KENT USA

KUG Series

OPERATION MANUAL

KUG-NC1

2014/12/16

Contents

1 SAFE PRECAUTION

Do not operate this machine until you read and understand the following safety precautions.

In order to make machine running properly, kindly read this Manual thoroughly before desires to operate machine concerning about machine installation, operation and some maintenance, inspection items etc.

Be sure all “Safety Precautions “and machine warning plate which are very important to operators, make it’s fully understand before operation. For programming refers to Fanuc in detail.

1.1 WARNING ITEMS

In order not to injury human body, owner has to offer complete operation training courses such general, special operation's equipment to be protected, also has to take the responsible for those who work at machine side. Be sure follow up all safety precautions…based upon labor's safety rules issue strictly.

1. Only be trained or qualified engineers who fully understand machines' features, specifications as well as precautions can operate the machine.
2. Not allow human being enter into machine where is working now, also includes the working area, shut off power if wants to.
3. Wear helmet to avoid long hair being rolled into machine.
4. Not allow wear any clothes which are easily loosen also not allow wear gloves, be attention to sleeve being ringed.
5. It's necessary to wear safety shoes and glasses
6. Never operate or maintain machine if not follow up proper instruction and monitoring
7. Stop Spindle completely before replaces or exchanges workpiece, clamping, fixtures.
8. Never uses both flammable and poison coolant.
9. Stop machine immediately and notice Kent USA or Dealers for further if machine supposes to be in unsafe situation.
10. Never disfigure any warning plate around machine to against the laws.

1.2 GENERAL NOTICE ITEMS

It’s very important to avoid any accident being happened under a working condition, so keeping best surroundings will increase the productivity.

1. Wear safety glasses.
2. Wear safety shoes.
3. Wear helmet and working clothes, be attention to ring the sleeve.
4. Never wear gloves to operate machine.
5. Place machine in bright place and keep clean in workpiece stocking plot.
6. Don’t blow any air into “Higher Voltage” district and CNC controller with chips and dusts.
7. Make sure machine foundation with rigid and steady, also keep floor tightened around the operation area.

1.3 MACHINE OPERATION SAFETY

Read this manual thoroughly before operating.

1. As an operator or maintenance people, be sure clean all warning plates and not allow disfiguring or replacing new one.
2. Keep cabinet well closed to prevent any chips, water and oil from permeating into " Higher Voltage " , CNC unit district unless it belongs to maintenance matter.
3. Moving away the limited switch boundary is prohibited.
4. Use proper tools to repair the machine.
5. Press emergency stop button immediately once machine occurs any event.
6. Be careful with following items in daily work :
   (1) Never touch running part like Spindle, Wheel, and Table during the operation.
   (2) Never clean Wheel or Table with hand unless machine had actually stopped.
   (3) Be sure machine has been stopped before adjust coolant nozzle.
   (4) Don't touch the workpiece during the Table movement.。
   (5) Make sure the workpiece is tightened completely when set up the center between Spindle and Tailstock.
   (6) Never force Wheel or Spindle into stopped by any objects.
   (7) Stop machine immediately if any abnormal situation is happened, check out carefully and figure out the trouble shooting before operation.
   (8) In semi-guard, machine has a wider movement, keep objects away the workable area.
7. Power off procedures in daily work：
   (1) Shut off main power.
   (2) Clean the Table.
   (3) Put on cover toward to machine dust-free.

1.4 ELECTRICAL EQUIPMENT AND NC CONTROLLER NOTICE ITEMS

Be attention to following during trouble shooting：

1. Never hard hit NC unit and components.
2. Cable only can be used based upon manual being recommended, cover it if lies on the ground.
3. Only qualified engineers are able to modify the parameters, anyone who tries to modify parameter is necessary confirmed with KENT USA.
4. Not allow exchange any PCB board or any button.
5. Never over voltage in socket by connection others source.
6. Shut off power for changing any Fuse, Component in cabinet.
7. Turn any switch in “Off “position inside cabinet whenever you’re in repairing to avoid any one who switches on the power.
8. Never touch the electrical equipment with wet tools.
9. Use identified Fuse instead of high capacity or copper fuses.
10. Open cabinet shortly in case of any sun light coming.
11. Check the electrical circuit screws periodically especially higher current like NFB, MS, Motor etc., see if any loosen there to avoid mal-function or shorted.

1.5 WARNING PLATES AND LOCATION

All warning plates as below stuck to machine side as 1~6.

Table1-1

1		2	
3		4	
5		6	

2 MACHINE SPECIFICATIONS

2.1 KUG SERIES SPECIFICATIONS

Table 2-1

ITEMS \ MODELS		KUG-2706NC1	KUG-27100NC1	KUG-27150NC1	KUG-3506NC1	KUG-35100NC1	KUG-35150NC1
Wheel head	Grinding wheel size	ψ405 x (25~50) xψ152.4					
	Max peripheral	2000 m/min					
	Wheel speed	60HZ：ψ405 \ 1499 rpm，1600 rpm 50HZ：ψ405 \ 1508 rpm，1603 rpm					
	Total front and rear travel	175 mm			192 mm		
	Speedy feed travel	40mm(Max)					
	Wheel head total feed travel	135 mm			152 mm		
Motor	Grinding wheel motor	3.7KW(5HP) 4P					
	Work head motor	0.4kW(1/2HP) 4P-100H，150H					
	Hydraulic motor	1.5kW(2HP) 4P					
	Compulsory lubrication motor	0.75kW (1/4HP) 4P					
	Coolant motor	0.2kW (1/4HP) 2P					
	Magnetic separator motor	0.03kW (1/25HP) 4P					
	Internal grinding motor	1.5kW (2HP) 2P					
	X Servo motor	1.5KW					
Hydraulic system	Hydraulic tank	60L					
	Compulsory lubrication tank	22L					
	Coolant tank	100L					

2.2 STANDARD EQUIPMENT & OPTIONAL EQUIPMENT

Table 2-2

MODEL	Standard Equipment	Optional Equipment
JHP / JHA	1. Grinding Wheel Flange (5”Or6”)	1. Chuck (3 - Jaw_6”or 9”；4 – Jaw_ 9”)
	2. Grinding Wheel Disassembly Nuts	2. Chuck Flange Plate (3 - Jaw_6”or 9”；4 – Jaw_ 9”)
	3. Grinding wheel Assembly Spanner	3. 3-Poing Center Rest (ϕ 10 - ϕ 100)
	4. Grinding wheel Dresser	4. Paper Filter
	5. Grinding wheel (ϕ 405)	5. Magnetic Separator
	6. 2-Point Center Rest (ϕ 12 ~ ϕ 100)	6. Internal Grinding Attachment
	7. Carbon Tungsten Center	7. Balancing Arbor
	8. Carrier	8. Balancing Base
	9. Hanger	
	10. Level ling Screws And Nuts	
	11. Splash guard	
	12. Tool box	
	13. Angle indicator	
	14. Work Lamp	

3 MACHINE LAYOUT

3.1 TOP VIEW

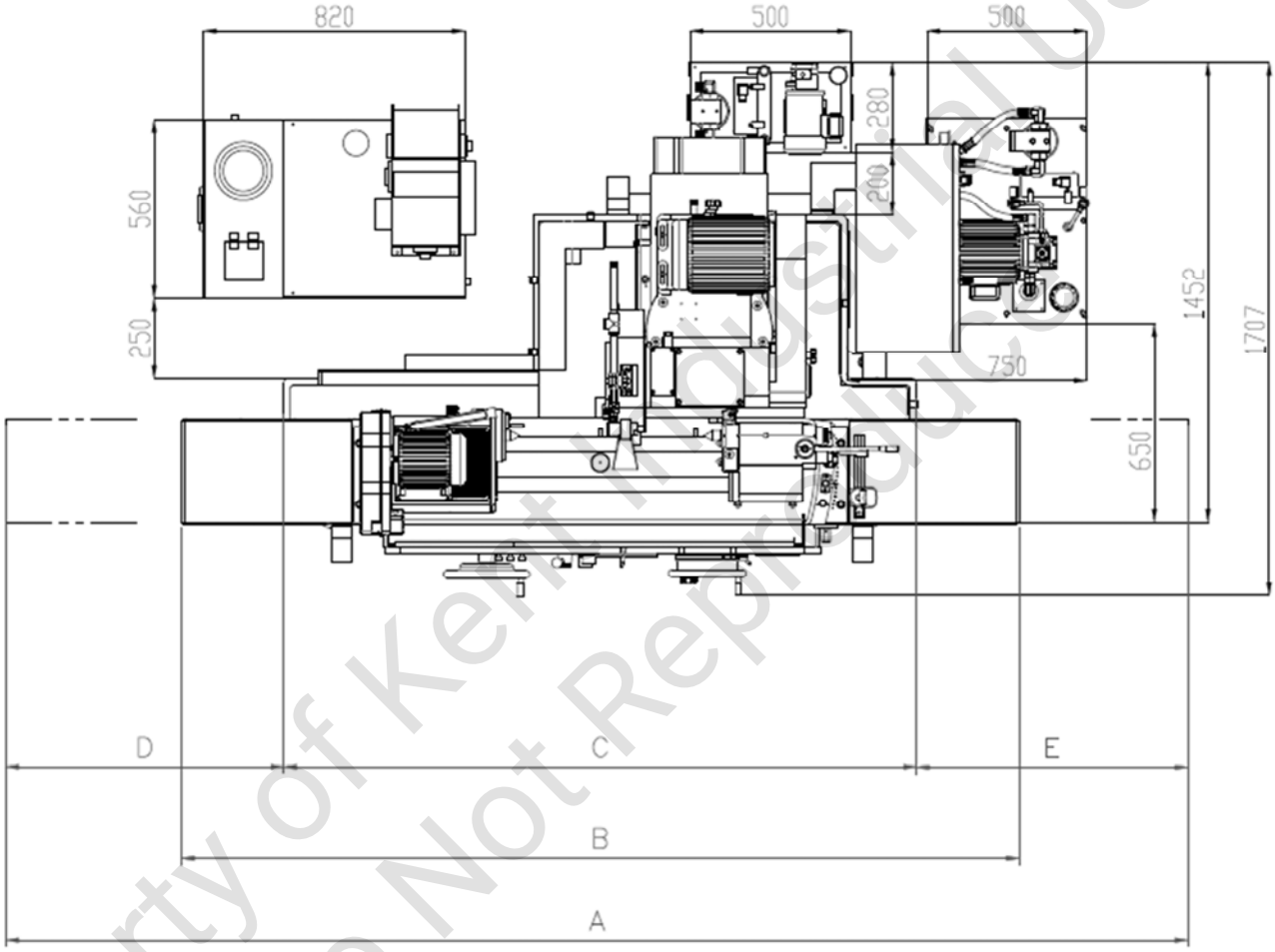


Figure 3-1

Table 3-1

SIZE / Models	A	B	C	D	E
KUG-2706NC1 / KUG-3506NC1	**3340**	**2620**	**1980**	**670**	**690**
KUG-27100NC1 / KUG-35100NC1	**4380**	**3240**	**2820**	**770**	**790**
KUG-27150NC1 / KUG-35150NC1	**6100**	**4470**	**3820**	**1130**	**1150**

3.2 FRONT VIEW

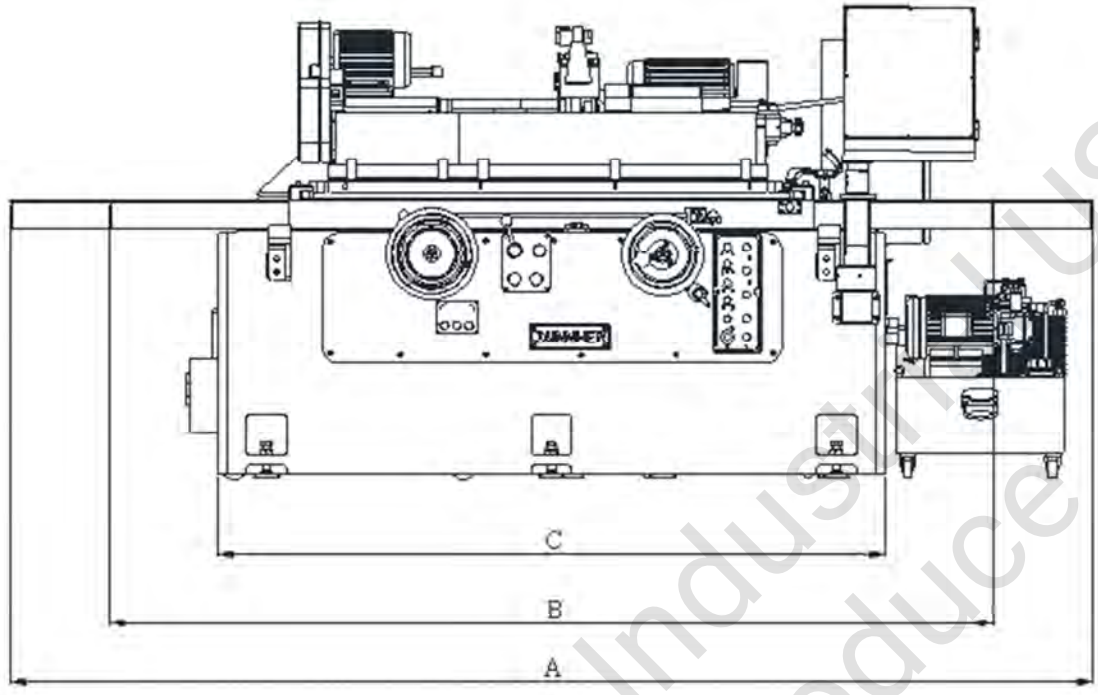


Figure 3-2

3.3 RIGHT VIEW

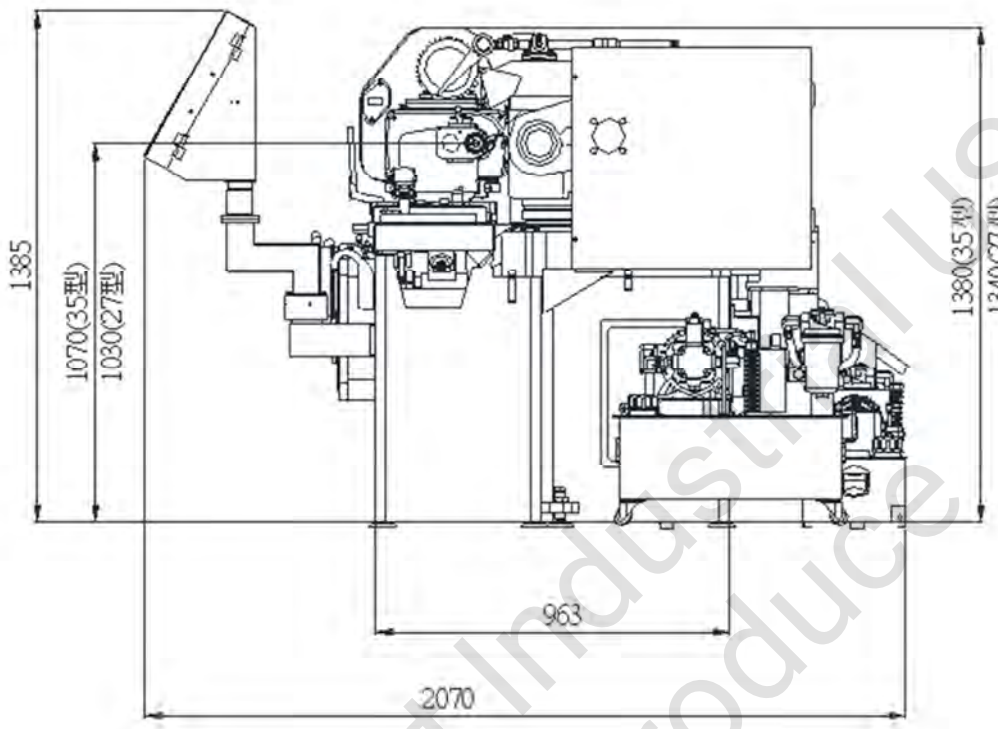


Figure 3-3

3.4 FOUNDATION VIEW

(KUG-2706NC1/KUG-3506NC1)

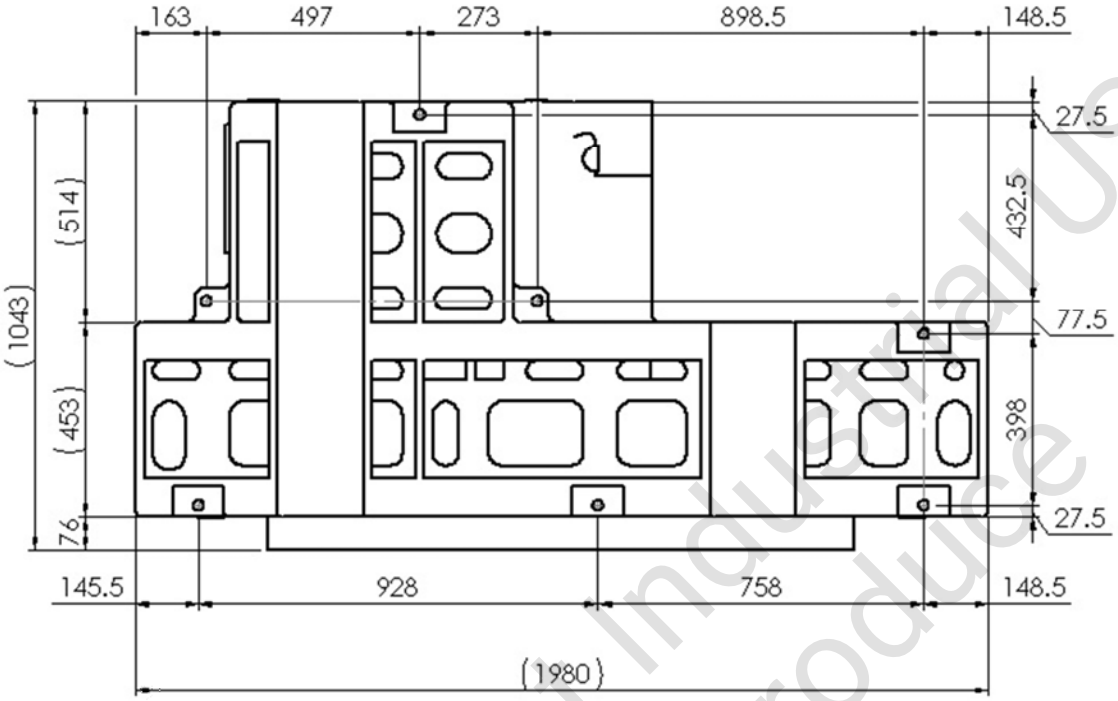


Figure 3-4

(KUG-27100NC1/KUG-35100NC1)

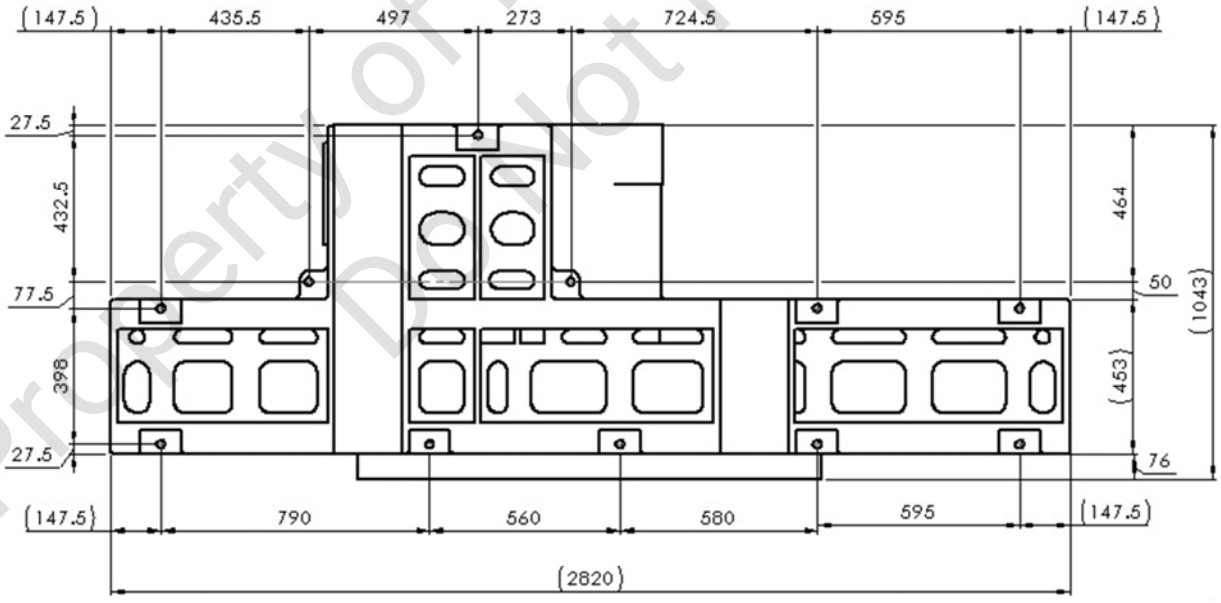


Figure 3-5

(KUG-27150 CN1/KUG-35150 CN1)

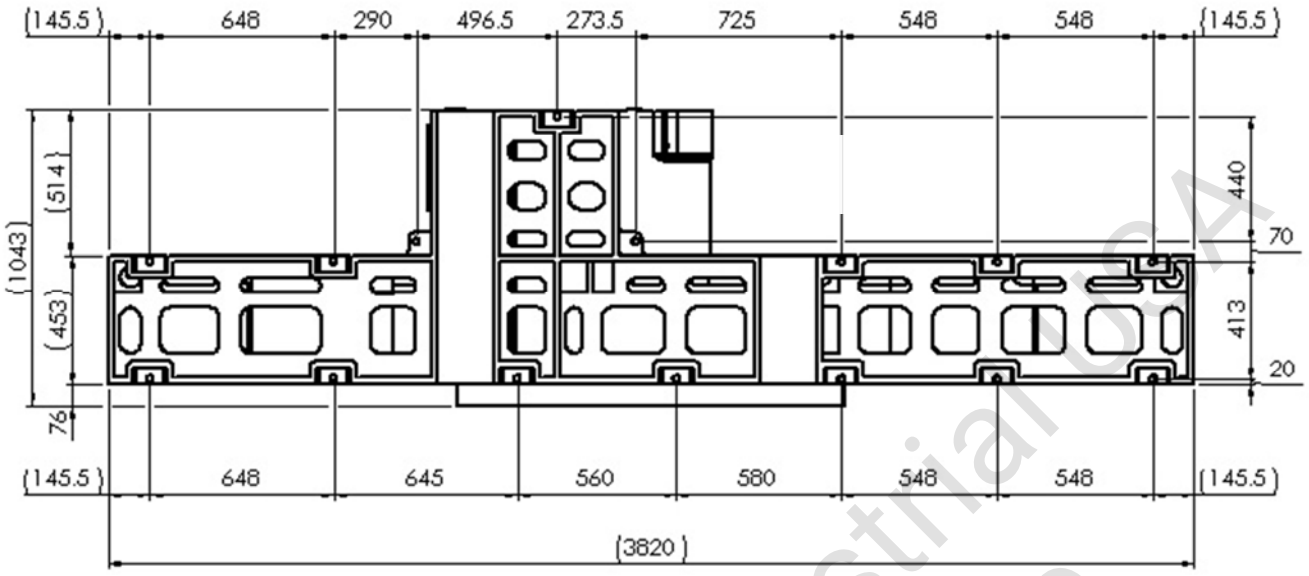


Figure 3-6

4 TRANSPOTATION & INSTALLATION

4.1 TRANSPORTATION

4.1.1 With Forklift

Lift machine by forklift as below shown：

Table 4-1

Models	Kgs
KUG-2706 NC1	3150
KUG-27100 NC1	4100
KUG-27150NC1	5150
KUG-3506 NC1	3350
KUG-35100 NC1	4300
KUG-35150 NC1	5350

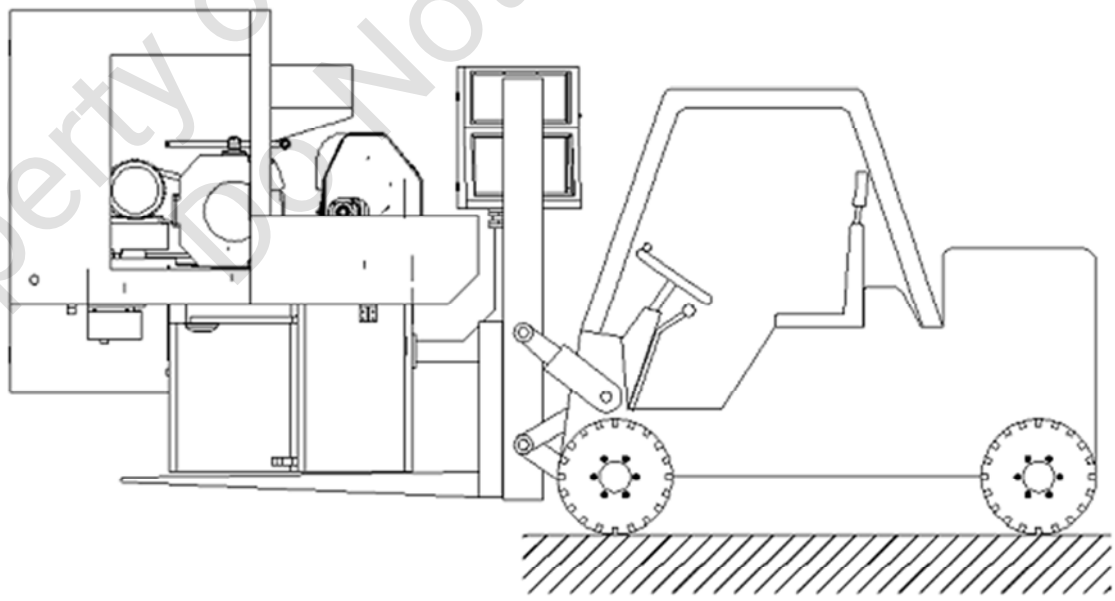


Figure 4-1

4.1.2 Hang up by Crane

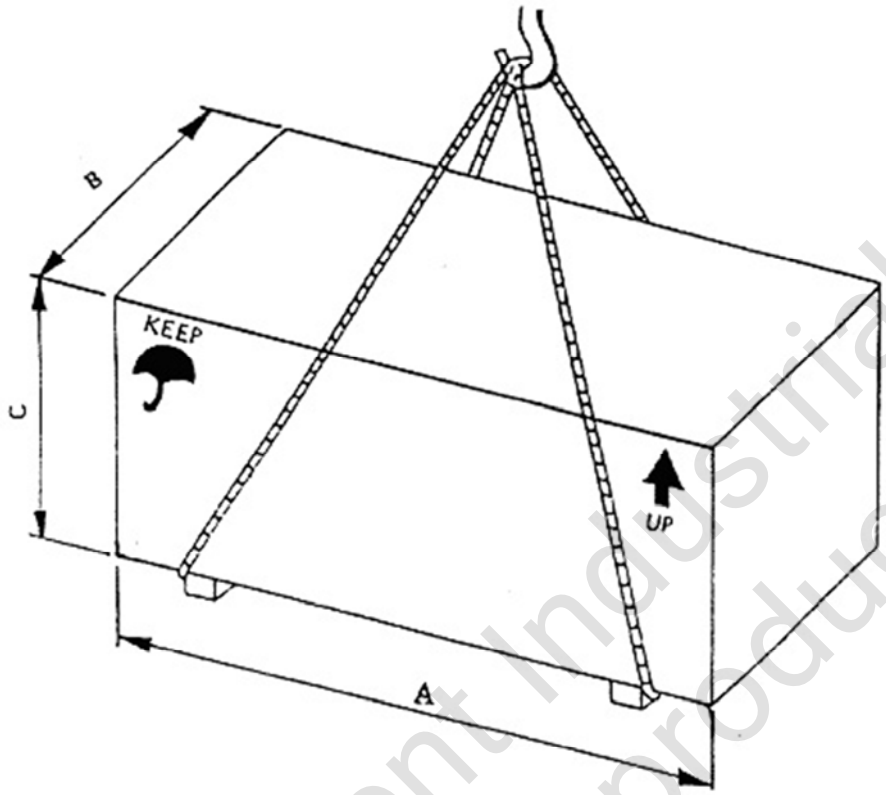


Figure 4-2

Table 4-2

DIMENSION/(AxBxC) MODELS	A	B	C
KUG-2706CNC / KUG-3506CNC	2800	1650	1820
KUG-27100CNC / KUG-35100CNC	3400	1650	1820
KUG-27150CNC / KUG-35150CNC	4670	1650	1820

4.2 INSTALLATION

Make sure the foundation into steady in order to accurate the machine, highly recommended that concretes the foundation before the 10 days to be installed and notice following items：

1. Never place directly the sun light, better place at fixed temp (10℃ ~ 30℃).
2. Keep machine away vibration such air compressor, punch machine etc.
3. With air-conditioner environment would be better for machine body.

