KNUTH
MACHINE TOOLS

# R 80 VT PRO

## FREQUENCY CONVERSION RADIAL DRILLING MACHINE


# OPERATION MANUAL

ENGLISH

R_80_VT_PRO_BA_EN_V1.0_2210

Art.-no. 101648

KNUTH MACHINE TOOLS

# Contents





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# Contents

## 0、 Key reminder

0.1 Reminder that the safety and warning signs in the table 1 shall be appeared in many places of this manual

Table 1: Safety and Warning

| | |
|---|---|
|  | Danger, it may cause dead or heavy injured. |
|  | Warning! It may cause injured. |
|  | Speed change is prohibited while spindle running |
|  | Hand approaching to the spindle is not allowed while spindle running. |
|  | Prevent sputter from chips |
|  | Operation reminder and some useful information |

0.2 Obey the rules and regulation mentioned in the operation manual is the pre-condition for your safety, for machine working performance as well as for running quality.

0.3 Please keep this document well as it is useful for the machine installation, machine operation and machine maintenance.

## 1. Safety instruction:

Safety instruction involves the machine transportation, machine installation and machine commissioning, machine use and its maintenance. Neglect the instruction may cause injure of your body and machine damage including the equipment, work piece and tools etc.

1.0 Brief description:

To those not well be trained persons who are not allowed to operate the following.

——Machine transportation

——Store of the machine

——Machine installation

——Use of the machine

——Machine maintenance

Please carefully ready the following documents before do the above mentioned jobs.

——Contents and sketches of the operation manual

——Contents and test record in the qualification certificate.

——Contents of the packing list
——Labels on the machine
——Special rules and regulations of the machine
——Regulations issued by State / Local government for the safety and accident prevention.

The followings may cause series body injured:

——Incorrect machine movement and machine transportation
——Incorrect machine installation
——Incorrect machine use or machine operation
——Disassemble necessary safety guard randomly.

1.1 Machine transportation and store of the machine:

——Checking if package of the machine is well as soon as the machine reached customer premise. Please contact your distributor in case machine damage is happened during transportation as this is the pre-condition for the claim.
——Please follow the instruction for machine moving and lifting, otherwise it may cause body injured or machine damaged.
——Please do not damage machine package and do not remove anti-rust material when machine to be kept in the warehouse for a long time, particularly pay attention to the electric cabinet.

1.2 Installation and commissioning

——The machine must be firmly anchored in the foundation.
——Please check the machine and count its accessories as well as all attached documents to see if it is the same as those listed in the packing list upon machine package is opened. Inform your distributor immediately if necessary, as this is the pre-condition for your claim.
——As the machine is a little bit higher, therefore machine arm may have shake so attention shall be paid when machine is lifting. Machine arm could not be pushed and machine could not be running before foundation bolts are to be fastened.
——Electric cabinet shall be well grounded. Check power phase first to see if it is correct after power on.
——Stop the machine immediately until problems are to be found if any in normal conditions appeared (such as vibration, sharp noisy, temperature increased rapidly, leakage happened or malfunction for the clamping or loosing existed) during machine commissioning.

1.3 Machine use and its maintenance:

——As spindle speed change or spindle feed rate change is made through gear shifting, therefore it is absolutely necessary to stop the spindle running first before spindle speed change or spindle feed rate change, otherwise gears or parts may be damaged.
——As long arm of the machine covers large area of the space, so sitting near the end of the arm is prohibited in order to prevent people from hit or fall down.
——Chip stick with the drill may happen sometimes, so no hand or hock for removing chip could be used. Chip removing could be made only when machine spindle is stopped.
—— Stop the machine immediately until problems are to be found if any abnormal conditions appeared (such as vibration, sharp noisy, temperature increased rapidly, leakage happened or malfunction for the clamping or loosing existed) when use of the machine.
——During machine maintenance or problem elimination period, some parts may with electric current and some gear transmission or parts disassemble or parts moving may possible, therefore please obey the

## 2. Main usage of the machine and its features:

R 80VT Radial Drill Machine is a newly designed and a widely used conventional drill machine. It retains the operation of the traditional radial drilling machine, and can use the touch screen to achieve conventional actions or obtain new functions. It is suitable for medium and small parts in drilling, spot facing, counter-boring and taping etc. Hole boring is possible with the help of fixture. The machine is equipped with special accessories such as quick change chuck and inclinable table etc. and tool change could be made by manual quickly and machine needn't be stopped.

It is really an idea machine suitable for single work piece machining and batch production in the machining workshop, maintenance workshop and tool production workshop.

In comparison with traditional Radial Drill Machines, the machine has the following features:

2.1 The spindle speed adopts frequency conversion motor and gear shift to realize stepless speed regulation in the full speed range and digital display

2.2 The spindle feed variable speed adopts AC servo motor stepless speed regulation, and displays the feed per revolution and feed per minute at the same time, and can switch display in metric or imperial units;

2.3 Both the stepless speed regulation of the spindle speed and feed rate adopts "slider" touch movement speed adjustion;

2.4 The spindle system adopts reinforced spindle structure and cylindrical spring balance mechanism, and is equipped with electrical limit protection for the lower limit position of the spindle;

2.5 The column, rocker arm and headstock are all hydraulically clamped. The lifting and clamping of the rocker arm are interlocked. The column and headstock can be clamped simultaneously or separately;2.6 Lubrication oil pump is to be used on the spindle box and lubrication oil could be available when spindle running in forward or in reverse.

2.6 With segmented drilling function, reliable chip breaking and chip removal;

2.7 "Automatic tapping, reverse and retreat" function: After the tapping is in place, the spindle can automatically reverse; and there is a "rigid tapping" as special optional function for users;

2.8 The depth of drilling and tapping can be preset and precisely controlled, and the residual value can be displayed timely;

2.9 It has the alarm function of electrical faulty and travel limit position.

2.10 The lower part of the spindle box is equipped with a protective cover for "open the door and power off", and the rocker arm lifting screw is equipped with a spiral protective cover

2.11 The main drive system adopts a new type of cycloid lubrication pump that can supply oil both forward and reverse.

2.12 In order to better serve users, the factory date of the machine tool is set on the touch screen for review.

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## 3. Main Technical Data and size of working area:

3.1 Main technical data:

| No | Name of the technical data | Data | Unit |
|---|---|---|---|
| 1 | Max. drilling diameter (No.45 steel) | 80 | mm |
| 2 | Max. drilling diameter (HT200 cast iron) | 105 | mm |
| 3 | Max tapping diameter(No.45 steel) | M52 | mm |
| 4 | Max tapping diameter(HT200 cast iron) | M60 | mm |
| 5 | Distance between column center line to the spindle center line | 465-2550 | mm |
| 6 | Travel distance of the spindle box in horizontal (by manual) | 2095 | mm |
| 7 | Distance between spindle end face to the machine bottom table | 360 - 1560 | mm |
| 8 | Max. spindle travel | 400 | mm |
| 9 | Spindle taper | MT.6 | Morse |
| 10 | Steps of spindle speed | step-less | |
| 11 | Spindle speed range | 30-192；205-1400 | r/min |
| 12 | Touch screen size | 307.4×231.3（15”） | mm |
| 13 | Steps of spindle feed | Stepless | Steps |
| 14 | Range of the spindle feed rate | 0~350 | mm/r |
| 15 | Speed of the arm up and down | 1.0 | m/min |
| 16 | Arm moving angle | ±180 | degree |
| 17 | Spindle moving distance of each dial revolution | 151 | mm |
| 18 | Max. spindle torque | 980 | N.m |
| 19 | Max. spindle feed resistance | 24500 | N |
| 20 | Main motor power (Frequency converson motor) | 7.5 | kW |
| 21 | Power for the arm up and down motor | 2.6/9.93 | kW/N.M |
| 22 | Feed motor power (AC servo motor) | 2.2 | kW |
| 23 | Rocker arm lifting motor power | 1.5 | kW |
| 24 | Machine dimension (L x W x H) | 3590×1250×3560 | mm |
| 25 | Machine weight (without table) | 7400 | kg |
| | | | |
| | | | |

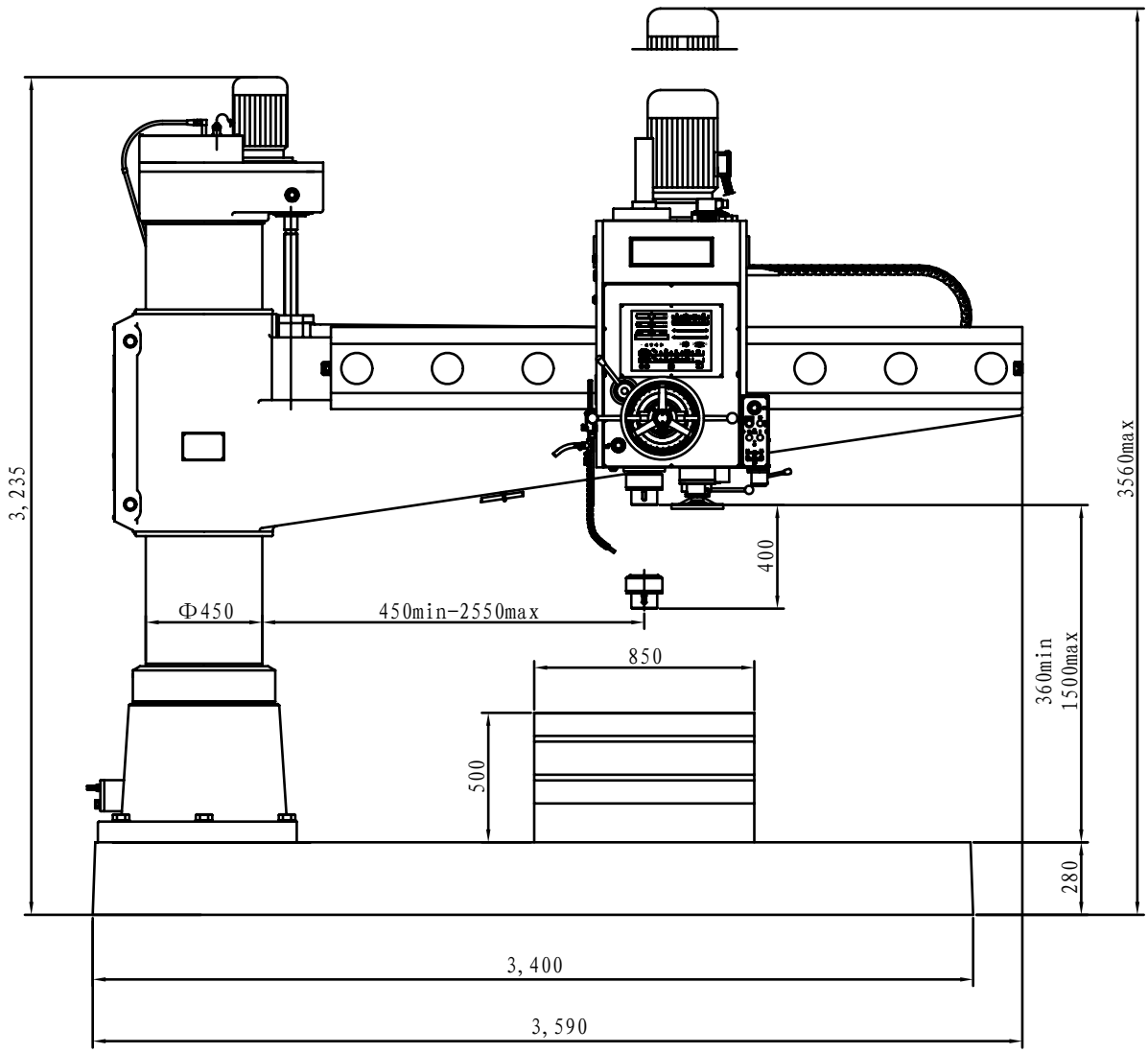
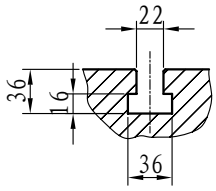
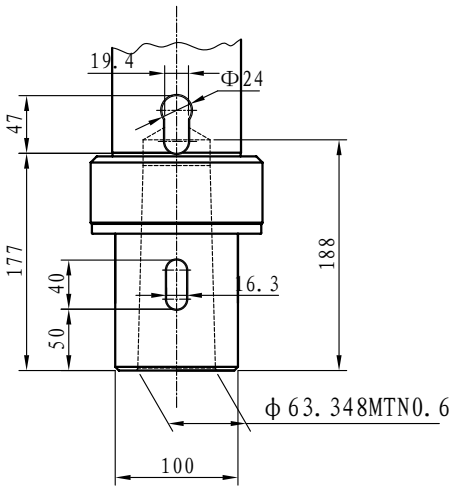


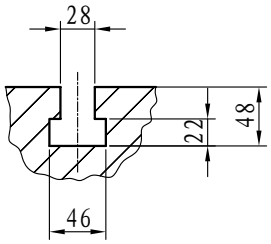

Diagram 1.Main tachnical data



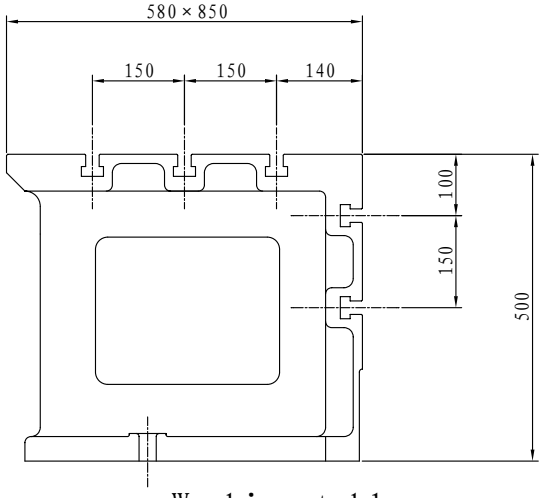

T slot of working table



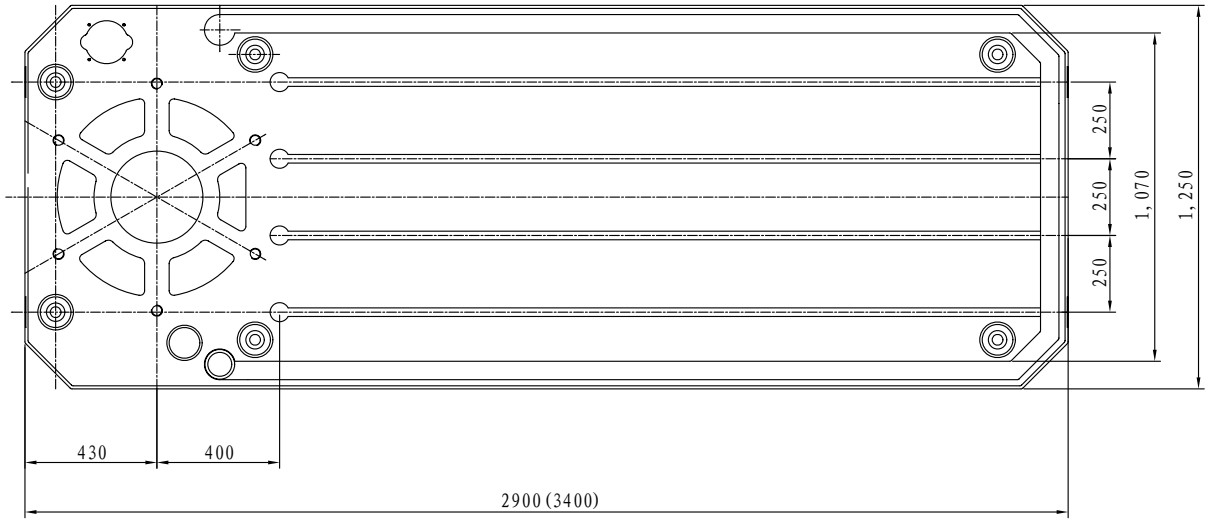

Spindle




T slot of machine base




Working table




Base

Diagram 2. Size of working area

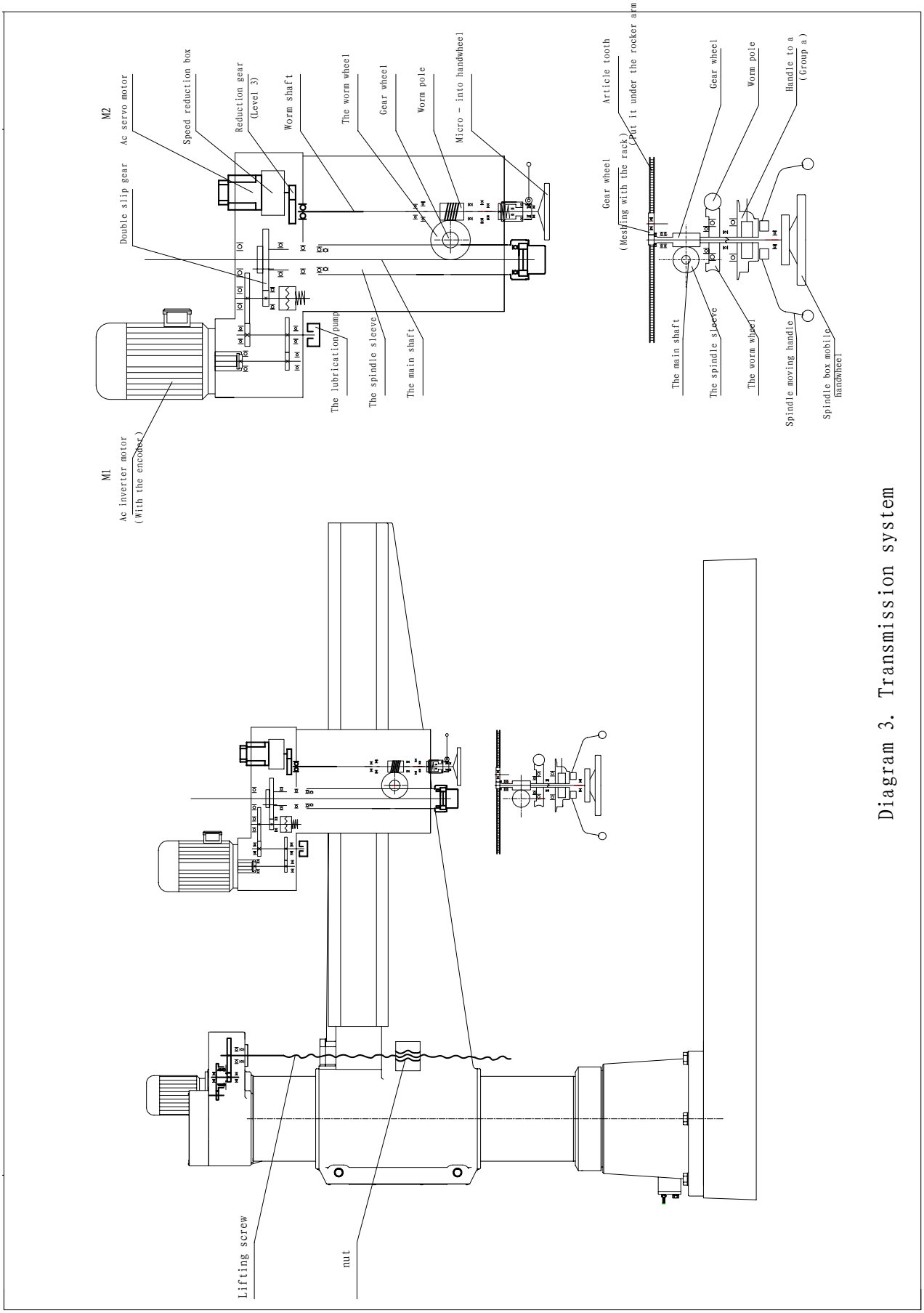



Diagram 3. Transmission system

3.2 Size of machine working area: Please refer to the diagram 2.
Diagram 1: Main data of the machine
Diagram 2: Size of machine working area.

**4. Transmission system:**

The machine consists of machine base, column, up and down box, arm, spindle box, hydraulic clamping device, electric, coolant device and some accessories etc.

Spindle revolution is main motion of the machine. Spindle movement along with its Axis is a feed motion.

Arm turning around with the column and spindle box movement along with the arm Guide way forms a polar movement to find out a place on the workpiece where the holes need to be drilled. The arm up and down movement along with the column is for the adjustment of working height.

The whole transmission system is working by three motors individually.

Coolant water is available by a coolant pump. The motor M1 located at the top of spindle box is for the use of spindle revolution, spindle feed and lubricating pump of the spindle box only (refer to the diagram 3). The motor M2 located at the top of the up and down box is for arm up and down purpose and the motor M3 located at back side of the arm is for gear pump use of the hydraulic system which is mainly responsible for the clamping and unclamping of the column, arm and spindle box.

Diagram 3: Transmission system
Diagram 4: Spindle speed chart
Diagram 5: Feed rate chart
Table 1: Table for Gears, Worm gears, screw and nut mechanism, rack and pinion etc.
Diagram 6: Bearings location diagram
Table 2: List for rolling bearings

**5. Main structure:**

5.1 The variable speed drive mechanism of the main shaft is set at the upper part of the main shaft box, and there are four drive shafts. The shaft extension of the variable frequency motor is connected with the I shaft through the inner and outer gear coupling sleeve, and then it is transmitted to the II shaft through the gear reduction, and then it is transmitted to the III shaft through another gear reduction. The lower end of the II shaft drives a new directional oil supply cycloid lubrication pump to provide lubricating oil to the transmission parts in the upper part of the main shaft box. The lower part of shaft III is equipped with adjustable torque safety clutch. Shaft IV is a spindle sliding sleeve with outer circle and spline in inner hole. The outer spline is equipped with double sliding gear to change the speed range of high and low speed stepless speed regulation, and the inner spline is used to drive the spindle.

