CAUTION

1. The strength of ground has to be over 5 ton/mm^2 and the thickness over 300mm.
2. The Foundation has to be over 300mm of bed in circumference.
3. When installing the suck absorbing pad, place it around boundary of foundation.
4. Do not use the foundation which is divided into small concrete blocks only supporting each level.

It is very important to located the machine in proper place. You have to check the interruption of machine operator which chip removing and maintenance like; pulling chip cart removing covers for maintenance.

No.	Name and Number	Figure	Qty.
1	SM1017020080 (Leveling Bolt)		6
2	SM1217002000 (Leveling Nut)		6

No.	Name and Number	Figure	Qty.
3	1676014040 (Leveling Seat)		6
4	Foundation Bolt		6
5	1676-09-301-0 (Level-Plate)		1

4-2. Foundation Work

CAUTION
Special attention should be paid o the foundation work since it have great influence on maintaining the accuracy of working and initial installing for a long time.

a. To install the machine, it needs the concrete floor over 300mm in thickness. Put the! levelling set under the levelling bolt.

b. To maintain machine accuracy, install new concreat ground at the place where has 1 less than 300m in thickness (See Para. 4-5, Foundation Work).

4-2-1. Without using Foundation Bolt

a. Put the levelling seat at the place shown in foundation diagram.

b. After inserting the levelling bolt in the machine, put it above the levelling seat with about 10mm distance from the upper side of levelling seat.

c. Adjust the levelling bolt, set the level of machine correctly and then tighten the levelling nut.

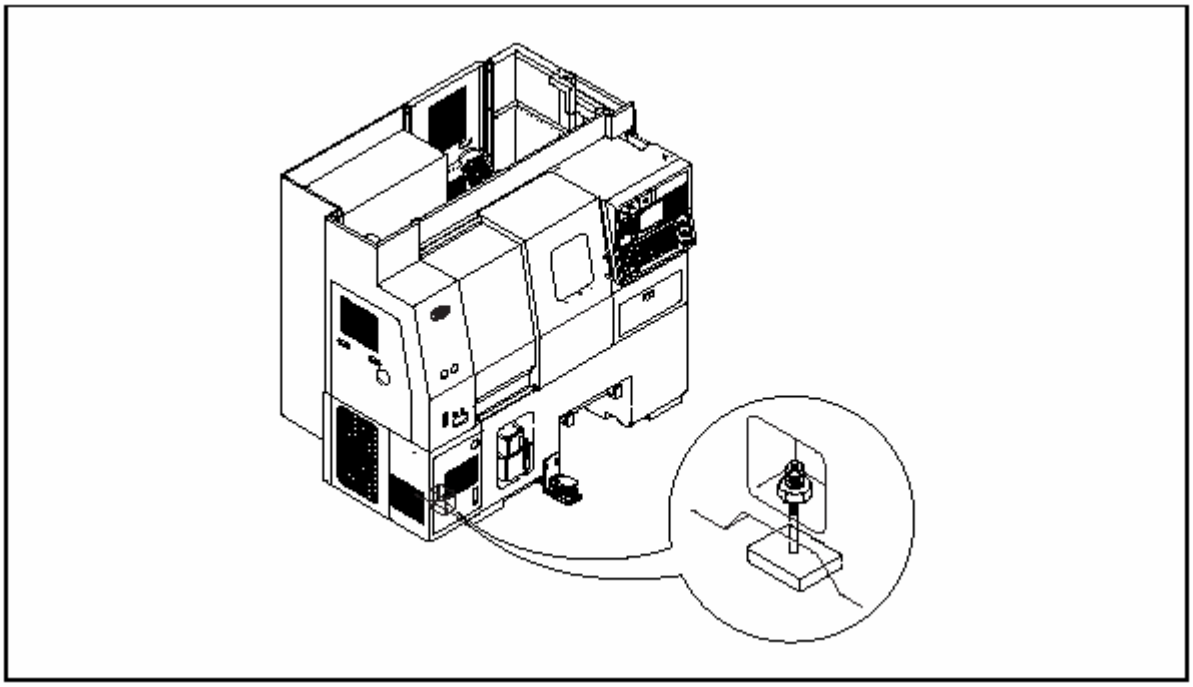


Fig. 4-4 Installation of Levelling Bolt

4-2-2. Using Foundation Bolt (Optional)

a. Place the machine at the place to be installed and perform the 1st levelling work. If the levelling seat is out its position or it is impossible to adjust it with the levelling bolt due to poor foundation, use a wedge to do a levelling work.

b. After a completion on the first levelling work, insert the foundation bolt from the bottom of machine and install it to the machine using nuts.

c. Fill the mortar up to the bottom and the side of levelling sear and stir it with a bar.

d. Adjust the levelling bolt, complete levelling work in all sides, and then engage the foundation bolt tightly.

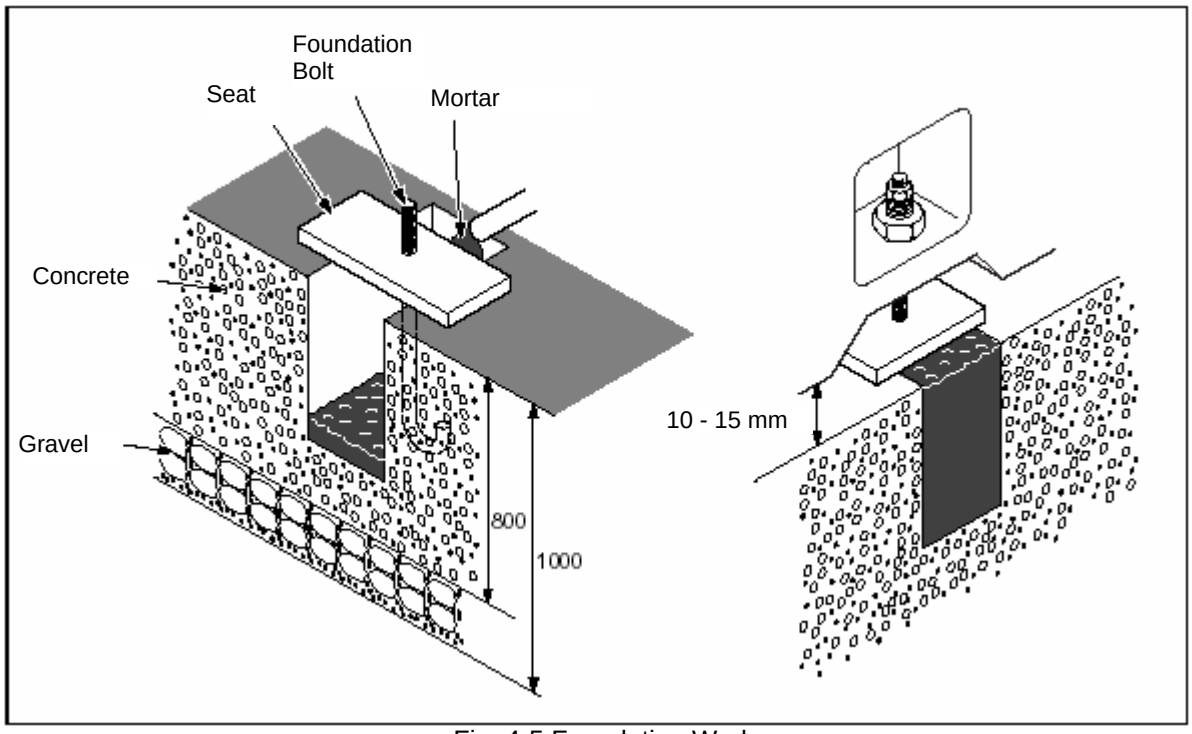


Fig. 4-5 Foundation Work

5. Adjustment of Level

(1) The levelling method is one of the factors to determine the degree of machine.

(2) Levelling the machine is the most- basic work and has an influence on the degree of the workpiece and the life of machine itself.

(3) Perform levelling in the following order.

a. Install the machine on the floor to be installed as shown in the chapter 4, "installation"

b. Attach the level plate to the turret as shown in Fig. 4-6.

c. Place the level above the level plate.

d. Move the level much as the full feed in 2-axis (430mm 16.93in) and then read the result. At the time, adjust the level using the levelling bolt so that the difference from the reading is ±0.04mm/m (±0.00157in/40in)

Level Tolerance	0.04 mm/m(0.00157in/40in)
Level Accuracy	1 scale = 0.02 mm/m(0.00079in/40in)

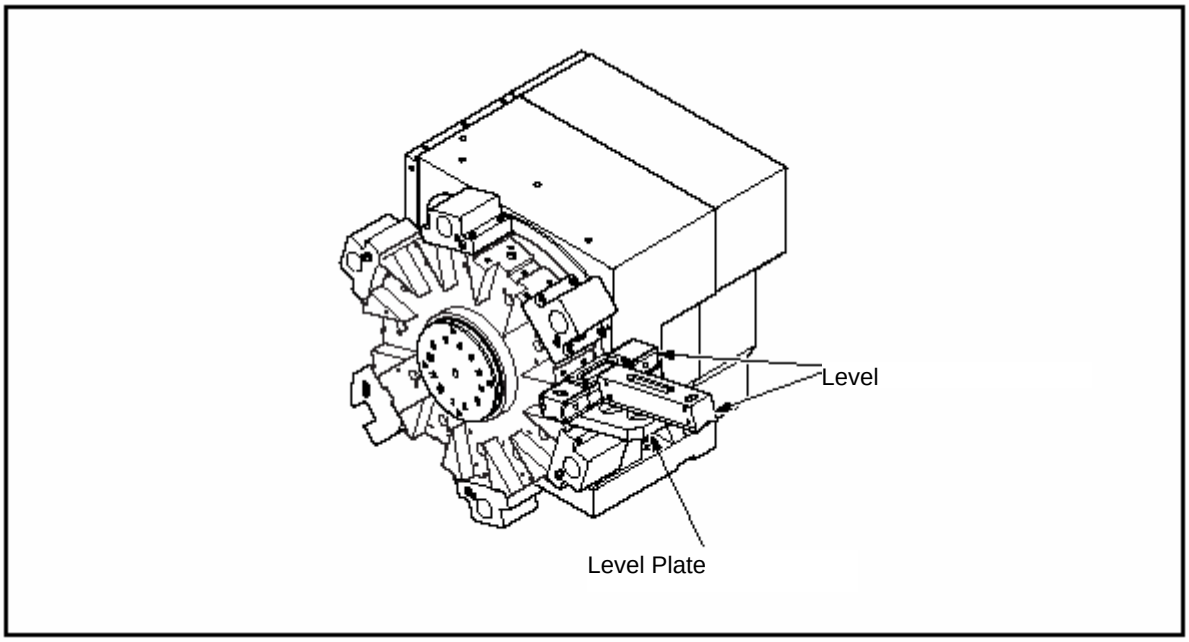


Fig. 4-6 Adjustment of Level

e. Handle the used level enable to maintain the same level in the same direction.

⚠ CAUTION

1. Keep the contact face of level clean to prevent dust, etc. from penetrating the level in measuring.
2. Uncontrolled level of the machine may result in malfunction due to declination or worn at the wet moving part of bed.
3. When move the level, be careful not to be interfered with chuck and tail stock.

(4) In the last horizontal levelling, do a job with the foundation bolt and nut tightened firmly.

(5) After installing the machine, perform the levelling as follows.

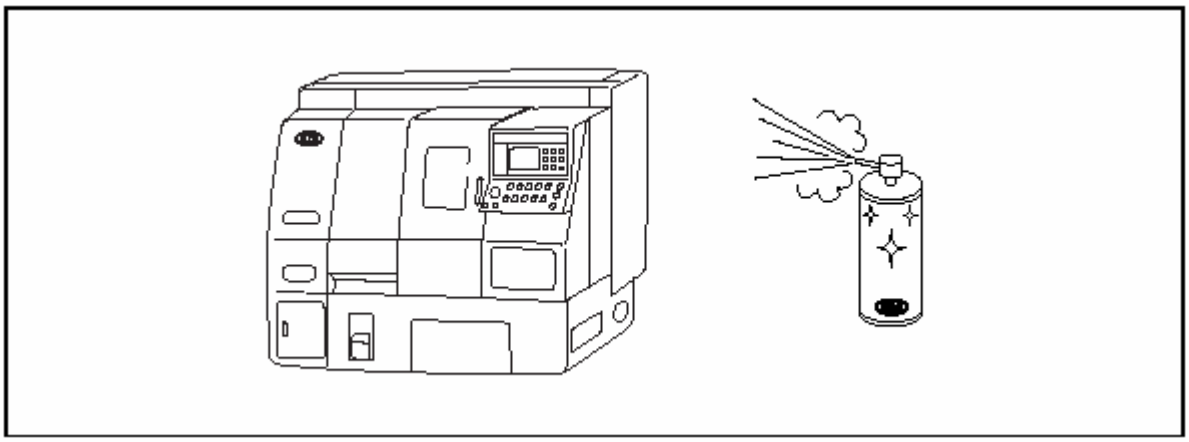
Term	Period
for 2 - 3 days after installing the machine	Daily
for 6 months	Monthly
after 6 months	Quarterly

6. Cleaning

(1) When transporting the machine, there is a risk of mixing with sand or dust. Therefore secure the saddle or cross slide before cleaning

(2) Because each part of this machine has tightened at factory, loosen and then clean it.

(3) When cleaning the machine, wipe out the anticorrosive paint using soft cotten clothes wet with kerosene or benzene.



(4) Remove the moisture all over the machine completely.

⚠ CAUTION
When cleaning, do not use compressed air. Otherwise, it may cause damage allowing foreign matters to enter into the crevice by air pressure.

7. Lubrication and Oiling

(1) Perform oiling at the positions as shown in Figs. 4-7, 4-8 and 4-9.

(2) Table 4-1 shows the recommended lubrication and oiling.

7-1. Hydraulic Oil

1) Fill up the quantity of oil to the degree higher than that of oil gage (After filled up, it is recommended that the level is met with the standard level of oil gage).

2) Quantity of oil is 15 liter(3.92 gal).

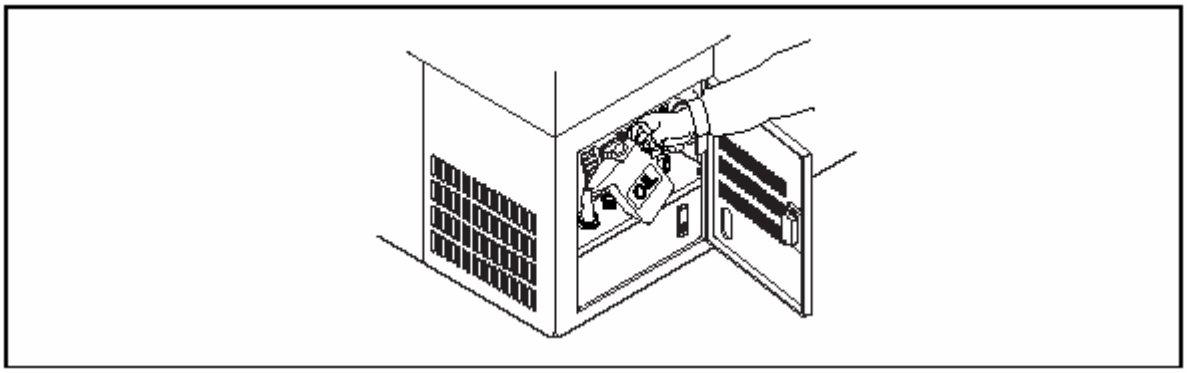


Fig. 4-7 Filling Hydraulic Oil

3) After this, perform oiling as specified.

7-2. Oiling Wet-Moving Parts in the X-and Z-axes

1) Fill oil the lubrication tank in front of bed.

2) The quantity about 1.8 liter(0.47 gal).

3) If the oil is exhausted in the tank, the red lamp will be illuminated on the Operating Panel. Then, fill it up.

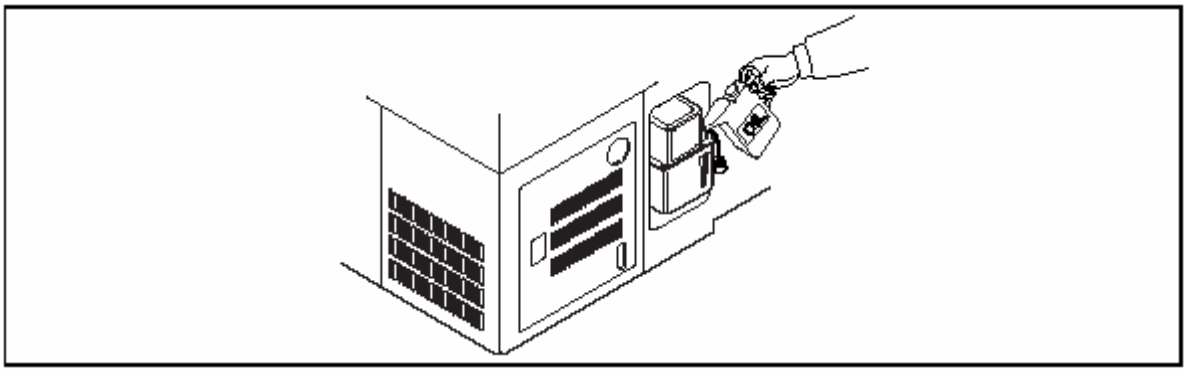


Fig. 4-8 Filling Lubrication Oil

7-3. Oiling Hydraulic Chuck

- Fill up the chuck daily while opening and closing it by means of the grease gun.

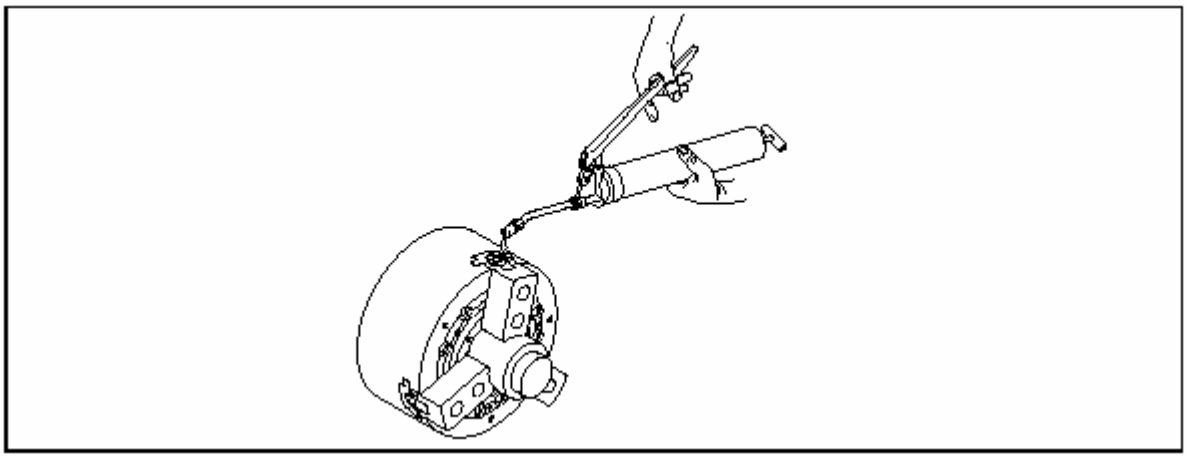


Fig 4-9 Greasing Chuck

Table 4-1. Lubrication Oiling Table

Place	Method	Quantity	Period	ISO Spec.	Maker	Used Oil
Hydraulic tank			Half-Yearly	CB32 or HL32	SHELL	SHELL TELLUS OIL C32
					ESSO	TERESSO 32
					MOBIL	MOBIL DTE OIL LIGHT
					CALTEX	FBK OIL RO32
Wet moving part			If the lubrication lack lamp illuminated	G68	SHELL	SHELL TONA OIL T68
					ESSO	FABIS K-68
					MOBIL	MOBIL VACTORA OIL No.2
Hydraulic chuck	Manual Oiling Grease Gun	fully	Daily More than one time	CC460	SHELL	ALBANIA 2
					DOW CORNING	MOLY KOTE BR2-S
					MOBIL	MOBILUS GREASE 2

8. Coolant

There are several kinds of coolant such as soluble and insoluble ones. The methods of filling coolant into the machine are as follows.

(1) Fill coolant into its tank in the rear of machine.

(2) Total quantity of coolant is 135 liter.

Name	Quantity	Total Quantity
Coolant main tank	92 liter(24 gal)	135 liter(35.23 gal)
Coolant auxiliary tank	43 liter (11.23 gal)	

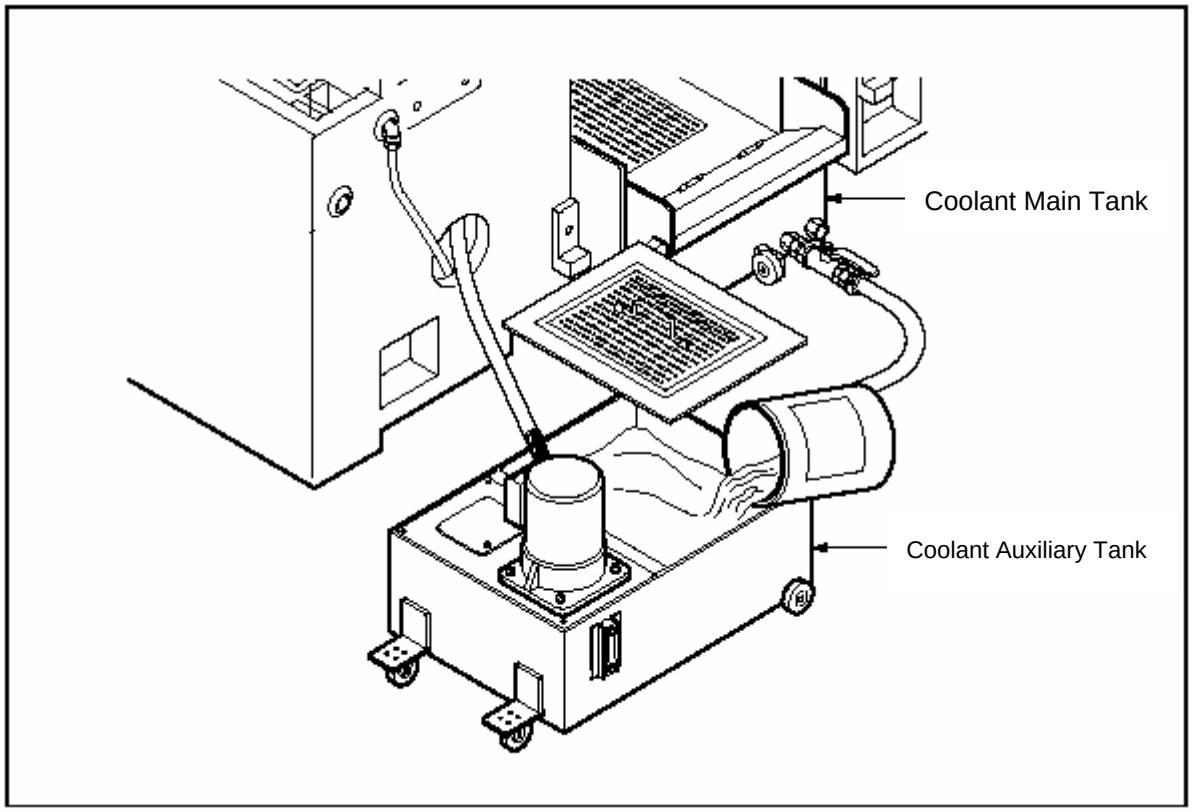


Fig. 4-10 Filling Coolant

(3) When installing the machine, performing test operation or having not used for long-term, use the spare sufficiently.

(4) Notice When Using Soluble Coolant

1) When selecting soluble coolant, select one in consideration of the lubrication, settlement, anticorrosive, foaming device, unfixing with oil, safety, and so on.
2) Before starting or after stopping the work, remove chips and clean up soluble coolant attached on each wet moving part, tool post turning part, and cross slide.
   After that, always apply lubrication oil lightly.
3) Exchange the soluable coolant if corroded.

⚠ CAUTION

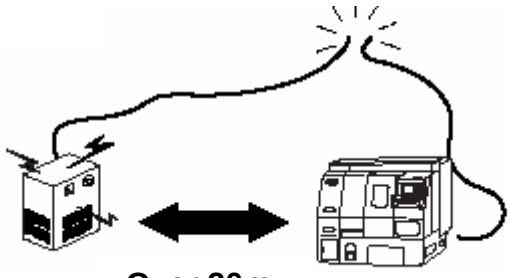
1. Because soluable coolant is anti-corrosive treated, it is good in wet condition but easy to be corroded in a dry state. After a completion of work, do not forget to apply anticorrosive oil on the wet moving part.
2. The soluable coolant has an alkalis factor and may remove fat from the personal skin. So, be careful of worker' s health.
3. For the dilution method and agent of soluable coolant, follow the manufacturer's instruction because they are different dependent on its kind.

4) For the dilution method and agent of soluable coolant, follow the manufactures's instruction because they are different dependent on its kind.

9. Electric Power and Wiring

⚠ CAUTION

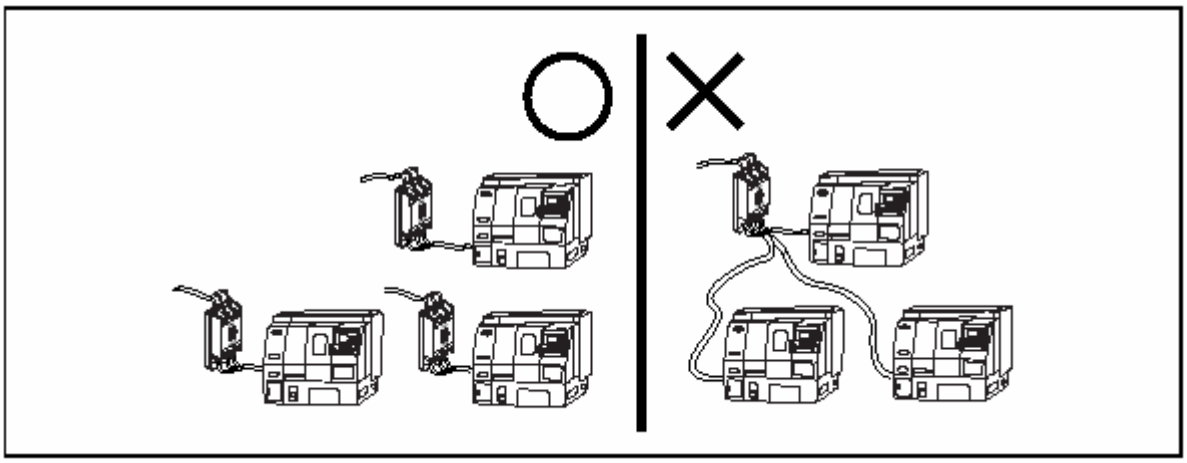
For the electric device (welder, high-frequency seasoning device, electric spark machine, and etc.) occurring high-frequency noise, use the independent switchboard or install it away from over 20m.



Over 20m

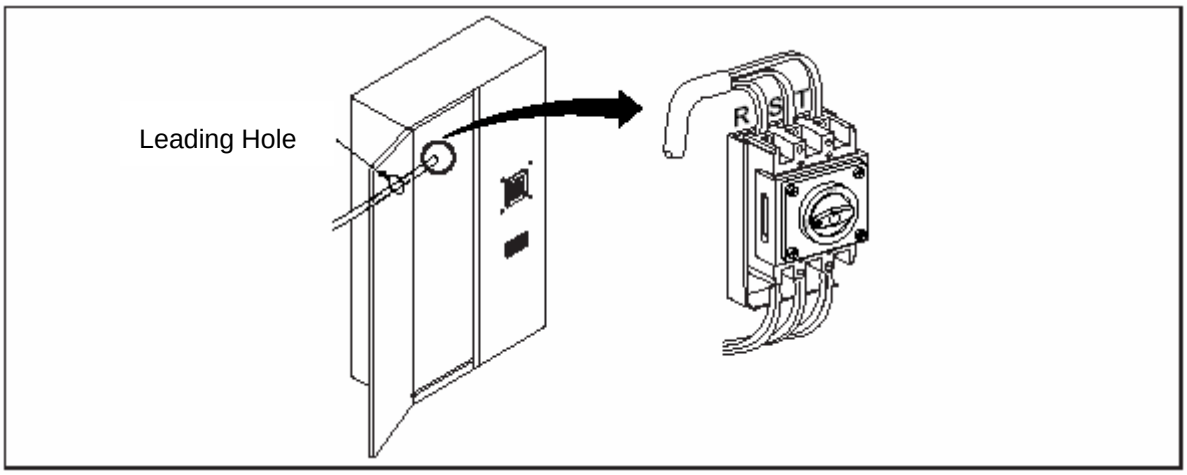
9-1. Power Switch

Install other machines with the independent power switches at the place where easy to open and close. See the following table for the capacity of fuse.



9-2. Wiring To Machine Form Power Switch

Perform wiring to the 1st NFB1 through leading hole located in the lower left of the Electric Control Panel. For the thickness of wire, see the following table and connect if so far the R.S.T not to be changed.



Model	Power Capacity (kVA)	Available [mm*]		Fuse [A]
		R, S, T	Grounding line	
SKT100	11.4	14	14	75
SKT200	14.1	16	14	75

9-3. Changing Electric Units According to Voltage and Frequency

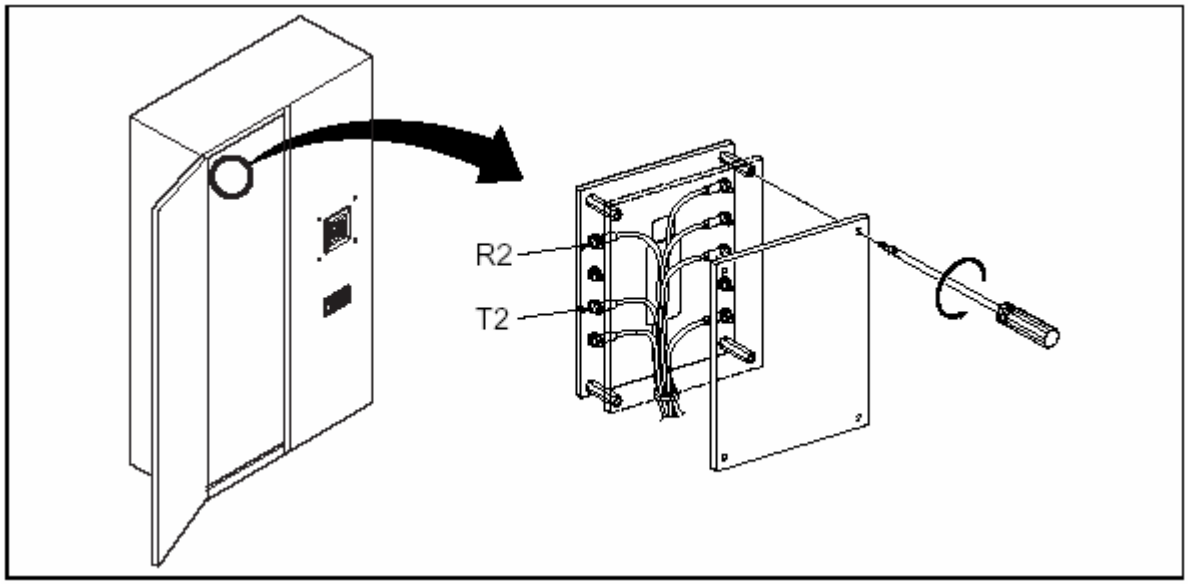
⚠ CAUTION
If the voltage fluctuated seriously, it may cause misoperation of the machine and failure of the electric and electronic parts. Therefore, set the fluctuating rate not to exceed ± 10%.

According to the voltage and frequency of the power of factory, it is needed to change the setting of electric applications. Prior to changing, check its voltage and frequency.

1) Power voltage 200/220V ± 10%
2) Power frequency 50/60Hz ± 1Hz

9-3-1. Tab Changing for Controlling Transformer

Open the door of the Electric Control Panel, remove the plastic cover of Transformer and then change the wiring as shown in the following table.



Voltage	R2	T,
191-210 V	200 V	0 V
211-240 V	220 V	0 V

9-3-2. External Transformer

⚠ CAUTION

Transformer for 220V power supplier

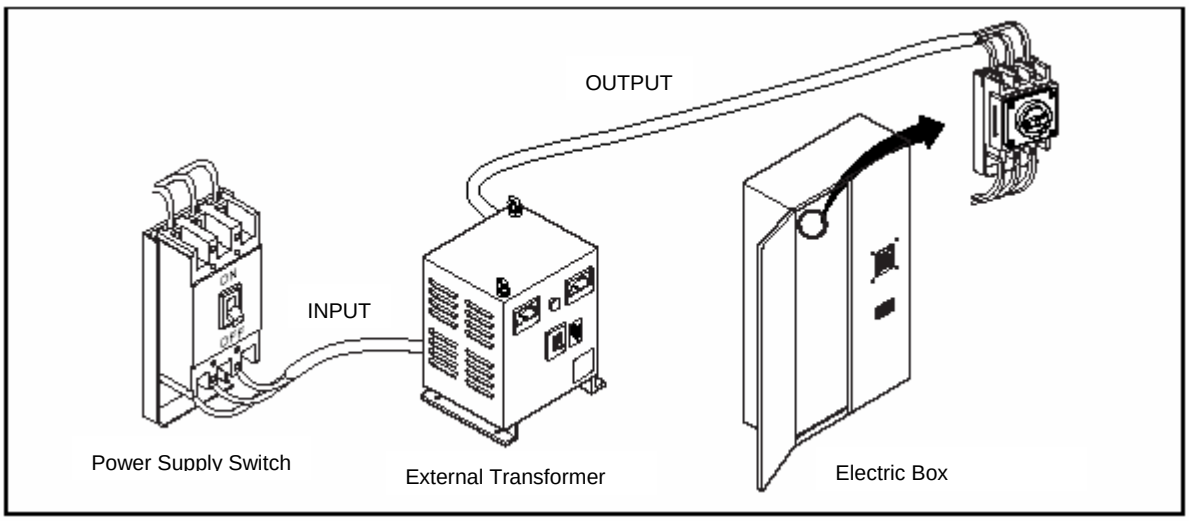
The transformer should be installed by the customer' s direct purchase. This company can't provide any external transformer for the 220V power supplier.

But the specific feature of a transformer should follow as below.

1) Available only to EN 60742 (Please use authorized products)

2) Feature

- Capacity : Above 25(KVA)
- Voltage - Primary : 380~440(V)
- Secondary : 200~220(V)



9-4. Grounding

⚠ WARNING

Only authorized engineer can do earth working. Failure to comply may result in personal severe injury, death, or accident.

1) All electric devices should be grounded to prevent personal injury and misoperation of the machine according to the specification, after installed.
2) Select the grounding point as close to the machine as possible and perform wiring independently.

3) Do the third-Class grounding only by the authorized engineer,

a. The third-Class grounding

- Thickness of wire : under 100 Ω
- Thickness of wire : 1.5 times as that of power supply in thickness.

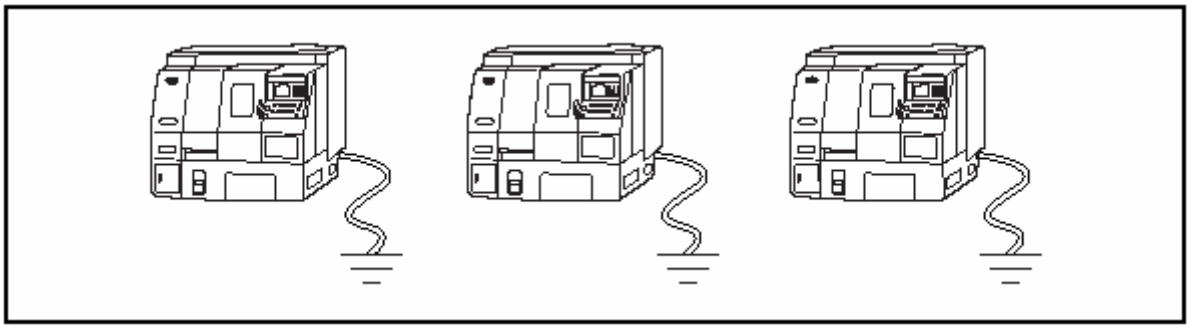
At least 14mm2

- Measuring device : 500V Megger

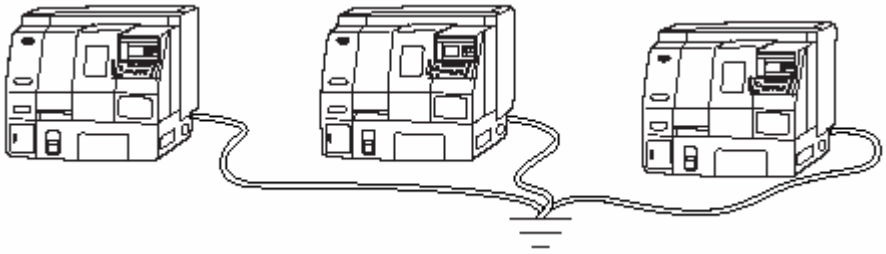
4). Grounding Method

The machine should be grounded by one of the following methods,

a. Individual grounding



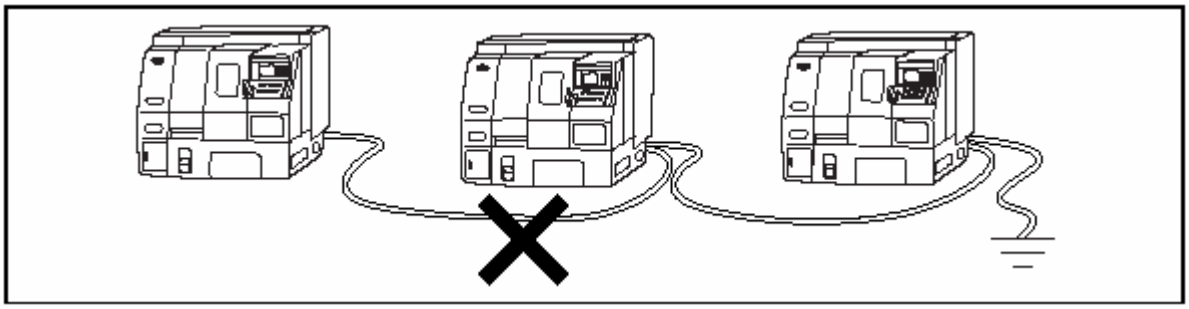
b. Common grounding



* The grounding line of each machine should be grounded at its ground terminal directly.(Only one line to one terminal)

* Grounding resistance = $\frac{100}{\text{number of machine}}$ [Ω]

c. Never ground in the following methods.



10. Disassembling and Cleaning Shipment Fixture

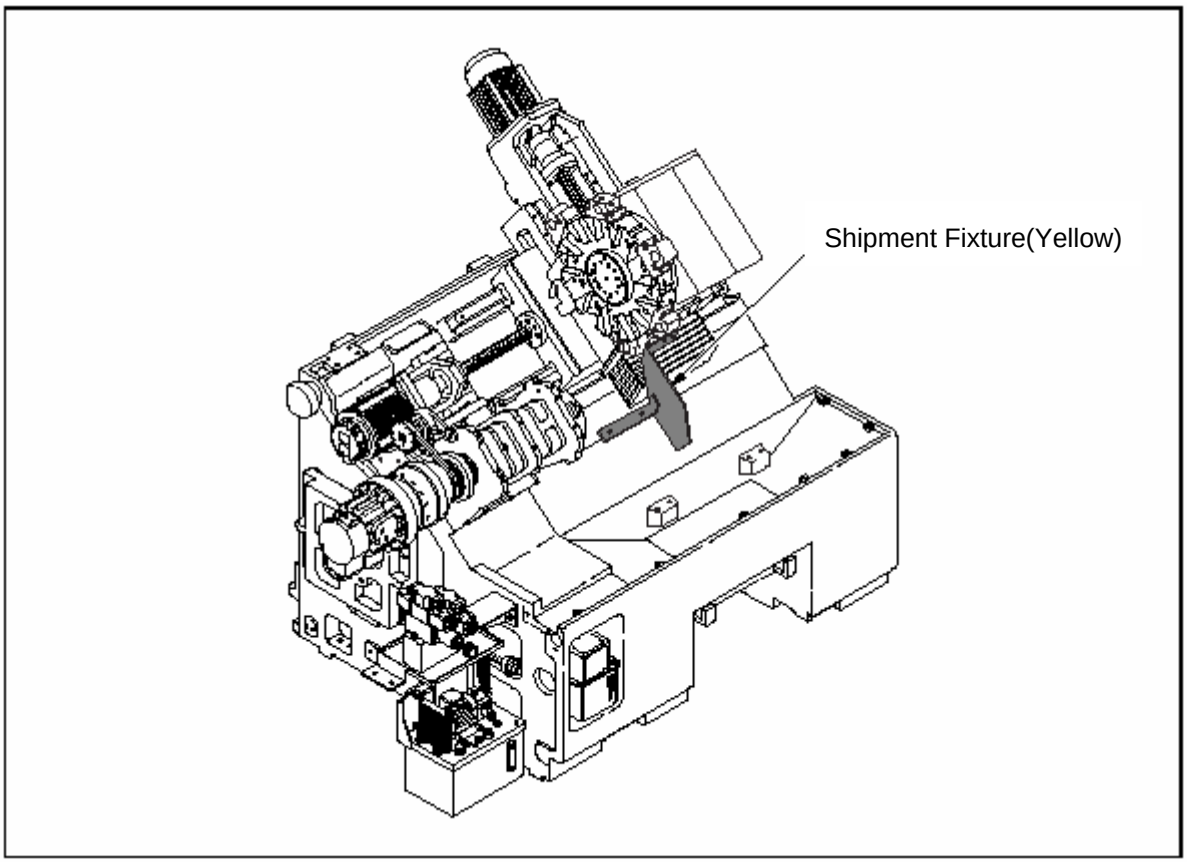
When shipped, each axis is fixed by shipment fixture for a safety.

⚠ WARNING
NEVER operate the machine before disassembling the shipment fixture.

After disassembling the shipment fixture, unless otherwise stated, clean the applied anticorrosive agents with light or cleaning oils and apply the cleaned part with lubricating oil for sliding.

⚠ CAUTION
Do not use oil or kinds of chemicals which may affect the painting of body. Be careful of a fire.

The location of the shipment fixture is shown in the following figure (yellow painting).



11. Checking Before Test Working

Before test working, make sure the followings.

(1) Check all the fixtures for transport or shipment are removed.

(2) Check any part or accessory is omitted.

(3) Check the lubricating, operating oil, and coolants are supplied properly.

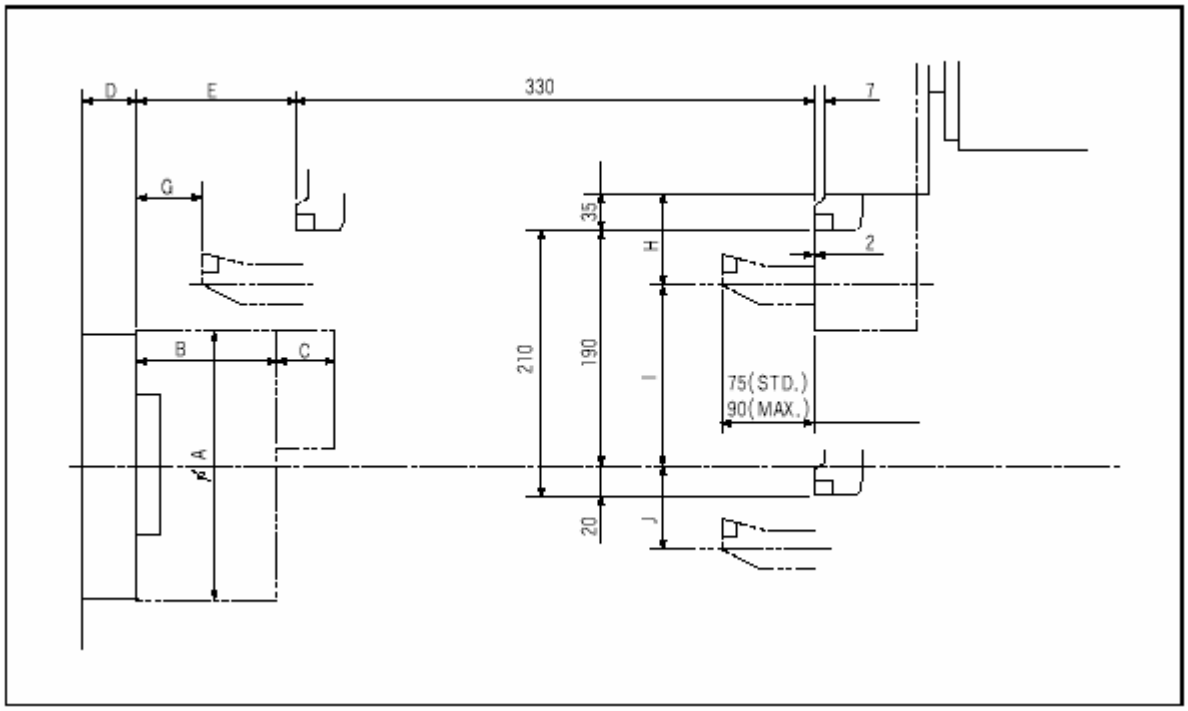
(4) Check the coolant tank is located properly.

12. Required Dimension In Working 12-1. Tool Moving Range

- Variable array tool post stroke

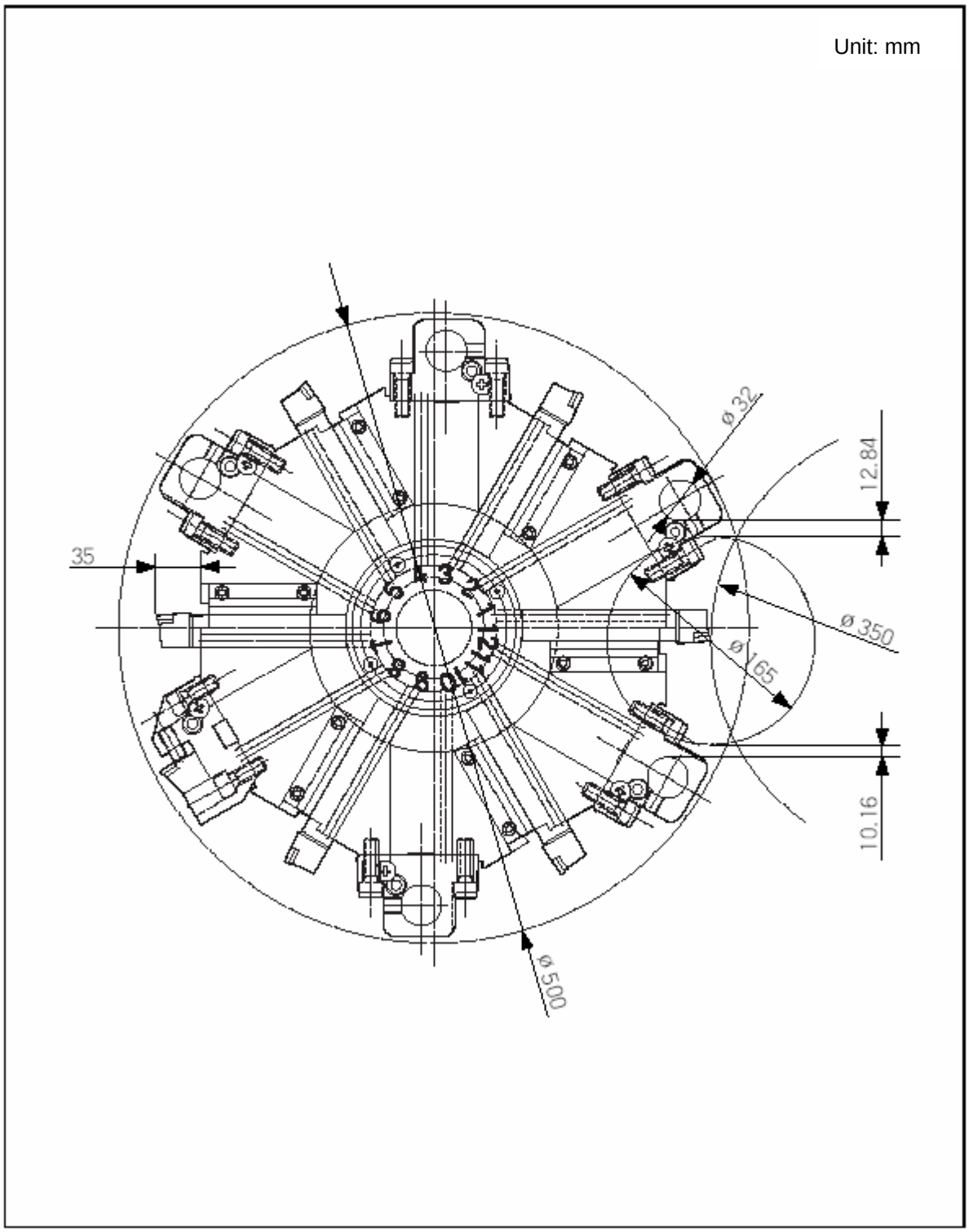
mm

Type	Tool Post	A	B	C	D	E	F	G	H	I	J
SKT100	12 angle spec.	169	91	32	35.2	91	185	18	35	190	20
SKT200	12 angle spec.	210	114	38	42.1	120	190	47	68	157	53

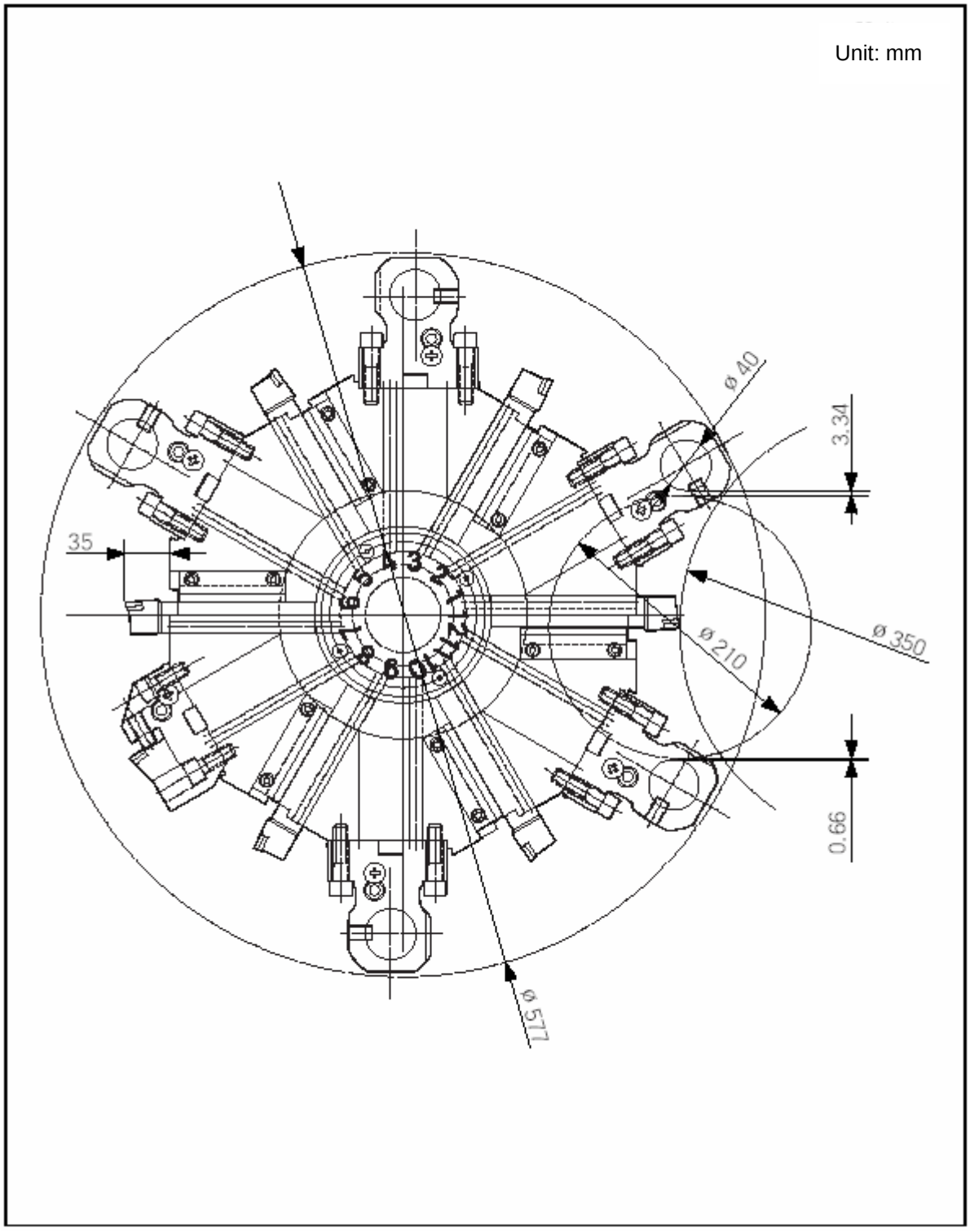


12-2. Tod Interference Diagram

1) SKT100 Interference Diagram



2) SKT200 Interference Diagram



V

REPAIR & PRESERVATION

Ⅴ REPAIR & PRESERVATION

1. Mechanical Overview 5-1

1-1. Mechanical Construction **5-1**

1-2. Moving Range of Axis **5-2**

1-3. Refe**rence Point Adjustment of Each Axis 5-3**

1-3-1. Reference Point Adjusting Method 1 ..... **5-3**

1-3-2. Reference Point Adjusting Method 2 ..... **5-7**

1-3-3. Z-axis Dog and Limit Switch Attached Position **5-15**

1-4. X- and Z-axes Backlash Adjusting Method **..... 5-16**

1-5. Q-Setter Position Adjustment **..... 5-18**

2. General Check and Repair 5-21

2-1. General **5-21**

2-2. Check and Repair Items **5-23**

2-3. Daily Check and repair **5-24**

2-3-1. Inside of the Machine **5-24**

2-3-2. Outside of the machine **5-26**

2-3-3. Checking Oil Flow **5-27**

2-3-4. Checking Pressure **5-28**

2-3-5. Filling and Changing Oil **5-29**

2-3-6. Around the Machine **5-31**

2-4. Weekly Check and Repair **5-31**

2-4-1. Inside of the Machine **5-31**

2-4-2. Outside of the Machine **5-32**
2-5. Monthly Check and Repair **5-33**
2-5-1. Inside of the Machine **5-33**
2-5-2. Filling and Changing Oil **5-34**
2-5-3. Outside of the Machine **5-36**
2-6. Six-monthly Check and Repair **5-36**
2-6-1. Filling and Changing Oil **5-36**
2-6-2. Around the Machine **5-40**
2-7. Yearly Check and Repair **5-45**
2-7-1. Around the Machine **5-45**
2-8. Check and Repair Before Long-term Storag **5-46**
2-9. Check and Repair Before Operation Since Long-term Storage ... **5-47**

3. Maintenance of Major Units 5-49
3-1. Spindle **5-49**
3-1-1. Adjustment of Degree in Spindle **5-49**
3-1-2. Cleaning Front Cover of Spindle **5-50**
3-2. X- and Z-Axes **5-51**
3-2-1. X- and Z-Axes Constructions **5-51**

3-3. Tool Post **5-52**
3-3-1. Tool Post Construction **5-52**
3-3-2. Tool Post Home Position Setting **5-52**
3-3-3. Adjustment and Exchange of Clamp, Unclamp and Limit Switches **5-55**
3-3-4. Restoration in Collision of Turret **5-56**

3-4. Hydraulic 5-57
3-4-1. Hydraulic Circuit Diagram 5-57
3-4-2. Repairing Hydraulic Tank 5-58
3-4-3. Pressure and Flow Adjustment 5-60
3-4-4. Repairing Manifold 5-62
3-5. Lubrication Device 5-66
3-5-1. Place to be lubricated 5-66
3-5-2. Cleaning Lubrication Unit 5-67
3-5-3. Discharge of Lubricating Oil 5-70
3-6. Coolant 5-71
3-6-1. Coolant Unit Construction 5-71
3-6-2. Specification and Cleaning 5-72
3-6-3. Check and Repair 5-74
3-7. Chuck and Cylinder 5-75
3-7-1. Chuck and Cylinder Construction 5-75
3-7-2. Adjustment 5-76
3-7-3. Specification 5-77
3-8 Cover 5-80
3-8-1. Door Roller 5-80
3-8-2. Door Safety Glass 5-81
3-9. Electricity 5-82
3-9-1. Electric Device Layout 5-82
3-9-2. Alarm Lamp (Option) 5-82
3-9-3. Alarm Indicator 5-83
3-9-4. Parameter 5-86
3-9-5. Exchanging Method of Battery 5-87
3-9-6. Error Codes (Serial spindle) 5-96
3-9-7. Alarm List 5-104

1. Mechanical Overview

1-1. Mechanical Construction

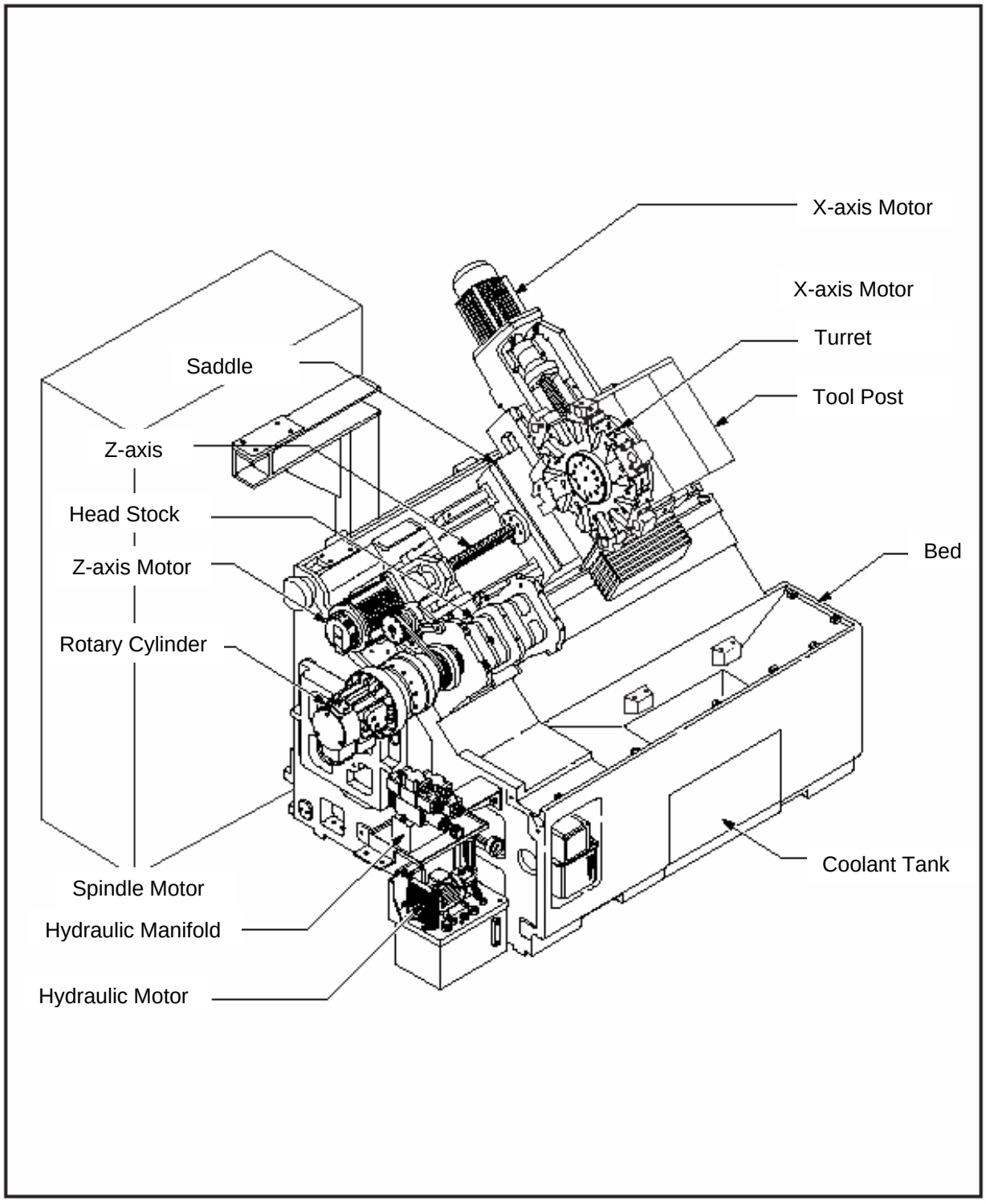


Fig. 5-1 Mechanical Construction – Major Unit

1-2. Moving Range of Axis

X-Axis	X-Axis Up/Down direction vertically with the center of spindle +: in tool post upward -: in Tool post downward
Z-axis	Z-axis Up/Downward direction horizontally with the center spindle +: in the right direction of tool post movement -: in the left direction of tool post movement

CAUTION

It is based when the operator spindle stands in front of the machine.

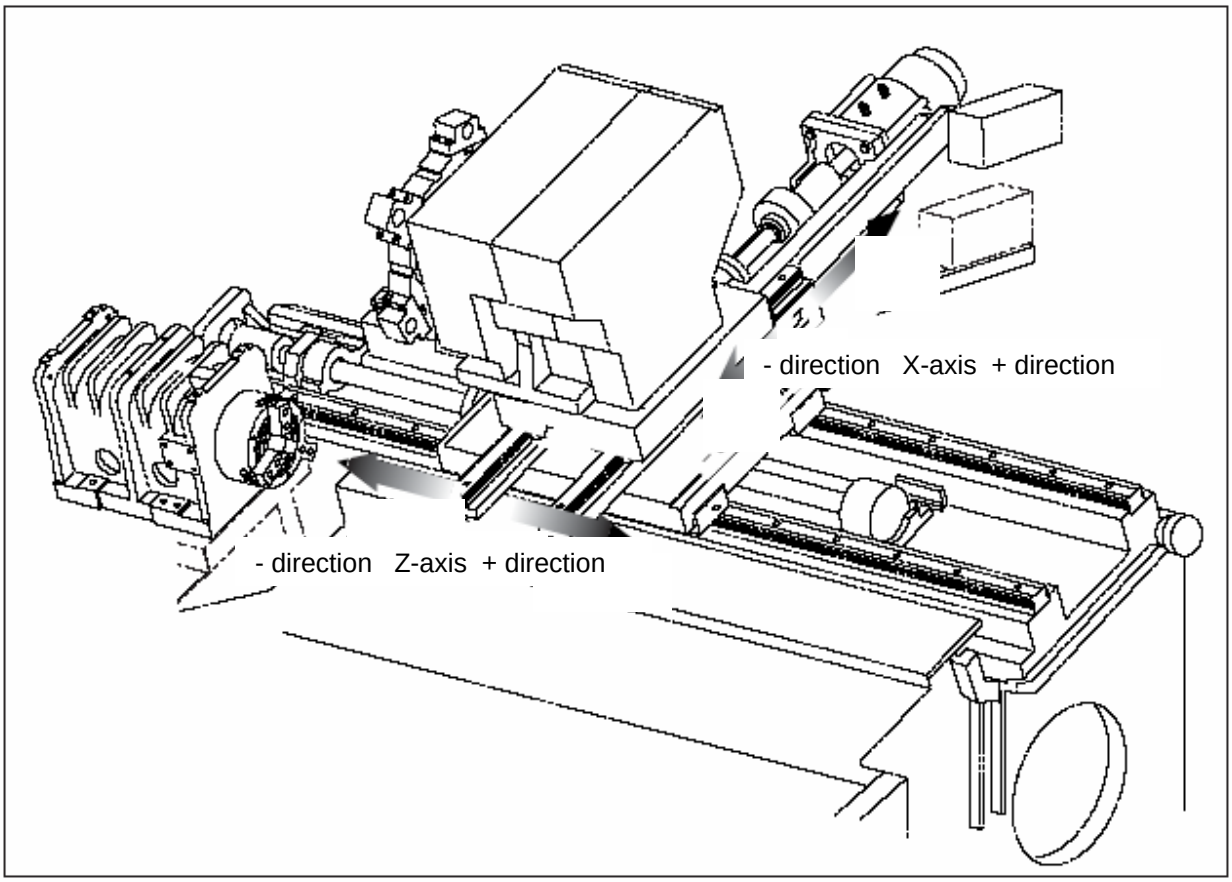


Fig. 5-2 Moving Range of Axis

1-3. Reference Point Adjustment of Each Axis

Reference point may be changed and resetted for repairing and checking or due to the collision of tool post. This time, the reference point should be adjusted in the following orders.