4.3 POWER SUPPLY

Table 4-3

Fuse Capacity（A）	50
Cable（mm^2）	8

4.4 FOUNDATION

Select a hard and flat ground to install the machine, KENT USA suggests to pave concretes at least 150mm thickness on surface and keep machine away from vibration source or Punch, Boring machines which cause big vibration. It would be much better to have vibration equipment on foundation which is very important for precise process.

4.5 CLEAN UP

Machine had been smeared into dusty oil already as machine shipment, clean up all dusty oil by soft cotton cloth, gasoline is prohibited strictly.

4.6 LEVEL ADJUSTINGS

Adjust machine's level after 24 hours once machine has placed at work pot, machine is easy to influence by temperature or others fact. In order to keep machine accuracy, adjusting level in every interval will be most recommended.

Keep Level scale within 0.02 mm/1 M and place Level onto Table surface to Easy set up machine's any position, of course, clean up surface of Level.

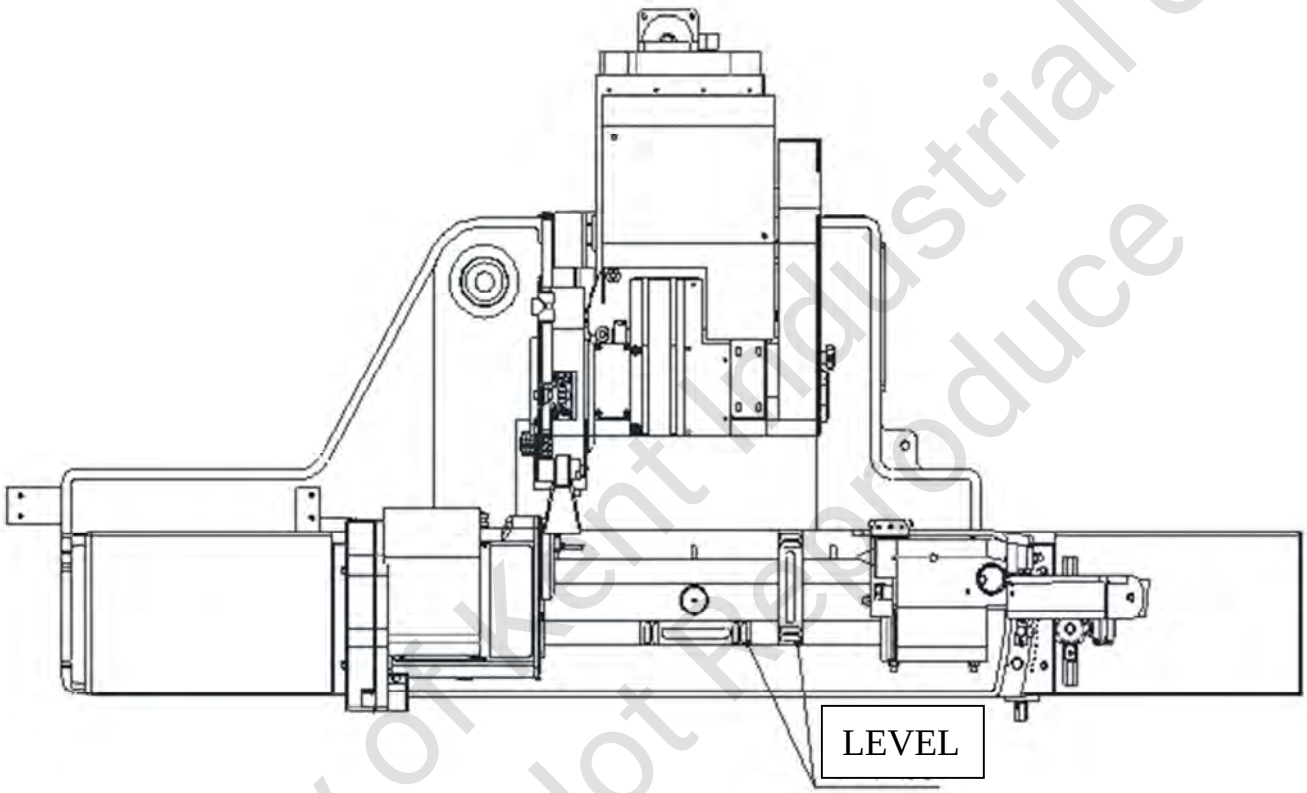


Figure 4-3

5 STRUCTURE AND ADJUSTING

5.1 TABLE

5.1.1 Table

Worktable consists of upper (9) and lower worktable (10) which is joined by center shaft (1). Adjusting bolt (4) and dial gauge (3) are used for micro adjustment of taper grinding.

5.1.2 Upper Table Angle Slight Adjustment

Angle slight adjustment：

1. First lose the tightening screw (2) nut plate both left /right side.
2. Touch the dial gauge (3) manually to make sure the pin in correction position.
3. Swivel the adjusting blot (4) to swivel table to be required position (checking the angle point and scaling plate), move table based upon dial gauge point.
4. Tighten the screw nut(2), try to grind see if fixes the position, retighten above procedures if necessary.

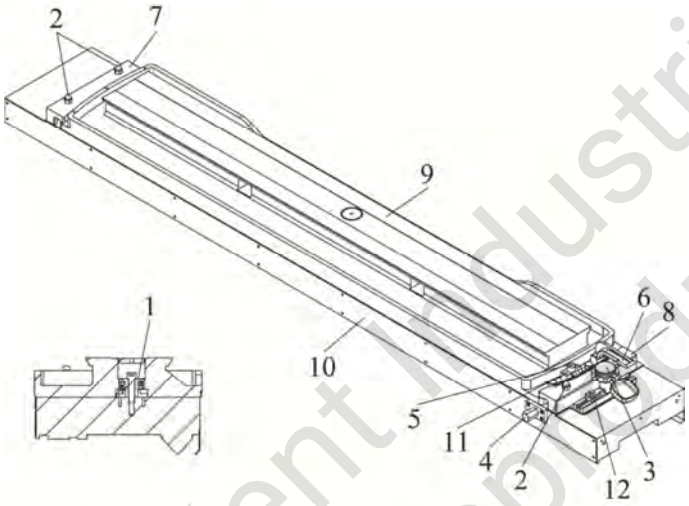


Figure 5-1

Table 5-1

NO.	NAME	NO.	NAME	NO.	NAME
1	Rotating Center shaft	5	Lock pin	9	Upper worktable
2	screw nut	6	Touching seat	10	Lower worktable
3	dial gauge	7	Left side fixed plate	11	Angel indicator
4	adjusting blot	8	Right side fixed plate	12	Fixed nut

Larger Angle Adjustment：

1. First lose tightening nut (2) plate both left/right side and pull the lock pin (5).
2. Unlock the dial gauge (12) screw, moving dial gauge away the position where it is anti-crash.
3. Hit upper Table by hammer moving table to required position.
4. Moving dial gauge (2) to required position and lock the screw nut (1).
5. Release the lock pin (4) and tighten the screw nut (1), reconfirm above procedures if grinding accuracy is not satisfied with the request.

5.1.3 Worktables horizontal transmission mechanism

1. **It is made of manual movement and hydraulic movement：**

Driving gear through the return of spring to join together with the hand wheel, so the operator can control the worktable through hand wheel. When hydraulic operation is set, hydraulic oil pushes driving gear away from hand wheel so the worktable can be driven automatically by hydraulic.

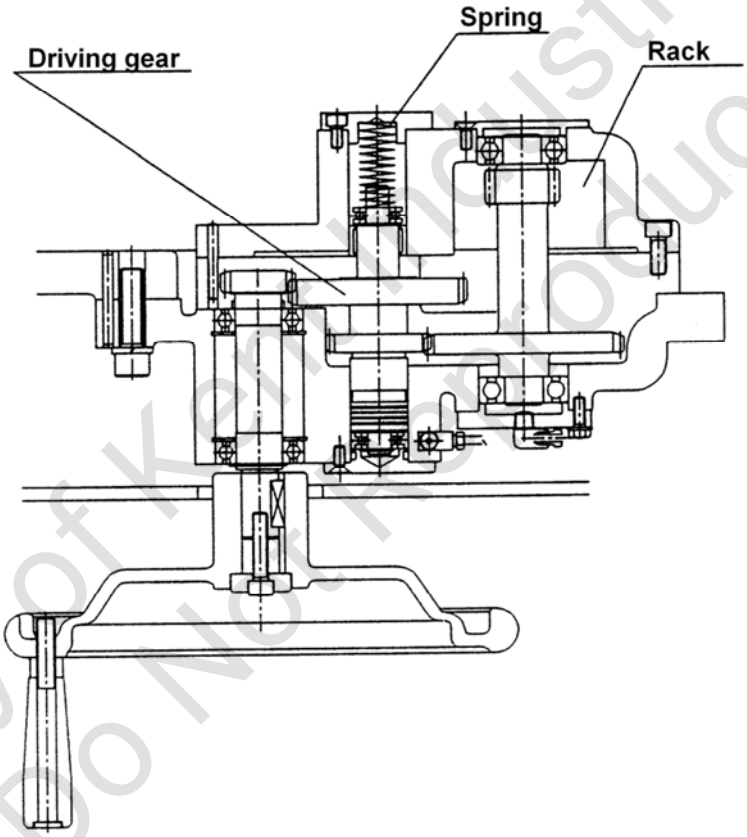


Figure 5-2

2. **Worktable horizontal moving speed can be adjusted freely.**

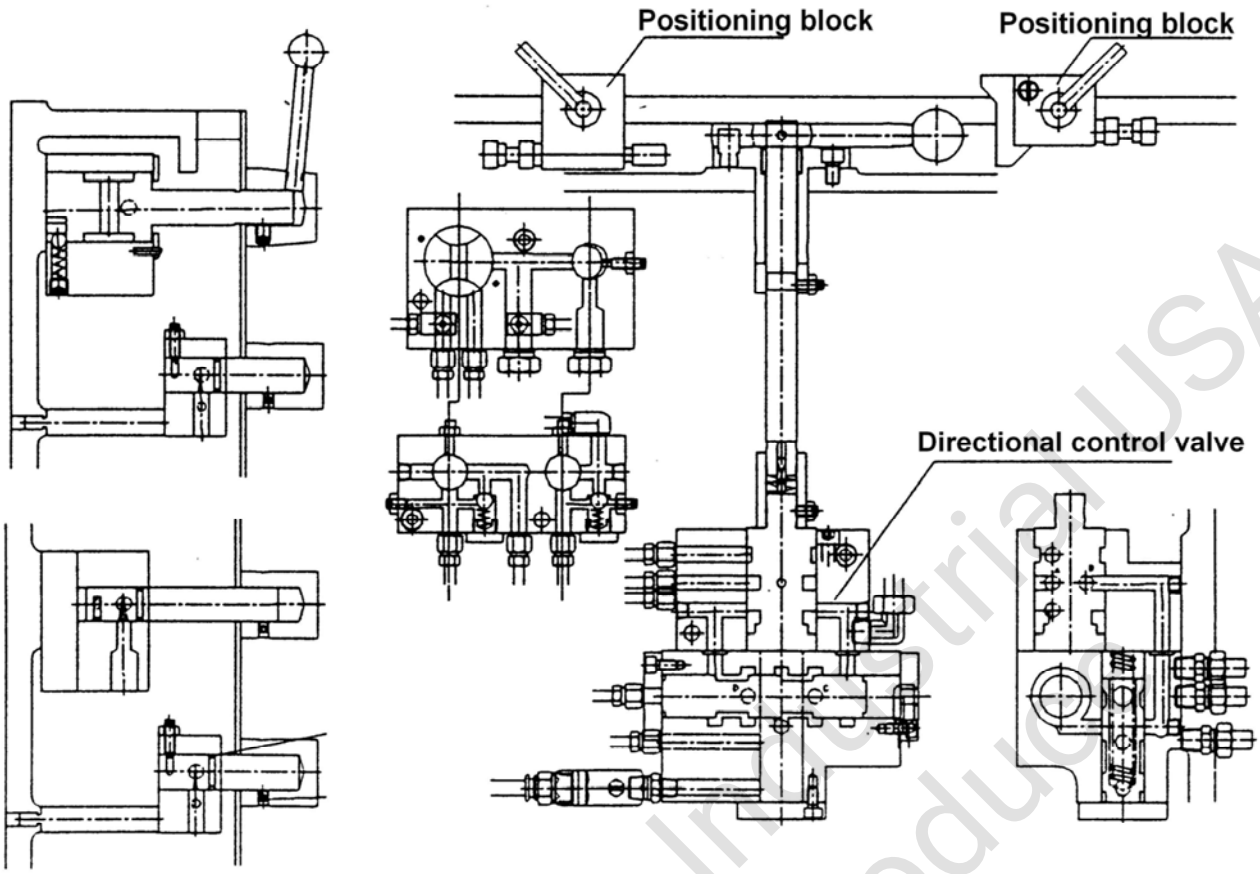


Figure 5-3

5.2 SPINDLE TABLE

5.2.1 Structure of Spindle Table

1. Adopting 0.37Kw x 6P/1130rpm motor associates 6 groove pulley to transmit for 6 steps speed.
2. 2 centers to be selected either fixed center or live center. Cylindrical Grinding applied fix center. Change spindle to be run freely while using 3 jaw chucks.
3. Spindle is supported by high precision beveled roller bearings so heavy work piece and big grinding force is affordable.

5.2.2 Spindle Table Adjusting

1. Spindle Table Moving：Tighten the screw of Spindle table (1), releasing 2 pieces of plates (2) in CCW direction, tighten the screw nut, then it's able to move Spindle Table .Tighten the screw (1) closely, be sure clean off all surface.
2. Spindle Table Swivel：Release the 3 fix Nuts (3) below the Table, swivel the Spindle Table in CCW direction to 0°~90°, tighten it when it reaches the required angle.
3. Fixed Center and Flexible Center Exchange：
4. When apply 3-jaw chuck grinding workpiece, the spindle should be follow rotating, then withdrawing the fixed pin (4), direct driving the 3-jaw chuck by transmission bar, the spindle can be rotating freely

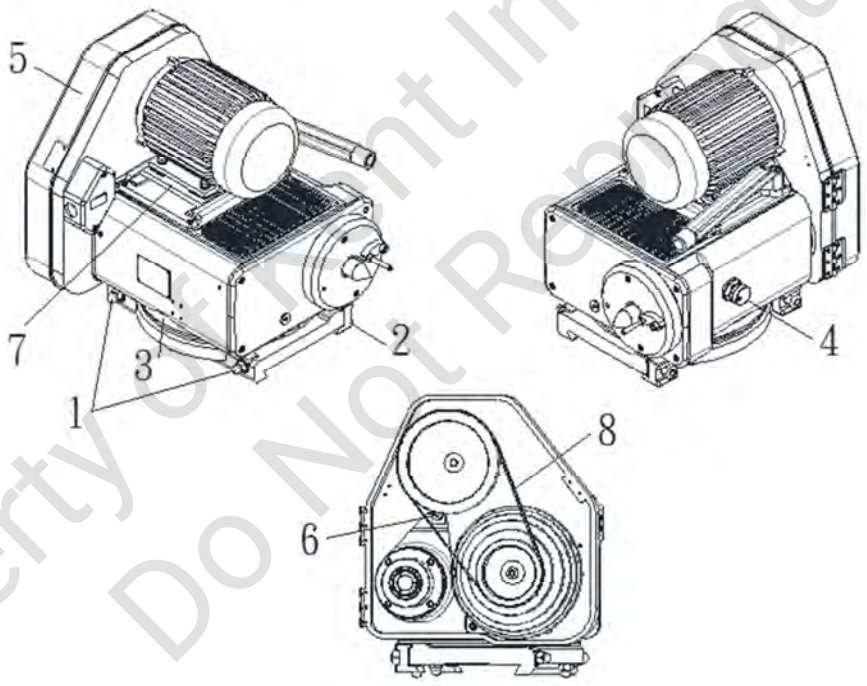


Figure 5-4

Table 5-2

NO.	NAME	NO.	NAME	NO.	NAME
1.	Tighten the screw	4.	Fixed pin	7.	Motor Base
2.	Plate	5.	Pulley protection	8.	Belt
3.	Nut	6.	Fixing screw	9.	

5.2.3 Spindle Belt Adjusting

1. Open the pulley protection cover (5), and release the fixing screw (6).
2. Push the motor base (7) to adjust the belt (8) tension.
3. Belt tension standard：Push belt in the middle about 30 Nm (About 3kgf) force, and push down around 3 mm.
4. Tighten the fixing screw (6) to finish the belt adjustment.

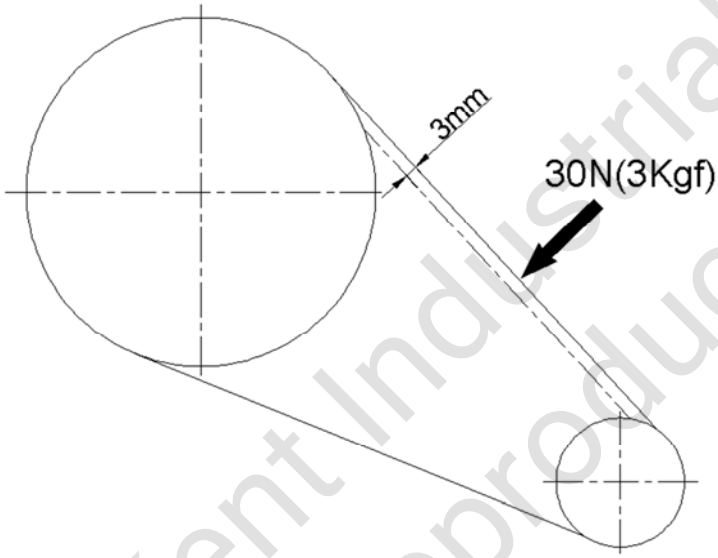


Figure 5-5

5.3 WHEEL HEAD

5.3.1 Structure of Wheel

Wheel has applied the high rigid Alloy steel and has proceed heat treatment besides grinding process, Wheel bearings are used special 5-face supporting Dynamic bearing, Bearings will general a higher pressure film and will follow up the rotation to absorb the vibration wheel operation to achieve the best accuracy.

Hydraulic motor and pump will be enabled at same time when starts the wheel, hydraulic oil enters the filter, meanwhile fan cooler will detect the pressure switch to make sure all oil has been enough to rotate the wheel. Otherwise, Wheel will be held.

Wheel motor will be stopped if the pressure is lower or pipe clogged during the wheel running. In order to protect bearings and wheel, detection switch will prevent the wheel and bearings lifetime from firm insufficiency.

Remark：

1. Wash the filter monthly
2. Not allow wheel running without firm.
3. Replace oil periodically to make sure the wheel and bearings life.

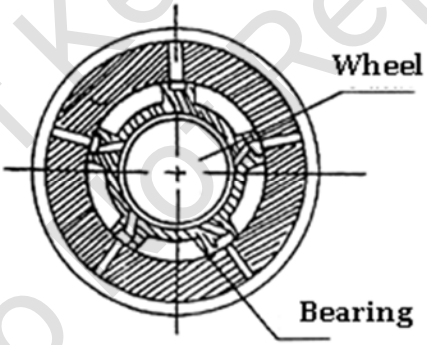


Figure 5-6

5.3.2 Wheel

Select the proper wheel based upon the work piece material, hardness (Refer to appendix A). Wheel is fixed on wheel flange and installed on spindle by screw. Be precaution following before installation：

1. Check if cracks on the wheel. With cracks that are prohibited to be installed.
2. Never hit wheel by hammer while installing.
3. Be sure not to lock nut too tight. Must leave a tiny gap which is able to insert 0.6 mm thickness paper or flexible material.
4. Please keep wheel vertically. Never place wheel horizontally to prevent crash.

5.3.3 Belt Transmission on Wheel

1. Unscrew the fixed blot screws ① on wheel motor seat as below figure.
2. Rotate the motor seat's adjusting bolt②, tension the belt.
3. Belt tension standard value : Push belt in the middle about 35 Nm (About)
4. Tighten the motor seat fixed screw to carry out the adjustment.

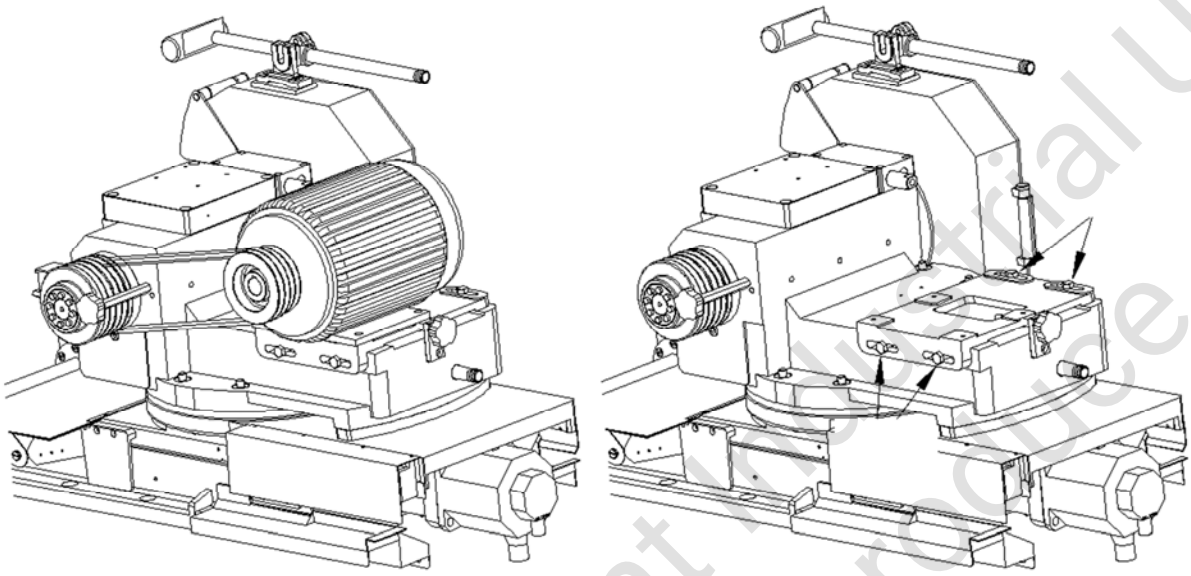


Figure 5-7

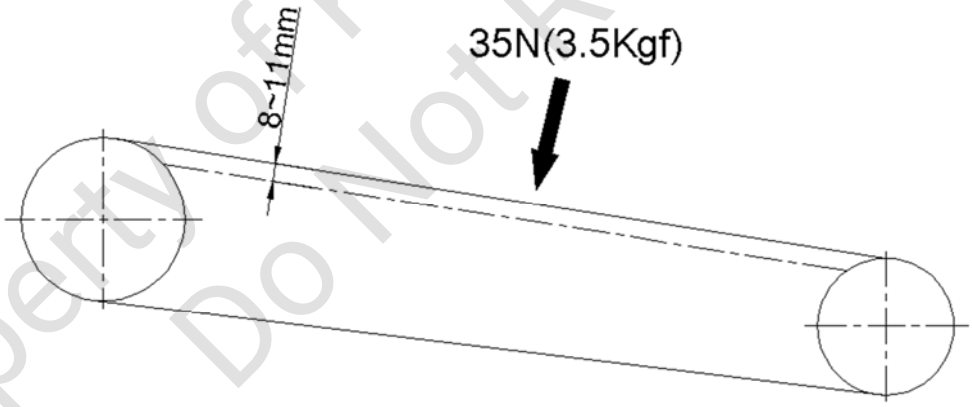


Figure 5-8

5.3.4 Wheel Balance

1. Adjust the wheel balancer seat (Refer to figure 1), make the X/Y bar to be leveled (be prepared the level)
2. Put wheel onto wheel flange and tighten all screws , located into balancer arbor, tighten it by spanner.(Refer to figure 2)
3. Put the balancer onto wheel flange by third in average as figure 3.
4. Put wheel onto bar of balancer seat and keep it stationary.
5. Rotate wheel unit to obverse the balancer position when it stopped, wheel has kept stationary if balancer (1)、(2)、(3) were not lower than the lowest position (figure 4), then finished the alignment. Repeat above procedures if it is not completed.

Caution：

To make sure wheel has been balanced, KENT USA will strongly recommend that after first balancing adjustment and dressing the wheel into circle, then, repeat above steps to adjust balance until get real balance.

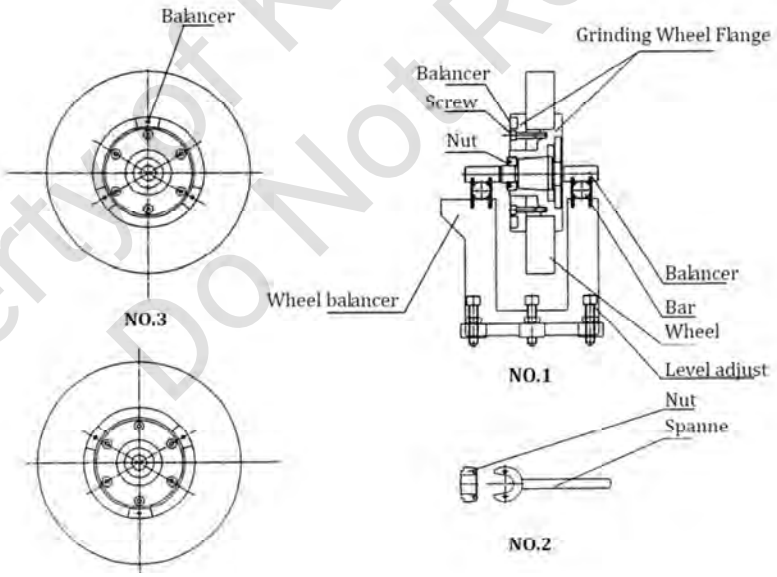


Figure 5-9

5.4 HYDRAULIC TAILSTOCK

Move the tailstock to the right position according the length of workpieces. Always clean the table surface before moving. Center pressure should be adjusted often according to the shapes and dimensions of workpieces. Center pressure can be adjusted by rotating the knob behind the tailstock. Increase pressure by rotating clockwise direction. Excessive pressure will cause bending of workpiece or problems of centers. Less pressure of center can’t hold workpiece.