A converter controls step-less speed in the range of 502 – 3209 r/min of the main motor. The low speed range 30 –192 r/min and the high speed range 205– 1400 r/min could be available by shifting of the twin gear, therefore the spindle speed range from 30 – 1400 r/min in step-less is available. Actual spindle speed number is available from the screen.

5.2 Spindle system (refer to the diagram 9)

The spindle system of the machine tool is a reinforced double support sleeve structure. The spindle sleeve moves up and down in the spindle hole of the spindle box through the guide sleeve, and the spindle is supported in the spindle sleeve by the upper and lower bearing components, and the rotation motion transmitted by the spindle sliding sleeve is obtained through the upper spline.

The spindle sleeve and the guide sleeve have a long matching length. The spindle sleeve is made of high-quality materials through nitriding treatment and fine processing. This structure makes the spindle system have higher stiffness, precision and better wear resistance.

The spindle system adopts the structure of cam and cylindrical spiral spring, and the cam is used to balance the gravity and spring force of spindle components. The balance force can be adjusted by turning the screw at the lower end of the spring.

5.3 Spindle feed mechanism: (refer to the diagram 10 and diagram 11)

The transmission of the main shaft feed system is powered by a servo motor installed in the right cavity on the top of the main shaft box. After the gear is reduced, the main shaft sleeve and the main shaft are fed linearly through a worm gear pair and a rack and pinion pair.

When the main shaft moves and the handle is pulled out, the side-tooth clutch on the worm gear is combined to turn on the motorized feed; when the handle is pushed inward, the side-tooth clutch is released under the action of the spring force, and then the handle can be manually turned Move the spindle up and down.

Worm shaft (Figure 7)

The position shown in the figure is the manual or micro-motion feed position. At this time, the handle is at the upper limit horizontal position. The steel ball safety clutch 2 and gear sleeve 3 are driven by the main shaft feed speed transmission mechanism to idle. When the handle is pressed down to the limit position, Pushing the inner gear sleeve 5 to mesh with the gear sleeve 3 drives the worm shaft 1 to rotate, and the main shaft is driven by the worm gear and the horizontal shaft to realize motorized feed movement. At this time, the hand wheel rotates with it. If you want to turn on the micro feed, pull the handle up to the limit horizontal position to disengage the inner gear sleeve 5 from the gear sleeve 3. Turn the handwheel to directly rotate the worm shaft 1, and drive the main shaft through the worm gear and horizontal shaft Realize micro-motion feed movement. If the hand wheel is not turned at this time, the horizontal axis mechanism can realize manual feed.

The function of the steel ball safety clutch is to disconnect the motorized feed when the feed resistance exceeds the specified value to play a safety role. Its working principle is: when the feed resistance exceeds the specified value, the steel ball slips on the end teeth of the clutch 2 to generate axial force, and the inner gear sleeve 5 and the rack sleeve 4 are pushed back to the original position as shown in the figure through the pad and sleeve. The handle also automatically returns to the upper limit horizontal position, that is, the motorized feed is stopped. The steel ball, pad and sleeve are reset under the action of the disc spring.

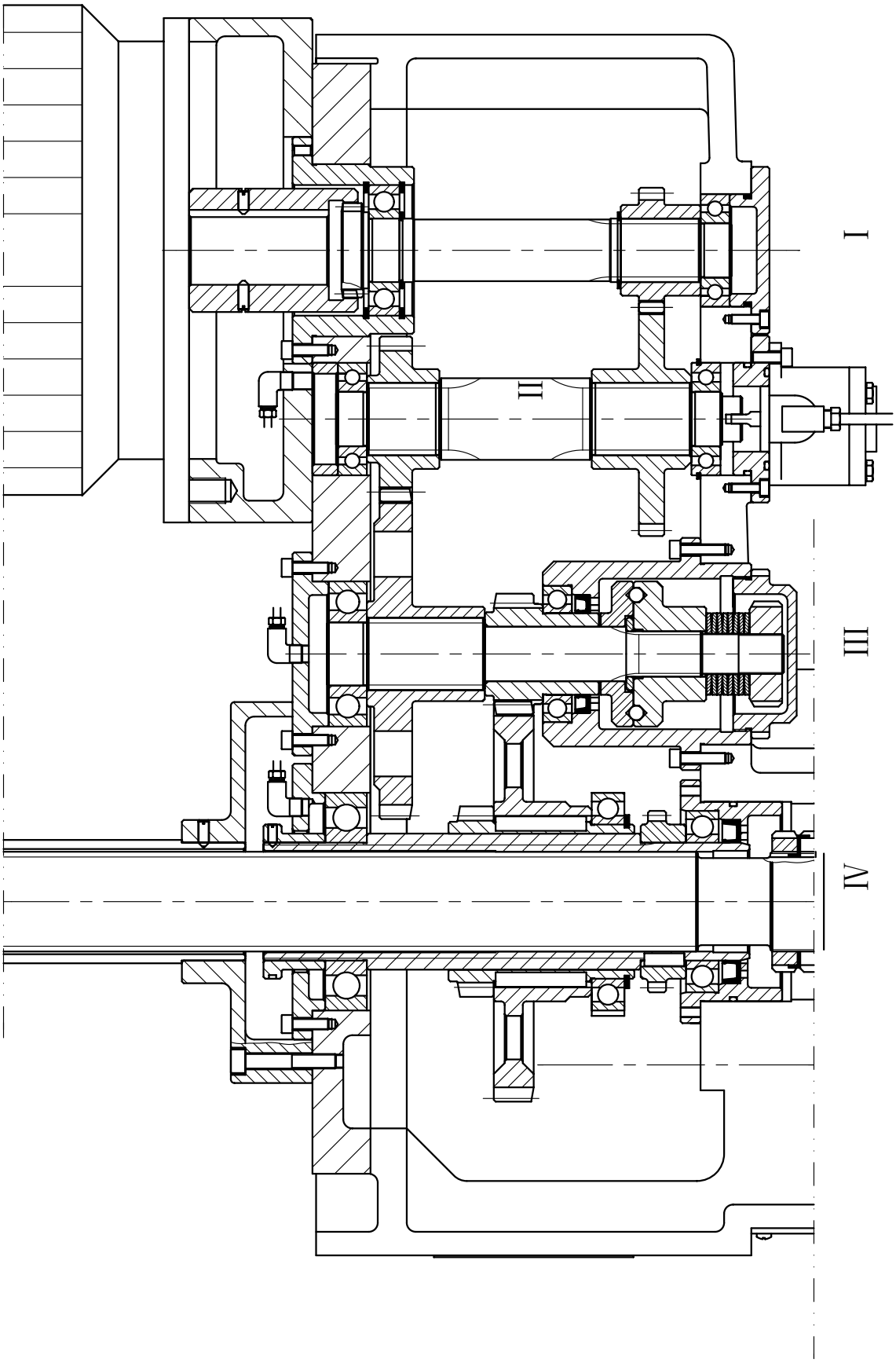



Diagram 4. Expanding drawing of spindle transmission mechanism

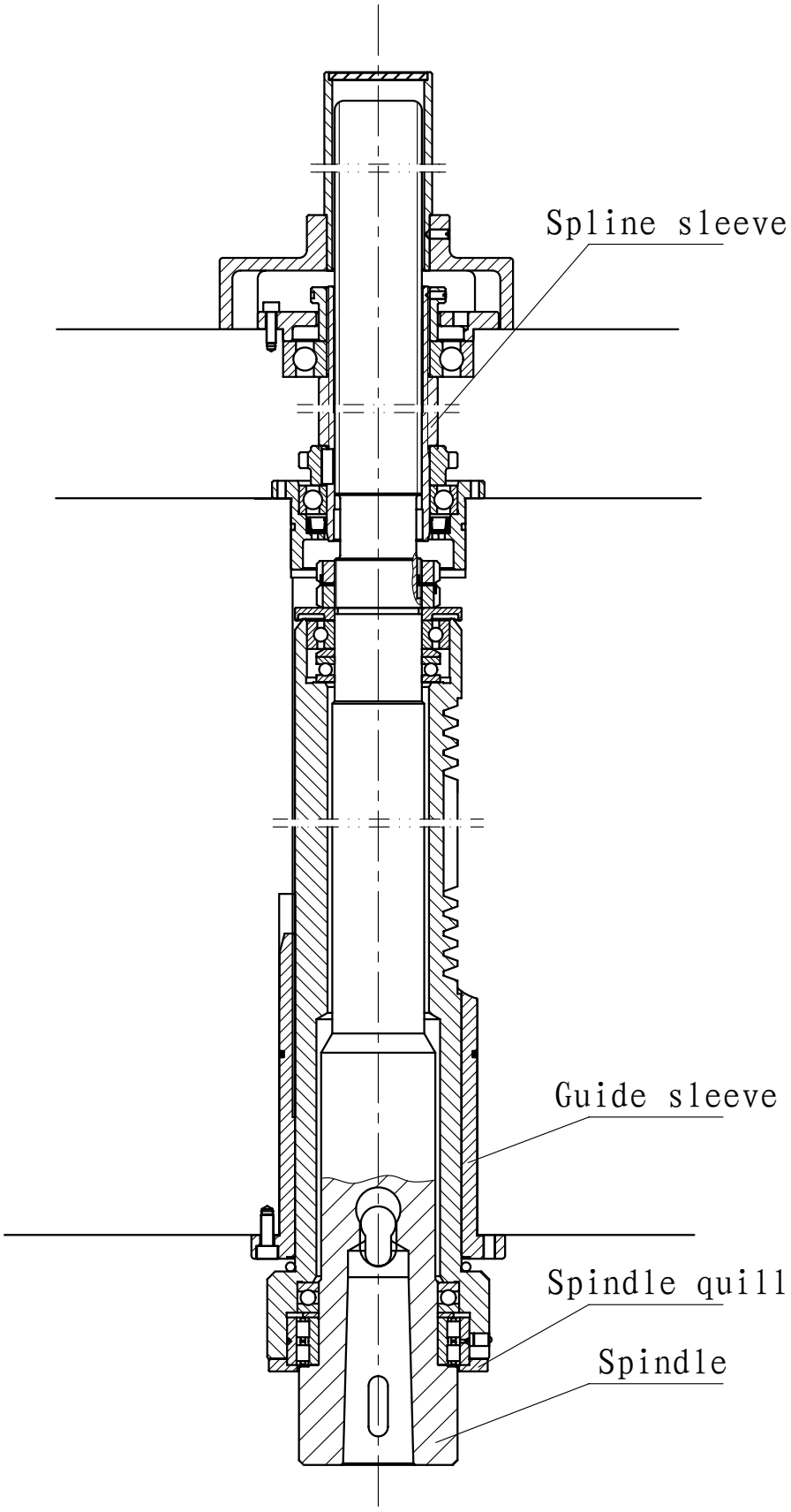
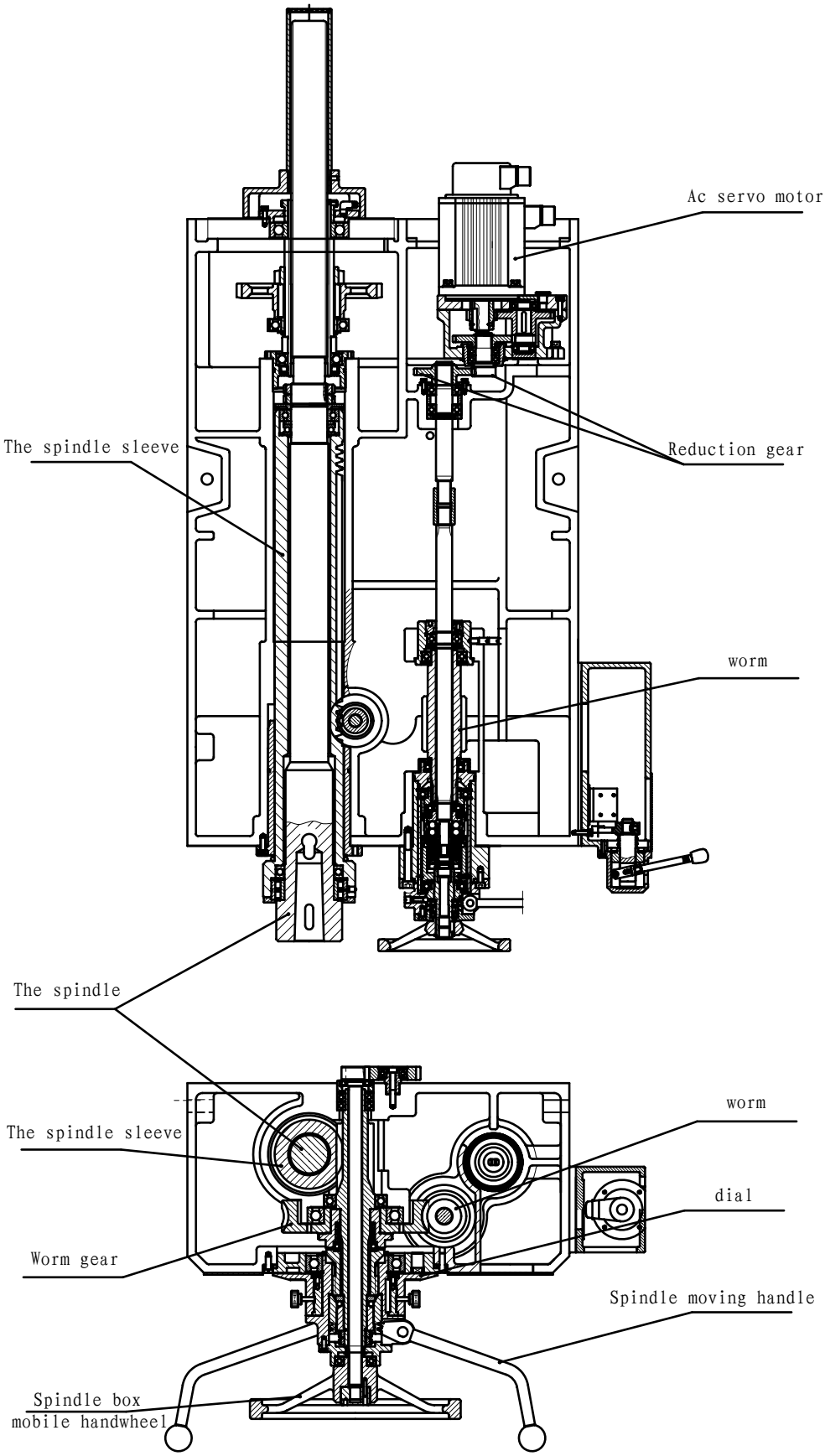



