

# SURFACE GRINDERS

- OPERATIONS MANUAL -

SH-920, SH-1224, SH-1632,  
SH-1640

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## **PREFACE**

- 1. This instruction manual is for SHARP series ONLY. Please keep this manual in a safe place where operators can easily access to when necessary. Please read this instruction manual carefully before operating SHARP machine.**
- 2. Please check the serial No. of machine which should be the same as the number indicated on the accuracy table of this manual.**
- 3. Please follow the instruction manual for operation and maintenance. Do not change any circuits, functions and parts of machine without approvals from SHARP. Please note that SHARP will not take any responsibilities for these faults.**
- 4. Since SHARP subscribes to a process of continuous improvement for our products, designs and specifications are subject to change without notices.**
- 5. Please check the machine and its accessories right away after unpacking. If there are any problems, please do not hesitate to contact us directly.**

## **SAFETY INSTRUCTIONS**

1. Avoid using any improper work pieces.
2. The grinder can only be operated or maintained by eligible persons who have trained for handling grinding machines.
3. On-site safety training is required for both operators and troubleshooters.
4. The buyer shall remind their operators to follow the safety instructions at all times.
5. ***Please read the instruction thoroughly before using the machine.*** If there are any queries about the machine, please contact our local representatives or us directly. Do not attempt to overcome any machine problems by yourself.
6. Make sure the main power source of machine is properly shut down during maintenance.
7. Do not measure, move or exchange work pieces when a working table is moving or the wheel is rotating / approaching to the work pieces.
8. DONT remove grits or dirt from machine until the grinding process is fully finished.
9. Before turning on the spindle, make sure the grinding wheel is fastened on the spindle and the rotating direction of wheel is matching the direction on the cover. Let the wheel run idly for at least 5 minutes before grinding any work pieces.
10. Be familiar to all switches, especially the emergency stop button.
11. Goggles, masks and working boots are required while operating machines.
12. Neckties, gloves, and unsuitable work suits like long sleeves and loose garments are not allowed while operating the grinder.
13. Hair tie or hat is required for longhaired operators.
14. Keeping a clean and dry environment around machine can prolong the machine service life.
15. Keep the chuck surface clean. If it is scratched, re-grind it immediately.
16. It is obligated to wear gloves while loading sharp work pieces. Please use cranes for loading bigger-sized work pieces, especially the ones are over 25 kg.

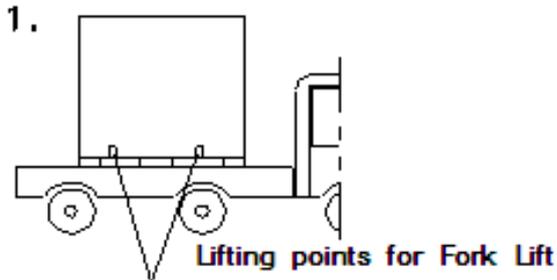
17. **DONT** make any table adjustments while machine is still functioning.
18. Stabilize work pieces before grinding.
19. To avoid any accidents, once a wheel starts functioning, keeping a safety distance between the work piece and the wheel is obligatory.
20. **DONT** leave the operating grinder unattended.
21. Only firmed work pieces are allowed to put on the machine during grinding.
22. **DONT** attempt to stop the running wheel by hands or other outer forces.
23. **DONT use compressed air / fluid to clean the machine at any time, since it will cause fallen grits and dusts uncontrolled.**
24. **DONT** use compressed air / fluid to clean the drain ditch of machine in order to prevent the dirt from entering the slide ways.
25. **DONT** adjust the nozzle after the wheel starts up. Close down the coolant before turning off the wheel.
26. **DONT** change any applications or machine capacity such as using overloaded work pieces or oversize wheels, installing a vertical spindle head and so on without confirming.
27. Before installing the wheel onto spindle, first to clean up the flange cone bore and spindle taper. Never knock on the wheel or flange if it is difficult to remove wheel. Please use the wheel spindle screw nut to remove wheel instead.
28. Except for trained operators, others are not allowed to access the machine during the grinding process. Leaning on the machine is prohibited.
29. **ONLY** professional electro-engineers are eligible to maintain the electrical devices.
30. Please read the warning signs carefully before checking the power source.
31. Any machine modifications should be approved by SHARP.
32. All electrical components must be properly grounded and comply with the related regulations for the safety concern. *Failure to do so will void the warranty.*
33. Avoid wearing metal adornments like eyeglasses frames, bracelets and bangles while repairing or maintaining electrical parts.
34. Please do not approach to the sparking zones while grinding.
35. **DONT** grind flammable metals like aluminum, magnesium and unhealthful

substances which will easily generate dusts, gases, liquids or vapors during grinding.

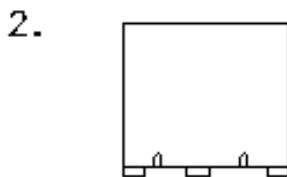
36. The interlock switches installed on wheel guard and control box are for the purpose of power interruption.
37. Please calculate peripheral speed before adjusting the frequency of spindle motor inverter (if installed this optional accessory). Please check page 50 for more details.
38. SHARP warranty of each machine is based on an 8-hour standard operation per day. If the machine is operating more than 8 hours per day, please note that SHARP has the right to shorten the warranty period to 6-month.
39. After an 8-hour operation, please rest the machine for at least 1 hour.
40. Please don't touch the directional control arm either by hand or by any outer forces during table movement.

## UNLOADING INSTRUCTIONS

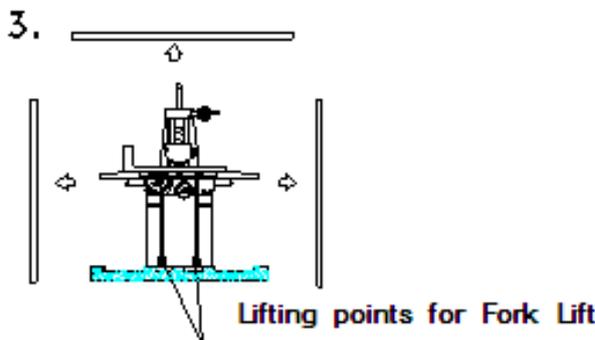
### (A) Using Fork-lift Trucks



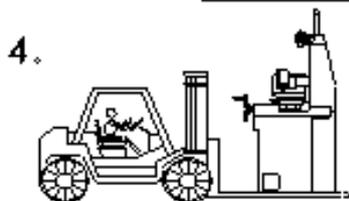
Release the wooden case from the fixative devices.



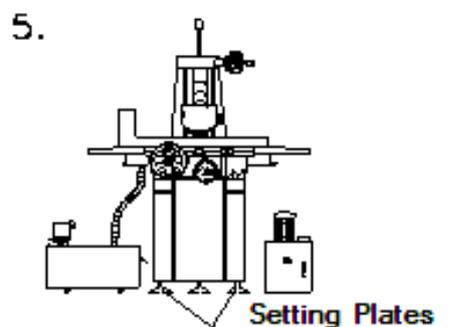
Unload the wooden case by the fork lift.



Uncrate the machine.



Position the machine at the desirable position.

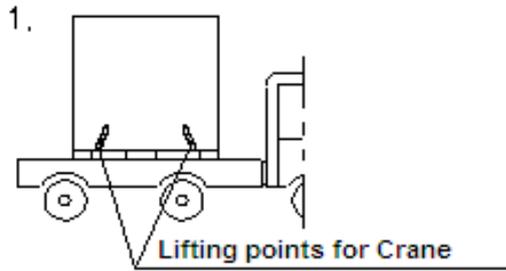


Unpack and install the machine.

**Note:**

The capacity of fork-lift trucks depends on the gross weight of machines.

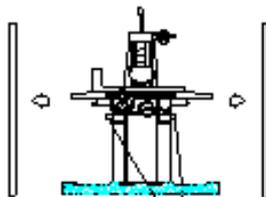
**(B) Using Cranes or Elevating Platforms**



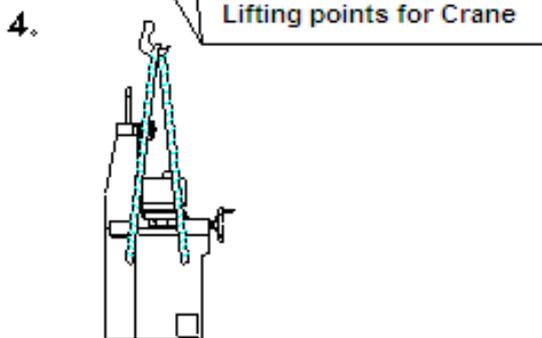
Release the wooden case from the fixative devices.



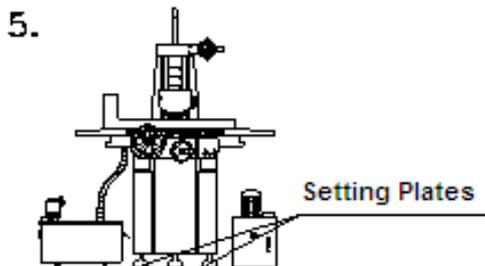
Unload the wooden case by the crane or elevating platform.



Uncrate the machine.



Position the machine at the desirable position.



Unpack and install the machine.

**Note:**

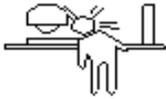
The capacity of cranes or elevating platforms depends on the gross weight of machines.

## N O T E S

- \* All SHARP machines have been undertaken a 4-hour running test for small machines and an 8-hour test for bigger machines before delivery, to insure their excellent condition. Please contact us immediately if there are any questions related to our machines.
  
- \* We would like to emphasize SHARP three prominent features as:
  1. Smooth table traverse running
  2. Quiet machine operations
  3. Simple and modern machine-design without much maintenance required

Thank you for using SHARP surface grinding machines and sincerely hope SHARP machines can grind you a bright future. Please enjoy it!

## WARNING

 <b>WARNING</b>	
	<ol style="list-style-type: none"> <li>1. The wheel spindle turns clockwise.</li> <li>2. The wheel should bear peripheral speed 2300 m/min or up.</li> <li>3. The spindle rotation speed is 1800/1500 (60Hz/50Hz)min<sup>-1</sup>.</li> <li>4. Max wheel dimension: OD 355mm x ID127mm x W 25mm. (SH-920) OD 355mm x ID127mm x W 38mm. (SH-1632, SH-1640, SH-1224)</li> </ol>
	<ol style="list-style-type: none"> <li>1. No allow to clean or remove workpiece &amp; tools before the wheel stopped.</li> <li>2. The wheel guard must be close while the wheel is in operation.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Avoid improper operation causing wheel cracks.</li> <li>2. Un' trained persons are not allowed in the working area.</li> <li>3. Do not use compressed fluid or air to clean up the spindle any time.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Keep head off the working table while the table is in motion.</li> <li>2. Do not grind unhealthful substance which is easy to cause dusts, gases, liquids or vapors in grinding.</li> <li>3. Do not grind flammable metals like aluminum, magnesium which are easy to cause fire or explosion.</li> </ol>

### HYDRAULIC SYSTEM

1. Keep oil pressure around 10~25 bar.
2. Use **SHELL** Tellus S2 M68, **MOBIL** DTE 26, **CASTROL** Hyspin AWH-M 68, **AGIP** OSO 68, **ARAL** Vitam GX 68.
3. Always keep the oil above the minimum red warning line.
4. Change new oil and clean oil tank after 3-month of the first usage, then repeat this cleaning process once a year.

### LUBRICATION OIL

- SHELL: Tonna S3 M68
- MOBIL: Vactra NO.2
- CASTROL: Magna BD68
- AGIP: Exidia HG68
- ARAL: Deganit B68



**DO NOT** use **COMPRESSED AIR** to clean the coolant channel and working table because the airborne grits and dusts will damage the slide ways.

- ※ **The chuck surface hasn't been grinded before delivery.**
- ※ **Please grind it after proper installation of the machine.**

### ※ ※ TO THE COMMISSIONED ENGINEER

1. Due to the improper operation, spindle vibrations would occur because of the caused damage. Please kindly make sure to provide the best quality of the spindle to the customer, with no noises and good run out of the taper nose.
2. Clean rusty preventive around the housing channel and throughout the spindle taper, in order to avoid the grit and dust glued alongside. It can be the major cause of the spindle noise.

