CNC LATHE

E-SERIES BY OKUMA ES-L10

OPERATION & MAINTENANCE MANUAL

(1st Edition)

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TATUNG-OKUMA

SAFETY PRECAUTIONS

The machine is equipped with safety devices, which serve to protect personnel and machine itself from hazards arising from unforeseen accidents. But operators must not rely exclusively on these safety devices. They must also become fully familiar with the safety guidelines presented below to ensure the accident-free operation.

This instruction manual and the warning signs attached to the machine cover only those hazards which Okuma can predict. Be aware that they do not cover all possible hazards. For safety consideration, the operator must be skilled and has been trained. And every operator must read this manual carefully before operating the machine.

Furthermore, the standard machine cannot incorporate with the ancillary handling device (e.g. robot) and if incorporate the redesign of the safety guarding system is required. Never try to install other devices by yourselves for safety consideration.

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 chuck.
Never run the spindle exceeding the maximum allowable spindle speed.
(3) If a chuck 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 chuck 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 is indicated on the nameplate 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 chuck gripping force with the standard soft-top jaw set in line with the periphery of the chuck body.

(6) If special jaws (large 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 black to the specified torque. Use lubrication oil. Make sure that the torque is at least 392 to 490 N [40 to 50kgf (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 type cutting fluid (coolant) when possible.
(4) It is recommended to a water-soluble coolant to prevent fire. Do not attempt unmanned operation if a non-soluble coolant is used.
(5) Change and replenish the lubricating oil and coolant in each reservoir according to the schedules in the manual.
(6) Clean the filters according to the schedules in the manual.
(7) Make sure that each pressure gauge on the air and hydraulic lines display the correct value as described in this manual.
(8) 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 without all of 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 safely.
    - 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 both the X- and Z-axis.
(14) Check the turret index/rotation position.
(15) Check the tailstock body 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.
(19) Check the lamp. The work lamp of 18 W can provide 500 Lux. of lighting and won’t dazzle the operator.

5. PRECAUTIONS AGAINST FIRE

(1) Use meticulous care to prevent fire especially when performing untended operation.
(2) Use nonflammable coolant.
(3) Do not leave any flammables around the machine.
(4) Do not heap up chips.
(5) Check the tool cutting edge, cutting conditions, and tool life.

6. SET UP

(1) Make sure that setup is complete. Refer to SAFETY PRECAUTION 4. BEFORE STARTING OPERATION.
(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.

7. 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 irregular-shaped workpiece, make sure that it is balanced properly.
(6) When handing heavy workpieces, use the 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.

8. 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.

9. 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 worker should be aware when a new process is about to begin.

(4) Only use specified replacement parts and fuses.

10. GENERAL PRECAUTIONS

(1) Wears appropriate clothing.

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

(3) Never touch the CNC control system or switches with wet hands.

(4) During cleaning the machine, loading and unloading workpiece, an operator must wear safety gloves, goggles and safety shoes. Do not wear gloves when an operator is operating a machine.

(5) During cleaning the machine, an operator must wear safety gloves and use iron-crook.

(6) Dismantle the revolving center of the tailstock before inspecting and maintaining the machine.

(7) The materials such as cast iron ,carbon steel ,copper ,brass ,bronze and aluminum can be used on this machine. But the flammable materials such as magnesium ,magnesium alloy ,carbon bar, plastic or wood should be prohibited. Also the low flash point cutting fluid and lubricant is not allowable.

(8) If the workpiece or processing materials are likely to produce the noxious dust, the extraction system should be added.

(9) When the reduced valve of the tailstock is adjusted, it is necessary to adjust the throttle valve of the tailstock to keep the speed of the tailstock center lower than 20 mm/sec for safety consideration.

(10) During a normal operation, the NC PANEL lockable switch should be in the “ lock” position only for authorized persons to operate.

(11) The disposal of wastes, such as oil, coolant, and chips, must comply the local regulations.

(12) If the buyer wants to change any mechanical or electrical, or electronic/software parts, especially the safety related components, please call our service member or representative for safety considerations. Only after confirming safety and completion of the changing, the machine can be operated.

11. SAFETY DEVICES AND FUNCTIONS

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

12. SYMBOLS

The following warning indications are used in this manual to draw attention to information of particular importance.

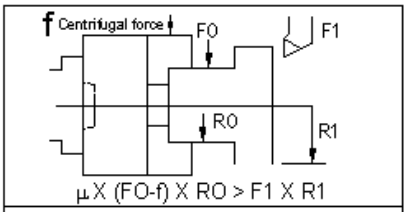
! DANGER : Indicates an imminent hazard which, if not avoided, will result in death or serious injury.

! WARNING : Indicates hazards which, if not avoided, could result in death or serious injury.

! CAUTION : Indicates hazards which, if not avoided, could result in minor injuries or damage to NC unit or other equipment.

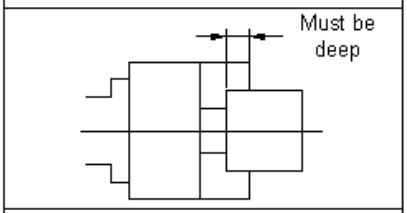
NOTICE : Indicates precautions relating to NC unit operations.

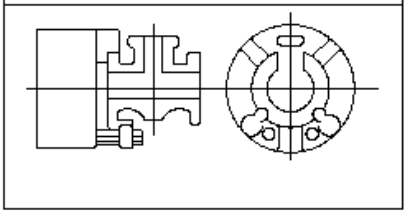
13. FOR SAFE CHUCK WORK



$N = (1000 \times V) / (\pi \times D)$

N: Spindle speed
V: Cutting speed
π: Circumference-to-diameter ratio,3.14
D: Machining diameter



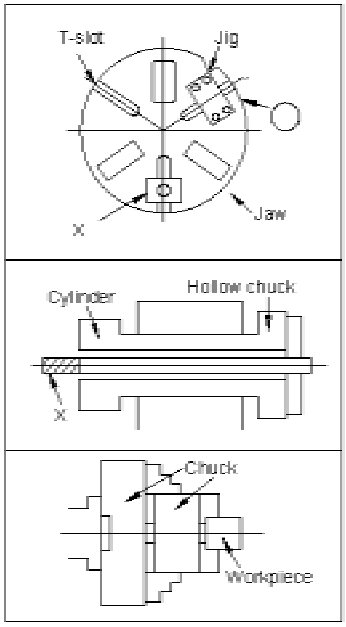


1. Safe the chuck gripping force by ensuring sufficient factor of safety (2 to 3 or over). Run the spindle with the allowable speed range set at this time.

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

3. Secure the jaw 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.

14. CAUTION PLATE

- The machine and its components are fitted with various caution plates. Carefully read these plates and follow the instructions described there.
- Do not teat or damage the caution plates. In case a plate has been lost or become illegible, ask us for a new plate, quoting the Tatung-Okuma part number written in this manual.

(1) Caution Plate and Tatung-Okuma Part Number

1) Tatung-Okuma Part No. 4163-6023-90

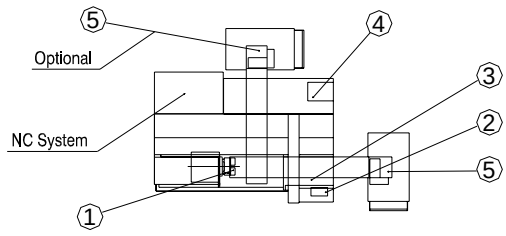
⚠ WARNING

1. During automatic operation, do not enter the machine's area of movement.
2. Before entering the machine's area of movement for cleaning, inspection, adjustments, or setup change, turn off the main power switch and make sure the entire situation is safe.
3. Do not remove protective covers, interlocks (mechanical or electrical), or other safety devices when using this machine Okuma Corporation will not be responsible for accidents resulting from unauthorized modification of the machine's original safety devices.
4. Never touch a rotating or moving spindle, cutting tool, or workpiece with your hand (or some makeshift device).

⚠ CAUTION

1. Operator and maintenance personnel must carefully read, understand, and fully comply with the instructions and safety precautions given in all machine related manuals and machine attached warning/instruction plates-before installing, operating, or performing maintenance on this machine.
2. Only qualified personnel should be allowed to operate this machine.
3. Always wear eye protectors, helmets, and safety shoes when working with this machine.
4. Always handle workpieces and cutting tools carefully.
5. If two or more personnel must work together, use constant communication signals.
6. Unauthorized modification of the original parameters in the machine's numerical control system is prohibited.
7. Do not remove or deface the warning/instruction plates attached to this machine.
8. Always lubrication oil comply with lubrication chart.

LUBRICATION CHART

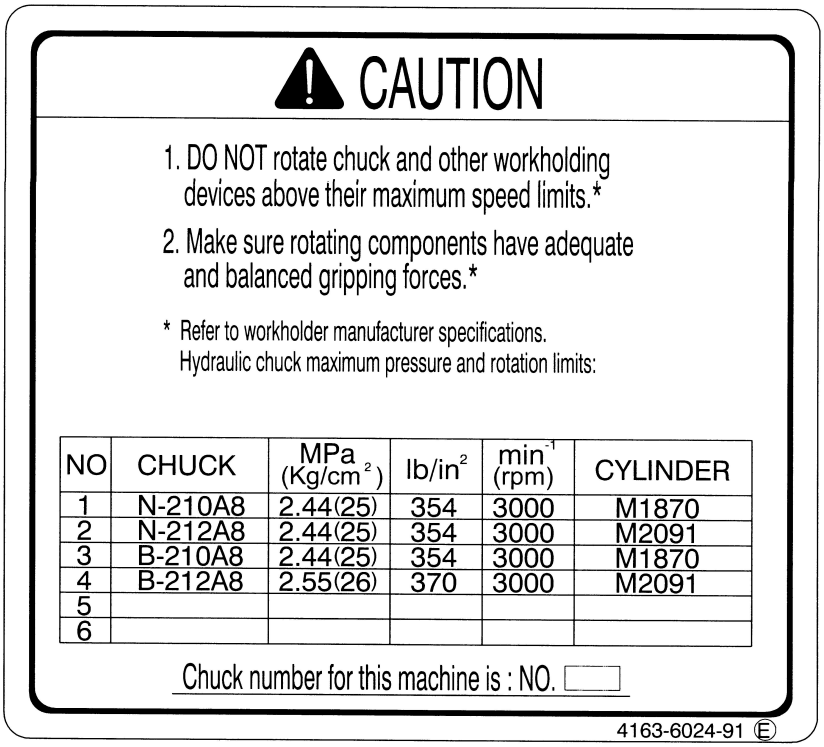


NO.	Location	Volume		Recommended Oil	Lubricating Intervals
1	Chuck jaws	Suitable amount		Molykoat EP Grease (Dow Corning)	Everyday when cleaning
2	Slideway lube tank	3 dm³(ltr)	0.79gal	Tonna oil T68 XHVI (Shell)	Replenish when needed
3	Coolant tank	180 dm³(ltr)	47.7gal	Hi-Chip NC10 (Taiyu) *	Replenish when needed
4	Hydraulic unit	22 dm³(ltr)	5.81gal	DTE Oil Light (Mobil)	Change after the 1st month, then every 6 months
5	Chip conveyor	Suitable amount		Mobilux 2 (Mobil)	Replenish every 3 to 6 months

* Use 1 part NC10 diluted at 20 to 30 parts water.

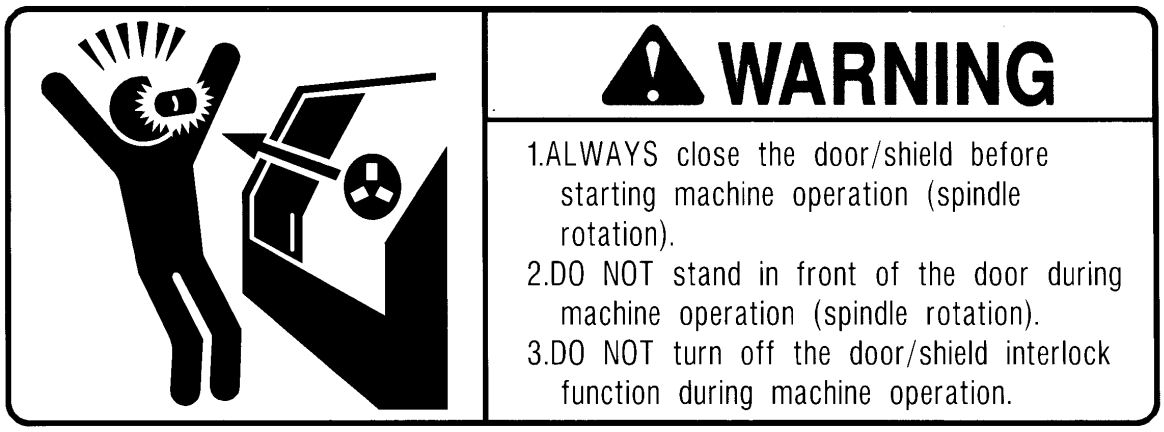
4163-6023-90 Ⓔ

2) Tatung-Okuma Part No. 4163-6024-91

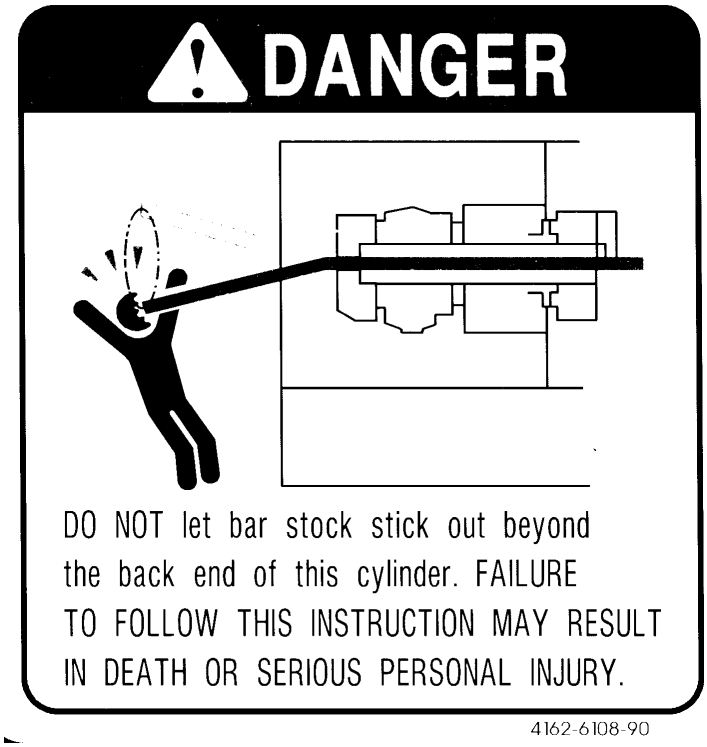


NO	CHUCK	MPa (Kg/cm^2)	lb/in^2	min^{-1} (rpm)	CYLINDER
1	N-210A8	2.44(25)	354	3000	M1870
2	N-212A8	2.44(25)	354	3000	M2091
3	B-210A8	2.44(25)	354	3000	M1870
4	B-212A8	2.55(26)	370	3000	M2091
5					
6					

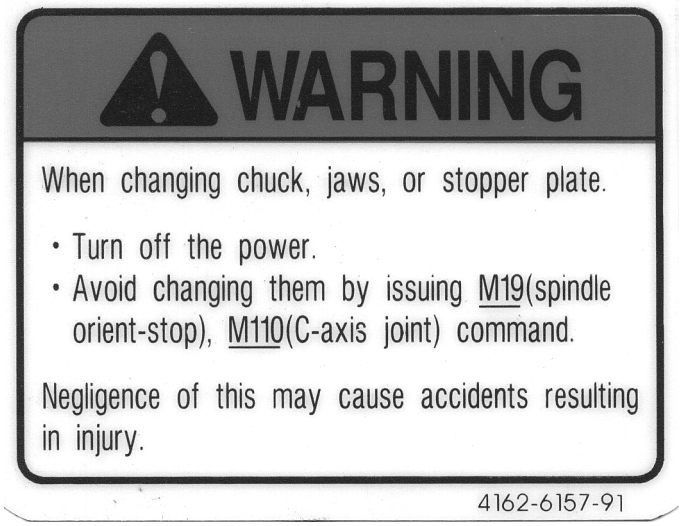
3) Tatung-Okuma Part No. 4162-6107-90



4) Tatung-Okuma Part No. 4162-6108-90



5) Tatung-Okuma Part No. 4162-6157-90



6) Tatung-Okuma Part No. 4162-6162-90

⚠ WARNING

OBSERVE THE FOLLOWING RULES TO PREVENT FIRE DURING UNTENDED OPERATION.
- USE NONFLAMMABLE COOLANT.
- DO NOT LEAVE ANY FRAMMABLES AROUND THE MACHINE.
- DO NOT HEAP UP CHIPS.
- CHECK THE TOOL CUTTING EDGE, CUTTING CONDITIONS, AND TOOL LIFE.

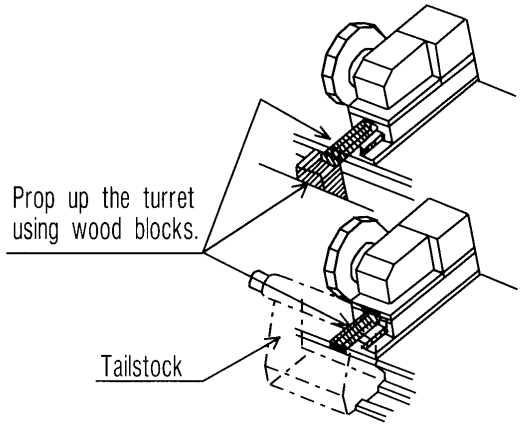
4162-6162-90

7) Tatung-Okuma Part No. 4162-6160-90

⚠ WARNING

Before removing X-axis feed servomotor for maintenance or inspection of X-axis ball screw, servomotor or other related parts, be sure to prevent the turret from slipping down using wood blocks or the like.
Negligence of this may allow the turret to slip accidentally, resulting in serious injury.

Example of Slip Preventive Measure



4162-6160-90

15. Others

(1) The machine is designed to cutting iron, aluminum, copper, bronze and cast iron.
For safety consideration, do not cut wood, magnesium ally and other combustible materials.

(2) Be sure to turn off the main power switch before maintaining this machine.

INTRODUCTION

Thank you for choosing a Tatung-Okuma Model L-390 CNC lathe. We are proud to have you among our Tatung-Okuma family of users.

This instruction manual contains concise information on the installation, setup, operation, and maintenance of your Model L-390 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

TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS

PAGE

SECTION 1 MACHINE SPECIFICATIONS

1. SPECIFICATION TABLE

Item		Unit	Specifications
CAPACITY:			
No. of controlled axes			2
Swing over bed		mm (in.)	∅520 (20.47)
Swing over carriage		mm (in.)	∅450 (17.72)
Swing over cross-slide		mm (in.)	∅300 (11.81)
Max. turning diameter x length		mm (in.) x mm (in)	∅390×500 (∅15.35×19.6) for V8 ∅310x 500 (∅112.2×19.6) for V12
SPINDLE:			
Spindle diameter		mm (in.)	∅120 (4.72)
Spindle nose type			JIS A2-8
Taper hole		mm (in.)	∅90 (3.54) ×1/10
Through-spindle hole		mm (in.)	∅80 (3.15)
No. of spindle speed ranges			Stepless x Auto 2 steps (Coil changeable)
Spindle speed		min^{-1}{rpm}	25 to 3,000
CROSS-SLIDE (X-AXIS):			
Axis travel		mm (in.)	220 = 195+25 (8.66 =7.68+0.98) for V8 220 = 155+65 (8.66 =6.1+2.56) for V12
Feedrate		mm/rev (ipr)	0.001 to 1,000.000 (0.00004 to 39.37)
Rapid feedrate		mm/min (ipm)	15,000 (590.55)
CARRIAGE (Z-AXIS):			
Axis travel		mm (in.)	520 (20.47)
Feedrate		mm/rev (ipr)	0.001 to 1, 000.000 (0.00004 to 39.37)
Rapid feedrate		mm/min (ipm)	20,000 (787.40)
TURRET:			
Type			V
No. of tools			8 [*12]
Tool size	OD turning tools	mm (in.)	□ 25 (1)
	ID turning tools	mm (in.)	∅40 (1.5)
TAILSTOCK*:			
Tailstock spindle diameter		mm (in.)	∅90 (3.54)
Tailstock spindle taper hole			MT No.5 (revolving center)

Item	Unit	Specifications
Tailstock spindle travel	mm (in.)	100 (3.94)
MOTOR:		
Spindle drive motor	kW (hp)	VAC 15 / 11 (20 / 15) (30min / cont.) VAC 11 / 7.5 (15 / 10) (30min / cont.)
Carriage feed (Z-axis)	kW (hp)	3 (4)
Cross-slide feed (X-axis)	kW (hp)	2 (2.7)
Hydraulic power unit pump	kW (hp)	1.5 (2)
Guideway lubrication pump	kW (hp)	0.017 (0.023)
Coolant pump	kW (hp)	0.19 (0.25)
MACHINE HEIGHT	mm (in.)	1,795 (70.67)
FLOOR SPACE REQUIRED	mmxmm (in.x in.)	2550 x 1970(100.39 x 77.56)-------15/11kW
		2280 x 1970(89.76 x 77.56) --------11/7.5kW
NET WEIGHT	kg (lb.)	3,800 (8377)

* V12 Turret,Tailstock is optional.

2. DIMENSIONAL DRAWINGS

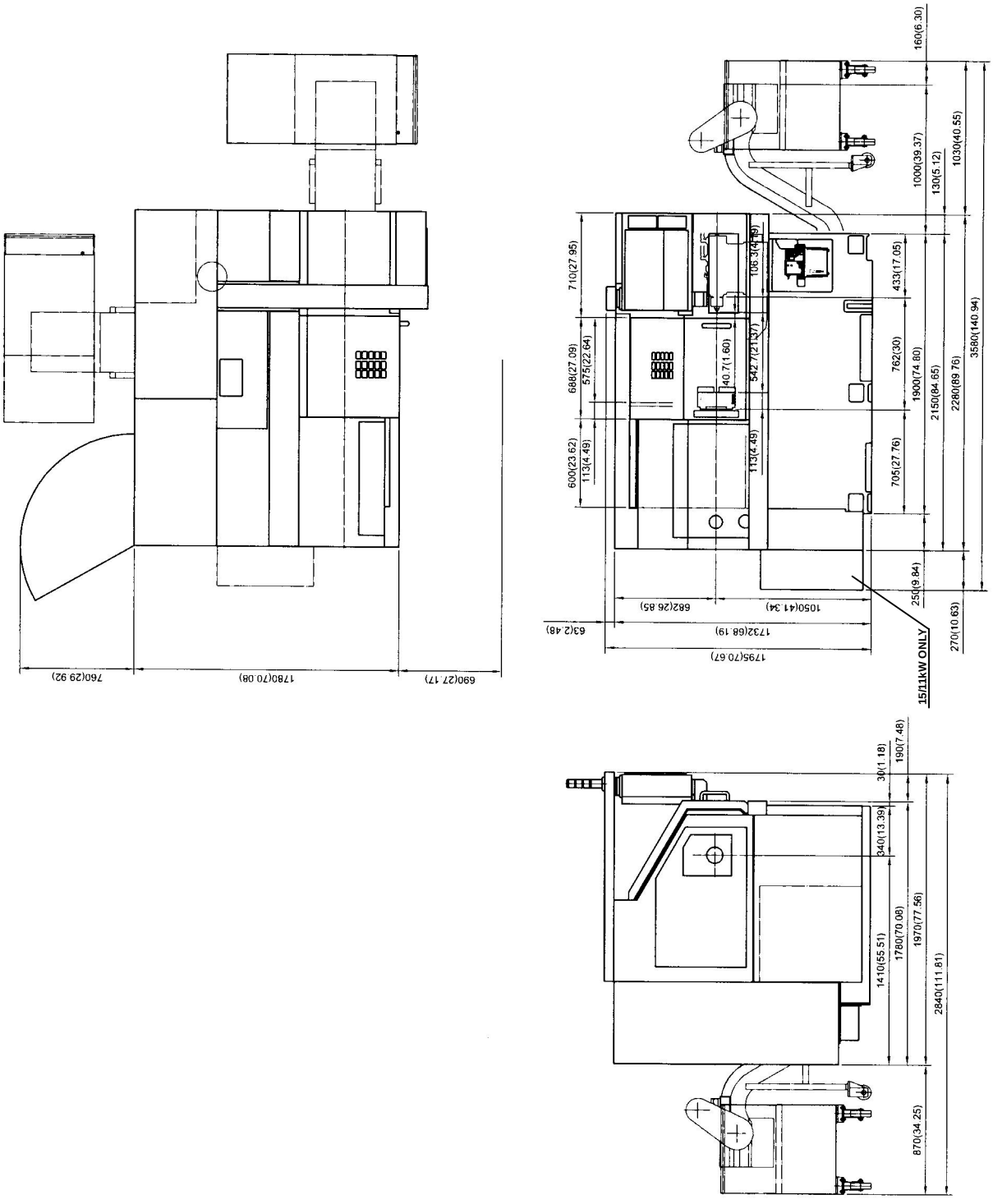


Fig. 1-1 Dimensional Drawing

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 a CNC lathe at your plant.

1. GUIDE TO SELECT A INSTALLATION SITE

In order to ensure high machine accuracy and performance, the following points should be considered with regard to the installation site.

(1) Foundation work is advised for sites where the subsoil is soft, to prevent the machine from titling or sinking after installation.

For details regarding foundations, refer to SECTION 2, 3. Of the Operation Manual.

(2) The installation site should be as far as possible from vibration sources such as roads, stamping/press equipment, or planer machine tools.

If nearby sources of vibration are unavoidable, prepare dampening pits around the foundation to reduce the vibration effects.

(3) NC malfunctions could result from the proximity of high-frequency power generator, electric discharge machines, and electric welding machines, or when power is supplied from the same distributor panel as these machines.

For wiring details, consult our service engineer dispatched to assist with installation.

(4) The ideal operating environment calls for an ambient temperature of 20°C, with humidity between 40 and 75%.

(5) Keeping the ambient temperature at a constant level is an essential factor for accurate machining.

(6) In order to maintain static machine accuracy within guaranteed values, the machine installation site should be air-conditioning is not required, the optimal ambient temperature range is 17°C to 25°C.

(7) To maintain static machine accuracy at levels even higher than the standard guaranteed values:

a) Keep the ambient temperature variance for 24 hours (1 day) within ±2°C

b) Ambient temperature variances from floor level to a height of about 5 meters should be held within 1°C.

(8) The machine is capable of operating correctly at the altitude up to 1,000 m above mean sea level.

(9) During transportation and storage, the temperature must be within a range of -25°C to 55°C and for a short period not exceeding 24 hr. at up to 70°C.

2. CARE IN HANDING 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 ES-L10 CNC lathe is built in one unit and it can be easily moved without separating it into consisting units.

Lifting and moving machine:

There are two different methods for moving the entire machine to any desire 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.

2-1. Machine Lifting

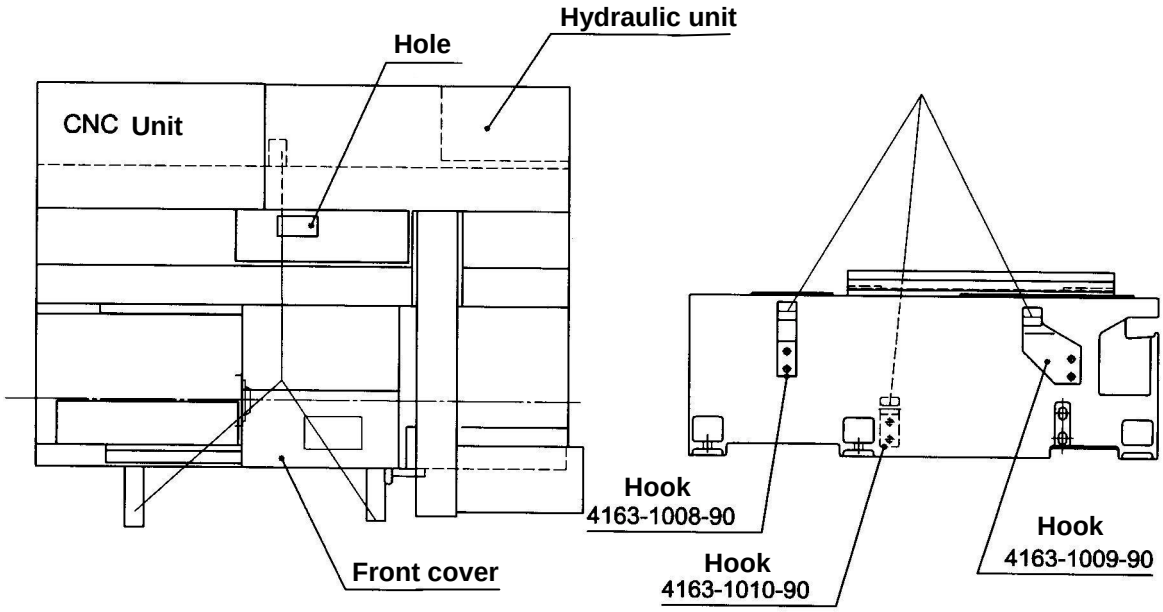


Fig. 2-1 Machine Lifting

Procedure:

(1) Detach the chip bucket and chip conveyor.

(2) Drain the coolant from the tank in leg.

(3) Move the saddle to the right.

(4) Open the front chip cover halfway.

(5) Fix the lifting hooks at the predetermined position.

(6) The crane can be loaded 5ton (or up) for lift lathe.

2-2. Precautions for Lifting

⚠ WARNING

: (1) The cables should have a nominal diameter of 16 mm (0.63in.) 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 FLOOR.

Approximate Weight of Machine
3800 kg(8377lb)

(Machine weight indicated above includes the weight of hydraulic power unit, electrical control box and CNC unit, but not the weight of chip conveyor.)

2-3. Rolling

⚠ WARNING

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

3. FOUNDATION REQUIREMENTS

3-1. General Precautions for Building a New Foundation

NOTICE

: 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 6.)

(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 unsetting 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.

4. GENERAL PROCEDURE FOR INSTALLATION

4-1. Procedure for Installation

(1) Place leveling plates, 150×150×19mm (5.91×5.91×0.75in.) 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.

(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.

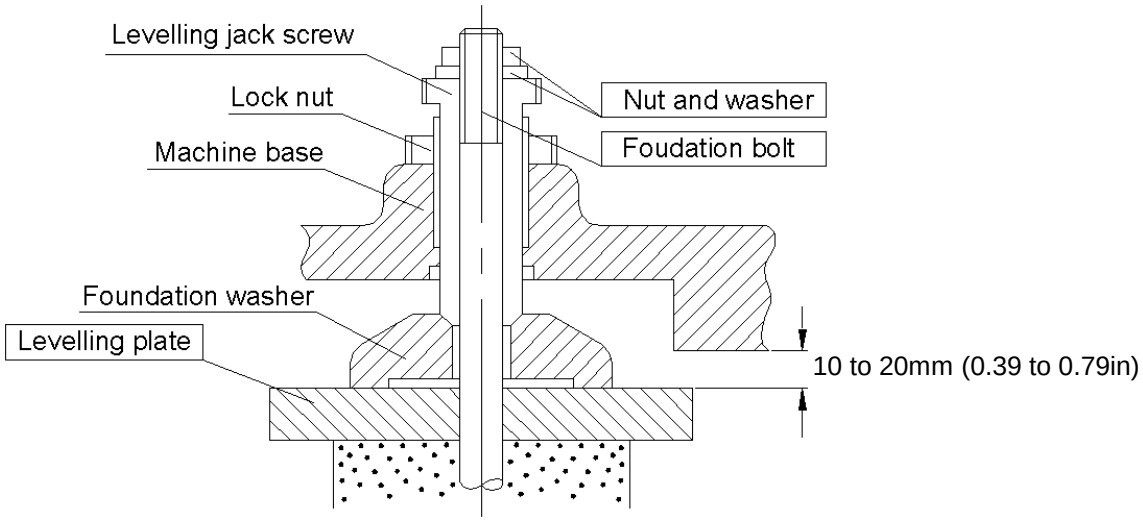
(6) After the mixture has become hard enough, remove the shims or leveling blocks from under the machine base, and level the machine within the specified limits.

4-2. Precaution 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 20mm (0.39 to 0.79in.) 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.



The part names shown in ▭ are not supplied as standard equipment

Fig. 2-2 Precautions for Installation

5. 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.

No. of Leveling Jack Screws	Remarks
5	Pass foundation bolts.

5-1. Leveling Procedure

(1) Measure the machine level at both right and left ends of bed ways in the X- and Z-axis directions. Set the feedrate override at about 30%.

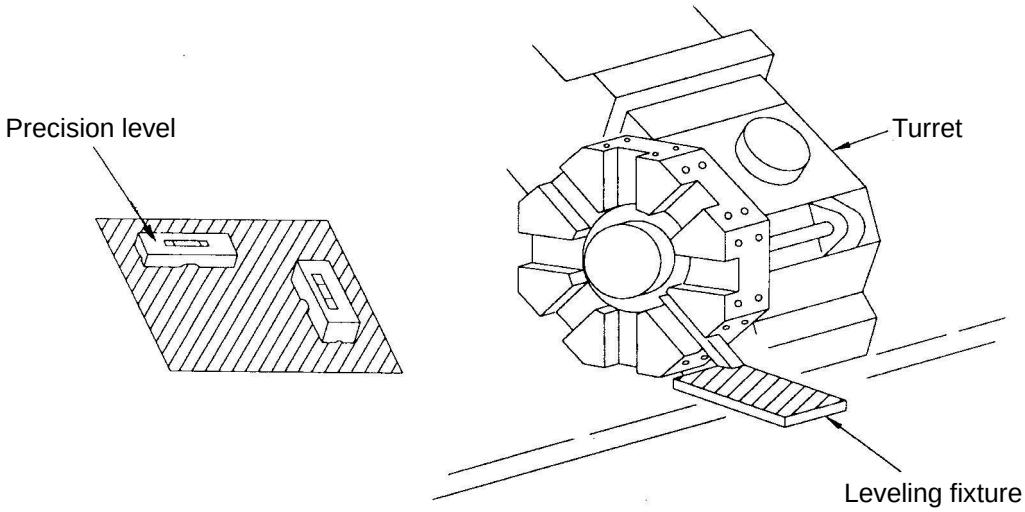


Fig2-3 Leveling Procedure

(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 : 0.04 mm per 1000 mm (0.0005 in./ ft)
Accuracy of level : 1 div.=0.02 mm per 1000 mm (0.00025 in./ft)

6. FOUNDATION PLAN

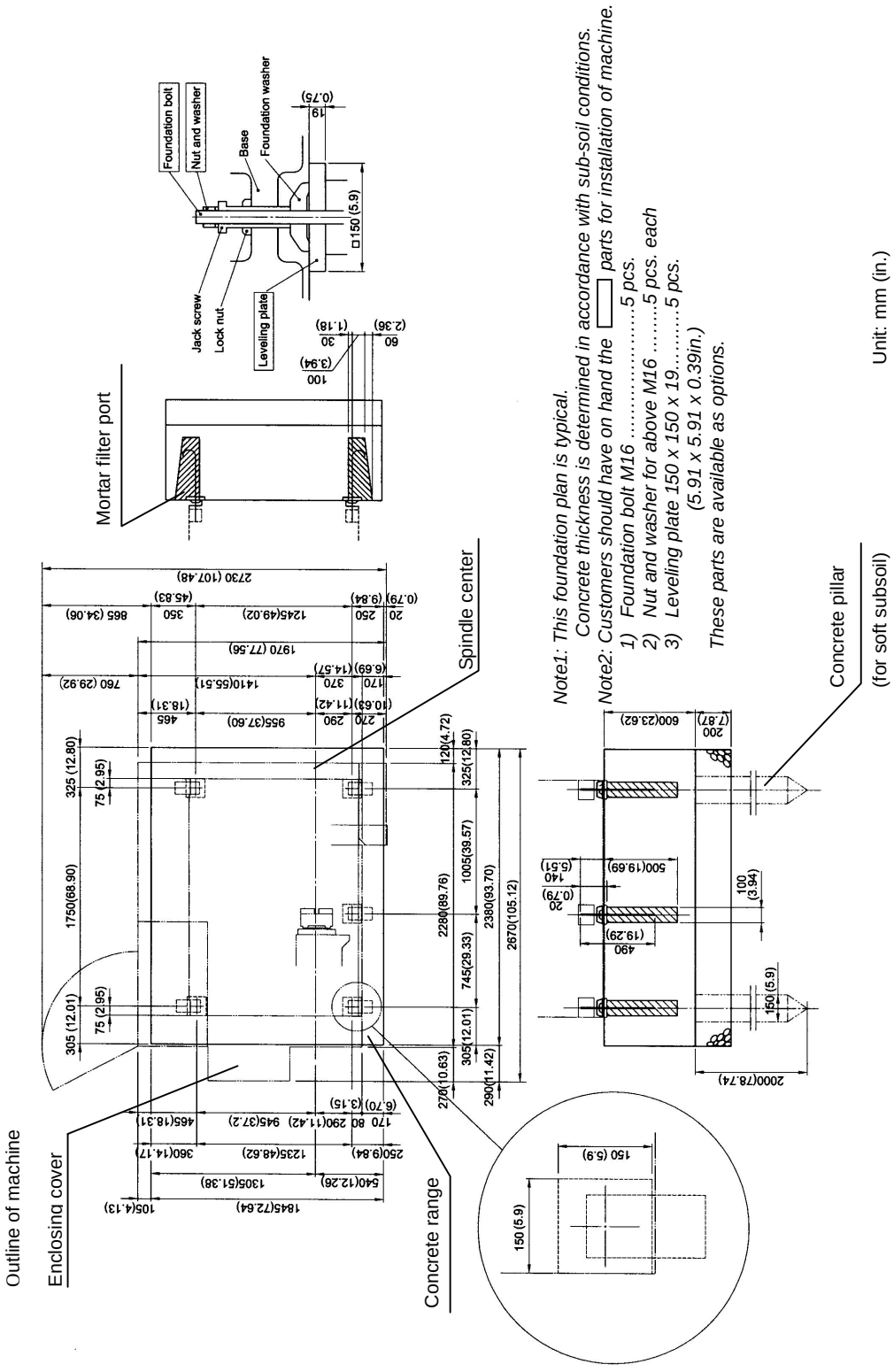


Fig. 2-4 Foundation Plan

7. POWER REQUIREMENTS

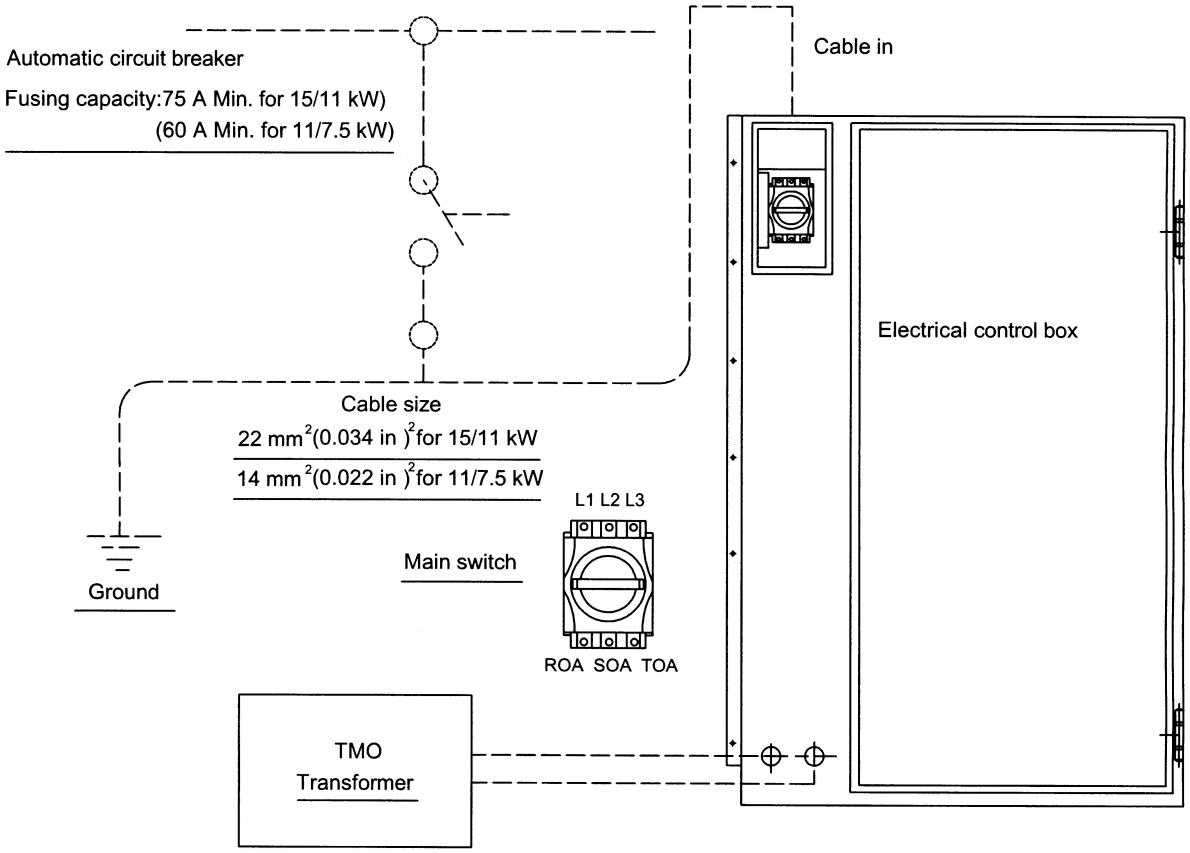


Fig.2-5 Power Requirements

3-phase power source	220 / 380V, 50 / 60Hz
Main motor	15 / 11 kW (20 / 15 Hp) 11 / 7.5 kW (15 / 10 Hp)
Automatic circuit breaker fusing capacity	75 A min for 15 / 11kW 60 A min for 11 / 7.5 kW
Cable size	22 mm² (0.034 in²) for 15 / 11kW 14 mm² (0.022 in²) for 11 / 7.5 kW

7-1. 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 {3.9Mpa {40kgf/cm^2 (568.8psi)}}

When it indicate the specified pressure level, the electrical connection is correct.

7-2. Electrical Work

CAUTION :

(1) Connect the ground to the external protector connection terminal (PE) located inside the control box.

(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 100mA or more
- Middle-sensitivity high-speed inverter type

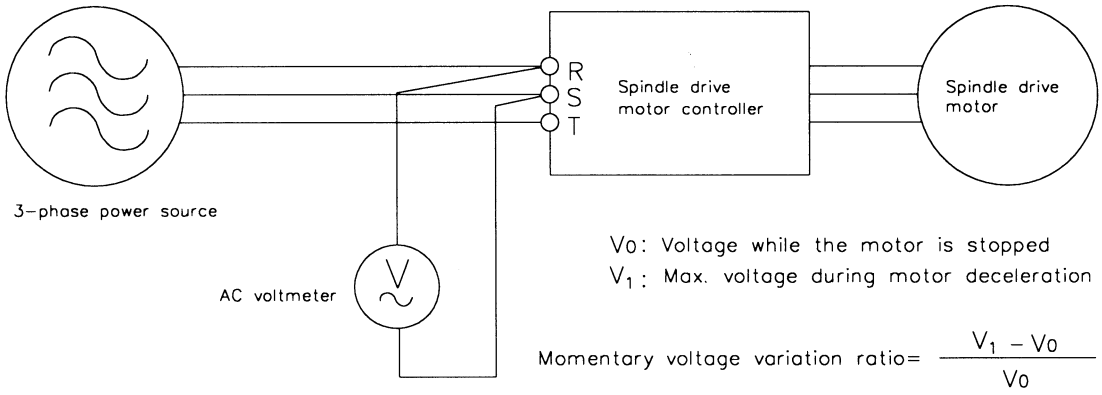
(4) If more than one machine tool is connected to the same single power source, the value of “inductance of power source” for each machine is obtained by dividing the value in the table by the number of machine tools to be connected.

(5) Wiring inductance in 50m (164.05ft) cable is approximately 12 μH when general KIV cable is used.

(6) The momentary voltage variation ratio is calculated in the manner as explained below. If the “excessive voltage variation ratio” warning function which function functions if power source inductance is higher than the allowable limit does not give warning signal and if the momentary voltage variation ratio is lower than the value indicated in the table above, then it is assumed that the power source inductance is lower than the limit.

(7) For further information on the momentary voltage variation ratio and power source induction, please contact your local Okuma service representative.

Calculating momentary voltage variation ratio:



(1) As indicated in the illustration above, connect the AC voltmeter to the power supply terminals at the spindle drive motor controller or the machine.

(2) Measure the voltage while the spindle drive motor is stopped. Take this value as "V_0".

(3) Measure the voltage while the spindle drive motor is decelerating. Take this value as "V_1".

(4) Calculate the momentary voltage variation ratio using the following formula:

Momentary voltage variation ratio = $(V_1-V_0)/V_0$

Note 1: Since a digital AC voltmeter has slow response, momentary voltage variation ratio obtained using the voltage measured with the digital AC voltmeter is lower than the actual value. To obtain the precise value, it is recommended to use an analog voltmeter.

Note 2: Voltage "V_1" cannot be measured accurately if motor decelerating time is short. Therefore, it is recommended start deceleration from as high spindle speed as possible.

Note 3: If the "excessive voltage variation ratio" warning function which functions if power source inductance is higher than the allowable limit gives a warning, output is restricted by the spindle drive motor controller. Therefore, the momentary voltage variation ratio calculated using voltage which has been measured under such situation does is not reliable.

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 inference 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 operators, read this manual repeatedly and also the Programming Manual for OSP.

⚠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 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 software 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.

A. Basic Construction of Operation Panel

For operating the machine, following four kinds of man-machine interfaces are provided:

(1) NC Operation Panel

The NC operation panel is used for operating the machine in other than manual mode operation. It is used for operations such as file operation and data setting.

(2) Machine Operation Panel

Switches and keys mainly used for manual operation are arranged on the machine operation panel.

(3) Option Panel

An option is provided when switches and indicating lamps are additionally used according to the selection of an optional specification. Arrangement of the switches and indicating lamps differ depending on the selected optional specification.

(4) Foot Pedal (Foot Switch)

A foot pedal is provided to control the operation of such as chuck open/close and tailstock spindle advance/retract.

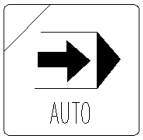
There are various types of operation panels according to the shape of the panel and the arrangement of the control on it. External views of the operation panels are provided in Appendix in OSP U-10L OPERATION MANUAL.

B. Outline of Controls on Operation Panel

B-1 Operation Mode Selection Keys

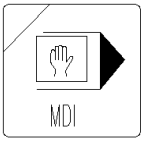
(1) AUTO Key

Select the automatic mode when operating the machine using a stored part program.



(2) MDI Key

Select the MDI mode when operating the machine in units of blocks by inputting the data necessary for operation the keyboard in the NC operation panel.



(3) MANUAL Key

Select the manual mode when operating the switches on the machine operation panel.

