CNC LATHE

LB25II

OPERATION & MAINTENANCE MANUAL
(1th Edition)

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OKUMA

SAFETY PRECAUTIONS

Thank you for your purchasing the LB25II. The machine is equipped with a variety of safety devices designed to prevent accidents and injuries from occurring. Still, operators must use the machine carefully and learn not to rely on these safety devices.

This section describes the general safety precautions required for machine operation. Every operator must read this section carefully and observe the guidelines it describes.

1. BEFORE TURNING ON THE POWER

(1) Make sure that the doors to the operation panel and the electric control cabinet are closed.

(2) Make sure that there are no obstacles around the machine.

(3) Turn on the main power disconnect switch before turning on the CONTROL ON switch on the operation panel.

2. CHUCK PRECAUTIONS

(1) Always close the front shield before starting the spindle or cutting operations.

(2) Always observe the spindle speed maximums for the installed chunk.

Never run the spindle exceeding the maximum allowable spindle speed.

(3) If a chunk or fixture is unique to your application. Check the maximum allowable spindle speed and stay within the limit. Also, take note of the workpiece gripping force and balance.

(4) The maximum spindle speed can be limited by inputting a G50 command with the spindle speed. The G50 command helps to ensure safety in operation.

(5) If the spindle must be rotated close to the maximum allowable spindle speed, observe the following points

- Make sure that the workpiece clamped in the chunk is balanced.
- Apply the allowable maximum amount of pressure to grip the workpiece because centrifugal force reduces the chuck gripping force.

The maximum allowable spindle speed and application pressure are indicated on the name plate on the front shield and on the chuck body. The allowable maximum speed and the applicable pressure ensure a chucking force that is more than one-third over the original chunk gripping force with the standard soft-top jaw set in line with the periphery of the chuck body.

(6) If special jaws (larger than standard soft-top jaws) are used, observe the following points:

- Lower the spindle speed because centrifugal force and lower efficiency reduce the chuck gripping force.
- If the jaw tightening nut (jaw nut) is outside of the periphery of the chuck, only one tightening bolt is holding the jaws in place. This is a potentially dangerous condition. Jaw nuts must always be within the periphery of the chuck.
- Machine the jaws to the workpiece shape.

(7) Securely tighten the bolts on the chuck body, the jaws, and the block to the specified torque. Use lubrication oil. Make sure that the torque is at least 392 to 490 N [40 to 50 kgf (88 to 110 lbf)].

3. GENERAL CHECKS

(1) Check the amount of lubricating oil every day before starting operation.

(2) Always use the specified brand of lubricating oil.

(3) Use the recommended type of cutting fluid (coolant) when possible.

(4) Change and replenish the lubricating oil and coolant in each reservoir according to the schedules in the manual.

(5) Clean the filters according to the schedules in the manual.

(6) Make sure that each pressure gauge on the air and hydraulic lines display the correct value as described in this manual.

(7) Always turn off the power before beginning any work inside the front shield. In addition, turn off the power before beginning work at the back of the machine that requires an operator to enter the machine operating zone.

4. BEFORE STARTING OPERATION

(1) Always follow the instructions in the operation manual.

(2) Never operate the machine with all of the protective covers and shields in place.

(3) Always close the front shield before starting operation.

(4) Never attempt to run a new program without checking its operation. Run the program without a workpiece set in the chuck and make sure that there is no interference. After making sure that the program has no bugs, cut a workpiece in the single block mode. If no problems are discovered, automatic operation may be started.

(5) Before attempting the following operations, make sure that they can be accomplished safety.

- Spindle rotation
- Turret indexing
- Axis movement

(6) Never touch chips or the workpiece while the spindle is rotating.

(7) Never attempt to stop a moving object by hand or with a tool.

(8) Check the jaw installation conditions, the hydraulic pressure, and the maximum allowable spindle speed for the power chuck.

(9) Check the installation and arrangement of the tools.

(10) Check the tool offset settings.

(11) Check the zero offset settings.

(12) Make sure that the spindle speed and feedrate override settings are at 100%.

(13) Before feeding the turret, check the software limit setting and the emergency limit LS (limit switch) dog positions for sub spindle.

(14) Check the turret index/rotation position.

(15) Check the sub spindle position.

(16) Make sure the cutting operation is within the allowable transmission power and torque ranges.

(17) Make sure that the workpiece securely fitted in the chuck or fixture.

(18) Check the cutting fluid nozzle positions. They must be set to properly supply cutting fluid to the appropriate points.

5. SETUP

(1) Make sure that setup is complete.

(2) If the setup is changed, operate the machine step-by-step to make sure that cutting can performed without any problems.

(3) Before changing the chuck and/or chuck jaws, make sure that the chuck fits the intended jog.

(4) If two or more workers must work together, establish signals so that they can communicate (for example, when lifting or setting heavy objects). Each worked should be aware when a new process is about to begin.

(5) Use the crane or equivalent tool to handle heavy objects.

(6) When attempting an unfamiliar setup, recheck the setup before beginning operation.

6. WORKPIECE LOADING AND UNLOADING

(1) Make sure that workpieces are loaded and unloaded securely.

(2) Before loading or unloading a workpiece, retract the turret so that the cutting tools in the turret cannot injure the operator.

(3) Before loading and unloading a workpiece, make sure that the spindle has come to a complete stop.

(4) Before running a new program, rotate the spindle to make sure that the workpiece is securely clamped in the chuck.

(5) Before machining an irregularly-shaped workpiece, make sure that it is balanced properly.

(6) When handling heavy workpieces, use the a crane, hoist, or other similar tool.

(7) Before loading a workpiece, make sure that the workpiece has a portion that can be used for proper chucking.

7. AT THE END OF THE DAY

(1) Clean the machine.

(2) Move the turret to the predetermined retraction position.

(3) Turn off the CONTROL ON switch on the operation panel, before turning off the main power disconnect switch.

(4) Make sure all power switches are turned off.

8. WHEN A PROBLEM OCCURS

(1) Stop the machine immediately by pressing the EMERGENCY STOP switch on the operation panel.

(2) Consult with the person in charge of maintenance to determine what corrective measures need to be taken.

(3) If two or more workers must work together, establish signals so that they can communicate (for example, when lifting or setting heavy objects). Each worked should be aware when a new process is about to begin.

(4) Only use specified replacement parts and fuses.

9. GENERAL PRECAUTIONS

(1) Wear appropriate clothing.

(2) Keep the machine and the area around it clean and organized.

(3) Never touch controls or switches with wet hands.

10. SAFETY DEVICES AND FUNCTIONS

Contents	Location	Remark
1. Front shield with grated glass and polycarbonate	Machine	
2. Shield open/close interlock	Machine	
3. Chuck interlock	Electric control cabinet	
4. Tailstock spindle interlock	Electric control cabinet	
5. Tailstock spindle position confirmation	Electric control cabinet	optional
6. Foot pedal protection cover	Machine	optional
7. Emergency limit setting LS (limit switch) (X-/Z-axis)	Machine	
8. Software limit	Operation panel	
9. Chuck barrier	Operation panel	
10. Turret barrier	Operation panel	2ST specification
11. Tailstock barrier	Operation panel	optional
12. Emergency stop button	Operation panel	
13. Slide hold button	Operation panel	
14. Alarm display	Operation panel	
15. Leakage circuit breaker	Electric control cabinet	optional
16. Self-lock cylinder for chuck	Machine	
17. Cycle start requiring simultaneous depression of both buttons	Machine	optional
18. Turret rotation at low speeds (manual)	Machine	

11. SYMBOLS

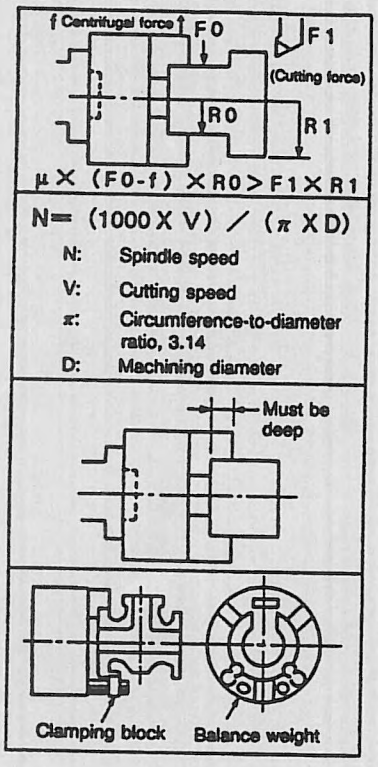
This manual uses the following symbols to emphasize the items which must be strictly observed:

REMARKS : Precaution in machine operations.
Default of this item affects the machining accuracy and smooth operation.

CAUTION : Default of this item may cause faulty machine operation, machine damage, or operator injury.
More care must be exercised to this item than the items indicated under "REMARKS".

WARNING : Default of this item may cause not only machine damage but also serious accidents that affect human life.
Sufficient care must be taken to this item.

12. FOR SAFE CHUCK WORK

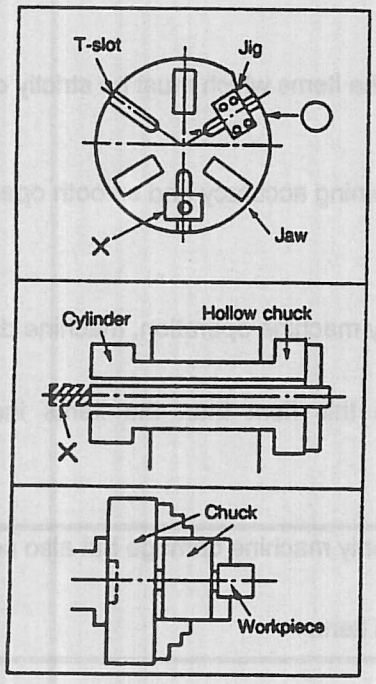


1. Set the chuck gripping force by ensuring sufficient factor of safety (2 to 3 or over). Run the spindle within the allowable speed range set at this time.

2. In constant peripheral speed cutting, calculate the actual machining speed before designating G50 (max. speed limit function).

3. Secure the haw gripping depth as much as possible.

4. Before machining an unbalanced workpiece, carry out balancing of the workpiece weight by gradually changing the spindle speed.



5. Never attempt to install jigs using T-nut.

   Be sure to fix the jigs with bolts.

   No chucks prepared by Okuma have T-groove.

6. When inserting a bar material into the hollow chuck, ensure that the bar does not protrude from the rear end of the cylinder.

7. Never use double chucking method.

INTRODUCTION

Thank you for choosing an Okuma Model LB25II CNC lathe. We are proud to have you among our Okuma family of users.

This instruction manual contains concise information on the installation, setup, operation and maintenance of your Model LB25II CNC lathe. To make the most of its outstanding performance over a long period, the machine must be properly installed, and operating and maintenance procedures must be clearly understood and carefully followed. You are encouraged to study this instruction manual carefully before the machine is installed and to keep it on file for future reference.

TABLE OF CONTENTS

PAGE

SECTION 1 MACHINE SPECIFICATIONS 1

1. SPECIFICATION TABLE 1
2. DIMENSIONAL DRAWINGS 3

SECTION 2 HANDLING AND INSTALLATION OF MACHINE 5

1. CARE IN HANDLING A PRECISION MACHINE 5
   1-1. Machine Lifting 5
   1-2. Precautions for Lifting 7
   1-3. Rolling 7
2. FOUNDATION REQUIREMENTS 8
   2-1. General Precautions for Building a New Foundation 8
3. GENERAL PROCEDURE FOR INSTALLATION 9
   3-1. Precautions for Installation 9
4. LEVELING THE MACHINE 10
   4-1. Leveling Procedure 10
5. FOUNDATION PLAN 11
6. POWER REQUIREMENTS 13
   6-1. Inspection of Cable Connection 13
   6-2. Electrical Work 13

SECTION 3 MACHINE OPERATION 14

1. BEFORE STARTING OPERATIONS 14
   1-1. NC Operation 14
2. MACHINE OPERATION 15
   2-1. Hydraulic Unit 15
   2-2. Selection of Spindle Speed 18
   2-3. Hydraulic Chuck 19
   2-4. Cutting Soft Top Jaws of Power Chuck 31
   2-5. Hydraulic Tailstock Operation 33
   2-6. Cautions on Operating the Turret 35
   2-7. Interlock 36
   2-8. After Completion of A Day's Operation 36
   2-9. Manually Operated Chuck 39

PAGE

SECTION 4 INSPECTION AND MAINTENANCE OF MACHINE 47

1. LUBRICATION 48
   1-1. Spindle 52
   1-2. Slideway Lubrication System 52
2. ADJUSTING CENTRALIZED LUBRICATION UNIT 53
3. CLEANING COOLANT TANK 54
4. TENSIONING BELTS 55
   4-1. Spindle Drive Belts 55
5. OTHER MAINTENANCE ITEMS 57
   5-1. Check the Bed Level 57
   5-2. Alignment of Headstock 57
   5-3. Adjustment of Tapered Gibs on Saddle Cross-slide 58
6. TROUBLESHOOTING FOR SIMPLE MECHANICAL TROUBLE 59
   6-1. Trouble with Headstock 59
   6-2. Trouble with Turret 59
   6-3. Trouble with X-axis Ball Screw 65
   6-4. Others 66

SECTION 5 SPARE PARTS LIST 68

1. HYDRAULICS 68
2. ELECTRICALS (ON MACHINE) 69
3. CONSUMABLE ITEMS 70

SECTION 6 TECHNICAL DATA 72

1. TOOLING SYSTEM 72
2. TOOLHOLDER DIMENSIONS 73
3. TOOL INTERFERENCE DIAGRAM 75
4. WORKING RANGE DIAGRAM 76
5. DIMENSION OF SPINDLE NOSE (JIS-A2-8) 79
6. HYDRAULIC CHUCK AND CYLINDER 80
7. HYDRAULIC CIRCUIT DIAGRAM 82
8. MANUAL HYDRAULIC TAILSTOCK (1SC) 84

PAGE

SECTION 7 TOUCH SETTER M (OPTIONAL) 88

1. OVERVIEW OF TOUCH SETTER 88
2. CAUTIONS ON HANDLING THE TOUCH SETTER 89
3. RE-ADJUSTING THE SENSOR 91
4. SPARE PARTS 92

SECTION 1 MACHINE SPECIFICATIONS

1. SPECIFICATION TABLE

Item	Unit	Specifications		
		LB25II-T 420 × 300	LB25II-C 420 × 650	LB25II-C 420 × 1250
CAPACITY:				
Swing over bed	mm (in.)	ϕ620 (24.41)		
Swing over carriage	mm (in.)	ϕ420 (16.54)		
Distance between centers	mm (in.)	——	675 (26.57)	1275 (50.20)
Max. turning diameter	mm (in.)	420 (16.54)		
Max. turning length	mm (in.)	330 (12.99)	650 (25.59)	1250 (49.21)
AXIS TRAVEL:				
X-axis	mm (in.)	300 (11.81) [210 + 90 (8.26 + 3.54)]		
Z-axis	mm (in.)	675 (26.57)		1275 (50.20)
SPINDLE:				
Spindle rotation speed	min^{-1} {rpm}	65 to 3500 [40 to 2800]*1		
No. of spindle gear range		Stepless × automatic 2 step (VAC motor winding changeover)		
Spindle nose type		JIS A2-8 (JIS A2-11)*1		
Through-spindle hole	mm (in.)	ϕ80 (3.15) [ϕ110 (4.33)]*1		
ID of spindle bearings	min^{-1} {rpm}	ϕ120 (4.72) [ϕ150 (5.91)]*1		
TURRET:				
Type		V12 NC		
No. of tools		12		
OD turning	mm (in.)	□25 (0.98)		
ID turing tools	mm (in.)	ϕ40 (1.57)		
Index time	s	0.2 (to the next station)		
Feedrate:				
Rapid feedrate	mm/min (ipm)	X: 15000 (590.55) Z: 20000 (787.40)		
Cutting feedrate	mm/rev (ipr)	X, Z: 0.001 to1000.00 (0.00001 to 39.37)		
TAILSTOCK:				
Tailstock spindle diameter	mm (in.)	——	ϕ100 (3.94)	
Tailstock spindle taper hole		——	MT. No. 5 (revolving center)	
Tailstock spindle travel	mm (in.)	——	120 (4.72)	
MOTOR:				
Spindle drive motor	kW (hp)	VAC 15/11 (20/15) (30 min/cont.) [22/15 (30/20)]*2		
Axis drive motor	kW (hp)	X: BL 2.4 (3.27) Z: BL 3.6 (4.82)		
Coolant unit pump motor	kW (hp)	0.25 (0.34)		
Power supply	KVA	36.8 (continuous)		

Item	Unit	Specifications		
		LB25II-T 420 × 300	LB25II-C 420 × 650	LB25II-C 420 × 1250
MACHINE HEIGHT	mm (in.)	1865 (73.43))		2043 (80.43)
FLOOR SPACE REQUIRED	mm (in.) × mm (in.)	3400 × 1950 (133.86 × 76.77)		4000 × 1880 (157.48 × 74.02)
NET WEIGHT (including CNC unit)	kg (lb)	6200 (13640)	6500 (14300)	7400 (16280)
CNC UNIT		OSP7000L		

*1 For large-diameter spindle

*2 For high-power spindle

2. DIMENSIONAL DRAWINGS

(1) LB25II-C × 650

Distance between centers:
650 mm (25.59 in.)

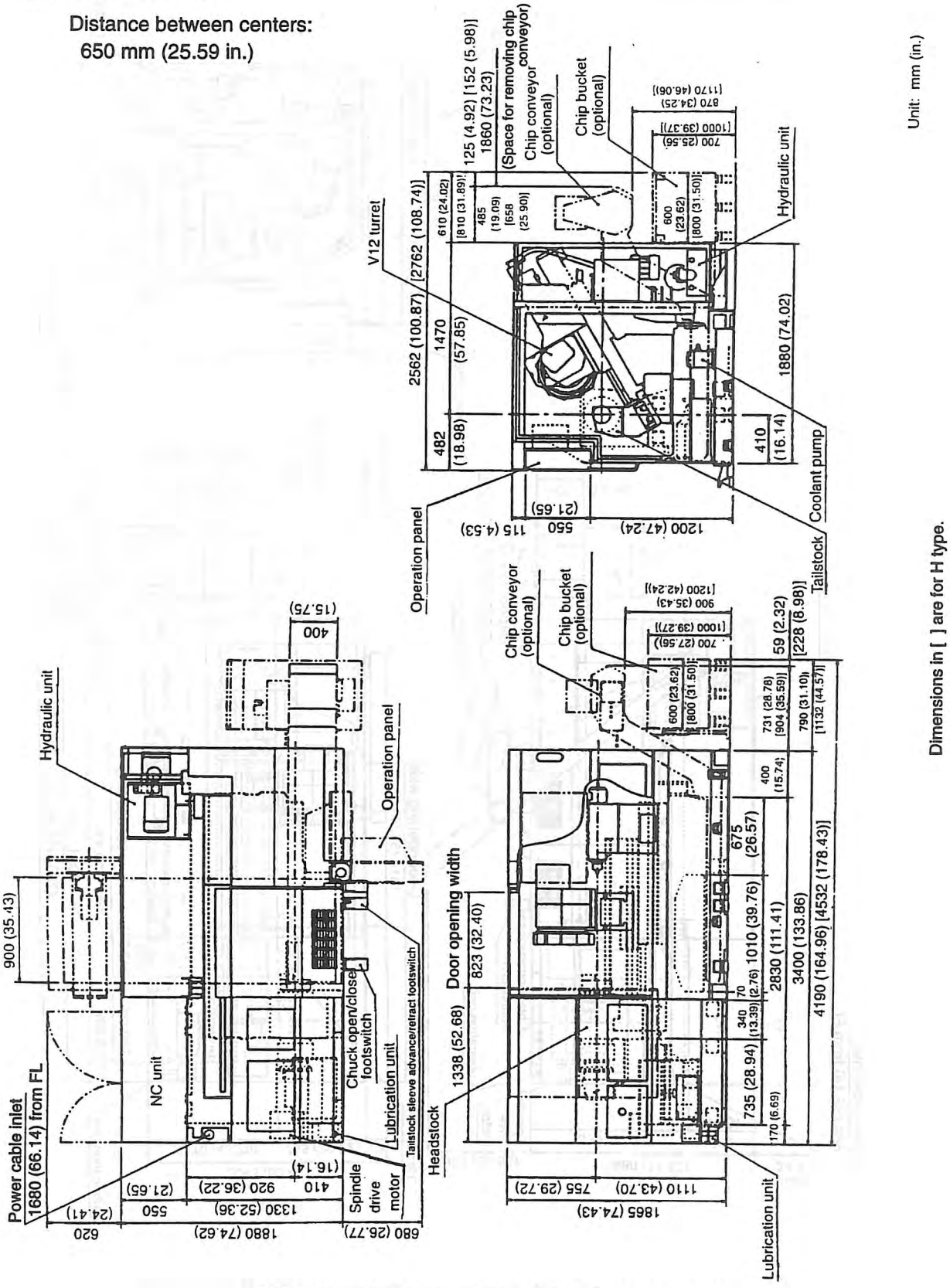


Fig. 1-1 Dimensional Drawings (LB25II-C × 650)

(2) LB25II-C × 1250

Distance between centers:
1250 mm (49.21 in.)

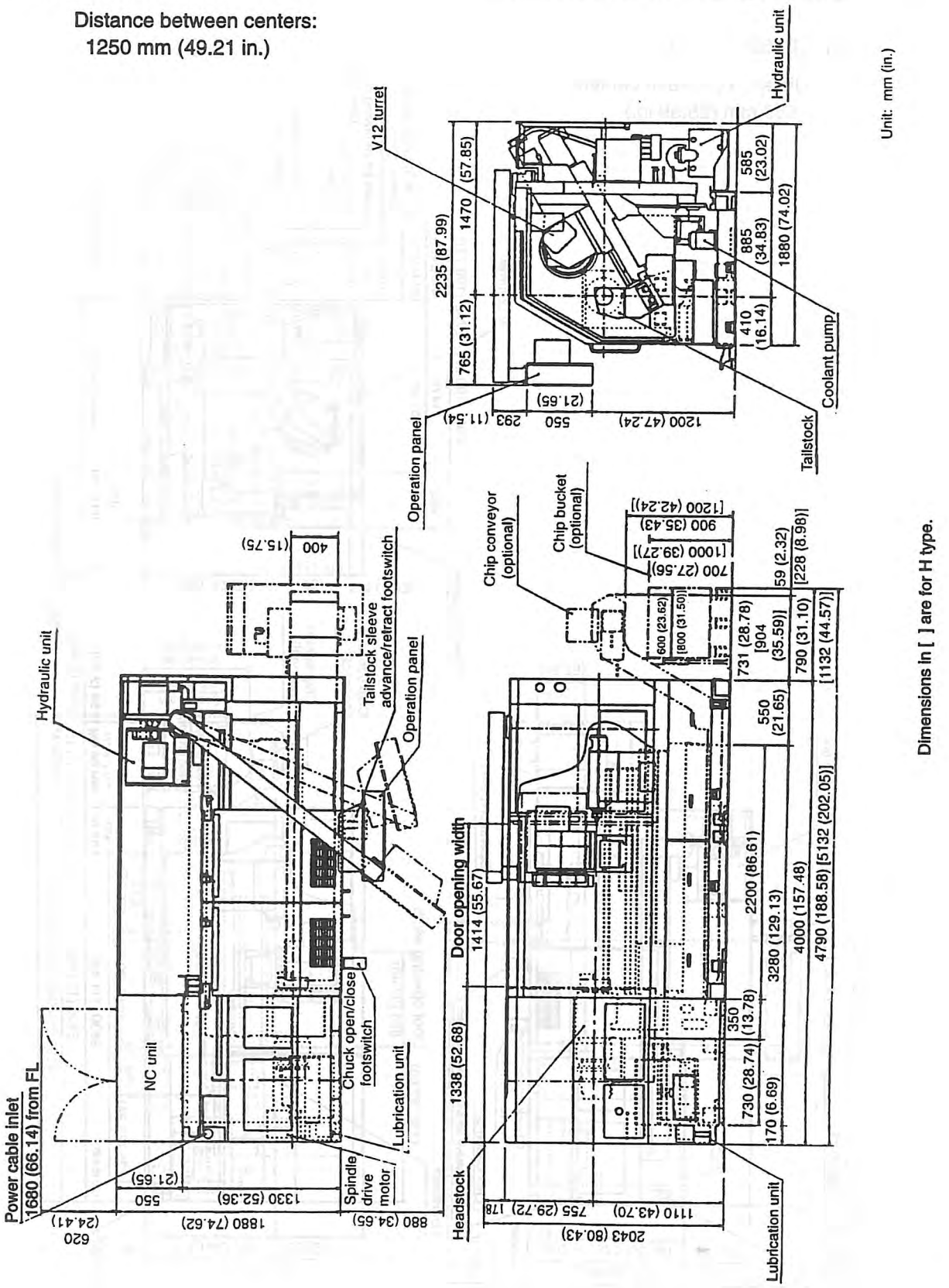


Fig. 1-2 Dimensional Drawings (LB25II-C × 1250)

SECTION 2 HANDLING AND INSTALLATION OF MACHINE

This section outlines the procedures for handling and installing your CNC lathe when it has to be moved to a place area due to any change in your plant layout.

Most precautions noted may also apply to the initial installation of an CNC lathe at your plant.

1. CARE IN HANDLING A PRECISION MACHINE

The CNC lathe consists essentially of four major components: the machine, the electric control box, the hydraulic power unit and the CNC unit. Model LB25II CNC lathe is built in one unit and it can be easily moved without separating it into consisting units. (Note that the coolant tank is installed separately.)

Lifting and moving machine:

There are two different methods for moving the entire machine to any desired location; by an overhead crane, using lifting hooks supplied together with the machine and by rolls over which the machine is pushed by manual labor.

1-1. Machine Lifting

(1) LB25II-C × 650

Distance between Centers: 650 mm (25.59 in.)

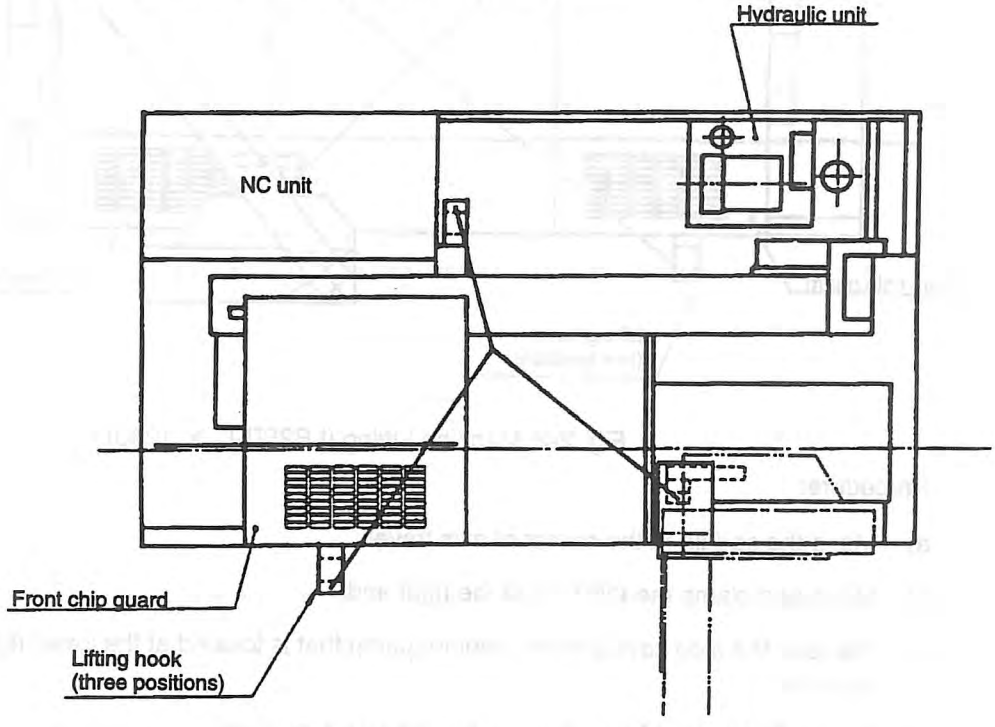


Fig. 2-1 Machine Lifting (LB25II-C × 650)

Procedure:

a) Move the saddle and the tailstock to the right end and clamp the tailstock in place.

b) Remove the side covers of the coolant pump that is located at the lower right side of the machine.

c) Disconnect the cables and hoses from the coolant pump.

d) Pull out the coolant tank.

e) Keep the front door of the machine opened.

f) Remove the upper cover at the headstock side.

g) Fix the lifting hooks at the predetermined positions.

(2) LB25II-C × 1250

Distance between Centers: 1250 mm (49.21 in.)

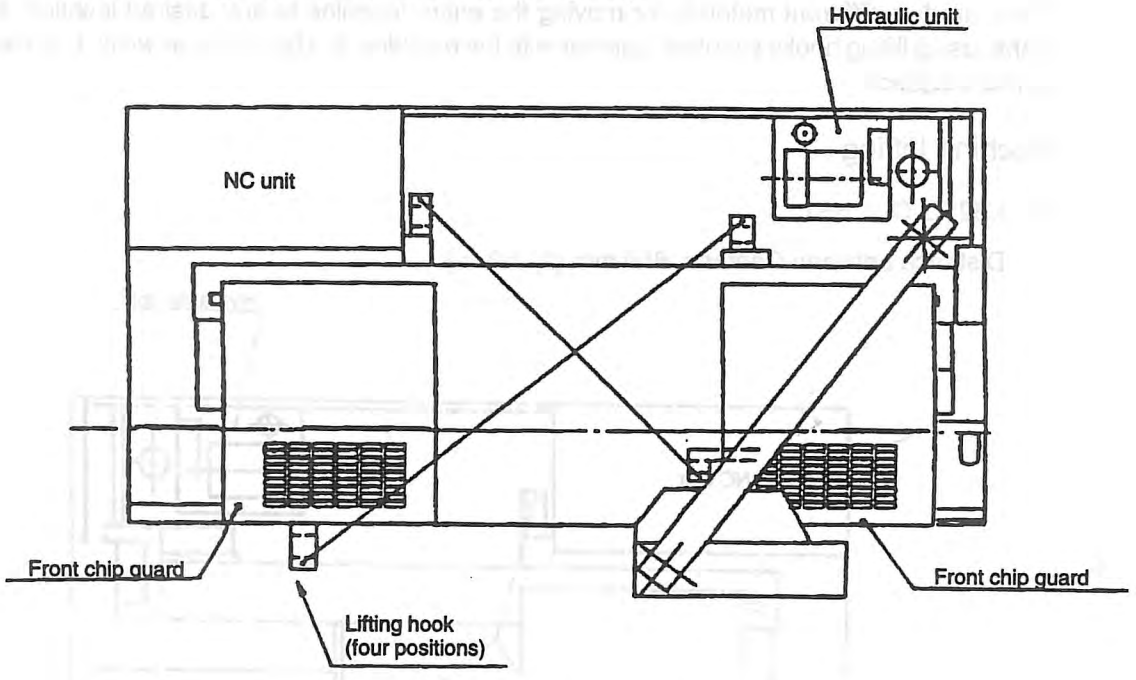


Fig. 2-2 Machine Lifting (LB25II-C × 1250)

Procedure:

a) Move the saddle at the center of axis travel.

b) Move and clamp the tailstock at the right end.

c) Remove the side covers of the coolant pump that is located at the lower right side of the machine.

d) Disconnect the cables and hoses from the coolant pump.

e) Pull out the coolant tank.

f) Keep the front door of the machine opened.

g) Remove the upper cover at the headstock side.

h) Fix the lifting hooks at the predetermined positions.

1-2. Precautions for Lifting



CAUTION :

(1) The cables should have a nominal diameter of 20 mm (0.79 in.) or larger.

(2) Change an angle formed by each cable line so that the cables will not contact the finished surfaces of the machine. (The cables may not form an angle larger than 40 degrees to the perpendicular line.)

(3) Check for balance and be very careful when lifting the machine.

(4) Use extra care to lower the machine gently onto the floor; NEVER APPLY SHOCKS TO THE MACHINE WHEN PLACING IT ON THE FLOOR.

Approximate Weight of Machine	
1ST ϕ410 × 330	5900 kg (12800 lb)
1SC ϕ410 × 650	6200 kg (13640 lb)
1SC ϕ410 × 1250	7400 kg (16280 lb)

(Including the hydraulic power unit, the electrical control box and CNC unit.)

1-3. Rolling



WARNING : Be careful that the machine does not tip over on any side so that the machine base may not strike the ground.

2. FOUNDATION REQUIREMENTS

2-1. General Precautions for Building a New Foundation

In most plants where concrete floors are solid and level, your CNC lathe may be installed without anchoring it to the floor and then used satisfactorily if leveled carefully.

For long-maintained accuracy and where sub-soil or ground under the floor is not strong enough, a new concrete foundation should be set up in accordance with the Foundation Plan attached to this Manual. (See 5.)

(1) Foundation requirements vary depending on the characteristics of the sub-soil. Under any soil conditions, it is important that sub-soil should be well compacted to keep the foundation from unsettling once the machine has been installed.

(2) Where sub-soil is too soft, it is necessary to drive concrete piles into the sub-soil.

(3) The Foundation Plan attached to this Manual is prepared for laying a typical concrete foundation specifically for the machine. The concrete thickness or depth should be determined in terms of the ground condition in each case.

3. GENERAL PROCEDURE FOR INSTALLATION

(1) Place leveling plates, 150 × 150 × 19 mm (5.91 × 5.91 × 0.75 in.) over individual foundation bolt-holes.

Refer to the Foundation Plan.

(2) Place foundation washers (furnished together with the machine) on the leveling plates and then place the machine on them.

(3) Pass foundation bolts through the hole in the leveling plate and a center bore through the built-in jack screw assembly.

Secure each foundation bolt carefully, using a washer and a nut on its upper end.

(4) Use wedge pieces, shims, or leveling blocks under the machine base to level the machine approximately.

(5) Pour mortar into the foundation bolt holes and allow it to set.

