



JRD-2100

RADIAL DRILL PRESS

GB
Operating Instructions



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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

- 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 loosening 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 loosening 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 rules and regulations of the instruction in order to avoid shock or injured to the people.

2. Main usage of the machine and its features:

JRD-2100 Radial Drill Machine is a newly designed and a widely used conventional drill machine. It is suitable for medium and small parts in drilling, spot facing, counter-boring and tapping 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 Hydraulic speed change system of the spindle box has been replaced by mechanical mechanism controlled by electric, therefore machine breakdown will be greatly reduced. Meanwhile machine maintenance will be more easy.
- 2.2 As the strengthening spindle is adopted, the rigidity and life of the machine spindle have been greatly increased.
- 2.3 Spindle speed change had been approved by using frequency conversion motor instead of stepped gear change spindle speed, therefore speed change is much easy than before. Feed rate change adopts ram device for well match purpose.
- 2.4 The electric box with coolant pump switch is located now at right side of spindle box instead of the bottom side of the column for safety and convenience purpose.
- 2.5 Hydraulic clamping is to be used for column, arm and spindle box. Meanwhile, clamping and unclamping of the spindle box and the column could be realized at the same time or could be carried out individually; wiring of the cable is arranged in the right side of the box inside instead of inside of horizontal shaft for easy operation and maintenance purpose.
- 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.

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 center of the spindle	685-2775	mm
6	Travel distance of the spindle box in horizontal (by manual)	2100	mm
7	Distance Spindle to Table (Max.)	275-1075mm	mm
8	Max. spindle travel	390	mm
9	Spindle taper	MT.6	Morse
10	Steps of spindle speed	2 & Variable speed	
11	Spindle speed range	30-192; 205-1400	r/min
12	Steps of spindle feed	8	Steps
13	Range of the spindle feed rate	0.06、0.09、0.15、0.23、0.36、0.60、0.90、1.38	mm/r
14	Arm moving angle	± 180	degree
15	Spindle moving distance of each dial revolution	151	mm
16	Max. spindle torque	980	N.m
17	Max. spindle feed resistance	24500	N
18	Main motor power (Frequency conversion motor)	7.5	kW
19	Machine weight (without table)	7400	kg
20	Machine dimension (L x W x H)	3780×1250×3500	Mm

