Cylindrical Grinder

KGC-27/50-80-100-150

Operation Manual

KENT USA. 2014/1/20

KGC-27-37 (500, 600, 1000, 1500, 2000)

UNIVERSAL CYLINDRICAL GRINDER

Operation and Maintenance Manual

Table of Content

1. General Specification

1 – 1 Major Specification

Unit: mm

Function	Item / Model		2750	2760	27100	27150	27200
Processing Capability	Spindle Maximum Swivel Diameter		270 （370）				
	Maximum Grinding Length		500	600	1000	1500	2000
	Maximum Grinding Diameter		150（250）/ 250（350）				
	Maximum Workload		100kg	150kg			
Spindle Table	Speed Range	60Hz	5 Speed: 72 , 110 , 174 , 276 , 403 rpm (Special part for stepless variable speed) (無段變速為特別附件皮帶輪轉速分為兩段 如 p17)				
		50Hz	5 Speed: 65 , 100, 157, 250, 265 rpm (Special part for stepless variable speed)				
	Swivel Angle		120°(90°ccw， 30°cw)				
	Lathe Center		MT4				
	Spindle Swivel		Positioning and Reverse				
Worktable	Transversal Velocity mm/min		50~4000		50~3000	50~3000	
	Handwheel Infeed / Turn		15				
	Swivel Angle CCW/CW		10°/ 7°	9°/ 4°	7°/ 3°	5°/ 2°	3°/ 1°
	Minimum Shifting Distance		8				
Grinding Wheel Table	Maximum Shifting Distance		Standard 355： 30° Special 405： ×				
	Grinding Wheel Size (Diameter x Thickness X Bore)		Standard A：355x25~50x152.4				
			Standard B : 355x25~50x125				
			Special C ：405x25~50x152.4				
	Grinding Wheel Maximum Peripheral Speed		2000m/min				
	Grinding Wheel Speed (Special part for stepless variable speed)	60Hz	Standard 355：1730，1917rpm Special 405：1499，1600rpm				
		50Hz	Standard 355：1721，1900rpm Special 405：1508，1603rpm				
	Front-and-Rear Movement Range		Standard 355：200 Special 405：175				
	Speed Infeed Range		50				
	Grinding Wheel Infeed Range		Standard 355：160 Special: 405：175				
	Handwheel Infeed / Turn		1				

Unit: mm

Function	Item / Model		500	600	1000	1500	2000
Grinding Wheel Table	Grinding Wheel Infeed	Manual Button Feed	0.0025				
Tailstock	Lathe Center Range		30				
	Lathe Center		MT4				
Driving Motor	Grinding Table Motor		3.7kw 5HP 4P				
	Workstation Motor		0.4kw 1/2HP 4P				
	Hydraulic Motor		0.75kw 1HP 4P			1.5kw 2HP 4P	
	Forced Lubricantion Motor		0.2kw 1/4HP 2P				
	Coolant Motor		0.4kw 1/2HP 4P				
	Magnetic Grinding Scrap Separation Motor		0.03kw 1/25HP 4P				
	Internal Grinding Motor		0.75kw 1HP 4P				
	Coolant Motor		0.05kw 1/16HP 4P				
Hydraulic System	Hydraulic Tank		54ℓ			66ℓ	
	Forced Lubrication Tank		40 ℓ			48ℓ	
	Coolant Tank		130ℓ / 140 ℓ（任選）				
General Specification	Total Weight		2400kg	2500kg	3200kg	4000kg	5000kg
	Packing Size (LxWxH)		2280×1440×1580	2600×1650×1820	3200×1650×1820	4200×1650×1820	6200×2200×1820

1-2 Machine Parts

1-2-1 Standard Parts

Item \ Model		500	600	1000	1500	2000
1. Grinding Wheel Flange (5” or 6”)		2 sets				
2. Grinding Wheel Dismantle Nut		1 pcs.				
3. Grinding Wheel Assembly Spanner		1 pcs.				
4. Grinding Wheel Repair Kit		1 pcs.				
5. Grinding Wheel		1 pcs.				
6. Static Balance Shaft		1 set				
7. Static Balance Adjustment Table		1 pcs.				
8. 2-Point Center Rest		1 set	1 set	1 set	2 sets	2 sets
9. Tungsten Carbide Lathe Center		2 pcs.				
10. Pull-wire		1 set				
11. Magnetic Grinding Scrap Separation Device		1 set				
12. Waterproof Lid		1 set				
13. Hook		3 pcs.				
14. Basic screw and nut		7 pcs.	7 pcs.	10 pcs.	15 pcs.	21 pcs.
15. Operation and Maintenance Description Manual		1				
16. Tool Kit	1. Tool Bag	1 pcs.				
	2. Socket Wrench	1 set				
	3. Crowfoot Wrench	5 pcs.				
	4. Screw Driver	2 pcs.				
	5. Fuel Nozzle	1 pcs.				
	6. Oil Tank	1 pcs.				
	7. Diamond Tools	1 pcs.				
	8. Bracket	1 pcs.				

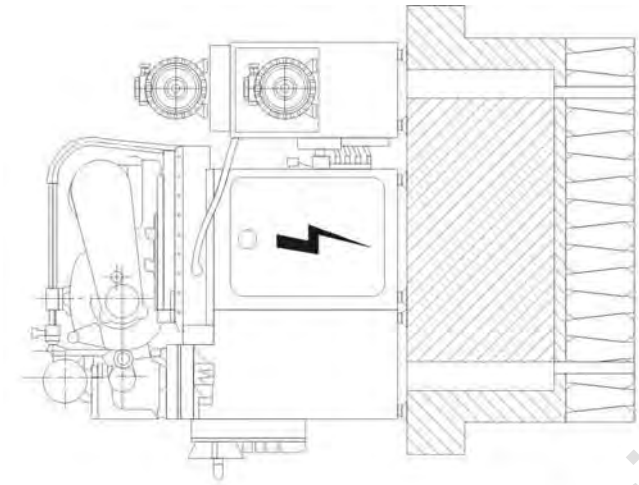
1 – 2 – 2 Special Parts

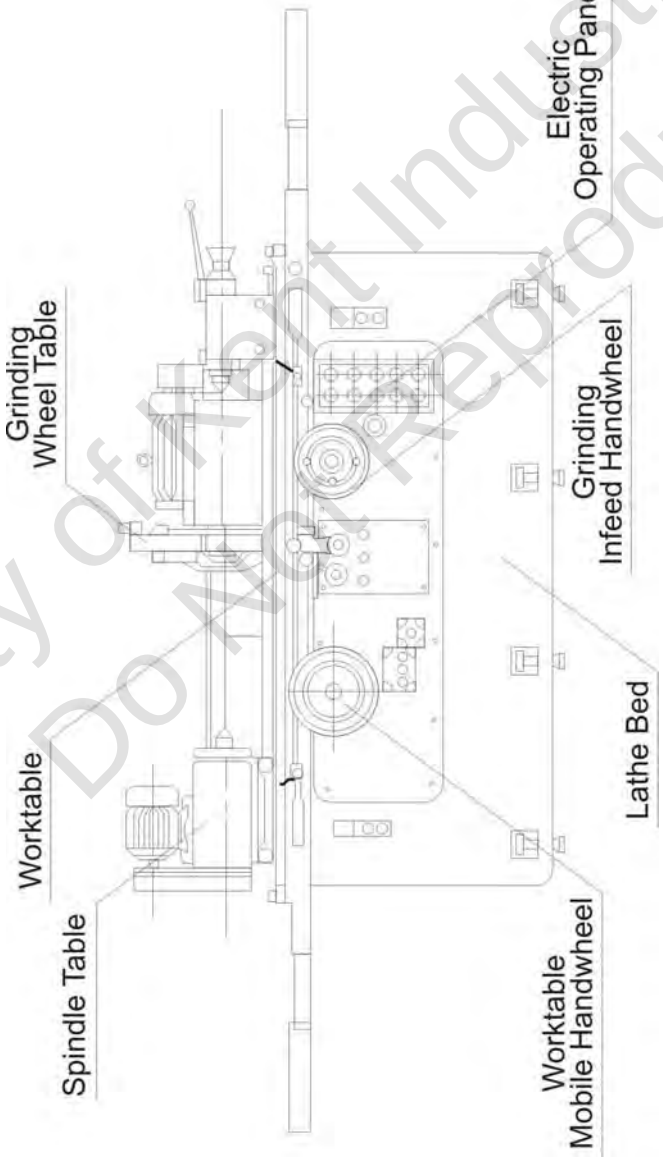
Item \ Model	500	600	1000	1500	2000
1. Spindle Variable Speed Device	1 set				
2. Chuck (3 jaw 6” or 9”, 4 jaw 9”)	1 set				
3. Chuck Flange (3 jaw 6” or 9”, 4 jaw 9”)	1 set				
4. Grinding Wheel Angle Adjustment Device	1 pcs.				
5. 405 Grinding Wheel Protecting Lid	1 set				
6. 3-Point Center Rest	1 set				
7. Worktable Angle Indicator	1 set				
8. Hydraulic Tailstock	1 set				
9. Automatic Timer Device	1 set				
10. Paper Filter	1 set				
11. Internal Grinder Device	1 set				

12. Internal Grinder Specification — Unit: mm

Internal Grinder Model	Speed	Horsepower	Shaft Changing		Processing Range (min-max) x Length	Grinding Wheel Measurement O.D. x Width x I.D
				Diameter x Length		
SA-101	20000 rpm	0.75 kw （1HP）	ϕ15× M14×1.5	16×51	20~40×50	13×12×4
				20×73	24~50×70	18×12×6
				24×91	28~80×90	25×25×10
SA-101	10000 rpm	0.75 kw （1HP）	ϕ17× M16×15	20×51	24~50×70	18×15×4
				24×81	28~80×90	25×20×6
				30×105	35~100×110	34×25×10

2. Machine Diagram





3. Transportation and Installations

3 – 1 Transportation

Diameter of the wire rope for machine hanging must be more than 16 mm. Hanging method as shown in Diagram 3-1, 3-2. Pay attention to below:

1. Elevator or lifting machine must be able to support the weight of machine. Model 500–2400kg Model 600 – 2500 kg, Model 1000 – 3200 kg, Model 1500 – 4000 kg.
2. Soft pad is required between wire rope and machine to avoid machine collision.

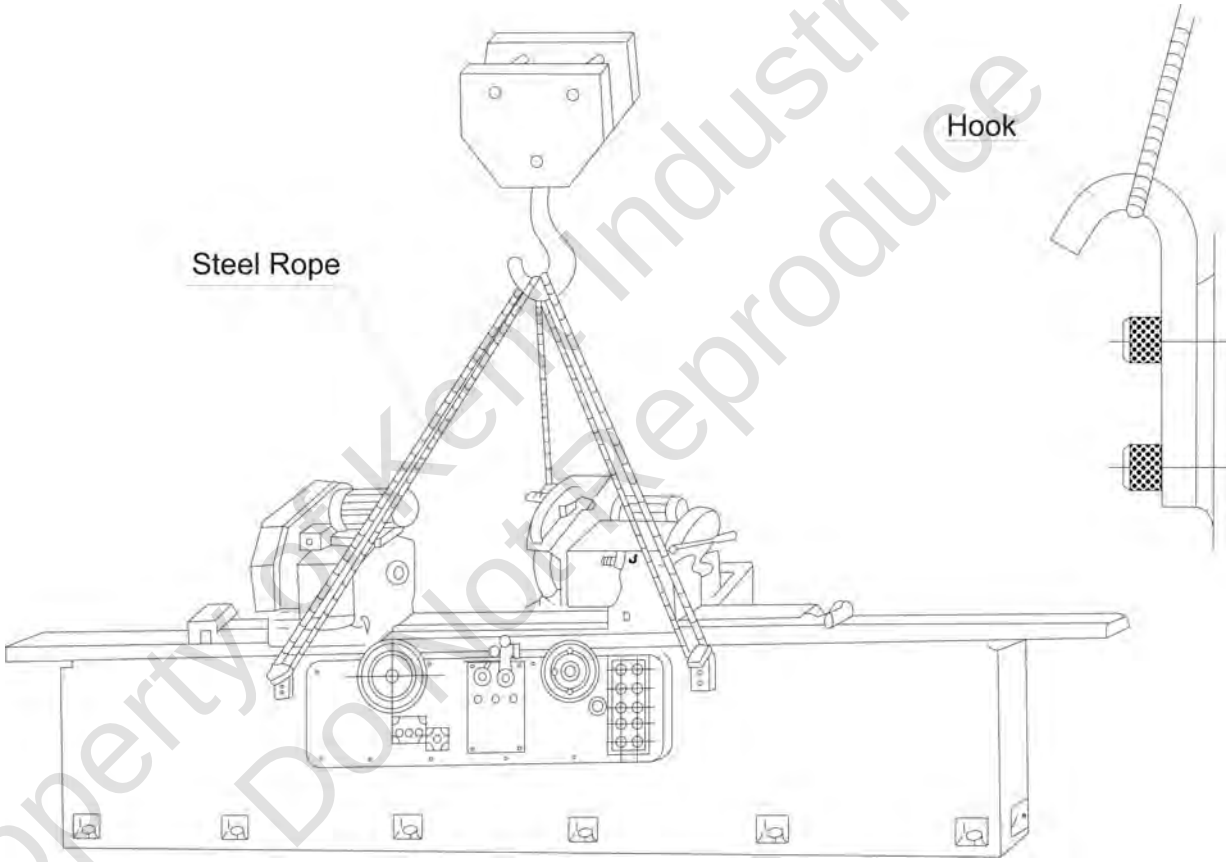


Diagram3-1 Machine Hanging

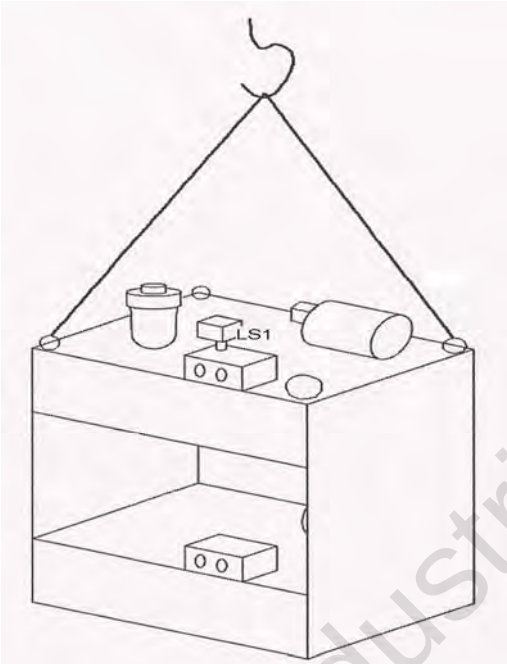
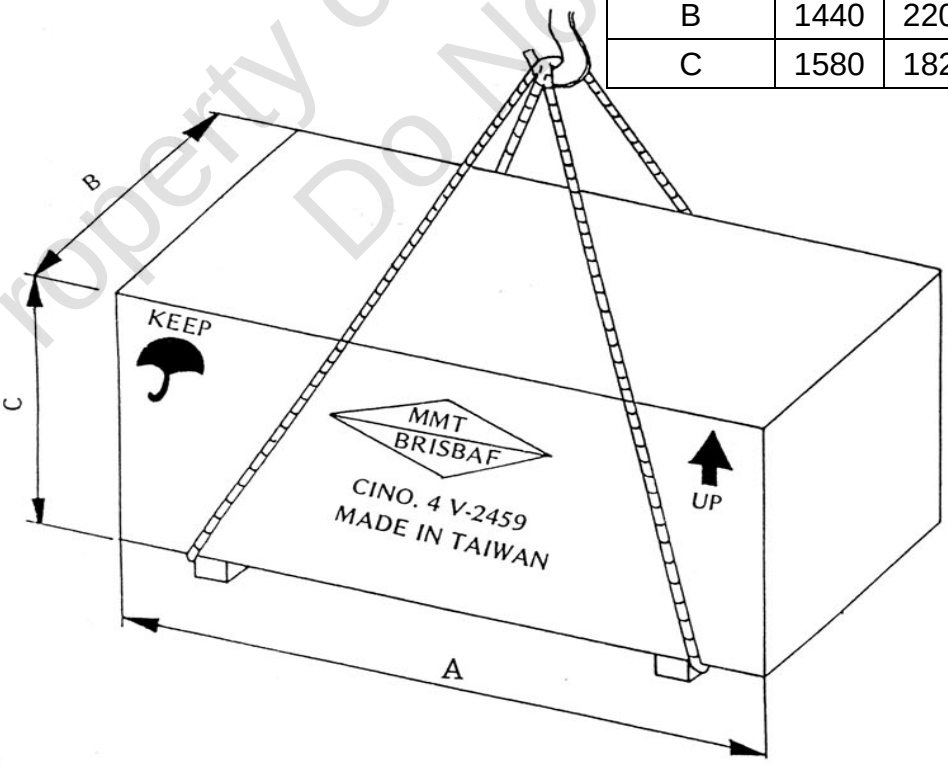


Diagram 3-2 Hydraulic Tank Lifting

3 – 2 Packing and Transportation

Dim. \ Model	2750	2760	27100	27150	27200
A	2280	2600	3200	4200	6200
B	1440	2200	2200	2200	2200
C	1580	1820	1820	1820	1820



3 – 3 Installation

The base needs to be installed firmly as to optimize the accuracy and capability of machine. The base must be installed 10 days before machine installation. Base configuration as shown in Diagram 3-3, 3-4, 3-5. Pay attention to below:

1. Do not expose the machine directly under the sun. Best to store under fixed temperature (10℃ ~ 30 ℃).
2. Avoid vibration. Keep machine away from air compressor of punching machine.
3. Best to install machine in dust-free room.
4. The depth of base depend on the flooring or geological conditions.
5. To avoid machine vibration and to adjust machine level, level adjusting pad (7 for Model 2750,7 for Model 2760, 11 for Model 27100, 17 for Model 27150 , 21 for Model 27200) can be utilized.