Diagram 5. Spindle strncture drawing




picture 6 Spindle feed system structure diagram

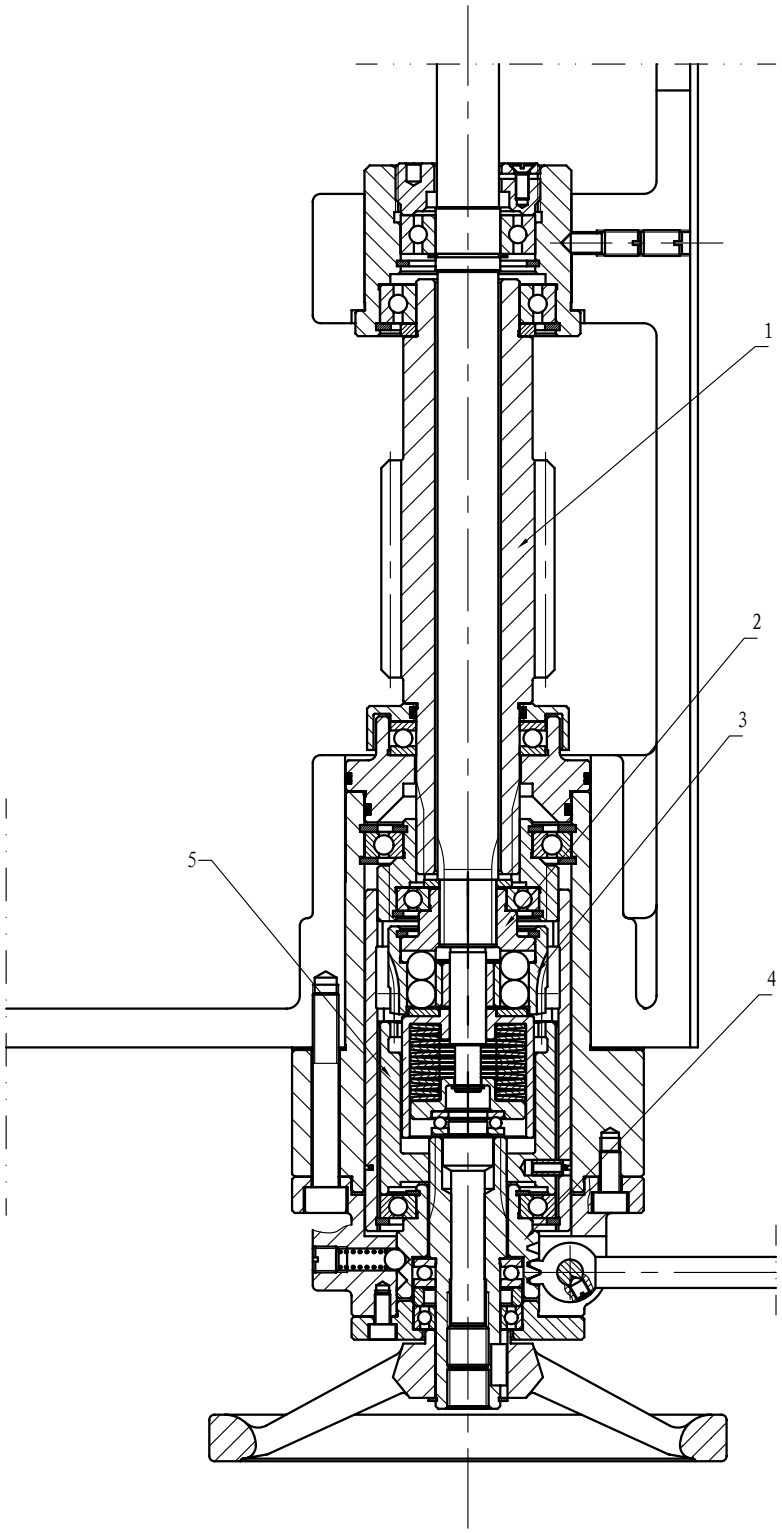



Diagram 7. Worm shaft

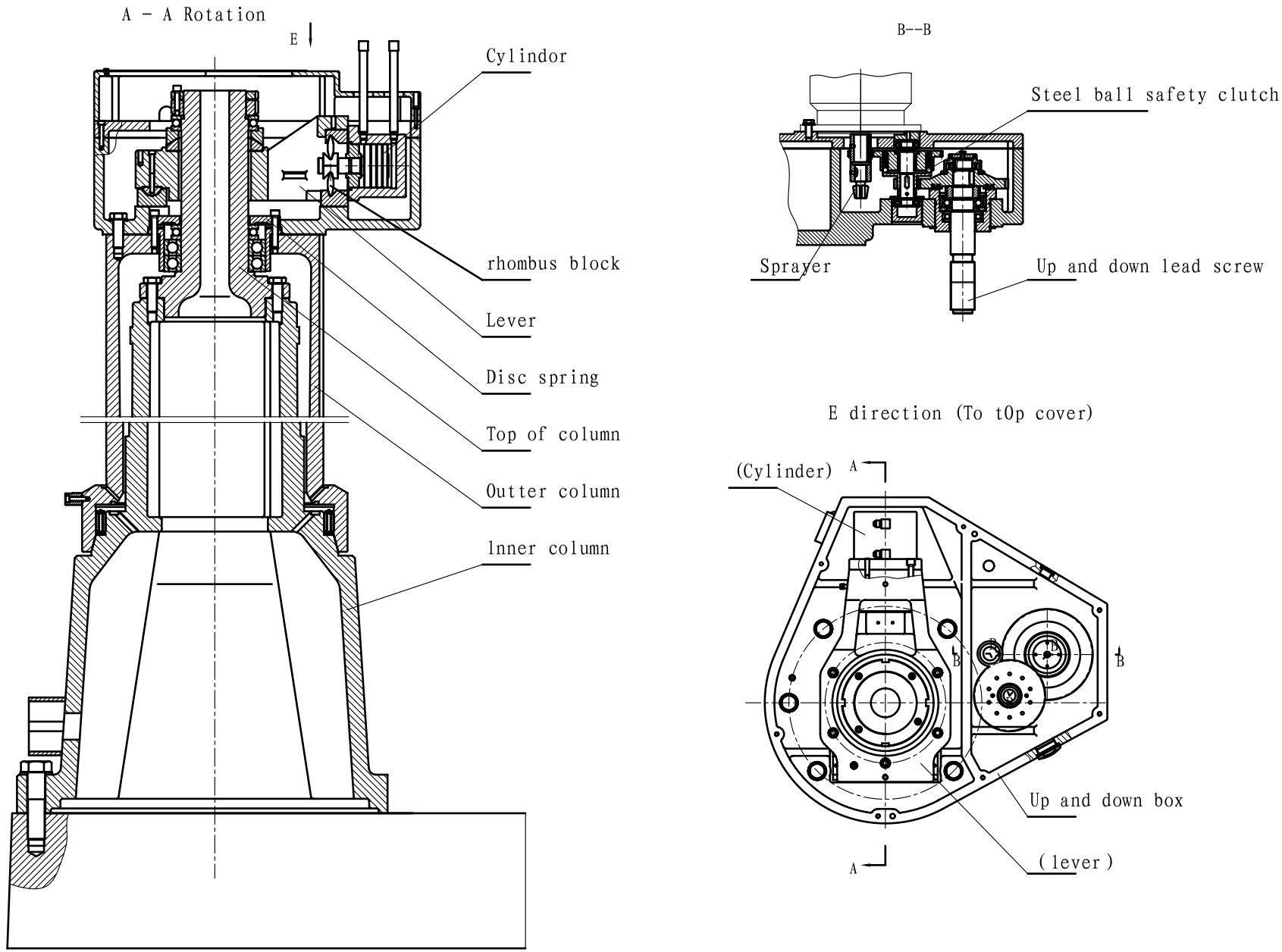



Diagram 8. Column clamping and rock arm up and down mechanism

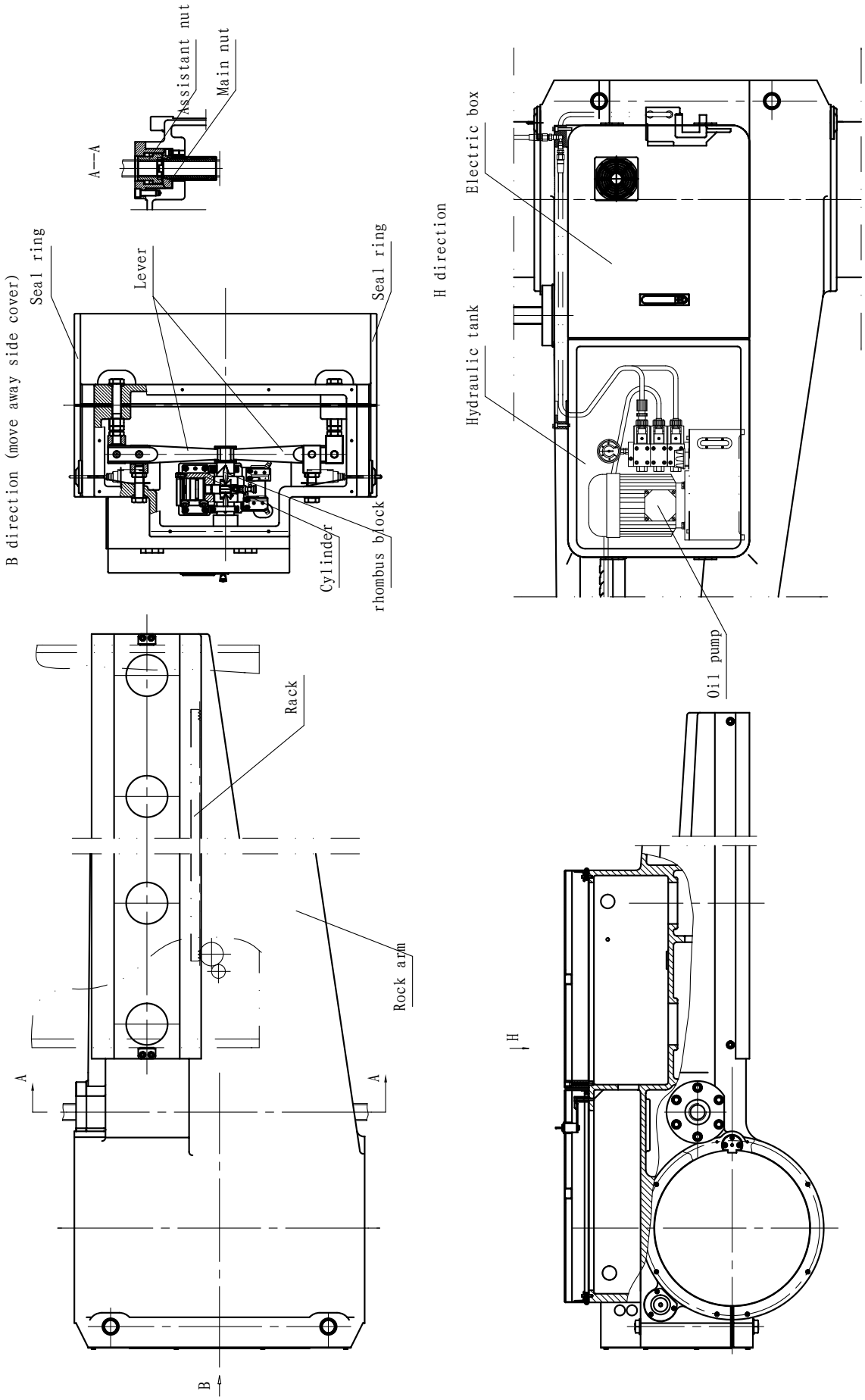



Diagram 9. Rock arm and its claming mechanism

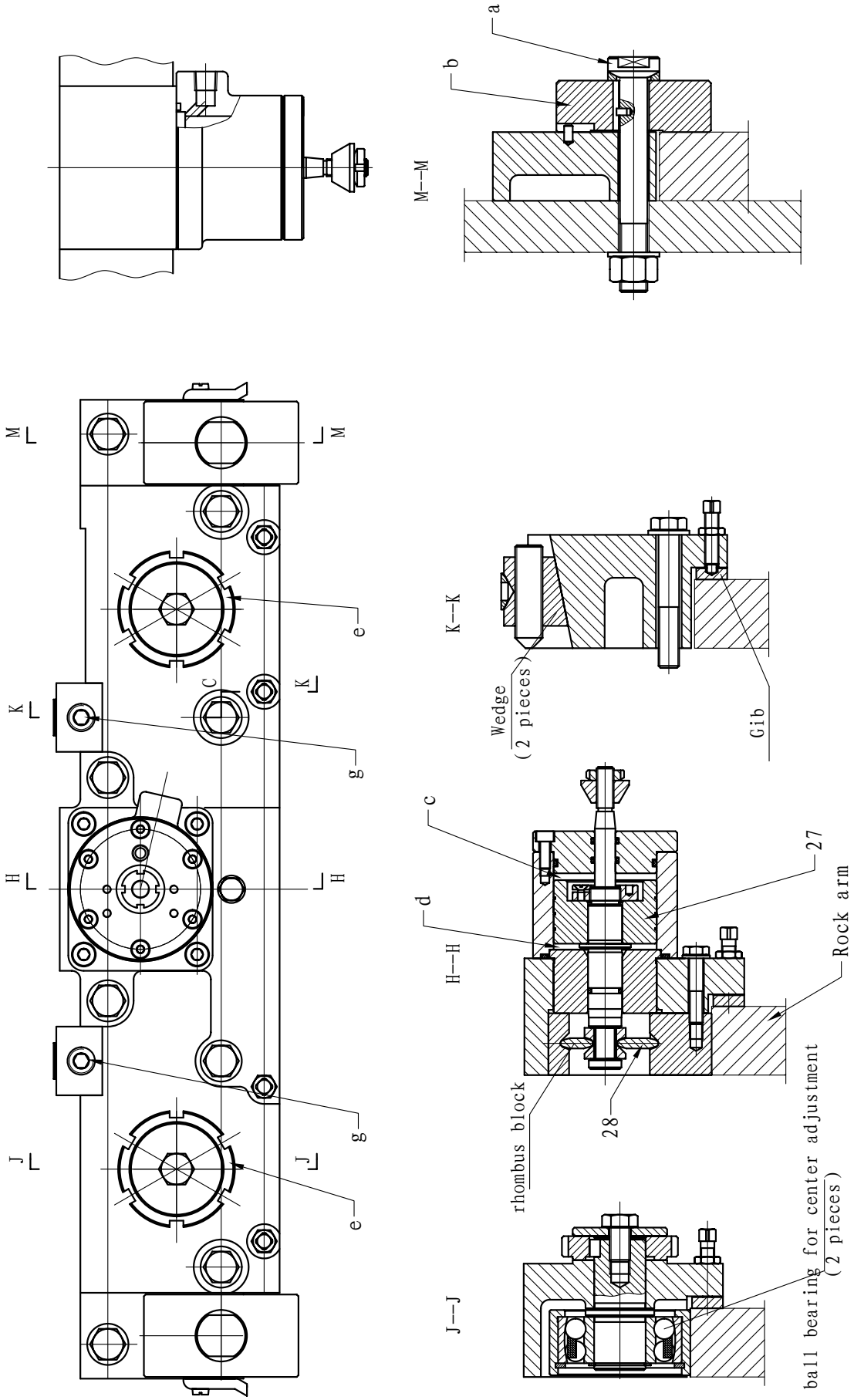



Diagram 10. Clamping mechanism of the spindle box

The large handwheel in the middle of the main shaft moving handle realizes the horizontal manual movement of the main shaft box through gears and racks (installed under the rocker rail).

When the horizontal shaft components or spindle system need to be removed, do not separate and remove many parts of the horizontal shaft one by one. Just remove the handwheel first (remove the middle nut first), push and pull the handle several times with both hands, then the handle seat, dial and side gear clutch can be connected to the hollow shaft and pulled out. The worm gear is still in the box. Only after removing the bearing seat can the worm gear be taken out. Note: if the hollow shaft with gear is not removed, it is impossible to remove the spindle system. When removing the spindle system, the counterweight and chain should be separated

5.4 Column, clamping and rock ram up and down mechanism. (refer to the diagram 12)

Sleeve barrel type structure is adopted for the column system. The bottom side of the inner column is connected with the base of the machine and its topside has a column cover together with some bearing components to be fixed with topside of the outer column. The bottom side of the outer column is connected with inner column by roller under which a cone surface is available. The diagram shows the column clamping statue, at that time, the pressure oil comes into the right chamber of the oil cylinder that makes the rhombus block in the right position, that makes the lever push down to the outer column and forced cone surface closely pressed therefore the column is clamped. When pressure oil comes into the left chamber of the oil cylinder that makes the rhombus block in the down position and the lever is unclamped, a circle plate spring lifts, a little bit, the outer column that disconnects the cone surface, therefore the outer column could be moved around with the inner column.

At the top side of the outer column, an up and down box in separate type is available, the left side of the box is for the location of the cylinder, levers and clamping device etc. and the right side (sealed box) is gear speed reduction box for the up and down movement of the rock arm. The motor transmits its power to the lead screw through two steps of gear speed reduction and makes the rock arm moving in up and down position along with the column, a steel ball protection clutch is mounted in the middle shaft for overload protection purpose of the up and down device. (Meanwhile, a position limitation protection device is arranged on the rock arm), low side of the motor shaft has an oil spray device for the lubrication of the gears and bearings inside of the up and down box.

5.5 Rock arm and its clamping device. (refer to the diagram 13)

The rock ram adopts suspension in structure. There is a very big hole at its left side in connection with the outer column. A guide key is located at up side of the big hole in order to prevent relative turning between the rock ram and the outer column. The suspension portion of the rock ram has a guide way for supporting and horizontal moving of the spindle box. There is a rack bar under the guide way to be used for moving the spindle box. The hydraulic box and electric box located parallel at backside of the rock ram. The nuts components (A-A section) for up and down movement forms a security nut system made by main nut, assistant nut and some relevant parts. In case the main nut is wear-out because of long time use or some

other reasons, the rock ram will go down 4 mm due to gravity and the assistant nut will therefore support the rock ram to avoid its further down and the rock ram will be stopped in up and down movement even if the lead screw turning. It pays a rule of security.

A slot existed at complete left side of the big hole, which creates the elastic force, because of this, the rock ram could be clamped and unclamped at any place of the outer column and its hydraulic clamping device is arranged in the chamber of left side of the rock ram. (View B direction), the principle is the same as that of column clamping system. Up or down and clamping or unclamping of the rock ram is interlocked, unclamping will be realized automatically before the rock ram moving up or moving down and clamping will be made automatically after moving up or moving down stopped.

5.6 Spindle box clamping device (refer to the diagram 14)

The pressure oil of the hydraulic system for clamping enters the large cavity c of the cylinder to push the piston 27 to make the diamond block 28 stand upright and offset slightly beyond the center to self-lock, eliminate the gap between the spindle box and the rocker arm guide, and clamp the spindle box On the rocker arm, when loosened, the pressure oil enters the small cavity d of the oil cylinder, and the headstock can be moved easily by pushing down the diamond block.

Manual clamping plates B are also set at both ends of the spindle box clamping frame. In order to firmly fix the spindle box on the rocker arm during transportation, the nut on bolt a has been tightened. After the machine tool is installed, the nut should be loosened moderately, otherwise the spindle box cannot move on the rocker arm. In addition, in order to adapt to the work of boring and spot facer, when the hydraulic clamping force of boring and spot facer is not enough, a wrench can be used to tighten the nut on bolt a, so that the spindle box can be firmly clamped on the rocker guide rail.

5.7 Hydraulic system (refer to the diagram 15)

Clamping or loosing of the spindle box、the column and the radial arm shall be realized by pressure oil when it pushes piston and rhomb. Oil pressure of the clamping device shall not low than 300 x 10Pa. Clamping of the spindle box and column could be done either individually or jointly. Clamping of the radial arm shall be done individually only as it involves the auto cycle with the radial arm up and down movement.

Clamping、releasing of the spindle box、the column and its action.

Put the three position selection switch in the middle position (working together position), push down the clamping button, the oil pump located at back side of the radial arm is working, the pressure oil shall respectively come into, through two position four ports solenoid value, the spindle box and big chamber of cylinder for column clamping or releasing which will push piston and rhomb and causes the spindle box clamped on the radial arm guide way and the outer column clamped on the inner column. At this moment, the spindle box as well as the piston rod of the clamping cylinder of column strokes the limit switch respectively, the indicator lamps both for the spindle box and for the clamping or releasing of the column are off, that means the clamping action has been finished. Push down the release button, spindle box and the column are released simultaneously, the indicator lamp is lighted.

Put the three position selection switch in the left side position, push down the release button, oil pump working, pressure oil comes into the small chamber of clamping cylinder of the column through two position four ports solenoid valve, then push down the rhomb block, the column is released and indicator lamp for column release is lighted, the release action has been finished. The spindle box is in the clamping status when column released.

Put the three position selection switch in the right side position, push down the release button, oil pump working, pressure oil comes into the small chamber of clamping cylinder of the spindle box through two position four ports solenoid valve, the spindle box is released and indicator lamp for spindle box release is lighted, the release action has been finished. The column is in the clamping status when spindle box released.

| No. | Drilling bit (mm) | Casting iron | | | Steel | | | Copper | | | Aluminum | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Speed (r/min) | Feed (mm/r) | Tapping speed (r/min) | Speed (r/min) | Feed (mm/r) | Tapping speed (r/min) | Speed (r/min) | Feed (mm/r) | Tapping speed (r/min) | Speed (r/min) | Feed (mm/r) | Tapping speed (r/min) |
| 1 | Φ10 | 500 | 0.09 | 200 | 400 | 0.15 | 200 | 800 | 0.15 | 200 | 1000 | 0.15 | 250 |
| 2 | Φ16 | 320 | 0.15 | 160 | 250 | 0.15 | 160 | 800 | 0.15 | 160 | 1000 | 0.15 | 300 |
| 3 | Φ20 | 250 | 0.23 | 125 | 200 | 0.23 | 125 | 600 | 0.23 | 125 | 800 | 0.23 | 200 |
| 4 | Φ25 | 200 | 0.23 | 125 | 180 | 0.23 | 125 | 500 | 0.23 | 100 | 800 | 0.23 | 200 |
| 5 | Φ30 | 160 | 0.23 | 100 | 150 | 0.23 | 100 | 400 | 0.36 | 100 | 600 | 0.36 | 150 |
| 6 | Φ40 | 125 | 0.36 | 100 | 120 | 0.36 | 100 | 300 | 0.36 | 80 | 500 | 0.36 | 150 |
| 7 | Φ50 | 100 | 0.36 | 80 | 85 | 0.36 | 80 | 150 | 0.36 | | 250 | 0.36 | 100 |
| 8 | Φ60 | 85 | 0.36 | | 70 | 0.36 | | 150 | 0.36 | | 250 | 0.36 | |
| 9 | Φ70 | 70 | 0.36 | | 60 | 0.23 | | 100 | 0.23 | | 150 | 0.36 | |
| 10 | Φ80 | 60 | 0.36 | | 50 | 0.23 | | 100 | 0.23 | | 150 | 0.36 | |

Up or down of the arm and its action:
Action for arm up or down is in automatic cycle, put the arm up or down switch at the up or down position, the oil pump works, the pressure oil from the oil pump comes into the small chamber of arm champing cylinder via two position four ports solenoid valve, that pushes the rhomb block down, release arm clamping and piston rod presses the switch SQ1 (arm up or down switch is on) and makes the oil pump motor power off, oil supply is stopped and up or down motor of the arm is working that brings the lead screw turning, when arm moves to the required place, limit switch works, up or down motor is off, oil pump motor works, pressure oil comes into big chamber of the arm clamping cylinder via two position four ports solenoid value that pushes the piston, the rhomb block makes the arm to be clamped on the column, at the same time, the piston stops the oil pump motor working, that's finish the automatic cycle.

When the arm moves up or down to the limited place, the limit switches located individually at the top or the down place of the arm shall be pressed respectively and the motor for up or down movement will be stopped for safety purpose.

## 6 Electrical system:

### 6.1 Description

The machine is suitable for the power of 400V/50HZ in three phases with neutral (L1, L2, L3, N), special voltage and frequency of machines for power supply is also available based on the order. A transformer supplies 24V, 24V and 9V to the control circuit, illustration circuit and spindle speed display circuit respectively. A shortcut protection and emergency stop button is available in the control circuit. The spindle drive motor, rock ram up and down movement motor and oil pump motor are for AC asynchronous motors in three phases. The main motor is driven by frequency converter for step less speed change.

Note: Please do not move the rock ram always in one direction in order to avoid broken the power wire from the inner column.

6.2 Circuit explanation

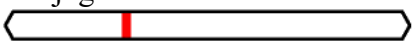
6.2.1 Preparation before machine running

1) Turn on the power(drawing 12、16): Turn on the main switch11( QS1), the signal lamp 7(HL1) is lighted.
2) Moving the handle 11 into the spindle brake slot located in the middle position so the power for control circuit is working.
3) Press the power key  on the display 4, then press the key  or  , pull the handle 9 to the forward or reverse position to start the spindle.
   When the machine running, keeping the circuit breakers QF1, QF2, QF3 and QF4 are in the "on" position. Turn off the relevant breakers when machine needs maintenance. The five breakers are for the protections of short circuit, overload and phase shortness for spindle motor, rock ram up and down motor, oil pump motor, water pump motor as well as for the control circuit respectively.

6.2.2 Control of the main motor:

See diagram 20, the handle 11 controls the running of the spindle in forward, revise, brake and stop position. The spindle runs in forward direction when the handle11 moves to the operator's direction, the spindle runs in reverse direction when the handle 11 moves to the opposite direction. (Need moving the handle into its slot for the above two operations, otherwise the spindle could not work). The spindle motor will be stopped when the handle is in the middle position and when the handle is in the middle slot position, the spindle will be brake immediately. Spindle jog is available when pushing the button 4(SB2).

Turn on the main power switch 11(QS1), the power indicator 7(HL1) is lighted, moving the handle 11 into the slot of the middle position that makes the frequency converter power on. In case, the frequency converter lose its power during working (suppose the emergency button 9 is pushed), restore its power is possible by moving handle 11 to slot of the middle position first, then moving the handle 11 to the spindle forward or spindle reverse position. Step less spindle speed is available by turn the speed adjustment knob 3 and the actual spindle speed will be indicated on the display. Remember spindle could be run in forward, reverse or jog two seconds after the frequency converter powers on.

Press  the slider button of spindle speed regulation to move left to accelerate and right to decelerate

### 6.2.3 Rock arm moving up or down

As shown in figures 16 and 17, press the rocker arm lifting button 11 (up button  or down button  ) in the display 4, The electromagnet ya1 and the contactor km4 pull in at the same time. The oil pump motor m3 rotates to supply pressure oil. The pressure oil enters the rocker arm to release the oil chamber through the two position two-way valve, and pushes the piston and diamond block to release the rocker arm. When the piston rod presses the upper limit switch SQ2 through the spring plate, the contactor km4 coil loses power and releases, and km2 (or KM3) is powered on to pull in. The oil pump motor m3 stops rotating, and the lifting motor M2 starts to rotate, Drive the rocker arm up (or down).

Suppose the rock arm is not released, the normal open contract points SQ2 could not be closed, KM2 (or KM3) could not be worked and the rock arm could not be moving in up and down direction.

Release the switch 14 (SX3) when arm is to be moved up or down at the required position, electric magnetic iron YA1 is power off, KM2 (or KM3) is released, up or down motor M2 stops, arm stops up or down, KM4 is power on, oil pump motor M3 turning, pressure oil comes back to the arm release oil channel, arm starts to be clamped to the certain place and SQ3 is pressed, KM4 coil is power off, oil pump stops running.

SQ1-1 and SQ1-2 are for the up and down limited switches. When rock arm moving to the limited up position, the SQ1-1 works and KM2 releases and the up and down motor M2 stops to running; When rock arm moving to the limited down position, the SQ1-2 works and KM3 releases and the up and down motor M2 stops to running;

Automatic clamping of the rock ram is realized by the switch SQ3.

### 6.2.4 Unclamping and clamping of the column and spindle box

The release and clamping buttons of the column and headstock are located in the lower right corner of the display 4 (as shown in Figure 17, hydraulic clamping 9). The loosening (or clamping) of column and headstock can be carried out simultaneously or separately

① When releasing or clamping at the same time, press the  button first, and then press the  or  button.

② When the column is released (or clamped) separately, press the  button first, and then press the  or  button.

③ When the headstock is released (or clamped) separately, press the  button first, and then press the  or  button

For example, when the column needs to be clamped, first press the  button, and then press the  button, the solenoid valve YA2 and the contactor km5 are powered on at the same time, the oil pump motor m3 rotates, and the pressure oil supplied enters the column clamping oil cylinder through the solenoid valve YA2 to clamp the column. When the piston of the column oil cylinder presses the upper limit switch sq7, the solenoid valve YA2 loses power, at this time, release the  button, and the clamping action is completed.