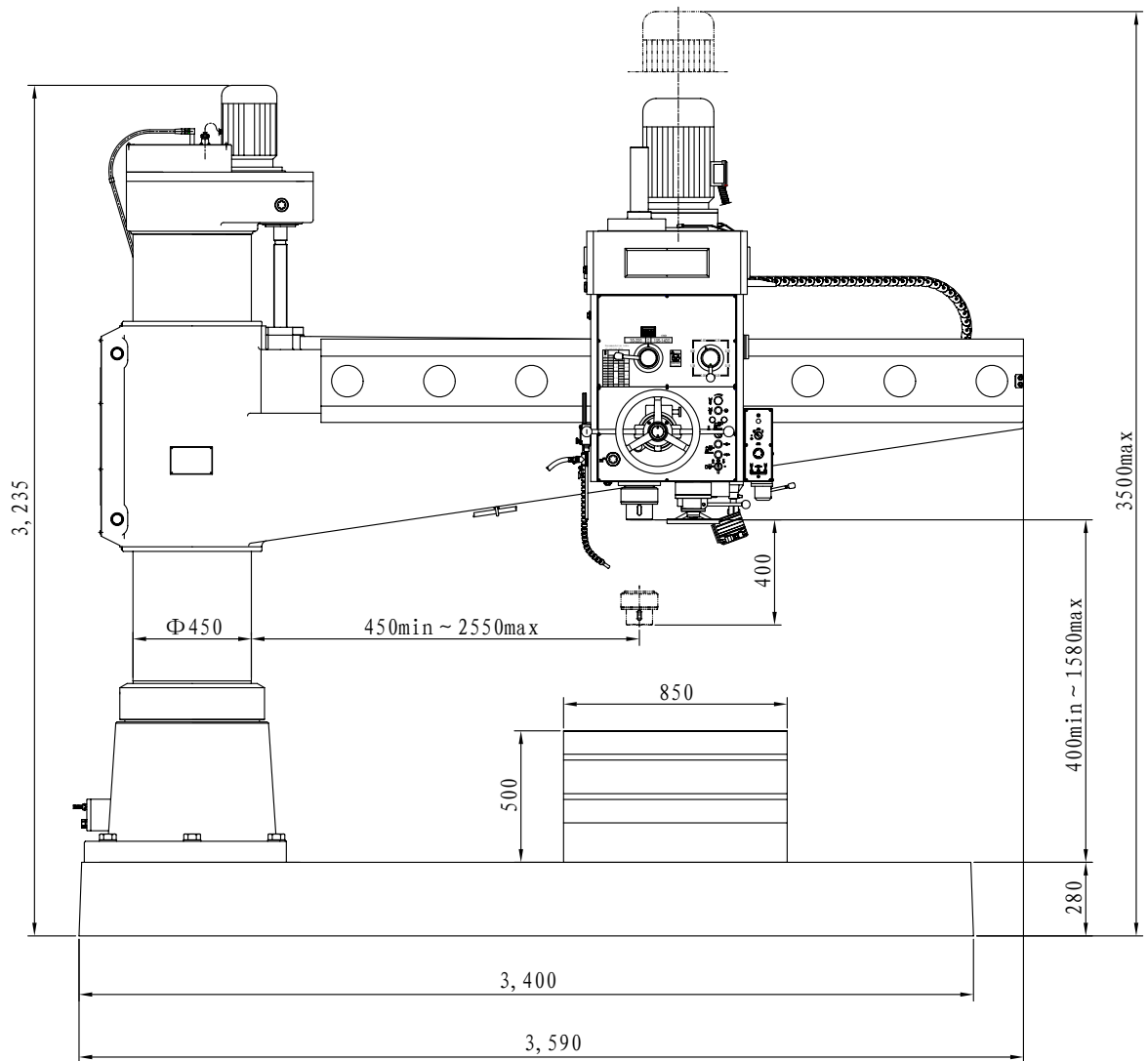


Diagram 1. Main technical data

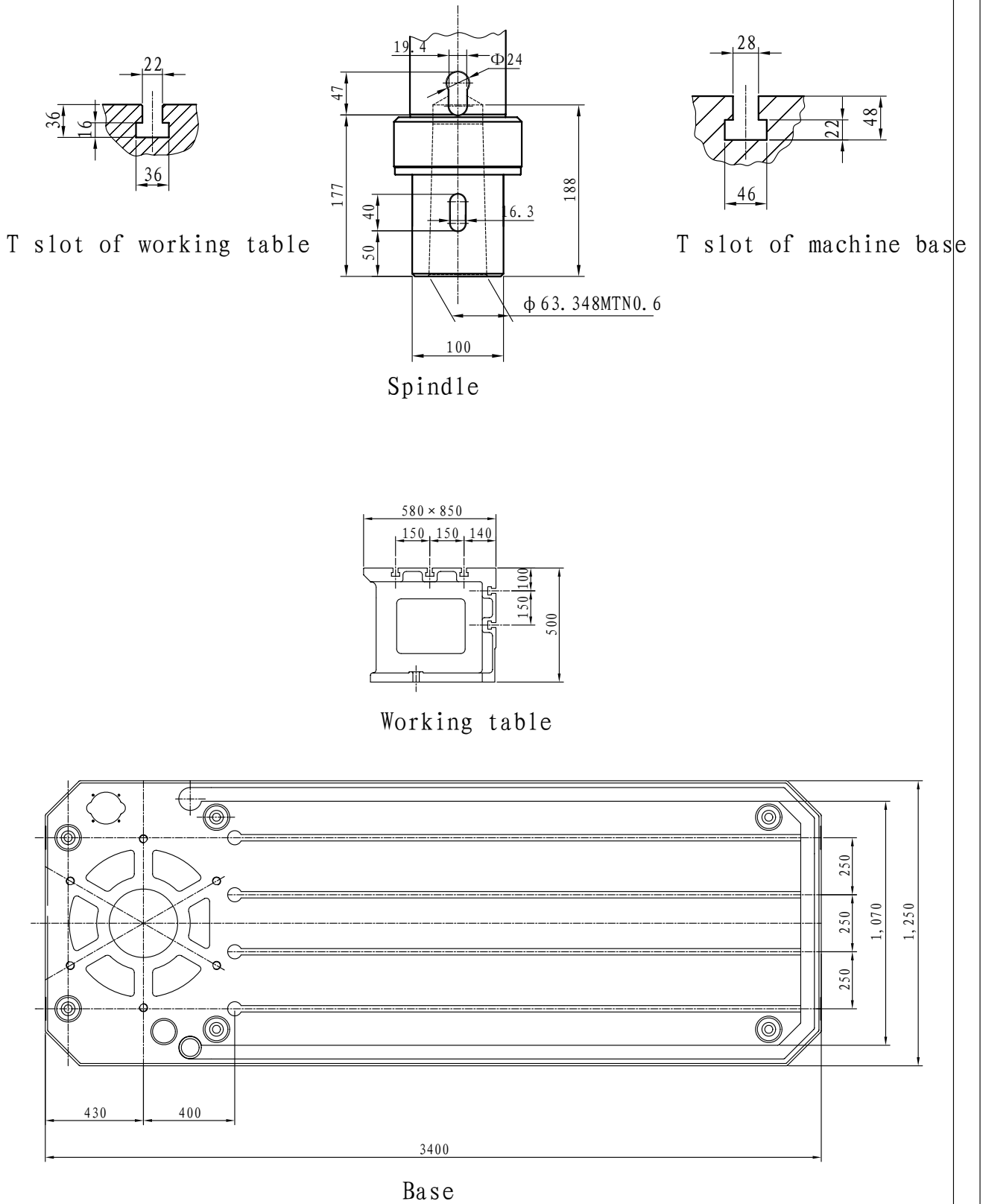
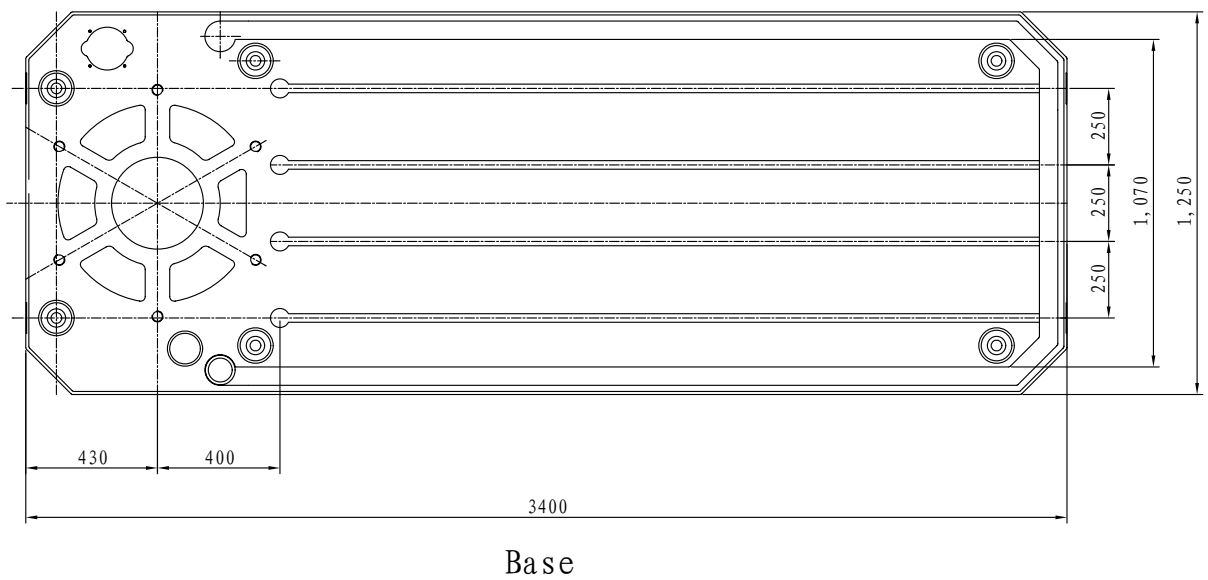


Diagram 2. Size of working area



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 Transmission mechanism of the spindle speed change. (refer to the diagram 7)

Spindle transmission device is located at upper side of spindle box. It has four transmission shafts. The frequency conversion motor shaft is extended to the quill of inner and outer gears that being connected with the shaft I, and transmission to the shaft II via gear speed reduction, and transmission once again to the shaft III via gear speed reduction, lubrication oil to all transmission parts of upper spindle box is offered by a new type single direction cycloid lubrication pump driven by shaft II. A adjustable torque safety clutch is located at lower part of the shaft III. A spindle shift quill with inner and outer spline is arranged in the shaft IV. A shifting twin gear is movable at the outer spline to be used for spindle speed change in higher or lower range with step-less speed and inner spline is for the purpose of transmission to 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 220– 1400 r/min could be available by shifting of the twin gear, therefore the spindle speed range from 38 – 2000 r/min in step-less is available. Actual spindle speed number is available from the speed table in front of the spindle box.

5.2 Spindle feed rate mechanism: (refer to the diagram 8)

Spindle feed rate mechanism is also located at the up side of the spindle box, which contains five transmission shafts. Transmission is from a small gear at the low side of the shift quill (IV shaft) to the shaft VI with speed reduction and then by shifting the two sets of twin shifting gears of the shaft VII as well as the twin shifting gear of the shaft VIII to obtain 8 different speeds at the shaft IX that transmits to the machine spindle for the movement in spindle axis, therefore 8 feed rate from 0.06 – 1.38mm/r could be available.

Spindle feed rate change is realized by 3 twins shafting gears controlled by three forks of cam device. Concrete feed rate is displayed by a label.