Centers can be locked at the retracted position to ease the change of heavy workpiece. Be sure to clean the center hole of the workpiece before inserting centers

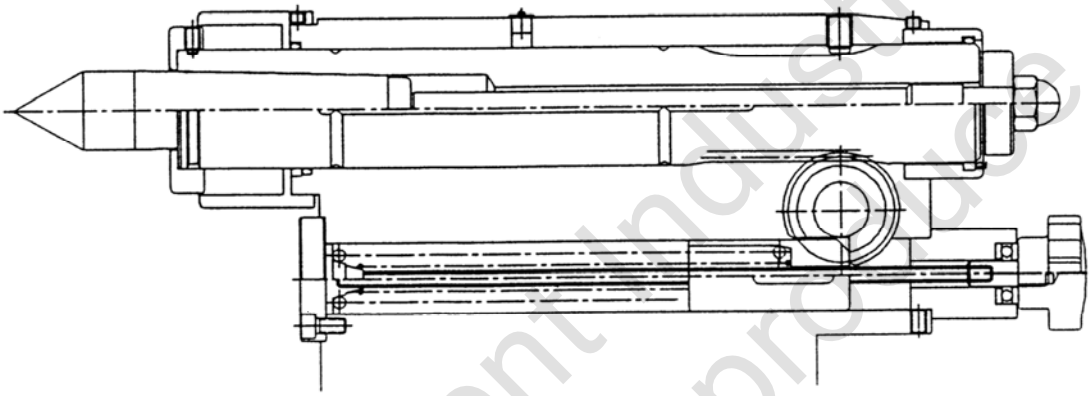


Figure 5-10

6 OPERATION

6.1 OPERATION HANDLE

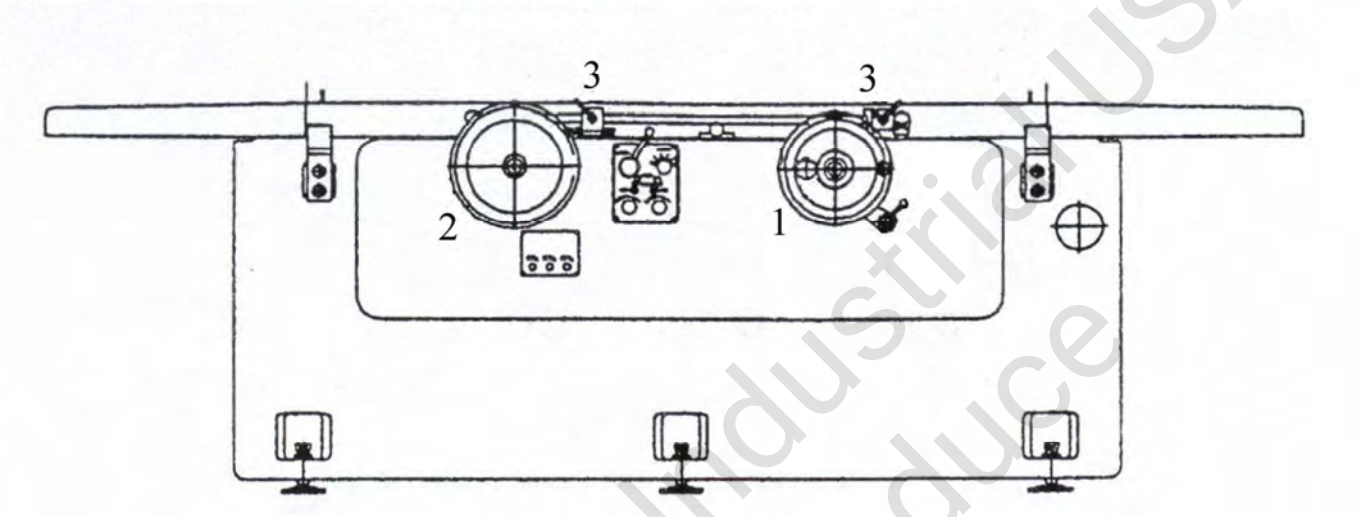


Figure 6-1

(1) FEEDING HANDWHEEL

Adopt panel type MPG (input voltage: DC5V, pause: 100PPR) and coordinate with MPG rate switch on the operation panel to control grinding wheel head advance and retract.

Clock-wise for advance and counterclockwise for retract.

(2) WORKTABLE MANUAL HANDWHEEL

Hand wheel for worktable horizontal movement.

Turn the hand wheel in clockwise direction to move worktable right.

Turn the hand wheel in counterclockwise direction to move worktable left.

(3) WORK TABLE HORIZONTAL STOCK PLATE

Both sides can adjust slightly during worktable move horizontally to the setting point.

6.2 LUBRICATOR FLOW ADJUSTMENT

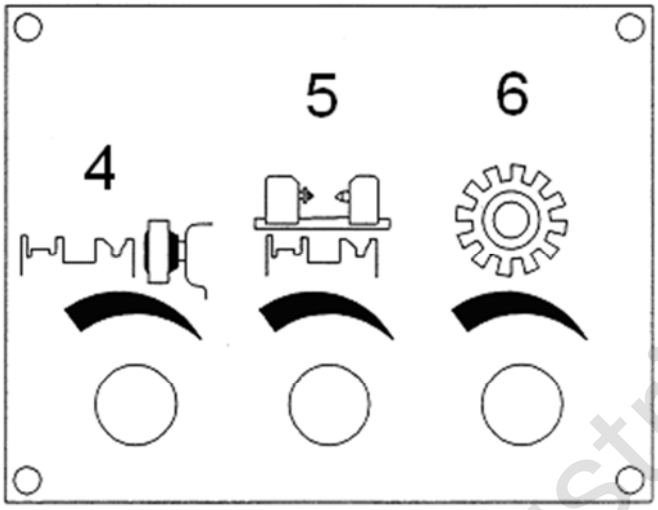


Figure 6-2

(4) GRINDINGWHEELSLIDE LUBRICATION

Turn this knob can adjust the lubricator flowing rate of grinding wheel slide.

(5) WORK TABLE SLIDE LUBRICATION

Turn this knob can adjust the lubricator flowing rate of worktable slide.

(6) GEAR LUBRICATION

Turn this knob can adjust the lubricator flowing rate of gear.

6.3 HYDRAULIC OPERATION PANEL

(7) WORKTABLE HYDRAULIC/MANUAL SELECTION HANDLE

The handle is to choose that worktable is driven by hydraulic or manual.

Turn right for manual drive.

Turn left for hydraulic drive.

(8) WORKTABLE SPEED ADJUSTING KNOB

The speed adjusting knob for worktable moving.

CW rotation is to speed up.

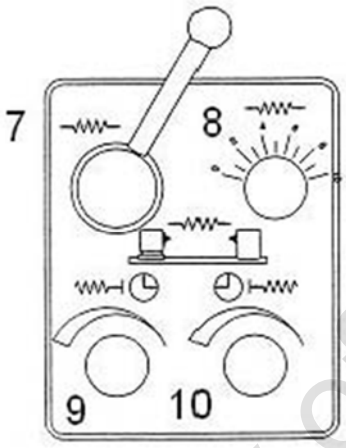
CCW rotation is to slow down.

(9) LEFT TERMINAL PAUSE KNOB

Worktable moves left and make a pause then moves right side.

(10) RIGHT TERMINAL PAUSE KNOB

Workable moves right and make a pause then moves left side.



6.4 ELECTRICAL OPERATION PANEL

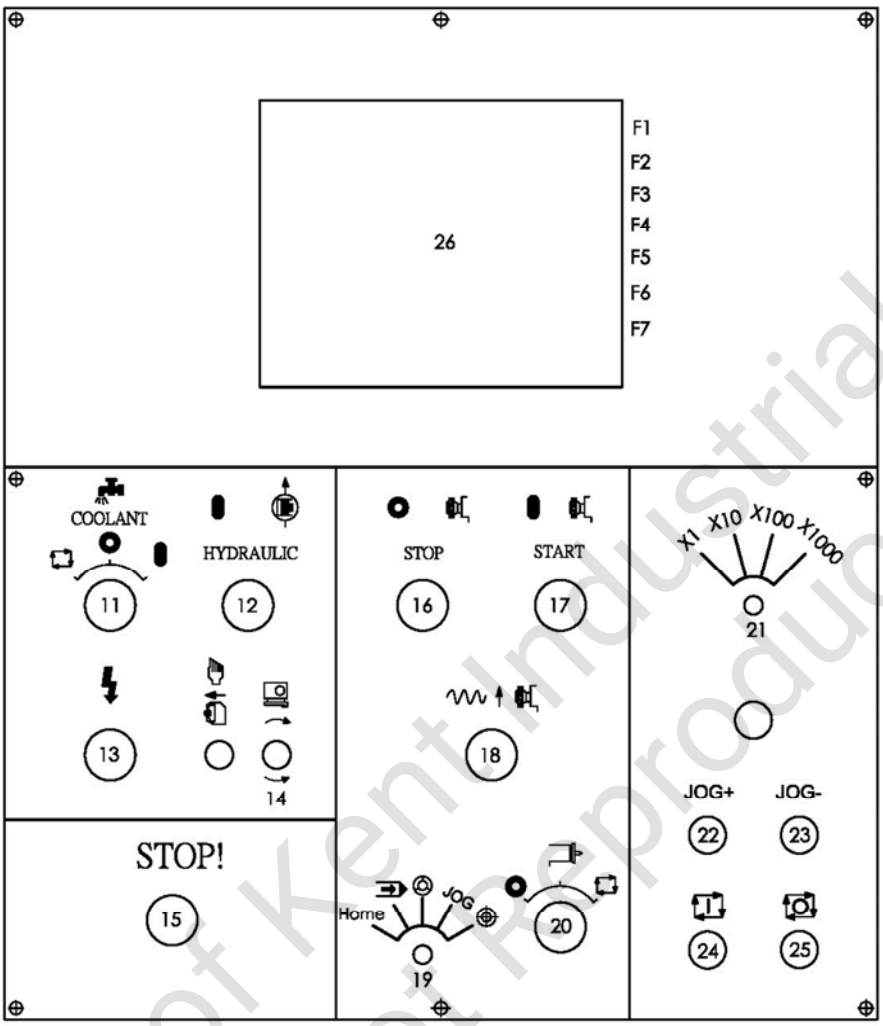


Figure 6-3

(11) Coolant supply mode selection switch

A. Left side-----Automatic.

B. Right side-----Manual.

C. Middle-----Stop.

(12) Hydraulic start button

(13) Power lamp

Pull the emergency stop button, and press this button. Then, the lamp lights to start the Interface.

(14) Work head spindle CW/CCW switch

A. Downward----CCW.

B. Upward-----CW.

(15) Emergency stop button

Press the button to stop running machine when emergency happens

(16) Grinding wheel spindle stop button
Press the button to stop running wheel.
(17) Grinding wheel spindle start button
Press the button to start running wheel.
(18) Grinding wheel quick feed button:
JOG mode and AUTO mode. In AUTO mode, the function is emergent retraction.
In JOG mode, the max. moving distance is 80mm in single way.
(19) Operation mode selection switch (Five Steps):
A. HOME: Mechanical original point return.
B.  ：Automatic cycle mode.
C.  ：Electrical hand wheel feed mode.
D. JOG：Jog feed mode.
E.  ：Grinding start point and end point setting
(20) Spindle head operation mode selection switch
A. Left------Stop.
B. Middle ------Manual.
C. Right -------Automatic.
(21) Electronic hand wheel rate selection switch, four steps：
A. x1: 0.0001mm
B. x10: 0.001mm
C. x100: 0.01mm
D. x1000: 0.1mm
(22) Jog feed (JOG+): Grinding Wheel retracts.
(23) Jog feed (JOG-): Grinding Wheel advances.
(24) Cycle start button (green light)
(25) Cycle stop button(red light)
(26) HMI

6.5 OPERATION PROCEDURE

6.5.1 External Grinding

(1) Set selection handle (7) on right side (Manual transmission.)
(2) Release emergency stop button (15), press the power on button (13), press hydraulic start button (12), adjust hydraulic pressure at 12~13 kg / cm2, and lubrication pressure at 1~1.5 kg/cm2.
(3) Operation mode selection switch turnes to JOG (19), press JOG –(23) to retract wheel away worktable about 40mm. Then, turns the knob (19) to home and press cycle start button (24) to execute zero return.
(4) Press grinding wheel spindle start button (17) to turn on forced-lubrication pump and motor.
(5) Move the worktable to avoid the grinding wheel touching grinding wheel head, tailstock and diamond dresser. Press grinding wheel quick feed button (18) to move wheel advances 40 mm. Turn coolant supply mode selection switch (11) and spindle head operation mode selection switch (20) to stop position and coolant and wheel are stopped.
(6) Adjust worktable angle to zero.
(7) Set the selection handle (7) to left side Hydraulic drive) and slowly rotate worktable speed adjusting knob (8) to appropriate speed.
(8) Adjust left/right terminal pause knob (9, 10) to ideal pause time.
(9) Press grinding wheel quick feed button (18), then, work head spindle and coolant are stopped. After that, grinding wheel retracts 40 mm.

6.5.2 Internal Grinding (Optional Accessories)

While using internal grinding attachment, firstly pull up the fixing rod and then fix the attachment. The setting of internal grinding is the same as external grinding including feeding and worktable stroke.

1. Installation sequence of chuck：

(1) Fix jaw plate of 3-jaw chuck.
(2) Fixed the rotation plate.
(3) Fixed 3-jaw chuck.
(4) Pull up the fixing pin behind work head spindle box to allow the spindle rotating freely.

2. Installation of coolant pipe：

(1) Fix the pipe at the work head spindle rear cover by screw.
(2) Insert the copper pipe to go through the center hole of work head spindle to the front.

3. Internal grinding operation procedure:

(1) Turn on power until power lamp (13) lights.
(2) Press grinding wheel spindle start button (17) to start internal grinding wheel. Press grinding wheel spindle stop button (16) to stop wheel.
(3) Press hydraulic start button (12) and turn worktable hydraulic/manual selection handle (7) to the right side, worktable stop moving. Turn the selection handle (7) to left side, worktable moves horizontally.
(4) Set spindle head CW/CCW selection switch (14) upper, start work head spindle rotates CW.
(5) Set coolant supply mode selection switch (11) as automatic or manual.
(6) Press grinding wheel quick feed button (18) to start internal grinding.

NOTE：

A. During internal grinding, press grinding wheel quick feed button (18) is not working. Do notice the distance to keep safe when turns on the machine power.
B. Grinding wheel quick retract can’t be worked while internal grinding.

6.5.3 PROCESSINGMODE OPERATIONS

STEPS

I. Work-piece grinding method, As shown in Figure 6-4

1.Parameter Setting

(1) **Grinding start point**：Display work-piece grinding start position. Grinding start point = Xmc (mechanical origin position) + Xwc (workpiece position)

(2) **Total compensation**：Display accumulation of grinding wheel dressing compensation amount.

(3) **JOG speed**：The wheel spindle speed rate in manual（JOG）mode.

(4) **INC. JOG feed**：Set the feed and retract amount of the button「Speedy feed and retract」.

2. Left function soft keys：Processing mode selection.

3. Right function soft keys：Settings of grinding parameter, grinding wheel dressing and System test.

4. Horizontal move release：Here press「Compound Feed」to carry out the work to be left and right travel latch-up.

5. Message Display：

(1) **YY-MM-DD**：Display system programmed date.

(2) **hh-mm-ss**：Display system programmed time.

(3) **Mode**：Display operation mode now. (Home、Auto、MPG、JOG、Process point)

(4) **Process**：Display executing parameter.

(5) **PIEC.**：Display ground quantity.

(6) **Time**：Display cumulated processing time.(single workpiece processing time*ground quantity)

(7) **Xmc**：Display X axis 「Machinery Original Position」

(8) **Xwc**：Display X axis 「Process point Position」

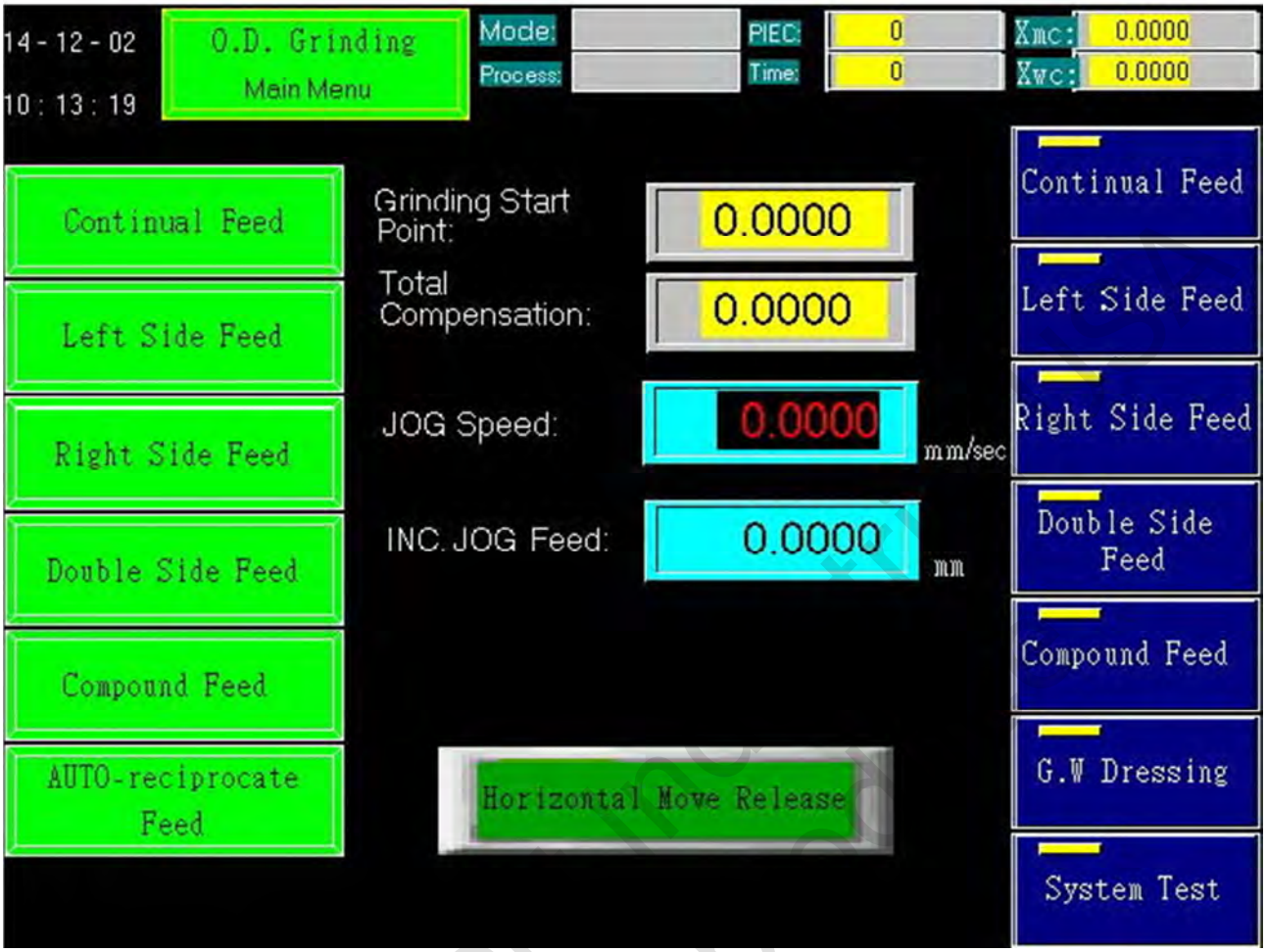


Figure 6-4

II. O.D Grinding Continual Feed parameter setting. As shown in Figure 6-5

The process is to feed continually base on grinding position during grinding range.

1. **Retract point**：Safe point between wheel and work-piece. (Speedy feed point)
2. **Process waiting point**：Buffer point of wheel before contacting to workpiece (slow feed point)
3. **Rough grinding amount**：Removal amount setting of rough grinding
4. **Rough feed rate**：Grinding feed speed rate setting of rough grinding
5. **Rough feed / time**：Feeding amount per time of rough grinding
6. **Rough pause time**：Stop time for each feeding of rough grinding
7. **Precise grinding amount**：Removal amount setting of precise grinding.
8. **Precise feed rate**：Grinding feed speed rate setting of precise grinding
9. **Precise feed / time**：Feeding amount per time of precise grinding
10. **Precise pause time**：Stop time for each feeding of precise grinding

11. Spark out grinding：The stop time when「Precise grinding amount」is reached, and the feeding axis is not proceed. (Unit：sec)

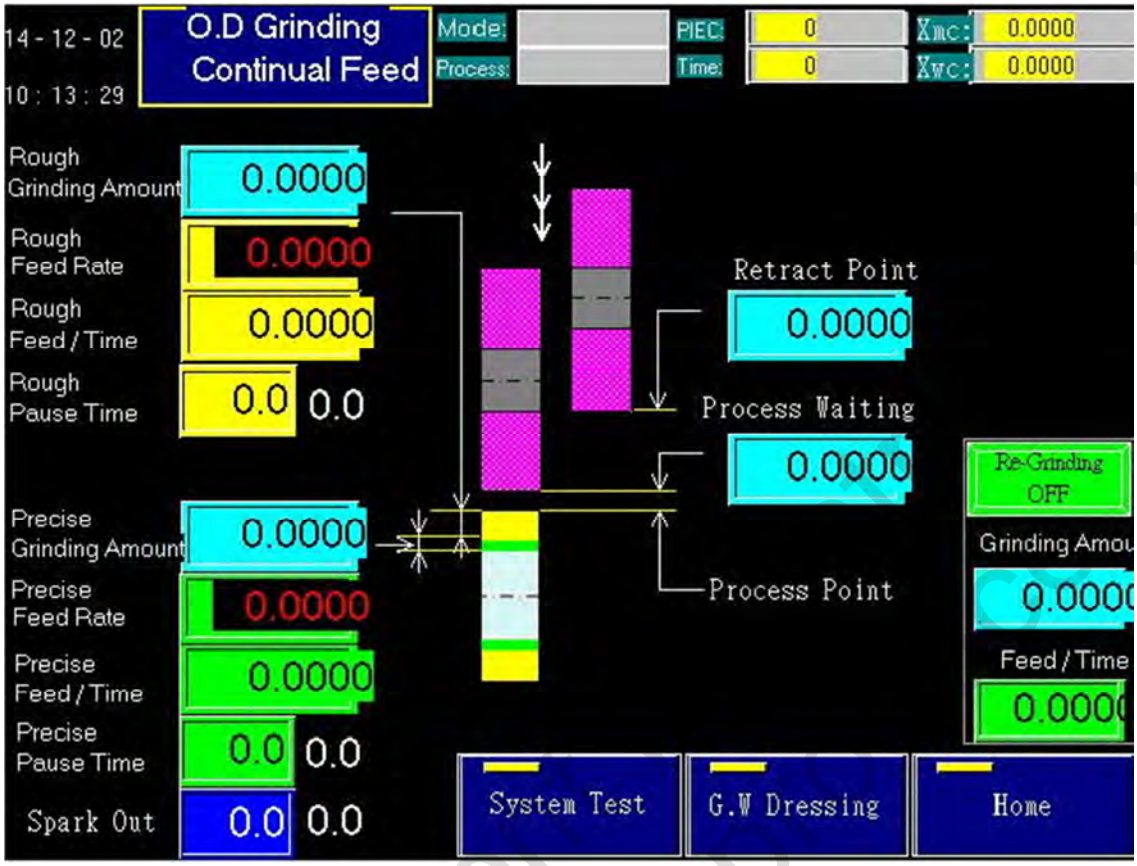


Figure 6-5

※「Continual Feed」grinding example：

- Process condition：Wheel thickness = 35 mm, workpiece stock removal =0.30 mm

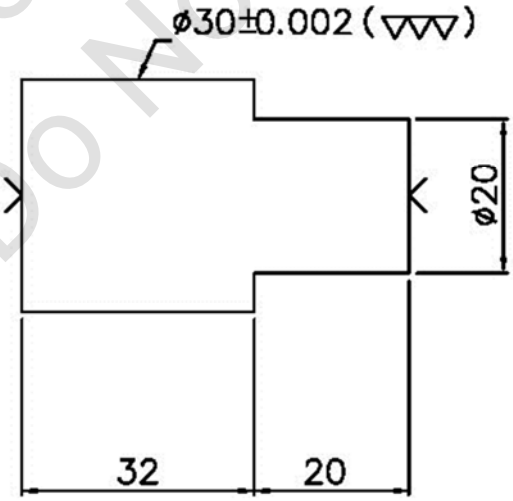


Figure 6-6

➢ Operation steps：

1. Change worktable operation mode from「Automatic mode」to「Manual mode」

2. Process point search：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process point setting：Switch to「Process Point Setting」. Press  to record position.
4. Enter「Continual Grinding」process parameter, set the value below：

If 「Process point」＝ －120.5000

>Process waiting point ＝ 10.0000 mm（10 mm away from process point）

>Retract point ＝ 50.0000 mm（50 mm away from process point）

>Rough grinding amount ＝ 0.2500 mm

> Rough feed rate ＝ 0.05 mm/sec

> Rough feed / time ＝ 0.05 mm

> Rough pause time ＝ 2 sec

> Precise grinding amount ＝ 0.0500 mm

> Precise feed rate ＝ 0.01 mm/sec

> Precise feed / time ＝ 0.01 mm

> Precise pause time ＝ 5 sec

> Spark out grinding ＝ 5 sec

1. Process cycle procedure：
   > Complete steps 1 - 4.
   > Change mode to  。
   > Press  。
   > Retract point ＝ －70.5000 mm.
   > Process waiting point ＝ －110.5000 mm.
5. Process cycle procedure：
   > Complete steps 1 - 4.
   > Change mode to  。
   > Press  。
   > Retract point ＝ －70.5000 mm.
   > Process waiting point ＝ －110.5000 mm
   > Process point ＝ －120.5000 mm.
   > Rough grinding cycle 5 times.

   (Total grinding amount 0.0250 mm, feeding amount each time 0.05 mm, stop

2sec. after feeding）

＞ Precise grinding cycle 5 times

(Total grinding amount 0.0500mm, Feed amount each time 0.01 mm, stop 2sec. after feeding)

＞ Spark out grinding, not feed and stop 5 sec.

＞ Return to「Retract point」

＞ Process complete.

III. 「O.D Grinding Left Side Feed」parameter setting：As shown in Figure 6-7

The process is to feed only at the left side of workpiece within grinding range.