CAUTION
Reference point is the unique position determined by the parameter of NC device and the dog & limit switch of machine.

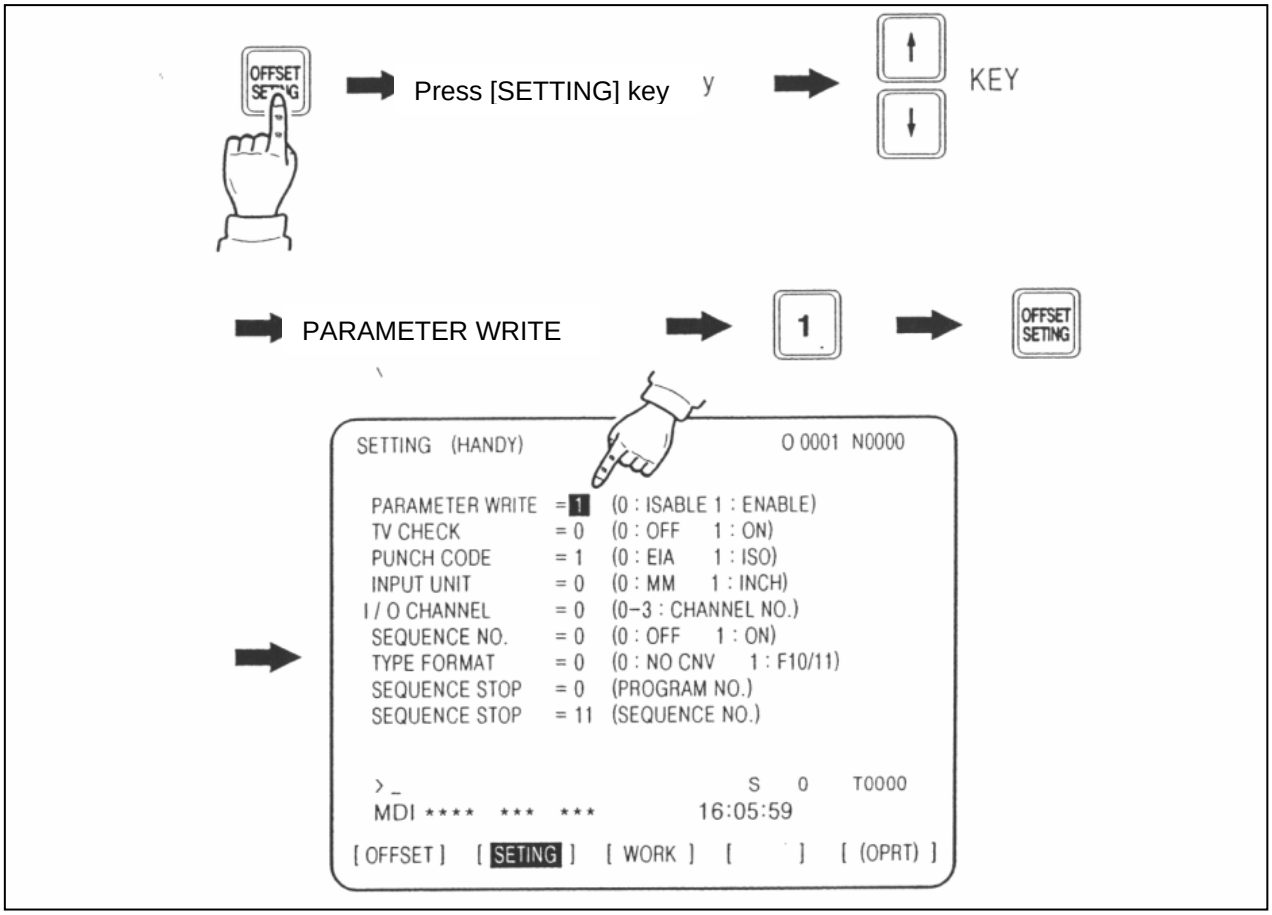
1-3-1. Reference Point Adjusting Method 1

In case that "[MACHINE(ABSOLUTE)]" coordinate value is less than reference point, adjust it in the following method.

1) Initiate running distance

Initiate the Reference Point Return Running Distance entered.

a. Select the setting screen and make the parameter change valid.



b. Initiate the Reference Point Return Distance by selecting parameter screen.

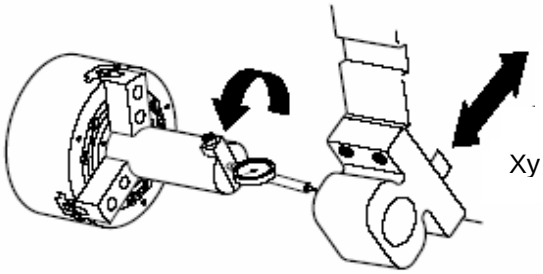
c. Make parameter change invalid, turn off and then re-apply the power.

2) X-Axis Reference Point Adjustment

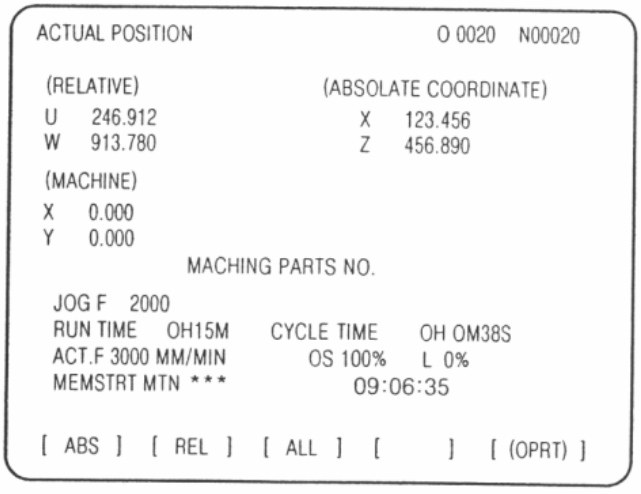
a. Attach Dial Gauge(1/100) at holder and then secure in chuck.

CAUTION
If using Magnet Stand instead of Fixture, it may be curved over 0.1 mm.

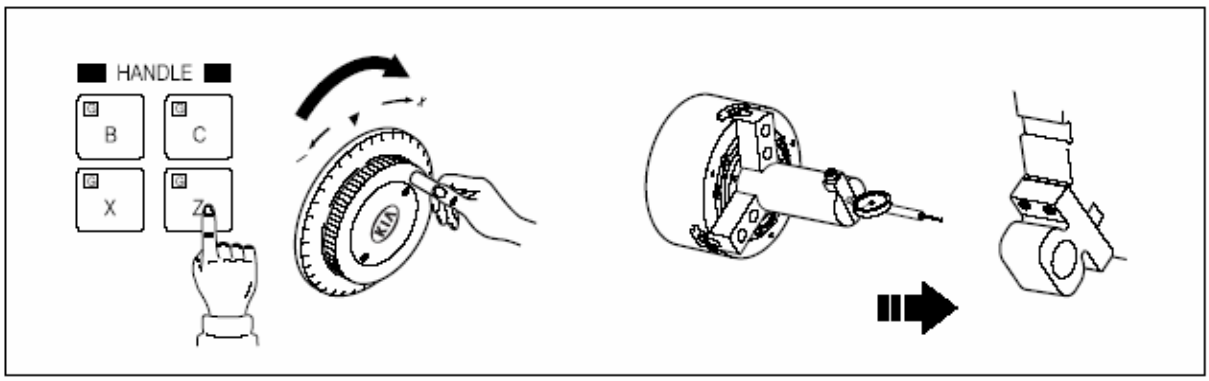
b. Put the indicator near to I.D base holder using feed handle and set the motion to "0" in the X direction.



c. Select the package position screen.



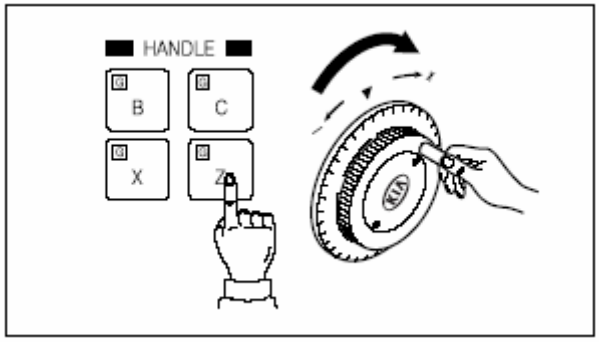
d. Set the mode to Handle Z, move the Head Stock in the + direction of Z-axis



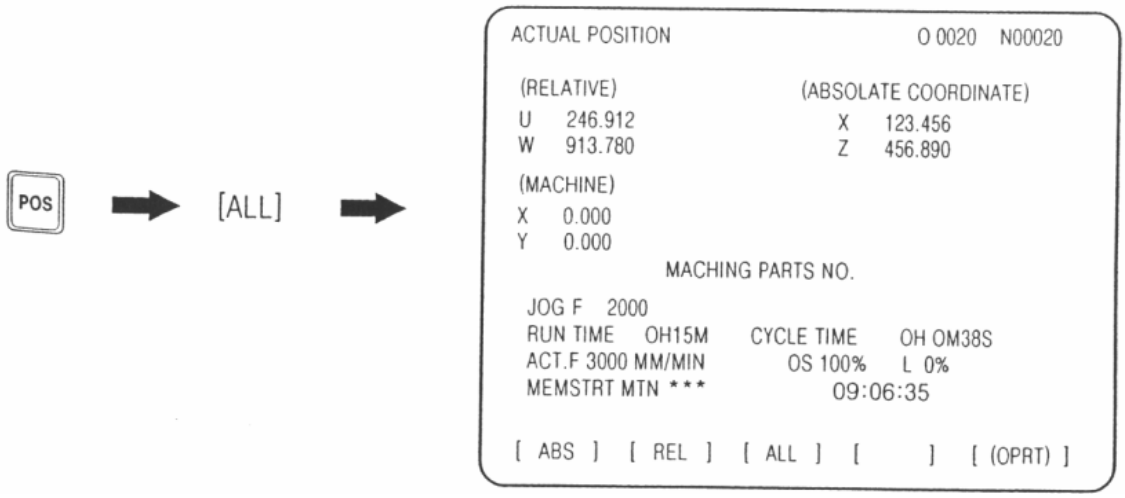
e. The differences between reference point position in X-axis and the coordinate value of MACHINE become a running distance.

3) X-Axis Reference Point Adjustment

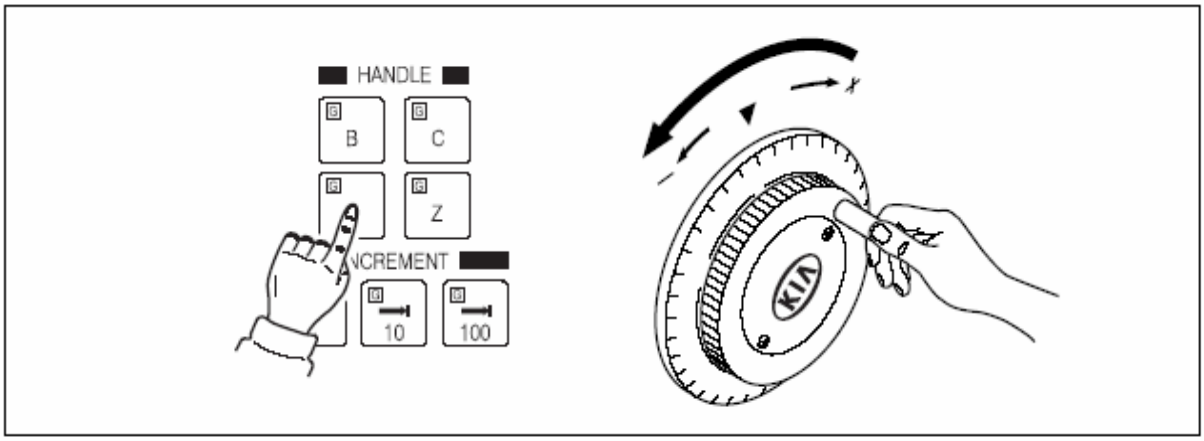
a. To approach the outer diameter bite tool to chuck and protect the blade end, use a thin piece of paper, feed the handle and approach the tip end of bite tool to the jaw section until the paper is not moved.



b. Select the package position screen.



c. Set the mode to Handle X, move the turret head in the + direction of X-axis, and make it not to disturbed in Tail Stock (Special Accessory).



d. The differences between reference point position in Z-axis and the coordinate value of MACHINE become the grid shift amount.

4) Input Running Distance

a. Make the parameter change valid according to para. 1).

b. Calculate the running distance

If the [MACHINE] coordinate is set to 377.268 and 332.754 for 380.000 in the X-axis and 330.000 in the Z-axis, the running distance of each axis will be calculated as follows.

- X-axis distance = initial value + (380.000-377.268) X1000
  = 1000+2732 = 3732
- Z-axis distance = initial value + (330.000-322.754) x 1000
  = 1000+7246 = 8246

CAUTION

In case that "MACHINE" coordinate value is more than the reference point distance, it is required to adjust the deceleration dog.

c. Change the parameter.

1-3-2. Reference Point Adjusting Method 2

In case that "MACHINE (ABSOLUTE)" coordinate value is more than the reference point distance, adjust in the following method.

1) Initialize running distance

   Initialize the running distance as in "Zero Adjusting Method 1", turn off and then re-apply the power.

2) X-axis

mm(in)

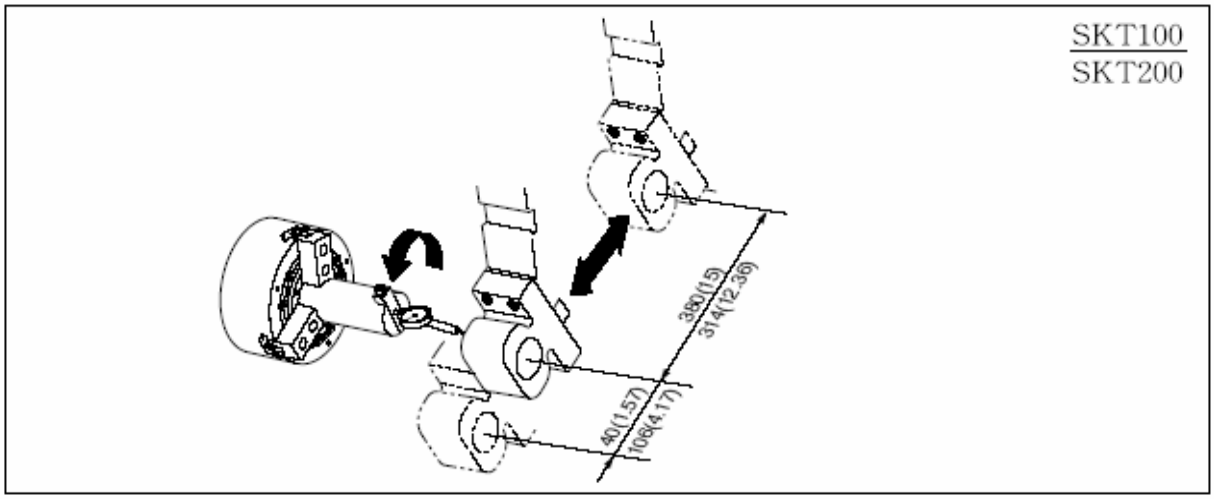


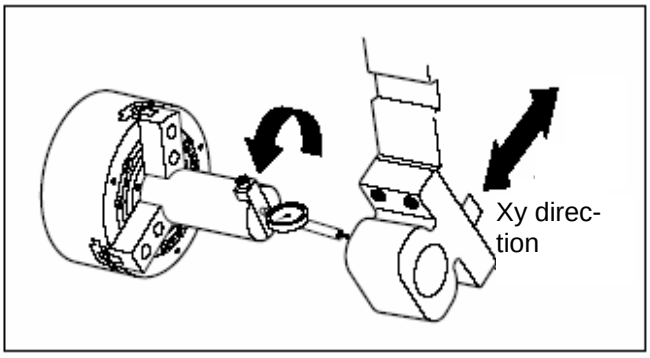
Fig. 5-3 Moving Range of X-axis

Set the distance to the center of spindle from that of I.D. Base holder from that of spindle at 380.000 (SKT100) and 314.000 (SKT200) in the + direction.

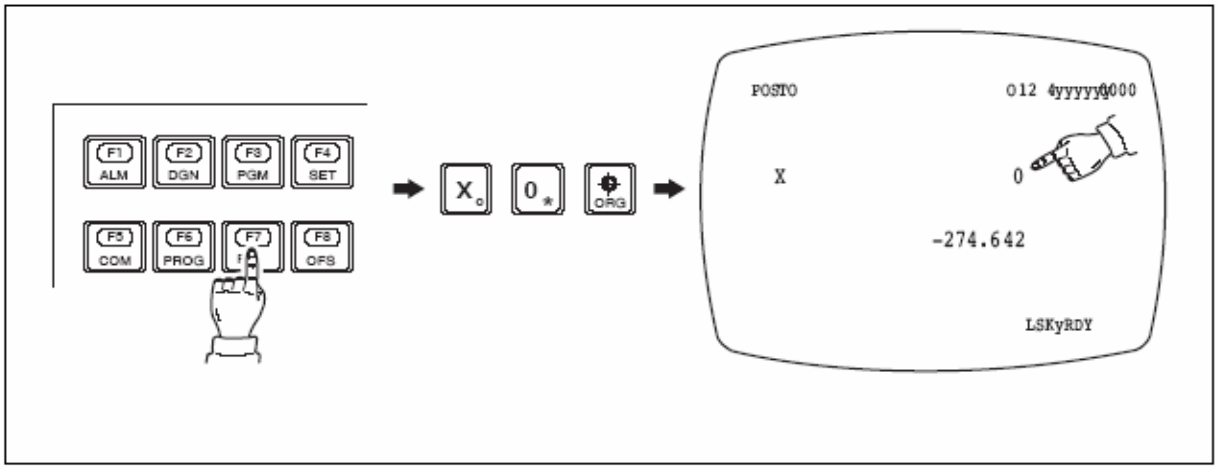
a. Attach Dial Gauge (1/100) at holder and then secure in chuck.

CAUTION
If using Magnet Stand instead of Fixture, it may be curved over 0.1 mm.

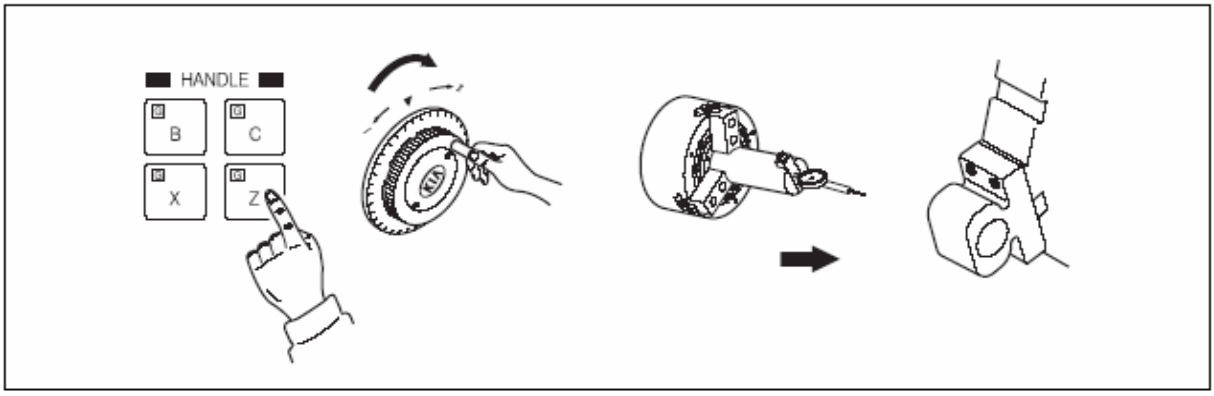
b. Make I.D. base holder in proximity to indicator using feed handle and set the motion in X direction to "0".



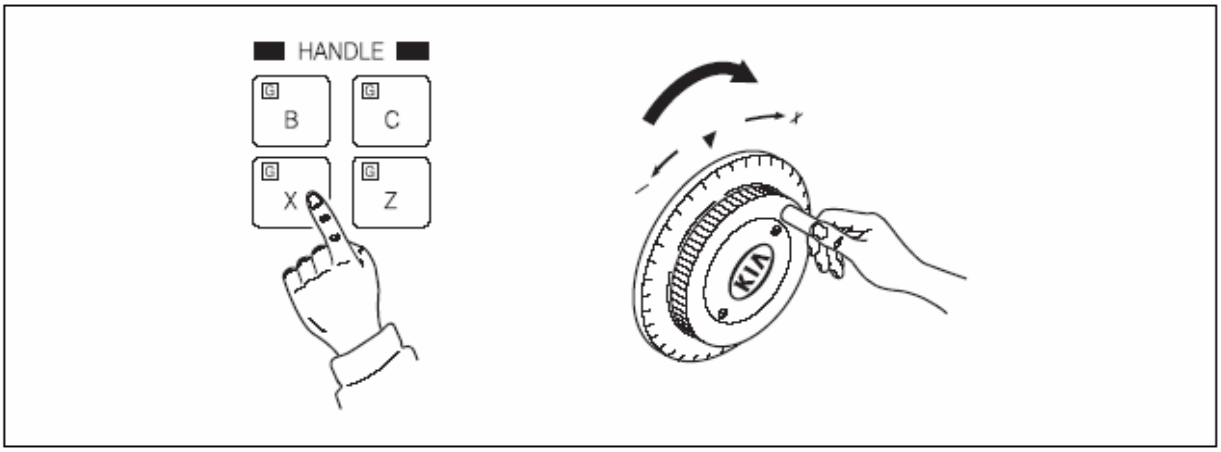
c. Set the coordinate "X" to "0



d. Set the mode to Handle Z, move the turret head in the + direction of Z-axis and make it not to be interfered with Tail Stock.



e. Move the X-axis to reference point by means of handle.



CAUTION

1. Perform only in X-axis.
2. Place Z-axis at a distance from reference point.

f. This time, move the current position "EXTERNAL" coordinate to be 380.000 (SKT100) and 314.000 (SKT200), set the coordinate X at "0" and then move it about 1/2 (6,000) of ball screw pitch in the opposite direction from Reference Point Return.

g. Move the reference point return dog to the position where the reference point reduction signal is turned ON.

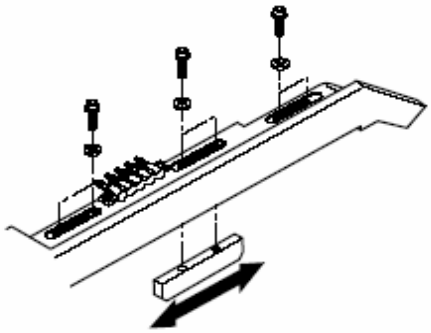
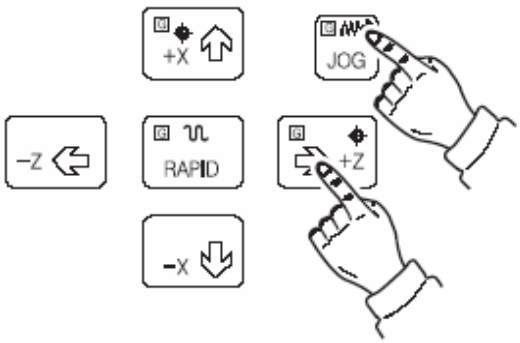


Fig. 5-4 Reference Point Return Dog Movement

h. Reference point return the X-axis.



i. Using the handle, confirm the distance from reference point to reduction signal OFF is within the limits. If being out of the limits, readjust the dog.

j. Perform para. 2 and 3 again and write the differences between "MACHINE" coordinate value 380.000 (SKT100), 314.000 (SKT200) at axis parameter No. 1850 as the running distance.

k. Turn off and then re-apply the power.

CAUTION
If para k has not been performed, it will not be operated properly.

3) X-axis Dog and Limit Switch

mm(in)

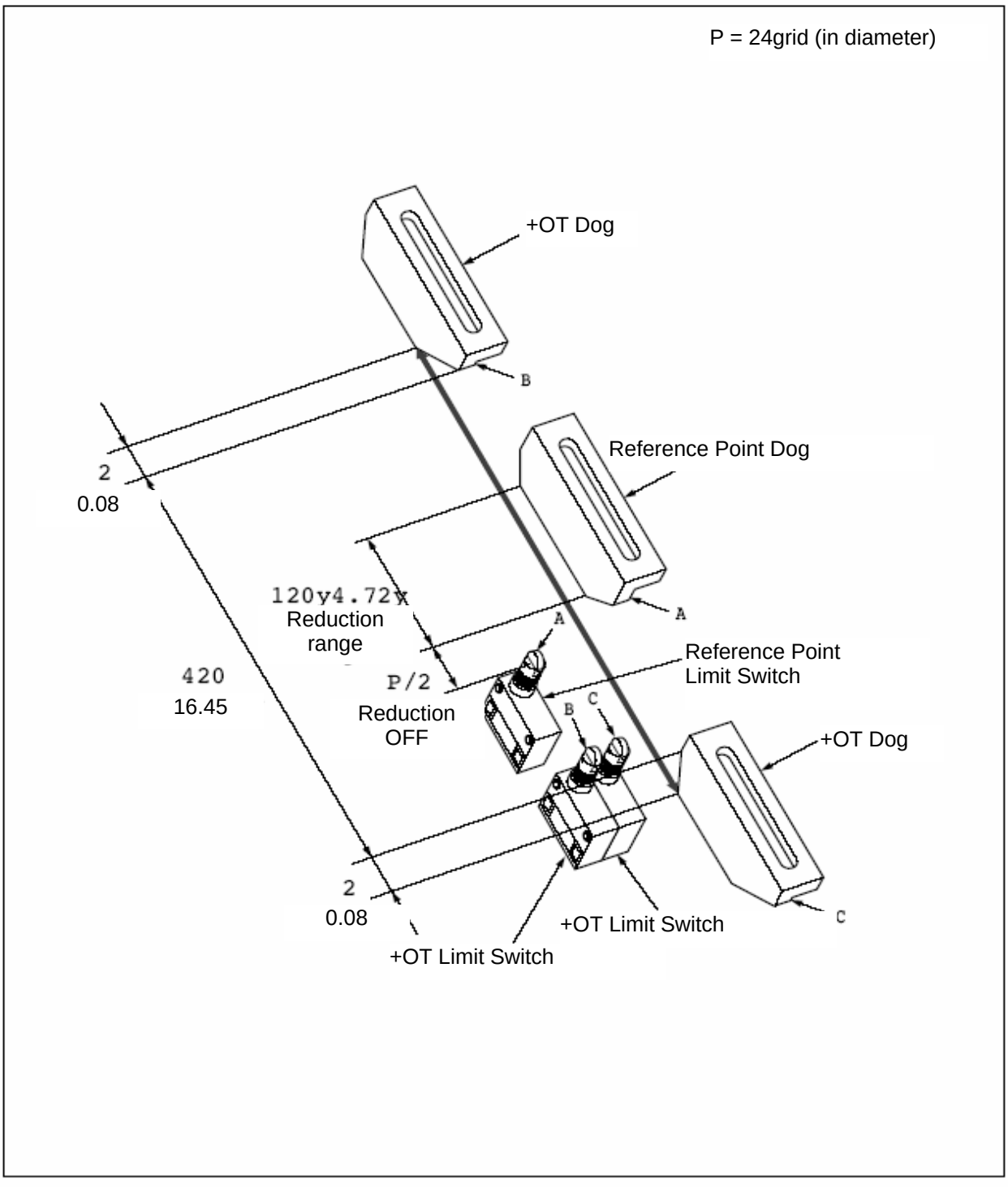
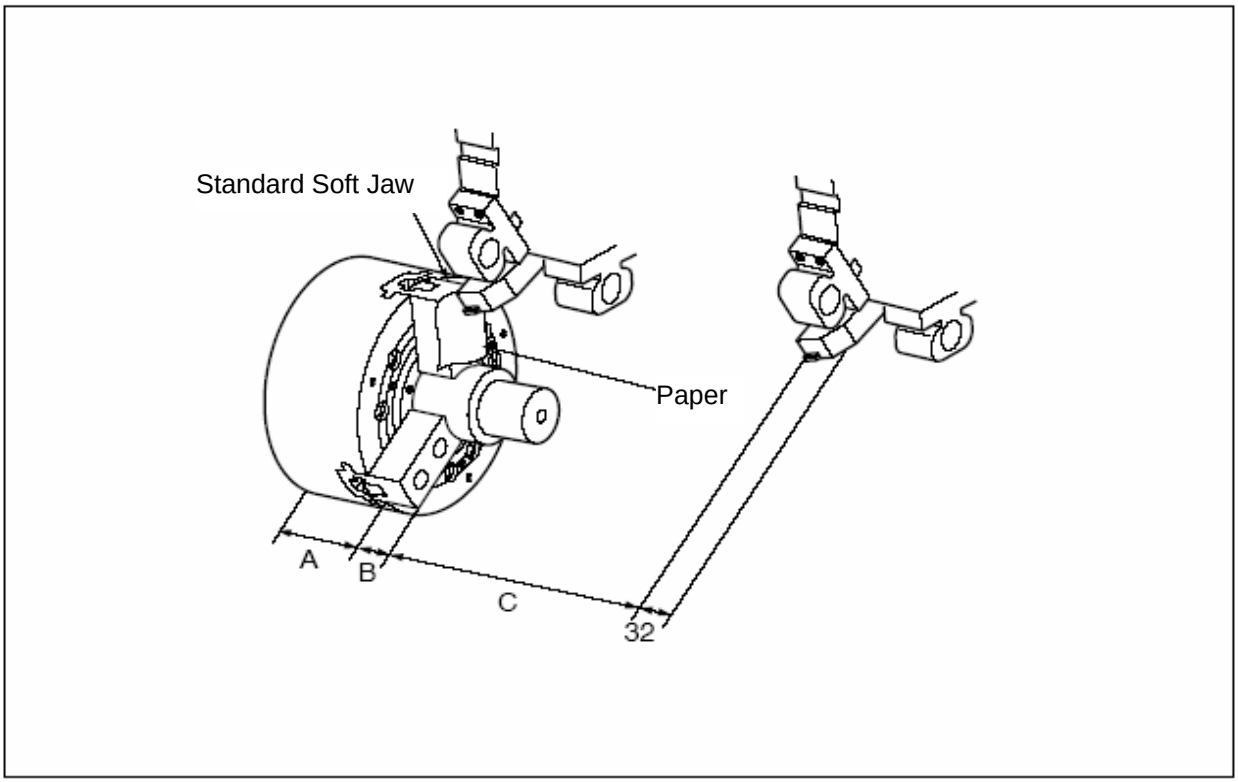


Fig. 5-5 X-axis Dog and Limit Switch Attached Position

4) Z-axis



Tab le 5-1. Chuck Dimensions

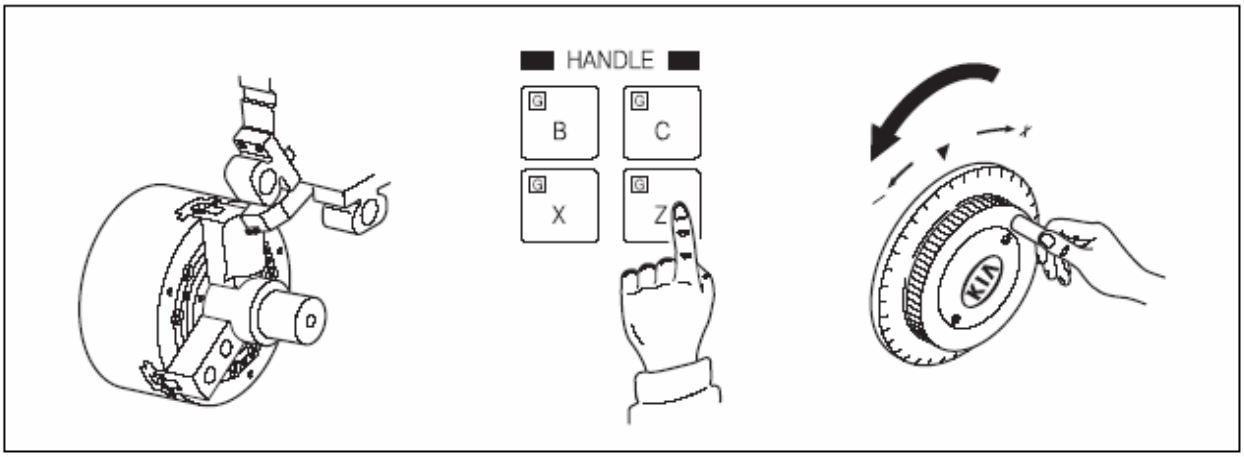
mm (in)

Type		A	B	C
SKT100	SAMCHUNREE Chuck	91(3.58)	32(1.26)	298(11.73)
	SMI Chuck	90(3.54)	32(1.26)	299(11.77)
SKT200	SAMCHUNREE Chuck	114(4.49)	38(1.5)	408(16.06)
	SMI (Chuck	104(4.02)	44(1.73)	404(15.9)

CAUTION

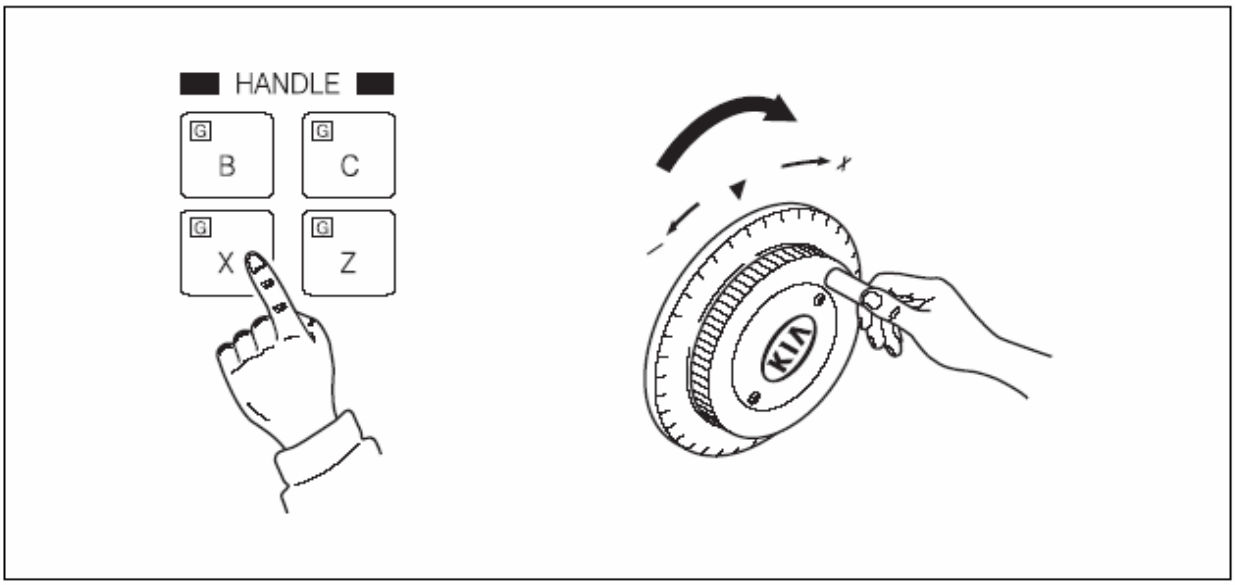
For SKT100/200, the reference point of Z-axis is different in diameter as shown in the above table, so adjust it after checking the specification of Chuck.

a. To approach the outer diameter bite tool to chuck and protect the blade end, use a thin piece of paper, feed the handle and approach the tip end of bite tool to the jaw section until the paper is not moved.

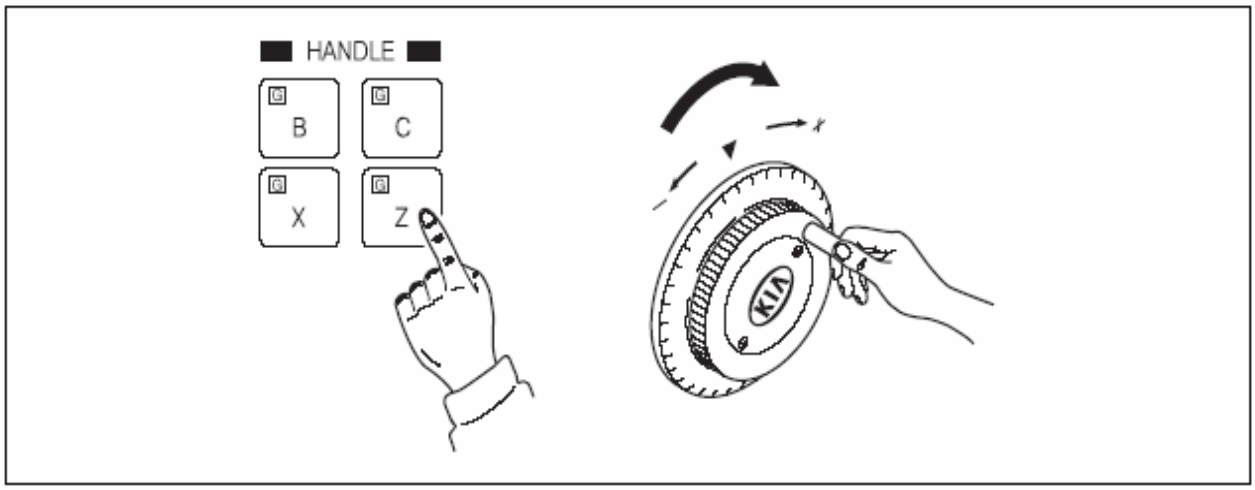


b. Set the "EXTERNAL" coordinate "Z" to "0" (see X-axis).

c. Set the mode to Handle X, move the head stock in the + direction of X-axis, and make it not to be interfered with Tail Stock.



d. Using the handle, determine the position at reference point.



CAUTION

1. Perform only in Z-axis.
2. Position X-axis at a distance from reference point.

e. This time, move the current position to be "C" value of Table 5-1, set "EXTERNAL" coordinate to "0" and then move it about 1/2 (6,000) of ball screw pitch in the opposite direction to Reference Point Return.

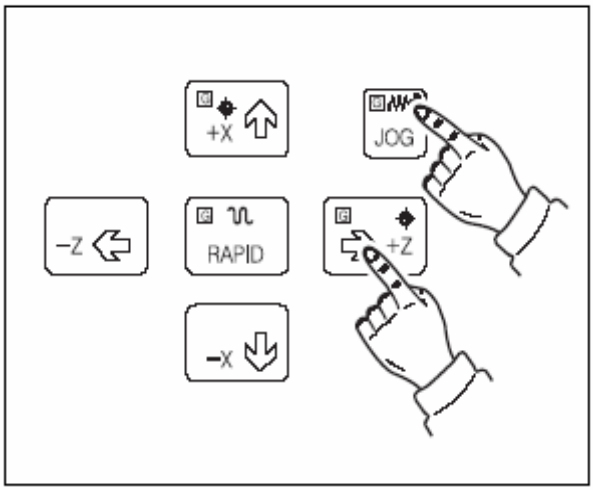
f. Move the reference point return dog to the position where reference point reduction signal is turned ON.

g. Reference point return the Z-axis.

h. Using the handle, confirm the distance from reference point to reduction signal OFF is within the specified range. If out of the specified, readjust the dog.

i. Perform para. 2 and 3 again and write the differences between "MACHINE" coordinate value and "C" value of Table 5-1 at parameter 1850 as the grid shift amount.

j. Turn off and then re-apply the power.



CAUTION
If the para. j being not performed, it will not be operated properly.

1-3-3. Z-axis Dog and Limit Switch Attached Position

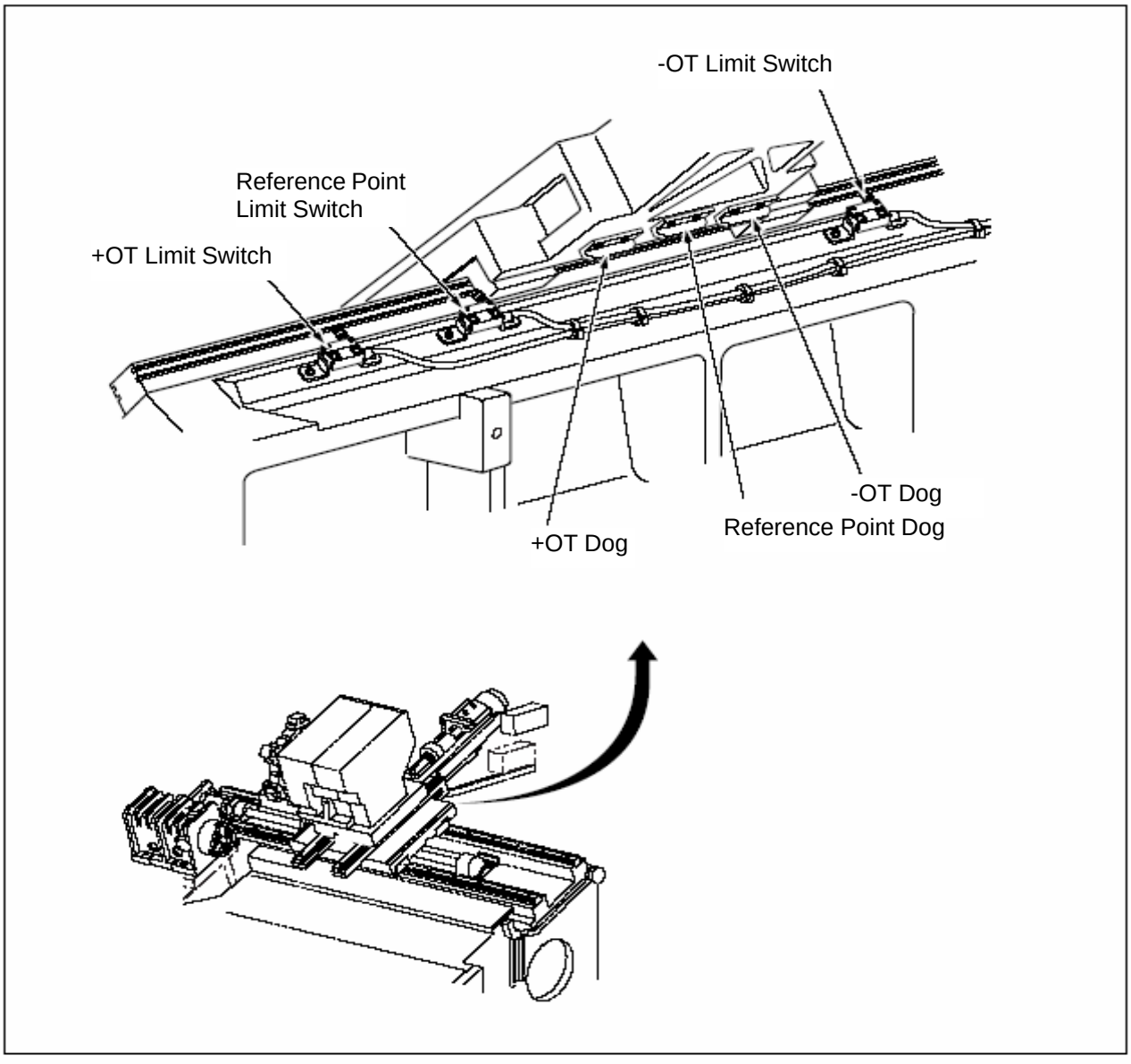
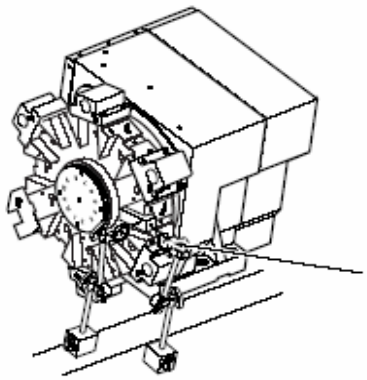


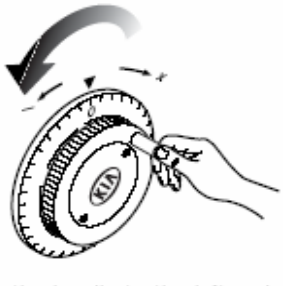
Fig. 5-6 Z-axis Dog and Limit Switch Attached Position

1-4. X- and Z-axes Backlash Adjusting Method

1) Delete the compensation entered.
   a. Select the setting screen and make the parameter change valid.
   b. Select the parameter screen and delete the backlash compensation.
2) Measuring Backlash
   a. Fit the dial indicator to the head stock from turret or Sub-spindle side.
   b. Measure the backlash using X- or Z-axis handle (See the following Fig.)

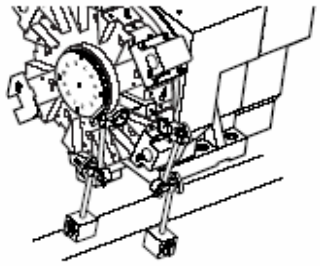
(a)



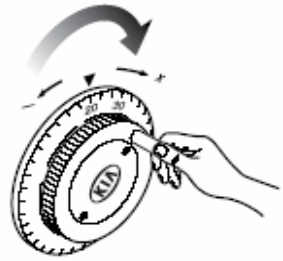


Turn the handle to the left and set the Handle Indicator mode to "0".

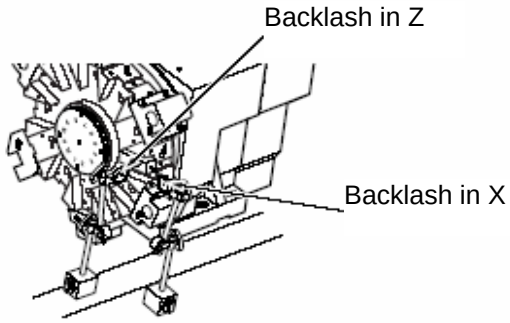
(b)



Turn again the handle to the right of 20 ~ 30°.



(c)



Turn the handle to the right and set the pointer to "0". This time, the difference of indicator becomes the backlash.

3) Setting Sequence of Backlash

a. Display the parameter screen as in above 1).

b. Confirm the cursor is positioned at no. of the axis to be compensated, key in the compensated value and then press INSERT key.

Ex. 1) X-axis backlash compensation

If 0.012 of backlash is compensated,

$$\text{Compensation} = \frac{\text{Backlash Value}}{\text{Compensated Unit (0.0005)}} = \frac{0.012}{0.0005} = 24 \text{ mm}$$

Ex. 2) Z-axis backlash compensation

If 0.015 of backlash is compensated,

$$\text{Compensation} = \frac{\text{Backlash Value}}{\text{Compensated Unit (0.001)}} = \frac{0.015}{0.001} = 15 \text{ mm}$$

In the above method, input the specific backlash value.

c. Turn OFF and then re-apply the power.

CAUTION
If para. c being not performed, it is impossible to operate properly.

4) Checking Backlash

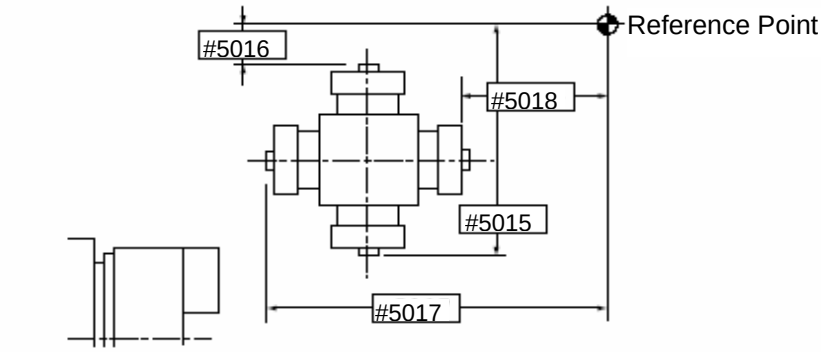
Check the setting value is proper in the method of 2).

1-5. Q-Setter Position Adjustment

After the machine collided or repaired, check the position of Q-setter is misaligned.

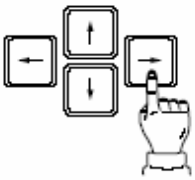
CAUTION
If the Q-setter used with misaligned, it requires the compensation as being misaligned.

1) Check the distance parameter to the position of sensor.



Set #5016 “1” → → Key in 5015

Press SYSTEM key



Press the Key, and "5015" will be displayed.

# 5015		For the inside of X-axis
# 5016		For the outside of X-axis
# 5017		For the opposite direction of Z-axis
# 5018		For Z-axis

2) Check the offset of tool to be used in measuring.

1: Outside Tool 01 X [ ] Z [ ]

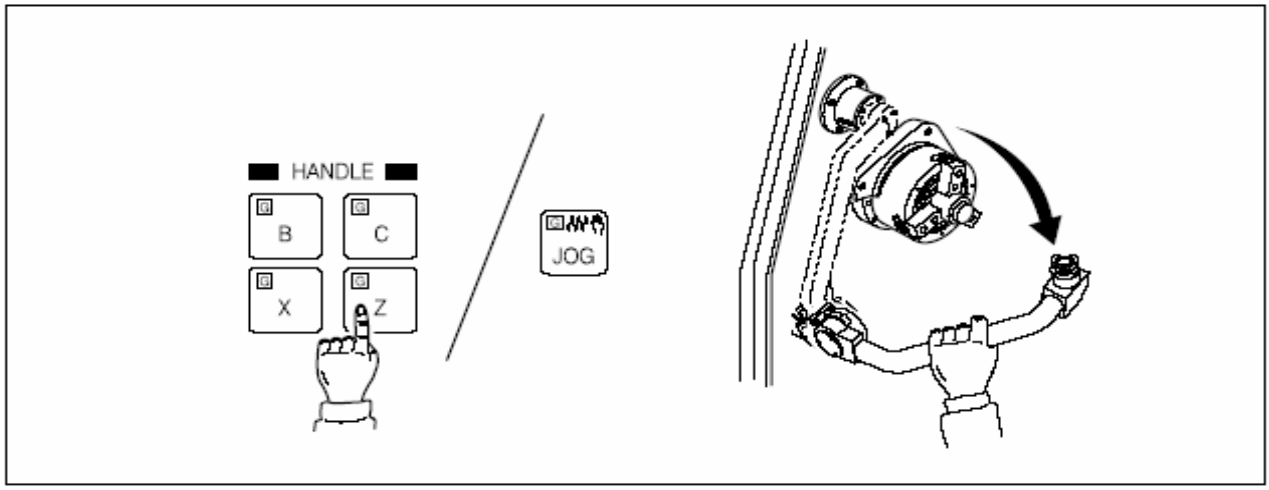
2: Inside Tool 02 X [ ] Z [ ]

3) Measure the compensation according to Q-setter.

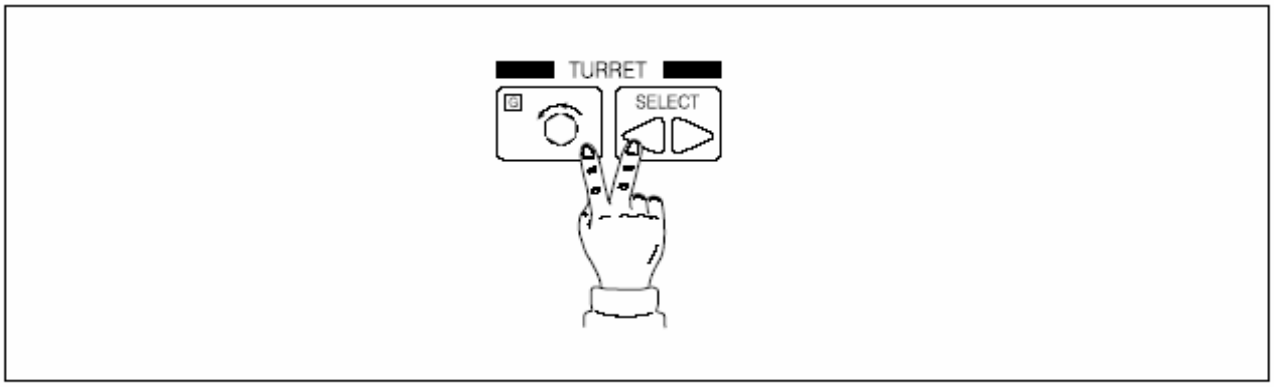
a. Check the reference point return lamp is illuminated.

If not illuminated, perform the reference point return manually.

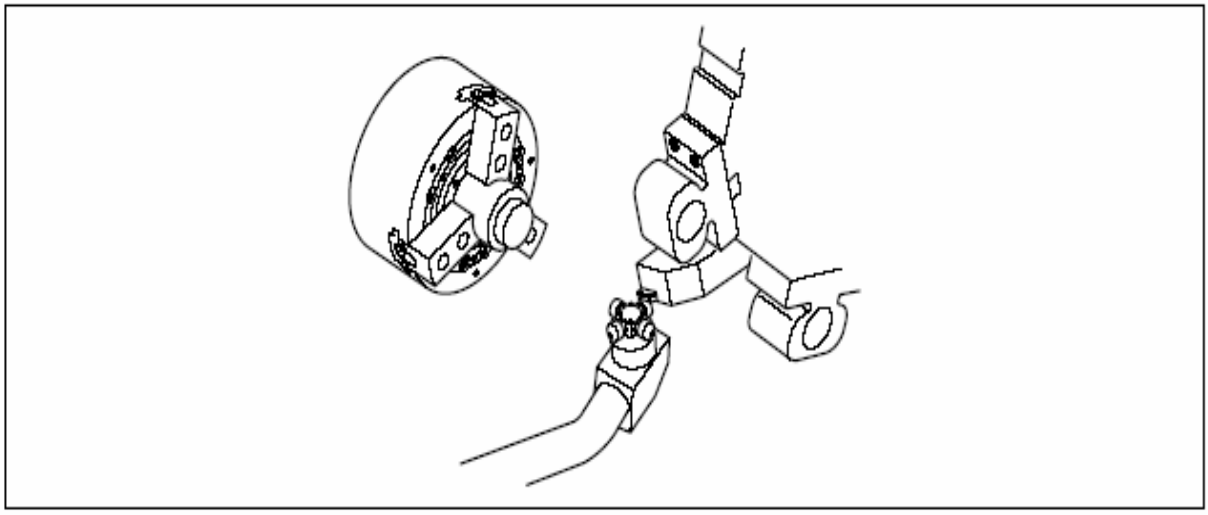
b. Set the mode to manual (JOG, handle feed) and pull out the Q-setter to the position to be measured.



c. Call the tool to be used in measuring.



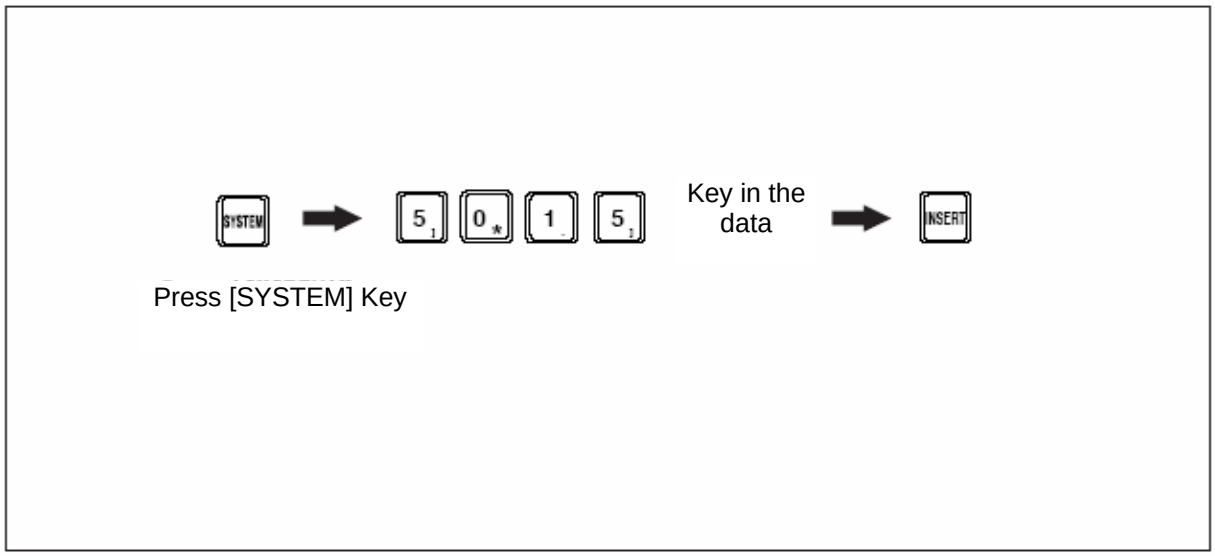
d. Approach the tool nose to Q-setter. If contacted to the sensor in the manual mode, the tool offset will be input automatically.



4) Calculate new parameter to the position of center.
New parameter = old parameter + (new offset - old offset) x 1000

	para. 1)		para. 3		para. 2)			para. 5)
new #5015)	=		+ (		-		) × 1000 =	
new #5016)	=		+ (		-		) × 1000 =	
new #5017)	=		+ (		-		) × 1000 =	
new #5018)	=		+ (		-		) × 1000 =	

5) Set the parameter at #5015.



CAUTION
After changing the data, always press the RESET key, turn off and then re-apply the power.

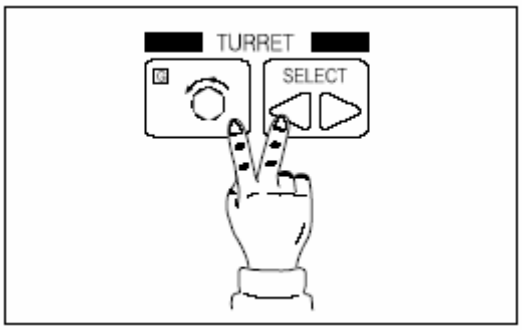
6) Adjusting Method according to Cutting. [(fine adjustment following data 5)]

a. Call the tool to be used in cutting.

b. When the desired value is assumed at 50 mm by chucking the workpiece, cut it with the work coordinate set to 50.0.

c. Measure the workpiece has been cut.

d. Calculate new parameter.



New parameter = (old parameter) + (measured value - desired value) x 1000

Ex. 1: #5015 = (-60482) + (49.8-50.0) x 1000 = (-60482) + (-200) =-60682

Ex. 2: #5015 = (-140657) + (50.25-50.0)x1000=(-140657)+250 = 140407

2. General Check and Repair

2-1. General

1) General check and repair are essential to maintain the high integriy for a long time. So, general check and repair take precedence of any other job.

CAUTION
1. When doing the general check and repair, open the necessary cover or door and the door of electric control panel remains closed. 2. Never use compressed air. It may result in penetration of foreign matters into the spindle bearing and guide-way.

WARNING
Prior to performing the general check and repair, place the main break of electric control panel to OFF as shown in Fig. 5-7.

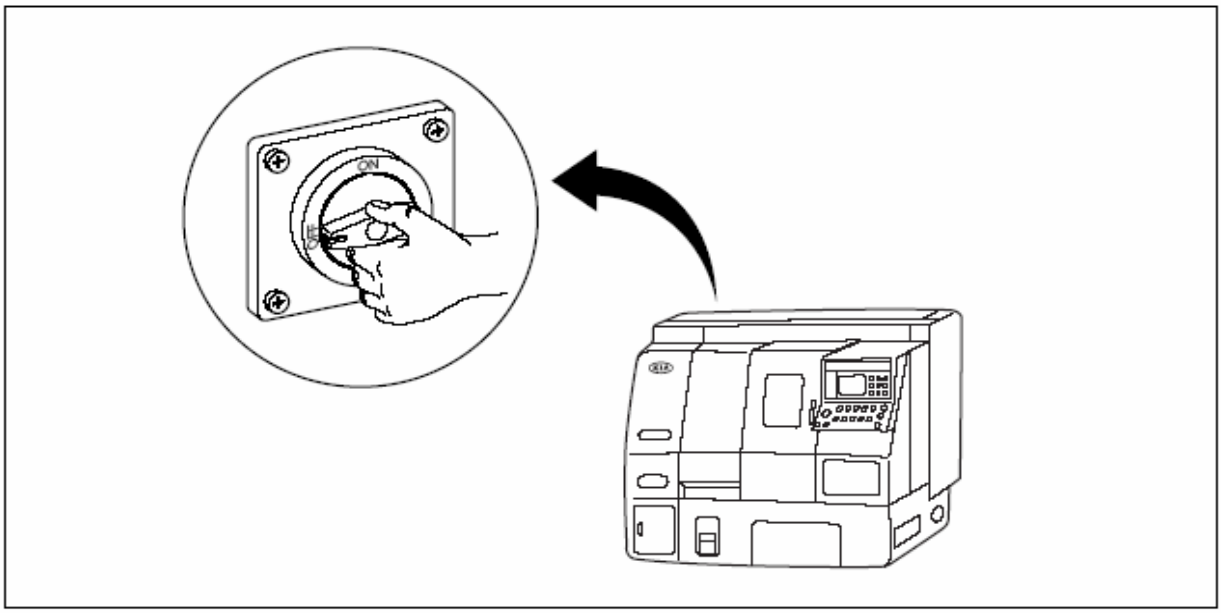


Fig. 5-7 Main Break Switch OFF Position

2) Always record the operation and check/repairing works.
Recording and Maintaining the operation is necessary for the operation of machine. Record the check and repairing works independently from the operation.

3) Check and repair will be performed in short time. This short-term work is important to avoid the unexpected accident or problem. And it is one of the important works to use the machine effectively for a long time.

4) Oiling

WARNING
If the recommended oil didn't supplied, it may occur damage in the machine.

This machine has many places to be lubricated. When lubricating, **"Avoid over-filling"** important. When oiling, follow this manual.

5) Check and repair can be performed daily, weekly, monthly and yearly. Check, fill oil an| clean the machine as instructed in this manual.