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## (A) INSTALLATION

### 1. LIFTING

- 1.1 The machine should be lifted by a fork-lift truck or crane.
- 1.2 There are clamps tightened on the spindle and table to stabilize during transition, DONT remove these clamps until the machine is completely installed.

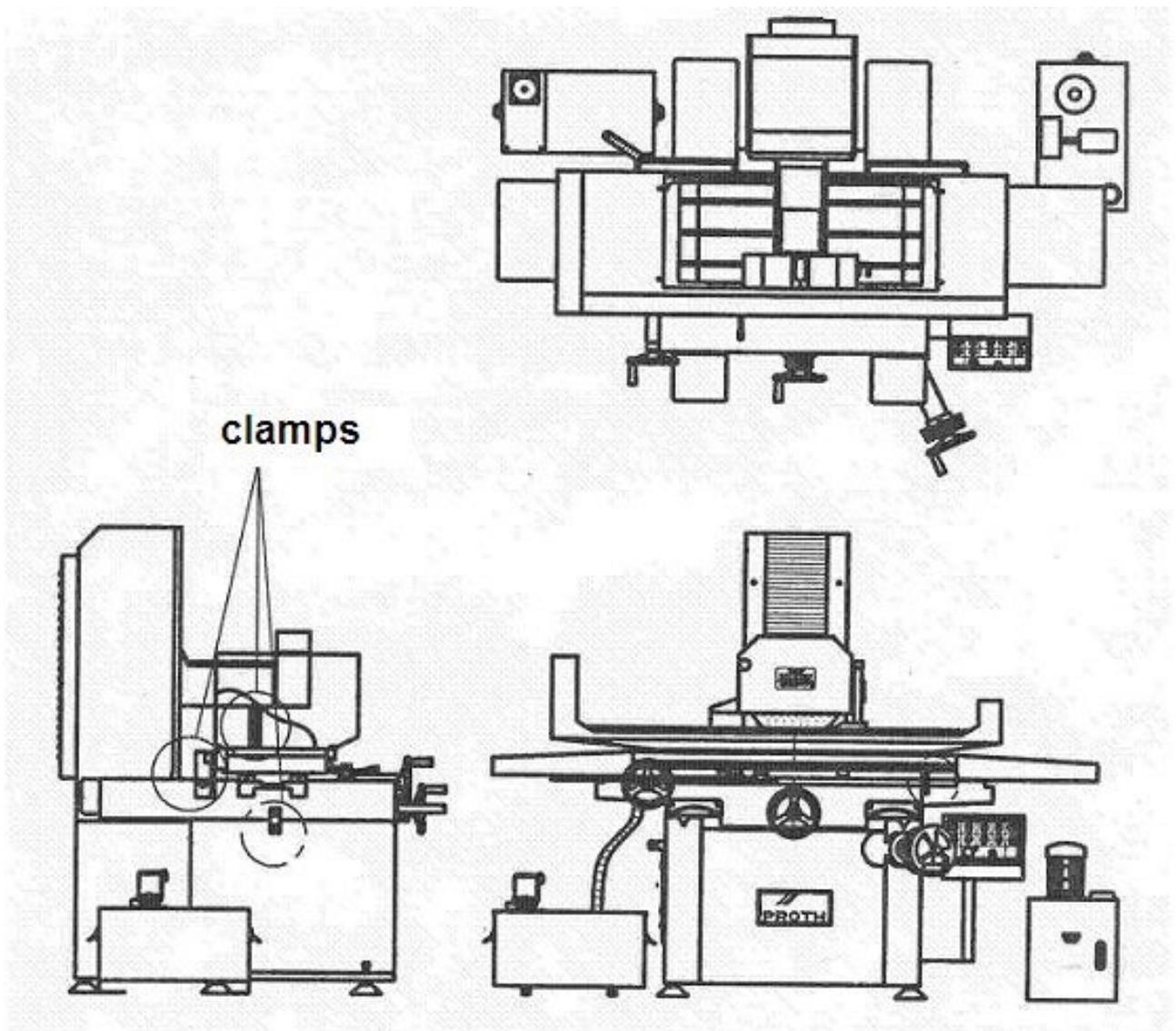


Fig. 1-1 Lifting

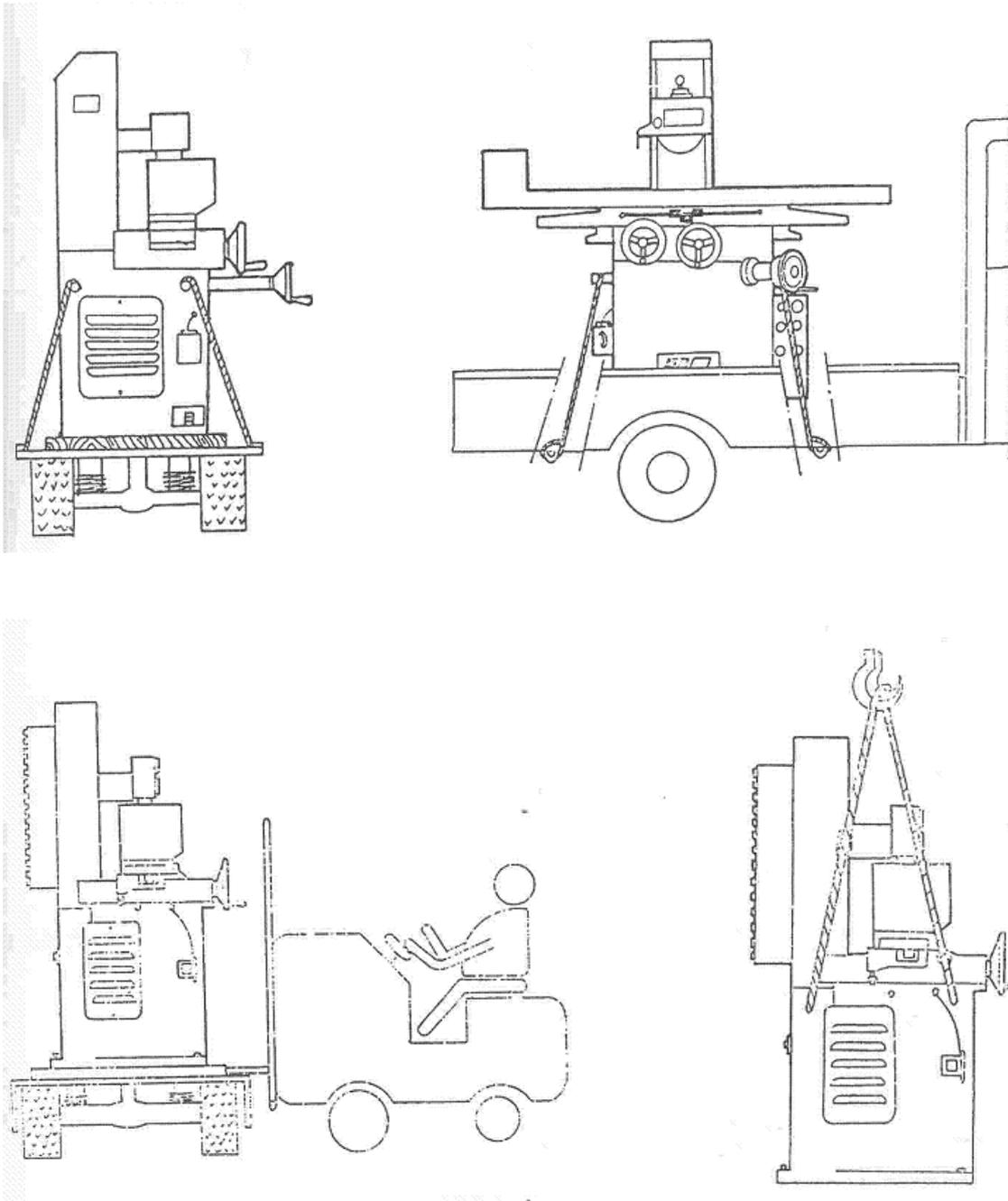


Fig. 1-2 Lifting

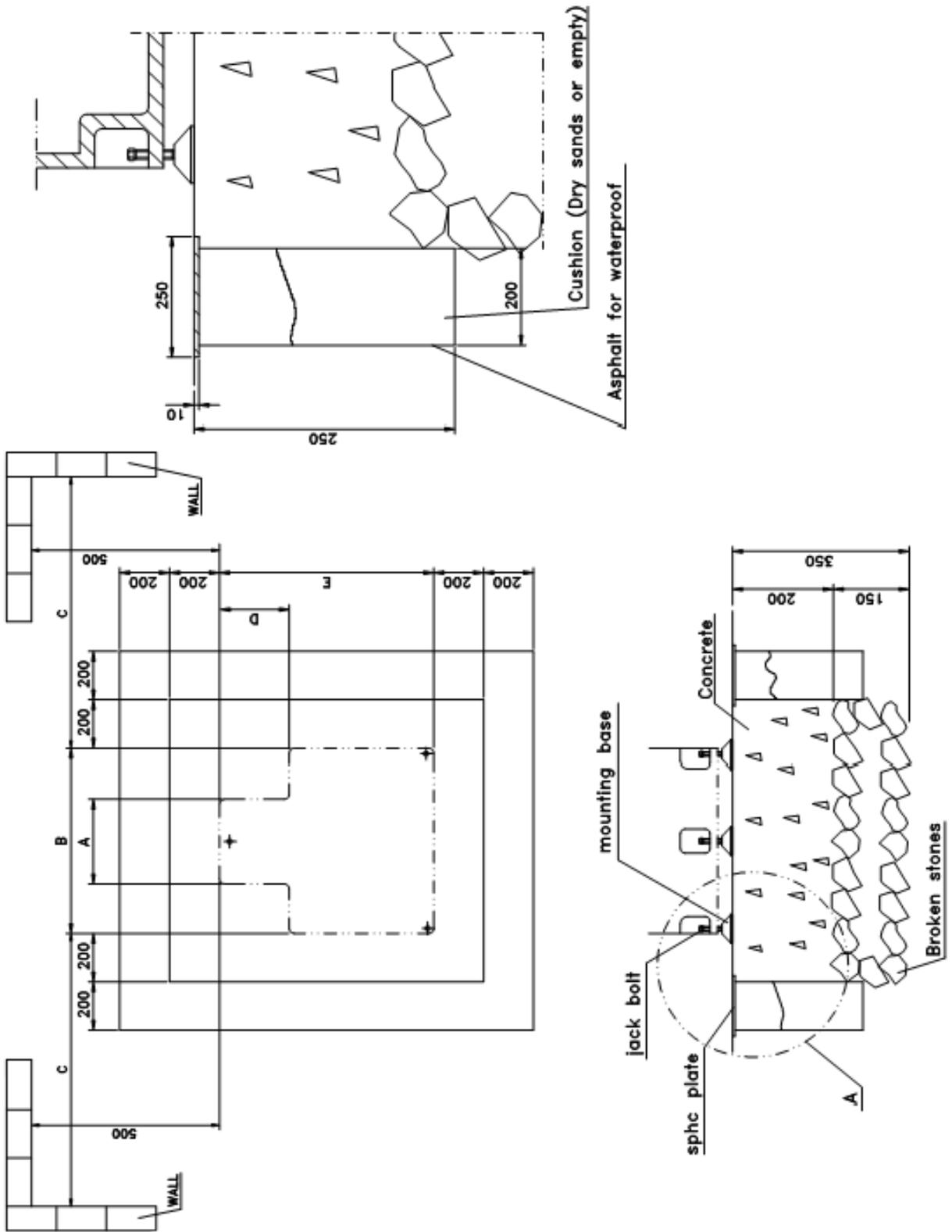
## 2. INSTALLATION

2.1 Location: It is very important to install the grinding machine at the proper site to obtain high accuracy. An ideal location is as followings:

- 2.1.1 The best location for the machine is where it has the least temperature variations.
- 2.1.2 Avoid installing the machine in a place where the nearby machines may splash cutting chips.
- 2.1.3 Install the machine at a vibration-free place, away from compressors, pressers, planers and other machines which would cause vibrations.
- 2.1.4 If the ground is not solid enough or very close to the vibrating sources, please install concrete foundation or setup a vibrant-free protection.