B-2 Data Setting Mode Selection Keys

(1) EDIT AUX. Key

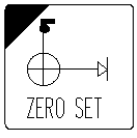
Select the program operation mode when operating program files and data files. In the program operation mode, edit, input/output, display, and deletion of a file are possible.

(2) PARAMETER Key

Select the parameter mode when setting, changing, or displaying parameter data necessary for NC control.

(3) ZERO SET Key

Selecting the zero set mode when setting, changing, or checking the zero offset data, and zero shift data, which define a program coordinate system.



(4) TOOL DATA

Select the tool data mode when setting, changing, or displaying the tool-offset data, nose R compensation data, tool shape data, and load monitor data.

(5) MacMan

Press the [MacMan] key to use the MacMan (machining management function).

B-3 NC Status Indicating Lamps

(1) RUN Lamp

The RUN-indicating lamp goes on when the machine is actually operating in the automatic or MDI mode.

(2) S.T.M Lamp

The S.T.M indicating lamp is on while auxiliary function operation such as spindle gear range change, tool change, and spindle rotation, is executed.
When an axis movement command is designated with an S, T, and/or M command, the axis movement command is executed after the completion of the S, T, and/or M command designated in the same block.
If a spindle gear range command, spindle speed command, or tool number command is changed using the manual intervention function (called out by pressing the [MDI AUTO MANUAL] key), the S.T.M. indicating lamp blinks.

(3) SLIDE HOLD Lamp

The SLIDE HOLD indicating lamp goes on when the [SLIDE HOLD] button is pressed in the automatic or MDI mode.
For the two-saddle specification, it also goes on if the operation of either of other the two saddles enters the slide hold state with the block operation of the other saddle having completed in the single block mode operation in the automatic mode.

(4) PROGRAM STOP Lamp

The PROGRAM STOP-indicating lamp goes on during the execution of a program stop (M00) or optional stop (M01) function in the automatic or MDI mode.
The indicating lamp blinks during the execution of a dwell (G04) function.

(5) LIMIT Lamp

The LIMIT indicating lamp goes on when either X- or Z-axis reaches the variable limit position.
The indicating lamp blinks if the actual spindle speed reaches the maximum or minimum speed of the selected gear range, or when it reaches the spindle speed specified using the maximum spindle speed specification function.

(6) ALARM Lamp

The ALARM indicating lamp goes on when the machine malfunctions or an incorrect program is input. It also goes on if the computer fails to function correctly.

Table 1-1 Status Indicating Lamp ON/Blinking Condition

Status Indicating Lamp	Condition ON	Condition for Blinking
RUN	- The machine is normally running in the AUTO or MDI mode (Except for during the SLIDE HOLD and PROGRAM STOP mode).	- The program selection command in a schedule program is being executed.
S.T.M	- The machine is waiting for the operation completion of an M code command. (Spindle rotation command, gear command, etc.). - A spindle speed command is given (S command). - A turret rotation command is given (T command). Only for the multi-machining specification - The machine is waiting for the operation completion of a multi-machining M code command. (C-axis joint command, M-tool spindle rotation command, etc.). - The C-axis brake pressure is switched between high and low. Only for the ATC specification - The machine is waiting for the operation completion of the MG, MT or TN command.	- The following items have been changed during manual intervention. Tool number Spindle rotation/gear command Only for the multi-machining specification C-axis joint state C-axis clamp M-tool spindle rotation/gear command
SLIDE HOLD	- The SLIDE HOLD button has been pressed in the AUTO or MDI mode. - A block of program commands has been executed on one saddle while the other saddle is placed in the slide hold mode with the single block function activated in the AUTO mode.	Does not blink.
PROGRAM STOP	- M00 or M01 is designated in the AUTO or MDI mode.	- The dwell command (G04) is executed.

Status Indicating Lamp	Condition ON	Condition for Blinking
LIMIT	- Either X- or Z-axis has reached the variable soft-limit position.	- The spindle speed has reached the limit speed in the selected gear range. - The spindle speed has reached the limit speed specified by the maximum spindle speed designation function. - The spindle position is controlled after the completion of spindle orientation (DIFF control). - The M-tool spindle position is controlled after the completion of spindle orientation.
ALARM	- Any erroneous operation is attempted (An alarm of level A, B, C, or D).	Does not blink.

B-4 Other Controls on NC Operation Panel

(1) Function Keys: F1 to F8

There are eight keys on the NC operation panel.

When an operator selects a desired operation mode, the screen displays the necessary operation functions at the bottom line. Each function corresponds to a function key (F1 to F8). Select the function to execute and press the corresponding function key.

If all functions called out by the selection of a mode cannot be displayed at a time, ([EXTEND]) message is displayed for function key [F8]. In this case, press [F8] to display the rest of functions.

F1 F2 F3 F4 F5 F6 F7 F8

(2) ? (Help) key

This key, called the help key, is provided to the left side of function key [F1].

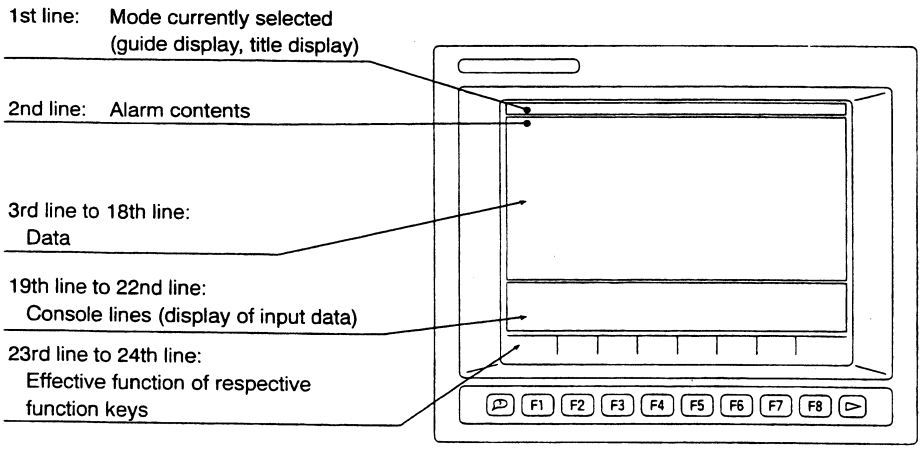
The key is used to display the description of the alarm, which occurred during machine operation and also the alarm history.

(3) Display Screen

The display screen has the information display area of 64 characters×24 lines.

It shows actual position data, part program data, block data, zero offset values, tool-offset values, parameter data, alarm description, etc.

The basic format of display on the screen is shown below.



(4) WRITE Key

Press the [WRITE] key to select an operation and also confirm the input data.

(5) BS (Backspace) Key

Press the [Bs] key when erroneous data has been input. Each time this key is pressed, the character input last is erased.

For the display of file index and list, this key is used to display the next page.

(6) CAN Key

Press the [CAN] key when erroneous data has been input. Each time this key is pressed, one line of the data is erased.

(7) Turret Selection (A/B) Keys

There keys are used to select the objective turret or saddle (A saddle side, B saddle side) of NC control for the two-saddle or two-turret models.

(8) Cursor Keys

Four cursor keys are used to move the cursor displayed on the screen.

(9) Page Keys

If the information called out is displayed in more than one page, the page keys are used to change the display page.

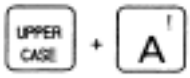
(10) Operator Keys

These keys are used when an operator is used for program editing or for entering more than one piece of data with an operator in data setting operation.

(11) Character Keys

Character keys are used for inputting a character for data input, program operation, and file edit operation.

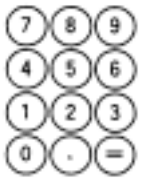
(d) To input a character shown at the upper right corner of a key top, use the [UPPER CASE] key.



(e) In put the state the [CAPS LOCK] key is pressed (indicating lamp at the upper left corner lit), upper case alphabetic letters A to Z are input. When the [CAPS LOCK] key is not pressed, lower case alphabetic letters a to z are input.

(12) Ten Keys

Character keys are used for inputting a number for data input, program operation, and file edit operation.



(13) Constant Adjusting Keys

(Only for Operation Panel with Monochrome STN Screen)

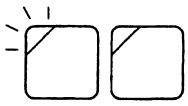
These keys are used to adjust the contrast for the display.

B-5 Controls on Machine Operation Panel

Flat keys used on the machine operation panel have feature as indicated below depending on whether or not an indicating lamp is provided in it.

<Flat keys with an indicating lamp>

The indicating lamp in a key indicates if the function of the key is valid or not.



- Indicating lamp lit . . . . . Key function is valid.
- Indicating lamp unlit . . . . . Key function is invalid.

<Flat keys without an indicating lamp>

The function of the key is valid only while the key is held down. In the state the key is not pressed, the function is invalid.

(1) CONTROL ON Switch

The [CONTROL ON] switch is used to turn on the control power of the NC unit after turning on the main switch of the machine.

The pilot lamp in this switch lights when the control power is turned on.

If the [EMERGENCY STOP] button is pressed, the pilot lamp in this switch goes off. To restore from the emergency stop state, press the [CONTROL ON] switch.

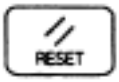
(2) CONTROL OFF Switch

The [CONTROL OFF] switch is used to turn off the control power of the NC unit.

When shutting off the power ,turn off the control power first by pressing

The [CONTROL OFF] switch before turning off the main switch of the machine.

(3) RESET Key



The NC unit is reset when the [RESET] key is pressed.

The key is used to recover the operation from such as an alarm state.

(4) NC PANEL Switch

(a) UNLOCK position

All controls on both the NC and machine operation panels are enabled.

(b) EDIT LOCK position

Operations in the program operation (EDIT AUX) mode and parameter setting mode are disabled.

(c) LOCK position

All controls on the NC operation panel are disabled.

(5) CYCLE START Button

The [CYCLE START] button is used to start the machine operation according to the contents of the commands.

The CYCLE START signal is output when the button is released after it is pressed.

(6) SLIDE HOLD Button

Axis movements of X-, Z-, and C-axis stop immediately when the [SLIDE HOLD] button is pressed. To resume axis movements, press the [CYCLE START] button.

If this button is pressed while an axis is not moving, the slide hold becomes valid after the completion of the sequence having been executed at the time the [SLIDE HOLD] button was pressed or when the next axis movement is going to be executed.

(7) EMERGENCY STOP Button

Press the [EMERGENCY STOP] button when an emergency state takes place.

Power supply to the NC is shut off when the [EMERGENCY STOP] button is pressed.

To release the emergency stop state, unlock the [EMERGENCY STOP] button and press the [CONTROL ON] button.

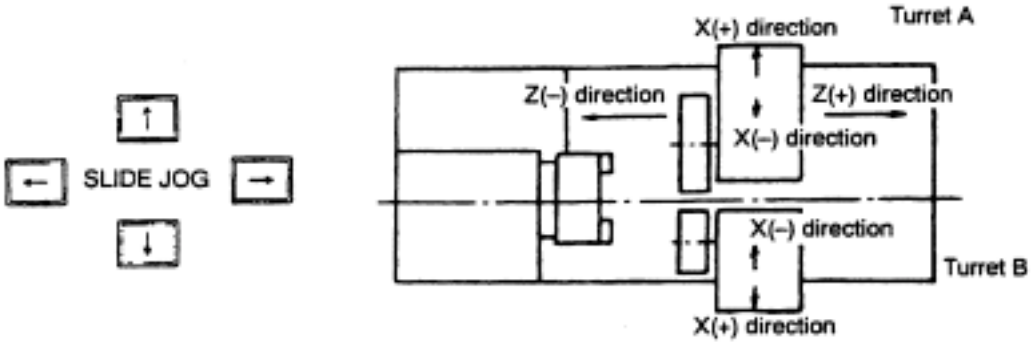
(8) SLIDE JOG Buttons.

These are used to jog an axis in the manual mode. The button is valid only while it is held pressed and the setting of the FEED RATE override dial is valid to jog feed operation.

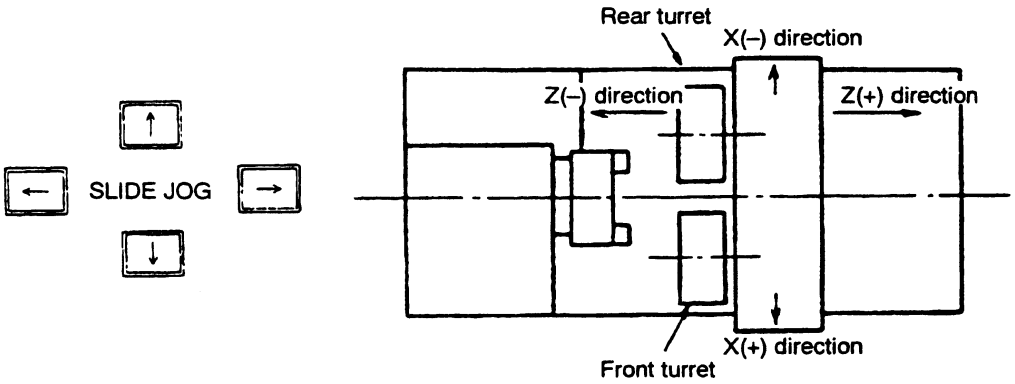
For the two-saddle specification, the saddle selected by the turret selection key moves.

: Feedrates differ depending on the machine models and specifications. With some special specification machines, the feed patterns will differ from those illustrated below.

(a) Other than flat-bed machines



(b) Flat-bed machines



(9) FEED RATE Dial

The FEED RATE override dial overrides the specified feedrate in the range 0 to 200% in 15 steps.

NOTICE

: In the single block OFF operation in the automatic mode, override is not valid for a rapid feed command (G00).
Override is not valid for thread cutting operation.

(10) PULSE HANDLE X Key

Select this key to operate the X-axis using the pulse handle.

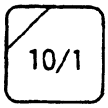
(11) PULSE HANDLE Z Key

Select this key to operate the Z-axis using the pulse handle.

(12) PULSE HANDLE 1/1 Key

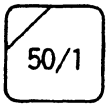
Select this key to move an axis using the pulse handle at the ratio of unit distance per pulse.

(13) PULSE HANDLE 10/1 Key



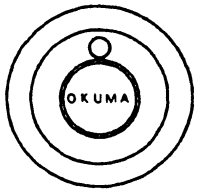
Select this key to extend axis movement distance per pulse to 10 times the unit distance.

(14) PULSE HANDLE 50/1 Key



Select this key to extend axis movement distance per pulse to 50 times per unit distance.

(15) PULSE HANDLE



The pulse handle is used to move a selected axis by the pulse signals, which are generated as the pulse handle is turned.

(16) TOOL INDEX Button

The [TOOL INDEX] button is used to rotate the turret manually. The turret will rotate continuously if it is held pressed.

(17) SPINDLE STOP Button

Use the [SPINDLE STOP] button to stop the spindle rotation manually.

(18) SPINLDE CW Button

Used to start the spindle in the forward (CW) direction.
For the multiple-machining models, the button is also used to start the M-tool spindle in the forward (CW) direction.

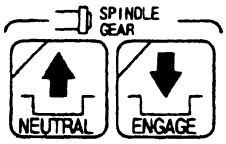
(19) SPINLDE CCW Button

Used to start the spindle in the reverse (CCW) direction.
For the multiple-machining models, the button is also used to start the M-tool spindle in the reverse (CCW) direction.

(20) SPINDLE JOG Button

The [SPINDLE JOG] button is used to jog the spindle at the speed set for a parameter. The spindle jogs while this button is held.

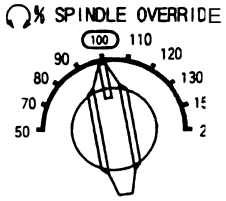
(21) SPINDLE GEAR ENGEAGE Key



For the machine equipped with a transmission, press this key to engage the spindle drive gears.
The indicating lamp at the upper left corner of the key goes on when the output of the gear range and the input pattern of the gear engage confirmation limit switches agree with each other. It blinks if they do not agree.

(22) SPINDLE GEAR NEUTRAL Key

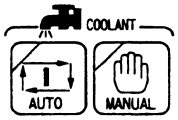
For the machine equipped with a transmission, press this key to set the spindle drive gears in the neutral state.



(23) SPINDLE OVERRIDE Dial

It is possible to override the specified spindle speed in 10 steps in the range 50 to 200%.

If the spindle speed reaches the allowable speed or the spindle speed limit set by G50 when it is overridden, the actual spindle speed is clamped at the allowable speed or the spindle speed limit.



(24) COOLANT-MAMUAL Key

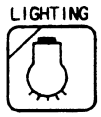
While the [COOLANT-MANUAL] key is valid (indicating lamp at the upper left corner lit), coolant can be supplied independent of the operation mode.

This key cannot be turned ON if the [COOLANT-AUTO] key is ON.

(25) COOLANT-AUTO Key

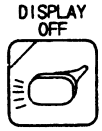
While the [COOLANT-AUTO] key is valid (indicating lamp at the upper left corner lit), coolant is supplied according to the coolant command given in the automatic or MDI mode.

This key cannot be turn ON if the [COOLANT-MANUAL] key is ON.



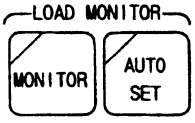
(26) LIGHTING Key

The [LIGHTING] key is used to turn on and off the work light of the machine.



(27) DISPLAY OFF Key

To turn off the display on the screen, make this key valid (indicating lamp at the upper left corner lit).

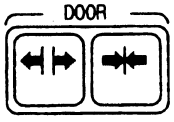


(28) LOAD MONITOR-MONITOR/AUTO SET Keys

Use these keys for the machine equipped with the load monitor specification.

(29) AIR BLOW Key

Air blow is supplied while the key is held pressed for the machine equipped with the air blow specification.



(30) DOOR-OPEN/CLOSE Keys

Use these keys for the machine equipped with the automatic door open/close specification.

(31) DOOR INTERLOCK-ON/OFF Switch

The switch is used to select whether or not the door interlock function is made valid for operations on which the interlock is set in the state the door is open.

For details of the door interlock function, refer to the Door Interlock Function Manual.

B-6 Mode Selection Keys

To operate the machine using a program, a variety of operation modes are provide.

(1) SINGLE BLOCK Key

(a) When the [SINGLE BLOCK] key is valid (indicating lamp at the upper left corner lit), a program is executed in units of blocks. To execute the next block, press the [CYCLE START] button.

(b) When the [SINGLE BLOCK] key is invalid (indicating lamp at the upper left corner unlit), program blocks are executed continuously.

(2) BLOCK DELETE Key

(a) When the [BLOCK DELETE] key is valid (indicating lamp at the upper left corner lit), commands between a slash (/) code and “ER” code are ignored.

NOTICE

: A slash code (/) must be placed at the start of a program block or immediately after the sequence number (or sequence name) of a block.

(b) When the [BLOCK DELETE] key is invalid (indicating lamp at the upper left corner unlit), commands entered following a slash code (/) are executed.

(3) OPTIONAL STOP Key

(a) When the [OPTIONAL STOP] key is valid (indicating lamp at the upper left corner lit), operation stops after the execution of an M01 block in a program. Spindle rotation and coolant supply also stop.
When the [CYCLE START] button is pressed, the previous state is recovered and the program is continuously executed.

(b) When the [OPTIONAL STOP] key is invalid (indicating lamp at the upper left corner unlit), program is continuously executed even after the execution of an M01 block.

(4) DRY RUN Key

(a) When the [DRY RUN] key is valid (indicating lamp at the upper left corner lit), axis feed is executed at the feed unit amount set for a parameter with exceptions of G00 feed and manual axis feed.

(b) When the [DRY RUN] key is invalid (indicating lamp at the upper left corner unlit), axis feed is executed at the specified feedrate.

[Supplement] To change the dry run mode valid/invalid state, it is necessary to press the [DRY RUN] key while holding down the [INTERLOCK] key.

(5) MACHINE LOCK Key

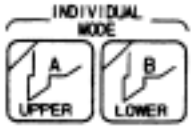
(a) When the [MACHINE LOCK] key is valid (indicating lamp at the upper left corner lit), all commands in a part program are executed without actual machine operation.

However, the actual position data and block data display are updated as the program is executed. The display of such data returns to the previous state when NC is reset.

(b) When the [MSCHINE LOCK] key is invalid (indicating lamp at the upper left corner unlit), all commands in a part program are executed normally.

[Supplement] To change the machine lock mode valid/invalid state, it is necessary to press the [MACHINE LOCK] key while holding down the [INTERLOCK] key.

(6) INDIVIDUAL MODE-TURRET A/TURRET B Keys



The individual turret operation function is valid only for the two-saddle specification.

The two-saddle specification allows cutting to be performed by controlling the four axes simultaneously. By using these keys, the following operation modes can be selected.

(a) Independent turret A operation mode

In the automatic or MDI mode of operation, only turret B side operates.

[UPPER A] key: Valid (indicating lamp at the upper left corner lit)

[LOWER B] key: Invalid (indicating lamp at the upper left corner unlit)

(b) Independent turret B operation mode

In the automatic or MDI mode of operation, only turret B side operates.

[UPPER A] key: Invalid (indicating lamp at the upper left corner unlit)

[LOWER B] key: Valid (indicating lamp at the upper left corner lit)

(c) Independent turret A/turret B operation mode

In the automatic or MDI mode of operation, turret A and turret B operate alternately according to the synchronization codes entered in a part program.

[UPPER A] key: Valid (indicating lamp at the upper left corner lit)

[LOWER B] key: Valid (indicating lamp at the upper left corner lit)

(d) Normal operation key

Simultaneous 4-axis operation is executed according to a part program.

[UPPER A] key: Invalid (indicating lamp at the upper left corner unlit)

[LOWER B] key: Invalid (indicating lamp at the upper left corner unlit)

[Supplement] To change the independent turret A/turret B operation mode valid/invalid state, it is necessary to press the [UPPER A] or [LOWER B] key while holding down the [INTELOCK] key.

(7) SEQUENCE RESTART Key

The [SEQUENCE RESTART] key is used to restart a part program from a desire block.

(8) MID AUTO MANUAL Key

To perform manual operation during automatic or MDI mode operation, press the [MID AUTO MANUAL] key.

(9) INTERLOCK Key

To change the valid/invalid state of the dry run mode, machine lock mode and independent turret A/turret B operation mode, it is necessary to press the [INTERLOCK] key at the same time the corresponding mode key is pressed.

This key is also used to start a part program from a selected block.

Although the key has indicating lamp at the upper left corner, the key is valid only while it is pressed.

B-7 Foot Pedal

In addition to the operation panel, foot pedals are used to operate the machine.

(1) Chuck Open/Close Foot Pedal

There are two types of foot pedals used for opening and closing a chuck. One type is the standard pedal in which the same pedal is used for opening and closing a chuck, and the other type is the dual-pedal type foot pedal in which the independent pedal is used for opening and closing a chuck.

(2) Tailstock Quill Advance/Retract Foot Pedal

The foot pedal used for tailstock operation can advance, retract, and inch the tailstock quill.

1-2. Setting Zero Offsets

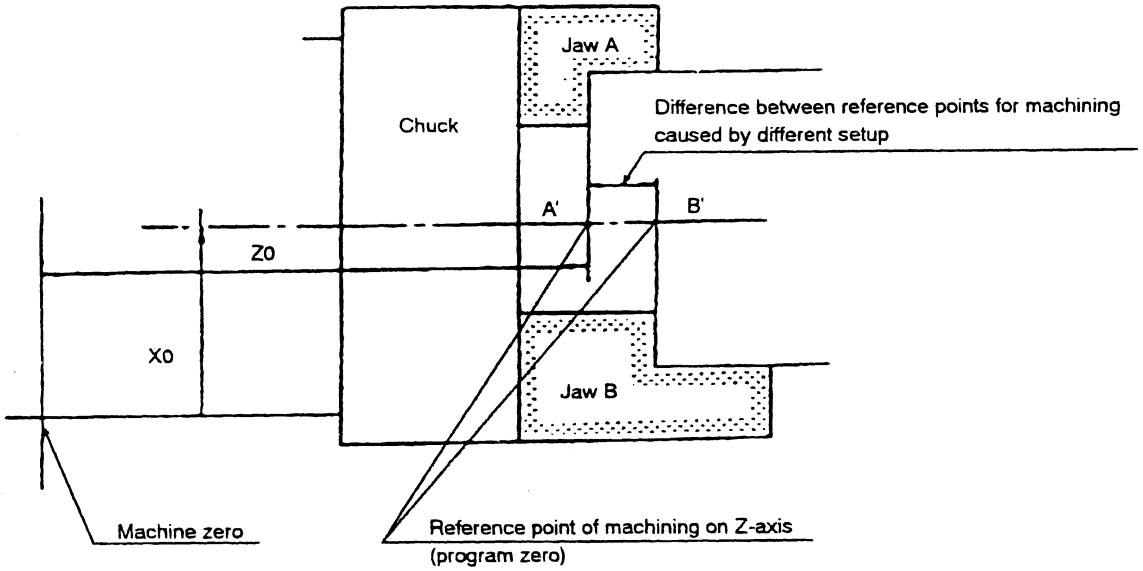
(1) What is Zero Offset?

The common coordinate position from which a complete program is made for a particular component is termed “zero point or program zero”.

The programming zero is located at the fixed position (center of the spindle) on the X-axis. However, the program zero on Z-axis will vary depending on the setup (incl. Chuck, jaws, etc.).

Within the NC lathe, the program origin (program starting point) is fixed anywhere on the Z-axis, that is, on the longitudinal axis of the spindle. It may vary with respect to the direction of Z-axis, according to the chucking requirements. As shown below, there is a difference in the coordinate position of zero points between one program using jaws A and another program using jaws B. This is caused by the difference in jaw sizes used in respective programs.

The zero offset features provides for shifting the zero point the program with respect to the zero point of the machine to match differences in individual workpieces or setups.

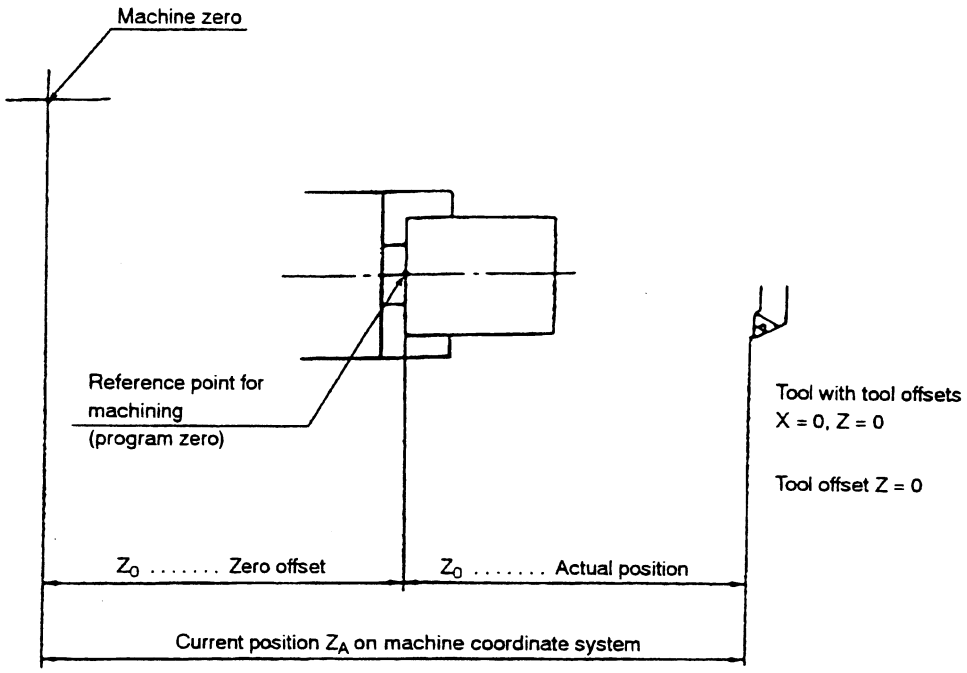


The operator can establish the reference point for machining (zero point of a program) by entering X_0 and Z_0 through the keyboard dimensioned from the fixed zero point the machine.

“X_0,Z_0” is called Zero Offset Values.

(2) Relation between Machine Zero, Program Origin, Zero Offset Value and Actual Position

Shown below is the positional relationship between the factors involved in the zero offset function:



Current position Z_A on machine coordinate system

The NC machining program needs distance Z as absolute position of the tool at A.

The control always performs calculation "Z_A5-Z_05" to obtain distance Z, i.e., the absolute position of the tool.

The operator can set the reference point of machining (machining origin) at any desired point by entering zero offset value Z_0.

(3) Setting Zero Offset Values

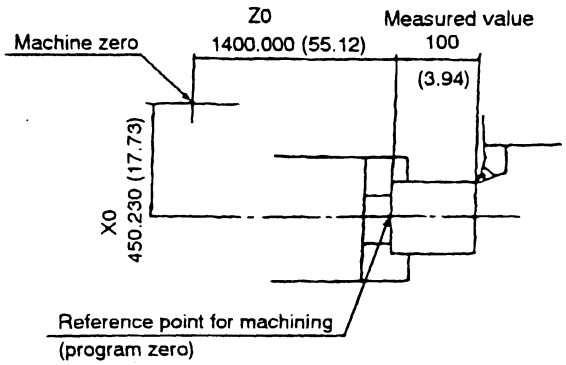
There are three possible cases for entering zero offset values:

a) Where zero offset values are known, as in cutting the first workpiece for instance.

b) Where offset values are known, as in cutting workpieces of repetitive lots.

c) Where the stored offset values are modified.

Explanation for each case is provided in this paragraph with the following example.



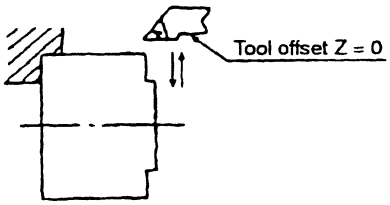
a) Case where zero offset value is unknown:

The explanation below is provided with 1 mm (0.04 in.) unit system.

To set the zero offset value of Z-axis, proceed as follows.

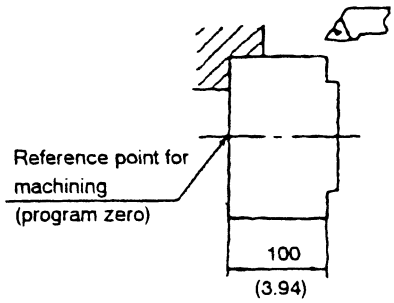
Procedure:

1) Turn the end face of the part with a proper depth of cut in the manual mode.

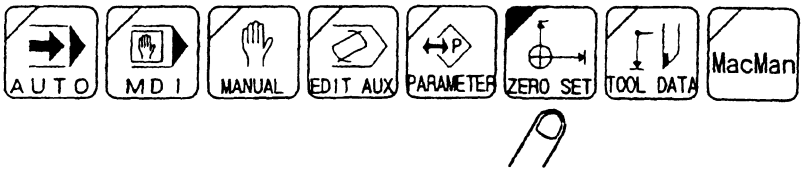


2) Measure the workpiece length to obtain the actual position of the tool dimensioned from the program zero.

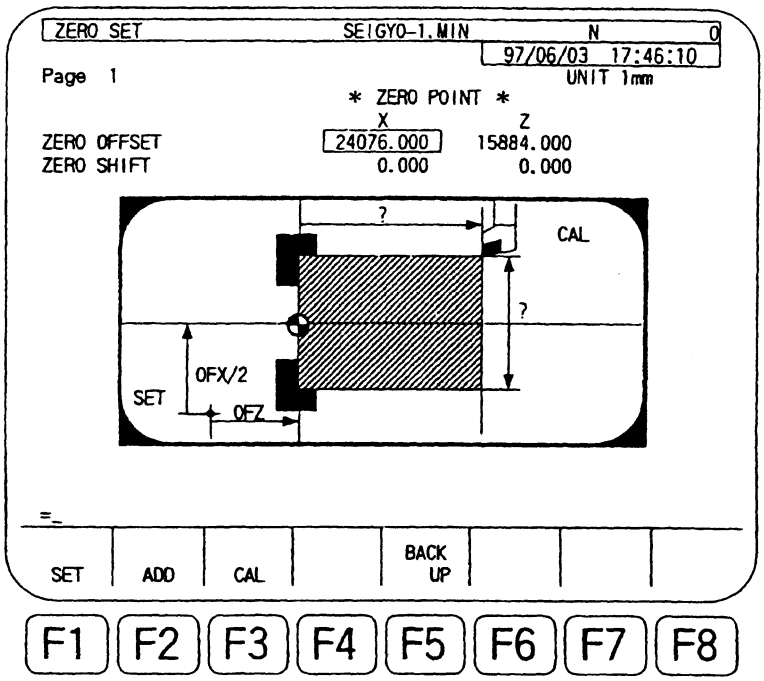
Assume this dimension is measured as 100 mm (3.94 in.) (100.000).



3) Select the ZERO SET mode pressing the ZERO SET key.

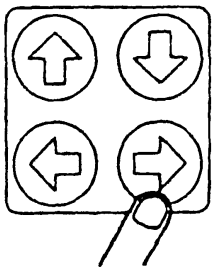


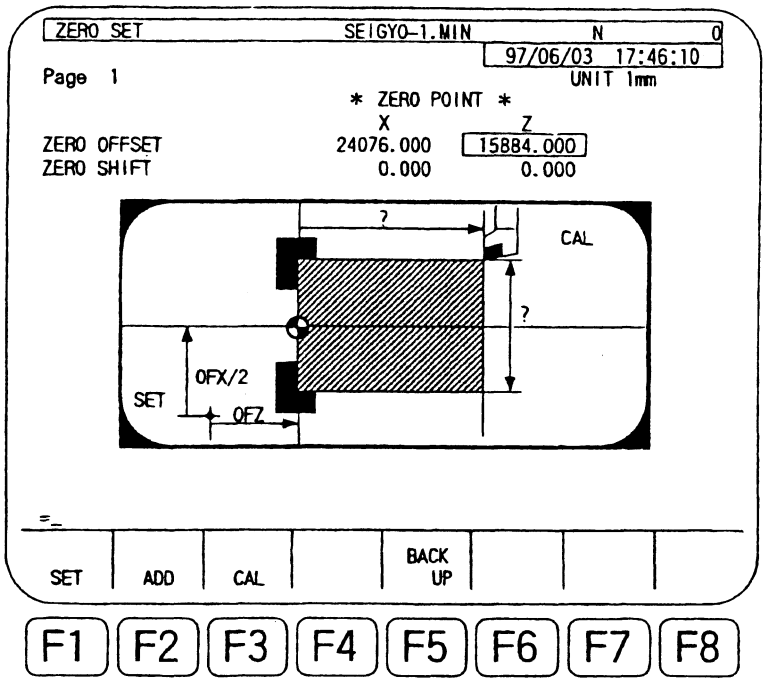
4) The display screen is as shown below.



5) Select the turret, either A- or B-turret (for two-saddle and two-turret models).
Each time [ﾀﾚｯﾄ] or [ﾀﾚｯﾄ] is pressed, turret A and B is selected alternately.

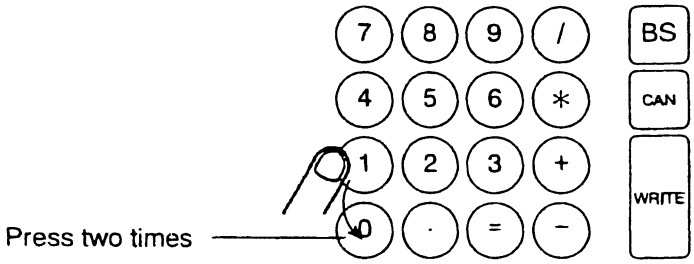
6) With the cursor control keys, move the cursor to the data column of ZERO OFFSET –ZA.

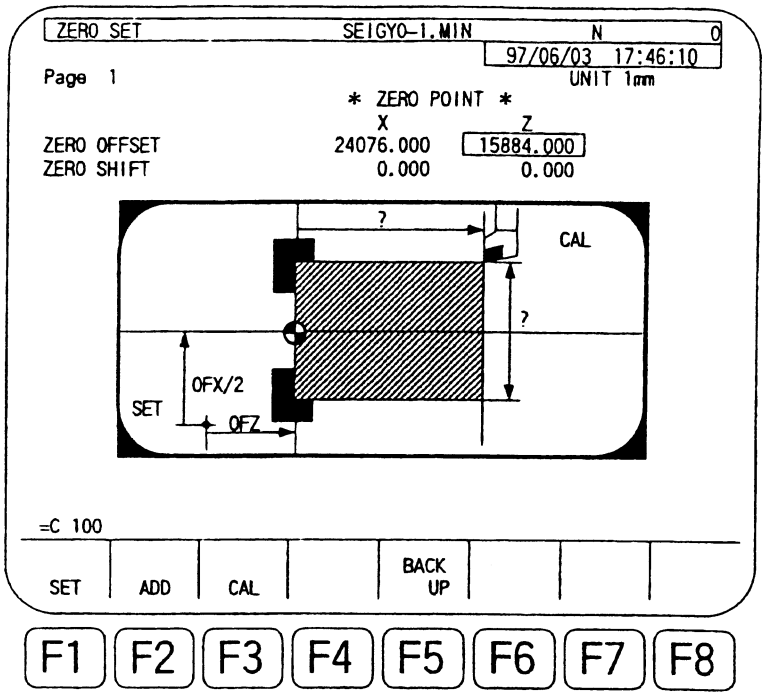




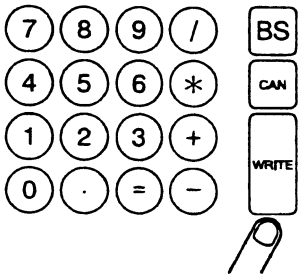
7) Press function key [F3] (CAL).

8) Key-in [1][0][0] through the keyboard.



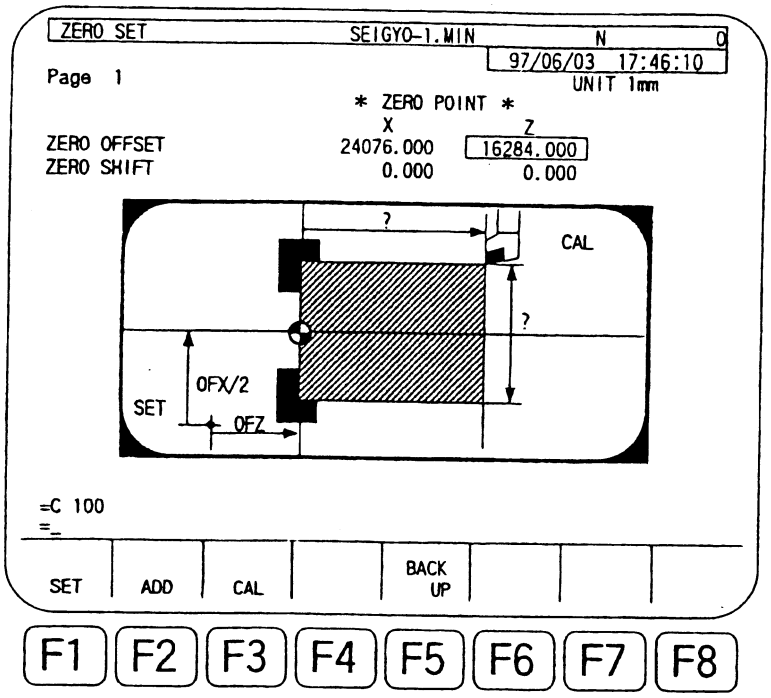


9) Press the WRITE key.



With this, the coordinate system is established so that the present tool position takes coordinate value Z100 mm.

10) The display screen displays the results of calculation or set value.



11) The setting of the zero offset value is complete.

CAUTION

: (1) Never move the turret in the Z-axis direction until zero offset setting is complete.

(2) For the X-axis, the reference point does not change even when the checking method or setup changes. Therefore, there is no need to carry out zero offset each time the set up changes.

(3) Use a tool with offset values of X=0, Z=0, where practicable, for zero offset setting. If the tool-offset values are not zero, the offset setting procedure will differ from the procedure indicated above. Refer to the following page.

When a tool with tool offset values is used to set the zero offset value:

The numerical data to be entered through the keyboard is the sum of “measured valuer” and “tool offset value”.

Setting value = Measure value + Tool offset value

Example: A tool with a tool offset value of Z = – 0.500 is used.

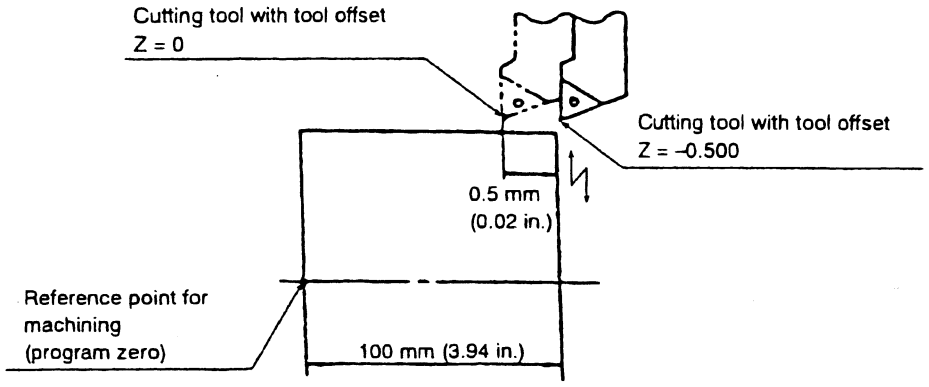
The zero offset value is calculated as

100.000 + (-0.500) = 99.500

Setting value

Tool offset value

Measured value



If the work-piece length is 100 mm (3.94in.) when it has been cut using a tool with a tool offset of Z = -0.500 mm(0.02in.), the position of the tool with a tool offset of Z=0 is 99.5mm(3.92in.) from the reference point (program zero).

A procedure that does not require a modification of the set zero value is described below.

1. Carry out step 1) and 2) as explained before.
2. Enter tool offset data to tool offset #1 register.
   To enter tool offset, refer to 3-2-3.
3. Cut the end face of the part by moving only the X-axis in the **MDI** mode with
   T01 01 active. (Refer to 3-3.)

Tool No. Tool offset No.

4. Carry out steps 3) through 9) as explained before.

With the procedure above, it is not necessary to modify the zero offset value by taking the tool-offset value into consideration.

[Supplement: Never reset the control after setting in the MDI mode.

.

b) Where the zero offset value is known.

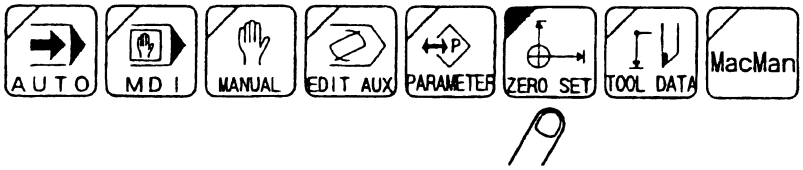
To set zero offset value of X-axis, proceed as follows:

Example: X_0=450.230

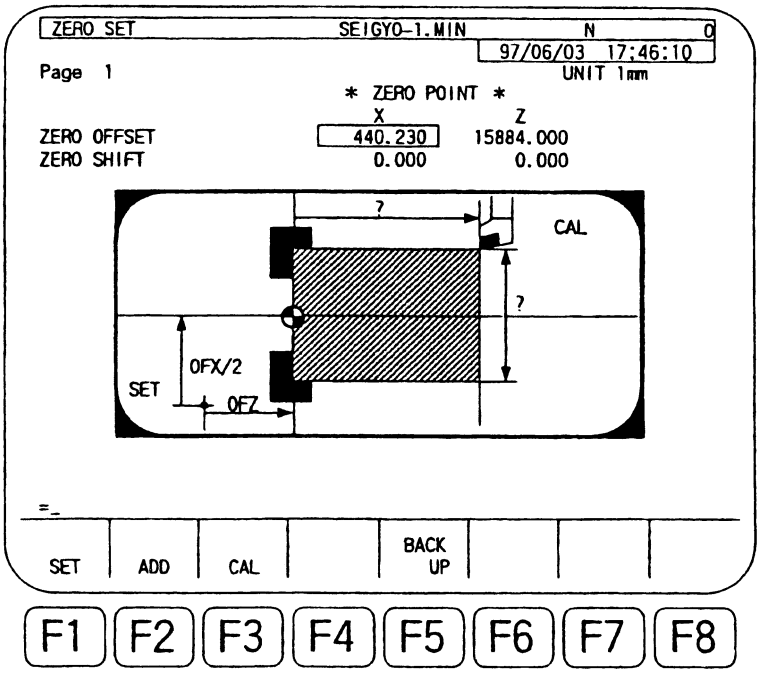
Z_0=1400.000

Procedure:

1) Select the ZERO SET mode by pressing the ZERO SET key.



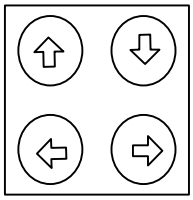
2) The display screen is as shown below.



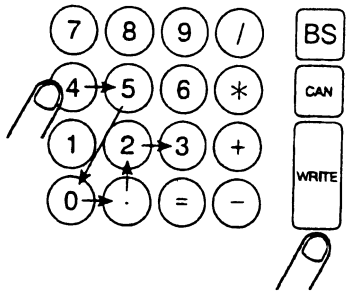
3) Select the turret, either A- or B-turret (for two-saddle and two-turret models).

Each time or is pressed, turret A and B is selected alternately.

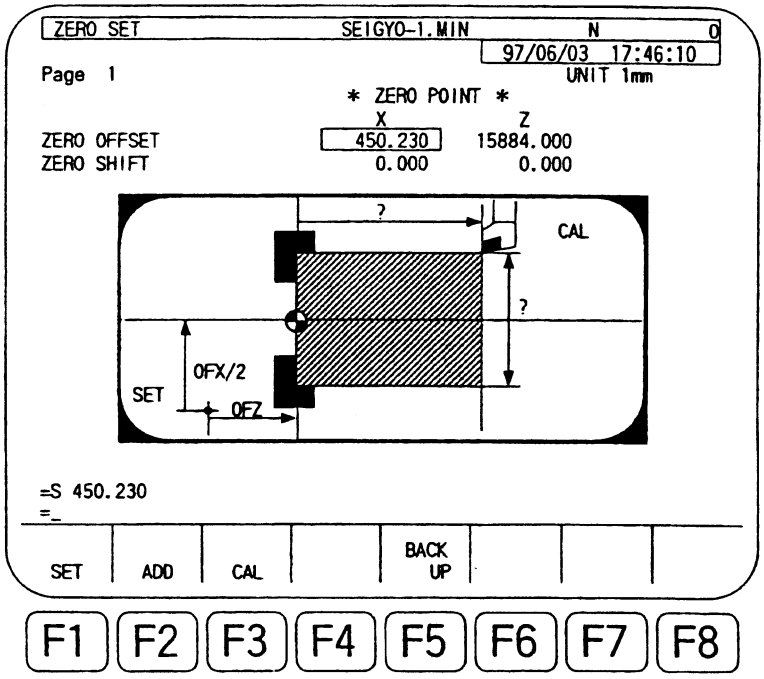
4) With the cursor control keys, move the cursor to the data column of ZERO OFFSET –XA.



5) After pressing function key [F1] (SET), key in [4][5][0][.][2][3] through the keyboard.



6) Press the WRITE key.



With the steps indicated above, keyed-in zero offset value is stored in the zero offset area of the memory.