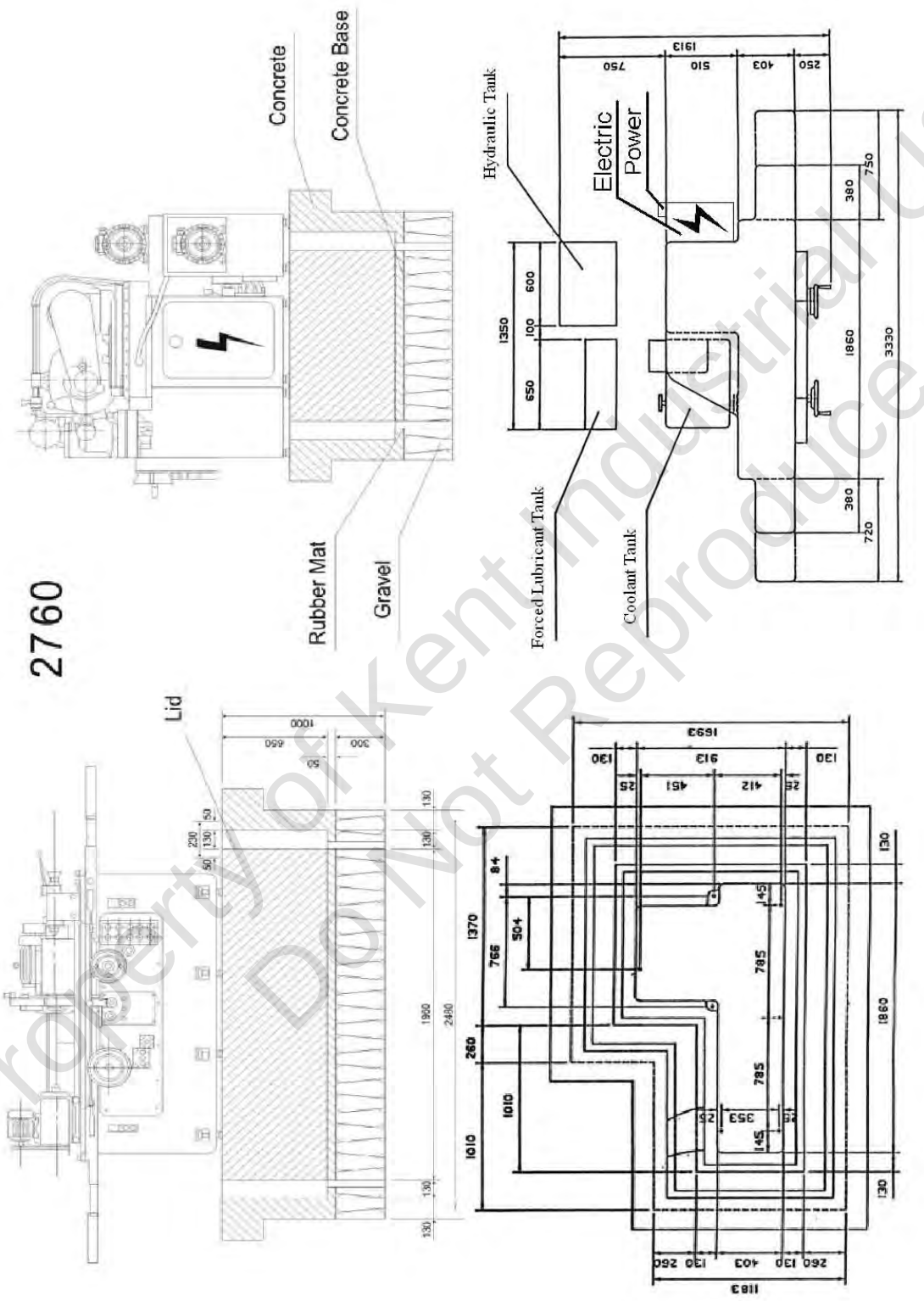


Diagram 3-3 Machine Sketch(Model 27/37-60)

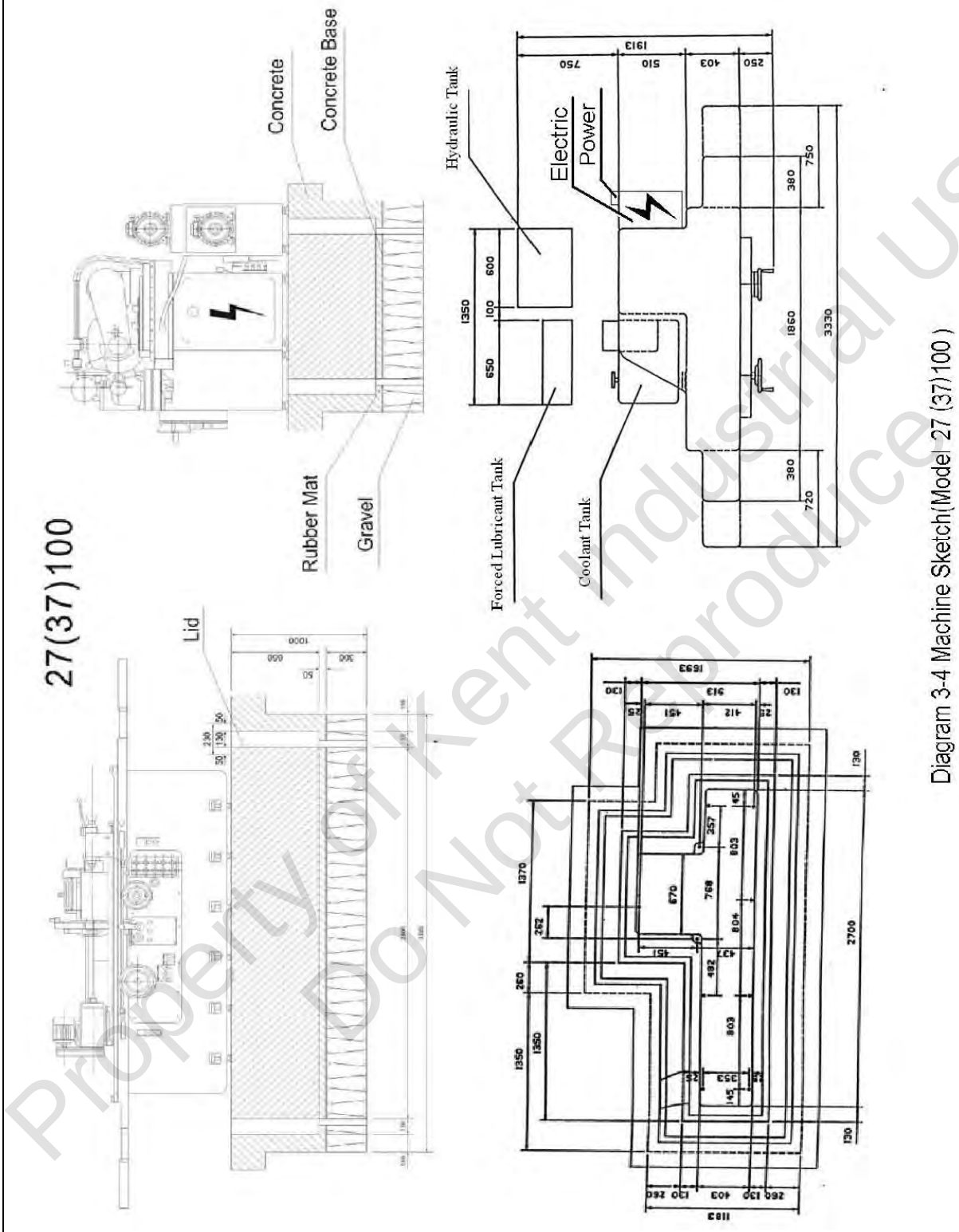
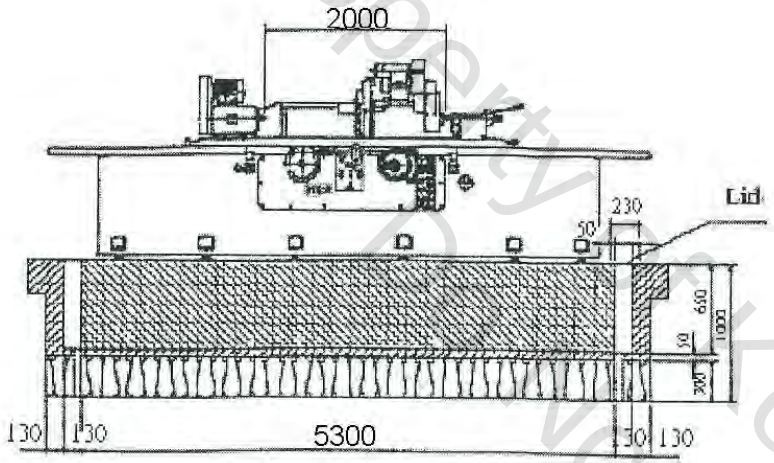
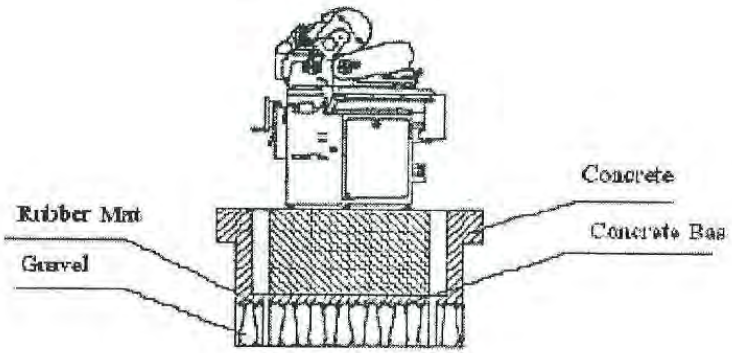
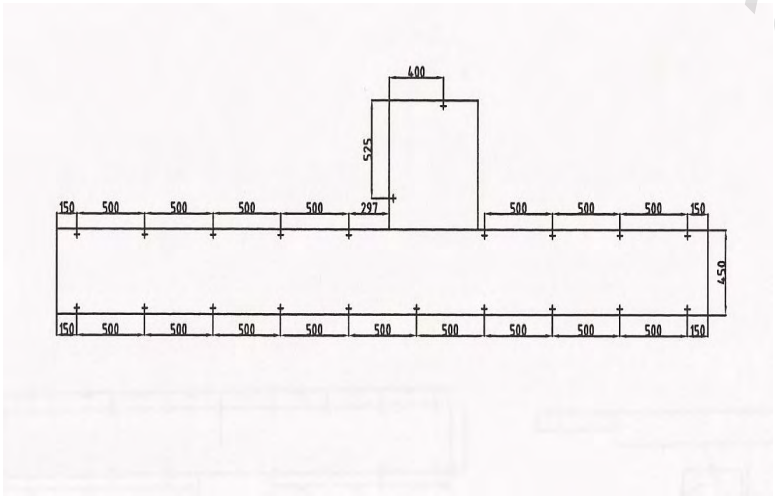


Diagram 3-4 Machine Sketch(Model 27 (37)100)







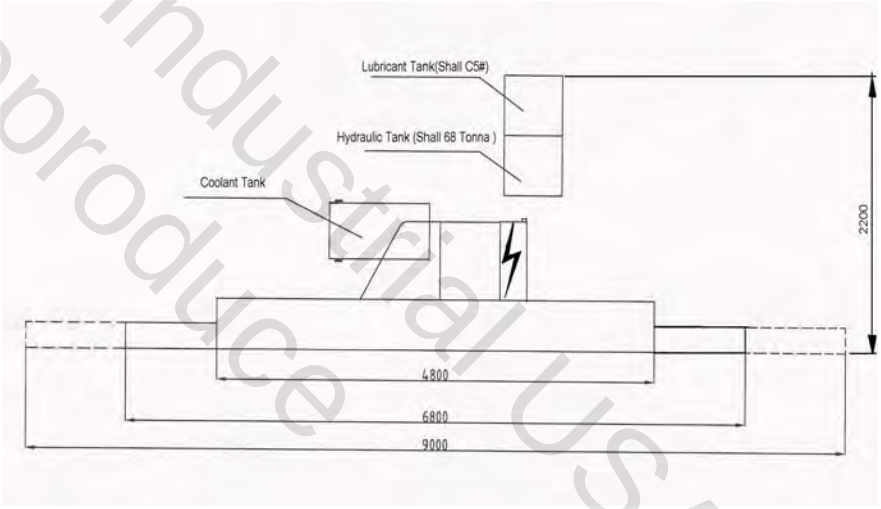


Diagram 3- 5Machine Sketch(Model 27 (37)200)

3 – 4 Level and Adjustment

1. One precise level is to be placed at the center of worktable as shown in Diagram 3-6.
2. Adjust the adjusting screws under bed to reset level.
3. Move worktable to left end and right end and measure level difference. Less than 0.02mm/m for Model 60H, less than 0.035 mm/m for both Model 27100H and 27150H.
4. Adjust level after installation is completed. Adjust again after 1-month test run. Then, check once every 6 months.
5. Immediate checking and adjustment when there is earthquake.