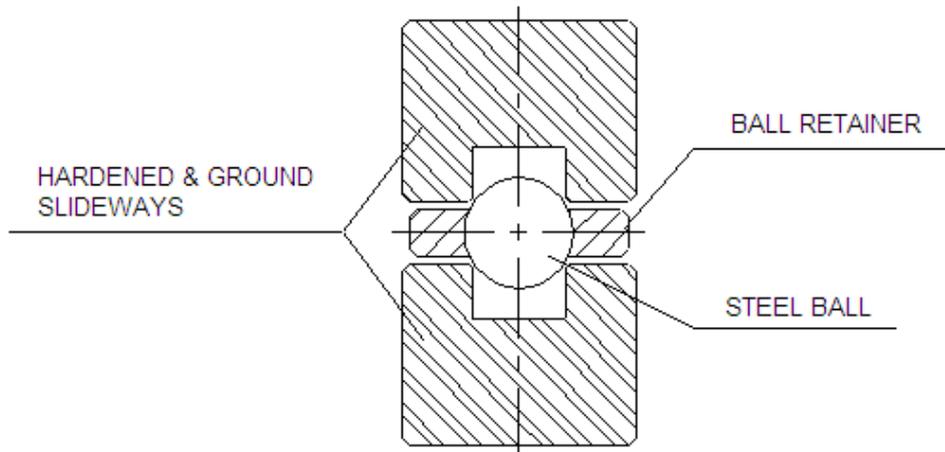
### 2.2 Foundation and Installation

- 2.2.1 In case the machine is not installed properly, the result of stripe or chatter marks can appear. To solve the problem, it is better to place the machine in a foundation as shown in Fig. 2 with jack bolts.



### 3. Mounting the table

3.1 The following procedures are applicable to grinders with ball-rolling slide ways. (Fig. 2a)



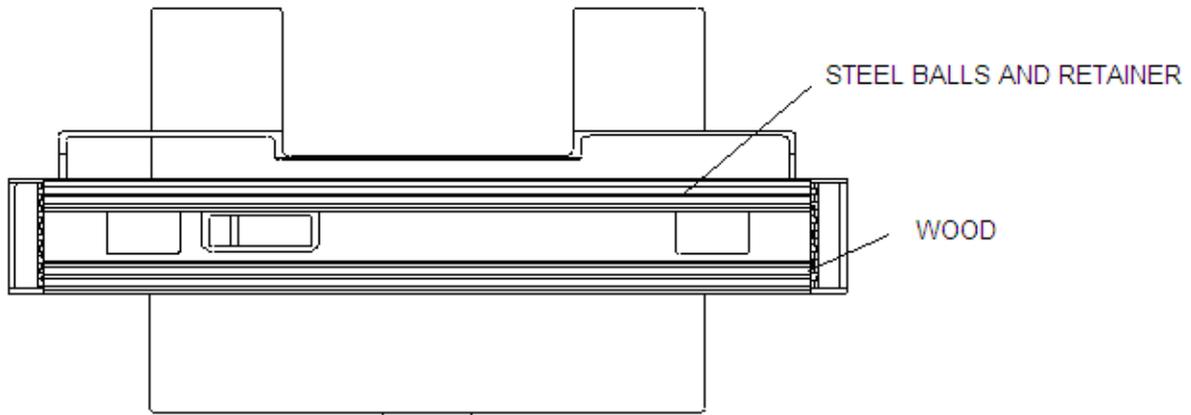
**Fig. 2a**

3.2 To protect the hardened and ground ball rolling slide ways, the table is floated from steel balls when machine in transportation.

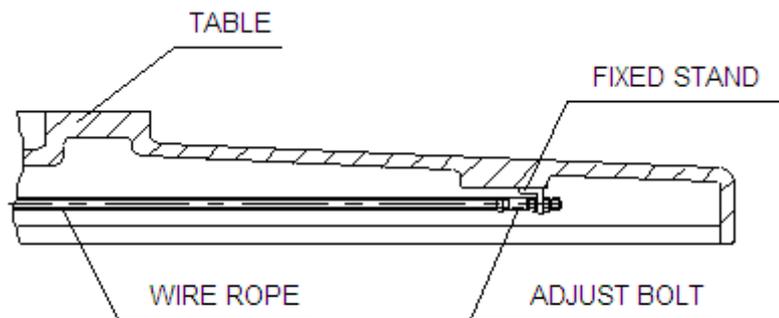
3.3 When the machine is placed in position, mounting the table as follows:

- 3.3.1 Wind the wire rope on the “drum” as shown in Fig. 2b, then tight and fix it temporarily.
- 3.3.2 Put steel balls and retainers on the slide ways (in Fig. 2a), with the longer one at the rear and the shorter one in the front close to the operator.
- 3.3.3 Have 2 pieces of wood on both ends of the saddle slide as shown in the below picture.

3.4 Put the table on the wood. Lift one end of the table by two hands and take off the wood. Lay down this table slide on the steel balls carefully, and repeat the same process for the other end.



3.5 Fix the wire rope on the fixed stand as Fig. 2c.



**Fig. 2c**

3.6 The wire rope will be loosen after long usage and may slip on the “drum”, and the result is that the table cannot move smoothly. If this situation happens, please adjust the “adjust bolt” at the right end of the table until it gets back to the tighten condition again.

## 4. Leveling:

Machines should be carefully leveled by a 0.02/m precision spirit level and equally load on the jack bolts. The adjusting procedure is as followings:

- 4.1 Put a spirit level in the middle of the table (or on its magnetic chuck if any) in longitudinal and transverse direction, adjust jack bolts until the level bulb indicates within 0.02/m.
- 4.2 To obtain good accuracy, it is recommended that the machine should be leveled repeatedly.
  - 4.2.1 The machine should stand still for 24 hours after final installation and it is better to ensure that the machine temperature is similar to that of the ambient circumstances.
  - 4.2.2 Start the machine with hydraulic system to let the table running reciprocally for at least 2 hours, to ensure the machine gets used to the temperature of its normal operation condition.
  - 4.2.3 Re-check and adjust the leveling condition of the machine, then regrind the table (or chuck) surface to make it flat.
  - 4.2.4 Every time the machine level is checked, make sure the table (or chuck) surface should be reground for accuracy.
  - 4.2.5 The machine will lose its level usually due to machine vibration and other causes, so it is highly recommended that the machine needs to check leveling periodically.
  - 4.2.6 Although the leveling operation is troublesome, it is essential for getting good operation results. It is better to have the machine leveled at least once every month.

**(B) STARTING UP THE MACHINE**

**1. Take away the clamping plates**

1.1 Take away the clamping plates which clamp:

- (A) the table with saddle, and
- (B) the saddle with machine bases.

1.2 Do not turn the hand wheel before the clamping plates are removed.

**2. Turn the table longitudinal control lever L1 to its valve closing position (Fig.3). Note: L1 correspond to the handle for flow control valve 10a of Fig.20.**

**3. Turn the directional arm L2 to its neutral position (L2 in Fig.3), correspond to the arm for pilot valve 10b of Fig.20.**

**4. Table dogs T1, T2 (Fig.3) must be well fixed at its proper position (not exceed its maximum stroke) in table slot.**

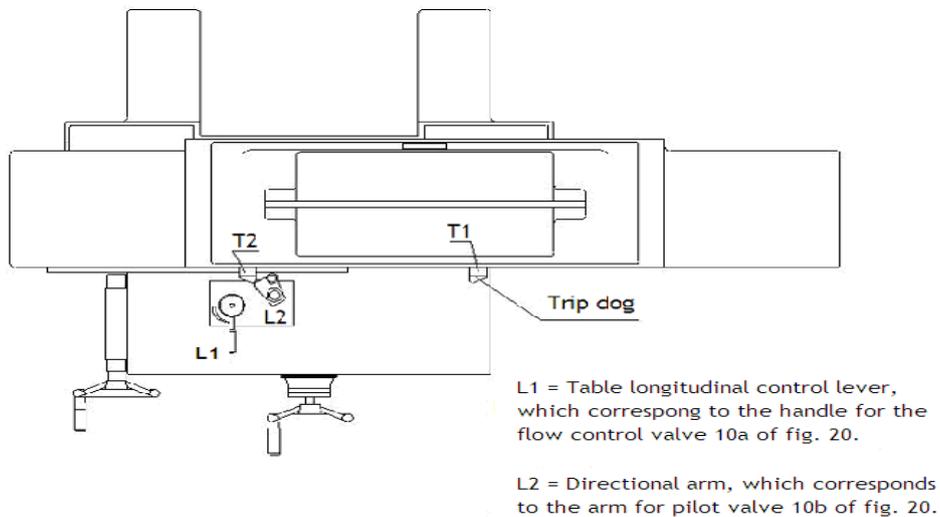


Fig. 3 Table Dogs

**5. Lubricants**

Lubricate every sliding surfaces with the recommended lubricants and the oil tank should be filled with oil to the center line of the level gauge, See the LUBRICATING INSTRUCATION CHART below:

**LUBRICATION AND MAINTENANCE I**

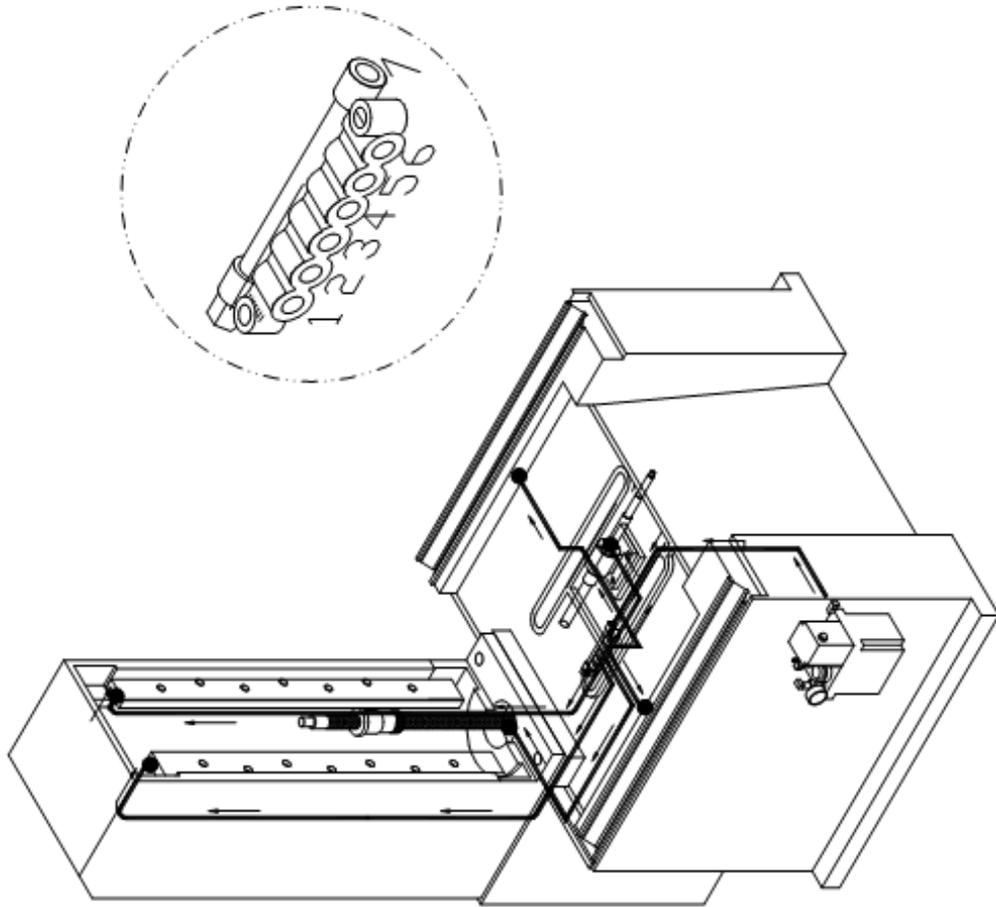
<b>MODEL</b>	<b>HYDRAULIC SYSTEM</b>	<b>TABLE SLIDEWAYS</b>	<b>VERTICAL SLIDEWAYS &amp; LEADSCREW</b>	<b>CROSS SLIDEWAYS &amp; LEADSCREW</b>
<b>SH SERIES</b>	1. Oil exchanged every 1 year.  2. Change new oil filter every 6 months.	1. Automatic recirculation oil lubed.  2. Clean and check the slide ways every 6 months.	1. Automatic non-recirculation oil lubed.  2. Clean & check the slide ways, leadscrews and nut every 6 months.	1. Automatic non-recirculation oil lubed.  2. Clean & check the slide ways, leadscrew and nut every 6 months.
<b>OIL REQUIRED</b>	SHELL: Tellus S2 M68 MOBIL: DTE 26 CASTROL: Hyspin AWH-M 68 AGIP: OSO 68 ARAL: Vitam GX 68		SHELL: Tonna S3 M68 MOBIL: Vactra NO.2 CASTROL: Magna BD68 AGIP: Exidia HG68 ARAL: Deganit B68	

**Soluble Cutting Oils**

<b>NO.</b>	<b>BRAND</b>	<b>SERIES</b>
1	ARAL	Multrol G100
2	CINCINNATI	CIMCOOL Cimtech 100
3	FUCHS	Ecocool S CO 5
4	OEMETA	Unimet 280 or AS 192

**Note:**

1. The main reason of peeling paint of machines is because of the contained nitrite and glycol within the soluble cutting oil.
2. Please use the brands of soluble cutting oil as Mentioned above only.