1. **Retract Point**：Safe point between wheel and work-piece. (Speedy feed point)
2. **Process Waiting Point**：Buffer point of wheel before contacting to workpiece (slow feed point)
3. **Rough Grinding Amount**：Removal amount setting of rough grinding
4. **Rough Feed / Time**：Feeding amount per time of rough grinding
5. **Rough Round Times Feed**：Left side feeding times during rough grinding.
6. **Precise Grinding Amount**：Removal amount setting of precise grinding.
7. **Precise Feed / Time**：Feeding amount per time of precise grinding.
8. **Precise Round Times Feed**：Left side feed times during precise grinding.

Spark Out Grinding：The worktable reciprocation times, when 「Precise grinding amount」is reached and the feeding axis is not proceed.

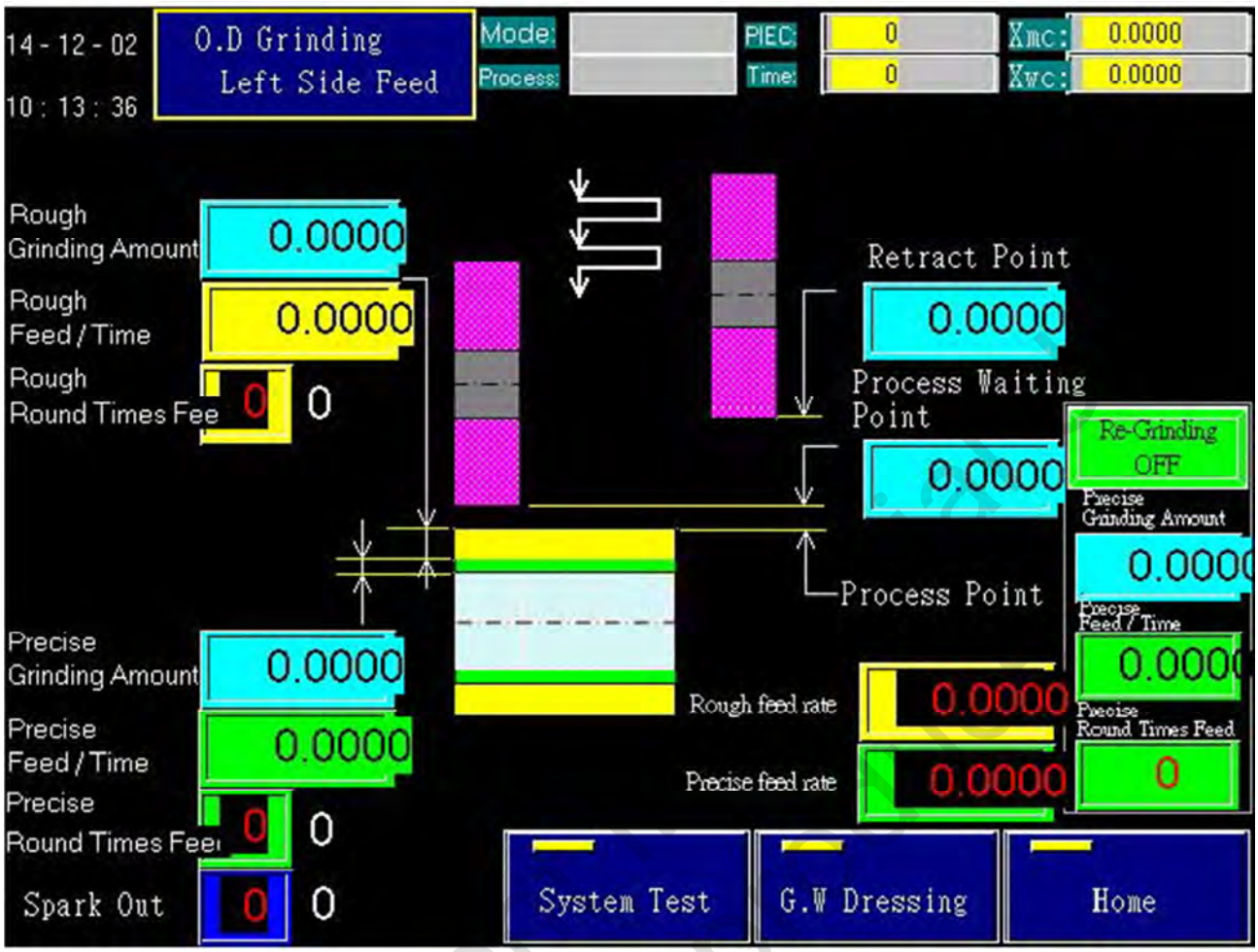


Figure 6-7

※ 「Left Side Feed」grinding example：

> Process condition：Wheel thickness= 35 mm, workpiece stock removal= 0.30 mm, Grinding wheel symbol indicates the feeding side.

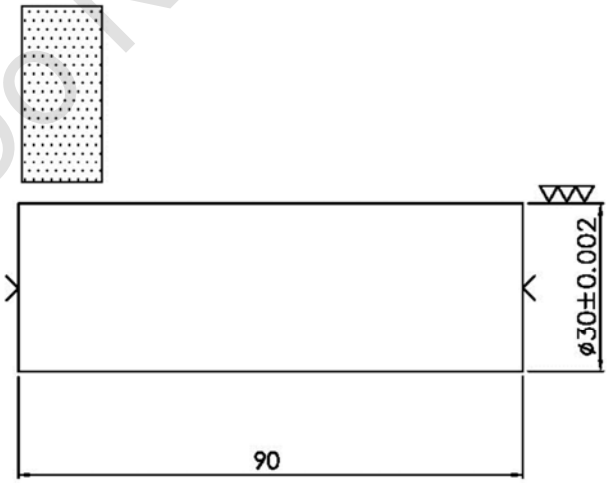


Figure 6-8

> Operation steps：

1. Switch work table operation mode from「Automatic mode」to「Manual mode 」.
2. Process point search ：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process point setting：Switch to「Process Point Setting」. Press to record position.
4. Enter「Left side feed」process parameter screen, set up the value below：

If 「Process point」position ＝ －120.5000

> Process waiting point ＝ 10.0000 mm（10 mm away process point）

> Retract point ＝ 50.0000 mm（50 mm away process point）

> Rough grinding amount ＝ 0.2500 mm

> Rough feed / time ＝ 0.05 mm

> Rough round times feed ＝ 5 times

> Precise grinding amount ＝ 0.0500 mm

> Precise feed / time ＝ 0.01 mm

> Precise round times feed ＝ 5 times

> Spark out grinding ＝ 5 times

5. Process cycle procedure：

> Complete steps 1 - 4.

> Change to 。

> Press 。

> Retract point ＝ －70.5000 mm.

> Process waiting point ＝ －110.5000 mm.

> Process point ＝ －120.5000 mm.

> Rough grinding cycle process 5 times.

Feed once when wheel returns to feeding side and feed amount/time is 0.05 mm. Rough grinding stock removal is 0.25 mm.

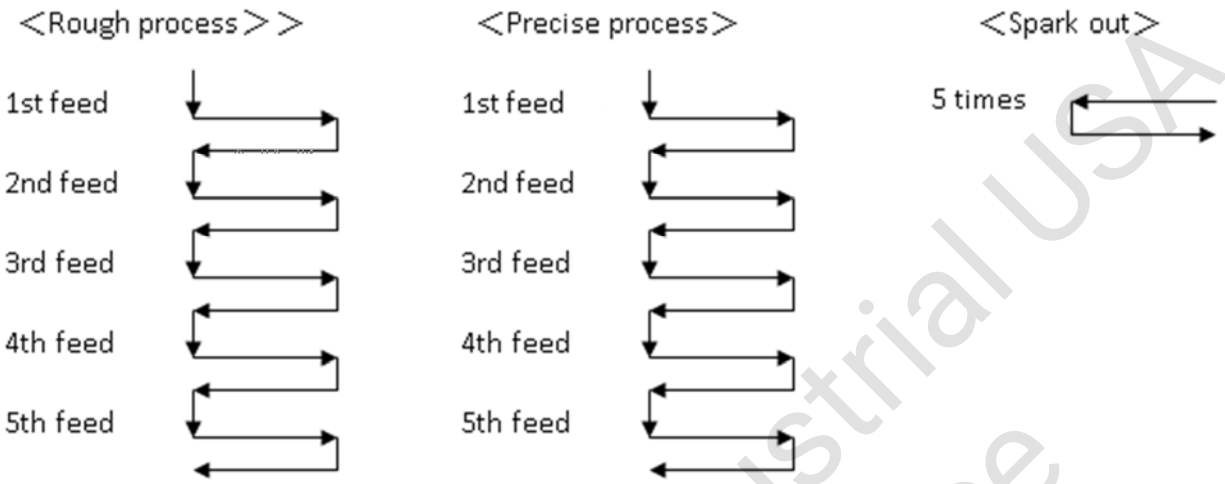
> Precise grinding cycle process 5 times.

Feed once when wheel returns to feeding side and feed amount/time is 0.01

mm. Precise grinding stock removal is 0.05 mm.

＞ Spark out grinding cycle process 5times.

Without feed, work table reciprocates 5 times.



＞ Return to「Retract point」

＞ Process complete.

IV. 「O.D Grinding Right Side Feed」parameter setting： As shown in Figure 6-9

The process is to feed only at the right side of workpiece within grinding range.

1. **Retract point**：Safe point between wheel and work-piece. (Speedy feed point)
2. **Process waiting point**：Buffer point of wheel before contacting to workpiece (slow feed point)
3. **Rough grinding amount**：Removal amount setting of rough grinding
4. **Rough feed / time**：Feeding amount per time of rough grinding.
5. **Rough round times feed**：Right side feeding times during rough grinding.
6. **Precise grinding amount**：Removal amount setting of precise grinding.
7. **Precise feed / time**：Feeding amount per time of precise grinding.
8. **Precise round times feed**：Right side feed times during precise grinding.
9. **Spark out grinding**：The worktable reciprocation times, when 「Precise grinding amount」is reached and the feeding axis is not proceed.

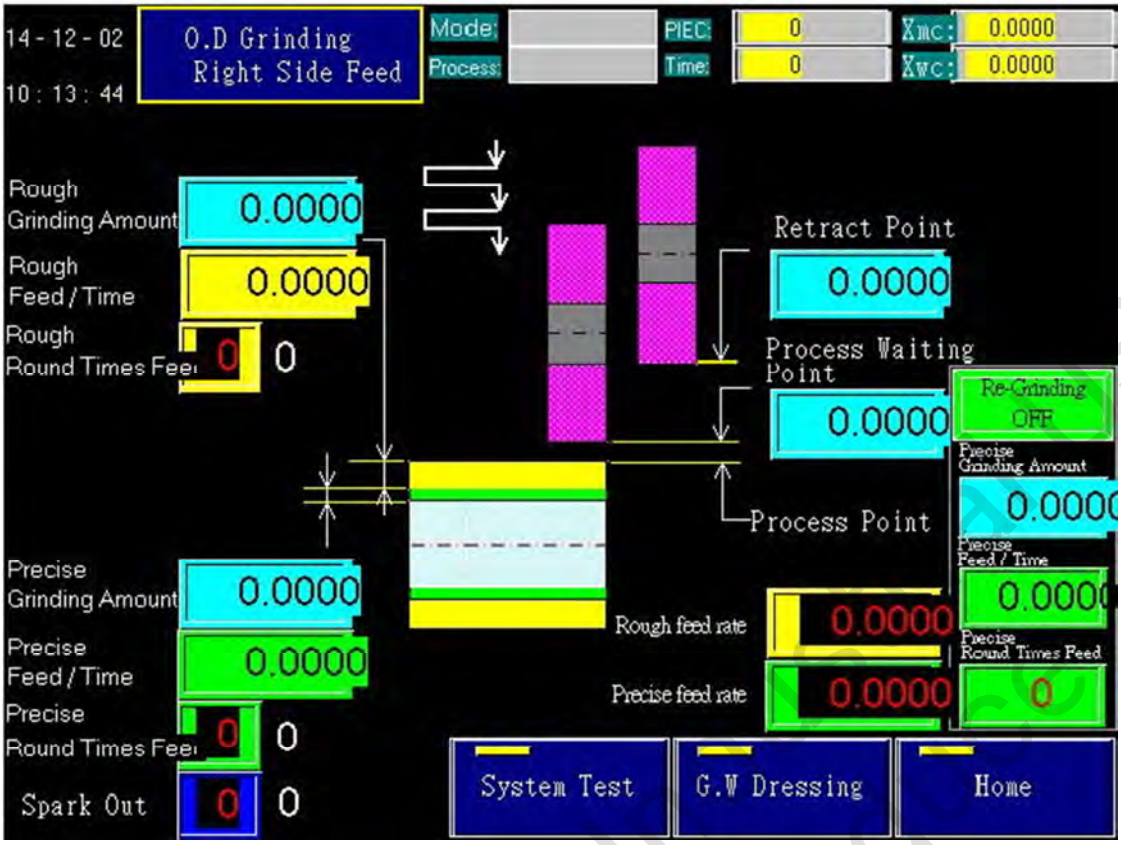


Figure 6-9

※ 「Right Side Feed」grinding example：

> Process condition：Wheel thickness = 35 mm, workpiece stock removal=0.3mm, grinding wheel symbol indicates the feeding side.

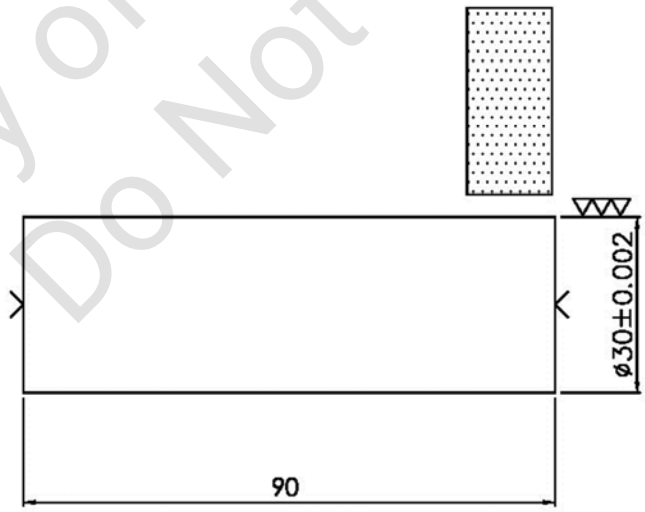


Figure 6-10

> Operation steps：

1. Switch worktable operation mode from 「Automatic mode」 to「Manual mode  」

2. Process point search：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process point setting：Switch to「Process Point Setting  」. Press  to record position.
4. Enter「Right side feed」process parameter screen, set up the value below：

If 「Process Point」position ＝ －120.5000

> Process waiting point ＝ 10.0000mm（10mm away from process point）

> Retract point ＝ 50.0000 mm（50 mm away from process point）

> Rough grinding amount ＝ 0.2500 mm

> Rough feed / time ＝ 0.05 mm

> Rough round times feed ＝ 5 times

> Precise grinding amount ＝ 0.0500 mm

> Precise feed / time ＝ 0.01 mm

> Precise round times feed ＝ 5 times

> Spark out grinding ＝ 5 times

5. Process cycle procedure：

> Complete steps 1 - 4.

> Change to  。

> Press 

> Retract point ＝ －70.5000 mm

> Process waiting point ＝ －110.5000 mm

> Process point ＝ －120.5000 mm

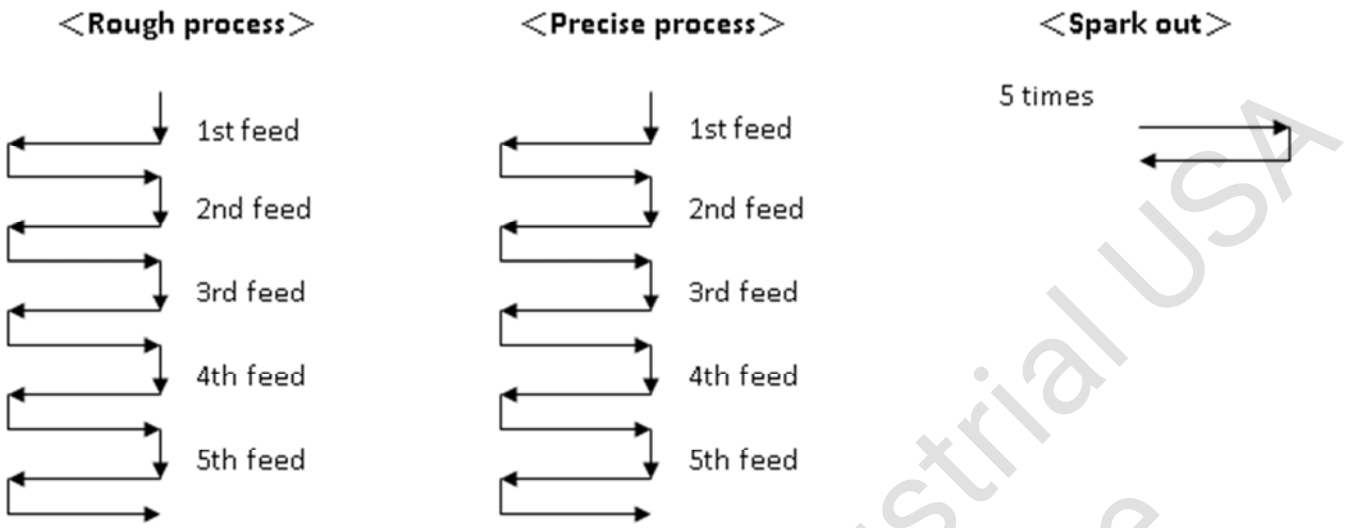
> Rough grinding cycle process 5 times.

Feed once when wheel returns to feeding side and feed amount/time is 0.05 mm. Rough grinding stock removal is 0.25 mm.

> Precise grinding cycle process 5 times.

Feed once when wheel returns to feeding side and feed amount is 0.01 mm. Precise grinding stock removal is 0.05 mm.

＞ Spark out grinding cycle process 5times. No feed, work table reciprocate 5 times.



＞ Return to「Retract point」

＞Process complete.

V. 「O.D Grinding Double Side Feed」parameter setting：As shown in Figure 6-11

The process is to fee at both sides of workpiece within grinding range.

1. **Retract point**：Safe point between wheel and workpiece. (Speedy feed point)
2. **Process waiting point**：Buffer point of wheel before contacting to workpiece (slow feed point)
3. **Rough grinding amount**：Removal amount setting of rough grinding
4. **Rough feed / time**：Feeding amount per time of rough grinding
5. **Rough round times feed**：Total feeding times at both sides during rough grinding.
6. **Precise grinding amount**：Removal amount setting of precise grinding.
7. **Precise feed / time**：Feeding amount per time of precise grinding.
8. **Precise round times feed**：Total feeding times at both sides during rough grinding.

Spark out grinding：The worktable reciprocation times, when「Precise grinding amount」is reached and the feeding axis is not proceed.

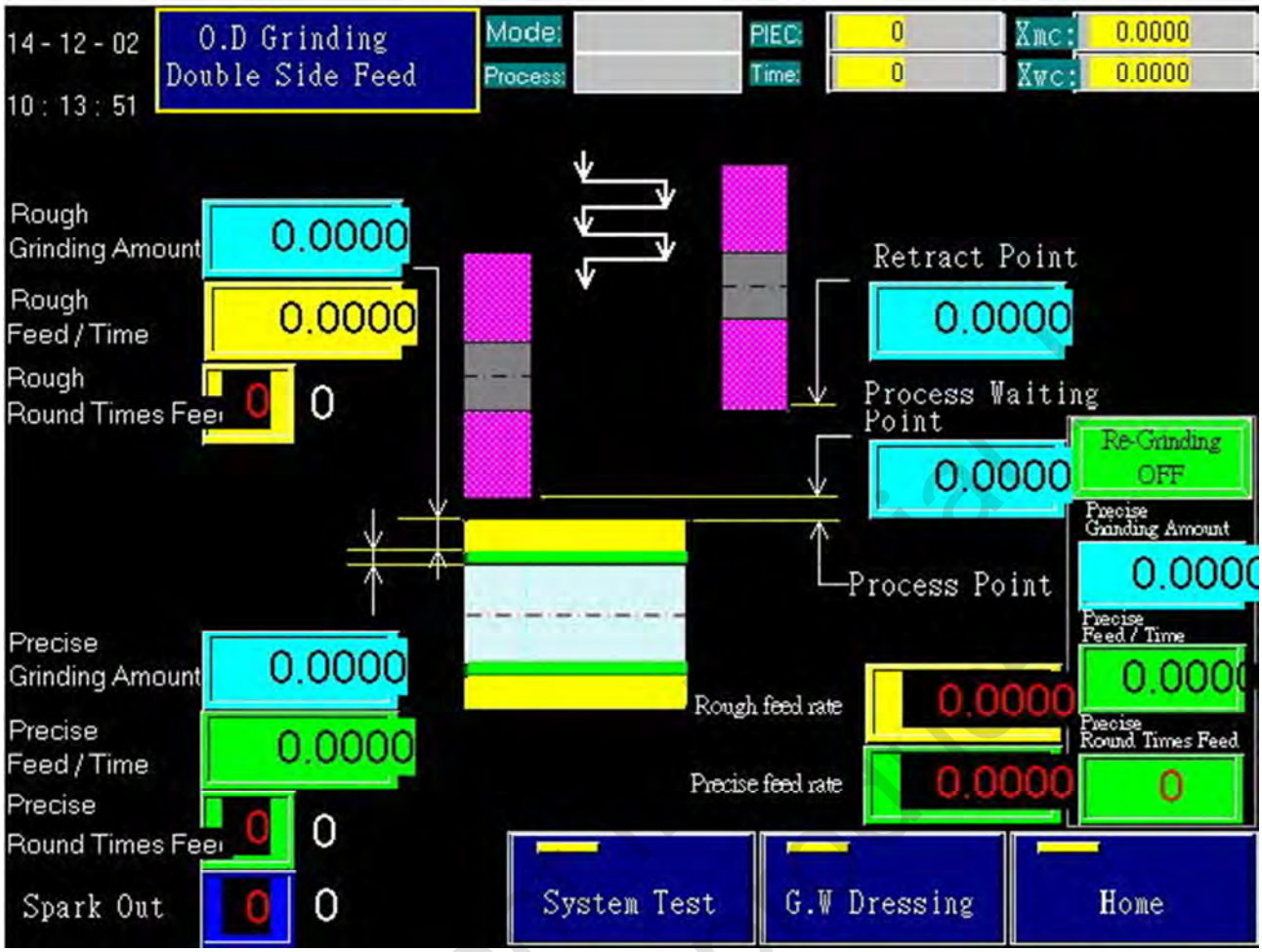


Figure 6-11

※「Double Side Feed」grinding example：

＞ Process condition： Wheel thickness = 35 mm, workpiece stock removal = 0.30 mm.

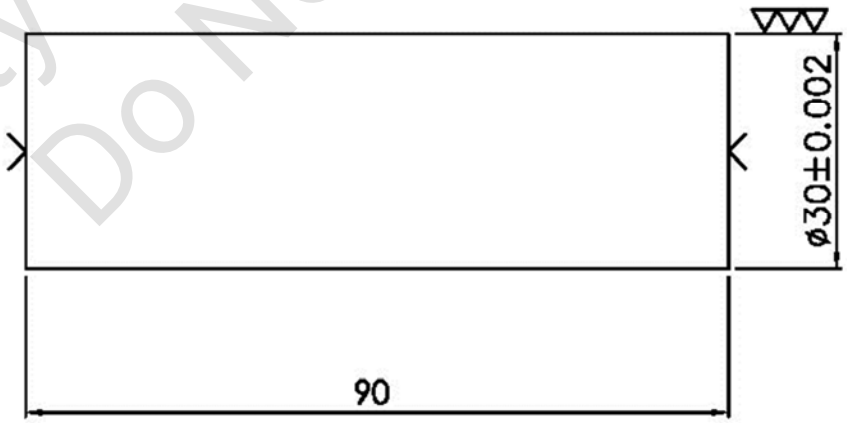


Figure 6-12

＞ Operation steps：

1. Switch work table operation mode from「Automatic mode」to「Manual mode

 」.

2. Process point search ：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process point setting：Switch to「Process Point Setting  」, press  to record position.
4. Enter「Double side feed」process parameter screen, set up the value below：

If 「Process Point」position ＝ －120.5000

＞Process waiting point ＝ 10.0000mm（10mm away from process point）

＞ Retract point ＝ 50.0000 mm（50 mm away from process point）

＞ Rough grinding amount ＝ 0.2500 mm

＞ Rough feed / time ＝ 0.05 mm

＞ Rough round times feed ＝ 5 times

＞ Precise grinding amount ＝ 0.0500 mm

＞ Precise feed / time ＝ 0.01 mm

＞ Precise round times feed ＝ 5 times

＞ Spark out grinding ＝ 5 times

5. Process cycle procedure：

＞ Complete steps 1 - 4.

＞ Change to 

＞ Press 

＞ Retract point ＝ －70.5000 mm.

＞Process waiting point ＝ －110.5000 mm.

＞Process point ＝ －120.5000 mm.

＞ Rough grinding cycle process 5 times.

Feed once when wheel returns to feeding side and feed amount/time is 0.05 mm. Rough grinding stock removal is 0.25 mm.

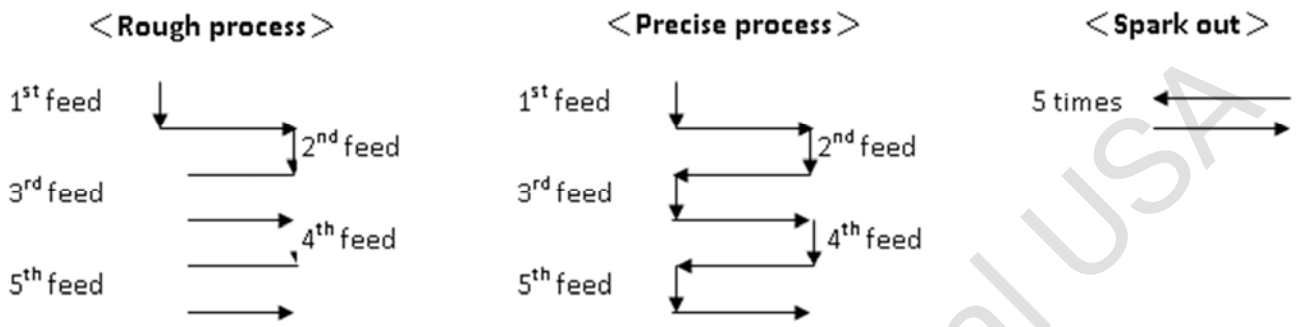
＞Precise grinding cycle process 5 times.

Feed once when wheel returns to feeding side and feed amount is 0.01 mm.

Precise grinding stock removal is 0.05 mm.

＞ Spark out grinding cycle process 5times.

No feed, work table reciprocate 5 times.



＞ Return to「Retract point」

＞ Process complete.

VI. 「O.D Grinding Compound Feed」parameter setting：As shown in Figure 6-13

This process is to feed sectionally by「Continual Feed」mode for rough grinding. After that, grind by「Double side feed」mode for precise grinding.