For Z-axis zero offset entry, the same procedure applies.

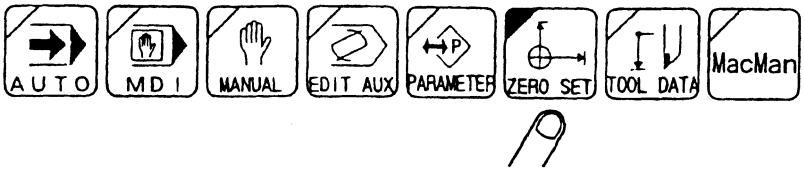
c) Where the stored zero offset value is to be modified:

Example: X0=450.230 . . . . . to subtract 10.000

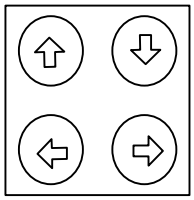
Z0=1400.000 . . . . . to add 10.000

Procedure:

1) Select the ZERO SET mode by pressing the ZERO SET key.

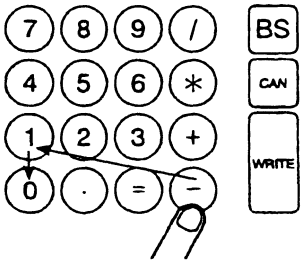


2) With the cursor control keys, move the cursor to the data column ZERO OFFSET –XA.

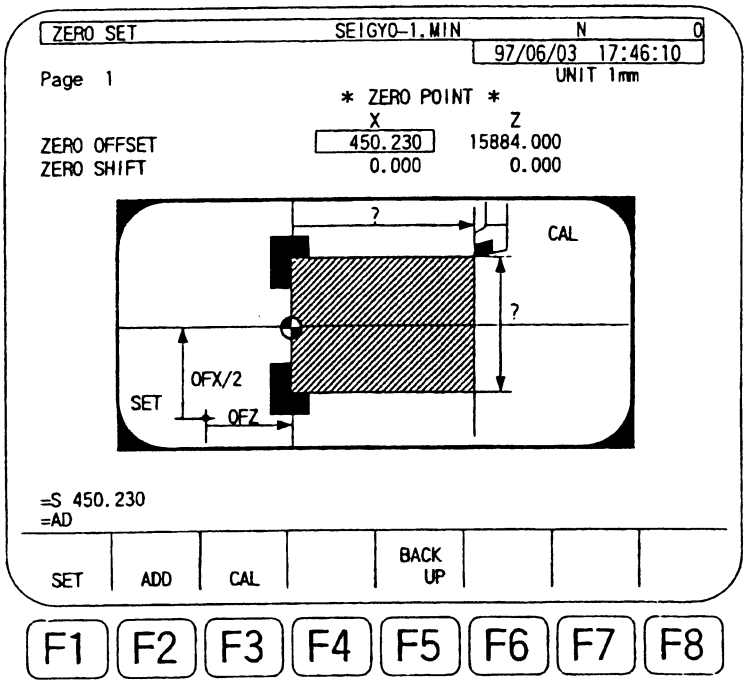


3) Press function key [F2] (ADD).

4) Key in [-][1][0] through the keyboard.

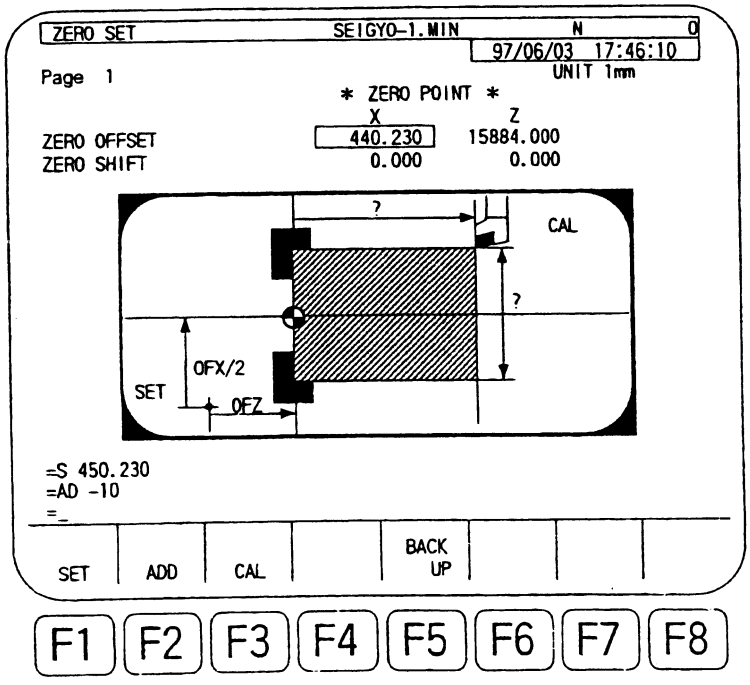


5) The corresponding display screen is:



6) Press the WRITE key, and the display screen changes as shown below.
With the WRITE key pressed, the following calculation is performed in the control and the result is stored as the X-axis zero offset value.

450.230 + (-10.000) = 440.230



For Z-axis zero offset entry, the same procedure applies.

1-3. MC user parameter

The parameters that control the machine operation are largely classified into the following:

(1) User parameter

(2) Chuck/tailstock spindle

(3) Common variables

(4) NC work counter

NC hour meter

(5) System parameter

Feed axis control parameter

Turret position error compensation

M-tool spindle control parameter

Turret axis control parameter

(6) Optional parameter

(7) Optional parameter (long word)

(8) Optional parameter (word)

(9) Optional parameter (bit)

(10) Tool interference parameter

(11) Turret index angle

(12) Machine user parameter

(13) Machine system parameter

About the details of MC user parameter, refer to the OSP U100L/10L OPERATION MANUAL, Part Ⅳ PARAMETER.

1-4. Alarm

The machine alarms are detected by NC and PLC.

Alarms to be detected by the NC unit are classified into 6 types: CPU alarm, alarm P, A, B, C and D. About the details of the alarms of NC, refers to the OSP-U10L ALARM & ERROR LIST.

PLC Alarms are classified into 4 types: A, B, C, and D as shown in the table below:

Alarm type	Alarm No.
A	1700~1799
B	2700~2799
C	3700~3799
D	4700~4799

About the details of the alarms of PLC, refer to the SECTION 6 TECHNICAL DATA 16. PLC ALARM LISTS.

1-5. Operation of Safety Interlock

Door Interlock E Specification

	Door Open / Door Closed			
	Interlock Valid		Interlock Invalid	
	Auto	Manual	Auto	Manual
Spindle Rotation	X / O	X / O	X / O	1* / O
Feed Axis Movement	X / O	X / O	X / O	2* / O
Turret Rotation	X / O	X / O	X / O	3* / O
Chuck Clamp/Unclamp	O / O	O / O	O / O	O / O
Tailstock Adv./Ret.	O / O	O / O	O / O	O / O

O : Enable

X : Disable

1*: Spindle rotation is limited under 50 rpm.

2*: Axis speed is limited under 2 m/min.

3*: Turret Rotation is only one index.

1-6. Measures for Operation in Extreme Cold Regions

When room temperature is 5°C or less, execute a 10- to 30-minute machine warm-up before beginning operation. A low room temperature could cause turret-indexing problems.

2. MACHINE OPERATION

2-1. Hydraulic Unit

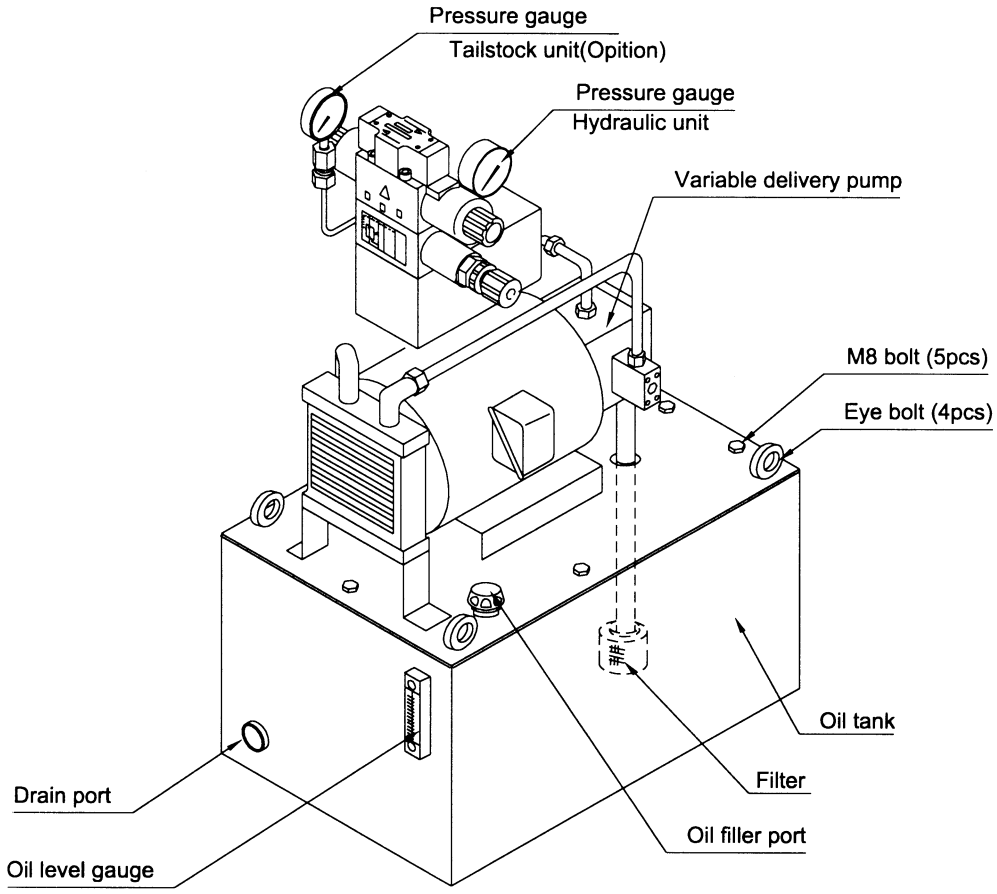


Fig.3-1 Hydraulic Unit

(1) Pressure Indication

Pressure setting for the hydraulic unit should be:

Pressure setting	3.9 Mpa {40kgf/cm^2 (568.8 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 personal, 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.)

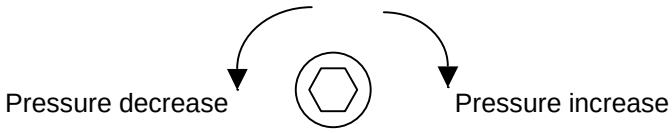


Fig.3-2 System Pressure Adjusting Valve

b) Hydraulic pressure for power chuck
Refer to 2-3. (2).

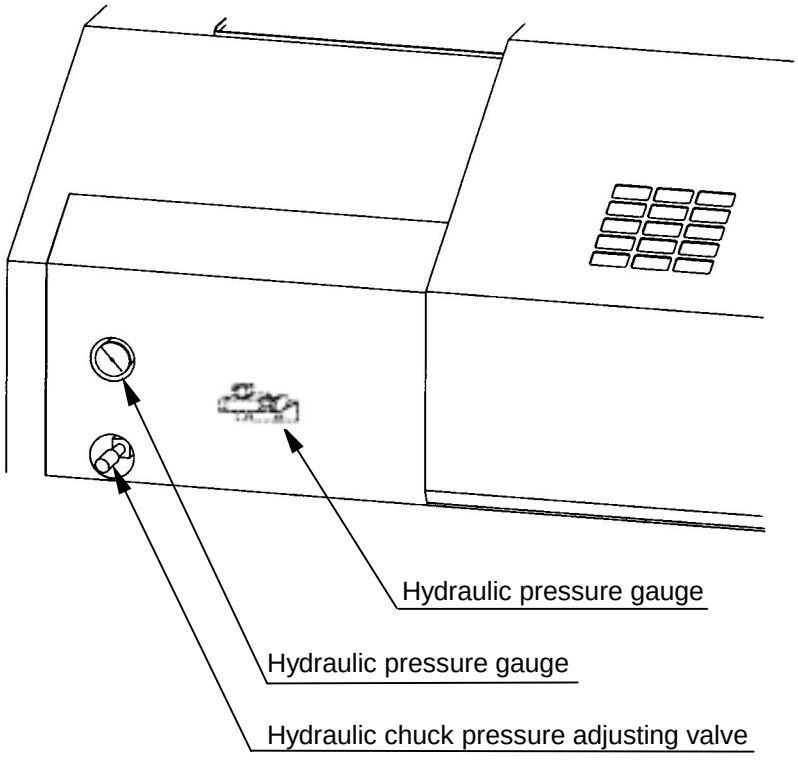


Fig.3-3 Hydraulic Pressure for Chuck

C) Low pressure chuck switch (optional)

The low pressure chuck switch has been pre-set 5 +/- 1 kg/cm² (71 +/- 14 psi). However, since the chuck pressure will require adjustment by the operator for the giving application, the low pressure chuck switch can also be adjusted, if desired, for the same application.

The following is the procedure to adjust the low pressure chuck switch(Refer to fig 3-3):

1) Use the chuck pressure gage to set the low pressure chuck switch. Adjust the chuck pressure valve until the pressure the gage reads is below the value desired for the low pressure switch.
   Slowly increase the pressure on the low pressure chuck switch until the “CHUCK PRESSURE LOW” disappear from the screen display. The low pressure switch set is compelete.
2) Adjust chuck pressure valve to the correct pressure for the type of chuck being used.
3) Press the reset button.

(3) Hydraulic Oil

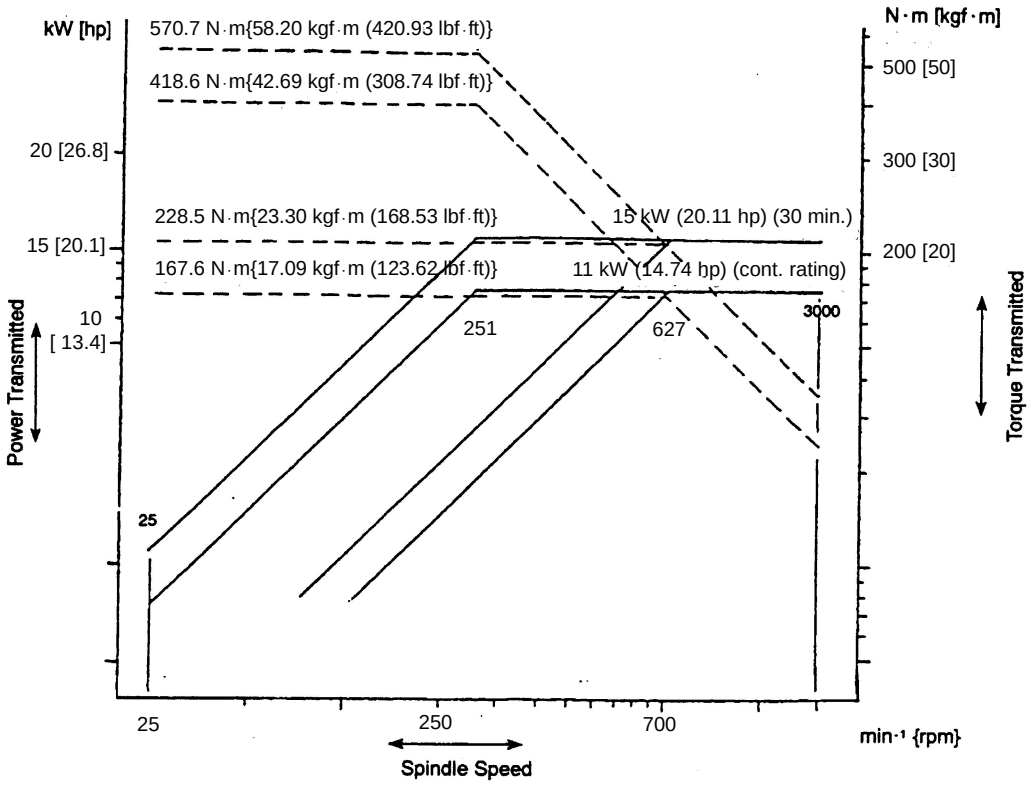
Oil specification	HL32 (MAS)
Amount	22 liter (5.81 gal)
Oil change interval	Change after first month of operation and every 6-month thereafter.

NOTICE

Clean the suction filter and the tank when changing the oil. Check the pressure for respective actuators.

2-2. Selection of Spindle Motor Speed

(1) Spindle Power Transmission Torque Diagram-3000 min^{-1} {rpm} Specification for 15 / 11 kW



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

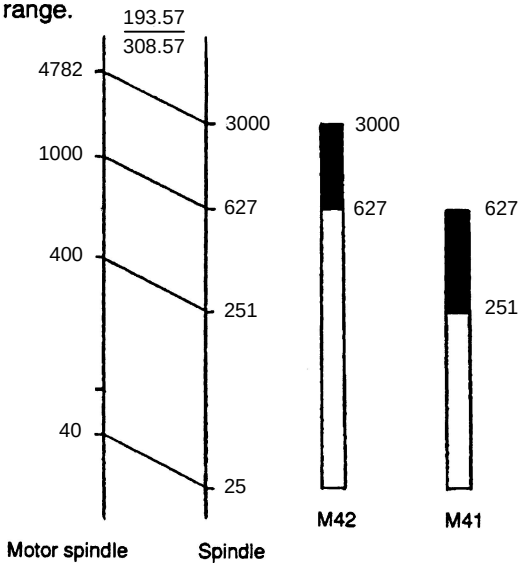
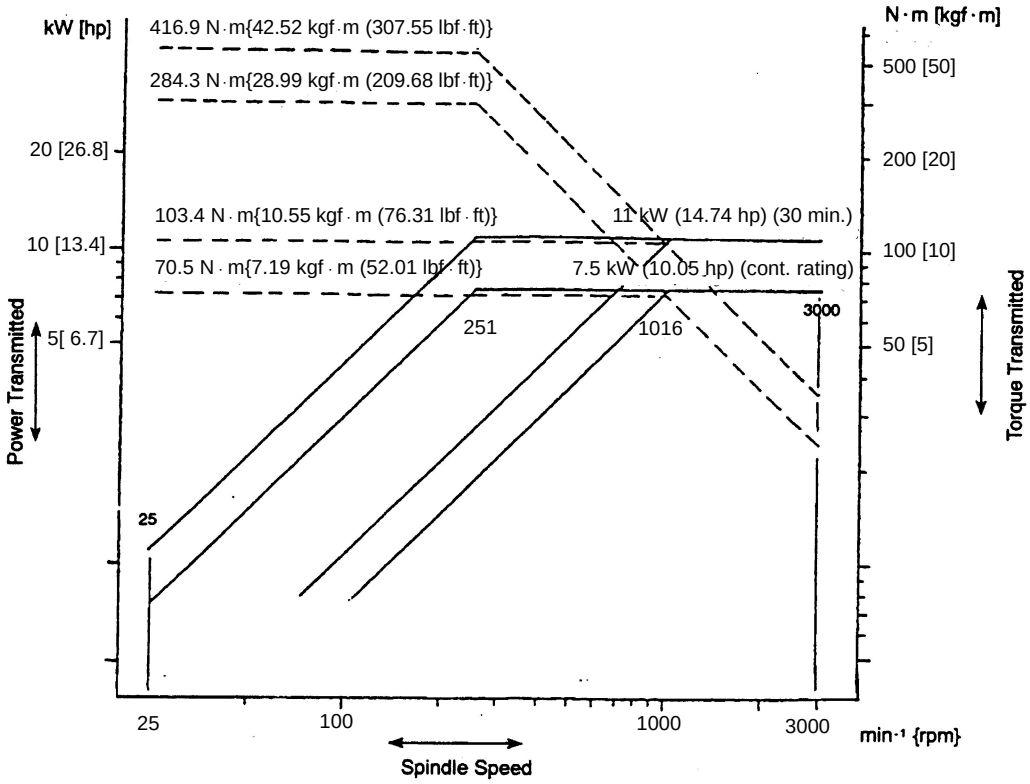


Fig.3-4 Spindle Power Transmission Torque Diagram 3000 min^{-1}{rpm} Specification for 15 / 11kW

CAUTION : Also refer to the Hydraulic Chuck Clamping Force Characteristic Diagram (the graph showing the relationship between chuck rotating speed and clamping force.

(2) Spindle Power Transmission Torque Diagram-3000 min^{-1} {rpm} Specification for 11 / 7.5 kW



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

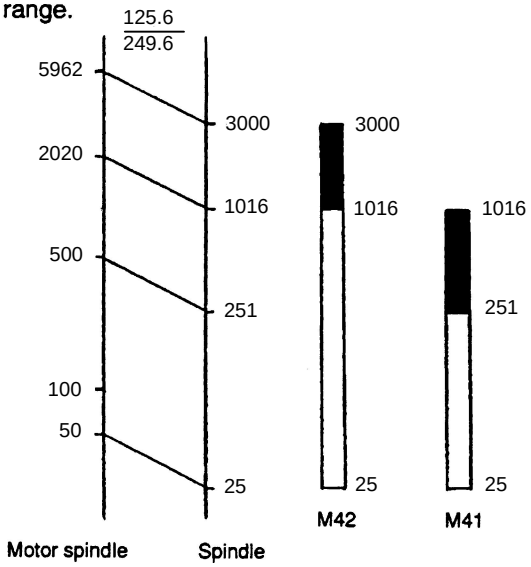


Fig.3-5 Spindle Power Transmission Torque Diagram 3000 min^{-1}{rpm} Specification

CAUTION

: Also refer to the Hydraulic Chuck Clamping Force Characteristic Diagram (the graph showing the relationship between chuck rotating speed and clamping force.

2-3. Hydraulic Chuck

(1) Construction

The construction of hydraulic chuck is shown below.

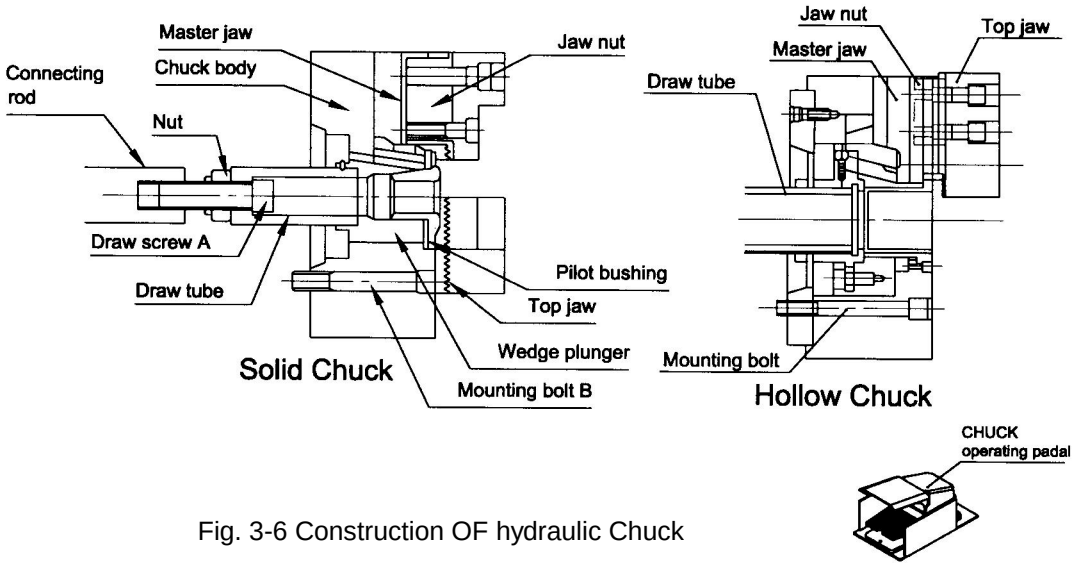


Fig. 3-6 Construction OF hydraulic Chuck

(2) Installation of Hydraulic Chuck

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. These causes the connecting rod in the spindle bore to move forward.

Procedure:

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

Connecting rod advance
(Draw tube advance)

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

Use the Allen wrench furnished with the machine

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

The individual chuck jaws can be moved in the “opening” direction as 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).

⚠ WARNING : If you enter the area inside the cover to change the chuck, jaws, contact block, etc.,

- Shut off power and ensure the safety for your work.
- Do not carry out your work by using M19 (spindle orientation) or M110 (C-axis joint) command.

(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.

Hollow chuck cylinder

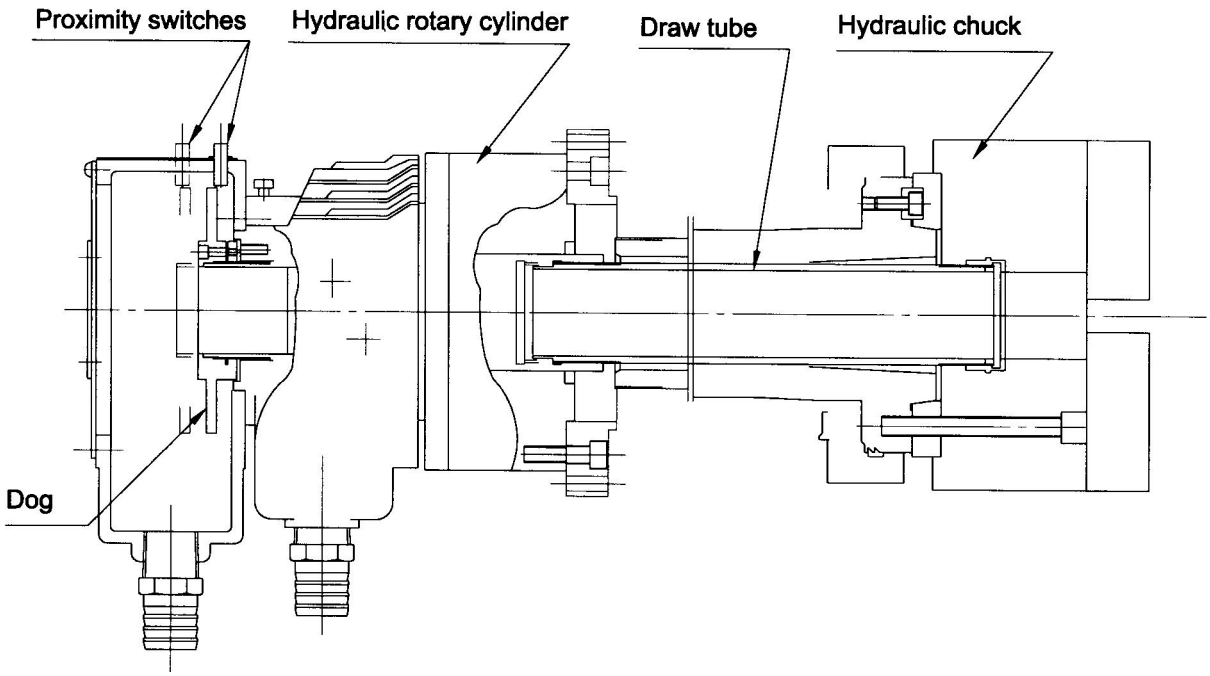


Fig. 3-7 Hollow Chuck Cylinder

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

(4) Adjusting Proximity Switch longitudinal Position (Optional)

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.

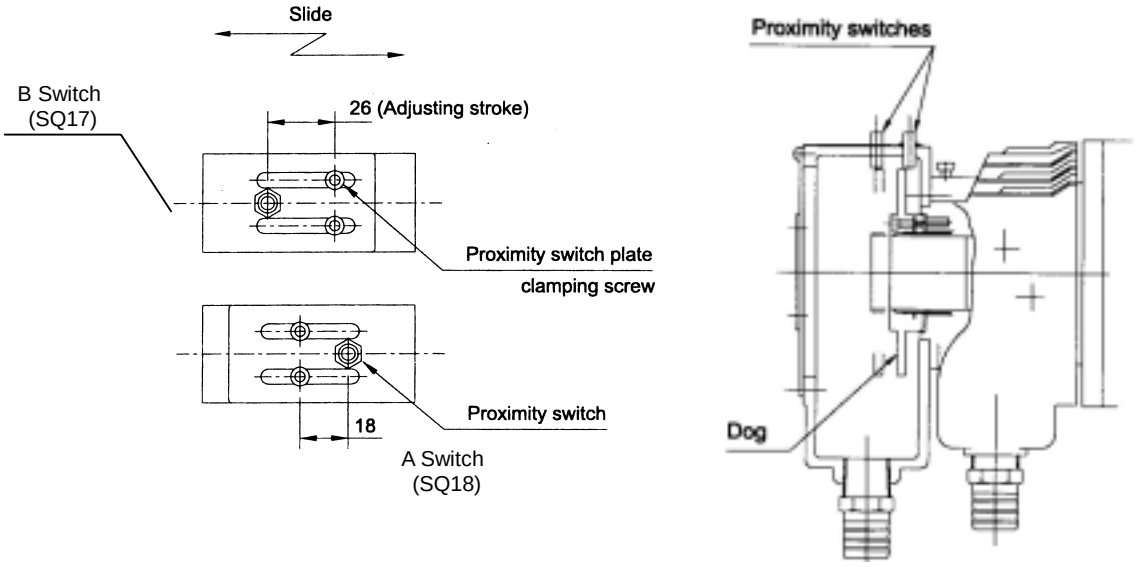


Fig. 3-8 Adjustment of Proximity Switch Position

⚠CAUTION

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

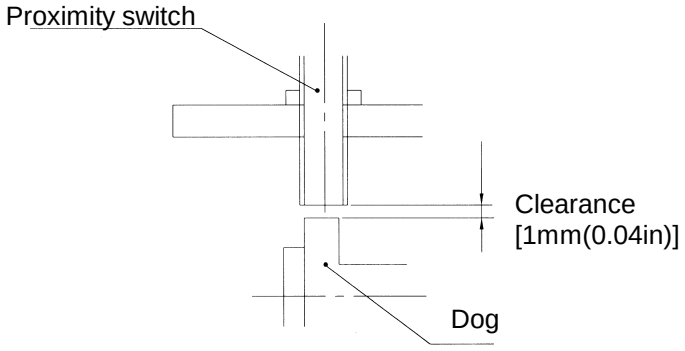


Fig.3-9 Clearance Between Proximity Switch And Dog

Chuck Unclamp Conditions (M84)

	B Switch	A Switch	Chuck PS
OD Chucking	OFF	ON	OFF
ID Chucking	ON	OFF	ON

Chuck Clamp Conditions (M83)

	B Switch	A Switch	Chuck PS
OD Chucking	ON	OFF	ON
ID Chucking	OFF	ON	OFF

(5) Setting Proximity Switches

a) OD chucking

Set the proximity switches at the positions as indicated below:

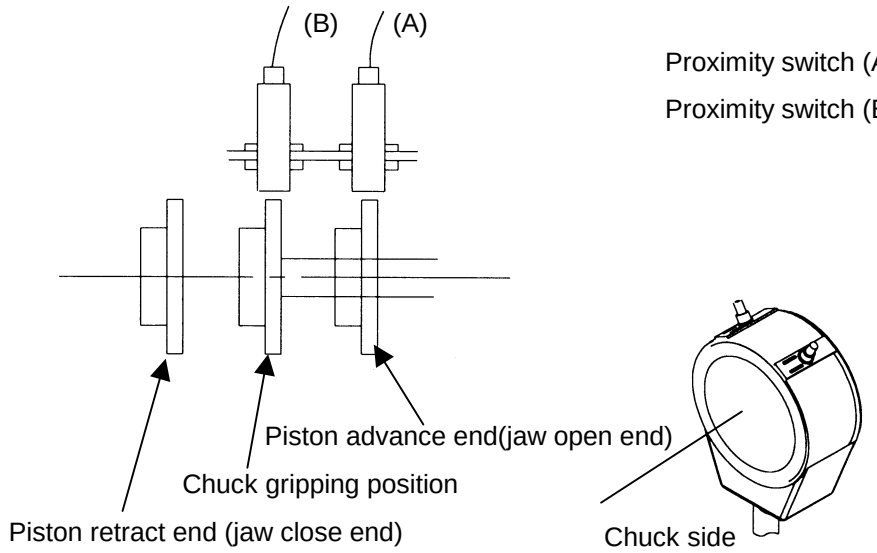


Fig. 3-10 Setting Proximity Switches (OD Chucking)

b) ID chucking

Set the proximity switches at the position as indicated below:

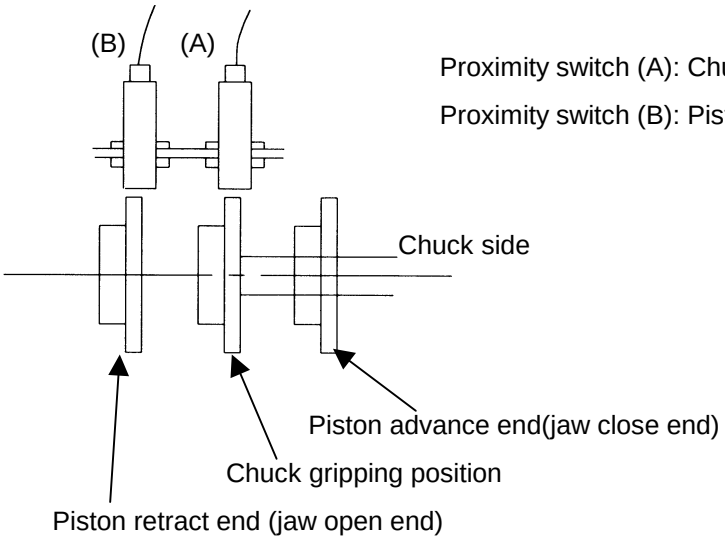


Fig.3-11 Setting Proximity Switches (ID Chucking)

Note: According to the OD/ID chucking, the 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.

(6) Confirmation Signals

a) Signal input statute display

Whether or not the proximity switches are set corresponding signals are input can be checked by the date display screen.

For the procedure to display the CHECK DATE screen, refer to OSP MAINTENANCE MANUAL.

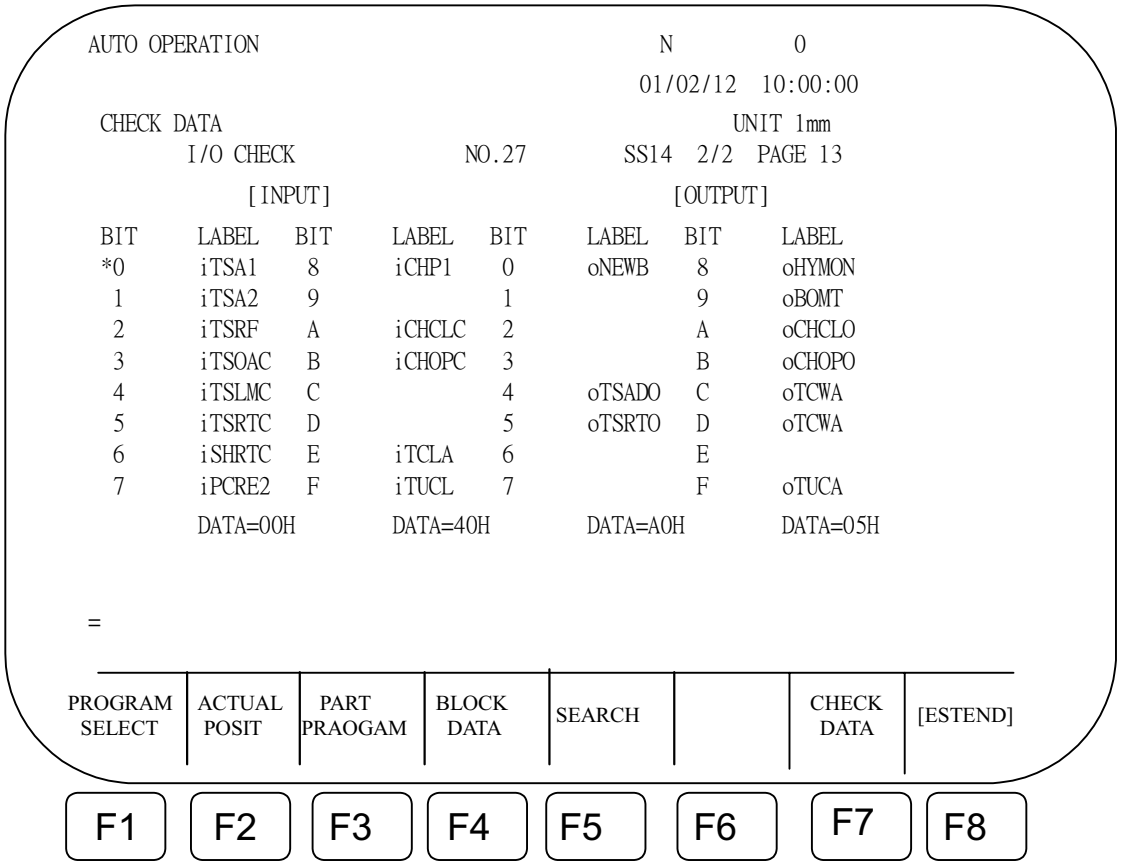


Fig 3-12 Signal Input Status Display

b) Check input signals

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

OD chucking:

At chuck gripping position
iCHOPC....blank
iCHCLC....black
At piston retract end position
iCHOPC....blank
iCHCLC....black

ID chucking:

At chuck gripping position
iCHOPC....blank
iCHCLC....black
At piston advance end position
iCHOPC....blank
iCHCLC....black

(7) 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 increases the working oil pressure directed into the chuck cylinder and counterclockwise turn decrease it.

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

(8) 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 (kg/cm^2)	lb/in^2	Min^{-1}(rpm)	Type of Cylinder
1	Solid type N-210A8	2.44 (25)	354	3000	M1870
2	Solid type N-212A8	2.44 (25)	354	3000	M2091
3	Hollow type B-210A8	2.44 (25)	354	3000	M1870
4	Hollow type B-212A8	2.55 (26)	370	3000	M2091

⚠ CAUTION

: 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 nameplate at the front cover of the machine.

(9) How to Set Maximum Spindle Speed

The maximum spindle speed to which 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.

(10) Hydraulic Chuck Clamping Force Characteristics Diagram

a) For hollow chuck

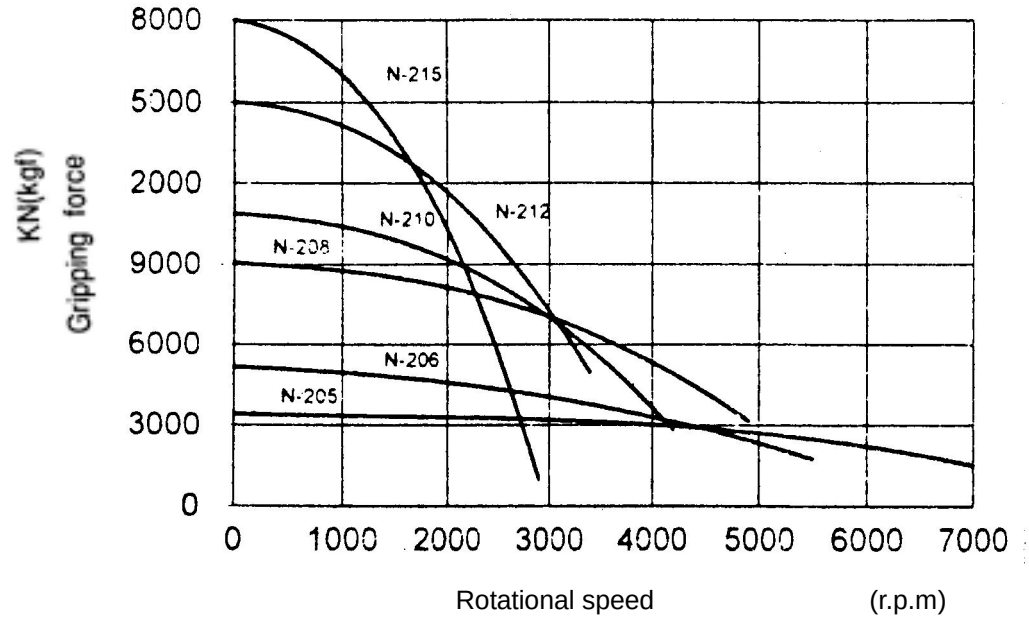


Fig.3-13 Chuck Speed –Gripping Force Diagram (for Hollow Chuck)

b) For solid chuck

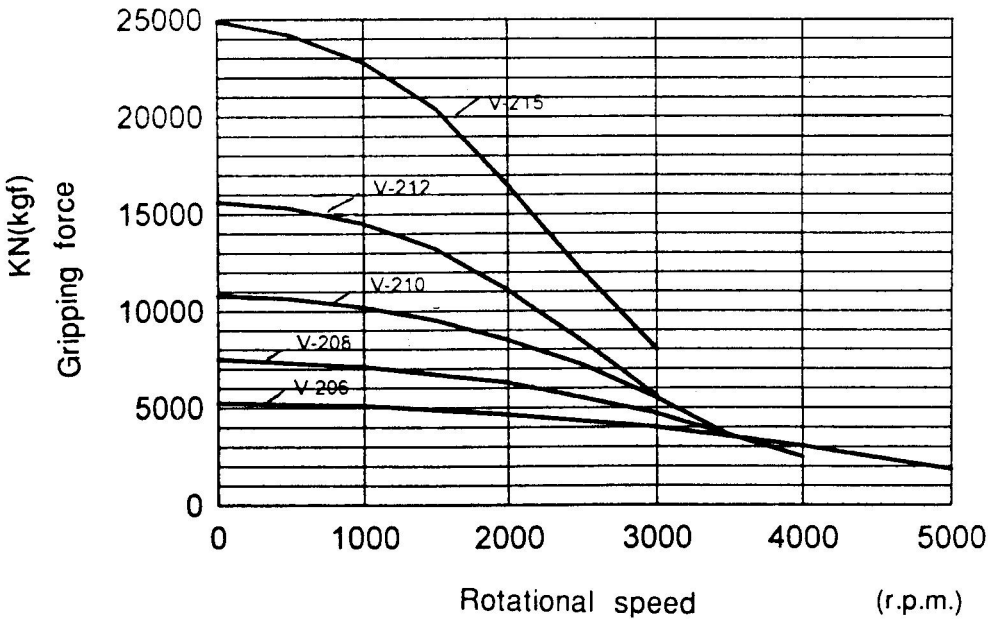


Fig 3-14 Chuck Speed –Gripping Force Diagram (for Solid Chuck)

(11) General Precaution for Using Power Chucks

CAUTION

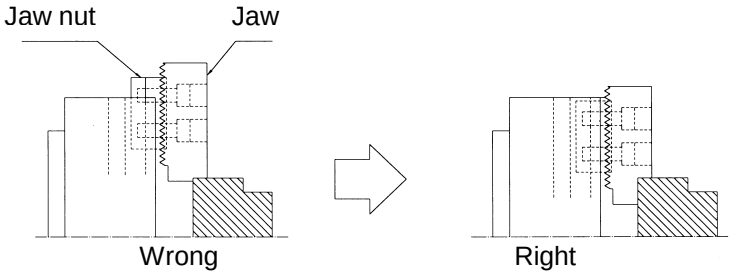
: In order to insure maximum safety in operation, the following points call for your special notice:

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

b) Workpieces should be clamped in the chuck without unbalance. Selection of cutting conditions must be made referring to (10) "Hydraulic Chuck Clamp 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 provides 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.



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

⚠CAUTION	: The chuck has grease nipple either on the chuck front face or on its periphery. Apply grease (XM2, MAS) 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 hydraulic oil (HG68, MAS).

(14) Chuck Operation

According to the work type, set the Center-work/Chuck-work parameter mode setting.

Chuck-work: a) Load the workpiece. (If the weight of the workpiece is heavier than 5kg, apply the lifting device for safety consideration.)

b) Step chuck operation pedal to grip the workpiece.

Center-work: a) Step the right foot pedal switch to retract the sleeve to the right.

b) Load the workpiece.

c) Step chuck operation pedal to grip the workpiece.

d) Depress slightly the left foot pedal switch to get the quill tip close to the workpiece.

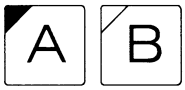
e) Depress fully the left foot pedal switch to get the quill tip to stick the workpiece.

2-4. Manual Turret Operation

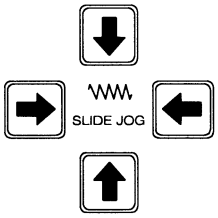
(1) Turret Movements at Rapid Traverse

a) Select the MANUAL mode.

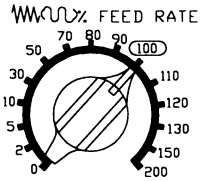
b) Select the turret.



While a SLIDE JOG button on the NC operation panel is held down, the turret moves in the direction of the arrow printed on the pressed button switch.



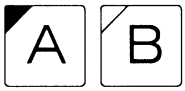
The turret feedrate can be changed using the FEEDRATE override dial. The standard feedrate is 100.



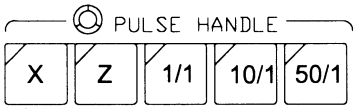
(2) Turret movements using pulse handle.

a) Select the MANUAL mode.

b) Select the turret.



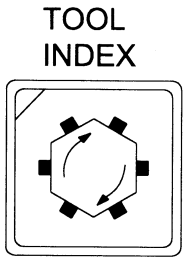
c) Select X- or Z- axis and a required magnification by pressing PULSE HANDLE switches.



d) When the pulse handle is rotated clockwise, the turret moves in the positive (+) direction.
When rotated counterclockwise, the turret moved in the negative (-) direction.

(3) To rotate the turret, select MANUAL mode.

If the button illustrated below is pressed momentarily, the turret rotates by one station. If kept pressed, the turret continuous rotation.



CAUTION	: Before indexing a tool by turret rotation, move the turret to a position where the tool will not interfere with the workpiece or the chuck. The turret may not be clamped completely for 0.5 second after turret rotation; therefore, do not attempt cutting at this moment.

2-5. 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 hand-wheel
- 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 ㎜ (2.75in.) with a depth of 15 ㎜ (0.6in.) by use of the manual data input.

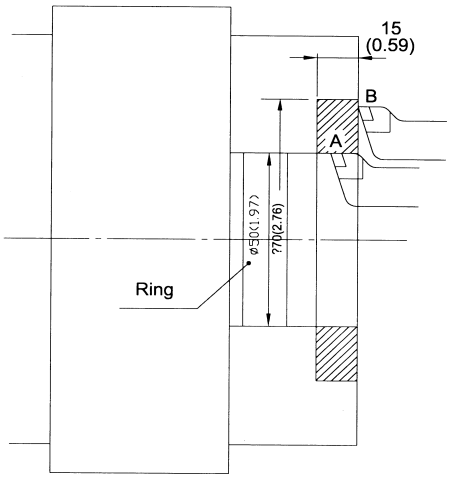


Fig.3-15 Cutting Soft Top Jaws

(1) Procedure

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

ϕ50 ㎜(2in.) 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 ㎜ (2in.) in this case.

Actual position: X=50.000 ㎜

(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 ㎜ (0.6in.) in this case.

Actual position: X=15.000 ㎜

(X=0.6000 in.)