The method of loosening or clamping the column and headstock at the same time, and the method of loosening or clamping the headstock separately is the same.

### 6.2.5 Emergency operation and down limited protection of the spindle

Please push the emergency button 9 (or the universal emergency 19 ) when emergency stop is necessary during machining, which makes the control circuit power off, so the machine is stopped to work. Please release the lock of the emergency button and moving the handle 9 to the slot in the middle position, moving the handle 11 once again to the forward or reverse position and the machine starts to work.

When electric box door is opened, the door switch SQ4 is off and control circuit is power off and the machine is stopped his work. During electric maintenance, if power supply is requested when electric box door is in the open position, the solution is that pull out the push rod of door switch SQ4, the function for power off when electric box door open will be elapsed.

### 6.2.6 Coolant pump

Press the cooling pump button  on the display screen 4, the indicator above the button will light up, and the cooling pump will work at the same time with the rotation of the spindle. The spindle stops and the cooling pump stops.

## 6.3 Power phase checking:

When power supply is connected, push on the main power switch 6 (QS1) first, then turn the arm up or down selection switch 14 (SX3), in case, the arm could not go up or go down, the problem could be solved by exchanging any two phase wires of the power supply. Machine is requested to be connected with ground.

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6.4 Maintenance of the electrical equipment

The electric equipment must keep on clean condition. Therefore, regularly cleaning is necessary. However, liquid such as kerosene, gasoline and detergent etc. is not be allowed for the cleaning. Wave of power supply shall not be over ±5 % required by the electric motor. Maintenance of electric equipment is absolutely important in order to keep machine works well.

6.5 Electric components

| Name | Model/spec. | Function description | Supply unit | Page | Col. |
|---|---|---|---|---|---|
| QF1 | GV2-ME20、GVAE11 | Spindle motor | Schneider | 27 | 2、3 |
| QF2 | GV2-ME10、GVAE11 | Lifting motor | Schneider | 27 | 3、4 |
| QF3 | GV2-ME08、GVAE11 | Oil pump motor | Schneider | 27 | 4、5 |
| QF4 | GV2-ME04、GVAE11 | Coolant pump motor | Schneider | 27 | 5、6 |
| QF5 | GV2-ME05、GVAE11 | Servo motor | Schneider | 29 | 8 |
| QS1 | JCH13-32 | Power switch | JUCHE | 27 | 2 |
| SA1 | LXP1(3SE3)020-0A | Spindle stop | shanghai | 28 | 3 |
| SA2 | LXP1(3SE3)020-0A | Spindle cw | shanghai | 28 | 3 |
| SA3 | LXP1(3SE3)020-0A | Spindle ccw | shanghai | 28 | 4 |
| SB1 | MPMT3-10R, MCBH-00,MCB-01 | Emergency stop button | ABB | 29 | 1、2 |
| SB2,HL2 | GQ22-11E/G/24V/S | Start button | ONPOW | 28 | 6、5 |
| SB3,,HL3 | GQ22-11E/R/24V/S | Stop button | ONPOW | 28 | 7、6 |
| SB4,HL4 | GQ22-11E/W/24V/S | Jog button | ONPOW | 28 | 8、9 |
| SB7,HL1 | GQ22-11E/B/24V/S | Reset button | ONPOW | 29 | 3 |
| SQ1-1 | SND6166-SP-C-001 | Rock arm up | SUNS | 28 | 4 |
| SQ1-2 | SND6166-SP-C-001 | Rock arm down | SUNS | 28 | 5 |
| SQ2 | LXW5-11G2/F | Rock arm release | JUCHE | 28 | 5 |
| SQ3 | LXW5-11G2/F | Rock arm clamping | JUCHE | 28 | 5 |
| SQ4 | JWM6-11 | Door switch | JUCHE | 28 | 7 |
| SQ5 | ZCP29+ZCPEP16+ZCE10 | Emergency stop button of spindle | Schneider | 28 | 6 |
| SQ7 | XCKN2102P20C | Column release | Schneider | 28 | 6 |
| SQ8 | XCKN2102P20C | Spindle box release | Schneider | 28 | 9 |
| SQ9 | SND4162-SL2-D | Limit switch of spindle | SUNS | 28 | 9 |
| A1 | MR-ZK3080-A1 | Control panel | Guong zhou | 28 | 1-10 |
| KM1 | LC1-D18B7 (AC24V) ,LAD-N20 | Spindle control | Schneider | 29 | 4 |
| KM2 | LC1-D12B7 (AC24V) | Rock arm up | Schneider | 28 | 3 |
| KM3 | LC1-D12B7 (AC24V) | Rock arm down | Schneider | 28 | 4 |
| KM4 | LC1-D12B7 (AC24V) | Oil pump control | Schneider | 28 | 4 |
| KM5 | LC1-D12B7 (AC24V) | Cooling control | Schneider | 28 | 5 |
| KM6 | LC1-D18B7 (AC24V) | Spindle control | Schneider | 28 | 3 |
| KM8 | LC1-D18CB7 (AC24V) | Servo control | Schneider | 28/ | 5 |
| T1 | JBK5-250TH ,400/24,24, 24,24,9 | Transformer | JUCHE | 27 | 6-9 |
| T2 | LRS-100-24 | Transformer | Ming wei | 27 | 9 |
| QL1 | QL5A200V | Coolant for inverter | Le Qing | 27 | 2 |
| QL2 | QL10A200V | Arm release | Le Qing | 28 | 6 |
| QL3 | QL10A200V | Column release | Le Qing | 28 | 7 |
| QL4 | QL10A200V | Spindle box release | Le Qing | 28 | 8 |
| INV1 | ATV320U75N4B(new) | Frequency converter | **Schneider** | 29 | 6 |

| Name | Model/spec. | Function description | Supply unit | Page | Col. |
|---|---|---|---|---|---|
| U2 | SD700-6R6D-PA | Servo system | Su Zhou | 29 | 9 |
| U3 | M13D2R625-D1L | Servo motor | Su Zhou | 29 | 10 |
| EL1 | M7-24V 8W | Illuminator | KNUTH | 27 | 6 |
| KA1、KA2 | HH52P AC24V(with seat) | Control | OMRON | 29 | 3、4 |
| KA3 | G9SA-321-T15 | Safety relay | OMRON | 29 | 1-4 |
| R1、V1 | RT 2W62Ω、IN5404 | Arm release | Le Qing | 28 | 7 |
| R2、V2 | RT 2W62Ω、IN5404 | Column release | Le Qing | 28 | 8 |
| R3、V3 | RT 2W62Ω、IN5404 | Spindle box release | Le Qing | 28 | 9 |
| YA1 | DC24V | Arm release valve | ALITE | 28 | 5 |
| YA2 | DC24V | Column release valve | ALITE | 28 | 6 |
| YA3 | DC24V | Spindle box release valve | ALITE | 28 | 7 |
| M1 | YUBP132M4A ( 7.5KW) | Spindle motor | An hui | 27 | 2、3 |
| M2 | YU100L4 A ( 2.2 KW) | Lift motor | An hui | 27 | 3、4 |
| M3 | YU90S4A ( 1.5 KW) | Oil pump motor | An hui | 27 | 4 |
| M4 | SP-6 ( 0.13 KW) | Coolant pump motor | zhangtie | 27 | 5 |
| M5 | FH120-B-24L-25 | Cooling for spindle motor | An hui | 27 | 6 |
| M6 | GH17250HA3BL(400V,0.15A) | Cooling for transducer | Hoofuer | 27 | 2 |

## 6 Lubrication and coolant system:

7.1 Lubrication system (refer to the diagram 17)

The spindle box and up and down box are lubricated automatically. Oil exchange shall be done exactly as per the stipulation. Oil feeding hole and oil release hole of the up and down box are located on the box cover and at the bottom of the box respectively. There are two oil tanks of the spindle box, the tank located in the middle of the box is for oil pump, the oil feeding hole is in the left side of the box and the oil release hole is in the middle of the box which could be found after moving away the front up side label. The tank in the down side is for lubrication of worm wheel, the oil feeding hole is in the left down side of the box and the oil release hole is at the bottom side of the box. Hydraulic oil tank is in the backside of the rock ram; oil could be feed when open up the hydraulic box cover. Oil release hole is in the down side of the oil tank.

The volume of cooling liquid are aproxmately 90L. The volume of lubricant above spindle box are aprox mately 7.8L.The volume of lubricant under spindle box are aproxmately 6.2L.The volume of lubricant o f lift box are 1L.The volume of hydraulic oil of the rock arm are 2L.

The spindle system, up and down lead screw and the guide way of the rock ram shall be lubricated by manual.

Lubricating places and lubrication requirements shall be refer to the diagram 18.

Note: Domestic made No.40 oil is equivalent to ISO VG68

Domestic made No.20 oil is equivalent to ISO VG33

Domestic made No.10 oil is equivalent to ISO VG15 or VG10

Domestic made No.2 grease is equivalent to GP2 or GP3 from BP; Fimax2 from ESSO; Unedo2 from SHELL.

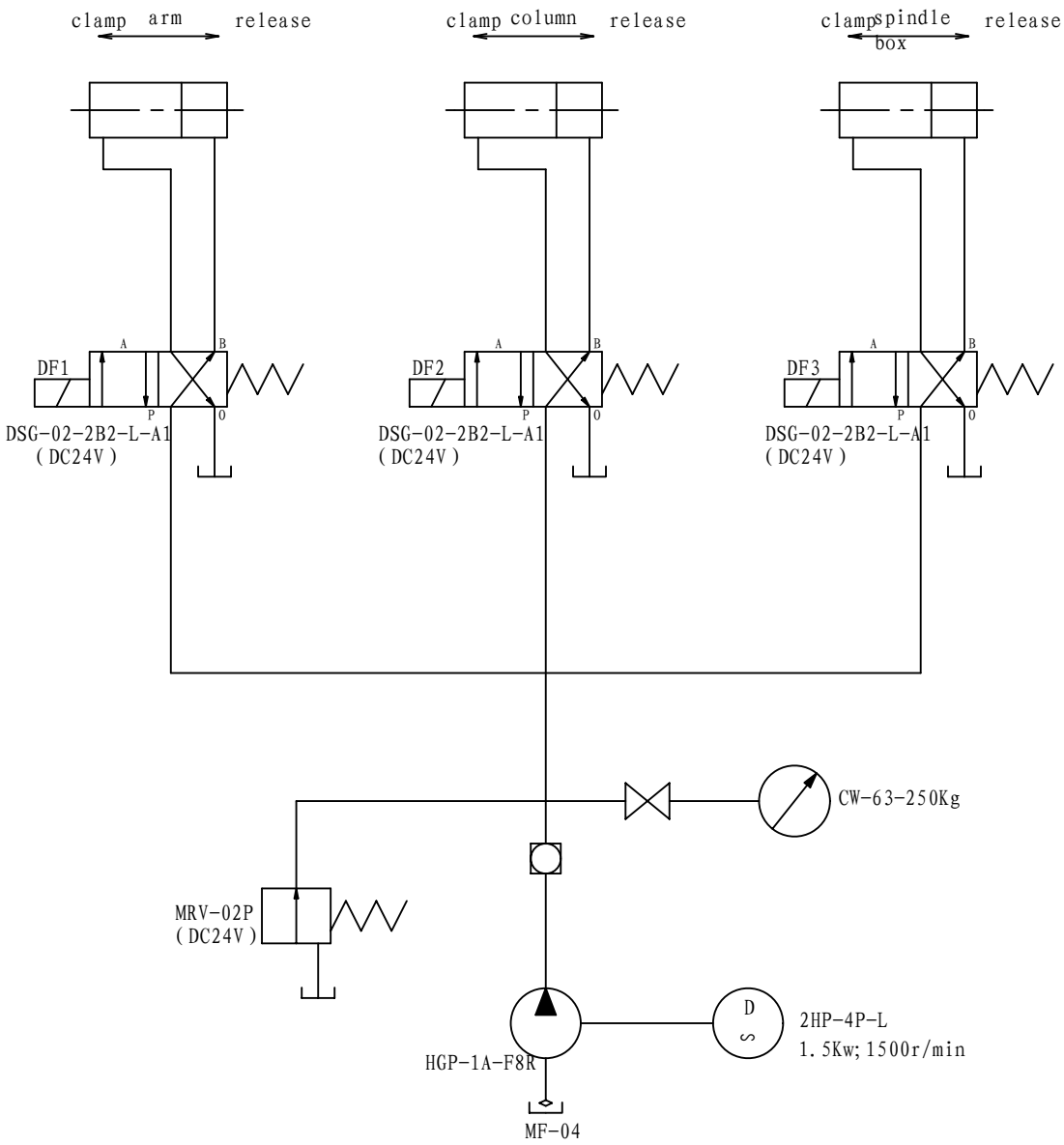
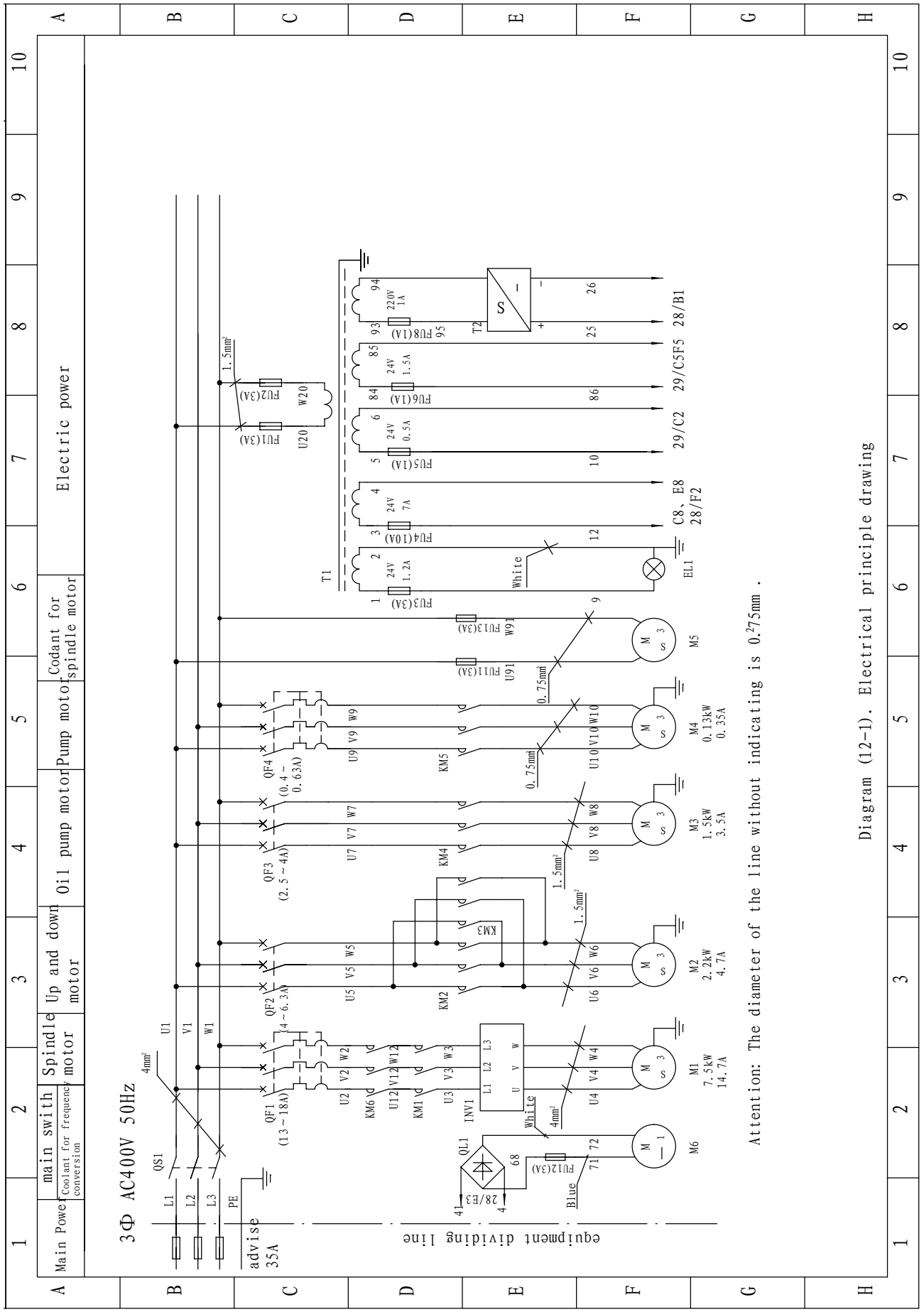
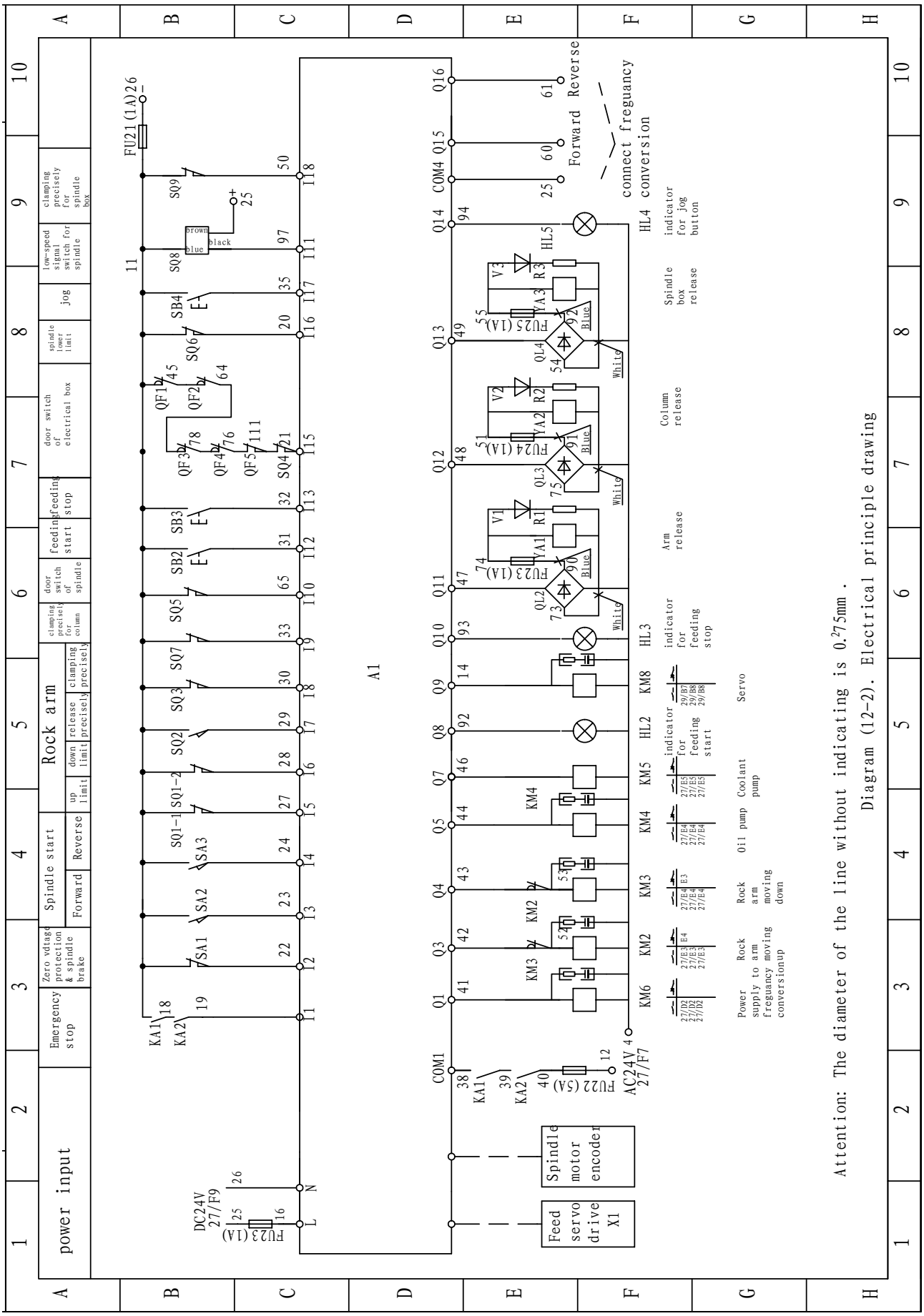



Diagram 11. Principle draw of hydraulic system for clamping purpose.