## 6. The procedures for checking the electrical connection.

- 6.1 For safety reason, remove the grinding wheel from spindle.
- 6.2 Fix power source lead wire to the terminal board R.S.T
- 6.3 Press push button "SB1" for power source "on"
- 6.4 Press push button "SA1" for spindle "on" the spindle must be rotated in clockwise direction, if not, please change any 2 wires on R.S.T terminals.
- 6.5 Press push button "SA2" for pump motor "on", it must be rotated in clockwise direction, if not, please change any 2 wires on U2, V2, W2 terminals.
- 6.6 Turn the selector switch"SA31" to left, and turn the switch "SA3" to the left, the saddle must be moved forward to the operator; if not, please change any 2 wires on U3, V3, W3 terminals.

In case the machine wiring voltage is different from that of power source.

- 6.7 Change the terminal on transformer Tr1, Tr2 to coordinate the machine wiring voltage with the power source voltage.
- 6.8 Change wire connection of the following motors: spindle motor, pump motor, coolant motor.
- 6.9 Cross feed motor is of constant voltage 220V, so needn't to change its wiring connection.
- 6.10 After changing the connections of the above mentioned transformer and motors, it requires to test the directions of rotation of all motors following the same procedure as in 6.1 to 6.6.

## 7. Table longitudinal traverse (Fig. 7a, 7b, 7c)

- 7.1 Switch on power source “SB1”
- 7.2 Switch on hydraulic pump motor, “SA2”
- 7.3 The table directional arm L2 should be able to turn for left or right an angle about 15 degrees from its neutral position.
- 7.4 Turn clockwise the table longitudinal control level L1 slowly until the table starts to move, the table will get its maximum speed when it turns to 90 degree.
- 7.5 If the table starts jerkily, there may be some air bubbles in the hydraulic system. The air bubbles can be removed easily if you operated the table at slow speed with its full stroke and stop a little while at both ends, repeat these processes several times.
- 7.6 If the table dogs T1, T2, fixed on the table T-slot, bump against table directional arm L2 due to some causes, L2 will slip out an angle from direction control shaft L3 (see Fig. 5a) and cause the table unable to travel automatically. In such case, the remedy is as followings:
  - 7.6.1 Turn L1 to its valve closing position (pump is in operation) to stop table moving.
  - 7.6.2 Take away table dogs T1, T2 or move it apart from L2, this is necessary for avoiding fingers being clamped by table dogs and L2.
  - 7.6.3 Take off arm L2 from its shaft L3 (Fig.5d) and turn L3 to a position with its marked line in a perpendicular direction as shown in Fig.5b. then re-put L2 on L3 in its correct position (as Fig.3)
  - 7.6.4 Turn L1 by left hand about 60 degrees for low table speed.
  - 7.6.5 Turn L2 right and left (about 15-20 degrees) by right hand, if still can't make the table move right and left, adjust L2 to other position on L3 and try turn L2 right and left again. Time after time you can find the right position for L3.
  - 7.6.6 Disassemble L2 from L3 (Fig.5d) and adjust L2 at its right position and then secure it firmly on L3.
  - 7.6.7 During this adjusting process, it needs that with left hand to control L1, and right hand to turn L2 simultaneously.
  - 7.6.8 This is a troublesome work, and requires lots of patience to try again

and again.

- 7.6.9 Please don't touch the directional control arm either by hand or by something else during table movement.

## **8. Automatic cross feed traverse (Intermittent)**

- 8.1 With the following operations, it needs that the table longitudinal traverse must be in actuated condition.
- 8.2 Turn change-over switch SA3 to left and then release the switch
- 8.3 SA31 for automatic operation, the cross feed will soon be actuated and the wheel head will move forward to the operator.
- 8.4 Turn SA3 to right, wheel head will automatically move backward to rear side.
- 8.5 Automatic cross feed traverse will reverse its direction when the limited switch LS3 or LS4 are actuated by trip dogs. (Fig.6)
- 8.6 The magnitude of cross feed is infinitely variable by the regulating knob "RP32".
- 8.7 By turning switch "SA31" to left, or pressing down the limit switch LS1, the automatic cross feed traverse can be interrupted at once.

## **9. Automatic cross feed traverse (Continuous)**

- 9.1 This function is available whenever the table longitudinal traverse is in actuation or not.
- 9.2 Turn selector switch SA31 to left position.
- 9.3 Turn SA3 to left, the wheel head will move approach to the operator.
- 9.4 Turn SA3 to right, the wheel head will move backward to the rear side.
- 9.5 This function will be stopped if limit switch LS1 or LS2 is pressed by stopper. But LS3 and LS4 are not able to reverse the direction or stop this function.

## **10. For crisscross grinding (Optional)**

- 10.1 Turn the selection switch SA31 to right.
- 10.2 Turn the selection switch SA3 to right (or left), with the hand released and the crisscross travel will be engaged.
- 10.3 Adjust the knob RP32 for the rate of feed movement.

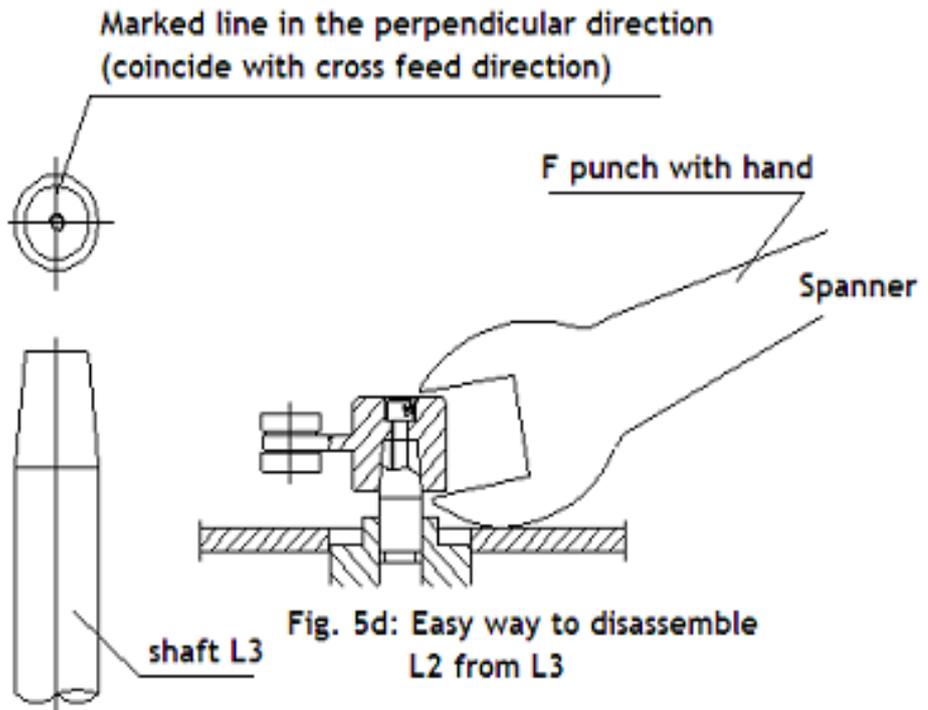
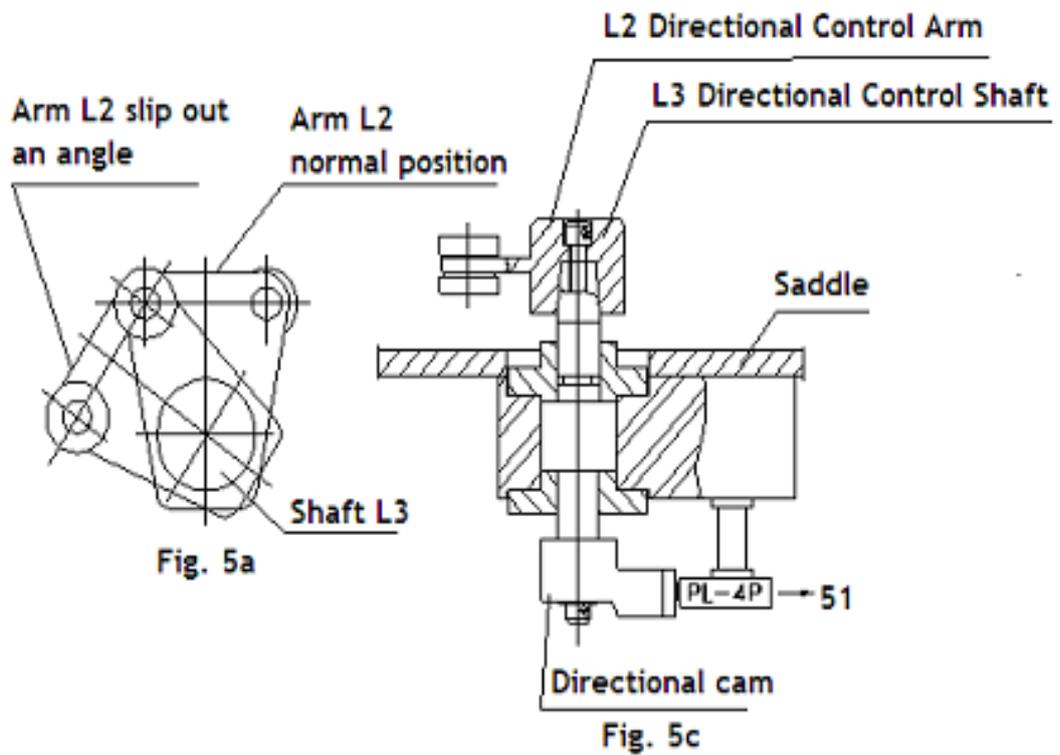