2-2. Check and Repair Items

Note: ○ Checking Period,
● CRT display

Item \ Period	Checking and Repairing period						Reference
	Daily	Weekly	Monthly	Six-monthly	Yearly	Biennially	Reference
1. Remove chips inside the machine	○						2-3-1
2. Remove chips above the tool post	○						2-3-1
3. Remove chips above the tail stock	○						2-3-1
4. Remove chips from each slider cover	○						2-3-1
5. Clean coolant nozzle			○ (if clogged)				3-6-3
6. Treatment of chip	○						2-3-1
7. Clean coolant tank	○						3-6-2
8. Coolant filter		○					3-6-2
9. Check the hydraulic oil flow	○						2-3-3
10. Check the coolant flow	●						2-3-3
11. Check the lubricating flow	○						2-3-3
12. Hydraulic oil pressure 35 kgf/cm^2	○						2-3-4
13. Check the lubricating oil supply	●						3-5-1
14. Check the coolant supply	○						3-6-1
15. Hydraulic oil strainer					○		3-4-2
16. Lubricating pump filter					○		3-5-2
17. Clean around the machine	○						2-3-1
18. Oil leakage	○						2-3-3
19. Remove the tool chip and check if damaged and broken	○						2-4-2
20. Loosen bolt		○					
21. Turret tool sank		○					2-4-2
22. Check Operating Panel		○					
23. Clean the Electric Panel		○					
24. Operation of emergency stop switch		○					
25. Vibration, noise and increased temperature		○					
26. Check the operation of safety device				●			
27. Check the tension of spindle belt			(○) one month after installation	○			2-6-2

Check and Repair Items (Continued)

Note: ○ Checking Period,
● CRT display

Item \ Period	Checking and Repairing period						Reference
	Daily	Weekly	monthly	Six-Monthly	Yearly	Biennially	
28. Check the multi cover of X-axis				○			2-6-2
29. Operation of the wiper in X-and Z-axes				○			2-6-2
30. Clean inside of the coolant tank and change oil				○			3-6-2
31. Moving hose				○			2-6-1
32. Clean the OSRAM lamp					○		2-7-1
33. Relay in the Electric Box					○		
34. Machine level					○		
35. Check backlash					○		1-4
36 Clean the fan			○				2-5-3
37. Clean the front cover of spindle				○			3-1-2
38. Applying chuck grease	○						2-3-1

2-3. Daily Check and Repair

2-3-1. Inside of the Machine

DANGER

Before cleaning inside of the machine, always turn OFF the power.

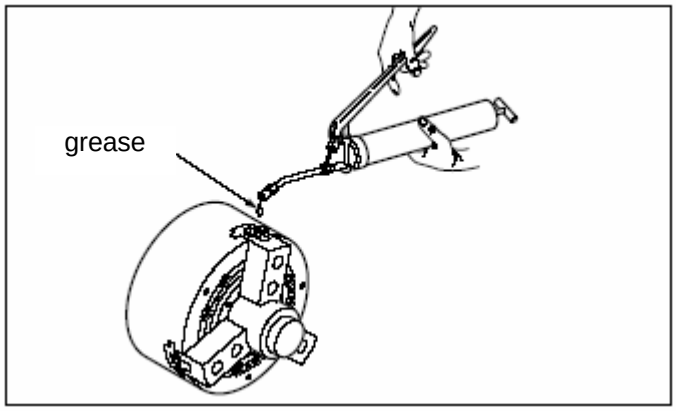
CAUTION

Never use compressed air. It may result in the machine failure.

1) Use the tool such as brush, damp cloth, etc.
2) Remove chips and collect them in the chip box of machine.

CAUTION
1. First, pull the collected chips out of the machine and collect them into the chip box. 2. Using coolant, clean the inside of machine. 3. If chips not removed, it may cause a failure of the machine.

3) Inject the grease into the Chuck and clean it. Use the specified grease.



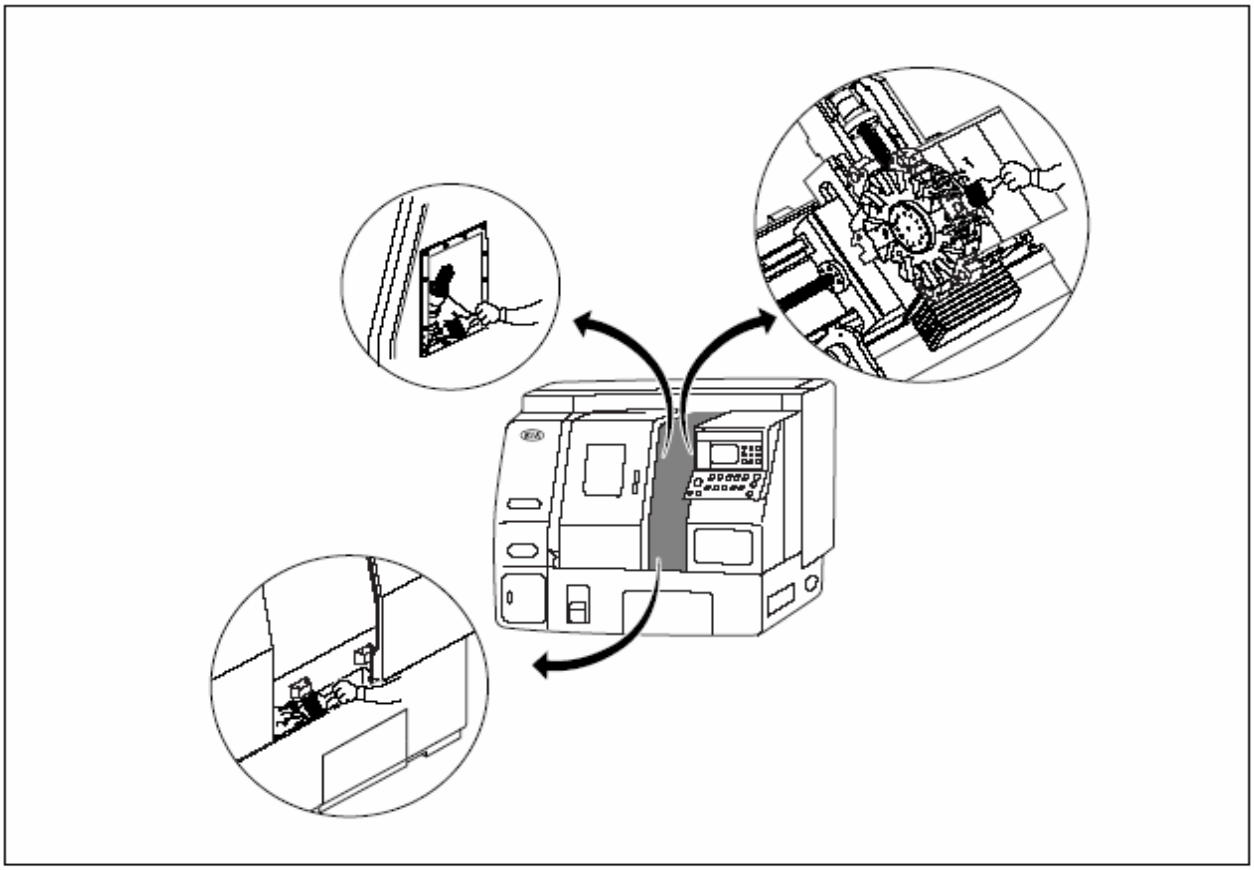


Fig. 5-8 Checking the inside of Machine

2-3-2. Outside of the Machine

1) Remove the collected chips into the separated chip box.

WARNING

If there are coolant, grease or water on the floor, immediately wipe it out using damp clothes or papers. Otherwise, it can cause personal injury from slipping.

Used tool: shovel, brush

A. If the machine hasn't equipped with chip conveyor

a. Remove chips from the front of the machine. Pull out the coolant tank in front of the machine, pick out chips from the chip box in coolant tank and put them into a separate container and return its original position.

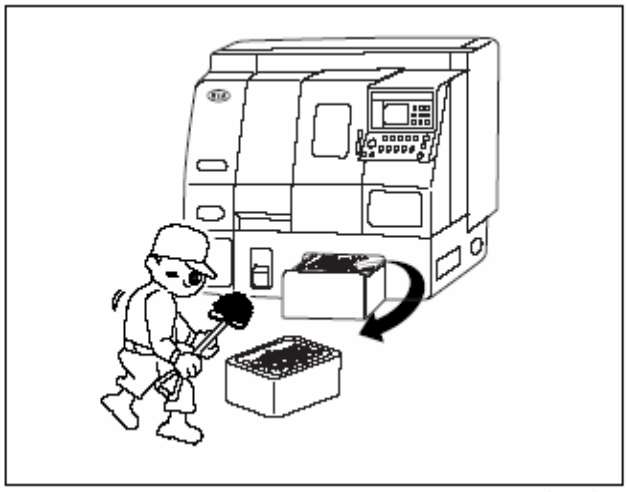


Fig. 5-9 Removing chips from the chip box(1/2)]

b. Remove chips from the rear of the machine

Disassemble the cover from a separate chip container, remove chips, put them int. the chip box and then reassemble the cover.

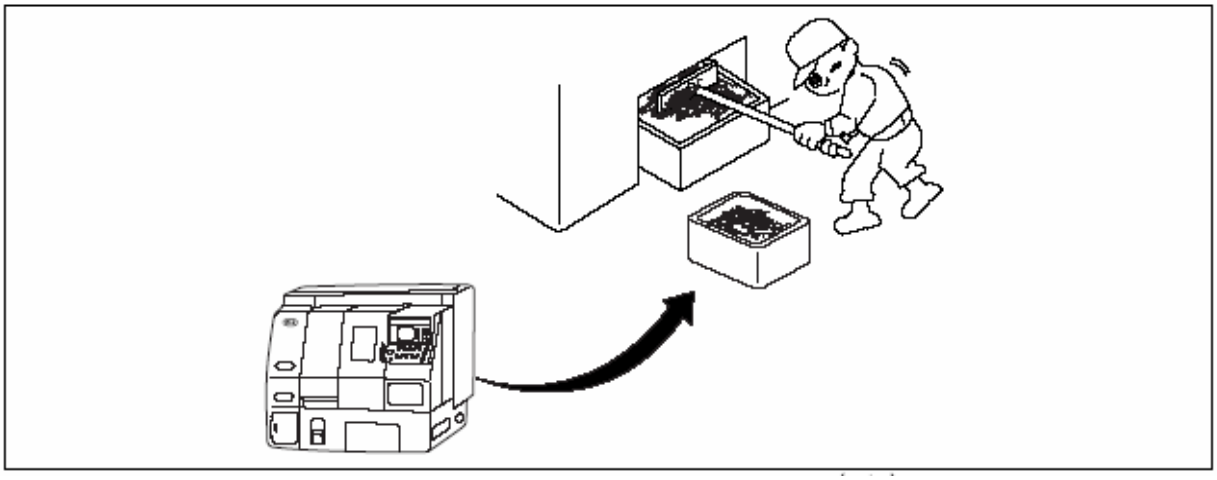


Fig. 5-9 Removing chips from the chip box (2/2)

B. If the machine equipped with chip conveyor

Position the chip box just under the chip conveyor and remove the collected chips.

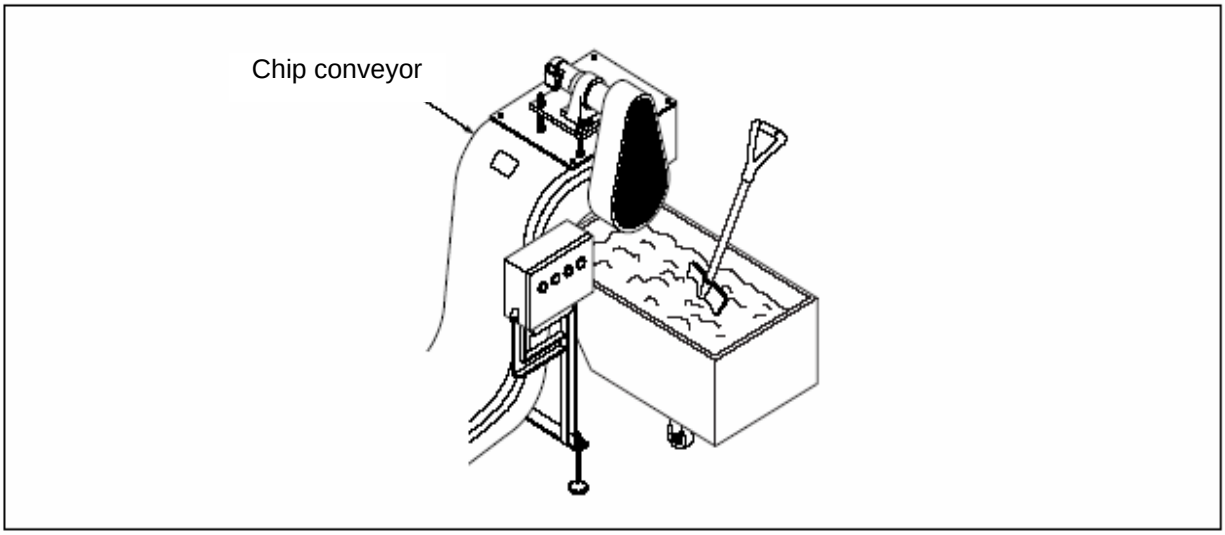


Fig. 5-10 Removing Chips out of the Chip Box

2-3-3. Checking Oil Flow

Oil flow can be checked by means of flow level gage in the tank. If filling oil, use the recommended oil.

1) Check the flow of hydraulic oil
2) Check the flow of lubricating oil
3) Check the flow of coolant

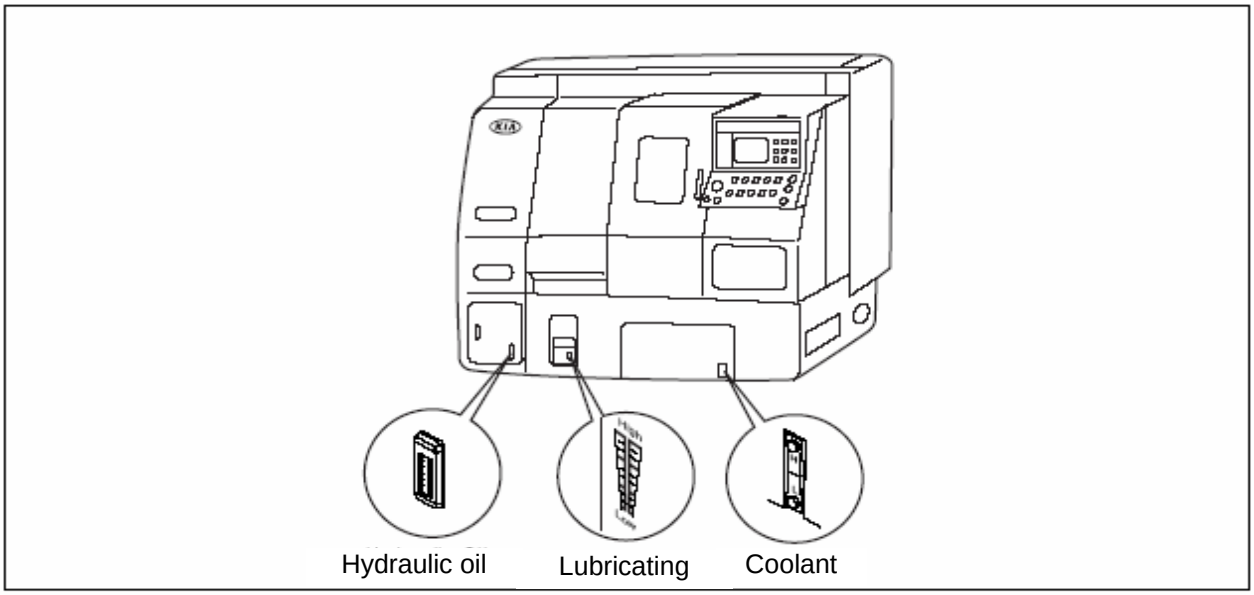


Fig. 5-111 Checking Oil Flow

2-3-4. Checking Pressure

Check the pressures in Hydraulic unit, Chuck, Sub-chuck and Tail Stock.

1) Hydraulic unit: 35 kgf/cm^2 (3.5 MPa)
2) Chuck: 5 ~ 27 kgf/cm^2 (0.5 ~ 2.7 MPa)
3) Tail Stock: 1 ~ 20 kgf/cm^2 (0.1 ~ 2 MPa)

WARNING
If being set above the specified pressure, it can cause machine failure.

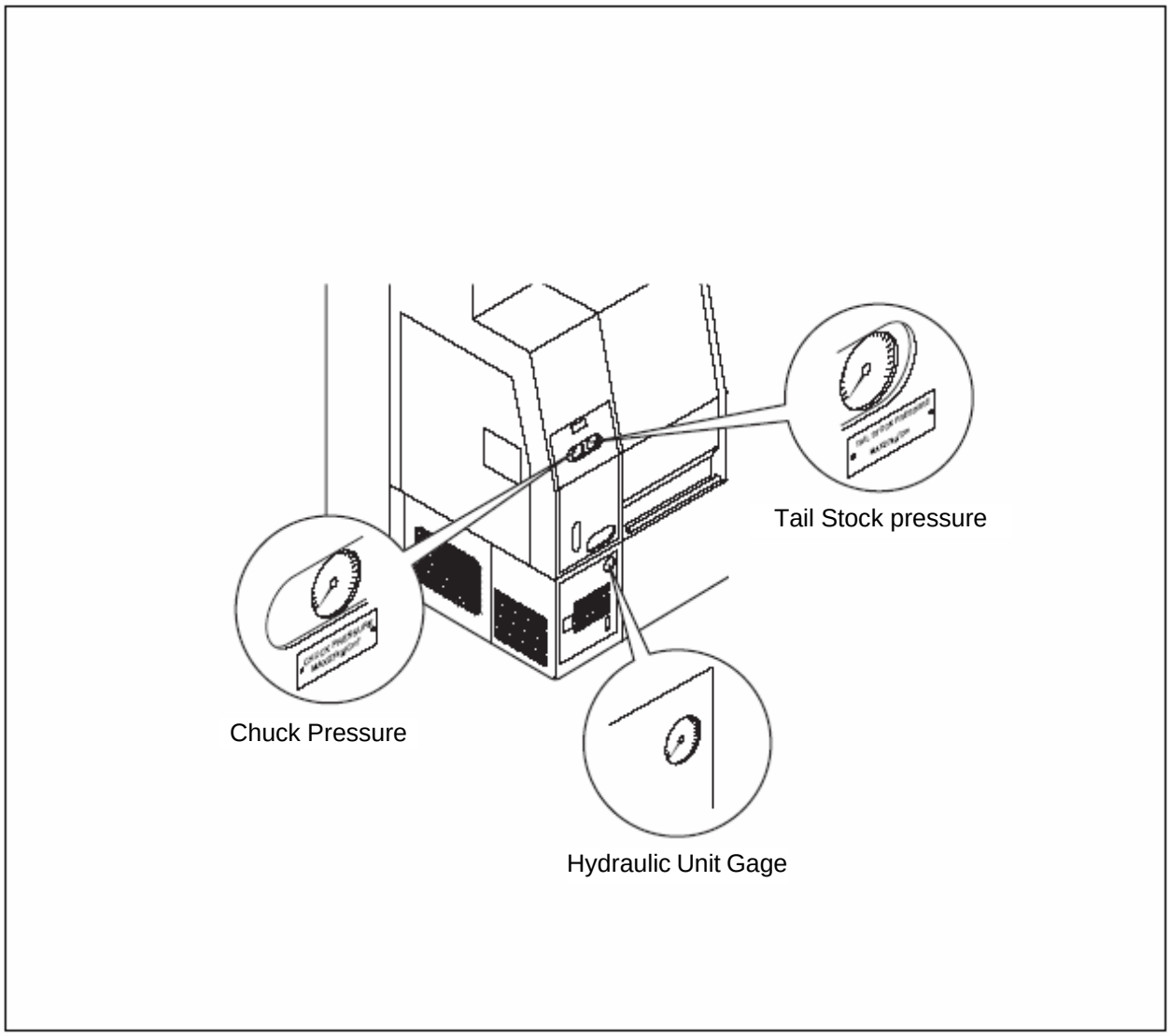


Fig. 5-12 Checking Pressure

2-3-5. Filling and Changing Oil

CAUTION

- If using soluble coolant
  1. Choose it in consideration of its characteristics such as rustproof, security, cooling, and etc.
  2. It should not include the contents dangerous to human body.
  3. It should not be deteriorated during the storage.
  4. It should not include corrosive or risk elements to the painting.
  5. It should not include elements melting to rubber products used in the machine.
  6. It should not include the contents which may degrade machine accuracy.
  7. Add a little rustproof oil when mixing coolant with soluble coolant. Otherwise, it may be rusted as coolant dried.
  8. When completing work, wipe out the part contacted with coolant. Apply it with rustproof oil after cleaning.
  9. Take care not to touch coolant with skin. Be sure you should be informed of its user's .instruction for your health.
  10. The mixing method of soluble coolant with water depends on the kinds of coolant and follow the instructions of the manufacturer.

WARNING

Make sure the problem occurred by coolant, and etc. is not warranted.

1) Filling Oil (if necessary)

WARNING

If there is coolant, grease, or water on the floor, immediately wipe it out with damp clothes or papers. Otherwise, it may cause personal injury.

A. Filling coolant is possible in front or rear of the machine, but generally supplied at the rear.

a. Oiling in the front box of the machine
Pull out the coolant tank and fill it.

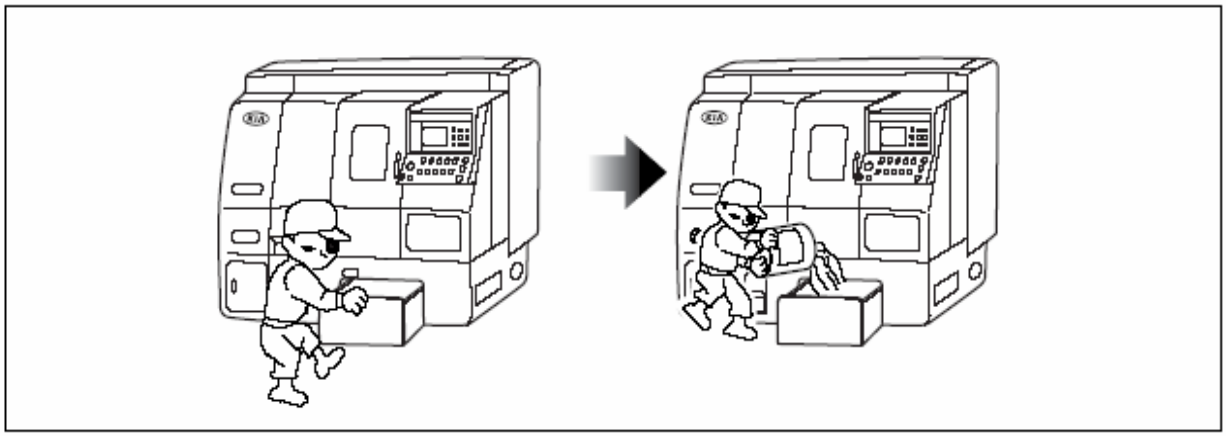


Fig. 5-13 Oiling in front of the machine

b. Oiling in the rear of machine
Disassemble the cover at the rear of machine, remove multi-hole iron plate from sub tank, and then fill coolant.

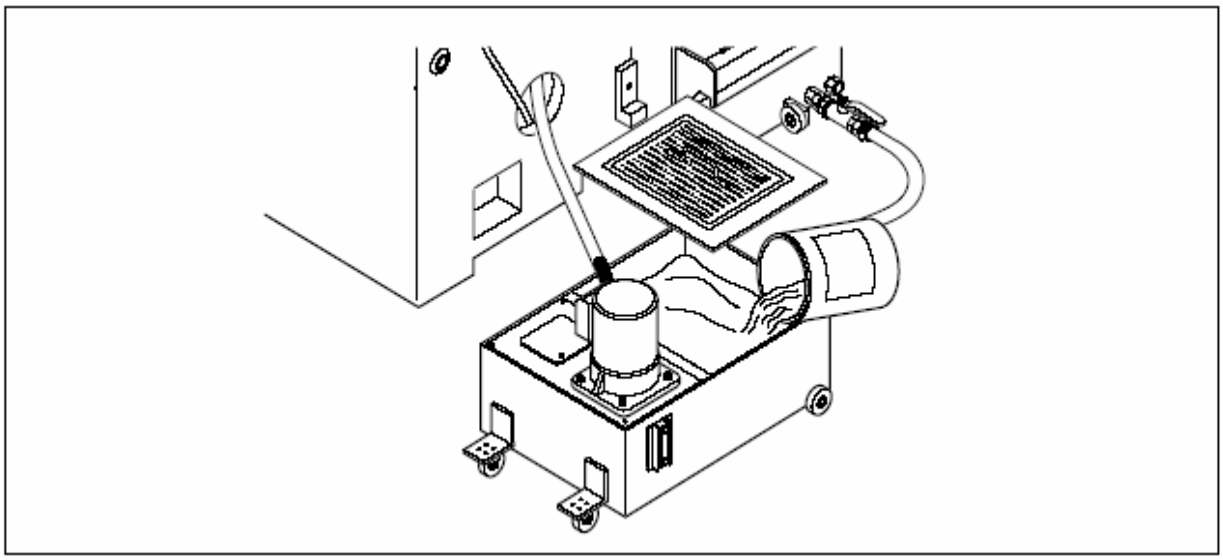


Fig. 5-14 Oiling at the rear of machine.

WARNING

1. Never touch coolant with bare hands.
2. Coolant may damage the skin seriously:

2-3-6. Around the Machine

1) Clean the outside of machine.
   Wipe out oil and remove coolant, chip, and etc.
   Clean CRT screen and operating panel with soft clothes dampened in cleaning solution.
2) Check there is an evidence of oil leakage outside of the machine.
3) Check if chips are removed, broken or damaged from the tool (insert),

2-4. Weekly Check and Repair 2-4-1. Inside of the machine

2-4-1 Inside of the machine

1) Cleaning the filter of coolant tank.

WARNING
When using compressed air, always wear protective goggles.

a. Use brush and air gun.
b. Remove the filter and clean it with brush.

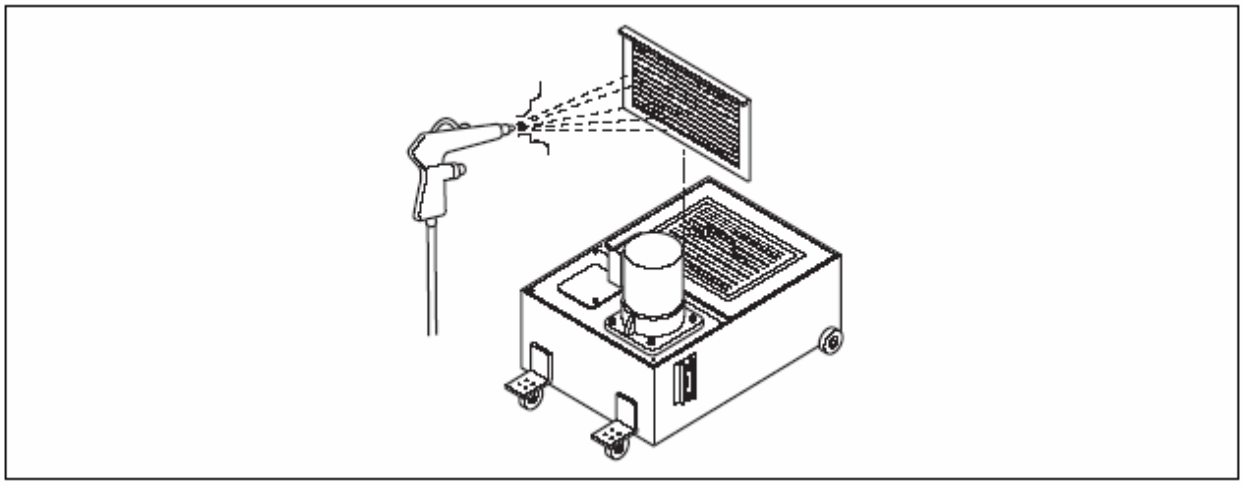


Fig. 5-15 Cleaning the Filter of Coolant Tank

CAUTION
The use of air gun in the vicinity of the machine may cause the machine failure.

2-4-2. Outside of the Machine

1) Turret Tool Holder and Shank

Check the chips are removed from the tool holder or shank and engaging bolt is attached.

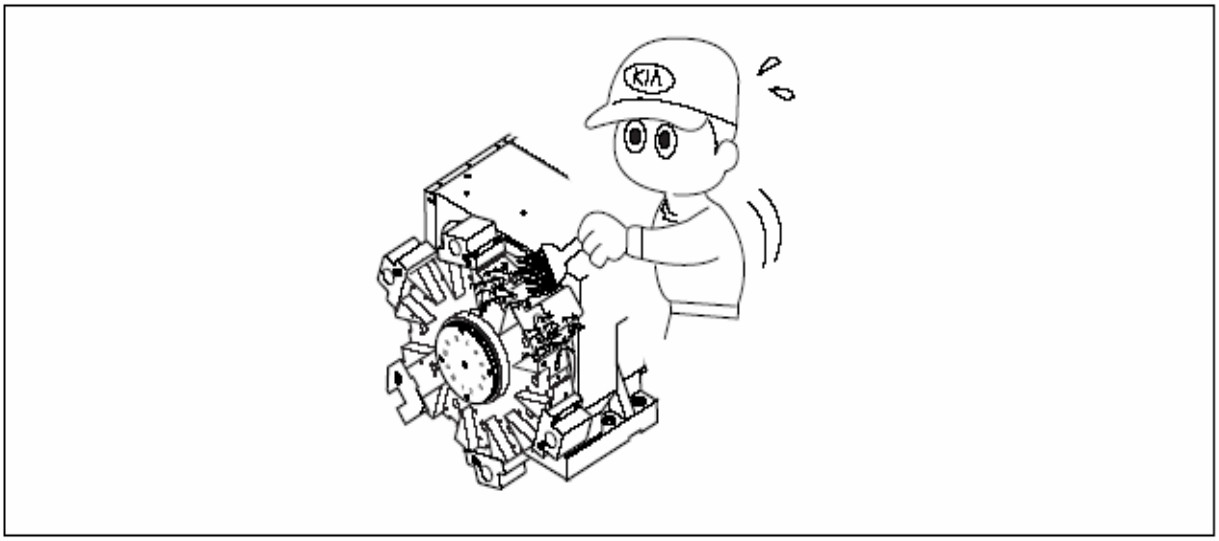


Fig. 5-16 Turret Tool Holder and Shank

2) Engaged State of Bolt

WARNING
1. This check is for preventing a failure in advance. 2. If neglecting this, it may cause the machine failure.

3) Check the Operating Panel is illuminated.

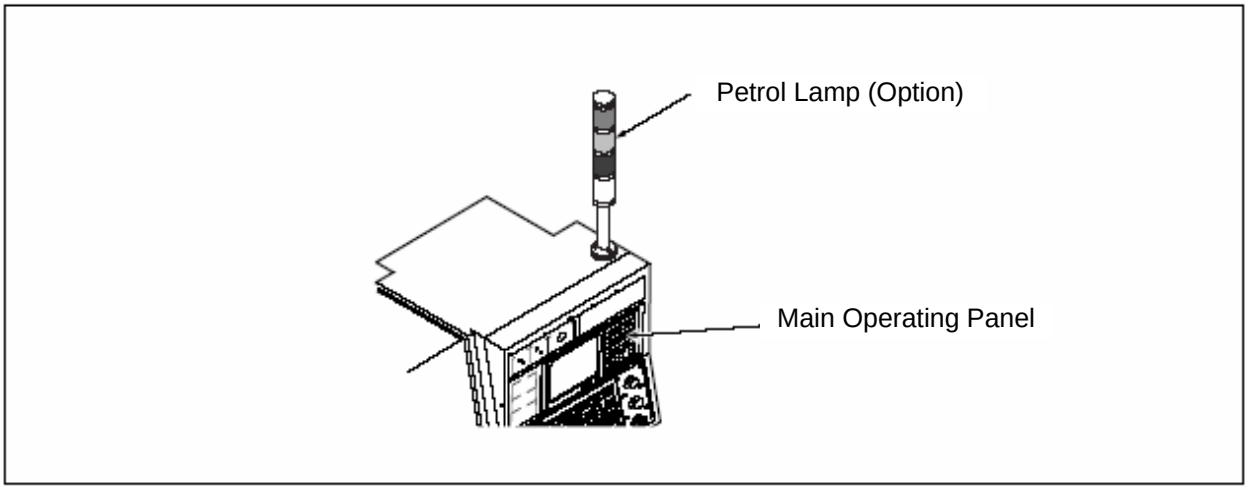


Fig. 5-17 Operating Position

2-5. Monthly Check and Repair

2-5-1. Inside of the Machine

1) Cleaning the nozzle of coolant
   Used tool: - and + screwdrivers
   Remove chips around the coolant nozzle attached at turret.

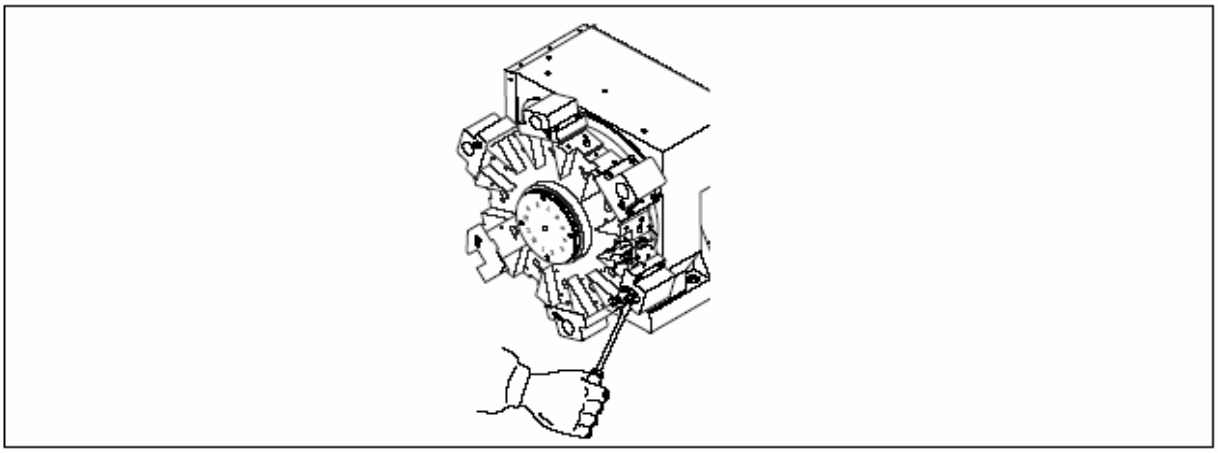


Fig. 5-18 Removing Turret Nozzle Chip

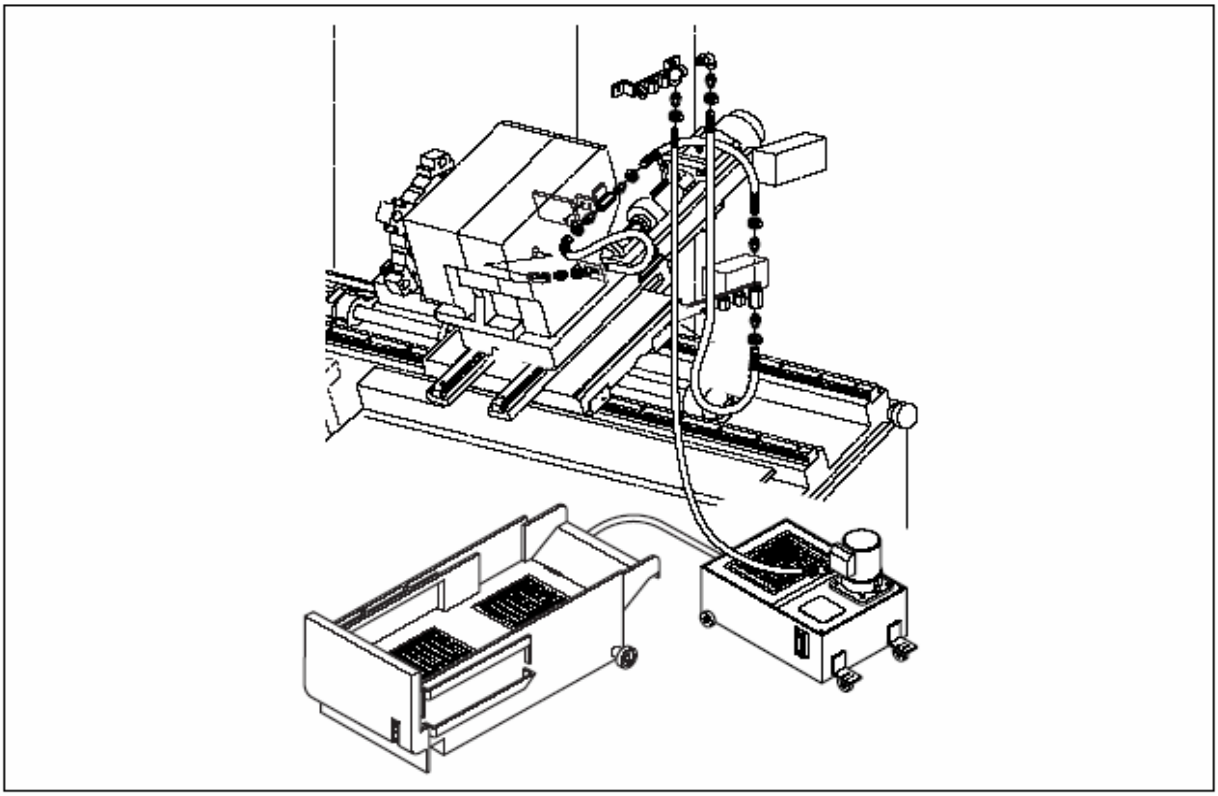


Fig. 5-19 Coolant Supplying Route

2-5-2. Filling and Changing Oil

1) Filling lubrication Oil

WARNING
When filling lubricating oil, always use the recommended oil by KIA. Otherwise, it may cause the machine failures.

a. tank capacity:
-1.8 l (0.47 gal)

b. Lubricating oil supply:
-33dd/h
Recommended oil:
See chap. 3-5-2 “Place to be Lubricated”.

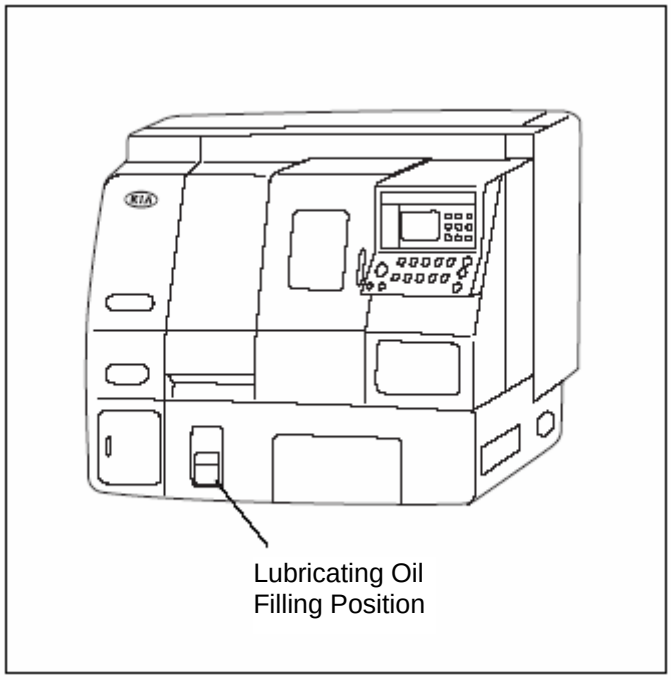


Fig. 5-20 Lubricating Oil Filling Position

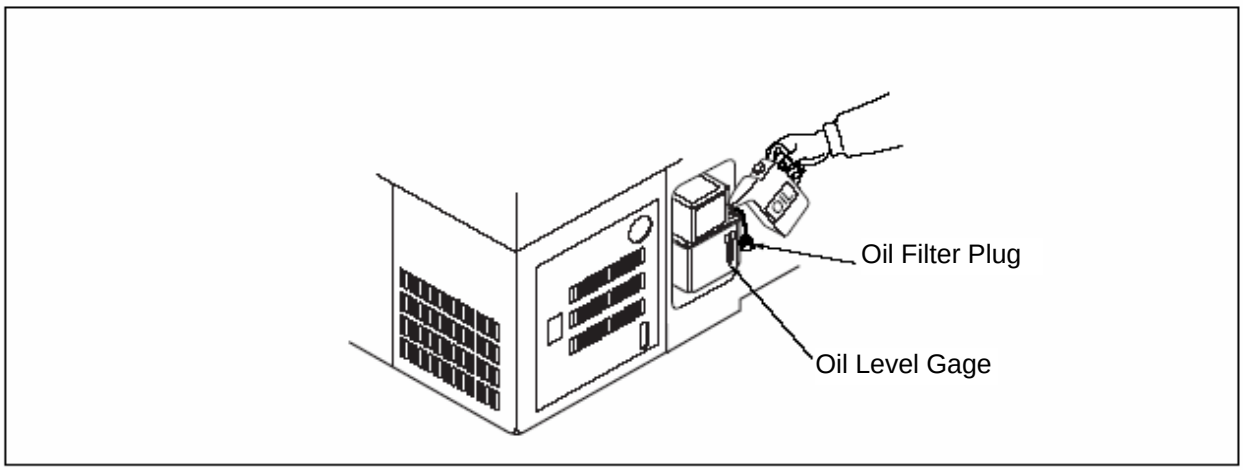


Fig. 5-21 Filling Lubricating oil

c. Open the plug of oil filter.
d. Fill the recommended lubricating oil up to the upper limit of level gage.
e. Plug the oil filter.

WARNING

When filling lubricating oil, wipe out dropped oil on the floor with damp clothes or papers. Otherwise, it may cause personal injury.

2) Whenever filling lubricating oil, always clean the waste oil tank.

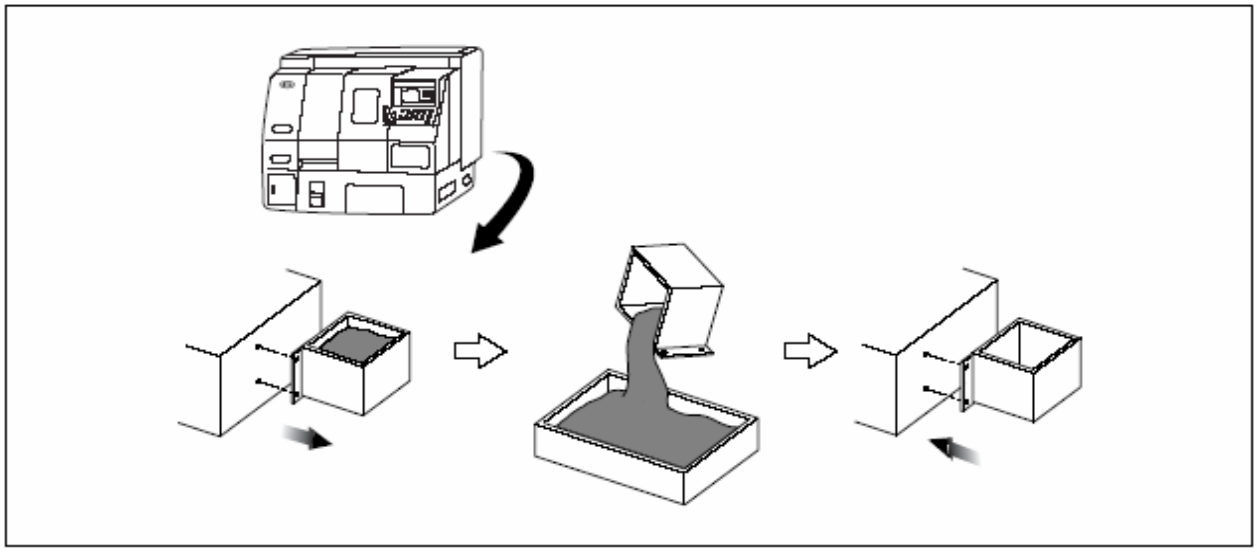


Fig. 5-22 Cleaning Waste Oil Tank

WARNING

Unless the waste oil tank cleaned, it may cause personal injury due to overflow oil.

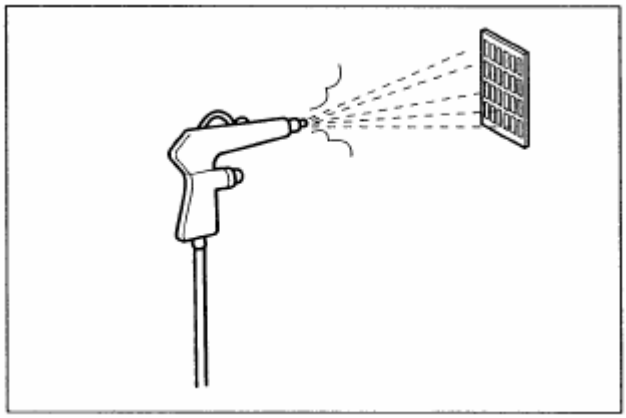
2-5-3. Outside of the Machine

1) Cleaning Cooling Fan

- Used tool: Wrench (3, 4, 5mm), damp clothes

WARNING
Before cleaning the fan, turn OFF the Main Power switch. Otherwise, it may cause personal injury.

a. Remove the door from the Electric control panel and the fan filter from the left side and then clean them using air gun.



2-6. Six-Monthly Check and Repair

2-6-1. Filling and Changing Oil

1) Exchanging Hydraulic Oil

WARNING
1. Before exchanging the hydraulic oil, always turn OFF the power. 2. When filling hydraulic oil, always use the recommended one by KIA. Otherwise, it may cause the machine failures.

The hydraulic oil should be changed after the first 3 months of installation. Thereafter, change it every 6 months.

Used tool: Wrench (5 and 10 mm)

Oil capacity: 15 l (3.92 gal)

a. Turn OFF the main power switch in the electric control panel at the rear of machine.
b. Disassemble the bolt in the left lower cover and place the collection container under the drain plug installed at the rear of hydraulic unit.
c. Loosen the drain plug and collect hydraulic oil.

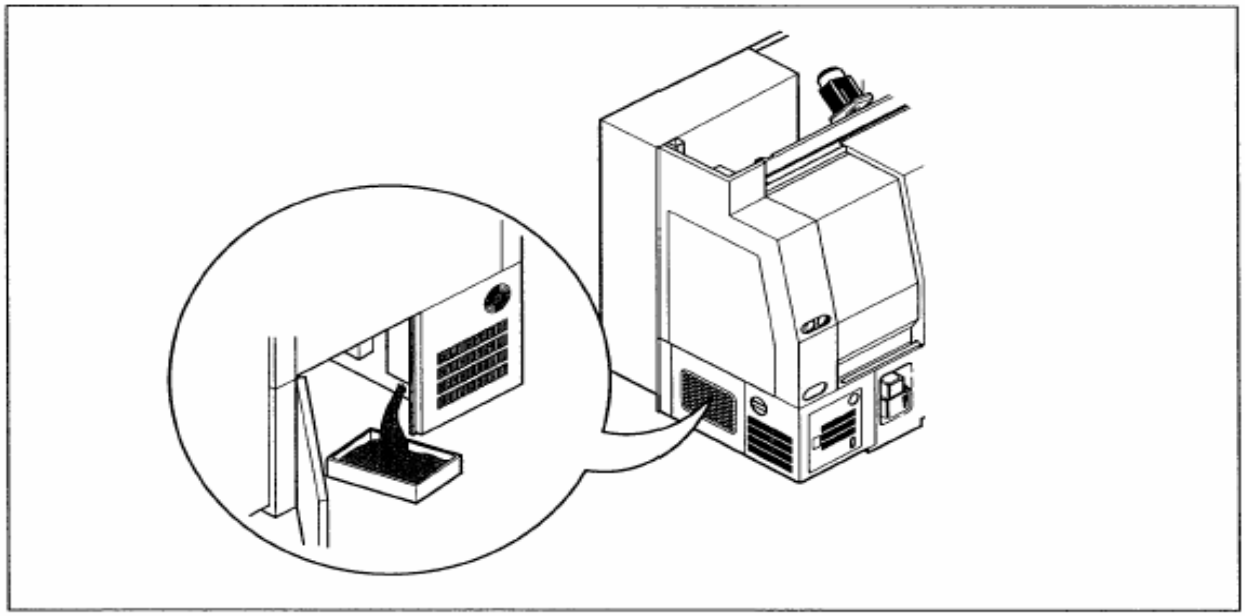


Fig. 5-23 Collecting Oil of Hydraulic Unit

d. When completed, close the drain plug.
e. Open the door for repairing in front of the machine and the oil filter cap and then supply the hydraulic oil.

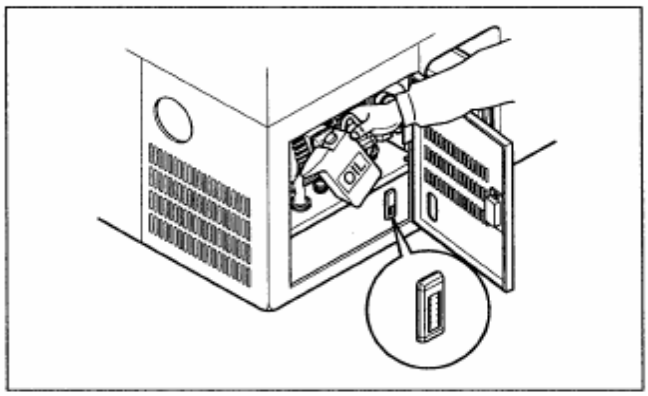


Fig. 5-24 Supplying Hydraulic Oil

2) Changing Coolant

Clean chips in coolant tank and perform in the following orders.

WARNING

When changing coolant, wipe out dropped oil on the floor with damp clothes or papers. Otherwise, it may cause personal injury.

- Used tools: Coolant collecting box, damp clothes, shovel, wrench (17 mm), + screwdriver, coolant capacity 135 l (35.25 gal)

a. Lock the ball valve before disconnecting hoses between the main and sub tanks.

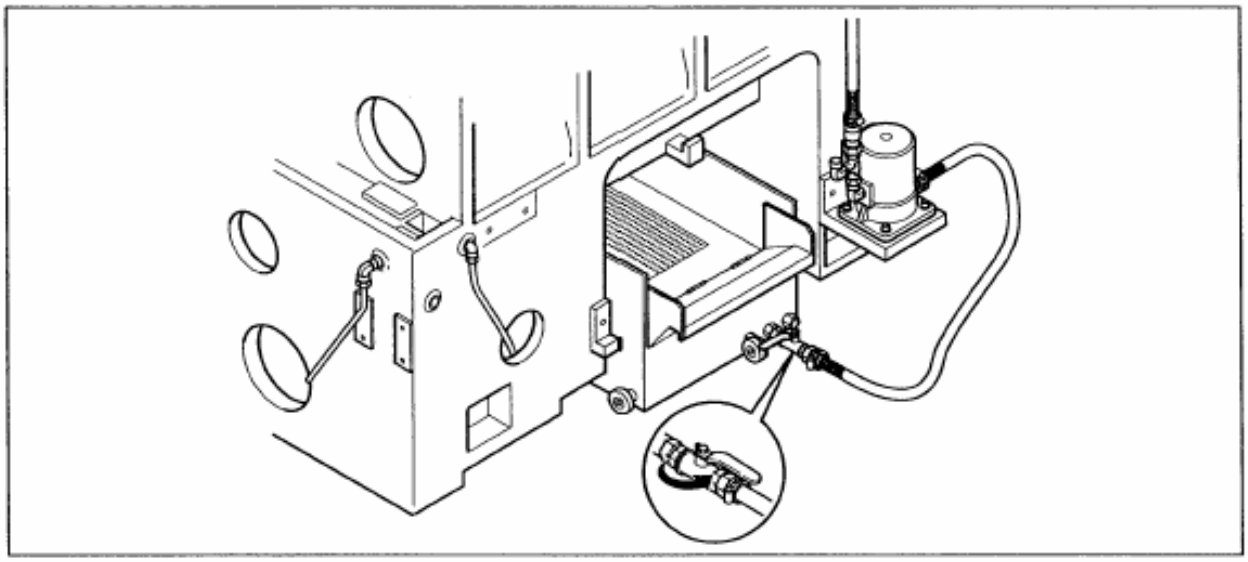


Fig. 5-25 Disconnecting Coolant Tank

Fig. 5-26 Main Tank

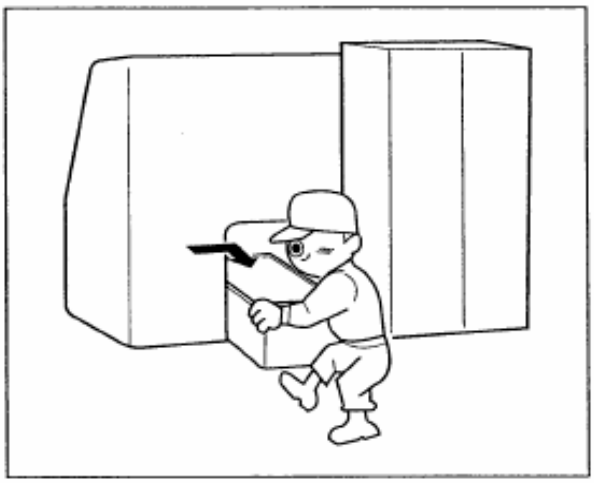


Fig. 5-27 Sub Tank

d. Position coolant collecting box under the drain plug in main and sub tanks, loosen the plug and allow all coolant to drain.

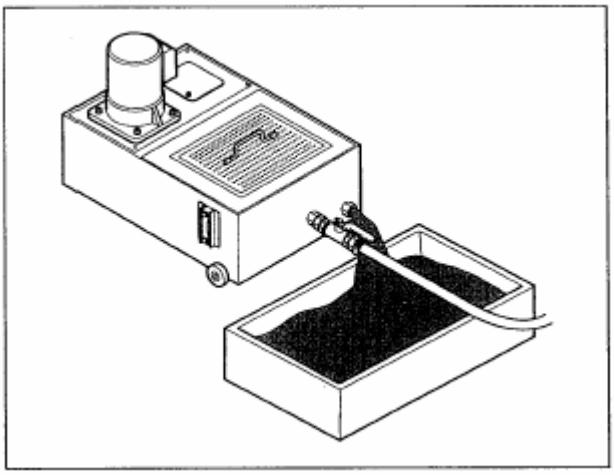


Fig. 5-28 Collecting Coolant

e. Clean inside of the coolant tank thoroughly.
f. Clean the filter.
g. Slide coolant tank into the bed and connect it with the main or sub tank.
h. Supply new coolant.

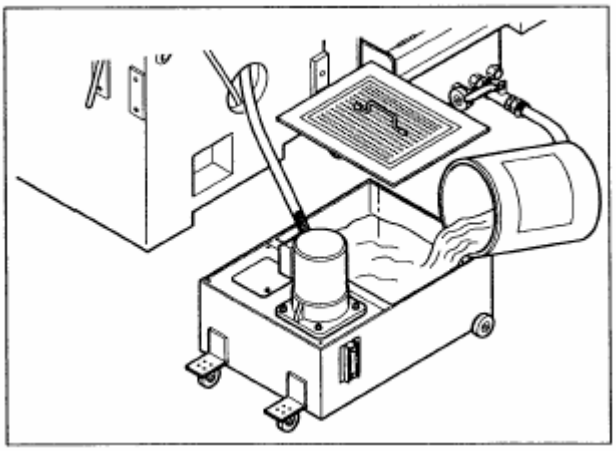


Fig. 5-29 Supplying Coolant

3) Checking Moving Hose

DANGER
Always turn OFF the power and then check moving hoses for damage. Otherwise, it may cause personal injury.

a. Disassemble the cover at the rear of machine and check hoses for damage in the Z-axis direction and two hoses in the X-axis direction.

b. Attach the cover.

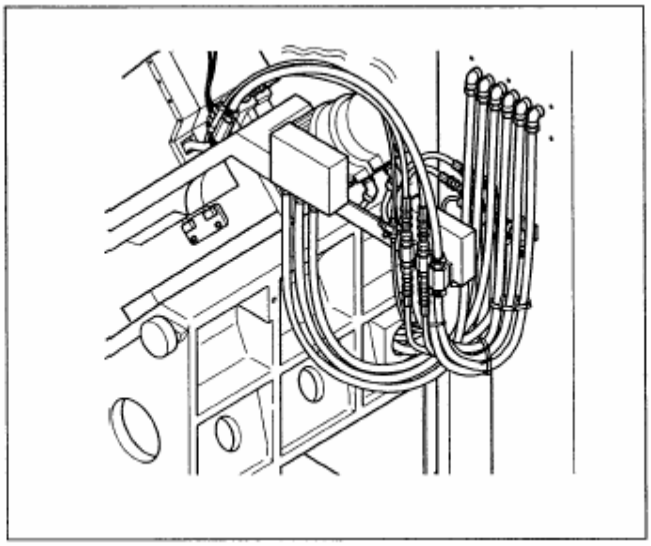


Fig. 5-30 Checking Moving Hose

4) Cleaning Front Cover of Spindle

For detailed information, see chap. 3-1-2 "Cleaning Front Cover of Spindle".

2-6-2. Around the Machine

1) Checking the operation of Safety device

Check the limit switch and dog installed on the door for operation.

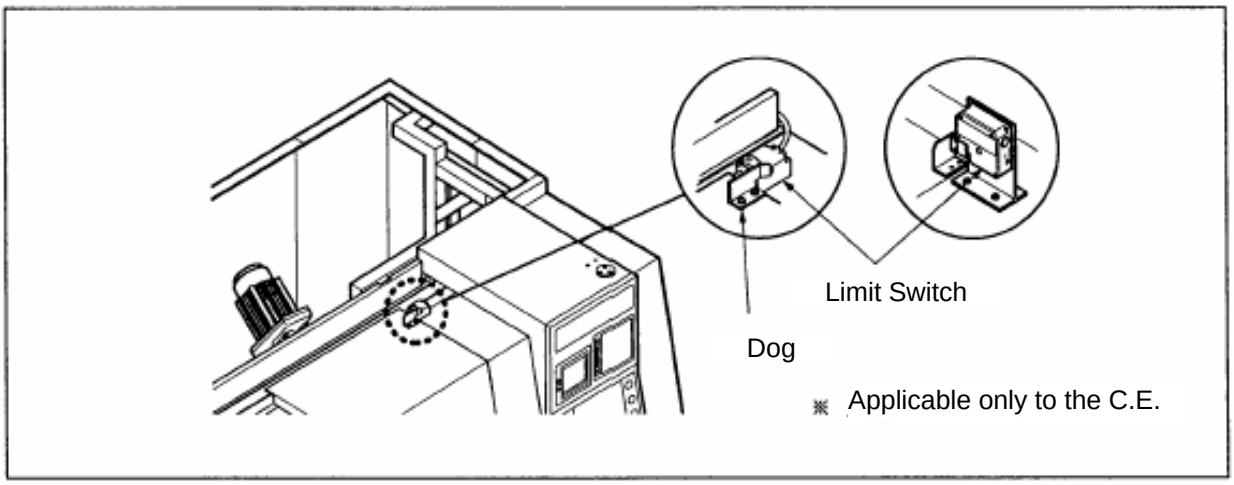


Fig. 5-31 Door Interlock

WARNING

Never change the positions of limit switch and dog installed on the door.

Also, using during stopping operation may cause personal severe injury.

2) Adjustment of Belt Tensions

a. Adjusting the tension of spindle belt.

The spindle belt should

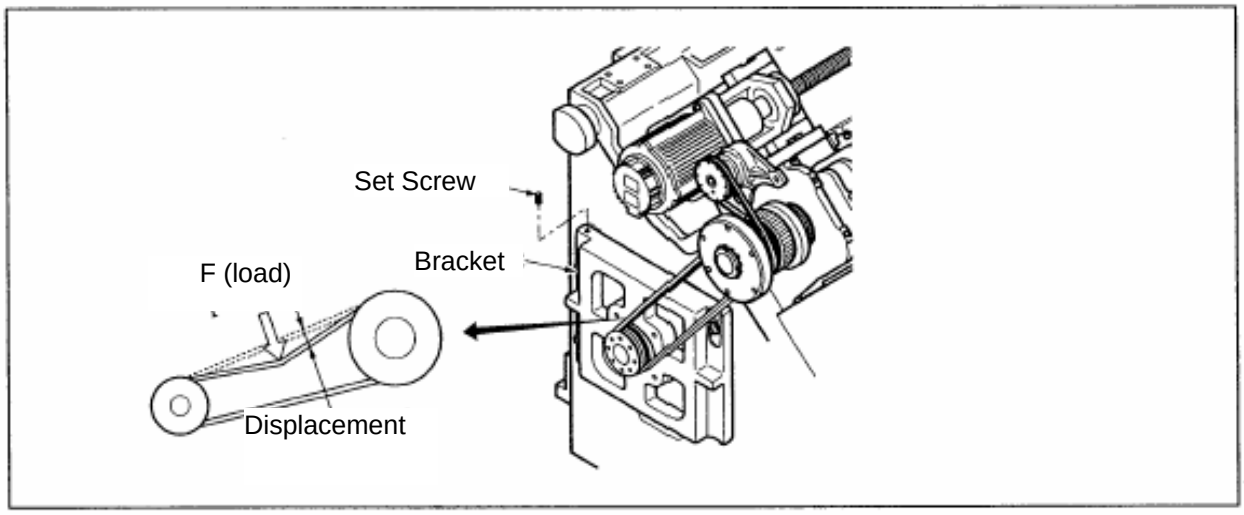


Fig. 5-32 Spindle Belt Tension

Table 5-2. Belt Tension

Unit : mm (in)

Model	Belt Displacement	Load
SKT100	10.8mm(0.43)	15.4kgf(154N)
SKT200	10.9mm(0.43)	17kgf(170N)

Used tool: wrench (6mm and 12mm)

b. Unscrew bolts, turn setscrews under bracket and then adjust the tension.

c. After adjustment of tension, secure bolts and engage the above set screws.

CAUTION

When adjusting the tension belt, tighten both of setscrews in bracket to equally to allot the bracket to move horizontally.

3) Adjustment of position coder timing belt tension

The timing belt should be checked first after one month of installation. Thereafter, check it every 6 months.

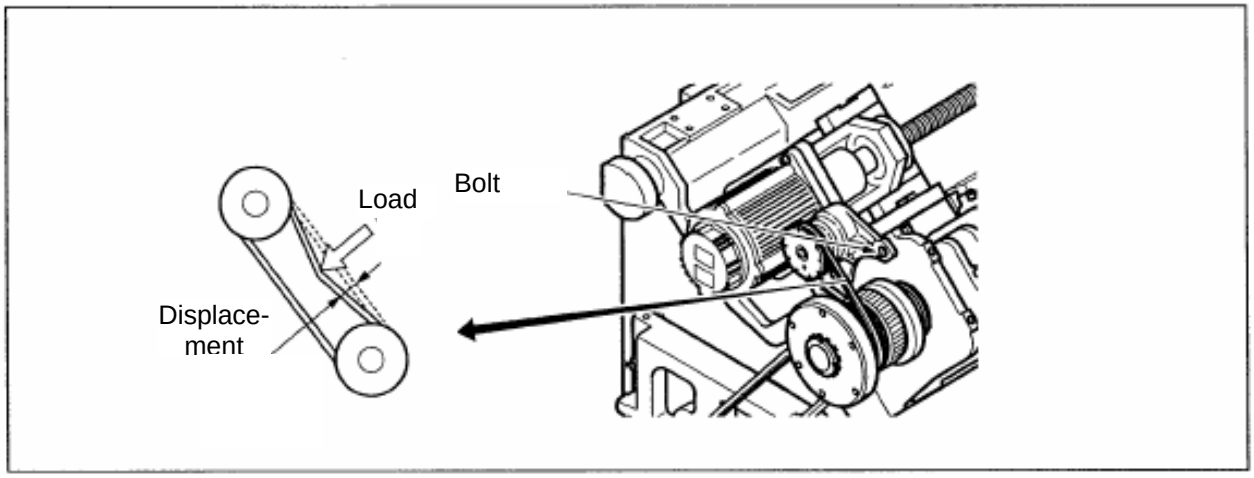


Fig. 5-33 SKT100 Timing Belt Tension

Unscrew a bolt, adjust the tension as in Table 5-3, and engage it again.