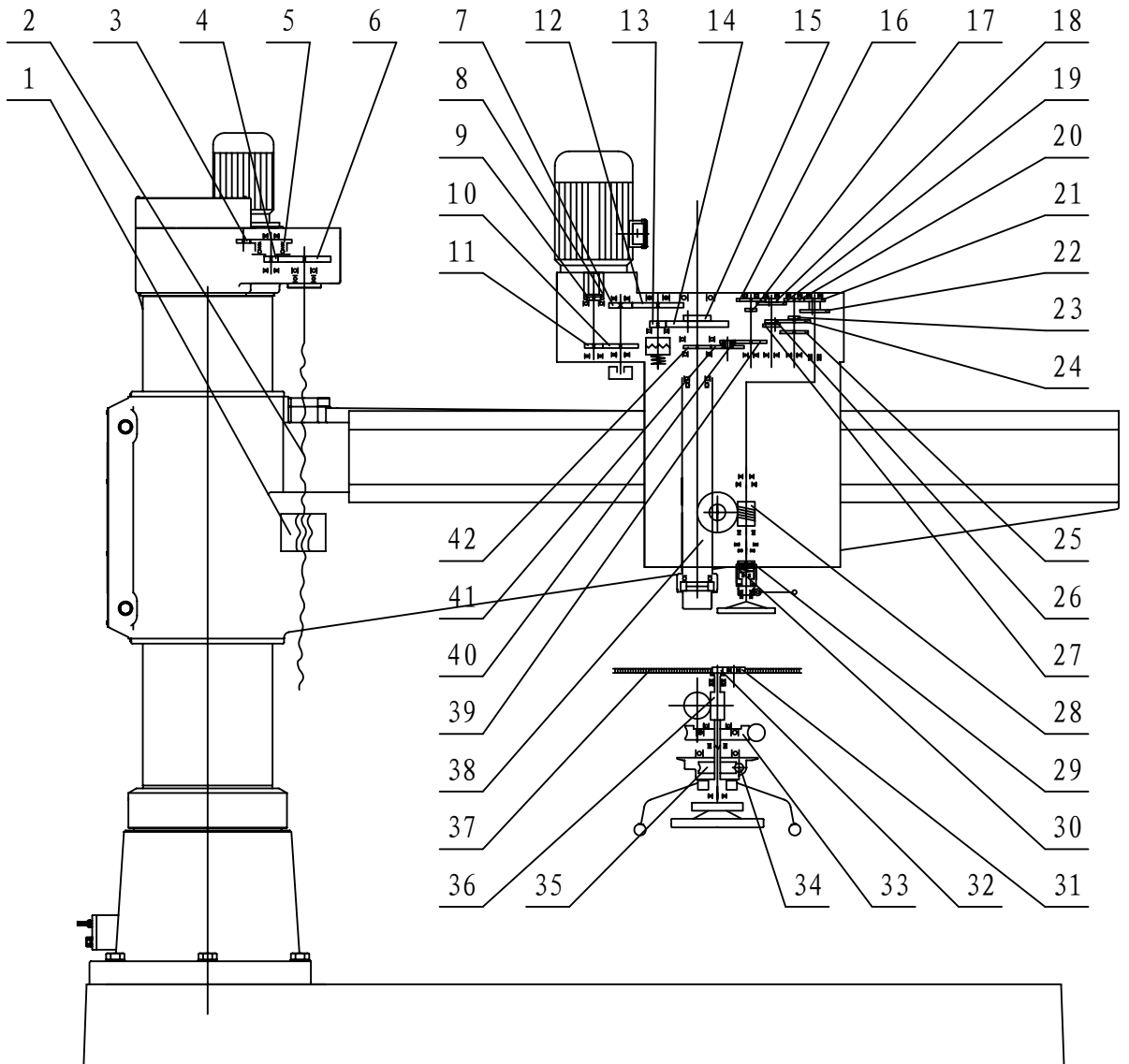


Diagram 3. Transmission system

List for Gears, Worm gears, Worm shaft and Rack.

Table (1)

Assembling place	Up and down box						Spindle box	
Transmission drawing no.	1	2	3	4	5	6	7	8
Gear no or line no.			24	16	72	31	23	24
Module or pitch	T50×38		2	3	2	3	3.5	2
Helical angle								
Position coefficient							+0.5	
Material	ZznAIC u10-5	45	45	45	45	45	40Cr	40Cr
Heat treatment and hardness		T235	G48	G48	G48	G48	G52	G52
Assembling place	Spindle box (main drive)					Spindle box (feed device)		
Transmission drawing no.	9	10	11	12	13	14	15	16
Gear no or line no.	24	41	21	51	16	62	27	40
Module or pitch	2	3	3	3.5	3.5	3.5	3.5	2.5
Helical angle								
Position coefficient				-0.5	+0.5	-0.5	+0.5	-0.5
Material	40Cr	40Cr	40Cr	40Cr	40Cr	40Cr	40Cr	45
Heat treatment and hardness	G42	G52	G52	G52	G52	G52	G52	G48
Assembling place	Spindle box (feed transmission)							
Transmission drawing no.	17	18	19	20	21	22	23	24
Gear no or line no.	16	17	41	28	29	41	16	45
Module or pitch	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Helical angle								
Position coefficient	+0.5	+0.5	-0.5			-0.5	+0.5	-0.5
Material	45							
Heat treatment and hardness	G48							

List for Gears, Worm gears, Worm shaft and Rack.

Table (1)

Assembling place	Spindle box (feed trans)			Spindle box (feed mechanism)				
Transmission drawing no.	25	26	27	28	29	30	31	32
Gear no or line no.	39	18	24	1	38	38	26	12
Module or pitch	2.5	2.5	2.5	3.5	1.5	1.5	3	3
Helical angle						3° 20'18"		
Position coefficient		+0.5						
Material	45	45	45	45	40Cr	40Cr	45	45
Heat treatment and hardness	G48	G48	G48	T235	G48	G42	G48	G48
Assembling place	Spindle box (feed mechanism)					Spindle box (feed trans)		
Transmission drawing no.	33	34	35	36	37	39	39	40
Gear no or line no.	60	2	80	12	46	35	44	21
Module or pitch	3.5	1.5	1.5	4	3	4	2.5	2.5
Helical angle	3° 20'18"	5° 42'38"	5° 42'38"					
Position coefficient							-0.5	+0.5
Material	HT300	45	40Cr	45	45	40Cr	45	45
Heat treatment and hardness		G48	G48	T235	T235	T235	G48	G48
Assembling place	Spindle box (feed trans)							
Transmission drawing no.	41	42						
Gear no or line no.	46	38						
Module or pitch	2.5	2.5						
Helical angle								
Position coefficient								
Material	45	40Cr						
Heat treatment and hardness	G48	G48						