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

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

G50				SOOO		
G00	X60	Z 18		SOOO	M41	M03
G01		Z 0.1	F0.1			
G00	X58	Z 18				
	X69.6					
G01		Z 0.1				
G00	X67	Z 18				
	X70					
G01		Z 0				
	X48					
G00		Z500				M05

2-6. Hydraulic Tailstock Operation

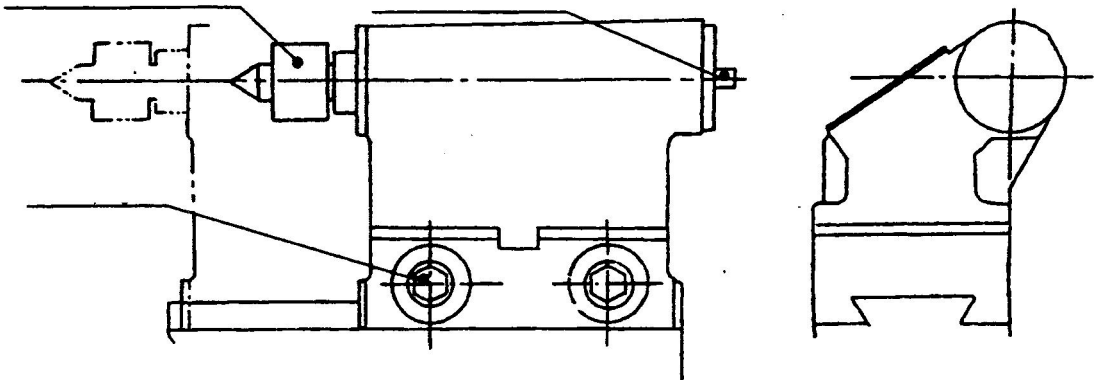


Fig.3-16 Tailstock Position Setting

(1) Positioning the Tailstock

To change the tailstock position, loosen the two tailstock clamping bolts and move it to the required position along the bed. Turn the clamping bolts into the clamp position to clamp the tailstock against the bed.

(2) Adjusting Tailstock Sleeve Thrust

NOTICE :Tailstock Sleeve thrust can be adjusted by the pressure adjusting valve at the right side of the machine front. For details, refer to 2-1. (2). The maximum hydraulic pressure for tailstock thrust is 1.52 Mpa {15.5 kgf/cm^2 (220.56 psi)} and the thrust with such pressure setting is 4900N{500kgf (1100lbf)}.

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.

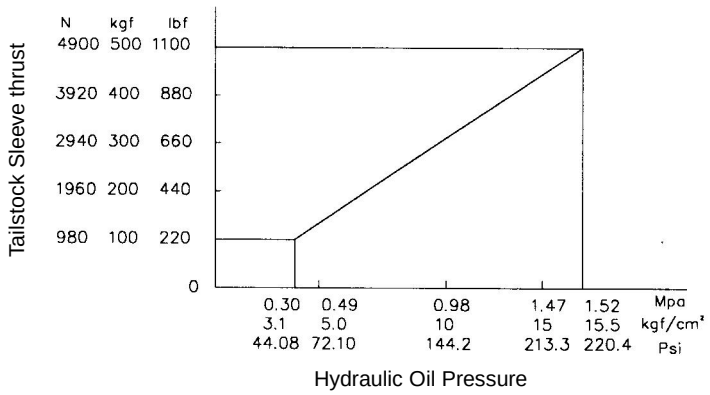
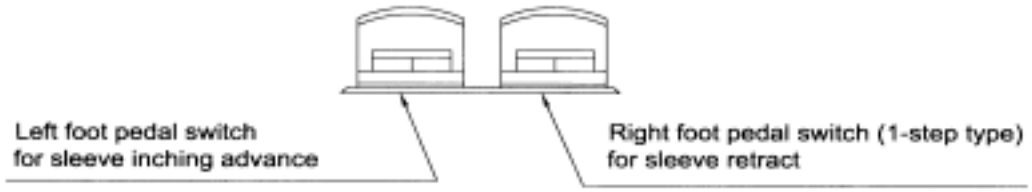


Fig.3-17 Relation between Hydraulic Oil Pressure and Tailstock Sleeve Thrust

(3) Advancing/Retracting Tailstock Sleeve

The foot-operated pedal switches located at the front of the machine can perform advance and retraction of the tailstock sleeve.



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

First slight-depress of pedal:

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

Second full-depress of pedal:

The sleeve advances up to the stroke end while the pedal is depressed fully.

When the tailstoke is in the specified position, the spindle rotation output is acknowledged. If the tailstock has not reached the position, the output is ignored.

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

(4) Center-work/Chuck-work Setting

The tailstock setup (for center-work tailstock is used, for chuck-work tailstock is not used.) condition should be set to the corresponding parameter. Please refer to 2-1 in the SECTION 2 of IV. PARAMETER of OSP-U10L OPERATION MANUAL.

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.

(5) Allowable load 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 (N) {kgf (lbf)} (life: 2000 hours)

Load Type / Speed min^{-1}{rpm}	Thrust	Radial
500	4707 {480(1056)}	6276 {640(1408)}
1000	3727 {380(836)}	5884 {600(1320)}
1500	3236 {330(726)}	5198 {530(1166)}
2000	2942 {300(660)}	4805 {490(1078)}
2500	2746 {280(616)}	4511 {460(1012)}
3000	2550 {260(572)}	4217 {430(946)}

(6) Exchange of the quill

(1) Screw clockwise the center extracting bar, then the quill will be loose.

(2) Unfix the quill.

(3) Screw counterclockwise the center extracting bar.

(4) Install the other quill again.

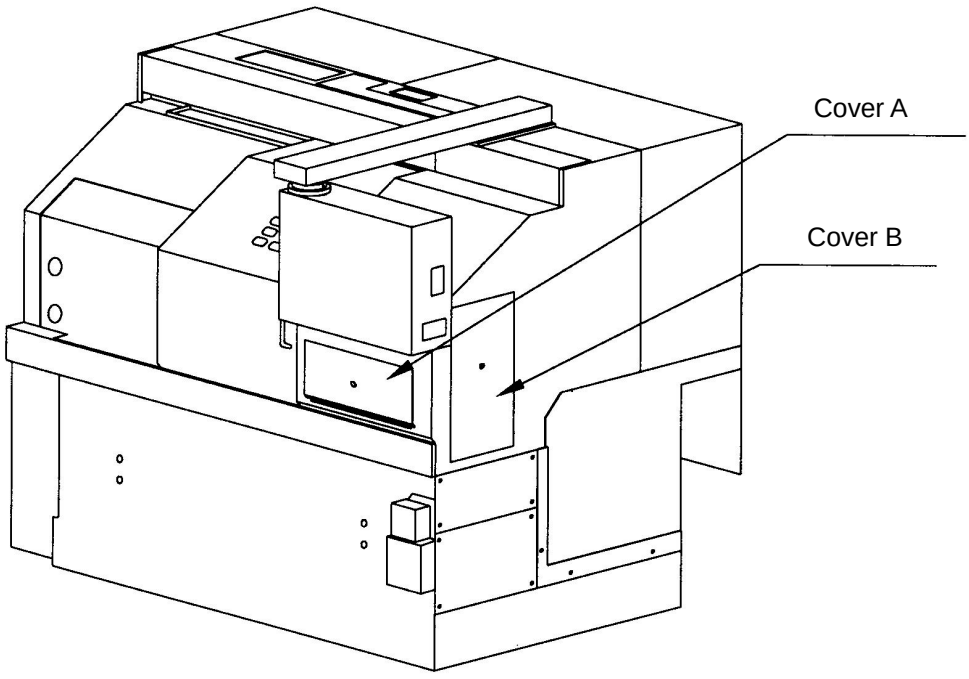
(7) Uninstallation of tailstock

When the tailstock must be moved for maintenance or safety consideration, please take steps as following:

a) Remove the cover A and B.

b) Loosen the tailstock clamping bolts and move the tailstock right to the required position along the slideway.

Because of the pressure of tailstock hydraulic system won't be stored when power cut happens, it is not necessary to detach the pipes during maintenance.



2-7. 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.

2-8. Interlock Functions (optional)

As the standard OSP interlock function, maximum spindle speed interlock function, door interlock function, and interlock activation confirming function are provided. These three interlock functions are provided to ensure safety in machine operations. Therefore, they must be correctly used following the instructions given below.

(1) Spindle Speed Interlock Function

a) Overview

In addition to the conventional maximum spindle speed designation function using the G50 command, the allowable chuck speed can be designated. The spindle speeds is limited using these two speeds.

The interlock is taken so that the spindle cannot be started unless the maximum spindle speed is designated in a program.

b) Function

1) Level A alarm occurs if the M03/M04 command is executed unless the maximum spindle speed is designated with the G50 command in a block preceding the M03/M04 command. The check is not conducted when a program is executed after the cursor movement or sequence number search.

2) Set the allowable chuck speed at the parameter. Each time the chuck is replaced set the allowable speed that is indicated on the chuck.

Parameter	:	MC USER PARAMETER SPINDLE Allowable chuck rotation speed
Initial value	:	0
Unit	:	Revolution per minute min^{-1} {rpm}
Setting range	:	0- allowable speed for each machine

If the setting of this parameter is “0”, level D alarm occurs, which cannot be reset until a value is set at this parameter.

3) The following interlock becomes effective according to the setting of the allowable chuck speed.

i) If the designated S value preceded by G50 exceeds the allowable chuck speed which is set at the spindle parameter of the Machine User Parameter.

ii) The spindle speed is limited by any of the following settings value, whichever lower; the maximum spindle speed designated by G50 or the allowable chuck speed.

iii) If the actual speed exceeds 120% of the maximum spindle speed designated following G50 or the allowable chuck speed, level A alarm occurs.

iv) Spindle speed is always checked in any operation mode (automatic, MDI, and manual).

Note: For controls with the optional IGF, pay attention to the following point.
In the program output using the IGF, the value set by the IGF integer parameter No.11 MAXIMUM SPINDLE RPM is output for an S command following G50. Because an alarm occurs if this S command value is greater than the allowable chuck speed, changing of this value becomes necessary.

(Refer to the operation Manual for Interactive Graphic MDI Function (IGF-L3).)

(2) Door Interlock D Function

a) Overview

There are cases which cause hazard to the operator if the spindle is rotated or the turret is moved while the front door is open. The door interlock D function inhibits spindle rotation and turret movement while the door is not closed.

b) Interlock function

The following interlock becomes effective in any operation mode, automatic, MDI, and manual) while the door is open when the DOOR INTERLOCK switch at the side panel of the machine operation panel is ON.

1) Level A alarm occurs when an attempt is made to start the spindle.
For spindle jog, oscillation, and orientation, spindle rotation below the parameter set speed does not cause an alarm even if the door is open.

Parameter : MC SYSTEM PARAMETER
DOOR INTERLOCK
Allowable spindle maximum speed
Initial value : min^{-1} {rpm}
Setting range : 50 (for all models)

To prevent an occurrence of an alarm even when the spindle jog or oscillation speed exceeds 50 rpm, set proper value at the parameter.

2) Level A alarm occurs if an attempt is made to start the M-spindle.
This interlock is effective only for the multi-machining model.

3) Level A alarm occurs if an attempt is made to feed the turret.
4) Level A alarm occurs if an attempt is made to rotate the turret.
5) Level A alarm occurs if the signal which indicates that the couple external device (bar feeder, for example) is in operation is ON.

If the door is opened in any of the following conditions, level A alarm occurs.

- Spindle is revolving.
- Turret is moving.
- Turret is Rotating.
- M-spindle is revolving.
- External signal from couple device is ON.

When the door interlock ON/OFF switch (with key) is set at OFF and the door is not closed, the following interlocks are effective.

1) Spindle rotation, jog, oscillation, or orientation can be specified and executed (interlock invalid) if their spindle speed command is equal to or smaller than the value set at the Door Interlock Parameter of Machine System Parameter. If larger than the set value, the above operation is disabled (interlock effective), resulting in occurrence of the following alarm:

   Alarm A 1718 Door interlock

   This interlock applies to the rotary axes of main spindle, rotary tool (M-tool) spindle, and second spindle (sub spindle, pick-off spindle).

2) Axis movement can be specified and executed interlock invalid) if the axis feedrate command is equal to or smaller than the value set at the parameter. If larger than the set value, the axis movement is disabled, resulting in occurrence of the alarm A.

   This interlock applies to the X-axis (XB, XA), Z-axis (ZA, ZB), W-axis, and X-axis.

Parameter	:	MC SYSTEM PARAMETER DOOR INTERLOCK Feed axis maximum speed
Initial value	:	2000
Unit	:	μm / ms
Setting range	:	0 to 2000

   * The initial value 2000 μm/min (78.74ipm) is equivalent to 426 μm/12.8 ms.

3) The turret can be rotated only in manual mode. (The other turret operations are disabled by the interlock function.)

   When the TOOL INDEX button is pressed, the turret rotates only by one station. Even when this button is kept pressed, the turret does not rotates until the button is released and pressed again.

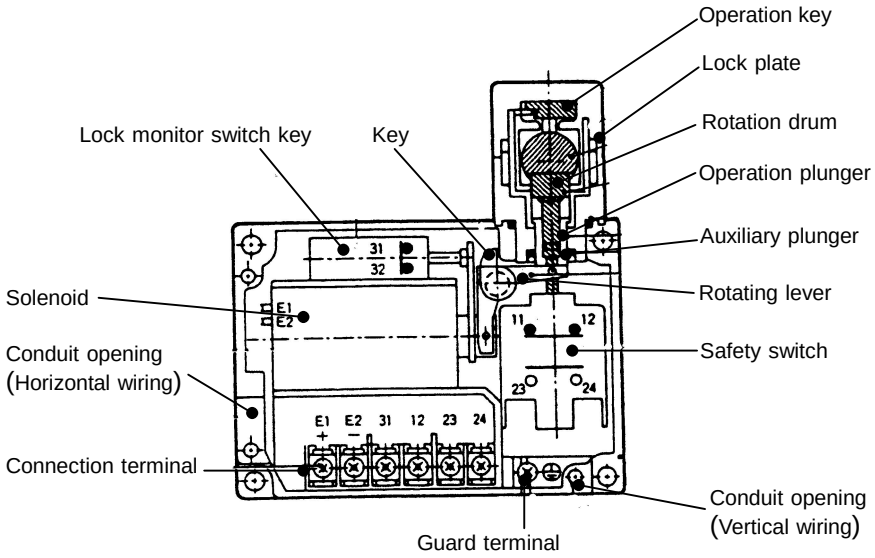
2-9. Safety Door Switch (optional)

In place of the standard limit switch, the OMRON safety door switch (D4BL) is mounted.

(1) Safety Door Switch Construction

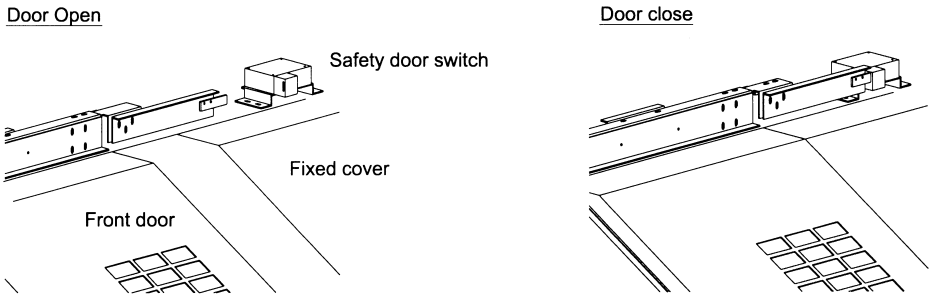
Component arrangement inside the switch

D4BL



(2) Safety Door Switch Installation

The switch is installed at the fixed cover, and the actuator key is installed at the front door.



(3) Function of Safety Door Switch

When the front door is been closed, the actuator key is put into the switch body. Then,

a) The front door is mechanically locked, unable to be opened.

b) The door close signal is output.

The safety door switch operates to lock the operation door at the door close position by electromagnetic force while the machine is in operation and unlock the door only while the machine is stopped.

The mechanical lock switch unlocks the door on receiving the unlock signal from the NC unit. The NC

unit outputs this signal when the door open pushbutton on the operation panel is pressed with the machine at a standstill.

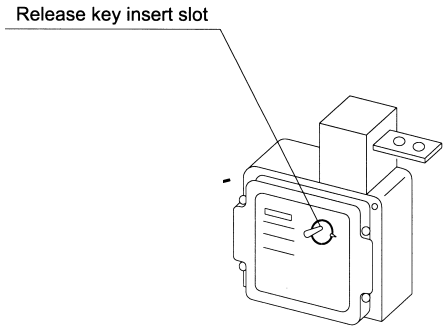
NOTICE

: Safety Door Switch

The function prevents the front door from being opened by mistake. While the machine is operating, the safety door switch provided at the top of the front door locks it closed so that it will not be opened.

Before opening the front door, make sure to confirm that the machine has completely stopped. If the front door is forcibly opened while it is locked by the safety door switch, it could cause switch failure.

The door is in the locked state when the power is turned OFF. To open the door when the power is off, after power failure for example, release the lock by using a release key supplied with the machine.



Safety door switch

2-10. Manually Operated Chuck

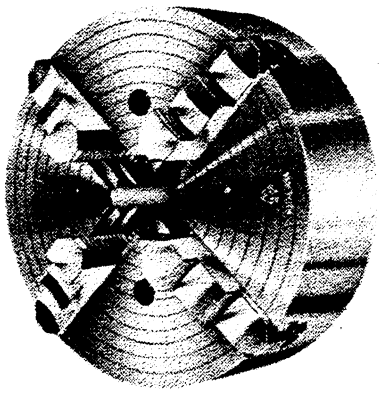


Fig. 3-18 Four-Jaw Independent Chuck Jaw

(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 (4.35)	4-M10
8	200	75(2.95)	185(7.25)		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)	4-M26
28	710	385(15.16)	650(25.59)		350 (13.78)		300 (11.81)	4-M20
30	762	435(17.13)	700(27.56)		375 (17.76)		325 (12.80)	4-M20
32	813	485(19.09)	750(29.53)	Within 0.050 (0.00197)	400 (15.75)		350 (13.78)	4-M20
36	915	555(21.85)	850(33.46)		450 (17.72)	+0.097 (0.00382) 0	400 (15.75)	4-M24
40	1000	630(24.80)	940(37.01)	Within 0.060 (0.00236)	500 (19.69)		450 (17.72)	4-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(12.30)	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 adapter installation section has direct influence to the workpiece chucking accuracy. Therefore, machine the adapter very carefully. Require accuracy is within 0.005 ㎜ (0.00020in.) 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 adapter.

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

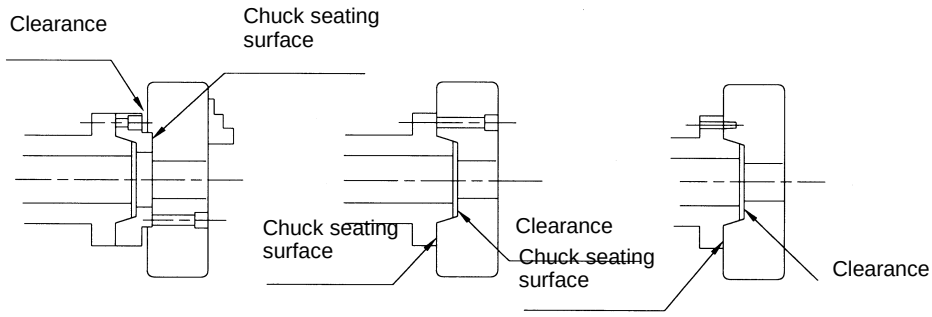


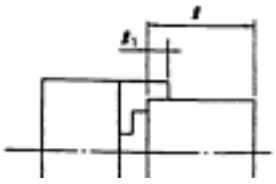
Fig.3-19 Chuck Installation

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 higher chuck.

⚠CAUTION

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



$l = l_1 + (l_1 \times 3.5)$

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

NOTICE

: 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

NOTICE

: 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

Spindle Nose	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)	Interia GD^2 $N.m^2$ $\{kgf.m^2\}$	Max. Allowable Speed $Min^{-1}\{rpm\}$
IC-4	34.3 {3.5(25.3)}	4.903 {500(100)}	40 (1.57)	90 (3.54)	2.4 (5.3)	0.098 {0.01}	2000
IC-6	49 {5(36)}	5.884 {600(1320)}	60 (2.36)	140 (5.51)	6.1 (13.4)	0.78 {0.08}	1600
IC-8	83.4 {8.5(61.5)}	9.807 {1000(2200)}	75 (2.95)	185 (7.28)	14.8 (32.6)	2.94 {0.3}	1600
IC-10	117 {12(87)}	13.729 {1400(3080)}	95 (3.74)	220 (8.66)	21 (46)	5.88 {0.6}	1600
IC-12	147 {15(108)}	15.691 {1600(3520)}	125 (4.92)	265 (10.43)	29.5 (64.9)	13.7 {1.4}	1400
IC-14	156 {16(116)}	16.671 {1700 (3740)}	155 (6.10)	310 (12.20)	40 (88)	28.4 {2.9}	1400
IC-16	215 {22(159)}	19.613 {2000(4400)}	190 (7.48)	360 (14.17)	56.5 (124.3)	44.1 {4.5}	1200
IC-18	215 {22(159)}	19.613 {2000(4400)}	220 (9.66)	405 (15.94)	70 (154)	68.6 {7.0}	1200
IC-20	245 {25(181)}	21.575 {2200(4840)}	250 (9.84)	450 (17.72)	90 (198)	116.0 {11.8}	900
IC-22	245 {25(181)}	21.575 {2200(4840)}	290 (11.42)	500 (19.69)	135 (297)	173.0 {17.6}	900
IC-24	275 {28(203)}	22.555 {2300(5060)}	320 (12.60)	550 (21.65)	150 (330)	248.0 {25.3}	900
IC-26	275 {28(203)}	22.555 {2300(5060)}	370 (14.57)	610 (24.02)	176 (387)	412.0 {42}	900
IC-28	294 {30(217)}	23.046 {2350(5170)}	385 (15.16)	650 (25.59)	247 (543)	569.0 {58}	900
IC-30	294 {30(217)}	23.536 {2400(5280)}	435 (17.13)	700 (27.56)	284 (625)	784.0 {80}	600
IC-32	294 {30(217)}	23.536 {24005280()}	485 (19.09)	750 (29.53)	357 (785)	1039 {106}	600
IC-36	353 {36(260)}	23.536 {2400(5280)}	555 (21.85)	850 (33.46)	413 (909)	1696 {173}	600
IC-40	510 {52(376)}	29.420 {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 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)	Interia GD^2 $N.m^2$ $\{kgf.m^2\}$	Max. Allowable Speed $Min^{-1}\{rpm\}$
A2-5	IA5-200	83 {8.5(61.5)}	9.807 {000(2200)}	75 (2.95)	185 (7.28)	14.9 (32.8)	3.14 (0.32)	3600
A2-6	IA6-250	117 {12(87)}	14.710 {1500(3300)}	95 (3.74)	220 (8.66)	24.2 (53.4)	7.35 (0.75)	3000
	IA6-300	147 {15(108)}	15.690 {1600(3520)}	125 (4.92)	265 (10.43)	39.1 (86.0)	15.7 (1.6)	2000
	IA6-350	147 {15(108)}	15.690 {(1600)3520}	155 (6.10)	310 (12.20)	50.9 (112.0)	29.4 (3.0)	2000
	IA6-400	215 {22(159)}	19.613 {2000(4400)}	190 (7.48)	360 (14.17)	69.8 (153.6)	46.1 (4.7)	1800
	IA6-450	245 {25(181)}	22.555 {2300(5060)}	220 (8.66)	405 (15.94)	97.2 (213.8)	69.6 (7.1)	1200
	IA6-500	245 {25(181)}	22.555 {2300(5060)}	250 (9.84)	450 (17.72)	103.5 (227.7)	132 (13.5)	1200
A2-8	IA8-350	215 {22(159)}	19.613 {2000(4400)}	155 (6.10)	310 (12.20)	56.2 (123.6)	30.4 (3.1)	2000
	IA8-400	245 {25(181)}	22.555 {2300(5060)}	190 (7.48)	360 (14.17)	73.8 (162.4)	49.0 (5.0)	1800
	IA8-450	245 {25(181)}	22.555 {2300(5060)}	220 (8.66)	405 (15.94)	102.5 (225.5)	71.6 (7.3)	1200
	IA8-500	245 {25(181)}	22.555 {2300(5060)}	250 (9.84)	450 (17.72)	108.4 (238.5)	139 (14.2)	1200
	IA8-550	245 {25(181)}	22.555 {2300(5060)}	290 (11.42)	500 (19.69)	123 (271)	158 (16.1)	1200
	IA8-610	275 {28(203)}	22.555 {2300(5060)}	320 (12.60)	550 (21.65)	136 (299)	224 (22.8)	1100
A2-11	IA11-500	245 {25(181)}	22.555 {2300(5060)}	250 (9.84)	450 (17.72)	130 (286)	166 (16.9)	1200
	IA11-550	245 {25(181)}	22.555 {2300(5060)}	290 (11.42)	500 (19.69)	145 (319)	185 (18.9)	1100
	IA11-610	275 {28(203)}	22.555 {2300(5060)}	320 (12.60)	550 (21.65)	204 (449)	338 (34.5)	900
	IA11-710	392 {40(289)}	29.420 {3000(6600)}	385 (15.16)	650 (25.59)	257 (565)	588 (60)	800
	IA11-750	451 {46(333)}	29.420 {3000(6600)}	435 (17.13)	700 (27.56)	300 (660)	840 (85.7)	800
	IA11-810	539 {55(398)}	29.420 {3000(6600)}	450 (17.72)	750 (29.53)	380 (836)	1299 (32.5)	600
	IA11-915	451 {46(333)}	29.420 {3000(6600)}	555 (21.85)	850 (33.46)	440 (968)	1809 (184.5)	600
	IA11-1000	657 {67(485)}	36.285 {3700(8140)}	630 (24.80)	940 (37.01)	570 (1254)	2826 (288.2)	600

Spindle Nose	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)	Interia GD^2 $N.m^2$ $\{kgf.m^2\}$	Max. Allowable Speed $Min^{-1}\{rpm\}$
A2-15	IA15-610	441 {45(325)}	26.478 {2700(5940)}	280 (11.02)	520 (20.47)	215 (473)	394 {40.2}	900
	IA15-710	451 {46(333)}	27.459 {2800(6160)}	385 (15.16)	650 (25.59)	280 (836)	799 {81.5}	800
	IA15-750	451 {46(333)}	27.459 {2800(6160)}	420 (16.54)	690 (27.17)	230 (506)	934 {95.2}	600
	IA15-810	539 {55(398)}	29.420 {3000(6600)}	460 (18.11)	750 (29.53)	392 (616)	1329 {136.6}	600
	IA15-915	726 {74(535)}	29.420 {3000(6600)}	500 (19.69)	800 (31.50)	500 (1100)	2045 {208.5}	500
	IA15-1000	726 {74(535)}	29.420 {3000(6600)}	550 (21.65)	900 (35.43)	610 (1342)	2844 {290}	500

SECTION 4 INSPECTION AND MAINTENANCE OF MACHINE

Your CNC lathe is a higjly 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 outline 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 tank and cooling 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. (3) Change cooling oil in the spindle cooling unit. There three 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) Change cooling oil the spindle cooling unit.

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

⚠WARNING

When maintaining or adjusting the machine, the operator should cut off the power supply of the machine.

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 mising 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 activators. If improper coolant is used, lubricatibg 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

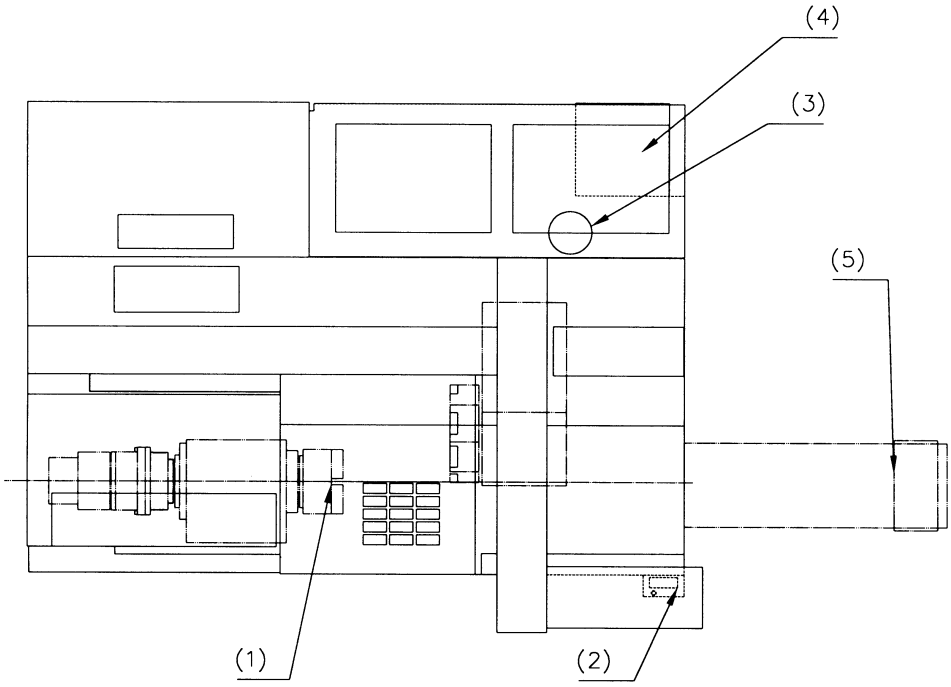


Fig. 4-1 Lubrication Chart

No.	Service Point	Amount	Oil Specification	(MAS)	Remarks
1	Chuck jaw	Sutiable amount	Molykoat EP grease (Dow Corning)	-	Everyday when cleaning chuck jaws
2	Centralized slideway lubrication tank	3 liter (0.79 gal)	Tonna Oil T68 (Shell)	G86	As required, always keep the proper oil level.
3	Coolant tank	180 liter (47.7gal)	Hi-Chip NC10*	-	As required, about 3 months.
4	Hydraulic power unit	22 liter (5.81gal)	DTE Oil Light (Mobil)	HL32	Change after the 1st month, then every 6 months.
5	Chip conveyor	Sutiable amount	Mobilux 2 (Mobil)	XM2	Replenish every 3 to 6 months.

*1 Apply G220 diluted by 20 to 30 times the coolant with tap water or distilled water.

Refer to 3. CLEANING COOLANT PUMP on next paragraph.

Note: Chip conveyor is optional.

Table 4-1 Lubricating Oil Specification

Application	Code	Esso	Shell	Mobil
Headstock gearbox (Spindle gearbox with C-axis) Sepatately 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*
Centerallized slideway lubrication unit (M-turret, ball screw)	G86	Febis K 68	Tonna Oil T68*	Vactra Oil No. 2 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		Unipower MP-2	Tetra Oil 2	Velocite No. 3* ISO viscosity grade =Equivalent to 2 cst (40° C)
Turret ball screw	(Grease)	Lithan 2	Alvania Grease 2	Mobilux 2

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 incour variety of trouble 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 moduls.

Note 3: 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 ballscrew. (We take no responsibility for the troubles caused by using the lubricating oil which is not our recommendation.)

Note 4: As for oil repenishment for the optional accessories such as special chucks or chip conveyor, refer to the Special Instruction Manual supplied with individual accessories.

Note 5: 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 Lubrication System

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

1-2. Slideway Lubrication System

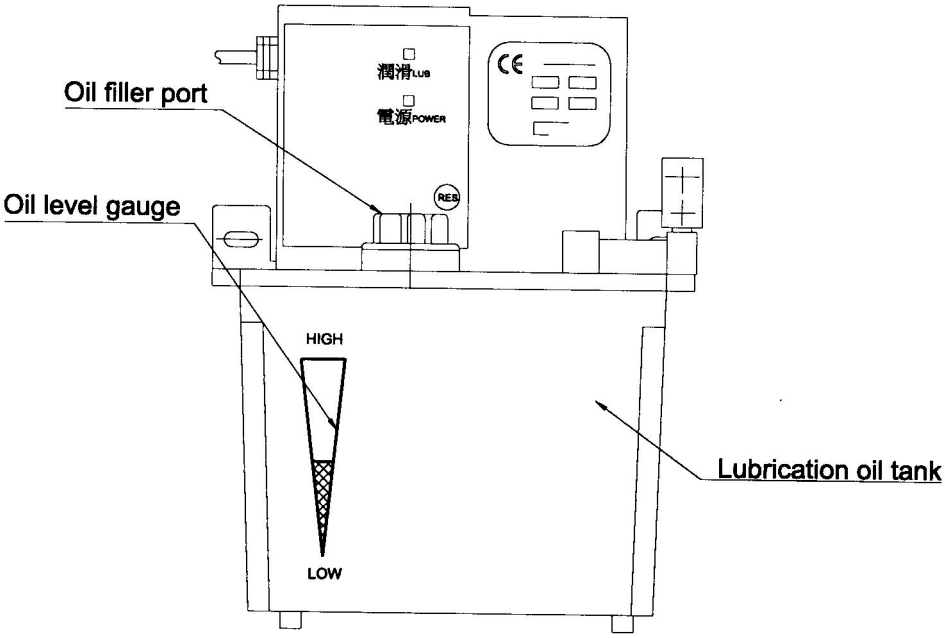


Fig. 4-2 Slideway Lubrication Oil Tank

Oil Specification	G86 (MAS)
Amount	3 liter (0.76 gal)
Oil Change Interval	Replenish as required. Since the lubricating oil is not re-circulated, lubricating oil amount must be checked every day.

The centralized lubricating oil tank is mounted at right slide of the machine. The lubricating oil is fed to the bed slidway, the cross-slide slideway, and the X- and Z-axis drive ball screws.

2. ADJUSTING CENTRALIZED LUBRICATION UNIT

2-1. 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.)

2-2. Maintenance and Countermeasure

When no lubricating oil is delivered:

(1) Oil level is low.

Replenish the lubricating oil of the same brand.

(2) The pump is at a rest: The pump operates intermittently.

The pump operation interval is set at 8 minutes.

(3) The suction filter is clogged.

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

(4) The motor does not rotate.

Check wiring.

2-3. Other Remarks

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

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

(3) Specified Lubricating Oil: G86 (MAS)

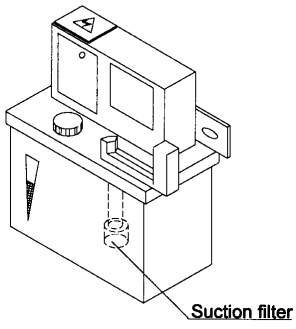


Fig.4-3 Adjusting Centralized Lubrication Unit

(4) Suction Filter Cleaning Procedure:

a) Remove the pump. (two M6 screws)

b) Take out the pump and clean the suction filter provided at the end of the suction pipe.

c) Reinstall the pump.

3. CLEANING COOLANT PUMP

3-1. Maintenance

(1) Because the coolant is diluted by water and could be mixed with chips and other objects, that will cause deteriorate or turbidity of oil. Therefore, pay attention to the use of the coolant.

a) Dilute the coolant with the clean water, and neutral soft water is better.

b) Always keep the coolant temperature not exceeding the ambient temperature.

c) Clean the coolant tank at least half of one year under the normal operation (8 hr./day)

d) Usually remove the floating oil to keep a good circulation.

e) Remove the sludge, swarf and clean the filter about every 3 months.

1. Check the quality of the coolant

Take some coolant sample from the front of the machine with the front guard open. If the coolant produces the peculiar smell, change the coolant.

2. Change the coolant

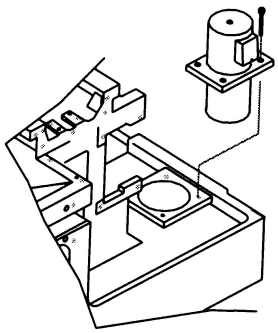
(a) Dip out the coolant from the bed.

(b) Detach the screw of PT3/4 plugged in the “DRAIN PORT” at the back of the bed. Clean out the bed and wipe the remains through the drain port.

(c) Fasten the screw of PT3/4.

(d) Replenish the tank with the new coolant specified.

(2) Cleaning Coolant pump filter



1. Detach the bolts (4pc) and remove the coolant pump from the bed.
2. Clean the coolant pump filter with the brush and kerosene.
3. Fix the coolant pump to predetermined position.

(3) Coolant specification

G220: diluted by 20 to 30 times their volume with tapwater or distilled water.

About 180 liter (27.7gal).

4. TENSIONING BELTS

4-1. Spindle Drive Belts (15 / 11 kW)

⚠WARNING : As a safety precaution, always turn OFF the machine when adjusting the belt tension or when replacing the belt.

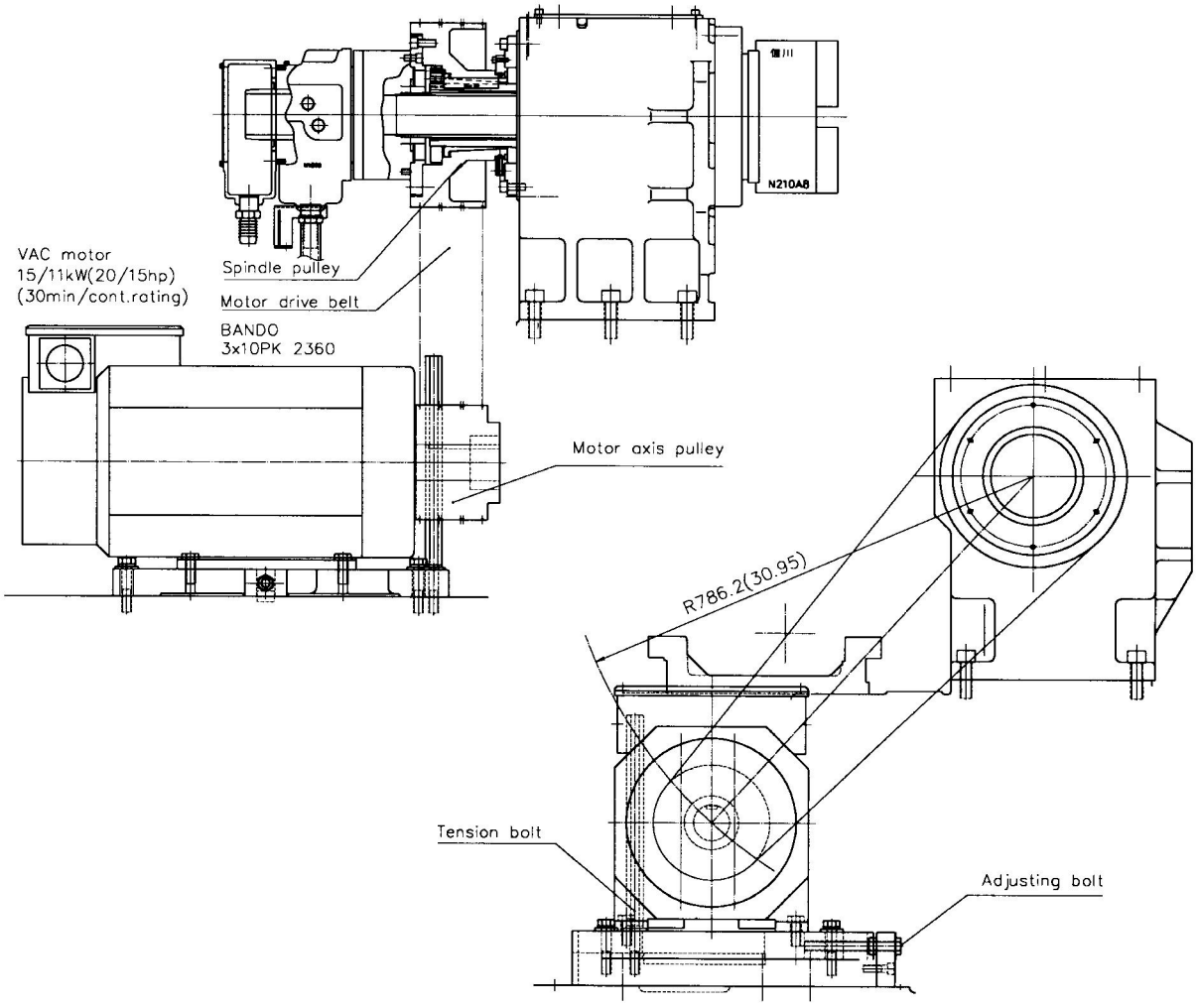
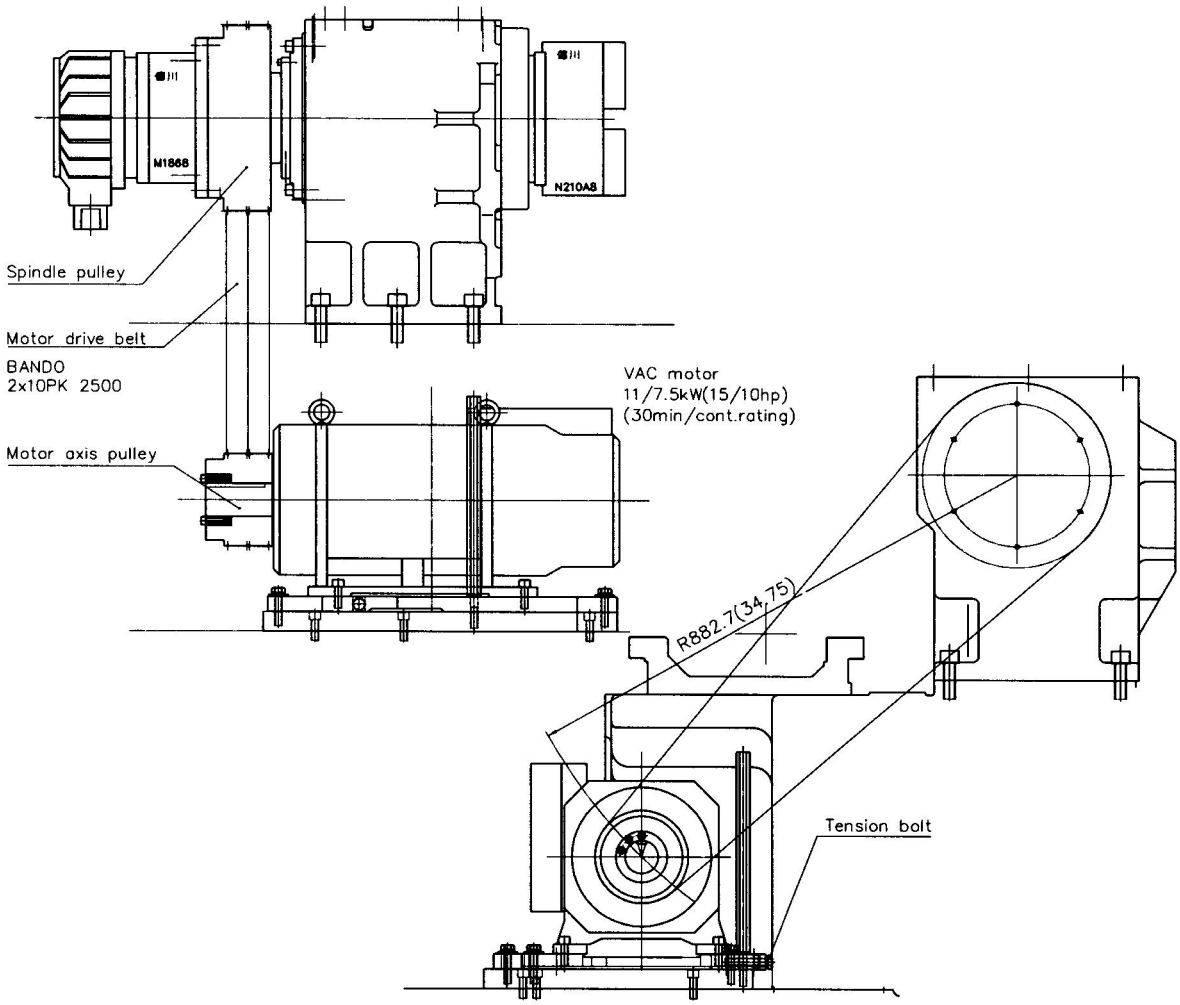


Fig. 4-4 Spindle Drive Belts for 15 / 11 kW

Spindle Drive Belts (11 / 7.5 kW)



(1) Adjusting Belt Tension

a) Loosen tension bolt.

b) Turn the adjusting bolt, and the motor base moves right and left. Adjust belt tension using a tension meter (optional) by referring to Table 4-2.

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

(2) How to Use Tension Meter

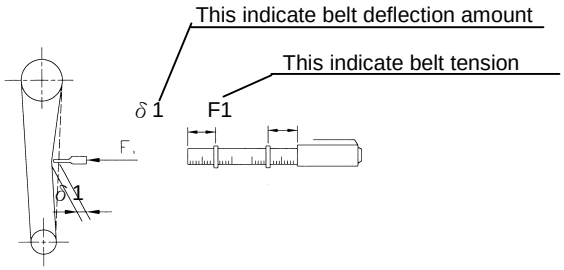


Fig. 4-6 Usage of Tension Meter

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

Power Spec.	RPM Spec.	Type of Belt	Type and Size	No. of Grooves	Tension F1 N{kgf(lbf)}	δ1 mm (in.)
15 / 11 kW	3000 min $^{-1}$ {rpm}	RIBACE	30PK-2360 (matched set in 3pc) (7987-3422-36)	10+10+10 grooves	121{12(27.16)}	12.55(0.49)
11 / 7.5 kW	3000 min $^{-1}$ {rpm}	RIBACE	20PK-2500 (matched set in 2pc) (7987-3422-50)	10+10 grooves	98{10(22.03)}	15(0.59)

4-2. Timing Belts for Z-axis Servo Motor

WARNING: As a safety precaution, always turn OFF the machine when adjusting the belt tension or when replacing the belt.

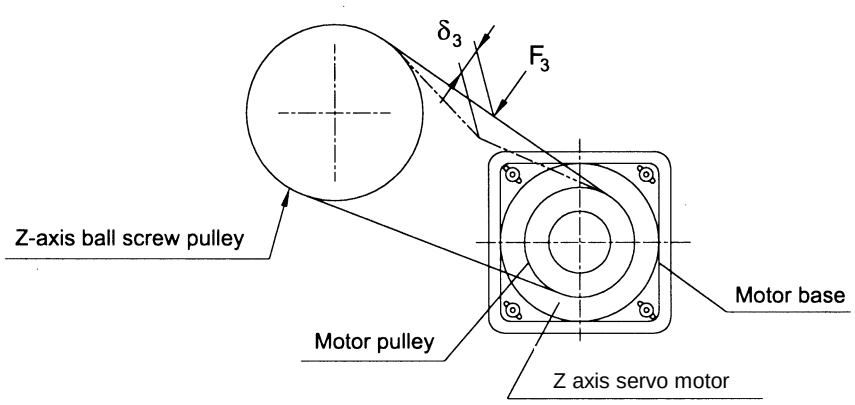


Fig.4-7 Timing Belt for Z-axis Servo Motor

Adjust the belt tension by moving the servo motor.

Type of Belt	Type and Size	No. of Belt	Tension F3 N{kgf (lbf)}	δ3 mm (in.)
Timing belt	STS 250S8M1096 (7987-8251-09)	1	32.3 {3.3 (7.26)}	5.0 (0.20)

4-3. Timing Belts for X-axis Servo Motor

⚠WARNING : As a safety precaution, always turn OFF the machine when adjusting the belt tension or when replacing the belt.