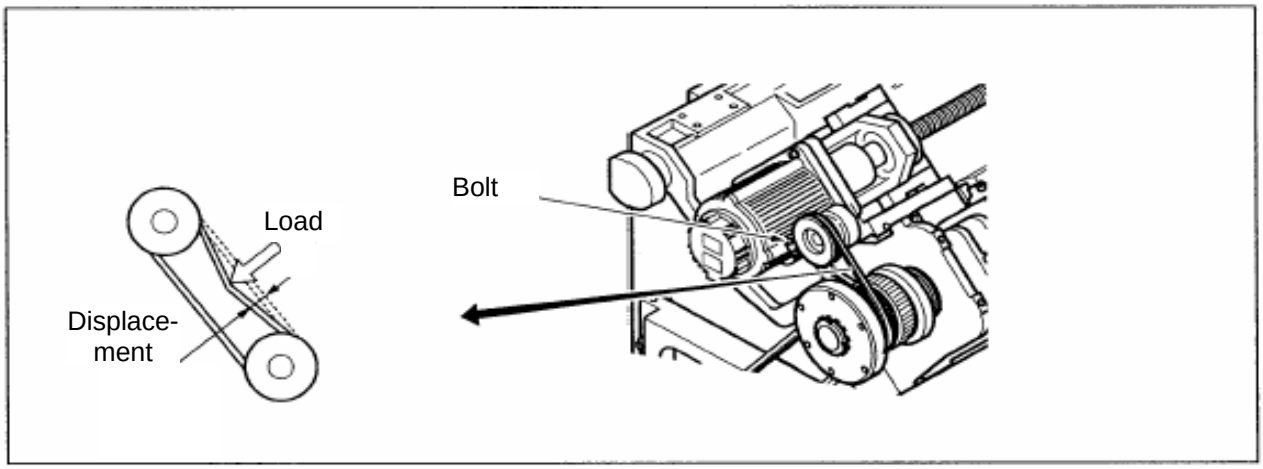


Fig. 5-34 SKT200 Timing Belt Tension

Table 5-2. Belt Tension

unit : mm (in)I

Model	Belt Displacement	Load
SKT100	2.8(0.11)	0.4kgf(4N))
SKT200	3.1mm(0.12)	0.4kgf(4N)

Used tool : Wrench (10mm)

4) Checking and Changing Wiper

DANGER
Always turn OFF the power before repairing the machine. Otherwise, it may cause personal severe injury.

Check the wipe for operation and if damaged or broken, exchange it with reference to the following diagram.

Used tool : Wrench (4mm)

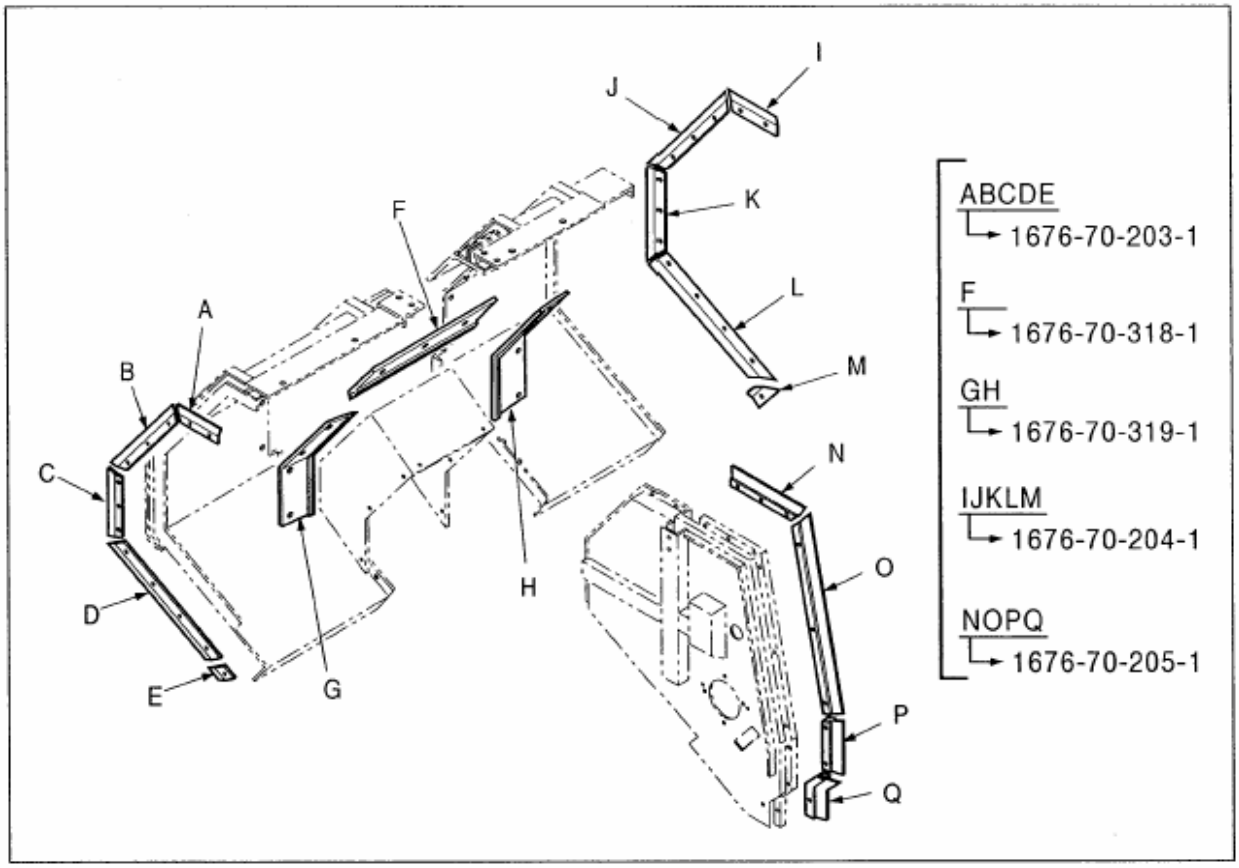


Fig. 5-35 Wiper location diagram

5) Checking and Exchanging X-axis Multicover

DANGER
Always turn OFF the power before repairing the machine. Otherwise, it may cause personal severe injury.

Used tool : wrench(5mm) and brush

a. Check the multicover for operation in the manual feed of X-axis.

b. Raise the stainless plate of multicover, check the inside neoprensheet for damage and then remove chips.

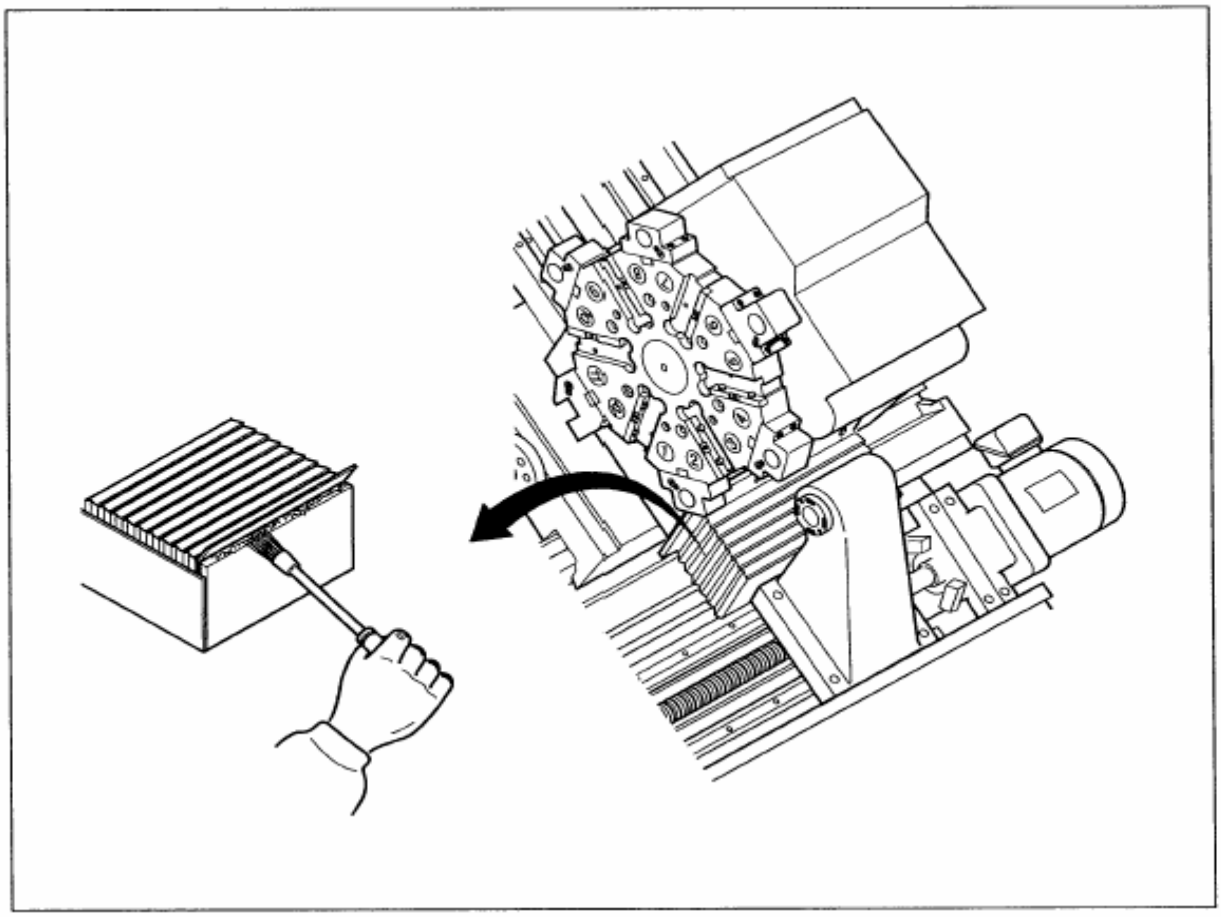


Fig. 5-36 X-axis Multicover

2-7. Yearly Check and Repair

2-7-1. Around the machine

1) Work light

Follow the orders as below when cleaning a glass of work light or changing a bulb.

WARNING
When exchanging a bulb, always turn OFF the power. Otherwise, it may cause personal injury.

WARNING
1. When exchanging a bulb, always wear clean gloves. Otherwise, this can result in contamination on the bulb and affect on its brightness. 2. Never grasp a bulb with bare hands.

Used tools: wrench (5 mm), damp clothes

a. Unscrew bolts and disassemble the front cover.

b. Remove a bulb by hands and insert new one.

c. Reassemble the front cover.

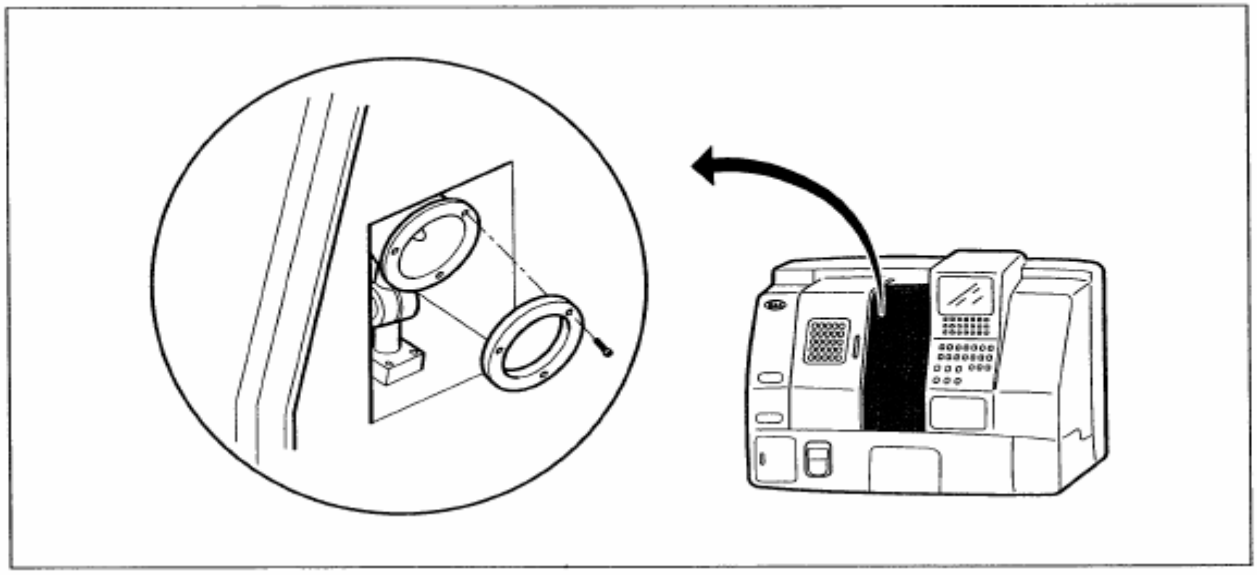


Fig. 5-37 Changing a Bulb of Work Light

2) Checking and Repairing Levelling bolt

Used tool: spanner (24 mm)

a. Check the levelling bolt and nut for looseness.

b. For the adjustment of level, see chapter 4 "Transport and Installation".

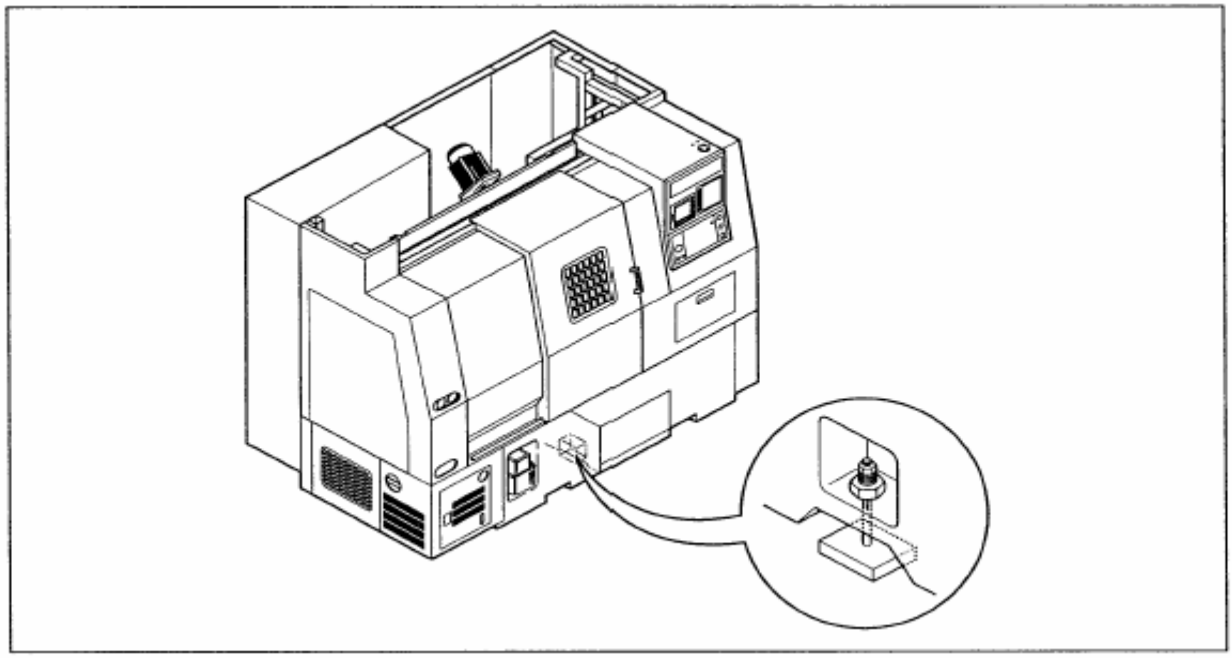


Fig. 5-38 Checking Levelling Bolt

3) Adjustment of Backlash in Each Axis

See para. 1-4 "Adjustment of backlash in X- and Z-axes".

2-8. Check and Repair Before Long-term Storage

Check and repair if the machine is stopped for more than 2 weeks as follows:

(1) Apply rust-proof oil.

(2) Remove coolant.

(3) Save the NC data.

1) Rust-proof

DANGER
Before applying rust-proof oil, turn OFF the main power of machine. Otherwise, it may cause personal injury.

During the long-term storage of machine, always apply the following units and parts with rust-proof oil.

① Vertical Motion Bearing(X- and Z-axes)
(Ballscrew (X- and Z-axes)
) Slider cover (X- and Z-axes)
(Turret head
(Work light

2) Collect coolant
Remove coolant in the main and the sub coolant tanks. For detailed information, see the desired one of para. 2-6-1 "Filling and Changing oil".

3) Save the NC data
Save the NC data in PC.

2-9. Check and Repair Before Operation Since Long-term Storage

Check and Repair before operation since long-term storage as follows:

(1) Remove rust-proof oil.
(2) Supply coolant.
(3) Perform general checks prior to operation.
(4) Check for oil leakage.
(5) Idling.
(6) Check a noise, vibration and the abnormal higher temperature, etc.

1) Cleaning rust-proof oil
Clean all unit parts free from rust-proof oil applied in para. 2-8 "Check and Repair Before long-term Storage". Use damp clothes and cleaning solutions.

2) Supplying coolant
For detailed information, see para. 2-6-1 "Filling and changing oil".

3) General Checks
For detailed information, see para. 2-2 "Check and Repair Items"

4) Checking for oil leakage
Check there is an evidence of oil leakage inside of the machine or hoses.

5) Warm up of Machine

A. Warm up of Spindle

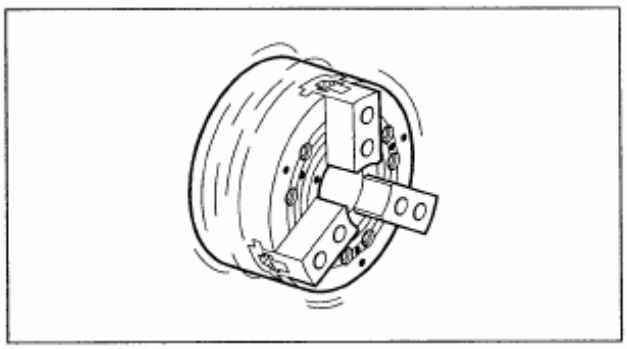
Before operating since stopped for a long time, idle the machine in the following orders.

a. Clamp the rotation speed of spindle to 1.000 rpm for a safety.

b. Rotate the spindle with 500 rpm for half an hour.

c. Rotate the spindle with 1.000 rpm for half an hour.

d. Stop the spindle.



WARNING

If rotating the spindle in a high speed suddenly since stopped for a long time, it may result in a failure of the spindle bearing or chuck cylinder.

B. Warm up each axis (X- and Z-axes) and Tail Stock

Idle X- and Z-axes for half an hour before operation since stopped for a long time.

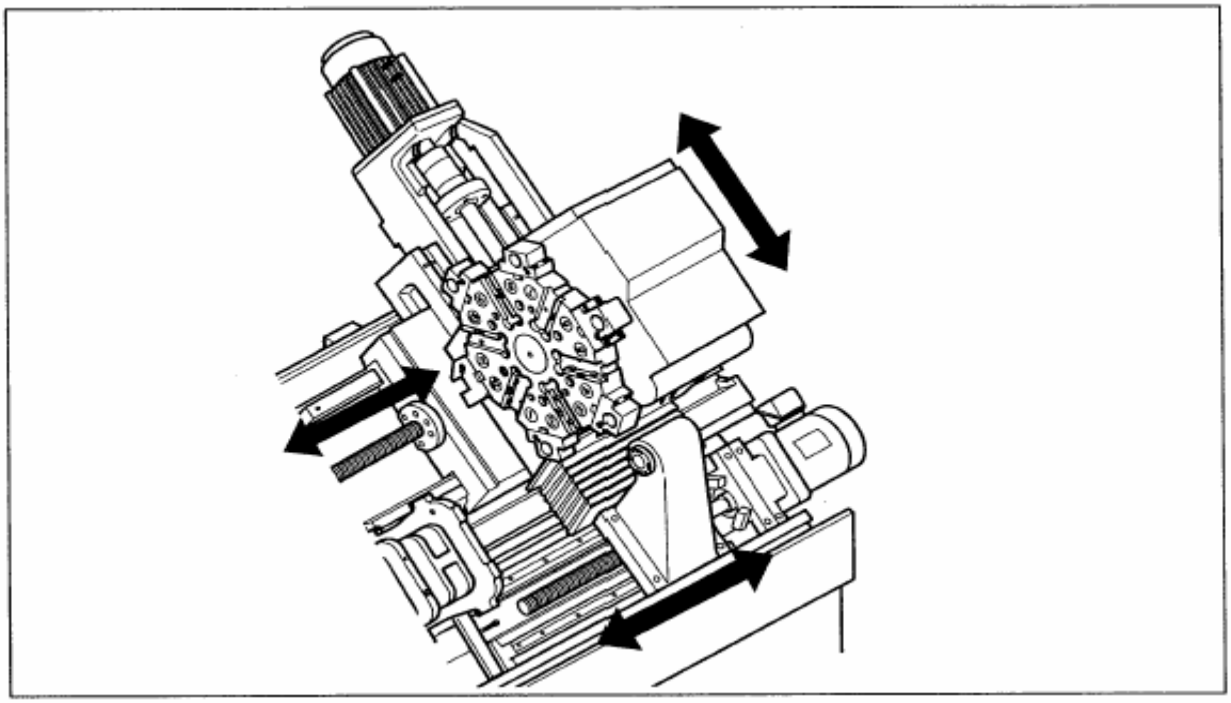


Fig. 5-49 Warm up Each Axis and Tail Stock

3. Maintenance of Major Units

3-1. Spindle

3-1-1. Adjustment of Degree in Spindle

If the spindle changed its position or disassembled for maintenance, adjust as follows:

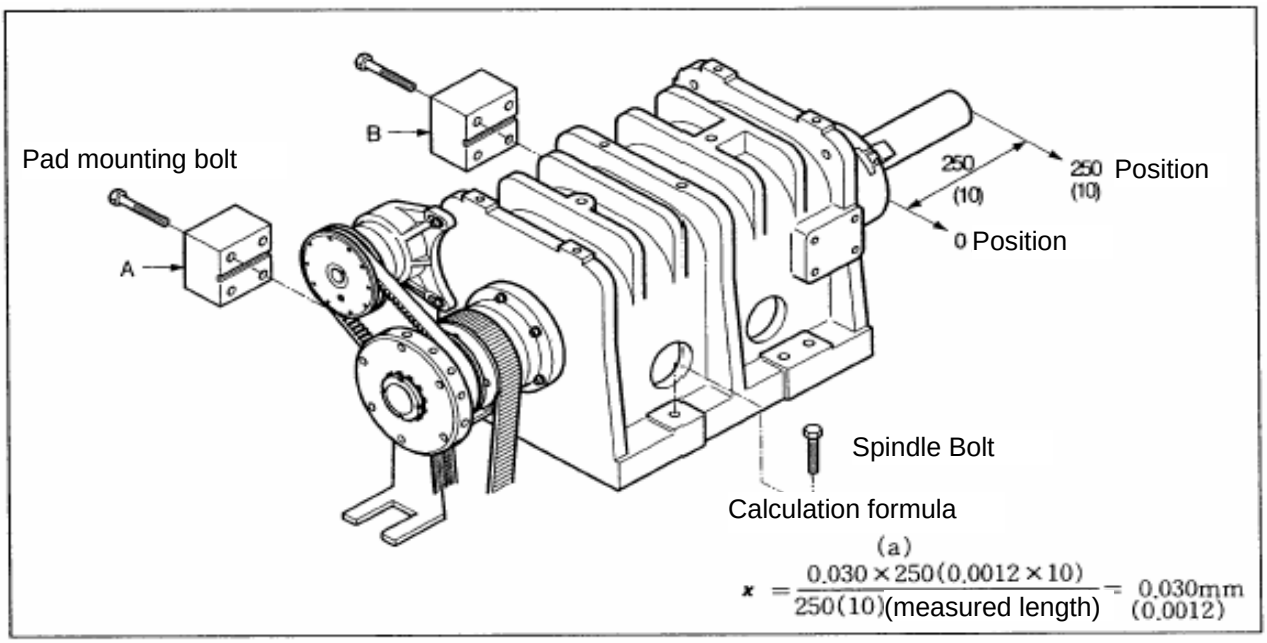
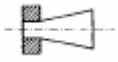


Fig. 5-40 Adjustment of Spindle Accuracy

Used tools: spanner (24 mm), dial gage (0.002 mm)
Material: ∅ 50x250 (∅ 2x10) aluminium or cast-iron

1) Loosen spindle bolt and disassemble into the bolt of A and B pads. Re-assemble A and B pads and engage spindle bolt.
2) Measure the material for testing (length: 250 mm).
3) Cut the material for testing (fine cut).
4) Measure the roundness of workpiece (For example).
   If the difference (overhall length of 250 mm (10)) of cylindricity is 0,015 (0.0006) mm, the current sum of pad will be 0,030 (0.0012) by the above calculation formula:

   ① If the configuration of manufacturing material is ,
   polish the grinded surf ace (attached to head stock) of A pad as 0.030 (0.0012).

   ② If the configuration of manufacturing material is  ,
   polish the grinded surf ace (attached to head stock) of B pad as 0,030 (0.0012).

5) Engage bolts for engaging head stock.
6) Fine cut the material for testing.
   Adjust the difference of roundness to be less than 0,015 (0.0006) mm.
7) Repeat between 2) and 6) until the roundness reaches to the desired value.

3-1-2. Cleaning Front Cover of Spindle

DANGER
Turn OFF the power when entering the machine for cleaning the front cover of spindle. Otherwise, it may cause personal injury.

Clean the drain hole located under the front cover of spindle to prevent from being clogged. Drill the drain hole, using a wire.

Used tool: ∅ 3 wire

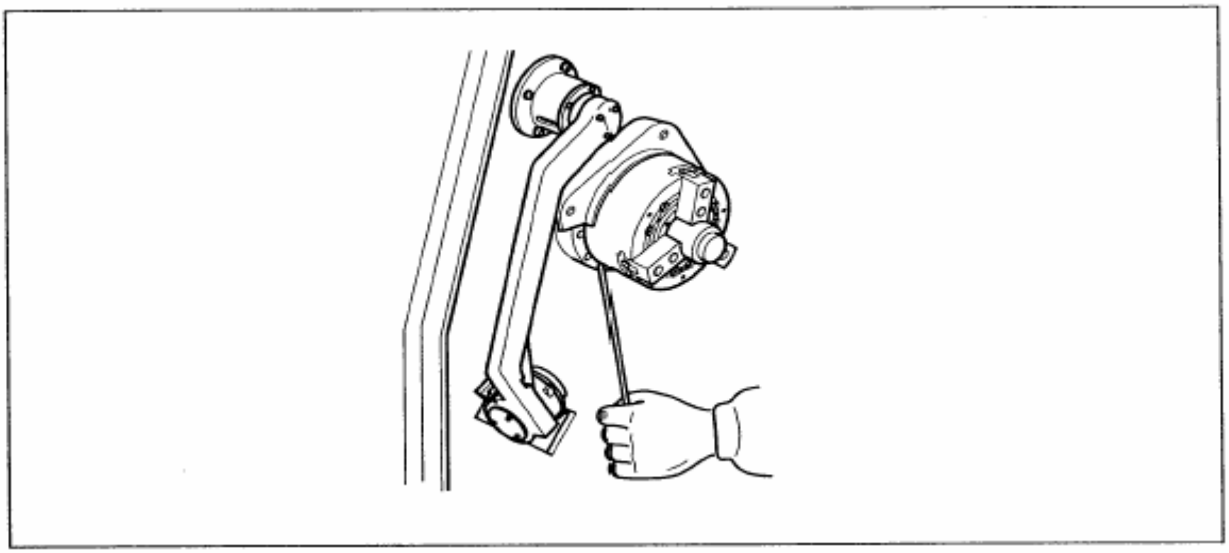


Fig. 5-41 Cleaning Front Cover of Spindle

CAUTION
Never use compressed air. It may cause machine failure.

3-2. X- and Z-axes

3-2-1. X-and Z-axes Constructions

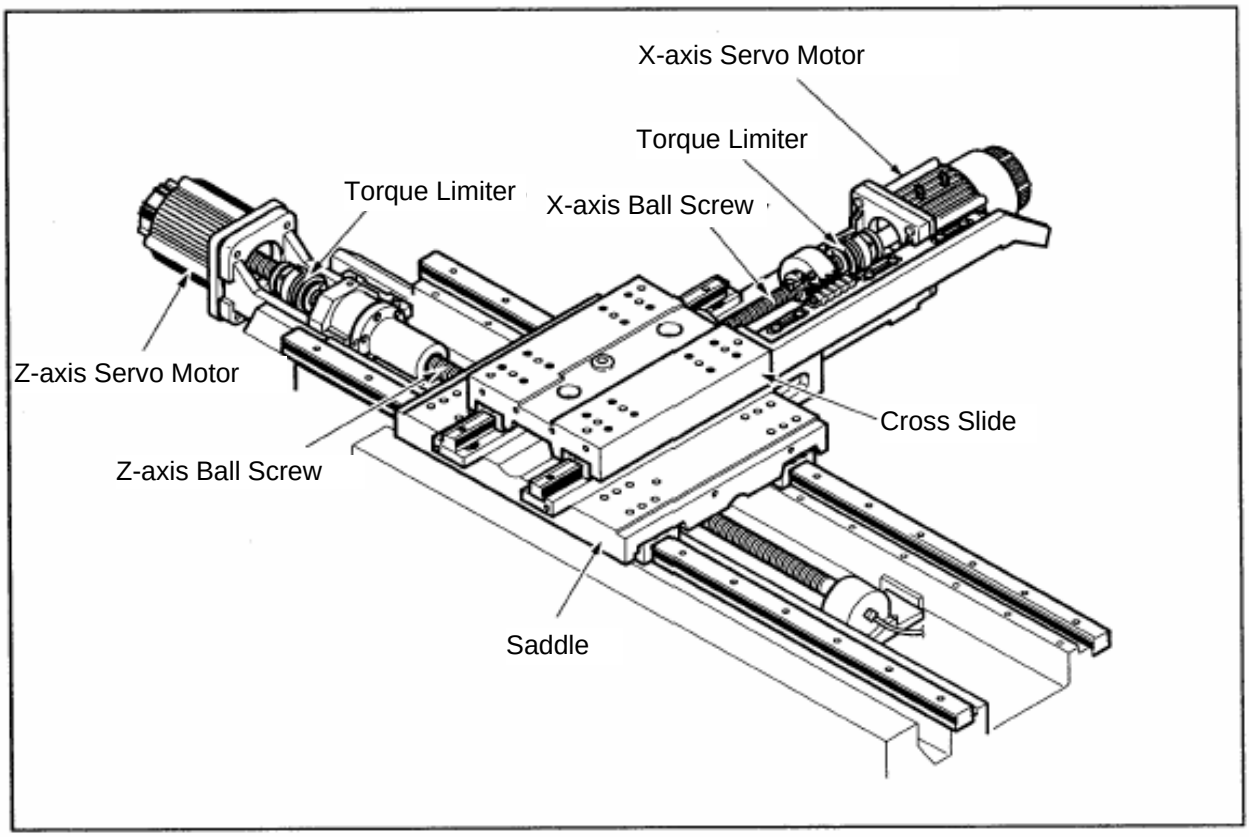


Fig. 5-42 X- and Z-axes Constructions

1) X- and Z-axes are driven by ball screws and AC servo motor.
2) The positions of X- and Z-axes are verified by the encoder installed in AC servo motor.
3) X- and Z-axes servo control units are located in the Electrical Box.

3-3. Tool Post

3-3-1. Tool Post Construction

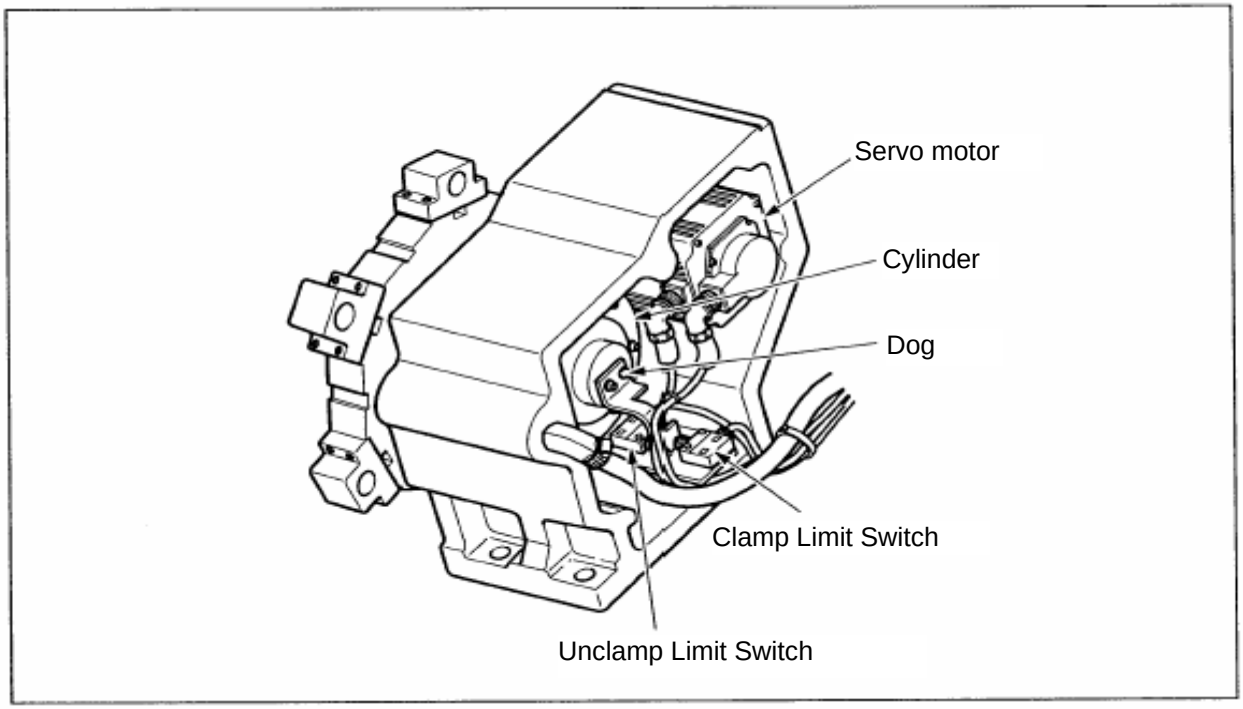


Fig. 5-43 Tool Post Construction

3-3-2. Tool Post Home Position Setting

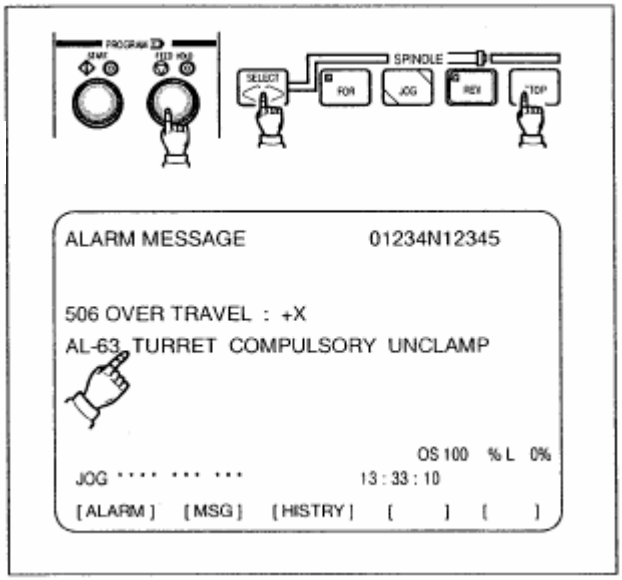
1) Period of Home Position Setting

Because the absolute position detector is used as the position detection system of tool post servo, the home position setting of Tool Post should be performed in the following cases. If indexing the tool post without home position setting, alarm no. “A90” will be displayed on the servo amp.

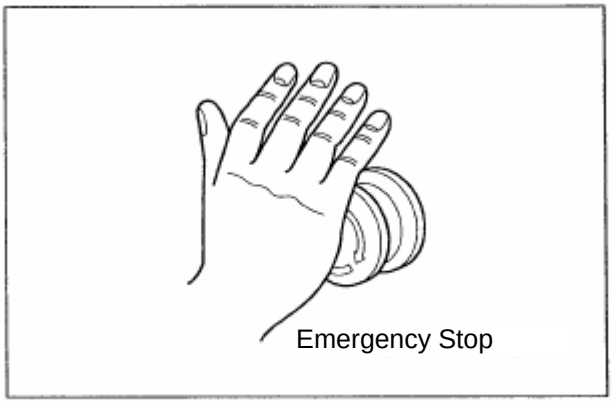
①	If have disassembled or reassembled the servo motor
❨	If exchanging the servo amp
❩	If exchanging the battery
❨	If disconnecting the detector connector of servo motor
❩	If the absolute position data has been missed by other causes.

2) Home Position Setting Method

a. Unclamp the turret by simultaneously pressing “[SPINDLE STOP]” and “[SELECT]”, “[FEED HOLD]” on the Operating Panel.
The Message, “2067 TURRET COMPULSORY UNCLAMP” will be displayed on the alarm screen.
Parameter K0#3="1"
Unclamp the turret by Simultaneously pressing [TURRET INDEX], [ROTATING TOOL STOP] on the operating panel.

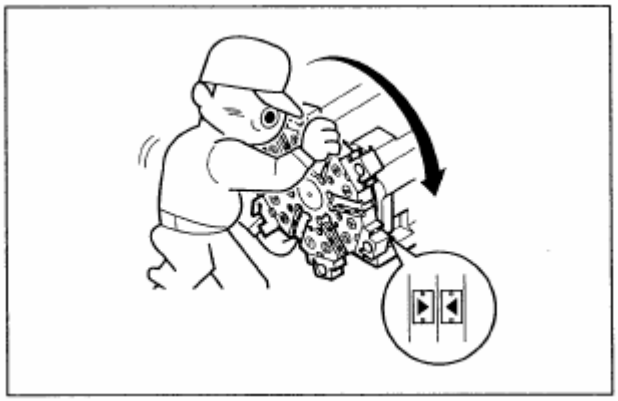


b. Press the Emergency Stop switch.



c. Turn the turret by hand and set the No. 1 tool. Turn the turret and remain it on the position where the arrows of turret and tool post body are aligned.

d. Release the Emergency Stop state and press the "STAND-BY" switch.

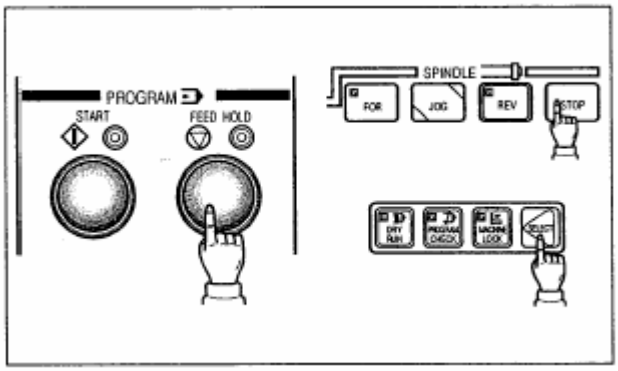


e. Press the “CALL LIGHT OFF” switch. The turret is clamped and ALARM “2067” disappears on the alarm screen.

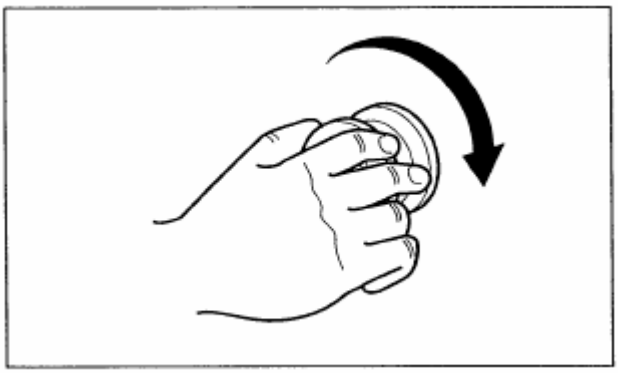
f. Verify that bit "7" of X1000 has been changed to "1" in the diagnostic screen.

NO	7	6	5	4	3	2	1	0
1000	1							

g. With the Emergency stop switch pressed, press the Spindle “STOP” Mode "SELECT”, and “FEED HOLD” switches simultaneously.



h. Reset the Emergency Stop switch.
Now the home position setting of tool post is completed and enables the turret index.



3-3-3. Adjustment and Exchange of Clamp, Unclamp and Limit Switches.

If clamp and unclamp operations are not satisfied or the limit switch requires to be exchanged, adjust as follows:

WARNING
Prior to implementing the actions, turn OFF the power. Otherwise, it may cause personal severe injury.

Used tools: wrench (5 mm), spanner

1) Disassemble the cover.
2) Adjust the dog bolt.
3) If exchanging the limit switch, disassemble engaging bolts, replace and then engage the limit switch (Adjust the dog bolt).
4) Attach the cover.

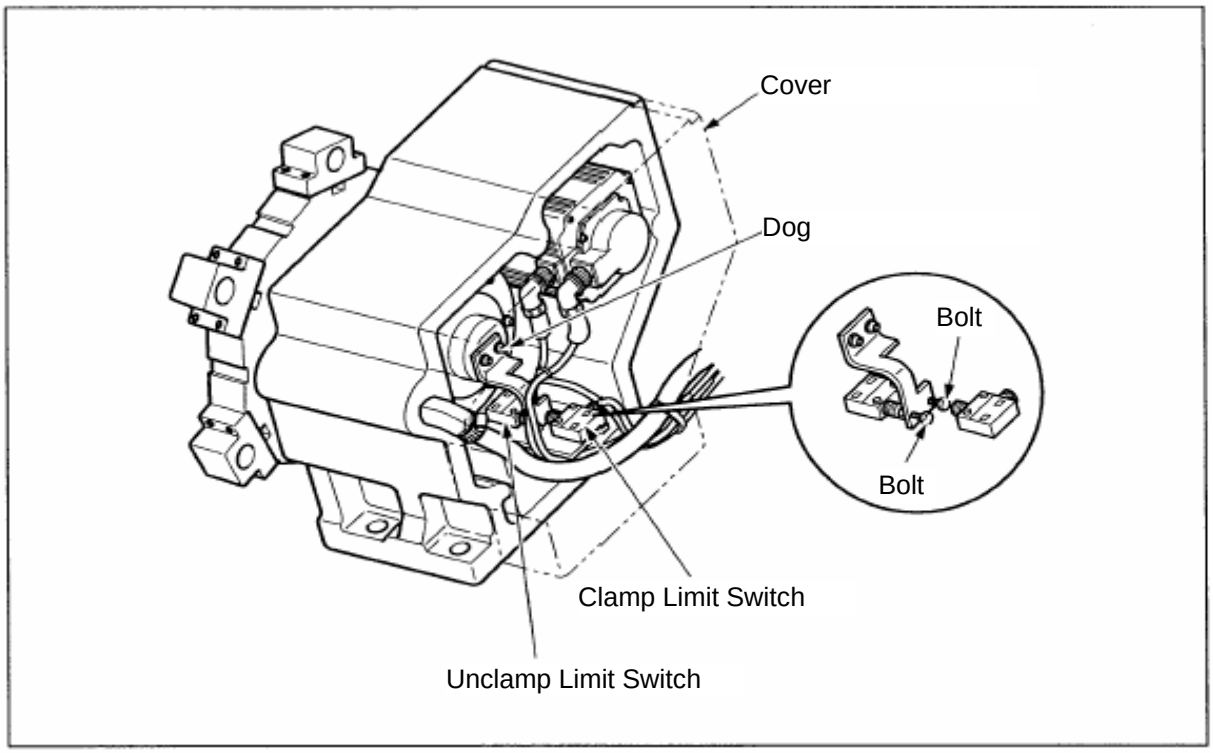


Fig. 5-44 Adjustment and Change of Proximity Switch

3-3-4. Restoration in Collision of Turret

If the turret is collided by crash, misoperation or program error while turning, correct it in the following orders.

WARNING

If the power required, always install the safety guard and then work inside of the machine. Otherwise, it may cause personal severe injury.

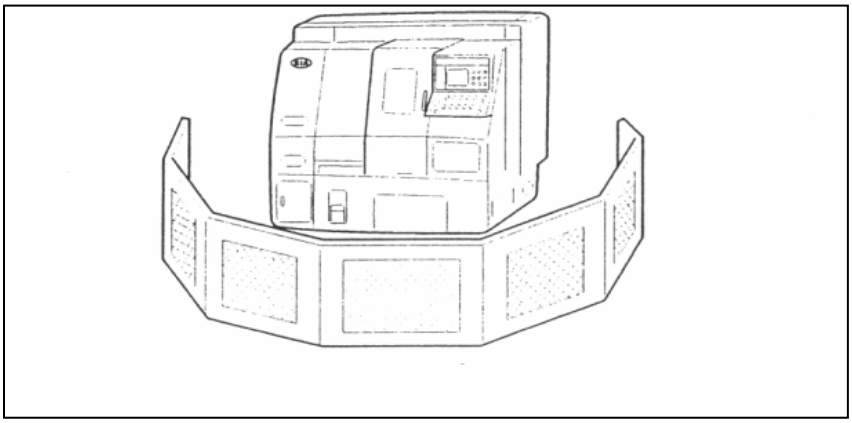


Fig. 5-45 Installation of Safety Guard in Repairing.

Used tools: dial gage (0,002 mm) ∅ 9.8 drill
wrench (8 and 10 mm) ∅ 10 reamer

1) Perform the Home Position Setting of turret as shown in param. 3-3-2 "Turret Home Position Setting".
2) Install the dial gage on the surface No. 1 of turret and check the X-axis for flat.
3) If the flatness of turret is more than 0.02 mm, disassemble the plug and pin in front of turret and loosen the bolt properly.
4) Adjust the turret so far the flatness is within 0.02 mm and engage the bolt.

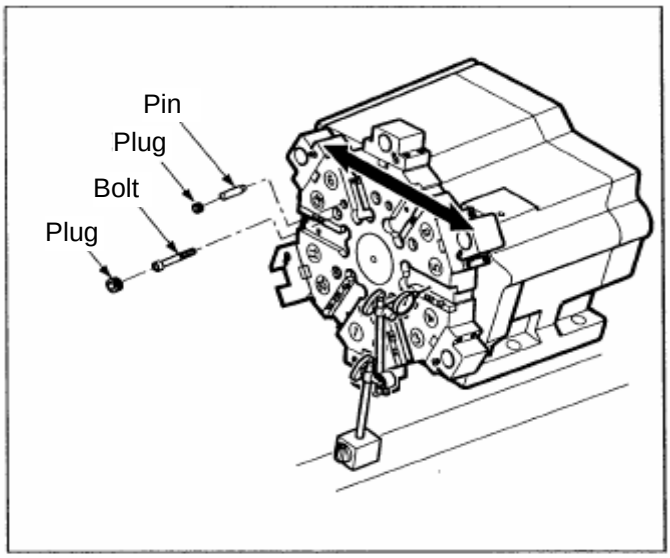


Fig. 5-46 Repairing Turret

5) After engaged, check again for the flatness.
6) Engage the pin to be deviated as 90° from the position of pulled out.
7) Close the plug after pin works.
8) Check for the flatness.

If the turret has been collided during rotation

Verify 1) and 2) and if the flatness is within the desired value, follow the instructions given below.

a. Loosen the bolt and remove a bundle of motor.
b. Disassemble the gear engaged with motor shaft and reengage it not to be slided.

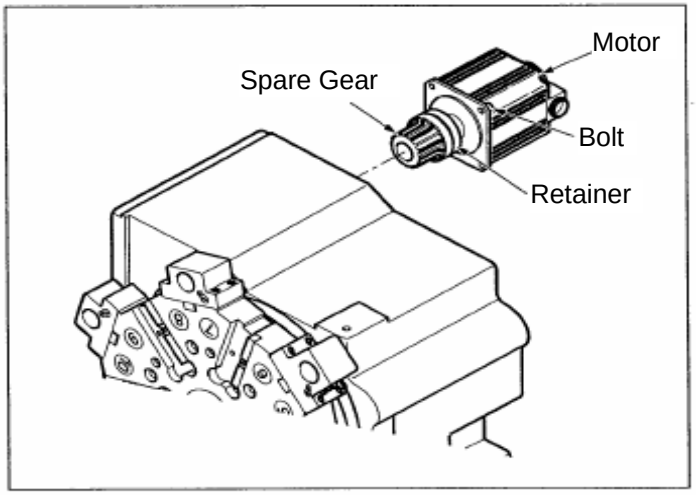


Fig.5-47 Repairing Turret

3-4. Hydraulic

3-4-1. Hydraulic Circuit Diagram

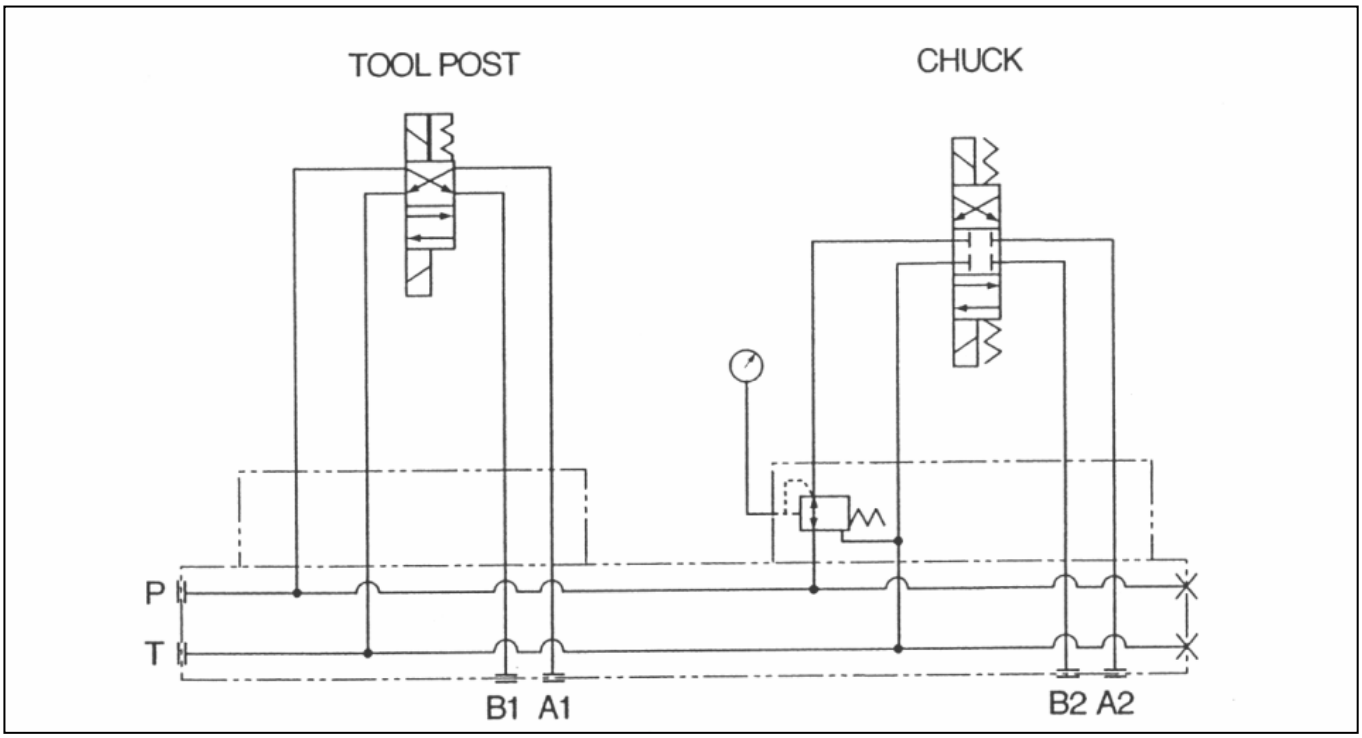


Fig.5-48 Hydraulic Circuit Diagram

3-4-2. Repairing Hydraulic Tank

If there is an abnormal noise or high temperature in the hydraulic tank, check, repair and replace the pump and motor, if necessary.

1) Turn OFF the power
2) Disassemble the bolt installed in the pump.
3) Disassemble the bolt connected the motor with pump.
4) Disconnect the pump from motor.
5) Apply the power and check the motor for rotation sound.
6) If the rotation sound of motor is high, change the motor.
7) If the motor is normal, change the pump.

CAUTION

Before applying the power since the pump has been changed, fill the filler hole installed on the pump with hydraulic oil. Otherwise, it may cause the pump burnout.

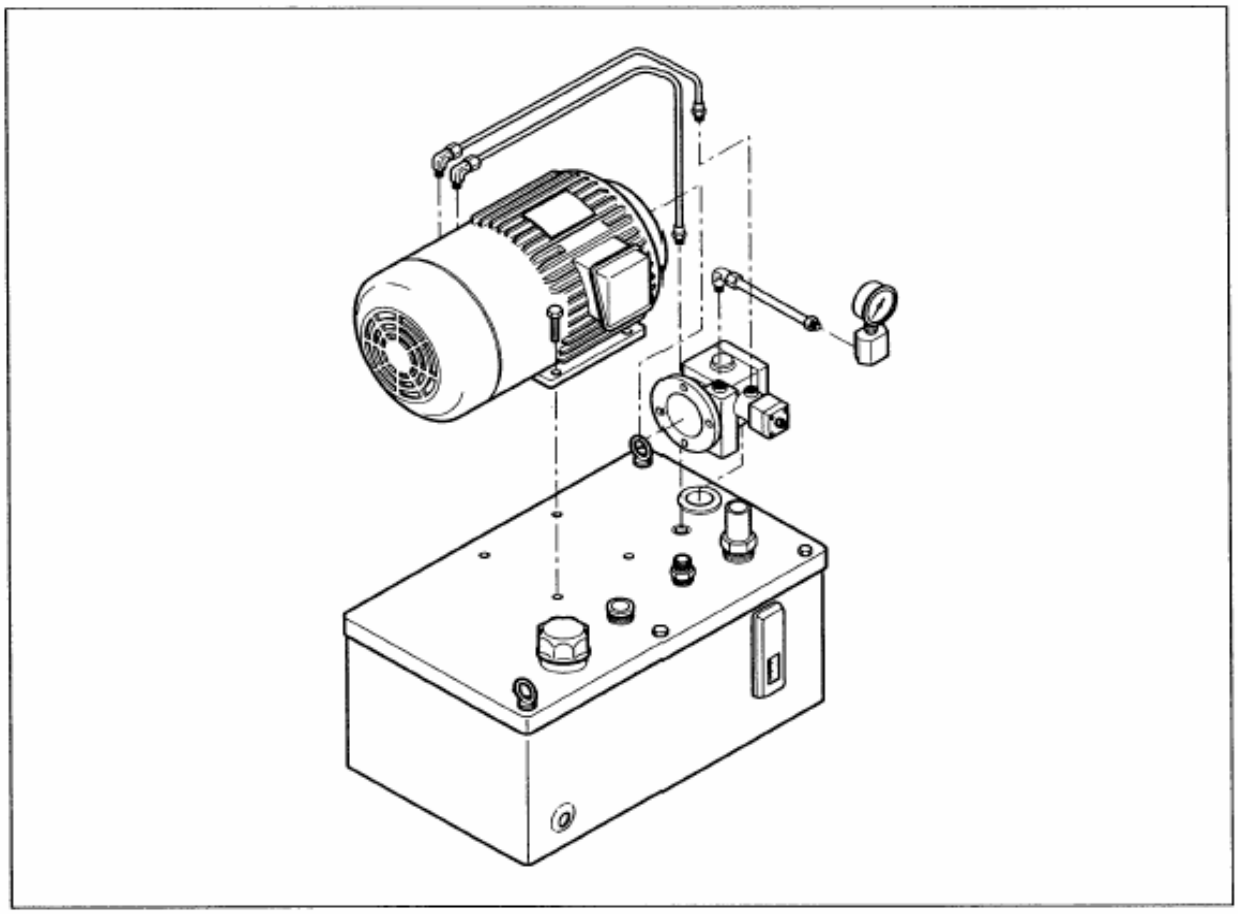


Fig. 5-49 Hydraulic Tank Disassembly Diagram

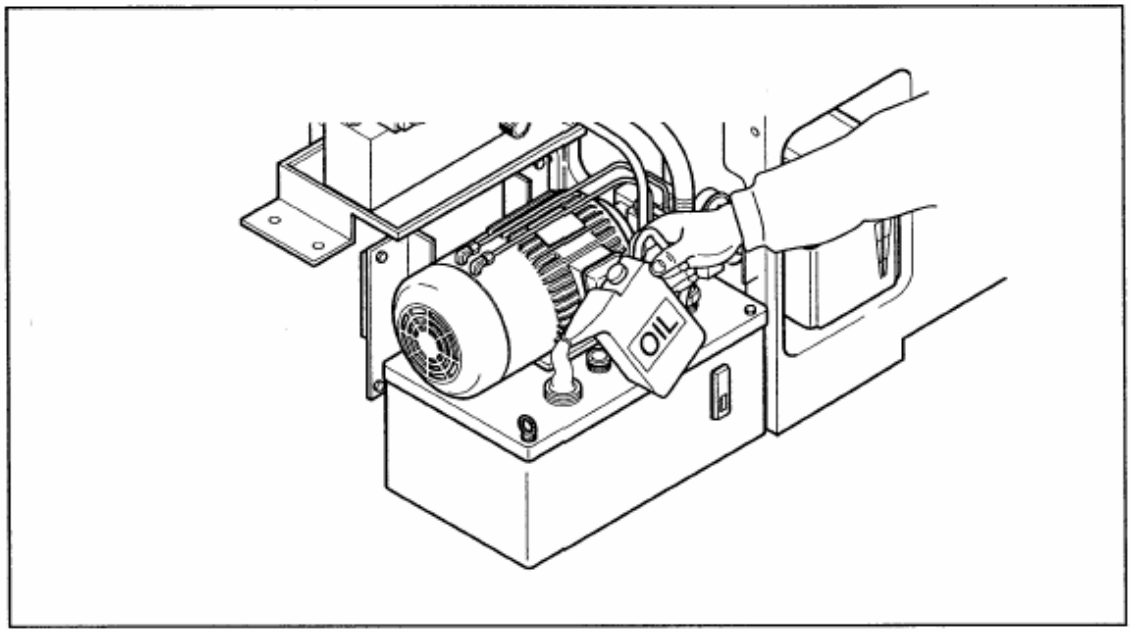


Fig. 5-50 Oiling After Changing Pump

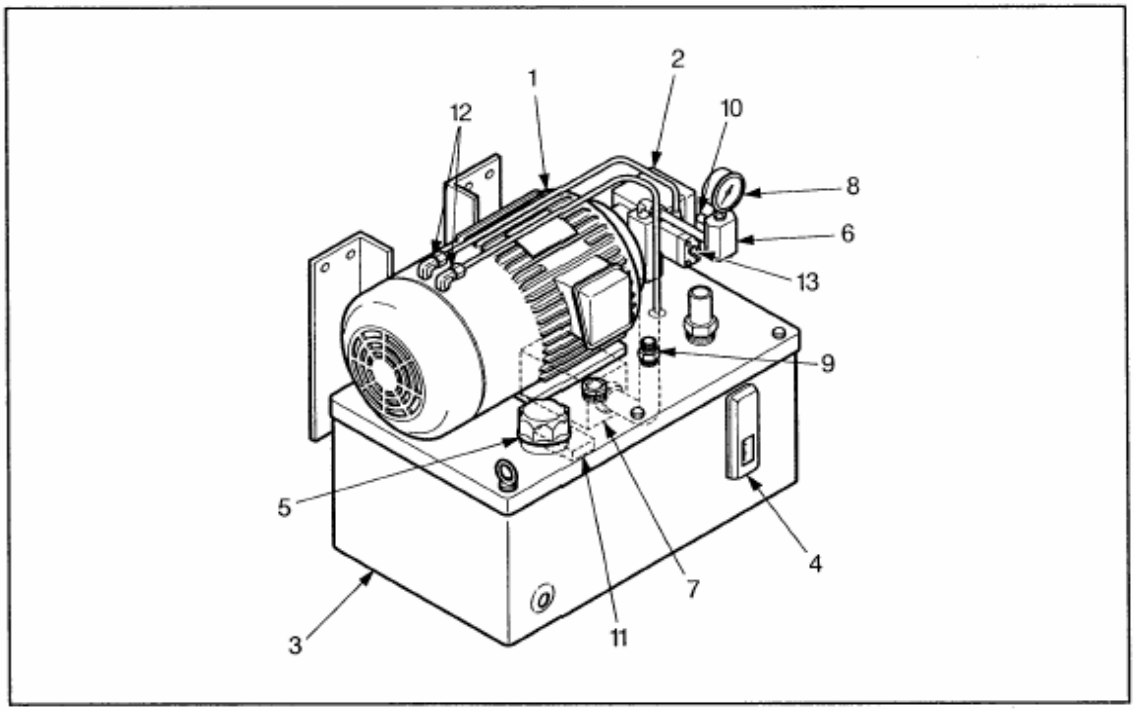


Fig.5-51 Hydraulic Tank

Table 5-4. Hydraulic Tank Parts List

No.	Nomenclature	Qty.	Type	Remark
1	Motor	1	0,4Kw x 4P	
2	Vane pump	1	MFG.S-2993	
3	Oil Tank	1	10 liter	
4	Oil Level Gage	1	VA-01	
5	Air Bleed	1		
6	T-chuck valve	1	CT-T03-0-4044A	
7	Strainer	1		
8	Pressure Gage	1	PT1/4 Ø 60 x 70 kgf/cm^2	
9	Socket	3	PT3/8	
10	Nipple	1	PT3/8XPF1/4	
11	Separator	1	40x25x10 mm	
12	Nipple	2		
13	Nut	1	M8	

3-4-3. Pressure And Flow Adjustment

The pressure and flow of hydraulic unit have been adjusted at factory and need not to be done specially. However, for the hydraulic chuck or tail stock it requires to be adjusted. If adjusting it, follow the instructions given below.