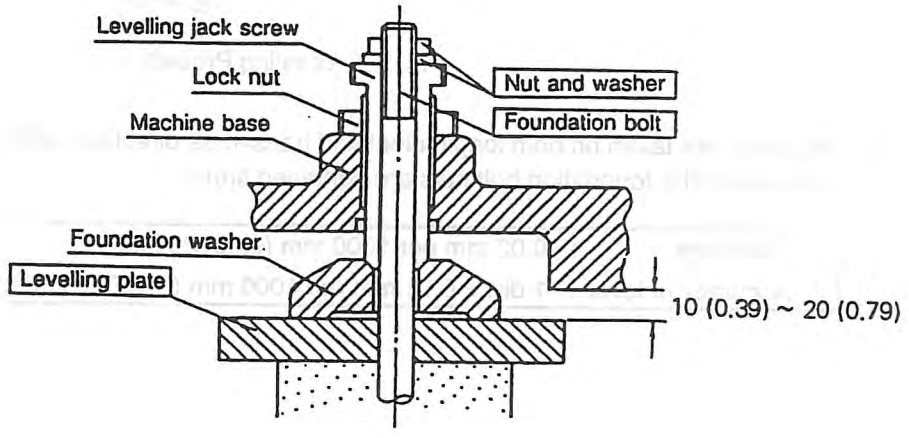
(6) After the mixture has become hard enough, remove the shims or leveling blocks from under the machine base, and level the machine within the specified limits.

3-1. Precautions for Installation

(1) Keep the underside of the leveling plates free from any oily substance.

(2) With leveling jack screws resting on foundation washers, the bottom surfaces of the machine base casting should be about 10 to 20 mm (0.39 to 0.79 in.) above concrete floor level.

(3) Fill the foundation bolt holes with mortar so as to reach the underside of the respective leveling plates. Be sure to compact the mortar thoroughly.



Unit: mm (in.)

The part names shown in [ ] are not supplied as standard equipment.

Fig. 2-3 Precautions for Installation

4. LEVELING THE MACHINE

The Machine must be carefully leveled because the accuracy of the level at the initial installation will greatly affect the working accuracy and the service life of the machine.

Model	No. of Leveling Jack Screws	Remarks
1ST φ410 × 330	11	Pass foundation bolt.
1SC φ410 × 650		
1SC φ410 × 1250	13	

4-1. Leveling Procedure

(1) Measure the machine level at both right and left ends of bedways in the X- and Z-axis directions.

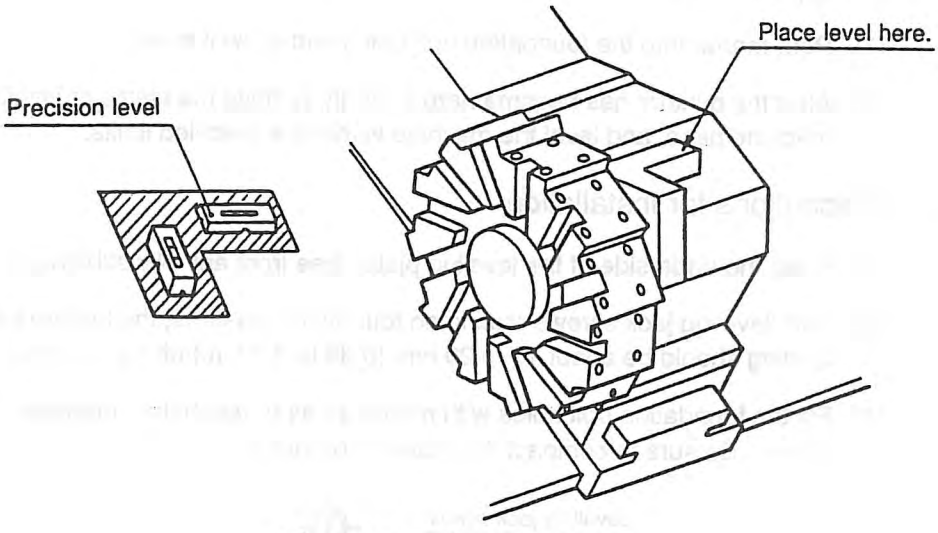


Fig. 2-4 Leveling Procedure

(2) Readings are taken on both longitudinal and transverse directions while both the leveling jack screws and the foundation bolt nuts are tightened firmly.

Tolerance	:	0.02 mm per 1000 mm (0.00025 in./ft)
Accuracy of level	:	1 div. = 0.01 mm per 1000 mm (0.000125 in./ft)

5. FOUNDATION PLAN

(1) LB25II-C × 650

Distance between centers: 650 mm (25.59 in.)

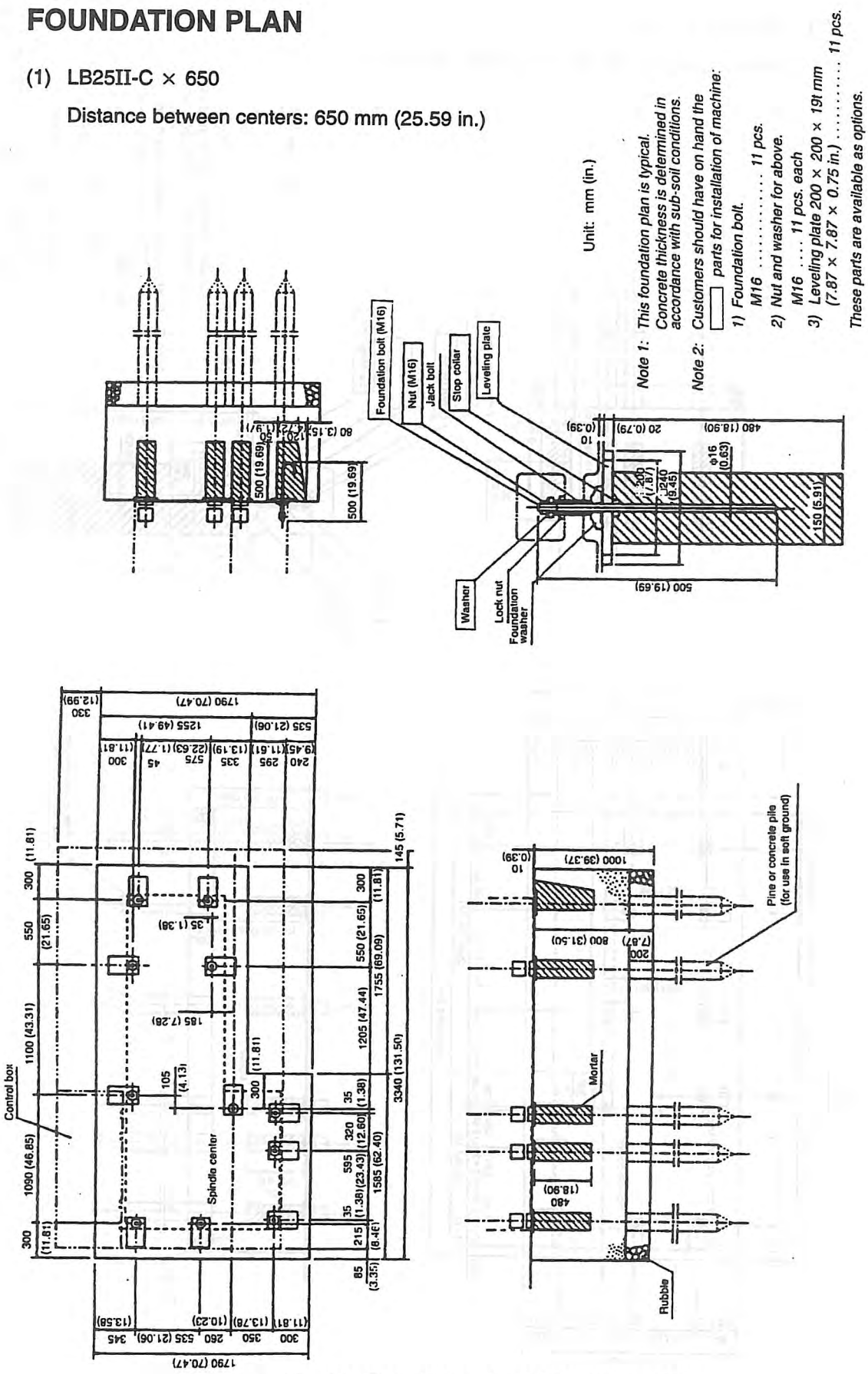


Fig. 2-5 Foundation Plan (LB25II-C × 650)

(2) LB25II-C × 1250

Distance between centers: 1250 mm (49.21 in.)

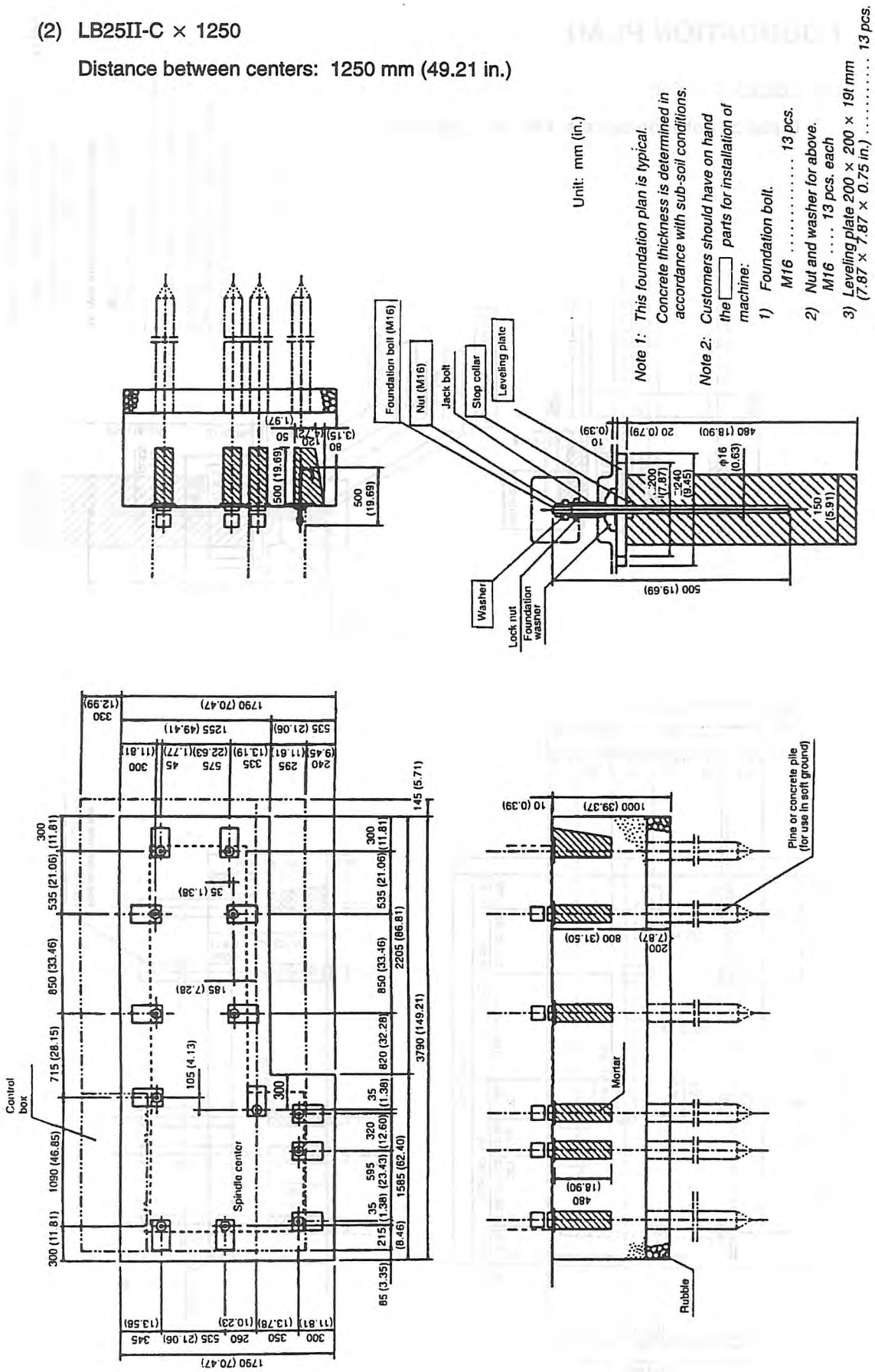


Fig. 2-6 Foundation Plan (LB25II-C × 1250)

6. POWER REQUIREMENTS

Power source: 3-phase, 200/220 V, 50/60 Hz

Main motor: VAC 15/11 kW (20/15 hp)	125 A min.

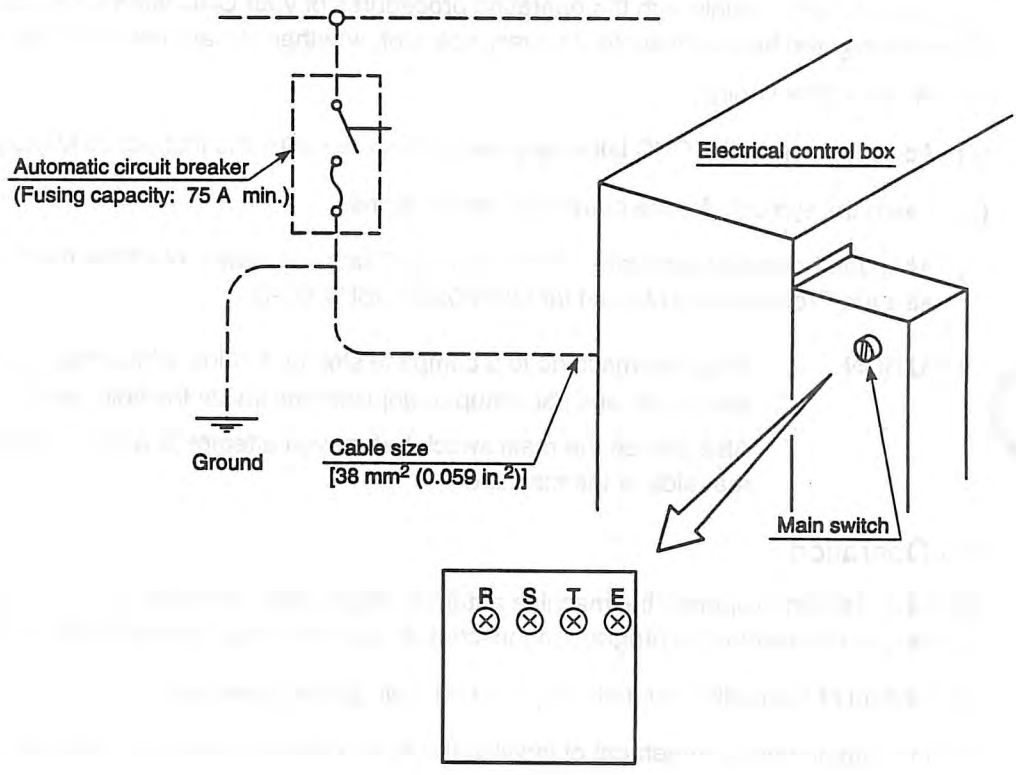


Fig. 2-7 Power Requirements

6-1. Inspection of Cable Connection

The operator can check correctness of cable connection by reading the pressure gauge whether it indicates the specified pressure level.

Confirm that the pressure gauge indicates the set pressure {4.4 MPa [45 kgf/cm² (640 psi)]}. When it indicates the specified pressure level, the electrical connection is correct.

6-2. Electrical Work

CAUTION : (1) For machine tools, class 3 grounding work (less than 100 Ω grounding resistance) is necessary.

(2) Do not connect the power cord and the grounding wire in serial; if attempted, it will give adverse affect to other equipment or cause malfunctioning of the leak breaker, etc.

(3) When a leak breaker is used, select the one meeting the following rating.

- For inverter circuit use
- Sensitive current of 100 mA or more
- Middle-sensitivity high-speed inverter type

SECTION 3 MACHINE OPERATION

1. BEFORE STARTING OPERATIONS

This section deals mainly with the operating procedures of your CNC lathe under manual control. So the information given here is essential to every operator, whether you are new to a CNC lathe or an "old pro".

Follow these three points:

(1) Actually operate the CNC lathe by yourself inreference to this Instruction Manual.

(2) Learn the symbols for the numerical control terms.

(3) After you have a general idea of how your CNC lathe operates, read this manual repeatedly and also the Programming Manual for OSP5020L/OSP500L-G.



CAUTION : Bring the machine to a complete stop by turning off the main switch before operations such as setup or adjustments inside the chip guard are carried out.

Also turn off the main switch before you attempt to work inside the machine at the rear side of the machine.

1-1. NC Operation

Before you begin to operate the machine automatically by tape, make it a rule to check the following points against a process sheet, a program manuscript, or any other chart giving detailed machining instructions:

(1) Setting of hydraulic power chuck jaws and their gripping pressure

(2) Installation and arrangement of individual cutting tools with respect to their operating sequence

(3) Setting of tool offsets

(4) Setting of zero offsets

(5) Setting of feedrate override to 100%

(6) Setting of softwired limit positions for each axis

(7) Positioning of the turret to the turret indexing position

(8) Positioning of tailstock (when the machine is equipped with tailstock)

All essential information on the setup and check-up procedures is described in the sections that follow.

2. MACHINE OPERATION

2-1. Hydraulic Unit

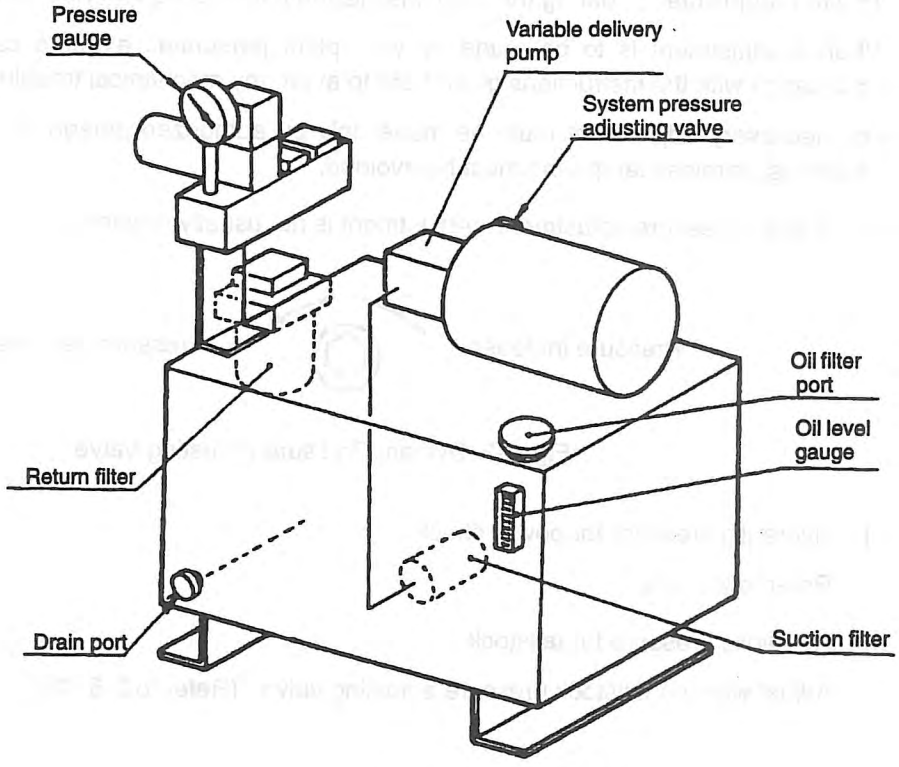


Fig. 3-1 Hydraulic Unit

(1) Pressure Indication

Pressure setting for the hydraulic unit should be:

Pressure setting	4.4 MPa [45 kgf/cm^2 (640 psi)]

(2) Adjustment of Hydraulic Pressure

The following outlines the methods of setting individual functional units for operating pressure. Since the pressure lines for the turret(s) have been adjusted at our factory before shipment, they will not require readjustments, during the initial installation and subsequent normal service of the machine.

When readjustment is to be made by your plant personnel, extreme caution must be taken in accordance with the instructions given here to avert any mechanical trouble in the drive lines.

Any necessary adjustment must be made only by authorized personnel, and under all operating conditions, careless tampering must be avoided.

a) System pressure adjustment (Adjustment is not usually required.)

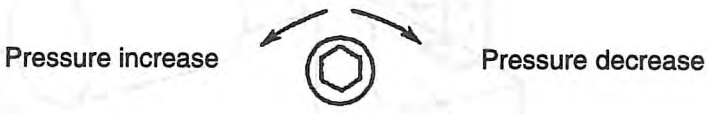


Fig. 3-2 System Pressure Adjusting Valve

b) Hydraulic pressure for power chuck

Refer to 2-3. (2).

c) Hydraulic pressure for tailstock

Adjust with the tailstock pressure adjusting valve. (Refer to 2-5. (2).)

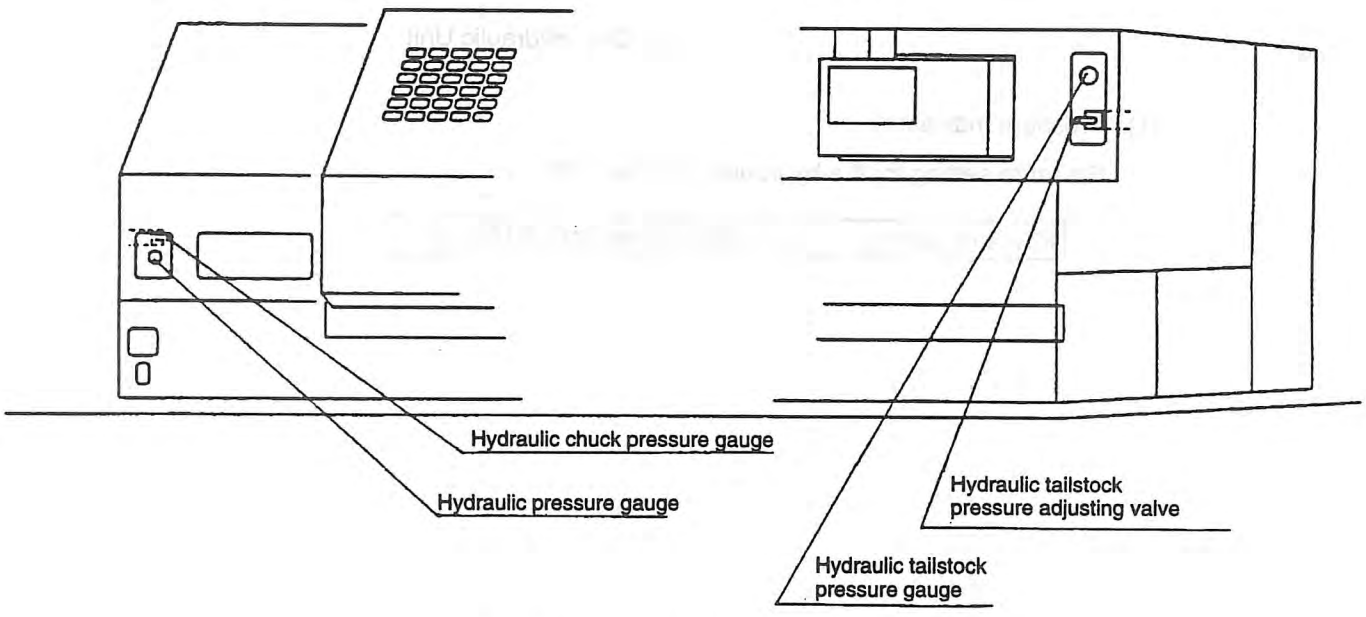


Fig. 3-3 Hydraulic Pressure for Tailstock

(3) Hydraulic Oil

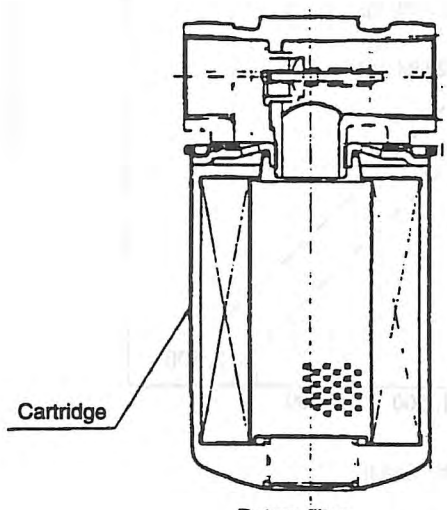
Oil Specification	HL32 (MAS)
Amount	40 liter (10.6 gal)
Oil Change Interval	Change after first month of operation and every 6 months thereafter.

REMARKS : Clean the suction filter, the line filter, and the tank when changing the oil. Check the pressure for respective actuators.

When it becomes necessary to change the element of the return filter due to clogging, change the cartridge (screw type).

Filter Element Specifications:

Maker	Taisei
Type	F-913-1
Part No.	H0032-0008-29

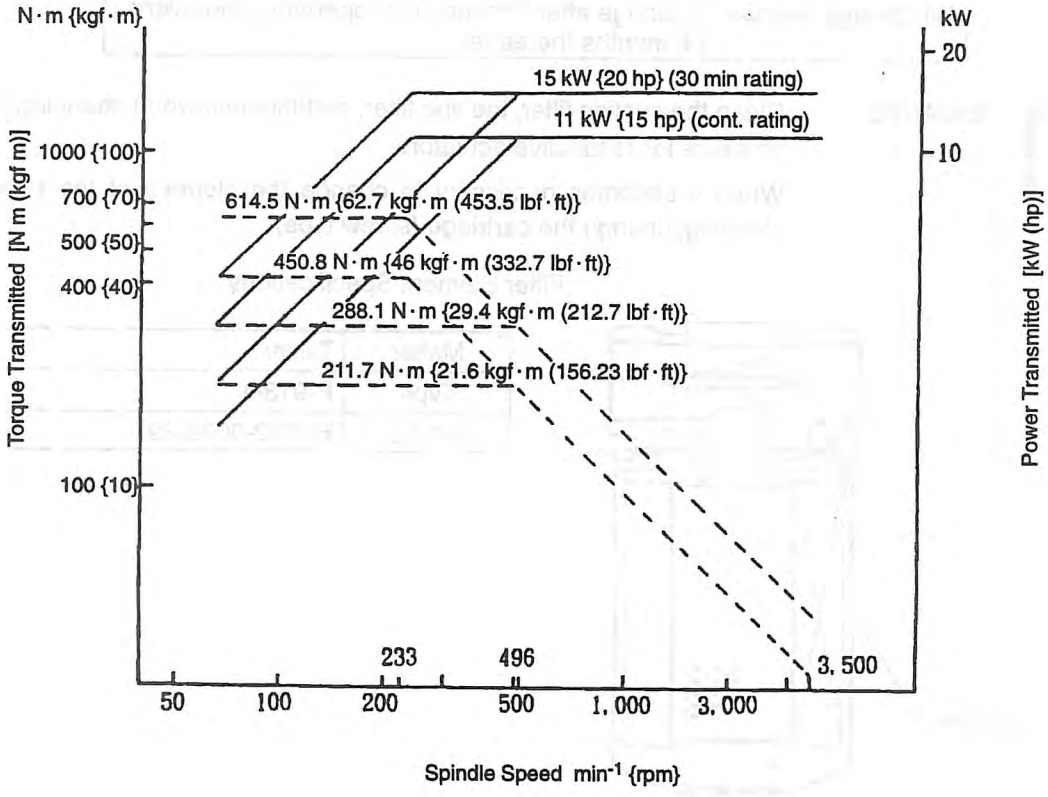


Return filter
(For hydraulic unit)

2-2. Selection of Spindle Speed

(1) Spindle Power Transmission Torque Diagram

- 3500 min^{-1} {rpm}



For heavy-duty cutting, select a spindle speed in the shaded area so that cutting is performed within a constant output range.

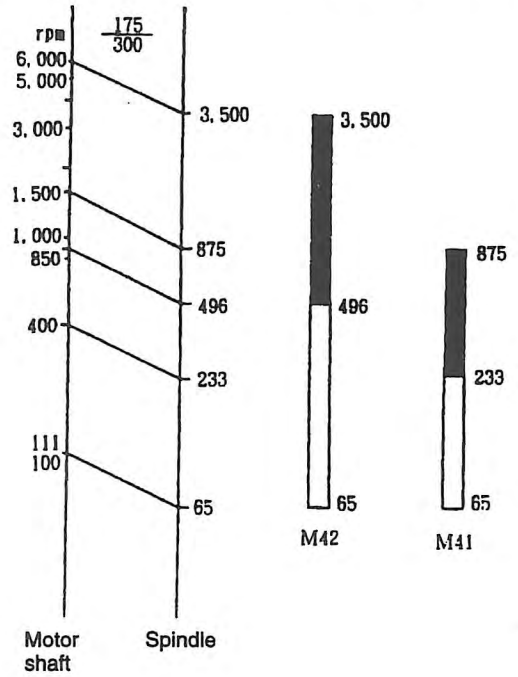


Fig. 3-4 Spindle Power Transmission Torque Diagram

2-3. Hydraulic Chuck

(1) Construction

The construction of hydraulic chuck is shown below.

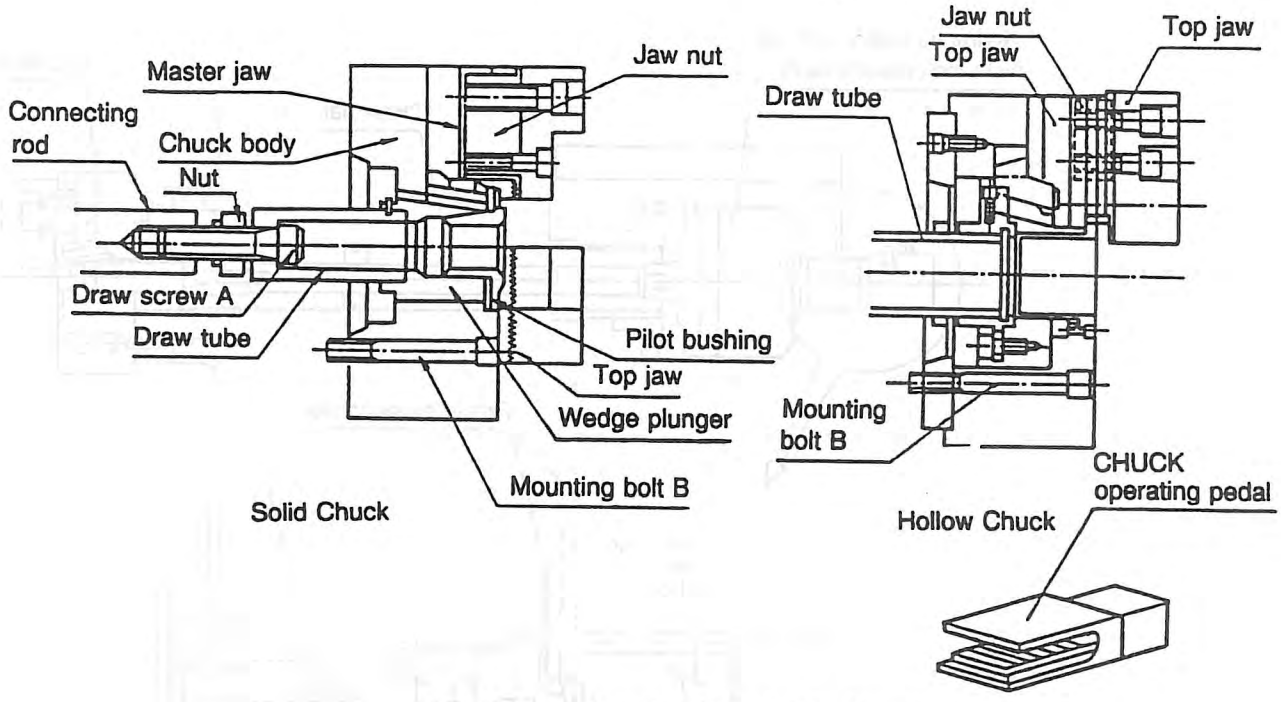


Fig. 3-5 Construction of Hydraulic Chuck

(2) Installation of Hydraulic Chuck

Procedure:

a) Press the CONTROL ON/RESET pushbutton on the operation panel to turn on the machine control circuit, and depress the CHUCK operating foot pedal. This causes the connecting rod in the spindle bore to move forward.

↓ Connecting rod advance (Draw tube advance)

b) Fasten the draw screws A to the connecting rod.

(Connecting the draw tube in the spindle with the chuck) — Use the Allen wrench furnished with the machine.

c) Secure the chuck body onto the spindle end, using mounting bolts B.

↓

d) Adjust the draw screw A so that the outer ends of the master jaws become flush with the peripheral surface of the chuck body when the top jaws are in the OPEN condition.

The individual chuck jaws can be moved in the "opening" direction as the draw screw A is turned in the counterclockwise direction. Removal of the hydraulic chuck from the spindle is the reverse of installation in steps from c) to b).