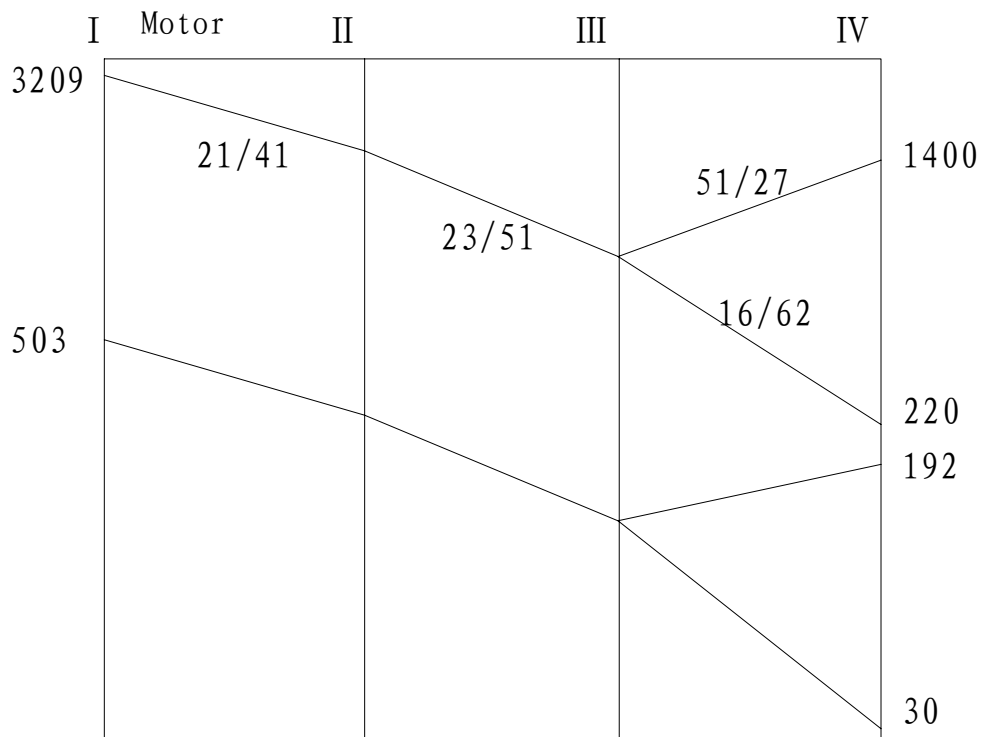


Diagram 4. Spindle speed chart

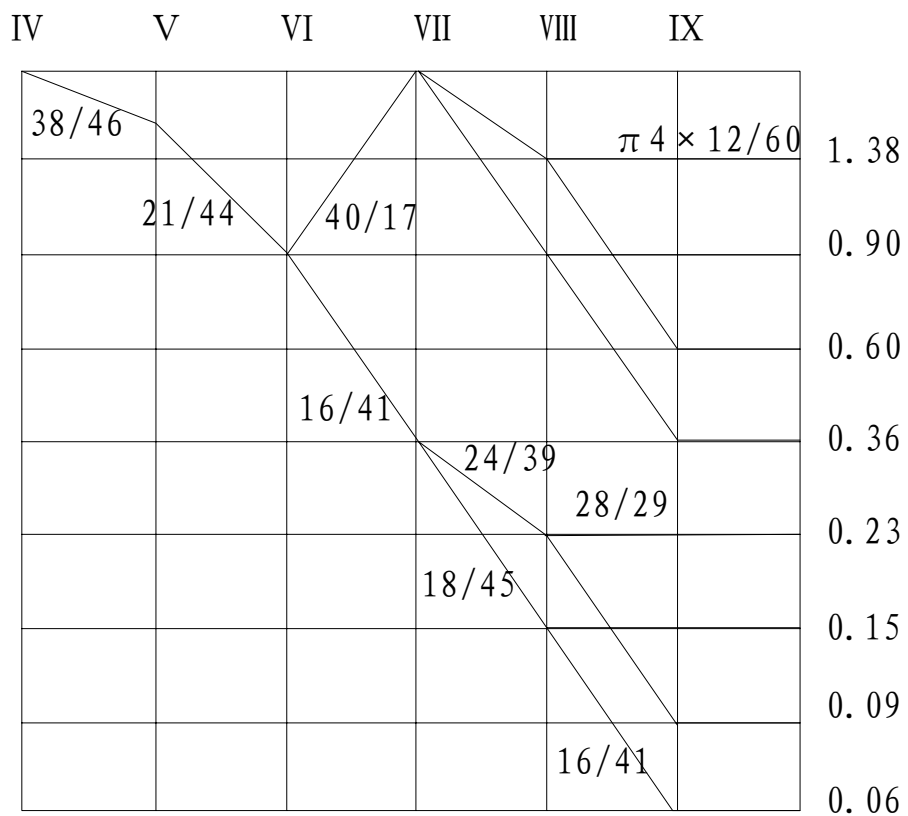


Diagram 5. Feed chart

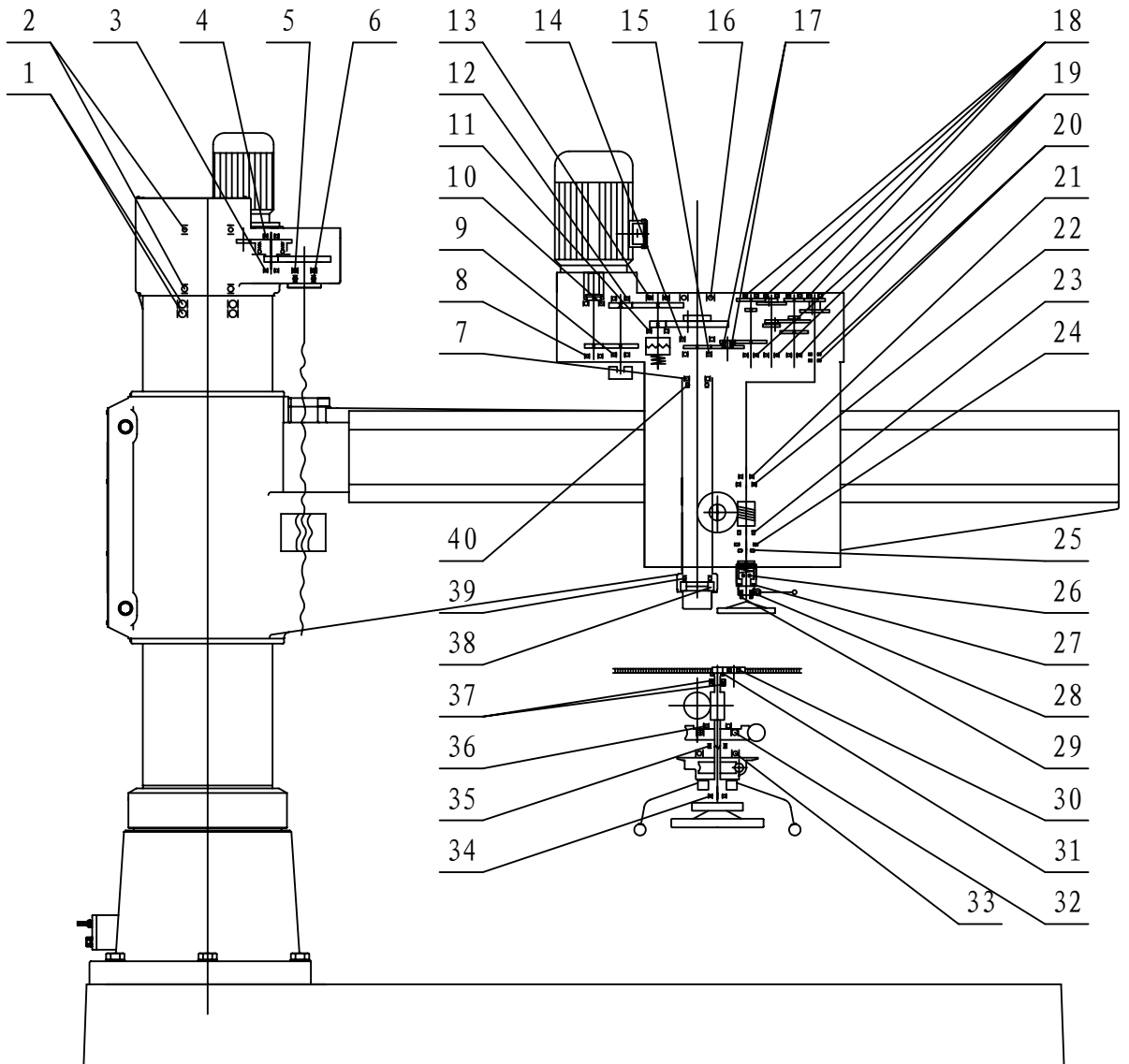


Diagram 6. Rolling bearing allocation

List for the bearings

Table (2)