1) Adjustment of Main Pressure

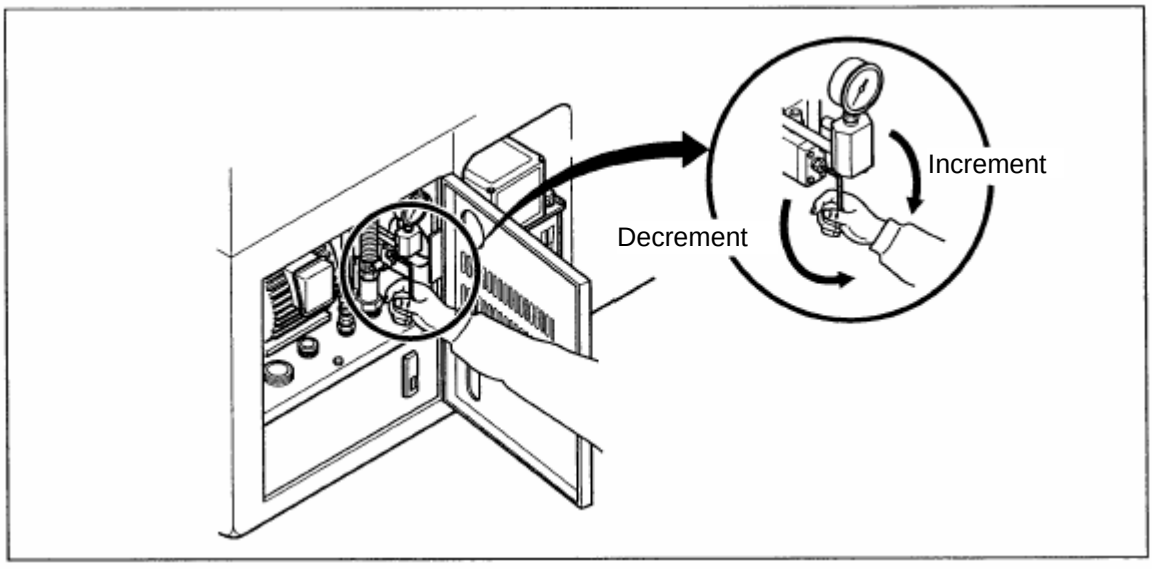


Fig. 5-52 Adjustment of Main Pressure

Used tools: wrench (5 mm) and spanner (17 mm)

a. Loosen the nut using spanner.
b. If turning clockwise, the pressure is increased and if anticlockwise, it is decreased.
c. After adjusting, engage the nut using spanner.

WARNING

The main pressure is specified to 35 kgf/cm^2. If used over the specified value, it may cause machine failure.

2) Adjusting the pressure of chuck and tail stock

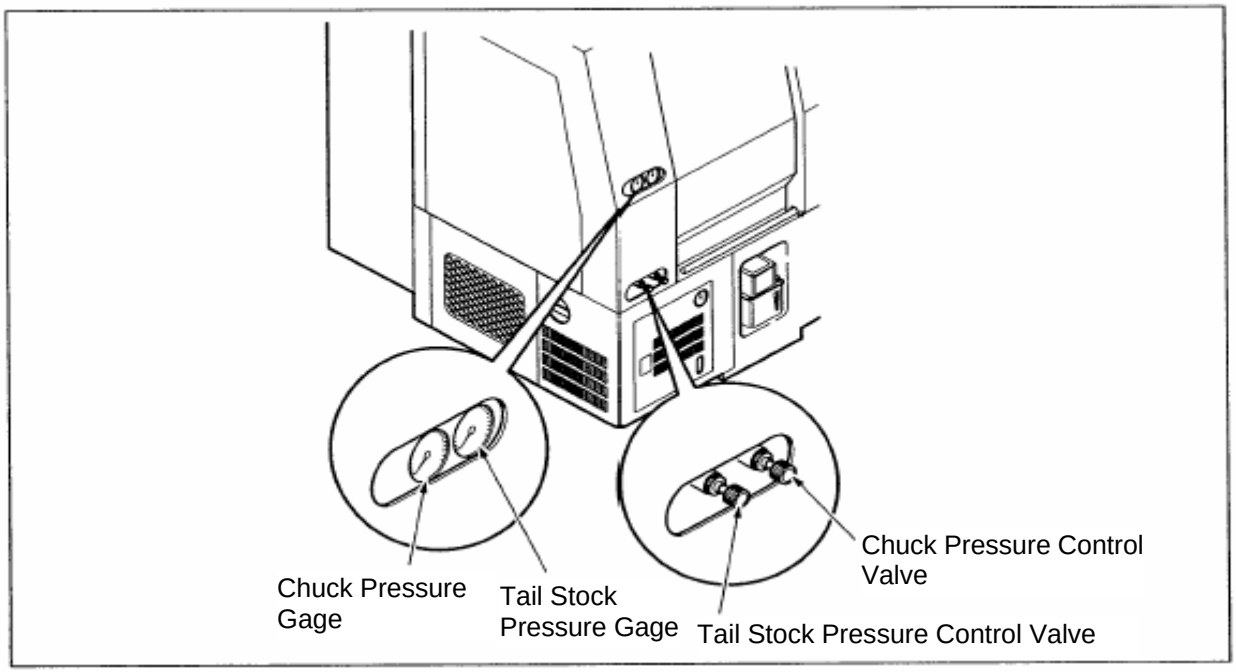


Fig. 5-53 Adjustment of Chuck and Tail Stock Pressure

If turning the pressure regulating valve knob clockwise, the pressure is increased and if anticlockwise, it is decreased.

WARNING

The pressures of chuck and tail stock are specified to 27 kgf/cm^2 and 20 kgf/cm^2. If used over the specified value, it may cause machine failure.

3-4-4. Repairing Manifold

A high level unit composed level the solenoid valve (direction converting valve), hydraulic control valve, check valve, and etc..

1) Manifold construction

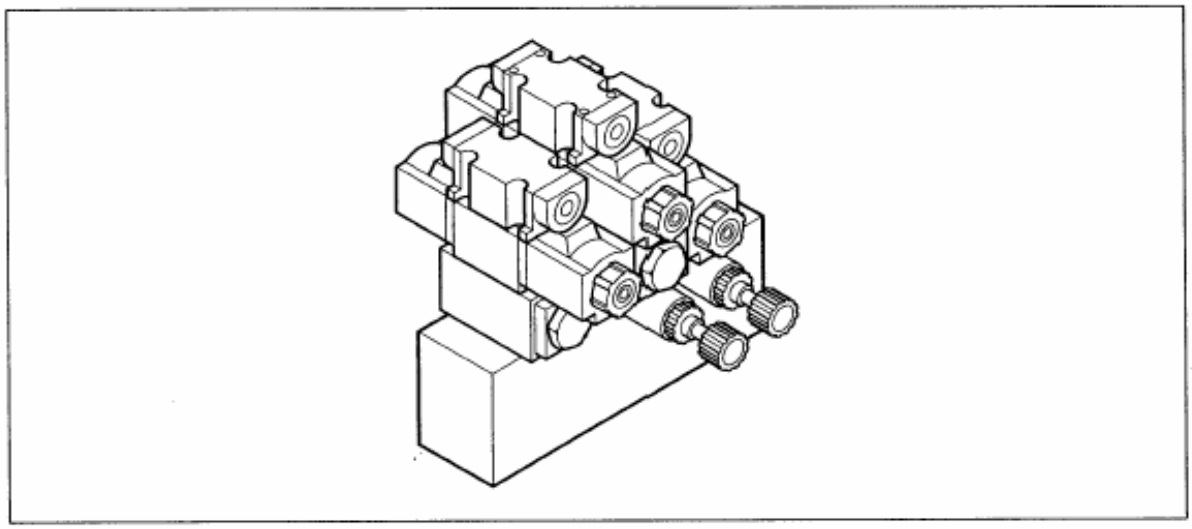


Fig. 5-54 Manifold Construction Diagram

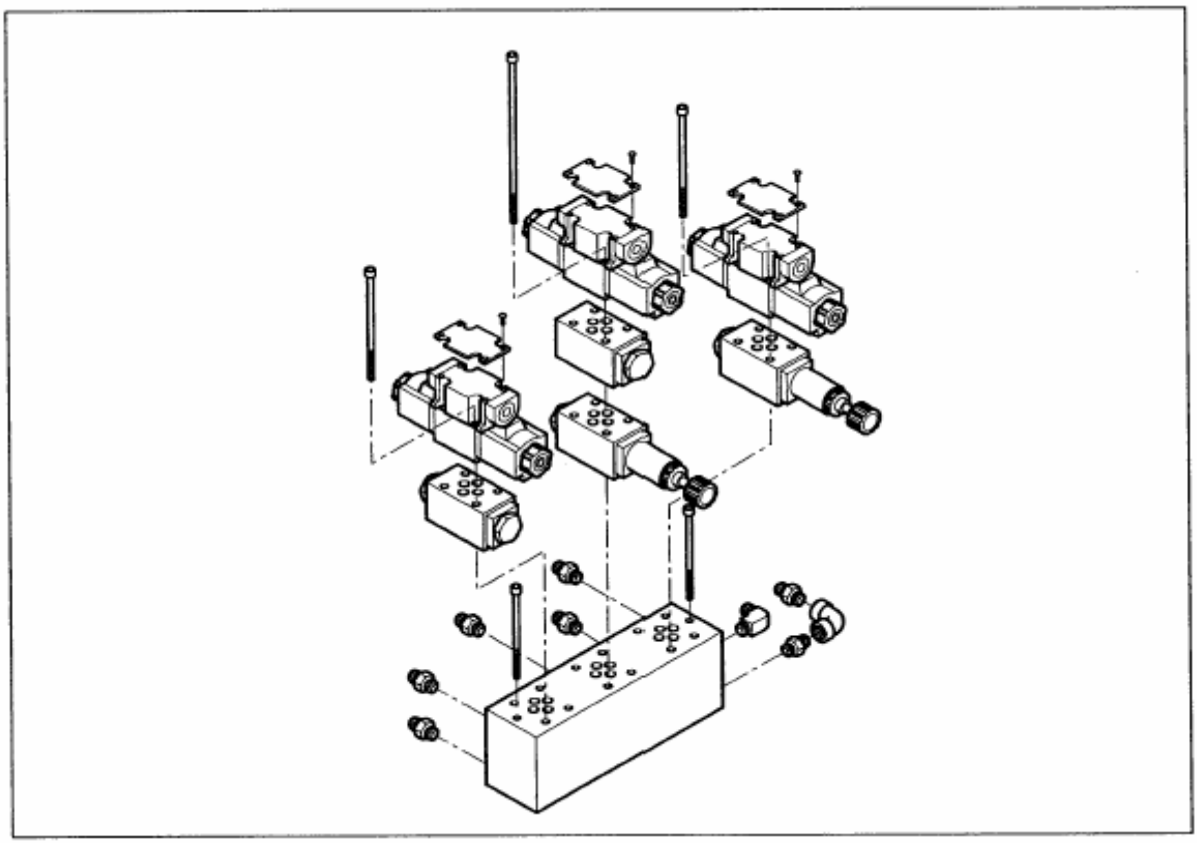


Fig. 5-55 Manifold Disassembly Diagram

2) Exchanging solenoid valve

In case of failures due to the broken internal spool or poor spring, disassemble, clean or change the damaged solenoid valve in the following orders.

CAUTION
After stopping operation, the solenoid will be hot and cause burns in disassembled and exchanged. Turn off the power, cool sufficiently and then replace it.

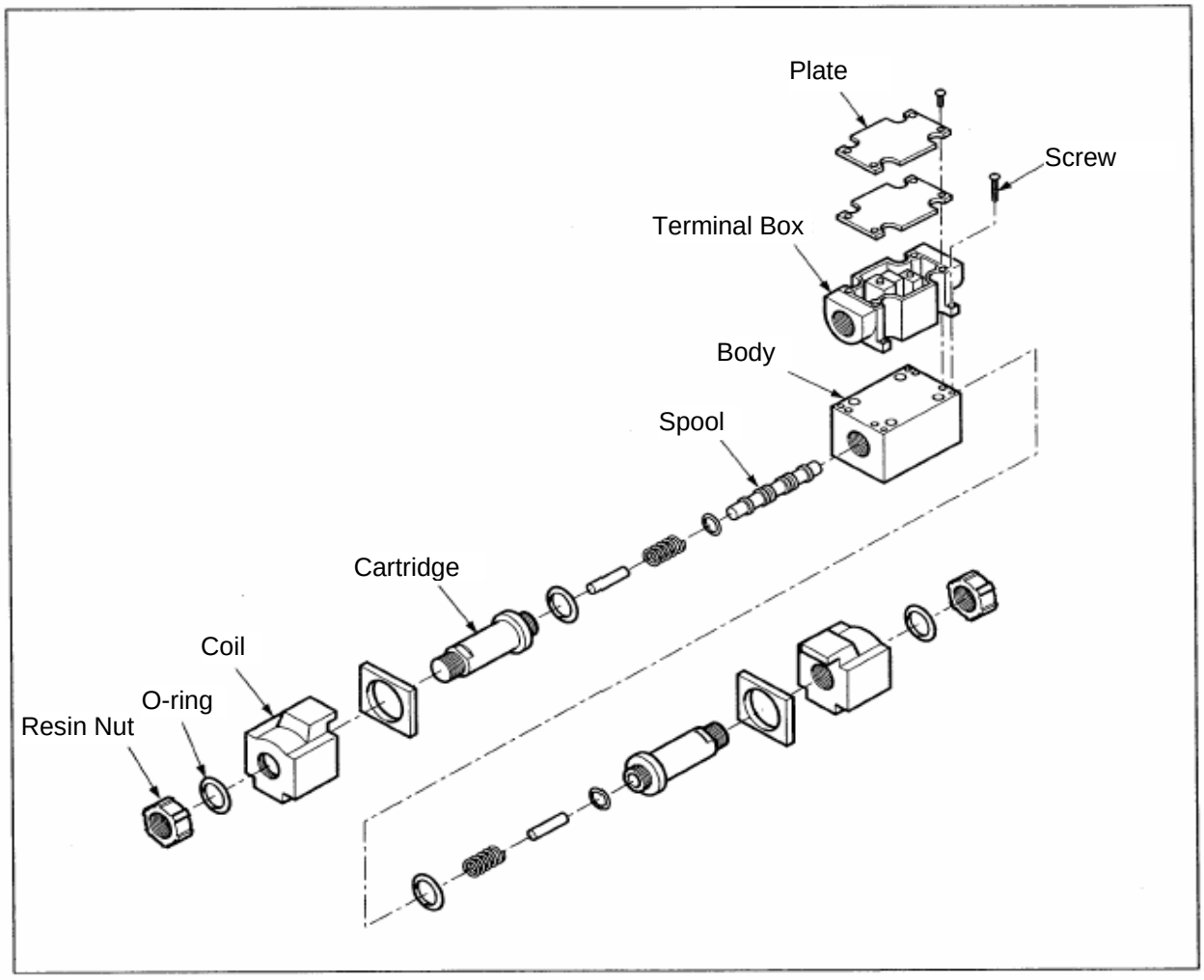


Fig. 5-56 Solenoid Valve Disassembly Diagram

Used tools: + screwdriver, wrench (4 mm)

A. Exchanging solenoid coil

a. Loosen and disassemble resin nut from solenoid coil.

b. Disassemble the washer and O-ring.

c. Pull out the coil in the axis direction and disassemble it from the body. Reassemble it in the reverse order.

CAUTION

Torque the resin nut to 40-50 kgf • cm (4 ~ 5 N • m).

B. Disassembling and cleaning the solenoid valve

If the solenoid valve clogged with foreign matters, disassemble and clean the body as follows:

a. Turn off the power.

b. Disconnect the coil.

c. Remove four bolts from the terminal box.

d. Disconnect the base plate.

e. Loosen and disconnect cartridge.

f. Disconnect internal parts from the body.

g. Pull out the spool from body without forced power.

h. Clean body and each parts.

i. Check each parts such as O-ring and then reassemble them.

CAUTION

1. When assembling the spool in the body of solenoid valve, never push it with a force.
2. Make sure there are no foreign matters in the valve.
3. Torque the cartridge to 390-420 kgf • cm (39 ~ 42 N • m).

j. Attach the base plate.

CAUTION

Torque the plate to 5.5 ~ 8.2 kgf • cm (0,55 - 0,82 N • m).

k. Install the terminal box
l. Install the solenoid coil
m. Connect wires and turn ON the power
n. Check the hydraulic units for operation.

C. Exchanging the solenoid valve

CAUTION

Solenoid valve is in the high temperature, therefore be careful not to be burned.

a. Turn OFF the power.
b. Remove four screws attached with the terminal box.
c. Disconnect wires.
d. Loosen the bolt securing valve.

CAUTION

When disconnecting bolts, make sure the reduction valve, check valve, and etc. are not disconnected.

e. Install new solenoid valve.
f. Torque the bolt to 40 - 50 kgf • cm(4 ~ 5 N • m).

CAUTION

1. Make sure O-ring between each blocks is not disconnected.
2. Avoid overtorque. It may cause a failure.

g. Connect the wire of terminal box.
h. Apply the power.
i. Check for oil leakage.
j. Check the hydraulic units for operation.

3-5. Lubrication Device

3-5-1. Place to be Lubricated

1) 4 places of bearing in the linear movement of X-axis.
2) 4 places of bearing in the linear movement of Z-axis.
3) 1 place of X-axis ballscrew and 2 places of support bearing.
4) 1 place of Z-axis ballscrew and 2 places of support bearing.
5) 2 places of tool post.

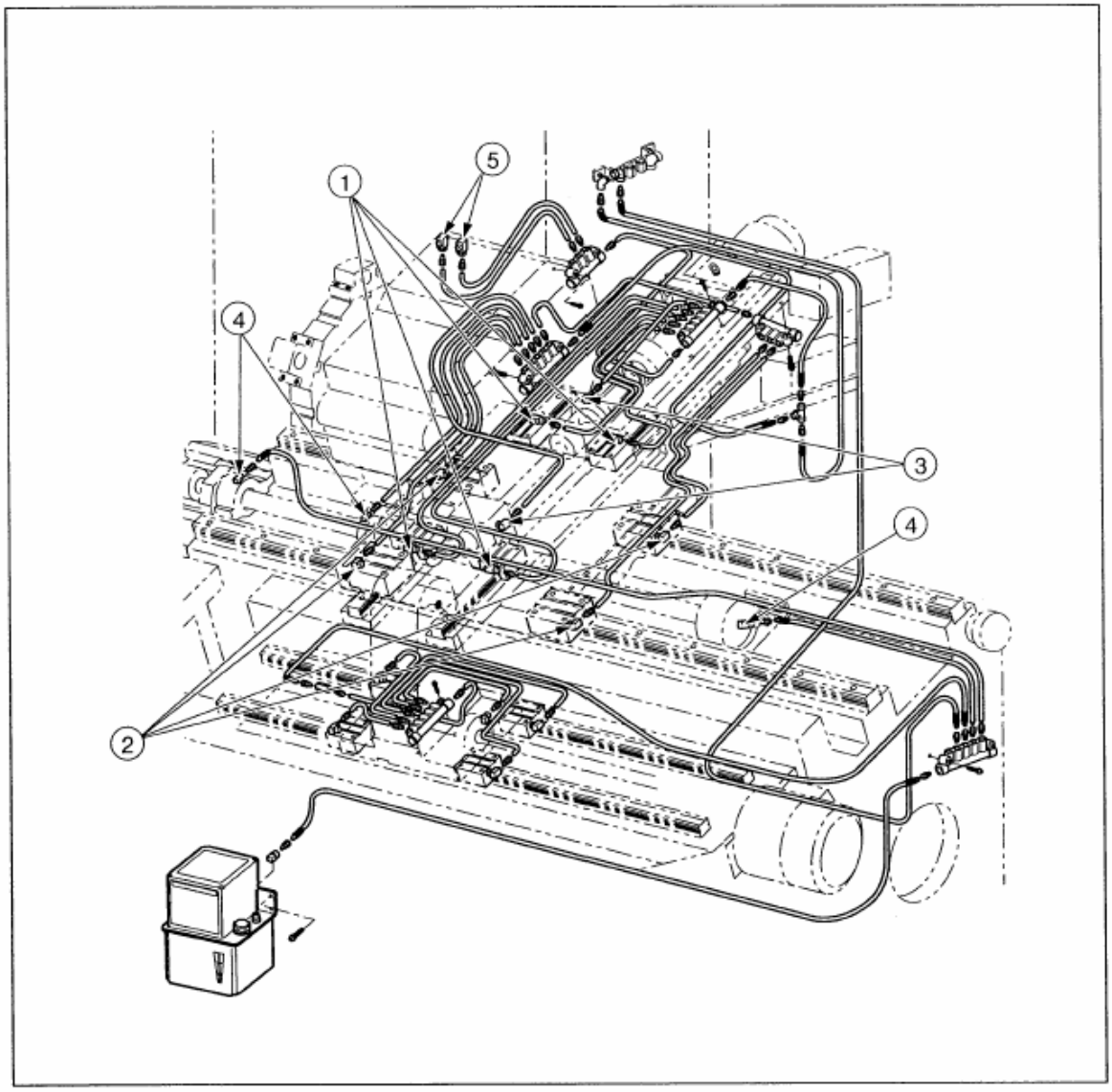


Fig. 5-57 Place to be Lubricated

3-5-2. Cleaning Lubrication Unit

1) Construction

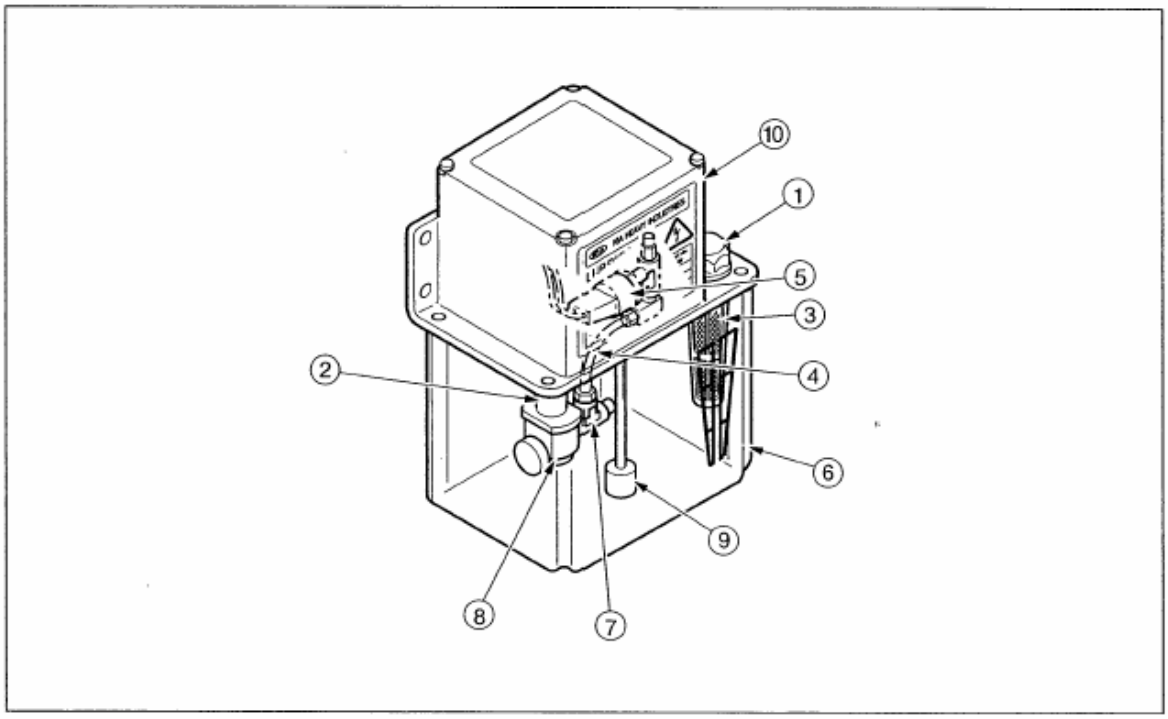


Fig. 5-58 Lubrication Unit construction

Table 5-5. Lubrication Unit Parts List

No.	Nomenclature	Qty	Model	Remark
1	Oil cap	1		
2	Shaft guide	1		
3	Filter	1		
4	Hose	1	Ø 6(Ø 0.024)	mm(in)
5	Pressure switch	1		
6	Oil tank	1	1800cc(0.47 gal)	
7	Relief valve	1		
8	Gear pump	1	See next page.	
9	Float switch	1		
10	Motor	1	15W(0.02HP) 2P	

2) Using Lubrication Oil Pump and Motor

A. Pump

Item	Specification
Discharge	100cc/min (0.02 gal/min) 50/60Hz
Maximum Discharge pressure	8 kgf/cm^2(0.8MPa)
Voltage	AC 110V(10)
Frequency	50/60Hz

B. Motor

Item	Specification
Power	15W (0.02HP)
Polarity	2P
Voltage	110V
Frequency	50/60Hz
Rated current	1.0/1.2 A
Revolution number	3000/3600 rpm

C. Cleaning Lubrication Unit

Used tools : wrench(5mm), + driver

a. Turn OFF the power.
b. Loosen bolts and disconnect the unit.
c. Disconnect the tank using + driver.
d. Clean the inside of tank.
e. Remove the filter from the suction port.
f. Clean the filter using kerosene.
g. Remove foreign matters from the filter using compressed air.
h. Mount the filter.
i. Mount the tank.

j. Install the unit.

k. Supply lubricating oil.

1. Turn ON the power.

m. Check the wet moving part are being supplied with lubricating oil.

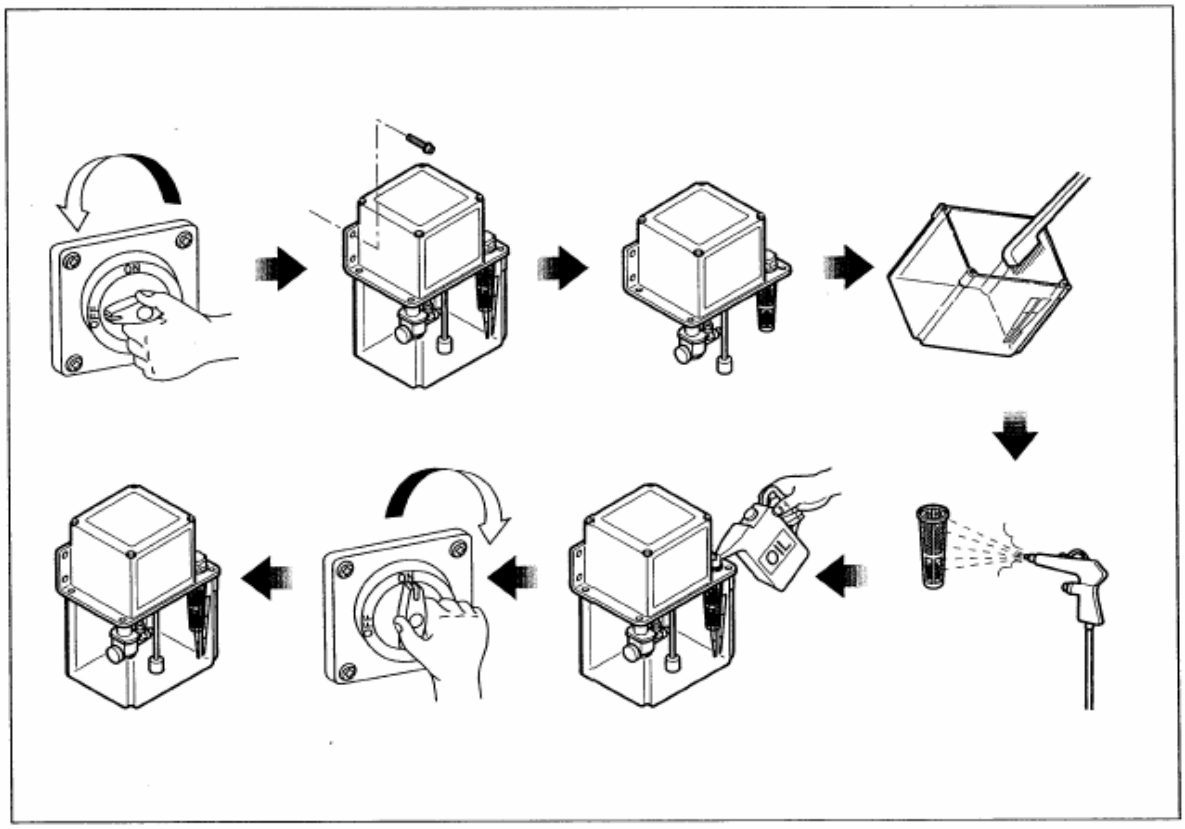


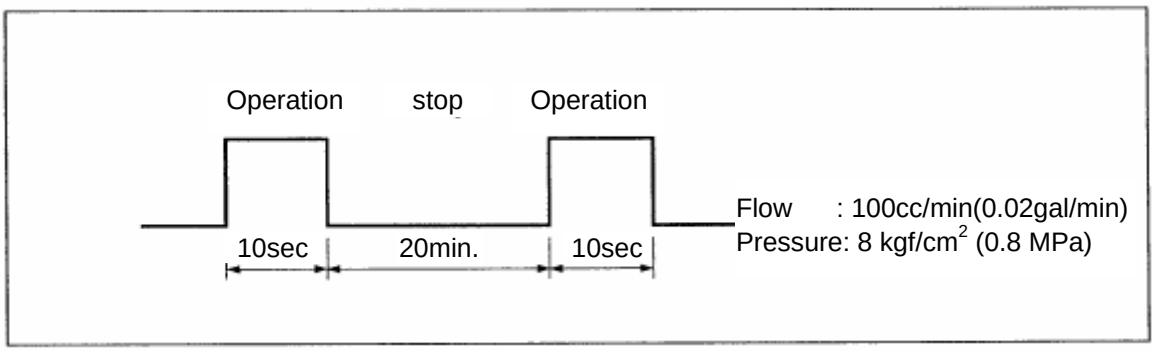
Fig. 5-59 Cleaning Lubrication Pump

WARNING

When cleaning the pump, remove oil dropped on the floor. Otherwise, it may cause personal injury.

3-5-3. Discharge of Lubricating Oil

1) Discharging period

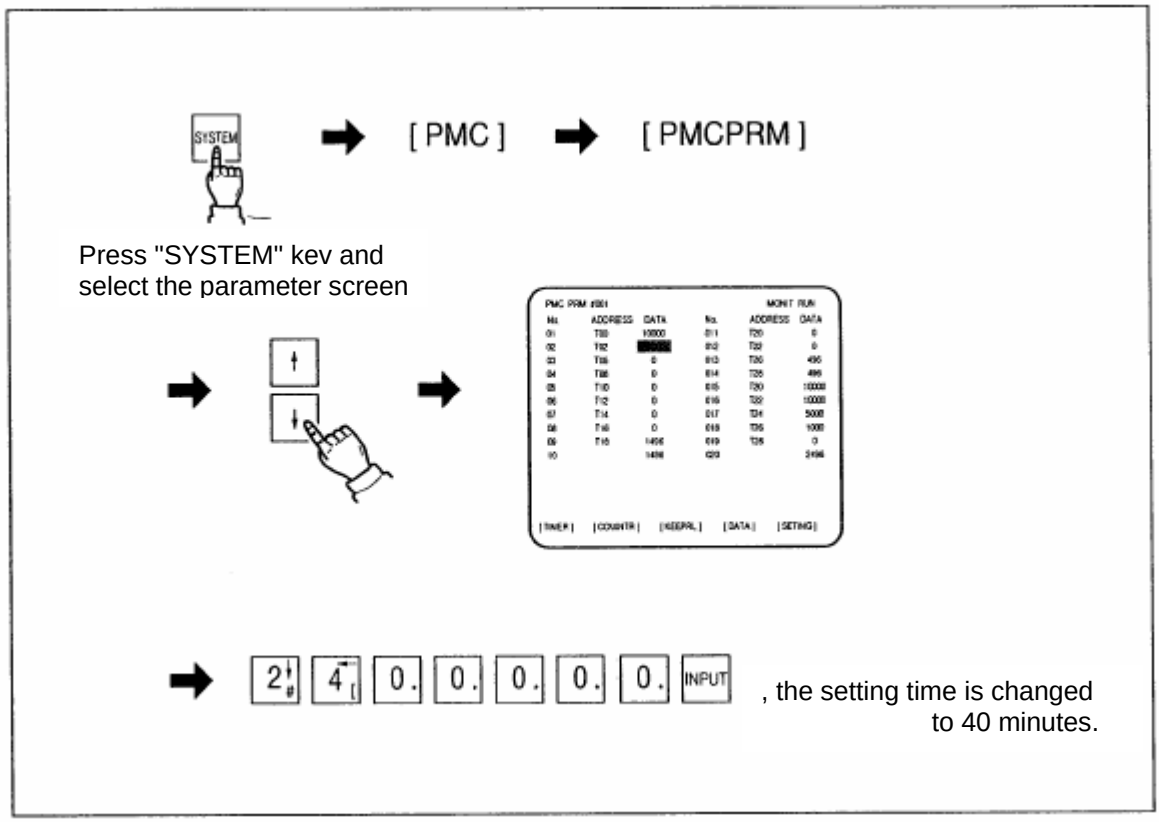


a. Discharging time is set to 10 seconds.
(TO No. TOO = 10000)

b. Discharging period is set to once a 20 min.
(T2 No. T02 = 1200000)

2) Adjustment of discharging period

To set the stop time to 40 min., perform as follows



3-6. Coolant

3-6-1. Coolant Unit Construction

Coolant is pumped by the pump in coolant tank, injected through the nozzle and used to cool and lubricate the workpiece.

CAUTION
Coolant can be divided to solubility or unsolubility in water, but it is recommended to use water-soluble coolant because in case of being unsoluable, it may cause major parts to be rusted.

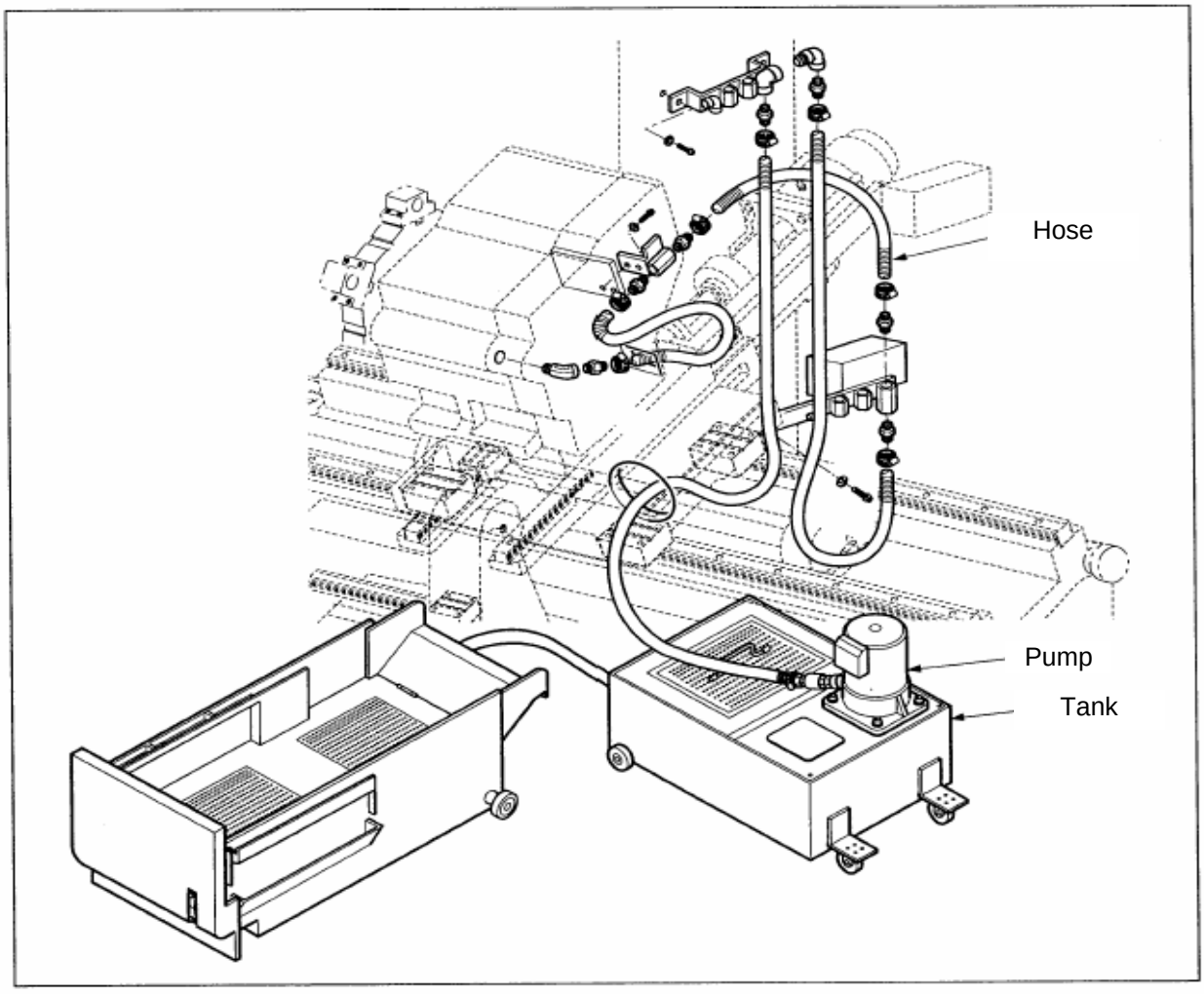


Fig. 5-60 Coolant and Construction

3-6-2. Specification and Cleaning

1) Specification

Table 5-6. Specification Table

Type		Flooding style ACP-180F	
Power (kW)		0.18(0.24HP)	
Polarity		3 Ø • 2P	
Voltage (V)		220	220/380
Permissible Maximum Current (A)		0.58	1.0
Frequency (Hz)		50	60
Ambient Temperature (°C)		-15-40	
Discharge (l/min)	50 Hz	75	
	60 Hz	90	
Overall lift (m)	50 Hz	3	
	60 Hz	3	
Available Density Limit (R")		1200/600	

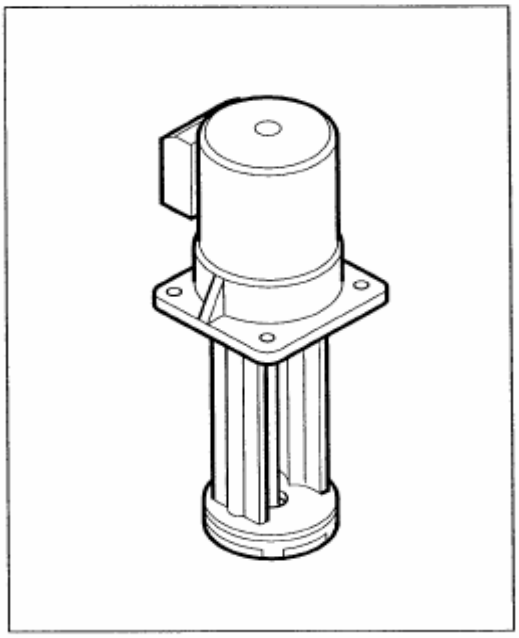


Fig. 5-61 Pump

CAUTION

The discharging amount of the above table is the flow on the discharge port of pump when the back pressure is set to "0". The discharging amount from the actual nozzle is different depending on the size of nozzle, pipe resistance, the height of nozzle and pump, and density of coolant.

2) Cleaning

Used tools: - wrench (5, 6, 7mm), + driver, clothes, coolant collecting box

a. Stop discharging of coolant
b. Open the drain plug of tank and allow the residual oil to drain using drain hole.
c. Remove the cover plate above the tank.
d. Disconnect the filter of sub tank.
e. Clean the inside of the tank, cover plate and filter.

f. Fill coolant (185 L) into tank

g. Assemble it in the reverse order of disassembly.

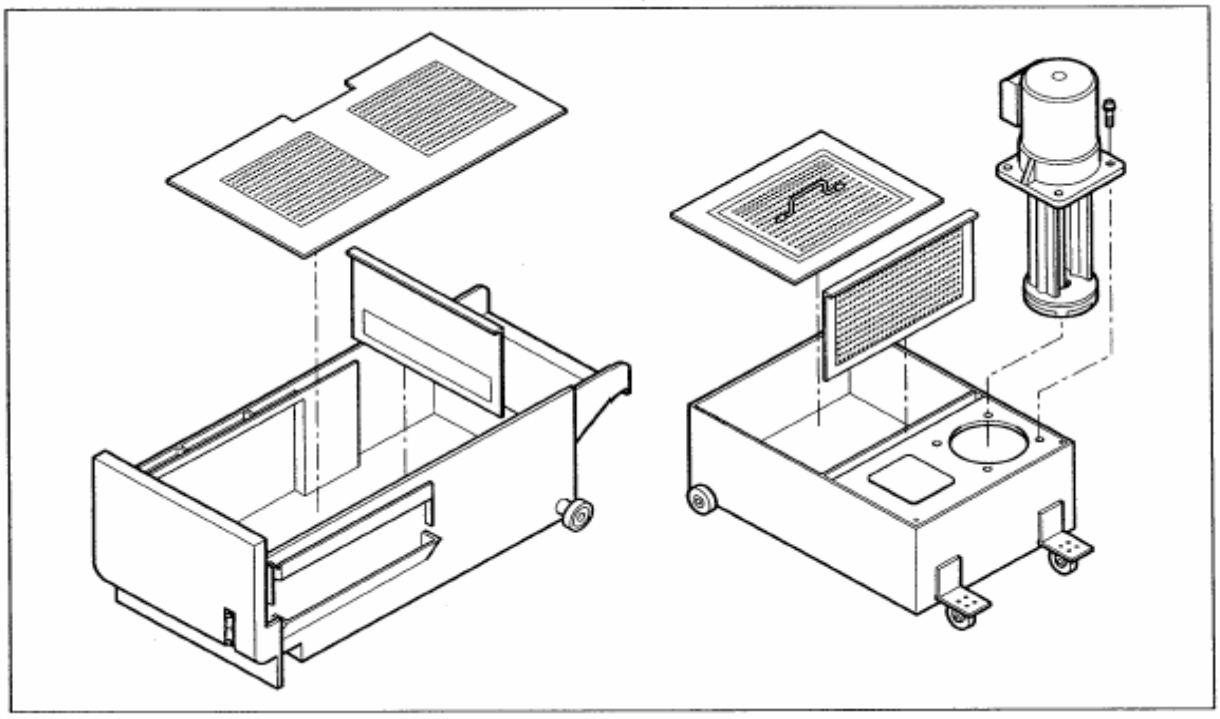


Fig. 5-62 Coolant Tank Disassembly Diagram

CAUTION
When cleaning the coolant tank, remove oil dropped on the floor. Otherwise, it may cause personal injury.

CAUTION
When filling coolant, you should use the oil recommended by KIA. Otherwise, it can cause machine failure.

CAUTION
Remove the cover plate above the tank and sludge from the chip box regularly.

3-6-3. Check and Repair

If there are vibration, noise, and abnormal discharging in coolant pump during daily operation, immediately stop discharging of coolant and repair as a reference with the following table.

CAUTION
Before checking and repairing coolant, turn OFF the power. Otherwise, it may cause personal injury.

Table 5-7. Checking and Repairing

Fault	Possible Cause	Remedy
Motor will not rotate	Disconnected	Repair or change
	Trip thermal circuit break	After, analysizing the cause, on
	Poor contact of switch	Inspect of contacts
	Low voltage	Contact the Electric Power Co.
	Faulty motor	Exchange
	Foreign matters in the fan	Disassemble and Repair
	Wet moving part (damaged Liner Ring Bearing)	Disassemble and Repair
	Rusted shaft	Disassemble and Repair
Motor rotates but coolant will not pump.	Low rotation speed	Check the rotation system
	Clogged pipe line	Check and clean pipe
	Pump improperly flooded in coolant	Fill coolant and clean tank
	Fan not being flooded in coolant	Open the air plug one time and allow the ambient air to enter
Coolant pumps but can't obtain the specified amount.	Clogged fan and case	Disassemble and Repair
	Worn fan	After diassembling, repair or change
	Water leakage in discharging pipe	Check and repair
	Low rpm	Inspect or review the rotation system
	Clogged pipe	Check and clean the pipe
Overload of motor	High gravity and viscosity	Check coolant
	Contacted rotation part	Exchange
	Excess discharge	Exchange
	Low voltage	Contact Electric Co.

Table 5-7. Checking and Repairing (cont.)

Fault	Possible Cause	Remedy
Vibration or noise in pump.	Clogged and unbalanced fan	Disassemble and check
	Damaged bearing or body	Change
	Cavitation	Contact the manufacturer (Maker)

3-7. Chuck and Cylinder

3-7-1. Chuck and Cylinder Constructions

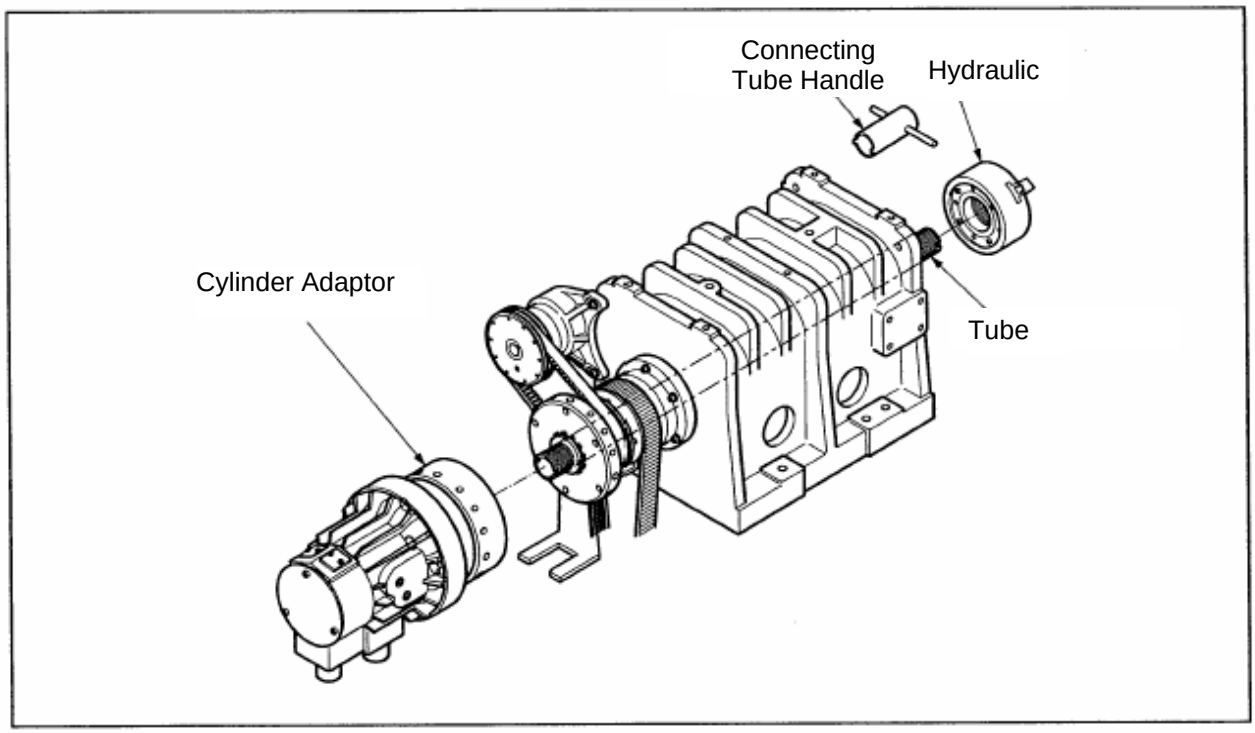
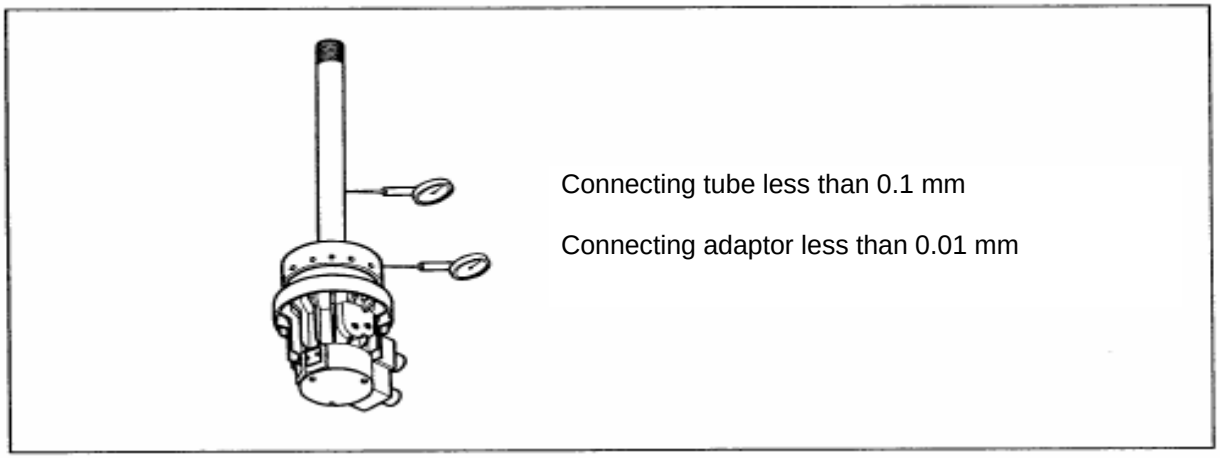


Fig. 5-63 Chuck and Cylinder Construction

Used Tools: wrench (8, 10 mm), spanner (17 mm)

3-7-2. Adjustment

1) Adjusting Sequence
   a. Secure the rotation cylinder to cylinder adaptor using bolts and connecting tube to cylinder using the connecting nut.
   b. When assembling them, adjust the trembling.



CAUTION

If assembling the cylinder with connecting tube, do it with pulled out.

WARNING

Turn OFF the power. Otherwise, it may cause personal injury.

   c. Put the assembled cylinder bundle into the hole of spindle.
   d. Fit the cylinder adaptor to the spindle flange using bolts, (trembling less 0,01 mm)
   e. Fit the chuck to the connecting tube and assemble it to spindle.
   f. Adjust the trembling of chuck to be less than 0,02 mm.
   g. Engage with connecting tube handle until the stroke of jaw being within specified value.
   h. Connect the hydraulic hose.
   i. Check the chuck is opened or closed properly.
   j. Raise the pressure of chuck up to the permissible pressure.

k. Check each part for leakage or abnormal.

l. Turn the spindle with the speed of 500 rpm and check for its vibration, (about 5 minutes)

m. Slowly raise the rpm of spindle and check for its vibration.

n. If the vibration being high, stop the spindle.

o. Reassemble the cylinder.

3-7-3. Specification

1) Seizing power

Seizing power is different depending on the fueled state, used grease, height of soft jaw. When engaging the machine in chuck and operating within the limit of maximum permissible pressure, the actual seizing power decreases as the speed of spindle increases because of a centrifugal power. These relationships between the speed of spindle, power and seizing power are shown in the following graph. Use the following jaw to obtain the seizing power of chuck.

a. Use the standard soft jaw.

b. Refill the recommended oil in this manual.

c. Secure the soft jaw engaging bolt in the specified torque.

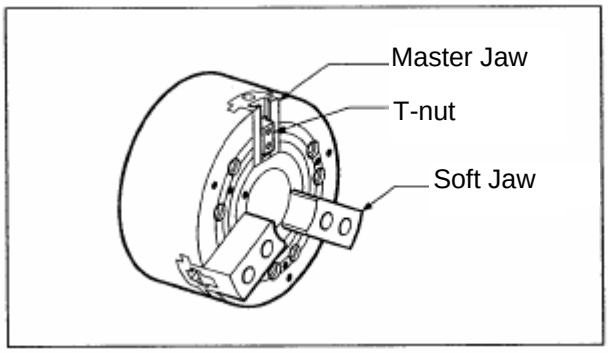
Bolt size	Specified torque
M6	130 kgf • cm (13 N • m)
M8	390 kgf • cm (39 N • m)
M10	640 kgf • cm (64 N • m)
M12	1090 kgf • cm (109 N • m)
M14	1740 kgf • cm (174 N • m)
M16	2550 kgf • cm (255 N • m)
M20	4100 kgf • cm (410 N • m)

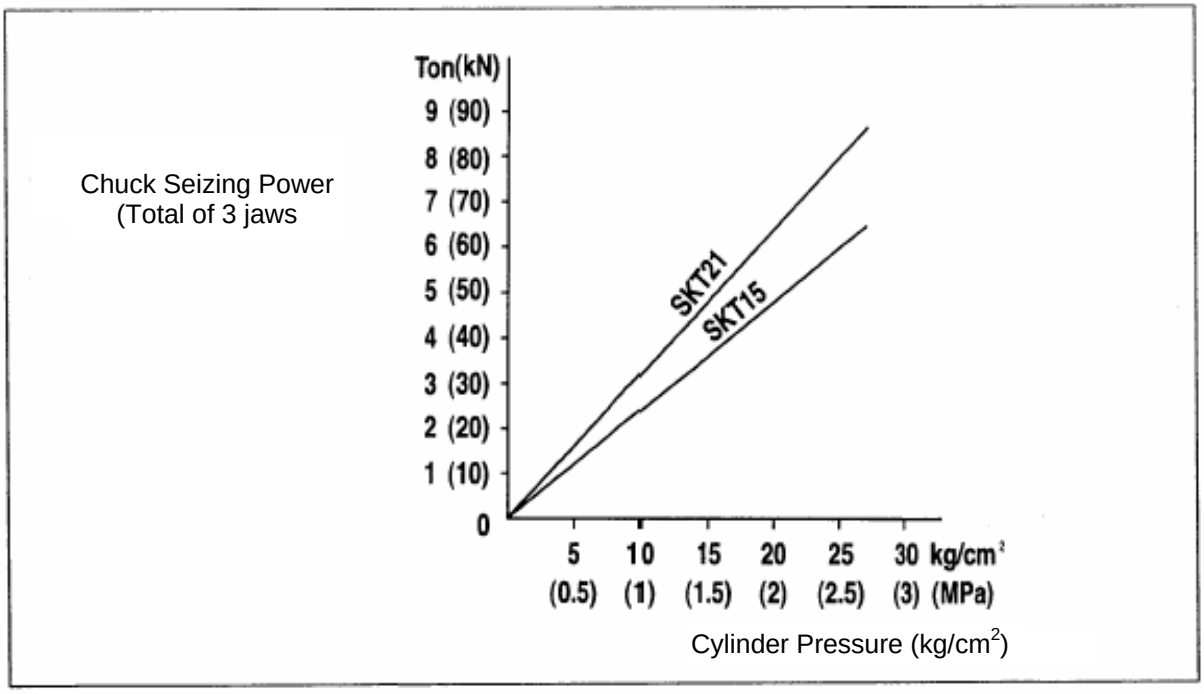
d. The thrust of cylinder is the permissible maximum one.

2) Permissible maximum rpm of Spindle

The permissible maximum rpm of Spindle is maintained to more than 1/3 of the rated power in the chuck seizing power when the outside end has been placed inside of the circumference in the Chuck body. This time the maximum rpm of spindle depends on the maximum rpm of chuck.

a. Use the standard soft jaw.
b. Place the master jaw in the center of stroke.
c. Attach the soft jaw inside of the circumference in chuck.





WARNING

When cutting heavily in a rapid speed, make sure the workpiece not to be sprang out.

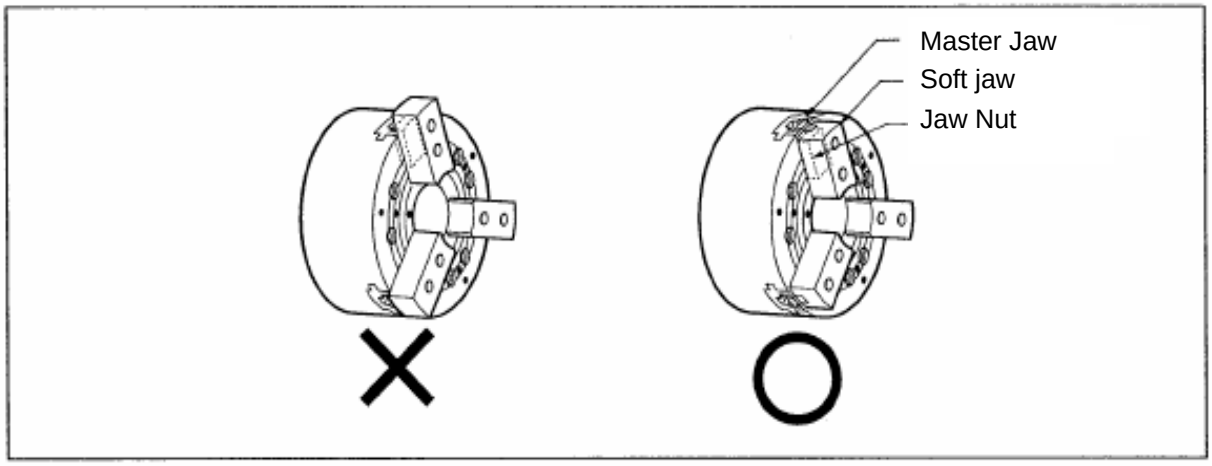
4) Attachment of Soft Jaw

a. Use the jaw nut for attaching the soft jaw of chuck within the range of soft jaw.

DANGER
If the jaw nut has been protruded out of the circumference, only one bolt will be engaged with jaw and may cause personal injury.

Used tools: wrench (8 mm SKT100), wrench (10 mm, SKT200)

b. Install the jaw nut inside of the circumference in Chuck as shown in the following.



5) Adjustment of proximity switch for checking the operation of cylinder

The proximity switch for confirming clamp/unclamp of the workpiece is attached inside of the coolant collector in cylinder.

Used tool: spanner (19 mm)

a. Engage the screw of proximity switch and the adjusting plate so the distances between proximity switch and guide flange might be 1 mm.

b. Check the proximity switch for operation.

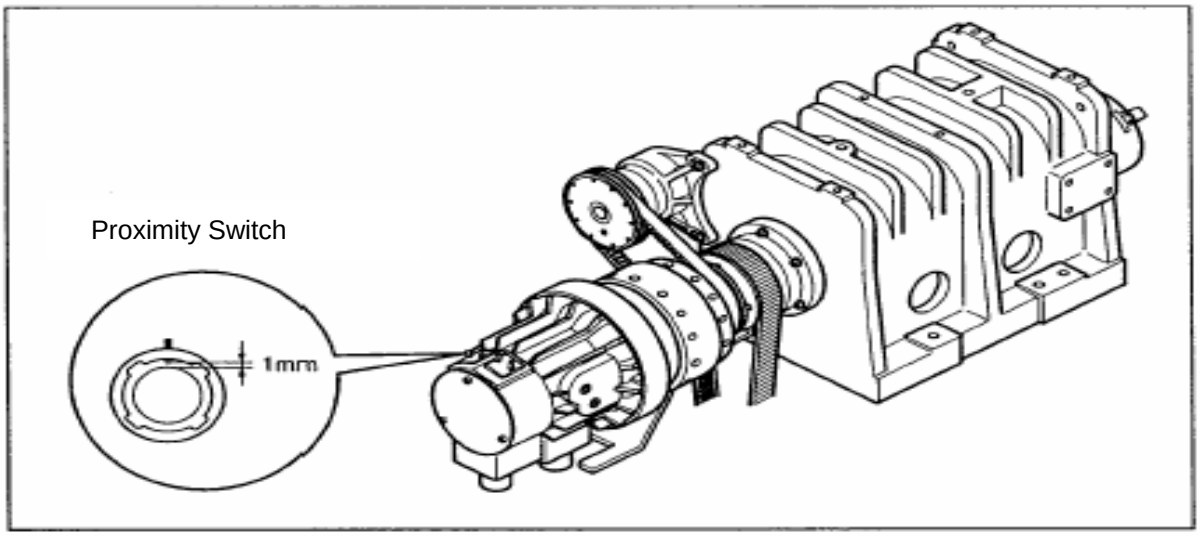


Fig. 5-64 Proximity Switch for Checking Operation of Cylinder

3-8. Cover

3-8-1. Door Roller

Used tool: spanner (13, 17 mm)

1) Disconnect the door and change the upper and lower rollers.
2) If reassembling the door, check the door for flat state and operation and adjust the lower roller.

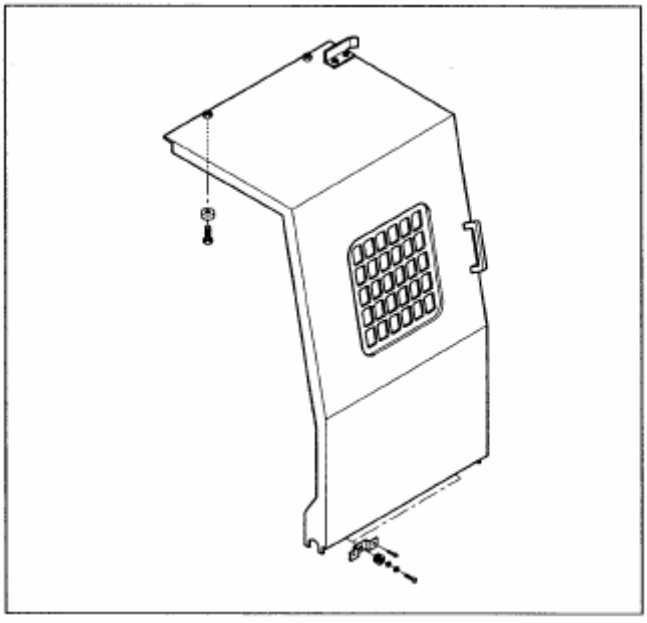


Fig. 5-65 Door Safety Glass

3-8-2. Door Safety Glass

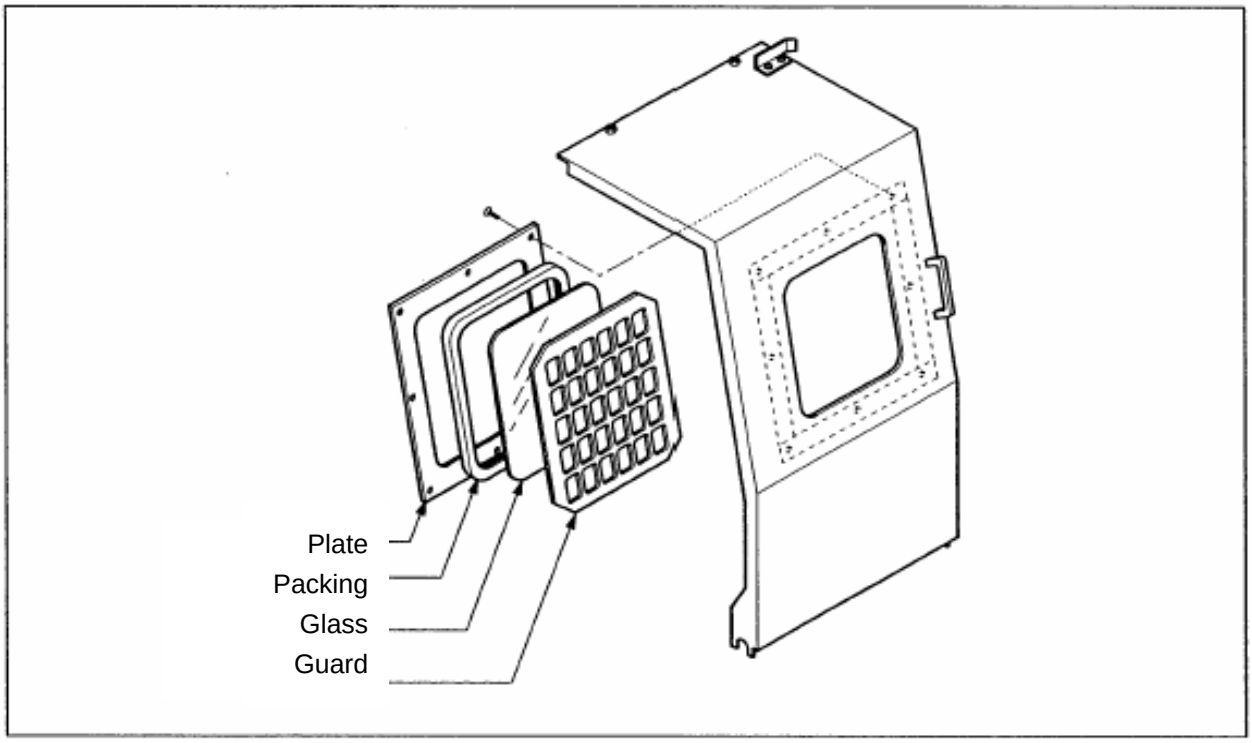


Fig. 5-66 Door Safety Glass

Used Tool: + driver, sealing agent

If the door safety glass has been broken due to the tool tip or workpiece while operating the machine, exchange as follows:

1) Disconnect the door
2) Disconnect the place using + driver and remove the glass.
3) Remove a piece of glass thoroughly.
4) Apply the boundary of guide with sealing agents and insert the packing into glass.
5) Put a glass on the guide and engage the plate.