(3) Chuck Grip Confirmation

To ensure your safety in using the chuck grip confirmation unit, read the following information carefully to understand the function and construction of the unit and observe the instructions.

a) Solid chuck cylinder

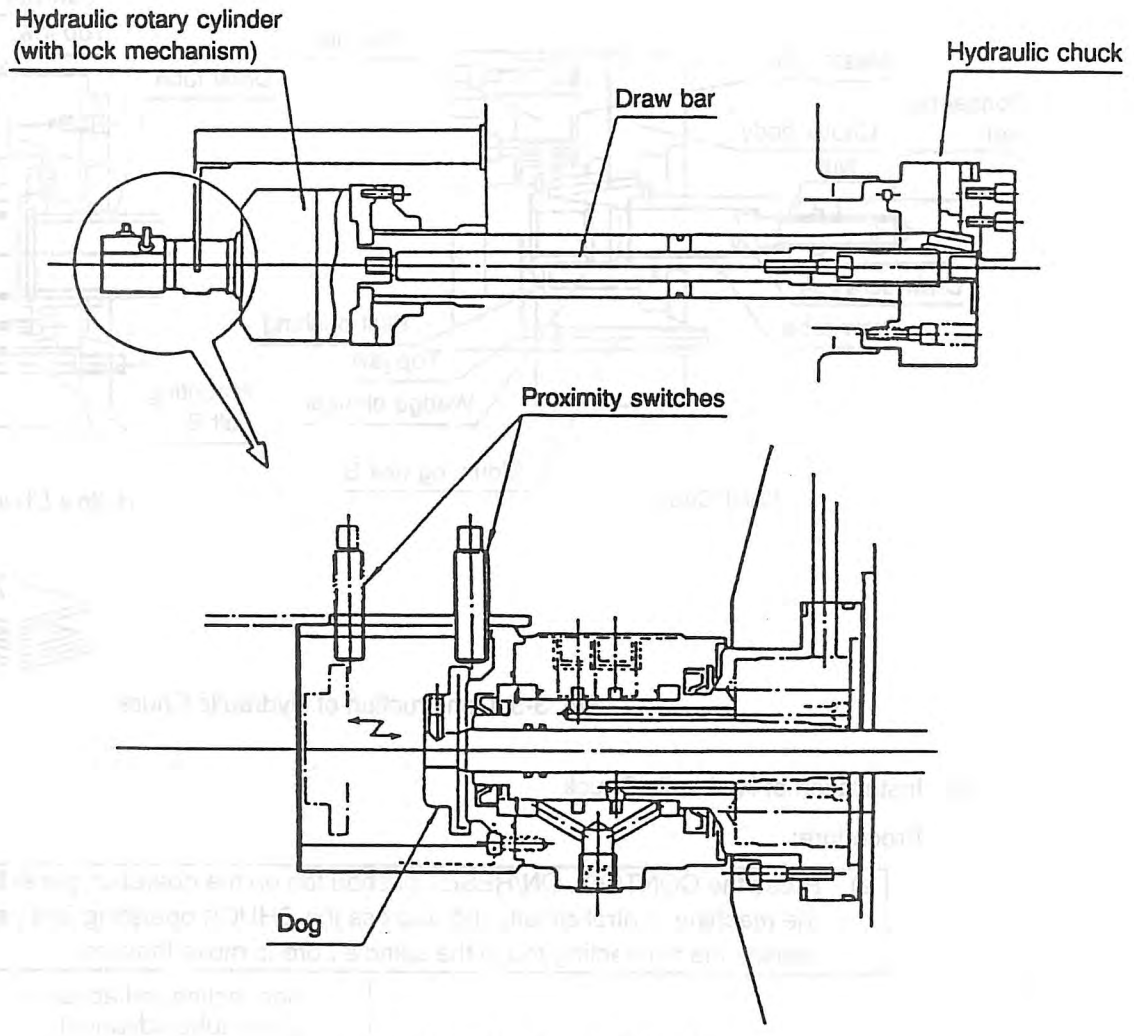


Fig. 3-6 Solid Chuck Cylinder

Position of the dog moving with the hydraulic rotary cylinder piston is detected by the proximity switches to confirm the chuck jaw position. (optional)

b) Hollow chuck cylinder

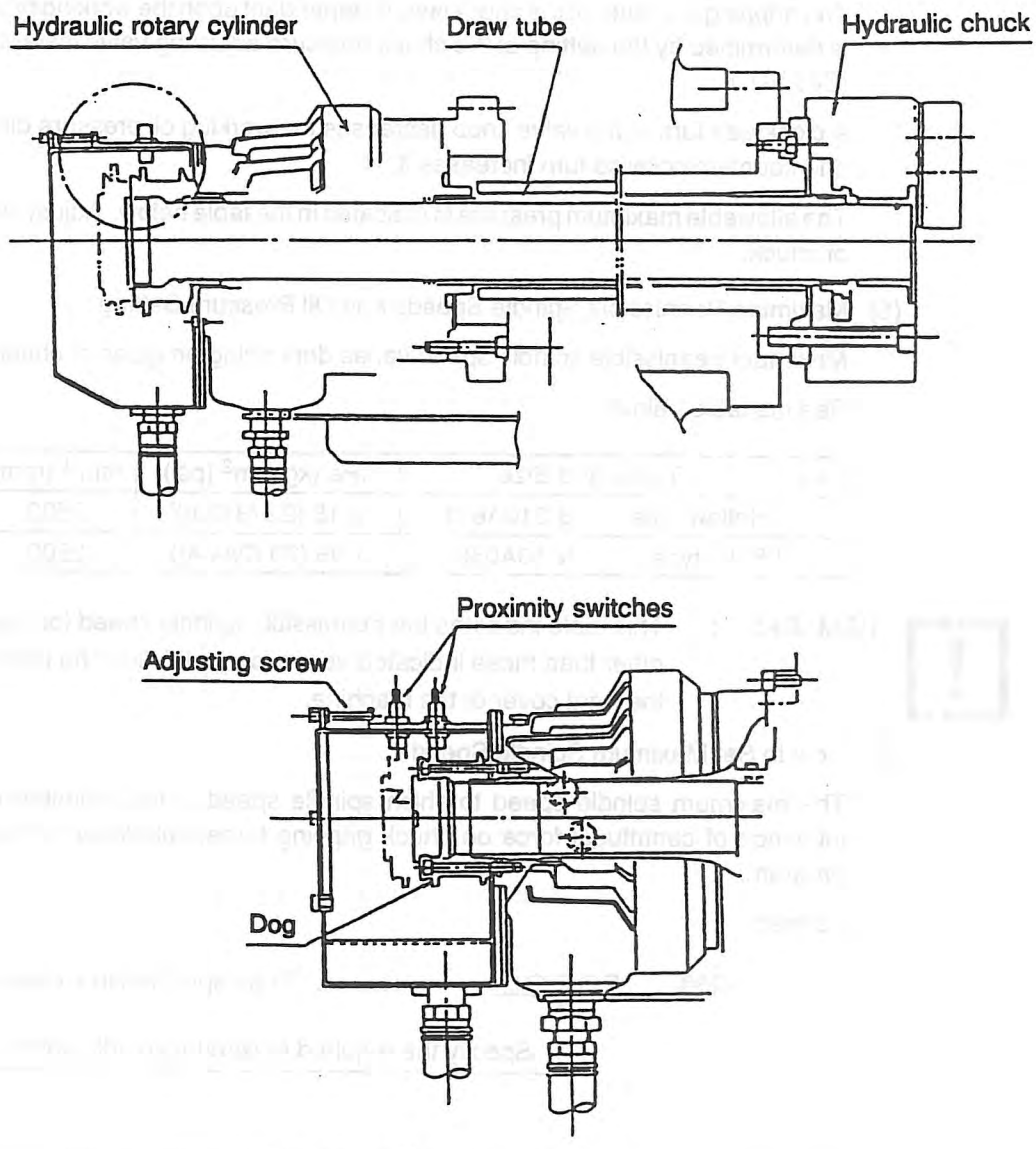


Fig. 3-7 Hollow Chuck Cylinder

Position of the dog moving with the hydraulic rotary cylinder piston is detected by the proximity switches to confirm the chuck jaw position. (optional)

(4) Adjustment of Oil Pressure for Hydraulic Chuck

The gripping pressure of the chuck jaws is dependent upon the working pressure of hydraulic fluid which is determined by the setting of the chuck pressure adjusting valve installed at the front of the machine (See 2-1.).

A clockwise turn of the valve knob decreases the working oil pressure directed into the chuck cylinder and counterclockwise turn increases it.

The allowable maximum pressure is indicated in the table below. Adjust the pressure meeting the types of chuck.

(5) Maximum Permissible Spindle Speeds and Oil Pressure Setting

Maximum permissible spindle speed varies depending on types of chuck and cylinder to be used.

See the table below:

No.	Types and Size		MPa {kgf/cm^2 (psi)]	min^{-1} {rpm}	Type of Cylinder
1	Hollow type	B-210A801	2.15 {22 (312.8)}	3500	S1870
2	Solid type	N-10A0801	1.96 {20 (284.4)}	3500	Y-1530R

REMARKS : This table indicates the permissible spindle speed for standard chuck. If a chuck other than those indicated above is used, follow the instruction on the name plate at the front cover of the machine.

(6) How to Set Maximum Spindle Speed

The maximum spindle speed to shich spindle speed is to be limited due to chuck specifications, influence of centrifugal force on chuck gripping force, imbalance of workpiece, etc. can be set by program.

Format:

G50 SOOOO ..... To be specified in a block without other command

Specify the required maximum spindle speed.

Programmed maximum spindle speed is effective until another spindle speed is designated.

(7) Adjusting Proximity Switch Longitudinal Position (optional)

a) For solid cylinder

Loosen the screws clamping the two proximity switch plates to slide them with the proximity switch to determine the position. After determining the position, tighten the proximity switch plate clamp screws.

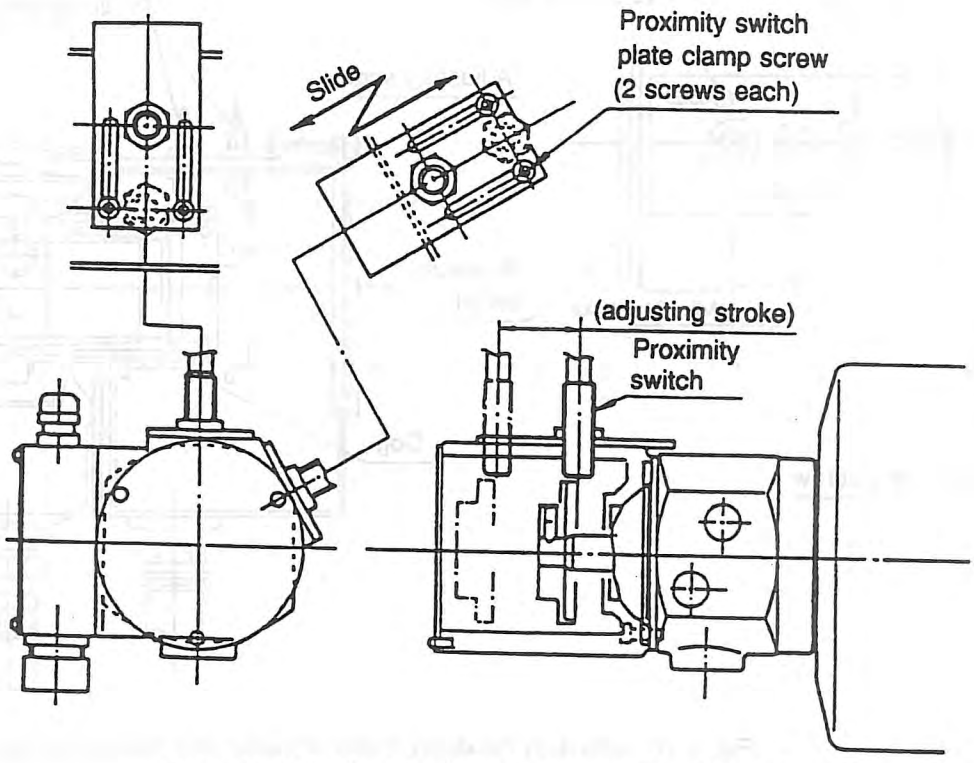


Fig. 3-8 Adjusting Proximity Switch Position (for Solid Cylinder)

Note: The proximity switch position is adjusted to provide the required clearance to the dog (1 mm (0.04 in.)) before shipment. Thus, adjustment is not required usually.

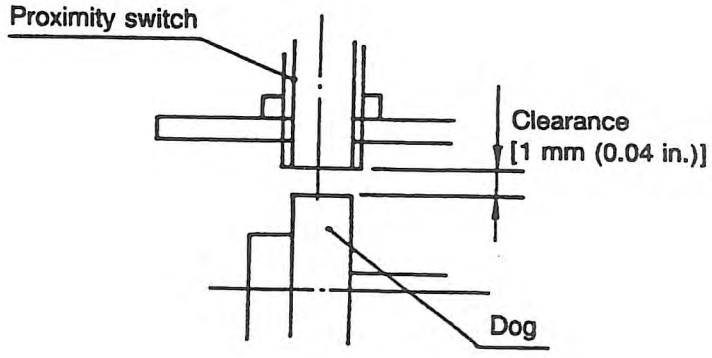


Fig. 3-9 Clearance between Proximity Switch and Dog

b) For hollow cylinder

Loosen the screws clamping the two proximity switch plates to slide them with the proximity switch to determine the position. After determining the position, tighten the proximity switch plate clamp screws.

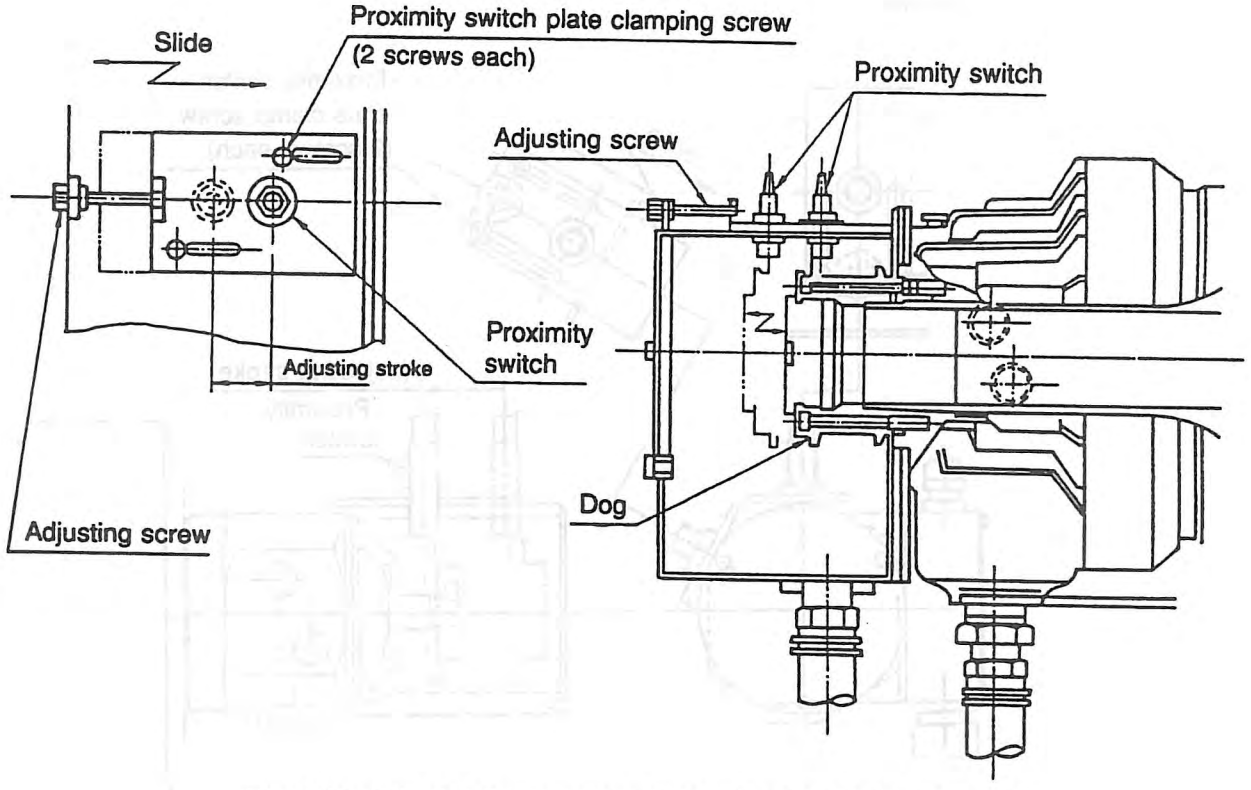
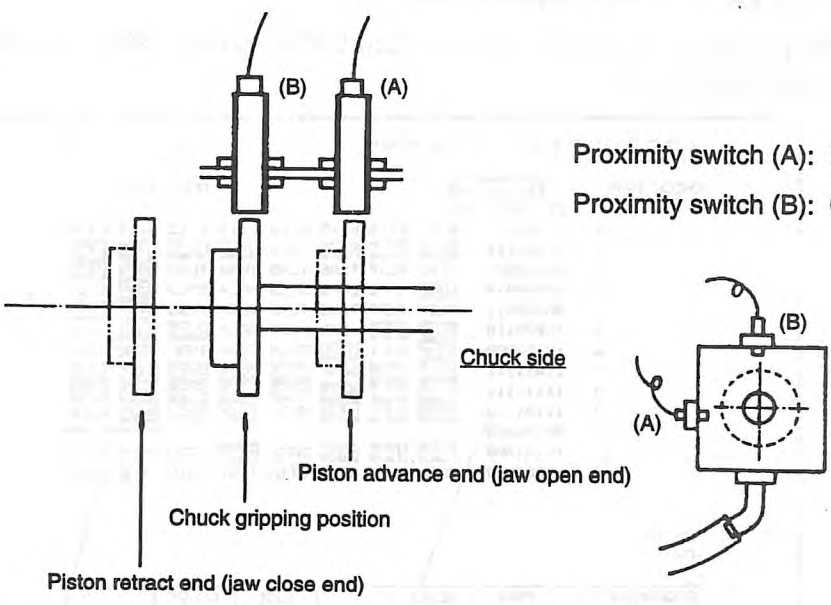


Fig. 3-10 Adjusting Proximity Switch Position (for Hollow Cylinder)

(8) Setting Proximity Switches

a) OD chucking

Set the proximity switches at the positions as indicated below:



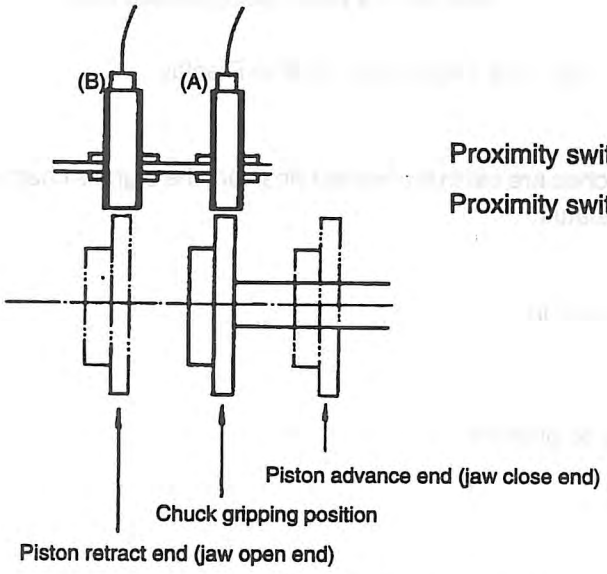
Proximity switch (A): Piston advance end

Proximity switch (B): Chuck gripping position

Fig. 3-11 Setting Proximity Switches (OD Chucking)

b) ID chucking

Set the proximity switches at the positions as indicated below:



Proximity switch (A): Chuck gripping position

Proximity switch (B): Piston retract end

Fig. 3-12 Setting Proximity Switches (ID Chucking)

Note: According to the OD/ID chucking, the proximity switch to be set at the chuck gripping position differs.

CAUTION : Always actually clamp the workpiece to set the proximity switch at the chuck gripping position.

(9) Confirmation Signals

a) Signal input status display

Whether or not the proximity switches are set correctly and corresponding signals are input can be checked by the check data display screen.

For the procedure to display the CHECK DATA screen, refer to Operation Manual for OSP5020L/OSP500L-G.

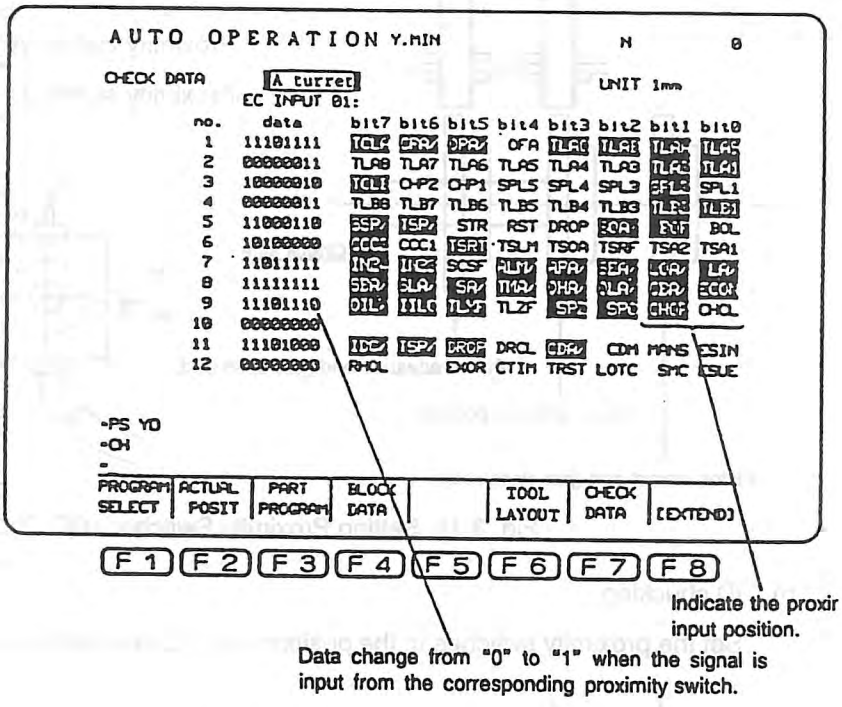


Fig. 3-13 Signal Input Status Display

b) Checking input signals

When the proximity switches are set in the correct position, the signals change as indicated below according to the chuck status.

OD chucking:

At chuck gripping position

CHOP 0
CHCL 1

At piston advance end position

CHOP 1
CHCL 0

ID chucking:

At chuck gripping position

CHOP 1
CHCL 0

At piston retract end position

CHOP 0
CHCL 1

c) Operation completion confirmation delay timer

There may be cases in which the chuck open/close is not completed even if the corresponding signal is input. For such cases, timer function can be used to delay the confirmation of the chuck operation after the input of the signal.

The timer is set using the following parameters.

Optional parameter (word) No. 5:

Chuck close timer

The timer to set the delay duration after the input of the signal from the chuck gripping position proximity switch to confirm the chuck close state.

Optional parameter (word) No. 6:

Chuck open timer

The timer to set the delay duration after the input of the signal from proximity switch detecting the piston retract end (for OD chucking) or the piston advance end (for ID chucking) to confirm the chuck open state.

Setting is made in units of 10 msec. The default values for these parameters are indicated below.

Optional parameter (word) No. 5: 100 (1 sec)

Optional parameter (word) No. 6: 0

For the procedure to set the data for optional parameters (word), refer to Operation Manual for OSP5020L/OSP500L-G.

(10) Hydraulic Chuck Clamping Force Characteristics Diagram

a) For solid chuck

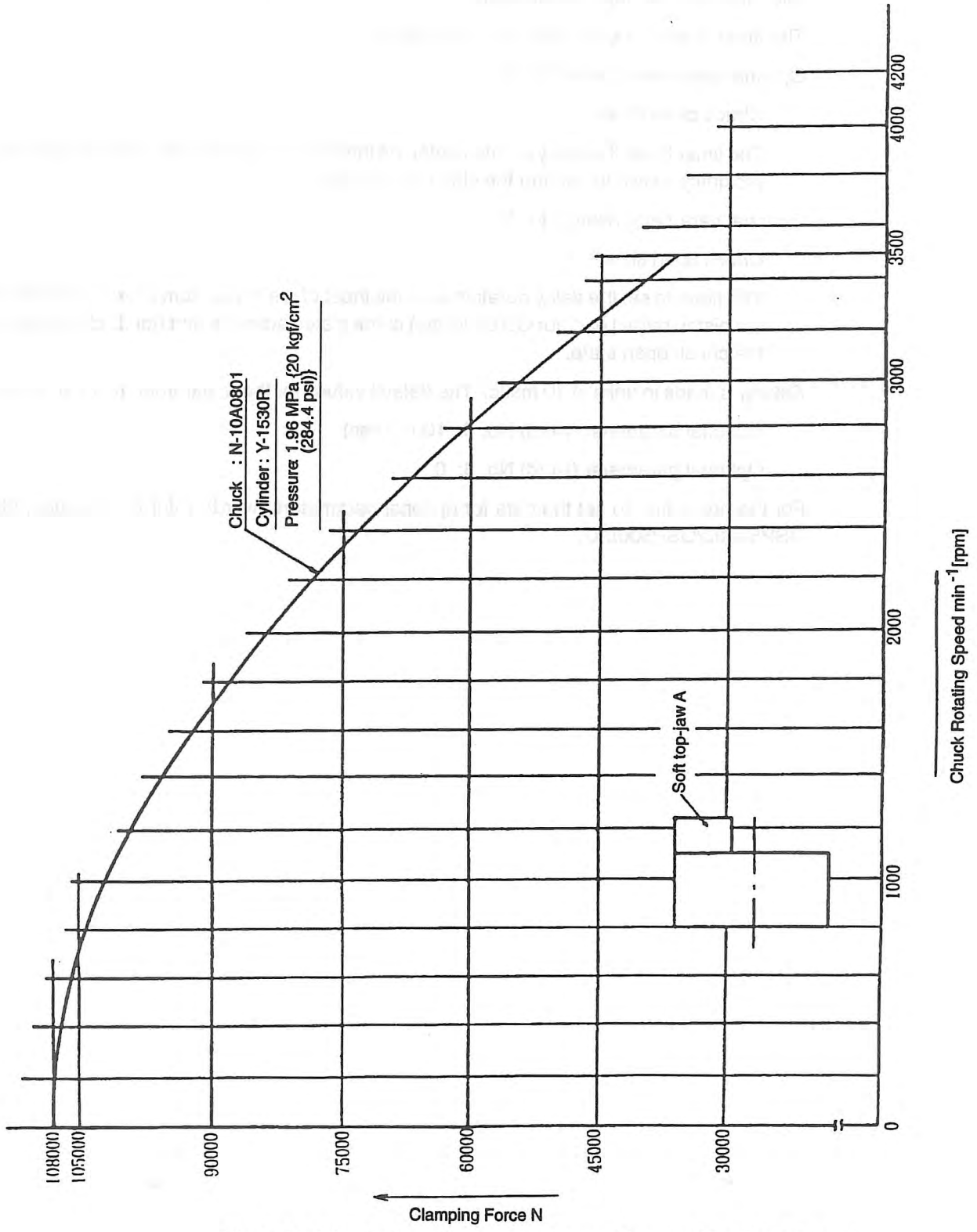


Fig. 3-14 Chuck Speed - Clamping Force Diagram (For Solid Chuck)

b) For Hollow Chuck

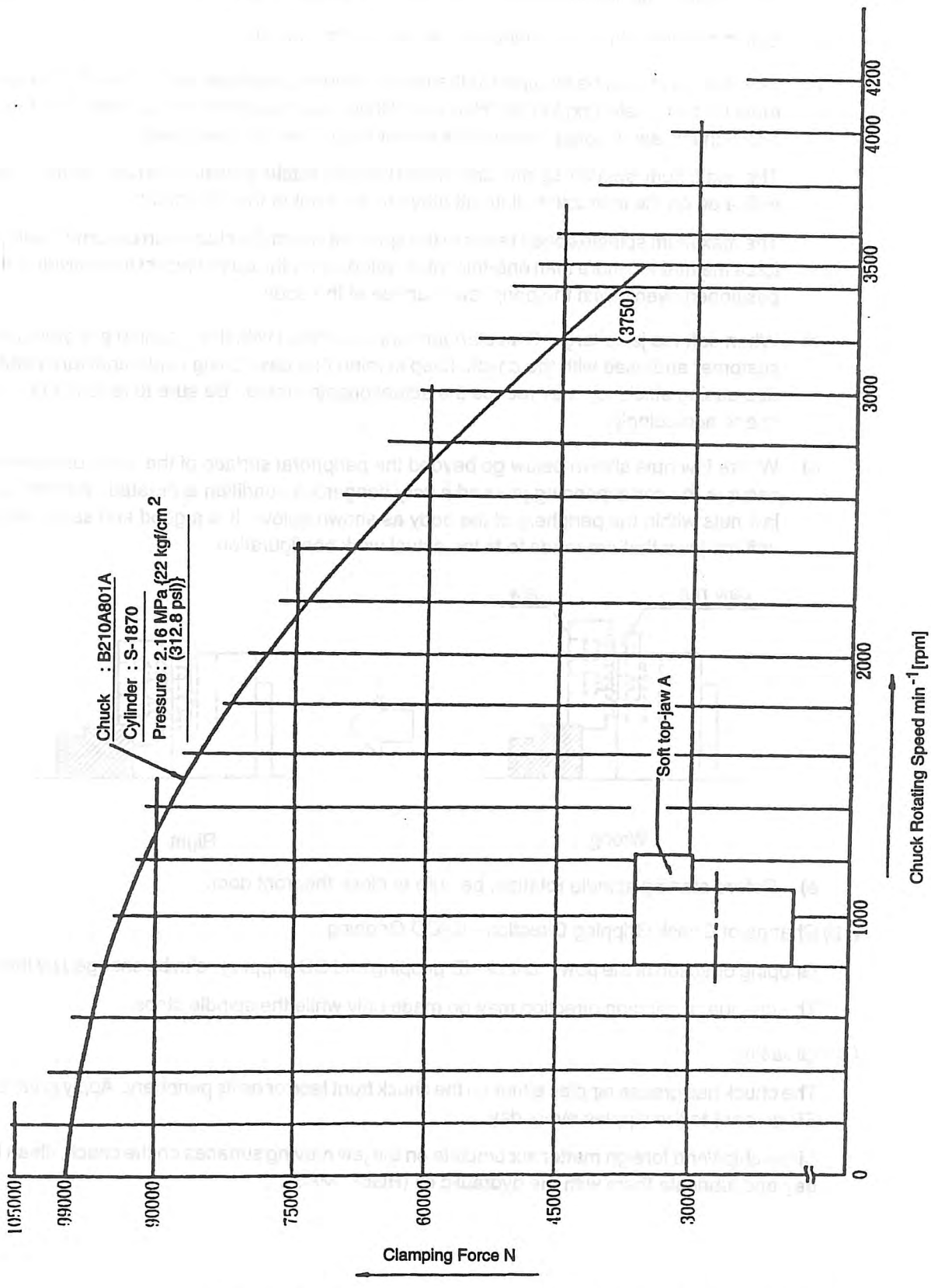


Fig. 3-15 Chuck Speed - Clamping Force Diagram (For Hollow Chuck)

(11) General Precaution for Using Power Chucks

In order to insure maximum safety in operation, the following points call for your special notice:

a) Select the right chuck that matches the machine's capacity.

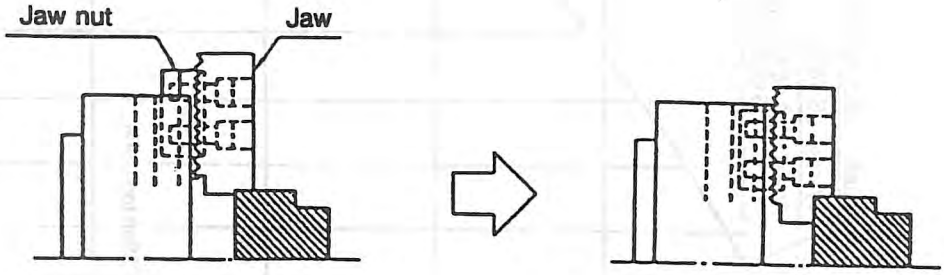
b) Workpieces should be clamped in the chuck without imbalance. Selection of cutting conditions must be made referring to (10) "Hydraulic Chuck Clamping Force Characteristics Diagram" since chuck jaw gripping force varies depending on the spindle speed.

The maximum spindle speed and maximum allowable pressure limit (maximum setting) are indicated on the instruction plate attached to the front of the chip guard.

The maximum spindle speed refers to the speed at which the chuck can be turned, with its gripping force maintained more than one-third of its rating, while the outer ends of the individual top jaws are positioned evenly with the peripheral surface of the body.

c) When soft top jaws larger than standard ones provided with the machine are prepared by the customer and used with the chuck, keep in mind that developing centrifugal force and decreasing efficiency may reduce the actual gripping force. Be sure to reduce the spindle speed accordingly.

d) Where jaw nuts shown below go beyond the peripheral surface of the body, only one bolt secures the corresponding jaw and a very dangerous condition is created. Always locate the jaw nuts within the periphery of the body as shown below. It is a good and safe practice to use soft top jaws that are made to fit the actual work configuration.



Wrong Right

e) Before starting spindle rotation, be sure to close the front door.

(12) Change of Chuck Gripping Direction - ID/OD Gripping

Gripping direction of the power chuck - ID gripping and OD gripping - can be changed by the parameter.

The change of gripping direction may be made only while the spindle stops.

(13) Greasing

The chuck has grease nipples either on the chuck front face or on its periphery. Apply grease (Molykoat EP grease) to the nipples every day.

Since chips and foreign matter accumulate on the jaw moving surfaces on the chuck, clean them every day and lubricate them with the hydraulic oil (HG68, MAS).

2-4. Cutting Soft Top Jaws of Power Chuck

There are three different methods applied in cutting soft top jaws of chuck jaws for chucking a particular lot of parts.

- by pulse feed handwheel
- by tape
- by manual data input (MDI)

They are all basically the same operations, and it is advisable to use the tape or the manual data input when a good finish on the chucking surfaces of the jaws is essential.

Now let's explain the steps necessary to produce the top jaws for chucking the diameter of 70 mm (2.75 in.) with a depth of 15 mm (0.6 in.) by use of the manual data input.

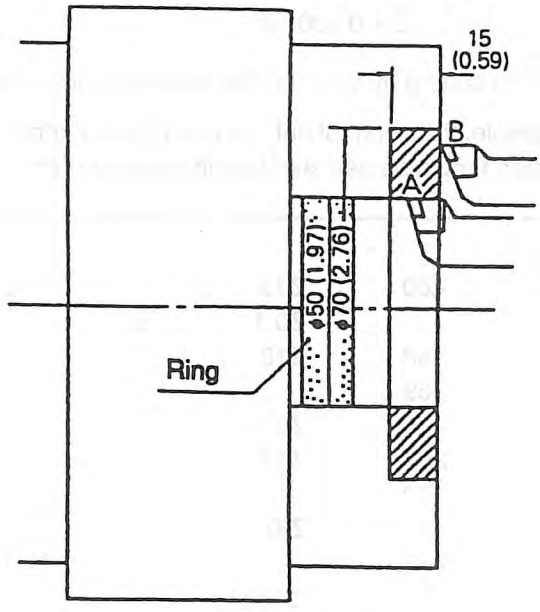


Fig. 3-16 Cutting Soft Top Jaws

(1) Procedure

a) Grip a ring of proper diameter in the chuck.

ϕ50 mm (2 in.) ring for instance

b) Locate the tool tip point at point A and set the zero offset value so that the actual position of X-axis is equivalent to the ring diameter; 50 mm (2 in.) in this case.

Actual position: X = 50.000 mm
(X = 2.0000 in.)

c) Locate the tool tip point at point B and set the zero offset value so that the actual position of Z-axis is equivalent to the required chucking depth of length; 15 mm (0.6 in.) in this case.

Actual position: Z = 15.000 mm
(Z = 0.6000 in.)

d) Proceed with cutting by entering the following commands block by block.

In the example, the depth of cut is 5 mm (0.2 in.) and the feedrate is 0.1 mm/rev (0.004 ipr). The spindle speed must be selected to suit the operation.