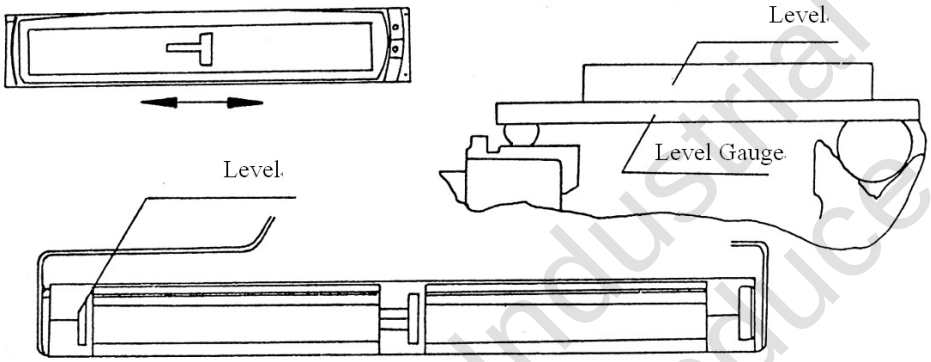


Diagram 3-6

3 – 5 Oil Tank Installation

3 – 5 – 1 Hydraulic Tank: Place tank behind the machine and connect the piping. Open the tank and refill oil.

Attention: DO NOT bend oil pipe.

3 – 5 – 2 Forced Lubrication Tank (Place at top of oil tank)

Connect oil pipe to oil chunk as shown in Diagram 3-6. Connect oil refluxing pipe and fill in grinding wheel oil.

3 – 5 – 3 Coolant Tank

Connect water pipe to spray pipe. The magnetic separator opening of coolant tank to be placed under water drain

4. Structure Description and Adjustment

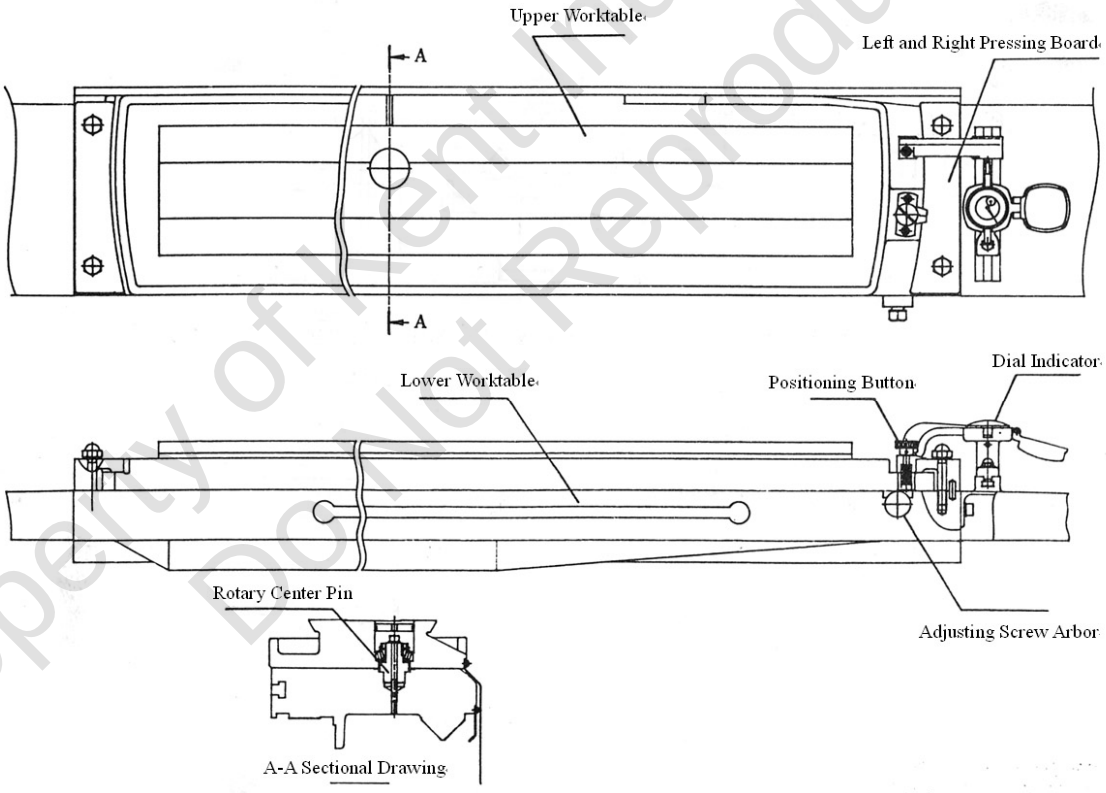
4 – 1 Worktable Structure

4 – 1 – 1 Worktable

Worktable is composed of rotary table and sliding table. These two are connected with center pin. Handwheel is used to tune the grinding taper.

4 – 1 – 2 Angle Adjustment of Rotary Table

First, loosen the screw of fixed board. Loosen the screws attached at the bottom of rotary disc. Adjust the required angle base on the indicator of corner box.



4 – 1 – 3 Table Transverse Structure

1. There are 2 parts: manual and hydraulic
   Driving gear wheel is the motive force of spring and hydraulic at each side. For manual operation setting, hydraulic oil is released and driving gear wheel goes through the spring and connects with handwheel. Operator can control the table with handhweel. For hydraulic operation setting, hydraulic oil pushes driving gear wheel to separate from handwheel. The table is raised automatically by hydraulic.

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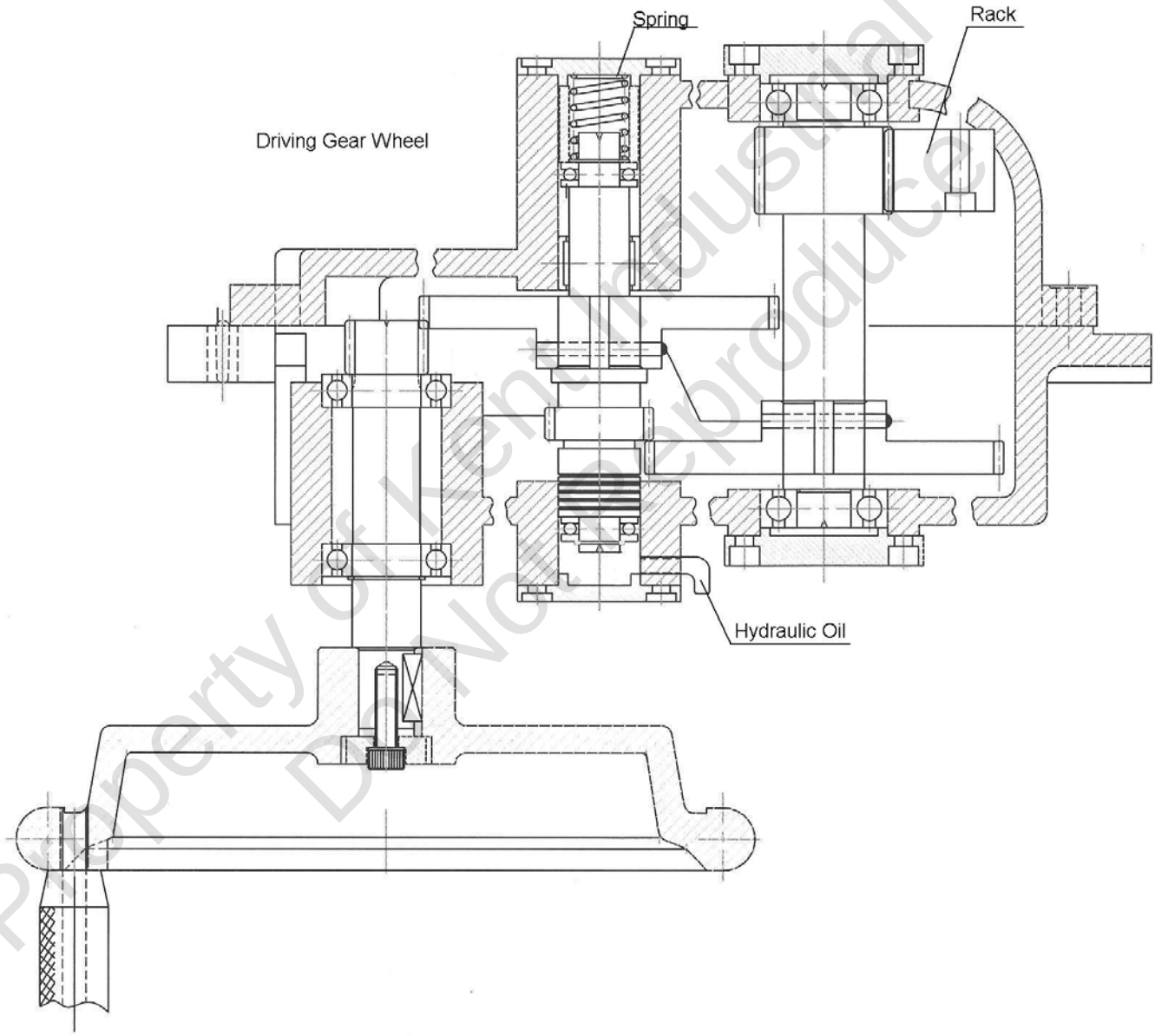


Diagram 4-2 Table Transverse Structure

2. The traverse movement speed of work table can be freely adjusted in accordance to regulation.

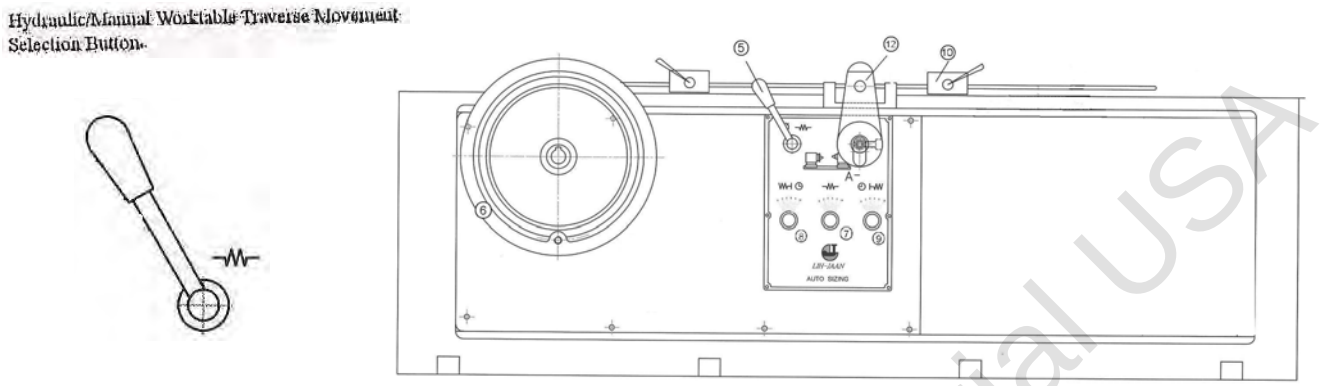


Diagram 4-3 Worktable Traverse Movement Adjustment Structure

4-2 Spindle Table

4-2-1 Structure

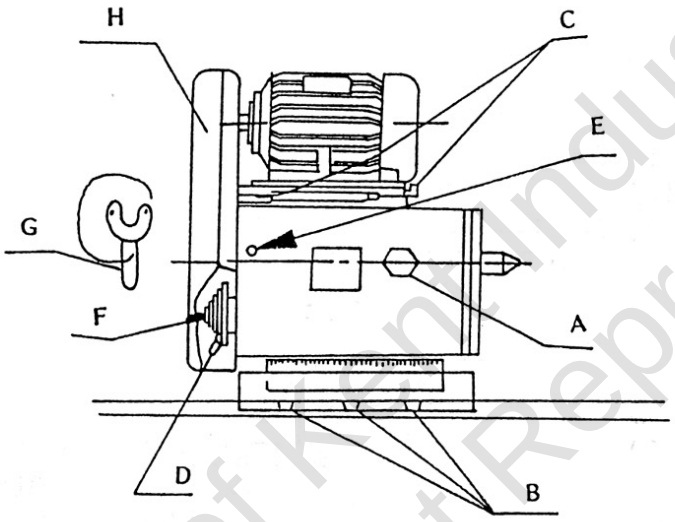
Spindle table is fixed on the worktable by 2 sets of fixing chunks. Before grinding, forward it to 0 position. The 2 fixing chunks are to fix the largest traverse distance of worktable. Clip the 2 fixing chunks on spindle table. Spindle table is supported by tapered roller bearing and it bears the weight of grinding force and work piece. The rotation of spindle table depends on bolt.

4-2-2 Turntable and Speed Adjustment

1. Slightly loosen wheel F at the back of spindle table. Insert dowel pin to stop spindle from moving. Take out dowel pin A when carry out internal grinding so that spindle turns automatically.
2. Lift the base of spindle table. Loosen screw B at the button. Turntable moves 120°.
3. Open up pulley protecting lid and loosen fixing screw arbor C. The motor is pushed forward so that the tightness of belt can be adjusted.

4. 5-speed of spindle: 46~360 r.p.m. for 60 HZ, 38~299 r.p.m. for 50 HZ.

5. When the internal belt is loosened, adjust screw E. Take down wheel F. Use spanner G to adjust eccentric shaft to required tightness.
6. From step 5, the speed is changed by the changing of belt position.



A	Pin
B	Fixing Screw
C	Fixing Screw Arbor
D	Eccentric Shaft
E	Screw
F	Turning Wheel
G	Spanner
H	Pulley Protecting Lid