1. **Horizontal pause time**：The pause time after worktable moves to next section.
2. **Retract point**：Safe point between wheel and workpiece. (Speedy feed point)
3. **Process waiting point**：Buffer point of wheel before contacting to workpiece (slow feed point)
4. **Ver. rough grinding amount**：Total grinding amount of section grinding.
5. **Ver. rough feed rate**：The feed speed rate of section grinding.
6. **Ver. Rough feed amount**：The feed amount per time of section grinding.
7. **Ver. pause time**：The pause time after every feeding of section grinding.
8. **Hor. precise grinding amount**：Total grinding amount of precise process.
9. **Hor. precise feed amount**：The feed amount per time of precise process.
10. **Hor. precise round times feed**：The left and right side feeding times during precise grinding.
11. **Spark out grinding**：The worktable reciprocation times, when 「Hor. Precise grinding amount」is reached and the feeding axis is not proceed.

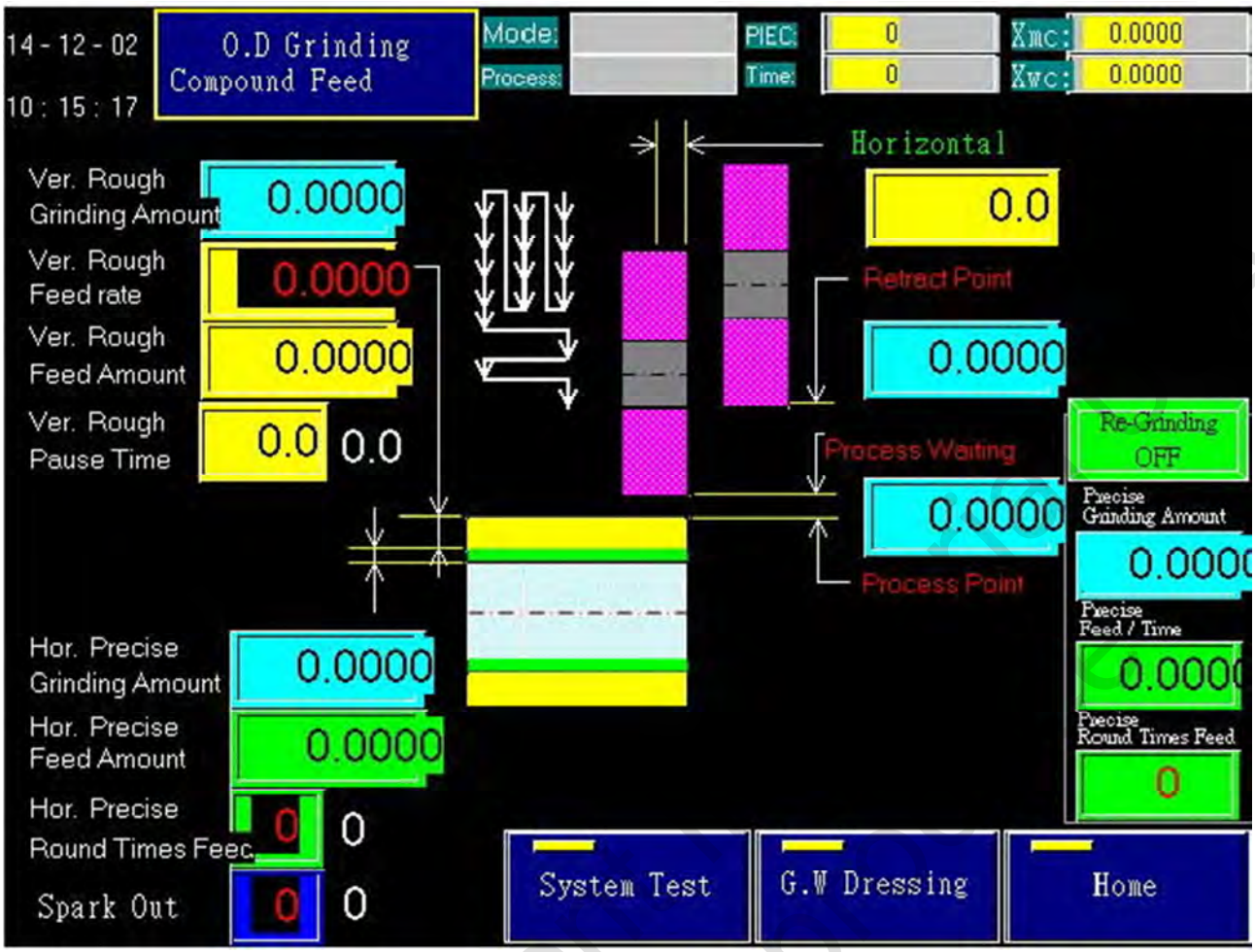


Figure 6-13

※「Compound Feed」 grinding example：

＞ Process condition： Wheel Thickness = 35 mm，workpiece stock removal = 0.30 mm.

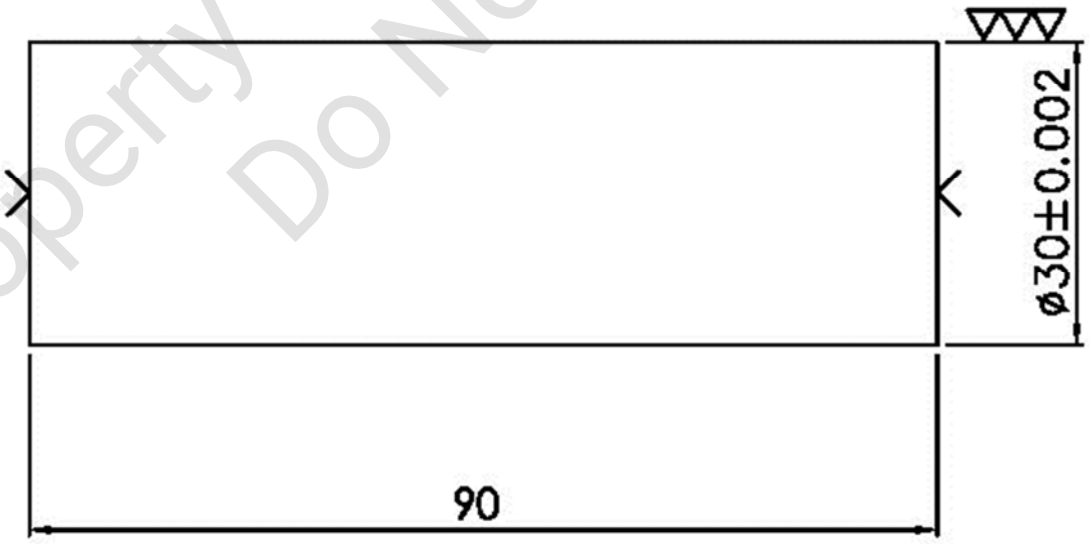


Figure 6-14

＞ Operation steps：

1. Switch worktable operation mode from 「Automatic mode」 to「Manual mode  」
2. Search of process point：Process point search：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Setting of process point：Switch to「Process Point Setting  」.Press  to record position..
4. Change the「Horizontal move release」function to「Horizontal move latch」
5. Enter「Compound feed」process parameter screen, set up the value below：

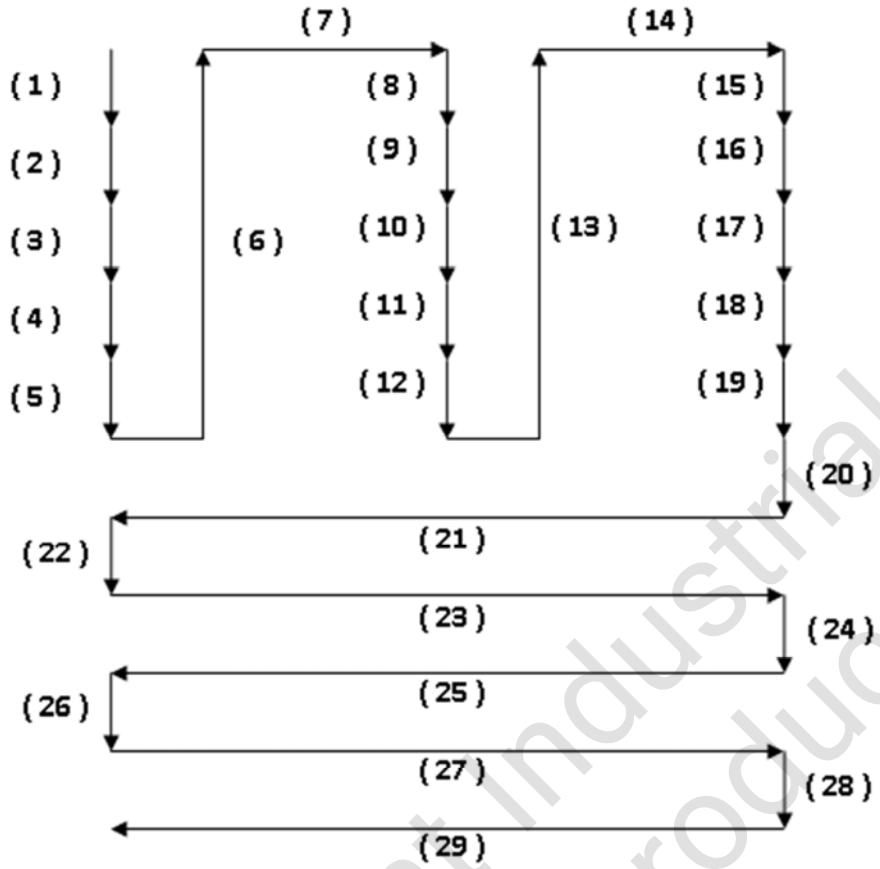
If 「Process Point」position ＝ －120.5000

> Process waiting point ＝ 10.0000 mm（10 mm away from process point）
> Retract point ＝ 50.0000 mm（50 mm away from process point）
> Ver. rough grinding amount＝ 0.2500 mm
> Ver. rough feed rate ＝ 0.05 mm/sec
> Ver. rough feed amount ＝ 0.05 mm
> Ver. rough pause time ＝ 2 sec
> Horizontal pause time ＝ 2 sec
> Hor. precise grinding amount＝ 0.0500 mm
> Hor. precise feed amount ＝ 0.01 mm
> Hor. precise round times feed ＝ 5 times
> Spark out grinding ＝ 5 times

6. Process cycle procedure：

> Complete steps 1 - 4.
> Change to  。
> Press  .
> Retract point ＝ －70.5000 mm.
> Process waiting point ＝ －110.5000 mm.
> Process point ＝ －120.5000 mm.

> Compound feed process cycle diagram，as shown below：



(1) ~ (5)：Straight feed rough grinding 1st section. Total grinding amount is 0.25mm. Feed speed rate is 0.05 mm/sec. Feed amount is 0.05 mm. Stops 2 sec for each feed, carried out 5 times totally.

> (6)：Return to「Process waiting point」

> (7)：Work table stops 2 sec. after moving horizontally to the 2nd section.

> (8) ~ (12)：Straight feed rough grinding 2nd section. Total grinding amount is 0.25mm. Feed speed rate is 0.05 mm/sec. Feed amount is 0.05 mm, Stops 2 sec for each feed, carried out 5 times totally.

> (13)：Return to「Process waiting point」

> (14)：Work table stops 2 sec. after moving horizontally to the 3rd section.

> (15) ~ (19)：Straight feed rough grinding 3rd section. Total grinding amount is 0.25mm. Feed speed rate is 0.05 mm/sec. Feed amount is 0.05 mm, Stops 2 sec for each feed, carried out 5 times totally.

> (20) ~ (29)：Use「Double side feed」mode to carry out precise grinding.

＞ Return to 「Retract point」

＞Process complete.

VII.「O.D Grinding G.W Dressing」parameter setting：As shown in Figure 6-15

In「Electronic hand wheel feed」, move grinding wheel base to make the grinding wheel touch diamond dresser for dressing.

1. **G.W dressing origin point**：Carry out the function to set up the position after dressing wheel.
2. **G.W dressing point**：Display the position of 「G.W dressing origin point」.
3. **G.W dressing point**：Carry out the function to retract 「G.W Dressing point」to dress wheel.
4. **Compensation amount**：Input grinding wheel dressing compensation amount and press「Enter」to load 「Grinding start point」position.
5. **Grinding start point**：Display workpiece grinding position.
6. **Total compensation amount**：Display accumulated dressing 「Compensation amount」
7. **Compensation clear**：Press this soft key to zero 「Total compensation amount」, and「Grinding start point」will be resumed to the position before loading compensation.
8. **Wheel Dressing Procedure**：

   Assume wheel「Dressing amount」is 0.02 mm per time, and workpiece「Grinding start point」is -120.5000.

   (1) Switch mode to「Electronic hand wheel」 and work together with 「Electronic hand wheel magnification selection」to look for wheel dressing position to dress wheel.

   (2) After wheel dressing, carrying out「G.W dressing origin point」to record this position. The position is shown at 「G.W dressing point」.

   (3) Input「Compensation amount」"0.02"（According to dressing amount）, and carry out「Enter」to load the value into「grinding start point」. Then,「grinding

start point」is changed to -120.5200.

(4) Return to process mode to carry out workpiece grinding.

(5) When wheel is weak, press processing mode 「G.W dressing」＞carrying out 「G.W dressing point」to return to the last dressing position to execute wheel dressing.

(6) Repeat steps 3-5 to complete workpiece grinding operation procedure.

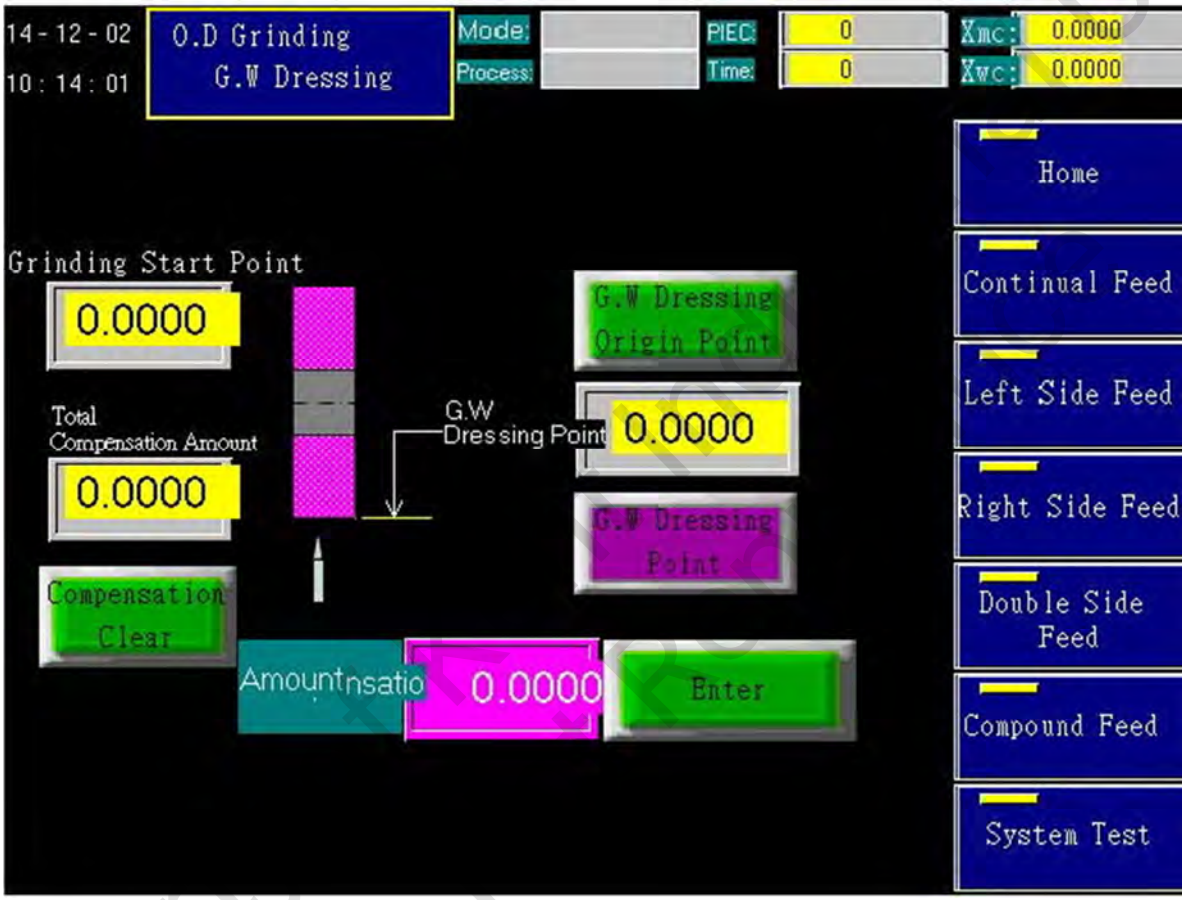


Figure 6-15

VIII. Alarm Display：As shown in Figure 6-16

1. Three twinkle color indication of electric cabinet:

(1) **Red color**：Abnormal system , Abnormal operation

(2) **Orange color**：Normal system

(3) **Green color**：Machine in operation.

2. When red light twinkles, the alarm must be excluded to continue machine operation. The excluding methods are as follow：

(1) Return to「O.D Grinding Main Menu」，press「System Test」function →

execute MMI right side function key「F7」, to display 「Alarm」screen.

(2) Use「Upward」、「Downward」operation soft key to check the cause.

(3) After troubleshooting, press「Reset」to clear all alarm messages.

Figure 6-16

IX. Record：Display the historical alarm record of machine. As shown in Figure 6-17

1. No.：The record number.
2. Time：The record time when alarm happens.
3. Downward：Cursor shifts downwards.
4. Upward：Cursor shifts upwards
5. Page down：Cursor moves next page
6. Page up：Cursor moves last page.
7. Return：Cursor leaves record point
8. Clear：Remove alarm historical record

Figure 6-17

X. Time adjustment parameter setting：As shown in Figure 6-18

1. Date：Year, month, and date setting
2. Time：Hour, minute, and second setting
3. Process cycle time：The cycle time to complete a wrokpiece.
4. Work-piece counting：Grinding work-piece counting
5. Process add up：Result of「Process cycle time」*「Work-piece counting」.
6. Timing stop：Stop executing item 3-5.

Figure 6-18

XI. **PLC I/O Signal Display**

※ PLC of Input signal checking：As shown in Figure 6-19

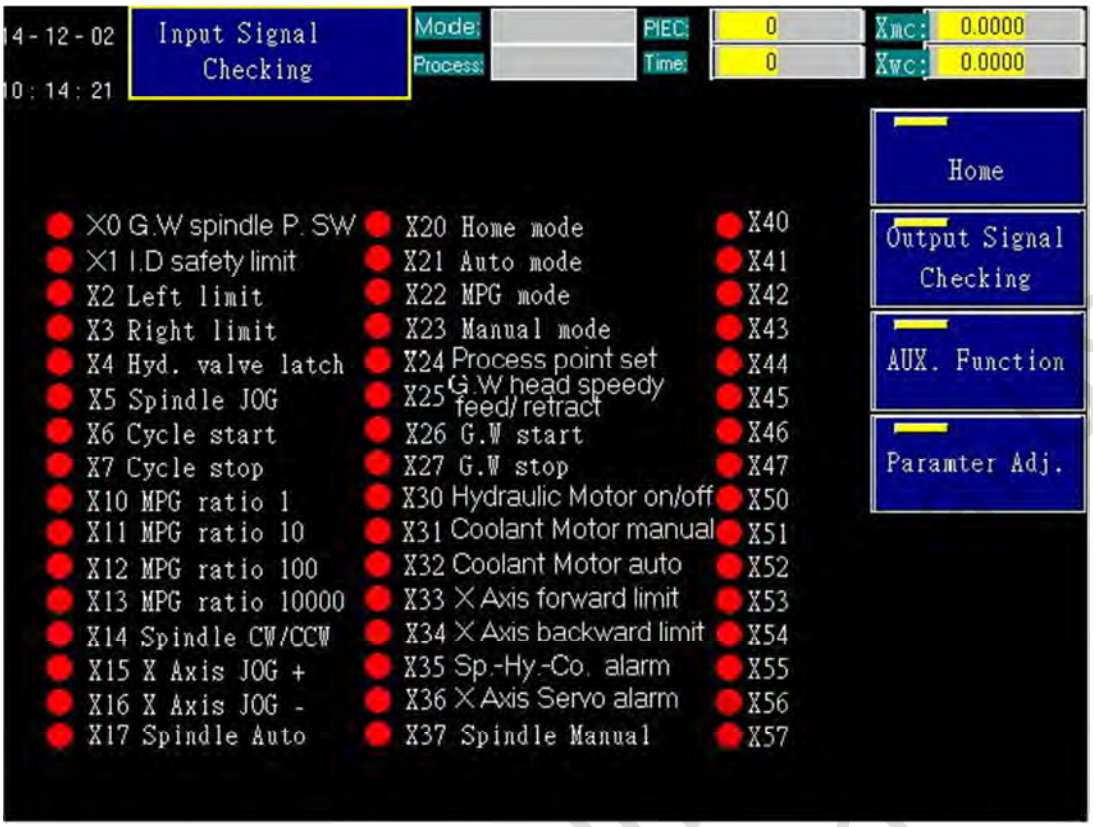


Figure 6-19

※ PLC of Output signal checking：As shown in Figure 6-20

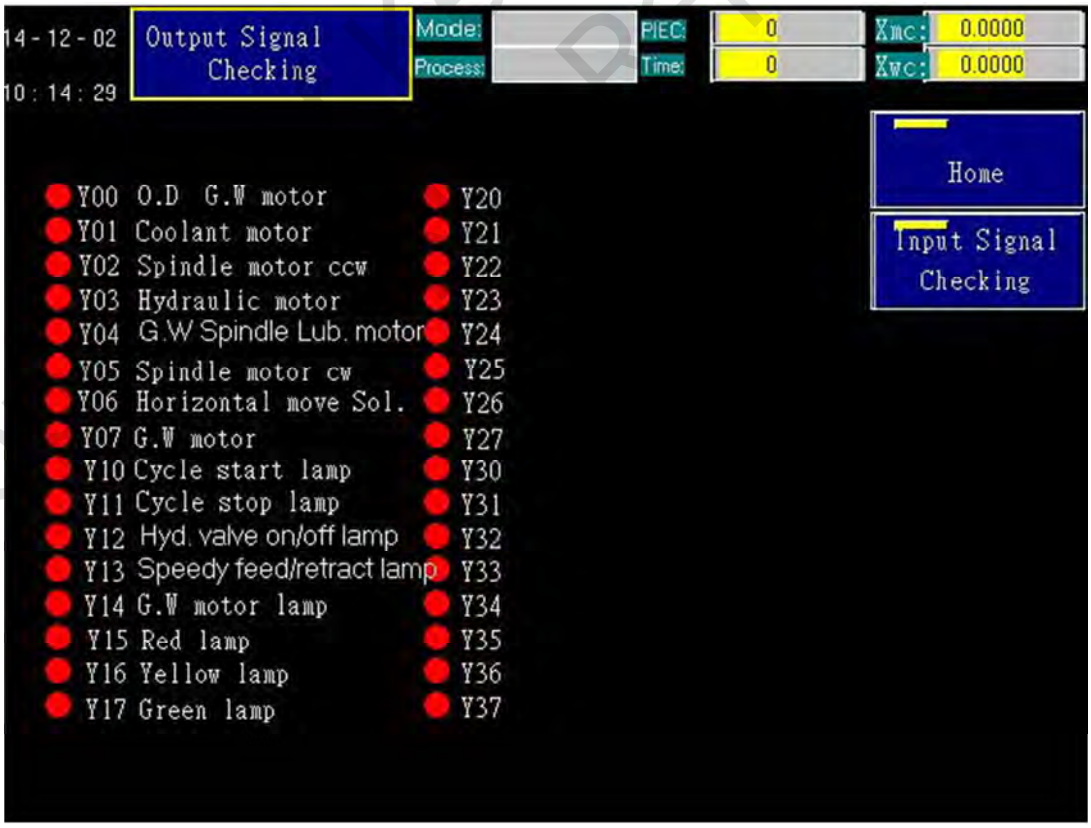


Figure 6-20

6.5.4 ID Grinding Main Menu (Option)

I. As shown in Figure 6-21：

Enter the operation screen. Switch to 「JOG」mode and turn on internal grinding wheel spindle at first to set processing parameter.

1. Parameter Setting

   JOG speed：Set the wheel spindle feed rate of （JOG）mode.

2. Left function soft keys：Processing mode selection.
3. Right function soft keys：Grinding parameter setting, wheel dressing setting and system testing.
4. Message Display：
   (1) **YY-MM-DD**：Display system programmed date.
   (2) **hh-mm-ss**：Display system programmed time.
   (3) **Mode**：Display operation mode now. (Home、Auto、MPG、JOG、Process point)
   (4) **Process**：Display executing process program.
   (5) **PIEC.**（**Quantity)**：Display the quantity of ground parts.
   (6) **Time**：Display accumulated processing time.
   (Single workpiece grinding time* ground workpiece quantity)
   (7) **Xmc**：Display「Machinery Original Position」of feeding axis.
   (8) **Xwc**：Display「Process point Position」of feeding axis.

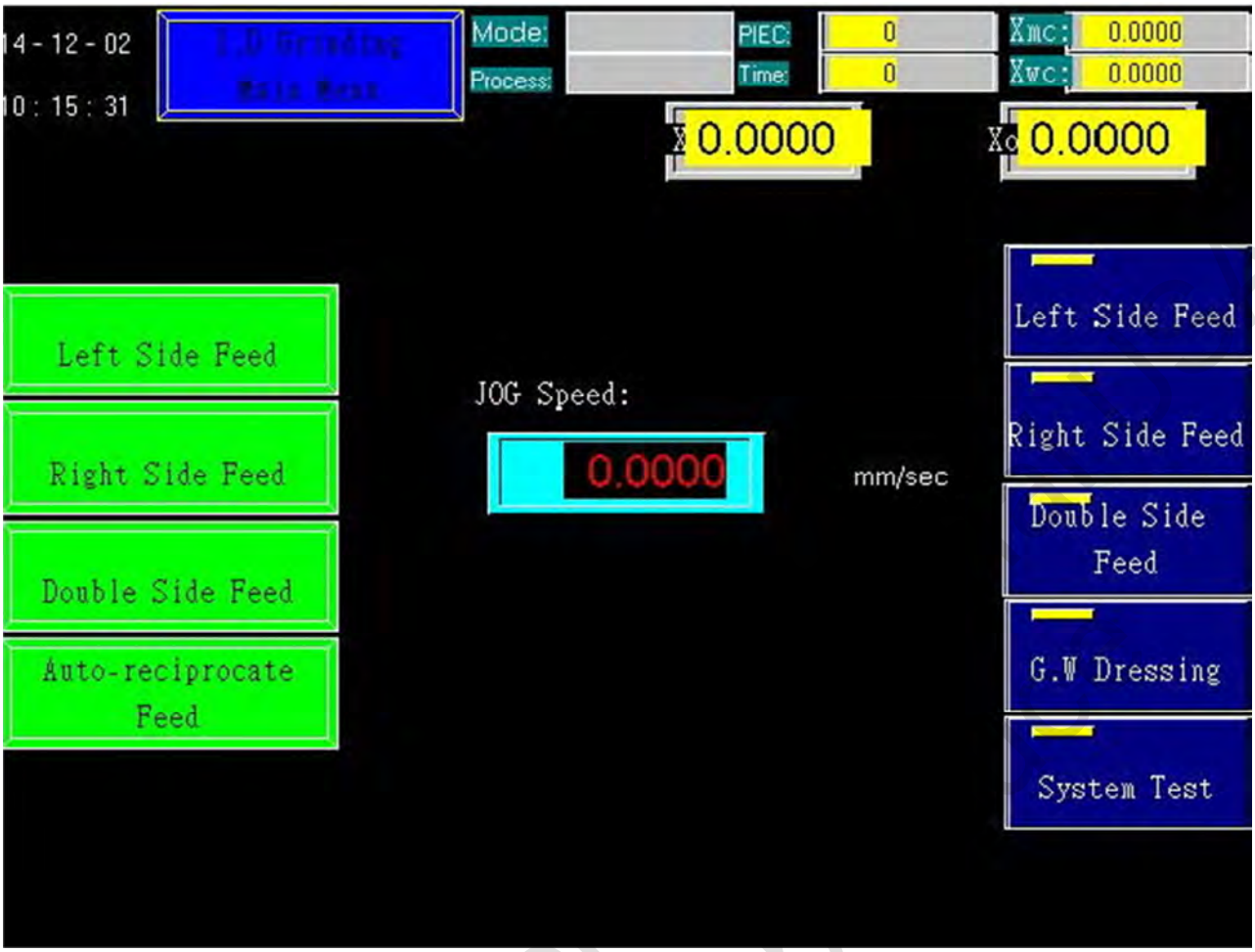


Figure 6-21

II. 「I.D Grinding Left Side Feed」parameter setting：As shown in Figure 6-22

This process is to feed only at the lift side of workpiece within grinding range.