3-9 Electricity

3-9-1. Electric Device Layout

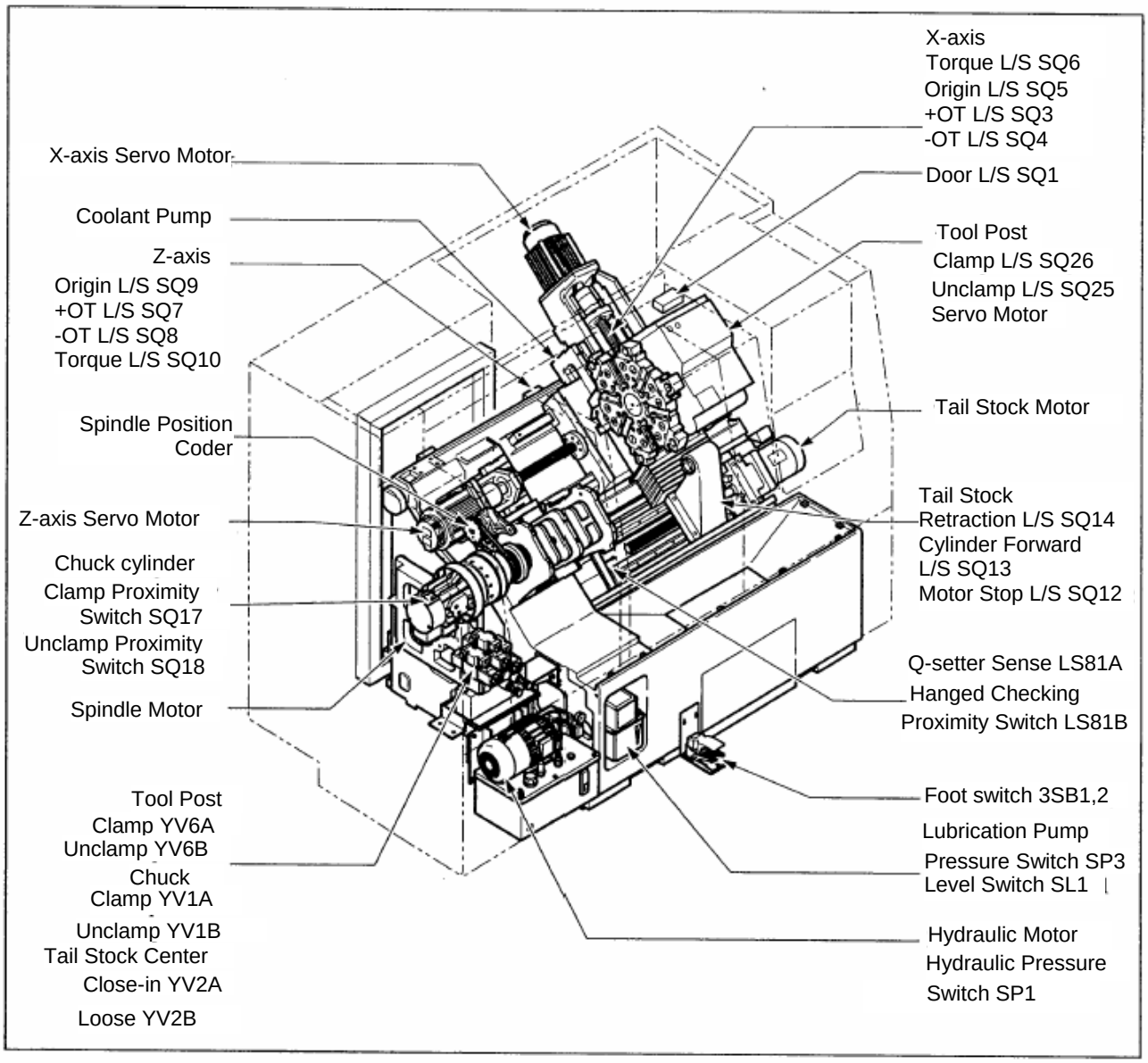
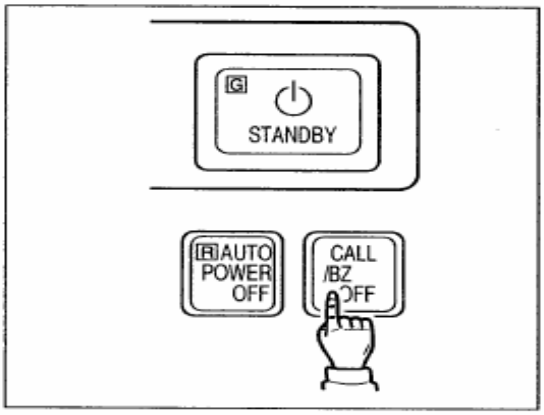


Fig. 5-67 Electric Device Layout

3-9-2. Alarm Lamp (Option)

It is attached to the top of Operating Panel and has the 1, 2 and 3 colors. It can be illuminated during program or when each sort of alarm occures and changed to the flickering style by the PC parameter. It will be exhausted by pressing the "[CALL/BZ OFF]" switch of Operating Panel.



1) 1 color (Yellow)

Illuminated if the alarm lamp is on by the occurence of each alarm or stop of the programs(M00, M01, M02, M30). If the alarm lamp is on, the machine stops temporarily and displays the text of alarm on the screen.

2) 2 colors (Green and Red)

a. Green: Illuminated when the automatic program being performed.

b. Red: Illuminated when each alarm occures or the program stop(M00, M01, M02 M30). For the others, it is the same with para. 1).

3) 3 colors (Green, Yellow and Red)

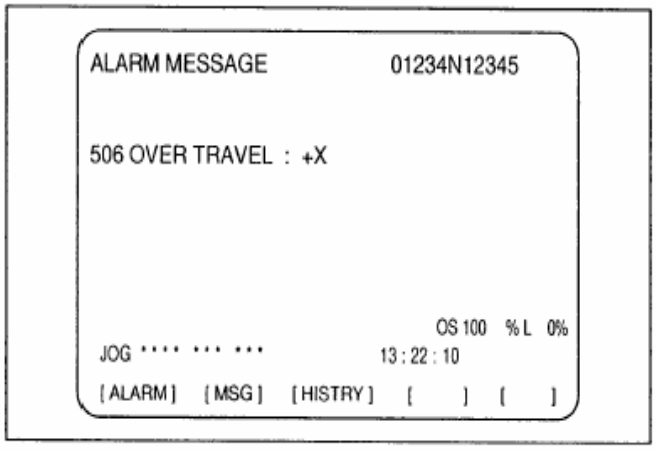
a. Green'- Illuminated when the automatic program being performed.

b. Yellow: Illuminated when the program stops(MOO, M01, M02, M30).

c. Red: Illuminated when each alarm occurs. For the others, it is the same with para. 1)

3-9-3. Alarm Indicator

1) When the alarm generally has occurred, the screen will be converted to the alarm automatically and the message "AL" or "A/B"(battery alarm) flashed in the lower right of screen.



2) The upper side (ALARM) of alarm diagnostic screen indicates the NC alarm and the lower (MESSAGE) displays up to 4 PC alarms. ft1

3) To delete the alarm, remove the cause and then press the RESET button. If the alarm has not been deleted by pressing the RESET key, it will remain the alarm state and not be returned unless the power turned OFF.

ALARM MESSAGE

[FANUC 0/-TB]

AL-NO.	MESSAGE
2000	AL-O CP & FUSE TRIP
2001	AL-1 SPINDLE AMP ALARM
2002	AL-2 TAILSTOCK MOTOR OVERLOAD
2003	AL-3 LUB. OIL LACK/FAULT
2004	AL-4 HYD. PRESSURE DROP
2005	AL-5 AIR PRESSURE DROP
2006	AL-6 X-AXIS TORQUE ALARM
2007	AL-7 Z-AXIS TORQUE ALARM
2010	AL-10
2011	AL-11
2012	AL-12 POWER OFF NC ALARM
2013	AL-13 DOOR OPERATION INHIBIT
2014	AL-14 SPINDLE ROTATION INHIBIT
2015	AL-15 SPINDLE COMMAND TIME OVER
2016	AL-16 Q-SETTER ARM DOWN
2017	AL-17 ROBOT FAULT
2020	AL-20 ZERO RETURN INCOMPLETED
2021	AL-21
2022	AL-22
2023	AL-23 TAIL-STOCK SET NG
2024	AL-24 POWER OFF PROGRAM END
2025	AL-25 SPINDLE ORIENTATION FAIL
2026	AL-26
2027	AL-27 TOOL LIFE END
2030	AL-30 CHUCK CLAMP NG
2031	AL-31 DOOR CLOSE NG,
2032	AL-32 CENTER POSITION NG
2033	AL-33 SPINDLE STOP INCOMPLETED

AL-NO.	MESSAGE
2034	AL-34 LNS MULTI BAR FEEDER ALARM
2035	AL-35 END OF BAR
2036	AL-36 COUNT UP
2037	AL-37 SPINDLE-DOOR INTERLOCK
2040	AL-40 BAR FEEDER NOT READY
2041	AL-41 TURRET INDEX INHIBIT ZONE
2042	AL-42 HYDRAULIC MOTOR OVERLOAD
2043	AL-43 COOLANT MOTOR OVERLOAD
2044	AL-44
2045	AL-45
2046	AL-46 X-AXIS OVERLOAD
2047	AL-47 Z-AXIS OVERLOAD
2050	AL-50 CHIP CONVEYOR OVERLOAD
2051	AL-51
2052	AL-52 PART CATCHER FAULT
2053	AL-53 PC PARAMETER SET NG
2054	AL-54 PROGRAM START PB NG
2055	AL-55
2056	AL-56
2057	AL-57
2060	AL-60 TURRET INDEX POWER OFF
2061	AL-61 TURRET SETUP ERROR
2062	AL-62 TURRET AMP ALARM
2063	AL-63 TURRET BATTERY ALARM
2064	AL-64 TURRET INDEX TIME OVER
2066	AL-66 TURRET INDEX CONDITION NG
2067	AL-67 TURRET COMPULSORY UNCLAMP
2075	AL-75 TURRET ADJUST MODE
2131	AL-131 COMMAND TOOL No.NG
2133	AL-133 POWER UNIT OFF REQUIRE

3-9-4. Parameter

Parameter is the important factor in determining the characteristics and functions of machine. There are ones for determining the standard specification and selective one, classification, function, or the capacity or the level of the desired performance. 1) Kinds and major contents a. NC parameter

See the NC parameter Table.

For the information, see "FANUC operating manual". (2) How to treat the parameter

Each parameter (data) has been set at the factory and doesn' t need revise or set, unless otherwise stated (Except for the custom macro, backlash/pitch error compensation areas). In addition, when shipping the machine, the values of NC and PC parameter should be tagged on the machine, so keep and prepare if for further use.

3-9-5. Alarm display and corresponding Coutermeasures

Alarm No.	Alarm type
000-299	Program/Setting Alarm
300-399. 401	Pulse Coder Alarm
400-499	Servo Alarm
500-599	Over Travel Alarm
-	System/ I/O Link Alarm

[Program/Setting Alarm (PS Alarm)**]**

No.	LED	Description	Countermeasure
000		A parameter that requires power-down has been specified.	Turn the power off, then back on.
011		The specified feedrate is zero.	Check the feedrate parameter specified with a function code.
013		The specified feedrate (maximum feedrate) is zero.	Check the value of parameter No. 043, which indicates the maximum feedrate that can be specified.
070		More than 32 blocks have been registered for a buffering operation.	Reduce the number of registered blocks to 32
085		Input from the reader/punch interface or the like caused ah overrun, parity, or framing error.	Correct the baud rate of the input/output unit (always 4800) or other settings.
086		Input from the reader/punch interface or the like includes an input/output unit operation ready signal (DR) that is set to off.	Turn the reader/punch on. Check the cable connection.
087		After input from the reader/punch interface or the like stops, character input does not stop even though ten characters have been input.	Check the cable connection.

[Program/Setting Alarm(PS Alarm)]

No.	LED	Description	Countermeasure
090		Reference position setting cannot be executed normally.	Move the tool in the direction of reference position return in jog mode at a speed that causes the servo position error to exceed 128. Then, specify another reference position setting.
093		A first to third reference position return cannot be executed because the referent position has not yet been established.	Set the reference position.
224		The reference position has not yet been established. This occurs only when the ZRTN bit of parameter No.00l is set to 0.	Set the reference position.
250		Input data 1 is invalid.	Check input data 1, specified with a function code.
251		Input data 2 is invalid.	Check input data 2, specified with a function code.
254		Enable coder or mode disabled	Check code instruction, specified with a function code. Check the mode.
255		Operation cannot be activated because an invalid mode is specified or because block execution is in progress.	Check the mode. Check whether a block is being executed.
290		The interface switch signal (DRC) was switched during block execution.	Switch the signal after block execution stops.
291		The speed of an axial movement specified by an external pulse has exceeded the upper limit. This occurs only when the EPEXA bit of parameter No.00l is set to 1.	Turn the reader/punch on. Check the cable connection.
292		A checksum error for the battery-powered memory was detected.	Parameters are cleared. Set the parameters again. If this alarm subsequently recurs, replace the unit

[Pulse Coder Alarm]

No.	LED	Description	Countermeasure
300		A communication error (DTER) for the serial pulse coder was detected.	Check the continuity of the signal cable. If the cable is normal, the pulse coder may be defective. Turn the power off. If the alarm recurs when the power is reapplied, replace the serial pulse coder, together with the motor.
301		A communication error (CRCER) for the serial pulse coder was detected.	Check the continuity of the signal cable. If the cable is normal, the pulse coder or servo unit may be defective. This error can also be caused by external noise.
302		A communication error (STBER) for the serial pulse coder was detected.	
303		A communication error (LDAL) for the serial pulse coder was detected.	Turn the power off. If this alarm recurs when the power is re-applied, replace the motor.
304		A communication error (PMAL) for the serial pulse coder was detected.	
305		A miscount alarm (CMAL) for the serial pulse coder was detected.	Turn the power off. If this alarm recurs when the power is re-applied, replace the motor. If the alarm does not recur, re-start the operation form reference position return.
306		The motor has overheated (OHAL).	This alarm is issued when the amplifier has overheated, causing the thermostat to trip. Possible causes include an excessively high ambient temperature and excessively strict operation conditions. Check the actual cause. Disconnect the power of about ten minutes, then release the emergency, replace the amplifier.

No.	LED	Description	Countermeasure
308		A soft phase alarm (SPHAL)was detected.	Turn the power off. This alarm may be caused by noise.
319		When the absolute pulse coder is used, the motor has not yet rotated through more than one turn after the first power-up.	Cause the motor rotate through more than one turn in jog feed mode, then turn the power off then back on.
350		The battery voltage of the absolute pulse coder is low.	Replace the battery. Restart the operation from reference position return.
351		The battery voltage of the absolute pulse coder is low.	Replace the battery.
401		Communication error of Serial Pulse Coder was detected.	Check if the signal cable of pulse coder being connected. If the cable being ok, there could be an error in the pulse coder or Servo AMP Unit. Otherwise, it could be caused by the outer Noise. Refer to the Precautions of Noise in the manual.

[Servo Alarm**]**

No.		LED	Description	Countermeasure
400		The servo motor has overheated (estimated value)		Turn the power off. After a while, turn the power back on. Possible causes include an excessively high ACC/DEC frequency.
403		SVU-12 SVU-20	The cooling fans have overheated. (Hardware detection)	The load on the motor may be too high. Re-examine the load conditions.
		SVU-40 SVU-80	This alarm was not occurred.	The load on the motor may be too high. Re-examine the load conditions.

<table>
<tr><th>No.</th><th>LED</th><th>Description</th><th>Countermeasure</th></tr>
<tr><td rowspan="2">404</td><td rowspan="2"> </td><td>The regenerative discharge unit has overheated.</td><td>This alarm is issued when the average regenerative discharge energy is too high (when the ACC/DEC frequency is too high, for example).</td></tr>
<tr><td colspan="2">When the regenerative discharge resistor is not being used, check whether a dummy connector is fitted to the CX11-6 connector.
1) The average regenerative discharge energy may be too high. Decrease the ACC/DEC frequency.
2) The thermostat line of the separate regenerative discharge unit may not be connected properly. Check the connection.
3) The thermostat of the separate regenerative discharge unit may be defective. Disconnect the separate regenerative discharge unit, then check the thermostat. If the thermostat is open even through the separate regenerative discharge unit is cool, replace the separate regenerative discharge unit.
If (1) to (3) are not the cause of the alarm, replace the servo amplifier.</td></tr>
<tr><td rowspan="2">405</td><td rowspan="2"> </td><td>Reference position return could not be executed correctly.</td><td>Re-execute reference position return.</td></tr>
<tr><td colspan="2">If setting parameter No.032 (CMR) to the value between 4 and 96, an alarm could be occurred. This time, set the parameter No.001 #4(N405) to "1" to prevent the alarm occurred.</td></tr>
<tr><td>410</td><td> </td><td>The servo position error in the stop state is larger than the value specified in parameter No. 110.</td><td>Determine the mechanical cause of the large position error. If no mechanical cause is found, specify a larger value for the parameter.</td></tr>
<tr><td>411</td><td> </td><td>The servo position error during movement is larger than the value specified in parameter No. 182.</td><td>Determine the mechanical cause of the large position error. If no mechanical cause is found, apply any of the following counter-measures:
• Specify a larger value for the parameter
• Specify a lower federate.
• Increase the time contants.</td></tr>
</table>

<table>
<tr><th>No.</th><th>LED</th><th colspan="2">Description</th><th>Countermeasure</th></tr>
<tr><td>412</td><td> </td><td colspan="3">An overcurrent alarm is issued. This alarm is issued when an excessively large current flows in the main circuit.
1) Check whether a valid motor number is specified in parameter No. 30.
2) Check whether the standard values are specified in the current control parameters for servo control.
Correct current control is possible only when the standard values are specified for following parameter.
=> No. 70, 71, 72, 78, 79, 84, 85, 86, 87, 88, 89, 90
3) Disconnect the power line from the amplifier connector. Then, release the emergency stop state.
=> If the overcurrent alarm continues to be issued, replace the AMP.
=> If no overcurrent alarm is issued, go to (4).
4) Disconnect the power line from the AMP connector. Check the insulation between the ground and each of U, V, and W. If the insulation is satisfactory, go to (5).
If a short-circuit is detected, disconnect the power line from the motor connector. Then, check the insulation between the ground and each of U, V, and W of the motor.
If the insulation is satisfactory, replace the power line.
5) Connect the power line. Observe the waveform of the motor current (IR, IS) while the motor is accelerating or decelerating. If the motor current (IR, IS) does not exhibit a normal sine wave, replace the amplifier.
6) If (1) to (4) above are not the cause of the alarm, the pulse coder, command cable, or internal hardware of the CNC may be defective.</td></tr>
<tr><td rowspan="2">413</td><td rowspan="2"> </td><td>A DC link overvoltage alarm is issued.</td><td colspan="2">This alarm is issued when the DC voltage of time main circuit power is too high.</td></tr>
<tr><td colspan="3">1) The supply voltage for dynamic power may exceed the rated value. Check the voltage. If the voltage is too high, reduce the voltage to an appropriate level.
2) The regenerative discharge unit may not be properly connected. Check the connection.
3) The resistance of the separate regenerative discharge unit may be abnormal Disconnect the separate regenerative discharge unit, then check the resistance. If the resistance is not within ±20% of the predetermined resistance, replace the separate regenerative discharge unit. If (1) to (3) are not the cause of the alarm, replace the servo AMP.</td></tr>
</table>

<table>
<tr><th>No.</th><th>LED</th><th>Description</th><th>Countermeasure</th></tr>
<tr><td rowspan="2">414</td><td rowspan="2"> </td><td>A DC link low voltage alarm is issued.</td><td>This alarm is issued when the DC voltage of the main circuit power is too low.</td></tr>
<tr><td colspan="2">1) The external circuit breaker may be turned off. Check the circuit breaker.
2) The supply voltage for dynamic power is lower than the rated value. Check the voltage. If the voltage is too low, increase it to an appropriate level.
3) The external magnetic contactor may not be connected properly. Check the connection. If (1) to (3) are not the cause of the alarm, replace the servo AMP.</td></tr>
<tr><td>417</td><td> </td><td>A parameter has been specified incorrectly</td><td>Check the following parameter :
No. 30: Is the specified motor type correct?
No. 31: Is the specified direction of rotation of the motor correct?
No. 106: Is the denominator of the number of pulses per single revolution of the motor "0"?
No. 180: Is the specified reference counter capacity 0 or a negative value?</td></tr>
<tr><td>418</td><td> </td><td>A DO alarm is issued.</td><td>Replace the servo unit</td></tr>
<tr><td>423</td><td> </td><td>The specified speed exceeds 32767000 detection units per second.</td><td>Re-examine the CMR and speed settings.</td></tr>
<tr><td rowspan="2">425</td><td rowspan="2"> </td><td>The cooling fan has stopped.</td><td>This alarm is issued when the fan motor built into the servo AMP has failed.</td></tr>
<tr><td colspan="2">1) Check that the fan is not clogged with foreign matter.
2) Check that the power connector of the fan is connected properly.
3) Replace the fan or servo unit.</td></tr>
</table>

[Over Travel Alarm]

No.	LED	Description	Countermeasure
500		The positive stroke limit has been exceeded.	Check whether *+OT and *-OT are connected correctly. Check whether a correct move command is specified. Move the tool in the opposite direction in jog mode, then perform a reset.
501		The negative stroke limit has been exceeded.	
510		The positive soft stroke limit has been exceeded.	Check whether appropriate values have been specified for parameters No. 142 and 143. Check whether a valid move command is specified. Move the tool in the opposite direction in jog mode, then per-form a reset.
511		The negative soft stroke limit has been exceeded.	

[System Alarm]

No.	LED	Description	Countermeasure
-		An error was detected in the RAM write/read test at power-up.	Replace the unit.
-		An error was detected in the data collation check for the battery-powered memory.	Turn the power off then back on. Then, re-enter the parameters. If this alarm recurs, replace the unit.
-		A data transfer alarm for the battery-powered memory has been issued.	Replace the unit.
-		A watch dog alarm was issued.	Turn the power off then back on. If this alarm recurs, replace the unit.
-		A checksum alarm for the control software ROM is issued.	Replace the unit.
-		A checksum alarm for the ROM that is built into the CPU is issued.	
-		An error was detected in the control circuit.	

[I/O Link Alarm]

No.	LED	Description	Countermeasure
-		A FANUC I/O link error occurred. A unit connected to the line was turned off.	Turn off the power the all units connected to the line. Then, turn on the slave devices, followed by the master device.

[No LED display]

No.	LED	Description	Countermeasure
-	No indi-ca tors lit	The control circuit is not operating normally.	1) Check the 24-VDC control supply voltage. If the voltage is low, increase the voltage to an appropriate level. 2) Check whether a fuse in the servo unit has blown. If (1)~(2) are not the cause, replace the servo AMP.

3-9-6. Error Codes Serial Spindle)

Note

Note that the meanings of the the SPM indictions differ depending on which LED, the redor yellow LED, is on.
When the red LED is on, the SPM indicates the number of an alarm generated in thee serial spindle.

No.	Faulty location and remedy	Description
00	Check the *EPS and MRDY sequence. (For MRDY, pay attention to the parameter setting regarding the use of the MRDY signal(bit 0 of parameter No.4001).)	Although neither *EPS (emergency stop signal; there are two types of signals including the PMC signal and PSM contact signal (*2)) nor MRDY (machine ready signal) is input, SFR (forward rotation signal)/SRF (reverse rotation signal)/ ORCM (orientation command) is input.
01	Check the spindle motor speed detector parameter (bits 2, 1, and 0 of parameter No.4011)	When the spindle motor has a high-resolution magnetic pulse coder (Cs sensor) (bits 6 and 5 of parameter No.4001 are set to 0 and 1, respectively), 128 /rev is to be set for the speed detector (bit 2, 1. and 0 of parameter No.4011 are set to 0, 0. and 1, respectively). However, a value other than 128 /rev is set. In this case, the motor is not excited.
02	Check the parameters for the detector for Cs contour control (bit 5 of parameter No.4001 and bit 4 of parameter No.4018)	Although use of a high-resolution magnetic pulse coder(bit 5 of parameter No.4001 = 1) or use of the Cs contour control function by the sensor (bit 4 of parameter No.4018 = 1) is not set. a Cs control command is input. In this case, the motor is not excited.
03	Check the position coder signal parameter (bit 2 of parameter No.4001)	Although use of the position coder signal (bit 2 of parameter No.4001 = 1) or use of the Cs contour function by the sensor (bit 4 of parameter No.4018 = l)is not set, a Cs control command is input. In this case, the motor is not excited.

No.	Faulty location and remedy	Description
04	Check the orientation software option.	Although the orientation option is not set, an orientation command(ORCM) is input.
05	Check the spindle output switching software option and power line status signal(RCH).	Although the output switching option is not set, the lowspeed winding is selected(RCH=1).
06	Check the sequence(CON, SFR, SRV).	Although the Cs contour control mode is specified, SFR/SRV is not input.
07	Check the sequence (SFR. SRV).	Although the servo mode (rigid tapping, spindle positioning) is specified, SFR/SRV is not input.
09	Check the sequence(SPSYC, SFR. SRV).	Although spindle synchronization mode is specified, SFR/SRV is not input.
10	During execution of the C-axis control command, do not specify another operation mode. Before entering another mode, cancel the Cs contour control command.	Although Cs contour control mode is set, another operation mode (servo mode, spindle synchronization, or orientation) is specified.
11	During execution of the servo mode command, do not specify another operation mode. Before entering another mode, cancel the servo mode.	Although servo mode (rigid tapping, or spindle positioning) is set, another operation mode(Cs contour control, spindle synchronization, or orientation) is specified.
12	During execution of the spindle synchronization command, do not specify another operation mode. Before entering another mode, cancel the spindle synchronization command.	Although spindle synchronization is being performed, another operation mode (Cs contour control, servo mode, or orientation) is specified.
13	During execution of the orientation command, do not specify another operation mode. Before entering another mode, cancel the spindle synchronization command.	Although the orientation command is being executed, another operation mode (Cs contour control, servo mode, or orientation) is specified.
14	Input the SFT or SRV signal.	The SFT and SRV signals are both input at the same time.
15	Check bit 5 of parameter No.4000 and PMC signal(CON).	When bit 5 of parameter No.4000 is set to 1 indicate the presence of the differential speed mode function, Cs contour control is specified.

No.	Faulty location and remedy	Description
16	Check bit 5 of parameter No.4000 and PMC signal (DERMD).	When bit 5 of parameter No.4000 is set to 0 to indicate the absence of the differential speed mode command (DEFMD) is input.
17	Check bits 2, 1 and 0 of parameter No.4011.	Setting of the speed detector parameter (bit 2. 1, and 0 of parameter No.4011) is invalid. (The corresponding speed detector is not present.)
18	Check bit 2 of parameter No.4001 and PMC signal(ORCM).	Although bits 2 of parameter No.4001 is set to 0 not to use the position coder signal, a command for orientation by a position coder (ORCMA) is input.
19	During execution of the orientation command, do not specify another operation mode. Before entering another mode, cancel the orientation command.	Although orientation by a magnetic sensor is being performed, another operation mode is specified.
20	Check bit 5 of parameter No.4001, bit 5 of parameter No.4014, and bit of parameter No.4018.	When the use of the slave operation mode function is set(bit 5 of parameter No.4014 = 1), the use of a high-resolution magnetic pulse coder (bit 5 of parameter No.4001 = 1) or the use of the Cs contour control function by the sensor (bit 4 of parameter No.4018 = l)is specified. These items cannot be set at the same time.
21	Input the slave operation mode command (SLV) in normal operation mode.	Although position control (such as servo mode or orientation) is being performed, a slave operation mode command (SLV) is input.
22	Input the position control command in normal operation mode	Although slave operation mode is set(SLVS = l), a position control command (such as servo mode or orientation) is input.
23	Check bit 5 of parameter No.4014 and PMC signal(SLV)	Although bit 5 of parameter No.4014 is set to 0 not to use the slave operation mode function, a slave operation mode command (SLV) is input.

No.	Faulty location and remedy	Description
24	Check the PMC signal (INCMD). Perform orientation by specifying an absolute position first.	Orientation is performed in incremental operation mode (INCMD = 1) fist, then the absolute position command (INCMD = 0) is input.
25	Check the spindle amplifier specifications and parameter setting (bit 4 of parameter No.4018)	Although the spindle amplifier SPM type 4 is not used, the use of the Cs control function by the sensor is set (bit 4 of parameter No.4018 = 1).

Note

PSM contact signal

Between EPS1 and EPS2 on the PSM

Contact open : Emergency stop

Contact closed : Normal operation

Maintenance Instruction Related To Fanuc Spindle Alarm

When a serial spindle alarm occurs, the following number is displayed on the CNC. n is a number corresponding to the spindle on which an alarm occurs. (n = 1 : First spindle: n = 2 : Second spindle; etc.)

Note

Note that the meanings of the SPM indications differ depending on which LED, the red or yellow LED, is on. When the red LED is on, the SPM indicates a 2-digit alarm number. When the yellow LED is on, the SOM indicates an error number that designates a sequence problem (for emergency stop state not released).

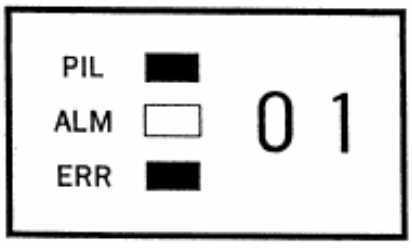
SPM indication (*1)	Faulty location and remedy	Description
A0 A	1 Replace the ROM on the SPM control printed circuit board. 2 Replace the SPM control printed circuit board.	The program does not start normally. ROM series error or hardware abnormality on the SPM control printed circuit board.
A1	Replace the SPM control printed circuit board.	An abnormality was detected in the CPU peripheral circuit of the SPM control circuit.
01	1 Check and correct the peripheral temperature and load status. 2 If the cooling fan stops, replace it.	The thermostat embedded in the motor winding operated. The internally temperature of the motor exceeds the specified level. The motor is used in excess of the continuous rating, or the cooling component is abnormal.
02	1 Check and correct the cutting conditions to decrease the load. 2 Correct parameter No.4082.	The motor speed cannot follow a specified speed. An excessive motor load torque is detected. The acceleration/deceleration time in parameter No.4082 is insufficient.

SPM indication (*1)	Faulty location and remedy	Description
03	1 Replace the SPM unit. 2 Check the motor insulation status. 3 Replace the interface cable.	The PSM becomes ready (00 is indicated), but the DC link voltage is to low in the SPM. The fuse in the DC link voltage is too low in the SPM is blown. (The power device is damaged or the motor is groundfault). The JX1A/JX1B connection cable is abnormal.
04	Check the state of the input power supply to the PSM.	The PSM found a missing power supply phase. (SPM alarm 5)
06	1 Check and correct the parameter. 2 Replace the feedback cable.	The temperature sensor of the motor is disconnected.
07	Check for a sequence error. (For example, check whether spindle synchronization was specified when the spindle could not be turned.)	The motor speed has exceeded 115% of its rated speed. When the spindle axis was in position control mode, positional deviations were accumulated excessively (SFR and SRV were turned off during spindle synchronization.)
09	1 Improve the heat sink cooling status. 2 If the heat sink cooling fan stops, replace the SPM unit.	Abnormal temperature rise of the power transistor radiator
11	1 Check the selected PSM. 2 Check the input power voltage and change in power during motor deceleration. If the voltage exceeds 253 VAC (for the 200-V system) or 530 VAC (for the 400-V system), improve the power supply impedance.	Overvoltage of the DC link section of the PSM was detected. (PSM alarm indication: 7) PSM selection error.(The maximum output specification of the PSM is exceeded).
12	1 Check the motor insulation status. 2 Check the spindle parameters. 3 Replace the SPM unit	The motor output current is abnormally high. A motor-specific parameter does not match the motor model. Poor motor insulation.

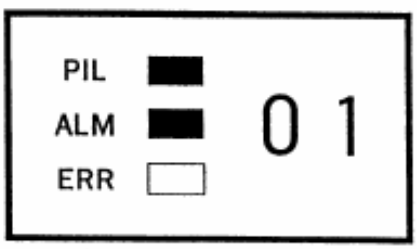
SPM indication (*1)	Faulty location and remedy	Description
15	1 Check and correct the ladder sequence. 2 Replace the switching MC.	The switch sequence in spindle switch/output switch operation is abnormal. The switching MC contact status check signal and command do not match.
16	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (RAM for external data is abnormal.)
18	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (Program ROM data is abnormal.)
19	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value for the U phase current detection circuit is abnormal.)
20	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value of the V phase current detection circuit is abnormal.)
21	Check and correct the parameters. (No.4000#0, 4001 #4)	The polarity parameter setting of the position sensor is wrong.
24	1 Place the CNC-to-spindle cable away from the power cable. 2 Replace the cable	The CNC power is turned off (normal power-off or broken cable). An error is detected in communication data transferred to the CNC.
26	1 Replace the cable. 2 Re-adjust the BZ sensor signal.	The signal amplitude of the detection signal (connector JY2) on the Cs contour control motor side is abnormal. (Unconnected cable, adjustment error, etc.)
27	1 Replace the cable. 2 Re-adjust the pre-amplifier.	1 The spindle position coder (connector JY4) signal is abnormal. 2 The signal amplitude (connector JY2)of the MZ or BZ sensor is abnormal (Unconnected cable, adjustment error, etc.)

SPM indication (*1)	Faulty location and remedy	Description
28	1 Replace the cable. 2 Re-adjust the BZ sensor signal.	The position detection signal (connector JY5)for Cs contour control is abnormal. (Unconnected cable, adjustment error, etc.)
29	Check and correct the load status.	Excessive load has been applied continuously for a certain period of time. (This alarm is issued also when the motor shaft has been locked in the excitation state.)
30	Check and correct the power supply voltage.	Overcurrent is detected in PSM main circuit input. (PSM alarm indication : 1) Unbalanced power supply. PSM selection error (The maximum PSM output specification is exceeded.)
31	1 Check and correct the load status. 2 Replace the motor sensor cable (JY2 or JY5).	The motor cannot rotate at a specified speed. (A level not exceeding the SST level for the rotation command has existed continuously.) Abnormality in the speed detection signal.
32	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit "component is detected. (The LSI device for serial transfer is abnormal.)
33	Check and correct the power supply voltage. 2 Replace the PSM unit.	Charging of direct current power supply voltage in the power circuit section is insufficient when the magnetic contractor in the amplifier is turned on (such as open phase and defective charging resistor).

<LED display on the AMP during spindle alarm and error>



(Error No.01)



(Alarm No.01)

3-9-7. Alarm List

(1) Program errors (P/S alarm)

No.	Message	Contents
000	PLEASE TURN OFF POWER	A parameter which requires the power off was input, turn off power.
001	TH PARITY ALARM	TH alarm (A character with incorrect parity was input). Correct the tape.
002	TV PARITY ALARM	TV alarm (The number of characters in a block is odd). This alarm will be generated only when the TV check is effective.
003	TOO MANY DIGITS	Data exceeding the maximum allowable number of digits was input (Refer to the item of max. programmable dimensions).
004	ADDRESS NOT FOUND	A numeral or the sign "-" was input without an address at the beginning of a block. Modify the program.
005	NO DATA AFTER ADDRESS	The address was not followed by the appropriate data but was followed by another address or EOB code. Modify the program.
006	ILLEGAL USE OF NEGATIVE SIGN	Sign "-" input error (Sign "-" was input after an address with which it cannot be used. Or two or more "-" signs were input). Modify the program.
007	ILLEGAL USE OF DECIMAL POINT	Decimal point "-" input error (A decimal point was input after an address with which it can not be used. Or two decimal points were input). Modify the program.
009	ILLEGAL ADDRESS INPUT	Unusable character was input in significant area. Modify the program.
010	IMPROPER G-CODE	An unusable G code or G code corresponding to the function not provided is specified. Modify the program.

No.	Message	Contents
011	NO FEEDRATE COMMANDED	Feedrate was not commanded to a cutting feed or the feedrate was inadequate. Modify the program.
014	ILLEGAL LEAD COMMAND	In variable lead threading, the lead incremental and decremental out-putted by address K exceed the maximum command value or command such that lead becomes a negative value is given. Modify the program.
015	TOO MANY AXES COMMAND	An attempt has been made to move the tool more than the maximum number of simultaneously controlled axes. Alternatively, no axis movement command or an axis movement command for two or more axes has been specified in the block containing the command must be accompanied with an axis movement command for a single axis, in the same block.
020	OVER TOLERANCE OF RADIUS	In circular interpolation (G20 or G30), difference of the distance between the start point and the enter of an arc and that between the end point and the center of the arc exceeded the value specified in parameter No.3410.
021	ILLEGAL PLANE AXIS COMMANDED	An axis not included in the selected plan (by using G17, G18, G19) was command in circular interpolation. Modify the program.
022	CIRCULAR INTERPOLATION	In circular interpolation, radius R, or the distance between the start point and the center of the arc, I, J, or K, has not been specified.
020	G NO CIRCLE RADIUS	When circular interpolation is specified, neither R (specifying an arc radius), or I, J, and K (specifying the distance from a start point to the center) is specified.
023	ILLEGAL RADIUS COMMAND	In circular interpolation by radius designation, negative value was commanded for address R. Modify the program.
028	ILLEGAL PLANE SELECT	In the plane selection command, two or more axes in the same direction are commanded. Modify the program.
029	ILLEGAL OFFSET VALUE	The offset values specified by T code is too large. Modify the program.
030	ILLEGAL OFFSET NUMBER	The offset number in T function specified for tool offset s too large. Modify the program

No.	Message	Contents
031	ILLEGAL P COMMAND IN G10	In setting an offset amount by G10, the offset number following address P was excessive of it was not specified. Modify the program.
032	ILLEGAL OFFSET VALUE IN G10	In setting an offset amount by G10 or in writing an offset amount by system variables, the offset amount was excessive.
033	NO SOLUTION AT NRC	A point of intersection cannot be determined for tool nose radius compensation. Modify the program.
034	NO CIRC ALLOWED IN ST-UP/EXT BLK	The start up or cancel was going to be performed in the G02 or G03 mode in tool nose radius compensation. Modify the program.
035	CAN NOT COMMAND G31	Skip cutting (G31) was specified in tool nose radius compensation mode. Modify the program.
037	CAN NOT CHANGE PLANE IN NRC	The offset plane is switched in tool nose radius compensation. Modify the program.
038	INTERFERENCE IN CIRCULAR BLOCK	Overcutting will occur in tool nose radius compensation because the arc start point or end point coincides with the arc center. Modify the program.
039	CHF/CNR NOT ALLOWED IN NRC	Chamfering or corner R was specified with a start-up, a cancel, or -switching between G41 and G42 in tool nose radius compensation. The program may cause overcutting to occurs in chamfering or corner R. Modify the program.
040	INTERFERENCE IN G90/94 BLOCK	Overcutting will occur in tool nose radius compensation in canned cycle G90 or G94. Modify the program. Modify the program.
041	INTERFERENCE IN NRC	Overcutting will occur in tool nose radius compensation. Modify the program.
046	ILLEGAL REFERENCE RETURN COMMAND	Other than P2. P3 and P4 are commanded for 2nd, 3rd and 4th reference position return command.
047	ILLEGAL AXIS SELECT	Two or more paralled axes (in parallel with a basic axis) have been specified upon start-up of three-dimensional tool compensation or three-dimensional coordinate conversion.
048	BASIC 3 AXIS NOT FOUND	Start-up of three-dimensional tool compensation or three-dimensional coordinate conversion has been attempted, but the three basic axes used when Xp, Yp, or Zp is omitted are not set in parameter No. 1022.

No.	Message	Contents
050	CHF/CNR NOT ALLOWED IN THRD BLK	Chamfering or corner R is commanded in the thread cutting block. Modify the program.
051	MISSING MOVE AFTER CHF/CNR	Improper movement or the move distance was specified in the block next to the chamfering or corner R block. Modify the program.
052	CODE IS NOT G01 AFTER CHF/CNR	The block next to the chamfering or corner R block in not G01. Modify the program.
053	TOO MANY ADDRESS COMMANDS	In the chamfering and corner R commands, two or more of I, K and R are specified. Otherwise, the character after a comma (",") is not C or R in direct drawing dimensions programming. Modify the program.
054	NO TAPER ALLOWED AFTER CHF/CNR	A block in which chamfering in the specified angle or the corner R was specified includes a taper command. Modify the program.
055	MISSING MOVE VALUE IN CHF/CNR	In chamfering or corner R block, the move distance is less than chamfer or corner R amount.
056	NO END POINT & ANGLE IN CHF/CNR	Neither the end point or angle is specified in the command for the block next to that for which only the angle is specified(A). In the chamfering command. I(K) is commanded for the X(Z) axis.
057	NO SOLUTION OF BLOCK END	Block end point is not calculated correctly in direct dimension drawing programming.
058	ND POINT NOT FOUND	Block end point is not found in direct dimension drawing programming.
059	PROGRAM NUMBER NOT FOUND	In an external program number search or external workpiece number search, a specified program number was not found. Otherwise, a program specified for searching is being edited in background processing. Check the program number and external signal. Or discontinue the background editing.

No.	Message	Contents
060	SEQUENCE NUMBER NOT FOUND	Commanded sequence number was not found in the sequence number search. Check the sequence number.
061	ADDRESS P/Q NOT FOUND IN G70-G73	Address P or Q is not specified in G70, G71, G72, or G73 command. Modify the program.
062	ILLEGAL COMMAND IN G71-G76	1. The depth of cut in G71 or G72 is zero or negative vale. 2. The repetitive count in G73 is zero or negative vale. 3. The negative value is specified to △ i or △ k is zero in G74 or G75. 4. A value" other than zero is specified to address U or W, though △ I or △ k is zero in G74 or G75. 5. A negative value is specified to △d, thought the relief direction in G74 or G75 is determined. 6. Zero or a negative value is specified to the height of thread or depth of cut of first time in G76. 7. The specified minimum depth of cut in G76 is greater than the height of thread. 8. An unusable angle of tool tip is specified in G76. Modify the program.
063	SEQUENCE NUMBER NOT FOUND	The sequence number specified by address P in G70, G71, G72, or G73 command cannot be searched. Modify the program.
064	SHAPE PROGRAM NOT MONO-TONOUSLY	A target shape which is not monotonous increase or decrease was specified in a repetitive canned cycle (G71 or G72).
065	ILLEGAL COMMAND IN G71-G73	1. G00 or G01 is not commanded at the block with the sequence number which is specified by address P in G71, G72, or G73 command. 2. Address Z(W) or X(U) was commanded in the block with a sequence number which is specified by address P in G71 or G72, respectively. Modify the program.
066	IMPROPER G-CODE IN G71-G73	An unallowable G code was commanded between two blocks specified by address P in G71, G72, or G73. Modify the program.

No.	Message	Contents
067	CAN NOT OPERATE IN MDI MODE	G70, G71, G72, or G73 command with address P and Q was specified. Modify the program.
069	FORMAT ERROR IN G70-G73	The final move command in the blocks specified by P and Q of G70, G71, G72, or G73 ended with chamfering or corner R.
070	NO PROGRAM SPACE IN MEMORY	The memory area is insufficient. Delete any unnecessary program, then retry.
071	DATA NOT FOUND	The address to be searched was not found, or the program with specified program number was not found in program number search. Check the data.
072	TOO MANY PROGRAMS	The number of programs to be stored exceeded 63(basic), 125(option), 200(option), 400(option), or 1000 (option). Delete unnecessary programs and execute program registration again.
073	PROGRAM NUMBER ALREADY IN USE	The commanded program number has already been used. Change the program number or delete unnecessary programs and execute program registration again.
074	ILLEGAL PROGRAM NUMBER	The program number is other than 1 to 9999. Modify the program number.
075	PROTECT	An attempt was made to register a program whose number was protected.
076	ADDRESS P NOT DEFINED	Address P (program number) was not commanded in the block which includes an M98, G65, or G66 command. Modify the program.
077	SUB PROGRAM NESTING ERROR	The subprogram was called in five folds. Modify the program.

No.	Message	Contents
078	NUMBER NOT FOUND	A program number or a sequence number which was specified by address P in the block which includes an M98, M99, G66 was not found. The sequence number specified by a GOTO statement was not found. Otherwise, a called program is being edited in background processing. Correct the program, or discontinue the back-ground editing.
079	PROGRAM VERIFY ERROR	In memory of program collation, a program in memory does not agree with that read from an external I/O device. Check both the programs in memory and those from the external device.
080	G37 ARRIVAL SIGNAL NOT ASSERTED	In the automatic tool compensation function (G36, G37), the measurement position reach signal (XAE or ZAE) is not turned on within an area specified in parameter 6254(value e). This is due to a setting or operator error.
081	OFFSET NUMBER NOT FOUND IN G37	Automatic tool compensation (G36, G37) was specified without a T code (Automatic tool compensation function). Modify the program.
082	T-CODE NOT ALLOWED IN G37	T code and automatic tool compensation (G36, G37) were specified in the same block (Automatic tool compensation function). Modify the program.
083	ILLEGAL AXIS COMMAND IN G37	In automatic tool compensation (G36, G37), an invalid axis was specified or the command is incremental. Modify the program.
085	COMMUNICATION ERROR	When entering data in the memory by using Reader/Puncher interface, an overrun, parity of framing error was generated. The number of bits of input data or setting of baud rate or specification No. of I/O unit is incorrect.
086	DR SIGNAL OFF	When entering data in the memory by using Reader/Puncher interface, the ready signal (DR) of reader/puncher was turned off. Power supply of I/O unit is off or cable is not connected or a P. C. B. is defective.

No.	Message	Contents
087	BUFFER OVERFLOW	When entering data in the memory by using Reader /Puncher interface, though the rad terminate command is specified, input is not interrupted after 10 characters read. I/O unit or P. C. B. is defective.
088	LAN FILE TRANS ERROR (CHANNEL-1)	File data transfer over the OSI-Ethernet was terminated as a result of a transfer error.
089	G LAN FILE TRANS ERROR(CHANNEL-2)	File data transfer over the OSI-Ethernet was terminated as a result of a transfer error.
090	REFERENCE RETURN INCOMPLETE	1. The reference position return cannot be performed normally because the reference position return start point is too close to the reference position or the speed is too slow. Separate the start point far enough form the reference position, or specify a sufficiently fast speed for reference position return. 2. During reference position return with the absolute-position detector, if this alarm occurs even though condition 1 is satisfied, do the following : After turing the servo motor for the axis at least one turn, turn the power off and then on again. Then perform reference position return.
091	REFERENCE RETURN INCOMPLETE	Manual reference position return cannot be performed when automatic operation is halted.
092	AXES NOT ON THE REFERENCE POINT	The commanded axis by G27(Reference position return check) did not return to the reference position.
094	P TYPE NOT ALLOWED (COORD CHG)	P type cannot be specified when the program is restarted (After the automatic operation was interrupted, the coordinate system setting operation was performed). Perform the correct operation according to the operator's manual.
095	P TYPE NOT ALLOWED (EXT OFS CHG)	P type cannot be specified when the program is restarted (After the automatic operation was interrupted, the external workpiece offset amount changed). Perform the correct operation according to the operator manual.
096	P TYPE NOT ALLOWED (WRK OFS CHG)	P type cannot be specified when the program is restarted (After the automatic operation was interrupted, the workpiece offset amount changed). Perform the correct operation according to the operator s manual.

No.	Message	Contents
097	P TYPE NOT ALLOWED (AUTO EXEC)	P type cannot be directed when the program is restarted. (After power ON. after emergency stop or P/S alarm 94 to 97 were reset, no automatic operation was performed. Perform automatic operation.
098	G28 FOUND IN SEQUENCE RETURN	A command of the program restart was specified without the reference position return operation after power ON or emergency stop, and G28 was found during search. Perform the reference position return.
099	MDI EXEC NOT ALLOWED AFT. SEARCH	After completion of search in program restart, a move command is given with MDI. Move axis before a move command or don" t interrupt MDI operation.
100	PARAMETER WRITE ENABLE	On the PARAMETER (SETTING) screen, PWE (parameter writing enabled) is set to 1. set it to 0, then reset the system.
101	PLEASE CLEAR MEMORY	The power turned off while rewriting the memory by program edit operation. If this alarm has occurred, press (RESET) while pressing <PROG>, and only the program being edited will be deleted. Register the deleted program.
109	P/S ALARM	A value other than 0 or 1 was specified after P in the G08 code, or no value was specified.
111	CALCULATED DATA OVERFLOW	The result of calculation is out of the allowable range (-10^{47} to -10^{29}, 0, and -10^{29} to 10^{47}).
112	DIVIDED BY ZERO	Division by zero was specified (including tan 90s). Modify the program.
113	IMPROPER COMMAND	A function which cannot be used in custom macro is command. Modify the program.
114	FORMAT ERROR IN MACRO	There is an error in other formats than (Formula). Modify the program.

No.	Message	Contents
115	ILLEGAL VARIABLE NUMBER	A value not defined as a variable number is designated in the custom macro or in high speed cycle cutting. The header contents are improper in a high speed cycle cutting. This alarm is given in the following cases : 1. The header corresponding to the specified machining cycle number called is not found. 2. The cycle connection data value is out of the allowable range(0-999). 3. The number of data in the header out of the allowable range(0~32767). 4. The start data variable number of executable format data is out of the allowable range (#85535). 6. The storing start data variable number of executable format data overlapped with the variable number used in the header. Modify the program.
116	WRITE PROTECTED VARIABLE	The left side of substitution statement is a variable whose substitution is inhibited. Modify the program.
118	PARENTHESIS NESTING ERROR	The nesting of bracket exceeds the upper limit (quintuple) Modify the program.
119	ILLEGAL ARGUMENT	The SQRT argument is negative. Or BCD argument is negative, or other values than 0 to 9 are present on each line of BIN argument. Modify the program.
122	FOUR FOLD MACRO MODAL-CALL	The macro modal call is specified four fold. Modify the program.
123	CAN NOT USE MACRO COMMAND IN DNC	Macro control command is used during DNC operation. Modify the program.
124	MISSING END STATEMENT	DO -END does not correspond to 1:1. Modify the program.
125	FORMAT ERROR IN MACRO	<Formula> format is erroneous. Modify the program.

No.	Message	Contents
126	ILLEGAL LOOP NUMBER	In Don, $1 \leq n \leq 3$ is not established. Modify the program.
127	NC, MACRO STATEMENT IN SAME BLOCK	Nc and custom macro commands coexist. Modify the program.
128	ILLEGAL MACRO SEQUENCE NUMBER	The sequence number specified in the branch command was not 0 to 9999. Or, it cannot be searched. Modify the program.
129	ILLEGAL ARGUMENT ADDRESS	An address which is not allowed in (argument Designation) is used. Modify the program.
130	ILLEGAL AXIS OPERATION	An axis control command was given by PMC to an axis controlled by CNC. Or an axis control command was given by CNC to an axis controlled by PMC. Modify the program.
131	TOO MANY EXTERNAL ALARM MESSAGES	Five or more alarms have generated external alarm message. Consult the PMC ladder diagram to find the cause.
132	ALARM NUMBER NOT FOUND	No alarm No. concerned exists in external alarm message clear. Check the PMC ladder diagram.
133	ILLEGAL DATA IN EXT. ALARM MSG	Small section data is erroneous in external alarm message or external operator message. Check the PMC ladder diagram.
135	SPINDLE ORIENTATION PLEASE	Without any spindle orientation, an attempt was made for spindle indexing. Perform spindle orientation.
136	C/H-CODE & MOVE CMD IN SAME BLK.	A move command of other axes was specified to the same block as spindle indexing addresses C, H. Modify the program.
137	M-CODE & MOVE CMD IN SAME BLK.	A move command of other axes was specified to the same block as M-code related to spindle indexing. Modify the program.

No.	Message	Contents
138	G SUPERIMPOSED DATA OVERFLOW	In PMC axis control, the increment for pulse distribution on the CNC and PMC side are too large when the superimposed control extended function is used.
139	CAN NOT CHANGE PMC CONTROL AXIS	An axis is selected in commanding by PMC axis control. Modify the program.
145	ILLEGAL COMMAND G112/G113	The conditions are incorrect when the polar coordinate interpolation starts or it is canceled. 1. In modes other than G40, G12.1/G13.1 was specified. 2. An error is found in the plane selection. Parameters No. 5460 and No. 5461 are incorrectly specified. Modify the value of program or parameter.
146	IMPROPER G COME	G codes which cannot be specified in the polar coordinate interpolation mode was specified. Modify the program.
150	ILLEGAL TOOL GROUP NUMBER	Tool Group No. exceeds the maximum allowable value. Modify the program.
151	TOOL GROUP NUMBER NOT FOUND	The tool group commanded in the machining program is not set. Modify the value of program or parameter.
152	NO SPACE FOR TOOL ENTRY	The number of tools within one group exceeds the maximum value registrable. Modify the number of tools.
153	T-CODE NOT FOUND	In 'tool life data registration, a T code was not specified where one should be. Correct the program.
155	ILLEGAL T-CODE IN M06	In the machining program, M06 and T code in the same block do not correspond to the group in use. Correct the program.
156	P/L COMMAND NOT FOUND	P and L commands are missing at the head of program in which the tool group is set. Correct the program.
157	TOO MANY TOOL GROUPS	The number of tool groups to be set exceeds the maximum allowable value (See parameter No. 6800 bit 0 and 1). Modify the program.

No.	Message	Contents
158	ILLEGAL TOOL LIFT DATA	The tool life to be set is too excessive. Modify the setting value.
159	TOOL DATA SETTING INCOMPLETE	During executing a life data setting program, power was turned off. Set again.
160	MISMATCH WAITING M-CODE(only with two path control)	Different M code is commanded in heads 1 and 2 as waiting M code. Modify the program.
161	COMMAND G68/G69 INDEPENDENTLY (only with two path control)	G68 and G69 are not independently commanded in balance cut. Modify the program.
169	ILLEGAL TOOL GEOMETRY DATA (only with two path control)	Incorrect tool figure data in interference check. Set correct data, or select correct tool figure data.
175	ILLEGAL G107	Conditions when performing circular interpolation start or cancel not correct. To change the mode to the cylindrical interpolation mode, specify the command in a format of "G07.1 rotation-axis name radius of cylinder."
176	IMPROPER G-CODE IN G107	Any of the following G codes which cannot be specified in the cylindrical interpolation mode was specified. 1. G codes for positioning, such as G28, G76, G81-G89, .including the codes specifying the rapid traverse cycle. 2. G codes for setting a coordinate system : G50, G52. 3. G code for selecting coordinate system : G53 G54-G59 Modify the program.
187	HOB COMMAND IS NOT ALLOWED	Error in the modal state when G81 (hobbing machine) 1) The C axis has not been set to be a rotary axis. 2) A hob axis and position coder gear ratio setting error Modify the parameter.
190	ILLEGAL AXIS SELECT	In the constant surface speed control, the axis specification is wrong. (See parameter No.3770) The specified axis command P) contain an illegal value. Correct the program.

No.	Message	Contents
194	SPINDLE COMMAND IN SYNCHRO-MODE	A control mode, spindle positioning (Cs-axis control) mode, or rigid tapping mode was specified during the serial spindle synchronous control mode. Correct the program so that the serial spindle synchronous control mode is released in advance.
197	C-AXIS COMMANDED IN SPINDLE MODE	The program specified a movement along the Cf-axis when the signal CON(DGN = G027#7)was off. Correct the program, or consult the PMC ladder diagram to find the reason the signal is not turned on.
199	MACRO WORD UNDEFINED	Undefined macro work was used. Modify the custom macro.
200	ILLEGAL S CODE COMMAND	In the rigid tapping, an S value is out of the range or is not specified. The maximum values for S which can be specified in rigid tapping is set in parameter 5241 to 5243. Change the setting in the parameter or modify the program.
201	FEEDRATE NOT FOUND IN RIGID TAP	In the rigid tapping, no F value is specified. Correct the program.
202	POSITION LSI OVERFLOW	In the rigid tapping, spindle distribution value is too large.
203	PROGRAM MISS AT RIGID TAPPING	In the rigid tapping, position for a rigid M code (M29) or an S command is incorrect. Modify the program.
204	ILLEGAL AXIS OPERATION	In the rigid tapping, an axis movement is specified between the rigid M code(M29) block and G84(G88) block Modify the program.
205	RIGID MODE DI SIGNAL OFF	Rigid tapping signal(DGNG061 #1) is not 1 when G84(G88)is executed though the rigid M code(M29) is specified. Consult the PMC ladder diagram to find the reason the signal is not turned on.
210	CAN NOT COMMAND M198/M199	M98 and M99 are executed in the schedule operation. M198 is executed in the DNC operation. Modify the program. 1) The execution of an Ml98 or M99 command was attempted during scheduled operation. Alternatively, the execution of an M198 command was attempted during DNC operation. Correct the program. The execution of an M99 command was attempted by an interrupt macro during pocket machining in a multiple repetitive canned cycle.

No.	Message	Contents
211	G3KHIGH) NOT ALLOWED IN G99	G31 is commanded in the per revolution command when the high speed skip option is provided. Modify the program.
212	ILLEGAL PLANE SELECT	The direct drawing dimensions programming is commanded for the plane other than the Z-X plane. Correct the program.
213	ILLEGAL COMMAND IN SYNCHRO-MODE	Movement is commanded for the axis to be synchronously controlled. Any of the following alarms occurred in the operation with the simple synchronization control. 1) The program issued the move command to the slave axis. 2) The program issued the manual continuous feed/manual handle feed/incremental feed command to the slave axis. 3) The program issued the automatic reference position return command without specifying the manual reference position return after the power was turned on. 4) The difference between the position error amount of the master and slave axes exceeded the value specified in parameter No.8313.
214	ILLEGAL COMMAND IN SYNCHRO-MODE	Coordinate system is set or tool compensation, of the shift type is executed in the synchronous control. Correct the program.
217	DUPLICATE G251 (COMMANDS)	G51.2 or G251 is further commanded in the polygon machining mode. Modify the program.
218	NOT FOUND P/Q COMMAND IN G251	P or Q is commanded in the G251 block, or the command value is out of the range. Modify the program.
219	COMMAND G250/G251 INDEPENDENTLY	G251 and G250 are not independent blocks.
220	ILLEGAL COMMAND IN SYNCHRO-MODE	In the synchronous operation, movement is commanded by the NC program or PMC axis control interface for the synchronous axis.
221	ILLEGAL COMMAND IN SYNCHRO-MODE	Polygon machining synchronous operation and axis control or balance cutting are executed at a time. Modify the program.
224	RETURN TO REFERENCE POINT	Not returned to reference point before cycle start.

No.	Message	Contents
225	SYNCHRONOUS/ MIXED CONTROL ERROR (only with two path control only)	This alarm is generated in the following circumstances.(Searched for during synchronous and mixed control command). 1. When there is a mistake in axis number parameter setting. 2. When there is mistake in control commanded. During hobbing synchronization, a command to bring the C-axis under synchrous, composite, or superimposed control is made.
226	ILLEGAL COMMAND IN SYNCHRO-MODE(only with two path control only)	A travel command has been sent to the axis being synchronized in synchronous mode. Modify the program or the parameter.
229	CAN NOT KEEP SYNCHRO-STATE (only with two path control only)	This alarm is generated in the following circumstances. 1. When the synchro/mixed state could not be kept due to system overload. 2. The above condition occurred in CNC devices (hardware) and synchrostate could not be kept (This alarm is not generated in normal use condition).
231	FORMAT ERROR IN G10 OR L50	Any of the following error occurred in the specified format at the programmable parameter input. 1. Address N or R was not entered. 2. A number not specified for a parameter was entered. 3. The axis number was too large. 4. An axis number was not specified in the axis-type parameter. 5. An axis number was specified in the parameter which is not an axis type. Correct the program. 6. In the locked state set by the password function, an attempt was made to set bit4 (NE9) of parameter No.3024 to 0 or change the contents of parameter No.3210. 7. An attempt was made to change a program encryption parameter (parameter No.3220 to 3223).
232	TOO MANY HELICAL AXIS COMMANDS	Three or more axes were specified as helical axes in the helical interpolation mode.
233	DEVICE BUSY	When an attempt was made to use a unit such as that connected via the RS-232-C interface, other users were using it.