No.	Name of the bearings	Type	Specification	Quantity
1	Deep slot ball bearing	128;GB276	140×210×33	2
2	Thrust ball bearing	8128;GB301	140×180×31	2
3	Deep slot ball bearing	205;GB276	25×52×15	1
4	Deep slot ball bearing with sealer	180205K;GB276	25×52×15	1
5	Deep slot ball bearing	209;GB276	45×85×19	1
6	Thrust ball bearing	8210;GB301	50×78×22	1
7	Deep slot ball bearing with sealer	D180111K;GB276	55×90×18	1
8	Deep slot ball bearing	206;GB276	30×62×16	1
9	Deep slot ball bearing	50206;GB277	30×62×16	1
10	Deep slot ball bearing	207;GB276	35×72×17	1
11	Deep slot ball bearing	109;GB276	45×75×16	1
12	Deep slot ball bearing	206;GB276	30×62×16	1
13	Deep slot ball bearing	307;GB276	35×80×21	1
14	Deep slot ball bearing	1000917;GB276	85×120×18	1
15	Deep slot ball bearing	113;GB276	65×100×18	1
16	Deep slot ball bearing	213;GB276	65×120×23	1
17	Deep slot ball bearing	103;GB276	17×35×10	2
18	Deep slot ball bearing	205;GB276	25×52×15	4
19	Deep slot ball bearing	50304; GB277	20×52×15	3
20	Deep slot ball bearing with sealer	180104k;GB276	20×42×12	2
21	Deep slot ball bearing with sealer	180205K;GB276	25×52×12	1
22	Deep slot ball bearing with sealer	180108K;GB276	40×68×15	1
23	Thrust ball bearing	8108;GB301	40×60×13	1
24	Deep slot ball bearing	7000110;GB276	50×80×10	1
25	Deep slot ball bearing	7000106;GB276	30×55×9	1
26	Thrust ball bearing	8102;GB301	15×28×9	1
27	Deep slot ball bearing	7000108;GB276	40×68×9	1
28	Thrust ball bearing	8105;GB301	25×42×11	1
29	Deep slot ball bearing with sealer	1180905K;GB276	25×42×9	1