Diagram 4-4 Spindle Table

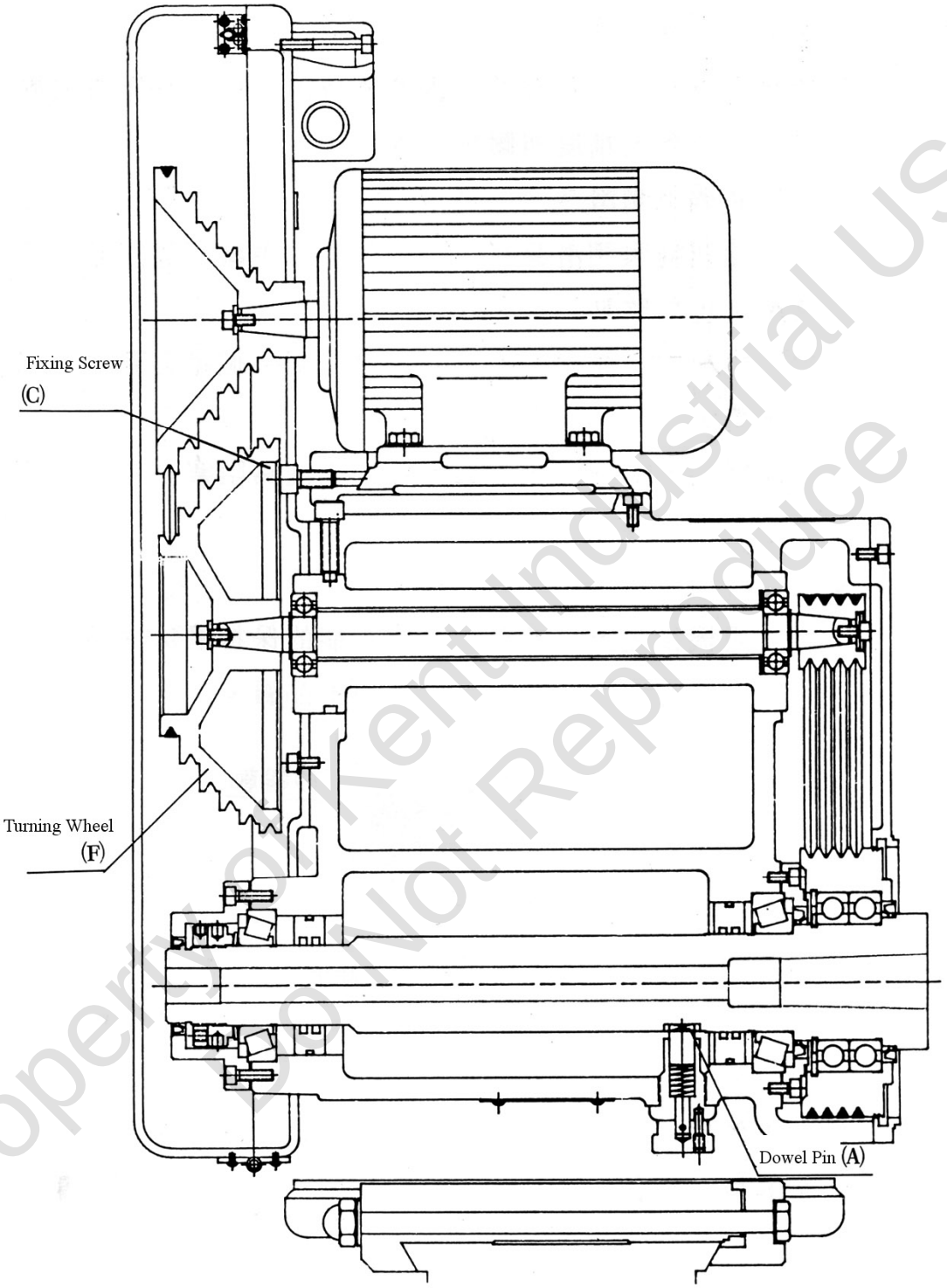


Diagram 4-5Spindle Table

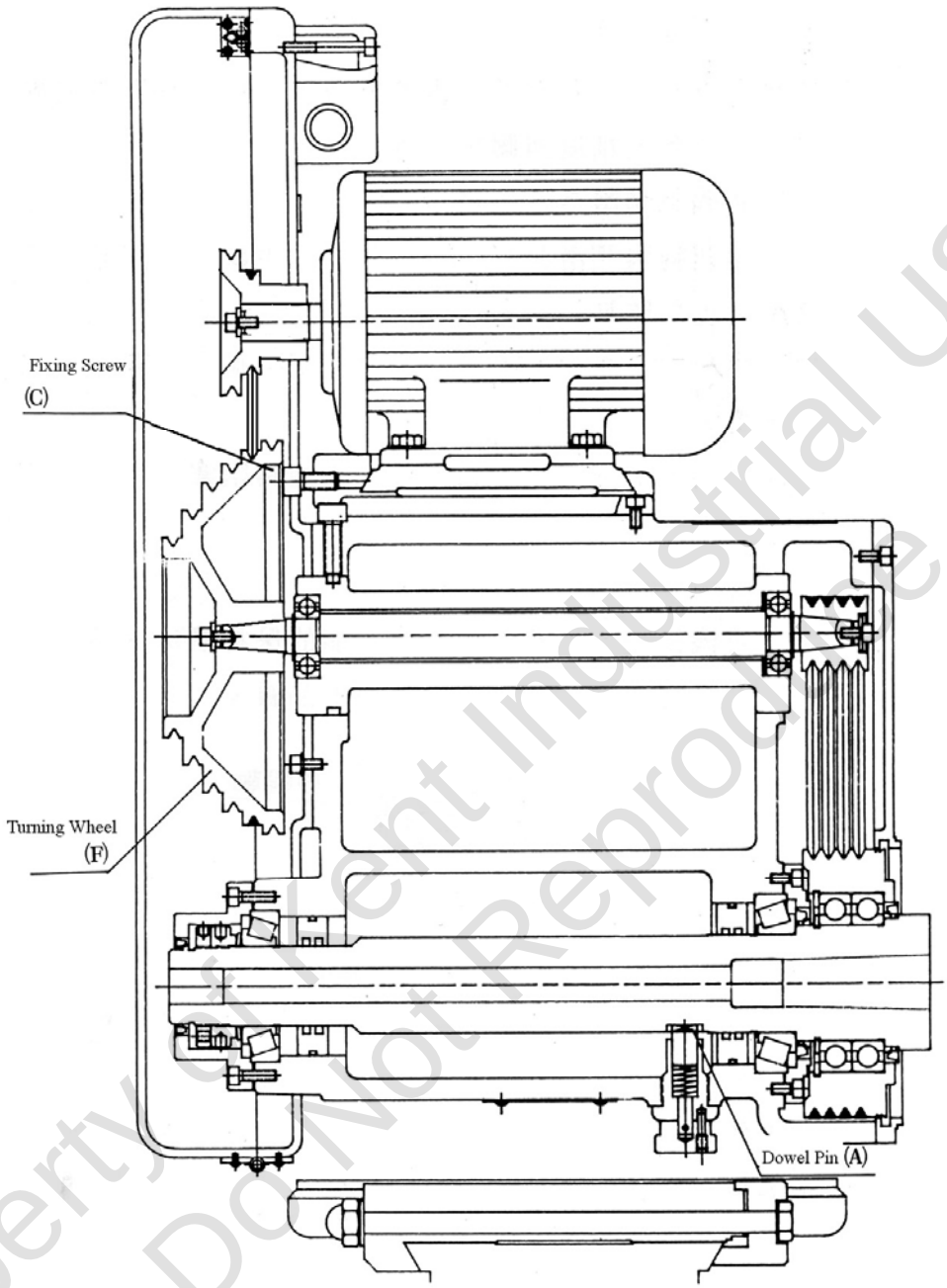


Diagram 4-5Spindle Table

4 – 3 Grinding Wheel Table

4 – 3 – 1 Grinding Wheel Shaft

Grinding wheel shaft is one of the most important parts for grinder. The material is alloy steel processed with suitable heat treatment and precision grinding.

The material of grinding wheel shaft bearing is copper alloy. When it operates, oil film between 3-point support spindle and bearing optimize accuracy and durability.

4 – 3 – 2 Grinding Wheel Shaft Lubrication

1. When grinding wheel operation and lubrication pump operate simultaneously, lubrication is started by hydraulic pump when the button of spindle button is pressed.
2. Before grinding wheel is lubricated, lubricant goes through filter to a pressure switch to start spindle motor.
3. When hydraulic motor operates, the pressure switch turns off automatically when pressure if too low or when the oil piping is blocked. Spindle stops right away.
4. Clean the oil filter once a month.

Remarks: Warm up for 30 minutes after turning on. Keep the highest stability of grinder as vibration affects grinding accuracy and processing quality.

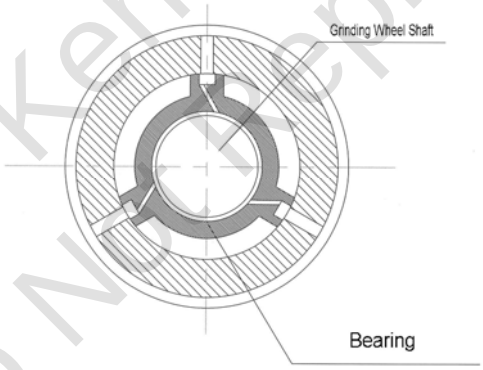


Diagram 4-6

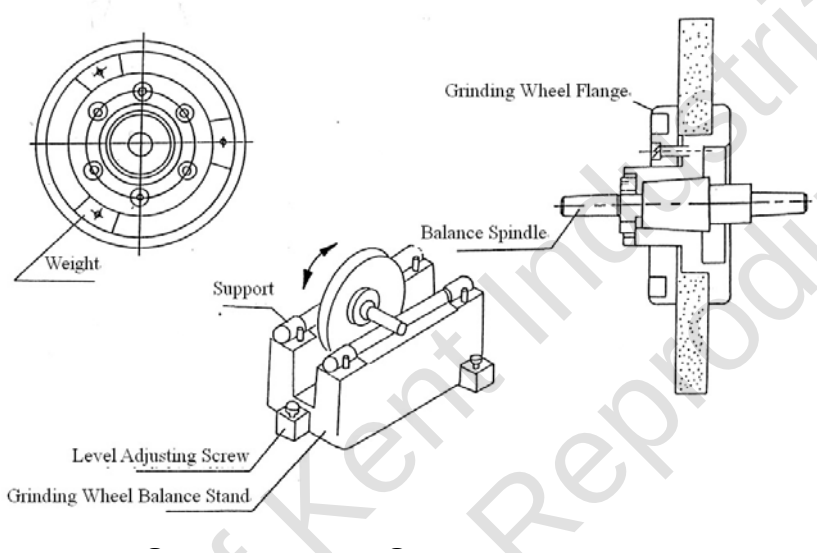
4 – 3 – 3 Grinding Wheel

1. Inspect the exterior of grinding wheel.
2. DO NOT use iron hammer for grinding wheel installation.
3. DO NOT over tighten the screws. Use under 0.6 mm thickness of blotting paper or under 3mm of uncompressible material between grinding wheel and grinding wheel flange.
4. Test run for 30 minutes after installation.

5. Place grinding wheel horizontally. Keep it moisture free.

4 – 3 – 4 Grinding Wheel Balance Adjustment

1. First, adjust balance stand.
2. Install grinding wheel and grinding wheel flange on balance spindle and tighten them.
3. Place shaft on the balance stand and let it standstill.
4. Put weight on the top of grinding wheel flange. Put the rest symmetrically.
5. Continue to adjust weight until the grinding wheel is balanced. Balance means it turns smoothly and stops. It should not be move after it stops or it slightly turns another way round.



4 – 3 – 5 Grinding Wheel Infeed Structure

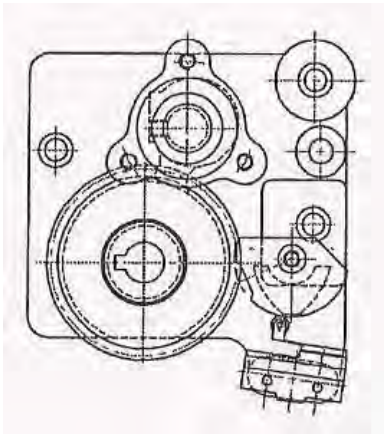
Grinding wheel infeed is controlled by manual infeed wheel. Backlash of lead screw is removed by spring as to provide smooth and precise infeed.

1. Installation Completion Confirmation

Mainly used in mass production and section grinding. There are 2 methods for this installation:

（1）Roughly grind the workpiece, use ratchet infeed to infeed wheel and obtain the final diameter.
*棘輪改手輪

（2）Most of the tests need to stop after the rough grinding rotation and the handwheel is turned to the last position to grind the next piece. If he test diameter is below tolerance and the turning wheel stops, repeat (1) and (2) until the most accurate stop is reached.



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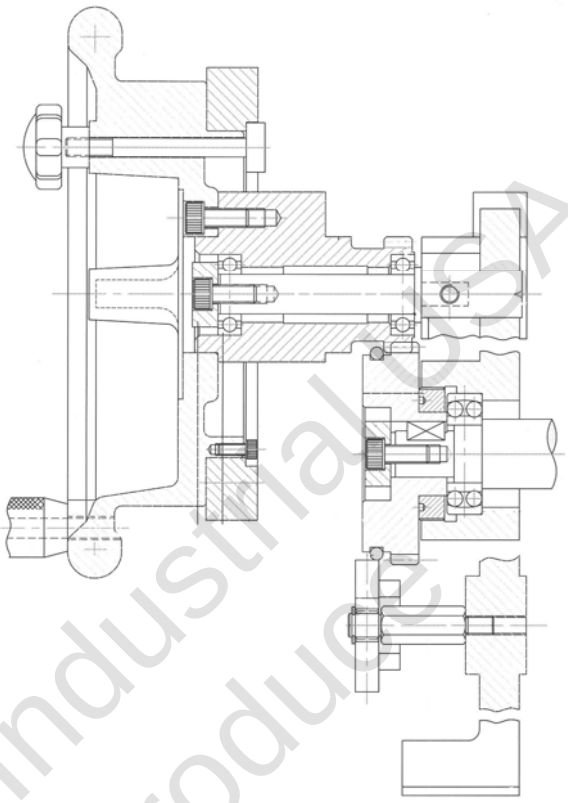


Diagram 4-8 Grinding Wheel Infeed Structure

(NC Model drive by ball screw, not this device)

Operation Procedure:

(1) Use manual or micro infeed button to finish the last grinding size of first piece.

(2) Release dial scale as to separate it from handwheel. Adjust dial scale, position the last infeed position of grinding wheel.

(3) Fix the positioning option stick.

(4) Reset when the infeed knife of handwheel reaches dial scale, meaning the position of positioning option stick.

Attention: When resetting the dial scale, eccentric shaft of dowel pin can be adjusted.

2. Hydraulic drives to speed infeed and retreat

Hydraulic oil into cylinder is controlled by SOL 1. When SOL 1 is “ON”, hydraulic drives to speed infeed. When SOL is “OFF”, hydraulic drives to retreat.

The traverse of grinding wheel speed movement is 50mm. When cylinder moves fast, when it comes to the end, this machine has decelerate device as to minimize the crash of piston.

Device for piston adjustment:

(1) Take down gear wheel protecting lid at the back.

(2) Loosen the screw.

(3) Adjust buffering speed (the higher the screw is adjusted, the slower the buffering is. The lower the screw is adjusted, the slower the buffering is.)

(4) Tighten the screw.

When the workpiece spindle is set at automatic circulation, grinding wheel infeed wheel, workpiece spindle, and coolant pump are connected.

When handwheel slightly turns clockwise, workpiece shaft and coolant pump are started. When it turns backward manually, workpiece shaft and coolant pump stop immediately.

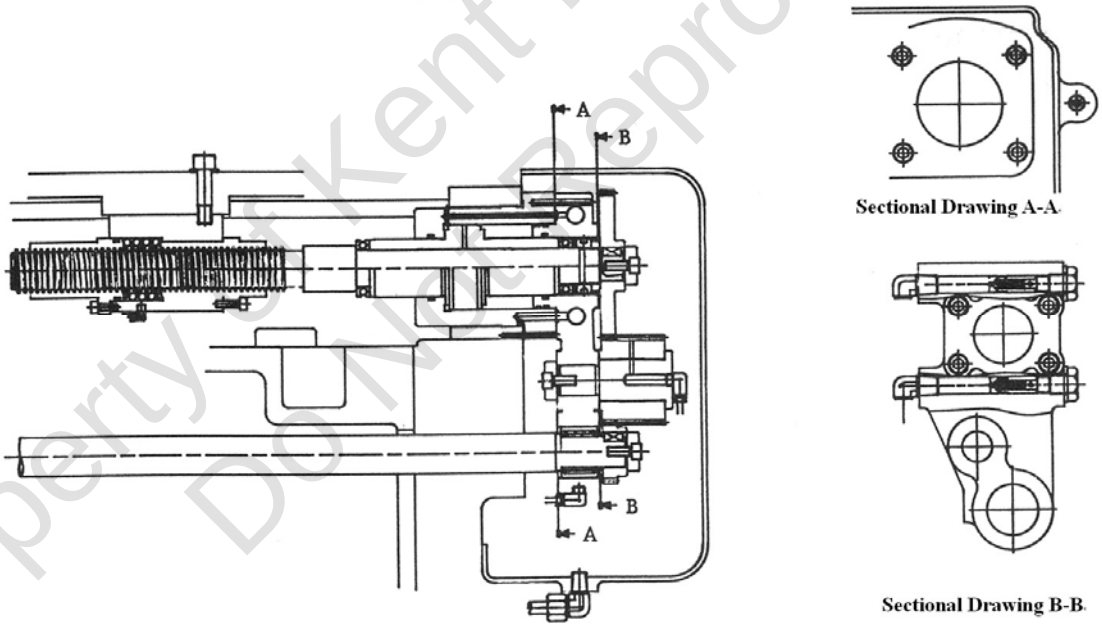


Diagram 4-9 Handwheel Infeed Structure

(NC Model drive by ball screw, not this device)

4 – 4 Tailstock

Move the tailstock to the correct position according to workpiece length. Clean the surface of worktable before moving. Regularly adjust the tip pressure according to workpiece size and shape. For tip pressure adjustment, turn the knob of tailstock and turn clockwise. Increase tip pressure. Too much of pressuring causes the curve of workpiece or problem at tip. Less of pressure causes the “click” sound.