Main Power
main swith
Coolant for frequency conversion
Spindle motor
Up and down motor
Oil pump motor
Pump motor
Codant for spindle motor
Electric power
3Φ AC400V 50Hz
advise 35A
equipment dividing line
Diagram (12-1). Electrical principle drawing
Attention: The diameter of the line without indicating is 0.75mm .


power input
Emergency stop
Zero vdtage protection & spindle brake
Spindle start
Forward
Reverse
Rock arm
up limit
down limit
release precisely
clamping precisely
clamping precisely for column
door switch of spindle
feeding start
feeding stop
door switch of electrical box
spindle lower limit
jog
low-speed signal switch for spindle
clamping precisely for spindle box
A1
FU21(1A)26
FU23 (1A)
DC24V 27/F9
FU22 (5A)
AC24V 27/F7
Feed servo drive X1
Spindle motor encoder
Power supply to arm freguancy conversion
Rock arm moving up
Rock arm moving down
Oil pump
Coolant pump
Servo
Arm release
Column release
Spindle box release
indicator for feeding stop
indicator for feeding start
indicator for jog button
Forward Reverse
connect freguancy conversion
HL4 conversion
Attention: The diameter of the line without indicating is 0.75mm .
Diagram (12-2). Electrical principle drawing

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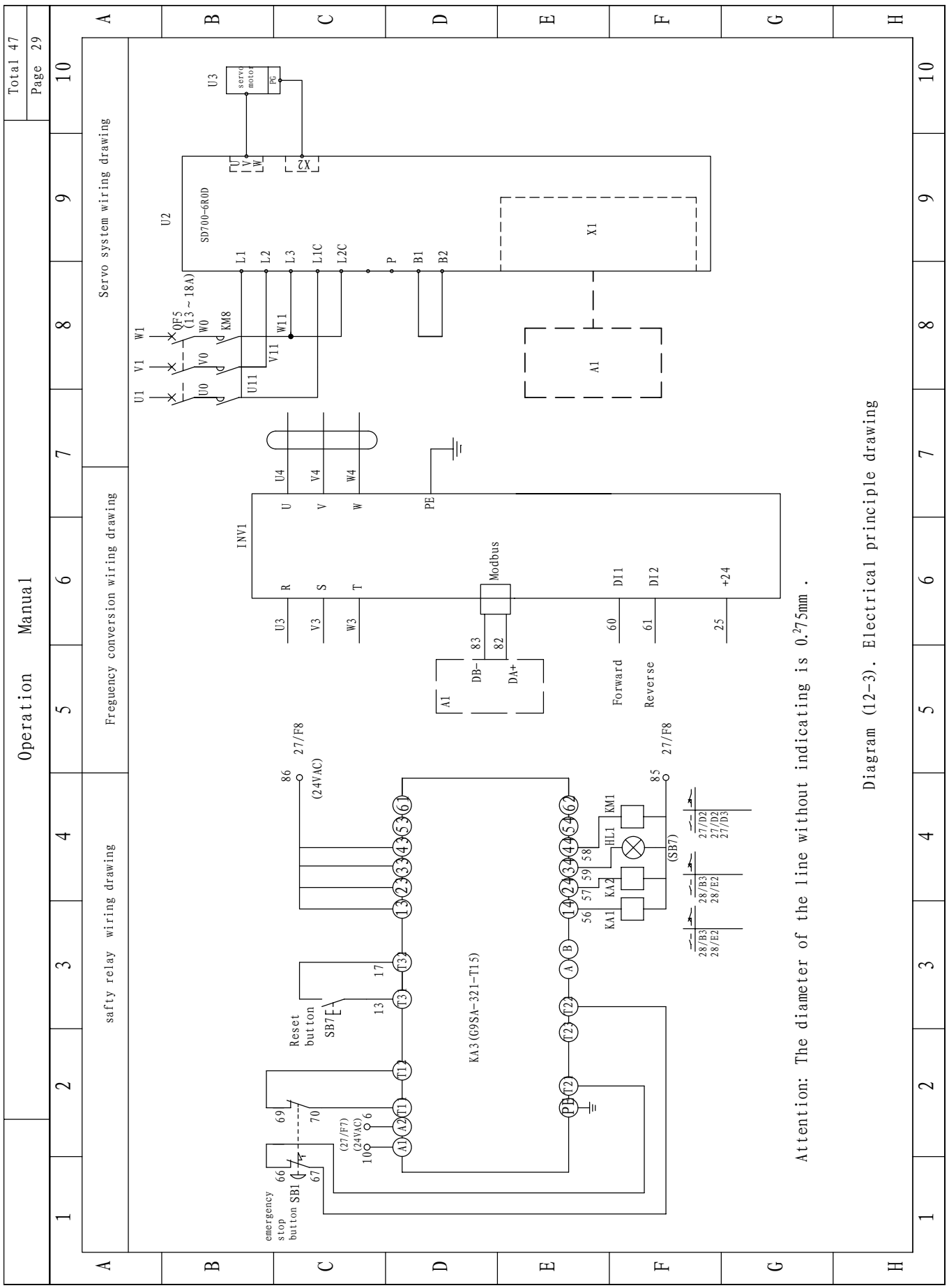

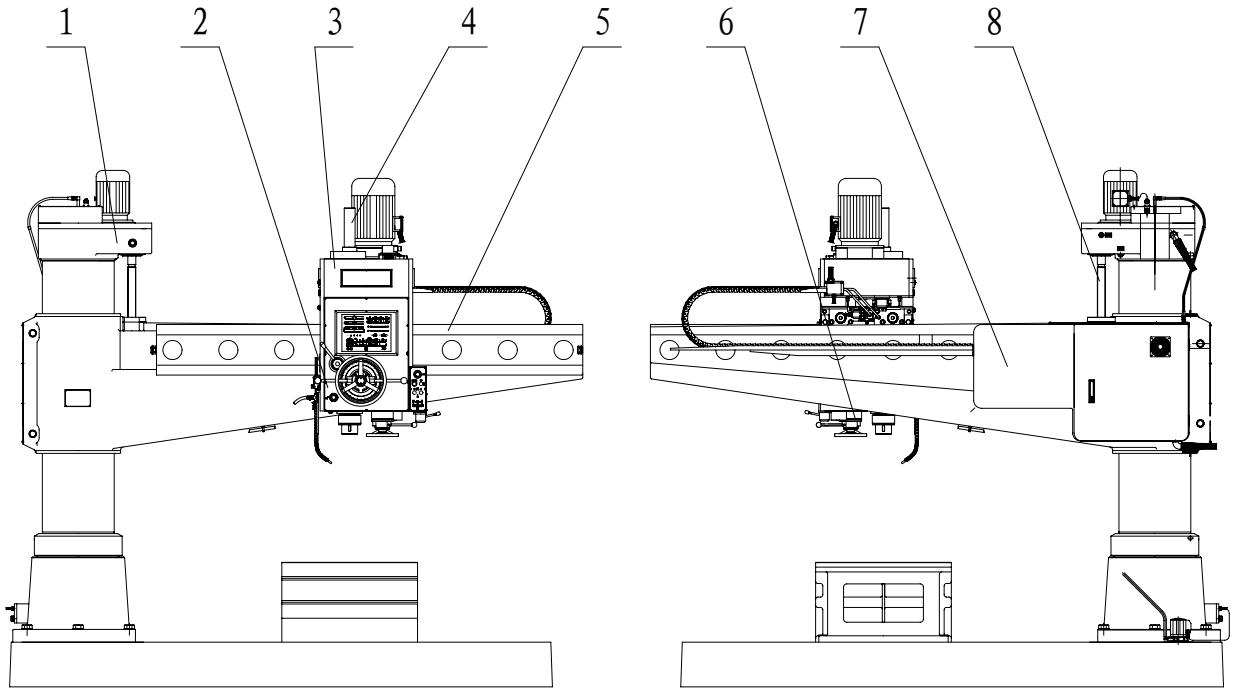


| No. | Lubrication place | Name of lubrication oil | Lubrication period |
|---|---|---|---|
| 1 | Up and down box | No. 20 mechanical oil | Once every three months |
| 2 | Lower oil tank of spindle box | No. 20 mechanical oil | Once every three months |
| 3 | Upper oil tank of spindle box | No. 20 mechanical oil | Once every three months |
| 4 | Spindle spline | No. 20 mechanical oil | Few drops each shift |
| 5 | Rock arm guide way | No. 40 mechanical oil | Keep oil all the time |
| 6 | Spindle bearings | Grease No.2 | Lubrication period |
| 7 | Hydraulic tank | No. 10 mechanical oil | Once every three months |
| 8 | Up and down lead screw | No. 40 mechanical oil | Once every shift |

Diagram 13. Lubrication places

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## 8. Hoist and installation

8.1 Hoisting (refer to the diagram 18)

The machine is strongly fixed inside of the crate. The crate must not be reversed or inclined and must not be strongly stroked when lift up the machine. **Note: the motor for up and down movement of the rock ram together with the gears and oil spray device were disassembled and be put at the machine base. Assemble them to the original place during machine installation.**

In case lifting equipment is not available, put steel tubes (diameter 50 to 80mm) under skid of the package and moving the machine slowly and steadily by using crowbar or capstan device.

Please refer to the diagram 18 for the machine lifting. A soft pad between machine and wire cable is necessary in order to avoid destroying guide way of the machine as well as paint of the machine. Checking if the gravity center is correct when lifting and machine going down shall be slowly and smoothly to the ground, recommend 10 ton crane hoist.

**Attention: Before machine is fixed to the foundation, please do not unclamp the column in order to prevent the rock ram turning that will cause machine fall down.**

8.2 Installation(refer to the diagram 19)

The machine should be fixed on the solid foundation. Machine foundation is not necessary if the ground of workshop is strong enough. However fastening the machine by bolt is absolutely required.

Machine foundation could be made as per the requirement of the diagram 19. The holes for pouring concrete of machine foundation bolts should be considered.

Insert the bolts inside of the machine base holes and suspend them in the foundation holes. Locate the pads at the places indicated at the drawing. Roughly leveling the machine first then final leveling the machine by adjusting No.1, No.2 and No.3 pairs of pads. No.4 pairs of pads is for auxiliary purpose only.

Filling the concrete into the foundation bolts hole after machine leveling. Micro adjustment of machine level is required when the foundation is completely dry. Required tolerance should not be over 0.04/1000mm both in horizontal and cross Directions. Checking all items of the accuracy as per the table sheet of the certificate.Accuracy value for each checked item must not be over the required value.

The method of intert wiring: drawing19, open electrical wiring box on inner column and put three phase live wire connect with terminal L1、L2、L3, and one earth wire connect with "⏚".

8.3 Preparation before machine running:

Install the up and down motor to the original place and plug in the power first.

Moving the spindle speed change handle in the low speed area and push the jog button to see if the spindle revolution is in the correction direction. (electric phase checking)

Clean the machine if electric phase is correct. Lubricating the oil on the lead screw and guide way surface. Attention that after clean the outer column and oiled on it, moving down the rock ram 50mm first, clean covered surface and oil it, then moving up the rock ram 100mm, clean covered surface and oil it, after that the rock ram could be moving in up or down position randomly. It is absolutely necessary to operate the machine as per the above instruction, otherwise the surface both for outer column and for the big hole of the rock ram may be scratched if moving the rock ram in up and down position randomly.

The end-user needn't readjust the machine as it was well adjusted before machine delivery. However, the End-user needs recheck the oil level both for the lubrication oil and hydraulic oil, which shall be a little bit higher than the centerline of each oil window and recheck if the oil is enough in the oil tank located at back side of the rock ram for lubricating the outer column. Finally please run the machine from low speed to high speed, meanwhile please check all handles, buttons to see if the machine is running in good condition. The machine could be used after 30 minutes running without any problem.

8.4 As this is a heavy duty machine, for the easy transportation and safety purpose, machine shall be packed in several cases. When machine reached spot site, it shall be installed as per the assembling procedure of "machine base → column → arm → up or down box → spindle box", assembling could be made on machine foundation or elsewhere, however, leveling machine base is necessary. Only the professional shall be allowed to install the machine if the machine is packed in several cases.

9. Machine operation:

9.1 Location and purpose of operating handles, buttons and switches. ( refer to the diagram 16 and table 4)

List for the handles, buttons and switches Table 4

| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Lever for spindle speed change | 08 | Motorized feed stop button |
| 2 | Spindle movement and switch on motorized feed handle | 09 | Power Button |
| 3 | Knob for Spindle Box Movement | 10 | Motorized feed stop button |
| 4 | Touch Screen | 11 | Spindle forward, reverse, stop, brake handle |
| 5 | Emergency Stop | 12 | Disengage and switch on the motorized feed handle |
| 6 | Electrical reset button | 13 | Spindle micro-feed handwheel |
| 7 | Spindle Inching Button | | |

Name of each part of the touch screen: see Figure 17

| No | Description | No. | Description |
|---|---|---|---|
| 4-1 | Spindle speed control slide mark | 4-16 | Metric and inch selection keys |
| 4-2 | Spindle feed rate sliding scale | 4-17 | Rocker arm up and down keys |
| 4-3 | Fault alarm display window | 4-18 | Number setting key |
| 4-4 | Cutting parameter function key | 4-19 | Number setting Confirmation key |
| 4-5 | Segment drilling setting key | 4-20 | Number shift key |
| 4-6 | Column and headstock clamping and releasing keys | 4-21 | Drilling depth setting display window |
| 4-7 | Spindle box clamping and releasing key | 4-22 | Feed per revolution display window |
| 4-8 | Factory date read button | 4-23 | Spindle speed display window |
| 4-9 | Release key | 4-24 | Feed rate |
| 4-10 | Clamping Key | 4-25 | Spindle speed |
| 4-11 | Column clamping and releasing key | 4-26 | Drilling depth |
| 4-12 | Screen Switch | 4-27 | Display window of preset speed |
| 4-13 | Tapping function key | 4-28 | Feed per minute display window |
| 4-14 | Drilling function key | 4-29 | Drilling depth residual value display window |
| 4-15 | Cooling pump switch key | | |