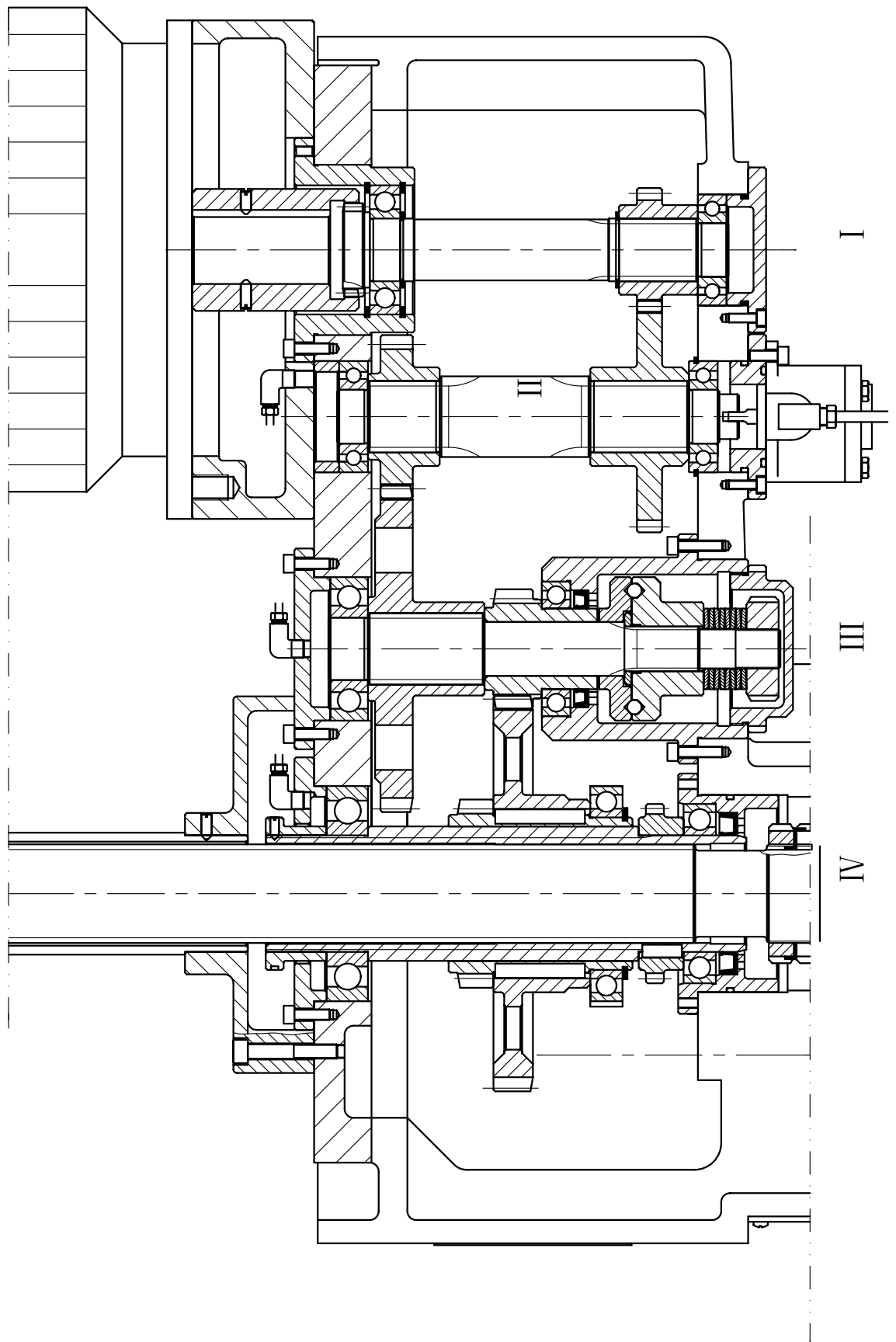


Diagram 7. Expanding drawing of spindle transmission mechanism

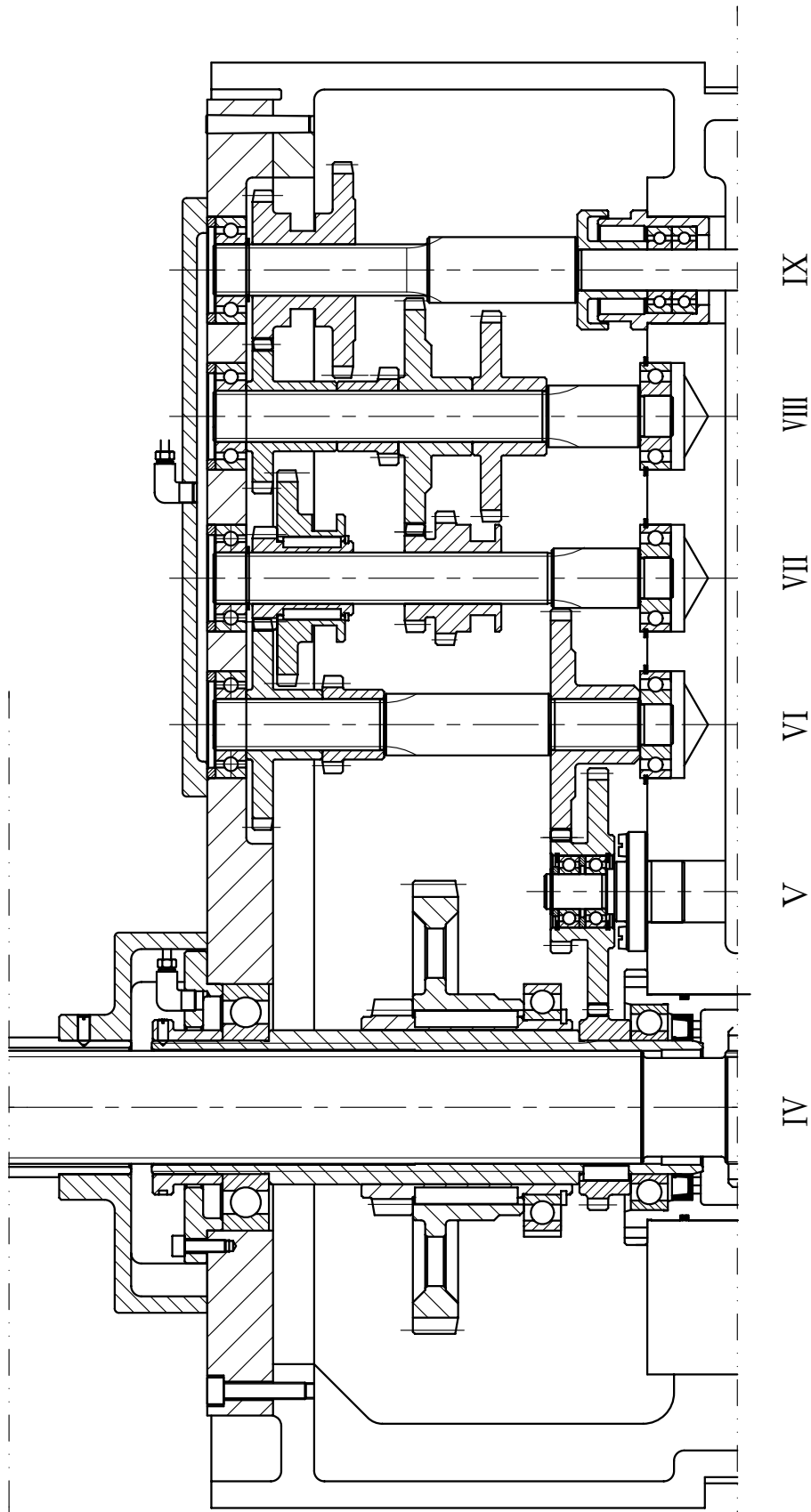


Diagram 8. Expanding drawing of spindle feed rate mechanism

5.3 Spindle system (refer to the diagram 9)

The spindle system of this machine adopts the structure by using strengthening spindle sleeve with double supports. The spindle sleeve will be moved up and down in the spindle hole of the spindle box and the spindle is supported by two bearings (up and down sides) located inside of the spindle sleeve and obtains the transmission from the spline in up side of the spindle sleeve.

Long match between spindle quill and guide sleeve is adopted and the spindle quill is made of superior quality material with nitrogen treatment and fine machining, because of these measures, the spindle became more rigidity, higher accuracy and better wear-ability.

A cam and helical cylindrical spring is used in the spindle component. The cam is to be used for balancing the gravity and springiness of the spindle component. Balancing force could be adjusted by fastening or loosening the bolt under the spring.

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

The spindle feed mechanism consists of worm shaft and horizontal shaft that be fixed respectively in vertical and in horizontal position of the down side of the spindle box. The feed power of the spindle is transmitted from spindle feed transmission mechanism to the spindle sleeve via worm shaft, worm wheel and horizontal shaft.

Worm shaft (diagram 10)

The diagram shows the manual or micro feed position and the lever now is in the upper horizontal place, the steel ball safety clutch 2 and gear sleeve 3 will be running idly driven by spindle feed change device, pushing down the lever to the end which forced inner gear sleeve 5 matches with gear sleeve 3 that brings the worm shaft 1 running and through worm gear and horizontal shaft, power feed of the spindle could be realized, at this movement, the hand wheel could be turning freely. If a micro feed is required, move the lever to the upper position, the inner gear sleeve 5 disconnects with the gear sleeve 3, the worm shaft 1 will be spinning by turning of the hand wheel, through worm gear and horizontal shaft brings the spindle to realize the micro feed movement. Manual feed is possible, realized by horizontal shaft device if hand wheel stops the turning.

Function of the steel ball safety clutch is for safety purpose when feed force is higher than the stipulation value, then power feed will be off automatically. This function could also be used for fixed cutting distance machining. The working principle is: when feed force is higher than the stipulation, the steel ball will be slippery at the end face of the clutch 2, which will create an axial force, via spacer and sleeve, pushes back the inner gear sleeve 5 and rack sleeve 4 in the original place as showed at diagram. Meanwhile the lever now returns automatically in his upper horizontal position and the power feed is stopped. The steel ball, the spacer and the sleeve will be in his original position forced by disc type spring.