Lathe center traverse 30mm.

Lathe center can return to its position and locked as to make it easier for heavier workpiece changing. Clean the workpiece center hole when inserting the tip.

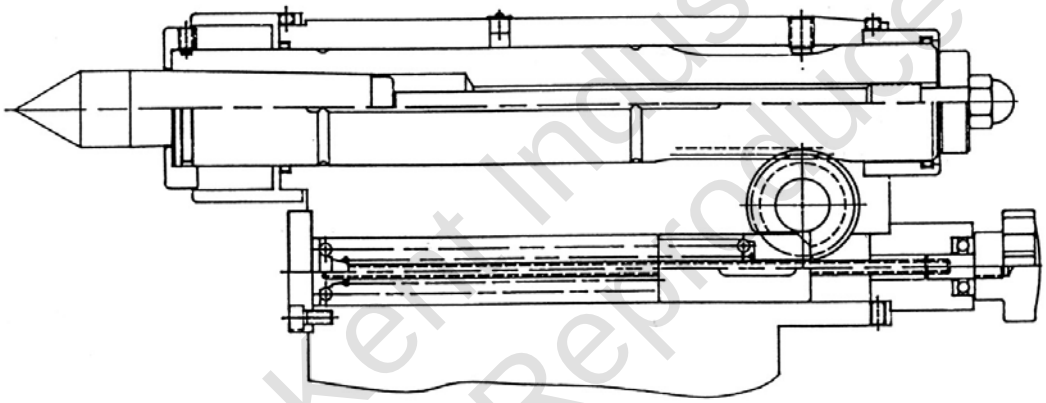


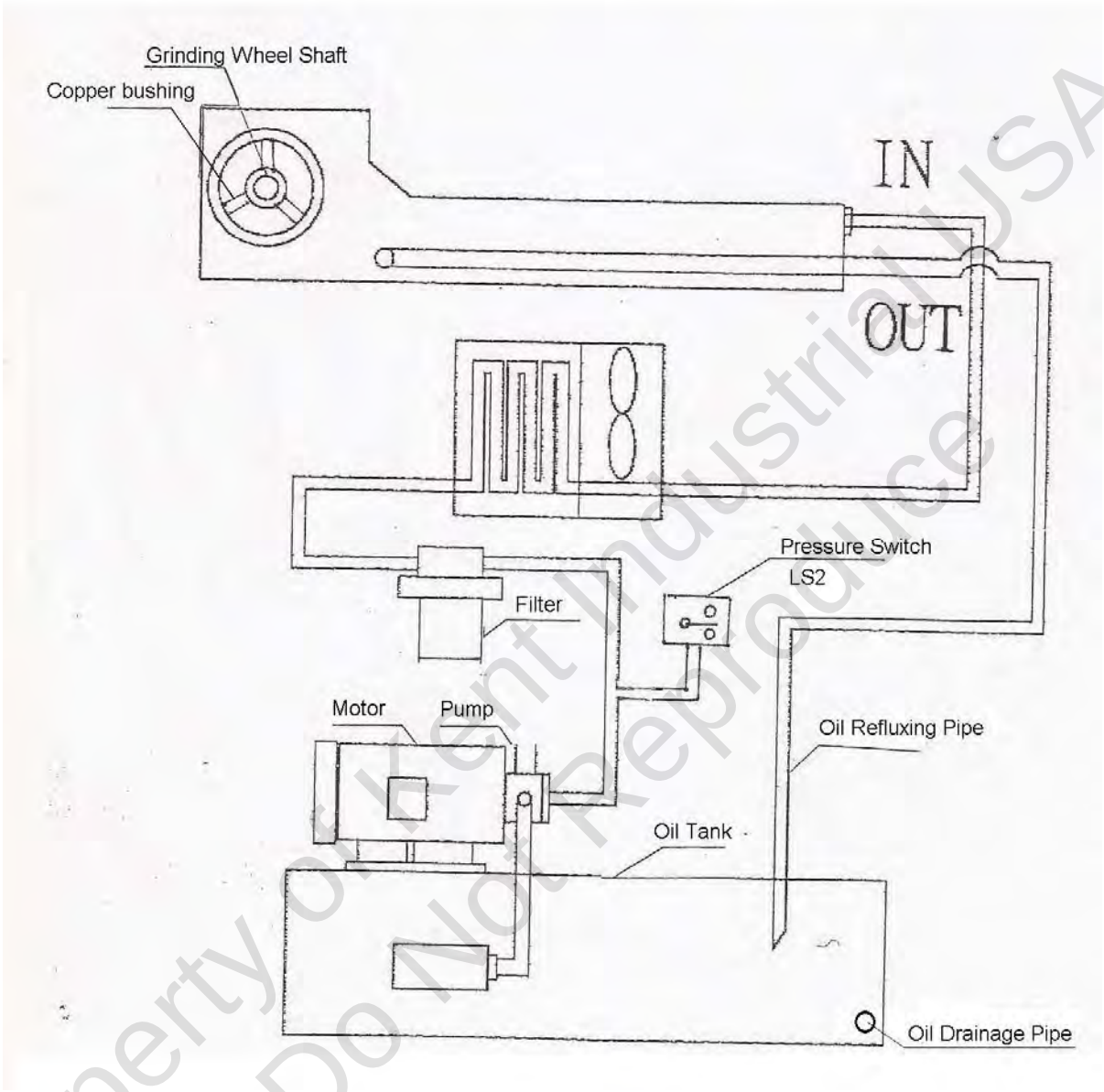
Diagram 4-10

5. Lubrication

5 – 1 Lubrication System

	Grinding Wheel Forced Lubrication Tank	Coolant Tank	Tailstock	Hydraulic Tank
Lubrication	Wheel Shaft Copper Bushing		Gear Wheel	(1) Lubrication System (2) Hydraulic System (a) Grinding Wheel Infeed and Retreat (b) Worktable left and right move
Method	Forced Lubrication	Recycle	Oil Nozzle	Change once a year
Frequency	Change once for 3-month operation. Follow by once every1 year.	Maintain when needed	Fill oil once every 6 months.	Change once a year.
Oil Requirement	(1) B.P. energol 5 (2) Mobil velocite oil No. 4 (3) Esso nuto H5 (4) Shell tellus oil C5 (5) Castrol Magna AB5	(1) B.P. fedaro AX (2) Mobil mobilmet 122S (3) Esso kutwell 30 (4) Shell dromus oil A (5) Chevron soluble oil	(1) Mobil catre oil light (2) Daphne oil 45 (3) Shell Vitea 27	(1) B.P. energo HTP 68 (2) Esso nuto 68 (3) Shall tonna oil T68 (4) Cherroh EP hychanlic oil 68

5 – 2 Forced Lubrication Circuit



5-3 Concentrate Lubrication Circuit(NC Model drive by ball screw, not this device)

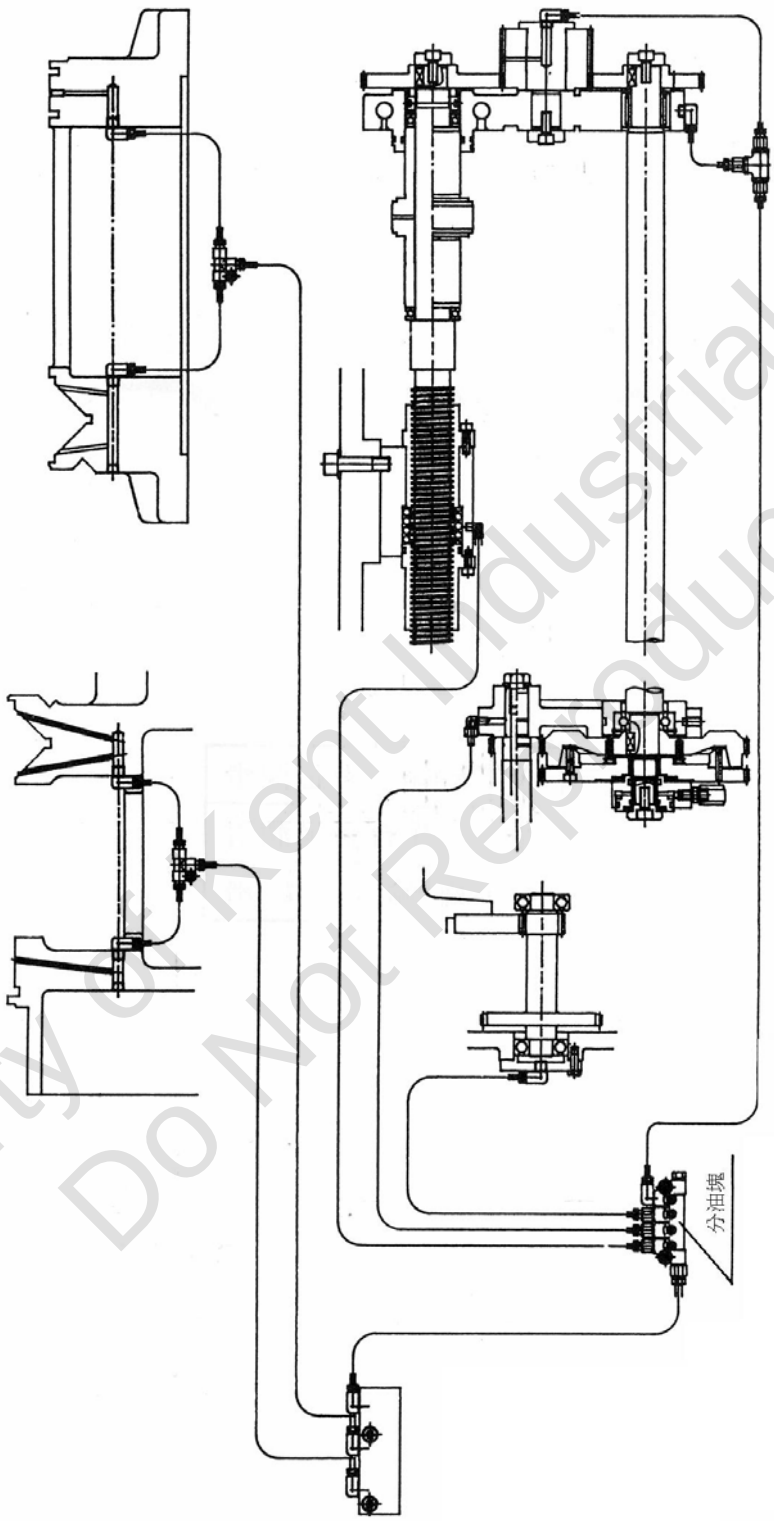


Diagram 5-2

5 – 4 Lubricant Flow Adjustment

The flow in Diagram 5-3 can be chanced by turning control switch. Turn clockwise to decrease flow, turn counter clockwise to increase flow.

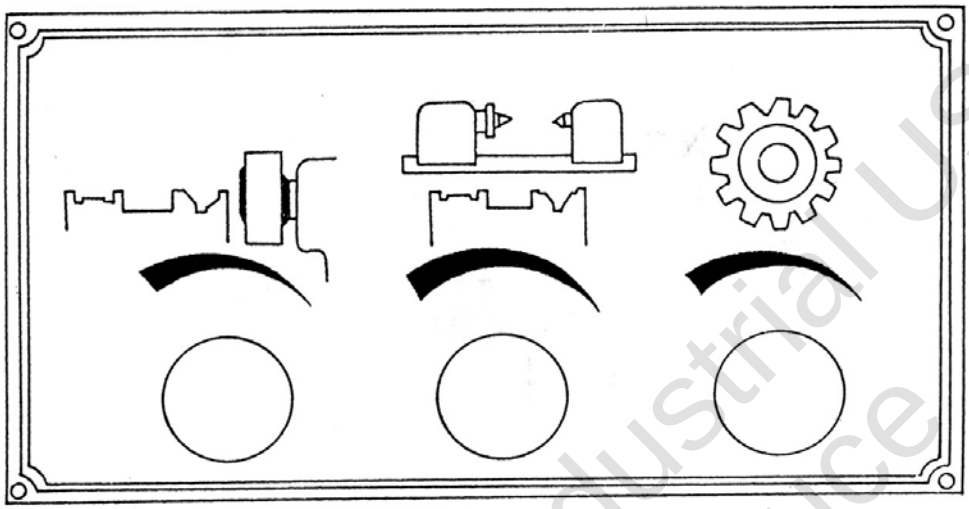


Diagram 5-3

A	Grinding Wheel Chute Lubrication
B	Worktable Chute Lubrication
C	Gear Wheel Set Lubrication

6 Operation Description

6-1 Control Stick and Handle

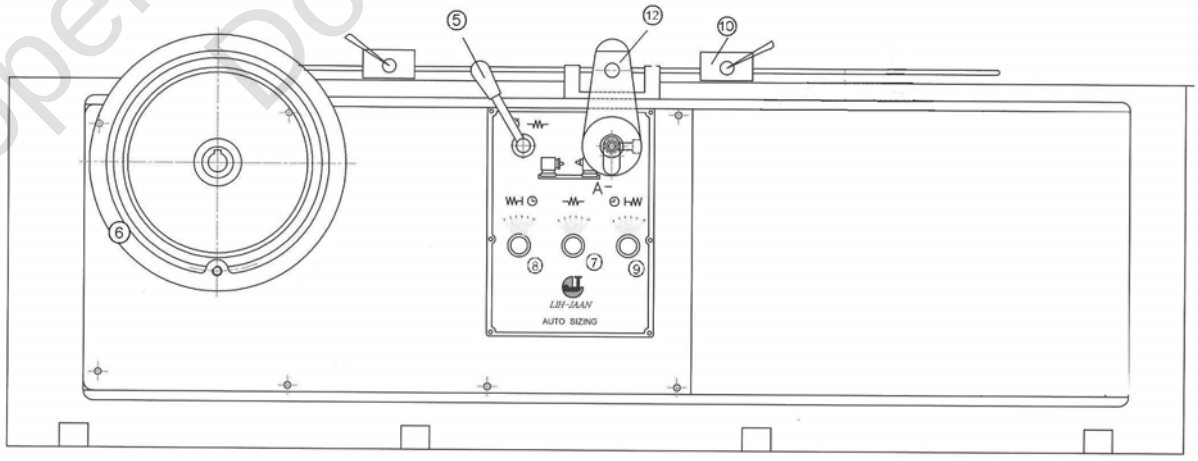


Diagram 6-1

1. Infeed Handwheel
2. Graduation Ring Fix Button
3. Infeed Termination Stopping Stick
4. Control Panell
5. Worktable Hydraulic/ Manual Turning Option Stick
6. Worktable Manual Turning Wheel
7. Bed Traverse Speed Adjustment Handle
8. Left Termination Time Suspension Setting Handle
9. Right Termination Time Suspension Setting Handle
10. Left and Right Worktable Hydraulic Traverse Fixing Chunk
11. Lubricant Adjustment Handle
12. Worktable Left and Right Direction Control Valve