G50				SOOO		
G00	X60	Z18		SOOO	M41	M03
G01		Z0.1	F0.1			
G00	X58	Z18				
	X69.6					
G01		Z0.1				
G00	X67	Z18				
	X70					
G01		Z 0				
	X48					
G00		Z500				M05

2-5. Hydraulic Tailstock Operation

(1) Tailstock Position Setting (When moved manually)

Move the turret to the X-axis plus limit position.

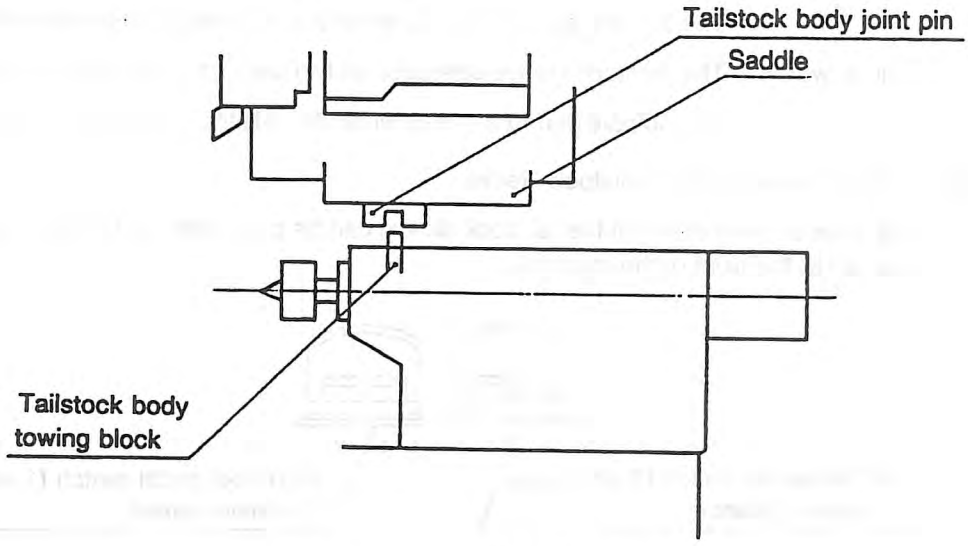


Fig. 3-17 Tailstock Position Setting

Move the saddle to align the center of the tailstock body towing block and the center of the tailstock body joint pin. After loosening the four tailstock body clamp screws to unclamp the tailstock body, connect it to the saddle.

Move the saddle using the pulse handle to bring the turret body to the required position. Release the joint pin of the turret body from the saddle and tighten the four clamp screws to fix the tailstock body to the bed.

(2) Adjusting Tailstock Spindle Thrust

Tailstock spindle thrust can be adjusted by the pressure adjusting valve at the right side of the machine front. For details, refer to 2-1. (3). The maximum hydraulic pressure for tailstock thrust is 2.26 MPa {23 kgf/cm^2 (327.1 psi)} and the thrust with such pressure setting is 6860 N {700 kgf (1540 lbf)}.

Note that the tailstock spindle thrust largely affects the service life of the main spindle; do not set the thrust unnecessarily high.

Relation between hydraulic oil pressure and tailstock spindle thrust:

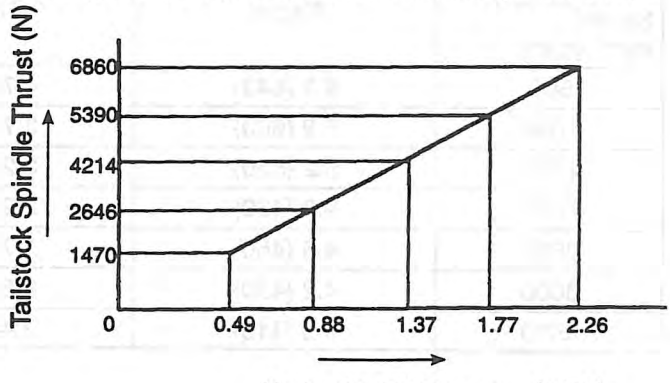


Fig. 3-18 Relation between Hydraulic Oil Pressure and Tailstock Spindle Thrust

(3) Center-work/Chuck-work Selector Switch

The tailstock setup (for center-work tailstock is used, for chuck-work tailstock is not used.) condition should be set to the corresponding parameter.

Center-work: The tailstock sleeve operation (advance/retract) is controlled by the foot pedal switch.

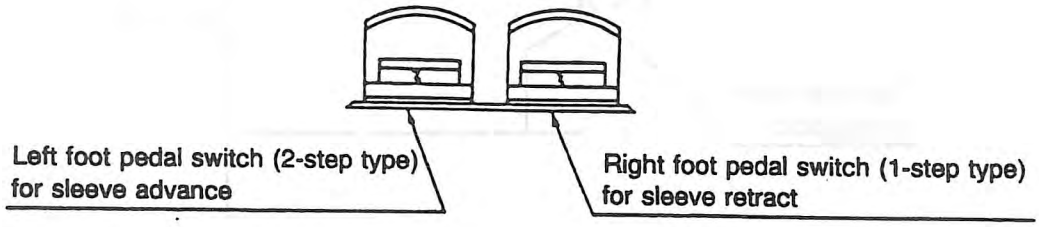
The spindle can rotate only when the left foot pedal switch is fully depressed.

Chuck-work: The tailstock sleeve operation (advance/retract) is not controllable.

The spindle can rotate only when the tailstock sleeve is located at the retract end.

(4) Advancing/Retracting Tailstock Sleeve

Advance and retraction of the tailstock sleeve can be performed by the foot-operated pedal switches located at the front of the machine.



a) Left pedal switch (2-step type) is used to advance the sleeve.

First slight-depress of pedal:

The sleeve advances while the pedal is depressed. (Spindle does not rotate.)

Second full-depress of pedal:

When depressed fully, the sleeve advances up to the stroke end. (Spindle rotates.)

b) Right pedal switch (1-step type) is used to retract the sleeve. When depressed, the sleeve retracts up to the stroke end.

(5) Allowable load and speed of the revolving center

The table given below indicates the allowable maximum load for MT No.5 revolving center. Make sure to use the center within the limits indicated in the table.

Allowable Load (kN) {kgf} (life: 2000 hours)

Load Type / Speed min^{-1} {rpm}	Radial	Thurst
500	6.3 {640}	4.7 {480}
1000	5.9 {600}	3.7 {380}
1500	5.2 {530}	3.2 {330}
2000	4.8 {490}	2.9 {300}
2500	4.5 {460}	2.7 {280}
3000	4.2 {430}	2.5 {260}
3500	4.0 {410}	2.4 {250}

2-6. Cautions on Operating the Turret



CAUTION : When indexing the turret, retract it to a position where rotating of the turret does not cause interference between the tools in the turret and the workpiece or chuck.

For 0.5 seconds after the completion of turret indexing, the turret may not be clamped securely. Therefore, do not start machining within this period.

2-7. Interlock

REMARKS : The door interlock function is provided to ensure operator's safety.

When an attempt is made to start the spindle, index the turret or feed an axis while the front door is open by more than 140 mm (5.51 in.), an alarm occurs to stop the machine.

If necessary, it is possible to deactivate the interlock function by turning the INTERLOCK key on the operation panel in the OFF position. But this setting is allowed only for maintenance purpose only in the case interlocked operations with the front door open. In daily operations, the key must be placed in the ON position.

2-8. After Completion of A Day's Operation

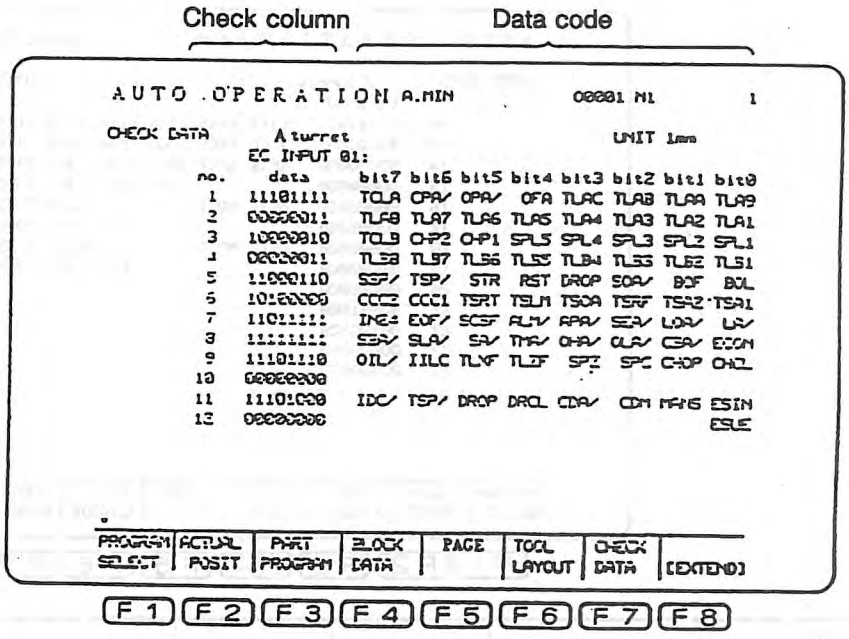
(1) Press the CONTROL OFF button on the operation panel.

(2) Turn the main switch on the control box to OFF.

(3) Clean the machine and keep the surrounding area neat and in order.

Status Display of EC Input Signal (No. 1)

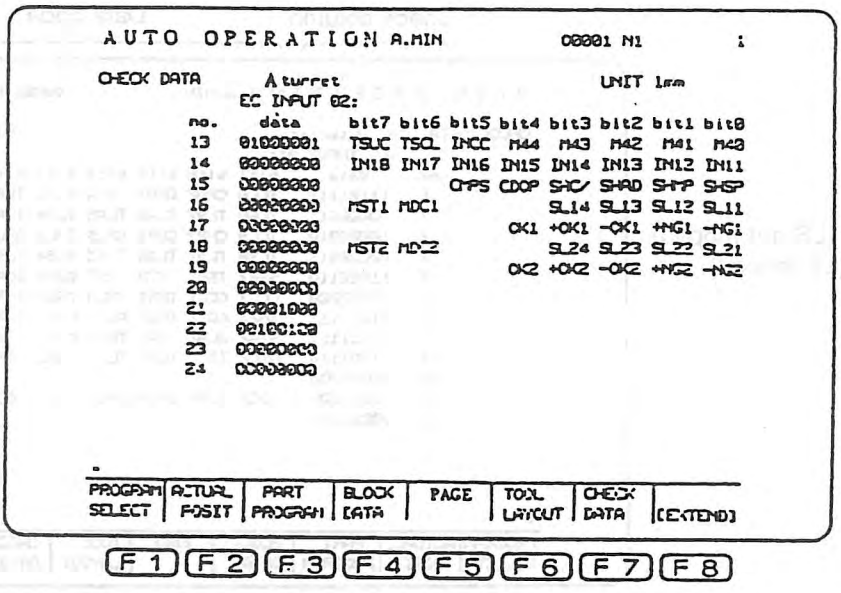
0: OFF (LS not tripped)
1: ON (LS tripped)



bit No.	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
1	Turret A clamp	Chuck pressure low/	Hydraulic source pressure low/	Alarm - oil filter clogged	← Rotary switch - turret A, #9 through #12 →			
2	← Rotary switch - turret A, #1 through #8 →							
3	Turret B clamp	Chuck pedal #2	Chuck pedal #1	← Spindle gear confirmation limit switch →				
4	← Rotary switch - turret B, #1 through #8 →							
5	External cycle stop/	External slide hold/	External cycle start	External reset	Door open confirmation switch	Spindle lubrication pressure low/	Slideway lubricating oil flow	Slideway lubricating oil level
6	Chip guard close confirmation switch 2	Chip guard close confirmation switch 1	Tailstock spindle retract confirmation switch	Tailstock spindle in-position confirmation switch	Tailstock spindle over-advance confirmation switch	Tailstock spindle retract foot switch	Tailstock spindle advance foot switch 2	Tailstock spindle advance foot switch 1
7	External input 24	External input 28	Spindle orientation completion/	External alarm/		Alarm - travel end	Alarm - LDU overload/	Alarm - LDU/
8	Alarm - spindle brush wear/	Alarm - spindle overload/	Alarm - SIXI/	Alarm - CPU temperature/	Alarm - transformer overheat/	Alarm - EC overload/	Alarm - EC circuit breaker/	EC power ON
9	External interlock/	Internal interlock release	Turret X-axis free	Turret Z-axis free	Spindle zero speed	Spindle at constant speed	Chuck open confirmation switch	Chuck close confirmation switch
10								
11	Index chuck completion limit/	Sensor protect limit/	Door open	Door close	Coupling device alarm/	Automatic mode	Answer for spare M code	External spindle jog
12								External start disabled

Note: Display contents are different depending on types and specifications of machine.

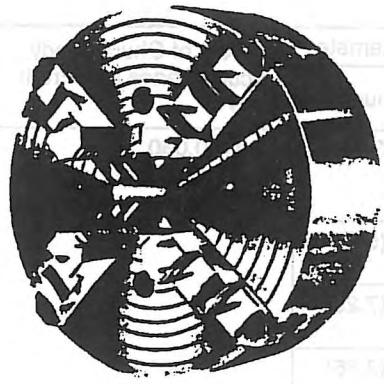
Status Display of EC Input Signal (No. 2)



bit / No.	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
13	Tailstock joint ON	Tailstock joint OFF	Spindle jog reverse	← Spindle speed range → M44	M43	M42	M41	M40
14	External input 18	External input 17	External input 16	External input 15	External input 14	External input 13	External input 12	External input 11
15				Coupling device retract position	Optical sensor workpiece detect	Sensor head advance position	Sensor head intermediate position	Sensor head retract position
16	Gauging start	Gauging data clear			← Switching signal →			
17				← Judging signal →				
18	Gauging start	Gauging data clear			← Switching signal →			
19				← Judging signal →				
20								
21								
22								
23								
24								

Note: Display contents are different depending on types and specifications of machine.

2-9. Manually Operated Chuck



Four-Jaw Independent Chuck (Kitagawa)

(1) Inspection

Check the model name indicated on the chuck body, possible damages during transportation, and accessories.

(2) Standards

The four-jaw independent chucks (Kitagawa) are manufactured in strict adherence to the standards stipulated in JIS B6154 (Independent chucks). The standards applied in manufacturing and inspection of the chucks are provided on the following pages.

IC Type

Unit: mm (in.)

Type		MaximUm Chucking Diameter		Run-out of Chuck Body Circumference and Front Face	Adaptor Installation Section Dimensions		Bolts	
inch	mm	ID Chucking	OD Chucking				P.C.D.	No. of bolts × Bolt Size
4	100	40 (1.57)	90 (3.54)	Within 0.030 (0.00118)	75 (2.95)	+0.030 (0.00118) 0	86 (3.39)	4-M8
6	150	60 (2.36)	140 (5.51)		130 (5.12)	+0.040 (0.00157) 0	115 (4.53)	4-M10
8	200	75 (2.95)	185 (7.28)		175 (6.88)		155 (6.10)	4-M12
10	250	95 (3.74)	220 (8.66)		150 (5.91)		125 (4.92)	4-M12
12	300	125 (4.92)	265 (10.43)		170 (6.69)		140 (5.51)	4-M12
14	350	155 (6.10)	310 (12.20)	Within 0.035 (0.00138)	190 (7.48)	+0.046 (0.00181) 0	160 (6.30)	4-M12
16	400	190 (7.48)	360 (14.17)		210 (8.27)		180 (7.09)	4-M16
18	450	220 (8.66)	405 (15.94)		230 (9.06)		200 (7.87)	4-M16
20	500	250 (9.84)	450 (17.72)	Within 0.040 (0.00157)	250 (9.84)		220 (8.66)	4-M16
22	550	290 (11.42)	500 (19.69)		275 (10.83)	+ 0.052 (0.00205) 0	240 (9.45)	4-M20
24	600	320 (12.60)	550 (21.65)		300 (11.81)		260 (10.24)	4-M20
26	660	370 (14.57)	610 (24.02)	Within 0.045 (0.00177)	325 (12.80)	+ 0.089 (0.00350) 0	275 (10.83)	8-M26
28	710	385 (15.16)	650 (25.59)		350 (13.78)		300 (11.81)	8-M20
30	762	435 (17.13)	700 (27.56)		375 (14.76)		325 (12.80)	8-M20
32	813	485 (19.09)	750 (29.53)	Within 0.050 (0.00197)	400 (15.75)		350 (13.78)	8-M20
36	915	555 (21.85)	850 (33.46)		450 (17.72)	+0.097 (0.00382) 0	400 (15.75)	8-M24
40	1000	630 (24.80)	940 (37.01)	Within 0.060 (0.00236)	500 (19.69)		450 (17.72)	8-M24

IA Type

Unit: mm (in.)

Spindle Nose	Type	Minimum Chucking Diameter		Run-out of Chuck Body Circumference and Front Face
		ID Chucking	OD Chucking	
A-5	IA5-200	75 (2.95)	185 (7.28)	Within 0.030 (0.00118)
	IA5-250	95 (3.74)	220 (8.66)	
	IA5-300	125 (4.92)	265 (10.43)	
A-6	IA6-205	75 (2.95)	185 (7.28)	
	IA6-250	95 (3.74)	220 (8.66)	
	IA6-300	125 (4.92)	265 (10.43)	
	IA6-350	155 (6.10)	310 (12.20)	Within 0.035 (0.00138)
	IA6-400	190 (7.48)	360 (14.17)	
	IA6-450	220 (8.66)	405 (15.94)	
	IA6-500	250 (9.84)	450 (17.72)	Within 0.040 (0.00157)
A-8	IA8-250	95 (3.74)	220 (8.66)	Within 0.030 (0.00118)
	IA8-300	125 (4.92)	265 (10.43)	
	IA8-350	155 (6.10)	310 (12.20)	Within 0.035 (0.00138)
	IA8-400	190 (7.48)	360 (14.17)	
	IA8-450	220 (8.66)	405 (15.94)	
	IA8-500	250 (9.84)	450 (17.72)	Within 0.040 (0.00157)
	IA8-550	290 (11.42)	500 (19.69)	
	IA8-610	320 (12.60)	550 (21.65)	
A-11	IA11-400	190 (7.48)	360 (14.17)	Within 0.035 (0.00138)
	IA11-450	220 (8.66)	405 (15.94)	
	IA11-500	250 (9.84)	450 (17.72)	Within 0.040 (0.00157)
	IA11-550	290 (11.42)	500 (19.69)	
	IA11-610	320 (12.60)	550 (21.65)	
	IA11-710	385 (15.16)	650 (25.59)	Within 0.045 (0.00177)
	IA11-750	435 (17.13)	700 (27.56)	
	IA11-800	485 (19.09)	750 (29.53)	Within 0.050 (0.00197)
	IA11-915	555 (21.85)	850 (33.46)	
	IA11-1000	630 (24.80)	940 (37.01)	Within 0.060 (0.00236)

(3) Installing Chuck

a) Accuracy of adaptor installation section has direct influence to the workpiece chucking accuracy. Therefore, machine the adaptor very carefully. Required accuracy is within 0.005 mm (0.00020 in.) for run-out on circumference, face run-out, and flatness.

b) Any damages such as score or foreign matter on fitting parts and installation surfaces will deteriorate chuck installation accuracy. Install the chuck only after cleaning both the chuck and the adaptor.

After the installation of the chuck, measure run-out of the chuck body circumference and face. Run-out must be within 0.020 mm (0.00079 in.).

c) Insert the chuck onto the spindle with the chuck drive pin hole aligned with the spindle pin. Tighten the chuck clamping bolts gradually and uniformly. After the installation, the chuck fits on the spindle end face in the following manner as illustrated below.

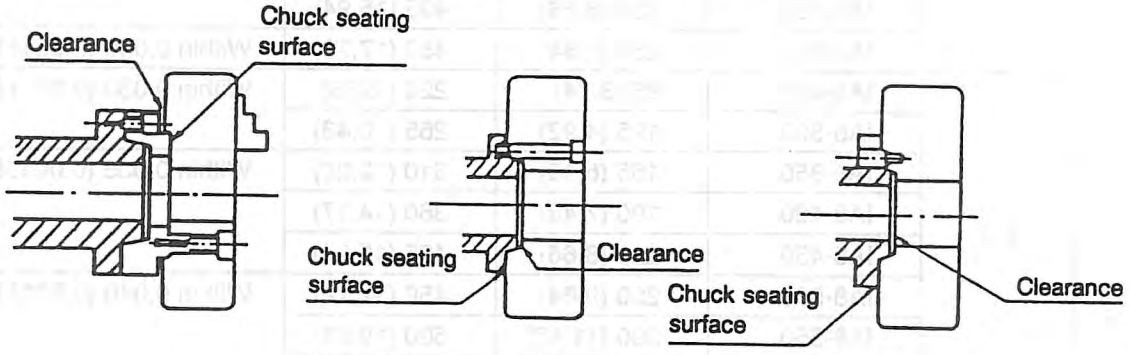
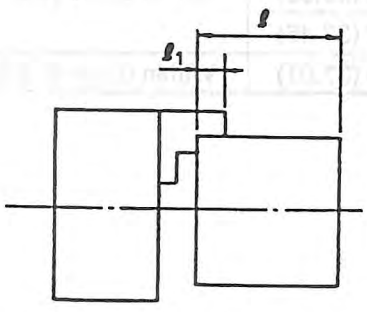


Fig. 3-19

d) To clamp a workpiece, use only the handle supplied with the chuck. If a workpiece is clamped forcibly by inserting a pipe into the handle hole, chucked part will be distorted causing shorter life and deteriorated accuracy.

If higher clamping force is required for your turning operation, use a larger chuck.

e) To hold a long workpiece, always use a tailstock or work rests to support the free end of the workpiece.



$\ell = \ell_1 + (\ell_1 \times 3.5)$

The workpiece whose length "ℓ" is longer than the value calculated using the formula above, it is recommended to use a tailstock.

f) Never tap a workpiece held in the chuck.

g) Select the chuck size meeting the intended machining operation.

(4) Lubrication and Cleaning

To ensure high accuracy for a long period, clean the fitting portions between the chuck body and the chuck jaws, and between the chuck jaw serration and a screw. For the cleaning, remove the jaws.

Supply oil once or twice a day.

(5) Maximum Speed

Each chuck has its allowable maximum speed. If a chuck is rotated at a speed exceeding this limit, it will institute hazards to both operators and the machine.

Always tighten or clamp the workpiece at the torque specified in the table below and use the chuck at a speed lower than the indicated maximum speed.

Chuck Specifications - Flat Back Type Chuck

Type	Gripping Force		Maximum Gripping Force		Chuck		
	Handle Torque N·m {kgf·m (lbf-ft)}	Gripping Force/Jaw kN {kgf (lbf)}	ID Chucking mm (in.)	OD Chucking mm (in.)	Weight kg (lb)	Inertia (GD^2) N·m^2 ($kgf.m^2$)	Allowable Max. Speed min^{-1} {rpm}
IC-4	34.0 {3.5 (25.3)}	4.9 {500 (1100)}	40 (1.57)	90 (3.54)	2.4 (5.3)	0.1 (0.01)	2000
IC-6	49.0 {5 (36)}	5.9 {600 (1320)}	60 (2.36)	140 (5.51)	6.1 (13.4)	0.8 (0.08)	1600
IC-8	83.0 {8.5 (61.5)}	9.8 {1000 (2200)}	75 (2.95)	185 (7.28)	14.8 (32.6)	2.9 (0.3)	1600
IC-10	118 {12 (87)}	13.7 {1400 (3080)}	95 (3.74)	220 (8.66)	21 (46.2)	5.9 (0.6)	1600
IC-12	147 {15 (108)}	15.7 {1600 (3520)}	125 (4.92)	265 (10.43)	29.5 (64.9)	13.7 (1.4)	1400
IC-14	157 {16 (116)}	16.7 {1700 (3740)}	155 (6.10)	310 (12.20)	40 (88)	28.4 (2.9)	1400
IC-16	215 {22 (159)}	19.6 {2000 (4400)}	190 (7.48)	360 (14.17)	56.5 (124.3)	44.1 (4.5)	1200
IC-18	215 {22 (159)}	19.6 {2000 (4400)}	220 (8.66)	405 (15.94)	70 (154)	68.6 (7.0)	1200
IC-20	245 {25 (181)}	21.6 {2200 (4840)}	250 (9.84)	450 (17.72)	90 (198)	116 (11.8)	900
IC-22	245 {25 (181)}	21.6 {2200 (4840)}	290 (11.42)	500 (19.69)	135 (297)	173 (17.6)	900
IC-24	275 {28 (203)}	22.5 {2300 (5060)}	320 (12.60)	550 (21.65)	150 (330)	248 (25.3)	900
IC-26	275 {28 (203)}	22.5 {2300 (5060)}	370 (14.57)	610 (24.02)	176 (387)	411 (42)	900
IC-28	294 {30 (217)}	23.0 {2350 (5170)}	385 (15.16)	650 (25.59)	247 (543)	569 (58)	900
IC-30	294 {30 (217)}	23.5 {2400 (5280)}	435 (17.13)	700 (27.56)	284 (625)	784 (80)	600
IC-32	294 {30 (217)}	23.5 {2400 (5280)}	485 (19.09)	750 (29.53)	357 (785)	1039 (106)	600
IC-36	353 {36 (260)}	23.5 {2400 (5280)}	555 (21.85)	850 (33.46)	413 (909)	1696 (173)	600
IC-40	510 {52 (376)}	29.4 {3000 (6600)}	630 (24.80)	940 (37.01)	600 (1320)	2971 (303)	600

Chuck Specifications - Type A Short Taper Chuck

Spindle Nose	Type	Gripping Force		Maximum Grip ping Force		Chuck		
		Handle Torque Nm {kgf·m (lbf-ft)}	Gripping Force/Jaw kN {kgf (lbf)}	ID Chucking mm (in.)	OD Chucking mm (in.)	Weight kg (lb)	Inertia (GD^2) $N·m^2$ ($kgf·m^2$)	Max. Allowable Speed min^{-1} (rpm)
A2-5	IA5-200	83 {8.5 (61.5)}	9.8 {1000 (2200)}	75 (2.95)	185 (7.28)	14.9 (32.8)	3.14 (0.32)	3.600
A2-6	IA6-250	118 {12 (87)}	14.7 {1500 (3300)}	95 (3.74)	220 (8.66)	24.2 (53.4)	7.35 (0.75)	3000
	IA6-300	147 {15 (108)}	15.7 {1600 (3520)}	125 (4.92)	265 (10.43)	39.1 (86.0)	15.7 (1.6)	2000
	IA6-350	147 {15 (108)}	15.7 {1600 (3520)}	155 (6.10)	310 (12.20)	50.9 (112.0)	29.4 (3.0)	2000
	IA6-400	215 {22 (159)}	19.6 {2000 (4400)}	190 (7.48)	360 (14.17)	69.8 (153.6)	46.0 (4.7)	1800
	IA6-450	245 {25 (181)}	22.5 {2300 (5060)}	220 (8.66)	405 (15.94)	97.2 (213.8)	69.6 (7.1)	1200
	IA6-500	245 {25 (181)}	22.5 {2300 (5060)}	250 (9.84)	450 (17.72)	103.5 (227.7)	132 (13.5)	1200
A2-8	IA8-350	215 {22 (159)}	19.5 {2000 (4400)}	155 (6.10)	310 (12.20)	56.2 (123.6)	30.4 (3.1)	2000
	IA8-400	245 {25 (181)}	22.5 {2300 (5060)}	190 (7.48)	360 (14.17)	73.8 (162.4)	49.0 (5.0)	1800
	IA8450	245 {25 (181)}	22.5 {2300 (5060)}	220 (8.66)	405 (15.94)	102.5 (225.5)	71.6 (7.3)	1200
	IA8-500	245 {25 (181)}	22.5 {2300 (5060)}	250 (9.84)	450 (17.72)	108.4 (238.5)	139 (14.2)	1200
	IA8-550	245 {25 (181)}	22.5 {2300 (5060)}	290 (11.42)	500 (19.69)	123 (271)	158 (16.1)	1200
	IA8-610	275 {28 (203)}	22.5 {2300 (5060)}	320 (12.60)	550 (21.65)	136 (299)	224 (22.8)	1100
A2-11	IA11-500	245 {25 (181)}	22.5 {2300 (5060)}	250 (9.84)	450 (17.72)	130 (286)	166 (16.9)	1200
	IA11-550	245 {25 (181)}	22.5 {2300 (5060)}	290 (11.42)	500 (19.69)	145 (319)	185 (18.9)	1100
	IA11-610	275 {28 (203)}	22.5 {2300 (5060)}	320 (12.60)	550 (21.65)	204 (449)	338 (34.5)	900
	IA11-710	392 {40 (289)}	29.4 {3000 (6600)}	385 (15.16)	650 (25.59)	257 (565)	588 (60)	800
	IA11-750	451 {46 (333)}	29.4 {3000 (6600)}	435 (17.13)	700 (27.56)	300 (660)	840 (85.7)	800
	IA11-810	539 {55 (398)}	29.4 {3000 (6600)}	450 (17.72)	750 (29.53)	380 (836)	1299 (132.5)	600
	IA11-915	451 {46 (333)}	29.4 {3000 (6600)}	555 (21.85)	850 (33.46)	440 (968)	1809 (184.5)	600
	IA11-1000	657 {67 (485)}	36.3 {3700 (8140)}	630 (24.80)	940 (37.01)	570 (1254)	2824 (288.2)	600

(cont'd)

Spindle Nose	Type	Gripping Force		Maximum Grip ping Force		Chuck		
		Handle Torque Nm {kgf·m (lbf-ft)}	Gripping Force/Jaw kN {kgf (lbf)}	ID Chucking mm (in.)	OD Chucking mm (in.)	Weight kg (lb)	Inertia (GD^2) $N·m^2$ ($kgf·m^2$)	Max. Allowable Speed min^{-1} (rpm)
A2-15	IA15-610	441 {45 (325)}	26.5 {2700 (5940)}	280 (11.02)	520 (20.47)	215 (473)	394 (40.2)	900
	IA15-710	451 {46 (333)}	27.5 {2800 (6160)}	385 (15.16)	650 (25.59)	280 (836)	798 (81.5)	800
	IA15-750	451 {46 (333)}	27.5 {2800 (6160)}	420 (16.54)	690 (27.17)	230 (506)	933 (95.2)	600
	IA15-810	539 {55 (398)}	29.4 {3000 (6600)}	460 (18.11)	750 (29.53)	392 (616)	1339 (136.6)	600
	IA15-915	726 {74 (535)}	29.4 {3000 (6600)}	500 (19.69)	800 (31.50)	500 (1100)	2043 (208.5)	500
	IA15-1000	726 {74 (535)}	29.4 {3000 (6600)}	550 (21.65)	900 (35.43)	610 (1342)	2842 (290)	500

SECTION 4 INSPECTION AND MAINTENANCE OF MACHINE

Your CNC lathe is a highly efficient production machine calling for a much higher utilization rate than an engine lathe.

This section deals with the maintenance requirements which must be met by every user in order to insure excellent, trouble-free performance and prolonged life.

It also outlines some basic steps to pinpoint possible causes of trouble, together with troubleshooting hints, if your CNC lathe is found out of order in any way, or in need of readjustment or repair.

Generally, NC lathes are used at three to four times higher "utilization" rates than manually controlled engine lathes. To insure a maximum productive time with a minimum of downtime, the machine must be periodically inspected and carefully serviced.

A periodical inspection schedule is presented below. In addition to the regular maintenance items given here. There are some maintenance items which should be checked according to the actual condition of the machine, as described in this section.

Periodical Inspection Schedule

Frequency	Inspection Items
Daily	(1) Check oil level through the oil level gauges in the hydraulic power unit, slideway lubricating oil tank and spindle coolant unit. Check oil flow through the oil window. (2) Check source pressure of the hydraulic unit, chuck pressure and tailstock pressure. (3) Supply lubricating oil to the power chuck master jaw.
Monthly	(1) Check the bedways for level and straightness. (2) Flush out the hydraulic power unit and change the hydraulic fluid. These two items must be carried out after the first month of operation following initial installation of the machine.
Every six months	(1) Change hydraulic oil in the hydraulic unit. (2) Supply lubricating oil to the chip conveyor. (3) Check belt tension.

The following details the regular maintenance requirements for your CNC lathe.

1. LUBRICATION

The machine should be completely and correctly lubricated in strict adherence to the directions in the Lubrication Chart in the following page.

(1) Always use the specified lubricating oil.

a) If the oil other than specified is used, the lubrication unit might fail to operate normally.

b) Lubricating oil used in common with coolant or lubricating oil used in common with hydraulic oil might cause corrosion of lubrication unit or mixing of oils to result in lubrication failure, which, in turn, leads to damages on the slideway surfaces.

(2) For coolant, use the specified coolant.

a) Coolant usually contains chemical additives such as activator. If improper coolant is used, lubricating oil will be affected by chemicals and therefore, use the specified coolant so far as possible.

b) If coolant which is not our recommendation is to be used, check to be sure that it will not cause any following problems.

Mixing with lubricating oil, possible parting, peel of paint, rusting, and swelling of packings.

If a problem is found during the use of the coolant, avoid the use of such coolant.

(3) Amount of lubricating oil and its discharge condition must be checked everyday.

a) Whether or not lubricating oil is properly supplied can be checked by checking oil level in the tank. For normal oil consumption amount, refer to 1-2 in this section.

b) Prior to shipment of the machine from our plant, the oil and the coolant tanks are flushed out and must therefore be refilled during the initial installation of the machine.

Lubrication Chart (Distance between Centers: 650 mm (25.59 in.))