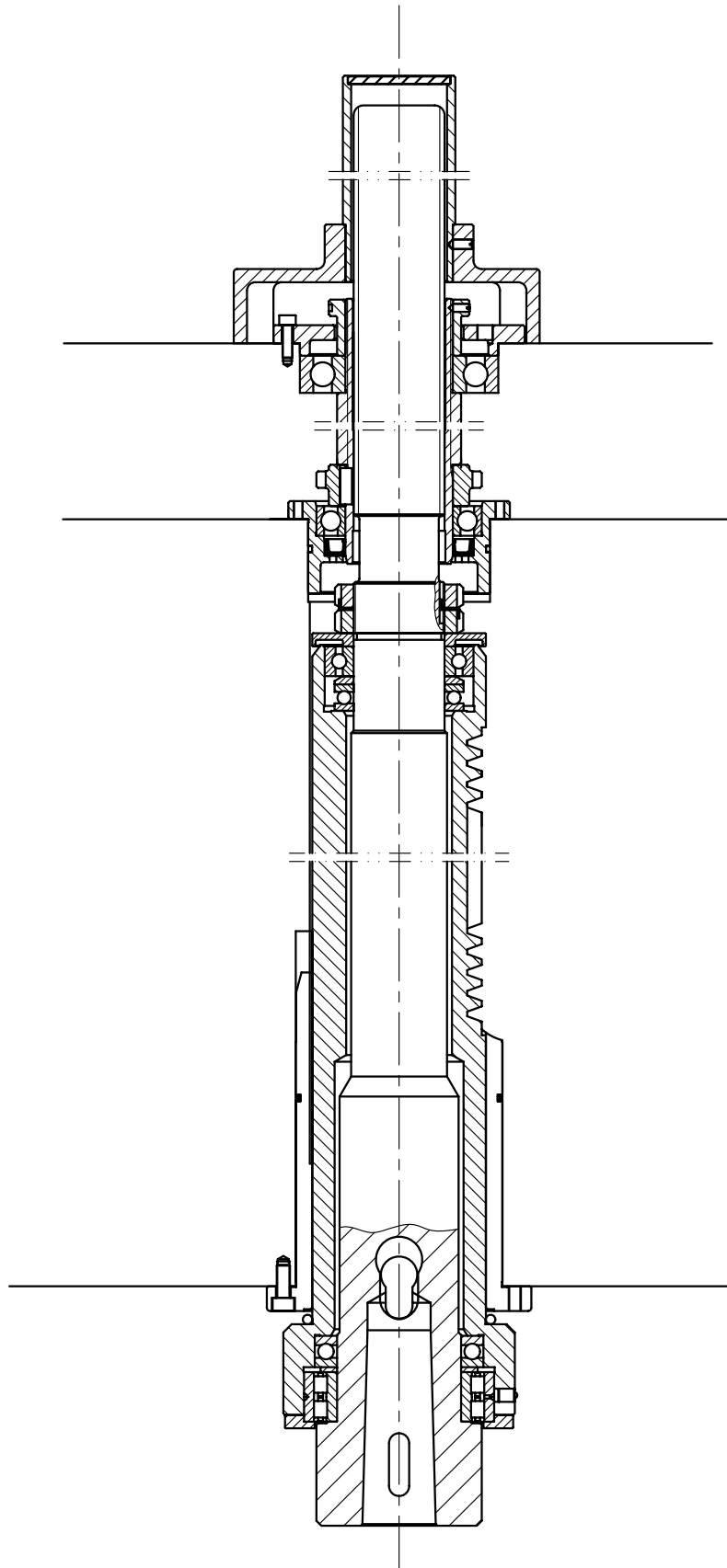


Diagram 9. Spindle structure drawing

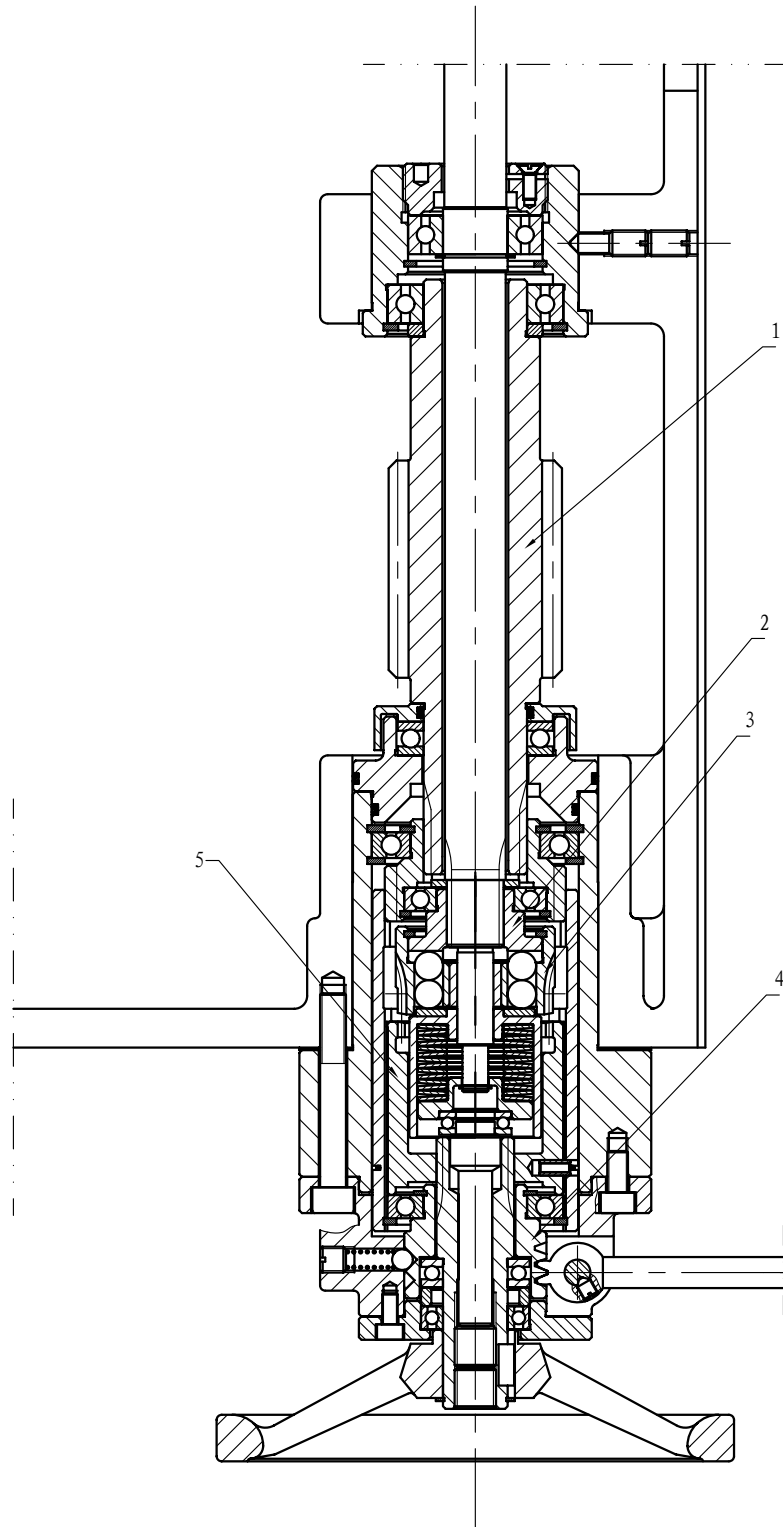
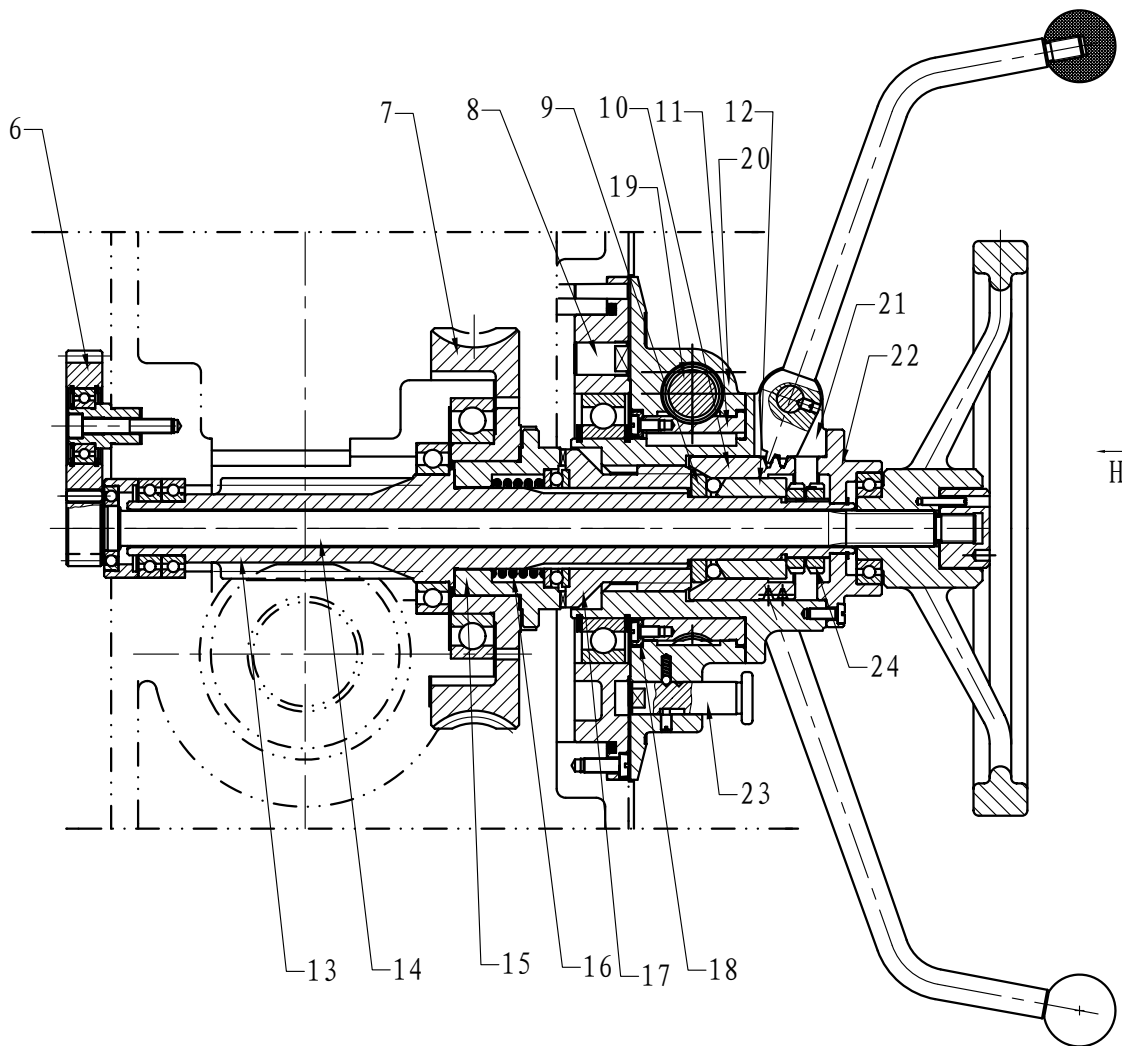