Fig. 5b: Turn shaft L3 with the marked line in perpendicular direction

# AUTOMATIC CROSS FEED MECHANISM

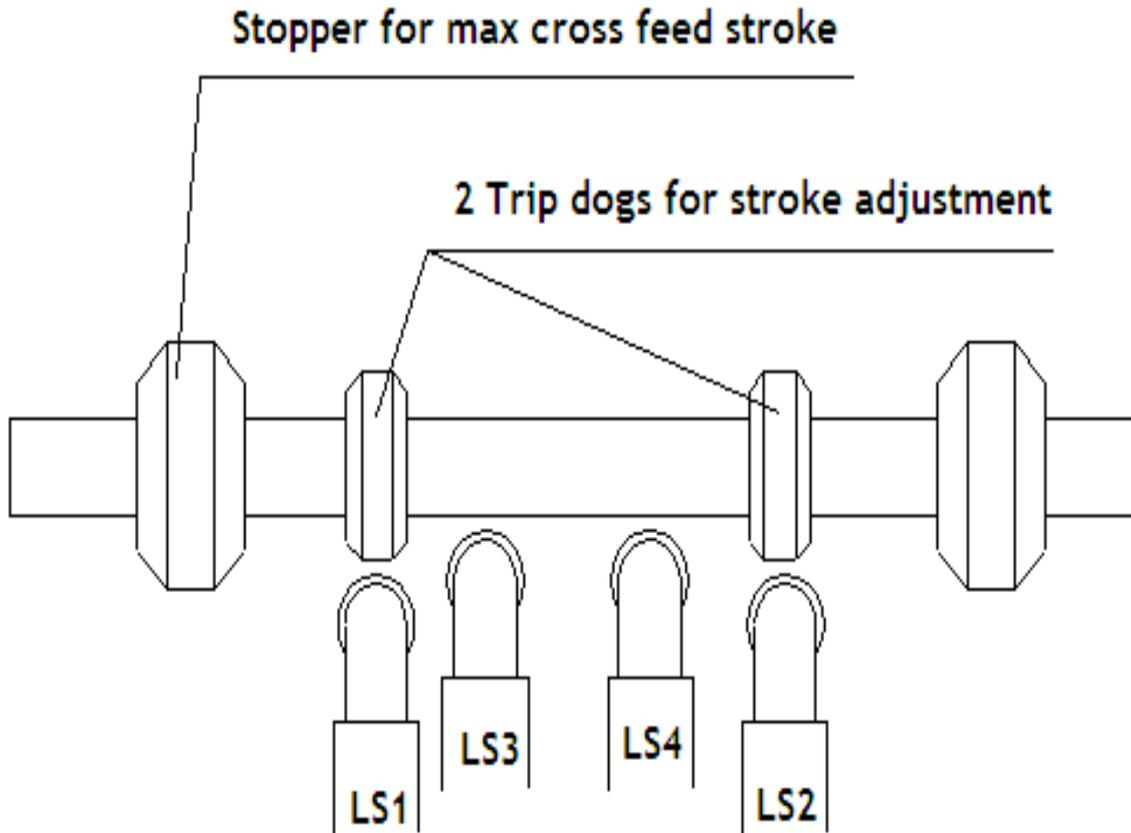
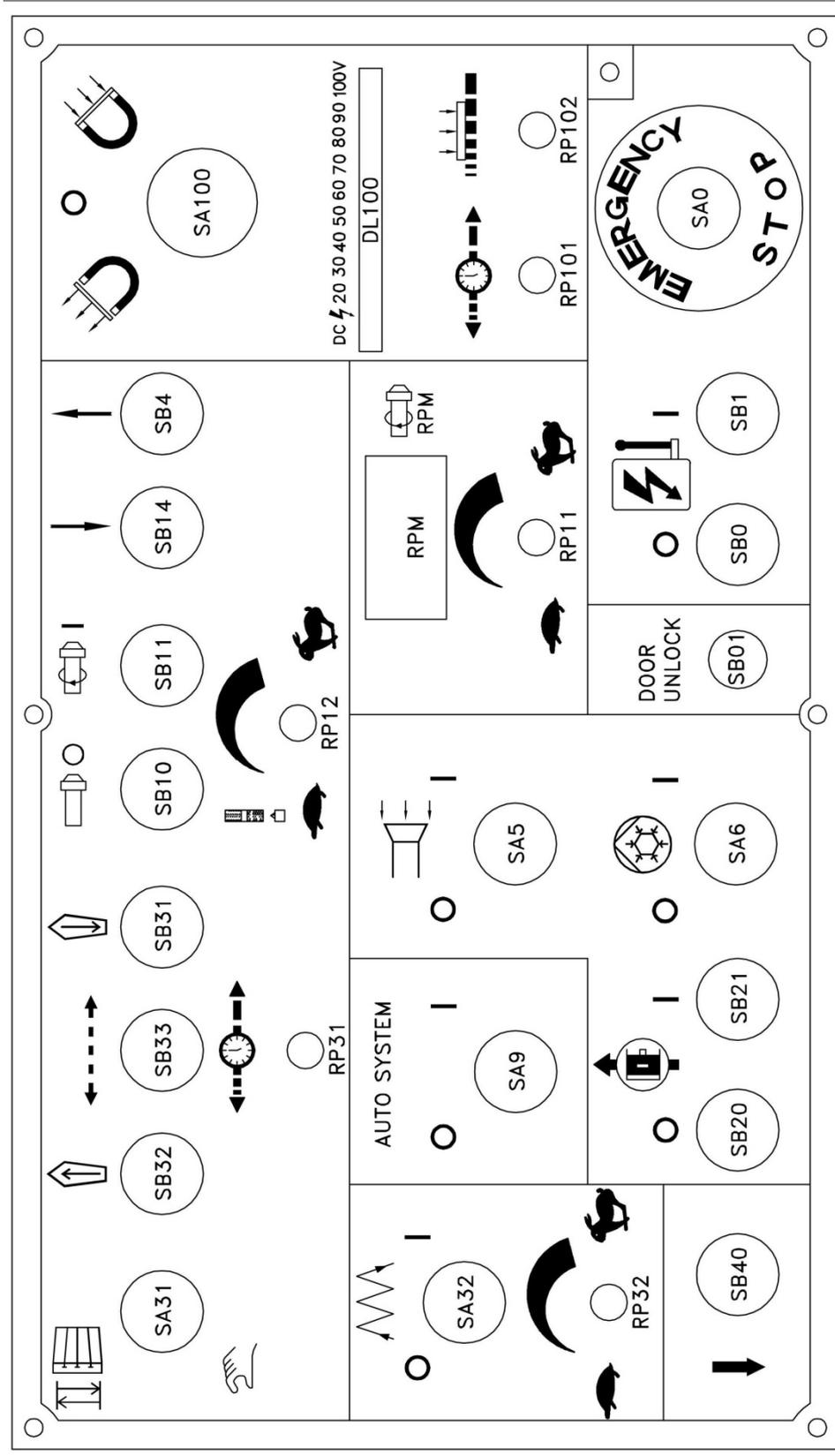


Fig 6. Automatic cross feed

**CONTROL PANEL**  
(STANDARD / WITH AD1)

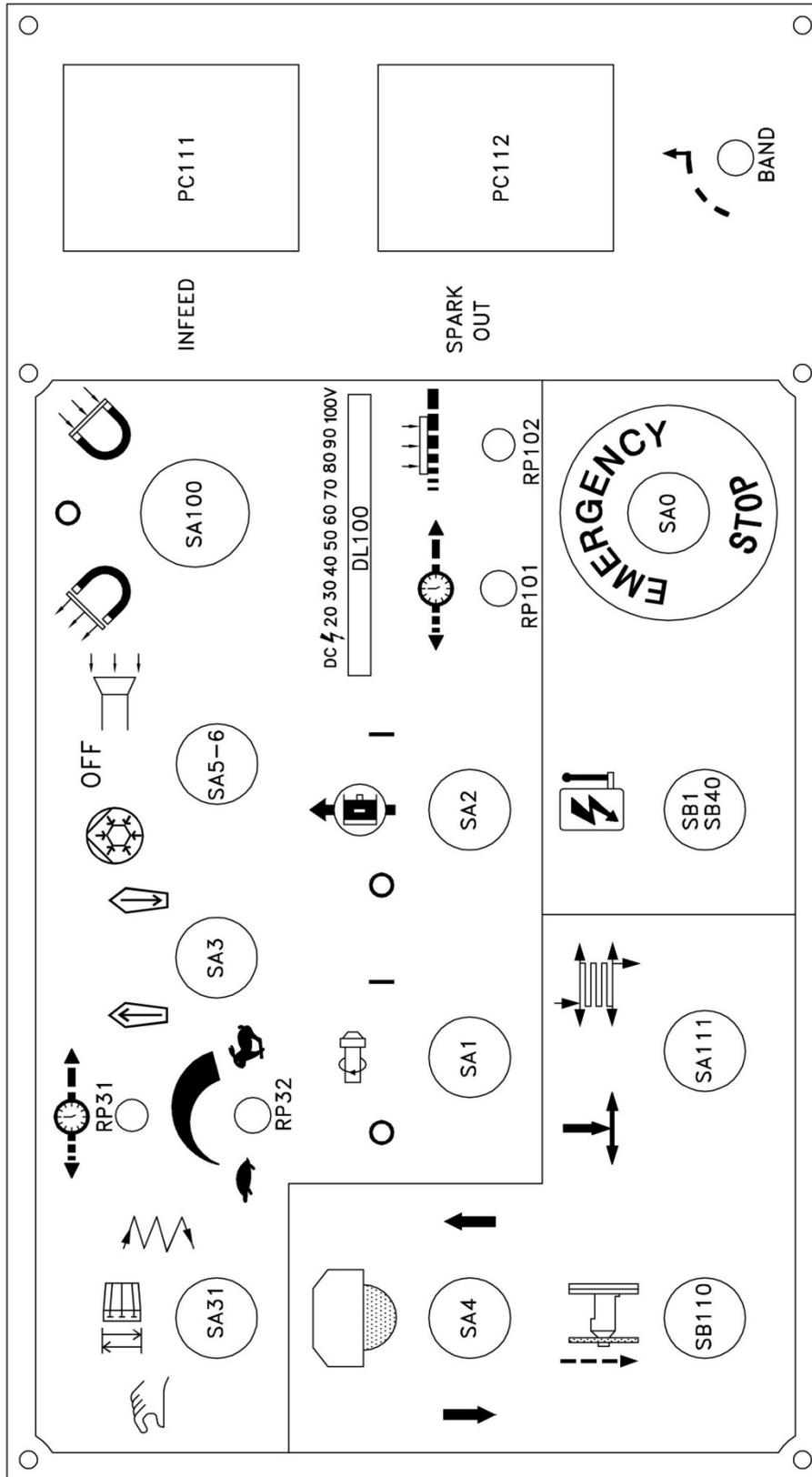


**FUNCTIONS OF PANEL**

(STANDARD / WITH AD1)

- SA0: Emergency stop.
- SB1: Main power "ON".
- SB0: Main power "OFF".
- SB01: Door unlock.
- SA100: Electro-magnetic chuck switch for magnetization and demagnetization.
- DL100: Chuck magnetization / demagnetization display.
- RP101: Demagnetization time.
- RP102: Adjustment for magnetic attraction.
- SB11: Grinding wheel "ON".
- SB10: Grinding wheel "OFF".
- RP11: Grinding wheel speed adjuster.
- RPM: Grinding wheel speed meter.
- RP12: Auto dressing speed adjuster.
- SB21: Hydraulic motor "ON". (SA100 must magnetic)
- SB20: Hydraulic motor "OFF".
- SA31: Auto / manual cross feed selections.
- SB31: Cross feed forward button.
- SB32: Cross feed backward button.
- SB33: Cross feed stroke adjuster by electronic one touch system.
- RP31: Cross feed rate adjuster.
- SA32: Criss-Cross grinding switch.
- RP32: Criss-Cross speed adjuster.
- SB4: Button for grinding wheel upward movement.
- SB14: Button for grinding wheel downward movement.(Press SB40 & SB14 together)
- SB40: Button for grinding wheel downward movement.(Press SB40 & SB14 together)
- SA5: Dust suction "ON" / "OFF".
- SA6: Coolant system "ON" / "OFF".
- SA9: Servo system "ON" / "OFF".

CONTROL PANEL



FUNCTIONS OF PANEL

(WITH AD3)

- SA0: Main power “OFF” and EMERGENCY STOP button.
- SB1: Main power “ON” button.
- SA100: Electro-magnetic chuck switch for magnetization and demagnetization.
- DL100: Chuck magnetization/ demagnetization display.
- RP101: Demagnetization time.
- RP102: Adjustment for magnetic attraction.
  - SA1: Grinding wheel “ON” / “OFF” switch.
  - SA2: Hydraulic motor “ON” / “OFF” switch. (SA100 must magnetic)
  - SA31: Auto / manual / Criss-cross feed selections. (Criss-cross is an option)
  - SA3: Cross feed forward / backward.
- RP31: Cross feed rate adjuster.
- RP32: Criss-Cross speed adjuster.
  - SA4: Grinding wheel upward / downward. (Downward with SB40)
- SB40: Button for grinding wheel downward movement.  
(Press SB40 & SA4 together)
- SB110: ON/OFF switch for auto down feed.
- SA111: Selector switch for surface grinding or plunge grinding.
- PC111: Down feed increments counter.
- PC112: Spark out passes counter.
- BAND: Wheel up traverse time, while auto down feed cycle is finished.
- SA5-6: Dust suction - Coolant system.

## (C) WHEEL

### 1. Wheel Mounting

- 1.1 The grinding wheel should be checked carefully before mounted by tapping it with a wood hammer to ensure that a clear sound is detected. A wheel having a crack inside it may result a sonant sound. Be sure that no crack is detected.
- 1.2 Two pieces of paper washers should be placed on each side of wheel and serve as elastic packing between wheel and flange.
- 1.3 The screws for fixing the flange should be tightened gradually and in diagonal sequence, the wrench should be applied step by step to each screw in turn.
- 1.4 When the wheel runs under coolant for some time the paper packing washers may be damaged, the fixing screws should be retightened in diagonal sequence again.