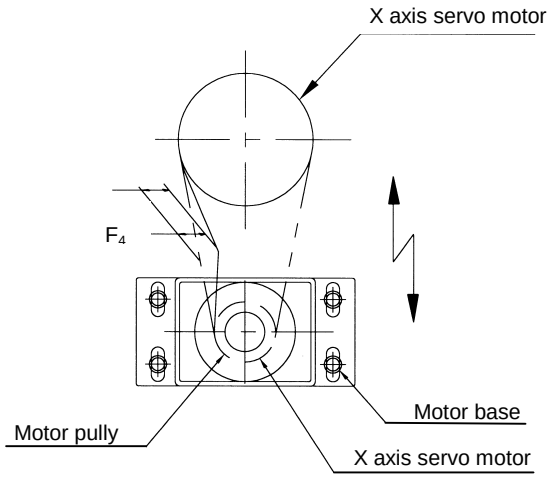


Fig.4-8 Timing Belt FOR X-axis Servo Motor

Adjust the belt tension by moving the servo motor.

Type of Belt	Type and Size	No. of Belt	Tension F4 N{kgf (lbf)}	δ4mm (in.)
Timing belt	STS 250S8M680 (7987-8256-80)	1	31.4 {3.2 (7.04)}	2.7 (0.11)

5. OTHER MAINTENANCE ITEMS

5-1. Adjusting the Turret Rotation Speed (Except NC Turret)

Warm-up of hydraulic devices and turret rotation speed adjustments:

About 10 to 15 minutes before starting the operation, turn on the power and warm up the hydraulic devices by such as rotating the turret occasionally.

If turret rotation is not smooth due to changes in environmental temperature, adjust the turret rotation speed following the procedure indicated below.

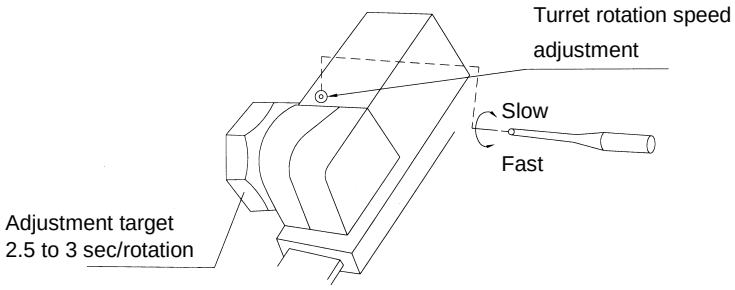


Fig.4-9 Adjusting the Turret Rotation Speed

(1) While the turret is stopped, open the throttle by turning it counterclockwise 2 to 3 turns. After that close it completely. With this, foreign matter caught in the throttle, if any, will be removed.

Never attempt this operation while the turret is rotating. Opening the throttle while the turret is rotating causes the turret to rotate quickly.

(2) Open the throttle gradually by turning it counterclockwise while pressing the TOOL ROTATION button on the pendant operation panel until the turret rotation speed, specified as the adjustment target is obtained.

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:

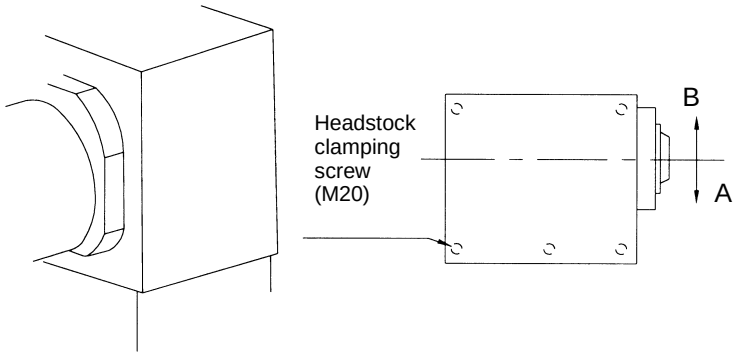


Fig. 4-10 Alignment of Headstock

Procedure:

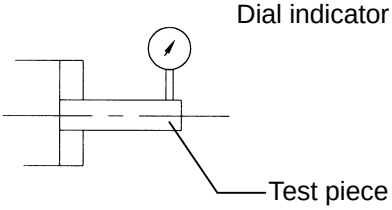
(1) Loosen the headstock clamping screws (M20, 5pcs.).

(2) To adjust the headstock alignment in the A/B direction, tap the headstock with a soft-head hammer to move it slightly.
Carry out this adjustment while reading the dial indicator applied at the front end of the test piece.

For Your information

The Japanese Industrial Standard (JIS) specifies that the lathe should turn cylindrically to within 0.015 per 225 mm (0.0006 per 8.86 in.) of finishing length of work held in a chuck without the use of tailstock center to hold the work.

(3) After the required accuracy is obtained, tighten the five headstock clamping screws. Note that reading of the dial indicator applied at the test piece top end must not change.



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.

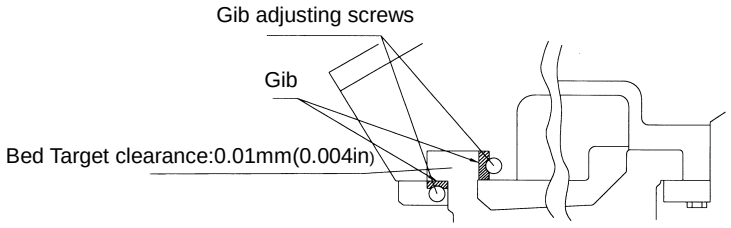


Fig.4-11 Adjustment of Tapered Gibs on Cross-slide

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

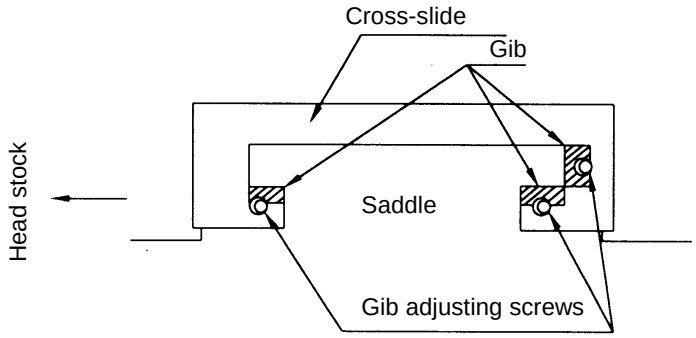
(1) Gib Adjustment Procedure

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 scew 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.



5-4. Cautions on Checking the X-axis Ball Screw and Related Parts

⚠WARNING

: When removing the X-axis drive servomotor for the purpose of inspection or maintenance of the X-axis ball screw, servomotor, and the related parts, make sure to support the turret with a wood block, etc., to prevent it from failing before starting your work.

An example of fall prevention measures

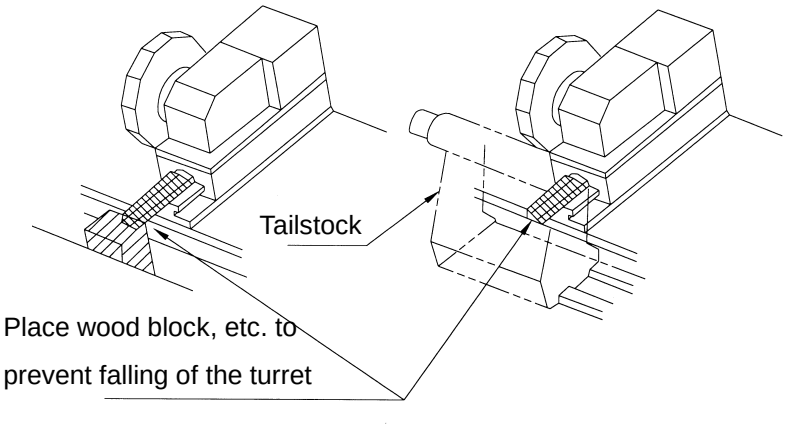


Fig. 4-12 Caution on Checking the X-axis Ball Screw

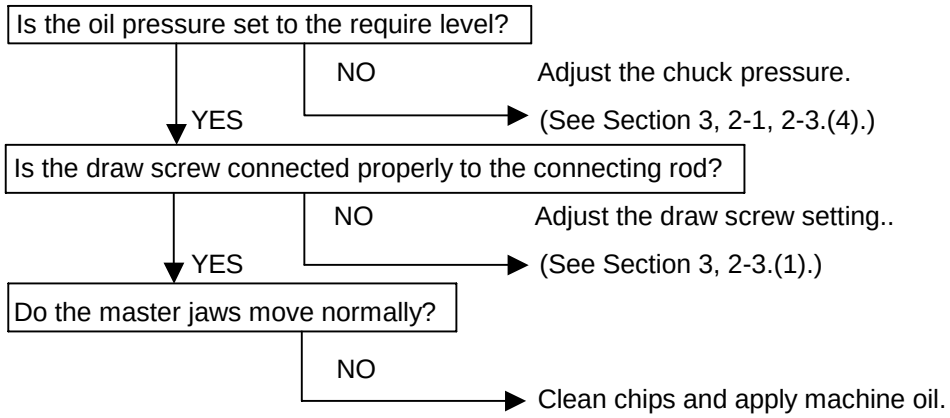
6. TROUBLESHOOTING FOR SIMPLE MECHANICAL TROUBLE

6-1. Trouble with Headstock

(1) No Spindle Rotation

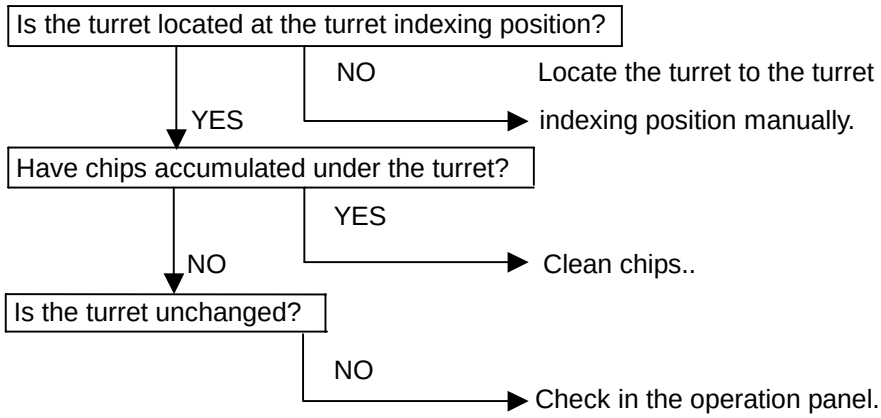
Is the power chuck closed?

(2) No Chuck Jaw Movement

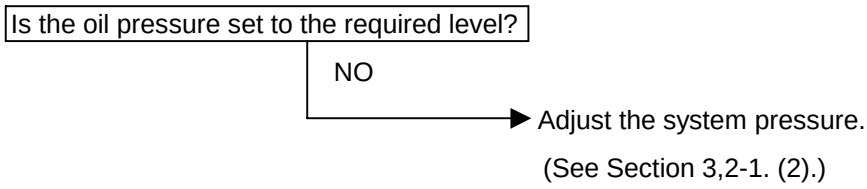


6-2. Trouble with Turret

(1) No Turret Indexing



(2) Weak Turret Clamping Pressure



(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

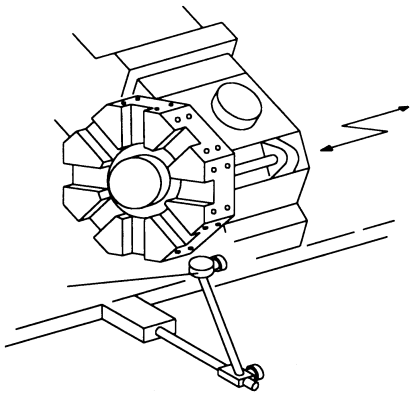


Fig. 4-13

Set the dial indicator as illustrated in Fig. 4-13 and feed the Z-axis with the pulse handle to check the inclination of the toolholder mounting surface on the V8 turret. If the inclination is larger than 0.02 mm (0.0008in.) it must be corrected. The procedure to make corrections is explained in item b)

Checking V8 turret offset

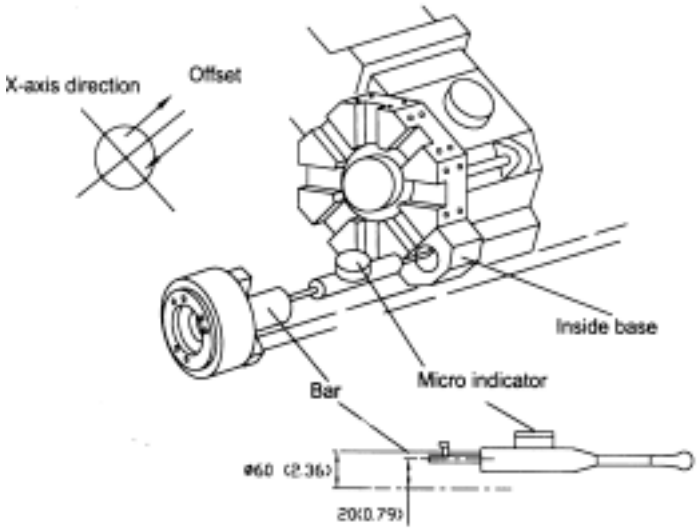
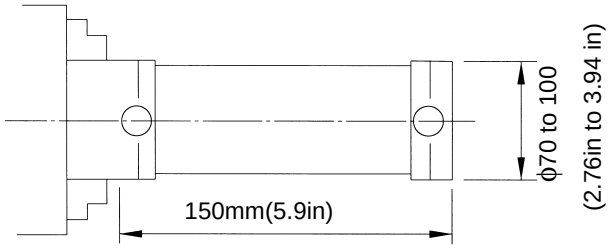


Fig. 4-14

Mount the inside base holder on the turret as illustrated in Fig. 4-14. 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 0.05mm(0.002in.), make corrections as explained in item 3).

1) Accuracy inspection of headstock

Finish a test piece indicated in Fig. 4-14 below in the MDI mode operation to check the cylindricity. If the measured cylindricity is large than 0.015mm/255 mm(0.0006 in./8.86in.), adjustment of the headsotck is necessary. For the procedure to adjust the headstock, refer to 4-2. In this section. This adjustment should be carried out in combination with the adjustment for offset in Fig. 4-13.



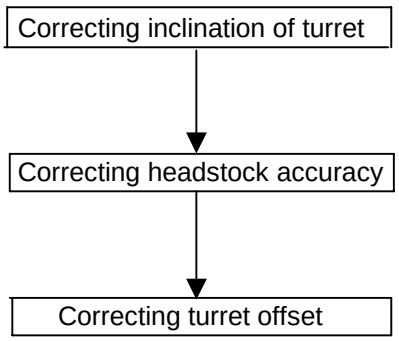
Cutting conditions

Material	:	Mild steel (S45C, JIS) or cast iron (FC, JIS)
Depth of cut	:	ϕ 0.2 ㎜ (ϕ0.008 in.)
Feedrate	:	0.1 ㎜/rev (0.004 ipr)

Fig. 4-15 Accuracy inspection of headstock

2) 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. 4-12 is larger than 0.02 mm (0.0008 in.), adjustment should be made in the manner indicated below (Refer to Fig. 4-15.):

1) Remove covers (1), (2) and (6).
2) Loosen four turret clamping screws (30. Note that turret clamping screws (4) and (5) should not be loosened.
3) After loosening four turret clamping screws (4) and (5) satisfactorily, check turret inclination as in Fig. 4-12 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 (6). Apply the sealant to the cover mounting surfaces.
This completes the adjustments.

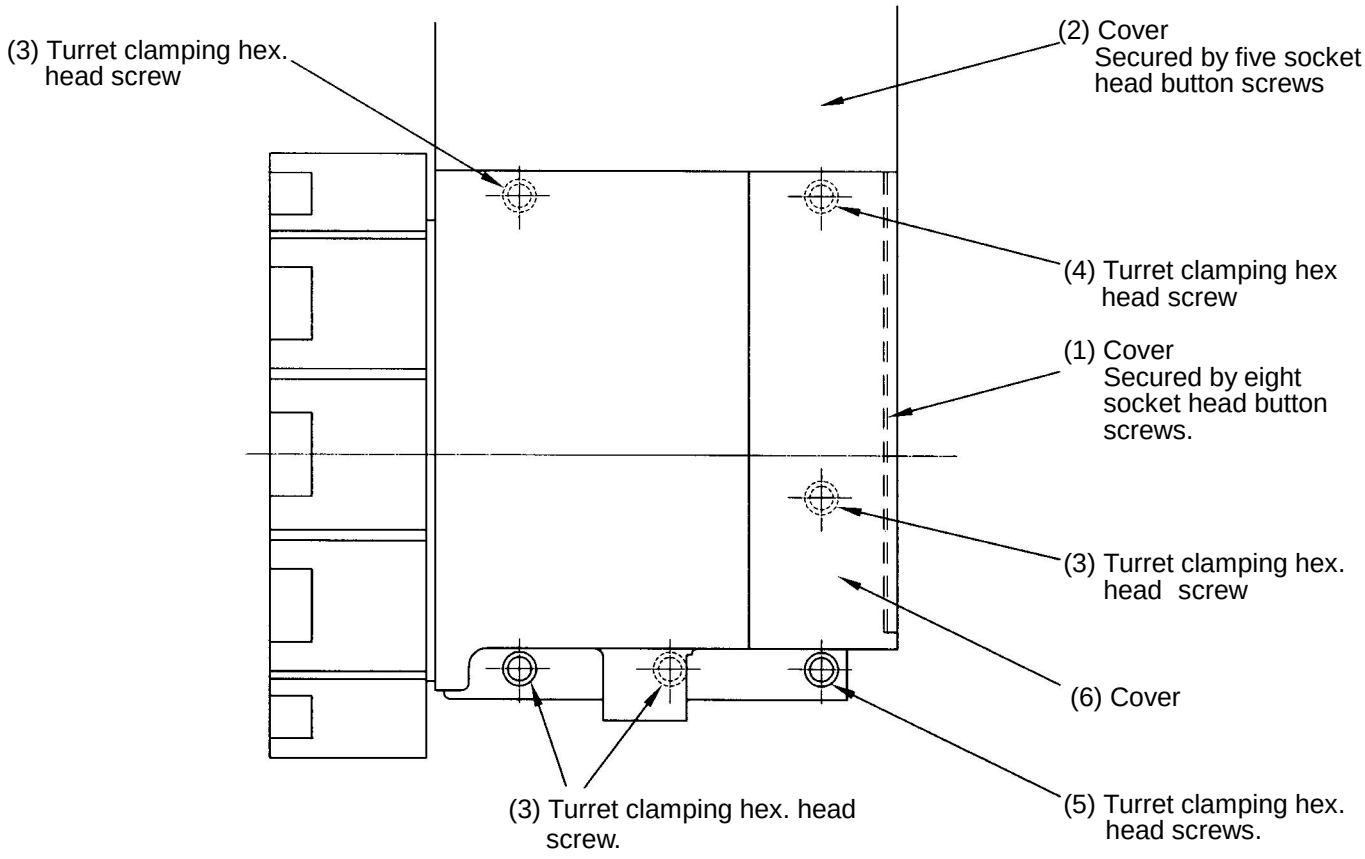


Fig. 4-16 Correction of turret inclination

c) Correcting turret offset

If the offset amount measured as per Fig. 4-13 is larger than 0.05 mm (0.002 in.), make corrections following the steps below: (Refer to Fig. 4-16.)

1) Press the CONTROLL OFF switch to turn off power supply to the NC and then, turn off the main switch.
2) After removing the bolt (1), detach the cap (2).
3) Loosen six V8 turret head clamping screws (3).
4) Prepare two taper pins with female thread (4), ϕ8×45 mm (ϕ0.31×1.77 in.), and drive fit them while tapping the V8 turret with a softhead hammer. It is recommended to screw the bolt into the female thread of the taper pin in advance.
5) After the two taper pins have been driven into the turret head, secure the V8 turret head clamping screws tight.
6) Turn on the power.
7) Measure the offset amount in the manner as illustrated in Fig. 4-13.
8) If steps 1) through 7) cannot eliminate offset, proceed to the steps below.
9) Turn the V8 turret manually. Turn off the NC power during turret rotation so that the turret head is left unclamped.
10) Lift up the turret with a jib crane and remove the taper pin (5) and bolt (6).
11) Detach the V8 turret.
12) Loosen the bolt (7) and then remove the taper pin (8).
13) Prepare two taper pins with female thread ϕ6×36 mm (ϕ0.24×1.42 in.) and drive fit them into taper pin holes (9).
14) Tighten clutch securing screw (3).
15) Finish two taper pin holes (10) with a taper reamer and drive the taper pin ϕ8×36 mm (ϕ0.31 ×1.42 in.) into the taper pin hole. If the taper pin removed in step 12) is stepped or bent, replace it with a new one.

    (if the taper pin is inserted too deeply, use a little longer taper pin.)
16) Remove taper pins (4) and (9).
17) Reassemble the turret head in reverse order of steps 10) to 11).

    (Apply grease to the clutch teeth slightly.)
18) Turn on power and check turret indexing operations in the manual mode.
19) Measure the offset amount again as illustrated in Fig. 4-13.
20) Reassemble the cap (2).

    Be sure that the O-ring (11) has been placed in position.

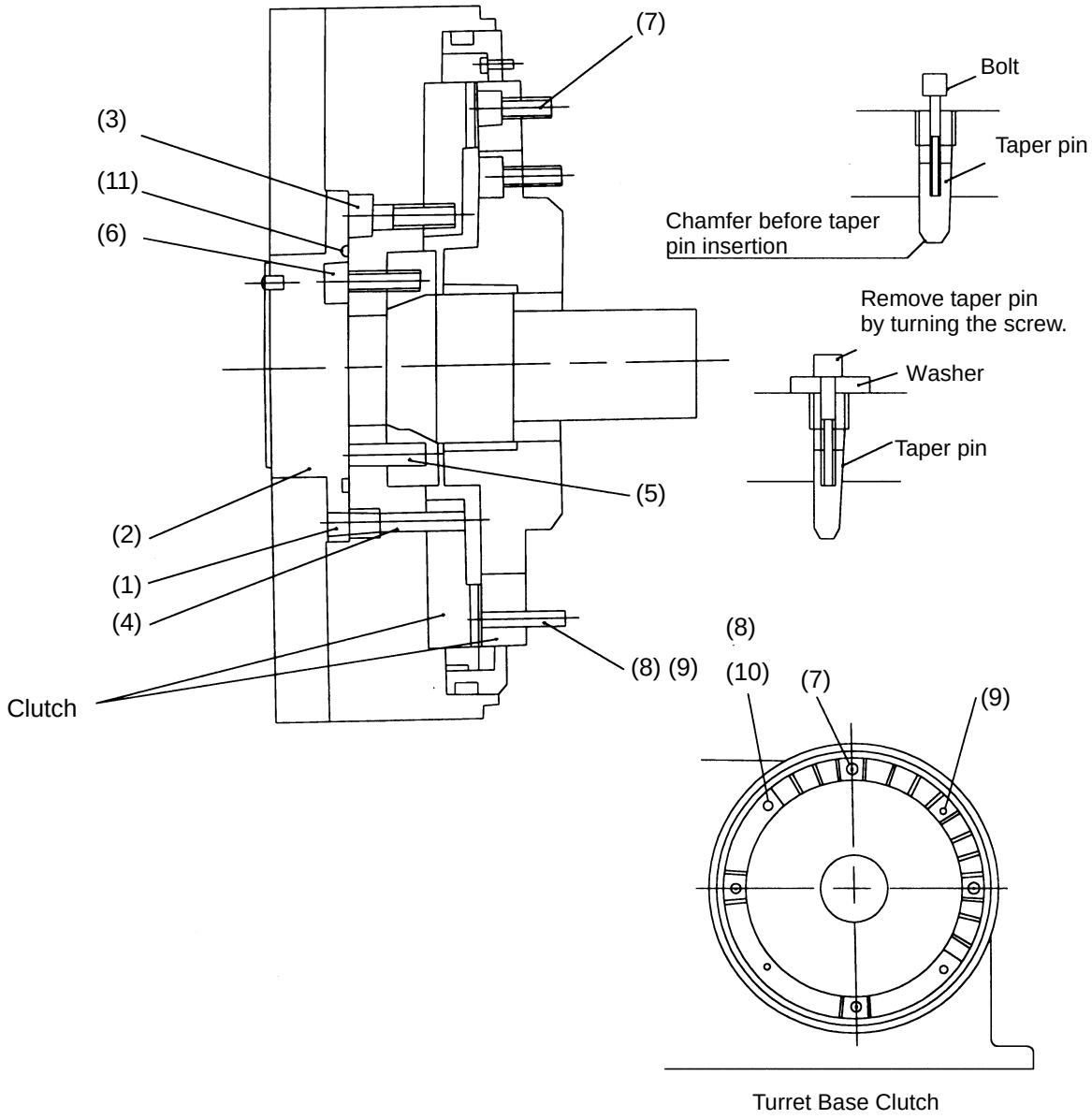
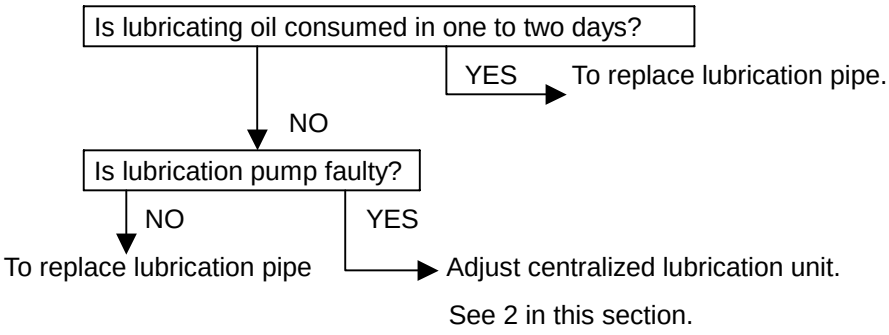


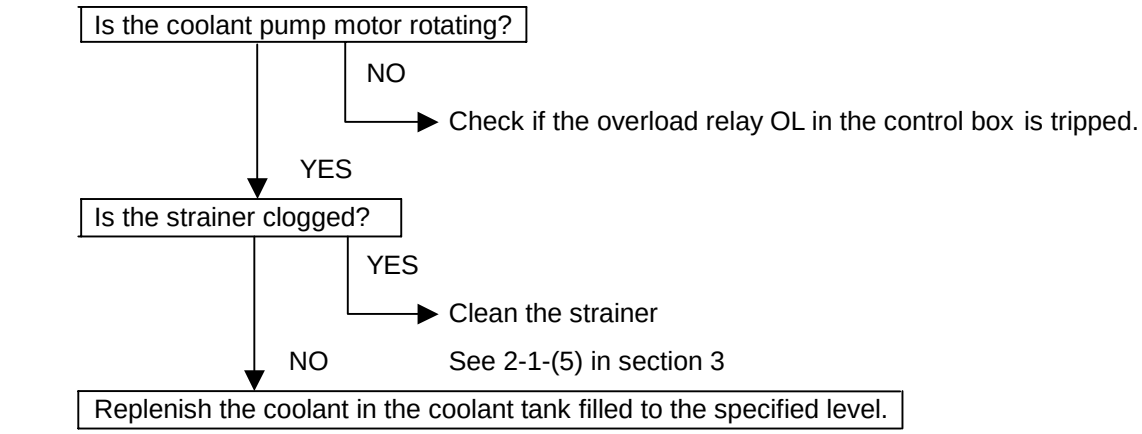
Fig. 4-17 Correcting Turret Offset

6-3. Others

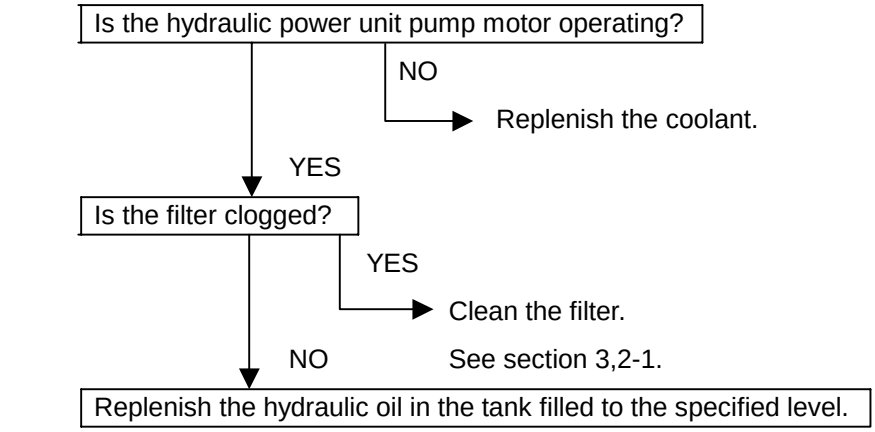
(1) No Lubricating Oil Flow to X-/Z-axis Slideways



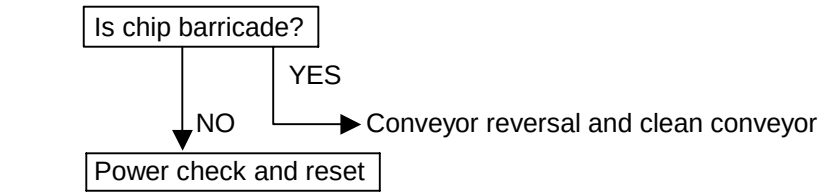
(2) No Coolant Supply



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



(4) Chip conveyor can't run



7. MACHINE RESTARTING

When the situations listed below happen, the machine will stop operation:

(1) Feed hold

(2) Alarm

(3) Programmable stop

(4) Emergency stop

(5) Power cut

(6) Overtravel

The solving measure are listed individually as follow:

(1) Press the CYCLE START button.

(2) Deal with the cause of “Alarm” and press the CYCLE START button. If necessary, shut off the machine and start again.

(3) Recover the situation of the time before machine stop. And press the CYCLE START button.

(4) Release the EMERGENCY STOP button after dealing with the problems. And press the POWER ON button.

(5) Confirm the condition of the machine is hazard-free before power on. Then start the machine again.

(6) To release the overltravel alarm state, follow the procedure indicated below.

a) Turn the SA5N switch left to the “ON” position.

b) Press the RESET button on the NC operation panel.

Power supply to the servo drive is turned on for all axes and an alarm message is displayed on the screen. In this state, pulse handle operation only is allowed.

c) Move the axis, causing the overtravel alarm, in the direction away from the travel-end by turning the pulse handle.

d) Turn the SA5N switch right to the “OFF”, then press the RESET button.

The SA5N switch is at the corner of the PCB connector in the electrical control cabinet as the drawing following.

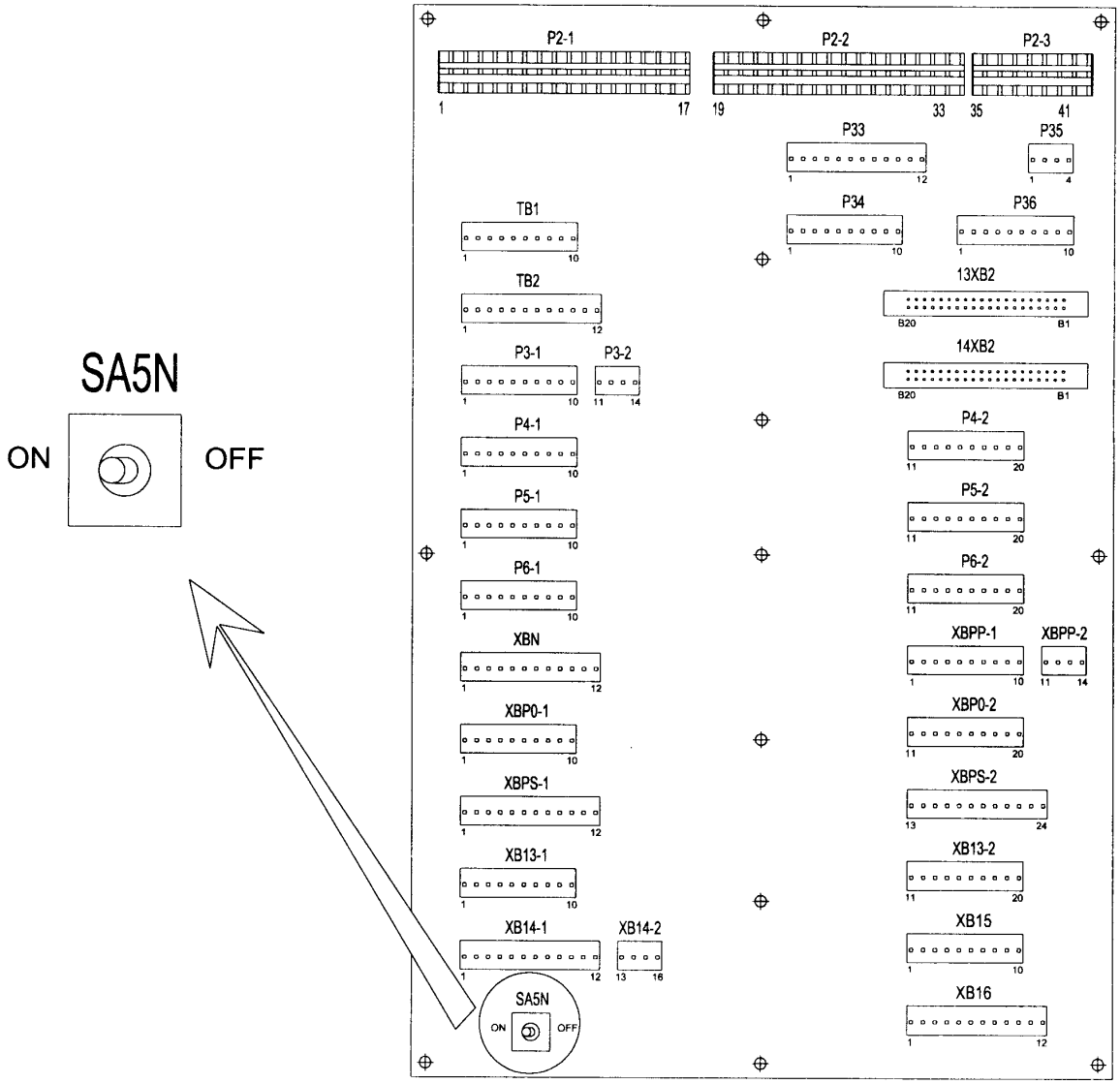


Fig. 4-18 Location of SA5N switch

8. CHIPS COLLECTION AND REMOVAL

Before cleaning the machine, the operator must wear safety gloves and goggles.

Chips can be removed away by a vacuum cleaner, instead of air-blower.

There are something important during cleaning the chip:

(1) Chips are collected in the bed and fall to the chip pan or conveyor (optional).

(2) Operator should use an iron-claw to pull the chip pan out.

(3) Operator must wear thick gloves during cleaning.

9. TROUBLE OF BLOCKAGE

The machine is so designed and constructed that the blockage won't occur during normal operation.

In case of blockage, please shut down the machine immediately and call our representative or Okuma service center to help you solve the problem.

SECTION 5 SPARE PARTS LIST

1. HYDRAULICS

No.	Part Name	Maker	Type	Qty	Use	Part No.
1	Vane pump	Anson	PVF-30-55	1	Hydraulic Unit	7900-2073-01
2.	Pressure gauge	Skon	PT1/4 0~100 kg/cm^2 (0~1500psi)	1	Hydraulic Unit	7909-0121-02
3	Radiator	Sinsor	AW0608	1	Hydraulic Unit	7924-0110-01
4	Filter	Sinsor	PT3/4 66X58 150mesh	1	Hydraulic Unit	7922-4150-42
5	Solenoid valve	Dofluid	DFB-2D2-02 DC24V	1	Chuck	7905-1434-11
6	Reducing Valve	7-Ocean	MGV-02P-0-10	1	Chuck	7906-1060-36
7	Pressure gauge	Skon	PT1/4 0~40 kg/cm^2 (0~600 psi)	1	Chuck	7909-0120-42
8	Solenoid valve	Dofluid	DFB-02-3C2 DC24V	1	Tail stock*	7905-0444-12
9	Reducing valve	7-Ocean	MGV-02-A-0-10	1	Tail stock*	7906-1060-38
10	Pressure gauge	Skon	PT1/4 0~40 kg/cm^2 (0~600 psi)	1	Tail stock*	7909-0120-42
11	Oil-motor	Sumitomo	H130BA4M-G	1	Turret	7904-2013-00
12	Solenoid	Dofluid	DFB-02-3C4 DC24V	1	Turret	7905-0445-13
13	Solenoid	Dofluid	DFB-02-2B2 DC24V	1	Turret	7905-2434-12
14	Throttle & check	Sunny	TVC-B-02M	1	Turret	7908-0061-03
15	Distributor block	Chiba	HBL-5-0.1	2	Cross-slide	7923-0369-15
16	Distributor block	Chiba	HBL-5-0.1	2	Saddle	7923-0369-15

*Tailstock is optional.

2. ELECTRICALS (ON MACHINE)

No.	Part Name	Maker	Type	Qty	Use	Par No.
1	VAC motor	Okuma	15 / 11 kW	1	Main motor	41U10-A093-5100
2	VAC motor	Okuma	11 / 7.5 kW	1	Main motor	41U10-A091-5100
3	Coolant pump	Yeong Chyuan	YC-T60-150 1/4Hp	1	Coolant	7900-6003-02
4	Lubrication pump	I Shaw	YET-C2P2	1	Slideway lubrication	7904-1201-10
5	Limit switch	E-ten	WL-EZ 5104-2	1	Z-axis	6455-3653-06
		E-ten	WL-EZ 5104-2	2	X-axis	6455-3653-06
6	Motor	Tatung	IK-FBB 4P 1.5kW	1	Hydraulic unit	7999-0870-40
7	Footswitch	Shan ho	SFS-337 Single	1	Chuck-operating	4162-9990-20
			SFS-337 Twin	1	Tailstock operating	4162-9991-20
8	Proximity switch (choose one)	Yamatake	FL7H-3J6HD	6	Turret	7990-7160-09
		Omron	E2E-X3D1-N	6	Turret	6455-6144-10
9	Work lamp	Mitsubishi	FPL18EX-N	1	Work lamp	7999-0714-45
10	Lock-switch	Omron	D4BL+K1 DC24V	1	Door interlock	7990-7040-64
11	Servo-motor	Okuma	BL-MC100J-20TB	1	X-axis	41U10-A005-4370
12	Servo-motor	Okuma	BL-MC150J-20T	1	Z-axis	41U10-A005-4273
13	Pressure switch	7-Ocean	PS-02-1-10	1	Chuck	7909-1402-02
14	Signal light	Shan ho	SCRR-35	1	Plate	7999-4721-12
15	Proximity switch	Balluff	BR3-1202D1-1	2	Chuck	6455-6144-10

3. CONSUMABLE ITEMS

No.	Part Name	Maker	Type	Qty	Use	Par No.
1	Wiper	Johnjun	Wiper edge	1	Cross-slide (bottom-right)	4162-1506-90
2	Wiper	Johnjun	Wiper edge	1	Cross-slide (top-left)	4162-1507-90
3	Wiper	Johnjun	Wiper edge	1	Cross-slide (top-right)	4162-1508-90
4	Wiper	Johnjun	Wiper edge	1	Saddle (fore-right)	4162-1307-90
5	Wiper	Johnjun	Wiper edge	1	Saddle (rear-left)	4162-1308-90
6	Wiper	Johnjun	Wiper edge	1	Saddle (fore-left)	4162-1309-90
7	Wiper	Johnjun	Wiper edge	1	Saddle (rear-right)	4162-1310-90
8	Wiper	Posa	Wiper edge	2	Tailstock*	4162-5114-90
9	Guard-cover	TOC	793x70	1	Cover (right)	4163-6651-90
10	Timing belt	Bando	STS 250S8M680	1	X-axis	7987-8256-80
11	Timing belt	Bando	STS 250S8M1096	1	Z-axis	7987-8251-09
12	Belt	Bando	3x10PK 2360	1	Spindle (15 / 11 kW)	7987-3402-36
13	Belt	Bando	2x10PK 2500	1	Spindle (11 / 7.5 kW)	7987-3402-50
14	Packing	NOK	SPGR 265x280x3.8	1	Turret	7933-4926-51
15	Packing	NOK	SPN 65.5X78X4.8	1	Turret	7933-4900-65
16	Packing	NOK	M18X26X5.5	1	Turret	7933-4918-01
17	Packing	Golden Sun	NBR 7X11X10	1	Coolant (Turret)	4162-2010-90
18	Packing	NOK	USH 67x77x6	1	Tailstock* (MT5)	7933-4206-71
19	Packing	NOK	SPGC 100	1	Tailstock* (MT5)	7933-4910-00
20	Seal	NOK	SEAL piston 80	1	Tailstock* (MT5)	7933-4208-01
21	Seal	NOK	DSI FQ0070D0	1	Tailstock* (MT5)	7933-4909-01
22	Wiper	Goushin	NBR+SPC	1	ES-L10 Cover (Z)	4163-6643-90
23	Wiper	Goushin	NBR+SPC	1	ES-L10 Cover (X)	4163-6635-90
24	Wiper	TOC	NBR+SPHC 115x59x6	1	ES-L10 Door	4163-6670-90
25	Wiper	TOC	NBR+SPHC 242x58x6	1	ES-L10 Door	4163-6671-90
26	Wiper	TOC	NBR+SPHC 394x37x6	1	ES-L10 Door	4163-6667-90
27	Wiper	TOC	NBR+SPHC 132x37x6	1	ES-L10 Door	4163-6668-90
28	Wiper	TOC	NBR+SPHC 66x30x6	1	ES-L10 Door	4163-6669-90

Exchange interval : Approx. 4800 Hr. or 2 years

* : Approx. 4000 Hr. or 22 months

SECTION 6 TECHNICAL DATA

1. TOOLING SYSTEM

(The tooling systems of V8 and V12 are the same.)

Drill sleeve

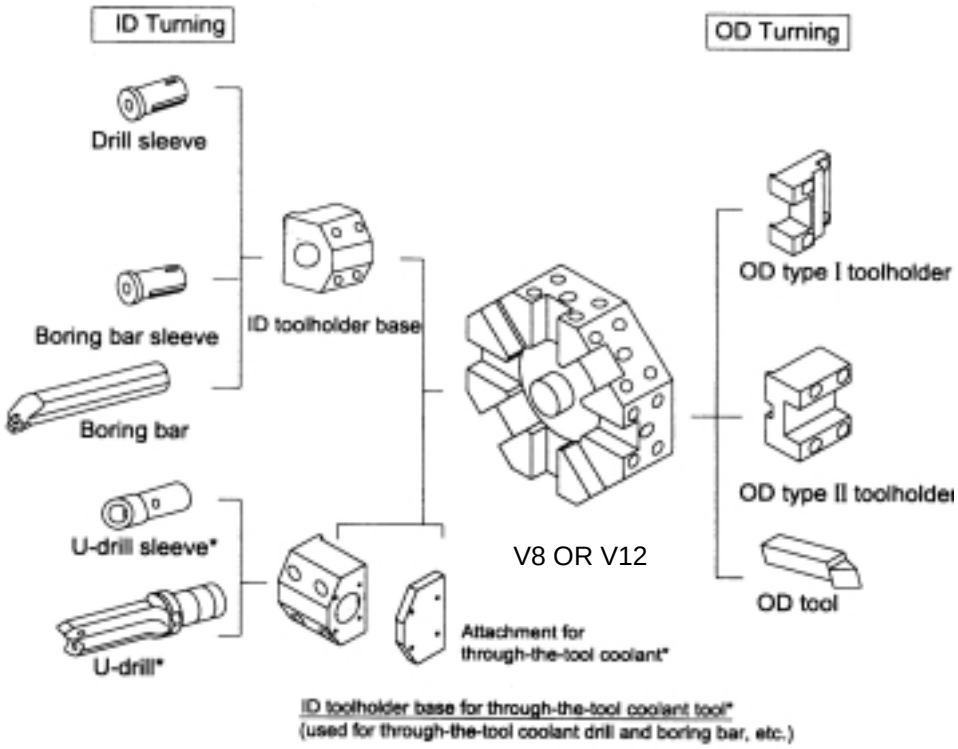
MT No.1-H40[H1.5]
MT No.2-H40[H1.5]
MT No.3-H40[H1.5]
MT No.4-H40[H1.5]

Boring bar sleeve

ϕ10[0.375]-H40[H1.5]
ϕ12[0.5]-H40[H1.5]
ϕ16[0.625]-H40[H1.5]
ϕ20[0.75]-H40[H1.5]
ϕ25[1]-H40[H1.5]
ϕ32[1.25]-H40[H1.5]

Boring bar

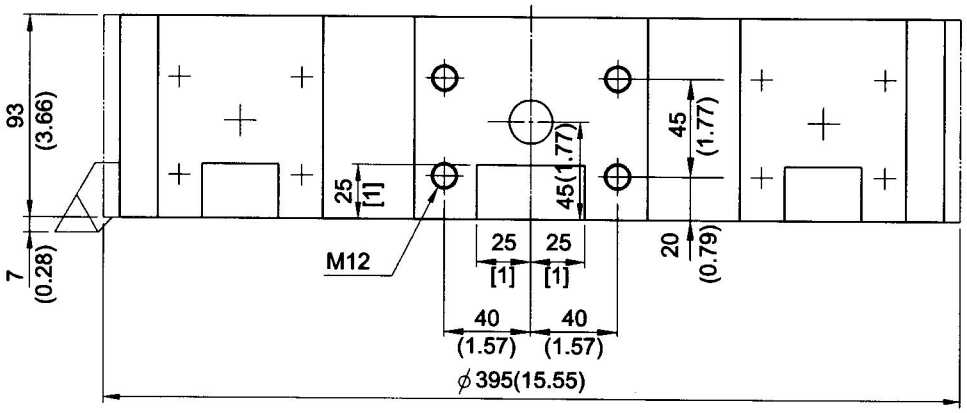
ϕ20[0.75]-H40[H1.5]U
ϕ25[1]-H40[H1.5]U
ϕ32[1.25]-H40[H1.5]U



[ ] is the dimension of INCH specification. Different of the dimension of METER specification.

2. V8 TURRET DIMENSIONS

[ ] is the dimension of INCH specification. Different of the dimension of METER specification.



Unit : mm (in.)