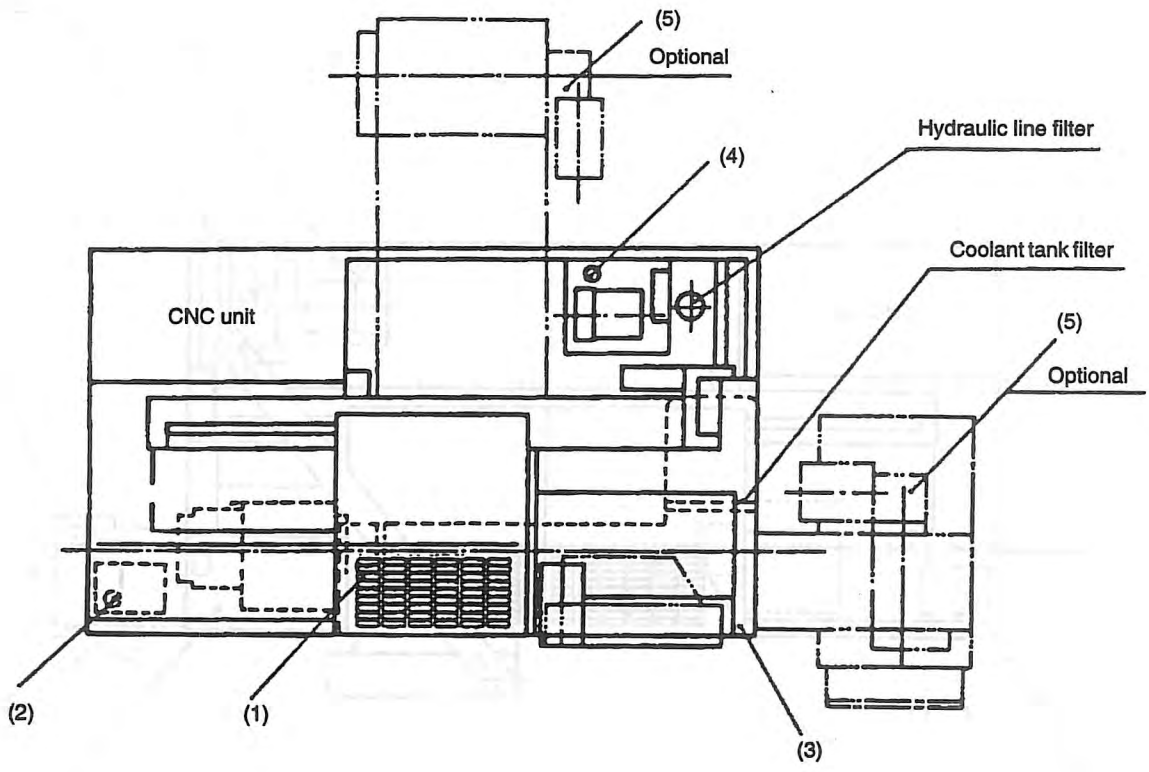


Fig. 4-1 Lubrication Chart

No.	Oiling Points	Quantity	Oil Used	(MAS)	Remarks
1	Chuck jaw	As needed	Molykoat EP grease (Dow Corning)	—	Everyday when cleaning chuck jaws
2	Slideway centralized lubrication	4 liter (1.06 gal)	Tonna Oil T68 (Shell)	G68	As needed
3	Coolant tank	160 liter (42.24 gal)	Hi-chip NC10 (Taiyu)*1	—	As needed
4	Hydraulic power unit	75 liter (19.8 gal)	DTE Oil Light (Mobil)	HL32	In 1 month after initial installation Every 6 months after that
5	Chip conveyor	As needed	Mobilux 2 (Mobil)	XM2	Replenish every 3 to 6 months.

*1 Use NC10 diluted by 20 to 30 times their volume with tap water or distilled water.

Refer to Table 4-1 on page 51 for similar oil of other makers.

Note: Chip conveyor is optional.

Lubrication Chart (Distance between Centers: 1250 mm (49.21 in.))

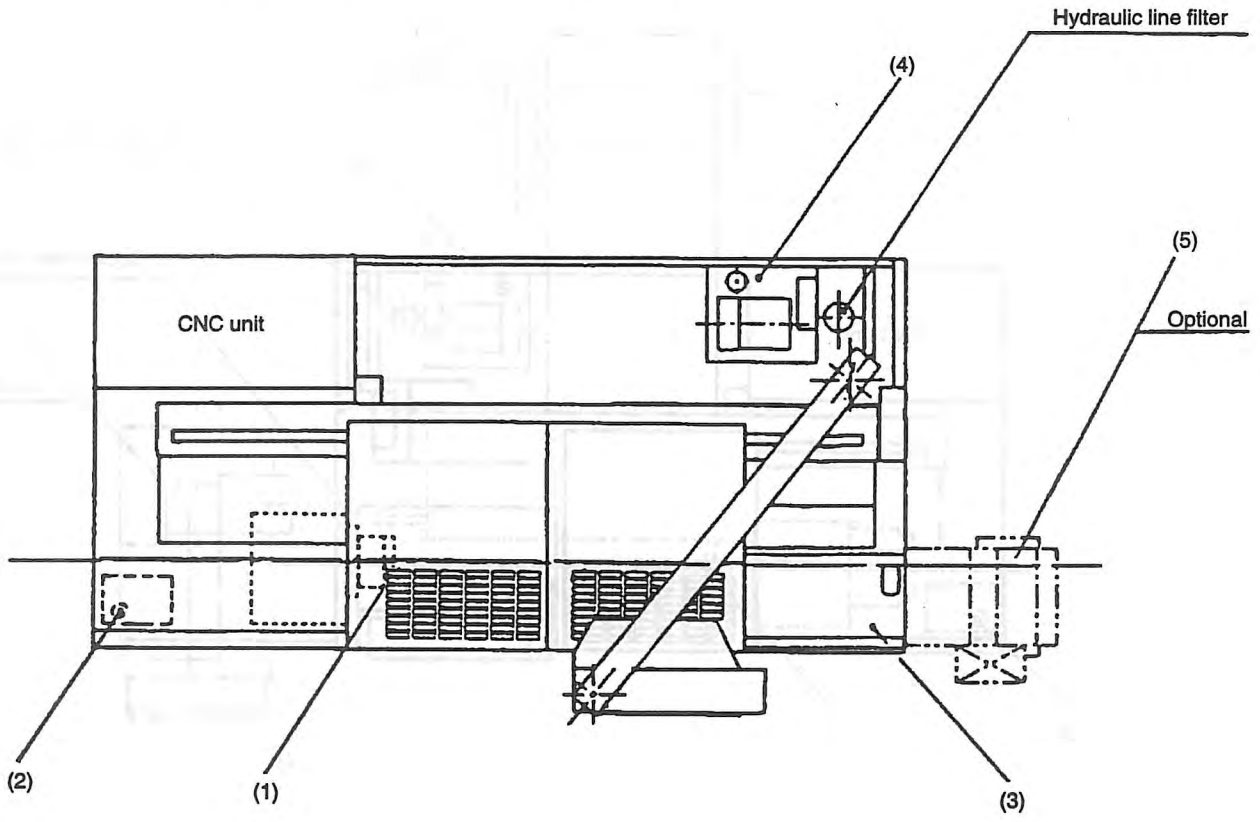


Fig. 4-2 Lubrication Chart

No.	Oiling Points	Quantity	Oil Used	(MAS)	Remarks
1	Chuck jaw	As needed	Molykoat EP grease (Dow Corning)	—	Everyday when cleaning chuck jaws
2	Slideway centralized lubrication	4 liter (1.06 gal)	Tonna Oil T68 (Shell)	G68	As needed
3	Coolant tank	160 liter (42.24 gal)	Hi-chip NC10 (Taiyu)*1	—	As needed
4	Hydraulic power unit	75 liter (19.8 gal)	DTE Oil Light (Mobil)	HL32	In 1 month after initial installation Every 6 months after that
5	Chip conveyor	As needed	Mobilux 2 (Mobil)	XM2	Replenish every 3 to 6 months.

*1 Use NC10 diluted by 20 to 30 times their volume with tap water or distilled water.

Refer to Table 4-1 on page 51 for similar oil of other makers.

Note: Chip conveyor is optional.

Table 4-1 Lubricating Oil Specification

Application	Code	Esso	Shell	Mobil
Headstock gearbox (Spindle gearbox with C-axis) Separately installed gearbox	CB32	Unipower 32	Tetra Oil 32	DTE Oil Light*
Cam type turret	CC320	Spartan EP320*	Omala Oil 320	Gear Oil 632
Spindle bearing lubrication unit	FC10	Spinesso 10*	Tetra Oil 10	Velocite No. 6*
Centralized slideway lubrication unit (M-turret, ball screw)	G68	Febis K68	Tonna Oil T68*	Vactra Oil No. 2 SLC
	G220	Febis K220	Tonna Oil T220*	Vactra Oil No. 4 SLC
Hydraulic power UNIT	HL32	Unipower 32	Tetra Oil 32	DTE Oil Light*
M-tool holders	(Grease)	—	—	Mobilux EP2*
Master jaw on chuck	(Grease)	Molykoat EP grease (Dow Corning) or Kitagawa chuck grease for Kitagawa power chuck. For special chucks, refer to the instruction manual supplied with the chuck.		
Headstock cooling unit	FC2	Unipower MP-2	Tetra Oil 2	Velocite No. 3* ISO viscosity grade = Equivalent to 2 cst (40°)

Note 1: The above table is based on the MAS.

We do not have any experience in using the oils other than those indicated by an asterisk (*). Selection should thus be made from them. Because slide-way lubricating oil contains additives such as extreme-pressure additive, it could incur variety of troubles if reacting with other oils or coolant. Therefore, pay special attention to the use of slide way lubricating oil.

Note 2: As for service point or amount of lubricating oil of the machine, refer to the Instruction Manual of respective machine models.

Note 3: G220 code oil for the centralized slideway lubrication unit is used only on LH55-N and LC50 (large-sized models).

Note 4: Lubricating oil used in common with coolant or lubricating oil used in common with hydraulic oil might cause corrosion of lubrication unit or turbidness of oils to result in lubrication failure, which, in turn, leads to damages on the slideway surface or ball screw. (We take no responsibility for the troubles caused by using the lubricating oil which is not our recommendation.)

Note 5: As for oil replenishment for the optional accessories such as special chucks or chip conveyor, refer to the Special Instruction Manual supplied with individual accessories.

Note 6: When slide way lubricating oil mixed with coolant and some trouble appears, contact your local Okuma representatives. They have optional accessories such as oil skimmer.

1-1. Spindle

All the spindle bearings are lubricated by packed high quality grease, requiring no further greasing.

1-2. Slideway Lubrication System

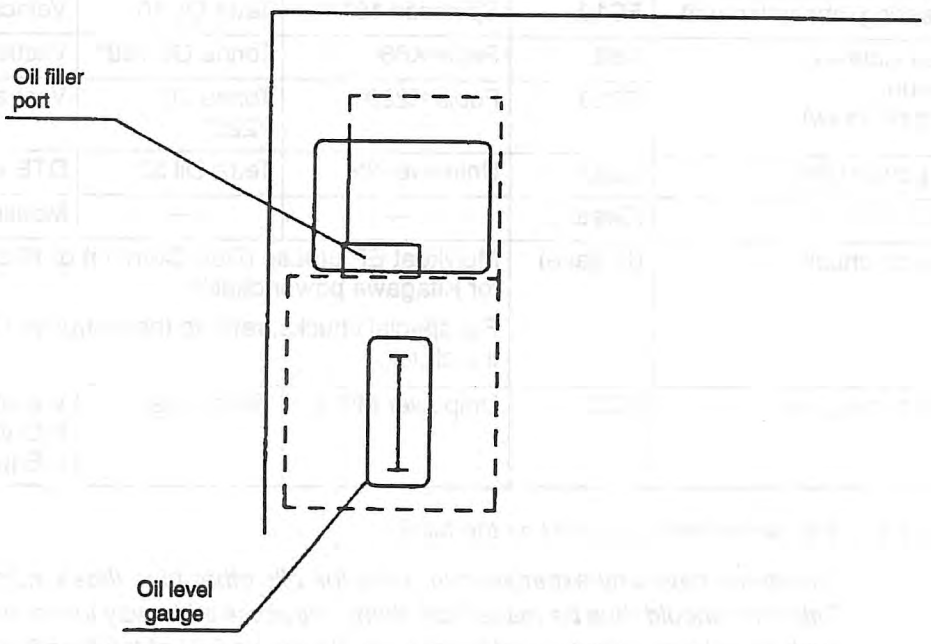


Fig. 4-2 Slideway Lubrication System

Oil Specification	G68 (MAS)
Amount	4.0 liter (1.06 gal)
Oil Change Interval	Replenish as required. Low lubrication level alarm detected by the level switch occurs in approx. 130 hour operation. Check oil level every day and replenish lubricating oil before the alarm occurs.

CAUTION : Check oil level before starting day's operation.

To forcibly deliver lubricating oil, follow the steps below:

(1) Press the EMERGENCY STOP button.

(2) Press the RESET button.

This delivers lubricating oil.

Repeat the above indicated steps several times.

The centralized lubricating oil tank is accessible by opening the oil filter port cover. The lubricating oil is fed to the bed slideway, the cross-slide slideway, the X- and Z-axis drive ball screws and the tailstock sleeve.

2. ADJUSTING CENTRALIZED LUBRICATION UNIT

(1) Adjusting Pump Delivery

The delivery amount to each lubrication point is controlled by the metering type distribution valve, and no further adjustment is necessary.

A metering type distribution valve is provided at the machine rear (inside the cover) and at the right side of the tailstock. The delivery condition of lubricating oil can be checked visually. (Use sufficient care when checking the delivery condition.)

(2) Maintenance and Countermeasure

When no lubricating oil is delivered:

a) Oil level is low.

Replenish the lubricating oil of the same brand.

b) The pump is at a rest: The pump operates intermittently.

The pump operation interval is set at 5 minutes.

c) The suction filter is clogged.

Clean the suction filter at least every six months. (See Fig. 4-3.)

d) The motor does not rotate. Check wiring.

(3) Other Remarks

a) The lubricating oil to be replenished must be clean and it must be of the same brand as currently used.

b) When cleaning the tank and the filter, NEVER USE THINNER OR TRICHLEN (TRICHLOROETHYLENE) SHOWING HIGH VOLATILE CHARACTERISTICS.

c) Specified Lubricating Oil: G68 (MAS)

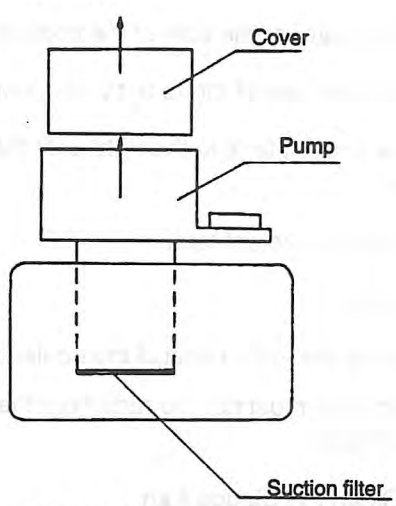


Fig. 4-3 Adjusting Centralized Lubrication Unit

d) Suction filter cleaning procedure

1) Remove the cover (two screws).

2) Remove the pump. (four screws)

3) Remove and clean the suction filter.

4) Set the suction filter to the pump flange and mount the pump flange and the cover as before.

3. CLEANING COOLANT TANK

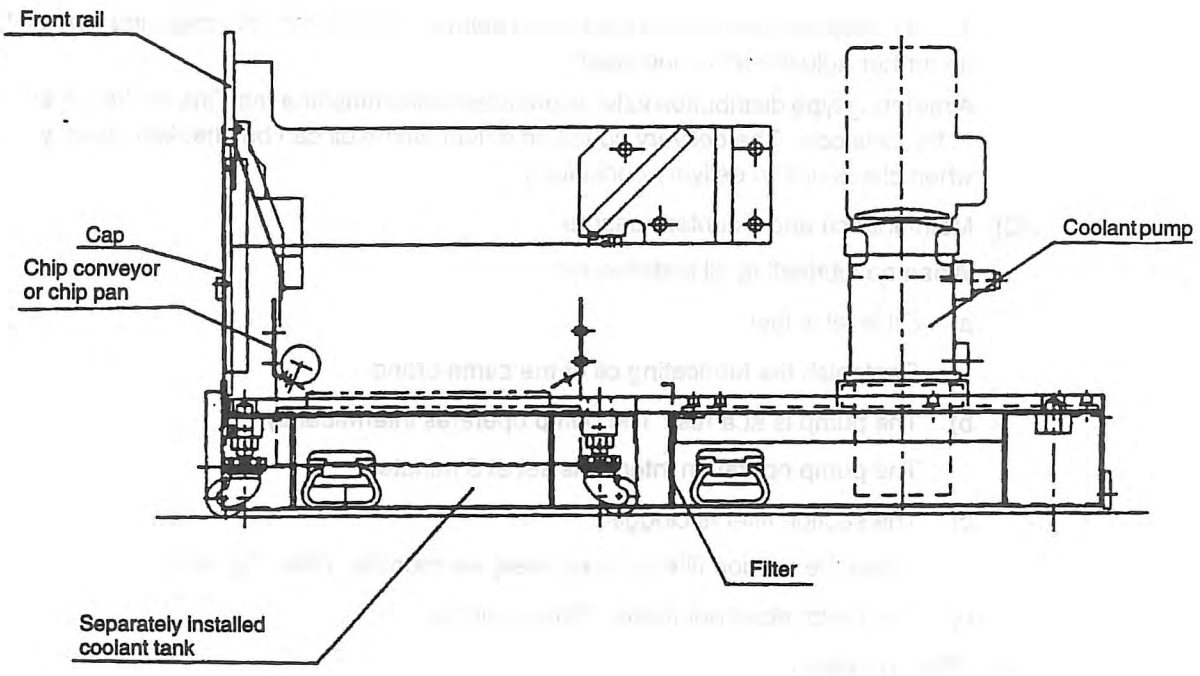


Fig. 4-4 Cleaning Coolant Tank

(1) Procedure to Clean the Separately Installed Coolant Tank

a) Remove the front cover.

b) Remove the cover at the side of the coolant pump.

c) Draw the coolant out of the tank by the pump.

d) Pull out the coolant tank to the right until the pump protrudes from the side cover, and pull it out to the front.

e) Clean inside the coolant tank.

f) Clean the filter.

g) After cleaning the tank, reinstall the coolant tank.

The coolant tank must not protrude from the front rail. If the coolant tank is not installed correctly, coolant will leak.

(2) Procedure to Clean the Sludge Pan

a) Remove the front cover.

b) Pull the sludge pan forward.

c) Clean the sludge pan.

d) Reinstall the sludge pan and the front cover.

4. TENSIONING BELTS

4-1. Spindle Drive Belts

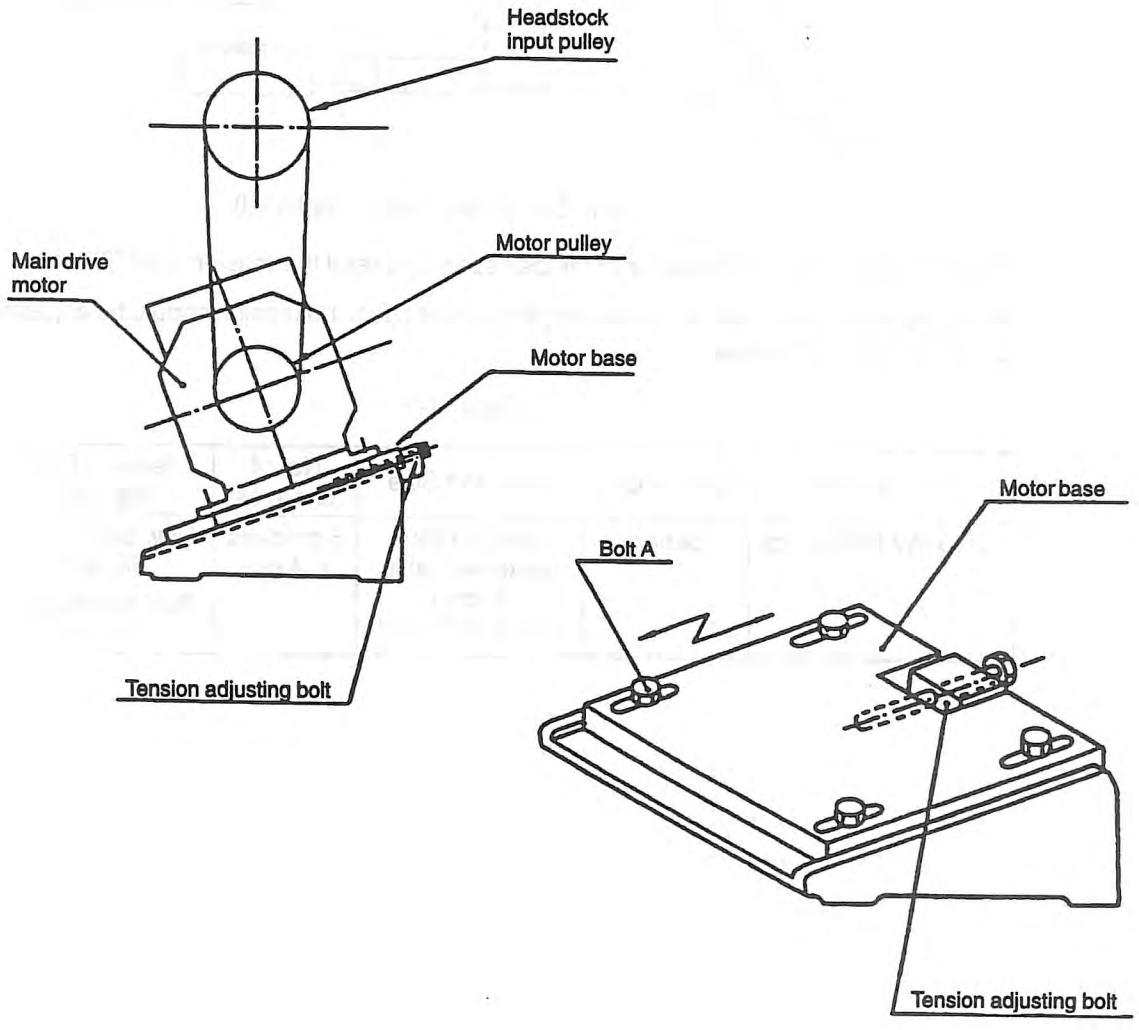


Fig. 4-5 Spindle Drive Belts

(1) Adjusting Belt Tension by Using A Tension Meter (Optional)

a) Loosen bolt A.

b) Turn the tension adjusting bolt, and the motor base moves up and down along the slanted face. Adjust belt tension using a tension meter (optional) by referring to Table 4-2.

c) After adjusting the belt tension, tighten bolt A to clamp the motor base.

(2) How to Use Tension Meter

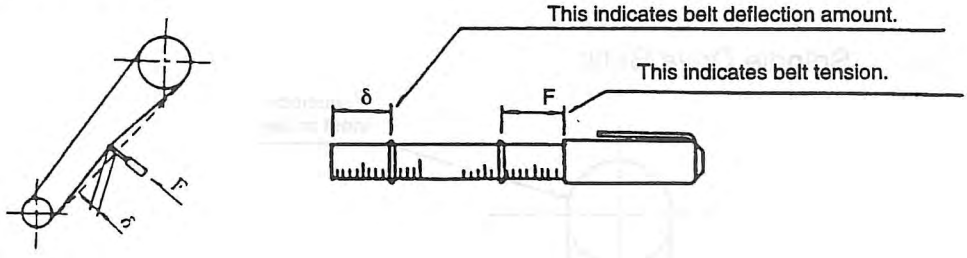


Fig. 4-7 Belt Tension Meter (optional)

Provide deflection δ at the center of the belt span and read the tension load "F".

When installing a new belt, or readjusting the present belt, the tension should be adjusted to the values shown in Table 4-2 below.

Table 4-2

Specification	Type of Belt	Type and Size	No. of Grooves	Tension F_1 N [kgf (lbf)]	δ_1 mm (in.)
11/15 kW (15/20 hp)	Bando	32PD-1850 (matched set in 4 pcs.) (M119-0015-65)	8 grooves × 4 pcs.	New belts: 95 {9.7} Readjustment: 82 {8.4}	8.7 (0.34)

5. OTHER MAINTENANCE ITEMS

5-1. Check the Bed Level

The straightness or level of the bedways will affect the machining accuracy. In case parts cannot be turned to specified tolerances, first check and secure the machine level, then proceed with necessary adjustments. (Refer to Section 2, 4.)

5-2. Alignment of Headstock

If taper is generated on the turned workpiece in the chuck work operation, proceed with the alignment of the headstock as follows:

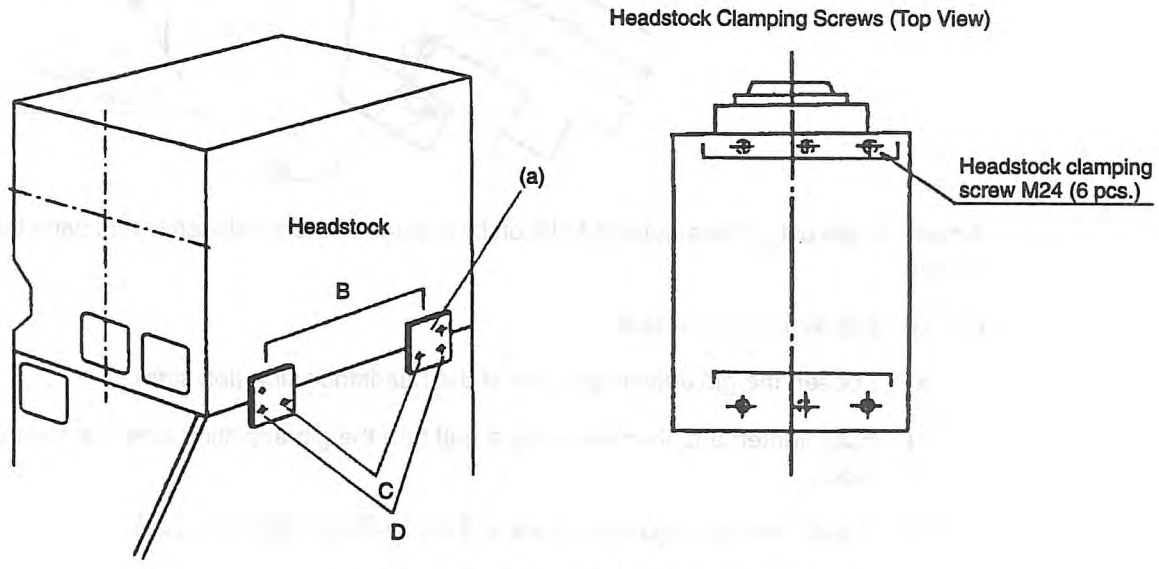


Fig. 4-7 Headstock Aligning Fixture Mounting Diagram

For Your Information

The Japanese Industrial Standard (JIS) specifies that the lathe should turn cylindrically to within 0.015 per 225 mm (0.00059 per 8.86 in.) of finishing length of work held in a chuck without the use of tailstock center to hold the work.

Procedure:

(1) Mount the aligning fixtures (A) to the front of the headstock with screws B (M12, 1 pc.~ each).

(2) Tighten screws C (M12, 2 pcs.) lightly to the base.

(3) Screw in screws D (M12, 2 pcs.) to fixture (A) until they contact the base.

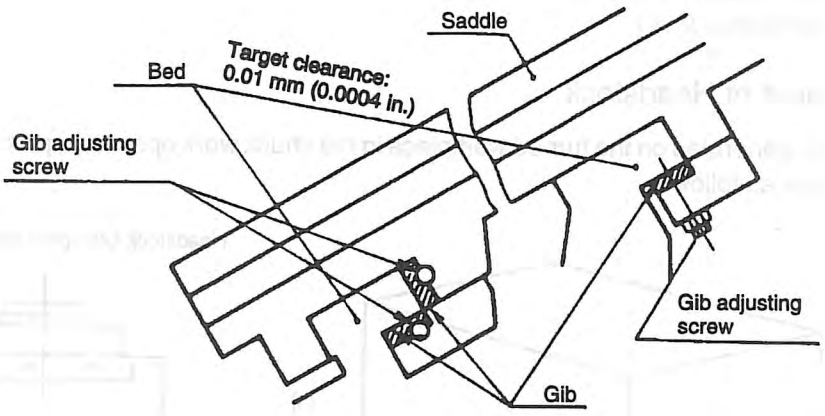
(4) Loosen screws E and F (M24, 6 pcs.).

(5) Adjust the alignment of the headstock with screws C and D.

(6) After completing the adjustment, tighten screws E and F, then remove fixtures (A).

5-3. Adjustment of Tapered Gibs on Saddle Cross-slide

The machine is shipped after complete adjustment of tapered gibs. Readjustment will become necessary when the gibs are worn or loosened by use, resulting in noticeable irregular feed movement, which adversely affects the working accuracy.



Adjust the gib using the adjusting belts on both sides of the saddle after removing the right and left saddle covers.

(1) Gib Adjustment Procedure

a) Loosen the gib adjusting screw at the headstock side (left side).

b) Fully tighten and then return by a half turn the gib adjusting screw at the tailstock side (right side).

c) Tighten the gib adjusting screw at the headstock side (left side).

Clearance should be 0.01 mm (0.0004 in.).

(2) Adjust the gibs for the cross-slide in the same manner.

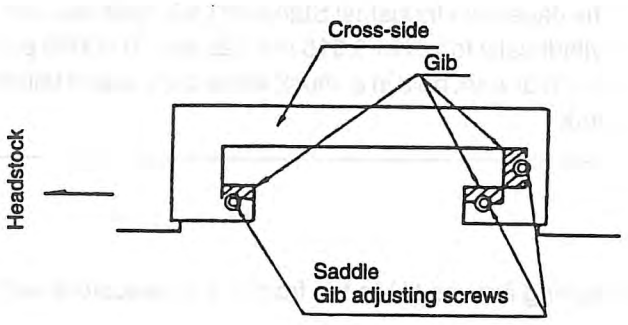


Fig. 4-8 The Gibs for the Cross-slide

6. TROUBLESHOOTING FOR SIMPLE MECHANICAL TROUBLE

6-1. Trouble with Headstock

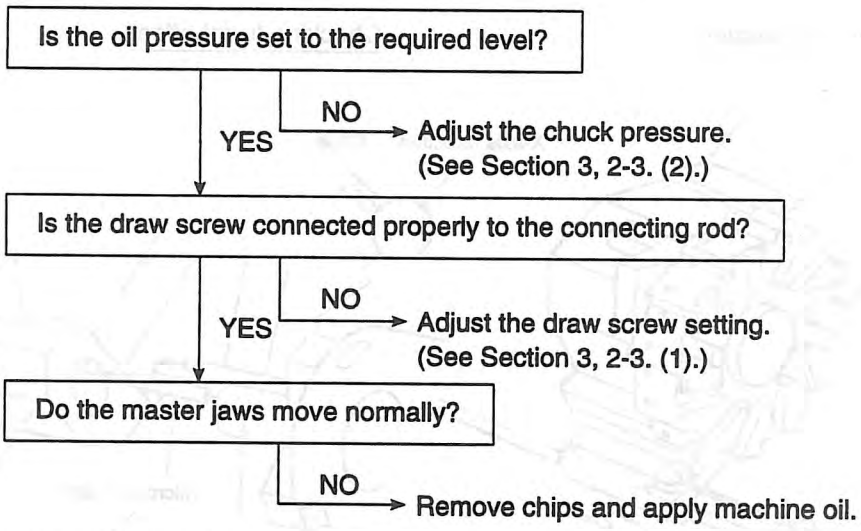
(1) No Spindle Rotation

Is the power chuck closed?

For model with tailstock:

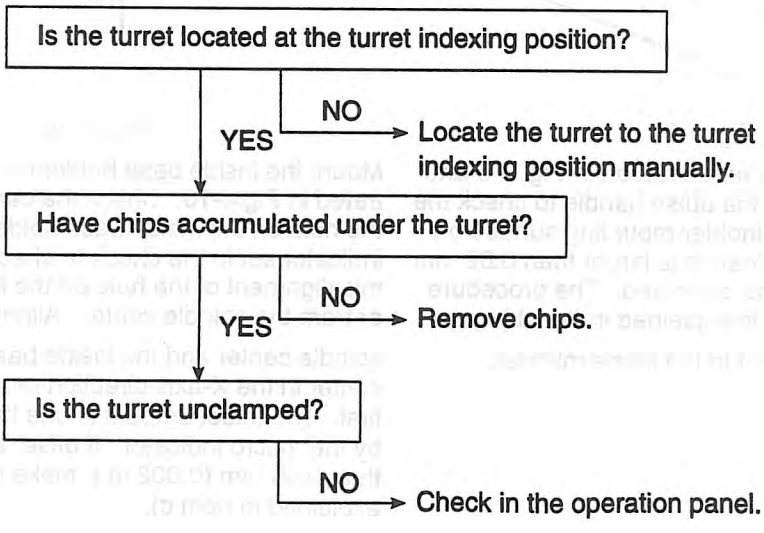
CENTER WORK/CHUCK WORK selector setting:
CENTER WORK . . . Tailstock sleeve must be at the advance end.
CHUCK WORK . . . . Tailstock sleeve must be at the retract end.

(2) No Chuck Jaw Movement



6-2. Trouble with Turret

(1) No Turret Indexing



(2) Weak Turret Clamping Pressure

Is the oil pressure set to the required level?

NO → Adjust the system pressure.
(See Section 3, 2-1. (2).)

(3) After Collision of Turret

a) Checking after turret collision

Misalignment of the turret or the headstock might be caused when the turret is struck against the workpiece or the chuck in rapid feed due to operation error or programming error, or when an abnormally heavy load is imposed on the turret due to axis feed with damaged inserts. The procedure to check the alignment of the turret and the headstock is explained below.

1) Checking turret alignment

Checking turret inclination

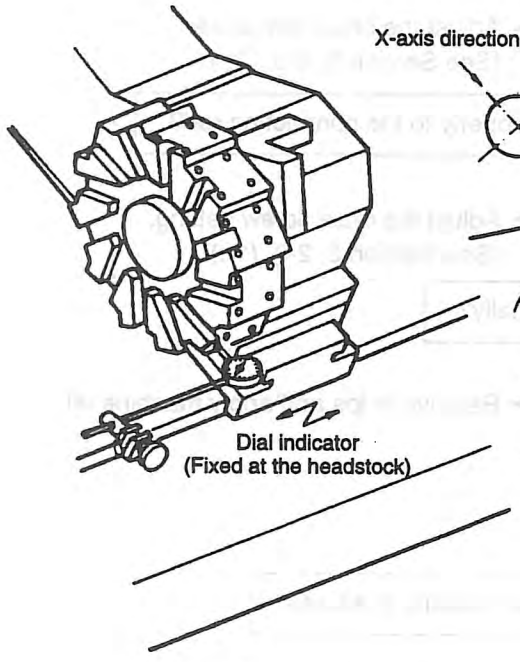


Fig. 4-9

Set the dial indicator as illustrated in Fig. 4-9 and feed the X-axis with the pulse handle to check the inclination of the toolholder mounting surface on the turret. If the inclination is larger than 0.02 mm (0.0008 in.) it must be corrected. The procedure to make corrections is explained in Item b).