No.	Message	Contents
239	BP/S ALARM	While punching was being performed with the function for controlling external I/O units, background editing was performed.
240	BP/S ALARM	Background editing was performed during MDI operation.
244	P/S ALARM	In the skip function activated by the torque limit signal, the number of accumulated erroneous pulses exceed 32767 before the signal was input. Therefore, the pulses cannot be corrected with one distribution. Change the conditions, such as feed rates along axes and torque limit, and try again.
245	T-CODE NOT ALOWED IN THIS BLOCK	One of the G codes, G50, G10, and G04, which cannot be specified in the same block as a T code, was specified with a T code.
246	ENCODE PROGRAM NUMBER ERROR	During read of an encrypted program, an attempt was made to store the program with a number exceeding the protection range.
247	ILLEGAL CODE USED FOR OUTPUT	When an encrypted program is output, EIA is set for the punch code. Specify ISO.
250	Z AXIS WRONG COMMAND(ATC)	Movement along the Z-axis is specified in a block specifying a tool change command (M06T__). (Only for ROBODRILL)'
251	ATC ERROR	This alarm is issued in the following cases: • An M06T__command contains an unusable T code. • An M06T command has been specified when the Z machine coordinate is positive. • The parameter for the current tool number tNo.7810) is set to 0. • An M06 command has been specified in canned cycle mode. • A reference position return command (G27 to G44) and M06 command have been specified in tool compensation mode (G41 or G44). • An M06 command has been specified without performing reference position return after power-on or the release of emergency stop. • The machine lock signal or Z-axis ignore signal has been turned on during tool exchange. • A pry alarm has been detected during tool exchange. Refer to diagnosis No.530 to determine the cause. (Only for ROBODRILL)

No.	Message	Contents
252	ATC SPINDLE ALARM	An excessive error arose during spindle positioning for ATC. For details, refer to diagnosis No.531(Only for ROBODRILL)
253	G05 IS NOT AVAILABLE	Alarm details Binary input operation using high-speed remote buffer (G05) or high-speed cycle machining (G05) has been specified in advance control mode (G08P1). Execute G08P0; lto cancel advance control mode, before executing these G05 commands.
5010	END OF RECORD	The end of record(%) was specified.
5011	PARAMETER ZERO (CUT MAX)	The maximum cutting feedrate (parameter No.1422, No.1430. No.1431. No.1432) is 0 in the HPCC mode.
5014	TRACE DATA NOT FOUND	Transfer cannot be performed because no trace data exists.
5015	NO ROTATION AXIS	The specified rotation axis does not exist for tool axis direction handle feed.
5016	ILLEGAL COMBINATION OF M CODE	M codes which belonged to the same group were specified in a block. Alternatively, an M code which must be specified without other M codes in the* block was specified in a block with other M codes.
5018	POLYGON AXIS SPEED ERROR	Function category : Polygon turning alarm details : In G51.2 mode, the speed of the spindle or polygon synchronous axis either exceeds the clamp value or is too small. The specified rotation speed ratio thus cannot be maintained.
5020	PARAMETER OF RESTART ERROR	An erroneous parameter was specified for restarting a program. A parameter for program restart is invalid.
5046	ILLEGAL PARAMETER (ST.COMP)	The parameter settings for straightness compensation contain an error. 1. A parameter for a movement axis or compensation axis contains an axis number which is not used. 2. Move than 128 pitch error compensation points exist between the negative and positive end points. 3. Compensation point numbers for straightness compensation are not assigned in the correct order.

No.	Message	Contents
5046	ILLEGAL PARAMETER (ST. COMP)	4. No straightness compensation point exists between the pitch error compensation points at the negative and positive ends. 5. The compensation value for each compensation point is too large or too small. 6. The settings of parameter Nos.13881 to 13886 are illegal (in the interpolation type straightness compensation).
5051	M-NET CODE ERROR	Abnormal character received (other than code used for transmission)
5052	M-NET ETX ERROR	Abnormal ETX code
5053	M-NET CONNECT ERROR	Connection time monitoring error (parameter No. 175)
5054	M-NET RECEIVE ERROR	Polling time monitoring error (parameter No. 176)
5055	M-NET PRT/FRT EEROR	Vertical parity or framing error
5057	M-NET BOARD SYSTEM DOWN	Transmission timeout error (parameter No.177) ROM parity error CPU interrupt other than the above.
5058	G35/G36 FORMAT ERROR	A command for switching the major axis has been specified for circular threading. Alternatively, a command for setting the length of the major axis to 0 has been specified for circular threading.
5059	RADIUS IS OUT OF RANGE	A radius exceeding nine digits has been specified for circular interpolation with the center of the arc specified with I, J, and K.
5063	ILLEGAL FORMAT IN G02.3/03.3	The value specified in an exponential interpolation command (G02.3/03.3) is illegal. A value that does not allow exponential interpolation is specified. (For example, a negative value is specified in In.)
5073	NO DECIMAL POINT	No decimal point has been specified for an address requiring a decimal point.
5074	ADDRESS DUPLICATION ERROR	The same address has been specified two or more times in a single block. Alternatively, two or more G codes in the same group have been specified in a single block.
5082	DATA SERVER ERROR	This alarm is detailed on the data server message screen.

No.	Message	Contents
5085	SMOOTH IPL ERROR 1	A block for specifying smooth interpolation contains a syntax error.
5134	FSSB : OPEN READY TIME OUT	Initialization did not place FSSB in the open ready state.
5135	FSSB : ERROR MODE	PSSB has entered error mode.
5136	FSSB : NUMBER OF AMPS IS SMALL	In comparison with the number of controlled axes, the number of amplifiers recognized by FSSB is not enough.
5137	FSSB : CONFIGURATION ERROR	FSSB detected a configuration error.
5138	FSSB : AXIS SETTING NOT COMPLETE	In automatic setting mode, axis setting has not been made yet. Perform axis setting on the FSSB setting screen.
5139	FSSB : ERROR	Servo initialization did not terminate normally. The optical cable may be defective, or there may be an error in connection to the amplifier or another module. Check the optical cable and the connection status.
5155	NOT RESTART PROGRAM BY G05	During servo leaning control by G05,, an attempt was made to perform restart operation after feed hold or interlock. This restart operation cannot be performed. (G05 leaning control terminates at the same time).
5195	DIRECTION CAN NOT BE JUDGED	When the touch sensor with a single contact signal input is used in the direct input B function for tool offset measurement values, the stored pulse direction is not constant. One of the following conditions exists : • The stop state exists in offset write mode. • Servo off state • The direction varies. • Movement takes place simultaneously along two axes.
5197	FSSB : OPEN TIME OUT	Detach operation was performed in HPCC mode. (If detach operation is performed in HPCC mode, this alarm is issued after the currently executed block terminates.)
5197	FSSB : OPEN TIME OUT	The CNC permitted FSSB to open, but FSSB was not opened.
5198	FSSB : IDID DATA NOT READ	Temporary assignment failed, so amplifier initial ID information could not be read.

No.	Message	Contents
5199	FINE TORQUE SENSING PARAMETER	A parameter related to the fine torque sensing function is illegal. • The storage interval is invalid. • An invalid axis number is set as the target axis. Correct the parameter.
5218	ILLEGAL PARAMETER (INCL. COMP)	There is an inclination compensation parameter setting error. Cause: 1. The number of pitch error compensation points between the negative (-) end and positive (+) end exceeds 128. 2. The relationship in magnitude among the inclination compensation point numbers is incorrect. 3. An inclination compensation point is not located between the negative (-) end and positive(+) end of the pitch error compensation points. 4. The amount of compensation per compensation point is tool large or too small. Correct the parameter.
5219	CAN NOT RETURN	Manual intervention or return is not allowed during three-dimensional coordinate conversion.
5220	REFERENCE POINT ADJUSTMENT MODE	A parameter for automatically set reference position is set. (Bt 2 of parameter No.1819 = 1) Perform automatic setting. (Position the machine at the reference position manually, then perform' manual reference position return.) Supplementary : Automatic setting sets bit 2 of parameter No.1819 to 0.
5222	SRAM CORRECT TABLE ERROR	The SRAM correctable error cannot be corrected.. . Cause : A memory problem occurred during memory initialization. Actio : Replace the master printed circuit board (SRAM module).
5227	FILE NOT FOUND	A specified file is not found during communication with the built-in handy File.
5228	SAME NAME USED	There are duplicate file names in the built-in Hand File.
5229	WRITE PROTECTED	A floppy disk in the built-in Handy File is write protected.
5231	TOO MANY FILES	There number of files exceeds the limit during communication with the built-in Handy File.
5232	DATA OVER-FLOW	There is not enough floppy disk space in the built-in Handy File.

No.	Message	Contents
5235	COMMUNICATION ERROR	A communication error occurred during communication with the built-in Handy File.
5237	READ ERROR	A floppy disk in the built-in Handy File cannot be read from. The floppy disk may be defective, or the head may be dirty. Alternatively, the Handy File is defective.
5238	WRITE ERROR	A floppy disk in the built-in Handy File cannot be read from. The floppy disk may be defective, or the head may be dirty. Alternatively, the Handy File is defective.
5257	G41/G42 NOT ALLOWED IN MDI MODE	G41/G42 (tool-nose radius compensation: T series) was specified in MDI mode. (Depending on the setting of bit 4 of parameter No.5008)
5300	SET ALL OFFSET DATAS AGAIN	After the inch/metric automatic conversion function (OIM : Bit 0 of parameter No.5006) for tool offset data is enabled or disabled, all the tool offset data must be reset. This message reminds the operator to reset the data. If this alarm is issued, reset all the tool offset data. Operating the machine without resetting the data will result in a malfunction.
5302	ILLEGAL COMMAND IN G68 MODE	A command to set the coordinate system is specified in the coordinate system rotation mode.
5303	TOUCH PANEL ERROR	A touch panel error occurred. Cause : 1. The touch panel is kept pressed. 2. The touch panel was pressed when power was turned on. Remove the above causes, and turn on the power again.
5306	MODE CHANGE ERROR	In a one-touch macro call, mode switching at the time of activation is not performed correctly.
5311	FSSB : ILLEGAL CONNECTION	A connection related to FSSB is illegal. This alarm is issued when either of the following is found : 1. Two axes having adjacent servo axis numbers (parameter No.1023), odd number and even number, are assigned to amplifiers to which different FSSB systems are connected. 2. The system does not satisfy the requirements for performing HRV control, and use of two pulse modules connected to different FSSB systems having different FSSB current control cycles is specified.
5321	S-COMP. VALUE OVERFLOW	The straightness compensation value has exceeded the maximum value of 32767. After this issued, make a manual reference position return.
5405	ILLEGAL PARAMETER IN G41.2/G42.2	The Parameter setting that determines the relationship between the rotation axis and rotation plane is incorrect.

2) Background edit alarm

No.	Message	Contents
???	BP/S ALARM	BP/S alarm occurs in the same number as the P/S alarm that occurs in ordinary program edit.
140	BP/S ALARM	It was attempted to select or delete in the background a program being selected in the foreground (Note). Use background editing correctly.

Note

Alarm in background edit is displayed in the key input of the background edit screen instead of the ordinary alarm screen and is resettable by any of the MDI key operation.

3) Absolute pulse coder (APC) alarm

No.	Message	Contents
300	APC ALARM : n AXIS NEED ZRN	Manual reference position return is required for the nth-axis(n = 1-8)
301	APC ALARM : n AXIS COMMUNICATION	nth-axis(m = l-8) APC communication error. Failure in data transmission Possible causes include a faulty APC, cable, or servo interface module.
302	APC ALARM : n AXIS OVER TIME	nth-axis(n = 1-8) APC overtime error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
303	APC ALARM : n AXIS FRAMING	nth-axis(n = 1-8) APC framing error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
304	APC ALARM : n AXIS PARITY	nth-axis(n = 1-8) APC parity error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
305	APC ALARM : n AXIS PULSE MISS	nth-axis(n = 1-8) APC pulse error. APC alarm. APC or cable may be faulty.
306	APC ALARM : n AXIS BATTERY ZERO	nth-axis(n = 1-8) APC battery voltage has decreased to a low level so that the data cannot be held. APC alarm. Battery or cable may be faulty.
307	APC ALARM : n AXIS BATTERY DOWN 1	nth-axis(n = 1-8) axis APC battery voltage reaches level where the battery must be renewed. APC alarm. Replace the battery.
308	APC ALARM : n AXIS BATTERY DOWN 2	nth-axis(n = 1-8) APC battery voltage has reached a level where the battery must be renewed (including when power is OFF). APC alarm. Replace battery.
309	APC ALARM : n AXIS ZRN IMPOSSIBLE	An attempt was made to perform reference position return without rotating the motor through one or more turns. Rotate the motor through one or more turns, turn off the power then on again, then perform reference position return.

4) Inductosyn alarms

No.	Message	Contents
330	INDUCTOS YN : DATA ALARM	The absolute-position data (offset data) from Inductosyn cannot be detected.
331	INDUCTOS YN : ILLEGAL PRM	Parameter No.1874, 1875, or 1876 is set to 0.

5) Serial pulse coder (SPC) alarms

No.	Message	Contents
360	n AXIS: ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built-in pulse coder.
361	n AXIS: ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built-in pulse coder.
362	n AXIS -'ABNORMAL REV.DATA(INT)	A rotation speed count error occurred in the built-in pulse coder.
363	n AXIS: ABNORMAL CLOCK (INT)	A clock error occurred in the built-in pulse coder.
364	n AXIS: SOFT PHASE ALARM(INT)	The digital servo software detected in valid data in the built-in pulse coder.
365	n AXIS: BROKEN LED(INT)	An LED error occurred in the built-in pulse coder.
366	n AXIS: PULSE MISS(INT)	A pulse error occurred in the built-in pulse coder.
367	n AXIS: COUNT MISS(INT)	A count error occurred in the built-in pulse coder.
368	n AXIS: SERIAL DATA ERROR (INT)	Communication data from the built-in pulse coder cannot by received.
369	n AXIS: DATA TRANS. ERROR (INT)	A CRC or stop bit error occurred in the communication data being received from the built-in pulse coder.
380	n AXIS: BROKEN LED (EXT)	The LED of separate detector is erroneous.
381	n AXIS: ABNORMAL PHASE (EXT LIN)	A phase data error occurred in the separate linear scale.

No.	Message	Contents
382	n AXIS: COUNT MISS (EXT)	A pulse error occurred in the separate detector.
383	n AXIS: PULSE MISS (EXT)	A count error occurred in the separate detector.
384	n AXIS: SOFT PHASE ALARM(EXT)	The digital servo software detected invalid data in the separate detector.
385	n AXIS: SERIAL DATA ERROR(EXT)	Communication data from the separate detector cannot be received.
386	n AXIS: DATA TRANSJERROR(EXT)	A CRC or stop bit error occurred in the communication data being received from separate detector.
387	n AXIS: ABNORMAL ENCODER(EXT)	An error occurs in the separate detector. For details, contact the manufacturer of the scale.

- The details of serial pulse coder alarm
  The details of serial pulse coder alarm are displayed in the diagnosis display (No. 202 and No.203) as shown below.

	#7#	6#	5#	4#	3#	2#	1#	#0
202		CSA	BLA	PHA	PCA	BZA	CKA	SPH

#6(CSA) : The serial pulse coder is defective. Replace it.

#5(BLA) : The battery voltage is low. Replace the batteries.

#4(PHA) : The serial pulse coder of feedback cable is defective. Replace the serial pulse coder or cable.

#3(PCA) : The serial pulse coder is defective. Replace it. #2(BZA) : The pulse coder was supplied with power for the first time.
Make sure that the batteries are connected.
Turn the power off, then turn it on again and perform a reference position return.

#1(CKA) : The serial pulse coder is defective. Replace it.

#0(SPH) : The serial pulse coder or feedback cable is defective. Replace the serial pulse coder or cable.

	#7#	6tt	5#	4#	3#	2#	1#	#0
203	DTE	CRC	STB	PRM				

#7(DTE) : The serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective.
Replace the pulse coder, feedback cable, or NC-axis board.

#6(CRC) : The serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective.
Replace the pulse coder, feedback cable, or NC-axis board.

#5(STB) : The serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective.
Replace the pulse coder, feedback cable, or NC-axis board.

#4(PRM) : An invalid parameter was found. Alarm 417(invalid servo parameter) is also issued.

6) Servo alarms(l/2)

No.	Message	Contents
401	SERVO ALARM : n-TH AXIS VRDY OFF	The n-th axis (axis 1-8) servo amplifier READY signal (DRDY) went off. Refer to procedure of trouble shooting.
402	SERVO ALARM : SV CARD NOT EXIST	The axis control card is not provided.
403	SERVO ALARM : CARD /SOFT MISMATCH	The combination of the axis control card and servo software is illegal. The possible causes are as following: • A correct axis control card is not provided. • Correct servo software is not installed on flash memory.
404	SERVO ALARM n-TH AXIS VRDY ON	Even though the n-th axis (axis 1-8) READY signal (MCON) went off, the servo amplifier READY signal (DRDY) is still on. Or, when the power was turned on. DRDY went on even thought MCON was off. Check that the servo interface module and servo amp are connected.
405	SERVO ALARM: (SERVO POINT RETURN FAULT)	Position control system fault. Due to an NC or servo system fault in the reference position return, there is the possibility that reference position return could not be executed correctly. Try again from the manual reference position return.

No.	Message	Contents
407	SERVO ALARM: EXCESS ERROR	The following error occurred during simple synchronous control : The difference in machine coordinates between the synchronized axes exceeds the value set in parameter No.8314.
409	SERVO ALARM :n AXIS TORQUE ALM	Abnormal servo motor load has been detected. Alternatively, abnormal spindle motor load has been detected in Cs mode.
410	SERVO ALARM : n-TH AXIS EXCESS ERROR	One of the following errors occurred : 1) The positional deviation value when the n-th axis stops exceeds the value set in parameter No. 1829. 2) In simple synchronous control, the compensation amount for synchronization exceeds the value set in parameter No.8325. This alarm is issued only for the slave axis.
411	SERVO ALARM : n-TH AXIS EXCESS ERROR	The position deviation value when the n-th axis (axis 1-8) moves is larger than the set value. Refer to procedure of trouble shooting.
413	SERVO ALARM : n-TH AXIS LSI OVERFLOW	The contents of the error register for the n-th axis (axis 1-8) exceeded $\pm 2^{31}$ power. This error usually occurs as the result of an improperly set parameters.
415	SERVO ALARM : n-TH AXIS EXCESS' SHIFT	A speed higher than 524288000 units/s was attempted to be set in the n-th axis (axis 1-8). This error occurs as the result of improperly set CMR.
417	SERVO ALARM : n-TH AXIS DGTL PARAMETER	This alarm occurs when the n-th axis (axis 1-8) is in one of the conditions listed below (Digital servo system alarm). 1) The value set in Parameter No.2020(motor form) is out of the specified limit. 2) A proper value (111 or -111) is not set in parameter x 'No. 2022(motor revolution direction). 3) Illegal data(a value below 0, etc.) was set in parameter No.2023(number of speed feedback pulses per motor revolution). 4) Illegal data (a value below 0, etc.) was set in parameter No.2024(number of speed feedback pulses per motor revolution). 5) Parameters No. 2084 and No. 2085(flexible field bear rate) have not been set. 6) A value outside the limit of {1 to the number of control axes} or a non-continuous value (parameter 1023(servo axis number) contains a value out of the range form 1 to the number of axes, or an isolated value (for example, 4 not preceded by 3) was set in parameter No. 1023(servo axis number). 7) A torque control parameter is set incorrectly in PMC axis control. (The torque constant parameter is set to 0.)

No.	Message	Contents
420	SERVO ALARM:n AXIS SYNC TORQUE	During simple synchronous control, the difference between the torque commands for the master and slave axes exceeded the value set in parameter No.2031.
421	SERVO ALARMS AXIS EXCEES ER(D)	The difference between the errors in the semi-closed loop and closed loop has become excessive during dual position feedback. Check the values of the dual position conversion coefficients in parameters No.2078 and 2079.
422	SERVO ALARM:n AXIS	In torque control of PMC axis control, a specified allowable speed has been exceeded.
423	SERVO ALARM :n AXIS	In torque control of PMC axis control, the parameter-set allowable cumulative travel distance has been exceeded.
430	n AXIS:SV. MOTOR OVERHEAT	A servo motor overheat occurred.
431	n AXIS:CNV.OVERLOAD	1) PSM : overheat occurred. 2) β series SNU : Overheat occurred.
432	n AXIS:CNV.LOW VOLT CONTROL	1) PSM : Control power voltage has dropped. 2) PSMR : The control power supply voltage has dropped. 3) β series SNU : The control power supply voltage has dropped.
433	n AXIS:CNV.LOW VOLT DC LINK	1) PSM : The DC link voltage has dropped. 2) PSMR : The DC link voltage has dropped. 3) α series SVU : The DC link voltage has dropped. 4) β series SNU : The DC link voltage has dropped.
434	n AXIS:INV.LOW VOLT CONTROL	SVM : The control power supply voltage has dropped.
435	n AXIS:INV.LOW VOLT CONTROL	SVM : The DC link voltage has dropped.
436	n AXISrSOFTTHERMAL (OVC)	The digital servo software detected the soft thermal state (OVC).
437	n AXIS:CNV. OVERCURRENT	PSM : Overcurrent flowed into the input circuit.
438	n AXIS: IN V. ABNORMAL CURRENT	1) SVM : The motor current is too high. 2) α series SVU : The motor current is too high. 3) β series SNU : The motor current is too high.
439	n AXIS :CNV.OVER VOLT POWER	1) PSM : The DC link voltage is too high. 2) PSMR : The DC link voltage is too high. 3) αseries SVU : The C link voltage is too high. 4) β series SNU : The link voltage is too high.

No.	Message	Contents
440	n AXIS:CNV.EX DECELERATION POW.	1) PSMR : The regenerative discharge amount is too large. 2) α series SVU : The regenerative discharge amount is tool large. Alternatively, the regenerative discharge circuit is abnormal.
441	n AXIS:ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
442	n AXIS:CNV.CHARGE FAILURE	1) PSM : The spare discharge circuit of the DC link is abnormal. 2) PSMR : The spare discharge circuit of the DC link is abnormal.
443	n AXIS:CNV.COOLING FAN FAILURE	1) PSM : The internal stirring fan failed. 2) PSMR : The internal stirring fan failed. 3) β series SVU : The internal stirring fan failed.
444	n AXIS:INV. COOLING FAN FAILURE	SVM : The internal stirring fan failed.
445	n AXIS:SPOT DISCONNECT ALARM	The digital servo software detected an broken wire in the pulse coder.
446	n AXIS:HARD DISCONNECT ALARM	A broken wire in the built-in pulse coder was detected by hardware.
447	n AXIS:HARD . DIS,CONNECT(EXT)	A broken wire in the separate detector was detected by hardware.
448	n AXIS:UNMATCHED FEEDBACK ALARM	The sign of feedback data from the built-in pulse coder differs from that of feedback data from the separate detector.
449	n AXIS:INV.IPM ALARM	1) SVM : IPM(intelligent power modual) detected an alarm. 2) α series SVU : IPM(intelligent power modual) detected an alarm.
453	n AXIS:SPC SOFT DISCONNECT ALARM	Software disconnection alarm of the α pulse coder. Turn off the power to the CNC, then remove and insert the pulse coder cable. If this alarm is issued again, replace the pulse coder.
456	ILLEGAL CURRENT LOOP	The current control cycle setting (parameter No.2004, bit 0 of parameter No.2003, and bit 0 of parameter No.2013) are incorrect. - For the two axes whose servo axis numbers (setting of parameter No.1023) are an odd number followed by an even number (a pair of axes 1 and 2 or axes 5 and 6, for example), a different current control cycle is set for each of the axes. - The requirements for slaves needed for the set current control cycle, including the number, type, and connection method of them, are not satisfied.

No.	Message	Contents
457	ILLEGAL HI HRV (250US)	Use of high-speed HRV is specified although the current control cycle is 200μs.
458	CURRENT LOOP ERROR	The current control cycle setting does not match the actual current control cycle.
459	HI HRV SETTING ERROR	Of two axes having adjacent servo axis numbers (parameter No.1023), odd number and even number, high-speed HRV control can be performed for one axis and not for the other.
460	n AXIS:FSSB DISCONNECT	FSSB communication was disconnected suddenly. The possible causes are follows : 1) The FSSB communication cable was disconnected or broken. 2) The power to the amplifier was turned off suddenly. 3) A low-voltage alarm was issued by the amplifier.
461	n AXIS ILLEGAL AMP INTERFACE	The axes of the 2-axis amplifier were assigned to the fast type interface.
462	n AXIS: SEND CNC DATA FAILED	Because of an FSSB communication error, a slave could not receive correct data.
463	n AXIS: SEND SLAVE DATA FAILED	Because of an FSSB communication error, a servo system could not receive correct data.
464	n AXIS: WRITE ID DATA FAILED	An attempt was made to write maintenance information on the amplifier maintenance screen, but it failed.
465	n AXIS: RE AD ID DATA FAILED	At power-up, amplifier initial ID information could not be read.
466	n AXIS: MOTOR/AMP COMBINATION	The maximum current rating for the amplifier does not match that for the motor.
467	n AXIS:ILLGAL SETTING OF AXIS	The servo function for the following has not been enabled when an axis occupying a single DSP (corresponding to two ordinary axes) is specified on the axis setting screen. 1. Learning control (bit 5 of parameter No.2008 = 1) 2. High-speed current loop (bit 0 of parameter No.2004 = 1) 3. High-speed interface axis (bit 4 of parameter No.2005 = 1)
468	HI HRV SETTING ERROR (AMP)	Use of high-speed HRV is specified for a controlled axis of an amplifier which does not support high-speed HRV.

- Details of servo alarm

  The details of servo alarm No. 414 are displayed in the diagnosis display. (No. 200 and No. 204) as shown below.

	#7#	6#	5#	4#	3#	#2	#1	#0
200	OVL	LV	OVC	HCA	HVA	DCA	FBA	OFA

#7(OVL) : An overload alarm is being generated.
(The details are indicated in diagnostic data No.20l)

#6 (LV) : A low voltage alarm is being generated in servo amp.
Check LED.

#5(OVC) : A overcurrent alarm is being generated inside of digital servo.

#4(HCA) : An abnormal current alarm is being generated in servo amp.
Check LED.

#3(HVA) : An overvoltage alarm is being generated in servo amp.
Check LED.

#2(DCA) : A regenerative discharge circuit alarm is being generated in servo amp.
Check LED.

#1(FBA) : A disconnection alarm is being generated.
(The details are indicated in diagnostic data No.201)

#0(OFA) : An overflow alarm is being generated inside of digital servo.

	#7#	6#	5#	4#	3#	2#	1#	#0
201	ALD			EXP				

When OVL equal 1 in diagnostic data No. 200(servo alarm No. 400 is being generated) :

#7(ALD) 0 : Motor overheating

1 : Amplifier overheating

When FBAL equal 1 in diagnostic data No. 200(servo alarm No.416 is being generated)

ALD	EXP	Alarm details
1	0	Built-in pulse coder disconnection (hard ware)
1	1	Separately installed pulse coder disconnection (hard ware)
0	0	Pulse coder is not connected due to software

	#7#	64*	5#	4#	3#	2#	1#	#0
204		OFS	MCC	LDA	PMS			

#6(OFS) : A current conversion error has occurred in the digital servo.

#5(MCC) : A magnetic contactor contact in the servo amplifier has welded.

#4(LDA) : The LED indicates that serial pulse coder C is defective

#3(PMS) : A feedback pulse error has occurred because the feedback cable is defective.

7) Over travel alarms

No.	Message	Contents
500	OVER TRAVEL : +n	Exceeded the n-th axis (axis 1-8) -t- side stored stroke check I (Parameter No. 1320 or 1326 NOTE).
501	OVER TRAVEL : -n	Exceeded the n-th axis (axis 1-8) - side stored stroke check I (Parameter No. 1321 or 1327 NOTE).
502	OVER TRAVEL : +n	Exceeded the n-th axis (axis 1-8) + side stored stroke check II (Parameter No. 1322).
503	OVER TRAVEL : -n	Exceeded the n-th axis (axis 1-8) - side stored stroke check II (Parameter No. 1323).
504	OVER TRAVEL : +n	Exceeded the" n-th axis (axis 1-8) + side stored stroke check III (Parameter No. 1324).
505	OVER TRAVEL : -n	Exceeded the n-th axis (axis 1-8) - side stored stroke check III (Parameter No. 1325).
506	OVER TRAVEL : +n	Exceeded the n-th axis (axis 1-8) + side hardware OT.
507	OVER TRAVEL : -n	Exceeded the n-th axis (axis 1-8) - side hardware OT.
508	INTERFERENCE : +n	A tool moving in the positive direction along the n axis has fouled another tool post.
509	INTERFERENCE : -n	A tool moving in the positive direction along the n axis has fouled another tool post.
510	OVER TRAVEL : +n	Alarm for stroke check prior to movement. The end point specified in a block falls within the forbidden area defined with the stroke check in the negative direction along the N axis. Correct the program.
511	OVER TRAVEL : -n	Alarm for stroke check prior to movement. The end point specified in a block falls within the forbidden area defined with the stroke check in the negative direction along the N axis. Correct the program.
514	INTERFERENCE : +n	The rotation area interference check function found interference on the plus side of the n axis.
515	INTERFERENCE : -n	The rotation area interference check function found interference on the plus side of the n axis.

Note

Parameters 1326 and 1327 are effective when EXLM (stroke limit switch signal) is on.

8) Servo alarms(2/2)

No.	Message	Contents
600	n AXIS:INV.DC LINK OVER CURRENT	DC link current is too large.
601	n AXIS:INV.RADIATOR FAN FAILURE	The external dissipator stirring fan failed.
602	n AXIS: OVERHEAT	The servo amplifier was overheated.
603	n AXIS:INV.IPM ALARM (OH)	The IPM (intelligent power module) detected an overheat alarm.
604	n AXIS: AMP. COMMUNICATION ERROR	Communication between the SVM and the PSM failed.
605	n AXIS:CNV.EX. DISCHARGE POW	SPMR : Regenerative power is too large.
606	n AXIS:CNV.RADIATOR FAN FAILURE	SPM : The external dissipator stirring fan failed. SPMR : The external dissipator stirring fan failed.
607	n AXIS:CNV. SINGLE PHASE FAILURE	PSM : Input voltage is in the open-phase condition. PSMR : Input voltage is in the open-phase condition.

9) Overheat alarms

No.	Message	Contents
700	OVERHEAT : CONTROL UNIT	Control unit overheat. Check that the fan motor operates normally, and clean the air filer.
701	OVERHEAT : FAN MOTOR	The fan motor on the top of the cabinet for the control unit is overheated. Check the operation of the fan motor and replace the motor if necessary.
704	OVERHEAT : SPINDLE	Spindle overheat in the spindle fluctuation detection. 1. If the cutting load is heavy, relive the cutting condition. 2. Check whether the cutting tool is share. 3. Another possible cause is faulty spindle amp.

10) Rigid tapping alarm.

No.	Message	Contents
740	RIGID TAP ALARM: EXCESS ERROR	The positional deviation of the stopped spindle has exceeded the set value during rigid tapping.
741	RIGID TAP ALARM: EXCESS ERROR	The positional deviation of the stopped spindle has exceeded the set value during rigid tapping.
742	RIGID TAP ALARM: LSI OVER FLOW	An LSI overflow has occurred for the spindle during rigid tapping.

11) Serial spindle alarm

No.	Message	Contents
749	S-SPINDLE LSI ERROR	[t is serial communication error while system is executing after power supply on. Following reasons can be considered. 1) Optical cable connection is fault or cable is not connected or cable is cut. 2) MAIN CPU board or option 2 board is fault. 3) Spindle amp. printed board is fault. 4) The spindle amplifier is under an abnormal condition. (The SPM indication is A, Al, A2, or the like, depending on the type of the abnormality.) If this alarm occurs when CNC power supply is turned on or when this alarm can not be cleared even if CNC is reset, turn off the power supply also turn off the power supply in spindle side. If the spindle amplifier is under an abnormal condition, check the SPM indication (A, Al, A2, or the like). Then, refer to the FANUC SERVO MOTOR αi series MAINTENANCE MANUAL (B-65285EN) or FANUC SERVO MOTOR α series MAINTENANCE MANUAL (B-65165E) to solve the problem.
750	SPINDLE SERIAL LINK ERROR	This alarm is generated when the spindle control unit is not' ready for starting correctly when the power is turned on in the system with the serial spindle. The four reasons can be considered as follows : 1. An improperly connected optic cable, or the spindle control unit* s power is OFF. 2. When the NC power was turned on under alarm conditions other than SU-01 or AL-24 which are shown on the LED display of the spindle control unit. In this case, turn the spindle amplifier power off once and perform startups again. 3. Other reasons (improper combination of hardware) This alarm does not occur after the system including the spindle control unit is activated. 4. The second spindle (when SP2, bit 4 of parameter No 3701, is 1) is in one of the above conditions 1) to 3). See diagnostic display No. 409 for details.

No.	Message	Contents
752	FIRST SPINDLE MODE CHANGE FAULT	This alarm is generated if the system does not properly terminate a mode change. The modes include the Cs contouring, spindle positioning, rigid tapping, and spindle control modes. The alarm is activated if the spindle control unit does not respond correctly to the mode change command issued by the NC.
754	SPINDLE-1 ABNORMAL TORQUE ALARM	Abnormal first spindle motor load has been detected.
762	SECOND SPINDLE MODE CHANGE FAULT	Refer to alarm No.752(For 2nd axis)
764	SPINDLE-2 ABNORMAL TORQUE ALARM	Same as alarm No. 754 (for the second spindle)
772	SPINDLE-3 MODE CHANGE ERROR	Same as alarm No. 752(for the third spindle)
774	SPINDLE-3 ABNORMAL TORQUE ALARM	Same as alarm No. 754 (for the third spindle)
782	SPINDLE-4 MODE CHANGE ERROR	Same as alarm number 752 (for the fourth spindle)
784	SPINDLE-4 ABNORMAL TORQUE ALM	Same as alarm number 754 (for the fourth spindle)

- The details of spindle alarm
  -1st and 2nd spindles

	#7#	6#	5#	4#	3#	2#	1#	#0
409				SPE	S2E	S1E	SHE	

#3(SPE) 0 : In the spindle serial control, the serial spindle parameter fulfill the spindle unit startups conditions.

1 : In the spindle serial control, the serial spindle parameter fulfill the spindle unit startups conditions.

#2(S2E) 0 : The second spindle is normal during the spindle serial control startups.

1 : The second spindle was detected to have a fault during the spindle serial control startups.

#1(S1E) 0 : The first spindle is normal during the spindle serial control startups.
1 : The first spindle was detected to have a fault during the spindle axis serial control startups.
#0(SHE) 0 : The serial communications module in the CNC is normal.
1 : The serial communications module in the CNC was detected to have a fault.

- The details of spindle alarm -3rd and 4th spindles
  The details of spindle alarm No.750 are displayed in the diagnosis display (No.409)as shown below.

	#7#	6#	5#	4#	3#	2#	1#	#0
409					SPE	S2E	S1E	SHE

#3(SPE) 0 : In the spindle serial control, the serial spindle parameter fulfill the spindle unit startups conditions.
1 : In the spindle serial control, the serial spindle parameter fulfill the spindle unit startups conditions.
#2(S2E) 0 : The second spindle is normal during the spindle serial control startups.
1 : The second spindle was detected to have a fault during the spindle serial control startups.
#1(S1E) 0 :The first spindle is normal during the spindle serial control startups.
1 : The first spindle was detected to have a fault during the spindle axis serial control startups.
#0(SHE) 0 :The serial communications module in the CNC is normal.
1 : The serial communications module in the CNC was detected to have a fault.

12) Safety zone alarms

No.	Message	Contents
4800	ZONE: PUNCHING INHIBITED 1	When a safety zone check was executed, a punch command was specified in area 1 where punching is inhibited.
4801	ZONE: PUNCHING INHIBITED 2	When a safety zone check was executed, a punch command was specified in area 2 where punching is inhibited.
4802	ZONE PUNCHING INHIBITED 3	When a safety zone check was executed, a punch command was specified in area 3 where punching is inhibited.
4803	ZONE: PUNCHING INHIBITED 4	When a safety zone check was executed, a punch command was specified in area 4 where punching is inhibited.
4810	ZONE ENTERING INHIBITED 1+X	When a safety zone check was executed, the machine moving in the positive X direction entered area 1 into which entry is inhibited.
4811	ZONE: ENTERING INHIBITED 1-X	When a safety zone check was executed, the machine moving in the negative X direction entered area 1 into which entry is inhibited.
4812	ZONE: ENTERING INHIBITED 2+X	When a safety zone check was executed, the machine moving in the positive X direction entered area 2 into which entry is inhibited.
4813	ZONE: ENTERING INHIBITED 2-X	When a safety zone check was executed, the machine moving in the negative X direction entered area 2 into which entry is inhibited.
4814	ZONE: ENTERING INHIBITED 3+X	When a safety zone check was executed, the machine moving in the positive X direction entered area 3 into which entry is inhibited.
4815	ZONE: ENTERING INHIBITED 3-X	When a safety zone check was executed, the machine moving in the negative X direction entered area 3 into which entry is inhibited.
4816	ZONE: ENTERING INHIBITED 4+X	When a safety zone check was executed, the machine moving in the positive X direction entered area 4 into which entry is inhibited.
4817	ZONE ENTERING INHIBITED 4-X	When a safety zone check was executed, the machine moving in the negative X direction entered area 4 into which entry is inhibited.

No.	Message	Contents
4830	ZONE: ENTERING INHIBITED 1+Y	When a safety zone check was executed, the machine moving in the positive Y direction entered area 1 into which entry is inhibited.
4831	ZONE: ENTERING INHIBITED 1-Y	When a safety zone check was executed, the machine moving in the negative Y direction entered area 1 into which entry is inhibited.
4832	ZONE ENTERING INHIBITED 2+Y	When a safety zone check was executed, the machine moving in the positive Y direction entered area 2 into which entry is inhibited.
4833	ZONE: ENTERING INHIBITED 2-Y	When a safety zone check was executed, the machine moving in the negative Y direction entered area 2 into which entry is inhibited.
4834	ZONE ENTERING INHIBITED 3+Y	When a safety zone check was executed, the machine moving in the positive Y direction entered area 3 into which entry is inhibited.
4835	ZONE: ENTERING INHIBITED 3-Y	When a safety zone check was executed, the machine moving in the negative Y direction entered area 3 into which entry is inhibited.
4836	ZONE ENTERING INHIBITED 4+Y	When a safety zone check was executed, the machine moving in the positive Y direction entered area 4 into which entry is inhibited.
4837	ZONE: ENTERING INHIBITED 4-Y	When a safety zone check was executed, the machine moving in the negative Y direction entered area 4 into which entry is inhibited.
4870	AUTO SETTING FEED ERROR	The feed rate of safety zone auto setting is other than the parameter value (No.16538, No.16539)
4841	AUTO SETTING PIECES ERROR	In safety zone auto setting, the safety zone pieces are not correct. Or the position detector has gone wrong, please tell your machine tool builder.
4872	AUTO SETTING COMMAND ERROR	M code, S code or T code is specified with safety zone auto setting command (G32). G32 is specified in the nibbling mode, in the cutter compensation, in the rotation mode or the scaling mode.

13) System alarms

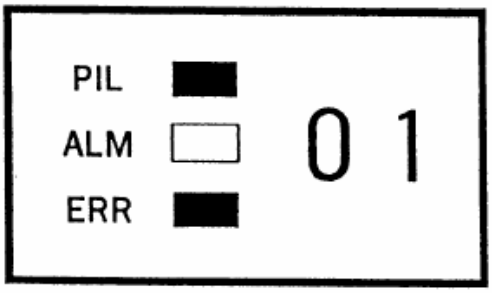
(These alarms cannot be reset with reset key)

No.	Message	Contents
900	ROM PARITY	A parity error occurred in the CNC, macro, or servo ROM. Correct the contents of the flash ROM having the displayed number
910	SRAM PARITY:(BYE 0)	A RAM parity error occurred in the part program storage RAM. Clear the RAM, or replace the SRAM module or motherboard. Subsequently, re-set the parameters and all other data.
911	SRAM PARITY:(BYE 1)	A RAM parity error occurred in the DRAM module. Replace the.DRAM module.
912	DRAM PARITY:(BYE 0)	
913	DRAM PARITY: (BYE 1)	
914	DRAM PARITY:(BYE 2)	
915	DRAM PARITY: (BYE 3)	
916	DRAM PARITY: (BYE 4)	
917	DRAM PARITY:(BYE 5)	
918	DRAM PARITY: (BYE 6)	
919	DRAM PARITY: (BYE 7)	
920	SERVO ALARM(1-4AXIS)	Servo alarm (first to fourth axis). A watchdog alarm condition occurred, or a RAM parity error occurred in the axis control card. Replace the axis control card.
921	SERVO ALARMI5-8AXIS)	Servo alarm (first to fourth axis). A watchdog alarm condition occurred, or a RAM parity error occurred in the axis control card. Replace the axis control card.
926	FSSB ALARM	FSSB alarm. Replace the axis control card.
930	CPU INTERRUPT	CPU error (abnormal interrupt). The motherboard or CPU card may be faulty.
935	SRAM ECC ERROR	An error occurred in RAM for part program storage. Action : Replace the master printed circuit board (SRAM module), perform all-clear operation, and set all parameter and other data other again.

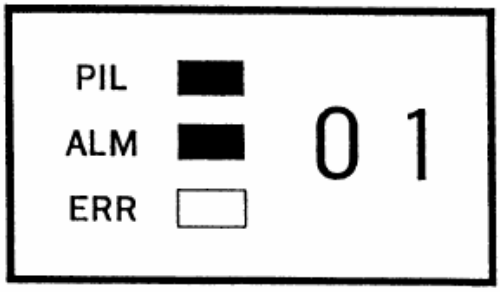
No.	Message	Contents
950	PMC SYSTEM ALARM PC xxx YYYYYYYYYYYYY	An error occurred in the PMC. For details of PC xxx, see the list of system alarm messages in Section A.2, "LIST OF ALARMS (PMC)" in this manual.
951	PMC WATCH DOG ALARM	An error occurred in the PMC. (Watchdog alarm) The motherboard may be faulty.
970	NMI OCCURRED IN PMCLSI	With the PMC-SA1, an error occurred in the control LSI device on the motherboard. (I/O parity). Replace the motherboard PMC RAM
971	NMI OCCURRED IN SLC	With the PMC-SA1, an I/O Link disconnection was detected. Check the I/O Link.
972	NMI OCCURRED IN OTHER MODULE	An NMI occurred on a board other than the motherboard. The option board may be faulty.
973	NON MASK INTERRUPT	An NMI occurred as a result of an unknown cause.
974	F-BUS ERROR	A bus error occurred on the FANUC bus. The motherboard or option board may be faulty.
975	BUS ERROR	A bus error occurred on the motherboard. The motherboard may be faulty.
976	L-BUS ERROR	A bus error occurred on the local bus. The motherboard may be faulty.

1. Spindle Amplifier Module

If an alarm occurs in the spindle amplifier module, the ALM LED lights red in the STATUS display, and the two-digit 7-segment LEDs indicate the alarm code.



<Error No. 01>



<Alarm No. 01>.

1-1. Alarm A0. A1

(1) Meaning

The control program is not running.

(2) Cause and corrective action

a) ROM installed improperly or yet to be installed.

Make sure that the ROM is attached properly to the socket and there is no imperfect contact due to a broken or bent pin.

⇒ Install the ROM properly.

b) Incorrect ROM installed

The series number of the software is printed on the ROM package and is displayed at power-on.

⇒ Replace it with the correct ROM.

c) Printed-circuit board defective

⇒ Replace it with a normal printed circuit board.

1-2. Alarm AL-01

(1) Meaning

The temperature inside the motor is higher than the rating.

(2) Cause and corrective action

a) Over loaded operation

Check the cutting conditions, the state of the cutting tool, and the load meter reading

during cutting.

⇒ Examine the cutting conditions and the tool.

b) The cooling fan inside the motor is defective. Check whether the cooling fan rotates smoothly.

⇒ Replace the cooling fan.

c) The motor cooling system is dirty.

⇒ Clean the cooling system with a vacuum cleaner or the factory air blower.

d) Motor overheat signal wire discontinued or loosely connected Check the motor overheat signal wire for secure connection.

⇒ Connect the signal wire properly.

e) Invalid detector parameter setting Check the detector and its parameters.

⇒ Set the parameters that match the detector correctly.

f) Motor or thermostat defective =s> Replace the motor.

1-3. Alarm AL-02

(1) Meaning

The actual motor speed is largely deviated from the commanded speed.

(2) Cause and corrective action

a) Over loaded operation or too heavy load.

Check the load meter to see if the load is too heavy.

⇒ Examine the cutting conditions and the tool again.

b) Abnormal power line connect

Check the power line for disconnection or poor contact.

⇒ Connect the power line properly.

c) Incorrect acceleration/deceleration duration parameter setting.

Check the parameter setting and the actual acceleration/deceleration duration.

FS 0i/16/18/21	Description
4082	Acceleration/deceleration duration setting

⇒ Set the parameter with a value somewhat greater (margin) than the required acceleration/deceleration duration.

d) Incorrect speed detector parameter setting
Check the parameter setting and the speed detector.

FS 0i/16/18/21	Description
4011 #2, 1, 0	Speed detector setting

VDT3	VDT2	VDT1	Speed detector setting
0	0	0	64λ/ rev
0	0	1	128 λ/ rev
0	1	0	256λ/ rev
0	1	1	512λ/ rev
1	0	0	192λ/ rev
1	0	1	384λ/ rev

⇒ Set the parameter correctly according to the speed detector.

e) IGBT module/IPM defective Replace the IGBT module/IPM.

f) Speed feedback signal faulty
Check the speed feedback signal level.
⇒ Check the speed detector. Also check the signal cable for continuity.

1-4. Alarm AL-03

(1) Meaning
The fuse at the DC link has blown.

(2) Cause and corrective action
a) Overcurrent flowed in the main circuit.

Check the IGBT module/IPM. If the IGBT module/IPM is defective, it allows overcurrent to flow in the main circuit.

⇒ Replace the fuse and/or IGBT module/IPM.

1-5. Alarm AL-07

(1) Meaning

The actual motor speed exceeded 115% of the maximum allowable motor speed (standard parameter setting). Cause and corrective action.

a) Incorrect speed detector parameter setting.

Check the parameter setting and the speed detector.

FS 0I/16/18/21	Description
4011 #2, 1, 0	Speed detector setting

⇒ Set the parameter correctly according to the speed detector.

1-6. Alarm AL-09

(1) Meaning

The temperature of the main circuit heat sink has risen abnormally.

(2) Cause and corrective action

a) Cooling fan defective

Check whether the cooling fan rotates smoothly.

⇒ Replace the cooling fan.

b) Overloaded operation

Check the load meter to see if the load is too heavy.

⇒ Examine the cutting conditions again.

c) Cooling fan clogged

⇒ Clean the cooling fan with a vacuum cleaner or the factory air blower.

1-7. Alarm AL-12

(1) Meaning

Excessive current flowed in the DC section (DC link) of the main circuit. The main circuit power module (IPM) detected an error.

(2) Cause and corrective action

a) Short-circuit between the amplifier output terminals or inside the motor Check the power line connection for a short-circuit.

⇒ Make a correct connection. Replace the motor if it is defective.

b) IGBT(or IPM) defective

Replace the IGBT(or IPM).

c) Printed circuit board defective

⇒ Replace the printed circuit board.

d) Incorrect model-specific parameters.

Check the model-specific parameter settings with the model specific parameter list.

⇒ Set the parameters with the values that match the motor used.

1-8. Alarm AL-13

(1) Meaning

The memory inside the CPU is abnormal when power is switched on.

(2) Cause and corrective action

a) Printed-circuit board defective

⇒ Replace the printed circuit board.

1-9. Alarm AL-15

(1) Meaning

A sequence of switching operations was incorrect during speed range switching control or spindle switching control. Cause and corrective action.

(2) Cause and corrective action

a) Switching unit (magnetic contactor for power line switching) defective Check the operation of the switching unit.
⇒ Replace the switching unit.

b) Loose contact of the magnetic contactor state signal (auxiliary contact signal) Make sure that the magnetic contactor state signal is switched properly.
⇒ Connect the magnetic contactor correctly.

c) Improper sequence
⇒ Adjust the switching unit for the correct sequence.

1-10. Alarm AL-16

(1) Meaning
The memory (RAM) is abnormal. It is checked when power is switched on.

(2) Cause and corrective action
a) Printed-circuit board defective
⇒ Replace the printed-circuit board.

1-11. Alarm AL-19

(1) Meaning
The offset voltage for the phase U current detection circuit is too high. This check is made when power is switched on.

(2) Cause and corrective action
a) Loose contact of the printed-circuit board
Check that the printed-circuit board is connected to the power circuit securely.
⇒ Connect the printed-circuit board securely.

b) Phase U current detection circuit defective.
⇒ Replace the printed-circuit board.

c) A/D converter defective
⇒ Replace the printed-circuit board.

1-12. Alarm AL-20

(1) Meaning

The offset voltage for the phase V current detection circuit is too high. This check is made when power is switched on.

(2) Cause and corrective action

a) Loose contact of the printed-circuit board

Check that the printed-circuit board is connected to the power circuit securely.

⇒ Connect the printed-circuit board securely.

b) Phase V current detection circuit defective.

⇒ Replace the printed-circuit board.

1-13. Alarm AL-24

(1) Meaning

The serial communication data between the CNC and spindle amplifier is abnormal. (This alarm occurs also when the CNC power is switched off.)

(2) Cause and corrective action

a) The CNC power is off.

⇒ Switch on the CNC power.

b) Serial communication cable defective

Check the connection of the cable. Also check for a broken wire.

⇒ Connect the cable correctly. If any wire in the cable is broken, replace it.

c) Serial communication LSI chip defective

⇒ Replace the LSI chip or the printed-circuit board with the LSI on it.

d) I/O link adapter defective (if used)

⇒ Replace the I/O link adapter.

1-14. Alarm AL-25

(1) Meaning

Serial communication between the CNC and the spindle amplifier has stopped.

(2) Cause and corrective action

a) Serial communication cable defective

Check the connection of the cable. Also check for a broken wire.

⇒ Connect the cable correctly. If any wire in the cable is broken, replace it.

b) Serial communication LSI chip defective

⇒ Replace the printed-circuit board.

1-15. Alarm AL-26

(1) Meaning

The Cs contouring control speed detection signal (detector on the motor sid(e) is abnormal.

(2) Cause and corrective action

a) Feedback signal level insufficient

Check the connection of the cable. Also check for a broken wire.

⇒ Connect the cable correctly. If any wire in the cable is broken, replace it.

b) Feedback signal level insufficient

Check the feedback signal level with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

c) Feedback signal cable not shielded properly (circuit malfunction due to noise) Check whether the cable is shielded properly.

⇒ Shield it correctly.

d) Detection circuit defective

⇒ Replace the parameter-circuit board.

e) Incorrect parameter setting

Check the parameter setting for use of the Cs contouring control detector.

FS 0I/16/18/21	Description
4011 #5	Parameter set to specify use of the Cs contouring control detector.

⇒ Set the parameter correctly according to the detector used.

1-16. Alarm AL-27

(1) Meaning

Position coder signal error

(2) Cause and corrective action

a) Feedback signal cable defective

Check the connection of the cable. Also check for a broken wire.

⇒ Connect the cable correctly. If any wire in the cable is broken, replace it.

b) Position coder defective Check the position coder signal.

⇒ Replace the position coder.

c) Feedback signal level insufficient (for built in sensor or the high resolution magnetic pulse coder)

Check the feedback signal level with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

d) Feedback signal cable not shielded properly (circuit malfunction due to nois(e) Check whether the cable is shielded properly.

⇒ Shield it correctly.

e) Detection circuit defective

⇒ Replace the printed-circuit board.

f) Incorrect parameter setting

Check the parameter set to specify use of the Cs contouring control detector.

FS 0I/16/18/21	Description
4011 #2	Parameter set to specify use of the Cs contouring control detector.

⇒ Set the parameter correctly according to the detector used.

1-17. Alarm AL-28

(1) Meaning

The Cs contouring control speed detection signal (detector on the spindle sid(e) is

abnormal.

(2) Cause and corrective action

a) Feedback signal level insufficient

Check the connection of the cable. Also check for a broken wire.

⇒ Connect the cable correctly. If any wire in the cable is broken, replace it

b) Feedback signal level insufficient

Check the feedback signal level with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

c) Feedback signal cable not shielded properly (circuit malfunction due to nois(e).

Check whether the cable is shielded properly.

⇒ Shield it correctly.

d) Detection circuit defective

⇒ Replace the printed-circuit board.

e) Incorrect parameter setting

Check the parameter set to specify use of the Cs contouring control detector.

FS 0I/16/18/21	Description
4011 #2	Parameter set to specify use of the Cs contouring control detector.

⇒ Set the parameter correctly according to the detector used.

1-18. Alarm AL-29

(1) Meaning

Excessive load (at least 90% of the maximum output as set initially by a parameter) was applied continuously for a certain

(2) Cause and corrective action

a) Overloaded operation, or too heavy load

Check the load meter to see if the load is too heavy.

⇒ Examine the cutting conditions and the tool again.

1-19. Alarm AL-31

(1) Meaning

The motor cannot rotate at a specified speed. It rotates at very low speed, or even stops.

(2) Cause and corrective action

a) Motor locked.

Check whether the motor cannot accelerate because it is physically locked.

⇒ Remove the cause.

b) Motor speed feedback cable defective

Check the connection of the cable. Also check for a broken wire.

⇒ Connect the cable correctly. If any wire in the cable is broken, replace it

c) Motor speed feedback signal abnormal

Check the speed feedback signal with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

d) Incorrect power line wire connection

Check the connection of the power line wires (for phase order, etc.)

⇒ Connect the power line correctly.

1-20. Alarm AL-32

(1) Meaning

The memory in the serial communication LSI chip is abnormal. It is checked when power is turned on.

(2) Cause and corrective action a) LSI chip defective

⇒ Replace the printed-circuit board.

1-21. Alarm AL-34

(1) Meaning

The parameter setting is invalid.

(2) Cause and corrective action

a) Incorrect parameter setting Check the parameter setting

⇒ Set the parameter with a valid value.

1-22. Alarm AL-35

(1) Meaning

The value set in the gear ratio data parameter is greater than the limit allowed in the internal processing.

(2) Cause and corrective action

a) Incorrect gear ratio parameter setting

Check whether the specified gear ratio is too high.

FS 0I/16/18/21	Description
4056 ~ 4059	Spindle to motor gear ratio data

⇒ Use the appropriate value.

1-23. Alarm AL-36

(1) Meaning

The error counter overflowed.

(2) Cause and corrective action

a) Incorrect parameter setting

Check whether the values set in the gear ratio and position gain parameters are too large.

⇒ Use the appropriate values.

FS 0I/16/18/21	Description
4056 ~ 4059	Spindle to motor gear ratio data
4060 ~ 4063	Position gain during orientation
4065 ~ 4068	Position gain during servo mode/ synchronization control of the spindle
4069 ~ 4072	Position gain during Cs contouring control

1-24. Alarm AL-37

(1) Meaning

When an emergency stop signal was entered, the motor did not decelerate, rather accelerate, or the motor was kept excited even after acceleration/deceleration duration (10 seconds as set initially by a parameter).

(2) Cause and corrective action

a) Incorrect speed detector parameter setting

Check the parameter setting and the speed detector.

FS 0I/16/18/21	Description
4011 #2, 1, 0	Speed detector setting

⇒ Set the parameter to the value that matches the speed detector used.

b) Incorrect acceleration/deceleration duration parameter setting

Check the parameter setting with the required deceleration time.

FS 0I/16/18/21	Description
4082	Acceleration/deceleration duration setting

⇒ Set the parameter with a value somewhat greater (margin) than the required deceleration duration.

1-25. Alarm AL-39

(1) Meaning

The Cs contouring control one-rotation signal has not been detected correctly.

(2) Cause and corrective action

a) Feedback signal cable not shielded properly

Check whether there is noise on the feedback signal.

Also check whether the cable is shielded properly.

⇒ Shield it correctly.

b) Feedback signal level insufficient

Check the feedback signal level with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

(c) Incorrect parameter setting

Check the parameter correctly according to the detector used.

FS 0I/16/18/21	Description
4003#7,6,4	Parameter set to specify use of the Cs contouring control detector.

⇒ Set the parameter correctly according to the detector used.

d) Detection circuit defective

⇒ Replace the printed-circuit board.

1-26. Alarm AL-40

(1) Meaning

The Cs contouring control one rotation signal is not generated.

(2) Cause and corrective action

a) Feedback signal cable defective Check the connection of the cable.

⇒ Connect the cable correctly.

b) Feedback signal level insufficient

Check the offset of the Cs contouring control one rotation signal with an oscilloscope.

⇒ Adjust the offset of the Cs contouring control one rotation signal.

c) Detection circuit defective

⇒ Replace the printed-circuit board.

1-27. Alarm AL-41

(1) Meaning

The position coder one rotation signal was not detected correctly.

(2) Cause and corrective action

a) Feedback signal cable not shielded properly

Check whether there is noise on the feedback signal. Also check whether the cable is shielded properly.

⇒ Shield it correctly.

b) Position coder defective Check the position coder signal.

⇒ Replace the position coder.

c) Feedback signal level insufficient (for built in sensor)

Check the feedback signal level with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

d) Incorrect parameter setting

Check the parameter setting and the Cs contouring control detector.

FS 0I/16/18/21	Description
4003#7,6,4	Position coder signal setting

⇒ Set the parameter correctly according to the detector used.

e) Detection circuit defective

⇒ Replace the printed-circuit board.

1-28. Alarm AL-42

(1) Meaning

The position coder one-rotation signal was not generated.

(2) Cause and corrective action

a) Feedback signal cable defective Check the connection of the cable.

⇒ Connect the cable correctly.

b) Position coder defective Check the position coder signal.

⇒ Replace the position coder.

c) Feedback signal level insufficient (for built in sensor)

Check the feedback signal level with an oscilloscope.

⇒ Adjust the feedback signal level.

d) Detection circuit defective

⇒ Replace the printed-circuit board.

1-29. Alarm AL-43

(1) Meaning

The position coder signal used for the main spindle during the differential speed mode was disconnected.

(2) Cause and corrective action

a) Feedback signal cable defective

Check the connection of the cable. Also check for a broken wire.

⇒ Connect the cable correctly. If any wire in the cable is broken, replace the cable.

b) Feedback signal cable not shielded properly Check whether the cable is shielded properly.

⇒ Shield it correctly.

c) Position coder defective

Check the position coder signal.

⇒ Replace the position coder.

d) Incorrect parameter setting

Check the parameter setting for the differential speed mode functions.

FS 0I/16/18/21	Description
4003#5	Setting to specify use of the differential speed mode functions

⇒ Set the parameter correctly according to the function used.

e) Detection circuit defective

⇒ Replace the printed-circuit board.

1-30. Alarm AL-44

(1) Meaning

An A/D converter error occurred.

(2) Cause and corrective action

a) A/D converter defective.

⇒ Replace the printed-circuit board.

1-31. Alarm AL-46

(1) Meaning

The position coder one rotation signal was not detected correctly during thread cutting.

(2) Cause and corrective action

a) Feedback signal cable not shielded properly

Check whether there is noise on the feedback signal. Also check whether the cable is shielded properly.

⇒ Shield it correctly.

b) Position coder defective. Check the position coder signal.

⇒ Replace the position coder.

c) Feedback signal level insufficient (for built in sensor)

Check the feedback signal level with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

d) Incorrect parameter setting

Check the parameter setting and the Cs contouring control detector.

FS 0I/16/18/21	Description
4003#7,6,4	Position coder signal setting.

⇒ Set the parameter correctly according to the function used.

e) Detection circuit defective

⇒ Replace the printed-circuit board.

1-32. Alarm AL-47

(1) Meaning

A pulse count for the position coder signal is abnormal.

(2) Cause and corrective action

a) Feedback signal cable not shielded properly

Check whether there is noise on the feedback signal. Also check whether the cable is shielded properly.

⇒ Shield it correctly.

b) Position coder defective Check the position coder signal.

⇒ Replace the position coder.

c) Feedback signal level insufficient (for built in sensor) Check the feedback signal level with an oscilloscope.

⇒ Adjust so that the feedback signal level becomes the rated value.

d) Incorrect parameter setting

Check the parameter setting and the detector.

FS 0I/16/18/21	Description
4003#7,6,4	Position coder signal setting.

⇒ Set the parameter correctly according to the detector used.

e) Detection circuit defective

⇒ Replace the printed-circuit board.

1-33. Alarm AL-49

(1) Meaning

During differential speed mode, the sub-spindle motor speed converted from the main spindle motor speed exceeded the limit.

(2) Cause and corrective action

a) The differential speed is calculated by multiplying the main spindle motor speed by the gear ratio.

Make sure that the calculation result does not exceed the maximum motor speed.

⇒ Do not exceed the maximum motor speed.

1-34. Alarm AL-50

(1) Meaning

During the synchronization control of the spindle, the calculation result for the speed command exceeded the limit.

(2) Cause and corrective action

a) The motor speed command is calculated by multiplying the spindle speed command by the gear ratio.

Make sure that the calculation result does not exceed the maximum motor speed.

⇒ Do not exceed the maximum motor speed.

1-35. Alarm AL-53

(1) Meaning

The ITP signal (sync signal for sync with the CN(C) stopped.

(2) Cause and corrective action

a) CNC error

⇒ Check the operation of the CNC.

b) Serial communication LSI chip defective

⇒ Replace the printed-circuit board.

1-36. Alarm AL-54

(1) Meaning

It was detected that a high current flowed in the motor for a long period.

(2) Cause and corrective action

a) Overloaded operation, or frequent acceleration/deceleration

Check the load meter to see if the load is too heavy. Also check that acceleration/deceleration was repeated frequently.

⇒ Examine the cutting conditions again.

1-37. Alarm AL-55

(1) Meaning

During spindle switching control or speed range switching control, there was a conflict between the switch request signal (SPSL or RSL) and the power line state confirmation signal (MCFN, MFNHG, or RCH, RCHH(G).

(2) Cause and corrective action

a) Switching umt(magnetic contactor for power line switchin(g) defective Check the operation of the switching unit.

⇒ Replace the switching unit (magnetic contactor for power line switchin(g).

b) Loose contact of the magnetic contactor state signal (auxiliary contact signal)

Make sure that the magnetic contactor state signal is switched properly.

⇒ Connect the magnetic contactor correctly.

c) Incorrect parameter setting

Make sure that the parameters for the power line state signals related to spindle switch control and output switch control are set correctly.

FS 0I/16/18/21	Description
4003#5	Setting to specify use of the differential speed mode function.
4003#3	Parameter to specify the power line state signal for speed range switching control.

⇒ Set the parameter correctly according to the system used.

1-38. Alarm AL-56

Set the parameter correctly according to the system used.

(1) Meaning

The cooling fan for the control circuit stopped.

(2) Cause and corrective action

a) Cooling fan defective

Check whether the cooling fan rotates smoothly.

⇒ Replace the cooling fan.

2. Tool Post Home Position Setting

2-1. Period of Home Position Setting

Because the absolute position detector is used as the position detection system of tool post servo, the home position setting of Tool Post should be performed in the following cases.

①	If have disassembled or reassembled the servo motor.
②	If exchanging the servo amp.
③	If exchanging the battery.
④	If disconnecting the detector connector of servo motor.