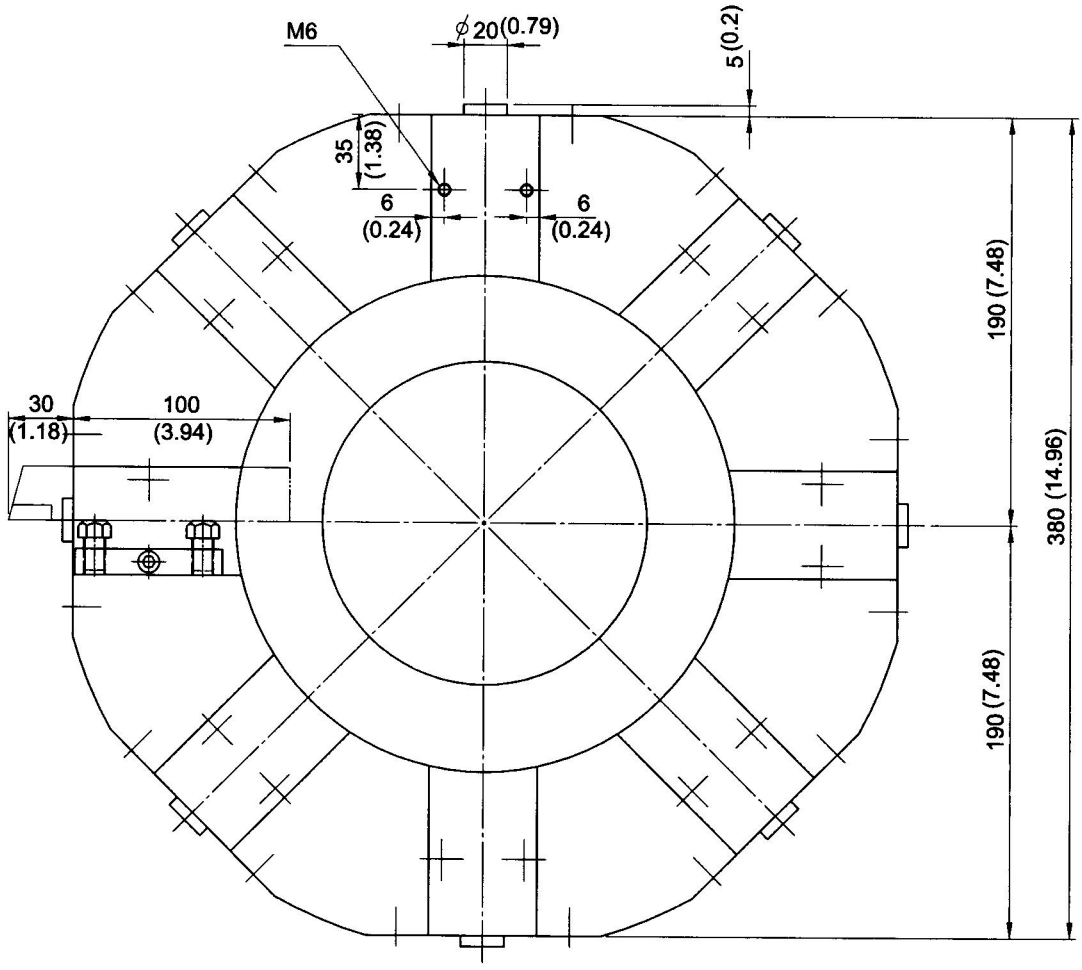
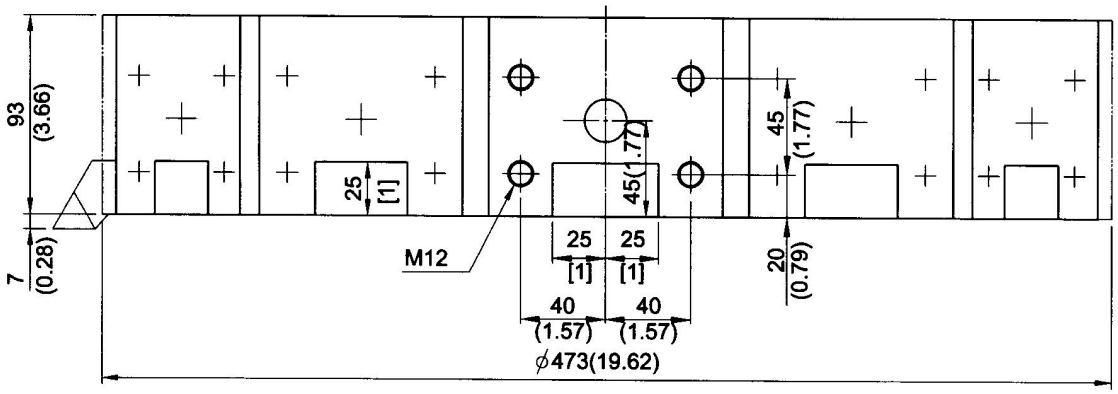


Fig. 6-2 V8 Turret Dimensions

3. V12 TURRET DIMENSIONS

[ ] is the dimension of INCH specification. Different of the dimension of METER specification.



Unit : mm (in.)

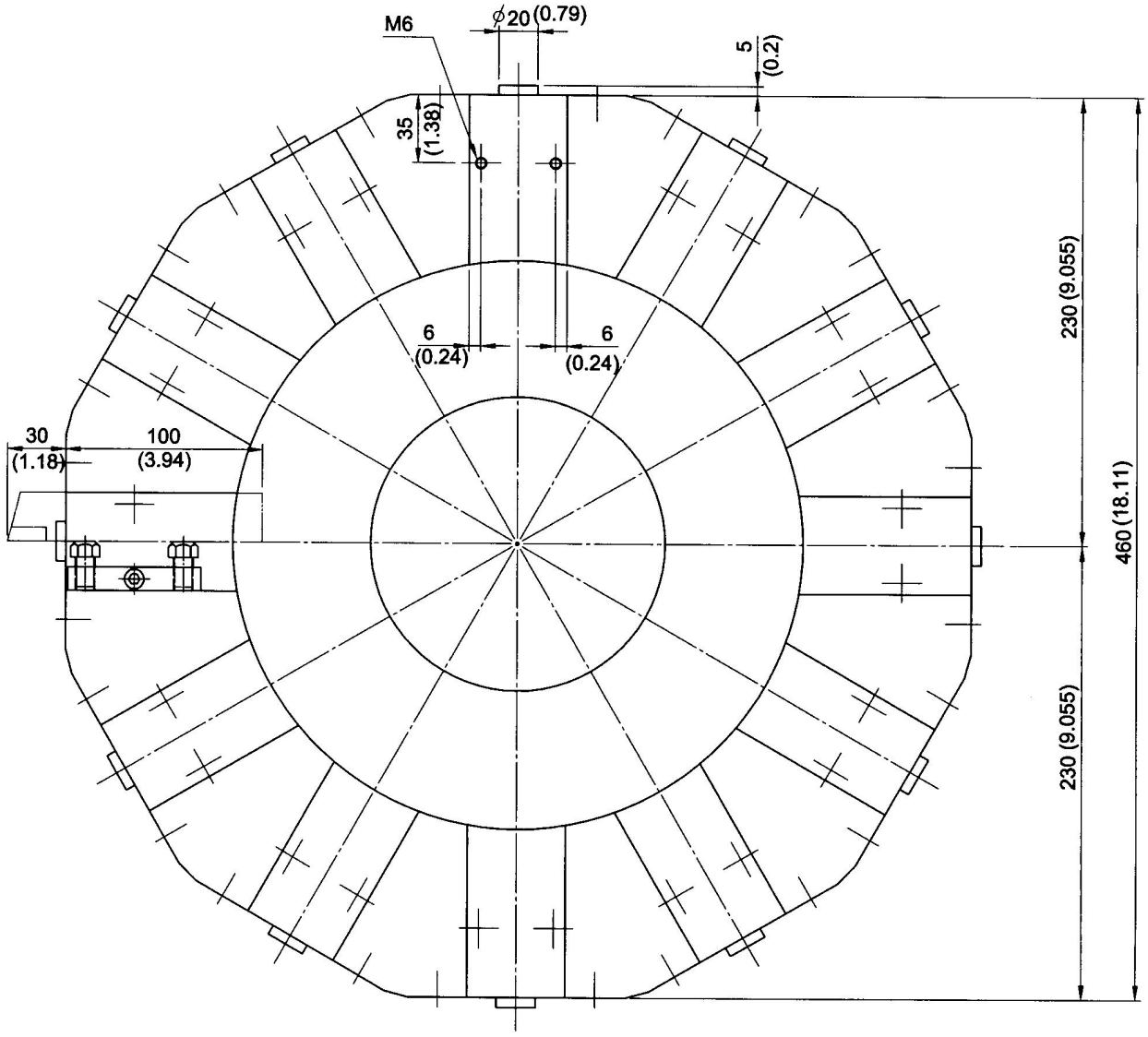
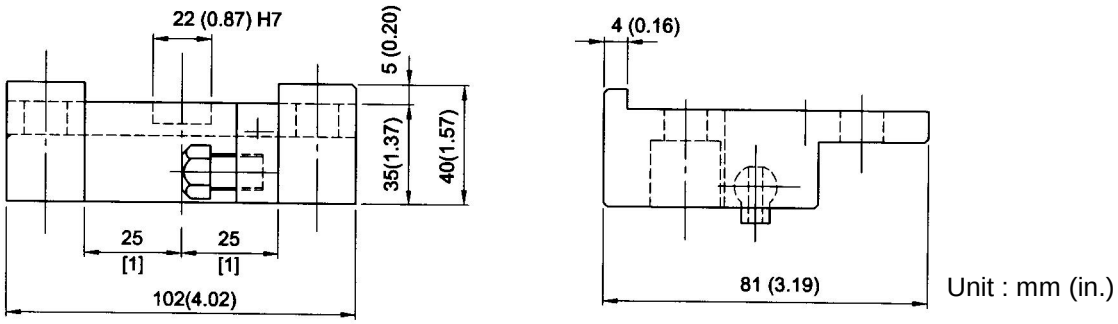


Fig. 6-3 V12 Turret Dimensions

4. TOOLHOLDER DIMENSIONS

[ ] is the dimension of INCH specification.
Different of the dimension of METER specification.

(1) OD Type I Toolholder (Optional)



Unit : mm (in.)

Fig. 6-4 Toolholder Dimensions (OD Type I Toolholder)

(2) OD Type II Toolholder

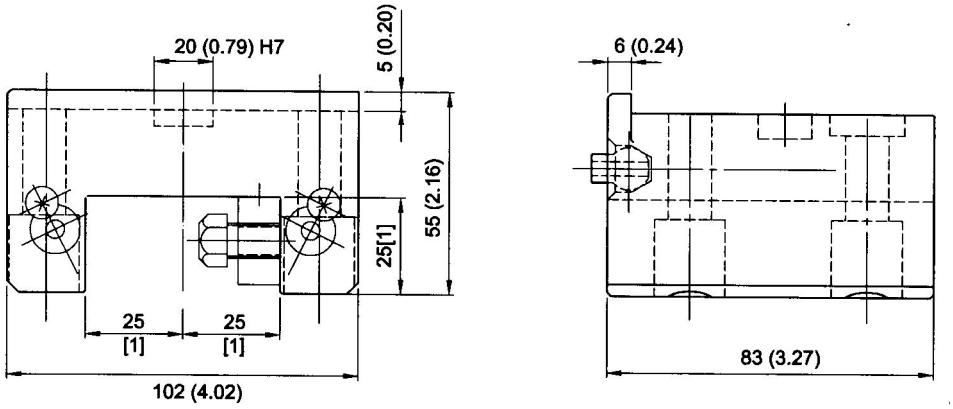


Fig. 6-5 Toolholder Dimensions (OD Type II Toolholder)

(3) ID Toolholder Base

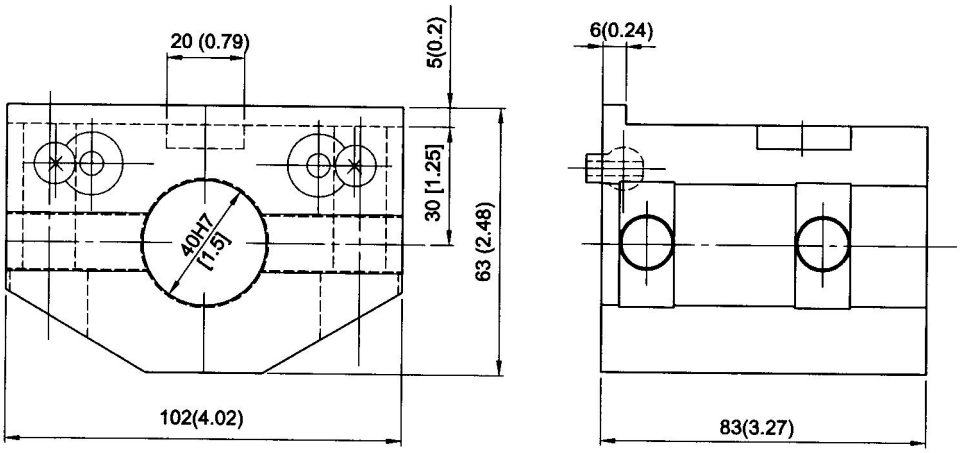
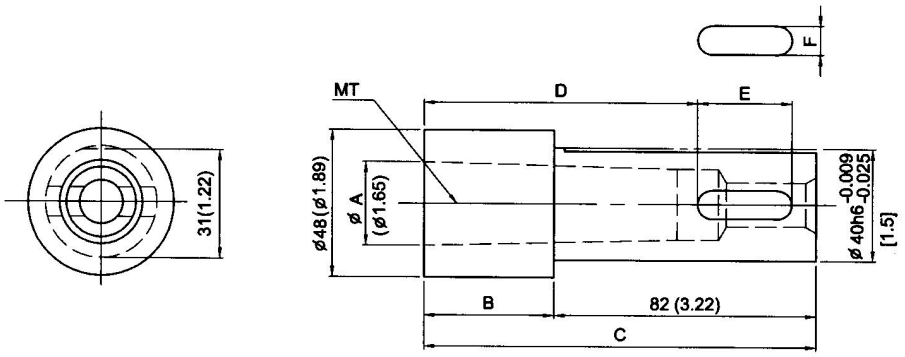


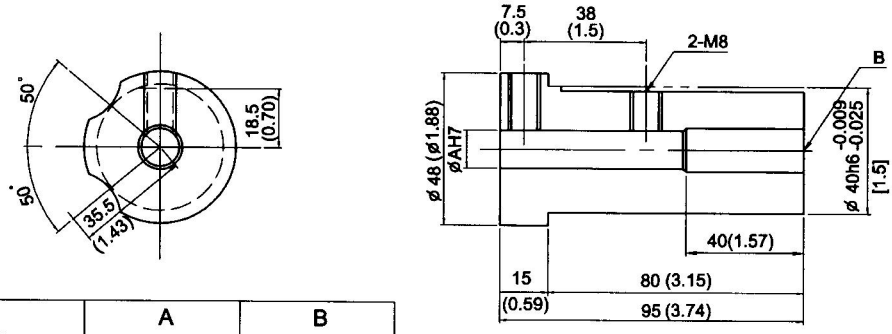
Fig. 6-6 Toolholder Dimensions (ID Toolholder Base)

(4) Drill Sleeve

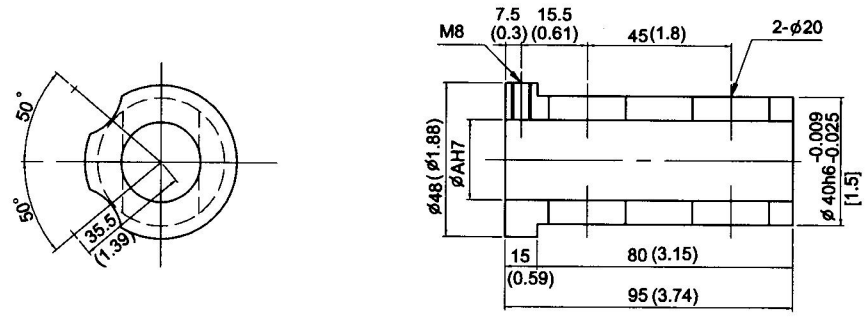


	A	B	C	D	E	F
MT NO.1-H40	12.065(0.48)	5(0.20)	87(3.43)	52(2.05)	19(0.75)	5.4(0.21)
MT NO.2-H40	17.780(0.70)	10(0.39)	92(3.62)	63(2.48)	22(0.87)	6.6(0.26)
MT NO.3-H40	23.825(0.94)	30(1.18)	112(4.41)	78(3.08)	27(1.06)	8.2(0.32)
MT NO.4-H40	31.267(1.23)	55(2.17)	137(5.39)	98(3.86)	32(1.26)	12.2(0.48)

Fig. 6-7 Drill Sleeve



	A	B
ø10-H40	10[0.375]	12(0.47)
ø12-H40	12[0.5]	14(0.60)
ø16-H40	16[0.625]	18(0.70)
ø20-H40	20[0.75]	22(0.87)

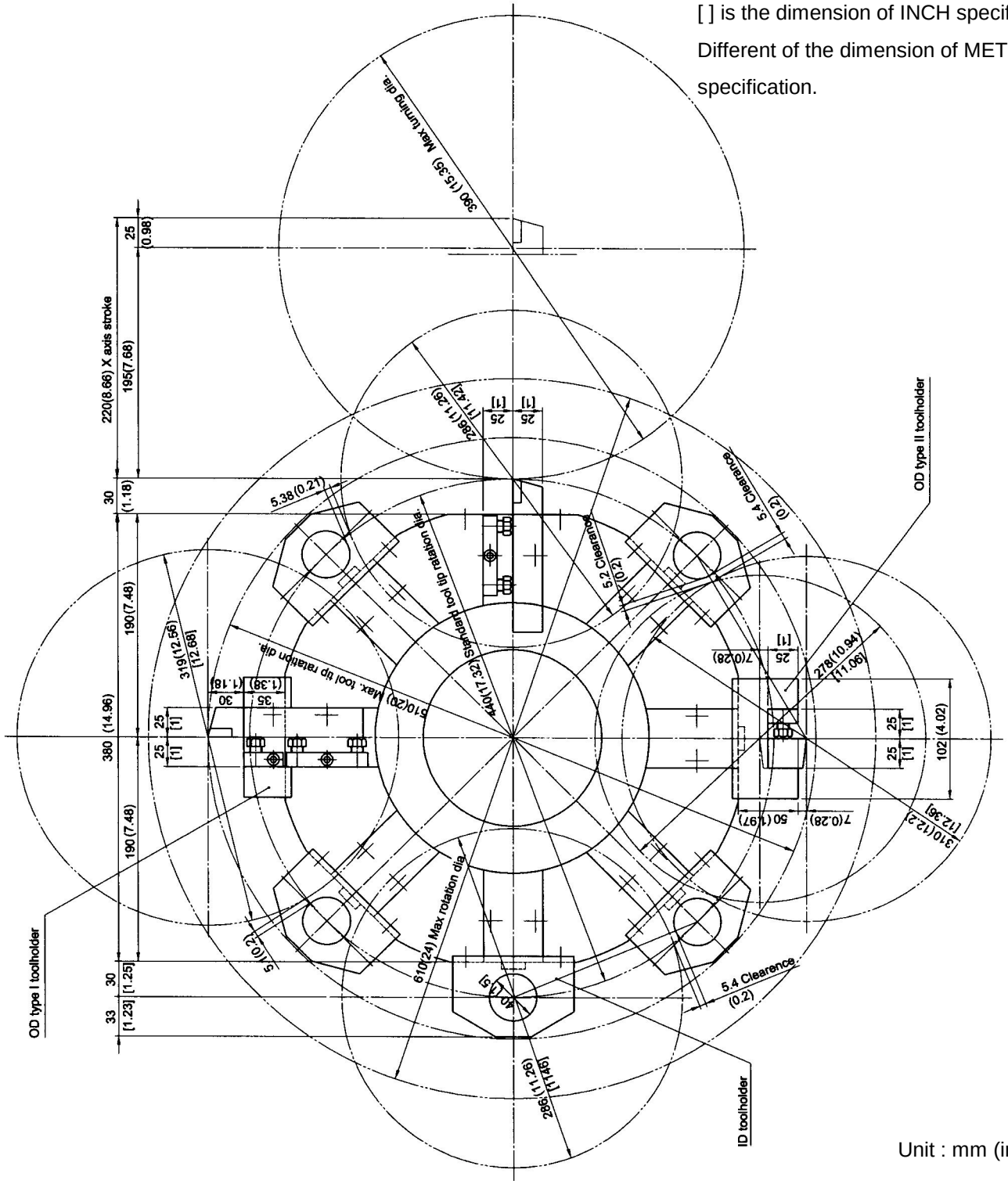


	A
ø25-H40	25[1]
ø32-H40	32[1.25]

Fig. 6-8 Boring Bar Sleeve

5. TOOL INTERENCE DIAGRAM (V8 TURRET)

[ ] is the dimension of INCH specification.
Different of the dimension of METER specification.

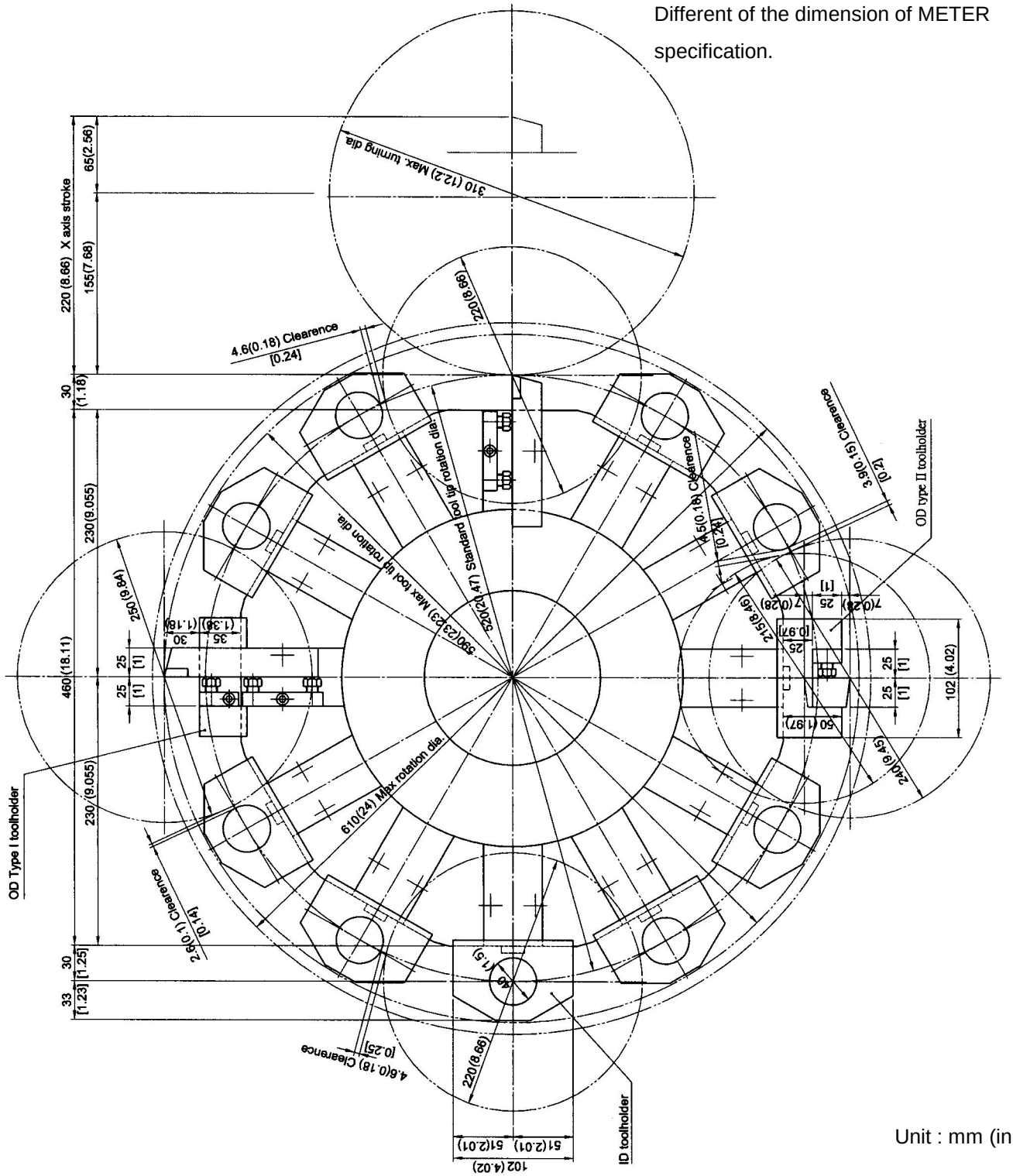


Unit : mm (in.)

Fig. 6-9 Tool Interference Diagram (V8 Turret)

6. TOOL INTERENCE DIAGRAM (V12 TURRET)

[ ] is the dimension of INCH specification.
Different of the dimension of METER specification.

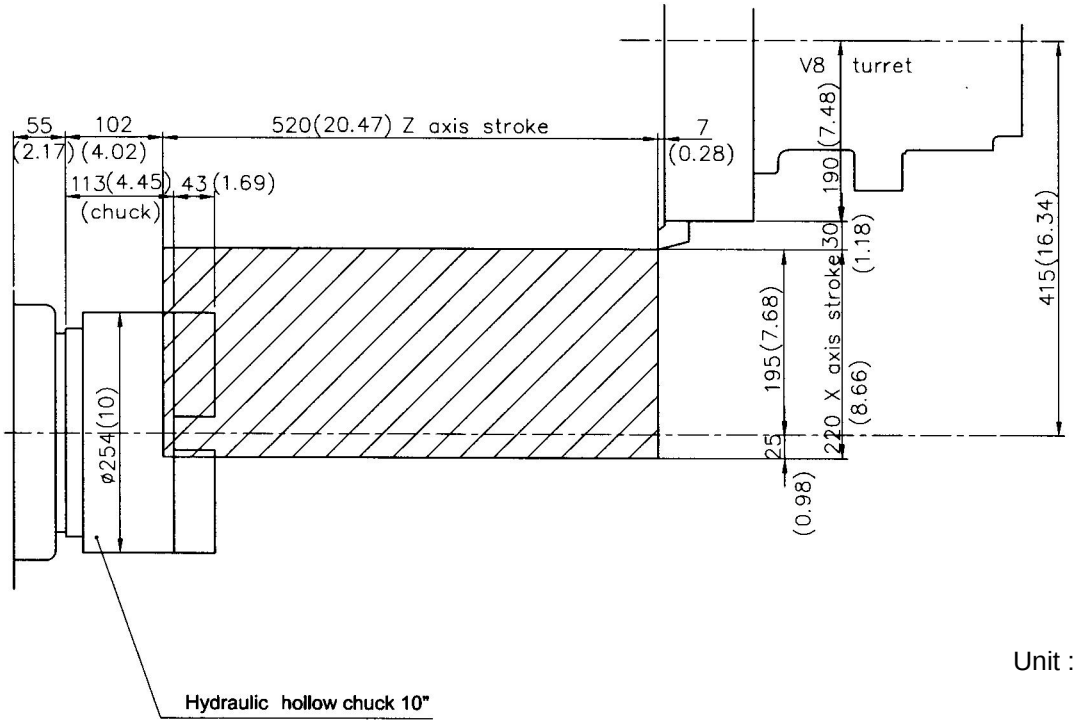


Unit : mm (in.)

Fig. 6-10 Tool Interference Diagram (V12 Turret)

7. WORKING RANGE DIAGRAM (V8 TURRET)

7-1. Standard Specification (Without Tailstock)



Unit : mm (in.)

Fig. 6-11 Working Range Diagram (Standard Tool Tip)

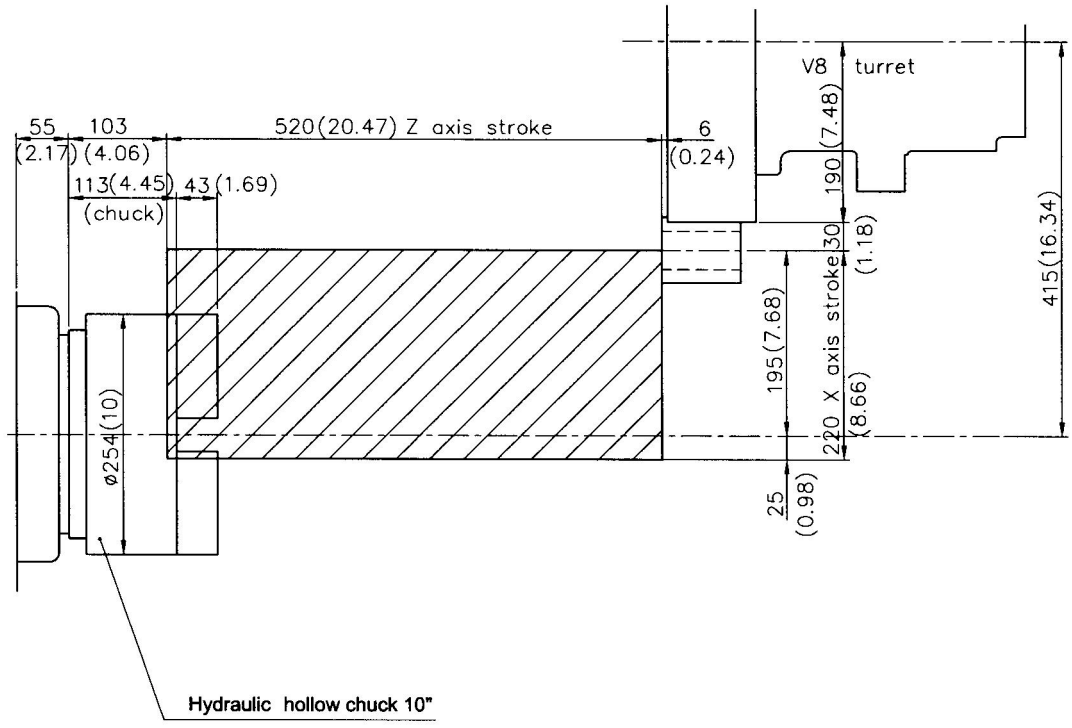


Fig. 6-12 Working Range Diagram (ID Toolholder Base)

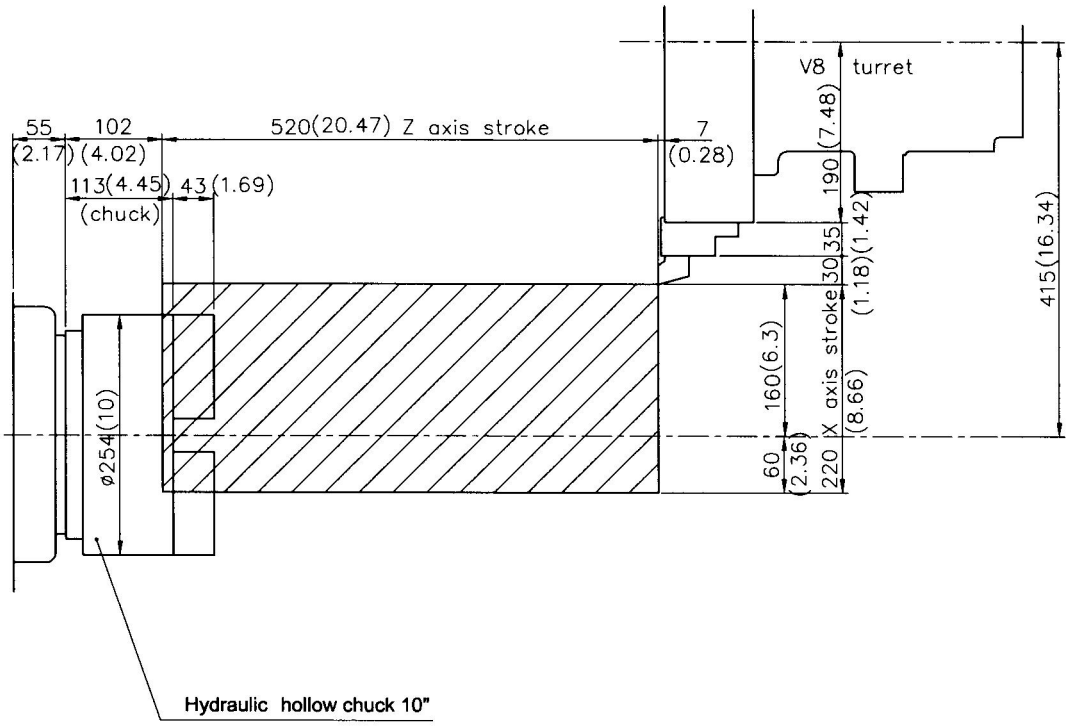


Fig. 6-13 Working Range Diagram (OD Type I Toolholder)

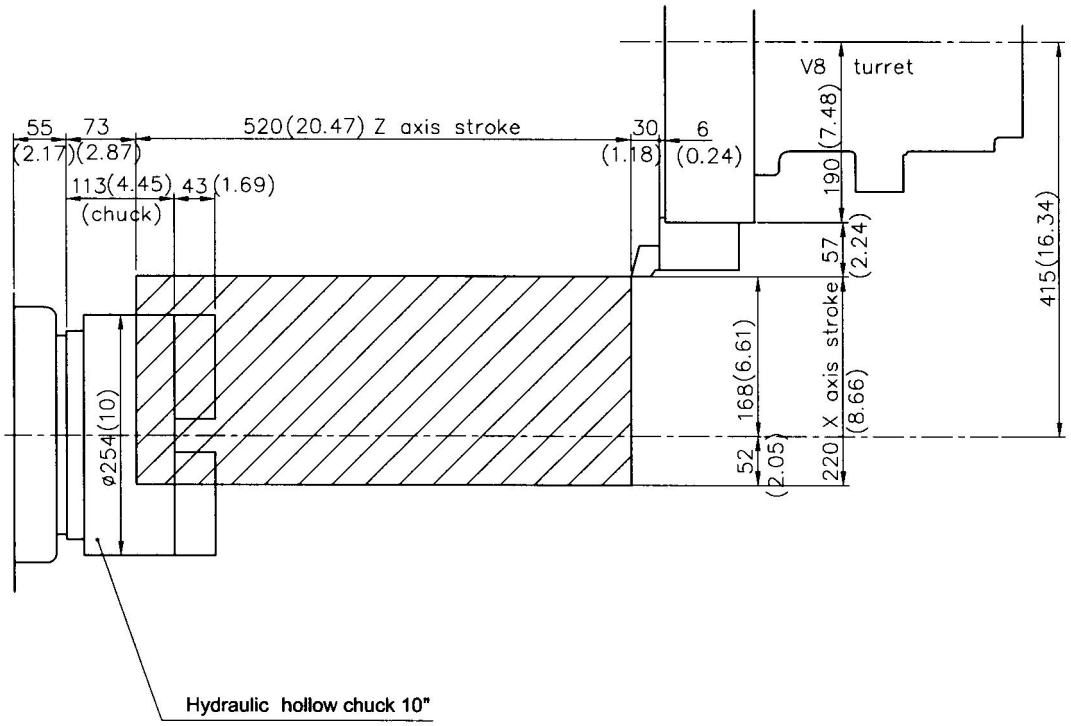


Fig. 6-14 Working Range Diagram (OD Type II Toolholder)

7-2. Tailstock Specification (With Tailstock)

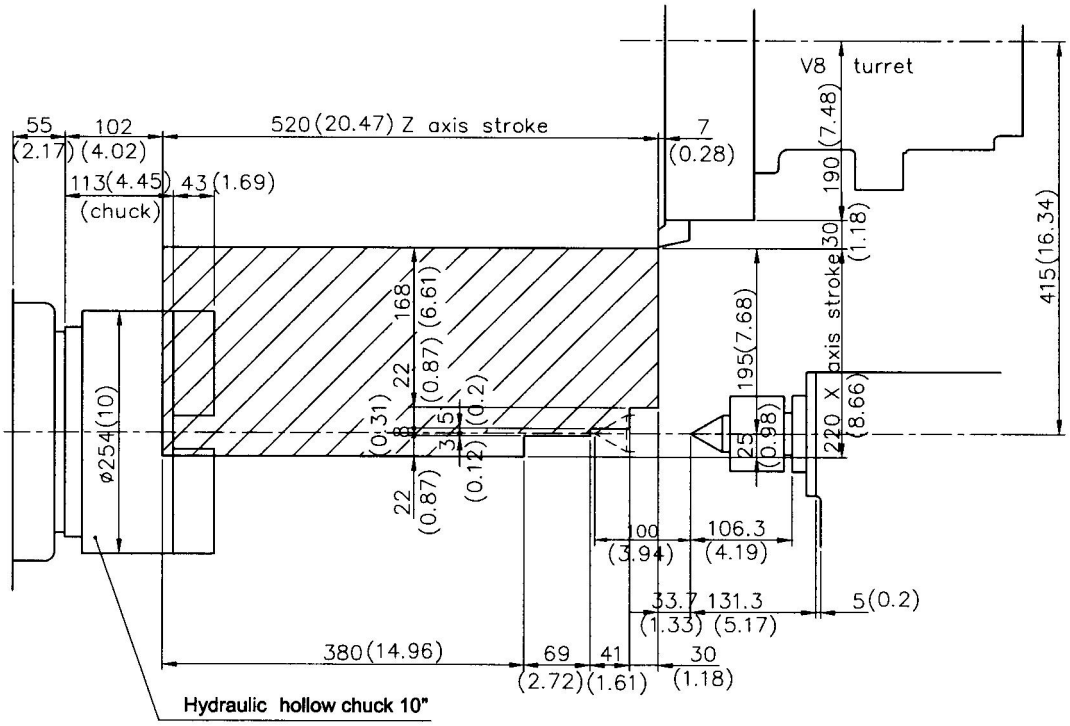


Fig. 6-15 Working Range Diagram (Standard Tool Tip)

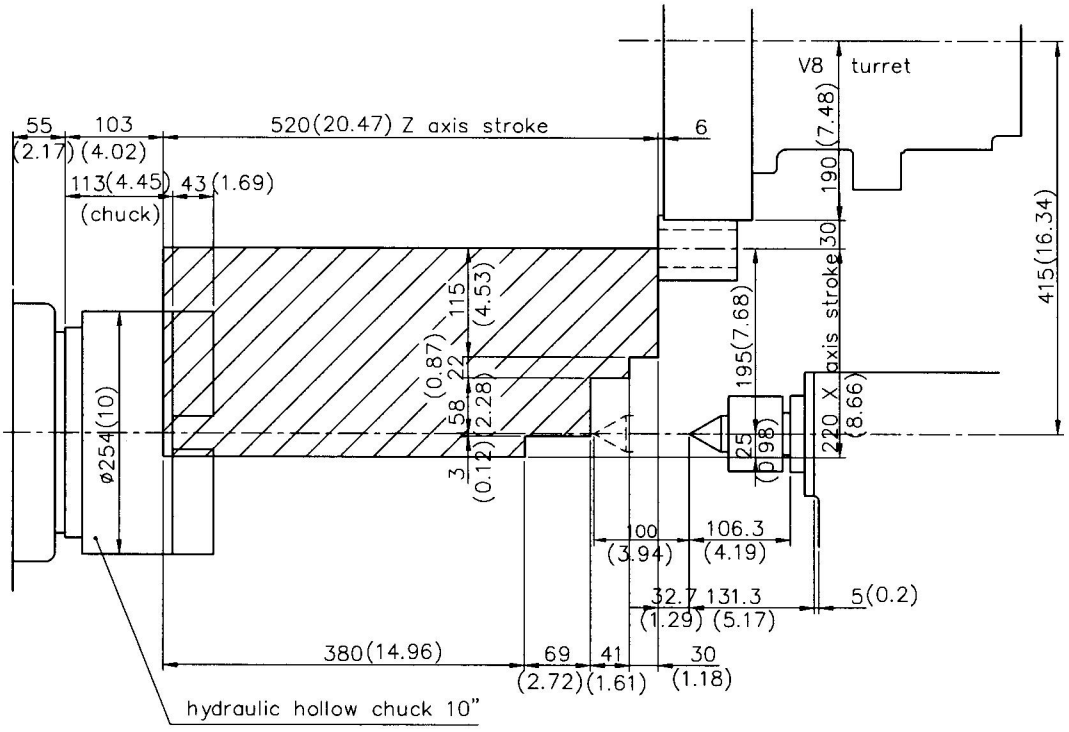


Fig. 6-16 Working Range Diagram (ID Toolholder Base)

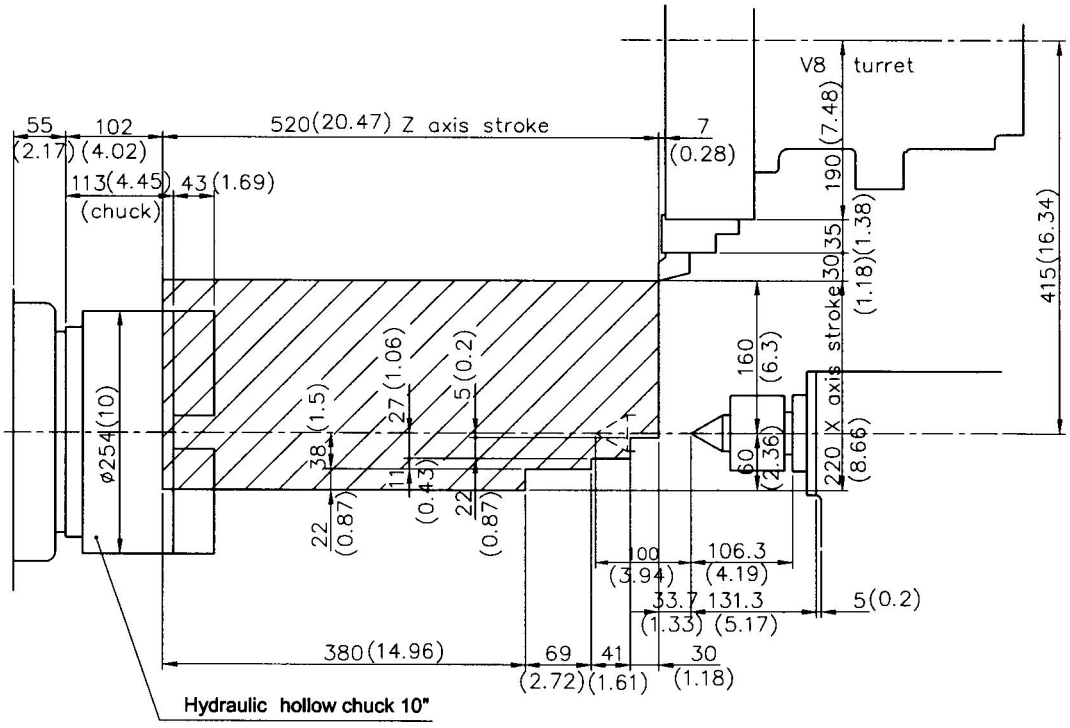


Fig. 6-17 Working Range Diagram (OD Type I Toolholder)

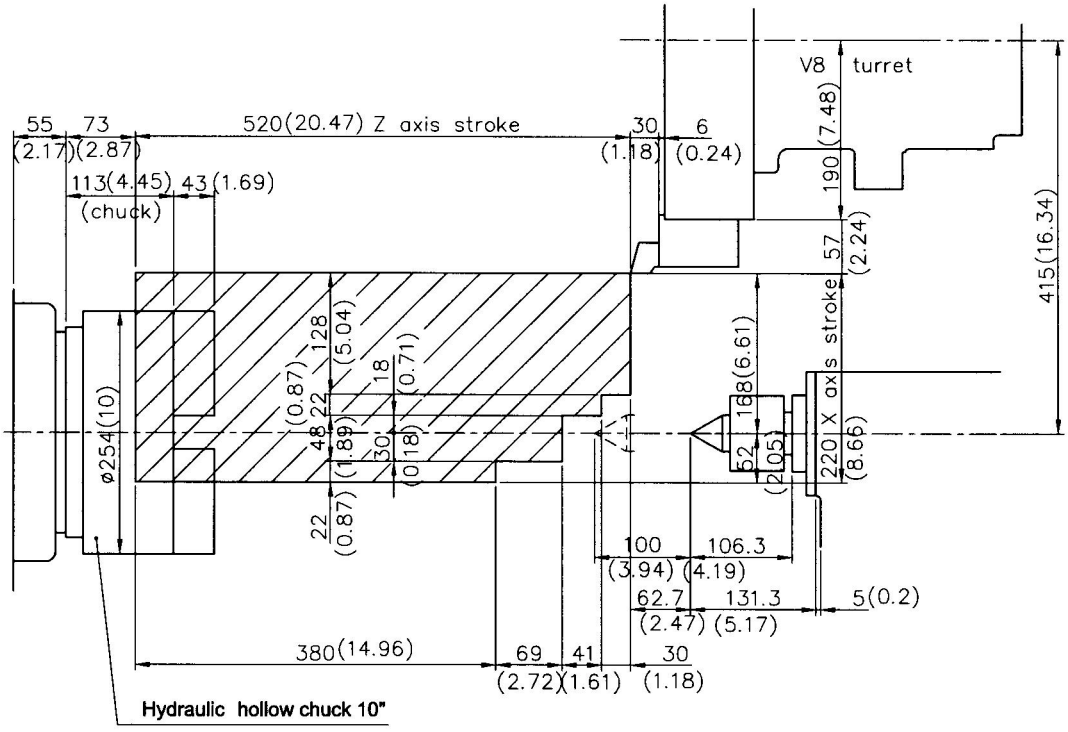
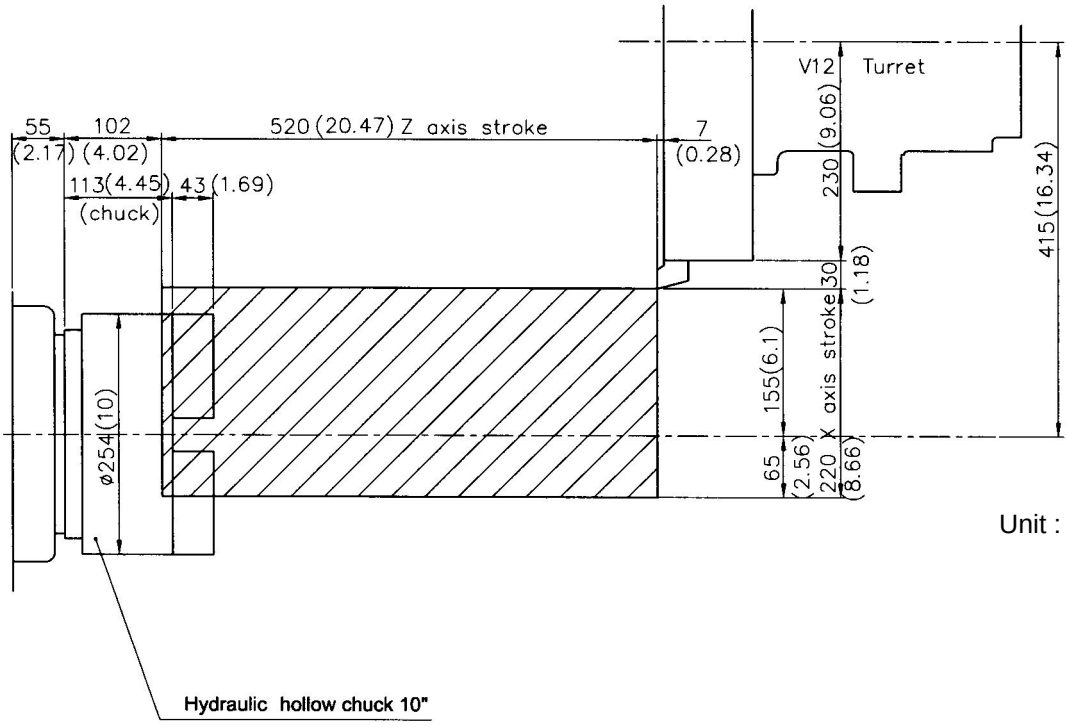


Fig. 6-18 Working Range Diagram (OD Type II Toolholder)

8. WORKING RANGE DIAGRAM (V12 TURRET)

8-1. Standard Specification (Without Tailstock)



Unit : mm (in.)