Check the lower turret in the same manner.

Checking turret offset

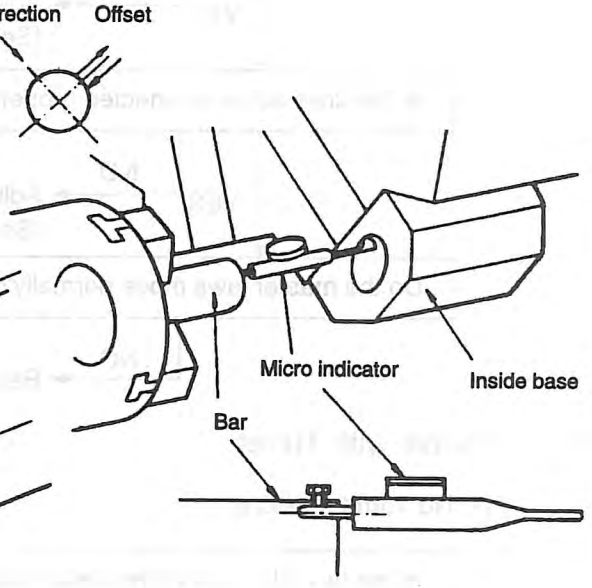
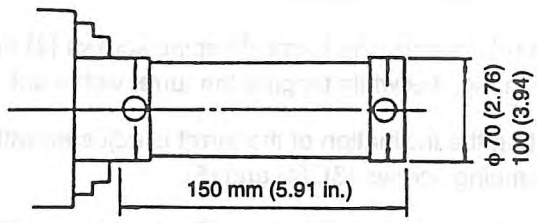


Fig. 4-10

Mount the inside base holder on the turret as illustrated in Fig.4-10. Check the center position of the hole on the inside base holder using the micro indicator set in the chuck to check the offset or misalignment of the hole on the inside base holder from the spindle center. Alignment of the spindle center and the inside base holder hole center in the X-axis direction must be adjusted first. The offset amount is one half the error read by the micro indicator. If offset amount is larger than 0.05 mm (0.002 in.), make corrections as explained in Item c).

2) Accuracy inspection of headstock

Finish a test piece indicated in Fig. 4-11 below in the MDI mode operation to check the cylindricity. If the measured cylindricity is larger than 0.015 mm/225 mm (0.0006 in./8.86 in.), adjustment of the headstock is necessary. For the procedure to adjust the headstock, refer to 4-1. in this section. This adjustment should be carried out in combination with the adjustment for offset in Fig. 4-10.



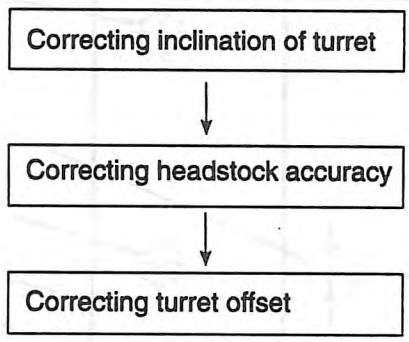
Cutting conditions

Material	:	Mild steel (S45C, JIS) or cast iron (FC, JIS)
Depth of cut	:	φ0.2 mm (φ0.008 in.)
Feedrate	:	0.1 mm/rev (0.004 ipr)

Fig. 4-11 Accuracy inspection of headstock

3) Headstock accuracy

Accuracy adjustment should be carried out in the following order:



b) Correcting turret inclination

If the turret inclination amount measured as per Fig. 4-9 is larger than 0.02 mm (0.0008 in.), adjustment should be made in the manner indicated below (Refer to Fig. 4-12.):

1) Remove covers (1), (2) and (7).

2) Loosen the four turret clamping screws (3). Note that turret clamping screws (4) and (5) should not be loosened.

3) After loosening the turret clamping screws (4) and (5) satisfactorily, check turret inclination as in Fig. 4-9 while tapping the turret with a soft head hammer.

4) When the inclination of the turret is adjusted within the allowable range, secure the turret clamping screws (3), (4) and (5).

5) Install the covers (1) (2) and (7). Apply the sealant to the cover mounting surfaces.

This completes the adjustments.

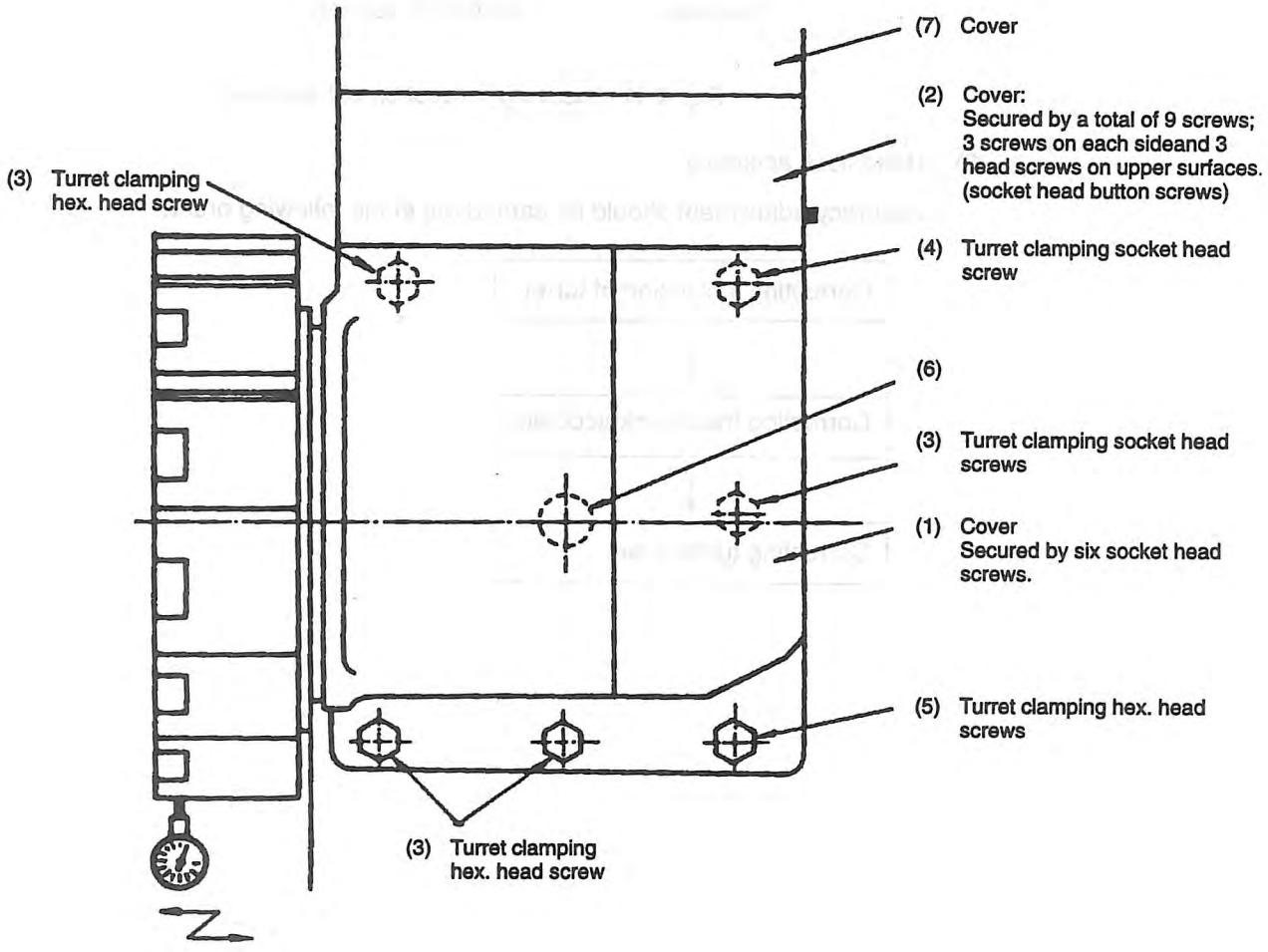


Fig. 4-12 Turret

c) Correcting turret offset

If the offset amount measured as per Fig. 4-10 is larger than 0.05 mm (0.002 in.), make corrections following the steps below: (Refer to Fig. 4-13.)

1) Press the CONTROL OFF pushbutton switch to turn off the power supply to the NC and then, turn off the main switch.
2) After removing the plug (1), loosen the bolt (2).
3) Prepare two taper pins with female thread (3), ϕ10 × 63 mm (ϕ0.39 × 2.48 in.), and drive fit them while tapping the turret with a softhead hammer. It is recommended to screw the bolt into the female thread of the taper pin in advance.
4) After the two taper pins have been driven into the turret head, secure the turret head clamping screws tight.
5) Turn on the power.
6) Measure the offset amount in the manner as illustrated in Fig. 4-10.
7) If steps 1) through 6) cannot eliminate offset, proceed to the steps below.

   Set "1" at the optional parameter No. 40, bit 1. The turret will be unclamped.
8) Press the CONTROL OFF pushbutton switch to turn off the power supply to the NC and then, turn off the main switch. Keep the power off until the turret head is reassembled.
9) After removing the six screw (4), remove the tool number plate (5). Before removing the tool number plate, mark match marks so that it can be replaced easily.
10) Remove screws (6) and detach cap (7).
11) Remove the bolt (8).
12) Remove the center shaft (10) and the cover (11) using a tap (9).
13) Lift up the turret with a jib crane and remove bolt (12).
14) Detach the turret head. (Leave marking for matching.)
15) Remove the bolt (13) and then remove the clutch (14). (Leave marking for matching.)
16) Loosen the bolt (15) and then remove the taper pin (16).
17) Prepare two taper pins with female thread, ϕ6 × 36 mm (0.24 × 0.42 in.) and drive fit them into taper pin holes (17).
18) Tighten clutch securing screw (15).
19) Finish two taper pin holes (18) with a taper reamer and drive the taper pin ϕ8 × 50 mm (0.31 × 1.97 in.) into the taper pin hole. If the taper pin removed in step 16) is stepped or bent, replace it with a new one. If the taper pin is inserted too deeply, use a little longer taper pin.
20) Remove taper pins (3) and (17).

21) Reassemble the turret head in reverse order of steps 9) to 15).
Be sure that all O-rings have been placed in position.
Apply grease to the clutch teeth slightly.

22) Turn on power.

23) Set "0" at the optional parameter No. 40, bit 1.

24) In the manual mode, check turret indexing operations by pressing the TOOL INDEX key.

25) Measure the offset amount again as illustrated in Fig. 4-10.

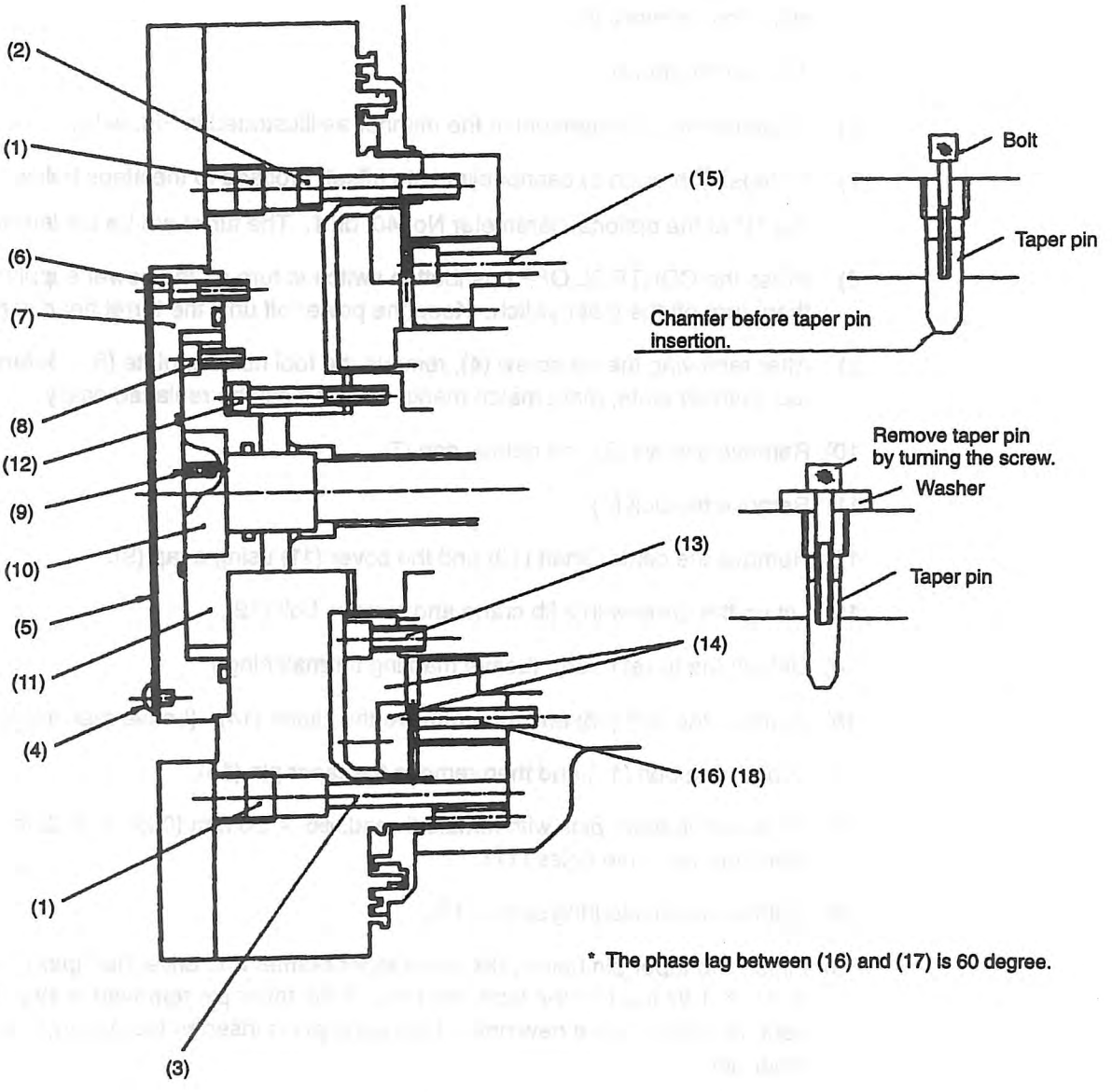


Fig. 4-14 Correcting Turret Offset

6-3. Trouble with X-axis Ball Screw

(1) Structure

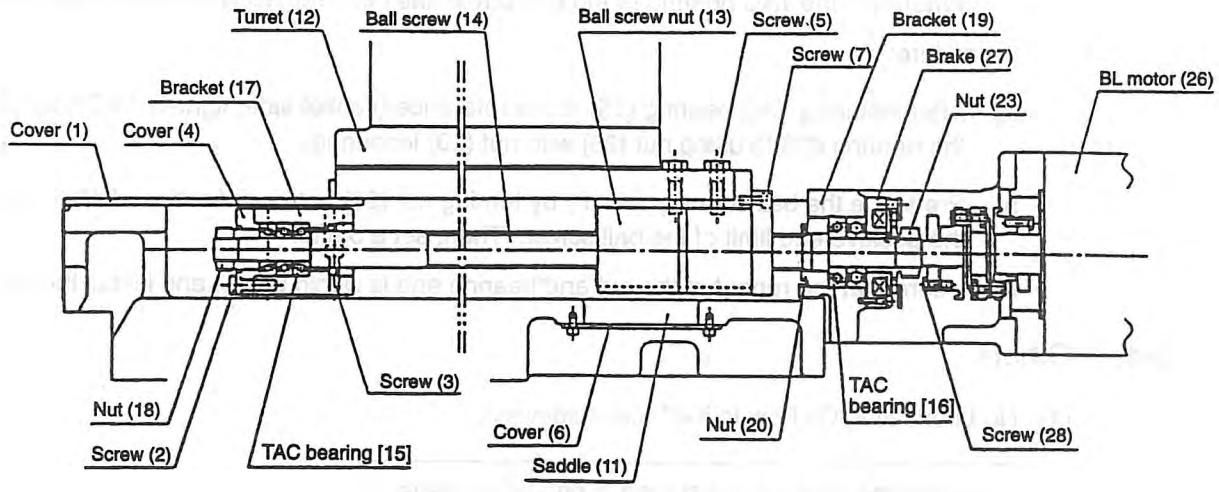


Fig. 4-14 Structure of Trouble with X-axis Ball Screw

(2) Maintenance

a) Replacemenball screw support of the BL motor

Loosen screw (28) and remove the BL motor. When installing the motor, the concentricity between the motor and the center of ball screw should be equal to or smaller than 0.015.

b) Replacement of TAC bearing

When replacing TAC bearing (15) at reference the bracket side:

1) Slide the turret to the dead end in the positive direction and remove cover (1).
2) Remove nut (18), screw (2) and cover (4).
3) Remove screw (3) and TP, and slide the bracket (17) to the right side.

When replacing TAC bearing (16) at the motor side:

1) Slide the turret to the dead end in the negative direction and remove nut (20).
2) Remove BL motor in the manner specified in a) above, and remove nut (23) and brake (27).
3) Push TAC bearing (16) from the side of nut (20).

c) Replacement of ball screw

1) Lift the turret using a crane or insert a support under the turret so that it will not drop.
2) Remove the BL motor and the TAC bearings in the manner specified in a) and b) above.
3) Remove cover (6), screw (7) and bracket (19) and remove the ball screw by raising it.

d) Procedure to adjust pretension

To protect the X-axis ball screw from thermal expansion caused by a temperature rise of approx. 3°C, the X-axis ball screw is pre-tensed by 415 kg (913 lb).

Whenever the TAC bearing or the ball screw has been replaced, perform pretension adjustment.

Procedure:

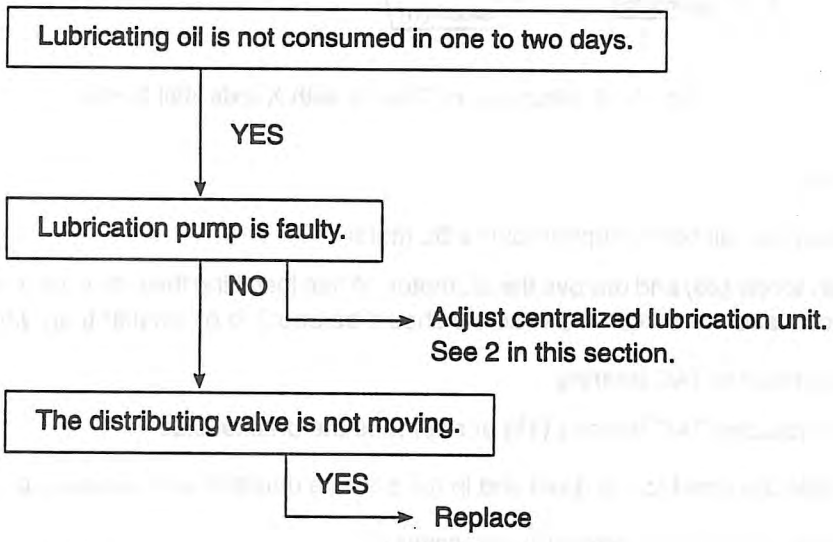
a) After installing TAC bearing (15) at the reference bracket side, tighten TAC bearing (16) and the bearing #6305 using nut (23) with nut (20) loosened.

b) Pre-tence the ball screw gradually by turning nut (20) until a deflection of 18.5 μ is obtained at the positive end limit of the ball screw. Then, set a baffle.

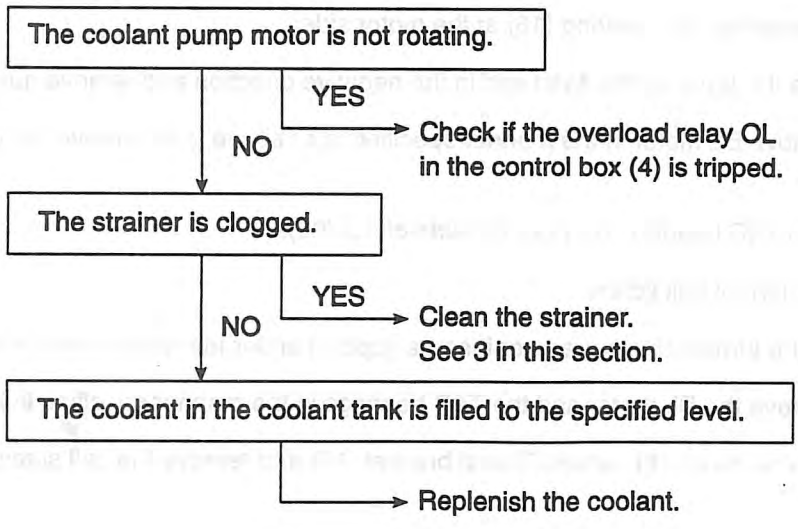
Make sure that the runout at the nut and bearing end is within 0.005, and install the BL motor.

6-4. Others

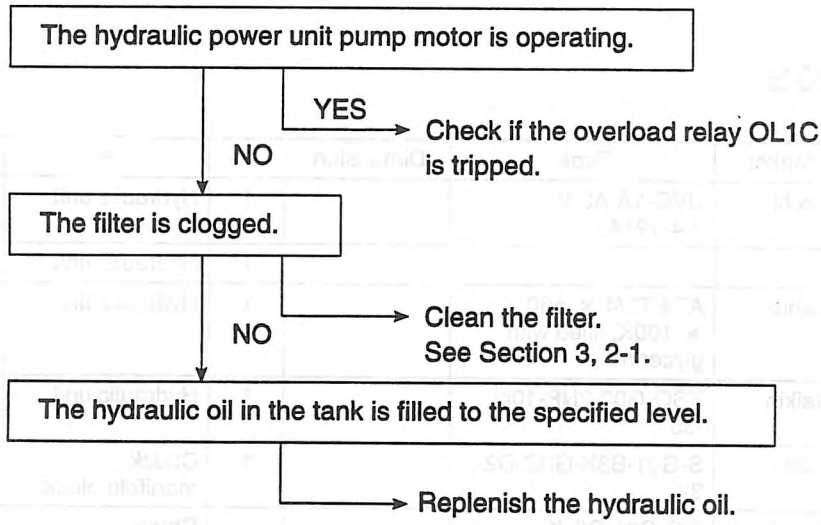
(1) No Lubricating Oil Fow to X-/Z-axis Slideways



(2) No Coolant Supply



(3) No Pressure Building-up of Hydraulic Power Unit



SECTION 5 SPARE PARTS LIST

1. HYDRAULICS

No.	Part Name	Maker	Type	Dimension	Q'ty	Use	Okuma Part No.
1	Pump	Nachi	UVC-1A-A3-2 2-4-1914J		1	Hydraulic unit	F0100-73-000-12
2	Return filter				1	Hydraulic unit	
3	Pressure gauge	Tomita	AT-PT1/4 × ϕ60 × 100K, filled with glycerine		1	Hydraulic unit	T019-400-003-22
4	Solenoid valve	Daikin	KSO-G02-2NP-10N -35		1	Hydraulic unit	F0000-431-000-29
5	Solenoid valve	Nachi	S-G01-B3X-GRZ-D2- 32		1	Chuck manifold block	F0000-431-000-19
6	P port reducing valve	Nachi	OG-G01-PC-K 5645C			Chuck manifold block	F0011-730-000-06
7	Pressure gauge	Asami	OPG-DT1/4–ϕ40 × 70K		1	Chuck manifold block	T019-400-003-45
8	Solenoid valve	Nachi	S-G01-B3X-GRZ-D2- 32		1	Tailstock manifold block	F0000-442-000-05
9	P port reducing valve	Nachi	OG-G01-PC-K-20 5645C		1	Tailstock manifold block	F0011-730-000-06
10	Pressure gauge	Asami	OPG-DF-U-PF1/4		1	Tailstock manifold block	T019-400-003-24
11	Dester block	Showa	DS8Z	0.08 × 3 0.05 × 2 0.03 × 2	1	Cross-side	H0019-0002-44
12	Dester block	Showa	DSB3C	0.2 × 2	1	Turret	H0019-0002-45
13	Dester block	Showa	DS8Z	0.08 × 7 0.05 × 1	1	Saddle	H0019-0002-44
14	Dester block	Showa	DS2Z	0.08 × 2	1	Saddle	H0019-0002-43
15	Dester block	Showa	DS5Z	0.05 × 2 0.03 × 2	1	Tailstock	H0019-0002-58
16	Dester block	Showa	DSA2	0.1 × 1	1	Tailstock	H0019-0001-46

2. ELECTRICALS (ON MACHINE)

No.	Part Name	Maker	Type	Dimension	Q'ty	Use	Okuma Part No.
1	Coolant pump	Hitachi	HP-025	250 W	1	Coolant	F0130-03-000-71-2
2	Lubrication pump	Showa	LCB4210B		1	Slideway lubrication	H0120-0005-11
3	Limit switch	Yamatake	1LSI-J		1	X-axis limit	E3012-891-001
4	Limit switch	Yamatake	1LSI-J		1	Z-axis limit	E3012-891-001
5	Limit switch	OMRON	D4E-P1A10		2	Door interlock	E3019-397-114
6	Electromagnetic brake	Miki	BXL-08-10-A-17		1	X-axis	E2131-835-010
7	Brushless servomotor	Okuma	BL-MH201E-12S	2.4 kW	1	X-axis	
8	Brushless servomotor	Okuma	BL-MH301E-12S	4.8 kW	1	Z-axis	
9	Brushless servomotor	Okuma	BL-MS140E-30T	4.3 kW	1	Turret	
10	Foot switch	Osaka Jido Denki	OFL-1-SM2C		1	Chuck operating pedal (at the bed front)	E2860-119-001
11	Foot switch	Osaka Jido Denki	OFLX-TWY-SM2C		1	Tailstock oprating pedal (at the bed front)	E2860-119-006
12	Proximity switch	OMRON	TL-T2E1		1	Turret	E3020-397-101
13	Proximity switch	OMRON	TL-T2E15 Different frequency type		1	Turret	E3020-397-182
14	Flourescent lamp	Matsushita	FUL18 × 1		1	Work lamp	E3532-801-016

3. CONSUMABLE ITEMS

No.	Part Name	Maker	Type	Dimension	Q'ty	Use	Okuma Part No.
1	Wiper	Bando	Wiper edge		1	Cross-slide (front)	H1023-0020-59-1
2	Wiper	Bando	Wiper edge		1	Cross-slide (left rear)	H1023-0020-60-1
3	Wiper	Bando	Wiper edge		1	Cross-slide (right rear)	H1023-0020-61-1
4	Wiper	Bando	Wiper edge		1	Saddle (left front)	H1023-0020-64-1
5	Wiper	Bando	Wiper edge		1	Saddle (right front)	H1023-0020-63-1
6	Wiper	Bando	Wiper edge		1	Saddle (left rear)	H1023-0020-66-1
7	Wiper	Bando	Wiper edge		1	Saddle (right rear)	H1023-0020-65-1
8	Wiper	Bando	Wiper edge		1	Tailstock (left front)	H1023-0020-56-1
9	Wiper	Bando	Wiper edge		1	Tailstock (right front)	H1023-0020-54-1
10	Wiper	Bando	Wiper edge		1	Tailstock (left rear)	H1023-0020-55-1
11	Wiper	Bando	Wiper edge		1	Tailstock (right rear)	H1023-0020-53-1
12	Wiper	Okuma			1	Turret rear cover (upper)	H1020-1155-21
13	Wiper	Nitta			1	Turret rear cover (left)	H1023-0020-78
14	Wiper	Nitta			1	Turret rear cover (right)	H1023-0020-79
15	Wiper	Nitta			1	Diaphragm cover (upper)	H1023-0020-86
16	Wiper	Nitta			1	Saddle cover (left)	H1023-0020-85
17	Wiper	Nitta			1	Saddle cover (lower right)	H1023-0020-83
18	Wiper	Nitta			1	Saddle cover (right)	H1023-0020-84
19	Wiper	Bando	Wiper edge		1	Tailstock cover (upper)	H1023-0020-57
20	Z ring	NOK	AZ2347I0		1	Z-axis ball screw	F119-0001-98
21	Oil seal	NOK	SB32458		1	X-axis ball screw	F1100-032-04508
22	Oil seal	NTN	G38 × 48 × 4		1	X-axis ball screw	F1113-038-04804
23	X ring	Nippon Valqua	R-40		1	Turret	H0031-0005-01
24	X ring	Nippon Valqua	R-35		1	Turret	H0031-0002-93
25	Packing	Sakagami	SKY-170		2	Turret	H0031-0007-76
26	O ring	NOK	G155		1	Turret	C6110-00G155
27	O ring	NOK	G220		1	Turret piston	C6110-00220
28	O ring	NOK	P205		1	Turret piston	C6110-00P205
29	Packing	NOK	USHCU0694K0		1	Tailstock	H0031-0007-59

No.	Part Name	Maker	Type	Dimension	Q'ty	Use	Okuma Part No.
30	Dust seal	NOK	DKIFD4046A0		1	Tailstock	H0031-0002-45
31	Cap seal	Dainihon densen	CAP-1BE-80		1	Tailstock	H0031-0004-14

Standard Spindle Specification:

No.	Part Name	Maker	Type	Dimension	Q'ty	Use	Okuma Part No.
1	Belt	Bando	3V-560	4 pcs. Matched	1	Spindle drive	M119-0015-76

SECTION 6 TECHNICAL DATA

1. TOOLING SYSTEM

MT No. 1-H40
MT No. 2-H40
MT No. 3-H40
MT No. 4-H40

ϕ10-H40
ϕ12-H40
ϕ16-H40
ϕ20-H40
ϕ25-H40
ϕ32-H40

ϕ16-H40U
ϕ20-H40U
ϕ25-H40U
ϕ32-H40U

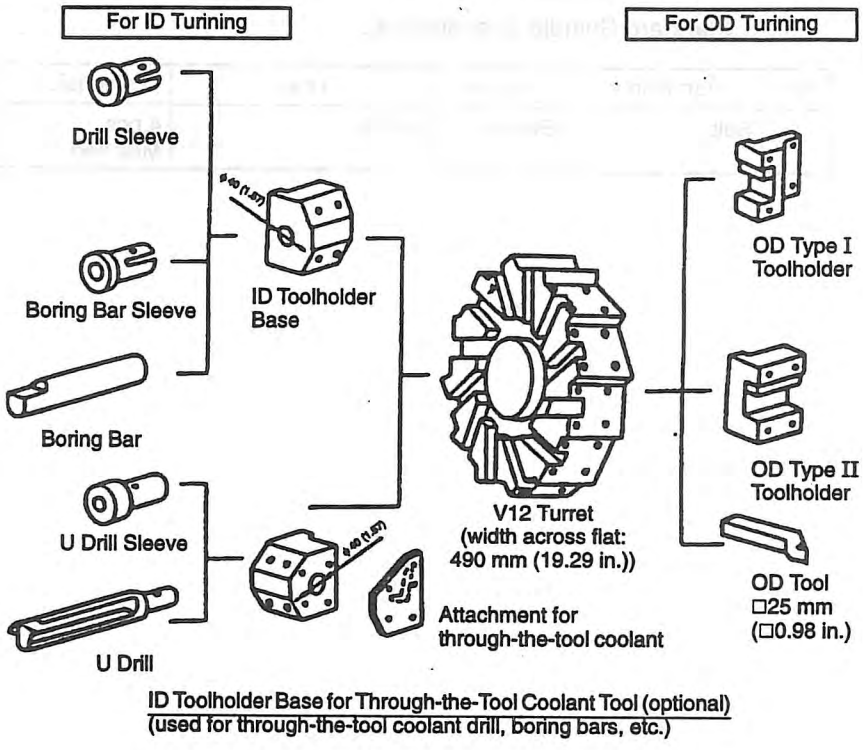


Fig. 6-1 Tooling System

2. TOOLHOLDER DIMENSIONS

(1) OD Type I Toolholder

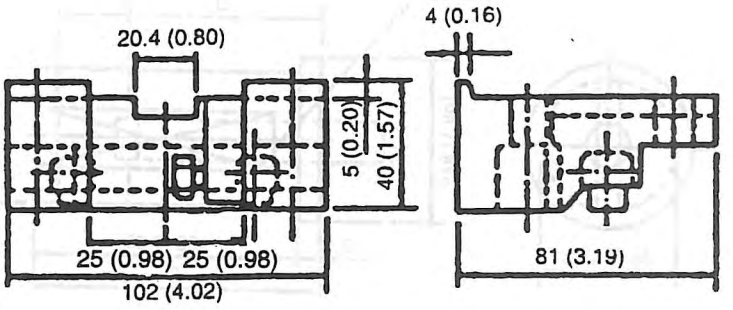


Fig. 6-2 Toolholder Dimensions (OD Type I Toolholder)

(2) OD Type II Toolholder

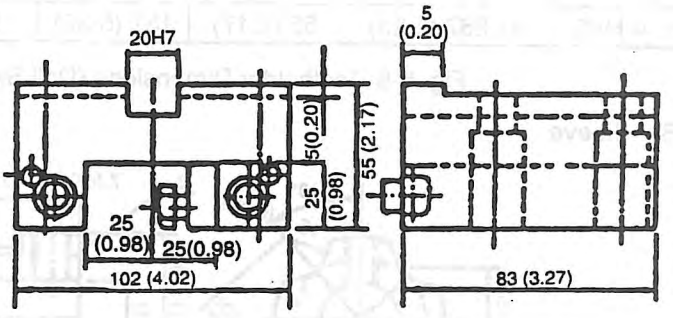


Fig. 6-3 Toolholder Dimensions (OD Type II Toolholder)