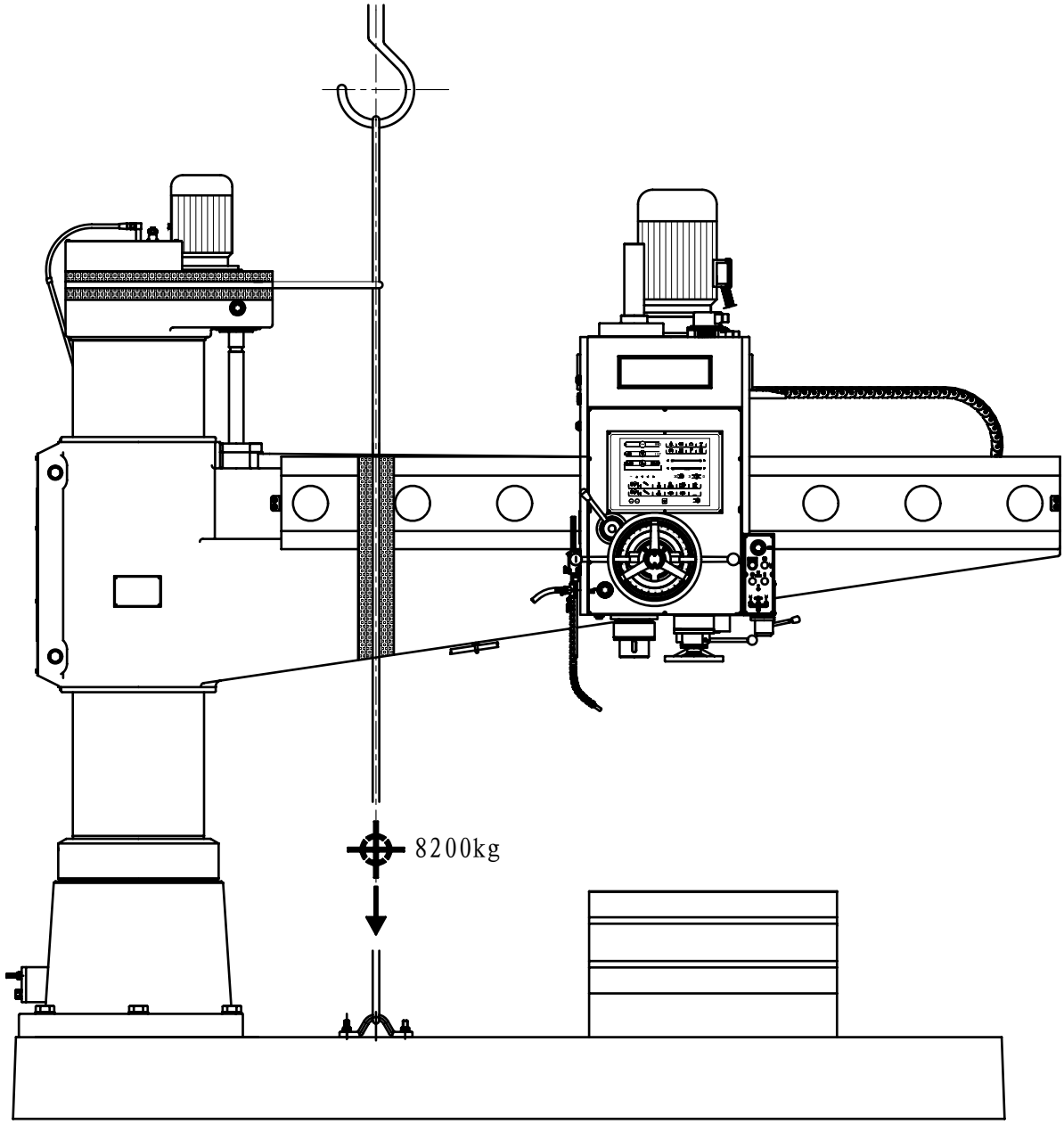


Diagram 14. Hoisting drawing

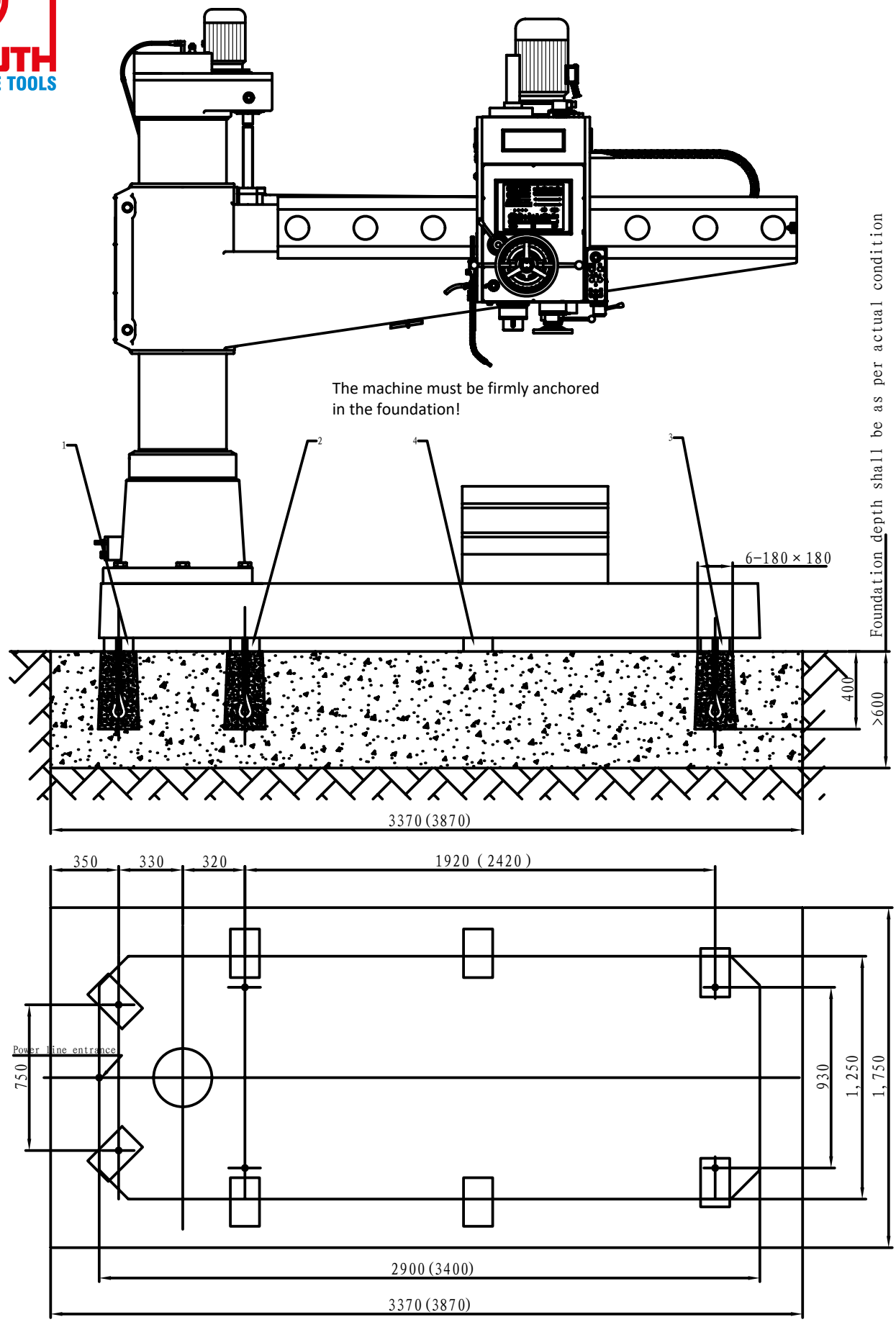


Diagram 15. Foundation drawing

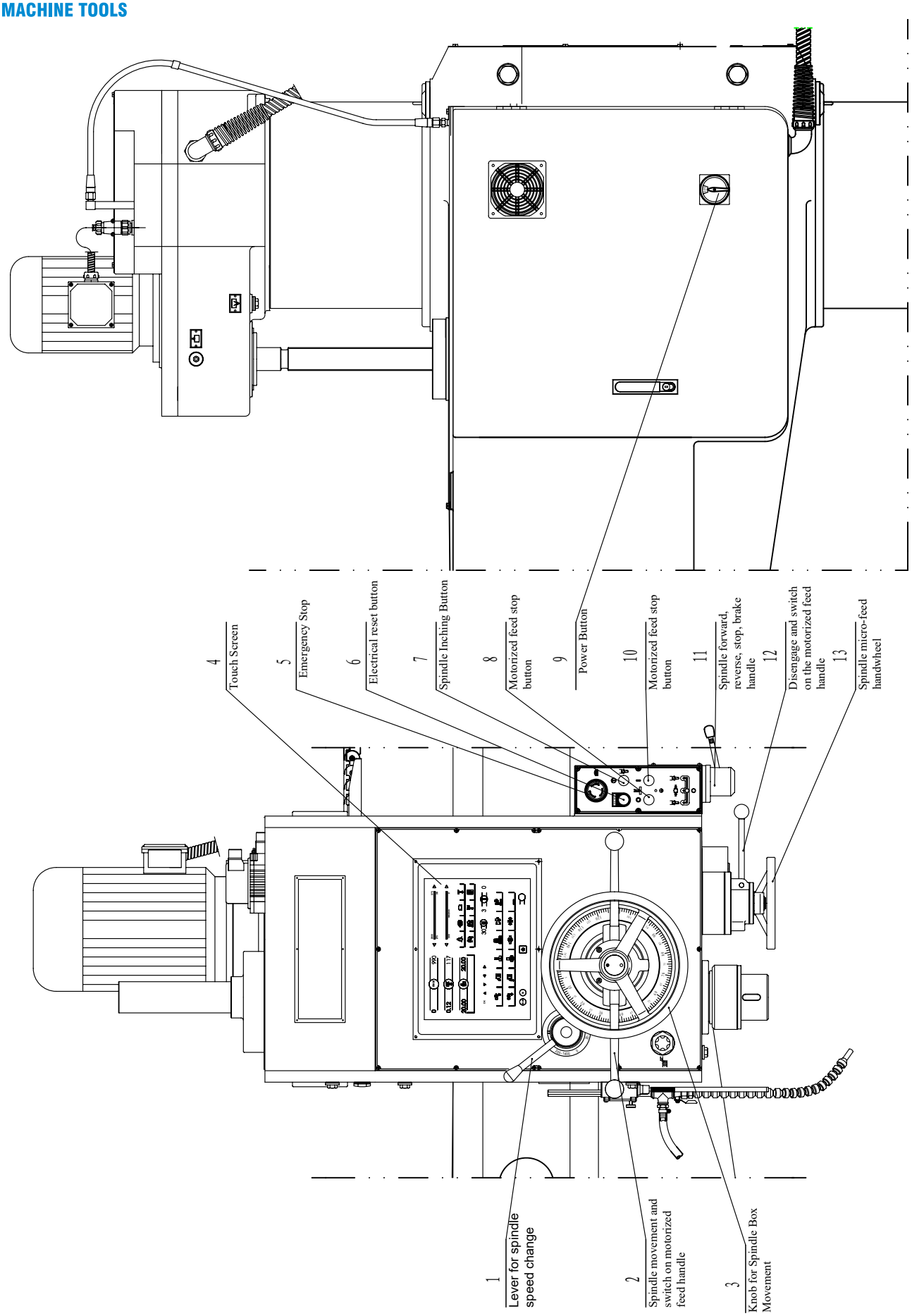


Diagram 16. Machine Operation sketch

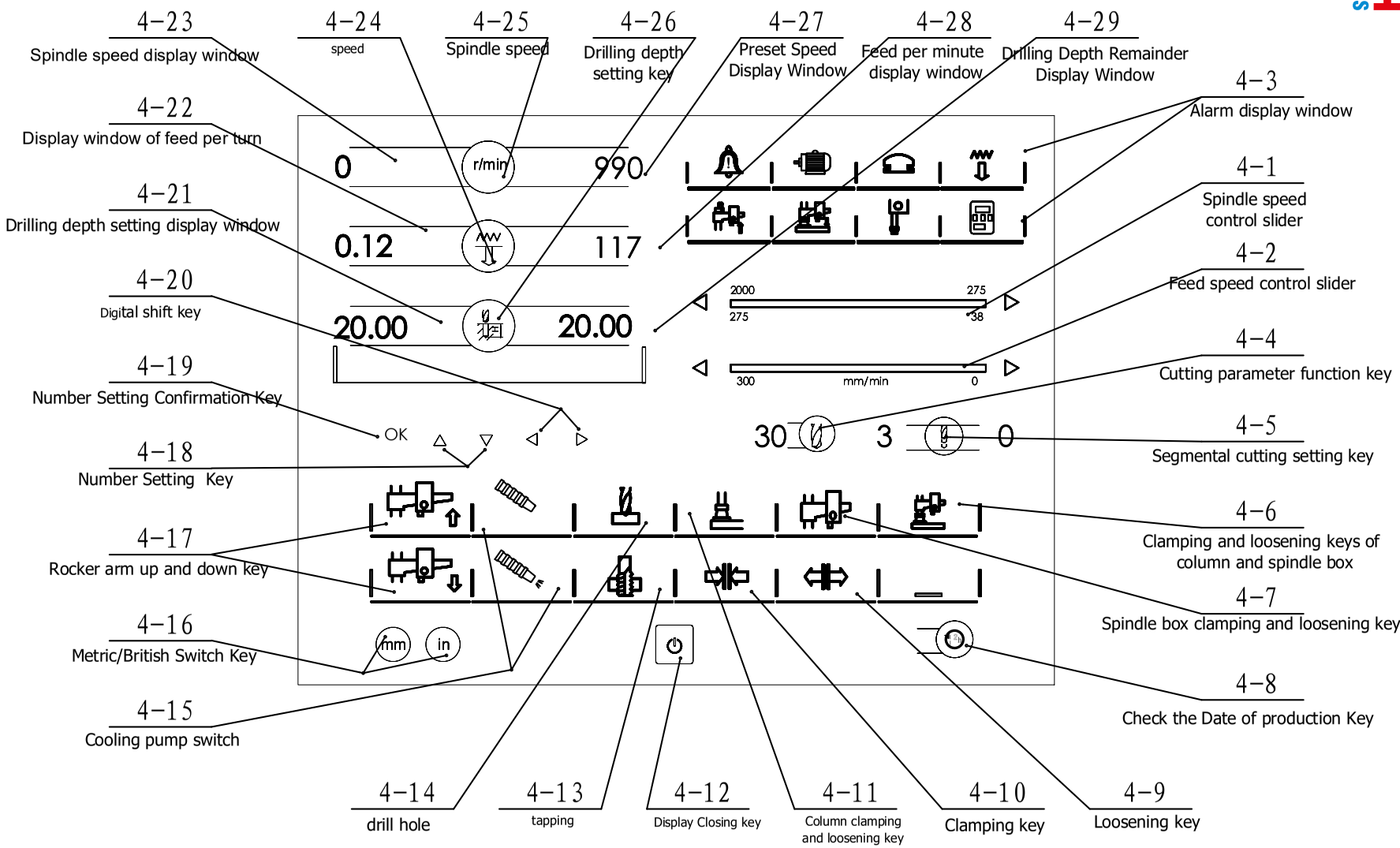


Diagram 17. Touch screen

9.2 Speed change, start or stop of the spindle

Handle 1 has three positions: Figure 16 shows the "neutral" position, which can easily turn the spindle by hand; the handle upward is the low-speed section of 30～192r/min, and the downward is the high-speed section of 205～1400r/min. If the "top gear" phenomenon occurs when the action handle 1 is shifted, the handle 9 can be operated to make an "inching" action. After the handle is shifted and positioned, press the 4-25 button and slide the 4-1 slider to adjust the speed. The parking pre-adjusted speed is displayed on the right end of the first line of the window. After driving, this number is displayed in green on the left end. The ◁ and ▷ symbols at both ends of the slide mark are to jog the "step" and "back" fine-tuning keys.

**The spindle rotation can be adjusted at any time, but it is not allowed to move the handle 1 at the same time to shift gears!**

9.3 Spindle rotation direction and stop, brake

The illustrated position of the handle 9 is the spindle brake position. Press the handle down to release the brake. At this time, you can turn the spindle by hand (when the handle 1 is in the low gear, the hand-turned spindle is heavier. Light), the main shaft rotates forward when the handle is pulled in its own direction, and the forward rotation is locked if the handle is lifted up, and the main shaft is reversed or locked by operating the handle in the opposite direction.

**In manual tapping, do not quickly pull the handle 9 to implement the fast forward and reverse rotation of the spindle. Pause for 1-2 seconds at the middle stop position of the handle, otherwise the gear and spindle motor will be damaged!**

9.4 Spindle feed in manual, in power and in micro

Manual feed could be realized by pushing the handle 20 in forward position.

Power feed could be made by moving down the handle 13 and pull out handle 20.

Micro feed could be realized by moving up handle 13 first, then pull out handle 20 and push up hand whee16 and turn it.

**Handle 12 upward: manual feed, micro feed, manual tapping;**
**Handle 12 downward: motor feed, motor tapping.**

9.5 Horizontal movement of headstock:

When the headstock and the rocker guide are in the "loose" state, turn the handwheel 3 to move the headstock horizontally to the left and right along the rocker guide.

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9.6 Lifting of rocker arm

There are two inching rocker lifting keys   at the bottom left of the touch screen to realize the lifting movement of the rocker. In static state, the big hole of the rocker arm is clamped on the column and is in the clamping state. It is released automatically before the lifting action, and clamped automatically immediately after the lifting action stops.

In the process of lifting, if the safety clutch in the lifting gear box will slip and the sound of steel ball job hopping can be heard in case of obstacles blocking the free lifting, it shall stop immediately; when the lifting reaches the limit position, it will stop automatically and give an alarm on the fourth line of the touch screen. At this time, press the rocker arm lifting key to make the rocker arm move reversely away from the electrical limit position

9.7 Clamping and loosening of headstock and column

In the lower right corner of the touch screen, there are five operation keys in a group. The top three are the selection keys for clamping and loosening the column and headstock separately and simultaneously, and the bottom two are the execution keys for clamping  or  loosening.

9.8 Selection and adjustment of feed rate

This machine tool has metric and imperial display of two feed measurement methods: "Feed per revolution" and "Feed per minute". The feed per revolution (mm/r) is automatically generated, and the feed per minute (mm/min) needs to be set. The conversion relationship between the two feeds is: feed per revolution (mm/r) × spindle speed (r/min) = feed per minute (mm/min).

(The imperial units are in/r and r/min respectively)

When setting the feed, press the function key  first, and then move the 4-2 slider to display the feed per minute on the right side of the second line of display window, and the feed per revolution on the left. The choice of metric system and imperial system is distinguished by two keys 4-16.

When you are used to selecting the cutting amount by the feed per revolution, according to the conversion relationship between the feed per revolution and the spindle speed and the feed per minute described above, you can know that you can change the spindle speed and feed per minute Can choose the appropriate feed per revolution, and can be adjusted in time during the processing.

The maximum allowable feed per minute of this product is 350mm/min. If this limit is exceeded, an alarm signal will be issued.

Setting of drilling depth and tapping depth

When using manual feed to drill, directly observe the dial to control the depth without setting. During motorized feeding, pull out the handle 2 and press the button 10, and the motorized feeding can be performed according to the selected amount of feeding, and the motorized feeding can be stopped by pushing in the handle 2 or pressing the button 8.

Buttons 10 and 8 cannot be used for manual tapping. Only handle 2 can be used to manually move the tap. Handle 11 makes the spindle (wire tap) forward and reverse to tap and exit.

It needs to be set when using motorized drilling, tapping and automatic depth control.

> When automatically controlling the tapping depth (fixed-range tapping), the handle 11 must be in the middle stop position.

When setting the drilling (tapping) depth, press the button first, then press the button, and click once to advance a number from 0 to 9, long press to jump quickly, and the number will be displayed on the left side of the display window (this window has a total of six digits and the decimal point is fixed The third digit from right to left is the depth that can be set to two digits after the decimal). When the first digit (hundreds, tens, and ones) of the depth value is set, press the key to move to the desired position to the left of the decimal point and continue to set the second digit (click the key once, the number will move one digit to the left). After setting all digits, press OK to confirm.

During processing, the residual value (countdown) of drilling (tapping) depth is displayed on the right side of the third line window.

The maximum stroke of the spindle of this product is 315mm, so the drilling (tapping) depth setting cannot exceed the maximum stroke, otherwise, not only the OK key is invalid, but also the alarm will occur.

When the drilling key is pressed in the drilling mode, the feed will stop automatically after drilling to the set depth, and the spindle will not stop rotating. The spindle should be returned manually, and the second hole should be drilled or stopped.

When the tapping key is pressed in the tapping mode and the control handle 2 is manually tapped to the set depth, the spindle will automatically reverse, and the tapping should be manually exited in time. After exiting, the spindle will automatically rotate forward, and the second screw hole can be tapped or manually stopped.

For machine tools with special order function of "rigid tapping", handle 2 should be pulled out (clutch engaged), handle 12 should be downward, and handle 11 should be in the middle position. After the cutting parameters (speed, pitch and depth) are set, press the button 10 to tap.

> When tapping by machine, the feed rate of spindle per revolution must be set according to the screw pitch of the tap (lead for multi thread)! Otherwise, the workpiece, tapping and chuck will be damaged!

9.9 Setting and application of sectional drilling function

When drilling low carbon steel or high alloy steel with good toughness, it is difficult to break and remove chips. When drilling deep holes in these materials, it is more difficult to break and remove chips. The segmented drilling function of this product can well solve this problem. The principle is that when the drill goes to a certain depth, the spindle will turn to feed motion continuously, stop for 0.2-0.5 seconds, then continue to drill, and stop again until the set depth.

When setting the segmented drilling function, first press the function key  , then press the Key  setting, click 1-9 times to automatically segment the drilling depth into 1-9 times, that is to automatically segment the drilling depth into 1-9 sections, and press the segmented drilling during the motor feed. The number displayed in the right window of the function key is the sequence number of the segmented number. When it is the same as the number in the left window, it means that the segmented is completed, but it does not mean that the drilling depth is in place. Whether the drilling depth is in place or not, you only need to observe the third line on the screen, and the window on the right shows it at a glance.

9.10 Cutting parameter function key.

In order to help you select the cutting parameters (spindle speed, feed rate), press the 4-4 key, input the drilling diameter, and the cutting parameters will be displayed automatically for your operation.

It must be stated that these parameters are the recommended values of spindle speed and feed rate when drilling on medium hardness materials with high speed steel standard twist drill bit! When the workpiece material changes, the processing requirements are different, and the drill bit is changed (such as using cemented carbide drill bit), the cutting parameters should also be changed accordingly, not limited to the recommended value.

9.11 Factory date key

The date recorded by this key is the date entered by the seller of the machine tool when the machine tool is sold. It can be viewed at any time and is difficult for the user to modify.

9.12 Fault alarm function

The fourth line of the touch screen is the fault alarm bar. When alarming, the "alarm bell" symbol on the left flashes red, and the fault classification window on the right also displays red response.

From left to right, the fault classification symbols are: emergency stop button failure, feed rate per minute reaches the limit value, rocker arm has risen to the upper limit position, rocker arm has fallen to the lower limit position, spindle extends to the limit position, servo motor fault.


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9.13 Additional tips on touch screen

a. The 4-12 switch on the screen is the screen display switch, not the power switch of the machine tool. It should be turned off when not in use.

b. When operating, only slightly touch, do not knock hard.

c. Rocker lifting key 4-17 is different from other keys. These two keys are inching keys. Long press will continue the function, and once the hand is released, the function will stop. However, rapid inching is not allowed to operate the rocker arm lifting, and the second action should be started after the lifting action is completed.

d. The touch screen system has the function of "power loss memory": when you leave the machine tool and cut off the main power supply or use the "emergency stop" button, when the power is transmitted again, the original functions and data will be displayed on the screen as before, so as to continue processing. Of course, you can also change the settings locally or reset them all.

e. If you need to wipe the touch screen, you should first turn off the power and wipe it lightly with a clean flannelette or wet towel. Gasoline, alcohol and other solvents should not be used, and articles with "frosting" effect should not be used.

## 10. Machine adjustment:

10.1 Adjustment for Clamping force of the spindle box(refer drawing 14)

Adjustment for Clamping force of the spindle box is realized by bolts replacement for taper wedge.Exert 500N force on to the handle 18 after spindle box is clamped, adjustment is approved if the spindle box could not be moved.

It will be accepted when unclamping of the spindle box, exert no more than 80N force on to the handle 18 that makes the spindle box moving. Clearance on the guide ways shall not be over 0.04mm after clamping (depth for the feeler insert shall be less than 20mm).

In case, the gap is too big or too small or not smooth, clamping spindle box first, then adjust the eccentric value of bearing until it reaches the requirement.

Fastening the manual clamping plate at two ends of the frame, it is useful when boring holes and spot facing machining as clamping force of the spindle box is to be increased. Particularly, it could also be used for machine package or during machine transportation.

10.2 Adjustment for clamping force of the column (refer to the diagram 12)

If the clamping force of the column is not strong enough, unclamping the column first, take away the cover on the up and down box, properly fastening the nut on the top of the column and then clamping the outer column, adjustment is approved if the rock ram could not be moved when exert 2000N horizontal force at the end of the rock ram. In case, the nut could not be adjusted, properly release the inner hexagon bolt on the disc spring when column is unclamped and adjust it again based on the ways mentioned above.

Furthermore, exert 30N horizontal force on to the end of the rock ram that shall make the rock ram moving when column unclamped. After adjustment, install four bolts in order to bolts release.

10.3 Adjustment for clamping force of the rock ram (refer to B direction view of the diagram 13)

Disassemble the upper and lower seal ring and left side cover, switch off the power when the rock ram moving, properly fastening the two (upper and lower) hexagon head bolts, switch on the power, after the rock ram stop moving checking the clearance between big hole of the rock ram and the outer column after the rock ram stop moving which shall not be over 0.04mm.

**Important notice: Clamping for the column, rock ram and spindle box is made by Cylinder – rhombus block mechanism. Suppose a pair of rhombus block is in the big angle cross means it is in unclamping status and a pair of rhombus block is in standing with line up condition means it is in clamping status but without interlock. When a pair of rhombus block is in standing condition and in 1mm pass over the center means it is in clamping status with interlock. Therefore observation is necessary when adjustment is made. Meanwhile, the rhombus block could not be stand if too much clamping force or less pressure force of the hydraulic system is existed.**

10.4 Adjustment for feed resistance force (refer to the diagram 10)

Before machine delivery, the permitted spindle feed resistance force has been checked by force test meter and test cutting has been made. The steel ball safety clutch could guarantee machine working in normal condition when the cutting resistance force is under 29400 N. The steel ball safety clutch will be slipping if the cutting resistance force is between 29400N to 35525 N and the steel ball safety clutch will be disengaged and be slipping if the cutting resistance force is over 35525 N, therefore adjustment is unnecessary.

In case, adjustment is required, disassemble the upper half of the label in front of the spindle box first, the feed resistance force could be increased or decreased by fastening or loosening the nut located in the above of the spring and fastening the locking bolt of the nut is necessary after adjustment finished. Be careful that too much feed resistance force is not allowed otherwise no slipping for the steel ball safety clutch is available which causes no protection of the machine and parts will be damaged.

10.5 Pressure adjustment of the hydraulic system

The hydraulic working pressure of the machine is between 3 MP adjusted
If pressure force of the hydraulic system needs to be adjusted, open the door of hydraulic box at back side of the arm, an overflow valve handle and a pressure force meter for the accumulating valve shall be appeared.

## 11. Machine maintenance

11.1 When machine is to be used, be sure to maintenance the machine as per the stipulation of the operation manual. Regular lubrication and timely oil exchange is required.

11.2 Cleaning using cotton yarn or towel and lubricating of the rock ram guide way surface, outer column and lead screw etc are necessary. Seal ring at both side of the big hole shall be disassembled and the felt shall be cleaned regularly in order to avoid dust or chip comes into the guide way surface.

11.3 Please do not move out too much the spindle quill when disassemble tool cutters or tools. Striking spindle with big force is strictly prohibited. In order to protect the spindle taper hole, substandard tool taper shall not be allowed to use, meanwhile spindle taper hole and tool taper must be kept cleaning.

11.4 The column and the spindle box must be in clamping status when machining, whether for small cutting or for small hole drilling.

11.5 As radial drilling machine is conventional machine, not a special purpose machine working on the stream line, therefore frequently tapping job will damage the electric motor and relevant parts such as gears etc.Five times per minute for hole tapping is recommended.

11.6 The Max. Spindle torque of the machine is 980N.m and the max. feed resistance of the spindle is 24500N, so please remember that actual cutting torque and feed resistance shall not be over its max value when choose cutting data. Besides, material hardness of work piece, cutting performance and sharp of tool cutter etcshall be considered, as it will influence cutting force.

11.7 Although the strengthening spindle with enough strong rigidity has been used on this machine, boring bog hole or facing big sunk hole with single boring insert is not allowed. Instead, guiding device or fixture supporting to the tool holder and multi tool inserts shall be used otherwise the spindle accuracy will be lost.