### 2. Check wheel mounting before operation. It is essential to check the following points before start for grinding operations.

- 2.1 Wheel guard is in its right position.
- 2.2 Turn the wheel in no load condition for a few minutes.

### 3. Wheel Balancing

- 3.1 Efficient balancing is essential to eliminate the unnecessary and additional stress to be build-up in the wheel. High-quality grinding results, such as grinding accuracy, surface finish as well as the extended life of grinding wheel, wheel spindle and bearings, depend to a considerable extent on careful balancing.

Usually the static balancing will be sufficient. The grinding wheel together with its mounting flange should be fitted to balancing arbor and then place it on the wheel balancer. And the balancing operations proceed as following:

- 3.1.1 The wheel balancer must be leveled first (Fig.9), and check it by a spirit.
- 3.1.2 Lay the wheel to oscillate, in order to find out the center of gravity, and then mark its downward position S with chalk. (Fig.14)

- 3.1.3 Move the first balance weight “G” opposite to point “S” and set it.  
(Fig.15)
  - 3.1.4 Move two correction weights “K” anywhere round the periphery, but at equal distance “a” from weight “G”. (Fig.16)
  - 3.1.5 Turn the wheel through 90 degree and to see whether it is in balance. If not, the correction weight “K” must change place until no oscillation occur in every position or the wheel is in balance. (Fig.17)
  - 3.1.6 Dressing: Mount the wheel onto the spindle, dressing it (especially for new wheel), make it concentric with rotation center.
  - 3.1.7 Rebalance: after dressing, the wheel may lose its balance, so that the rebalancing operation is necessary.
  - 3.1.8 After balancing, the wheel must be given a test run of grinding operation at least five minutes at full working speed before it is being used.
- 3.2 Mount the wheel flange assembly:
- Prior to get the flange-mounted grinding wheel to the grinding spindle, operators must be taken to ensure the flange cone bore and spindle taper are in absolutely clean condition. After that the wheel is pushed by hand onto the spindle taper, and subsequently, tighten wheel flange assembly securely with fixed bolt (Fig.12). Release wheel flange assembly from spindle taper will be effected by using jack bolt (Fig.13).
- 3.3 How to check the wheel vibration:
- If the spindle vibrates significantly please take off the wheel assembly first, and then switch on the spindle and proceed to check with the following precautions:
- 3.3.1 If no vibration occurred it means the wheel balance is no good, please rebalance it.
  - 3.3.2 If the spindle is still vibrate, please disassemble the motor and spindle cartridge, and check the rubber coupling and coupling refer SD 50008A Index NO. 1, if the rubber coupling is found broken, change a new one, if couplings found loosen set it well.

- 3.3.3 The spindle cartridge assembly are designed to have a life of operation more than 10 years under normal operation, please should not disassemble it without our advice.
- 3.3.4 Because of the very high spindle running speed, the wheel must be well balanced. Otherwise spindle vibration will be resulted and unable to get good surface finish. A balanced wheel assembly will lose its balance during grinding operation owing to its wear. It is advisable to rebalance the wheel assembly periodically.

Grinding wheel is intended to absorb humidity and coolant, it is advisable not to start coolant supply when the wheel is not running. Otherwise the wheel will absorb liquid on its bottom side only and make it out of balance. If the wheel is allowed to stand for any length of time coolant will be collected at its lowest side. Unbalance will also be resulted, if the wheel is not allowed to idle running some length of time after the completion of grinding operation. The purpose of idle running is essential to throw-off coolant by centrifugal force.

- 3.4 The wheel dressing can be done either by diamond dresser mounted on the magnetic chuck (Fig.18b) or on the parallel dressing attachment (Fig.18a) which mounted beside spindle cartridge.
- 3.4.1 The diamond tool should be located at an angle to the center line of the wheel as shown on Fig.18a, so that when the diamond loses its keenness (Fig.18c) it can be turned an angle, and another sharp edge can be utilized (Fig.18d).
- 3.4.2 The wheel dressing should begin from the middle of the width, as shown on (Fig.18e), due to two edges are usually worn out. If dressing begins at the edges, there may result in a danger of the higher pressure in the middle, so as overstress the diamond tool and chattering it. As far as the life of the grinding wheel and diamond is concerned the light dressing with more time is better than a heavy dressing.
- 3.4.3 Various degrees of roughness can be produced by varying the feeds and speeds of the diamond dressing. For a 0.2mm or 0.3mm stock removal, it is advisable to roughen the wheel, this is done by feeding the diamond in about 0.03mm and let the diamond moves quickly over the wheel, this will makes the wheel bite well and the stock removal good. If the workpiece is to be finish-ground to size with the same wheel, the wheel must be redressed in different ways. In this time, the dressing operation should be proceed slowly in two or three passes, with the diamond dressing feed limited to 0.01mm.
- 3.4.4 Experience has shown that, with highly accurate grinding or better surface finish is required, the dressing operation with the diamond dresser mounted on the magnetic chuck is better than which mounted on the spindle housing. The former is more stable than the latter and the latter condition will causes light undulation in the surface of the wheel.
- 3.4.5 Sufficient coolant supply spray to contact point of wheel and diamond is necessary.
- 3.4.6 A 250mm/min to 1000mm/min wheel travel to pass through diamond is recommended. For rough grinding higher travel speed is better.

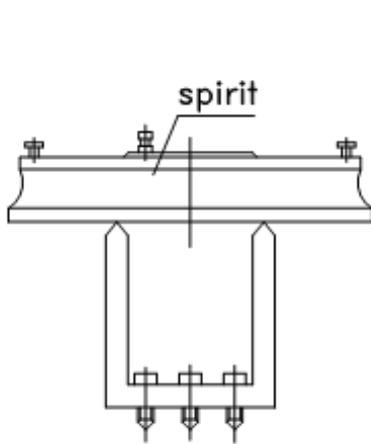


Fig.9

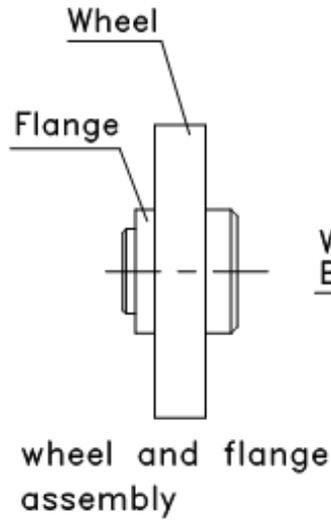


Fig.10

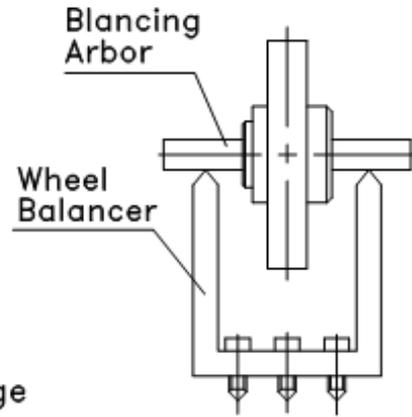
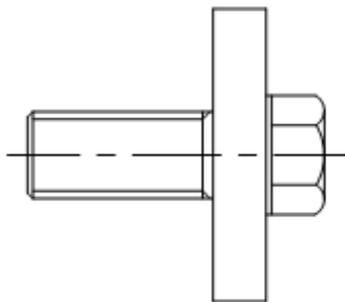
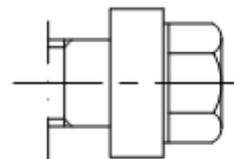


Fig.11



Fixed Bolt

Fig.12



Jacket Bolt

Fig.13

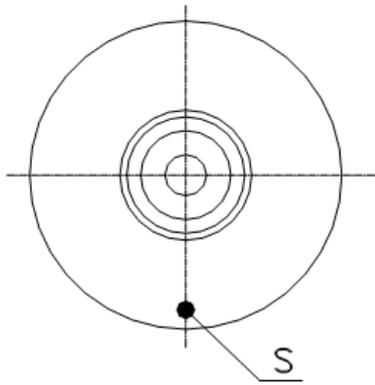


Fig. 14

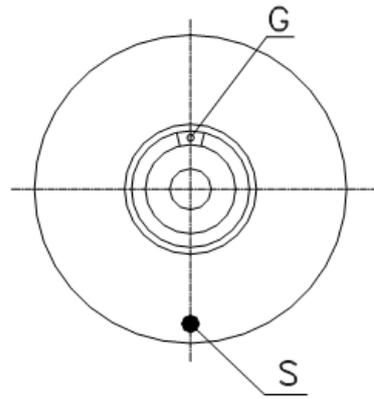


Fig. 15

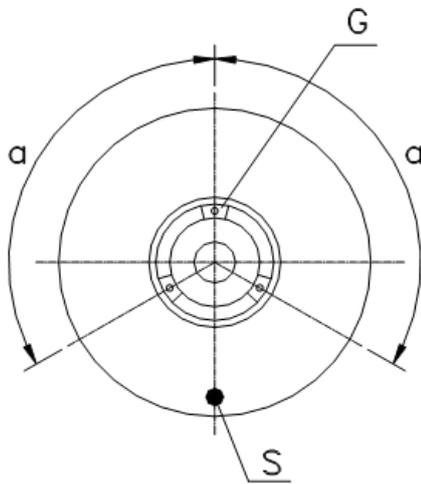


Fig. 16

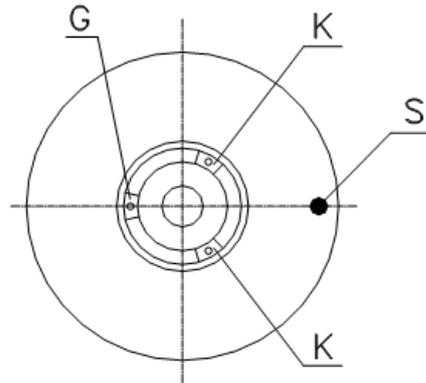
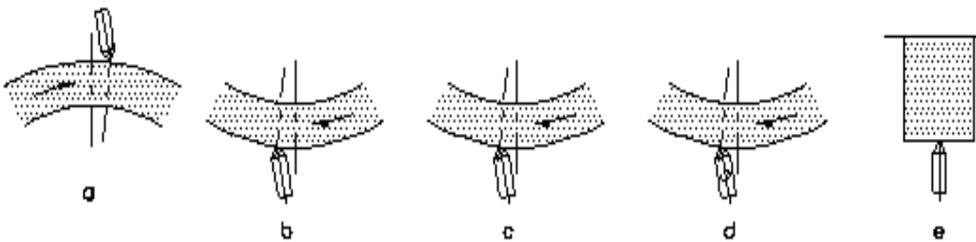


Fig. 17



**Fig 18. CORRECT DRESSING**



**Fig 19. INCORRECT DRESSING**

## (D) GRINDING OPERATION

### 1. The grinding results obtained depend to a very large extent on the choice of the correct grinding wheel and suitable operation.

#### 1.1 For stock removal efficiency

For intensive stock removal a coarse grain (about 30-60) wheel should be used. The wheel is dressed by passing over the diamond quickly, so that the surface of the wheel is roughened and bites well.

#### 1.2 Surface finish is required

If fine finish is to be produced, a finer grain wheel is required (40-80). In this case the diamond is passed slowly over the wheel, so as to break up the grain.

#### 1.3 Distortion of the workpiece

If the workpiece shows too much distortion as it is being ground, it announces that the stock removal is too great and the longitudinal and cross movements of the table are too slow, or the grinding wheel is blunt or "clogged".

#### 1.4 If the workpiece appears undesirable burns and grinding cracks, it announces that the wheel is too hard, or the wheel is blunt or "clogged".

### 2. Selection of suitable grinding wheel:

Grinding wheel are usually characterized by the kind of abrasives, the grain size, the grade of bond, the structure and the type of bond which they selected. The different symbols of each item format the expression of a grinding wheel. We are in need to familiar with them.