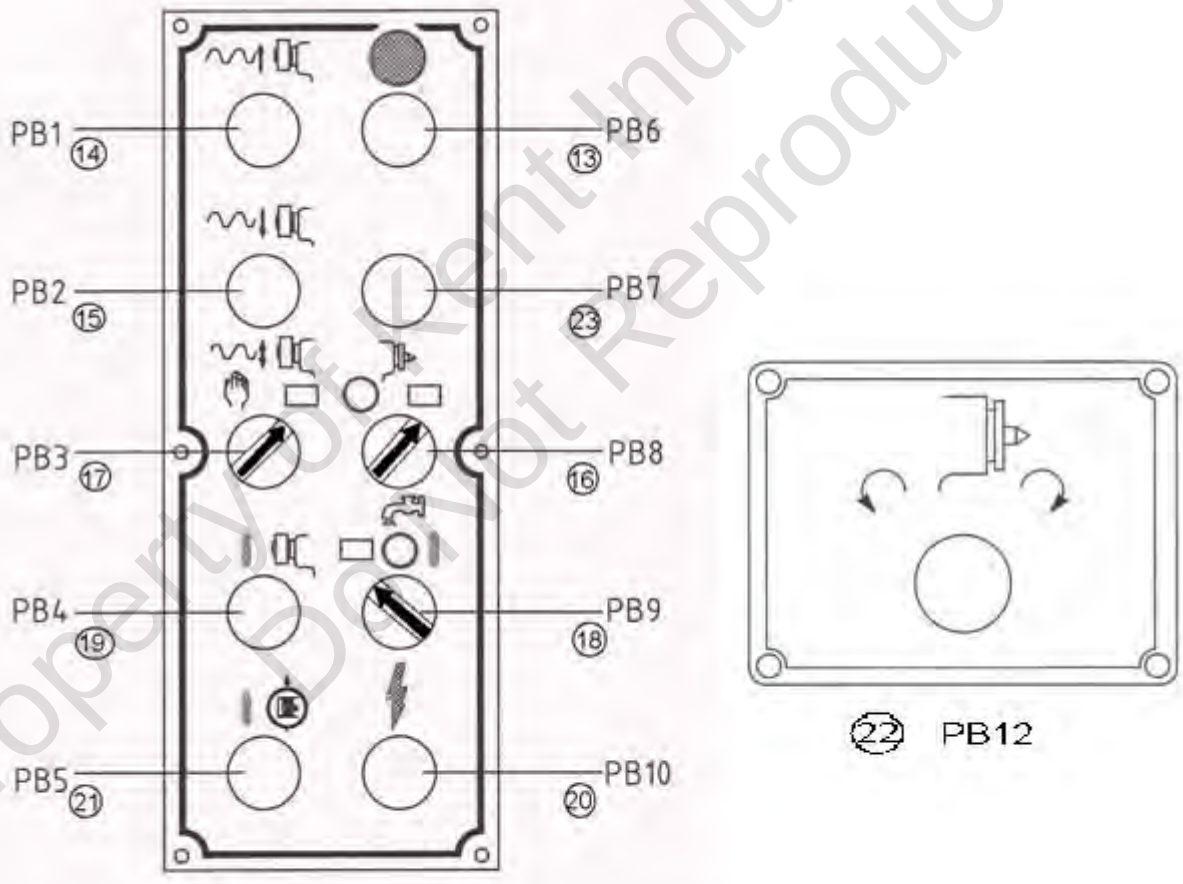


Diagram 6-2

(NC Model drive by ball screw, not this device)

6 – 2 Electric Operating Panel

(13) Power Stop Button (PB6)
(14) Grinding Wheel Speed Retreat Button (PB14)
(15) Grinding Wheel Speed Forward Button (PB15)
(16) Spindle Manual /Automatic Selector (PB16)
(17) Grinding Wheel Infeed Manual/Automatic Selection Switch
(18) Coolant Pump Automatic/Manual Stop Selection Switch
(19) Grinding Wheel Operation Button
(20) Power Indicator
(21) Hydraulic Operation Button (Power)
(22) Working Shaft Clockwise Turning Selection Switch
(23) Grinding Wheel Stopping Button

6 – 3 Operation Sequence

1. Set stick ⑤ selection to the right (manual).
2. Press operation switch ㉑. Then, adjust hydraulic pressure to 15~25 kg/cm^2 lubrication pressure to 1~3 kg/cm^2
3. Press grinding wheel operation switch ⑲. After the grinding wheel is adjusted to match section 3-5 cd, forced lubrication pump is turned on and hydraulic drives pressure switch to operate motor.
4. Press grinding wheel operation switch speed infeed button
   Move the bed as to avoid the contract of grinding wheel with grinding wheel table, tailstock, and diamond tool. Press button ⑮ grinding wheel speed infeed 50mm. Set selection switch ⑯ and ⑱ to automatic. Turn off coolant to stop grinding wheel as grinding stop turning. Prevent from vibration.
5. When the bed is moved, left and right move of shaft is not to collide with spindle table.
6. Reset turning bed traverse speed adjustment handle ⑦ (C.C.W).
7. Setting stick ⑤ to the left (hydraulic). Slowly turn handle ⑦ to the right (C.W) to turning bed.
8. Adjust left/right end to suspend adjustment handle to ideal suspension timing.
9. Press grinding wheel speed retreat button ⑭. Working shaft stops, coolant not supplying. Grinding wheel return to 50 mm after a short while.
   (Change to “Press grinding wheel speed retreat button ⑭”, and hand wheel back, then Working shaft stops, coolant not supplying)
   (改：按下砂輪快速退回鈕⑭，工作軸和冷却液皆不停止，以手輪左轉退刀後，才停止。)

10. Grinding wheel infeed handle （ ） is locked when⑮ is set at manual, ⑯at manual（◯）, ⑱at handwheel（◯）. All the movements make all the operation buttons and handwheels set at automatic. Grinding wheel move fast, wheel shaft turn on, coolant infeed to grinding wheel before turning wheel① operates. In contrast, turn handwheel ① to retreat grinding wheel. Grinding wheel return to 50mm immediately. Working shaft stops, coolant not supplying.

6 – 4 Internal Grinder (Special Part)

When using internal grinder, take down the parts and fix them. Set the internal grinding condition. Grinding wheel infeed and worktable traverse sequences are the same as external grinding.

6 – 4 – 1 Installation Sequence of Internal Grinder Parts

1. Pull out the pin found at the bracket of internal grinding spindle.
2. Turn the bracket of turning spindle downwards.
3. Utilize the fixing chunk installed at the front of grinding wheel table and install it at the motor spindle inside the bracket. The micro switch has to contact to fixing chunk as to operate motor.
4. Install safety belt between motor pulley and the internal grinder spindle pulley.
5. Adjust motor stand to make the belt tension suitable for operation. Tighten motor stand.

6 – 4 – 2 Chuck Installation Procedure

1. Fix 3-jaw fixing plate.
2. Fix transmission stick.
3. Fix 3-jaw chuck.
4. Pull the dowel pin at the back of main shaft box as to make the main shaft operate.

6 – 4 – 3 Internal Grinder

1. Use fixing screw to fix the water pipe at the back lid of main shaft.
2. Pass copper pipe through the spindle center hole of spindle table to the front.

6 – 4 – 4 Operation Sequence of Internal Grinder

1. Switch on power indicator ⑳. Light is on.
2. Press grinding wheel operation button ⑲ to operate internal grinder.
3. Press hydraulic operation button㉑. Selection stick ⑤ to the right, worktable stops moving. Selection stick⑤ to the left, worktable move left and right.

4. Set the selector switch ⑩ to operate spindle (clockwise).
5. Set cutting oil selector⑱, manual or automatic.
6. Press grinding wheel speed infeed button ⑮ to operate grinding wheel.

Attention: (1) When using internal grinder, press grinding wheel speed infeed button⑮. Grinding wheel infeed reaches 50mm and internal grinder started to operate. Make sure grinding wheel shaft and relevant parts keep safety distance of 51 mm before the button is pressed.

(2) For grinding wheel speed retreat function, when internal grinder is not operating, limitation switch will turn off when it contacts with fixing chunk and speed retreat function is carried out.

(3) Before grinding wheel speed infeed button is pressed, do not insert internal grinding wheel into the center hole of workpiece.

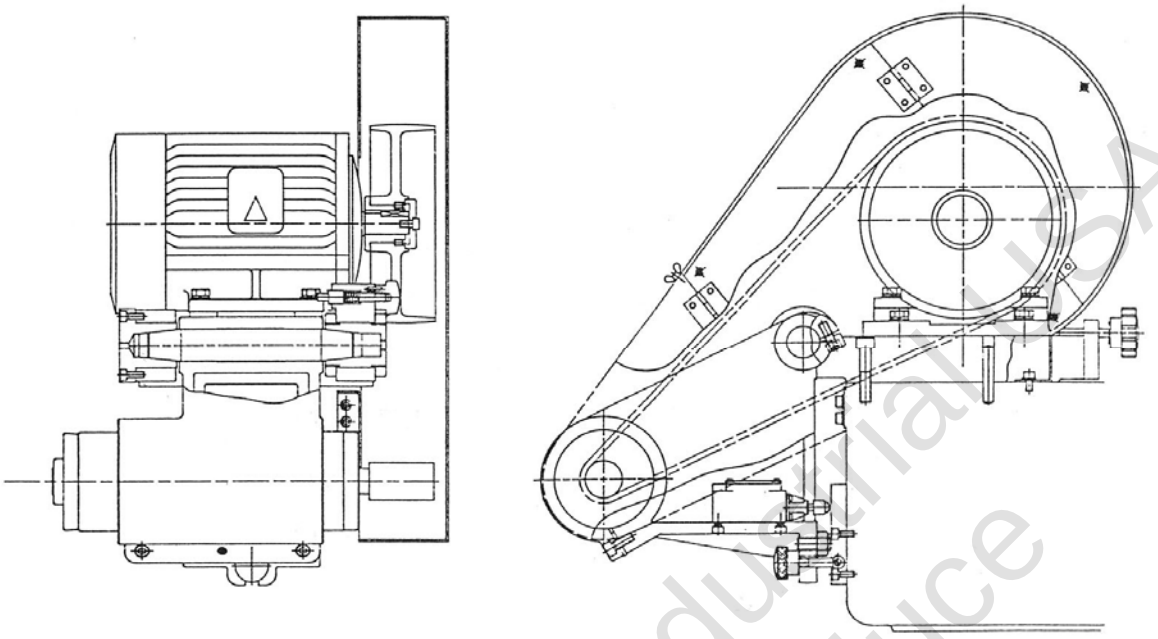


Diagram 6-3

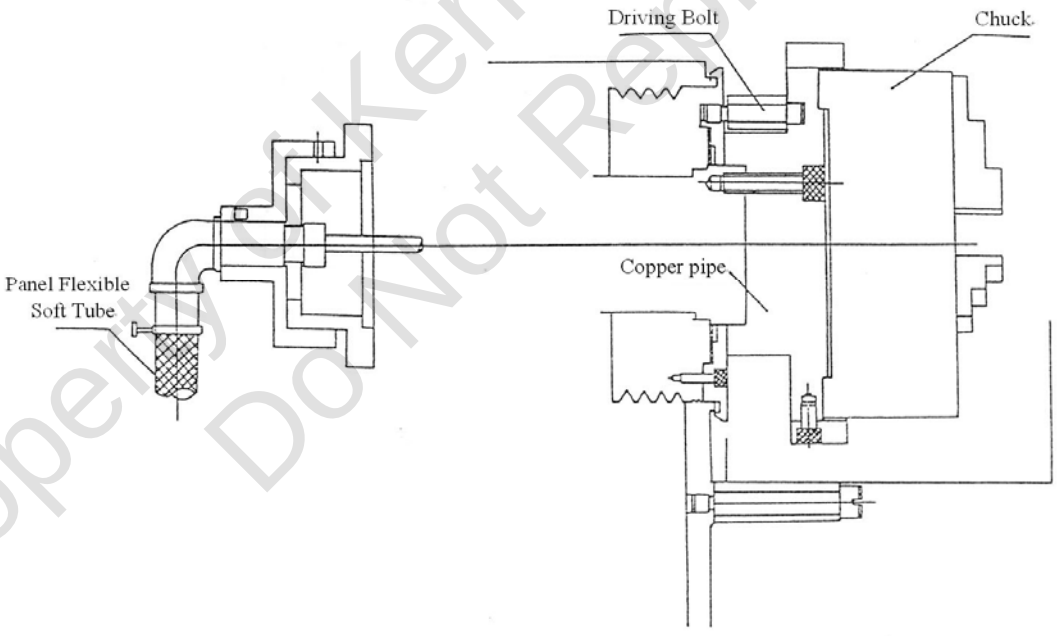
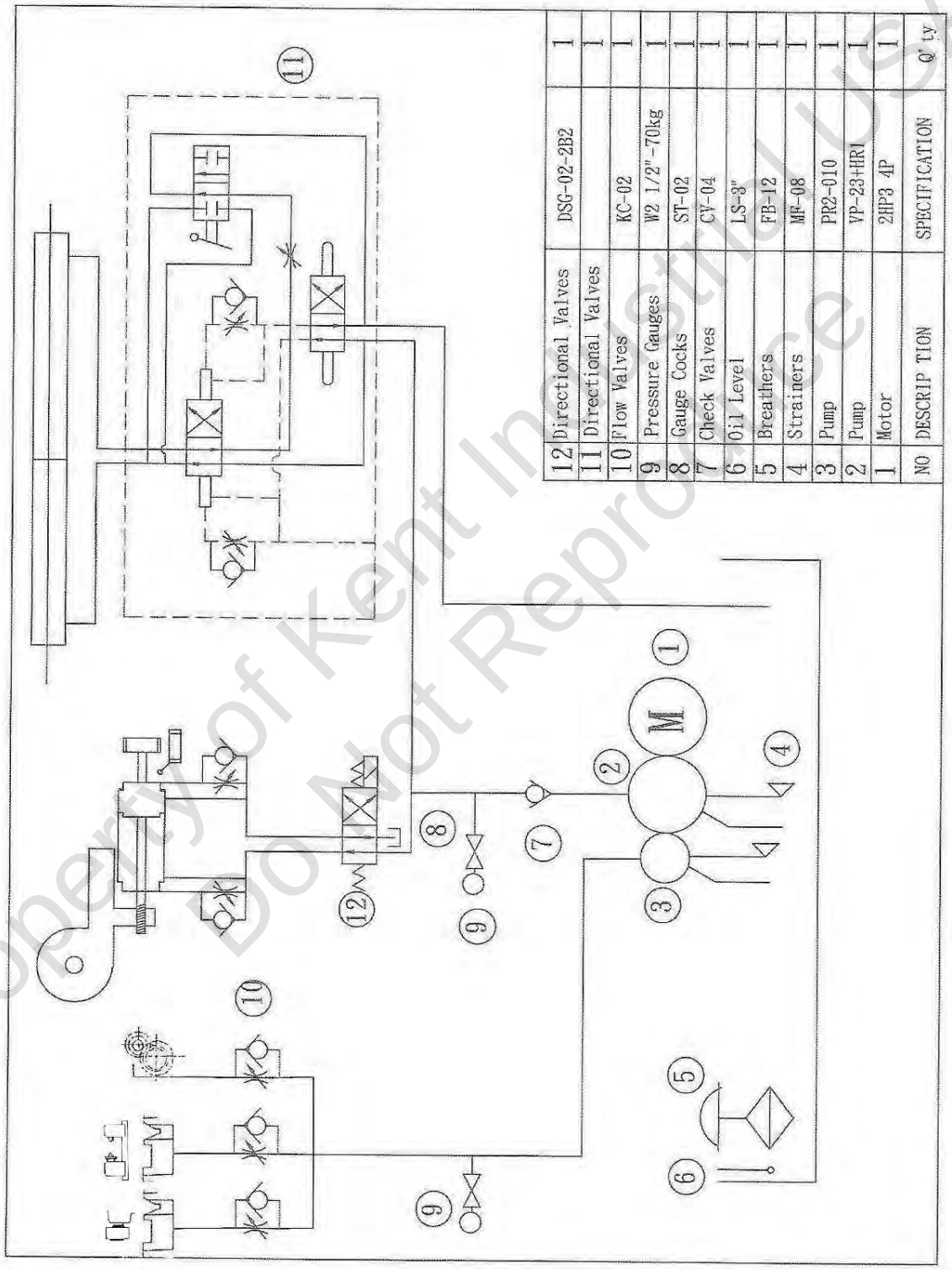