Fig. 6-19 Working Range Diagram (Standard Tool Tip)

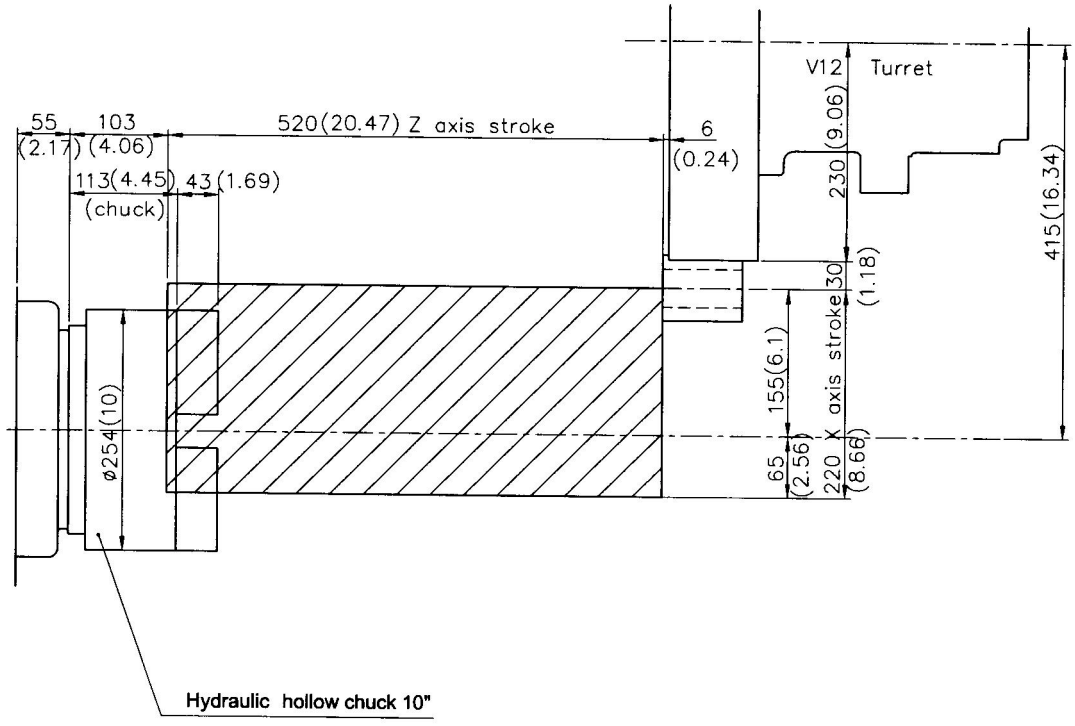


Fig. 6-20 Working Range Diagram (ID Toolholder Base)

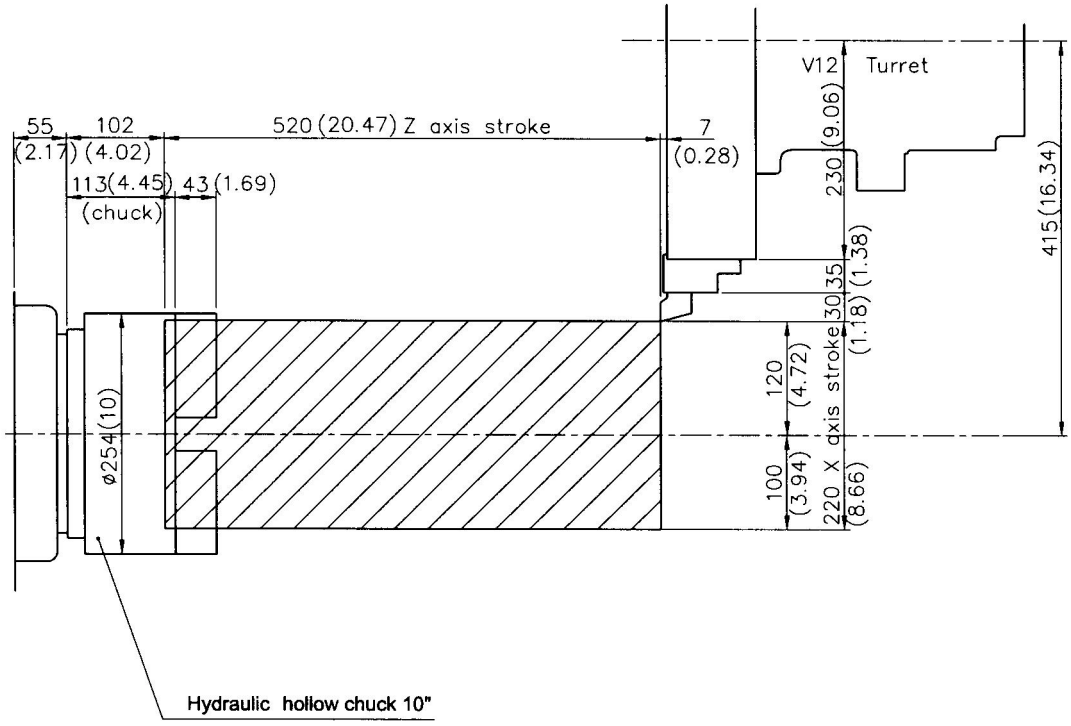


Fig. 6-21 Working Range Diagram (OD Type I Toolholder)

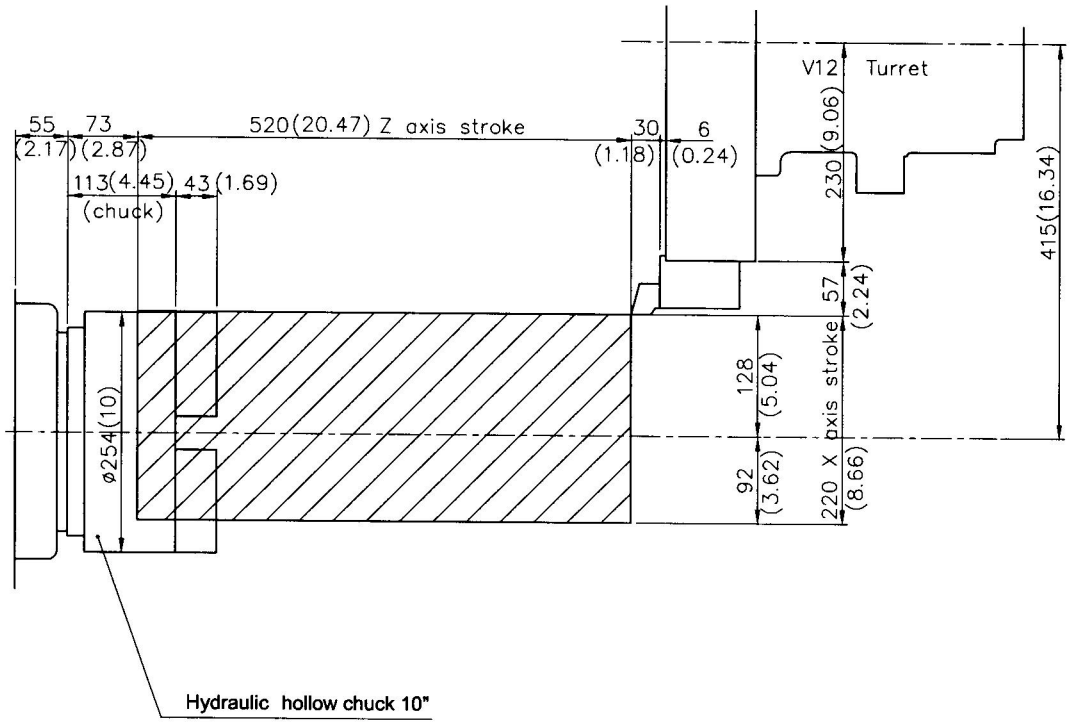


Fig. 6-22 Working Range Diagram (OD Type II Toolholder)

8-2. Tailstock Specification (With Tailstock)

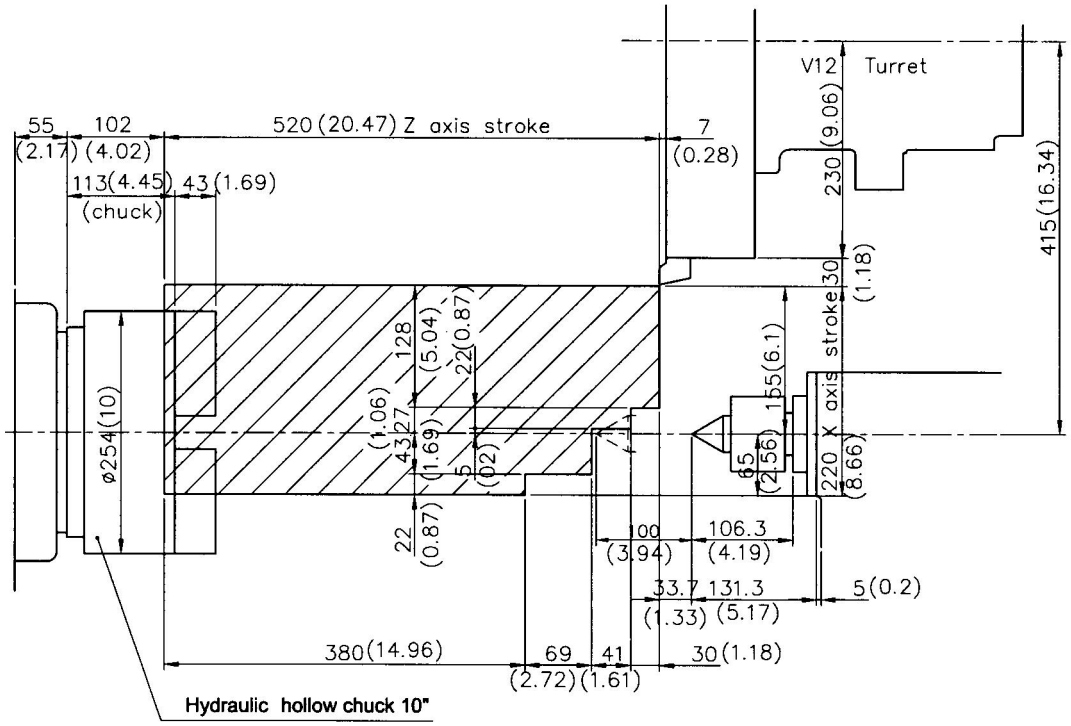


Fig. 6-23 Working Range Diagram (Standard Tool Tip)

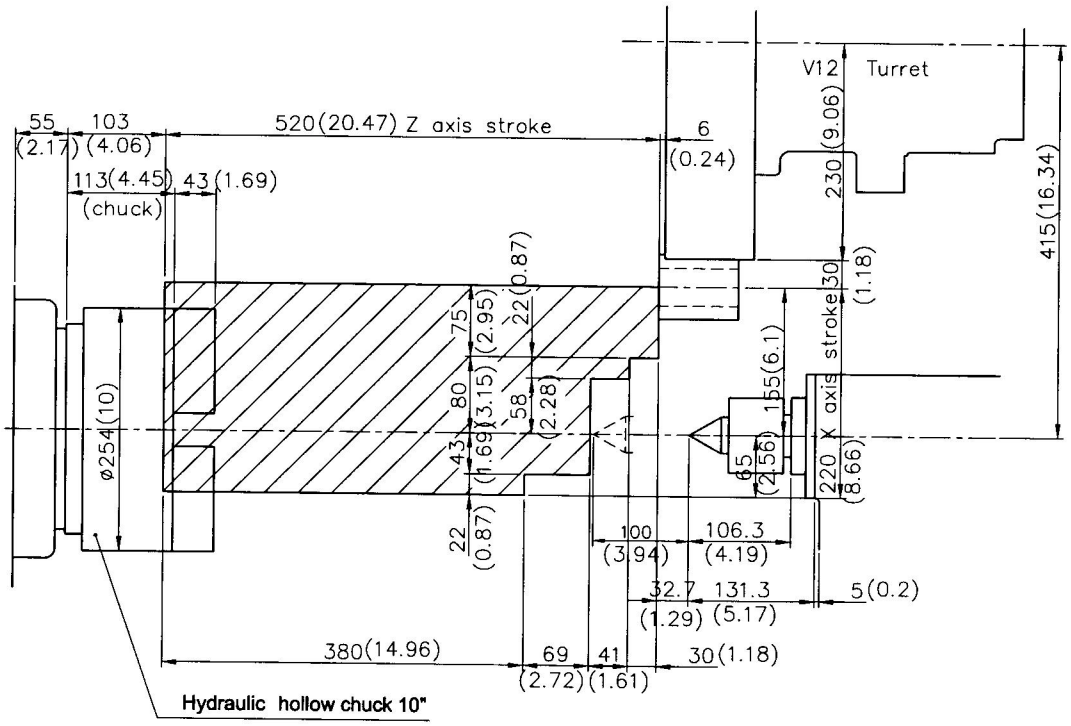


Fig. 6-24 Working Range Diagram (ID Toolholder Base)

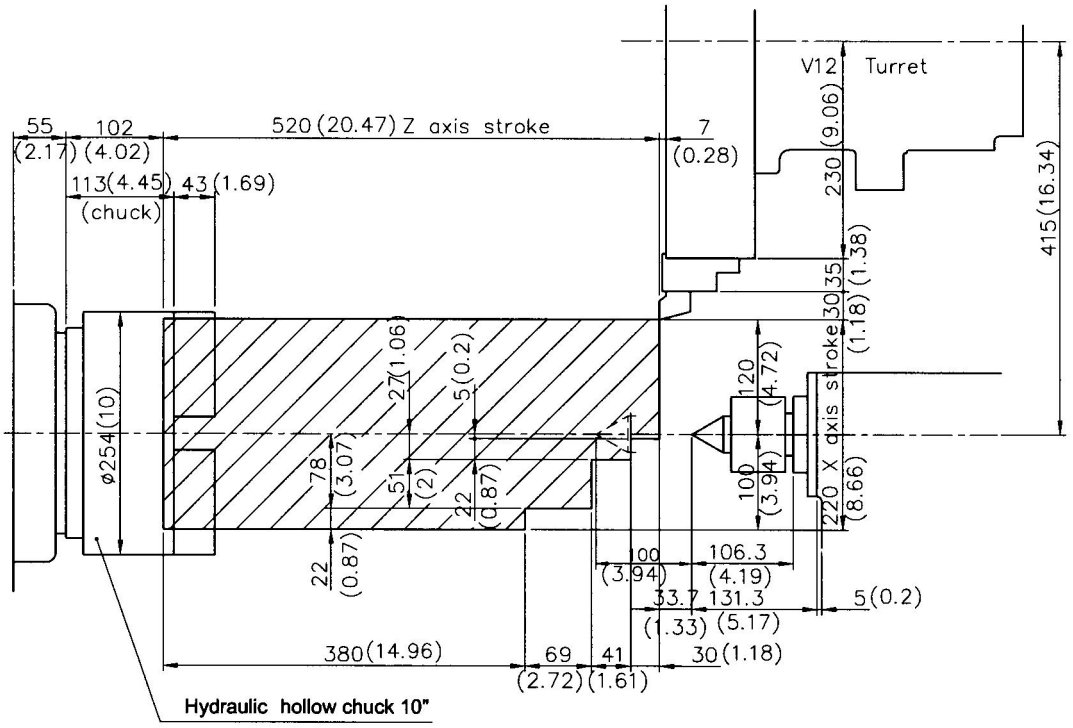


Fig. 6-25 Working Range Diagram (OD Type I Toolholder)

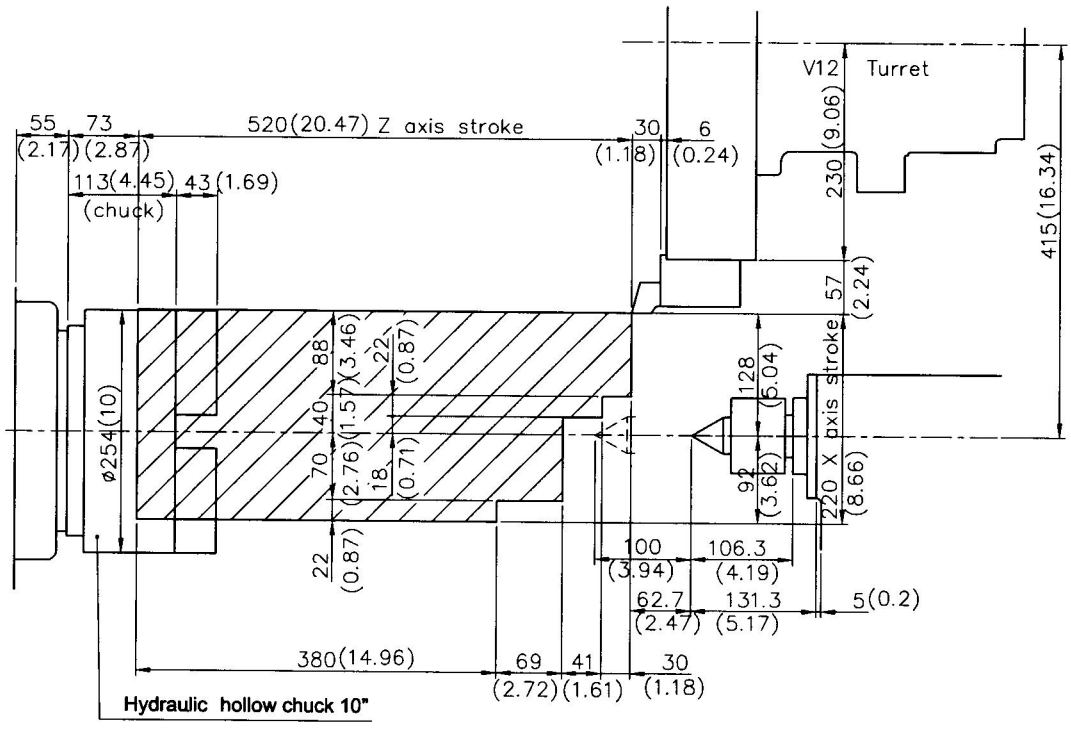


Fig. 6-26 Working Range Diagram (OD Type II Toolholder)

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

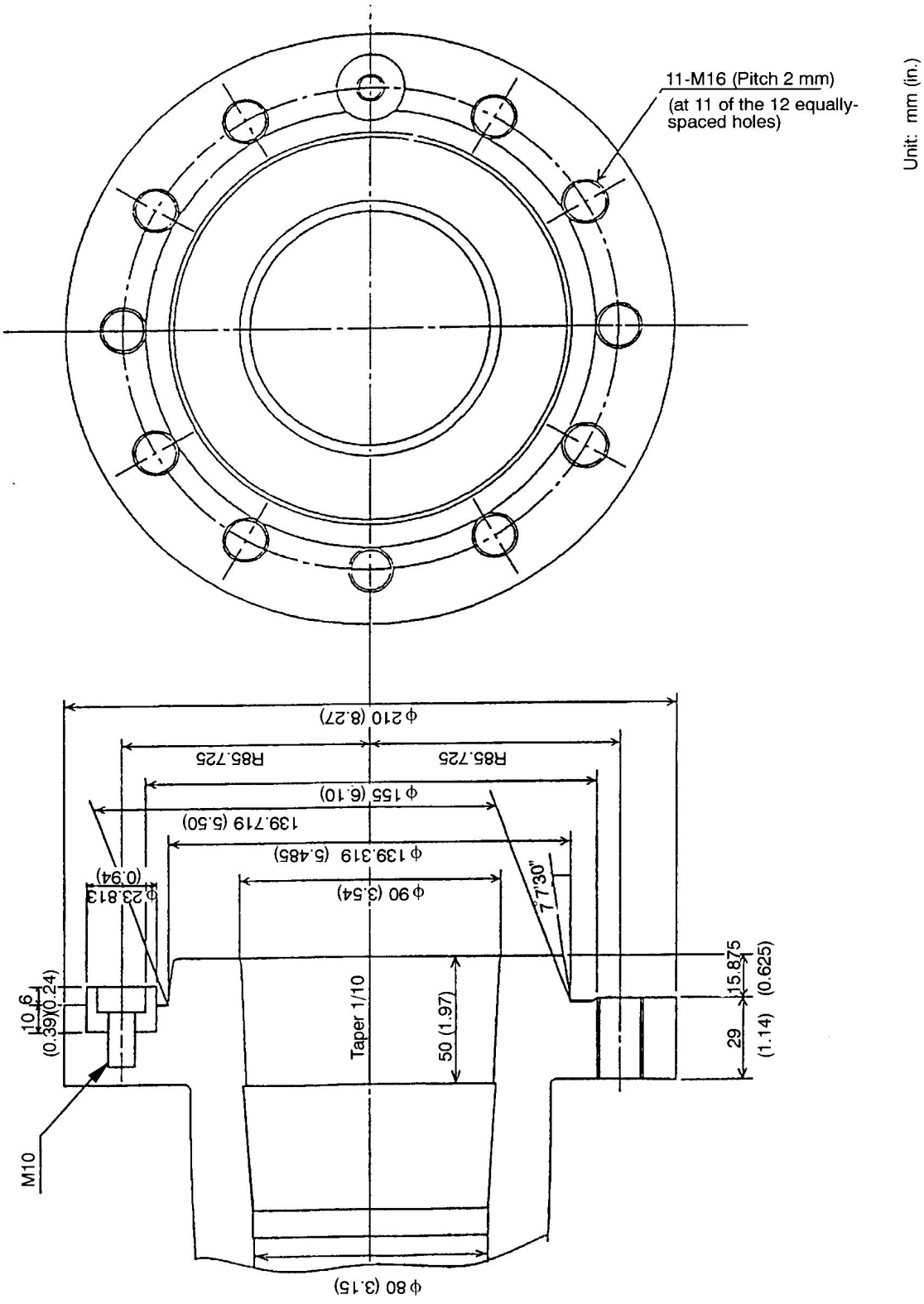
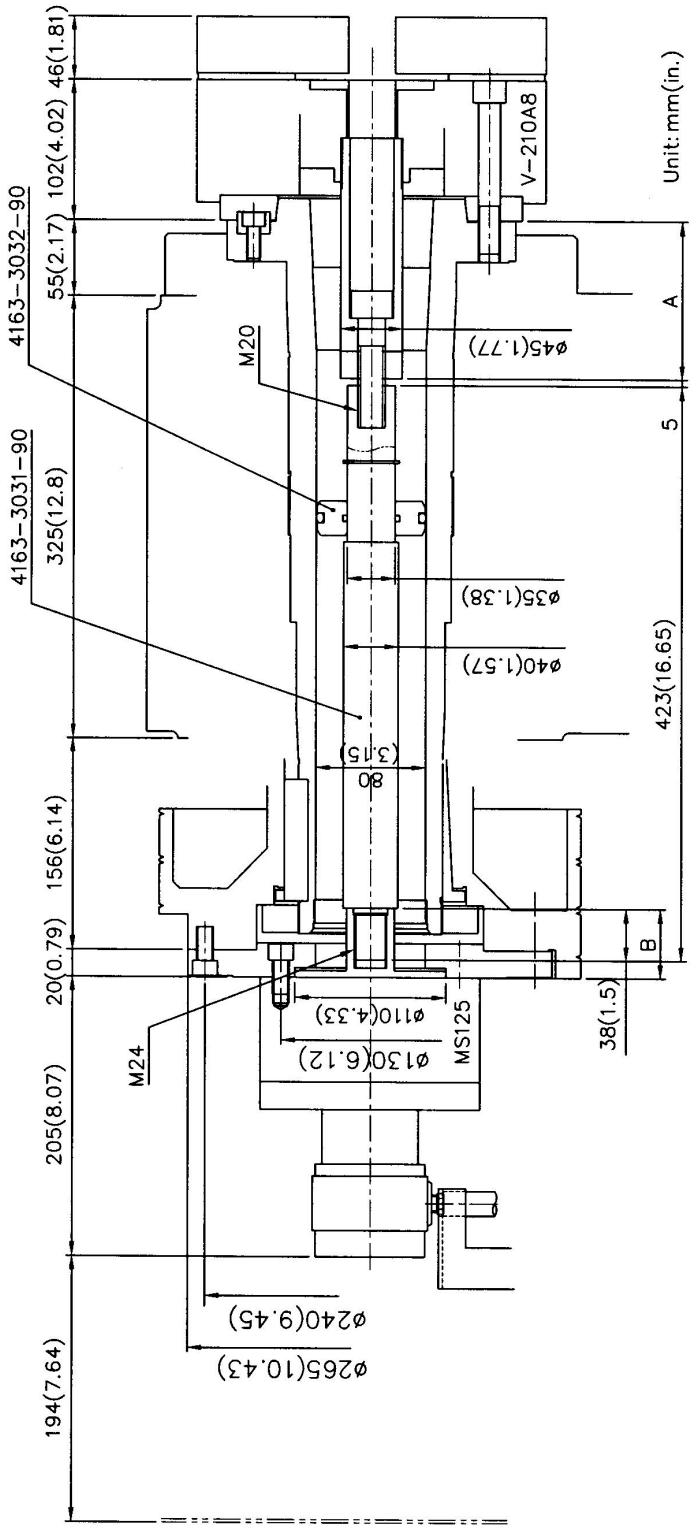


Fig. 6-27 Dimension of Spindle Nose (JIS-A2-8)

10. HYDRAULIC SOLID CHUCK AND CYLINDER



Chuck Specification	
Type of Chuck	V-210A8
Max.Speed	3500min^{-1}{rpm}
Allowable Thrust	29KN {2957 kgf(6505 lbf)}
Plunger Travel	25 mm{0.984 in}
Jaw Travel (in diameter)	8.8 mm{0.346 in}
Gripping Force per jaw	98KN {10013Kgf(22028lbf)}
Weight	37.15Kg(81.73lb)

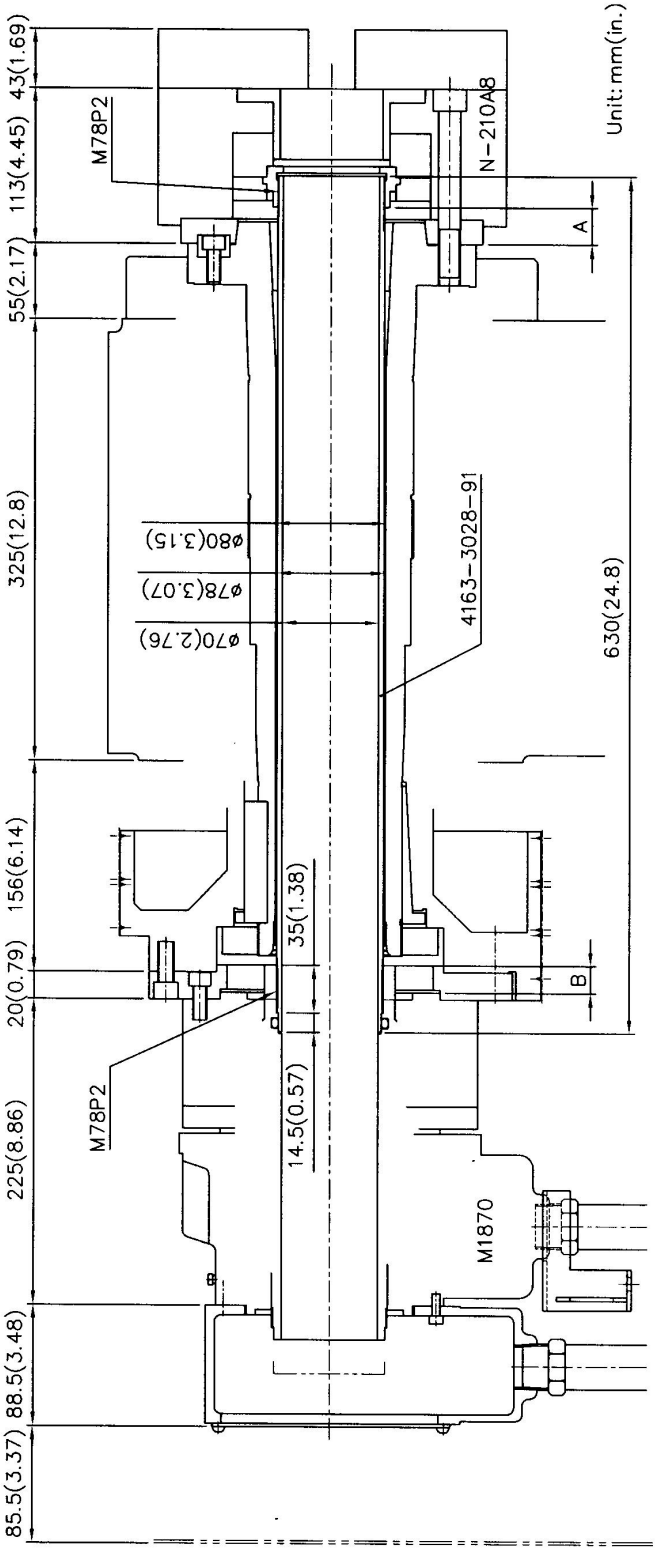
Dimension / Chuck Type	A		B	
	Max.	Min.	Max.	Min.
V-210A8	140 mm (5.51")	115 mm (4.53 ")	51 mm (2")	26mm (1.02")

Cylinder Specification	
Type of Cylinder	MS125
Max. speed	6000 min^{-1}{rpm}
Piston Thrust Hydraulic Pressure: 4Mpa 40.8Kg/cm^2 580.2psi	42KN {4283 kgf (9422.6lbf)}
Piston Travel	25 mm{0.984in}
Max.Pressure	4Mpa{40.8kg/cm^2(580.2psi)}
Weight	10Kg(22Olb)

Machine Specification	
Max.Speed	3000 min^{-1}{rpm}
Max. Pressure	3.9Mpa {40Kgf/cm^2 (568.8psi)}

Fig. 6-28 Hydraulic Solid Chuck and Cylinder

11. HYDRAULIC HOLLOW CHUCK AND CYLINDER



Chuck Specification	
Type of Chuck	N-210A8
Max.Speed	4200min^{-1}{rpm}
Allowable Thrust	42.17KN {4300 kgf(9460 lbf)}
Plunger Travel	19 mm{0.75 in}
Jaw Travel (in diameter)	8.8 mm{0.346 in}
Gripping Force	107.87KN {11000Kgf(24200lbf)}
Weight	37.4Kg(82.28lb)

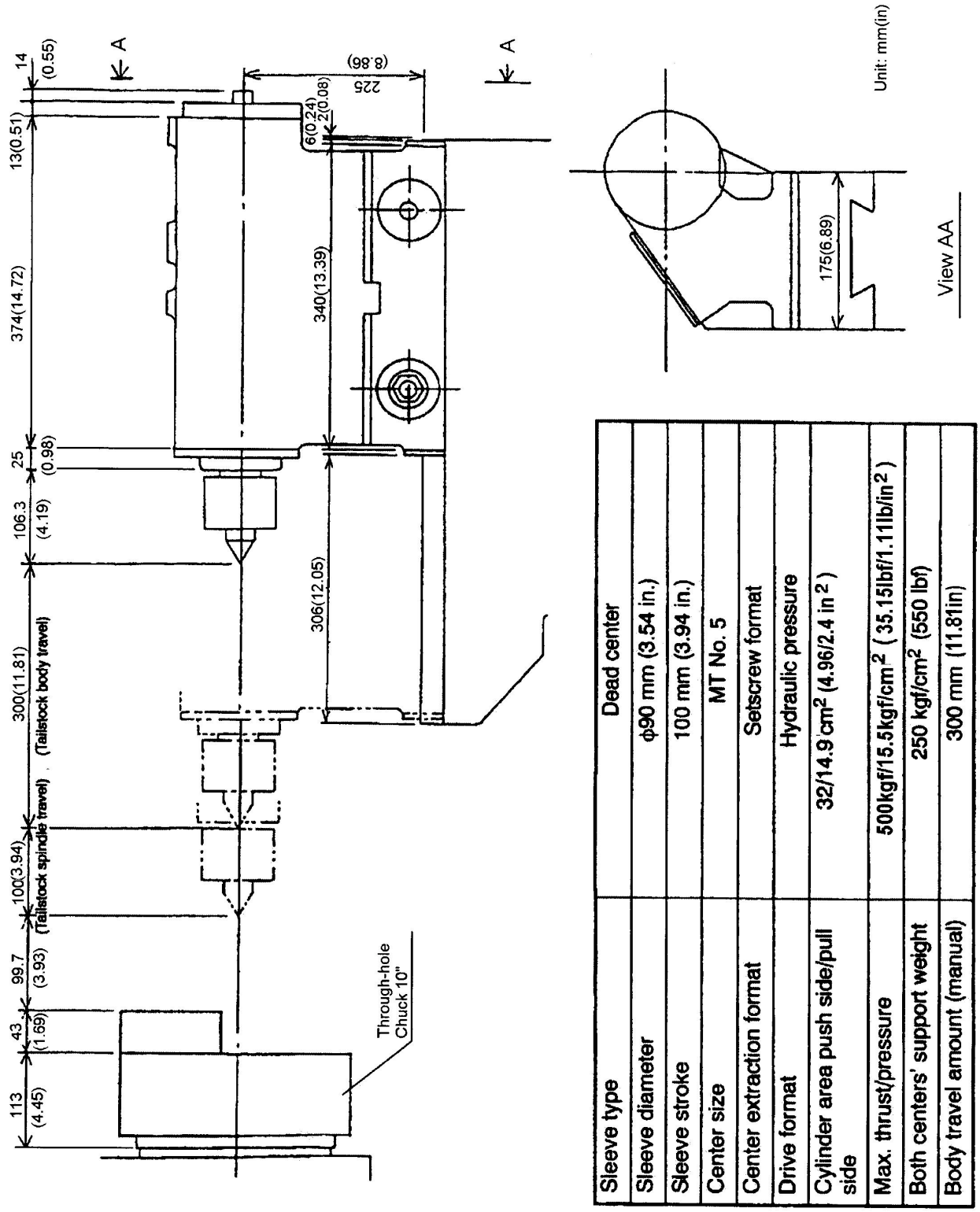
Dimension / Chuck Type	A		B	
	Max.	Min.	Max.	Min.
N-210A8	26.5mm (1.04")	7.5mm (0.3 ")	20mm (0.79")	-5mm (-0.2")

Cylinder Specification			
Type of Cylinder	M1870		
Max. speed	4700 min^{-1}{rpm}		
Piston Thrust Hydraulic Pressure: 4Mpa 40.8Kg/cm^2 580.2psi	Push	75KN {7546 kgf (16601lbf)}	
	Pull	69KN {7036 kgf (15479lbf)}	
Piston Travel	25 mm{0.984in}		
Max.Pressure	4Mpa{40.8kg/cm^2(580.2psi)}		
Weight	28Kg(61.6lb)		

Machine Specfication	
Max.Speed	3000 min^{-1}{rpm}
Max. Pressure	3.9Mpa {40Kgf/cm^2 (568.8psi)}

Fig. 6-29 Hydraulic Hollow Chuck and Cylinder

12. HYDRAULIC TAILSTOCK



Sleeve type	Dead center
Sleeve diameter	ϕ90 mm (3.54 in.)
Sleeve stroke	100 mm (3.94 in.)
Center size	MT No. 5
Center extraction format	Setscrew format
Drive format	Hydraulic pressure
Cylinder area push side/pull side	32/14.9 cm^2 (4.96/2.4 in^2)
Max. thrust/pressure	500kgf/15.5kgf/cm^2 (35.15lbf/1.11lb/in^2)
Both centers' support weight	250 kgf/cm^2 (550 lbf)
Body travel amount (manual)	300 mm (11.81in)

Fig. 6-30 Hydraulic Tailstock

13. HYDRAULIC CIRCUIT DIAGRAM

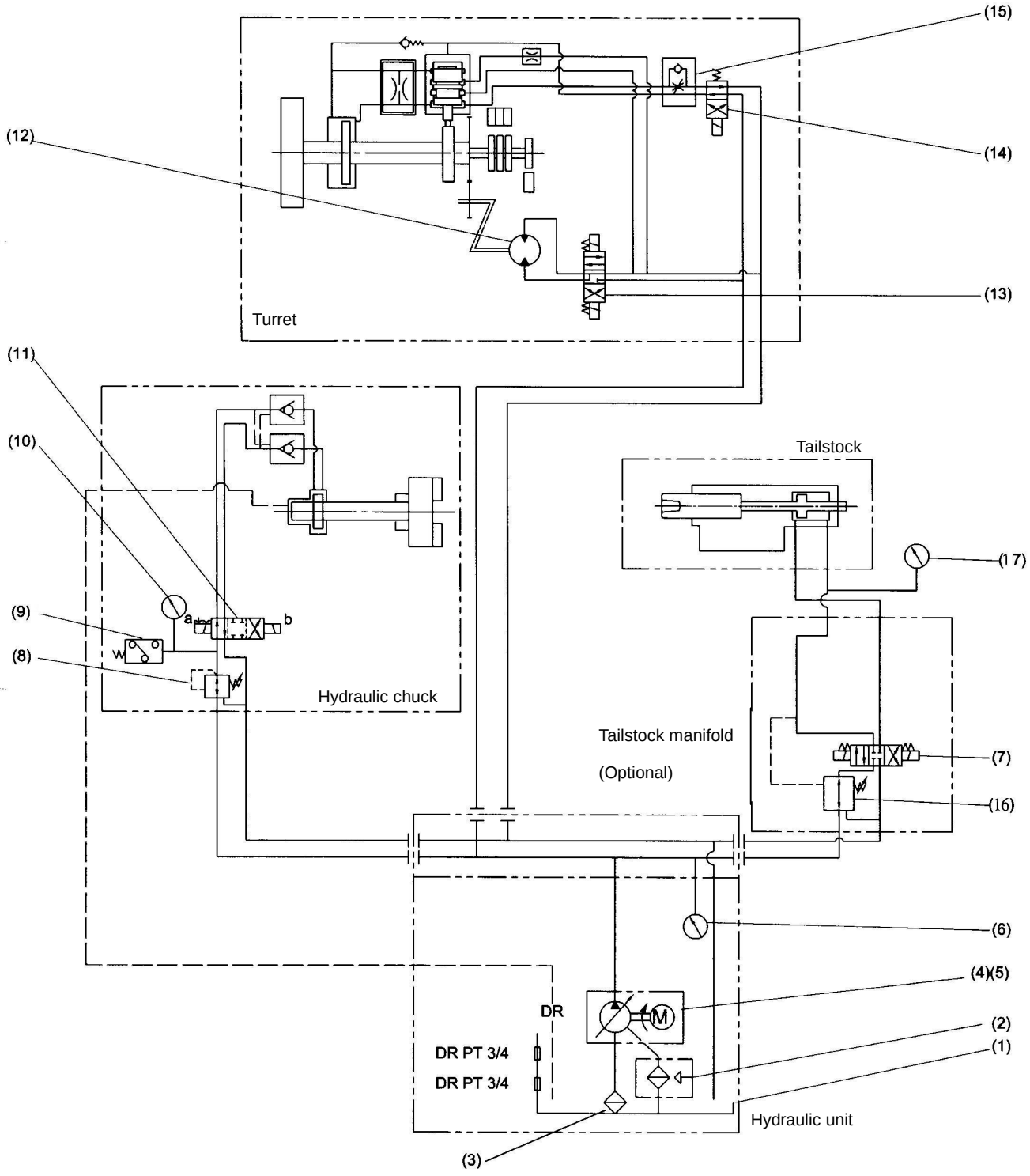


Fig. 6-31 Hydraulic Circuit Diagram

No.	Part Name	Maker	Type	Qty	Use	Part No.
1	Oil tank	Anson	TK-30	1	Hydraulic	4162-4001-20
2.	Radiator	Sinsor	AW0608	1	Hydraulic Unit	7924-0110-01
3	Filter	Sinsor	PT3/4 66x58 150mesh	1	Hydraulic Unit	7922-4150-42
4	Motor	Tatung	IK-FBB 4P 1.5kW	1	Hydraulic unit	7999-0870-40
5	Vane pump	Anson	PVF-30-55	1	Hydraulic Unit	7900-2073-01
6	Pressure gauge	Skon	PT1/4 0~100kg/cm^2 (0~1500psi)	1	Hydraulic Unit	7909-0121-02
7	Solenoid valve	Dofluid	DFB-02-3C2 DC24V	1	Tail stock	7905-0444-12
8	Reducing valve	7-Ocean	MGV-02P-0-10	1	Chuck	7906-1060-36
9	Pressure switch	7-Ocean	PS-02-1-10	1	Chuck	7909-1402-02
10	Pressure gauge	Skon	PT1/4 0-40kg/cm^2 (0~600 psi)	1	Chuck	7909-0120-42
11	Solenoid valve	Dofluid	DFB-02-2D2 24V	1	Chuck	7905-1434-11
12	Oil-motor	Sumitomo	H130BA4M-G	1	Turret	7904-2013-00
13	Solenoid	Dofluid	DFB-02-3C4 DC24V	1	Turret	7905-0445-13
14	Solenoid	Dofluid	DFB-02-2B2 DC24V	1	Turret	7905-2434-12
15	Throttle & check	Sunny	TVC-B-02M	1	Turret	7908-0061-03
16	Reducing valve	7-Ocean	MGV-02-A-0-10	1	Tailstock	7906-1060-38
17	Pressure gauge	Skon	PT1/4 0-40kg/cm^2 (0~600 psi)	1	Tailstock	7909-0120-42

14. CHIP CONVEYOR (OPTIONAL)

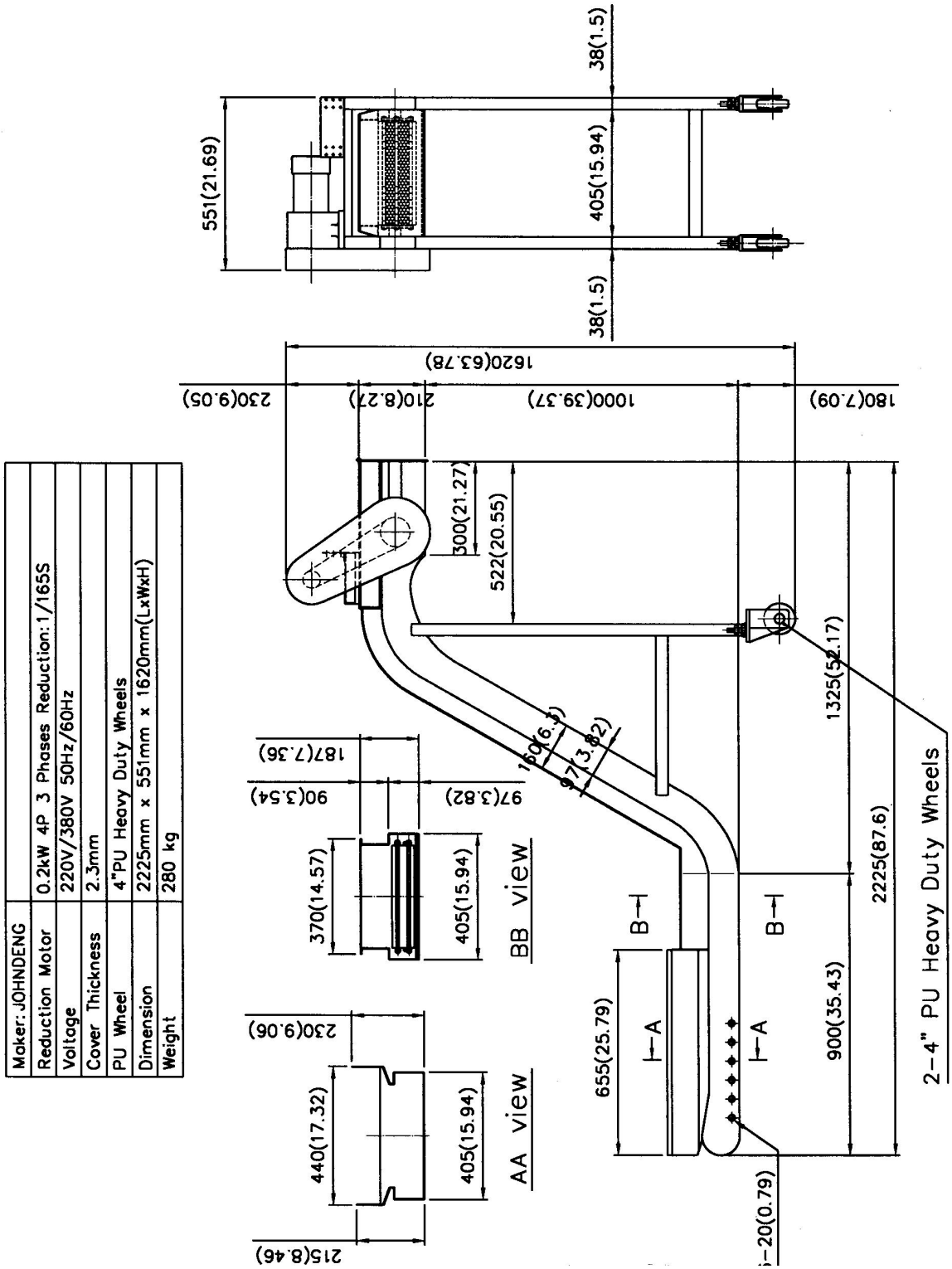


Fig 6-32 Chip Conveyor – Side (H-type)

15. PLC ALARM LIST

According to “Alarm No.”, consult the manual in following pages to deal with the causes of alarm (The Alarm No. not listed here are detected by NC, consult OSP-U10L ALARM &ERROR LIST.)

<< Alarm List >> (Alarm A)

*1700 Stroke end over

An axis stroke end limit switch is tripped.
Object: Axis
Probable faulty location:
(a) Positive or negative soft limit position setting error.
(b) The soft limit position setting is outside the emergency limit position.
Measures to take: Check the axis travel end limit switches. Verify if any axis limit switch is tripped by an axis limit dog or if a foreign object has tripped the limit switch. In manual mode, press and hold the Emergency limit release push button on the system reset panel inside the control box. While holding emergency limit release have another operator press NC reset on operation panel. Then slowly move the axis off the machine limit dog with the Pulse handle. After axis limit switch is away from the limit, release the emergency limit release push button. Reset soft limits within the emergency limit position.

*1701 Stroke end limit cancel

Operation mode other than MANUAL is selected while the stroke end limit cancel switch is on.
Object: Axis
Probable faulty location: Stroke end limit cancel push button is pressed while machine is not in MANUAL mode.
Measures to take: Switch machine to MANUAL mode. Press NC reset push button on operation panel to reset alarm.

*1702 Emergency stop

One or more Emergency Stop push buttons are depressed.
Object: None
Probable faulty locations: One or more Emergency stop button(s). Press Control On push button.
Measures to take: Release emergency stop pushbutton(s). Press Control On pushbutton.

*1703 EC over load

The EC over load relay is tripped.
Object: Contactor over load.
Probable faulty locations: One or more of the following motors have overheated or otherwise malfunctioned.
- Spindle lubrication motor
- Hydraulic pump motor
- Coolant motor
- Slideway lubrication motor

Measures to take: Check each motor contactor inside the control box to determine if any of the above motors have overheated.

*1704 BDU over load

The overload relay signal from one or more of the axis servo motors is lost.
Object: Axis
Probable faulty location: One or more of the axis servo motor overload relays is tripped.
Measures to take: Check each axis motor overload circuit to determine which axis overload is causing the alarm. Press NC reset to reset the alarm.