For instance, the expression WA 46K8V of a wheel which denotes:

WA: Kind of abrasive

46: Grain size

K: Grade

8: Structure

V: Bond type

## 2.1 Kinds of abrasive

- A: For grinding common annealed steels
- WA: For grinding steels with higher hardness, such as heat-treated carbon steel, alloy steel, etc.
- H: Suitable for higher hardness steel, particularly high-speed steel
- C: For grinding with cast iron and non-ferrous materials.
- GC: For super-hard metal grinding such as tungsten carbide

## 2.2 Grain size:

Coarse: 10, 12, 14, 16, 20, 24

Medium: 30, 36, 46, 54, 60

Fine: 70, 80, 90, 100, 120, 150, 180.

Grain Size Condition	Coarse	Fine
Stock removal	much	little
Surface roughness	rough	fine
Workpiece hardness	soft	hard
Surface contacted	wide	narrow
Dia. of the wheel	big	small

2.3 Grade: It indicates the strength of the bond which hold abrasive.

Soft: A-H

Medium: I-P

Hard: Q-Z

<b>Grade</b> <b>Grinding</b> <b>Condition</b>	<b>Soft</b>	<b>Hard</b>
Workpiece hardness	hard	soft
Surface contacted	wide	narrow
Movement of workpiece	slow	quick
Wheel speed	high	slow

2.4 Structure: The structure number of a wheel refers to the relative spacing of abrasive grains, the larger the number, the wider the grain spacing.

Close: 0, 1, 2, 3, 4, 5

Medium: 6, 7, 8, 9

Wide: 10, 11, 12

<b>Structure</b> <b>Grinding</b> <b>Condition</b>	<b>Wide</b>	<b>Close</b>
Surface roughness	rough	fine
Surface contacted	wide	narrow
Workpiece hardness	soft	hard

## 2.5 BOND TYPE

\* The symbol of bonds Listed bellows:

V: Vitriified

S: Silicate

B: Resinoid

R: Rubber

E: Shellac

## 3. Wheel to be recommended

Material To Be Ground		Wheel Diameter	Under 205mm	205-355MM
Carbon Steel	Under HRC25		WA 46K or A 46K	WA 46J or A 46J
	Above HRC25		WA 46J	WA 46I
Alloy Steel	Under HRC55		WA 46J	WA 46I
	Above HRC55		WA 46I	WA 46H
Tool Steel	Under HRC60		WA 46I	WA 46H
	Above HRC60		WA 46H	WA 46J
Stainless steel			WA 46J	WA 46H
Cast Iron			C 46J	C 46J
Brass			C 30J	C 30I
Aluminum Alloy			C 30J	C 30I
Tungsten Carbide			GC 60-100 H, I	GC 60-100 H, I
Glass			C 60K	C 60K
Marble			C 36M or GC36M	C 36M or GC36M

## 4. Choice of the Grinding Conditions

### 4.1 Down feed of grinding wheel

<b>Down Feed</b>	Great	Small
<b>Grinding resistance</b>	large	small
<b>Heat produced</b>	much	less
<b>Surface finish</b>	rough	fine
<b>Wheel worn-out</b>	much	little

### 4.2 Cross Feed

<b>Cross Feed</b>	Great	Small
<b>Grinding resistance</b>	large	small
<b>Heat produced</b>	less	much
<b>Surface finish</b>	rough	fine
<b>Wheel worn-out</b>	much	little

\* Rough grinding: 100-500 mm/min, or under 1/2 of the wheel width.

\* Fine grinding: Under 50 mm/min, or under 1/4 of the wheel width.

### 4.3 Table Longitudinal Traverse:

<b>Table traverse</b>	Quick	Slow
<b>Grinding resistance</b>	large	small
<b>Heat produced</b>	less	much
<b>Surface finish</b>	rough	fine
<b>Wheel worn-out</b>	much	little

#### 4.4 Suitable speeds of the table traverse: m/min

Workpiece Material	Soft steel	Heat-Treated steel	Tool steel	Cast iron
Speed	6-15	30-50	6-30	16-20

#### 4.5 Suitable Peripheral speeds of wheel: 20-30m/sec.

Wheel Peripheral Speed Condition	High	Low
Grinding resistance	small	large
Heat produced	much	less
Surface finish	fine	rough
Wheel worn-out	small	great
Safety	bad	better

Material	Peripheral Speed
Steel	20-30 m/sec
Cast Iron	20-18 m/sec
Tungsten Carbide	8-18 m/sec
Zinc alloy & Light Metal	25-30 m/sec

### 4.6 Down Feed and Feed Chart:

Grinding Workpiece Material	Down Feed			Cross Feed
	Cast Iron, Soft Steel & Hardened Steel	Stainless & Heat Resistant Steel	Tool Steel	
<b>Rough</b>	0.0006~0.0012" 0.015-0.03mm	0.0008~0.0012" 0.02- 0.03mm	0.0008~0.0016" 0.02-0.04mm	Feed amount is smaller than the 1/2 of wheel width
<b>Fine</b>	0.002~0.0004" 0.005-0.01mm	0.0008~0.0004" 0.002-0.01mm	0.0002~0.0006" 0.005-0.015mm	Feed amount is smaller than the 1/4 of wheel width

**Note:**

- (A) Before adjusting frequency of spindle motor inverter (option), please calculate peripheral speed in accordant with a following formula.

$V = \pi DN$ , D= wheel diameter (ψm),  $\pi=3.14$ , N= R.P.M. (spindle motor), V= peripheral speed (m/min),  $N = (120xf)/np$ , f= frequency (Hz), np= polar number (spindle motor).

- (B) The calculated speed cannot exceed maximum safe operating speed indicated on the wheel.

## (E) THE HYDRAULIC SYSTEM

A special hydraulic system for driving the longitudinal traverse of the table is adapted. The table speed is variable and can be adjusted from 5 m/min to 25m/mn.

### 1. The hydraulic oil

For trouble free operation, the specified oil Mobil Vacouline 1409 or its equivalent one is recommended.

### 2. Change of new oil

The oil is apt to oxidation contamination and ageing, it is recommended to have the replacement of new oil after its first three months operation and every one year operation of the machine.

The mix of new oil with highly aged oil is senseless. The addition of new oil can't improve the quality of the old oil, but cause the added new oil become useless rapidly.

### 3. How to test the hydraulic oil

A simple way to test the degree of oxidation contamination and ageing of the oil is:

Take a drop of hydraulic oil to the filter paper, if it appears light and yellow it means the oil is clean and good. On the other hand, if it appears a dark spot, it means the oil has been considerable aged, and has lost its quality.

### 4. Table shock

4.1 If the hydraulic system particularly in pipe line having contained some air in it, it will cause the table shock.

4.1.1 If pipe connections do not be fastened well, air will be sucked in.

4.1.2 During the operation of connecting the hydraulic tank to the machine, air will have chance to enter into the system.

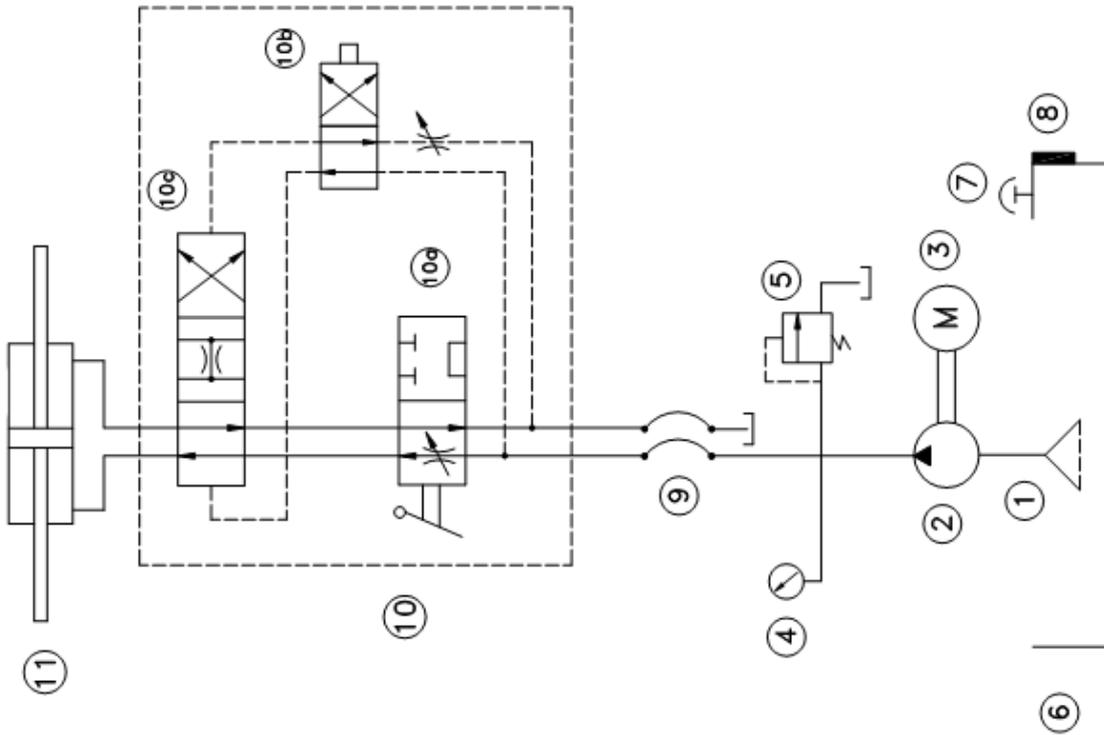
4.1.3 In case the air have already been existed in the system the remedy process is to run the table with low speed at full stroke, after a long period of operation the air will be squeezed out.

4.2 A too high pressure will cause the table to shock also.

## 5. Oil capacity

MODEL	HYDRAULIC MOTOR	OIL TANK CAPACITY	LUBRICANT CAPACITY
SH-920, SH-1224	3HP	90L	2L
SH-1632, SH-1640	5HP	120L	2L

## HYDRAULIC SYSTEM



\* SUBJECT TO DIFFERENT MODEL

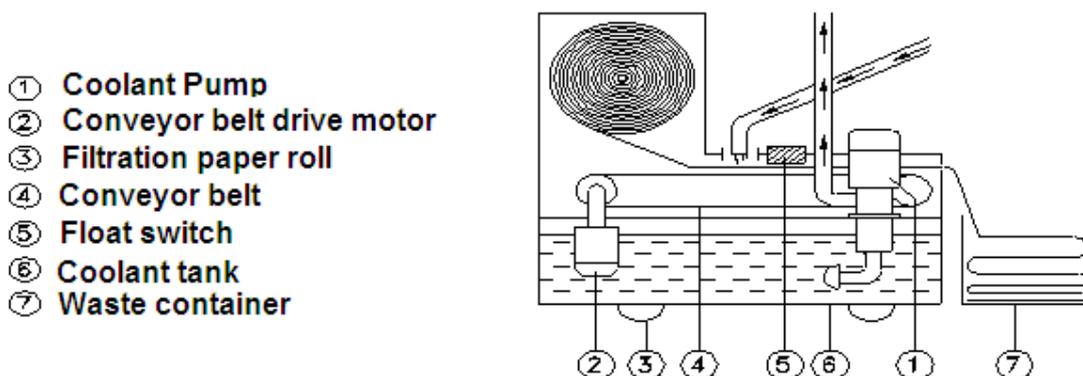
ITEM	DESCRIPTION	MODEL	QUANTITY	
12				
11	CYLINDER	φ30xφ20x***	φ40xφ16x***	1
10c	MAIN SPOOL CHAMBER	PST-03	PST-04	1
10b	PILOT VALVE	PST-03	PST-04	1
10a	FLOW CONTROL VALVE	PST-03	PST-04	1
10	DIRECTIONAL CONTROL VALVE	PST-03-04	PST-04	1
9	HYDRAULIC HOSES	04	06	*
8	LEVEL INDICATOR	LG-3"	LG-5"	1
7	INLET		HY-08	1
6	OIL TANK	600x350x400	800x550x470	1
5	RELIEF VALVE	PPT-04	PPT-08	1
4	PRESSURE GAUGE		0 ~70 kg/cm <sup>2</sup>	1
3	HYDRAULIC MOTOR	1HPx6P	2HPx6P	*
2	HYDRAULIC PUMP	DS-22	DVS-5V	*
1	OIL FILTER		MF-06	*
ITEM DESCRIPTION		25,30 SERIES	40 SERIES	QUANTITY
		MODEL		

**(F) WET GRINDING**

The wet grinding for most of the workpiece can provide the following advantages:

1. Reduced the possibility of distortion of the workpiece caused by heating.
2. Reduce the danger of burning.
3. Prevent wheel from clogging.
4. Shorten the grinding time.
5. Lengthen the wheel life.
6. Protect operator, machine and circumstances from grinding dust.
7. Clear transparent coolant is recommended to replace the milky one, because:
  - 7.1 The surface of workpiece can be easily watched during g grinding operation.
  - 7.2 The grinding wheel can be kept bite and sharp to a longer time than the milky one.
8. The recommended oil base coolant having the prefer mixing ratio at oil: water =1: 60-80, if it is reduced to less than 1: 50, the excessive heat make the workpiece apt to distortion.
9. The coolant will gradually lose its effectiveness, due to lost as spray and evaporates during grinding, eventually it will become a thin mixture, so that new oil must be added to correct the mixing ratio.
10. The coolant delivered from a water pump must be sprayed to the wheel through a nozzle, to prevent the wheel from clogging.
11. An automatic paper strip filter is preferred instead of the simple coolant system in order to obtain a sound surface finish.