Diagram 6-4



NO	DESCRIP TION	SPECIFICATION	Q'ty
12	Directional Valves	DSG-02-2B2	1
11	Directional Valves		1
10	Flow Valves	KC-02	1
9	Pressure Gauges	W2 1/2"-70kg	1
8	Gauge Cocks	ST-02	1
7	Check Valves	CV-04	1
6	Oil Level	LS-3"	1
5	Breathers	FB-12	1
4	Strainers	MF-08	1
3	Pump	PR2-010	1
2	Pump	VP-23+HR1	1
1	Motor	2HP3 4P	1

7. Troubleshooting

Abnormal Condition	Possible Reason	Action
1. Indicator is not lightened when Power is on.	1. Short of power 2. Breaker (NFB) cut off 3. NFB malfunction 4. Power indicator not lightened 5. Transformer burnt	1. Check operating power 2. Reset NFB to ON 3. Fix power indicator 4. Change new NFB 5. Change new transformer
2. Pump is not operating when pump operation button is pressed.	1. Bad button contact 2. Bad wire contact 3. Relay too hot and cut off 4. Bad contact of MS3 E-shape inverted magnet 5. MS3 platinum contact surface worn 6. Motor is burnt 7. MS3 Coil is burnt	1. Repair or replace 2. Fix the wire 3. Press reset button 4. Clear the contact surface of E-shape inverted magnet 5. Replace 6. Repair or replace 7. Replace
3. Grinding wheel motor not operating	1. Relay too hot and cut off 2. Lack of pressure, pressure switch not functioning, filter blocked, micro switch not functioning 3. Hydraulic pump not functioning Bad contact of grinding wheel stop button Bad MS2 contact or MS2 loosen MS2 coil burnt 4. Lubricant is not delivered when pump operates 5. When pressure switch is on, motor not operating Bad MS1 contact or MS1 is loosen Bad MS1 wire contact MS1 coil burnt 6. Motor burnt	1. Press reset button 2. Adjust pressure, clean filter, replace 3. Repair or replace Replace or fix Replace Repair or replace 4. Repair or replace oil pump 5. Repair or replace Repair or replace Repair or replace Repair or replace Repair or replace 6. Repair or replace
4. Spindle table not turning	1. Relay too hot and cut off 2. Wire connecting clip loosen	1. Press reset button 2. Repair

	3. Bad button contact 4. Bad contact of MS4 E-shape inverted magnet 5. MG 4 coil burnt 6. MS4 platinum contact surface worn 7. Motor burnt	3. Repair or replace 4. Clean E-shape inverted magnet contact surface 5. Replace 6. Replace 7. Repair or replace
5. Coolant not flowing	1. Coolant pump not operating 2. Relay too hot and cut off 3. Too little of coolant 4. Pump impeller worn	1. Press reset button Clean E-shape inverted magnet contact surface Repair or replace 2. Supply coolant 3. Turn on coolant switch 4. Replace
6. When pump operates, pressure cannot be adjusted higher Not functioning when grinding wheel manual speed input button is pressed. Not functioning when grinding wheel manual retreat button is pressed.	1. Oil pipe connector loosen 2. Magnetic valve (SOL1) not functioning when hydraulic operates 3. Magnetic valve (SOL1) not stopping	1. Repair to reconnect 2. Refer circuit diagram 3. Refer circuit diagram
7. Worktable not operating when hydraulic is selected for grinding wheel infeed traverse	1. Worktable speed adjustment button is off 2. Speed control valve or direction valve blocked 3. Hydraulic pressure setting too low	1. Adjust worktable speed adjustment button 2. Refer oil circuit diagram 3. Set pressre as 12~13 kg/cm^2
8. Worktable Traverse Collide	1. Adjust speed control valve or left right suspension valve broken 2. Oil quality not good	1. Repair and adjust suspension timing to stop it 2. Replace
9. Pump not supplying oil	1. Oil level of oil tank too low 2. Pump oil insert pipe blocked	1. Fill in designated or similar type of oil into the tank 2. Check filter and oil pipe for blockage

	3. Oil stickiness too high 4. Pump parts broken	3. Check if oil used matches with recommendation from manufacturer 4. Let technician to change parts according to specification
10. Oil pressure low or unstable	1. Oil temperature too low 2. Connecting pipe leaks or blocked 3. Pump turning too slow 4. Pump parts clearance over limitation	1. If system heat up effective 2. Check leakage and blockage or replace 3. Check motor operation and pump 4. Let technician dissemble and repair or replace new pump
11. Pump noise	1. Air caught inside oil input pipe 2. Air caught in the system 3. Pump operation speed too high 4. Pump part stagnant 5. Miscellaneous objects blocked the filter 6. Oil pipe blocked 7. Oil pump part broken 8. Oil stickiness too high 9. Different movement of pump and motor shafts	1. Confirm if oil input pipe is soak in the tank 2. Confirm if the air in system is eliminated. 3. Change motor according to its original speed 4. Check if hydraulic oil is contaminated, if parts are broken 5. Maintain according to scheduled dates 6. Confirm if oil pipe is cleaned 7. Let technician to change parts according to specification 8. Oil changing (please use recommended oil) 9. Reinstall
12. Belt noise	1. Belt loosen 2. Belt broken	1. Adjust motor stand for suitable tightness 2. Change belt
13. Grinding wheel speed infeed and coolant pump operation are not connecting	1. Improper LS1 position	1. Adjust LS1 position (within in
14. Speed positioning on dial scale	1. Grinding wheel worn out too fast 2. In infeed structure, spring that eliminate backlash lost elasticity	1. Change proper grade of grinding wheel 2. Change new spring

	3. Grinding wheel speed moving position not accurate 4. When infeeding, operating screw worn out	3. Clean cylinder and piston 4. Change the worn parts

8. Lubrication System Cleaning

8 – 1 Lubricant Tank Cleaning

Miscellaneous objects mix into lubricant after a period of time and thus block oil flow. Regular cleaning is necessary.

8 – 2 Hydraulic Tank Cleaning

1. Loosen screws at top lid. Lift top lid.
2. Loosen the screws that connect filter to oil pipe.
3. Take down the filter. Clean miscellaneous objects on metal net. Clean metal net. Use compressed air to blow.
4. Leak oil in the tank. Clean the miscellaneous objects at the bottom of tank.

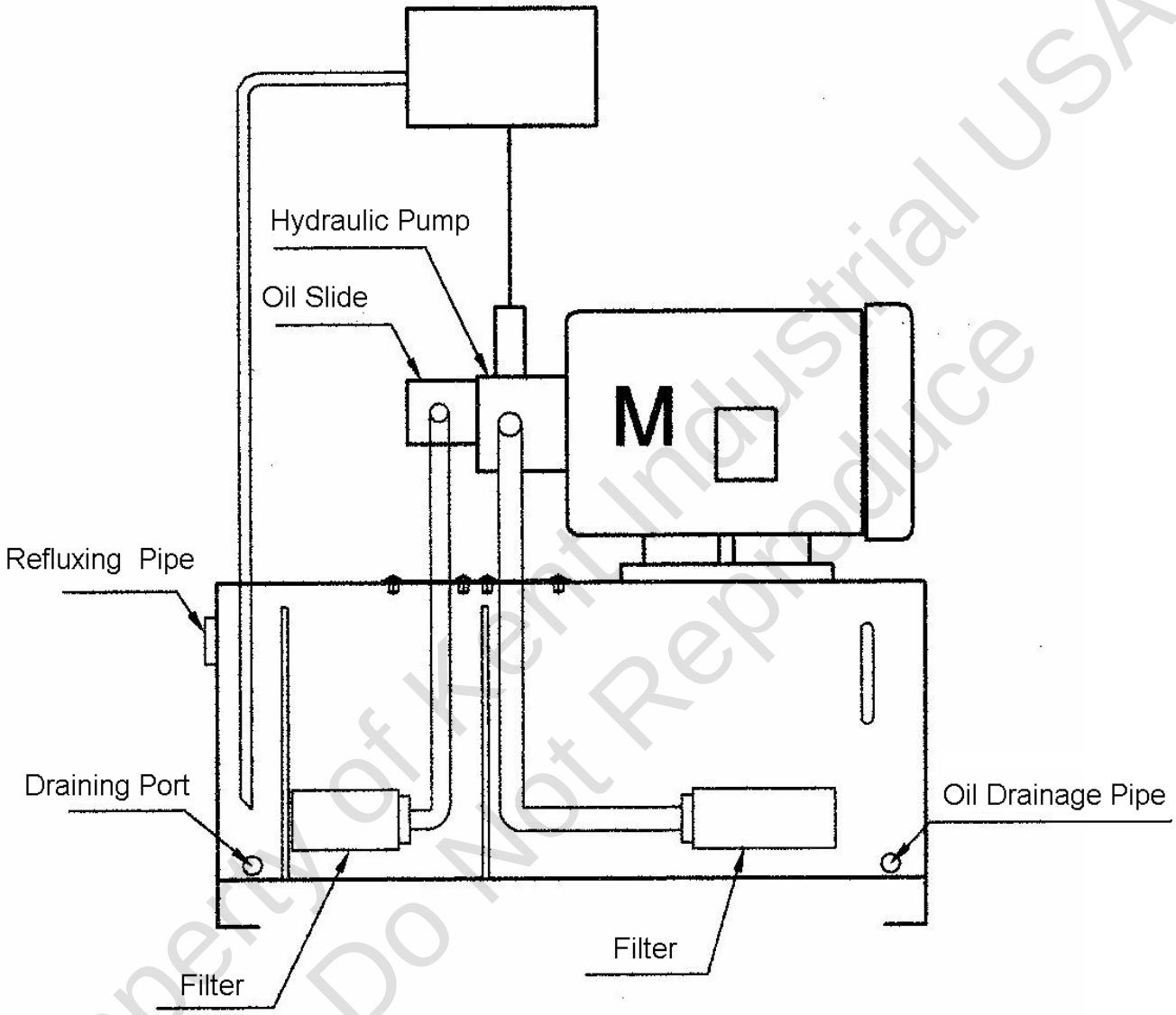


Diagram 8-1

8 – 3 Forced Lubrication Tank Cleaning

1. Loosen the screw of hydraulic tank top lid. Lift the lid.
2. Leak out the oil. Clean the miscellaneous articles at tank bottom.

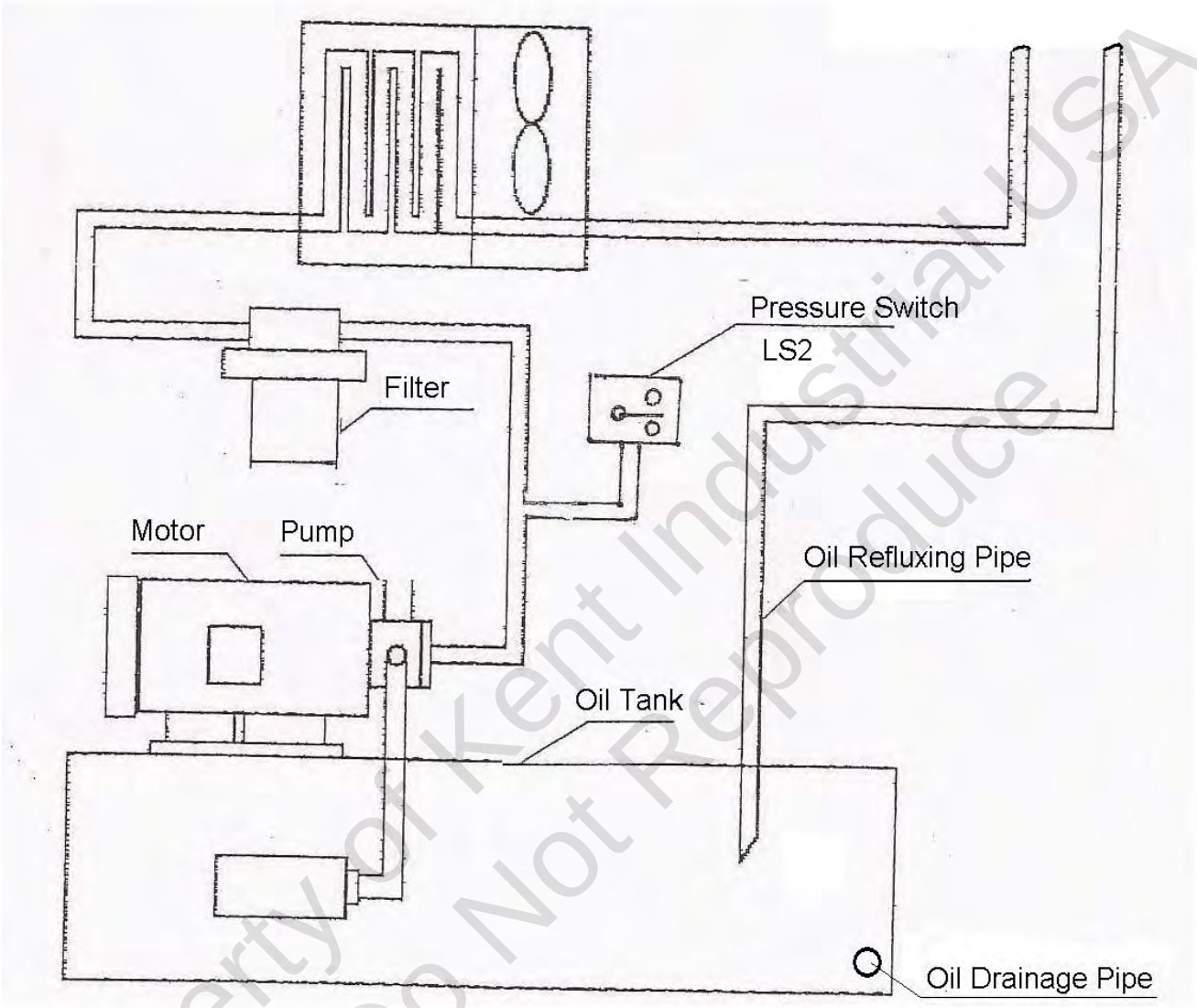


Diagram 8-2

8 – 4 Oil Filter Cleaning

Filter is very important for precision grinding. There are 2 filters installed at this machine. One is the lubrication for worktable chute, the other one is for forced lubrication of grinding wheel table.