(3) ID Toolholder Base

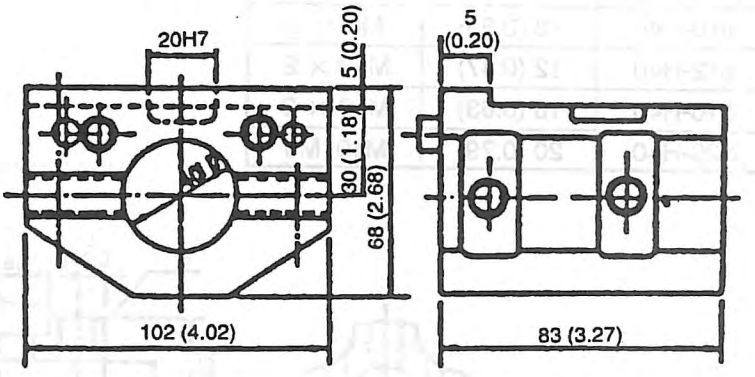
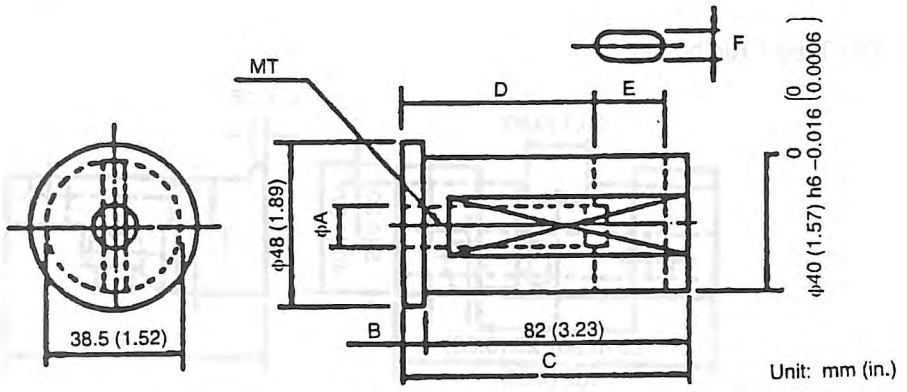


Fig. 6-4 Toolholder Dimensions (ID Toolholder Base)

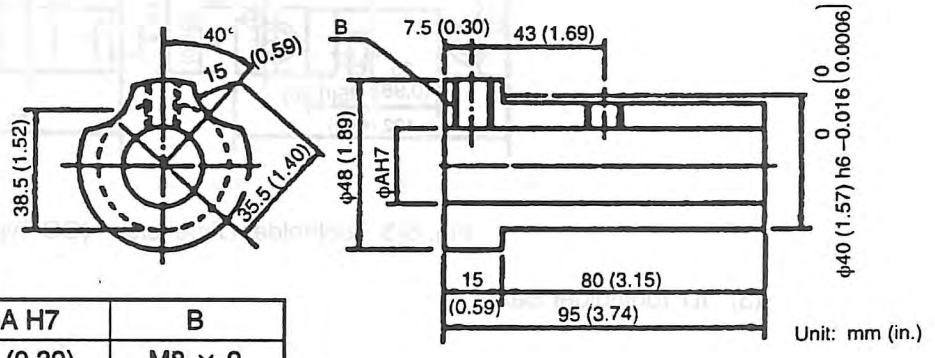
(4) Drill Sleeve



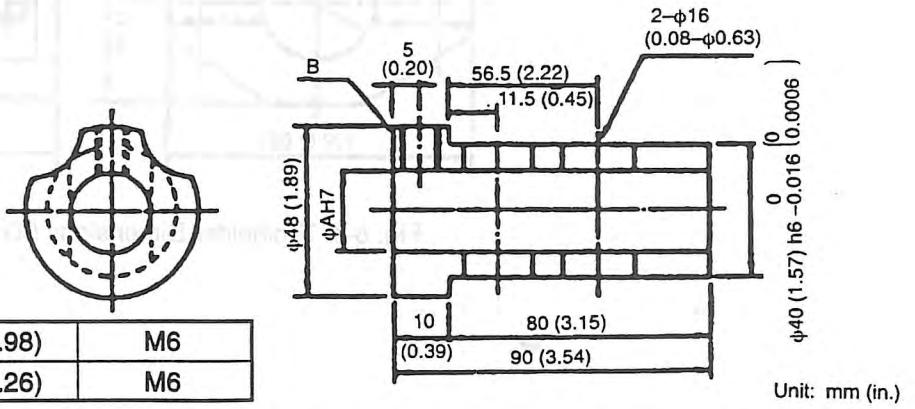
	φA	B	C	D	E	F
MT No. 1-H40	12.065 (0.475)	5 (0.20)	87 (3.42)	52 (2.05)	19 (0.75)	5.4 (0.21)
MT No. 2-H40	17.780 (0.70)	10 (0.39)	92 (3.62)	63 (2.48)	22 (0.87)	6.6 (0.26)
MT No. 3-H40	23.825 (0.94)	30 (1.18)	112 (4.41)	78 (3.08)	27 (1.06)	8.2 (0.32)
MT No. 4-H40	31.267 (1.23)	55 (2.17)	137 (5.39)	98 (3.86)	32 (1.26)	12.2 (0.48)

Fig. 6-5 Toolholder Dimensions (Drill Sleeve)

(5) Boring Bar Sleeve



	φA H7	B
φ10-H40	10 (0.39)	M8 × 2
φ12-H40	12 (0.47)	M10 × 2
φ16-H40	16 (0.63)	M10 × 2
φ20-H40	20 (0.79)	M10, M8



φ25-H40	25 (0.98)	M6
φ32-H40	32 (1.26)	M6

Fig. 6-6 Toolholder Dimensions (Boring Bar Sleeve)

3. TOOL INTERFERENCE DIAGRAM

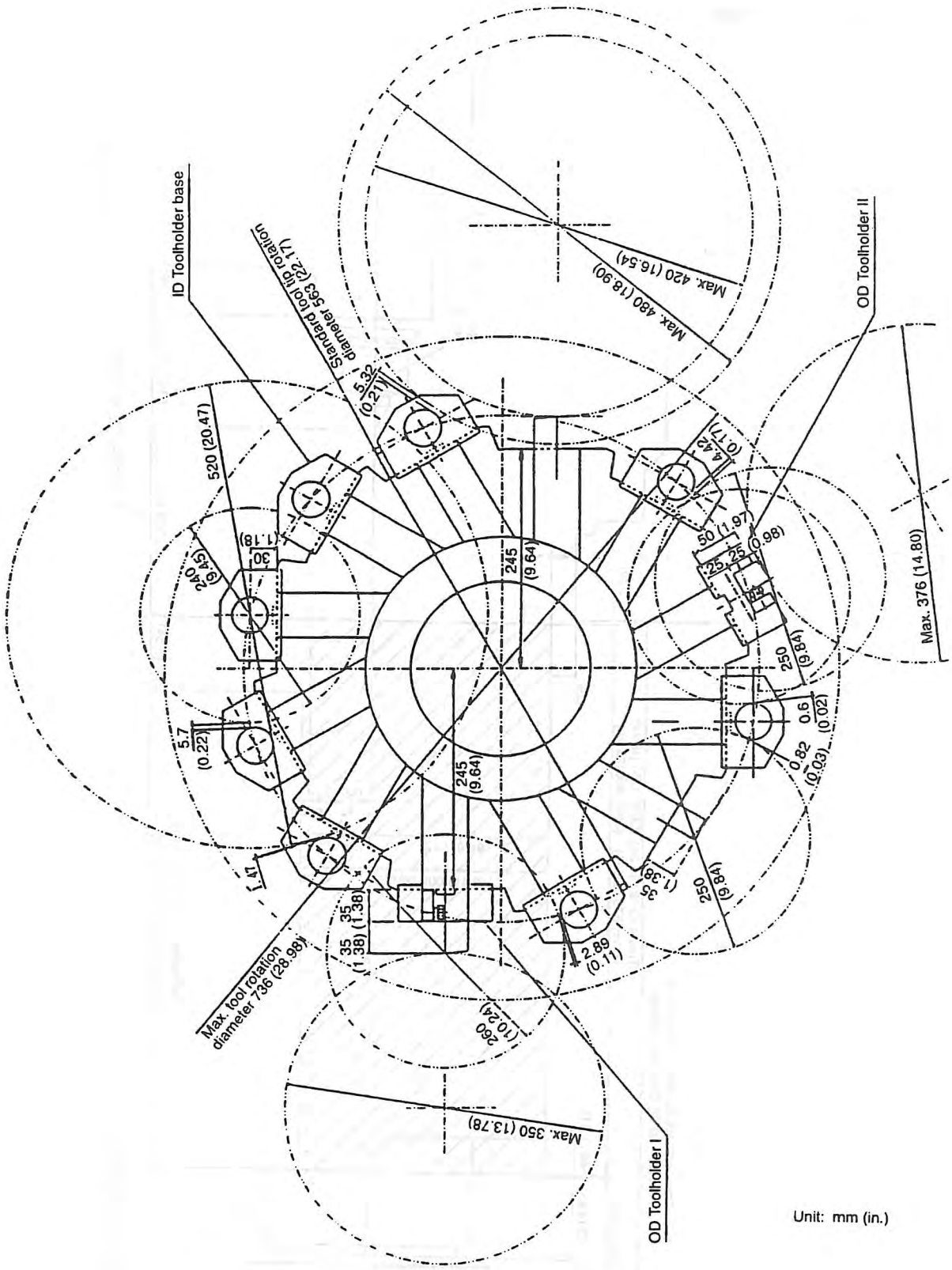


Fig. 6-7 Tool Interference Diagram

4. WORKING RANGE DIAGRAM

(1) ID Toolholder

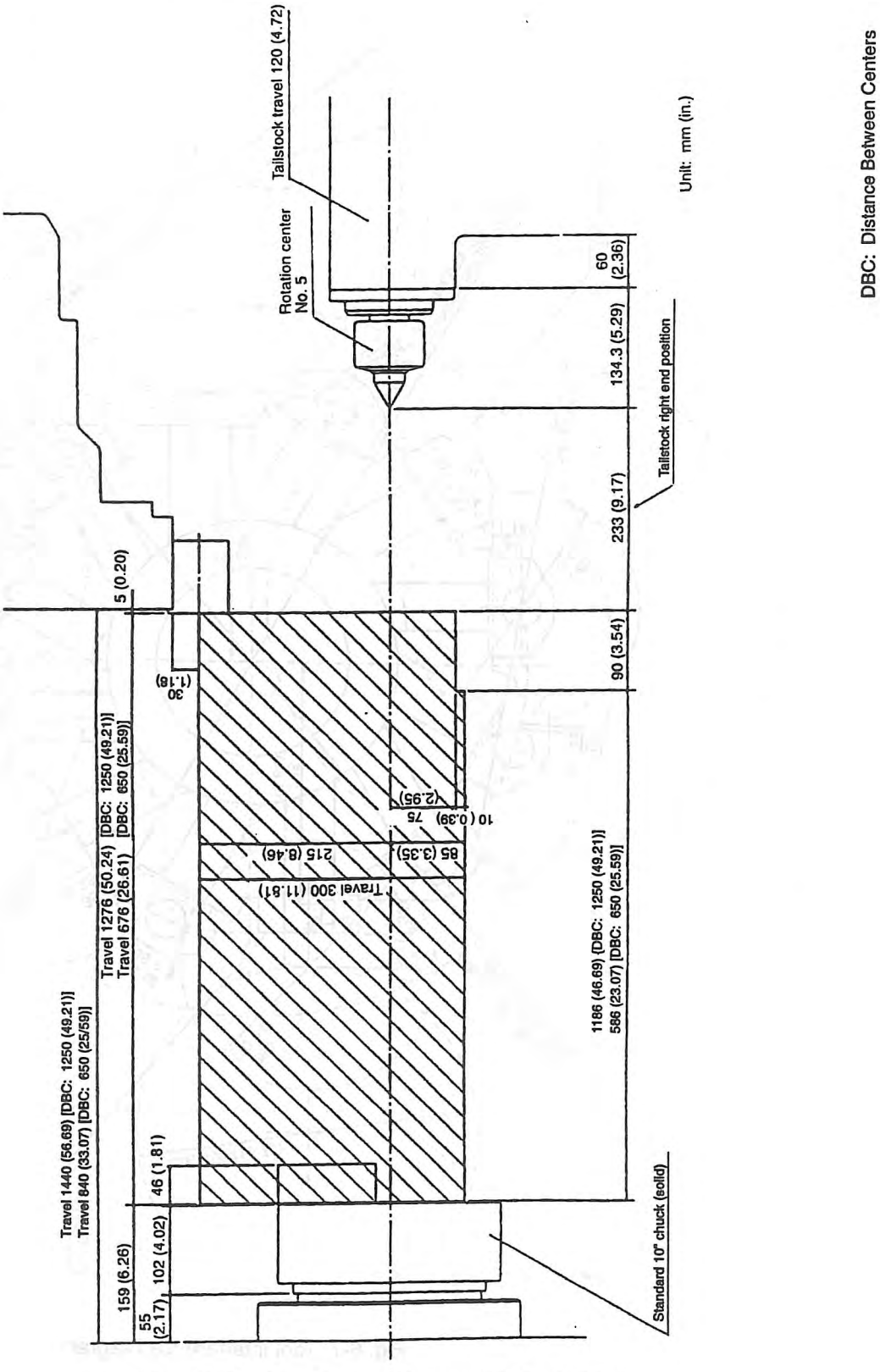


Fig. 6-8 Working Range Diagram (ID Toolholder)

(2) OD Type I Toolholder

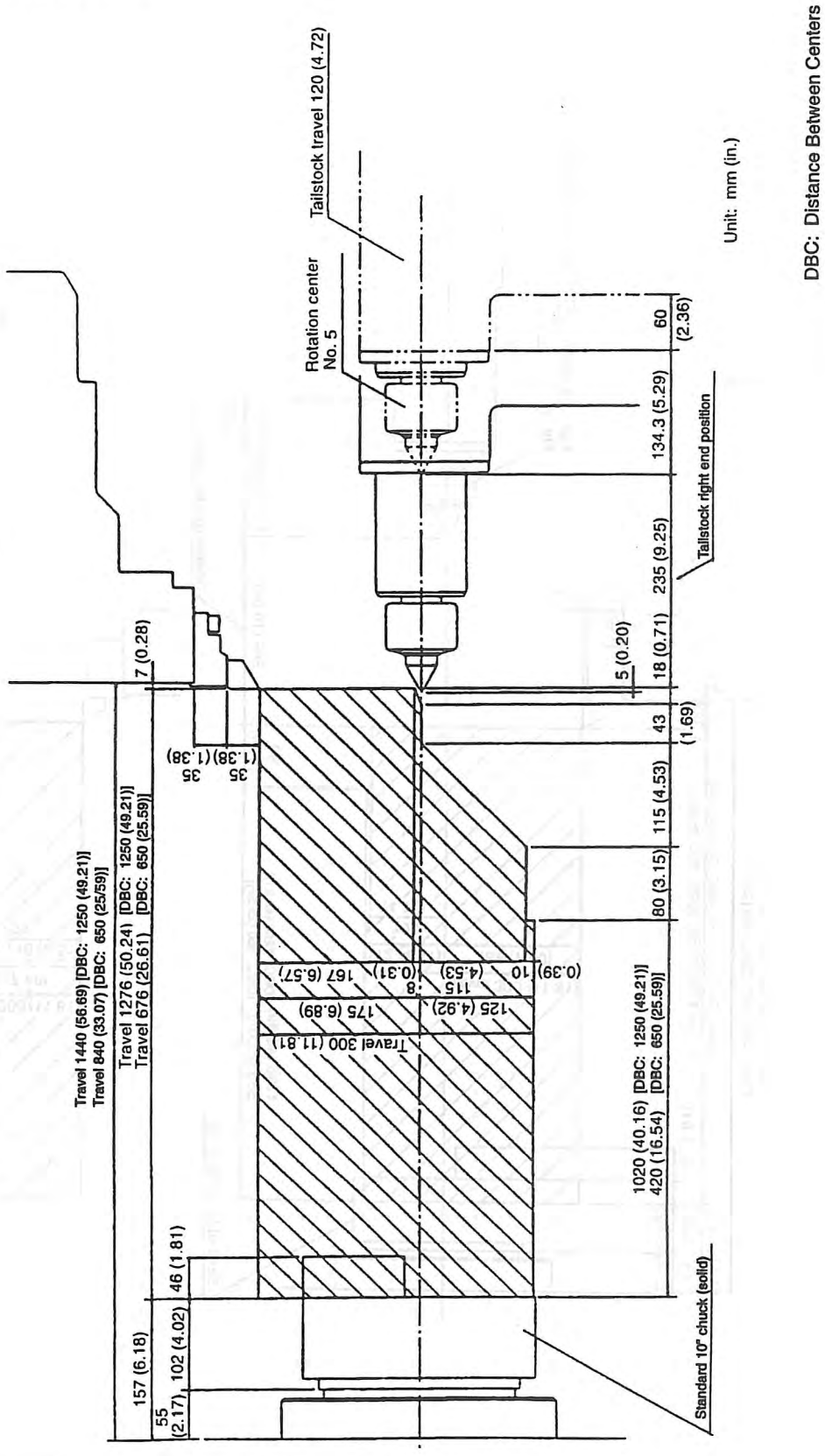


Fig. 6-9 Working Range Diagram (OD Type I Toolholder)

(3) OD Type II Toolholder

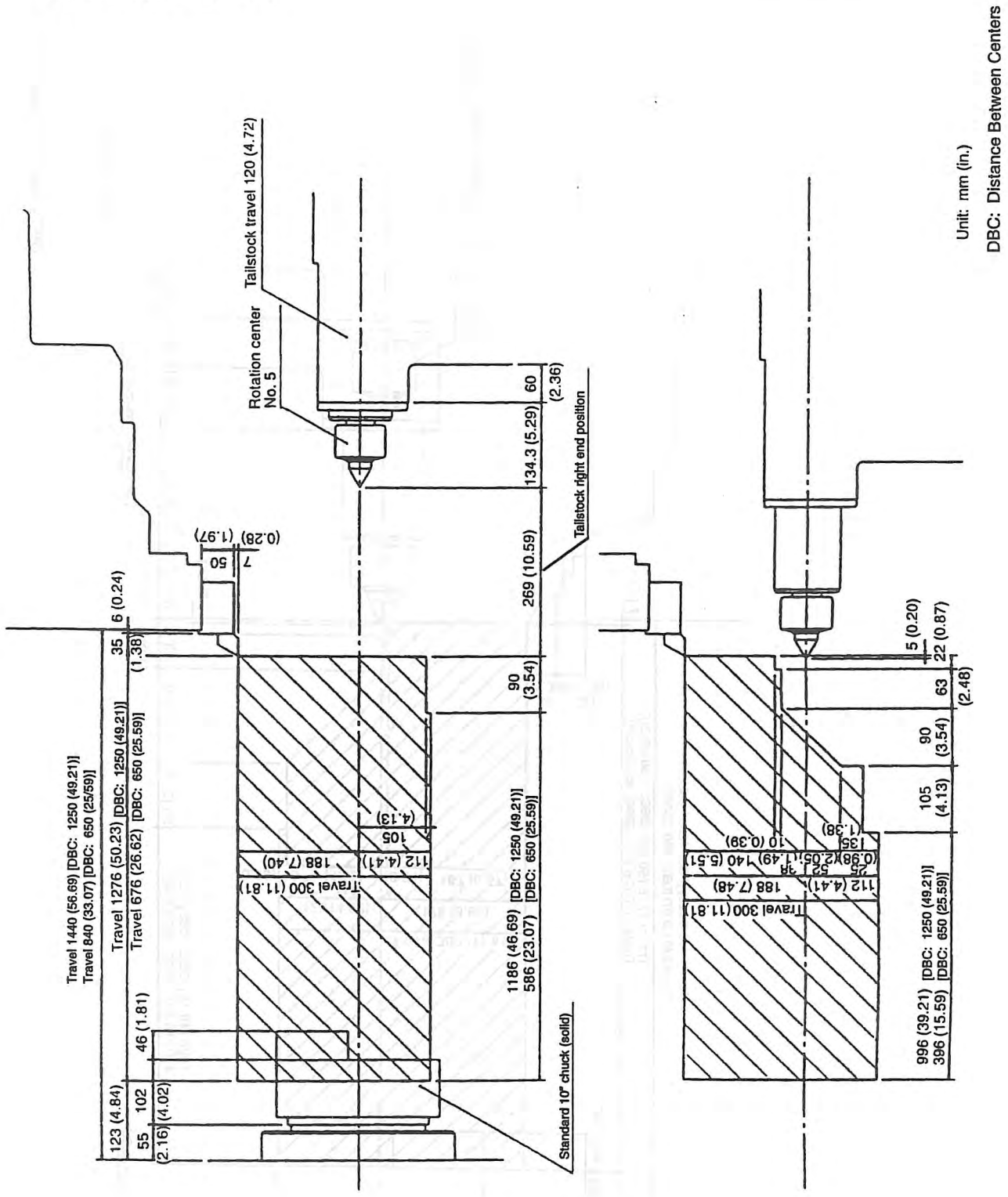


Fig. 6-10 Working Range Diagram (OD Type II Toolholder)

5. DIMENSION OF SPINDLE NOSE (JIS-A2-8)

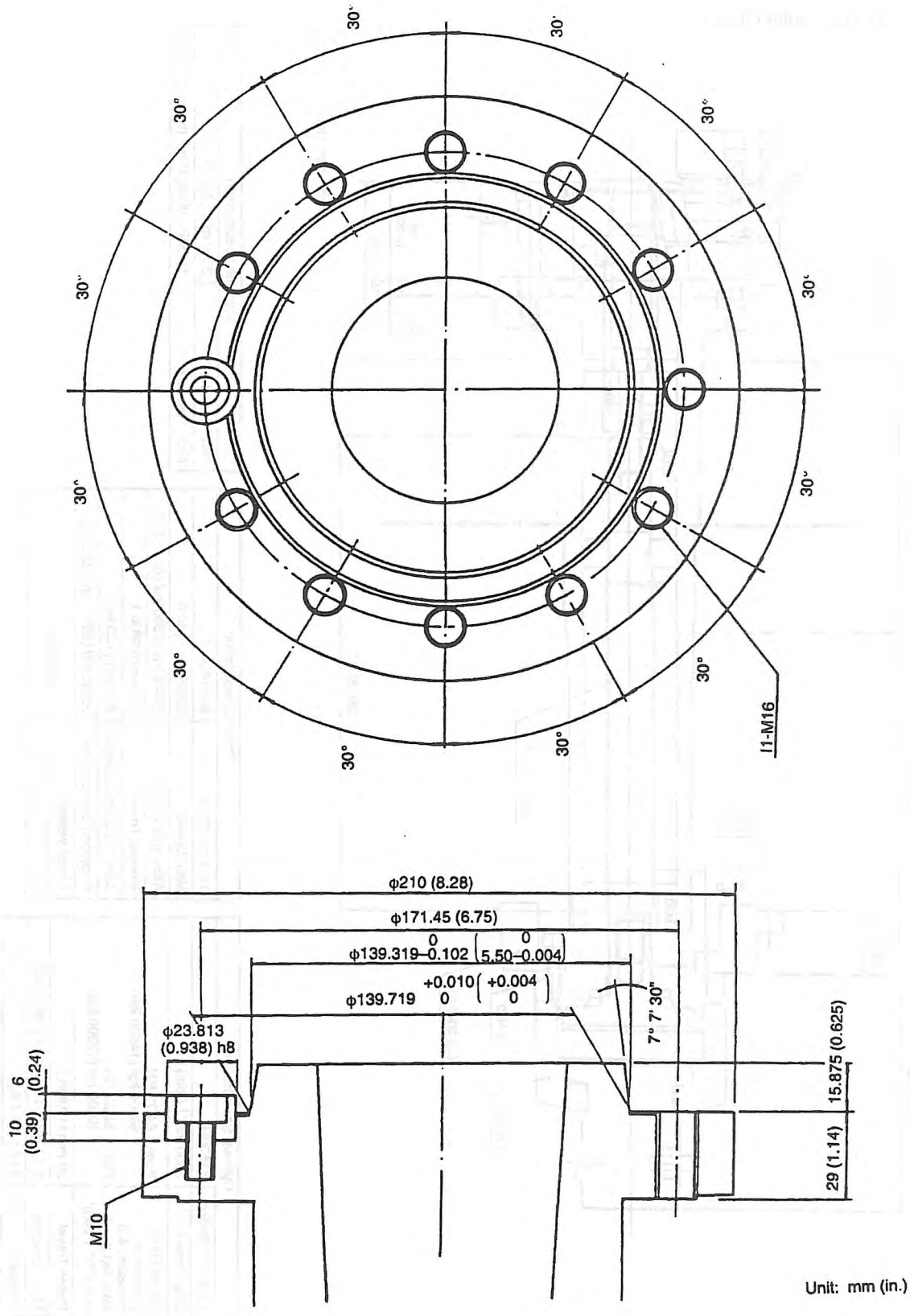
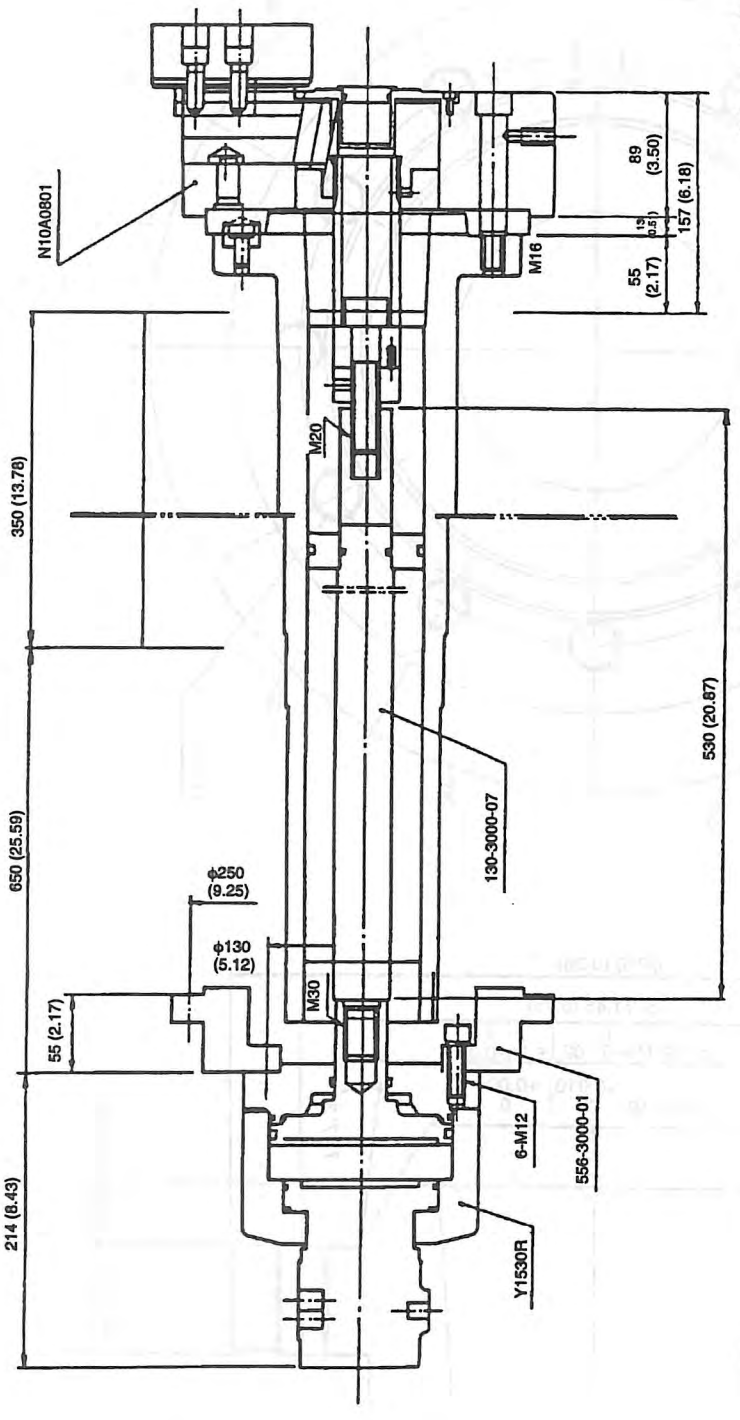


Fig. 6-11 Dimension of Spindle Nose (JIS-A2-11)

6. HYDRAULIC CHUCK AND CYLINDER

(1) For Solid Chuck



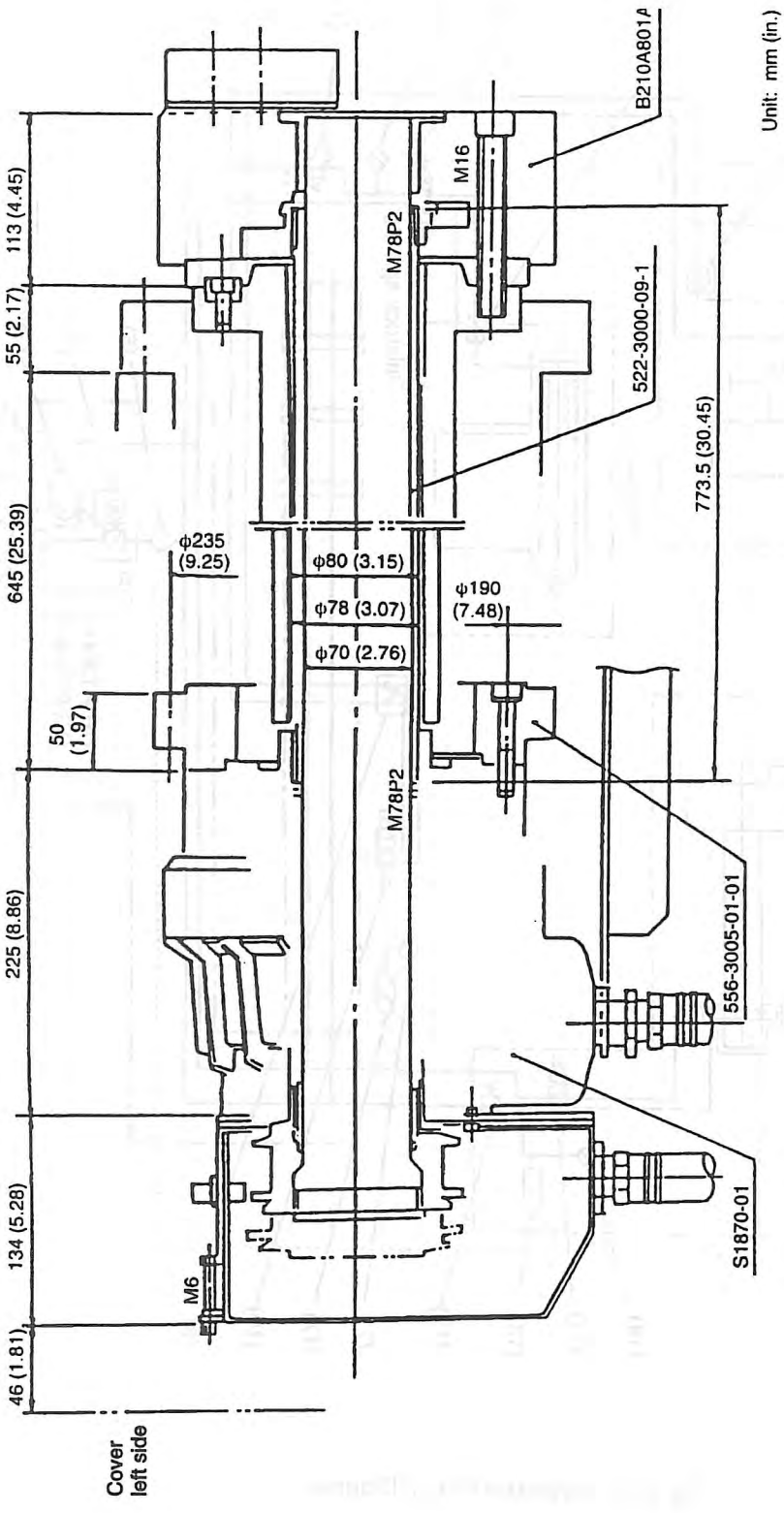
Machine Specification	
Max. Speed	3500 min^{-1} {rpm}
Max. Pressure	4.4 MPa {45 kgf/cm^2 (64 psi)}

Chuck Specification	
Type of Chuck	N-10A0801
Max. Speed	3500 min^{-1} {rpm}
Allowable Thrust	28.44 KN {2900 kgf (6380 lbf)}
Plunger Travel	25 mm (0.98 in.)
Jaw Travel (in diameter)	8.8 mm (0.35 in.)
Gripping Force per Jaw	35.30 KN {3600 kgf (7920 lgf)}
Chuck weight (with standard soft jaw)	40 kg (88 lb)

Cylinder Specification	
Type of Cylinder	Y1530R
Max. Speed	5500 min^{-1} {rpm}
Piston Thrust (Hyudraulic pressure: 4.0 MPa {40.8 kgf/cm^2 (580.2 psi)})	Push: 64.72 KN {6600 kgf (14520 lbf)} Pull : 59.20 KN {6000 kgf (13200 lbf)}
Piston Travel	30 mm (1.18 in.)
Max. Pressure	3.92 MPa {40kgf/cm^2 (568.8 psi)}
Weight	13.5g (29.7 lb)

Fig. 6-12 Hydraulic Chuck and Cylinder (Solid Chuck)

(2) For Hollow Chuck



Machine Specification	
Max. Speed	3500 min^{-1} {rpm}
Max. Pressure	4.4 MPa {45 kgf/cm^2 (64 psi)}

Chuck Specification	
Type of Chuck	B210A801A
Max. Speed	3500 min^{-1} {rpm}
Allowable Thrust	37.3 KN {3800 kgf (8360 lbf)}
Plunger Travel	19 mm (0.75 in.)
Jaw Travel (in diameter)	8.8 mm (0.35 in.)
Gripping Force per Jaw	32.3 KN {3300 kgf (7260 lgf)}
Chuck weight (with standard soft jaw)	38.5 kg (84.7 lb)

Cylinder Specification	
Type of Cylinder	S1870-01
Max. Speed	4700 min^{-1} {rpm}
Piston Thrust (Hyudraulic pressure: 4.0 MPa {40.8 kgf/cm^2 (580.2 psi)})	Push: 70.6 KN {7200 kgf (15840 lbf)} Pull : 65.70 KN {6700 kgf (14740 lbf)}
Piston Travel	25 mm (0.98 in.)
Max. Pressure	3.92 MPa {40kgf/cm^2 (568.8 psi)}
Weight	28 kg (61.6 lb)

Fig. 6-13 Hydraulic Chuck and Cylinder (Hollow Chuck)