## Table for machine maintenance

| Classification | Maintenance place | Maintenance method |
|---|---|---|
| Daily maintenance | Every place of the machine | Clean the machine and moving away chips and sundries. |
| | Visible part of spindle spline | Fill few drops of oil No.20 |
| | Up or down lead-screw | Fill few drops of oil No.40 |
| | Arm guide way | Oil No.40 shall be kept all the time |
| | Lubrication oil box of column | Oil No.40 shall be kept all the time |
| Quarter maintenance | Oil tank of up or down box | Oil No.20 needs to be replaced every three months |
| | Oil tank at low part of spindle box | |
| | Oil tank at top of spindle box | |
| | Hydraulic oil tank | Oil NO.10 needs to be replaced every three months |
| | Coolant tank of machine base | Coolant shall be exchanged constantly. |
| | Electric box | Move dust, keep dry |
| Annual maintenance | Bearings both end of the spindle | Replace No.2 grease. |
| | Driving and operation components | Check if wear-out parts need to be replaced |
| | Hydraulic clamping parts | Washing, oil filling and adjustment |
| | Spindle taper hole | Recover scar or refurbish or replace |
| | Electric box | Dust remove or replace component |
| | Geometric accuracy of the machine | Restore or adjusting as per the test card |
| Temporary maintenance | Wear-out parts damaged | Stop the machine, checking or replace |
| | Spindle quill and column outside | Recover it if scar happened |
| | Accident or damage | Emergency stop and checking |
| | Power up or down limitation | Adjustment for over distenance |

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| Trouble shooting | | | |
|---|---|---|---|
| No. | Phenomenon | Analysis | Elimination |
| 1 | Clutch working unstable | Too fastening or too loosing of the compressed spring that causes slippage or not slippage | Fastening the nut after pressure force of compressed spring is adjusted |
| 2 | Spindle box could not be clamped well or released well. | Un-proper gap between clamping place and guide way surface. | Adjusting and checking as per manual 10.1 and diagram 14. |
| 3 | Column could not be clamped well or released well | Too big or too small gap for the clamping surface between inner and outer column | Adjusting and checking as per manual 10.2 and diagram 12. |
| 4 | Arm could not be clamped well or released well | Too big or too small gap between big hole of the arm and outer of the column | Adjusting and checking as per manual 10.3 and diagram 13. |
| 5 | Clamping problem due to hydraulic system | Malfunction of oil pump, not enough press force, malfunction of the solenoid valve, leakage of pipe line | Checking hydraulic component, adjusting pressure force of pipe line as per manual 10.5 and diagram 16 |
| 6 | No enough oil for the lubrication system of spindle box. | Malfunction of oil pump, leakage of pipe line, oil not enough of the oil tank, oil dirty. | Checking oil pump and pipe connectors, fill oil or replace oil. |
| 7 | Arm could not up or down, clamping or release status of the column and spindle box is in opposite of the label indicator. | Reverse phase of power supply | Exchange any of two power phase outside of the machine |
| 8 | Power indicator lamp on the operation penal is light, no reaction when any button is pressed. | Spindle lever (forward or reverse) is in hollow. | Spindle lever shall be in the middle hollow position (stop or brake) before power on |
| | | Emergency button of operation penal is not restored. | Restore the emergency button of the operation manual |
| 9 | Power indicator lamp is light arm up or down and column and spindle box could be clamped or released, but spindle could not be running. | Spindle housing is open | Close the spindle housing |

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## 12 Machine accessories:

Please refer to the table 5 for machine accessories. Some special accessories is remarked on the table for customer's choose and additional charge is required.

| No. | Name of the parts | Specification | Q'ty | Remark |
|---|---|---|---|---|
| 1 | Box type working table | 850×580×500 | 1 | |
| 2 | Bolts for T slot | GB37; M24×120 | 4 | For box type table and lifting box fixed |
| 3 | Hexagon bolts | GB6170; M24 | 4 | For box type table and lifting box fixed |
| 4 | Ring | GB97.1;24 | 4 | For box type table and lifting box fixed |
| 5 | Intermediate taper sleeve | JB3411.67; MT4 / MT3 | 1 | |
| 6 | Intermediate taper sleeve | JB3411.67; MT5 / MT4 | 1 | |
| 7 | Intermediate taper sleeve | JB3411.67; MT6 / MT5 | 1 | |
| 8 | Wedge for taper sleeve | JB3411.72; 4 | 1 | |
| 9 | Wedge for taper sleeve | JB3411.72; 5 | 1 | |
| 10 | Foundation bolt | GB799; M30×600 | 6 | |
| 11 | Hexagon nut | GB6170；M30 | 6 | |
| 12 | Washer | GB97.2；30 | 6 | |
| 13 | Shoes | | 8 | Special accessory |
| 14 | Drill chuck | 3-16, B16 | 1 | |
| 15 | Connecting rod for drill chuck | MT4 / B16 | 1 | |
| 16 | Collet | 6,8,10,12,15,16 | 1 set | Special accessory |
| 17 | Connecting rod for collet | | 1 | Special accessory |
| 18 | Quick change chuck | MT4 | 1 set | Special accessory |
| 19 | Ring | | 2 | Special accessory |
| 20 | Bolts for T slot | M24×120 | 4 | Special accessories |
| 21 | Hexagon bolts | M24 | 4 | Special accessories |
| 22 | Ring | 24 | 4 | Special accessories |
| 23 | Rotation worktable | | 1 | Special accessory |
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Frequency Conversion Radial Drilling Machine

# Model: R 80VT

# Ancillary page of Operation Manual

**Max. Drilling Diameter: 80mm**

**Series Number:**

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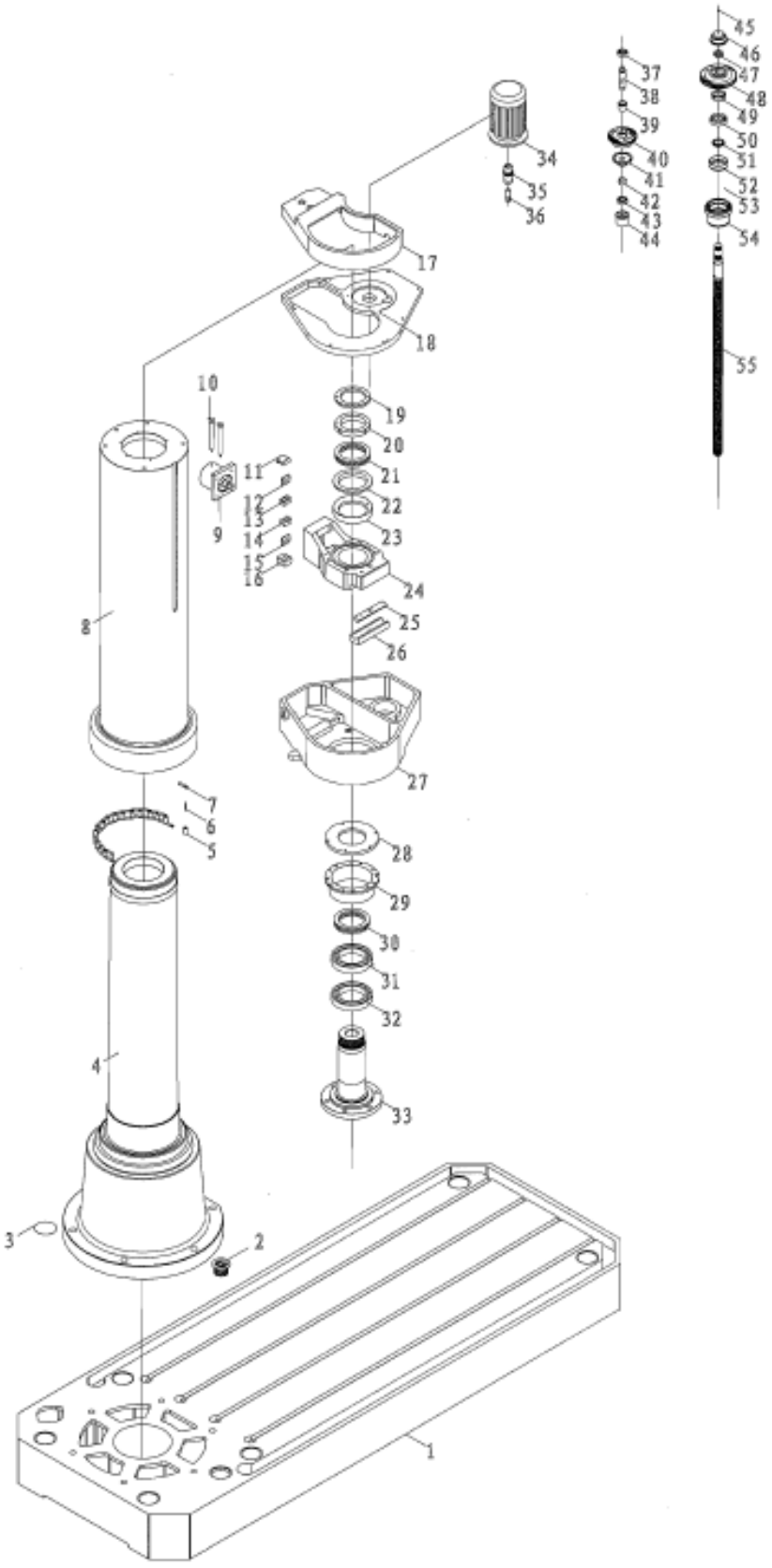
# Drawing (1) Picture of dimension of Column and Radial parts structure



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Contrast for the parts number of R 80VT Column and Radial

| No. | Parts number | Name of the parts | Q'ty | Remarks |
|---|---|---|---|---|
| 1 | 11005/ZB3070 | Base（25） | 1 | |
| 2 | 12033/ZB3070 | Filter | 1 | |
| 3 | 12023/ZB3070 | Cover | 7 | |
| 4 | 11002/ZB3070 | Inner column | 1 | |
| 5 | 12034-5/ZB3070 | Roller | 32 | |
| 6 | 12034-4/ZB3070 | Shaft | 31 | |
| 7 | 12034-3/ZB3070 | Link | 45 | |
| 8 | 11003/ZB3070 | Column | 1 | |
| 9 | 11011/ZB3070 | Hydro-cylinder | 1 | |
| 10 | 12025/ZB3070 | Joint | 2 | |
| 11 | 12018/ZB3070 | Semi-circle block | 1 | |
| 12 | 12017/ZB3070 | Block | 1 | |
| 13 | 12016/ZB3070 | Clamping block | 1 | |
| 14 | 12016/ZB3070 | Clamping block | 1 | |
| 15 | 12017/ZB3070 | Block | 1 | |
| 16 | 12015/ZB3070 | Block | 1 | |
| 17 | 11007/ZB3070 | Cover | 1 | |
| 18 | 11006/ZB3070 | Cover | 1 | |
| 19 | 12026/ZB3070 | Round nut | 1 | |
| 20 | 12020/ZB3070 | Round nut | 1 | |
| 21 | 8128；GB301 | Thust ball bearing | 1 | |
| 22 | 12013/ZB3070 | Washer | 1 | |
| 23 | 12012/ZB3070 | Washer | 1 | |
| 24 | 11010/ZB3070 | Lever | 1 | |
| 25 | 12011/ZB3070 | Block | 1 | |
| 26 | 11014/ZB3070 | Block | 1 | |
| 27 | 11001/ZB3070 | Up and down movement box | 1 | |
| 28 | 12007/ZB3070 | Spring | 1 | |
| 29 | 11008/ZB3070 | Sleeve | 1 | |
| 30 | 8128；GB301 | Thrust ball bearing | 1 | |
| 31 | 128；GB276 | Deep groove ball bearing | 1 | |
| 32 | 128；GB276 | Deep groove ball bearing | 1 | |
| 33 | 11009/ZB3070 | Column yop | 1 | |
| 34 | YU100L4A(2.2Kw) | Motor | 1 | |

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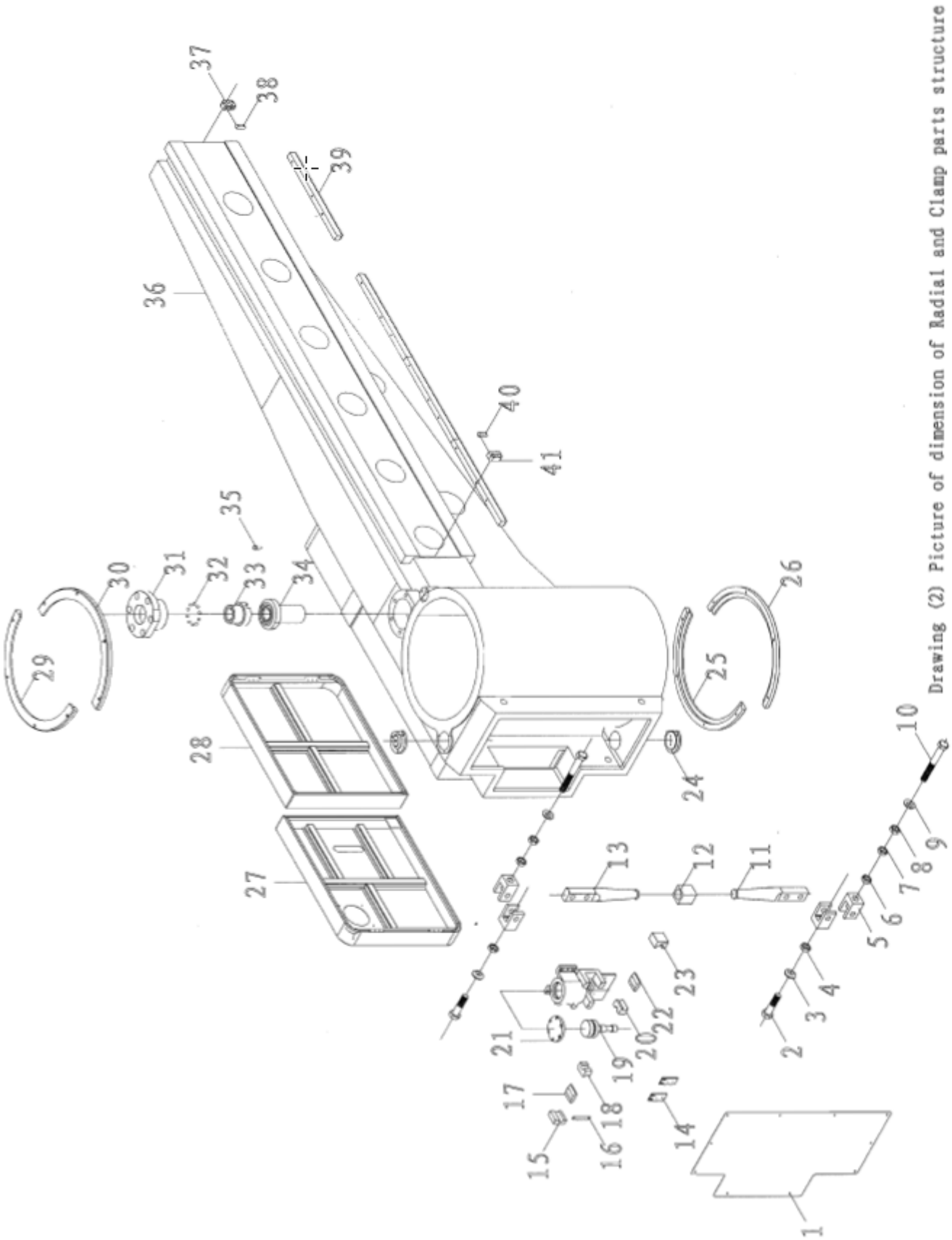
| Contrast for the parts number of R 80VT Column and Radial | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 35 | 12019/ZB3070 | Gear | 1 | |
| 36 | 11017/ZB3070 | Splash device | 1 | |
| 37 | 180205K；GB276 | Deep groove ball bearing | 1 | |
| 38 | 12021/ZB3070 | Shaft | 1 | |
| 39 | 11013/ZB3070 | Shaft sleeve | 1 | |
| 40 | 12022/ZB3070 | Gear | 1 | |
| 41 | 12030/ZB3070 | Engagement clutch | 1 | |
| 42 | 12031/ZB3070 | Sleeve | 1 | |
| 43 | 205；GB276 | Deep groove ball bearing | 1 | |
| 44 | 11015/ZB3070 | Bearing seat | 1 | |
| 45 | M6×25；GB5782 | Hexagon bolt | 1 | |
| 46 | 12027/ZB3070 | Shield | 1 | |
| 47 | M39×1.5；GB812 | Round nut | 1 | |
| 48 | 12028/ZB3070 | Gear | 1 | |
| 49 | 12029/ZB3070 | Round nut | 1 | |
| 50 | 209；GB276 | Deep groove ball bearing | 1 | |
| 51 | 11018/ZB3070 | Washer | 1 | |
| 52 | 12032/ZB3070 | Bearing sleeve | 1 | |
| 53 | 8210；GB301 | Thrust ball bearing | 1 | |
| 54 | 12001/ZB3070 | Bearing seat | 1 | |
| 55 | 12002/ZB3070 | Lead screw | 1 | |


Drawing (2) Picture of dimension of Radial and Clamp parts structure
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| Contrast for the parts number of R 80VT Radial and Clamping | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 1 | 22010/ZB3070 | Cover | 1 | |
| 2 | 22001/ZB3070 | Bolt | 2 | |
| 3 | 24；GB849 | Washer | 2 | |
| 4 | M24；GB6172 | Hexagon thin nut | 2 | |
| 5 | 22016/ZB3070 | Pull rod | 4 | |
| 6 | M24；GB6172 | Hexagon thin nut | 2 | |
| 7 | M24；GB6172 | Hexagon thin nut | 2 | |
| 8 | M24；GB6170 | Hexagon nut | 2 | |
| 9 | 24；GB849 | Washer | 2 | |
| 10 | 22002/ZB3070 | Bolt | 2 | |
| 11 | 22007/ZB3070 | Lever | 1 | |
| 12 | 22018/ZB3070 | Sleeve | 1 | |
| 13 | 22007/ZB3070 | Lever | 1 | |
| 14 | 22021/ZB3070 | Plate | 2 | |
| 15 | 22017/ZB3070 | Block | 1 | |
| 16 | 22005/ZB3070 | Patand | 1 | |
| 17 | 22004/ZB3070 | Block | 1 | |
| 18 | 22006/ZB3070 | Block | 1 | |
| 19 | 22019/ZB3070 | Piston | 1 | |
| 20 | 22006/ZB3070 | Clamping block | 1 | |
| 21 | 21008/ZB3070 | Cover | 1 | |
| 22 | 22004/ZB3070 | Block | 1 | |
| 23 | 22020/ZB3070 | Block | 1 | |
| 24 | 21004/ZB3070 | Switch cover | 2 | |
| 25 | 21007/ZB3070 | Sealing ring | 1 | |
| 26 | 21007/ZB3070 | Sealing ring | 1 | |
| 27 | 22023/ZB3080 | The elevtrical box door | 1 | |
| 28 | 22024/ZB3080 | Cover of door | 1 | |
| 29 | 21007/ZB3070 | Sealing ring | 1 | |
| 30 | 21007/ZB3070 | Sealing ring | 1 | |
| 31 | 21005/ZB3070 | Cover | 1 | |
| 32 | 10V.b；GB308 | Ball | 24 | |
| 33 | 21006/ZB3070 | Nut | 1 | |
| 34 | 22008/ZB3070 | Nut | 1 | |

| Contrast for the parts number of R 80VT Radial and Clamping | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 35 | 22014/ZB3070 | Stop pin | 1 | |
| 36 | 21001/ZB3070 | Arm （25） | 1 | |
| 37 | 22001/ZB3060×16 | Limited block | 1 | |
| 38 | 25001/ZB3060×16 | Block | 1 | |
| 39 | 22015/ZB3070 | Rack | 5 | |
| 40 | 25001/ZB3060×16 | Block | 1 | |
| 41 | 22001/ZB3060×16 | Limited block | 1 | |

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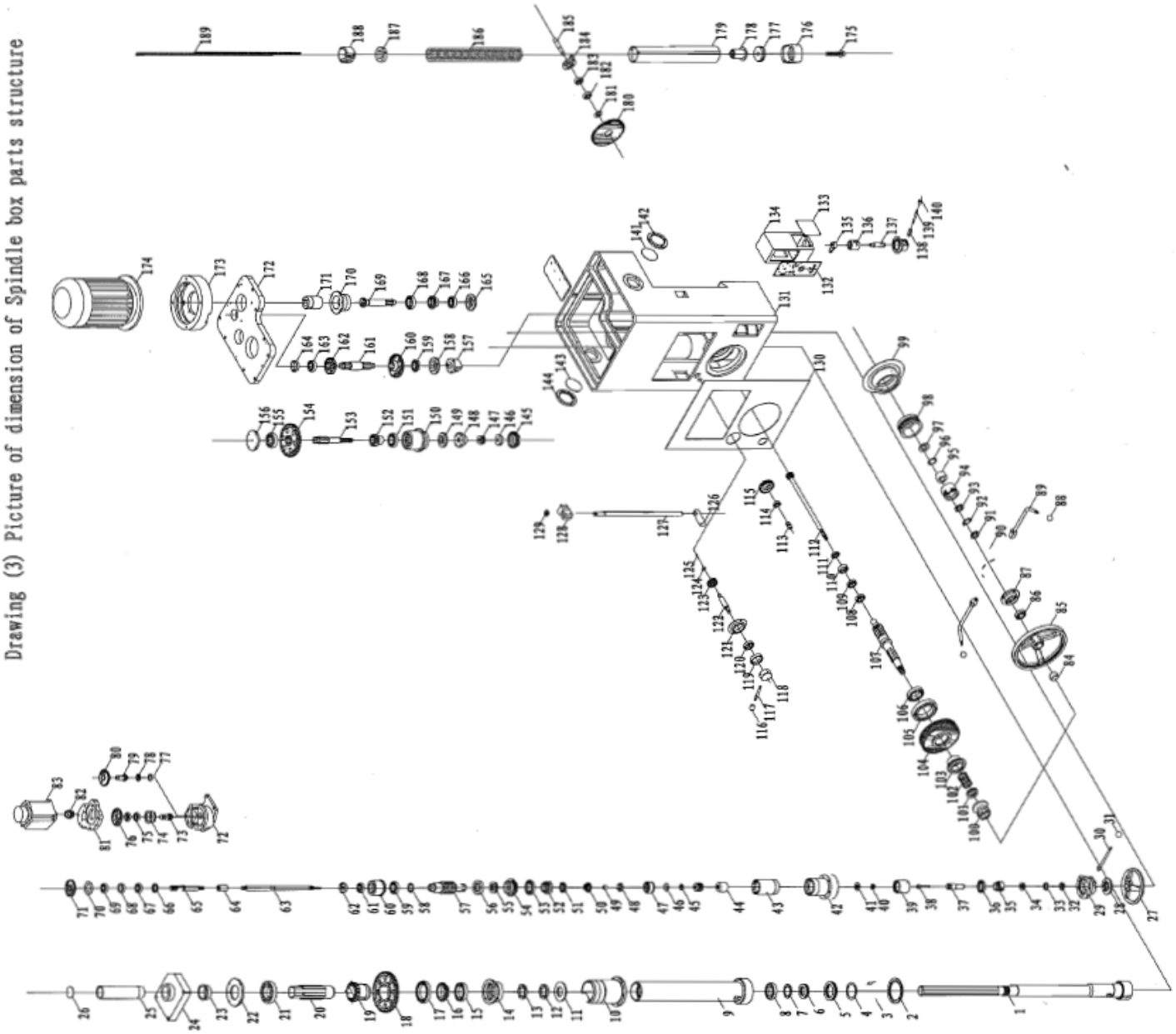
Drawing (3) Picture of dimension of Spindle box parts structure