1. **Retract Point**：Safe point between wheel and work-piece. (Speedy feed point, ID should be concerned)
2. **Process Waiting Point**：Buffer point of wheel before contacting to workpiece (slow feed point, ID should be concerned)
3. **Rough Grinding Amount**：Removal amount setting of rough grinding
4. **Rough Feed / Time**：Feeding amount per time of rough grinding
5. **Rough Round Times Feed**：Left side feeding times during rough grinding.
6. **Precise Grinding Amount**：Removal amount setting of precise grinding.
7. **Precise Feed / Time**：Feeding amount per time of precise grinding
8. **Precise Round Times Feed**：Left side feed times during precise grinding.
9. **Spark Out Grinding**：The worktable reciprocation times, when 「Precise grinding

amount」 is reached and the feeding axis is not proceed.

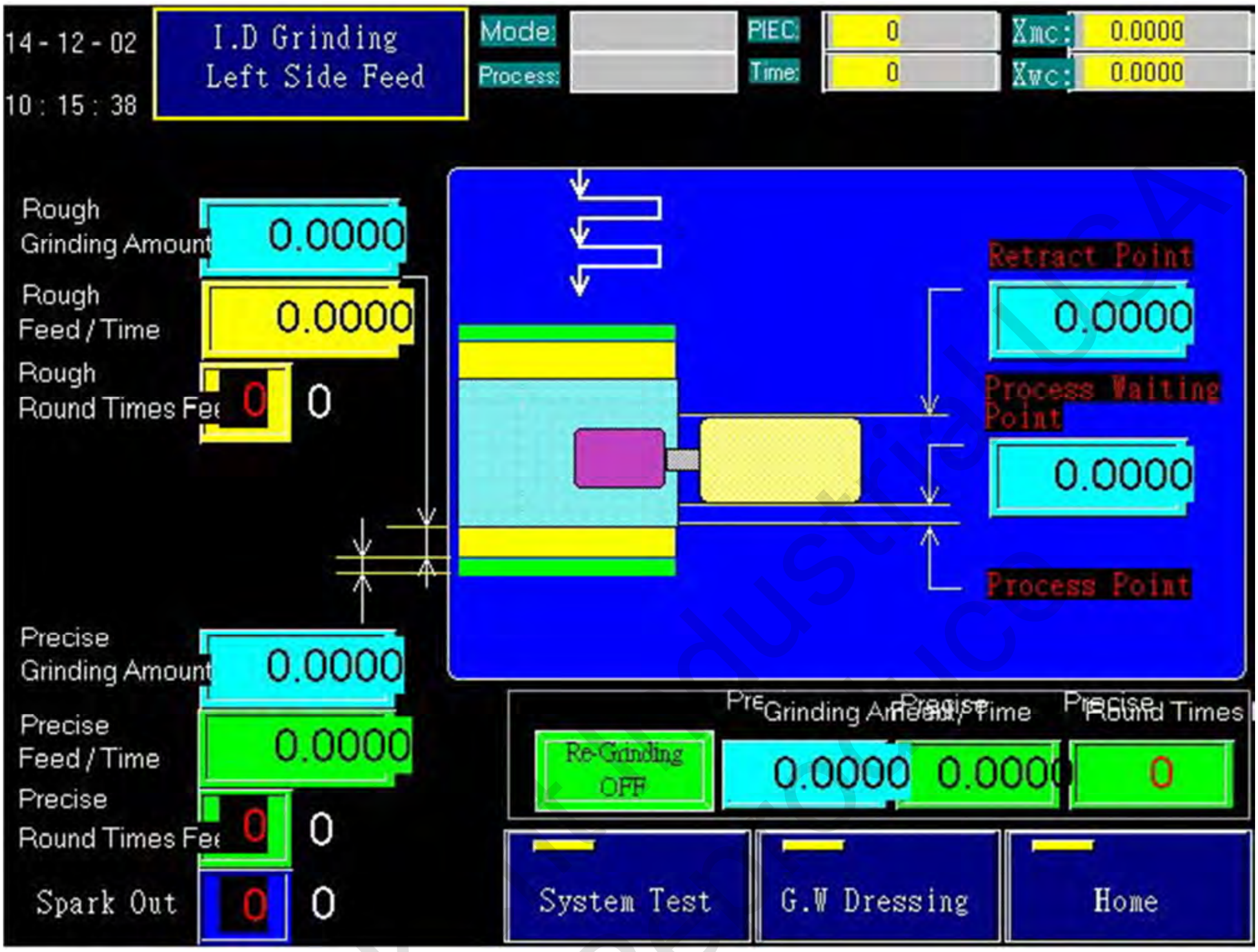


Figure 6-22

※「Left Side Feed」 of parameter setting：

＞ Process condition：Wheel thickness = 35 mm, Workpiece stock removal = 0.30 mm, grinding mark indicates the feeding side.

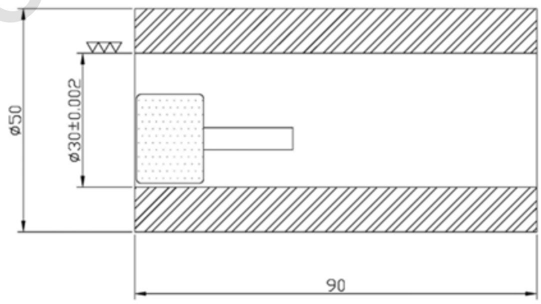


Figure 6-23

＞ Operation steps：

1. Switch worktable operation mode from 「Automatic mode」 to「Manual

mode 」

2. Process point search：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process point setting：Switch to「Process Point Setting 」. Press to record position.
4. Enter「Left Side Feed」process parameter screen, set up the value below：

If 「Process point」position ＝ －120.5000

> Process waiting point ＝ According to internal diameter (Distance away from 「Process point」in mm)

> Retract point ＝According to internal diameter size (Distance away from 「Process point」in mm)

> Rough grinding amount ＝ 0.2500 mm

> Rough feed / time ＝ 0.05 mm

> Rough round times feed ＝ 5 times

> Precise grinding amount ＝ 0.0500 mm

> Precise amount / time ＝ 0.01 mm

> Precise round times feed ＝ 5 times

> Spark out grinding ＝ 5 times

5. Process cycle procedure：

> Complete steps 1 - 4.

> Change to 。

> Press

> Retract point.

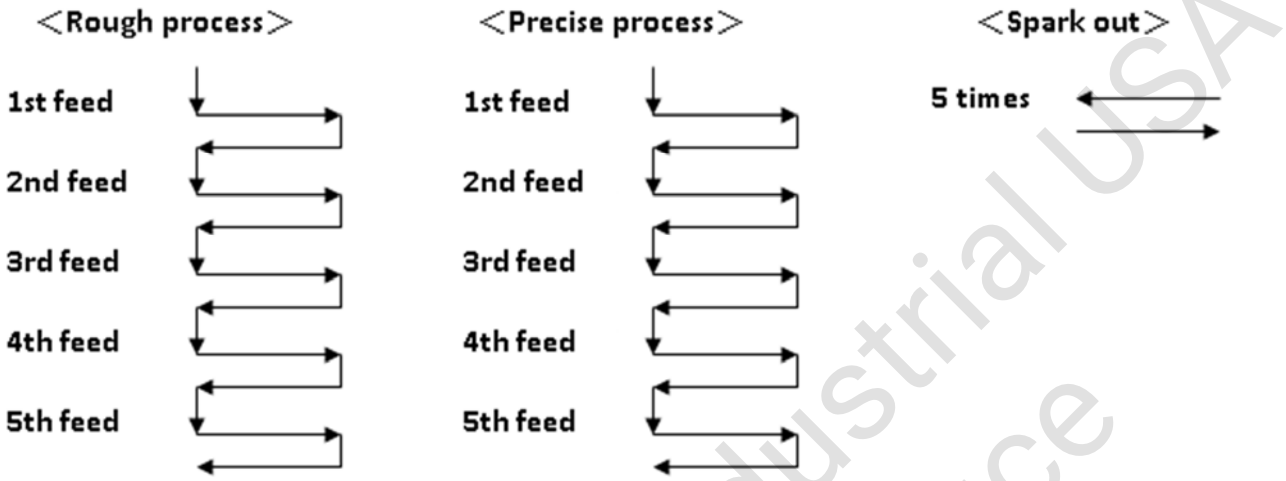
> Process waiting point.

> Process point (Position value) ＝ －120.5000 mm. 「Total dressing amount」

> Rough grinding cycle process 5 times. Feed once when wheel returns to feeding side and the feed amount is 0.05 mm. Rough grinding amount is 0.25 mm.

＞ Precise grinding cycle process 5 times. Feed once when wheel returns to feeding side and the feeding amount is 0.01 mm. Precise grinding amount is 0.05 mm.

＞ Spark out grinding cycle process 5times. Work table reciprocate 5 times without feeding.



＞ Return to 「 Retract point」.

＞ Process complete.

III. 「I.D Grinding Right Side Feed」parameter setting：As shown in Figure 6-24

The process is to feed only at the right side of workpiece within grinding range.

1. **Retract Point**：Safe point between wheel and work-piece. (Speedy feed point, ID should be concerned)
2. **Process Waiting Point**：Buffer point of wheel before contacting to workpiece (slow feed point, ID should be concerned)
3. **Rough Grinding Amount**：Removal amount setting of rough grinding
4. **Rough Feed / Time**：Feeding amount per time of rough grinding
5. **Rough Round Times Feed**：Right side feeding times during rough grinding.
6. **Precise Grinding Amount**：Removal amount setting of precise grinding.
7. **Precise Feed / Time**：Feeding amount per time of precise grinding
8. **Precise Round Times Feed**：Right side feed times during precise grinding.
9. **Spark Out Grinding**：The worktable reciprocation times, when 「Precise grinding amount」is reached and the feeding axis is not proceed.

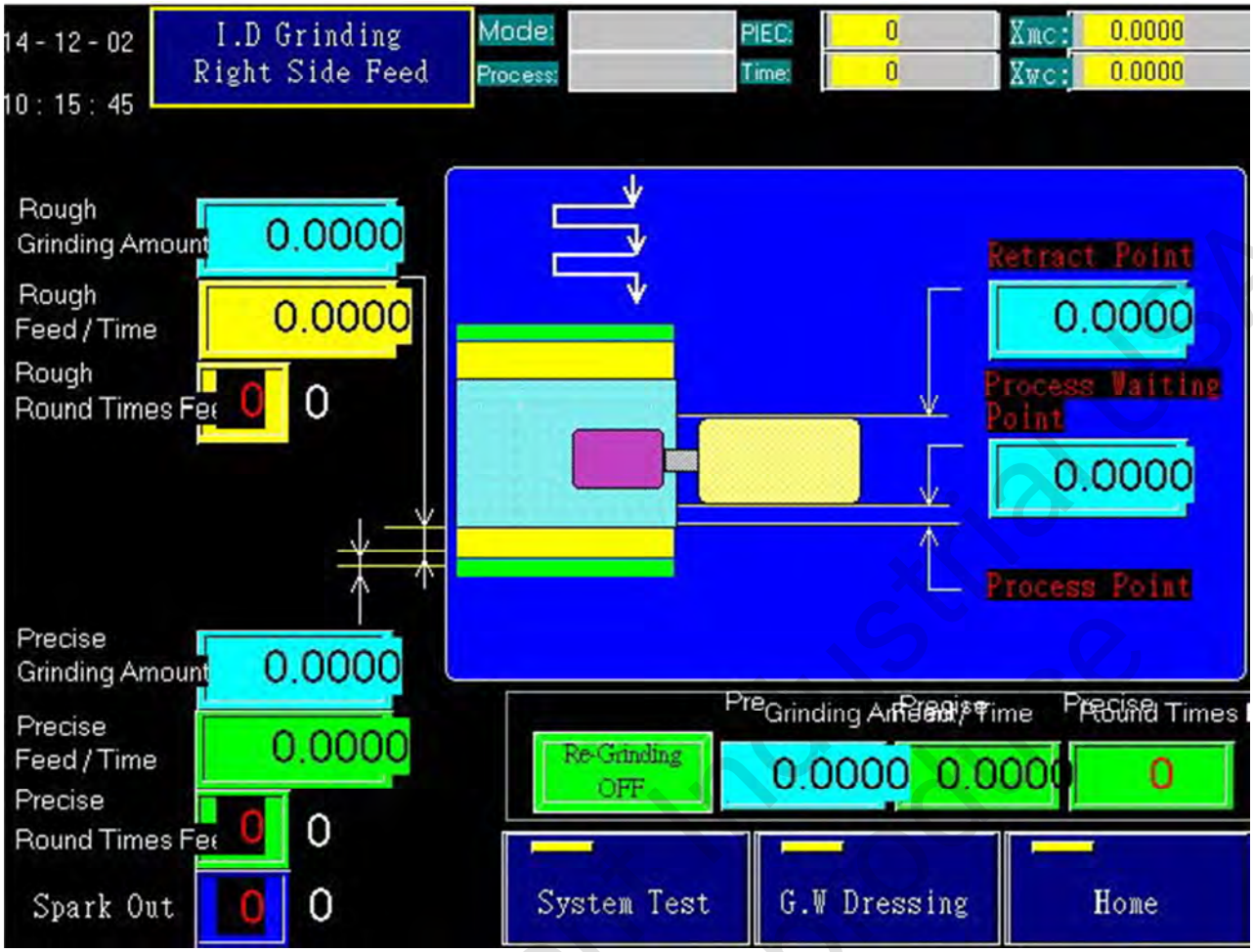


Figure 6-24

※「Right Side Feed」grinding example：

＞ Process condition：Wheel diameter =20 mm, workpiece stock removal = 0.30 mm, wheel mark indicates the feeding side.

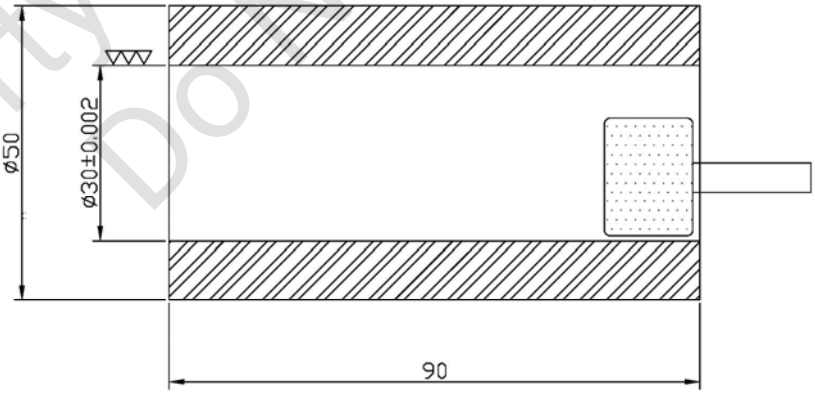


Figure 6-25

＞ Operation steps：

1. Switch worktable operation mode from 「Automatic mode」 to「Manual mode ⚙」

2. Process point search：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process point setting：Switch to「Process Point Setting」. Press  to record position.
4. Enter「Right Side Feed」process parameter screen, set up the value below：

If 「Process point」position ＝ －120.5000

> Process waiting point ＝ According to internal diameter (Distance away from 「Process point」in mm)

> Retract point ＝ According to internal diameter (Distance away from 「Process point」in mm)

> Rough grinding amount ＝ 0.2500 mm

> Rough feed / time ＝ 0.05 mm

> Rough round times feed ＝ 5 times

> Precise grinding amount ＝ 0.0500 mm

> Precise feed / time ＝ 0.01 mm

> Precise round times feed ＝ 5 times

> Spark out grinding ＝ 5 times

5. Process cycle procedure：

> Complete steps 1 - 4.

> Change to

> Press 

> Retract point

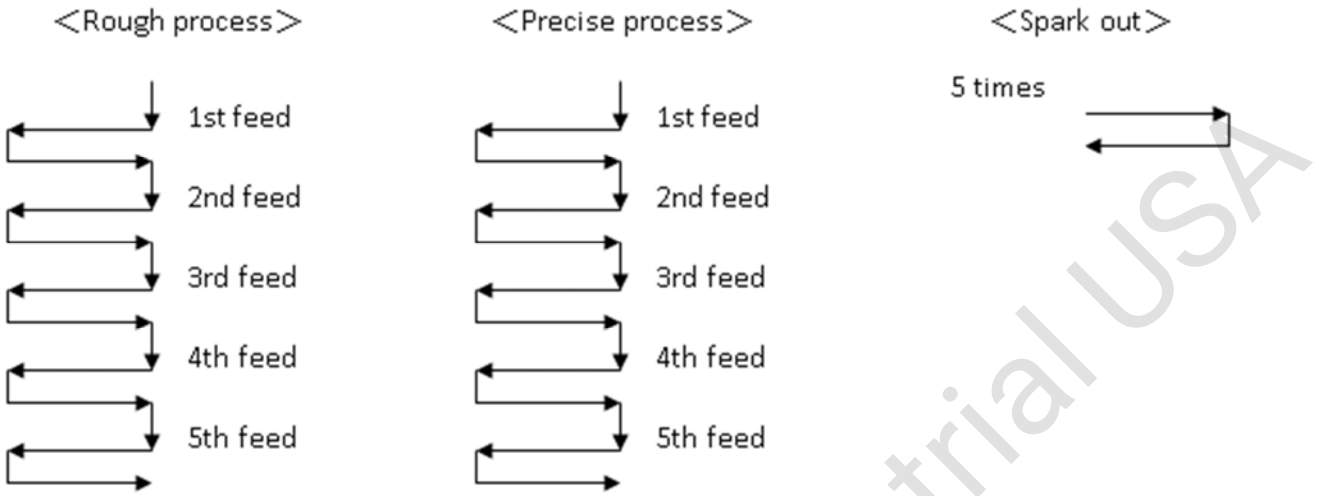
> Process point

> Process point (Position value) ＝ －120.5000 _ 「Total dressing amount」

> Rough grinding cycle process 5 times. Feed once when wheel returns to feed side and the feeding amount is 0.05 mm. Rrough grinding amount is 0.25 mm.

> Precise grinding cycle process 5 times. Feed once when wheel returns to feed side and the feeding amount is 0.01 mm. Precise grinding amount is 0.05 mm.

＞ Spark out grinding cycle process 5times. Work table reciprocate 5 times without feeding.



＞ Return to「Retract point」

＞ Process complete.

IV. 「I.D Grinding Double Side Feed」parameter setting：As shown in Figure 6-26

The process is to fee at both sides of workpiece within grinding range.

1. **Retract Point**：Safe point between wheel and work-piece. (Speedy feed point, ID should be concerned)
2. **Process Waiting Point**：Buffer point of wheel before contacting to workpiece (slow feed point, ID should be concerned)
3. **Rough Grinding Amount**：Removal amount setting of rough grinding
4. **Rough Feed / Time**：Feeding amount per time of rough grinding
5. **Rough round times feed**：Total feeding times at both sides during rough grinding.
6. **Precise grinding amount**：Removal amount setting of precise grinding.
7. **Precise feed / time**：Feeding amount per time of precise grinding.
8. **Precise round times feed**：Total feeding times at both sides during precise grinding.
9. **Spark out grinding**：The worktable reciprocation times, when 「Precise grinding amount」is reached and the feeding axis is not proceed.

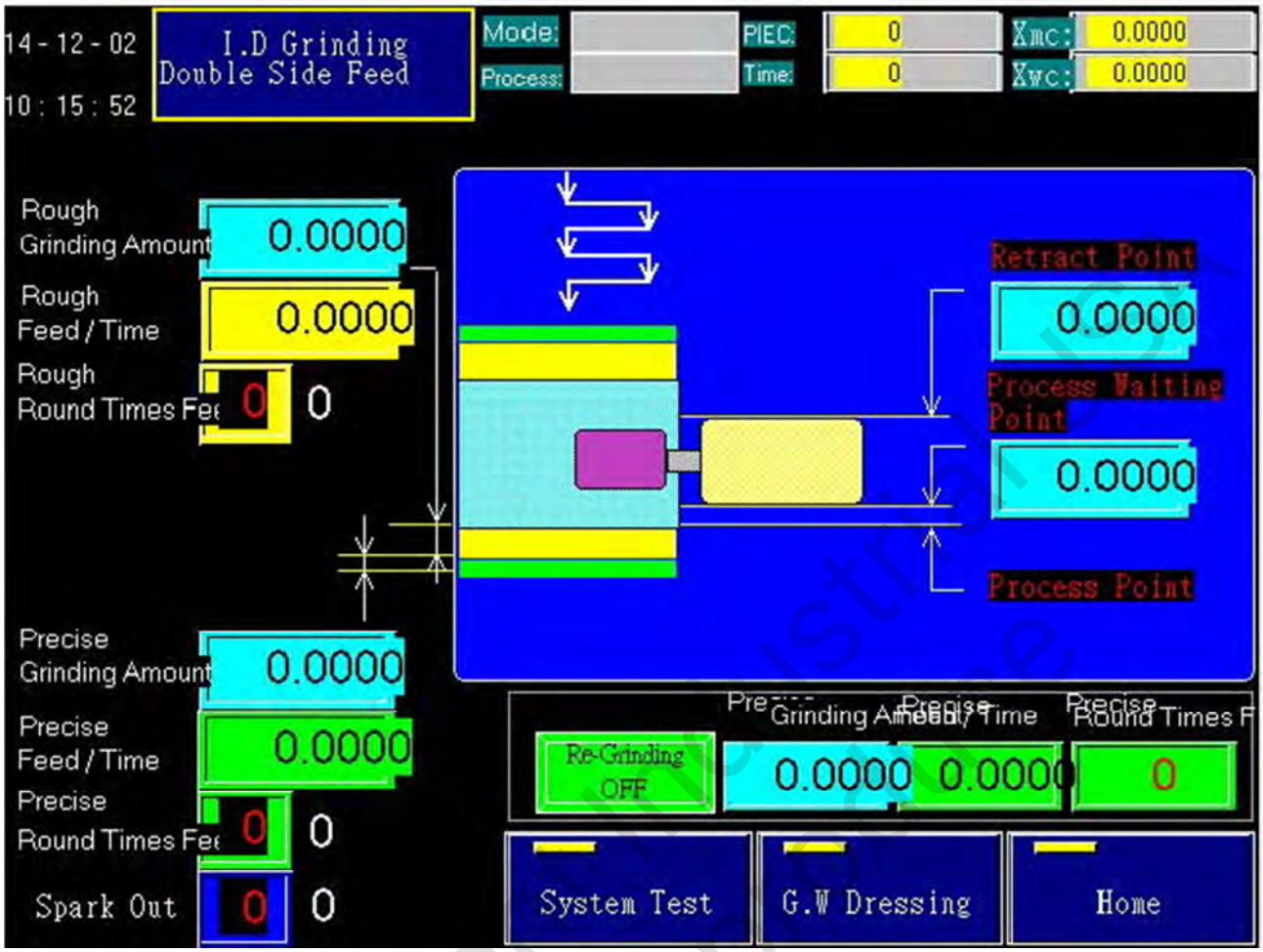


Figure 6-26

※「Double Side Feed」grinding example：

＞ Process condition： Wheel diameter = 35 mm, workpiece stock removal = 0.30 mm.

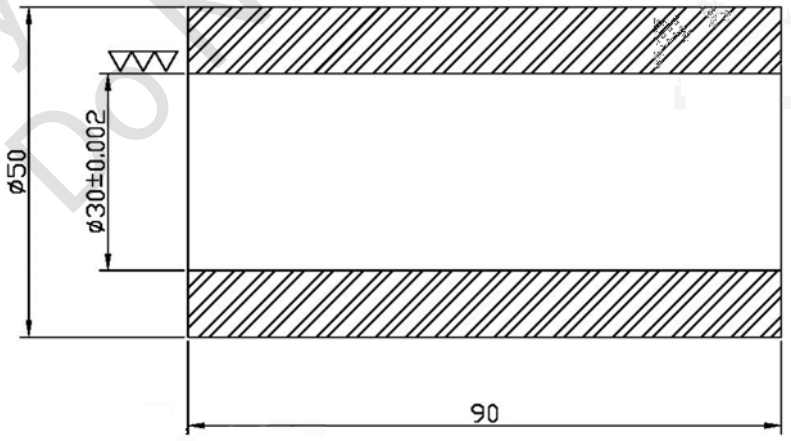


Figure 6-27

＞ Operation steps：

1. Switch worktable operation mode from「Automatic mode」to「Manual mode 」

2. Process point search：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process point setting：Switch to「Process Point Setting 」. Press to record position.
4. Enter「Double Side Feed」process parameter screen, set up the value below：

If 「Process Point」position ＝ －120.5000

> Process waiting point ＝ According to internal diameter (Distance away from 「Process point」in mm)

> Retract point ＝ According to internal diameter (Distance away from 「Process point」in mm)

> Rough grinding amount ＝ 0.2500 mm

> Rough feed / time ＝ 0.05 mm

> Rough round times feed ＝ 5 times

> Precise grinding amount ＝ 0.0500 mm

> Precise feed / time ＝ 0.01 mm

> Precise round times feed ＝ 5 times

> Spark out grinding ＝ 5 times

5. Process cycle procedure：

> Complete steps 1 - 4.