Usually the filters are to be cleaned once a year. Cleaning method as below:

1. Loosen the screw.
2. Take down the filter and wash it.
3. Change the filter when needed.

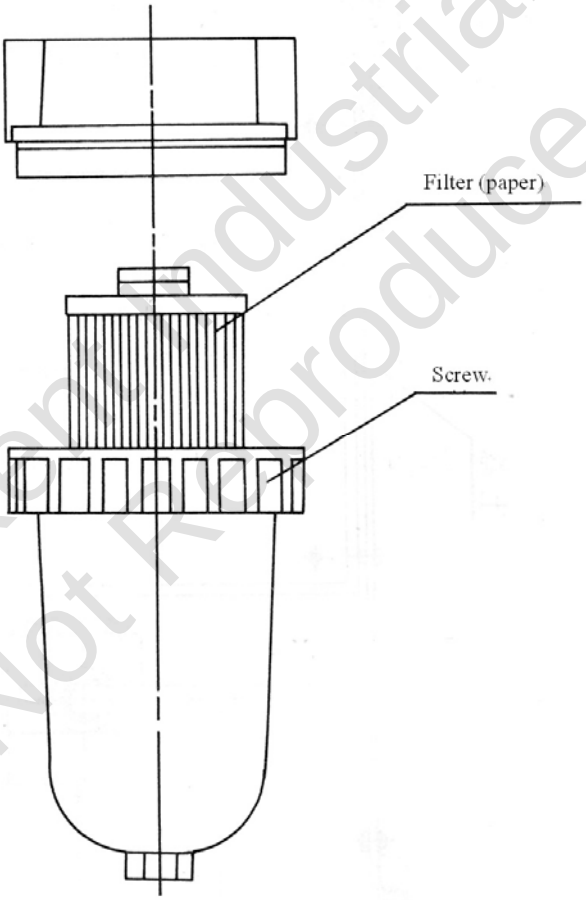


Diagram 8-3

9. Prevention and Maintenance

9 – 1 Inspection Time

Item	Period	Inspection Content
1. Hydraulic oil amount	Everyday	Oil pressure joint lateral amount indicator
2. Forced lubricant amount	Everyday	Grinding wheel shaft oil tank front amount indicator
3. Grinding fluid amount	Everyday	Above 3/5 of radiator
4. Hydraulic pressure	Everyday	Pressure meter inspection (15~25kg/cm^2)
5. Lubricant pressure	Everyday	Inspect hydraulic pressure indicator (1~3kg/cm^2)
6. Waterproof rubber	Everyday	Inspect if waterproof rubber is broken. Replace when needed.
7. Oil and water separator trough	Everyday	Leak water when water exceed half of oil meter by open up the oil stopped at the bottom.
8. Spindle table belt elasticity	Everyday	Daily inspection and adjustment for the first week when new belt is changed. Once every month afterwards.
9. Grinding wheel belt elasticity	Everyday	Daily inspection and adjustment for the first week when new belt is changed. Once every month afterwards.
10. Forced lubrication filter cleaning	Everyday	Clean once every for the first week when new machine is used. Once every month afterwards.
11. Concentrate lubricant filter cleaner	Everyday	Clean once every for the first week when new machine is used. Once every month afterwards.
12. Hydraulic filter	Every Season	Clean once every for the first week when new machine is used. Once every 3-month afterwards.
13. Slide-oil filter		Clean once every for the first week when new machine is used. Once every1~ 3-month afterwards.

Attention: Inspection, adjustment or cleaning of item 8~12 require complete stop of hydraulic motor and others.

9 – 2 Oil Changing Cleaning

Item	Period	Content
Forced Lubrication Tank	Every Year	Change lubricant after 3 months for new machine. Once a year afterwards.
Hydraulic Tank	Every Year	Change oil after 3 months for new machine. Once a year afterwards.
Radiator	About Every Week	Depends on grinding fluid quality and required processing precision.

Attention: Cleaning of the below require complete stop of machine with the power turned OFF.

10. Appendix

Appendix 1: Inspection Suggestion List for Universal Cylindrical Grinder

Manufacturer: Purchase Date:

Model: Machine No.:

Differentiation	Item
Exterior	(1) No rust or scratch on processing table and chuck (2) No rust or scratch on grinding wheel push and pull part (3) If protecting lid safe (4) No rust or scratch on conducting and contacting surfaces (5) If wiper or skimmer is worn (6) If carrier, handwheel, knobw and others bent or loosen (7) If oil glass, grease cup damaged or bent (8) If installation is normal (9) If all the scales and indicators are clear
Electric Parts	(1) If switch lid fully function (2) If grinding fluid or dust goes into switch box (3) If switch connector damaged (4) If specified fuss is installed in control box (5) If ground is installed (6) If insulation at motor and wiring is fine (7) If wiring connection loosen (8) If protecting fuss of wiring is damaged (9) If all the switches function well (10) If all the indicator lights function (11) Subsidiary galvanometer function well (12) If there is abnormal noise or heat at motor (13) If magnetic chunk function well (14) Is illumination installation functioning?
Lubricant, hydraulic	(1) If enough oil is filled in lubricant tank (2) If the quality of lubricant changed (3) If oil provision for lubrication suitable (4) If oil cup and grease cup blocked (5) If enough oil in hydraulic tank

Differentiation	Item
Water Flooding Installation	(1) If grinding wheel fluid operates well (2) If separator and filter in good condition (3) If pipe connector or switch leaks
Worktable Left Right Infeed or Turning	(1) If manual infeed handwheel switch in good condition (2) If manual infeed smooth (3) If infeed and turning switches in good condition (4) If there is abnormal noise and vibration in infeed and turning (5) If changing of interval infeed, turning speed stand in good condition (6) If continual infeed, turning speed adjustment smooth (7) If automatic infeed, automatic turning stops in between (8) If direction changing of infeed direction collides
Grinding Wheel Table Grinding Infeed	(1) If switch of manual infeed handwheel in good condition (2) If manual infeed smooth (3) If backlash of infeed handwheel too big (4) If graduation ring is fixed (5) If on and off of grinding operation in good condition (6) If grinding operation smooth (7) If abnormal noise or vibration during grinding (8) If changing of interval grinding amount functions well (9) If continual grinding speed adjustment is smooth (10) If automatic stop of infeed amount setting device functions well

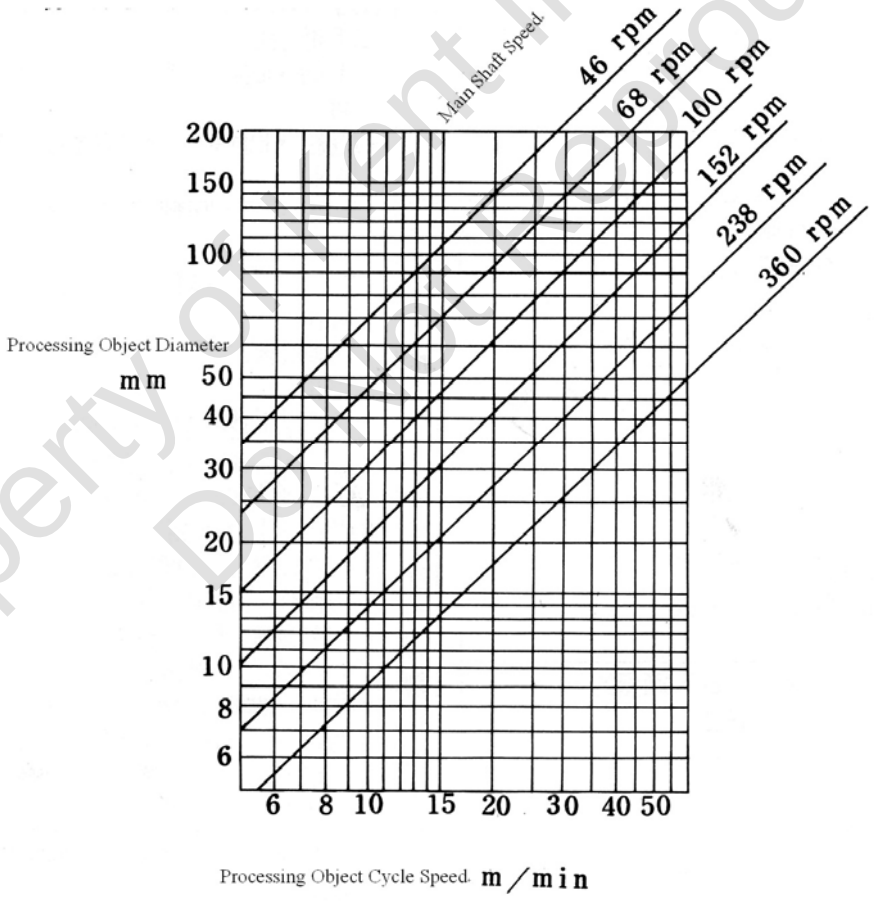
oil and hydraulic installation	(6) If hydraulic oil is changed regularly (7) If oil pressure normal (8) If pressure gauge indicator function well (9) If hydraulic tank leaks (10) If leakage found at pipe connector and switches (11) If the filtration net blocked (12) Is there abnormal noise, vibration, heat of magnetic switch

Grinding Wheel Shaft	(1) If there is abnormal noise or vibration at turning (2) If the temperature of bearing is abnormally high (3) If the handing of belt is suitable
Spindle Table	(1) If there is abnormal noise or vibration during turning (2) If the handing of belt is suitable

Appendix 2: Suggestion Table for Processing Operation Method

Operation Method		Mild Steel	Chilled Steel	Tool Steel	Cast Iron	Copper Alloy	Aluminum Alloy
Cylinder Grinding	- Rough Grinding - Finishing Grinding - Precision Finishing Grinding	10~20 6~15 5~10	15~20 6~16 5~10	15~20 6~16 5~10	10~15 6~15 5~10	25~30 14~20 ---	25~40 18~30 ---
Internal Grinding	Finishing Grinding	20~40	16~50	16~40	20~50	40~60	40~70

Relationship diagram of processing object cycle speed, processing object diameter, and main shaft speed.



Appendix 3: Suitable Grinding Depth

Unit: mm

Grinding Method	Finishing Quality	Mild Steel	Chilled Steel (HRC40 and above)	Tool Steel	Stainless Steel Heat Resistance Steel	Cast Steel
Direct Grinding Finishing Grinding	Finishing Rough Grinding	0.005~0.01 0.02~0.04	0.01~0.02 0.03~0.04	0.05~0.01 0.02~0.03	0.005~0.01 0.02~0.03	0.005~0.01 0.02~0.04
Rough Grinding Traverse Grinding	Finishing Rough Grinding	0.005~0.015 0.015~0.3	0.005~0.01 0.02~0.04	~0.005 0.005~0.01		0.01~0.03
Internal Grinding	Finishing Rough Grinding	0.005~0.01 0.015~0.003	0.005~0.01 0.015~0.03	~0.005 0.005~0.015	~0.005	0.005~0.01 0.015~0.03

Influence of Grinding Wheel Grinding Depth

Small ⟷ Big

Grinding Depth

Small ⟷ Big

Grinding Resistances

Big ⟷ Small

Friction Heat

Fine ⟷ Rough

Finishing Surface

Smooth ⟷ Grinding articles fall off stuffing

Grinding Wheel Surface Condition

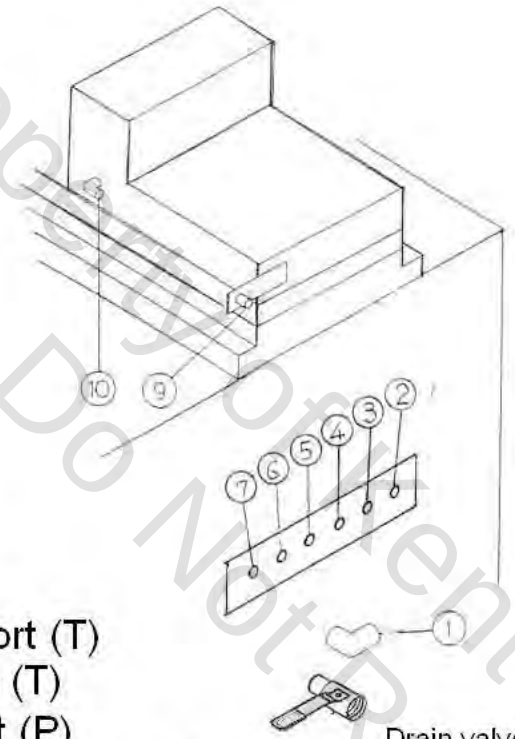
Small ⟷ Big

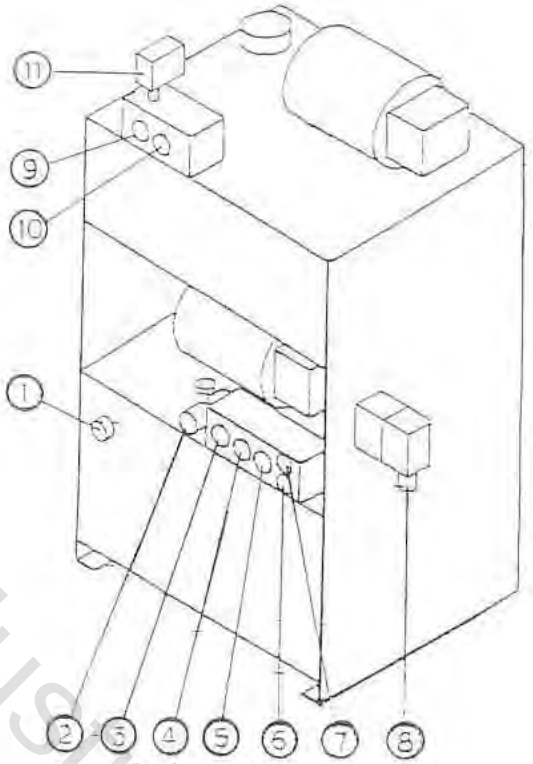
Grinding Wheel Consumption

Appendix 4: Grinding Wheel Option Standard for General Metal Processing

Processing Object		Grinding Method		Cylinder Grinding		Internal Grinding			
		Grinding Wheel Diameter		Below 355	Between355~455	Below 16	Between 16~32	Between 32~50	Between 50~75
		Hardness		Small ⟷ Big			Small ⟷ Big		
	Ordinary Carbon Steel	General structure use roll steel (SS) Mechanical use carbon steel (S-C, S-CK) Structure use carbon steel pipe (STK) Carbon steel forged steel item (SF) Carbon steel cast steel item (SC)	Below HRC22	A 60M	54m	A80M	A60L	A54K	A46K
			HRC25 Aluminum Alloy	WA60L	A54M	WA80L M	WA60K L	WA54J K	WA46J K
			BelowHRC55	WA60L	WA54L	WA80L M	WA60K L	WA54J K	WA46I
			HRC55	WA60L	WA54K	WA60L	WA60K	WA54J	WA46J
			Aluminum Alloy	WA60J	WA54J	WA80K	WA60J	WA54J	WA46J
Steel	Alloy Steel	Nickel Chromium Alloy Steel (SNC) Nickel Chromium Molybdenum Steel (SNCM) Chromium Steel (SCr) Chromium Molybdenum Steel (SCM) Aluminum Chromium Molybdenum Alloy Steel (SACM) High Carbon Chromium Bearing Steel (SUJ) Structure Use Alloy Steel Forged Steel Item (SCA) Tool Use Carbon Steel (SK)	HRC55	WA60K	WA54K	WA80L	WA60K	WA54J	WA46I
			HRC55	WA60K	WA54K	WA80L	WA60K	WA54J	WA46I
	Tool	High Speed Steel (SKH)	BelowHRC60	WA60J	WA54K	WA60L	WA60K	WA54J	WA46J

	Steel	Alloy Tool Steel (SKS, SKD, SKD)	HRC60	WA60J	WA54J	WA80K	WA60J	WA54J	WA46J
Cast Iron	Stainless Steel	Stainless Steel 1~4 SUS 1~4) Heat Resistance Steel 1~3 SHE 1~3)		WA60J	WA54J	WA80K	WA60J	WA54J	WA46J
		Stainless Steel 5~16 SUS 5~16) Heat Resistance Steel 4~5 SHE 4~5)			WA46L		C54K C36K		
	Ordinary Cast Iron	Carey Iron 1~5 FC 1~5)		C60J	C54K	C80K	C60J	C54J	C46J
		Malleable Cast Iron	Black Heart Malleable Cast Iron (FCMB) White Heart Malleable Cast Iron (FCMW)	A60M	A54M	WA 80M A	WA60 M A	WA 54 K A	WA 46 K A
Non-Iron Metal	Brass (Bs)			C46J,C36J				C36 I	C46J
	Bronze (BC)			A54L,C36I			A60L A46K		
	Aluminum Alloy A1, A2, A3			C46J,C36J					
	Extra Hard Alloy S, G, D			GC80I,GC60,D1000				D150	
	Permanent Magnetic Use Material (Forged Magnet) MC			WA46JK					





1. Way oil return port
2. Way oil output port
3. Manual handwheel port (T)
4. Direction valve return (T)
5. Direction valve output (P)
6. Rapid tarry of wheel head (A) (Forward)
7. Rapid tarry of wheel head (B) (Retract)
8. Electrical plug (10 P)
9. Spindle oil output port 3/8P
10. Spindle oil return port 3/4P
11. Pressure regulator