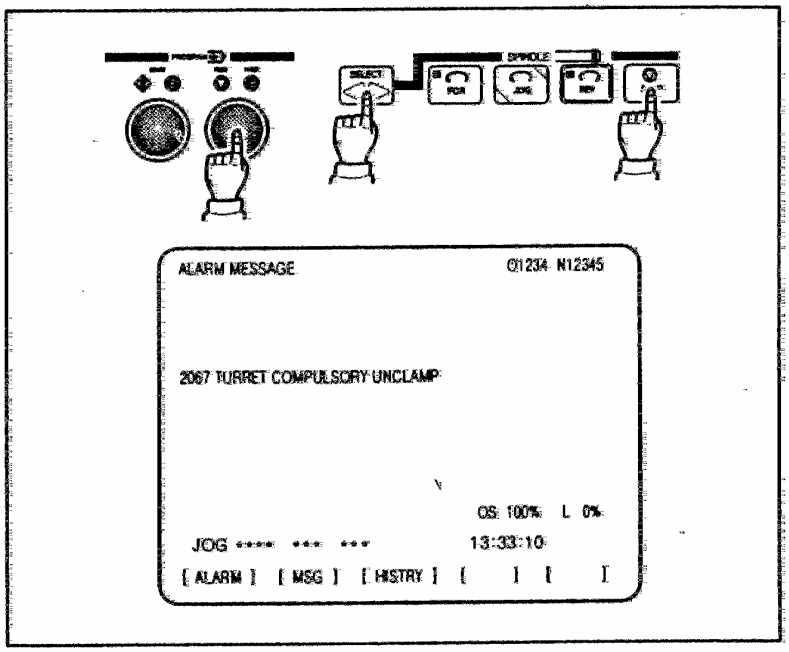
2-2. Home Position Setting Method

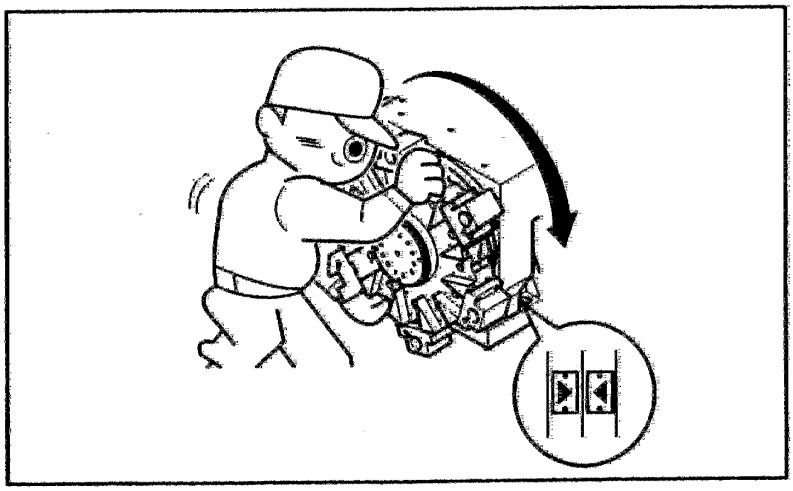
Check the Turret Clamp L/S status.(TURRET CLAMP L/S = "I") And press the "MDI" mode in the sheet key.

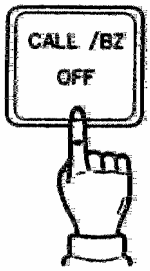
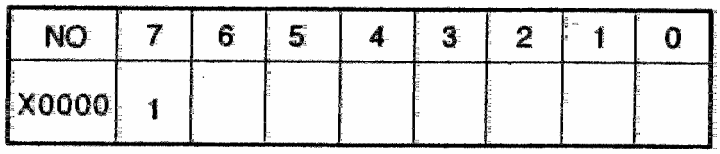
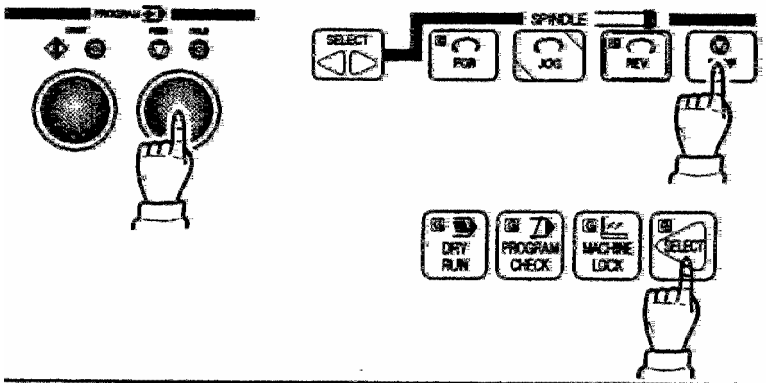
(1) Set the KEEP RELAY PARAMETER K5#0 =1

(2) Unclamp the turret by simultaneously pressing[Spindle STOP] , [SELECT], [FEEDHOLD] on the operating panel. The message " 2067 TURRET COMPANY UNCLAMP" will be display on the alarm screen.

(3) Turn the turret by hand and set the No.1 tool. Turn the turret and remain it on the position where the arrows of turret and tool post body are aligned.





(4) Press the [CALL/BZ OFF] switch. The turret is clamped and "2067" disappears on the alarm screen.	
(5) Verify that X0000.7 has been changed to "I" in the diagnostic screen.	
(6) Set the KEEP RELAY PARAMETER K5#0="0" (7) Press the Spindle [STOP]. Mode select [SELECT] and [FEEDHOLD] switch simultaneously. Now the home position setting of the tool post is completed and turret index is enabled.	

2-3. TOOL NO. SETTING

Select the PMM (Power Mate CNC Manager) parameter screen.

(1) Set the basic parameter for turret.

(Set **PMM Parameter No.11#0 = "0")**

(2) Press the "MDI" mode.

(3) Set the KEEP RELAY PARAMETER K5#0=1"

=> The Alarm Message "**AL-75 TURRET ADJUST MODE**" is displayed.

=> Unclamp the Turret compulsorily.

(4) Turn the Turret by hand and set the No.1 tool.

(5) Clamp the Turret compulsorily.

=> Set the **KEEP RELAY PARAMETER K5#0="0"**

(6) Set the **PMM Parameter No.11#0=”1”.**

=> The Alarm Message "**AL-133 POWER UNIT OFF REQUIRE**" is displayed.

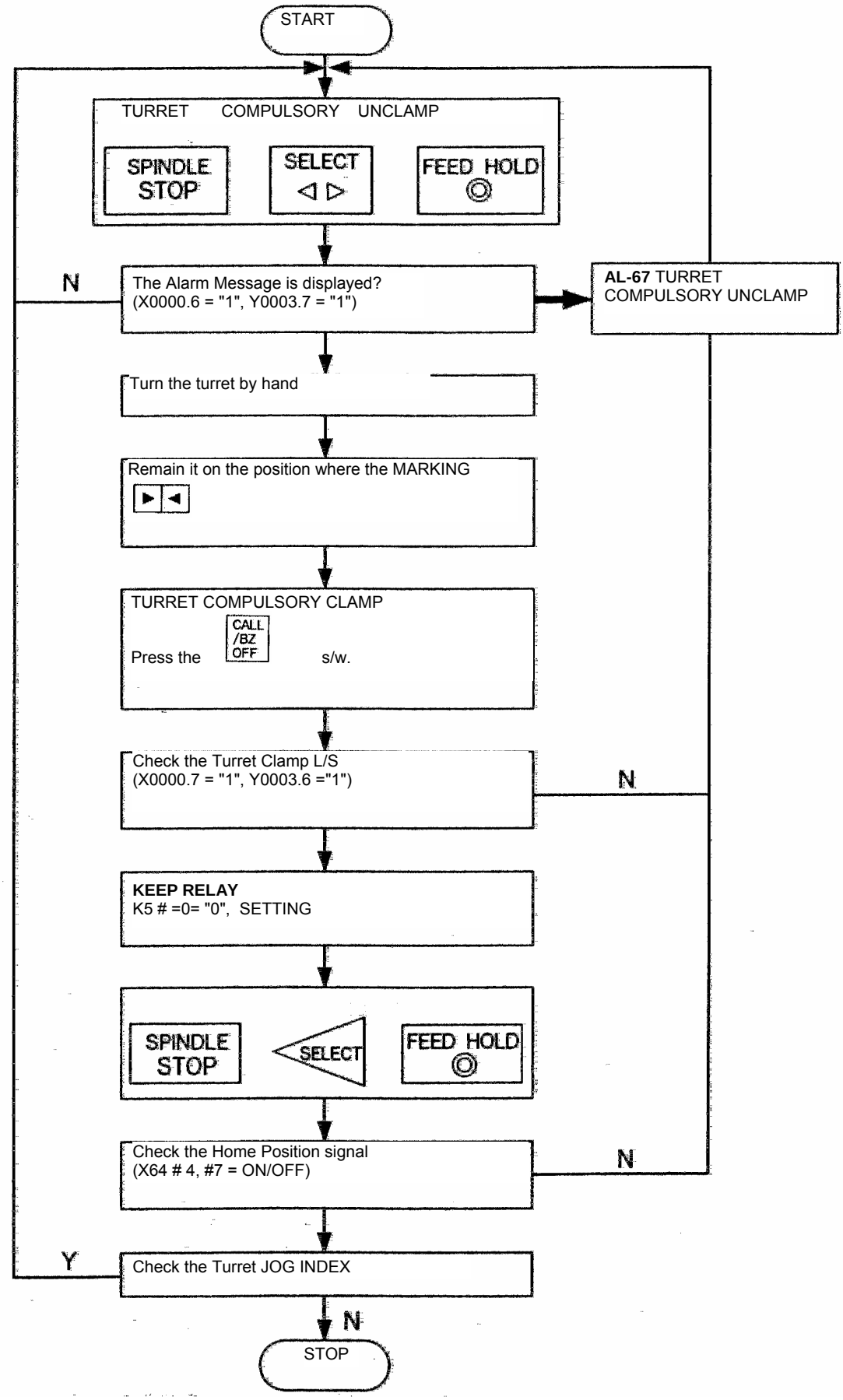
(7) Turn off and then re-apply the power.

=> The Alarm Message "**AL-61 TURRET SET UP ERROR**" is displayed.

(8) Press the Spindle [STOP], mode select [SELECT] and [FEEDHOLD] switch simultaneously.

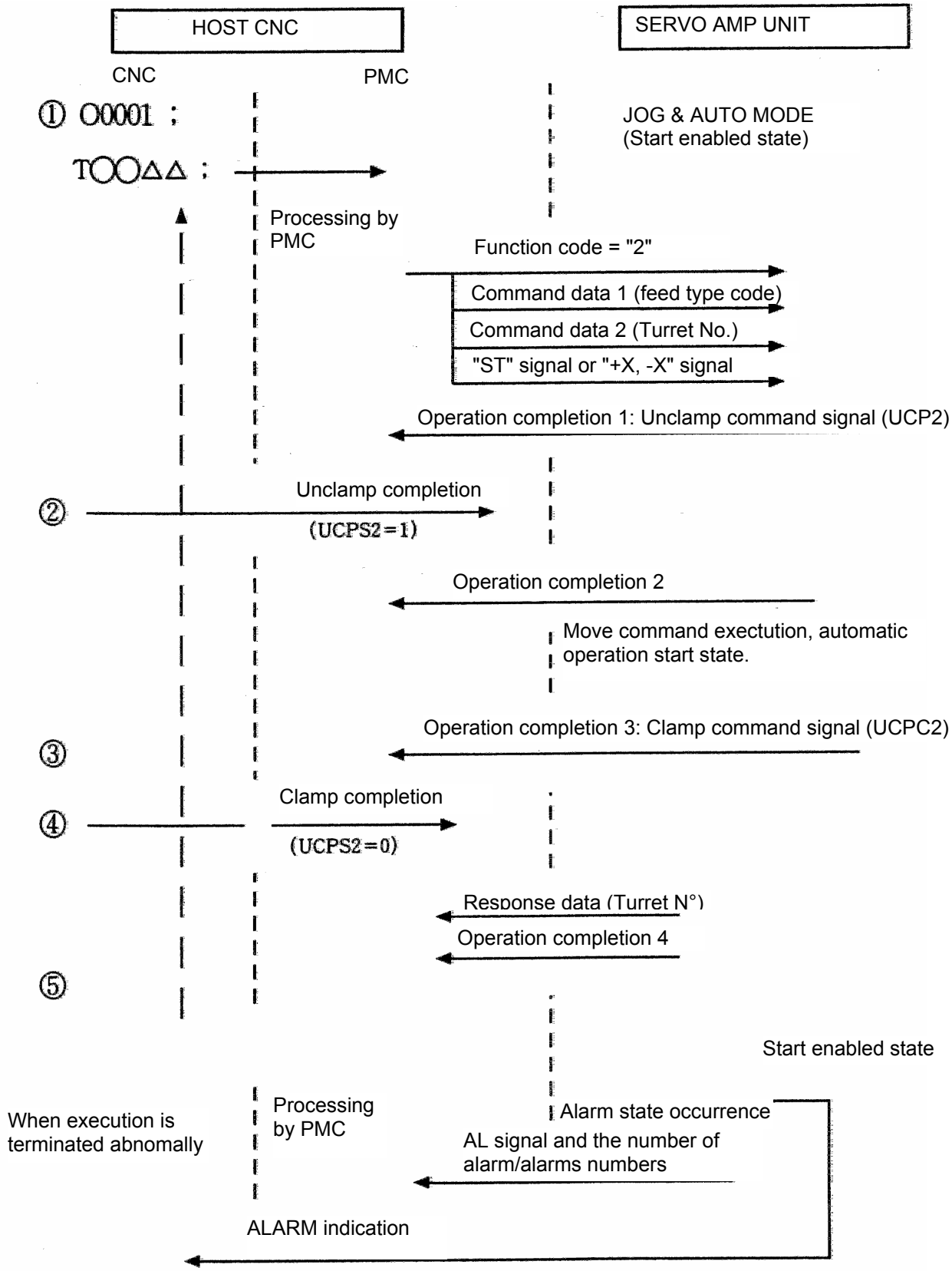
► Tool Post Home Position Setting ◄

(1) Select the MDI Mode.
(2) Set the KEEP RELAY Parameter K5#0 = "1".
(3) Adjust in the following method.



2-4. TURRET SERVO AMP

2-4-1. βSERVO TURRET CONTROL TIME CHART



(1) When the host NC program executes a T code command, the PMC on the host NC sets the function code, command data 1, and command data 2, then sends the ST signal or +X/-X signal to the servo unit. Upon receipt of the data, the servo unit returns the operation completion 1 signal to the NC, and also outputs the unclamp command signal.

(2) When unclamp completion notification is sent from the host NC, the servo unit returns the operation completion 2 signal to the host NC, then starts movement to the position corresponding to a specified turret/magazine number.

(3) Upon completion of the movement, the servo unit returns the operation completion 3 signal to the NC, and also outputs the clamp command signal.

(4) When clamp completion notification is sent from the host NC, the servo unit returns response data (turret/magazine number or coordinatesland the operation completion 4 signal, and is placed in the start enabled state.

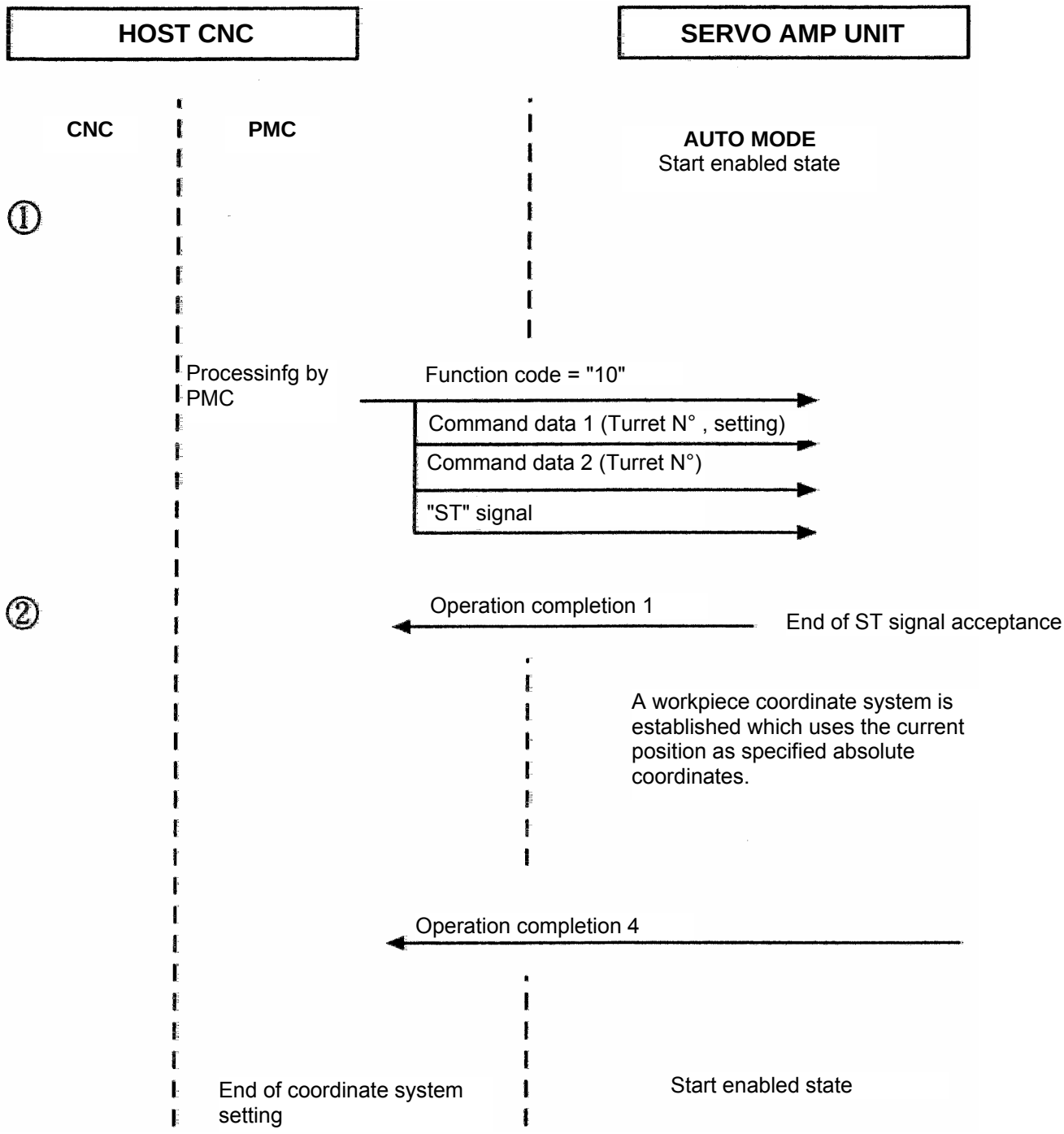
(5) Upon receipt of the operation completion 4 signal, the PMC on the host NC returns the FIN signal.

(6) If an alarm is issued while the servo unit is executing an instruction, the AL signal is output. So, the PMC on the host NC is to perform processing such as alarm indication. In this case, the number of alarms and alarm numbers can be included in the response data by setting the DSAL signal to 1.

[Supplementary information]

1. The unclamp/clamp command signal and state signal are used for communication with the host.
2. Whether the unclamp/clamp state signal is to be checked is specified by setting bit 2 (IGCP)of parameter No. 003. When IGCP is set such that no check is to be made, the operation completion 2 signal and operation completion 3 signal are not output.
3. Use parameter No. 167 to set the period between the servo unit being turned on and the output of the unclamp command signal. Use parameter No. 168 to set the period between the clamp command signal being output and the servo unit being turned off.
4. The "ST" signal can be accepted in the start enabled state only.
5. The start enabled state is that state in which the STL signal is off.

2-4-2. Coordinate System Setting



(1) In coordinate system setting, the PMC on the host NC sets the function code, command data 1, and command data 2, then sends the ST signal to the servo unit, Upon receipt of the data, the servo unit returns the operation completion 1 signal to the NC.

(2) Upon receipt of the operation completion 4 signal, the PMC on the host NC returns the FIN signal.

[Supplementary information]

(1) The start enabled state is that state in which the STL signal is off.

2-4-3. β DI/DO Diagnosis signal

1) β AMP DO signal (CNC → PMM)

ADDRESS	7	6	5	4	3	2	1	0
	128	64	32	16	8	4	2	1
Y64 (000)	ST	UCPS2	-X	+X	DSAL	MD4	MD2	MD1
Y65 (001)		IGNVRY	DRC	ABSRD	*ILK	SVFX	*ESP	ERS
					1	1	1	
Y66 (002)	Function code				Command DATA 1			
Y67(003) ~ Y70(006	Command DATA 2 (Command TOOL NO.) BINARY DATA							
Y71 (007)	RT	DRN	ROV2	ROV1	*OV8	*OV4	*OV2	*OV1

CAUTION

1) DGN numbers 000 to 015 correspond to signal addresses Yy+O to Yy+15, respectively.
2) DGN numbers 008 to 015 (signal addresses Yy+8 to Yy+15)are not used for the peripheral equipment control interface.

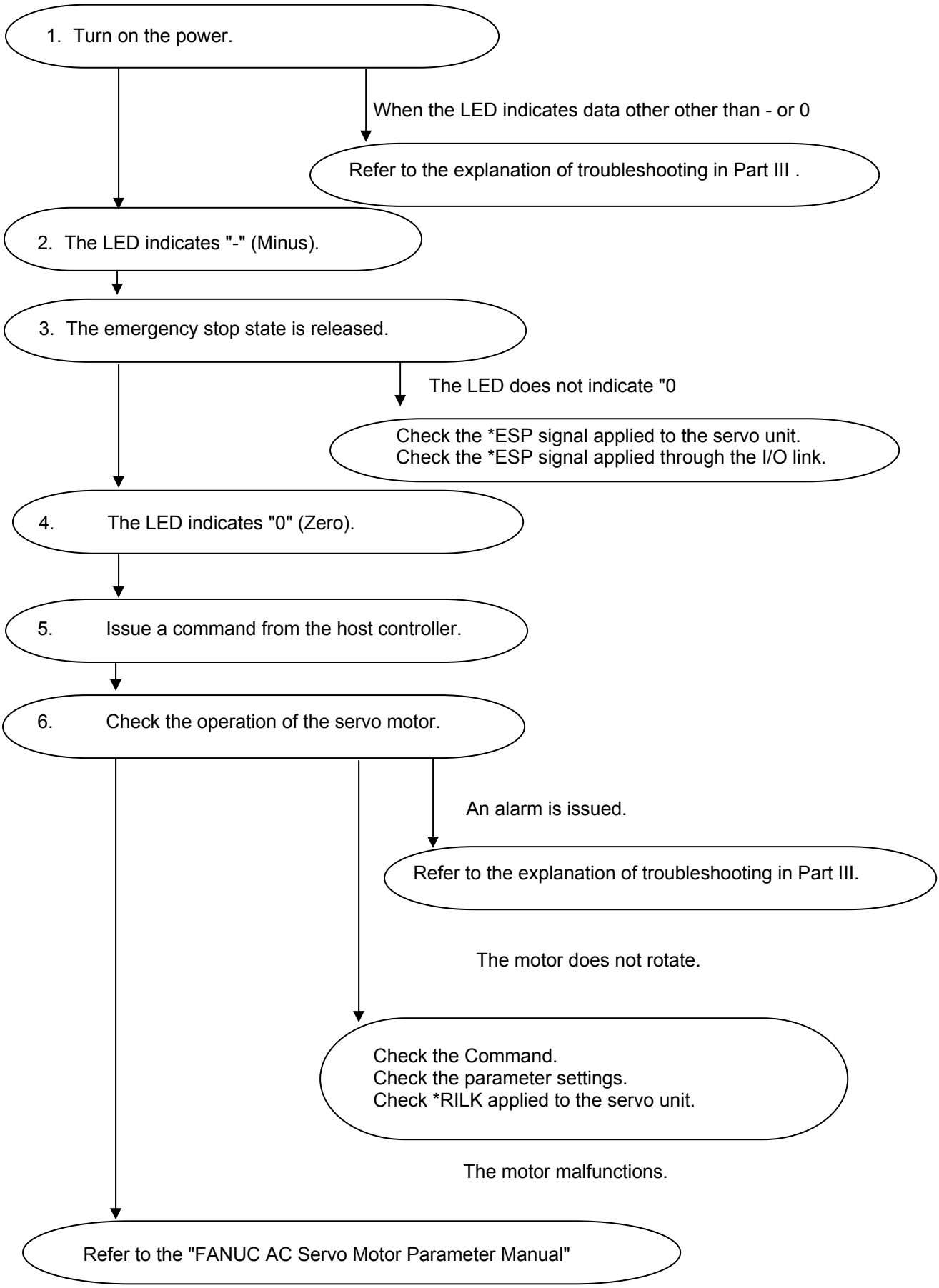
(2) β AMP DI signal(PMM → CNC)

ADRESS	7	6	5	4	3	2	1	0
	128	64	32	16	8	4	2	1
Y64 (016)	OPC4	OPC3	OPC2	OPC1	INPX	SUPX	IPLX	DEN2
					1			
Y65 (017)	OP	SA	STL	UCPC2			DRCO	ABSWT
	1	1						
Y66 (018)	MA	AL	DSP2	DSP1	DSALO	TRQM	RST	ZPX
	1	1						
Y67(019) ~ X70(022)	Response DATA (Current TOOL NO.) BINARY DATA							
Y71 (023)		SVERX		PSG2	PSG1	MVX	APBAL	MVDX
				1	1			

CAUTION

1) DGN numbers 016 to 031 correspond to signal addresses Xx+O to Xx+15. respectively.
2) DGN numbers 024 to 031 (signal addresses Xx+8 to Xx+15)are not used for the peripheral equipment control interface are used as response area for power motion manager.

2-4-4. CHECK PROCEDURE



2-4-5. Check Procedure

<LED Indications and Meanings>

LED	State	Description
	Amplifier not ready	This indicates that control power (+24V DC) is supplied. No alarm is issued, but the motor is not activated.
	Amplifier ready	This indicates that the motor is activated and that commands can now be accepted.
Blinking	Command being executed	This indicates that an accepted command is now being executed.
Blinking	Parameter being loaded.	This indicates that parameters are being loaded in a batch from the power motion manager or through the RS-232C interface.
Indication other than the above	Alarm	An alarm is issued. For information about alarms, see the explanation of troubleshooting in Part III.

2-4-6. β SERVO AMP Alarm Detect Function

PWM board LED display	I/O Link board	Alarm	Description
		Overvoltage(HV)	This alarm is issued when the DC voltage of the main circuit power is too high.
		DC link low voltage (LVDC)	This alarm is issued when the DC voltage of the main circuit power is too low.
		Regenerative overheat (DCOH)	This alarm is issued when the average regenerative discharge energy is too high
		Overheat (OH)	The load on the motor may be too high.
		Fan stop (FAL)	This alarm is issued when the fan motor built into the servo AMP has failed.
		Overcurrent (HC)	This alarm is issued when an excessively large current flows in the main circuit
		AMP NOT READY	This indicates that control power (+24VDC) is supplied. No alarm is issued, but the motor is not activated.
		AMP READY	This indicates that the motor is activate, and that commands can now be accepted.

2-4-7. β AMP Function Codes

Function code	Command data 1 4 Bit	Command data 2 4 Byte	Mode	Start signal	Remark
0 :Jog operation			JOG	+X/-X	
2 :ATC operation	1: Automatic operation (shortcut rotation) 2: Automatic operation (positive direction) 3: Automatic operation (negative direction)	Turret/magazine number	AUTO	ST	Set an amount of travel per ATC rotation and the number of turrets/magazine in the parameters. (Caution 2, 9)
	4: 1 -pitch rotation 5: Continuous indexing (Caution 1)		JOG	+X/-X	
3 :POINT positioning	Feedrate code 1 to 7 15: Rapid traverse	Point number 1 to 12	AUTO	ST	(Caution 3) (Caution 4) (Caution 5)
4 : Reference position return	Reference position No. 1: First ZRN position 2: Second ZRN POS. 3: Third ZRN position		JOG	ST +X/-X	(Caution 4) (Caution 6) (Caution 8)
	15: Reference position number			ST	
	15: Reference position external setting				
5 : Positioning (absolute specification)	Feedrate code 1 to 7 15: Rapid traverse	Workpiece coordinates	AUTO	ST	(Caution 3)
6 : Positioning (Incremental specification)	Feedrate code 1 to 7 15: Rapid traverse	Travel distance	AUTO	ST	(Caution 3)
10 : Coordinate system setting	1: Coordinate system setting 2: Magazine number setting 3: Point number setting	Coordinates Magazine No. Point No.	AUTO	ST	The coordinates corresponding to a number represent the current position.
14 : Point data external setting	Point number 1 to 12	Point data	JOG	ST	Data is entered into the parameter corresponding to a point number.
15 : Data setting by teaching					A coordinate is entered into parameter corresponding to a point number.

CAUTION

1. If the remaining distance to the next point is shorter than the required deceleration distance for stopping at that point when the feed axis and direction selection switch (+X, -X) is released, movement is made to the poing immediately after the next point.
2. Set bit 1 (ROTX) of parameter No.000 (for rotation axis setting) to 1, and set bit 7 (ROAX) of parameter No.000 to 1 (for rollover)
3. As the position corresponding to each point number, workpiece coordinates are set in parameter Nos. 154 to 165.
4. The feedrates of feedrate codes 1 to 7 are set in parameter Nos. 044 to 050. and a rapid traverse rate is set in parameter No.040.
5. In rollover setting, shortcut control is possible. In rollover setting, set a value within + 1 rotation for the absolute positioning command.
6. When a reference position is set after the power is turned on. Magazine/turret number 1 is output. Before reference position setting, perform movement by jog operation for a minimum given distance at a minimum given feedrate (distance and feedrate for accumulating a servo position deviation of 128 pulses or more).
7. Normal jog feed operation can be used only when function code 0, 1, 10, or 15 is specified.
8. When an absoulute pulse coder is used, the current position can be used as a reference position. After positioning to a reference position, set function code 4, command data 1 = 15, jog mode, and emergency stop release state, then turn on the ST signal.
9. In ATC automatic operation mode, the rapid traverse rate (parameter No. 040) is used unconditionally. In jog operation mode, the rapid traverse rate (parameter No. 040) is used when the RT signal is turned on. The jog feedrate (parameter No. 041) is used when the RT signal is turned off.
10. Never change the current mode during operation 1. The mode can be changed only after operation has been stopped.

2-4-8. SIGNAL DETAILS - The peripheral equipment

<table>
<tr><th>SYMB</th><th>ADD.</th><th>Description</th></tr>
<tr><td>DEN2</td><td>X64.0</td><td>Remaining travel in-range signal
This signal indicates that, in the servo unit, the number of axis move command distribution pulses that have not been used for axis movement (residual movement amount) is smaller than a parameter-specified value.
• The signal becomes 1 when :
- The number of axis move command distribution pulses that have not been used for axis movement (residual movement amount) is smaller than a parameter-specified value.
• The signal becomes 0 when :
- The number of axis move command distribution pulses that have not been used for axis movement (residual movement amount) is larger than a parameter-specified value.
- When the value of a parameter for the remaining travel in-range signal is 0.

CAUTION
1. The DEN2 signal remains 0 during jog feed (JOG).
2. The DEN2 signal maintains its current state until another move command is issued.</td></tr>
<tr><td>IPLX</td><td>X64.1</td><td>Distribution pulse signal
This signal indicates that the servo unit has axis move command distribution pulses that have not been used for axis movement (residual movement amount).
• The signal is 1 when :
- There are axis move command distribution pulses that have not been used for axis movement (residual movement amount).
• The signal is 0 when :
- There are no axis move command distribution pulses that have not been used for axis movement (residual movement amount).

CAUTION
The IPLX signal is valid while jog feed (JOG) mode is set.</td></tr>
<tr><td>SUPX</td><td>X64.2</td><td>Acceleration/deceleration pulse signal
This signal indicates that the servo unit has accumulated pulses in the acceleration/deceleration control section.
• The signal is 1 when axis movement distribution pulses are accumulated in the ACC/DEC control section.
• The signal is 0 when no axis movement distribution pulses are accumulated in the ACC/DEC control section.</td></tr>
</table>

<table>
<tr><th>SYMB</th><th>ADD.</th><th>Description</th></tr>
<tr><td>INPX</td><td>X64.3</td><td>In-position signal
This signal indicates that the controlled axis is in position (has reached the specified value).
• The signal is 1 when :
- There is no ACC/DEC delay (accumulated pulses) for the controlled axis, and the servo positional deviation is within a parameter specified range.
• The signal is 0 when :
- There is an ACC/DEC delay (accumulated pulses)for the controlled axis.
- The servo positional deviation falls outside a parameter specified range.</td></tr>
<tr><td>OPC1
OPC2
OPC3
OPC4</td><td>X64.4
X64.5
X64.6
X64.7</td><td>Operation completion signal
The servo unit indicates information about the completion of each function code. The host executes its sequence according to this signal. See the timing chart of each function code for the corresponding input timing. • OPC1 indicates, to the host, that the servo unit has received a command. The servo unit issues an unclamp command signal (UCPC2 = 1) to request the host to unclamp the machine.
• OPC2 indicates, to the host, that the servo unit has received an unclamp completed command signal (UCPS2 = 1). The servo unit starts axis operation.
• OPC3 is output simultaneously with the clamp command signal (UCPC2 = 0) when axis operation is completed.
• OPC4 indicates, to the host, that the servo unit has received the clamp completion signal (UCPS2 = 0) and finished executing all commands. The timing at which the signal is input is set in parameter No. 166. The clammp signal can be prevented from being used by resetting the NCLP parameter (bit 1 of parameter No.003) to 0.</td></tr>
<tr><td>UCPC2</td><td>X65.4</td><td>Unclamp command signal
The host is responsible for clamping and unclamping the machine. The servo unit issues this signal to request the host to clamp/unclamp the machine when a peripheral equipment control function code command is executed.
The signal is set to 1 when a request is issued to the host to unclamp the machine. It is reset to 0 when a request is issued to the host to clamp the machine. The servo unit sets the UCPC2 signal to 1 when it starts execut ing commands whth function codes 0 and 2 to 6. When the move command is terminated, the UCPC2 signal is reset to 0. See the timing chart for the function codes for peripheral equipment control.
 CAUTION
The UCPC2 signal is valid when the NCLP parameter (bit 1 of parameter No. 003) is 0.</td></tr>
</table>

<table>
<tr><td>SYMB.</td><td>ADD.</td><td>Description</td></tr>
<tr><td>STL</td><td>X65.5</td><td>Automatic operation start in-progress signal The signal indicates that automatic operation has been started. • The signal becomes 1 when a command to start automatic operation is issued. It becomes 0 when automatic operation stops.</td></tr>
<tr><td>SA</td><td>X65.6</td><td>Servo preparation completion signal
This signal indicates that the servo unit is ready to operate. Conversely, if this signal is not issured, the servo unit is not operating.
• SA = "1"
- Self-diagnosis in the servo system completes normally when the power to the control unit is switched on.
- A Servo alarm (if any has occurred) is reset.
• SA = "0"
- The power to the control unit is switched off.
- A servo alarm condition is detected.
- An emergency stop is effected.

CAUTION
In the servo-off state, the SA signal remains at 1 unless a condition which resets it to 0 occurs.</td></tr>
<tr><td>OP</td><td>X65.7</td><td>Automatic operation signal
This signal indicates that a series of automatic operations is in progress.
• The signal becomes 1 when a command to start automatic operation is issued. The signal remains set to 1 even after automatic operation stops. It becomes 0 upon the occurrence of a reset.</td></tr>
<tr><td>ZPX</td><td>X66.0</td><td>Reference position return completion signal
The signal becomes 1 when :
- Manual reference position return is completed, and the servo unit enters the in-position state.
- Function code command-based reference position return is completed, and the servo unit enters the in-position state.
The signal becomes 0 when the servo unit moves out of the reference position.</td></tr>
<tr><td>RST</td><td>X66.1</td><td>Reset in-progress signal
This signal indicates that the control unit is being reset.
• The signal becomes 0 when a reset is completed.
• The signal becomes 1 when a reset is in progress.
That is, the external reset signal ERS is "1", or the emergency stop signal *ESP is 0.</td></tr>
</table>

<table>
<tr><th>SYMB.</th><th>ADD.</th><th>Description</th></tr>
<tr><td>DSALo</td><td>X66.3</td><td>Alarm output state check signal
The servo unit indicates the contents of the response data.
When the signal is 0, 1 turret, magazine, point number, or coordinates are being output as response data. When the signal is 1, the number of alarms and the first alarm number are being output as response data.</td></tr>
<tr><td>DSP1
DSP2</td><td>X66.4
X66.5</td><td>Response data check signals
The servo unit indicates the contents of the response data.
The servo unit specifies the response data using a combination of signals, as listed blow.
<table>
<tr><th>DSP2</th><th>DSP1</th><th>Response data</th></tr>
<tr><td>1</td><td>1</td><td>Coordinate</td></tr>
<tr><td>1</td><td>0</td><td>Current position number</td></tr>
</table></td></tr>
<tr><td>AL</td><td>X66.6</td><td>Alarm signal
This signal indicates that the servo unit is in an alarm state.
• The signal becomes 1 when :
- The servo unit enters an alarm state
☞ P/S Alarm, Pulse Coder Alarm, Servo Alarm, Over Travel Alarm.
• The signal becomes 0 when :
- The Servo unit is released from an alarm state by a reset.
Some alarms occur again after they are reset, unless their cause is removed. So, the AL signal is issued again immediately. In this case, the AL signal may become 0 for a moment.</td></tr>
<tr><td>MA</td><td>X66.7</td><td>Preparation completion signal
This signal indicates that the servo unit is ready to operate.
• The signal becomes 1 when :
- Self-diagnosis in the servo unit completes normally when the power is switched on.
- The signal becomes 0 when :
- The power to the servo unit is switched off.
- A control unit error such as a CPU or memory failure is detected.</td></tr>
</table>

<table>
<tr><td>SYMB</td><td>ADD</td><td>Description</td></tr>
<tr><td>RESPONSE DATA</td><td>X67 ~ X70</td><td>Response data
A) The servo unit outputs the current position number (point, turret, or magazine number) for point or ATC control. This response data is set up upon the completion of positioning. The servo unit continues to output the previous number until the new response data is set up.
B) Machine coordinates or workpiece coordinates can be output in real time according to the setting of parameter No.020.
C) When the DSAL signal is 1, the servo unit outputs the number of alarms and the first alarm number.</td></tr>
<tr><td>MVDX</td><td>X71.0</td><td>Movement direction signal
The servo unit indicates the movement direction of its controlled axis.
• The signal becomes 1 when controlled axis movement in the negative direction begins.
• The signal is 0 when controlled axis movement in the positive direction begins.

 CAUTION

1. The MVDX signal is valid while jog feed (JOG)mode is set.
2. The MVDX signal maintains its current state during a stop. It does not become 0 even upon a stop after movement in the negative direction.
3. The servo unit outputs the MVX signal even during follow-up, provided the necessary condition is satisfied.</td></tr>
<tr><td>APBAL</td><td>X71.1</td><td>Absolute pulse coder battery alarm signal
This signal indicates that the batteries of the absolute pulse coder require replacement.
• The signal becomes 1 when :
The absolute pulse coder battery voltage is low.
• The signal becomes 0 when :
The batteries are replaced, and the battery voltage becomes higher than or equal to the rating.
This alarm will occur again after it is reset, unless the batteries are replaced. So, the APBAL signal is immediately issued again. In this case, the APBAL signal may become 0 for a moment.</td></tr>
</table>

<table>
<tr><td>SYMB</td><td>ADD</td><td>Description</td></tr>
<tr><td>MVX</td><td>X71.2</td><td>Axis movement in-progress signal
The signal indicates that movement along the controlled axis is being performed.
• The signal becomes 1 when :
- Controlled axis movement begins.
• The signal becomes 0 when :
- Controlled axis movement ends, and the controlled axis enters the in-positon state.
 CAUTION
1. The MVX signal is valid while jog feed(JOG) mode is set.
2. The MVX signal is output even during follow-up, provided the necessary conditions are satisfied.</td></tr>
<tr><td>PSG1
PSG2</td><td>X71.3
X71.4</td><td>Area signals
The Servo unit indicates that the current machine coordinates are within a parameter-specified range, using two code signal outputs.
 CAUTION
The servo unit outputs the PSG1 and PSG2 signals even during follow-up, provided the necessary condition is satisfied.</td></tr>
<tr><td>SVERX</td><td>X71.6</td><td>Servo positional deviation monitor signal
This signal indicates that, in the servo unit, the amount of servo positional deviation has exceeded a parameter-specified value.
• The signal is 1 when the servo positional deviation amount is larger than a parameter-specified value.
• The signal is 0 when:
- A parameter-specified value for the servo positional deviation amount is 0
- The servo positional deviation amount is within a parameter-specified range.</td></tr>
</table>

<table>
<tr><th>SYMB</th><th>ADD</th><th>Description</th></tr>
<tr><td>MD1
MD2
MD4</td><td>Y64.0
Y64.1
Y64.2</td><td>Mode selection signal
This signal selects an operation mode.
The signal is a code signal consisting of three bits: MD1, MD2, and MD4. The code signal selects one of three modes: automatic operation (AUTO), handle feed(HANDLE), or jog(JOG), according to the combinatin of these bits.
<table>
<tr><th>MD1</th><th>MD2</th><th>MD4</th><th>Description</th></tr>
<tr><td>1</td><td>0</td><td>0</td><td>Automatic operation (AUTO)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Handle feed (HANDLE)</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>Jog feed by +X and -X(JOG)</td></tr>
</table>
CAUTION
Do not switch the operation mode during automatic operation.
Stop automatic operation before switching the operation mode.</td></tr>
<tr><td>DSAL</td><td>Y64.3</td><td>Alarm out command signal
The host specifies that alarm information be output as response data.
When DSAL is 1, the following information is output as response data.
<table>
<tr><td>X67</td><td>Number of alarm (byte type)</td></tr>
<tr><td>X68.X69</td><td>Alarm number (word type)</td></tr>
</table>
When the signal is 0, a turret, magazine, point number, or coordinates are output as response data, when the signal is 1, the number of alarms and the first alarm number are output as response data.</td></tr>
<tr><td>+X -X</td><td>Y64.4
Y64.5</td><td>Feed axis and direction selection signals These signals select the direction in which jog feed movement (rotation) is to be performed, and cause it to be performed in the selected direction. - The signals are valid when jog feed (JOG) is selected. They indicate the direction of feed, from 0 to 1 causes and keeps movement in the corresponding direction at a feedrate specified by the override signals *0V1 to *0V8 or the manual rapid traverse selection signal RT, provided the signal is 1.
CAUTION
1. Simultaneously setting +X and -X to 1 results in neither direction being selected (dquivalent to when both are 0).
2. If a feed axis selection signal becomes 1 before the jog feed selection signal (JOG) becomes 1, it must be reset to 0 before the feed axis selection signal is set. The servo unit begins feeding when the JOG signal rises.</td></tr>
</table>

<table>
<tr><td>SYMB</td><td>ADD</td><td>Description</td></tr>
<tr><td>STL</td><td>X65.5</td><td>Clamp/unclamp state output signal
When the servo unit requests clamping/unclamping of the machine, using the UCPC2 signal, the host actually clamps/unclamps the machine.
Upon the completion of clamp/unclamping, it reports it to the servo unit, which then proceeds to the next processing.
The signal is set to 1 when machine is undamped.
When it is clamped, the signal is reset to 0.
See the timing chart for the
function codes for peripheral equipment control.

CAUTION
The UCPS2 signal is valid when the NCLP parameter (bit 1 of parameter No.003) .is 0.</td></tr>
<tr><td>SA</td><td>X65.6</td><td>Automatic operation start signal The host starts function code commands, such as part of peripheral equipment control ATC operations and point positioning. Specifically, the host issues a direct command to start 32-block buffering. When the ST signal is set to 1 then reset to 0 again, the servo unit begins operating.

CAUTION
It is also possible to start operation at the rising edge (form off to ton) of the ST signal as specified by the STON parameter (bit 7 of parameter No.003)</td></tr>
<tr><td>OP</td><td>X65.7</td><td>External reset signal
This signal resets the servo unit.
• When the signal becomes 1, the servo unit operates as follows :
- The servo unit immediately decelerates axis movement to a stop.
- After as. stop, the servo unit is reset, then the following are canceled :
☞ Function code commands being executed, buffered, and sent as an input signal.
☞ Alarm condition (if any).
- While the external reset signal is 1, jog and function code commands cannot be issued.</td></tr>
<tr><td>RST</td><td>X66.1</td><td>Emergency stop signal
This signal brings the control unit to an emergency stop.
- The control unit decelerates axis movement to a stop immediately.
- A reset is applied after the stop.
- When the emergency stop signal is 0, the servo preparation completion signal SA is also 0, because the servo system is not operating, the amount of movement is reflected in the current position coordinates held in the control unit (follow-up)
- While the emergency stop signal is 0, jog and function code commands cannot be issued.</td></tr>
</table>

SYMB	ADD	Description
SVFX	X65.2	Servo-off command signal The host turns off the servo circuit for a controlled axis, that is, shuts off the current to the servo motor of the controlled axis. This disables positioning control. Position detection continues, however. So, the current position will not be lost. The servo motor remains off while the signal is 1. If the machine is moved by the application of external force, its coordinates are shifted, because positioning control does not work during the servo-off state. How the shifted machine coordinates are handled can be selected by a parameter, as follow: 1. The machine coordinate shift is recorded in an error counter. When the servo-off signal becomes 0, the machine moves to cancel out the error recorded in the error counter. 2. Follow-up is performed. The machine coordinate shift is regarded as being the result of a command, and the control unit adjusts its current position data so that the error counter becomes 0. With this method, the machine remains in a shifted position even after the servo-off signal becomes 0. However, the machine moves to the correct position the next time an absolute command is issued, because the control unit has information about the correct position. [USE] Generally, method (1) above is used to prevent excessive current flowing through the servo motor when it is clamped mechanically with a force stronger than the servo motor can generate. Usually, the host keeps the inter lock signal at 0 while the servo-off signal is 1. Generally, method (2) is used to operate the machine by rotating the motor with a handle feed mechanism.
*ILK	Y65.3	Inter lock signal The host stops sending jog feed and function code commands. • When the *ILK signal is 0, the host resets jog feed and function code command signals to 0 to decelerate and stop controlled axis feed. When it becomes 1, movement is resumed immediately. No command other than a move command is affected. **CAUTION** The interlock signal is valid when jog feed (-X or +X) is being performed based on the jog feed selection signal (JOG).

<table>
<tr><td>SYMB</td><td>ADD</td><td>Description</td></tr>
<tr><td>IGNVRY</td><td>Y65.6</td><td>V READY OFF alarm ignore signal
This signal is used to disable the detection of "Servo alarm (No.0401): V ready off" for the controlled axis.
When the signal becomes 1, the control unit behaves as follows:
• Even when the servo amplifier preparation completion signal is off, "servo alarm (No.401) : V ready off" is not detected. The Servo preparation completion signal SA becomes 0, however.(This signal can be held at 1 using the SAK parameter (bit 0 of parameter No.004)</td></tr>
<tr><td>COM. Data 1</td><td>Y66.0
~
Y66.3</td><td>Command data 1
The host sets command data 1 to specify the feed rate for peripheral equipment control.</td></tr>
<tr><td>FUNC. Code</td><td>Y66.4
~
Y66.7</td><td>Function code
The host sets the peripheral equipment control function code.</td></tr>
<tr><td>COM. Data 2</td><td>Y67
~
Y70</td><td>Command data 2
The host sets command data 2 to specify the amount of movement for peripheral equipment control.</td></tr>
<tr><td>*OV1 ~ *OV8</td><td>Y71.0
Y71.1
Y71.2
Y71.3</td><td>Override signals
The host applies override to jog feed and cutting feedrates.
<table>
<tr><td>*OV8</td><td>*OV4</td><td>*OV2</td><td>OV1</td><td>"Override</td><td>*OV8</td><td>*OV4</td><td>*OV2</td><td>*OV1</td><td>*Override</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>80</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>10</td><td>0</td><td>1</td><td>1</td><td>0</td><td>92</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>20</td><td>0</td><td>1</td><td>0</td><td>1</td><td>100</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>30</td><td>0</td><td>1</td><td>0</td><td>0</td><td>110</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>40</td><td>0</td><td>0</td><td>1</td><td>1</td><td>120</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>60</td><td>0</td><td>0</td><td>0</td><td>1</td><td>140</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>70</td><td>0</td><td>0</td><td>0</td><td>0</td><td>150</td></tr>
</table>
Actual jog feed and automatic cutting feedrates are obtained by multiplying the respective specified values by the override values.</td></tr>
</table>

<table>
<tr><th>SYMB</th><th>ADD</th><th>Description</th></tr>
<tr><td>ROV 1
ROV 2</td><td>Y71.4
Y71.5</td><td>Rapid traverse override signals
The host specifies override for rapid traverse
The following table lists the override amount.
<table>
<tr><th>ROV2</th><th>ROV1</th><th>Override amount</th></tr>
<tr><td>0</td><td>0</td><td>100%</td></tr>
<tr><td>0</td><td>0</td><td>50%</td></tr>
<tr><td>1</td><td>1</td><td>25%</td></tr>
<tr><td>1</td><td>1</td><td>F0</td></tr>
</table>
NOTE
F0 is a value specified in parameter No. 061.</td></tr>
<tr><td>DRN</td><td>Y71.6</td><td>Dry run signal
Dry run is valid during automatic operation (AUTO mode). During dry run, a feedrate command issued during automatic operation is ignored, and a manual-feed feedrate determined by override signals *OV1-*OV8 is used. Dry run is also valid for rapid traverse. When the RT signal is set to 1 during dry run, the "rapid traverse rate" and the "maximum manual-feed feedrate"are used for the rapid traverse and cutting feed blocks, respectively. When the RT signal is reset to 0, the "sage rate as the manual-feed feedrate" is resumed.
- Setting the DRN signal to 1 causes the system to enter the dry run state. Resetting it to 0 resumes the feed rate specified during automatic operation.</td></tr>
<tr><td>RT</td><td>Y71.7</td><td>Manual rapid traverse selection signal.
The host selects rapid traverse for jog feed.
The RT signal is valid when jog feed mode (JOG) is selected. When the signal is 1, jog feed is performed at a rapid traverse rate. Under this condition, setting a feed axis and direction selection signal (+X or -X) is 1, and an override signal is valid, setting the RT signal to 1 starts rapid traverse. Resetting the RT signal to 0 resumes normal feed.</td></tr>
</table>

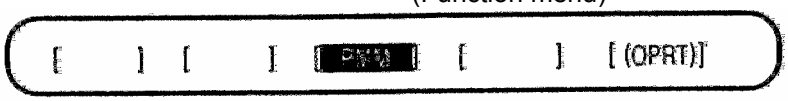
2-4-9. POWER MATE CMC MANAGER Function

1. SOFT KEY Status Transition Diagram

① After CNC function select key

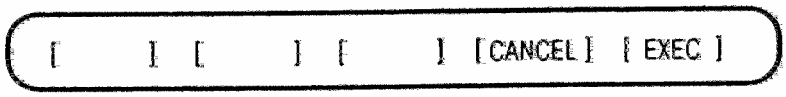
is selected, the following screen can be selected by pressing the next -menu key [>] several times until [PMM] is displayed.

(Function menu)

⇒ 

② Pressing the soft key [PMM], system configuration screen appears, and the following soft key menu is displayed.

(Sub menu)

⇒ 

2-1) When [POS] is selected, and the following soft key menu is displayed.

(Sub menu)

⇒

2-2) When [SYSTEM] is selected, and the following soft key menu is displayed.

(Sub menu)

⇒

※ The following screen can be selected by pressing the next-menu key [>] several times.

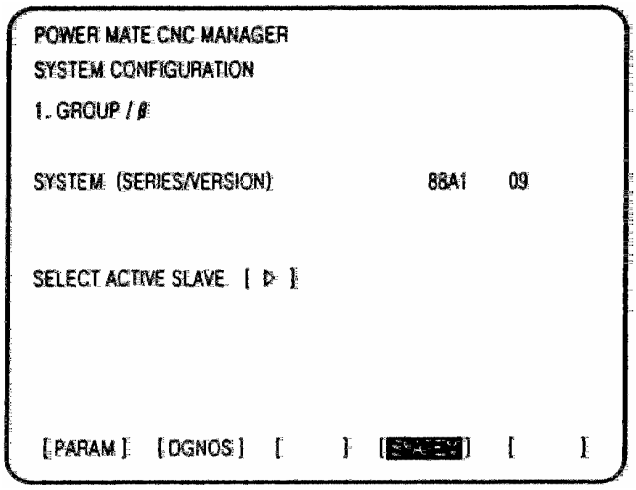
(Sub menu)

⇒

⇒ Pressing the previous-menu key [<] resumes the function selection soft key menu.

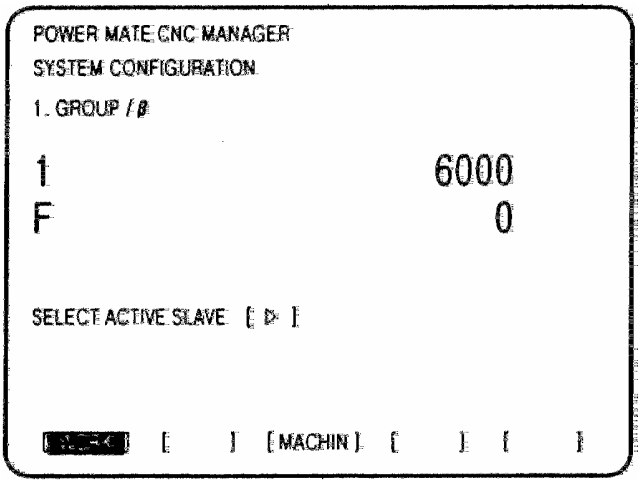
3) System Configuration

① Pressing the [SYSTEM] function selection soft key displays the following soft key menu.



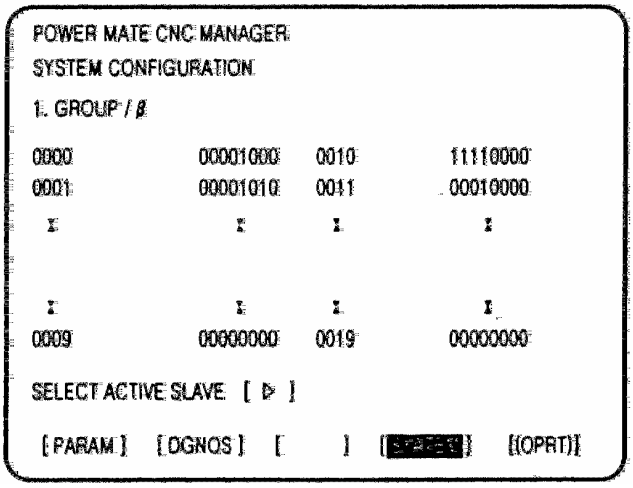
⇒ Servo unit β series system software series and edition

② Pressing the [WORK] soft key displays the absolute coordinate screen.

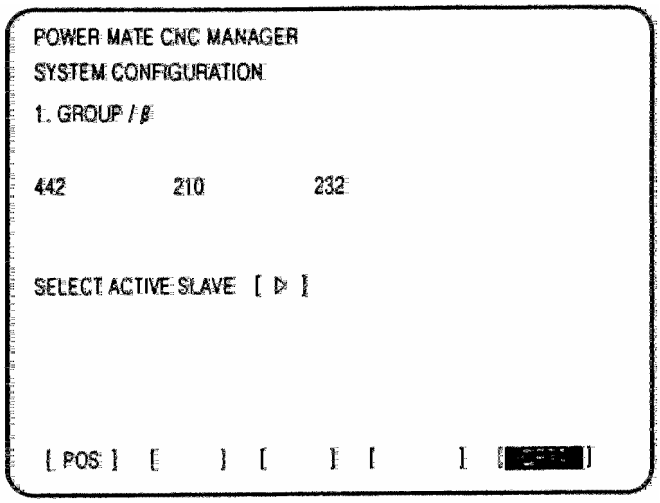


※ 1 : Coordinate F: Actual speed

③ Pressing the [PARAM) soft key displays the parameter screen.



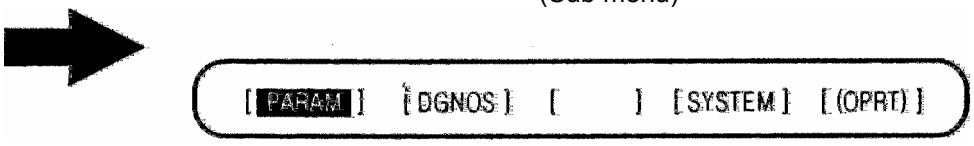
④ Pressing the [MSG] function selection soft key display only an error code on the screen.



4) Parameters
The parameters required for each function of the β AMP with an I/O link must be set up in advance.

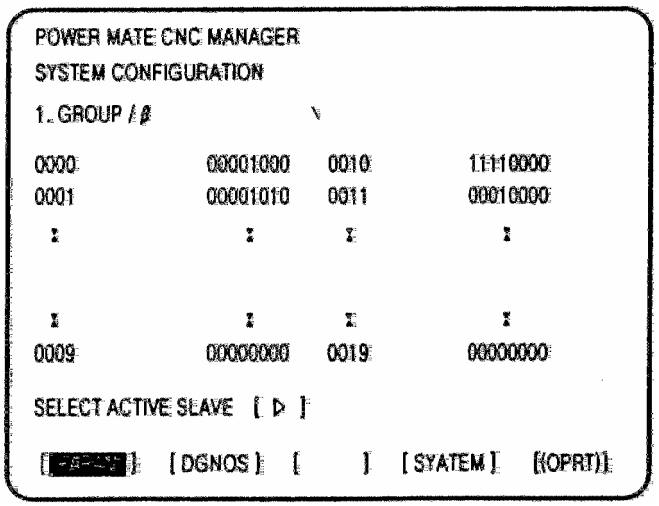
① Display operations
Pressing the [SYSTEM] function selection soft key displays the following soft key menu:

(Sub menu)



Pressing the [PARAM] soft key displays the parameter screen.

② Displays



This screen display bit-type and decimal data only.

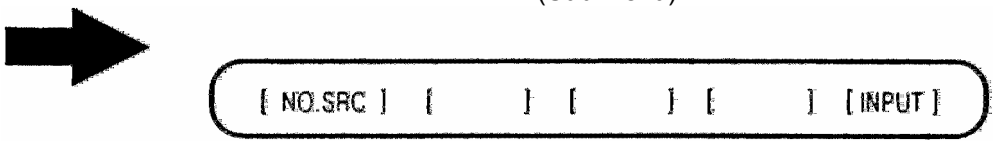
③ Saving parameter
Parameters can be saved as program data files to the CNC memory or to a memory card.

To save parameters, first set the first registration program number in parameter P8760. Program are created using a number assigned to each β AMP with an I/O link. This number is treated as a program number when the parameters are saved to the CNC memory. When they are saved to a memory card, however, a file is created using the program number and PMM as its file name and file extension, respectively.

ex) If 6500 is set in parameter P8760
A program number for a program in group n is: 6500 + n*10.
The group number is a number in "group n" displayed in the title of a β AMP with an I/O link. If an existing program in the memory has the same program number, the existing program is overwritten with the new data.
Parameter P960 is used to select a device to save parameters.
Before proceeding to the following steps, connect a memory card or ensure that the CNC memory is available.

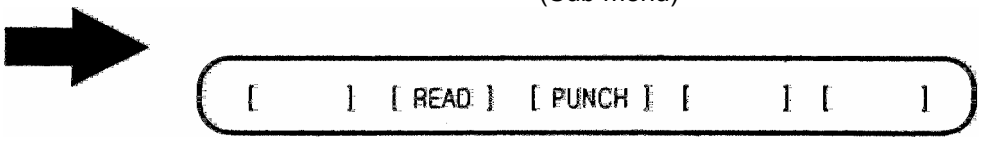
a. Select an active slave.
b. Press the [(OPRT)] soft key to display:

(Sub menu)



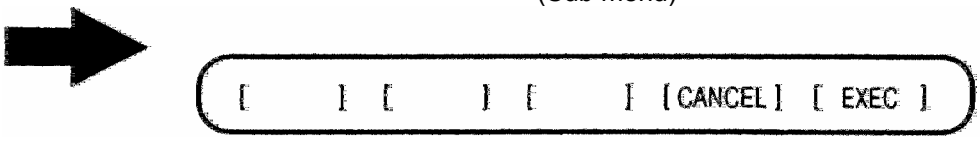
Press the next-menu [>] key.

(Sub menu)



c. Press the [READ] soft key to display:

(Sub menu)

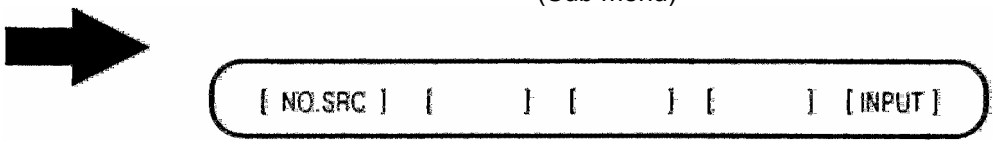


Press the [EXEC] soft key.
While the parameters are being saved, the message [INPUT] blinks on the message line.

④ Writing parameter
Parameter data files saved as programs to the CNC memory or memory card can be restored and written to the βAMP with an I/O link determined from a program number. The program number and device are determined using the same method as in item (3).

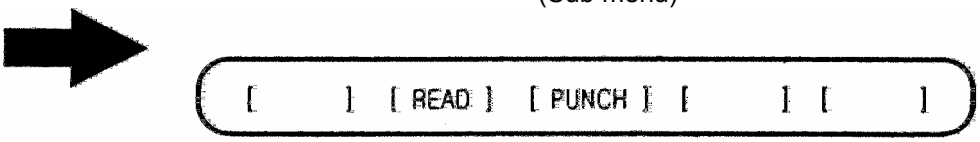
a. Select an active slave.
b. Press the [(OPRT)] soft key to display:

(Sub menu)



Press the next-menu key.
c. Press the [PUNCH] soft key to display:

(Sub menu)

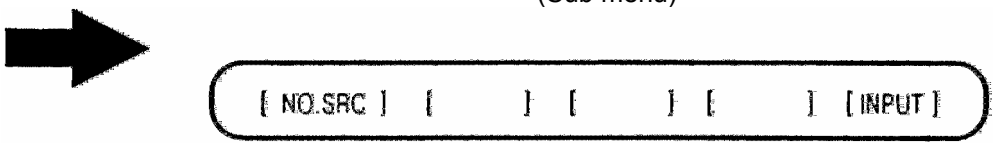


Press the [EXEC] soft key.

While the parameters are being written, the message [OUTPUT] blinks on the message line.

⑤ Searching for parameter
A parameter can be searched for and displayed by means of the following procedure.
a. Select an active slave.
b. Press the [(OPRT)] soft key to display:

(Sub menu)

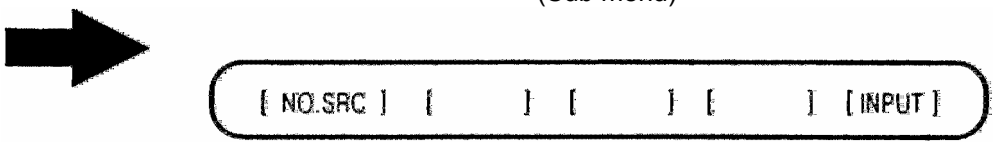


c. Key in a desired number on the key-in line using the MDI keypad, then press the [NO.SRC] soft key to start the search.

⑥ Setting parameter
Parameters for β AMP with an I/O link can be set directly from the CNC by means of the following procedure.
a. Select an active slave.

b. Press the [(OPRT)) soft key to display:

(Sub menu)



c. Position the cursor to the desired parameter.

d. Key in the desired data Key-in line using the MDI keypad, then press the [INPUT] soft key or the INPUT key on the MDI keypad.

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