> Change to

> Press

> Retract point

> Process point

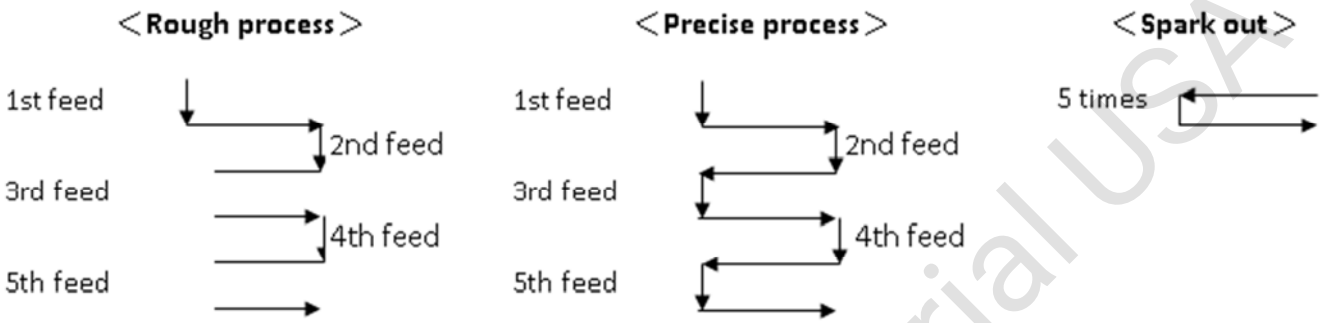
> Process point (Position value) ＝ －120.5000 _ 「Total dressing amount」

> Rough grinding cycle process 5 times and feed at both sides. Feed once when wheel returns to the feeding side and feed amount is 0.05 mm. Rough grinding amount is 0.25 mm.

> Precise grinding cycle process 5 times and feed at both sides. Feed once when

wheel returns to the feeding side and feed amount is 0.01 mm. Precise grinding amount is 0.05 mm.

＞Spark out grinding cycle process 5times.Work table reciprocate 5 times without feeding.



＞ Return to「Retract point」

＞ Process complete.

6.6 PROCESSING MODE SWITCHING

STEPS

1. Switch worktable operation mode from「Automatic mode」to「Manual mode 」
2. Process point search：Choose「JOG」or「Electronic Hand-wheel」mode to move wheel to touch workpiece grinding position.
3. Process mode selection：「Continual Feed Grinding」、「Left Side Feed Grinding」、「Right Side Feed Grinding」、「Double Side Feed Grinding」、「Compound Feed Grinding」、「Auto-reciprocate Feed」.
4. Set corresponding process parameter.
5. Switch worktable operation mode from「Manual mode 」to「Automatic mode」.
6. Press processing cycle start button
7. To change processing mode, repeats 1-6 steps to restart.

6.7 HMI OPERATION FRAME

EXPLANATION

Main page:

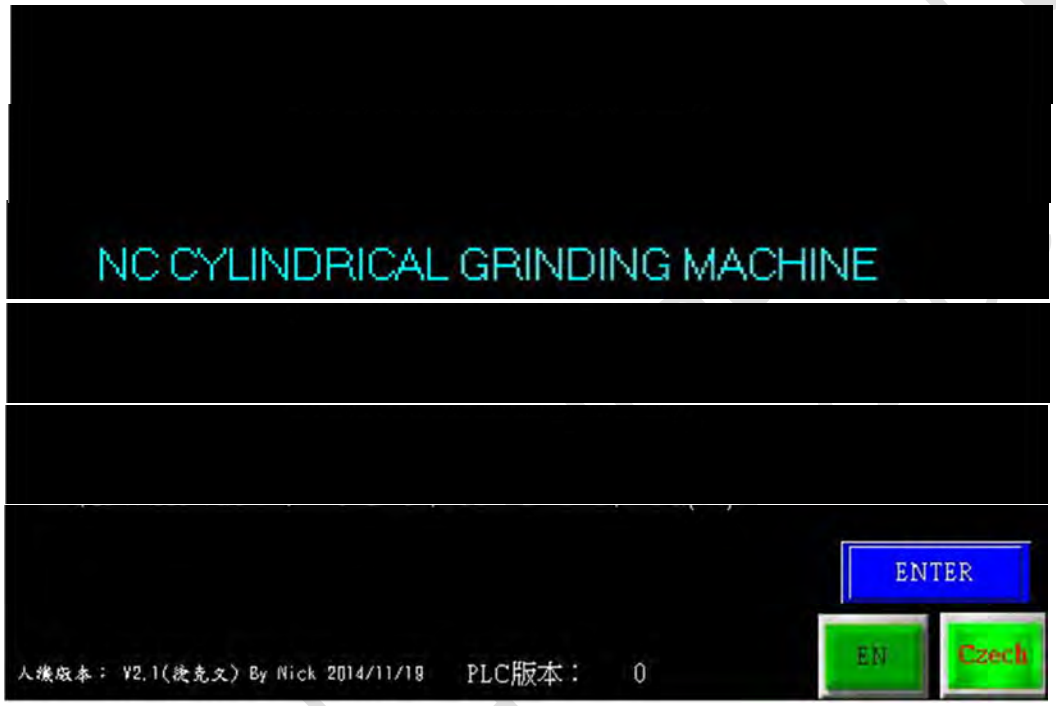


Figure 6-28

7 MAINTENANCE

7.1 PRECAUTION ITEMS

1. Not allow to use unidentified , worse quality and unclear oil
2. Be sure power off the main power before clean, maintenance the machine.
3. Always make machine into stopped operation to avoid any danger being happened.

7.2 PERIODICAL MAINTENANCE

ITEM	Periodical	Contents
Hydraulic Oil	Daily	The Volume could not low than the standard.
Lubrication Oil	Daily	The Volume could not low than the standard.
Coolant Supply	Daily	Not allow lower than 3/5 to height of tank.
Hydraulic pressure	Daily	12kgf / cm^2
Lubricator pressure	Daily	1kgf / cm^2
Anti-Water Robber	Daily	Replace if it damages.
Oil Skimmer	Daily	Drain out the oil if the meter over half.
Tank	Weekly	Replace new brand based upon Grinding degree and quality it get the best accuracy.
Spindle Belt Extension	Monthly	Check the extension whether it meets the std.
Wheel Belt Extension	Monthly	Check the extension whether it meets the std.
Filter	Monthly	Wash once from the first month, then monthly.
Lubricator Tank	Yearly	Fill new oil for the 3 months, then once yearly.
Hydraulic Tank	Yearly	Fill new oil for the 3 months, then once yearly.

7.3 CYLINDRICAL GRINDING MONTHLY

CHECK LIST

Unit	Item
Appearance	(1) Check if any rusts or scratches on worktable or chuck.
	(2) Check if any rusts or scratches on wheel spindle taper.
	(3) Check if splash guards equipped well.
	(4) Check if any rusts or scratches on guide surface or connection surface.
	(5) Check if any breakage on scraper.
	(6) Check if carrier, handwheels, ball shape handles bent and loosen.
	(7) Check if any bending or breakage on oil cup.
	(8) Check if any devices abnormal.
	(9) Check if all scale and indications clear.
Electrical equipment	(1) Check if covers of all switches complete.
	(2) Check if any coolant or dust enters the cabinet.
	(3) Check if any damage on switch connector.
	(4) Check if any incorrect fuses at cabinet.
	(5) Check if ground wire installed well.
	(6) Check if any poor isolation to motors and wiring.
	(7) Check if any loosen wire.
	(8) Check if any damage fuse.
	(9) Check if every switch is available.
	(10) Check if any indicating lamp normal.
	(11) Check if current meter abnormal.
	(12) Check if any noise or over heat to motors
	(13) Check if all coils are available.
	(14) Check if lights work well.
Lubricator, Hydraulic and relevant Devices	(1) Check if lubricator is enough.
	(2) Check if lubricator quality normal.
	(3) Check if oil supplying amount proper to lubricate.

Unit	Item
Lubricator, Hydraulic and relevant Devices	(4) Check if oil box plugged.
	(5) Check if enough oil filled in Hydraulic Tank.
	(6) Check if oil is replaced regularly.
	(7) Check if hydraulic pressure is normal.
	(8) Check if any abnormal vibration to the indicator.
	(9) Check if any leaking to cylindrical.
	(10) Check if any leaking from connectors or switches.
	(11) Check if filters plugged.
	(12) Check if any noise, vibration or over heated of Solenoid switch.
Filling Devices	(1) Check if coolant pump works properly.
	(2) Check if oil skimmer, filters are normal
	(3) Check if any leaking from pipe connectors or switches.
Worktable horizontal feed or angle swivel	(1) Check if the switch of hand wheels is normal.
	(2) Check if the hand wheel movement is smooth.
	(3) Check if the feeding and swiveling motion normal.
	(4) Check if any abnormal noise or vibration while feeding or
	(5) Check if the change of interval feeding or swivel speed normal.
	(6) Check if the adjustment of continue feeding or swivel speed
	(7) Check if auto-feeding or auto-swiveling stop halfway.
	(8) Check if any impaction happens wheel feeding direction is
Wheel head feed	(1) Check if hand wheel switch is normal.
	(2) Check if hand wheel movement is smooth.
	(3) Check if hand wheel backlash is too big.
	(4) Check if scale ring is fixed.
	(5) Check if the grinding motion starts and stops normally.
	(6) Check if the grinding movement is smooth.
	(7) Check if any noise or vibration happens while grinding.
	(8) Check if the exchange of interval grinding amount is normal.
	(9) Check if the speed adjustment of continue feeding is smooth.
	(10)Check if the auto-stop function of feeding amount device is

Unit	Item
Wheel spindle	(1) Check if any abnormal noise or vibration.
	(2) Check if bearing temperature is over heat.
	(3) Check if belt hook properly.
Work head	(1) Check if any abnormal noise, vibration during rotation.
	(2) Check if belt hook properly.

UNIT	ITEM
Lubricator, Hydraulic and relevant Devices	(1) Fill oil into tank.
	(2) Be sure the oils quality.
	(3)Supply the proper oil to lubrication.
	(4) Any plugged onto oil boxes?
	(5) Fill oil into Hydraulic Tank.
	(6) Whether fills oil regularly?
	(7) Hydraulic pressure is normal?
	(8) Any vibration to the indicator?
	(9) Any leaking to cylindrical?
	(10)Any leaking to connectors, switches?
	(11)Any plugged to filters?
	(12)Any noise, abnormal vibration or heat of electromagnetic switch?
Filling Devices	(1) Does Coolant Pump work properly?
	(2) Oil skimmer, Filters are normal?
	(3) Any leaking to water connection or switches.
Wheel Axis	(1) Any abnormal noise, vibration?
	(2) Is the temperature within range?
	(3) Any appropriate to the Belt hook?
Spindle	(1) Any abnormal noise, vibration during the rotation?
	(2) Any appropriate to the Belt hook?

7.4 RELEVANT OIL MAINTENANCE

1. Fill new oil if the oil quality is worse, will cause the machine badly.
2. Be sure keep the filters freely flow on inlet of Pump and maintenance periodically.
3. Replace the washer causes the main reason why it leaks.
4. Open the air free hole of hydraulic circuit to avoid the noise and vibration be occurred.

7.5 LUBRICATION

Will cause the machine life whether it uses the correct oil brand,thus, be sure purchase the oil from reliable suppliers and fill the oil specification asTable 7-1.

Be sure the oil level see if reaches the red line , fill it full till Reaches the red line, also prevent it from draining, all pressure should be follow up the specified pressure under the label instruction.

Table 7-1Lubrications

Item	Features	Mode	Periodical	Specification
Wheel spindle	1) Viscosity ISO VG5 2) Antirust, anti-oxidation anti-emulsify anti-foam	Force lubrication	New Machine Firstly：3 months Secondly：Once yearly Or 3000 hours	1) Mobil Velocite Oil No.4 2) ESSO Nuto H5 3) Shell Tellus C5
Coolant	1) Dissipate heat well 2) Good lubrication	Cycle	Proper	1) Soluble Oil 2) Mobil Mobilmet 122S 3) ESSO Kutwell 30 4) Shell Dromus Oil B
Tailstock	Antirust, anti-oxidation anti-emulsify anti-foam	Oil cup	Proper	1) Shell Tellus C68
Hydraulic box	1) Viscosity ISO VG46 2) Antirust, anti-oxidation anti-emulsify anti-foam	Cycle	Once yearly or 3000 hours	1) CPC (GULF) LPS46 2) MOBIL VELOCITE 1405 3) ESSO NUTO H46 4) SHELL TELLUS OIL 46 5) CHEVRON AW HYDRAULIC OIL 46 6) B.P ENERGOL HLP 46

PS:

1. Applied the same degree if cannot get the same brand specification.
2. Basically, the working cycle time is by 8 hours per day.

7.6 HYDRAULIC UNIT

7.6.1 Machine Body and Measuring System

I. Circuit of Lubrication：

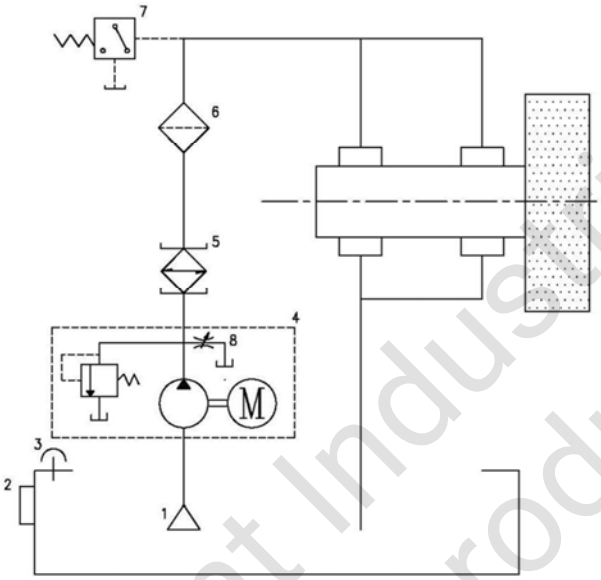


Figure 7-1

Table 7-2 Parts list

No.	Name	Specification Material No.	Quantity	Remark
01	Oil Filter	W03 / 2706-0062P06	1	
02	Level	LS-3 #12 / OO21-LS3	1	
03	Fill	HY-08-A / 2706-0062P02	1	
04	Motors	1/4HP 4P MA6+ Pressure/ 2706-0062P01	1	
05	Heat Exhauster-low pressure	AL608-CAI / 2706-0062P05	1	
06	Can of Oil	FPT-06 / OT-1OIL006-2P	1	
07	Pressure switch	Z-15GW22-B / ET16-Z15GW22B	1	
08	Throttle	TVC-02T / OO24-TVC-02T	1	

II. Hydraulic Unit

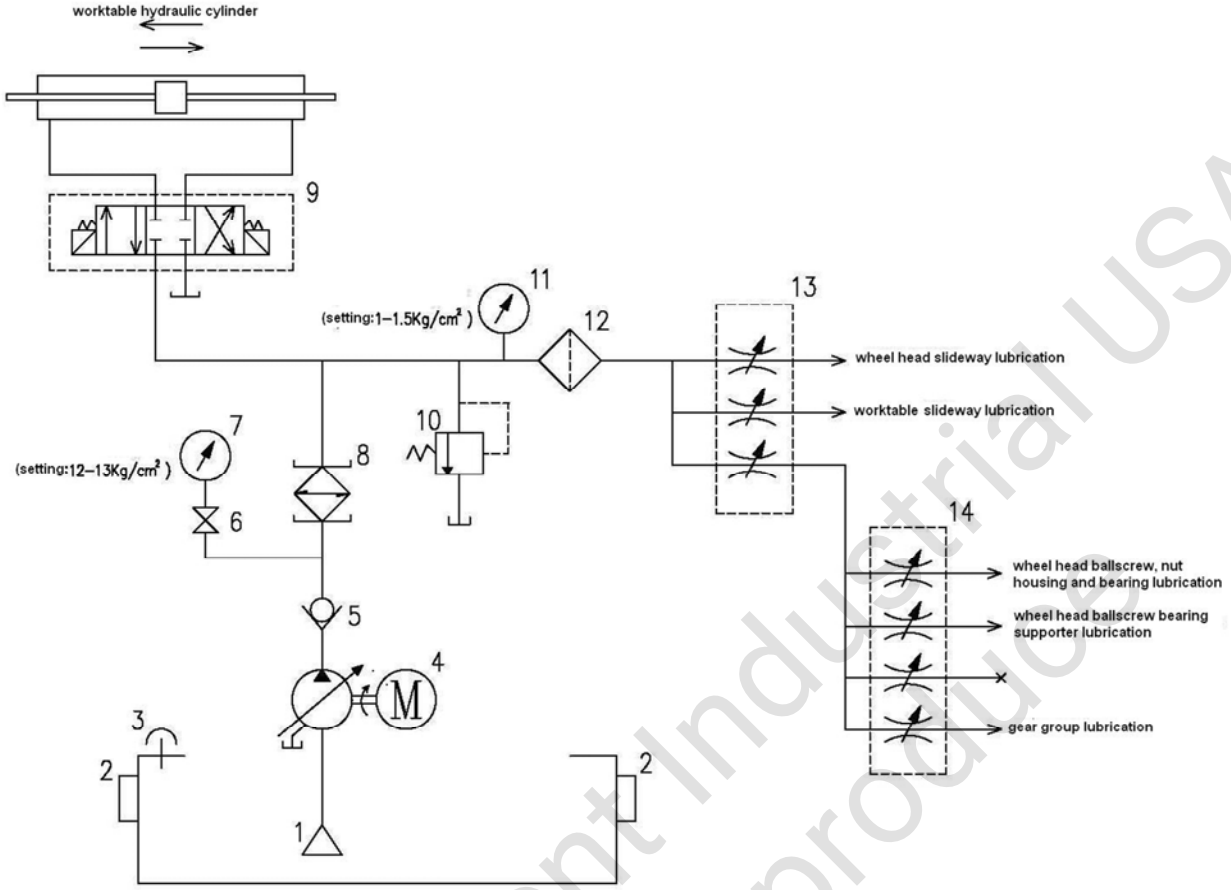


Figure 7-2

Table 7-3Parts List

No.	Name	Specification Material No	Quantity
01	Oil Filter	MFC-08	1
02	Level gauge	LS-3 #12	2
03	Oil Filler	HY-08-A	1
04	Motor	2HP 4P （M2-P3/4-SI）	1
		PVF-30-35（30 l/min）	1
05	Check Valve	CV-04 3/8” 90°	1
06	Suspension Valve	ST-02	1
07	Pressure gauge	2 1/2”-50kg	1
08	Slow Pressure Fan	AL608-CA1	1
09	Double solenoid valve	4WE6E/110V	1
10	Pressure relief valve	BRV-P-02M-30-0	1
11	Pressure gauge	2 1/2”-10kg	1
12	Oil filter can	FPT-06	1
13	Lubrication adjusting	2706-6007-1P	1
14	Oil distributor	B-4 Hole Radiusφ6	1

7.6.2 Lubrication Of Grinding Wheel (Dynamic Pressure)

I. Circuit of Lubrication

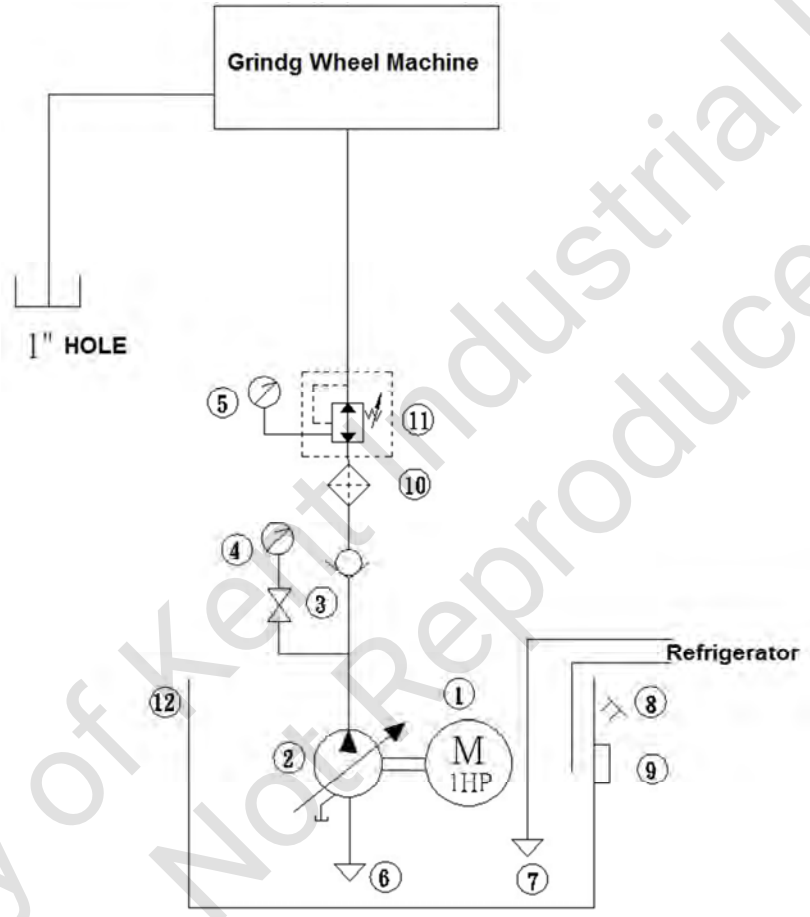


Figure 7-3

II. Hydraulic Unit

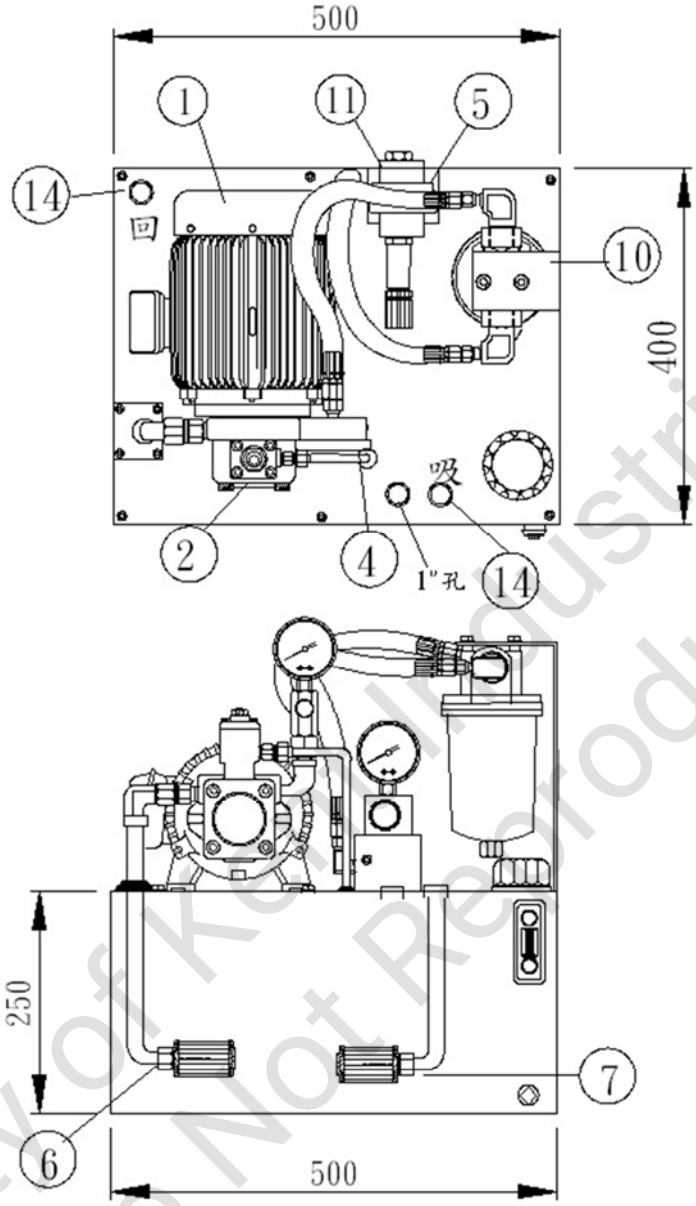


Figure 7-4

Table 7-4Parts List

NO.	NAME	Specification Material No.	Q'ty	NO.	NAME	Specification Material No.	Q'ty
1	Motor	M1-P3/4V20	1	8	Fill	HY-08-A	1
2	Pump	VPKC-F20A2-01	1	9	Level	LS-03	1
3	Stopper Valve	CKLG-03	1	10	Can Of Oil	FPP-06	1
4	Pressure gauge	SA2-50	1	11	Reducing Valve	BRV-02G-0-10	1
5	Pressure gauge	SA2-10	1	12	Oil Tank (LxWxH)	500x400x300 (mm)	1
6	Oil Filter	MF-06	1	13	Oil Duct Board	02/1	1
7	Oil Filter	MF-06	1	14	External Cooler Hole	1"	2

7.6.3 Accumulation of lubrication returns

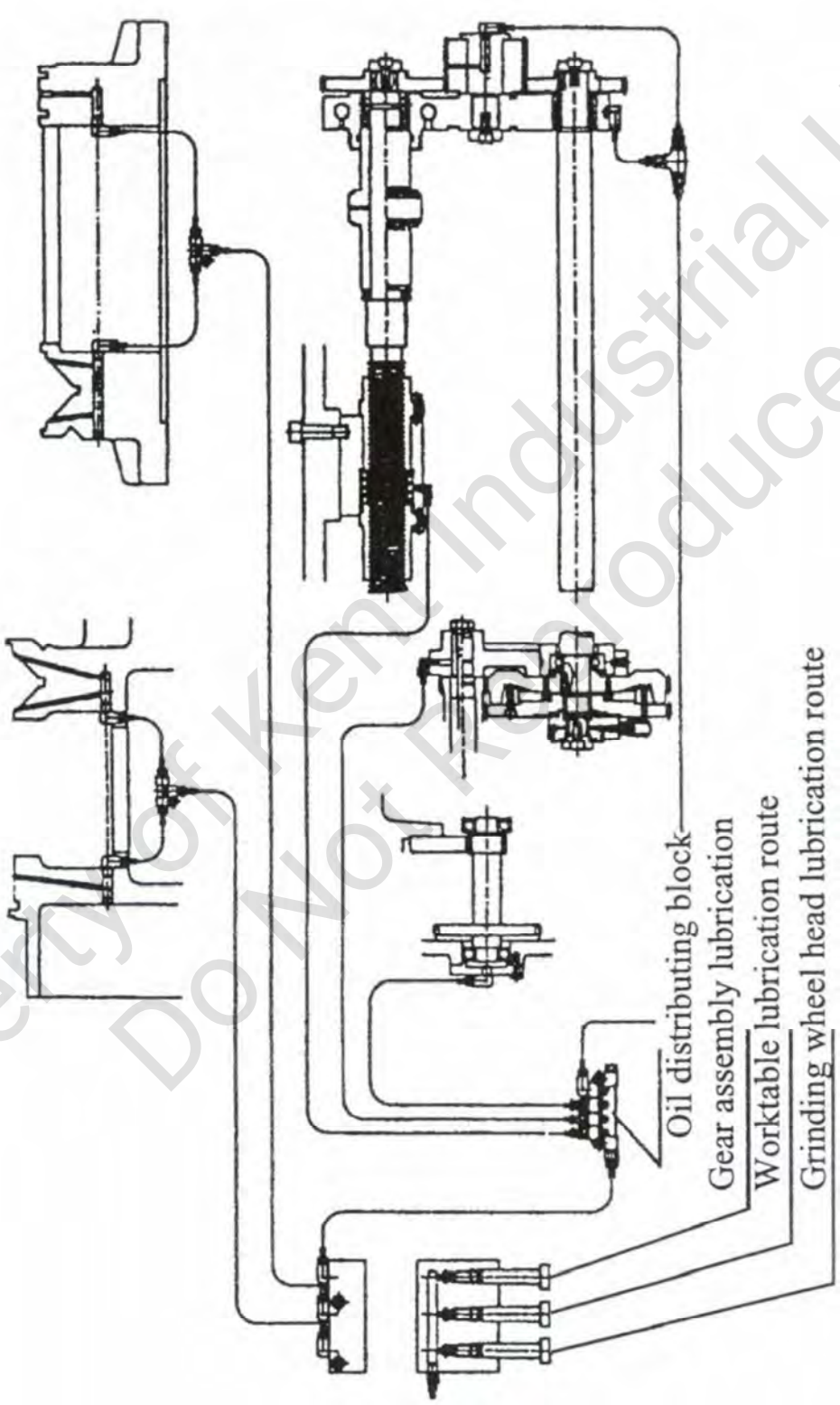


Figure 7-5

7.6.4 Hydraulic Actuator System

Wheel spindle force lubrication tank

Set 1/4HP bump pressure to be 1.5~1.8kg/cm^2 and cool by cooling fan. Then, pass oil filter can and through pressure switch to enter wheel spindle bearing for lubrication. If the pressure is too low, spindle can't be started. Therefore, pressure switch stops spindle running when hydraulic pressure is too low or oil circuit is stocked to protect spindle and bearing.