**AUTOMATIC PAPER STRIP FILTER**



## **(G) PERFECT SURFACE FINISH**

- 1. Too hard a wheel or wheel is not correctly chosen.**
- 2. Workpiece is not clamped well.**
- 3. A dirty mating surface between the spindle taper and wheel flange (adaptor) bore will make the wheel to vibrate.**
- 4. An unqualified wheel flange, such as poor concentricity and poor squareness.**
- 5. Wheel and flange not matched well or there have somewhat slippage.**
- 6. An unbalanced wheel or the wheel is not be balanced well.**
- 7. Wheel won't be well dressed.**
- 8. The coupling between motor and spindle become loosen or broken.**
- 9. A defect bearing is used in spindle or motor.**
- 10. Coolant mixing ratio is improper, or too much oil.**  
**< The correct ratio is oil: water=1: 60-80. >**
- 11. The coolant is dirty. For getting good surface finish the automatic paper strip filter attachment is recommended.**

## (H) ELECTRO MAGNETIC CHUCK

The electromagnetic chuck is an indispensable attachment for surface grinding machine. It requires a perfect flat mounting surface to be clamped to the machine table, otherwise the table will be subjected to distortion due to the huge magnetic attracting force of the chuck.

The following practice must be followed to grind the mounting surface of the magnetic chuck before it has to be clamped in the machine table.

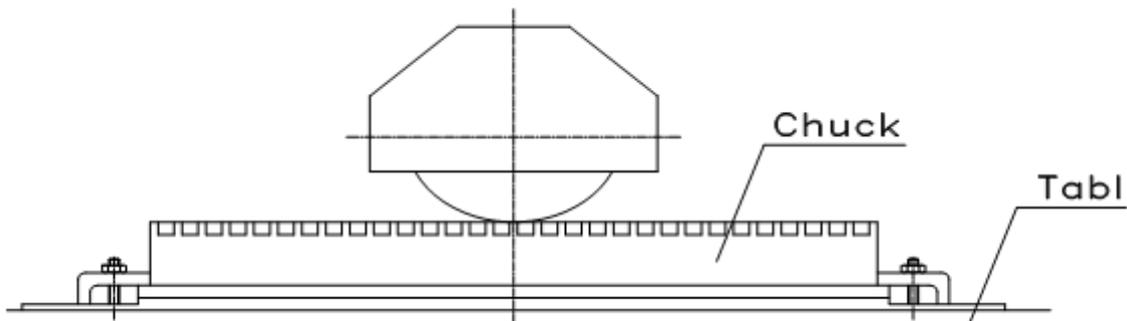


Fig. 27

1. The underside of the magnetic chuck must first be ground to a perfect flat with great care. The chuck is laid upside down on the table, not to be clamped, but stoppers at both right and left sides are used to prevent the chuck from moving.

**Caution:** the chuck should never be switched on. Wet grinding with maximum coolant volume and minimum wheel infeed is recommended to avoid excessive heating and the consequent surface inaccuracy to be resulted.

2. Both the ground area of the machine table and the underside of the magnetic chuck are lightly greased to prevent them from getting dust during their clamping operation. A very thin grease film is preferred for keeping the mounting accuracy.

3. Clamp the magnetic chuck to the machine table.

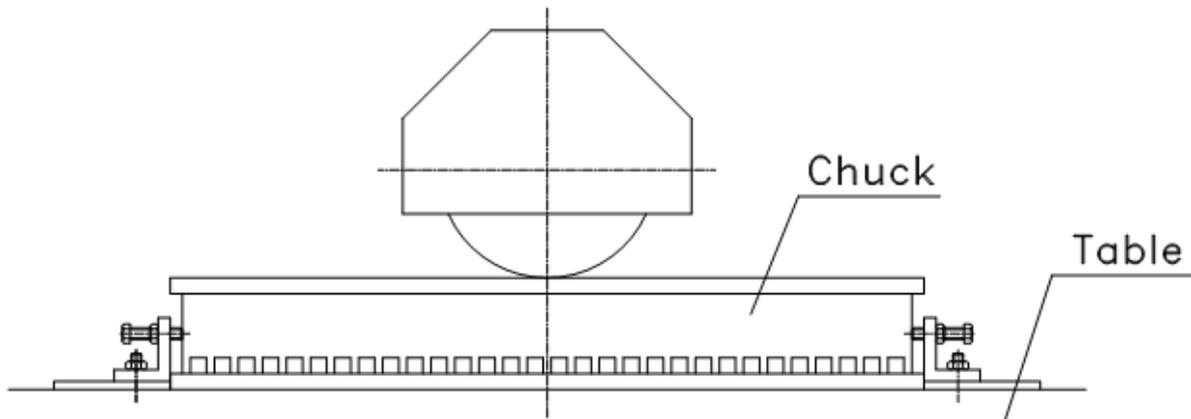
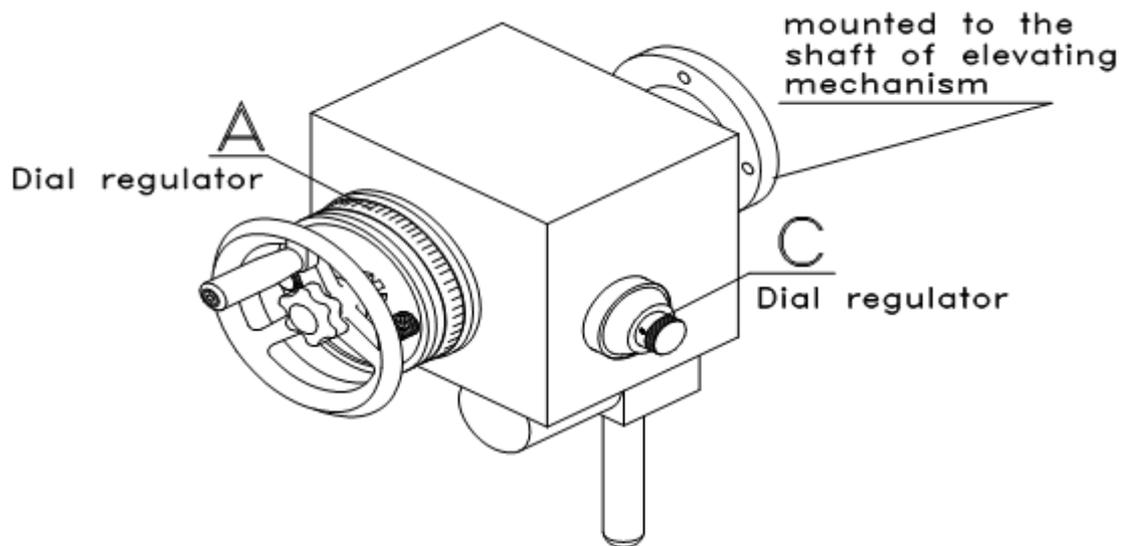


Fig. 28

- 3.1 Rough grinding the chuck surface same as the grinding of the underside of the chuck, but with different clamping method.
- 3.2 Switch on the magnetic chuck and then fine grinding the surface with 0.005mm wheel infeed.
- 3.3 Spark out grinding with no infeed, 2 to 3 times passes of wheel over the chuck surface.

## (I) FOR AD3 AUTO DOWN FEED OPERATION

The special arrangement for AD3 auto down feed includes an auto down feed unit mounted to the shaft of elevating mechanism and two counters (one for down feed, the other for spark out) to be built-in at the right side of control panel. There are six increments of feed values, namely 0.005,0.010,0.015, 0.020,0.025 and 0.030mm,which can be selected on the dial regulator C of the auto down feed unit at your will (see the picture below).



AUTO DOWNFEED UNIT FOR AD3

(The function of dial regulator D is replaced by the counters PC111 and PC112 in control panel, it will not be in use here.)

### 1. FOR SURFACE GRINDING + AUTO DOWN FEED.

- 1.1 Turn selector switch SA111 to right for surface grinding.
- 1.2 Select the required down feed increment on the dial regulator C of auto down feed unit AD3 and set the number of down feed increments on the lower portion of PC111 counter (the upper portion of counter shows the actual number of cross slide passes actuated).
- 1.3 Set the number of spark-out passes required on PC112 counter.
- 1.4 Press the power button SB1 "ON" for power (usually press the power button for 2-3 seconds is required and then the hand can be released).
- 1.5 Switch "ON" the hydraulic pump switch SA2 (hydraulic table drive).

- 1.6 Turn lever L1 to left for table movement.
- 1.7 Turn SA31 to right for auto cross feed.
- 1.8 Turn SA3 to left or right as required (auto cross feed is engaged).
- 1.9 Push "ON" the switch SB110 FOR ARTO DOWN FEED.

## **2. FOR PLUNGE GRINDING + AUTO**

- 2.1 Turn SA111 to left for plunge grinding.
- 2.2 Select the required down feed increments to the dial regulator C of auto down feed unit AD3.
- 2.3 Set the number of down feed increments required on PC111 counter.
- 2.4 Set the number of spark-out passes on PC112 counter.
- 2.5 Switch "ON" the hydraulic pump switch SA2 (hydraulic table drive).
- 2.6 Turn lever L1 to left for table movement.
- 2.7 Turn SA31 to left.
- 2.8 Press "ON" the switch SB110 for auto down feed.

## **3. After the auto down feed grinding cycle is finished, should the hydraulic pump switch SA2 turn to "OFF" position and the hydraulic system to be stopped as well as the table control lever L1 run to closed position, so as the power button SB1 can be engaged for next cycle.**

## **4. RAPID UP/DOWN**

- 4.1 Turn the rapid up/down switch SA4 to right for up movement.
- 4.2 Turn switch SA4 to left and press button switch SB1 simultaneously for down movement.

**(J) MAINTENANCE**

Interval	Maintaining points	Remark
Each Time	The surface of working table.	To keep the clean and oiled surface is a necessity after working hours.
	The grinding wheel.	*Re-correct the wheel balance and re-clean up the inner hole of wheel flange and the spindle.
Daily Routine	Hydraulic oil tank.	Check the oil level of it whether the oil need to be re-filled.
	Lubricating oil tank.	Check the oil level of it whether the oil needs to be re-filled.
	Emergency stop.	Check the function of switch whether it loses efficacy or not.
	Wheel cover locker.	Check the function of switch whether it loses efficacy or not.
	Warm-up.	Depending on working environment, we suggest to warm up the machine when the room temperature is below 25°C.
	Longitudinal sideways lubricating advice.	To check lubricating oil is even on slide ways.
	Cross slide ways and ball screw lubricating advice.	To check lubricating oil is even on slide ways and the ball screw.
	Upward / downward slide ways and the lead-screw lubricating device.	To check lubricating oil is even on slide ways and the lead screw.
	Machine surface.	Wipe it up.
	The rear drain ditch.	Clean up the dust and grit. Please do not use the compressed fluid or air.
Weekly Routine	The automatic lub. system.	Check the automatic lub. system and fill it up.
Every Month	The electrical box.	Keep the inner of electrical box dry and clean.
	Strainer mesh on hydraulic cooler fan	Keep dry and clean.
Every Season	The machine level.	The deviation must be within the range of 0.002 mm/m.
Every Year	Hydraulic oil change.	The hydraulic oil has to be changed and the oil deposit located on the bottom of oil tank has to be cleaned.

**Notes:**

Do not use compressed fluid or air to clean up the spindle any time.