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| Contrast for the parts number of R 80VT Spindle box | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 1 | 32050/ZB3070 | Spindle | 1 | |
| 2 | 32048/ZB3070 | Bearing cover | 1 | |
| 3 | DNN3015/W33;GB/T285 | Cylindrical roller bearing | 1 | |
| 4 | 32047/ZB3070 | Wahser | 1 | |
| 5 | D8115；GB301 | Thrust ball bearing | 1 | |
| 6 | E8111；GB301 | Thrust ball bearing | 1 | |
| 7 | 32053/ZB3070 | Mat | 1 | |
| 8 | D180111K；GB276 | Deep groove ball bearing | 1 | |
| 9 | 32049/ZB3070 | Spindle quill | 1 | |
| 10 | 31007/ZB3070 | Guide sleeve | 1 | |
| 11 | 32052/ZB3070 | Cover | 1 | |
| 12 | 32051/ZB3070 | Nut | 1 | |
| 13 | 32051/ZB3070 | Nut | 1 | |
| 14 | 32014/ZB3070 | Bearing seat | 1 | |
| 15 | 113；GB276 | Deep groove ball bearing | 1 | |
| 16 | 32025/ZB3070 | Feed gear | 1 | |
| 17 | 1000917；GB276 | Deep groove ball bearing | 1 | |
| 18 | 32009/ZB3070 | Gear | 1 | |
| 19 | 32008/ZB3070 | Gear | 1 | |
| 20 | 32012/ZB3070 | Spline sleeve | 1 | |
| 21 | 213；GB276 | Deep groove ball bearing | 1 | |
| 22 | 31002/ZB3070 | Bearing cap | 1 | |
| 23 | 32013/ZB3070 | Signal panel | 1 | |
| 24 | 31031/ZB3070 | Cover | 1 | |
| 25 | 32133/ZB3070 | Protecting cover | 1 | |
| 26 | 32134/ZB3070 | Cover | 1 | |
| 27 | 31015/ZB3070 | Hand wheel | 1 | |
| 28 | 32067/ZB3070 | Cover | 1 | |
| 29 | 31014/ZB3070 | Fulcrum bearing | 1 | |
| 30 | 32064/ZB3070 | handggrip | 1 | |
| 31 | M10×32；GB4141.11 | Handle globe | 1 | |
| 32 | 1180905K；GB276 | Deep groove ball bearing | 1 | |
| 33 | 32068/ZB3070 | Sleeve | 1 | |
| 34 | 81005；GB301 | Thrust ball bearing | 1 | |

KNUTH MACHINE TOOLS

| Contrast for the parts number of R 80VT Spindle box | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 35 | 32057/ZB3070 | Geared sleeve | 1 | |
| 36 | 7000108; GB276 | Deep groove ball bearing | 1 | |
| 37 | 32066/ZB3070 | Sleeve | 1 | |
| 38 | 32065/ZB3070 | Pin | 1 | |
| 39 | 32112/ZB3070 | Gear sleeve | 1 | |
| 40 | 8102; GB301 | Thrust ball bearing | 1 | |
| 41 | 32107/ZB3070 | Sleeve | 1 | |
| 42 | 31013/ZB3070 | Sleeve | 1 | |
| 43 | 32130/ZB3070 | Sleeve | 1 | |
| 44 | 32108/ZB3070 | Sleeve | 1 | |
| 45 | 32106/ZB3070 | Spring | 14 | |
| 46 | 32105/ZB3070 | Washer | 1 | |
| 47 | 32088/ZB3070 | Geared sleeve | 1 | |
| 48 | 11; GB301 | Ball | 1 | |
| 49 | 34003/ZB3070 | Sleeve | 1 | |
| 50 | 32100/ZB3070 | Clutch | 1 | |
| 51 | 7000106; GB276 | Deep groove ball bearing | 1 | |
| 52 | 32099/ZB3070 | Connection sleeve | 1 | |
| 53 | 7000110; GB276 | Deep groove ball bearing | 1 | |
| 54 | 31022/ZB3070 | Cover | 1 | |
| 55 | 8108; GB301 | Thrust ball bearing | 1 | |
| 56 | 32098/ZB3070 | Supporting cover | 1 | |
| 57 | 32129/ZB3070 | Worm shaft | 1 | |
| 58 | 32104/ZB3070 | Adjustable washer | 1 | |
| 59 | 180108K; GB276 | Deep groove ball bearing | 1 | |
| 60 | 31023/ZB3070 | Sleeve | 1 | |
| 61 | 180205K; GB276 | Deep groove ball bearing | 1 | |
| 62 | 32103/ZB3070 | Nut | 1 | |
| 63 | 32058/ZB3070 | Spline shaft | 1 | |
| 64 | 31021/ZB3070 | Spline sleeve | 1 | |
| 65 | 32006/ZK3080 | axis | 1 | |
| 66 | 32005/ZK3060x16 | Washer | 1 | |
| 67 | 205;GB276 | Deep groove ball bearings | 1 | |
| 68 | 32004/ZK3060x16 | distance sleeve | 1 | |

KNUTH MACHINE TOOLS

Contrast for the parts number of R 80VT Spindle box

| No. | Parts number | Name of the parts | Q'ty | Remarks |
|---|---|---|---|---|
| 69 | 205;GB276 | Deep groove ball bearings | 1 | |
| 70 | 32003/ZK3060x16 | Cover | 1 | |
| | M5x12;GB70 | hexagonal socket head cascrew | 4 | |
| 71 | 32001/ZK3060x16 | Gear | 1 | |
| 72 | 31009/ZK3060x16 | reduction gear box | 1 | |
| 73 | 32021/ZK3060x16 | Gear shaft | 1 | |
| 74 | 32026/ZK3060x16 | bearing block | 1 | |
| | 42;GB893.1 | Circlip for hole | 1 | |
| 75 | 105;GB276 | Deep groove ball bearings | 1 | |
| 76 | 32019/ZK3060x16 | Gear | 1 | |
| | 25;GB894.1 | Circlip for haft | 2 | |
| 77 | 32025/ZK3060x16 | Bulkhead | 1 | |
| 78 | 50103;GB277 | Deep groove ball bearings with snap ring | 1 | |
| 79 | 32022/ZK3060x16 | Gear shaft | 1 | |
| 80 | 32020/ZK3060x16 | Gear | 1 | |
| | 6h9x6x32;GB1096 | Key | 1 | |
| 81 | 31010/ZK3060x16 | reduction gear box cover | 1 | |
| | M12x1.5;JB/GQ0316 | Oil Plug | 1 | |
| 82 | 32002/ZK3060x16 | Gear | 1 | |
| | 8h9x7x32;GB1096 | Key | 1 | |
| | M4x5;GB71 | Slotted tapered screw | 1 | |
| | M4x10;GB71 | Slotted tapered screw | 1 | |
| 83 | 130MAH07725 | Servo motor | 1 | |
| 84 | 32083/ZB3070 | Nut | 1 | |
| 85 | 31017/ZB3070 | Hand wheel | 1 | |
| 86 | 180107K; GB276 | Deep groove ball bearing | 1 | |
| 87 | 31018/ZB3070 | Supporting seat | 1 | |
| 88 | M12×40; GB4141.11 | Handle globe | 2 | |
| 89 | 32132/ZB3070 | Handgrip | 2 | |
| 90 | 31026/ZB3070 | Supporting seat | 1 | |
| 91 | M33×1.5; GB812 | Round nut | 1 | |
| 92 | 33; GB858 | Washer | 1 | |
| 93 | M33×1.5; GB812 | Round nut | 1 | |

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| Contrast for the parts number of R 80VT Spindle box | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 94 | 32124/ZB3070 | Sleeve | 1 | |
| 95 | 32090/ZB3070 | Supporting sleeve | 1 | |
| 96 | 8；GB308 | Ball | 18 | |
| 97 | 32091/ZB3070 | Washer | 1 | |
| 98 | 32005/ZK3080*25 | Worm gear | 1 | |
| 99 | 31001/ZK3080 | Dial | 1 | |
| 100 | 32126/ZB3070 | Clutch | 1 | |
| 101 | 8109；GB301 | Thrust ball bearing | 1 | |
| 102 | 32095/ZB3070 | Spring | 1 | |
| 103 | 32127/ZB3070 | clutch | 1 | |
| 104 | 31029/ZB3070 | Worm | 1 | |
| 105 | 180119K；GB276 | Deep groove ball bearing | 1 | |
| 106 | 180112K；GB276 | Deep groove ball bearing | 1 | |
| 107 | 32131/ZB3070 | Horizontal shaft | 1 | |
| 108 | 180106K；GB276 | Deep groove ball bearing | 1 | |
| 109 | 180106K；GB276 | Deep groove ball bearing | 1 | |
| 110 | 32093/ZB3070 | Bearing seat | 1 | |
| 111 | 7000105；GB276 | Deep groove ball bearing | 1 | |
| 112 | 32084/ZB3070 | Gear | 1 | |
| 113 | 32094/ZB3070 | Shaft | 1 | |
| 114 | 180104K；GB276 | Deep groove ball bearing | 1 | |
| 115 | 32128/ZB3070 | Gear | 1 | |
| 116 | M10×32；GB4141.13 | Handle sleeve | 1 | |
| 117 | 32022/ZB3050×16 | Handle | 1 | |
| 118 | 32081/ZB3070 | Handle seat | 1 | |
| 119 | 32080/ZB3070 | Taper reduction sleeva | 1 | |
| 120 | 32077/ZB3070 | Positioning plate | 1 | |
| 121 | 32003/ZK3080 | Indicating dial | 1 | |
| 122 | 32004/ZK3080 | Shaft | 1 | |
| 123 | 32028/ZB3050×16 | Gear | 1 | |
| 124 | 32118/ZB3050×16 | Washer | 1 | |
| 125 | M6×12；GB70 | Socket cap screw | 1 | |
| 126 | 32074/ZB3070 | Positioning shaft | 1 | |
| 127 | 32001/ZK3080 | Rack | 1 | |

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Contrast for the parts number of R 80VT Spindle box

| No. | Parts number | Name of the parts | Q'ty | Remarks |
|---|---|---|---|---|
| 128 | 32024/ZB3070 | Fork | 1 | |
| 129 | M20×1.5；GB812 | Round nut | 1 | |
| 130 | 34002K/ZK3080 | Brand | 1 | |
| 131 | 31003/ZK3080 | Spindle box | 1 | |
| 132 | 34004F/ZK3060x16 | Switch panel | 1 | |
| 133 | 32108/ZB3050×16 | Cover plate | 1 | |
| 134 | 31028/ZB3050×16 | Switch box | 1 | |
| 135 | 31029/ZB3050×16 | Lever | 1 | |
| 136 | 32106/ZB3050×16 | Sleeve | 1 | |
| 137 | 32105/ZB3050×16 | Shaft | 1 | |
| 138 | 32104/ZB3050×16 | Lever | 1 | |
| 139 | 32103/ZB3050×16 | Handle | 1 | |
| 140 | M8×25；GB4141.13 | Handle sleeve | 1 | |
| 141 | 35001/ZB3050×16 | Cover | 1 | |
| 142 | 32101/ZB3050×16 | Ring | 1 | |
| 143 | 35001/ZB3050×16 | Cover | 1 | |
| 144 | 32101/ZB3050×16 | Ring | 1 | |
| 145 | 32021/ZB3070 | Cover | 1 | |
| 146 | 32135/ZB3070 | Round nut | 1 | |
| 147 | 45×22.4×2.5×3.5；GB1972 | Spring | 8 | |
| 148 | 32020/ZB3070 | Clutch seat(below) | 1 | |
| 149 | 32019/ZB3070 | Clutch seat(above) | 1 | |
| 150 | 31006/ZB3070 | Bearing seat | 1 | |
| 151 | 109；GB276 | Deep groove ball bearing | 1 | |
| 152 | 32007/ZB3070 | Gear | 1 | |
| 153 | 32011/ZB3070 | spline shaft | 1 | |
| 154 | 32006/ZB3070 | Gear | 1 | |
| 155 | 307；GB276 | Deep groove ball bearing | 1 | |
| 156 | 31003/ZB3070 | Bearing cover | 1 | |
| 157 | SBRB-6 | Oil pump | 1 | |
| 158 | 32017/ZB3070 | Pump seat | 1 | |
| 159 | 50206；GB277 | Deep groove ball bearing | 1 | |
| 160 | 32004/ZB3070 | Gear | 1 | |

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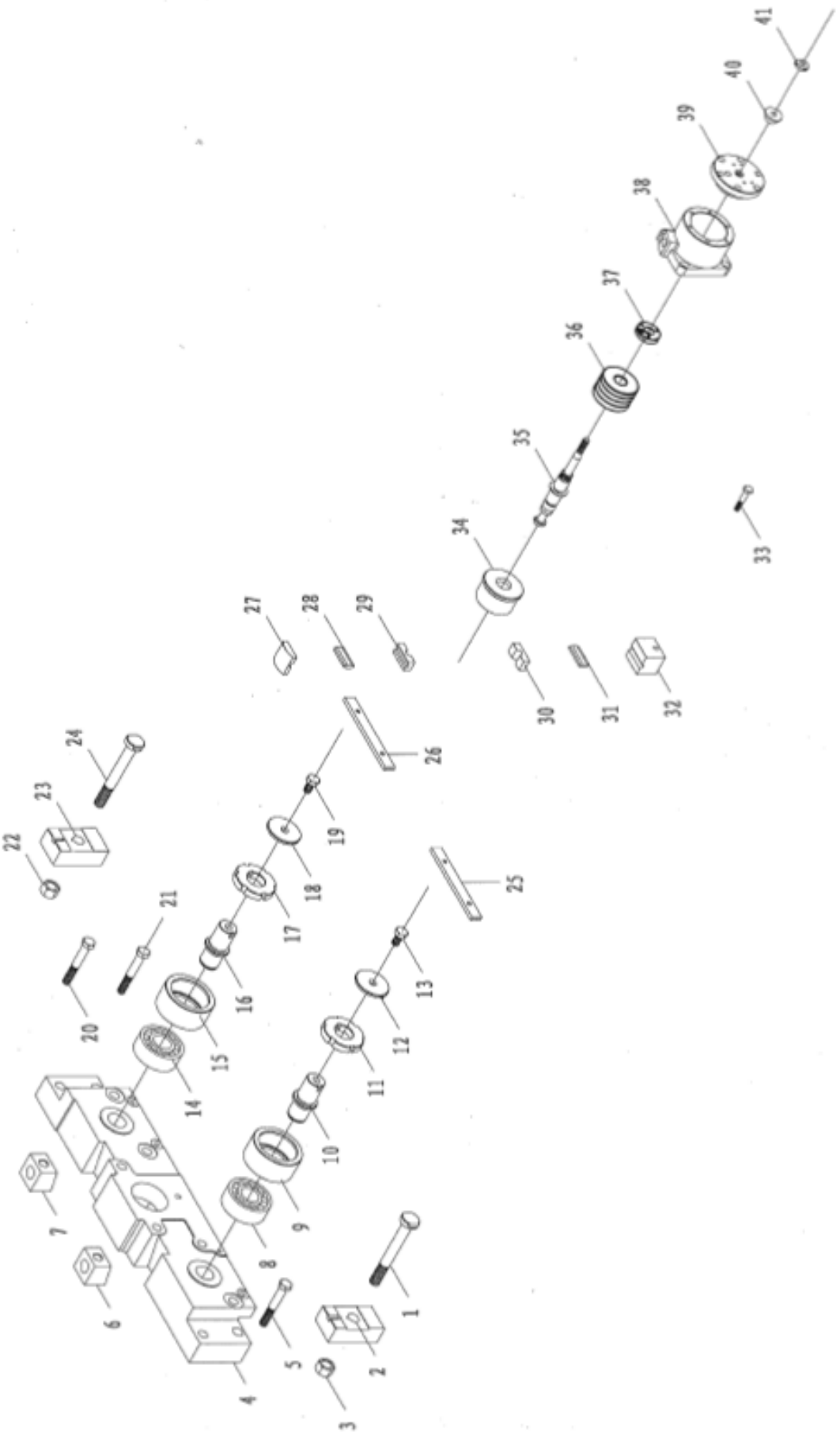
| Contrast for the parts number of R 80VT Spindle box | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 161 | 32010/ZB3070 | spline shaft | 1 | |
| 162 | 32005/ZB3070 | Gear | 1 | |
| 163 | 206；GB276 | Deep groove ball bearing | 1 | |
| 164 | 32015/ZB3070 | Washer | 1 | |
| 165 | 32016/ZB3070 | Cover | 1 | |
| 166 | 206；GB276 | Deep groove ball bearing | 1 | |
| 167 | 32003/ZB3070 | Gear | 1 | |
| 168 | 207；GB276 | Deep groove ball bearing | 1 | |
| 169 | 32002/ZB3070 | Shaft | 1 | |
| 170 | 31004/ZB3070 | Bearing seat | 1 | |
| 171 | 32001/ZB3070 | Gear sleeve | 1 | |
| 172 | 31002/ZK3080 | Spindle box cover | 1 | |
| 173 | 31005/ZB3070 | Motor base | 1 | |
| 174 | YUBP132M4(7.5KW) | Motor | 1 | |
| 175 | 32122/ZB3070 | Screw | 1 | |
| 176 | 32054/ZB3070 | Cover | 1 | |
| 177 | 32121/ZB3070 | Screw | 1 | |
| 178 | 32120/ZB3070 | Supporting seat | 1 | |
| 179 | 32119/ZB3070 | Sleeve | 1 | |
| 180 | 32113/ZB3070 | Gear | 1 | |
| 181 | 32114/ZB3070 | Sleeve | 1 | |
| 182 | 180303K；GB276 | Deep groove ball bearing | 1 | |
| 183 | 180303K；GB276 | Deep groove ball bearing | 1 | |
| 184 | 32056/ZB3070 | Cam | 1 | |
| 185 | 32115/ZB3070 | shaft | 1 | |
| 186 | 32055/ZB3070 | Spring | 1 | |
| 187 | 31025/ZB3070 | Ring | 1 | |
| 188 | 31024/ZB3070 | Rack | 1 | |
| 189 | 12.7×8.5×8.2 | Chain | 1 | |




Drawing (4) Picture of dimension of Hydraulic pressure clamp parts structure

KNUTH MACHINE TOOLS

Contrast for the parts number of R 80VT Hydraulic pressure clamp

| No. | Parts number | Name of the parts | Q'ty | Remarks |
|---|---|---|---|---|
| 1 | 42011/ZB3070 | Ball stud | 1 | |
| 2 | 42012/ZB3070 | Pressing plate | 1 | |
| 3 | M16；GB6170 | Hexagon nut | 1 | |
| 4 | 41001/ZB3070 | Bracket | 1 | |
| 5 | M12×80；GB5782 | Hexagon bolt | 1 | |
| 6 | 42014/ZB3070 | Wedge | 1 | |
| 7 | 42014/ZB3070 | Wedge | 1 | |
| 8 | 1606；GB281 | Bearing | 1 | |
| 9 | 42017/ZB3070 | Wheel | 1 | |
| 10 | 42008/ZB3070 | Eccentric shaft | 1 | |
| 11 | 42018/ZB3070 | Adjustable ring | 1 | |
| 12 | 42013/ZB3070 | Ring | 1 | |
| 13 | M12×20；GB5782 | Hexagon bolt | 1 | |
| 14 | 1606；GB281 | Self-aligning ball bearing | 1 | |
| 15 | 42017/ZB3070 | Wheel | 1 | |
| 16 | 42008/ZB3070 | Eccentric shaft | 1 | |
| 17 | 42018/ZB3070 | Adjustable ring | 1 | |
| 18 | 42013/ZB3070 | Washer | 1 | |
| 19 | M12×20；GB5782 | Hexagon bolt | 1 | |
| 20 | M12×80；GB5782 | Hexagon bolt | 1 | |
| 21 | M12×80；GB5782 | Hexagon bolt | 1 | |
| 22 | M16；GB6170 | Hexagon nut | 1 | |
| 23 | 42012/ZB3070 | Pressing plate | 1 | |
| 24 | 42011/ZB3070 | Ball head bolt | 1 | |
| 25 | 42007/ZB3070 | Panel | 1 | |
| 26 | 42007/ZB3070 | Panel | 1 | |
| 27 | 42004/ZB3070 | Block | 1 | |
| 28 | 42003/ZB3070 | Block | 1 | |
| 29 | 42001/ZB3070 | Block | 1 | |
| 30 | 42001/ZB3070 | Block | 1 | |
| 31 | 42003/ZB3070 | Block | 1 | |
| 32 | 42006/ZB3070 | Block | 1 | |
| 33 | M12×40；GB5782 | Hexagon bolt | 1 | |
| 34 | 41003/ZB3070 | Bushing | 1 | |

| Contrast for the parts number of R 80VT Hydraulic pressure clamp | | | | |
|---|---|---|---|---|
| No. | Parts number | Name of the parts | Q'ty | Remarks |
| 35 | 42010/ZB3070 | Piston rod | 1 | |
| 36 | 42005/ZB3070 | Piston | 1 | |
| 37 | M18×1.5；JB/GQ0175 | Round nut | 1 | |
| 38 | 41002/ZB3070 | Cylinder | 1 | |
| 39 | 41004/ZB3070 | Oil pump cover | 1 | |
| 40 | 42019/ZB3070 | Connecting plate | 1 | |
| 41 | 42009/ZB3070 | Round nut | 1 | |

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