7. HYDRAULIC CIRCUIT DIAGRAM

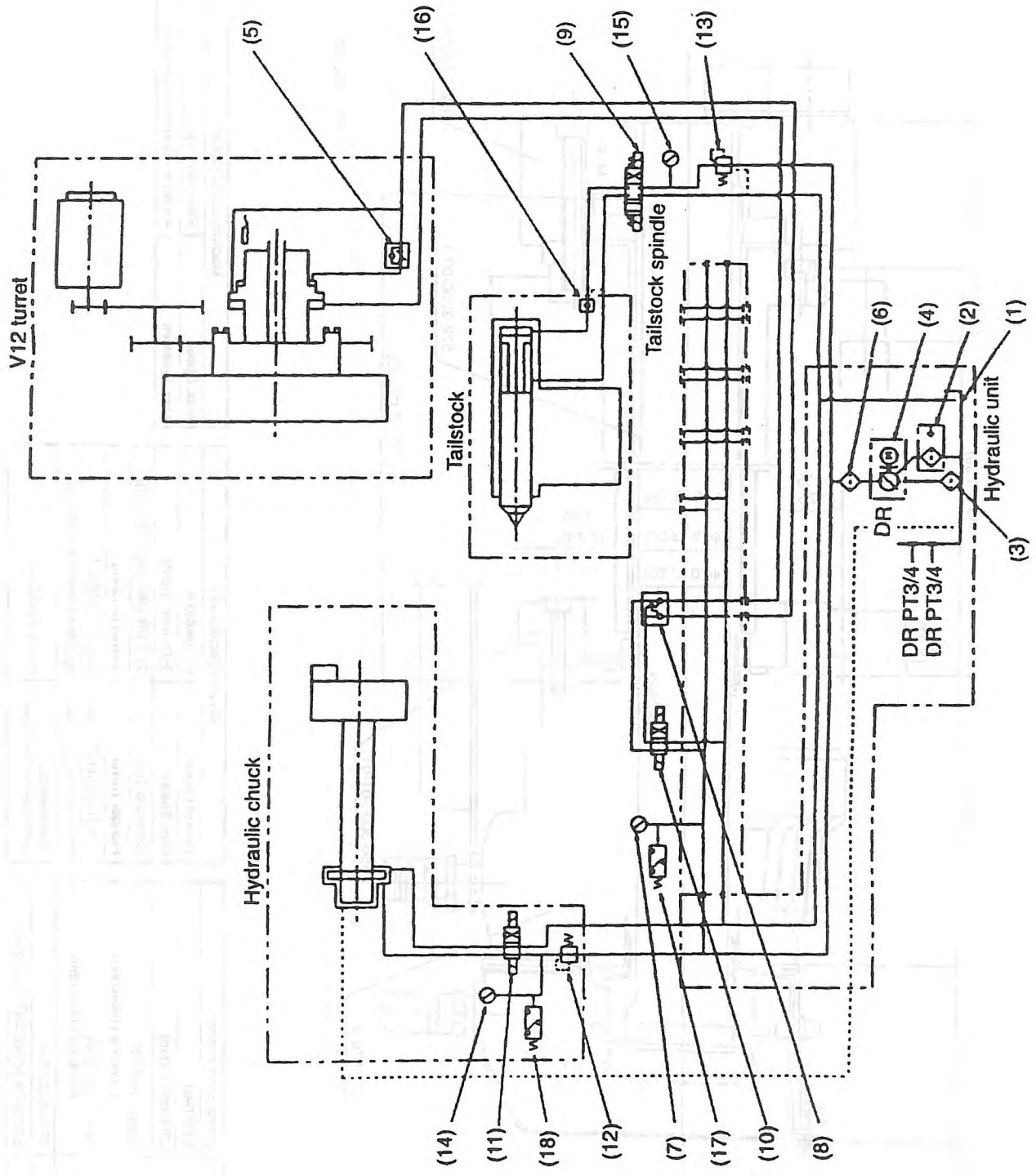


Fig. 6-14 Hydraulic Circuit Diagram

No.	Part Name	Use	Maker	Type
1	Oil tank		Showa	
2	Radiator		Nakamura	1013-201-138
3	Suction filter		Sega	SH-06 150 mesh
4	Uni-pump		Nachi	UVC-1A-A3-2.2-4-1914J
5	Throttle valve	Clamp speed adjustment	Okuma	
6	Line filter		SMC	FH-440-04-000-P010
7	Pressure gauge	For system pressure confirmation	Tomita	Filled with glycerine AT1/4 × ϕ60 × 100K
8	AB port pilot check valve	For preventing oil leak	Daikin	MP-02W-20-50
9	Solenoid valve	Tailstock spindle IN/OUT	Nachi	S-G01-C5-GRZ-D2-30
10	Solenoid valve	Turret clamp/unclamp change	Daikin	KS0-G02-2NP-10N-35
11	Solenoid valve	Chuck open/close	Nachi	S-G01-B3X-GRZ-D2-30
12	P port reducing valve	Chuck clamping force adjustment	Nachi	OG-G01-PC-K-20 5645C3-45 kg/cm^2
13	P port reducing valve	Tailstock thrust adjustment	Nachi	OG-G01-PC-K-20 5645C3-45 kg/cm^2
14	Pressure gauge	Chuck pressure	Asami	OPG-DF-U-PF1/4 60 × 70 kg/cm^2 (853.2 × 995.4 psi)
15	Pressure gauge	Tailstock pressure	Asami	OPG-DF-U-PF1/4 60 × 70 kg/cm^2 (853.2 × 995.4 psi)
16	Check valve	For preventing tailstock spindle from retracting	Nachi	OCP-G01-A1-20
17	Pressure switch	Chuck pressure inspection (option)	Nagano Keiki	CP-20-223 Pressure range: 14 to 70 kgf/cm^2
18	Pressure switch	Chuck pressure inspection (option)	Nagano Keiki	CQ20-731-0-70K

8. MANUAL HYDRAULIC TAILSTOCK (1SC)

Standard

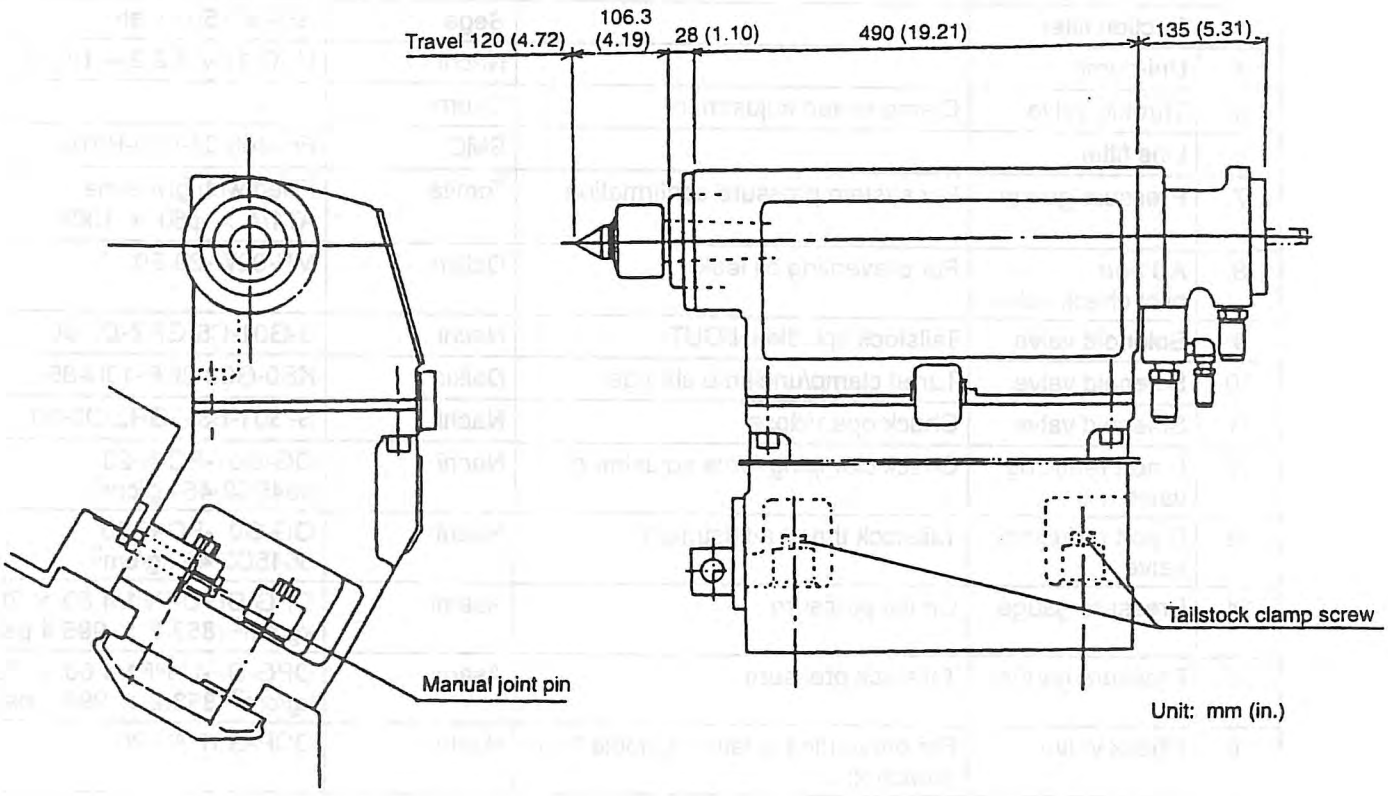


Fig. 6-15 Manual Hydraulic Tailstock (Standard)

Item	Dimensions	Remarks
Center	MT No. 5	Revoliving center
Oil pressure stroke	120 mm (4.72 in.)	
Sleeve dia.	ϕ100 mm (3.94 in.)	
Thrust	Max. 6.86 KN {700 kgf (1540 lbf)}	Adjustable
Oil pressure	Max. 2.26 MPa {23 kgf/cm^2 (327.06 psi)}	Adjustable
Cylinder area Push: Pull:	31.4 cm^2 (4.84 in^2) 17.4 cm^2 (2.70 in^2)	

Built-in

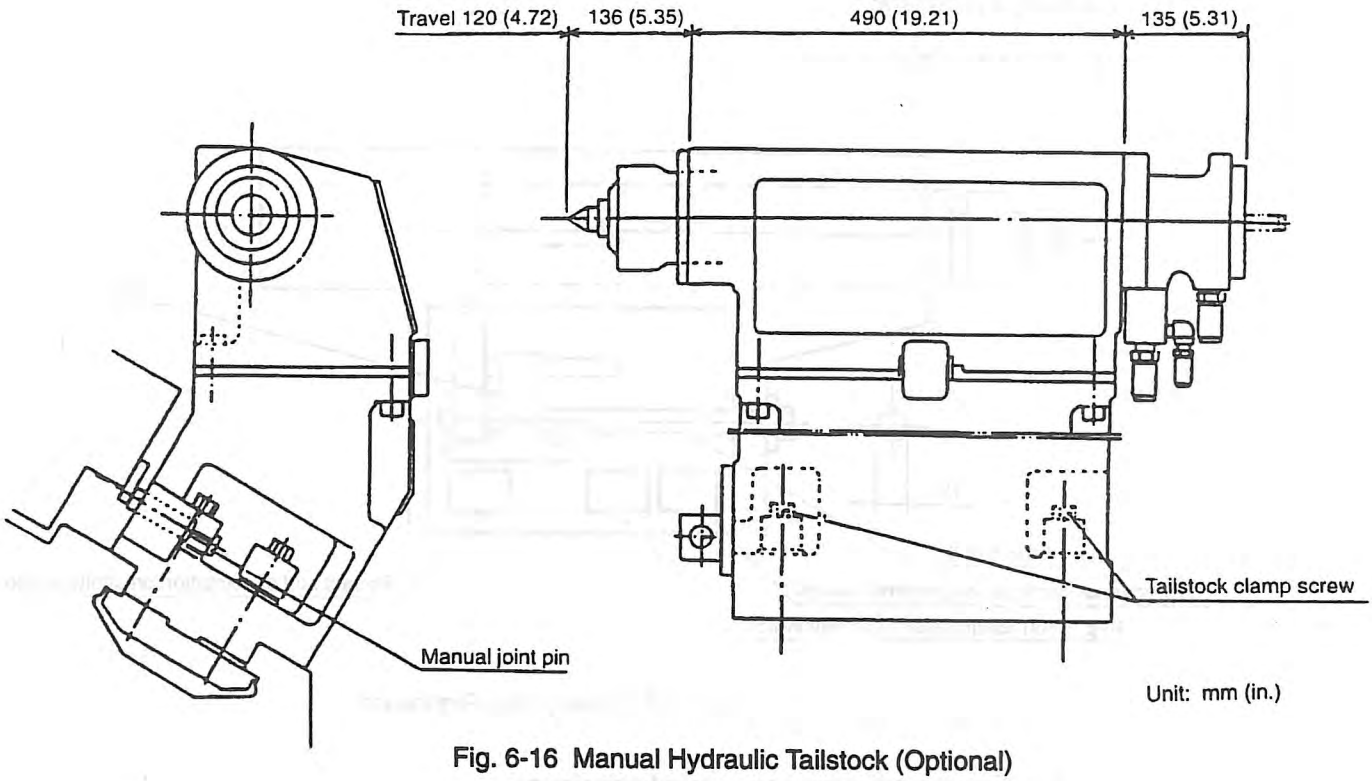


Fig. 6-16 Manual Hydraulic Tailstock (Optional)

Item	Dimensions	Remarks
Center	MT No. 5	Revlving center
Oil pressure stroke	120 mm (4.72 in.)	
Sleeve dia.	ϕ100 mm (3.94 in.)	
Thrust	Max. 6.86 KN {700 kgf (1540 lbf)}	Adjustable
Oil pressure	Max. 2.26 MPa {23 kgf/cm^2 (327.06 psi)}	Adjustable
Cylinder area Push: Pull:	31.4 cm^2 (4.84 in^2) 17.4 cm^2 (2.70 in^2)	

(1) Tailstock Spindle Advance/Retraction Position Confirmation Device (Optional)

Adjusting Procedure:

a) Move the dog rightward.

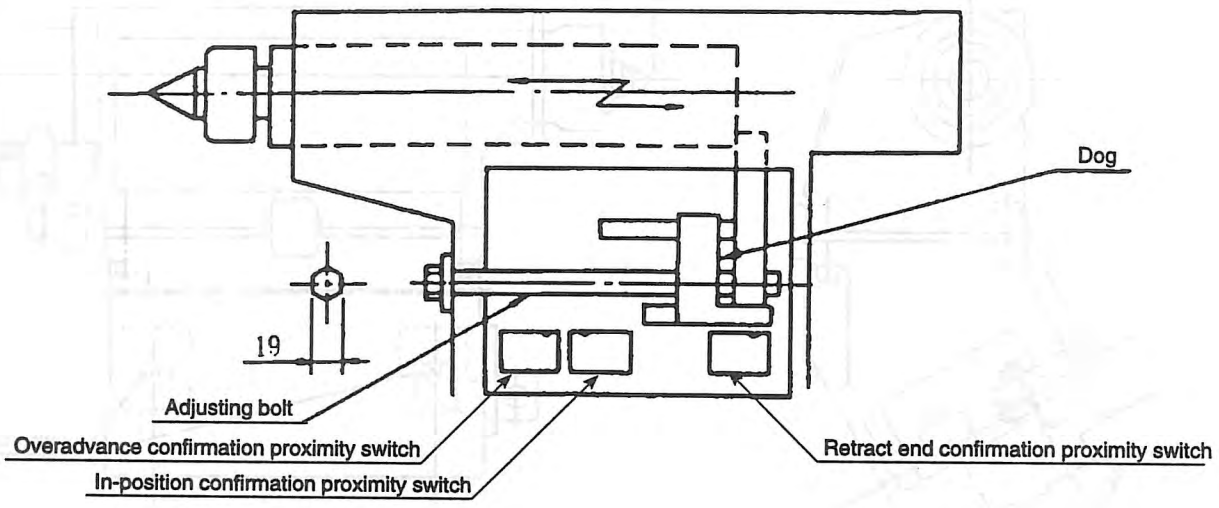


Fig. 6-17 Moving Dog Rightward

1) Turn the adjusting screw counterclockwise.

2) The dog then moves rightward.

b) Advance the tailstock spindle as desired and reposition the tailstock body so that the workpiece is hold by the tailstock spindle. Step the tailstock spindle advance pedal to the 2nd position. Under such setup turn the adjusting screw until both the overadvance detection proximity switch and the in-position detection proximity switch are actuated.

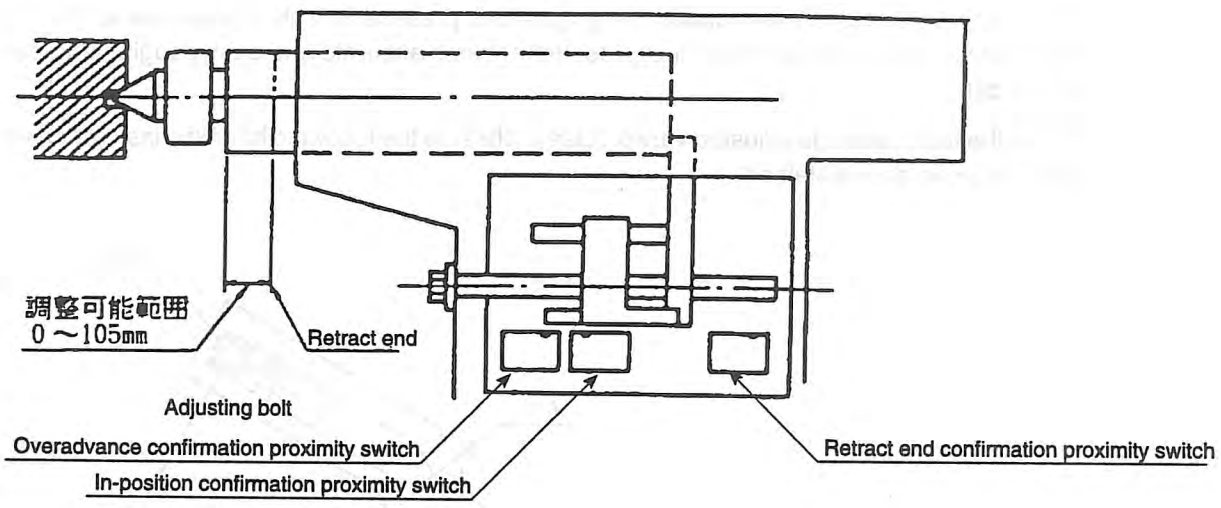


Fig. 6-18 Adjusting Dog Position

1) Turn the adjusting screw clockwise with the workpiece pressed by the tailstock spindle.

2) The dog moves leftward. First locate the dog at the position where both of the overadvance and the in-position signals are output from the corresponding proximity switches. Further turn the adjusting screw two turns from that point.

3) The signal output status can be checked on the CRT display as detailed in d) below.

Note: The in-position signal can be output within the tailstock spindle extending range of 0 to 150 mm (0 to 5.91 in.).

c) In case workpiece length varies, adjust the dog position by turning the knob: counterclockwise for longer workpiece and clockwise for shorter workpiece.

d) Checking correct position

Correct position ..... Both of the overadvance and in-position proximity switches have been actuated.

1) After selecting any of AUTO, MDI and MANUAL modes, press the function key [F7] (CHECK).

2) Press the function key [F5] (PAGE) several times, and the CRT displays EC INPUT 01 page.

3) See explanation of EC INPUT 01 data page signal coding provided on the following page.

Bit 4 and bit 3 of No. 6 indicates the operation status of the relating proximity switches tailstock spindle in-position confirmation and tailstock spindle overadvance confirmation, respectively.

1 indicates ON and 0 indicates OFF.

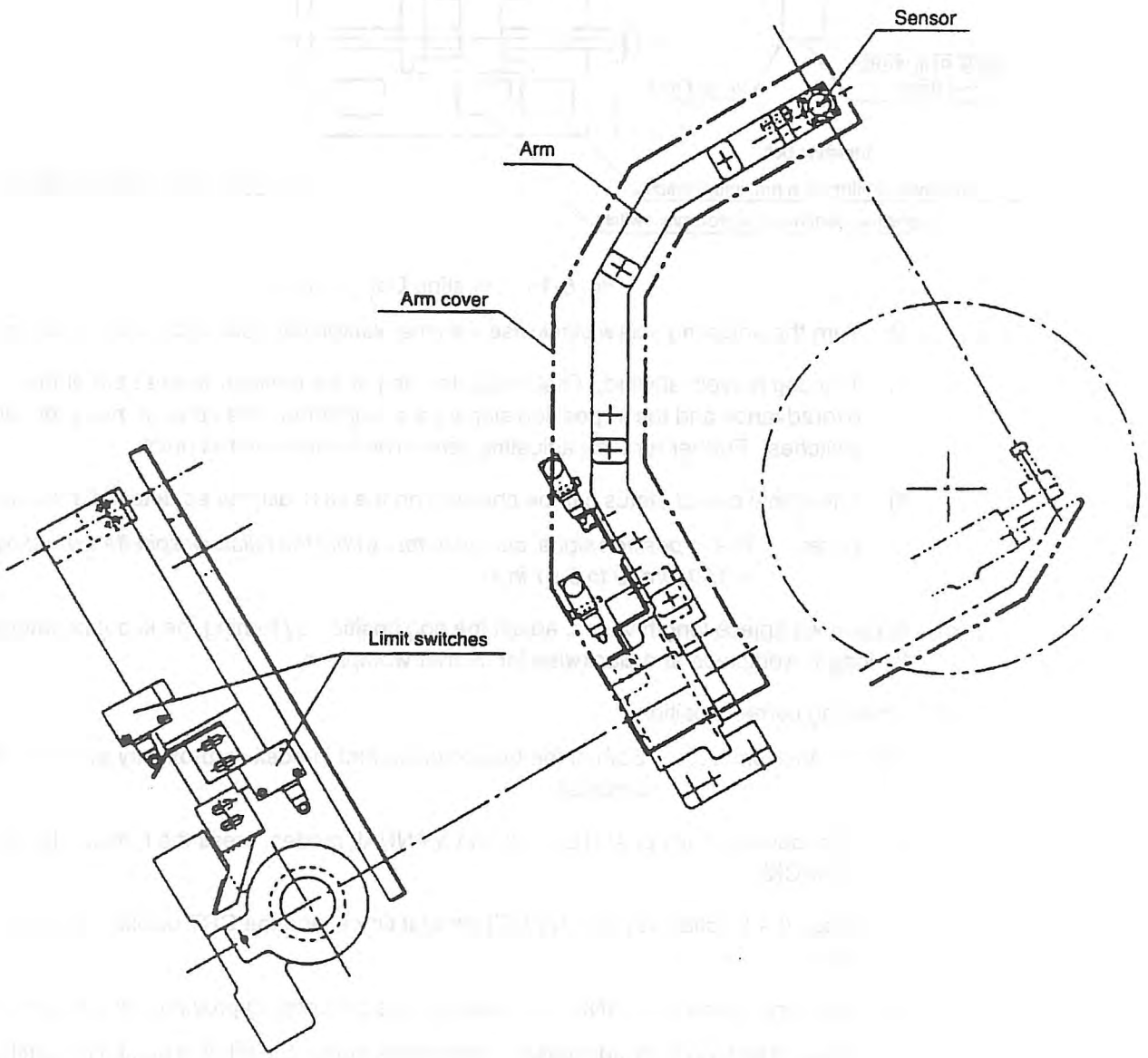
4) When both bit 4 and bit 3 are 1.1, it indicates that both of the in-position and the overadvance confirmation proximity switches are actuated and the tailstock spindle is located in position.

SECTION 7 TOUCH SETTER M (OPTIONAL)

1. OVERVIEW OF TOUCH SETTER

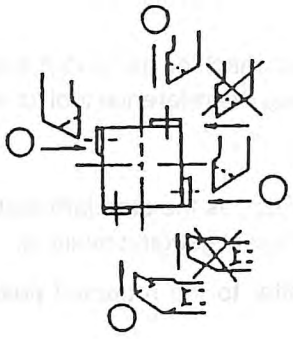
The touch setter M is the manual swing type tool presetter which is mounted at the front side of the headstock. This semi-automatic tool presetter ensures accurate and easy gauging and setting of the tool offset data.

Since the touch setter is adjusted very precisely, observe the following handling instructions so that gauging accuracy can be maintained.



2. CAUTIONS ON HANDLING THE TOUCH SETTER

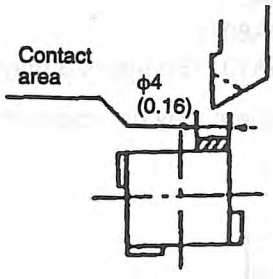
(1) Gauging Direction



a) The sensors allow gauging in four directions. Each of the sensors operate only in one direction and the tool nose must be brought into contact with the proper sensor which operates in the required gauging direction.

b) If the tool nose is brought into contact with the sensor in wrong direction, the sensor is damaged.

(2) Contact Area

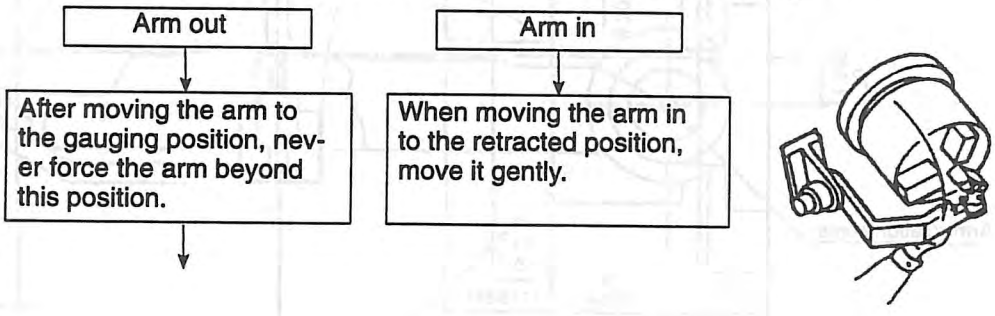


a) The ϕ4 mm (0.16 in.) tip made of cemented carbide is the contact area of the sensor.

Bring the tool nose at the center of the contact tip.

(3) Arm Motion

a) The touch setter is precision device used for gauging. Therefore, the touch setter arm must not be subject to shock. In addition, the arm must be moved gently.



b) If shock is applied to the arm while moving it out or in, check the sensor position using the reference tool.

(4) Resetting the Sensor Position

a) If cutting conditions (feedrate, tool nose R, etc.) are changed, surface roughness in finishing is changed and the finishing dimensions change accordingly. Due to this, error is generated in gauging.

To eliminate gauging error, machine the workpiece at the same cutting conditions. Then, set the sensor position again using the reference tool for which the tool~ offset data is known accurately.

(5) Interlock

The touch setter has the interlock as the standard feature. Gauging is not allowed unless the arm is completely pulled out to the correct gauging position.

When restoring the touch setter to the retracted position, place the arm correctly at the retracted position.

Interlock conditions: Chuck open and arm out

(6) Interference

The standard chucks which can be used with the touch setter without interference are indicated below:

Solid chuck : 10" N-10A0801
12" N-212A801
15" N-15A1101

Hollow chuck: 10" B-210A801A
12" B-212A801y
15" B-215A101 (Soft-jaws B may cause interference.)

If a special chuck is used, there may be~ cases that the touch setter cannot be used with the special chuck.

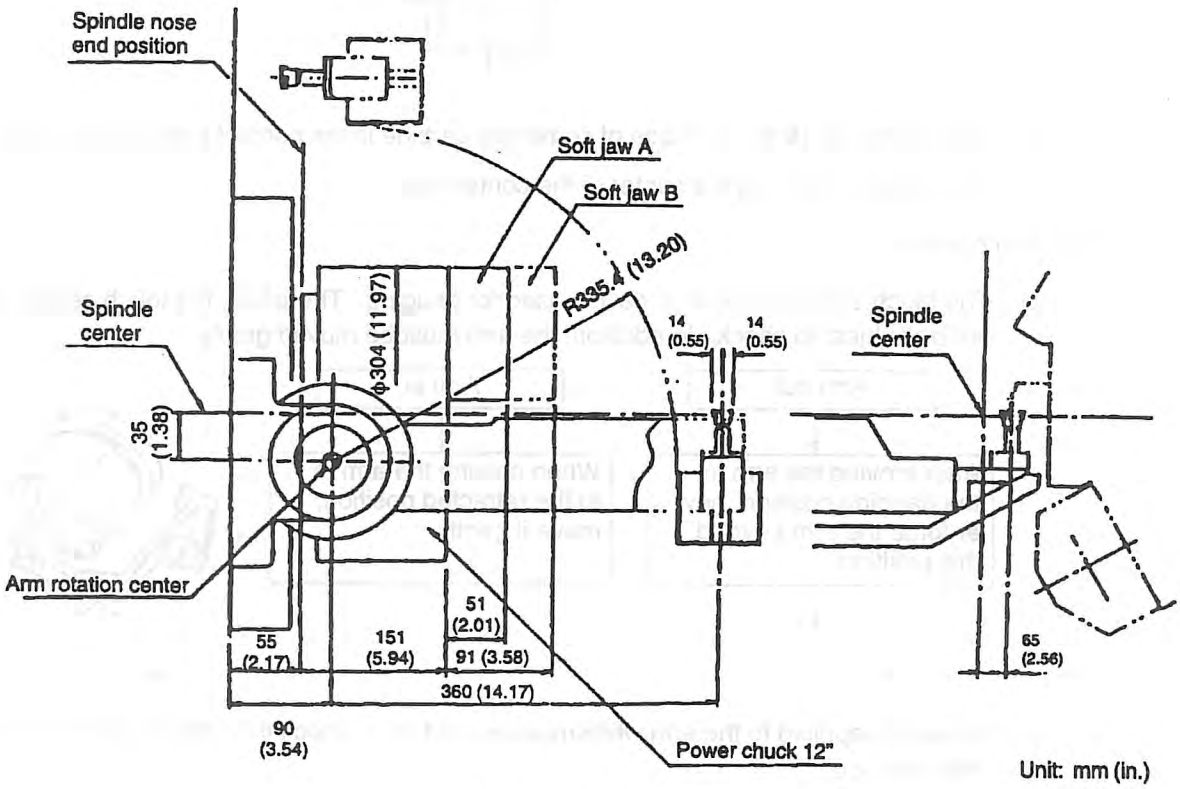
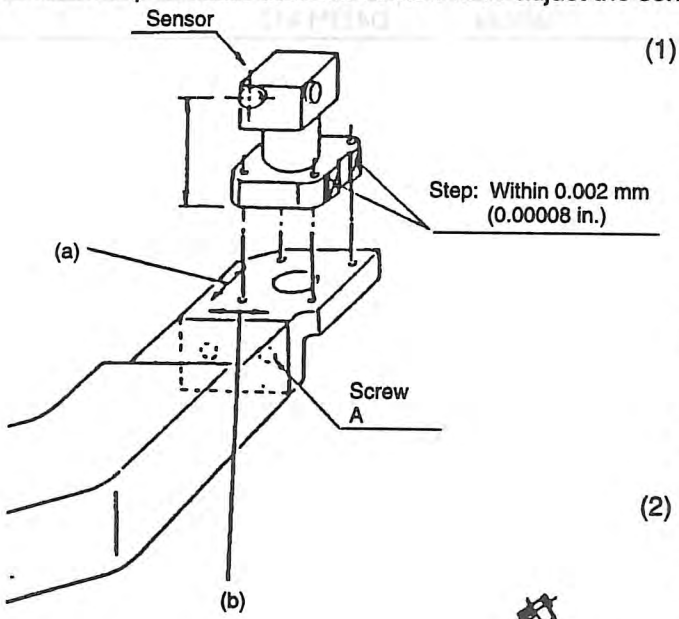


Fig. 7-1 Interference Diagram

3. RE-ADJUSTING THE SENSOR

Since the sensor is accurately adjusted before shipping, it is not necessary to adjust the sensor after installing the machine.

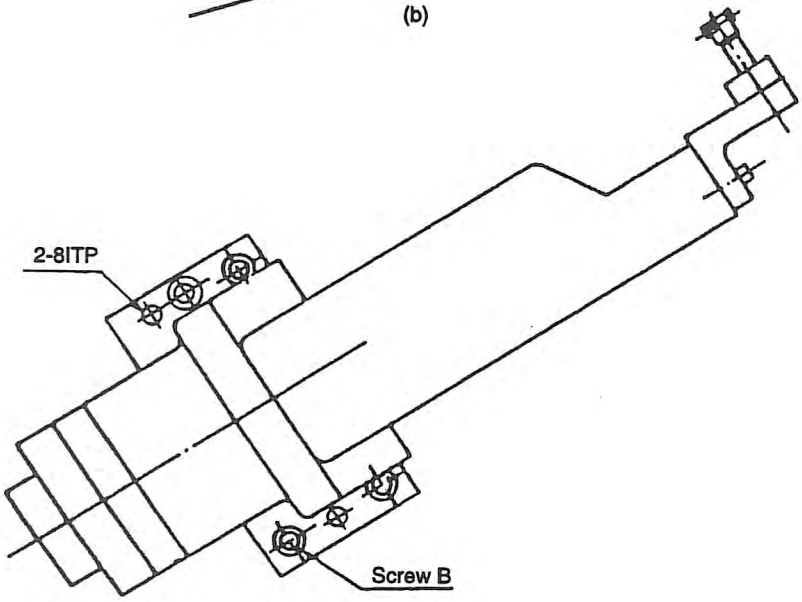
However, re-adjustment becomes necessary if the sensor position is offset due to mechanical shock or other reasons. Follow the procedure indicated below to re-adjust the sensor:



(1) Measure the sensor mounting face parallelism along (a) and (b), shown in the illustrated to the left, with a small tester and adjust it within 1/100 (0.00039 in.) mm from saddle motion. For adjustment, use screws B in direction (a) and use screws A in direction (b). For the adjustment of screws B, use two ITP 8 × 32 screws.

Adjust the center height of the sensor at the same time.

(2) One side of the sensor mounting block is ground. Adjust parallelism of the sensor in reference to the X-axis motion of the saddle using this ground face. The step measured on this face must be within 0.002 mm (0.00008 in.) to the saddle X-axis motion.



REMARKS :

(1) Sensor adjustment requires skill of an operator. Therefore, before attempting sensor adjustment, contact your local service center of Okuma.

(2) If the sensor position is adjusted, it is necessary to set the sensor position data. For details of sensor position data setting, refer to the Instruction Manual for Touch Setter M, published separately.

4. SPARE PARTS

Electrical Spare Parts

No.	Part Name	Maker	Type	Q'ty	Okuma Part No.
1	Machine switch	Metrol	H-4D-05-01	1	E3045-857-019
2	Limit switch	OMRON	D4EP1A10	2	E3019-397-114



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Publication No.	Date	Edition
3790-E	March 1994	1st

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