*1705 EC circuit breaker

Not used.

*1706 Transformer overheat

<< Alarm List >> (Alarm A)

The main power transformer is overheated.
Object: Transformer
Probable faulty location: Main step down transformer thermal sensor.
Measures to take: Power machine down and allow transformer to cool. If problem persists check the following:
- sensor
- transformer ventilation
- primary and secondary voltages

*1707 Hydraulic oil pressure low

Hydraulic oil pressure is lower than the minimum recommended level for more than two seconds.
Object: Hydraulic unit
Probable faulty location: Hydraulic unit
Measures to take: Confirm that hydraulic motor is operating.

*1708 Spindle speed over

The spindle drive motor is rotating at a speed greater than #112.5% of the commanded speed.
Object: Spindle
Probable faulty location: Spindle drive unit or drive motor
Measures to take: Check the timing board, the spindle drive unit and the spindle drive motor.

*1709 M03/M04 change

Not used.

*1710 Tool clamp position limit switch OFF

While machine is not in MANUAL mode, an axis move is attempted without turret clamp confirmation ON or a mismatch between the apparent actual position and the programmed position exists.
Object: Turret
Probable faulty location: Turret clamp limit switch or turret position limit switches
Measures to take: Check the turret clamp limit switch to determine if it is faulty or needs adjustment on the turret. Check the turret position limit switches to determine if any are faulty or if any are connected to the wrong port.

*1711 Incorrect tool number

The turret position limit switches are indicating an invalid position.
Object: Turret
Probable faulty location: Turret position limit switches
Measures to take: Check the turret position limit switches and port connections.

*1712 Chuck I/O clamp change during M83/84

Chuck inner/outer diameter selection is changed during M83/M84 operation.

Object: Chuck

Probable faulty location: Chuck/tailstock parameter screen

Measures to take: Determine correct chuck clamping orientation before commanding M83/M84.

*1713 M83/M84 while spindle rotating

Object: Spindle/chuck

Probable faulty location: Spindle/chuck

Measures to take: Stop spindle rotation before actuating the chuck.

<< Alarm List >> (Alarm A)

*1714 M03/M04 while chuck unclamped

M03/M04 is commanded while chuck is unclamped.

Object: Spindle/chuck

Probable faulty location: Spindle/chuck

Measures to take: Clamp the chuck before rotating the spindle (Jogging is OK).

*1715 Tailstock quill advance answer

Tailstock spindle in position answer signal is not received within 60 seconds after the tailstock spindle advance command (M56) is executed.

Object: Tailstock

Probable faulty location: Tailstock spindle in position limit switch is incorrectly adjusted.

Measures to take: Adjust the dog position so that the in position limit switch is on when the tailstock spindle is against the workpiece.

*1716 Tailstock quill over advance

In Auto/MDI mode, the tailstock quill is over advanced, exceeding the advance end limit switch.

Object: Tailstock
Probable faulty location: The tailstock over advance limit switch is actuated.
Measures to take: Move the tailstock closer to the workpiece or adjust the dog position. Do not advance the tailstock quill without a workpiece in the chuck.

*1717 Tailstock/Spindle condition illegal

Measures to take: Check NC program or MDI command to determine if an operation error exists. Check the chuck/tailstock parameter screen. Check tailstock position before commanding M157.

*1718 Door interlock

Probable faulty location: Operation error/Door limit switches
Measures to take: Do not open door during an operation that is restricted by the door interlock function. Check the door open/close limit switch signals.
(Refer to alarm book for detailed conditions.)

*1719 Door open/close LS abnormal

An abnormal front door limit switch condition is detected. Either both limit switch signals are OFF, or both limit switch signals are on for more than 20 seconds.
Object: Front door limit switches
Probable faulty location:
- Limit switches
- Limit switch cables
- Door position

Measures to take: Move door to closed position or fully open position to make sure the dog is not tripping both switches.
Check switches and cables for malfunction or damage.

*1720 Rotary parity switch error

Not used.

*1721 Turret index control abnormal

The turret unclamp output solenoid is ON but the turret is not

indexing.
Object: Turret
Probably faulty location: Turret solenoids or limit switches

<< Alarm List >> (Alarm A)

Measures to take: Check the turret solenoids, solenoid cables, limit switches, and connections to determine if a solenoid or limit switch is malfunctioning or a cable is damaged or mis-wired.

*1722 Chuck clamp/unclamp switch abnormal

An abnormal chuck clamp/unclamp switch condition is detected. Either both proximity switches are ON, or both switches are OFF for more than 10 seconds.
Object: Chuck proximity switches
Probable faulty location:
- Proximity switches
- Proximity switch cables

Measures to take: Check the mounting location of the proximity switches to make sure each switch is properly aligned with the chuck cylinder. Check each switch and cable for malfunction or damage. Check connections of each cable.

*1723 Spindle gear limit switch abnormal

An abnormal spindle gear limit switch condition is detected. Either both limit switches are ON, or both switches are off for more than 10 seconds and a spindle rotation command is pending.
Object: Spindle gear limit switches
Probable faulty location:
- Limit switches
- Limit switch cables

Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1724 Spindle gear LS-SOL mismatch

The high/low gear limit switches are opposing the high/low gear solenoids.
Object: Spindle gear limit switches and solenoids
Probable faulty location: Either the limit switches or solenoids are connected backwards.
Measures to take: Check the connections of the limit switches and solenoids to determine which components are incorrect.

*1725 Chuck LS-SOL mismatch

The chuck clamp/unclamp limit switches are opposing the chuck clamp/unclamp solenoid.
Object: Chuck clamp/unclamp limit switches and solenoid.
Probable faulty location: Either the limit switches or solenoids are connected backwards.
Measures to take: Check the connections of the limit switches and solenoids to determine which components are incorrect.

*1726 Robot/loader abnormal

The robot/loader controller is reporting an abnormal condition to the NC.
Object: Robot/loader
Probable faulty location: Robot/loader
Measures to take: Check the condition of the robot/loader to determine the cause of the alarm.

*1727 Auto or MDI command during towalong

An Auto or MDI axis move is attempted while the tailstock is locked with the saddle.

<< Alarm List >> (Alarm A)

Object: Tailstock
Probable faulty location:
- Tailstock joint
- Operation error

Measures to take: Move towalong tailstock with the Pulse Handle to the

desired location.
Unlock tailstock joint after tailstock is properly located.

*1728 Torque over limit for towalong

Axis motor torque has exceeded maximum limit while moving tailstock.
Object: Tailstock
Probable faulty location: Tailstock
Measures to take: Loosen tailstock mounting bolts to allow tailstock to move freely with the saddle. Make sure nothing is impeding the tailstock from moving freely.

*1729 Door open movement abnormal

Front door has not opened properly after the door open M-command or push button has been activated.
Object: Front Door
Probable faulty location:
- Limit Switches
- Solenoid

Measures to take: Check limit switches for malfunctioning switch, damaged switches/cables or mis-wiring of the cables.
Check the air pressure/lines to the solenoid.
Check to verify the solenoid cables were connected properly.

*1730 Door close movement abnormal

Front door has not closed properly after the door close M-command or push button has been activated.
Object: Front Door
Probable faulty location:
- Limit Switches
- Solenoid

Measures to take: Check limit switches for malfunctioning switch, damaged switches/cables or mis-wiring of the cables.
Check the air pressure/lines to the solenoid. Check to verify #the solenoid cables were connected properly.

*1731 Air pressure not built up

Not enough pressure has built up for pressure switch to sense and close

electrical circuit
Object: Air Chuck
Probable faulty location:
- Pressure Switch
- Solenoid
Measures to take:
- Check for faulty wiring or damage to the pressure switch.
- Check the pressure switch setting.
- Check the air pressure/lines to the solenoid.

*1732 Air chuck switch movement detected

The air chuck selector switch changed state during NC running or foot switch was depressed while air chuck switch on HYD followed by the switch change to AIR.
Object: Air chuck switch
Probable faulty location:
- Air chuck selector switch position

<< Alarm List >> (Alarm A)

Measures to take:
- Select the AIR position on the air chuck selector switch panel.

Press the reset button and re-command the chuck.

*1733 Parts catcher interlock

The parts catcher interlock is activated when an attempt is made to advance or retract the parts catcher by M-codes.
Object: Parts catcher
Probable faulty location:
(a) M76/M77 commanded and the front door is not closed.
(b) Parts catcher retract confirmation was lost while an axes was moving.
(c) If a touch setter is installed, M76/M77 commanded while the sensor head is advanced.

Measures to take: Check the NC program or MDI command to determine if an operation error exist. Also perform checks for alarm 1735.

*1734 Touch setter/Peripheral device I/L

An attempt to advance the touch setter is made while an #interlocked device is not at a retracted or home position.Or, #the touch setter is not retracted when an interlocked device #move is attempted.

Object: Touch setter arm

Probable faulty location: Touch setter arm

- Parts catcher
- Robot/loader

Measures to take: If a parts catcher is installed, confirm that it is retracted and confirmation is received. If a robot/loader is installed, confirm that it is at home position and confirmation is received.

Check NC program or MDI command to determine if an attempt to move the touch setter and an interlocked device occured

*1735 Parts catcher limit switch abnormal

An abnormal parts catcher limit switch condition is detected. #Either both limit switches are ON, or both switches are off for more than 10 seconds.

Object: Parts catcher limit switches

Probable faulty location:

- Limit switches
- Limit switch cables

Measures to take: Check the condition of each switch to termine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1736 Parts catcher solenoid abnormal

The parts catcher limit switches are opposing the parts catcher solenoids.

Object: Parts catcher limit switches and solenoids

Probable faulty location: Either the limit switches or solenoids are connected backwards.

Measures to take: Check the connections of the limit switches and solenoids to determine which components are incorrect.

*1737 Touch setter/Axis Interlock

M117/M118 (Touch setter advance/retract) is attempted before all basic machine conditions are met.

Object: Touch setter arm

Probable faulty location: Touch setter arm

- Spindle
- Tailstock

<< Alarm List >> (Alarm A)

- Chuck
- Axis

Measures to take: Verify that the following machine conditions are met before commanding M117 or M118.

- Spindle rotation is stopped.
- Tailstock is retracted (no workpiece).
- Chuck is unclamped (no workpiece).
- Axis is at the Z -direction positive limit and not moving.

*1738 Touch setter ADV/RET illegal

An attempt is made to operate the machine (other than gauging cycle) while the touch setter is not retracted.

Object: Touch setter arm

Probable faulty location: Touch setter arm

Measures to take: If tool gauging cycle is complete, retract the touch setter arm before attempting any of the following operations.

- Spindle rotation
- Axis movement
- Turret rotation
- Tailstock advance

*1739 Touch sensor contact ON

An axis movement is attempted while the sensor contact is ON.

Object: Touch setter sensor contact

Probable faulty location: Sensor contact

Measures to take: Press reset pushbutton to clear the alarm. Have another operator press the stroke end limit cancel pushbutton inside the

control cabinet to allow axis movement with the pulse handle. Slowly move the axis away from the sensor contact. See related Alarm D-4704 Touch setter limit release.

*1740 Chuck interlock cancel condition

The M185 m-code was given when the front door was not closed or the Auto ON/OFF switch as in the OFF position (only for the automatic operation with automating equipment connected).
Object: M-code - Chuck open/close interlock off
Probable faulty location: Front door position
Automatic equipment Auto ON/OFF switch
Measures to take: Close the front door completely. Check for faulty/damaged door switches. Verify the Auto ON/OFF switch on the automatic equipment is in the ON position.

*1741 Roof door abnormal

The roof door failed to open or close when commanded.
Or, an attempt is made to open the roof door while the front door is open.
Object: Roof door
Probable faulty location:
Limit switches
Solenoids
Measures to take: Check the limit switches and solenoids to determine if the wiring is correct. Verify the air pressure is correct.

*1742 Pop-up turret not clamped

During pop-up mode, cutting feed was commanded and the turret clamp limit switch was not detected within 300 sec.
Object: Turret
Probable faulty location: Turret clamp limit switch
Measures to take: Check turret clamp limit switch for proper operation.

<< Alarm List >> (Alarm A)

*1743 M188/M189 condition illegal

M188/M189 (Tailstock connect/disconnect)is attempted before all basic machine conditions are met.

Object: Tailstock

Probable faulty location: M188/M189 is commanded while:

(a) The spindle is rotating.

(b) The spindle rotation command M03/M04 is active.

(c) Center work is not selected.

(d) The tailstock is not at the retract position.

(e) X-Axis is not at positive limit.

Measures to take: Check NC program or MDI command to determine if an operation error exists.

*1744 Tailstock manual operation illegal

Tailstock unclamp push button is pressed before all basic machine conditions are met.

Object: Tailstock

Probable faulty location: Tailstock unclamp push button is pressed when:

(a) The spindle is rotating.

(b) Center work is not selected.

(c) The tailstock is not at the retract position.

(d) The tailstock is not unclamped.

(e) Z-Axis is moving.

(f) X-Axis is not at positive limit.

(g) During tailstock returning cycle.

Measures to take: Check the connection of tailstock limit switches and solenoids to determine which components are incorrect. Also, verify all conditions above before pressing the unclamp push button.

*1745 Tow along tailstock clamp/unclamp

Object: Tailstock

Probable faulty location:(a) Neither joint ON nor joint OFF signal is detected for more than three seconds.

(b) Both joint ON and joint OFF signals are detected for more than three seconds.

(c) Joint ON signal is detected and X-Axis is not at the positive limit.

(d) Joint ON signal is detected and tailstock is not retracted.

(e) Joint ON signal is detected and spindle is rotating.

Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1746 Barfeeder Abnormal

Object: Barfeeder

Probable faulty location: Barfeeder is in an abnormal condition while the barfeeder interface is ON.

Measures to take: Check the condition of the barfeeder to determine if it is in an alarm state. Make sure of the connections between the barfeeder and the lathe.

*1747 Barfeeder spindle interlock

Object:Barfeeder

Probable faulty location:Barfeeder is in an abnormal condition which is unsafe to rotate the spindle.

*1748 Tailstock joint return illegal

<< Alarm List >> (Alarm A)

Object: Tailstock

Probable faulty location: The joint position return push button is pressed while:

(a) The spindle is rotating.

(b) Center work is not selected.

(c) The tailstock is not at the retract position.

(d) The tailstock is not unclamped.

(e) Z-Axis is moving.

(f) X-Axis is not at positive limit.

Measures to take: Check the connection of tailstock limit switches and solenoids to determine which components are incorrect.

Verify all conditions above before pressing the unclamp push button.

*1749 Tailstock LS abnormal

Object: Tailstock limit switches

Probable faulty location: Limit switches

Limit switch cable

Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1750 Tailstock LS-SOL mismatch

The tailstock limit switches are opposing the tailstock solenoids.

Object: Tailstock limit switches and solenoids

Probable faulty location: Either the limit switches or solenoids are connected backwards.

Measures to take: Check the connections of the limit switches and solenoids to determine which components are incorrect.

*1751 Tailstock SOL abnormal

Object: Tailstock solenoids

Probable faulty location: Both solenoids are ON

Measures to take: Check the tailstock solenoids, solenoids cables, and connections to determine if a solenoid is malfunctioning or cable. is damaged or mis-wired.

*1752 Tow along LS abnormal

Object: Tow along limit switches

Probable faulty location: Limit switches

Limit switch cable

Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any miswire of either cable.

*1753 Tow along LS-SOL mismatch

The tow along limit switches are opposing the solenoid.

Object: Tow along limit switches and solenoid

Probable faulty location: Either the limit switches or solenoid are

connected backwards.
Measures to take: Check the connections of the limit switches and solenoid to determine which components are incorrect.

*1754 Touch setter LS abnormal

An abnormal touch setter limit switch condition is detected.
Either both limit switches are ON, or both switches are OFF for more than 20 seconds.
Object: Touch setter limit switches
Probable faulty location:

<< Alarm List >> (Alarm A)

- Limit switches
- Limit switch cables

Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1755 Touch setter LS-SOL abnormal

The touch setter limit switches are opposing the touch setter solenoids.
Object: Parts catcher limit switches and solenoids
Probable faulty location: Either the limit switches or solenoids are connected backwards.
Measures to take: Check the connections of the limit switches and solenoids to determine which components are incorrect.

*1757 Air chuck switch wrong position

The air chuck selector switch is in AIR position and machine is using hydraulic chuck.
Object: Air chuck selector switch
Probable faulty location: Air chuck selector switch position
Measures to take:Change the state of the air chuck selector switch to HYD.

*1758 Optical measurement system error

Measures to take: Refer to the gauging manufacturer's documentation.

*1759 PLC spec code mismatch

PLC specification code mismatch.
Object: Software
Probable faulty location: Software
Measures to take: Consult your nearest Okuma representative

*1760 Robot/Loader Interlock

The robot/loader interlock is activated when an attempt is made to rotate the spindle or to move the saddle or to index the turret while the robot/loader is not in the retract position.
Object: Robot/loader retract limit switches.
Probable faulty location: Limit switches
Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1761 Turret rotation impossible

Turret rotation attempted while the turret pulse handle mode is active.
Object: Turret
Probable faulty location: Servo turret control parameter
Measures to take: Reset servo turret pulse handle mode parameter.

*1762 Servo Turret motor overload

The overload signal from the turret servo motor is lost.
Object: Turret motor overload
Probable faulty location: The axis servo motor overload relay is tripped.
Measures to take: Check turret servo motor overload circuit. Press NC reset to reset the alarm.

<< Alarm List >> (Alarm A)

*1763 Parts Cradle Interlock

The parts cradle interlock is activated when an attempt is made to operate the parts cradle by M-codes.
Object: Parts cradle
Probable faulty location:
(a) M120/M121/M122/M123 commanded and the front door is not open.
(b) M120/M121/M122/M123 commanded while an axis was moving or the spindle is rotating.
(c) If a touch setter is installed, M120/M121/M122/M123 commanded while the sensor head is advanced.
Measures to take: Check the NC program or MDI command to determine if an operation error exist. Also perform checks for alarm 1764.

*1764 Parts Cradle Limit Switch Abnormal

An abnormal parts cradle limit switch condition is detected. Either both limit switches are ON, or both switches are OFF for more than 10 seconds.
Object: Parts cradle limit switches
Probable faulty location:
- Limit switches
- Limit switch cables
Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1765 Parts Cradle Solenoid Abnormal

The parts cradle limit switches are opposing the parts cradle solenoids.
Object: Parts cradle limit switches and solenoids
Probable faulty location: Either the limit switches or solenoids are connected backwards.
Measures to take: Check the connections of the limit switches and solenoids to determine which components are incorrect.

*1766 Tailstock Brake/Spindle interlock

Object: Tailstock brake.
Probable faulty location: An attempt is made to rotate
the spindle while tailstock brake solenoid is ON.
Measures to take: Check the NC program or MDI command
to determine if an operation error exist Check for malfunction
or damage to the tailstock brake solenoid cable.

*1767 Parts Cradle/Tailstock interlock

An attempt is made to move the parts
cradle down while tailstock is in retract position.
Object: Parts cradle.
Probable faulty location: Tailstock confirmation limit switches.
Measures to take: Check the NC program or MDI command
to determine if an operation error exist Check for malfunction
or damage to the tailstock limit switches cables.

*1768 Parts cradle/TS/Chuck interlock

An attempt is made to retract the tailstock while the parts cradle
is in up position and spindle chuck is clamped.
Object: Parts cradle.
Probable faulty location: Tailstock confirmation limit switches
or parts cradle up/down confirmation limit switches.
Measures to take: Check the NC program or MDI command

<< Alarm List >> (Alarm A)

to determine if an operation error exist Check for malfunction
or damage to the tailstock limit switches cables or the chuck
prox. switch cable.

*1769 Steady rest press. switch mismatch

An abnormal steady rest pressure switch condition is detected.
Either both pressure switch signals are OFF, or both pressure
switch signals are ON for more than 10 seconds.
Object: Steady rest pressure switches

Probable faulty location:
- Pressure switches
- Pressure switch cables

Measures to take: Check the condition of each switch to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either switch or cable. Check for any mis-wire of either cable.

*1770 Steady rest SOL-Pres switch mismatch

The steady rest open/close pressure switches are opposing the steady rest open/close solenoids.
Object: Steady rest open close press. switches and solenoids
Probable faulty location: Either the switches or solenoids are connected backwards.
Measures to take: Check the connections of the pressure switches and solenoids to determine which components are incorrect.

*1771 Steady rest solenoid mismatch

An abnormal steady rest solenoid condition is detected.
Either both solenoid signals are OFF, or both solenoid signals are ON for more than 10 seconds.
Object: Steady rest solenoids
Probable faulty location:
- Solenoid
- Solenoid cables

Measures to take: Check the condition of each solenoid to determine if a foreign object is interfering with correct operation. Check for malfunction or damage to either solenoid or cable. Check for any mis-wire of either cable.

*1772 Steady rest/Spindle interlock

The steady rest/spindle interlock is activated when an attempt is made to operate the steady rest or spindle by M-codes.
Object: Steady rest/spindle.
Probable faulty location:
(a) M78, M79, M176, M177, M264, M265, M266, M267 commanded

and the spindle is not stopped.
(b) M03/M04 commanded while steady rest is not closed.
Measures to take: Check the NC program or MDI command to determine if an operation error exist. Also perform checks for alarm 1769.

*1773 Air chuck SOL-Press. switch mismatch
The air chuck open/close pressure switches are opposing the air chuck open/close solenoids.
Object: Air chuck open close press. switches and solenoids
Probable faulty location: Either the switches or solenoids are connected backwards.
Measures to take: Check the connections of the pressure switches and solenoids to determine which components are

incorrect.

*1774 Chuck High/Low-Spindle interlock
Chuck pressure high/low M-Codes M101/M102 is commanded while spindle is rotating.
Object: Chuck/Spindle
Probable faulty location: Chuck/Spindle
Measures to take: Stop spindle rotation before command the chuck pressure.

*1775 Steady rest/Tailstock interlock
Steady rest/Tailstock interlock is activated when an attempt is made to operate the tailstock while spindle is rotating and steady rest is not closed.
Object: Steady rest/Tailstock.
Probable faulty location: Steady rest open/close confirmation limit switches (if available).
Measures to take: Check the NC program or MDI command to determine if an operation error exist.

*1776 Tailstock 2nd Advance time out

The timer delay to bypass the tailstock over travel alarm times out and the tailstock in position confirmation limit switches is still OFF.
Object: Tailstock.
Probable faulty location: TS confirmation limit switches.
Measures to take: Check the NC program or MDI command to determine if an operation error exist. Adjust the time delay setting for second advance position "Tailstock 2nd advance parameter" page.

*1777 Chip conveyor motor overload

The overload signal from the chip conveyor motor is lost.
Object: Chip conveyor motor overload
Probable faulty location: The chip conveyor motor overload relay is tripped.
Measures to take: Check chip conveyor motor overload circuit. Press NC reset to reset the alarm.

*1778 Turret clamp time over

A turret rotation command has completed but the turret clamp confirmation was not received.
Object: Turret clamp switch
Probable faulty location: Turret clamp switch, cable, or timer parameter setting. Measures to take: Check the clamp switch adjustment. Check the turret unclamp switch cable. Verify the "Turret Clamp Switch Check Timer" in "Machine System Parameter" section is set to a reasonable value.

*1779 Turret unclamp time over

A turret rotation command was issued but the turret unclamp confirmation was not received.
Object: Turret unclamp switch
Probable faulty location: Turret unclamp switch, cable, or timer parameter setting. Measures to take: Check the unclamp switch adjustment. Check the turret unclamp switch cable. Verify the "Turret Unclamp Switch Check Timer" in "Machine System Parameter" section is set

to a reasonable value.

*1780 Face drive chuck interlock

<< Alarm List >> (Alarm A)

An attempt to start the spindle has occurred while the tailstock is not advanced and the "Face drive chuck installed" parameter is ON.
Object: Spindle/Tailstock
Measures to take: (1) Advance the tailstock before starting the spindle. (2) Turn off Face drive chuck parameter if special chuck not installed. (3) Turn center work on. (4) Make sure tailstock spec code is ON. (5) Do not command M157/M167 with parameter turned ON.

*1781 Robot/Loader interference

A Robot/Loader axis command was issued while the Robot/Loader was operating in an interference zone.

*1782 Chuck I/O change and spindle rotate

The chuck inner/outer diameter clamping selection parameter has been changed while the spindle is rotating.
Object: Spindle
Measures to take: Stop the spindle before attempting to change the inner/outer parameter. Make sure the parameter setting is correct before restarting.

*1783 Light curtain broken

The light curtain has been broken while the front door is in a closing state, or the front door was commanded to close while the light curtain was already broken and the obstruction was not removed within 5 seconds to allow the door to close.
Object: Front Door
Probable Faulty Location: Light Curtain sensing area obstructed.
Measures to take: (1) Remove all obtructions from the light curtain while the door is closing and until door closed confirmation. (2) If door is commanded to close when the light curtain was already broken, remove the obstruction within 5 seconds to allow door to close. (3) If

the machine has the Whisker Switch cycle start option mounted outside the light curtain sensing area, this alarm will occur if this switch is used to cycle start the control while the light curtain is already broken.

*1784 Chucking miss detect

The Chucking error detection pressure switch has been off for more than .5 seconds although a workpiece is clamped in the chuck during spindle rotation, or the workpiece is not clamped correctly in the chuck during spindle rotation.

Object: Chuck Error Detection

Probable faulty location: Operator's chucking error.

Measures to take: Check the workpiece chucking condition.

*1785 Tool revolution command

The M-tool rotation command is designated when the M-tool spindle is not allowed to rotate. (1) The M-tool rotation command is designated when the C-axis is not connected. (2) The M-tool spindle rotation command is designated when the turret is not clamped.

Object: M-tool

Probable faulty location: (1)Programming error. (2)Operation error.

Measures to take: Modify the program.

*1786 T Command in tool revolution

A command to index turret is designated while the M-tool spindle is rotating.

Object: M-tool

Probable faulty location:(1) Programming error. (2) Operation error;

Program example:

<< Alarm List >> (Alarm A)

N100 M13
N101 G41
N102 T010101

Measures to take: Modify the program.

*1787 Revolution tool orientation

The orientation command (M229) for the M-tool spindle is designated under the condition that the M-tool spindle orientation is impossible.
(1) Orientation command is designated while the M-tool is in flat turning mode.
Object: M-tool
Probable faulty location:(1) Programming error.
Measures to take: Modify the program.

*1788 C-axis connect command

C-axis connect/disconnect command (M110,M109) is designated under illegal conditions.(1) The spindle is not stopped.(2) The spindle rotation command is active.(3) C-axis is clamped. (4) C-axis is interlocked.(5) M-tool spindle is rotating.
Object: C-axis
Probable faulty location:(1) Faulty spindle zero speed input.(2) Faulty EC input for C-axis connection.(3) M110 is designated during spindle rotation.
Measures to take: Modify program and check related inputs.

*1789 C-axis clamp/unclamp command

C-axis clamp/unclamp command is given when C-axis is not connected or C-axis command is not valid.
Program example:
M109 C-axis disconnect
M147 C-axis clamp
Object: C-axis
Probable faulty location:(1) Programming error.(2) Operation error.
Measures to take: Modify the program.

*1790 Index time over

For the machine equipped with the Index Chuck option, an index was initiated and no index confirmation switch came on within (Ton + Toff) seconds. Or at any time, all index position confirmation switches were off for more than
(Ton + Toff) seconds.
Object: Index chuck

Probable faulty location: Mis-adjusted index confirmation switch or broken wire/bad connection.
Measures to take: Inspect circuit for continuity or adjust position of confirmation switch.

*1791 Index chuck erroneous input

For the machine equipped with the Index Chuck option, two or more index confirmation switches are on at the same time.
Object: Index chuck
Probable faulty location: Mis-adjusted index confirmation switch or shorted switch.
Measures to take: Inspect circuit for shorted condition of all confirmation switches.

*1792 Index chuck-spindle/axis interlock

For the machine equipped with the Index Chuck option; 1) All index confirmation switches are off while the spindle is rotating at a speed which is higher than the maximum allowable speed. 2) A spindle rotation

<< Alarm List >> (Alarm A)

command is issued while all index confirmation switches are off. 3) A chuck index was issued while the spindle is rotating at a speed which is higher than the maximum allowable speed. 4) A chuck index was issued while the Z-axis is not at the positive limit.
Object: Index chuck
Probable faulty location: Mis-adjusted index confirmation switch or broken wire/bad connection. Do not attempt to index the chuck while rotating at speed which is higher than the maximum allowable speed, or when the Z-axis is off the + limit.
Measures to take: Inspect circuit for continuity or adjust position of confirmation switch. Correct part program.

*1794 High pressure cool

For the machine equipped with the external high pressure coolant supply unit, the N.C. error input signal is low.
Object: High pressure coolant option. Probable faulty location: High

pressure coolant unit motor overload.
Measures to take: Inspect ultra high pressure coolant unit for any alarms or indications and refer to the manufacturer's instruction manual. Specifically, inspect unit for clogged filter or motor overload condition.

*1795 Index chuck lock pressure input low

For the machine equipped with the Index Chuck option, although the index chuck lock output is on and an index confirmation input is on, the pressure switch input, indicating a locked position, is low.
Object: Index chuck
Probable faulty location: Hydraulic pressure low or faulty pressure switch.
Measures to take: Inspect circuit for continuity or faulty pressure switch. Inspect hydraulic system for leaks.

*1850 Emergency stop

The system is in the emergency stop state.
Probable faulty location: The emergency stop button was pressed.

*1851 Air pressure

The air source pressure is low (the air source pressure/signal is off.
Probable faulty location: 1) The air source is off. 2) The pressure of the air source is too low.

*1852 NC Alarm

The machine (NC) is in the alarm state.

*1853 Oil pressure

The hydraulic pressure is low (the hydraulic pressure/signal is off.)
Probable faulty locations: 1) The oil level is low. 2) The hydraulic motor is faulty.

*1854 External

An external alarm has occurred (external alarm A/signal is off.)

*1855 Robot/Loader BDU overload

The overload relay of the loader axis drive unit is tripped.

Probable faulty location: Overload to the loader axis drive unit.

Measures to take: Check the load applied to the loader axes.

*1856 Circuit Breaker

The circuit breaker of the loader is tripped.

<< Alarm List >> (Alarm A)

Probable faulty location: Short in the circuit connected to the tripped circuit breaker.

Measures to take: Repair the circuit.

*1860 Axis interlock

An axis command is specified in the MDI or automatic mode in the axis interlock state. All conditions required to move the loader axes are not met.

Probable faulty location: 1) Program error 2) Operator error.

*1861 Robot/Loader stroke end over

The travel end limit switch is actuated.

Probable faulty location: Setting error of the soft limit.

Measures to take: After turning ON the loader axis emergency limit release switch in the electrical cabinet, select the manual mode with the loader operation panel, then reset the system and move the loader axis away from the travel end limit switch. After the loader axis has moved away from the travel end limit switch, turn OFF the loader axis emergency limit release switch and set the soft limit again.

*1862 Stroke end limit cancel

While the stroke end limit cancel switch is set ON, the operation mode is changed to other than manual.

*1863 Robot/Loader interference

A Robot/Loader axis command was issued while the Robot/Loader was operating in an interference zone.

*1864 Work prepare/Swing robot not home

M324, Work prepare command, is issued while the robot is not at the home position. The robot must be at the home position, which is the load/unload position, before M324 is commanded. This will prevent a Hand-A/Workpiece collision.

Probable faulty location: 1) Operator error 2) Program error.

*1865 Out Chute Check

M325, Out Chute check command, did not receive an answer within 10 seconds. The "Work passing at out chute" should be actuated by a finished part passing through the out chute.

Probable faulty location: 1) Work passing at out chute, WP_C, proximity switch. 2) Part is sutck in the out chute.

*1866 Hand A clamp no workpiece

When hand A close operation is executed by the hand A close command, there is no workpiece to be gripped and the hand close end confirmation signal is turned ON.

Probable faulty location: 1)Operator error

2)Program error.

*1867 Hand B clamp no workpiece

When hand B close operation is executed by the hand B close command, there is no workpiece to be gripped and the hand close end confirmation signal is turned ON.

Probable faulty location: 1)Operator error

2)Program error.

*1868 Wrist broken

The loader or robot hand is broken due to the excessively large load.

Probable faulty location: The hand is broken. Hand limit switch(hand

<< Alarm List >> (Alarm A)

breakage alarm/ signal is OFF.)

*1869 Work table motor overload

The overload relay of the work table motor protector unit is tripped.
Probable faulty location: Overload to the work table motor.
Measures to take: Check the load applied to the work table.

*1871 Robot/Loader interference

A Robot/Loader axis command was issued while the Robot/Loader was operating in an in an interference zone.

*1872 Safety fence interlock

The safety fence is opened while the loader(robot) is operating.
Probable faulty location: While the loader(robot) is operating, the safety fence cannot be opened by the safety fence electromagnetic lock.
The electromagnetic lock switch is faulty or its wiring is broken.
Measures to take: Check the safety fence electromagnetic lock switch and its wiring.

*1873 Robot/loader front door interlock

The front door of the NC lathe is opened while the loader is operating.

*1876 Swing interlock

The swing command is executed while the loader's Z axis or Y axis enters the unswingable zones.
Probable faulty location: Operator error, Program error, Setting error for the parameter used to judge robot entry to the checking zones.

*1882 Loader hand swing incomplete

The swing axis position input signal is turned OFF. In robot swing operation, both the swing right end answer and the swing left end answer signal are input at the same time Loader cannot perform swing gripper.
Probable faulty location: 1) Swing wrist is broken 2) Swing axis limit switches 3) Vertical Axis overload 4)Losing suppied air source

*1883 Vertical axis overload

The vertical limit switch of the loader or robot is tripped.
Probable faulty location: 1) Excessive force applies upward to the loader gripper hand. 2) Parameter (soft limit) setting error 3) Operator error 4) Program error

*1884 Work table operation interlock

The work table forward or reverse operation is interfering with loader.
Probalbe faulty location: 1) Loader is loading/unloading part at work table. 2) Paramter (soft limit/zone checking) setting error. 3) Operator error. 4) Program error.

*1891 In-chute work load empty

<< Alarm List >> (Alarm B)

*2700 Tailstock quill over advance

In MANUAL mode, the tailstock quill is over advanced, exceeding the advance end limit switch.
Object: Tailstock
Probable faulty location: The tailstock over advance limit switch is actuated.
Measures to take: Move the tailstock closer to the workpiece or adjust the dog position. Do not advance the tailstock quill without a workpiece in the chuck.

*2703 User M-Code not supported

The chosen M-code is not activated in current version of software.
Object: User M-Codes
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2704 Pop-up M-Code not supported

The chosen M-code (M203 or M284) is not activated in current version of software.
Object: Pop-up turret
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2705 Barfeeder M-Code not supported

The chosen M-code (M92, M93 or M336) is not activated in current version of software.
Object: Barfeeder
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2706 Chuck high/low M-Code not supported

The chosen M-code (M58 or M59) is not activated in current version of software.
Object: Chuck pressure high/low
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2707 Parts catcher M-Code not supported

The chosen M-code (M76 or M77) is not activated in current version of software.
Object: Parts catcher
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2708 Touch setter A M-Code not supported

The chosen M-code (M117 or M118) is not activated in current version of software.
Object: Touch setter A
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2709 Tailstock adv/ret not supported

The chosen M-code (M166 or M167) is not activated in current version of software.

<< Alarm List >> (Alarm B)

Object: Tailstock adv/ret I/L
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version

*2710 Measurement System not supported

The chosen M-code (M270) is not activated in current version of software.

Object: Measurement system
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version

*2712 Chuck air blow M-Code not suppported

The chosen M-code (M88 or M89) is not activated in current version of software.
Object: Chuck Air Blow
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version

*2713 Chuck open/close I/L not supported

The chosen M-code (M184 or M185) is not activated in current version of software.
Object: Chuck open/close I/L
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version

*2714 Tailstock high/low not supported

The chosen M-code (M98 or M99) is not activated in current version of software.
Object: Tailstock high/low
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version

*2715 Auto Door O/C M-Code not supported

The chosen M-code (M90 or M91) is not activated in current version of software.
Object: Auto Door O/C
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version

*2716 Auto tow along not supported

The chosen M-code (M188 or M189) is not activated in current version of software.

Object: Tailstock connect/disconnect

Probable faulty location: Current version of software

Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2717 Robot/Loader M-Code not supported

The chosen M-code (M180, M181, M182, and M183) is not activated in current version of software.

Object:Robot/Loader request.

Probable faulty location: Current version of software

Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

<< Alarm List >> (Alarm B)

*2718 Roof Door M-Code not supported

The chosen M-code (M290 and M291) is not activated in current version of software.
Object:Roof Door Open/Close.
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2719 Spindle ovrride ignore not supported

The chosen M-code (M48 and M49) is not activated in current version of software.
Object:Spindle override rotary switch.
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2720 Steady rest "A" M-Code not supported

The chosen M-code (M78 and M79) is not activated in current version of software.
Object:Steady rest "A" single.
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative to obtain the necessary version of software.

*2721 T Code tool number out of range

The T-command tool number is out of range.
Object: Turret
Probable faulty location: Operation error.
Measures to take: Correct the T-command.

*2722 Steady rest "B" M-Code not supported

The chosen M-code (M176 and M177) is not activated in current version of software.
Object:Steady rest "B" double.

Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative

*2723 Steady rest I/L M-Code not supported
The chosen M-code (M372 and M373) is not
activated in current version of software.
Object:Steady rest with confirmations.
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative
to obtain the necessary version of software.

*2724 TS 2nd Advance M-Code not supported
The chosen M-code (M350) is not activated in current version
of software.
Object:Tailstock 2nd Advance.
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative
to obtain the necessary version of software.

*2725 Steady rest "C" M-Code not supported
The chosen M-code (M264 and M265) is not
activated in current version of software.
Object:Steady rest "C" triple.
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative

<< Alarm List >> (Alarm B)

to obtain the necessary version of software.

*2726 Steady rest "D" M-Code not supported
The chosen M-code (M266 and M267) is not
activated in current version of software.
Object:Steady rest "D" quadruple.
Probable faulty location: Current version of software
Measures to take: Consult your nearest Okuma representative
to obtain the necessary version of software.

*2727 Spindle command while C axis connect

A spindle command is attempted while the C-axis is connected.

Object: Spindle

Probable faulty location: Programming error

Measures to take: Do not program spindle commands (M03,M04,M05,M19,M41, or M42) while the C-axis is connected.

*2728 Unusable M-code (Index chuck)

The chosen M-Code (M352 to M259) is not activated in current version of software.

Object: Index chuck

Probable faulty location: Current version of software.

Measures to take: Consult your nearest Okuma representative ot obtain the necessarry version of software.

*2729 Turret clamping error

After executing the current T-Code, the turret was unable to clamp back up.

Object: Turret

Probable faulty location: Turret clamp switch or turret encoder.

Measures to take: Check the alignment of the turret encoder and the turret clamp switch input. Try to manually index the turret to a valid station.

*2733 Chucking error

Chucking error detection (M133) was commanded and the air pressure switch failed to come on, or when M133 was commanded the air pressure switch was already on.

Object: Chuck Error Detection

Probable faulty location: Workpiece is not clamped in the chuck correctly.

Measures to take: Check the workpiece chucking condition.

*2734 Chucking error air OFF illegal usage

Chucking error detection air pressure OFF (M130) was commanded during the constant chucking error monitoring mode.

Object: Chuck Error Detection

Probable faulty location: Programming error.

Measures to take: Correct the program.

*2741 Invalid G-code commanded with M203

M203 can only be commanded with rapid traverse.

Object:Turret

Probable faulty location: Operation error.

Measures to take: Correct the G-command.

<< Alarm List >> (Alarm C)

*3700 Power save on

The system is in power conservation mode. In Auto Mode/Single Block OFF, no cycle has been started within the period set at the Machine User Parameter Screen.

Object: None

Probable faulty location: None

Measures to take: Press NC reset pushbutton on the operation panel.

*3701 Control cabinet temperature

The CPU temperature is too high.

Object: None

Probable faulty location:

- Cooling unit is clogged.
- Cooling fan motor is not operating.
- Sensor is defective.

Measures to take: Check for any of the above problems.

*3702 Lubrication oil flow switch ON

The lubrication motor flow switch did not turn ON shortly after the lube motor turned on.

Object: Lubrication motor

Probable faulty location:

- Lubrication motor flow switch
- Lube level

- Parameter setting

Measures to take: Check the flow switch. Check the flow switch input to determine if signal is received. Set parameter on Machine User Parameter Screen to a time value long enough to allow lube flow to reach 100%.

*3703 Lubrication oil level low

The lubrication oil level is too low.

Object: Lubrication motor

Probable faulty location:

- Lube level
- Lube level switch

Measures to take: Add lubrication oil. If alarm does not clear check the level switch.

*3704 Lubrication oil flow switch OFF

The lubrication motor flow switch did not turn OFF shortly after the lube motor turned off.

Object: Lubrication motor

Probable faulty location:

- Lubrication motor flow switch
- Lube level
- Parameter setting

Measures to take: Check the flow switch. Set parameter on Machine User Parameter Screen to a time value long enough to allow lube flow to cease.

*3705 Barfeeder abnormal

Object: Barfeeder

Probable faulty location: Barfeeder is in an abnormal condition while the barfeeder interface is ON.

Measures to take: Check the condition of the barfeeder to determine if it is in an alarm state. Make sure of the connections between the barfeeder and the lathe.

*3706 Robot/loader abnormal

The robot/loader controller is reporting an abnormal condition

<< Alarm List >> (Alarm C)

to the NC.
Object: Robot/loader
Probable faulty location: Robot/loader
Measures to take: Check the condition of the robot/loader to determine the cause of the alarm.

*3707 Optical sensor battery change

The optical sensors battery is low or dead.
Object: Optical gauging interface
Probable faulty location: Optical sensor
Measures to take: Replace the battery in the sensor.

*3708 High pressure coolant unit abnormal

High pressure coolant unit abnormal. For the machine equipped with the external high pressure coolant supply unit, the N.C. error input signal is low.
Object: High pressure coolant option.
Probable faulty location: Various warning conditions.
Measures to take: Inspect ultra high pressure coolant unit for any alarms or indications and refer to the manufacturer's instruction manual. Specifically, inspect unit for clogged filter and other preventive maintenance items.

*3713 Chip Conveyor overload tripped

The Chip Conveyor overload relay is tripped.
Object: Chip Conveyor contactor overload.
Probable faulty locations: The Chip Conveyor motor has overheated or otherwise malfunctioned.
Measures to take: Turn the Chip Conveyor off and allow the motor to cool. If problem persists, check the following:
-Chip Conveyor jammed
-Chip Conveyor wiring
-Chip Conveyor overload

*3850 External

<< Alarm List >> (Alarm D)

*4700 Stroke end limit release

The axis emergency limit release switch is ON in MANUAL mode.
Object: Axis
Measures to take: After the axis is moved away from the emergency limit, release the emergency release switch and reset alarms.

*4701 Door open

The front door is open and the door interlock is ON. If any machine movements (spindle, axis, turret) are attempted, then Alarm A Door Interlock will occur.
Object: Front door
Measures to take: Close front door before beginning machine auto operation or turn Door Interlock switch OFF to manually move the machine.

*4702 Turret conditions abnormal

After resetting Alarm A-1711 or Alarm A-1721, this alarm will appear until the problem which triggered the Alarm A condition is corrected.
Object: Turret
Measures to take: Check turret limit switches and solenoids to determine if any are faulty.

*4703 Motor not ready to start

Object: None
Probable faulty location: Wiring error
Drive unit failure
Measures to take: After turning ON power or resetting a level A alarm, wait several seconds before issuing a spindle command. If Alarm persists check the motor ready signals.

*4704 Touch setter limit release

The axis limit release button is pressed while the sensor contact is ON.
Object: Axis

Measures to take: With the pulse handle, move the axis away from the sensor contact and release the pushbutton.

*4705 No chuck clamp/unclamp confirmation

This alarm will occur if no chuck clamp confirmation is received after a manual chuck command or after Alarm A-1722 Chuck clamp/unclamp switch abnormal is reset.

Object: Chuck

Measures to take: If a part is chucked, verify that it is seated correctly. If the part is seated correctly, then the chuck proximity switches need to be adjusted to according to the size of the part. If no confirmation is given after adjustments have been made, then the switches or cables may be faulty or the switches need to be moved closer to the chuck position disk.

*4706 Bar stock empty

During the loading cycle of the barfeeder, there is no stock available on the magazine. Sends the lathe into a cycle stop.

Object: Barfeeder

Measures to take: Check the stock available on the magazine of the barfeeder. After reloading, press reset and cycle start to continue.

*4707 Tailstock not at limit

The tailstock is neither at the setting limit nor the retract limit.

Object: Tailstock

Measures to take: Advance the tailstock to the setting

<< Alarm List >> (Alarm D)

limit or retract the tailstock to the retract limit.

*4708 Please open the door

The machine has been powered up with the door closed.

Please open the door to confirm that the switches are operating correctly.

Object: Front door

Measures to take: Open the door to clear the alarm.

If the alarm does not clear, check the confirmation switches.

*4709 Work gauge limit release

The axis limit release button is pressed while the sensor contact is ON.

Object: Axis

Measures to take: With the pulse handle, move the sensor away from the work piece and release the pushbutton.

*4711 NC Turret pulse handle mode

The NC Turret User Parameter - Pulse Handle Mode is set to "1".

Object:NC Turret User Parameter

Measures to take: Set the NC Turret Pulse Handle Mode parameter to "0".

*4712 Power on effective parameter

Control power must be turned off and back on before the the parameter that has been changed will be effective

Object:None

Measures to take: Turn control power off to clear alarm message and activate new parameter setting.

*4713 Please move away from light curtain

When manually closing the door, or cycle starting with standard pushbutton and the door is open, the operator must move to a position clear of the light curtain.

Object: Front Door

Probable Faulty Location: Light Curtain sensing area obstructed.

Measures to take: (1) Remove all obstructions from the light curtain while the door is closing and until door closed confirmation. (2) If door is commanded to close when the light curtain was already broken, remove the obstruction within 5 seconds to allow door to close.

*4715 Machine cycle start/Robot not home

*4723 Spindle gear not engaged

A spindle gear change was commanded but the gears did not engage.
Object: Spindle gear
Measures to take: Give a spindle revolution command to allow the spindle gear to engage itself.

*4724 External work counter full count

The number of work pieces have reached the preset number on work counter. The machine cycle start will be disable and the schedule cycle stop will activate.
Object: External work counter.
Measures to take: Press the reset button on the external work counter to reset the counter.

*4850 Safety guard door open

The loader safety guard door is open and the loader is not in Teach

<< Alarm List >> (Alarm D)

Mode. The loader axes will slide hold if the door is not closed or the parameter, "No slide hold with door open", is not set.

*4852 Stroke end limit cancel

*4853 Out Chute Full/No M325 Feedback

*4854 HAND A NOT CLAMPED

*4855 HAND B NOT CLAMPED

*4856 Robot cycle start/Machine not home

Robot cycle start is attempted while the machine is not at the home position.
Object: Machine
Measures to take: Move machine to the home position before starting the robot cycle.