Oil tank for machine structure, tailstock and touch probe system (base on clients' demand)

Set 1HP adjustable bump motor total pressure to be 12~13kg/cm^2, and pass check valve to enter Manifolds.

Manifold exit 1→Single head solenoid valve controls movement and through throttle valve to control tailstock speed.

Manifold exit 2→Set the pressure of pressure relief valve to be 10kg/cm^2→Single head solenoid valve controls the hydraulic cylinder movement of end face probe.

Manifold exit 3→Set the pressure of pressure relief valve to be 10kg/cm^2 → Single head solenoid valve controls the outside diameter or thickness gauge via throttle valve. (Optional accessories)

Manifold exit 4→Set the pressure of pressure relief valve to be the hydraulic chuck default pressure→ Double head solenoid valve control hydraulic chuck clamp and release via guided check valve. (Optional accessories)

Manifold exit 5→Set the pressure of pressure relief valve to be 1~1.5kg/cm^2 and pass through oil filter. Then, distribute oil to sliders, ball screw, nuts, bearings and etc. by oil distributor for lubrication.

8 TROUBLE SHOOTING

8.1 REGULARLY ABNORMAL AND REMEDY

Table 8-1

Abnormal Condition	Causes	Remedy
Power indicator doesn't light after turning on.	1. Power supply shortage.	1. Check the power
	2. Off NFB.	2. Return on NFB.
	3. Power indicator not lights.	3. Repair the indicator.
	4. NFB faulty	4. Replace new NFB
	5. Transformer burn out	5. Replace new transformer
Pump is unavailable After pressing hydraulic start button.	1. Button switches contact failure.	1. Repair or Replacement
	2. Wire off or contact failure	2.Tighten the screw
	3. Relay is overload.	3. Press RESET key
	4. MS3 E magnetic contact failure.	4. Clean E magnetic contact surface.
	5.MS3 platinum contact wear	5. Replacement new one
	6. Motor burned out.	6. Repair or Replace new motor.
	7. MS3 coil burned out.	7. Replace new one.

Table 8-2

Abnormal Condition	Causes	Remedy
Grinding wheel spindle motor can't work.	1. Overloaded.	1. Press RESET key
	2. Low pressure makes pressure switch useless, filter stocked and micro switch failed.	2. Adjust pressure, clean oil filter and replace new switch.
	3. Hydraulic pump is failed.	3. Repair or Replace.
	4. Hydraulic pump works without delivering lubricator.	4. Repair or replace hydraulic pump
	5. When the pressure switch is on, the motor is not working.	5. Repair or Replace.
	6. Motor is burnt out	6. Repair or Replacement
Workhead is unavailable.	1. Relay is overheating.	1. Press RESET key
	2. Wire coupling clip is loosen.	2. Repair.
	3. Button contacts failure.	3. Repair or Replace.
	4. MS4 E magnetic contact failure.	4. Clean E magnetic contact surface.
	5. MS4 E coils burnt out.	5. Repair or Replace.
	6. MS4 E platinum contact surface worn.	6. Replace new one.
	7. Motor burnt out.	7. Repair or Replace.
Coolant doesn't flow.	1. Pump is unavailable.	1. Repair
	2. Coolant is not enough.	2. Fill more coolant.
	3. Coolant Switch is off.	3. Turn on the switch.
	4. Wheel Breakage	4. Replace new one

Table 8-3

Abnormal Condition	Causes	Remedy
Pressure can't be raised when bump is working.	Oil pipe connector is losing.	Repair and engage.
Worktable is not working.	1. Worktable speed adjusting knob is off.	1. Adjust worktable speed adjusting knob.
	2. Speed controlling valve or direction switching valve is stocked.	2. Repair base on oil circuit.
	3. Low hydraulic pressure.	3.Set pressure to be 12~13 kgf/㎠
Worktable horizontal stock bump	1. The horizontal pause function of adjust speed control valve is Broken.	1. Repair or reset pause time.
	2. Hydraulic oil is metamorphic.	2. Refill the new oil.
No Oil from Pump	1.Oil level too low	1. Fill in the oil.
	2. Oil pope to be clogged	2. Check any obstructer around the pipe causes clogged.
	3. Oil too viscosity	3. Refill in the oil in appliance with the Oil being used.
	4.Components Damaged	4. Replace the damaged one

Table 8-4

Abnormal Condition	Causes	Remedy
Noise from Pump	1. There is air in the pipe.	1. Make sure the pipe sunk into the tank completely.
	2. Air exists inside.	2. Make sure to exclude the air inside.
	3. Speed is too high.	3. Set up the original speed
	4. Filter has been clogged.	4. Be sure maintenance as label instructions.
	5. Oil pipe has been clogged.	5. Clean up the oil pipe.
	6. Components are broken.	6. Replace new one based upon The specifications.
	7. Oil viscosity is too high.	7. Applied as the specified.
	8. Pump and Motor are out of concentric	8. Re-installation
Belt Noise	1. Belt is losing.	1. Adjust the housing seat.
	2. Belt is deformed	2.Replace new belt
No chain reaction of grinding wheel rapid feeding and coolant pump	LS1 improper position	Adjust LS1 position
Wrong size display	1. Wheel wear too fast	1.Use proper grinding wheel
	2. .Eliminate spring fatigue of backlash	2. Replace a new spring
	3. Incorrect position of wheel rapid move	3. Clean cylinder and piston
	4. Transmission nut is broken during feeding.	4. Replace the worn parts

8.2 GRINDING ABNORMAL AND REMEDY

During grinding, 5 main elements should be concerned; machine, wheel, workpiece coolant and processing condition.

Table 8-5 ABNORMAL WHEEL LIST

Abnormal	Cause	Remedy
Blocked wheel surface (pores are blocked)	Unsuitable wheel	• Choose wheel with rough grain and rough pore • Choose wheel with friable grain
	Poor dressing device	• Dress by sharp diamond dresser • Speed up while dressing • Increase feeding amount while dressing
	Lack of coolant liquid	• Enlarge coolant flow
	Unsuitable coolant	• Choose low viscosity coolant
	Dirty coolant	• Clean the coolant tank and refill new coolant
	Unsuitable processing condition	• Increase workpiece peripheral speed • Choose smaller width wheel • Postpone the pause time of worktable reciprocation

Table 8-6 ABNORMAL WHEEL LIST

Abnormal	Cause	Remedy
Blocked wheel surface (wheel surface is smooth)	Unsuitable wheel	• Choose wheel with rough grain and soft grade
	Poor dressing device	• Dress by sharp diamond dresser • Speed up while dressing • Increase feeding amount for dressing
	Lack of coolant liquid	• Enlarge coolant flow
	Unsuitable coolant	• Use the coolant of concentrated system
	Dirty coolant	• Clean the coolant tank and refill new coolant
	Unsuitable processing condition	• Choose softer wheel and processing condition
Sand-dropping problem	Unsuitable wheel	• Choose wheel with fine grain and hard grade
	Poor dressing device	• Decrease speed while dressing • Decrease feeding amount for dressing
	Unsuitable coolant	• Choose high viscosity coolant
	Unsuitable processing condition	• Decrees workpiece Peripheral speed

Table 8-7 Unsatisfied accuracy

Abnormal	Cause	Remedy
Bad roundness	Bad center hole of centers	• Change new centers • Improve center hole accuracy • Clean and lubricate center hole
	Improper pressure of center	• Adjust center pressure until fits workpiece.
	Bad adjustment of center rest	• Re-adjust supporting position and quantity
	Uneven carrier force	• Adjust carrier force.
	Improper wheel	• Choose hard grad wheel
	Lack of coolant	• Enlarge coolant flow.
	Improper processing condition	• Reduce wheel feeding speed.
Bad cylindricity	Improper center position	• Adjust center position of workhead and tailstock
	Improper wheel dressing	• Check if dresser position is proper.
	Improper wheel	• Choose hard grade wheel
	Workpiece thermal expansion	• Enlarge coolant flow.
	Improper processing condition	• Reduce feeding speed while grinding (fine grinding) • Dress wheel into circle. Feed few amount and grind horizontally.
	Bad sliders	• Please contact with KENT USA.

Table 8-8 Unsatisfied workpiece surface

Abnormal	Cause	Remedy
Machining surface is burnt.	Improper wheel	• Choose soft grade wheel
	Lack of coolant	• Enlarge coolant flow
	Improper processing condition	• Reduce wheel feeding amount • Workpiece can't stop turning when wheel touches workpiece. • Increase workpeice peripheral speed • Choose the process condition which is fit to soft wheel
Fine spiral machining marks	Improper wheel dressing	• Replace new diamond dresser • Fasten diamond dresser • Reduce speed while dressing • Reduce dressing amount • Dress from the edge not from the wheel centre • Fix speed for dressing • The final dressing direction should be opposite to grinding direction.
	Improper wheel shape	• Dress wheel edge into circle.
Linear machining marks	Wheel end face is run out.	• Replace the new grinding wheel
Interval ring machining marks	The Centre of wheel spindle and workpiece is discordant.	• Please contact KENT USA.
	The Centre of wheel head and tailstock is discordant.	• Please contact KENT USA.

Table 8-9 Unsatisfied workpiece surface

Abnormal	Cause	Remedy
Trembling machining marks	Unbalanced wheel	• Adjust wheel balance after dressing. • Wheel dry runs 10~15 min. after coolant is stopped (remove internal water)
	Improper wheel	• Choose wheel with soft grade. • Choose wheel with rough grain. • Choose wheel with rough structure.
	Improper center, center hole and center rest	• Replace new center. • Re-grind center hole. • Re-adjust supporting position and supporting quantity.
	Insufficient belt tension of wheel head and work head	• Adjust belt tension.
	Improper wheel dressing	• Replace new diamond dresser. • Fasten diamond dresser.
	Machine shakes.	• Follow regulation to create machine foundation. • Stay away from vibration source.

9 GRINDING APPLICATION

I. WORKPIECE'S PERIPHERAL SPEED SUGGESTION LIST

Table 9-1

Operation Method		Soft Steel	Quenched Steel	Tool Steel	Cast Iron	Copper Alloy	Aluminum Alloy
Cylindrical Grinding	Rough	10~20	15~20	15~20	10~15	25~30	25~40
	Precise	6~15	6~16	6~16	6~15	14~20	18~30
	Precision	5~10	5~10	5~10	5~10	- -	- -
Internal Grinding	Precise	20~40	16~50	16~40	20~50	40~60	40~70

II. WORKPIECE'S PERIPHERAL , DIAMETER AND THEIR RELATIONS WITH SPINDLE SPEED

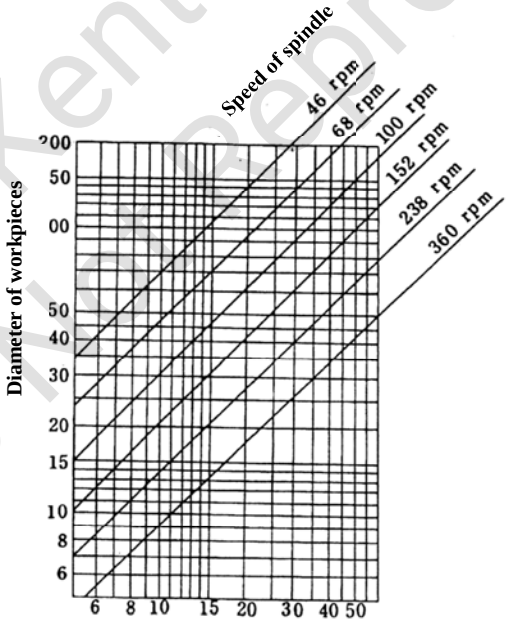
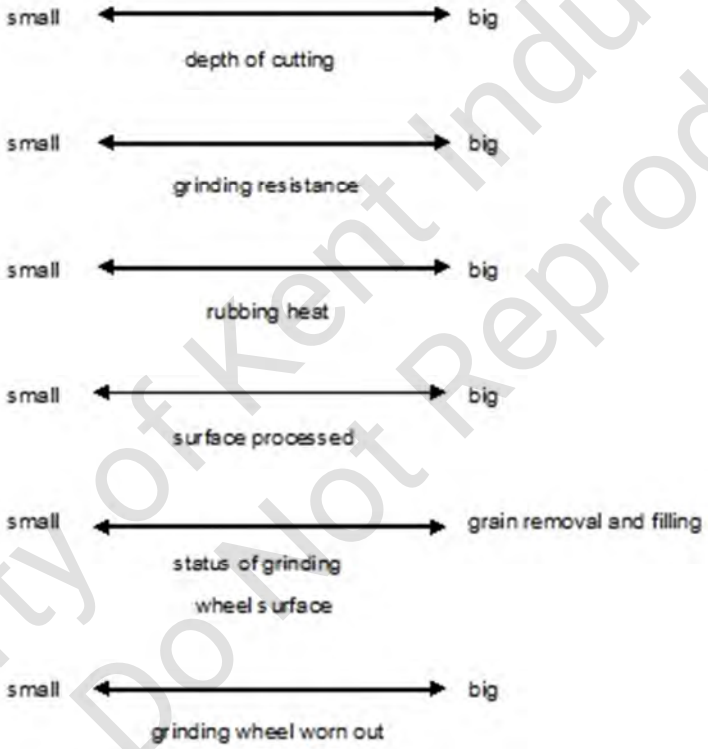


Figure 9-1

III. GRINDING WHEEL'S SUITABLE GRINDING DEPTH

Material / Surface Roughness / Process method		Soft steel	Quenched Steel (over HRC 40)	Tool steel	Heat Resistant Steel	Cast iron
Plunge Grinding	Precise	0.005~0.01	0.01~0.02	0005~0.01	0.005~0.01	0.005~0.01
	Rough	0.02~0.04	0.03~0.04	0.02~0.03	0.02 ~0.03	0.02 ~0.04
Horizontal Grinding	Precise	0.005~0.015	0.005~0.01	~0.005	-	0.005~0.01
	Rough	0.015~0.01	0.02~0.04	0.005~0.01	-	0.015~0.04
Internal Grinding	Precise	0.005~0.01	0.005~0.01	~0.005	~0.005	0.005~0.01
	Rough	0.015~0.03	0.015~0.03	0.005~0.015	-	0.015~0.03

IV. EFFECT OF GRINDING WHEEL CUTTING DEPTH



V. GRINDING WHEEL FOR COMMON METALS

Workpiece \ Method of grinding / Diameter of grinding / Wheel / Hardness			Cylindrical		Internal			
			~ 355	355 ~ 455	~ 16	16 ~ 50	32 ~ 50	50 ~ 75
			Small ◄► Big		Small ◄► Big			
General carbon steel	General structure rolled steel (SS) Mechanical structure carbon (S-C,S-CK) Structural carbon steel pipe (STK) Carbon steel wrought work (SF) Carbon steel cast work (SC)	Below HrC22	A60M	A54M	A80M			
		HrC22 Aluminum alloy	WA60L	WA54L	K WA80 L	K WA60 L	J WA54 K	J WA46 K
Alloy steel	Nickel chromium alloy steel (SNC) Nickel chromium molybdenum alloy steel (SNCM) Chromium steel (SCr)	Below HrC55	WA60L		L WA80 M	K WA60 L	J WA54 K	J WA46 K
	Chromium molybdenum alloy steel (SCM) Aluminum chromium molybdenum alloy steel (SACM) High carbon chromium bearing steel (SUJ) Structural alloy steel cast work (SCA) Carbon tool steel (SK)	HrC55Aluminum alloy	WA60K		WA80L	WA60K	WA54J	WA46J
Tool Steel	High speed steel (SKH)	Below HrC60	WA60K	WA54K	WA80L	WA60K	WA54J	WA46J
	Alloy tool steel (SKS,SKD,SKD)	HrC60	WA60J	WA54J	WA80K	WA60J	WA54I	WA46I
Stainless Steel	Stainless steel 1~4 (SUS 1~4) Heat-resistance steel 1~3 (SHE 1~3)		WA60K	WA54K	WA80L	WA60K	WA54J	WA46J
	Stainless steel 1~4 (SUS 5~16) Heat-resistance 1~3 (SHE 4~5)			WA46L		C54K		C63K
Common cast iron	Grey cast iron 1~5 (FC 1~5)		C60J	C54K	C80K		C54I	C46I
Special cast iron			GC60I	GC54J	GC80J	GC60I	GC54H	GC64H
Cold hardened cast iron			GC60I	GC54J				
Malleable cast-iron	Black heart malleable cast iron (FCMB) White heart malleable cast		A60M	A54M	WA 80M A	WA 60L A	WA 54K A	WA 46K A
Brass (Bs)			C46J，C36J				C36I	
Bronze (BC)			A54L，C36I				A60L	A46K
Aluminum A1,A2,A3			C46J，C63J					
Super hardened alloy S,G,D			GC80I，GC60，D100				D150	
Materials for permanent magnet (CAST MAGNET) MC			WA46K					

VI. Grinding Wheel Flange And Grinding Wheel Size

1. Grinding Wheel Flange Size(5in)

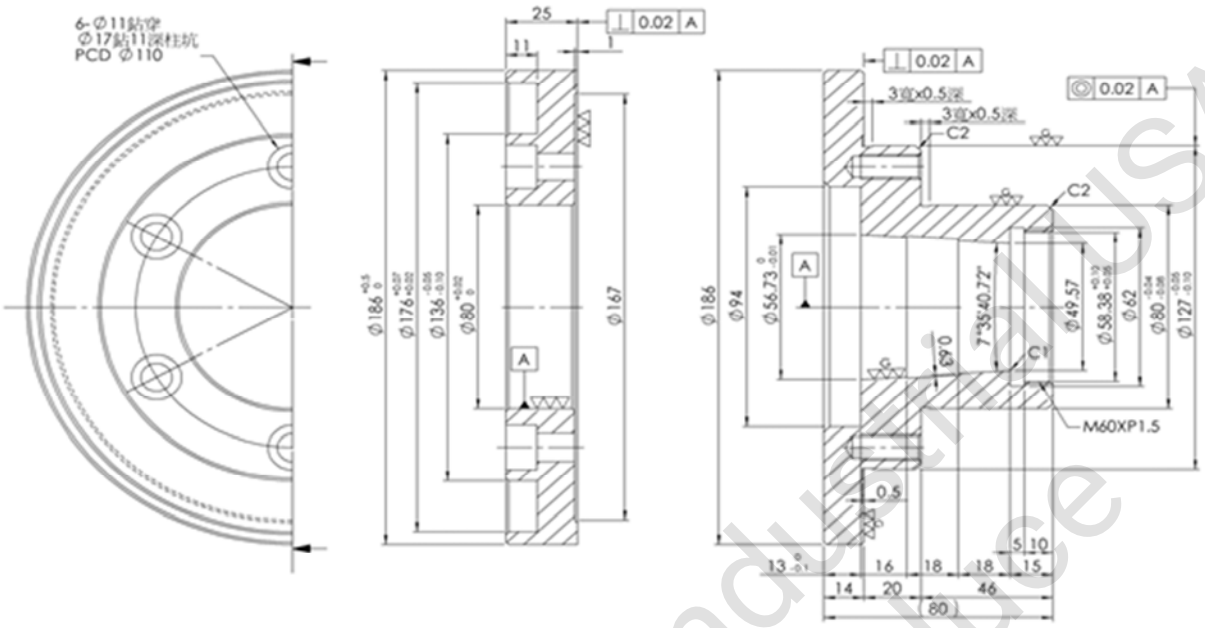


Figure 9-2

2. Grinding Wheel Flange Size(6in)

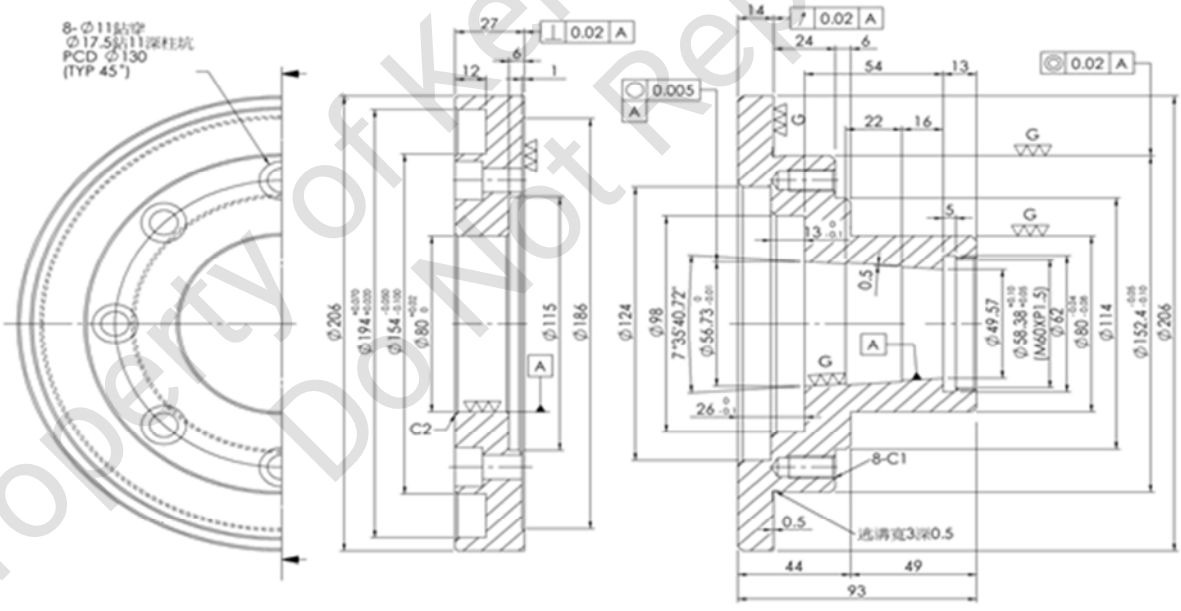


Figure 9-3

3. Grinding Wheel Flange Size（405 * 52 * 127mm）

Figure 9-4

4. Grinding Wheel Flange Size（405 * 52 * 152.4mm）

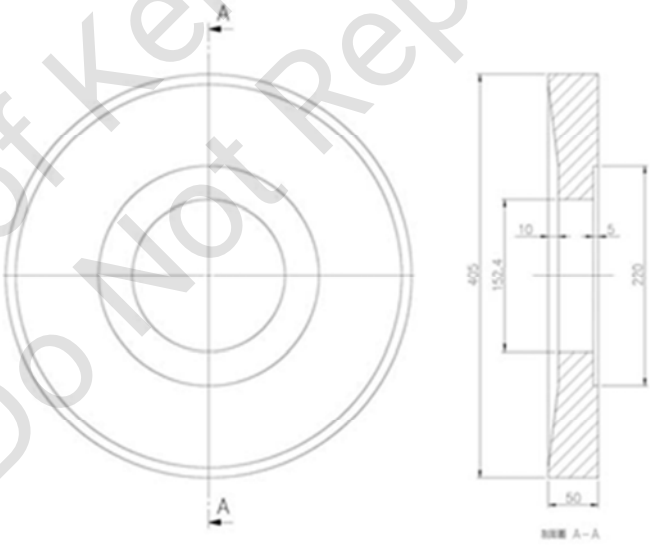


Figure 9-5

5. Bore, spindle and quill selection.

(1) Quill Size

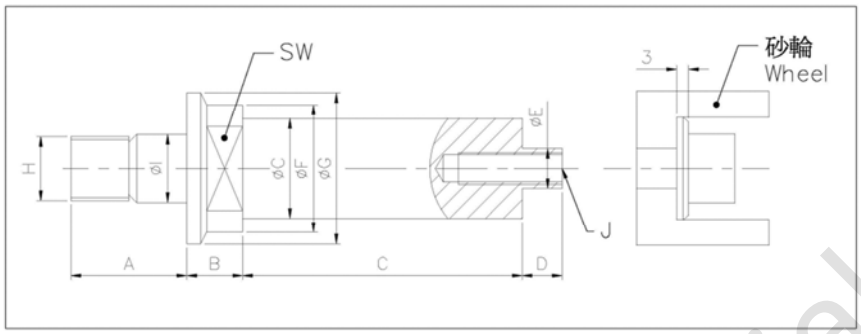


Figure 9-6

(2) Selection list （Bore : Length = 1：3，Maximum 150mm ）

	Spindle type （r.p.m）		ID	A	B	C	D	E	F	G	H	I	J	SW
1	Grease type	8,000	ϕ 65~180	42	16	ϕ 40*100 ϕ 40*85 ϕ 40*55	12	ϕ 12	ϕ 50	ϕ 58	M26*P2.0	ϕ 28	M8*P1.25	41
2	Grease type	15,000	ϕ 35~70	29	14	ϕ 30*90 ϕ 25*70 ϕ 20*60	10	ϕ 10	ϕ 32	ϕ 38	M16*P1.5	ϕ 17	M8*P1.25	24
	Oil-mist type	20,000	ϕ 24~40											
3	Grease type	20,000	ϕ 24~40	28	11	ϕ 24*80 ϕ 20*60 ϕ 16*40	8	ϕ 8	ϕ 26	ϕ 32	M14*P1.5	ϕ 15	M6*P1.0	19
	Oil-mist type	30,000	ϕ 15~25											
4	Grease type	30,000	ϕ 15~25	21	9	ϕ 16*40 ϕ 13*30 ϕ 10*25	6	ϕ 6	ϕ 21	ϕ 26	M10*P1.5	ϕ 10.5	M4*P0.7	17
	Oil-mist type	40,000	ϕ 12~16											
5	Grease type	40,000	ϕ 12~16	20	8	ϕ 12*35 ϕ 10*30 ϕ 8*25			ϕ 18	ϕ 23	M8*P1.25	ϕ 8.5	M4*P0.7	14
	Oil-mist type	50,000	ϕ 9~13											
6	Grease type	50,000	ϕ 9~13	18	7	ϕ 12*35 ϕ 10*30 ϕ 8*25			ϕ 15	ϕ 20	M7*P1.0	ϕ 7.5	M4*P0.7	11
	Oil-mist type	60,000	ϕ 7~10											
7	Oil-mist type	80,000	ϕ 6~8	13	6	ϕ 6.7*25 ϕ 6*20 ϕ 5.7*15			ϕ 11	ϕ 14	M5*P0.8	ϕ 5.5	M4*P0.7 M3*P0.5	8