Diagram 10. Worm shaft



H Direction of rotation

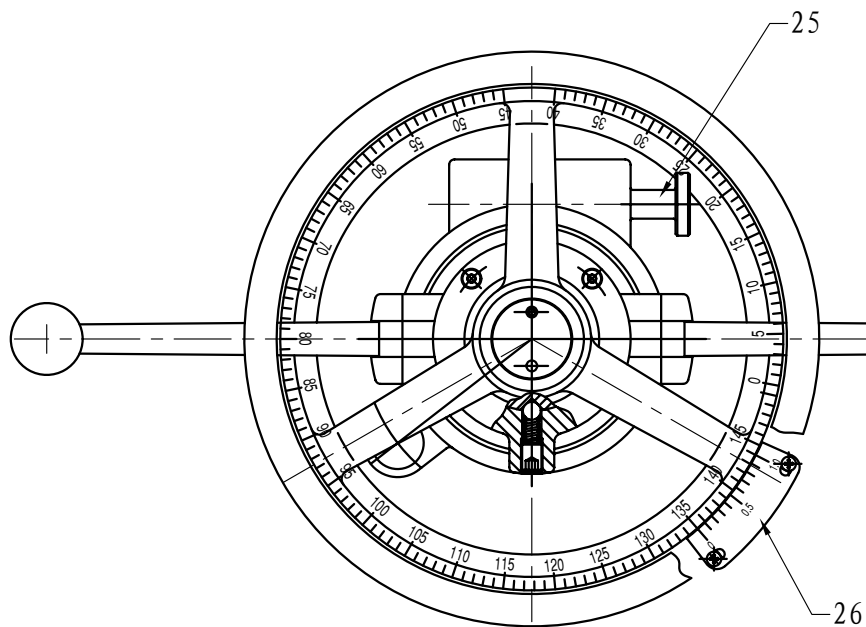


Diagram 11. Horizontal shaft

Horizontal shaft (diagram 11)

The diagram illustrates the power feed cutting status. Suppose a power feed is required, push down the lever of the worm shaft to the end position first (diagram 10), and then pull out two levers of the horizontal shaft, thus the power feed is realized.

The working principal is:

Pull out two levers means pushing sleeve 10; the cone of the sleeve moves the steel ball into the center of the horizontal shaft, the axial force created by the steel ball makes clutches 17 and 15 connected through spacer 9. The movement transferred by worm shaft I (diagram 10) makes worm gear 7, clutches 17, 15 and horizontal shaft 13 running, which realizes the power feed movement of the spindle, followed, the support, the handle etc will also be turning, the dial as well caused by worm shaft and worm-gear. If power feed off is requested, push forward the lever, the sleeve 10 will returns the original place, the steel ball, under the pressure of the spring, moves away to the cone of the sleeve 10 and clutches disconnected, worm gear 7 running idly and power feed is stopped.

If fixed cutting distance under power feed is required, pull out the shaft 23 first, and turn the knob 25, which brings the small worm shaft running, the worm shaft and worm-gear will be disconnected when the line of scale on the knob is in the same line of the label that marks "disconnected) and now the dial could bring the worm shaft turning freely, now the dial could be roughly moved toward to the "0" scale of the sub-ruler located at right down corner as per the required cutting depth, micro adjustment for the cutting depth is possible by turning knob, that makes the small worm shaft and small worm-gear matches (the scale of the knob is line up with the center position of the "micro" of the label), adjusting the knob a little bit, which will turn the dial until the required scale of the cutting depth on the dial is in line up with the "0" line on the sub-ruler, push in the collision shaft, power feed is to be connected, the spindle will be working as per the required cutting distance, the dial is turning and when its "0" mark is in line up with the "0" line of the sub-ruler, the collision shaft h of the dial strokes of collision block 8 that will cause the dial, worm shaft and worm-gear stopped, the steel ball clutch of the worm shaft will disconnect the power feed as the force is higher than the fixed value and therefore the required cutting depth is fulfilled. Manual feed is available by pushing in the handle and turn it. Spindle box moving is possible by turning handle, the gear shaft 14 makes the gear 6 and arm rack matched which realizes the spindle box moving horizontally along with the arm guide way.

Suppose the component of horizontal shaft or the spindle unit needs to be disassembled, it is not necessary to disassemble parts one by one, instead, disassemble the handle first (take away the nut in the middle), the handle socket, dial and end face clutch etc connected with a hollow shaft could be taken out by pulling and pushing the handle several times. The worm gear could be taken out after disassembling of the bearing socket. Note: the spindle unit could not be disassembled only when the hollow shaft is disassembled first.

5.5 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.

5.6 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.

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

Pressure oil for clamping use comes into the big chamber C who pushes the piston 27, and causes rhomb block 28 in upright position with a little bit over the center line then it is self-locked, the spindle box hence be clamped on the arm upon elimination of gap between spindle box and arm guide way. Pressure oil for loosening use comes into the small chamber d and push down the rhomb block therefore the spindle box could be moved easily.

Manual clamping plate b is available at both end of clamping frame of the spindle box. The nut of bolt a is fastened in order to let spindle box to be fixed on the radial arm for transportation. Properly loosening the nut when machine is installed, otherwise the spindle box could not be moved along with the radial arm. In case, hydraulic clamping force is not strong enough when hole boring or spot facing machining, fastening the nut of bolt a by using spanner, the spindle box shall be tightly fixed on the radial arm guide way.

5.8 Hydraulic system (refer to the diagram 15)

Clamping or loosening 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 $300 \times 10\text{Pa}$. 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 valve, 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.

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 clamping 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 valve 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.

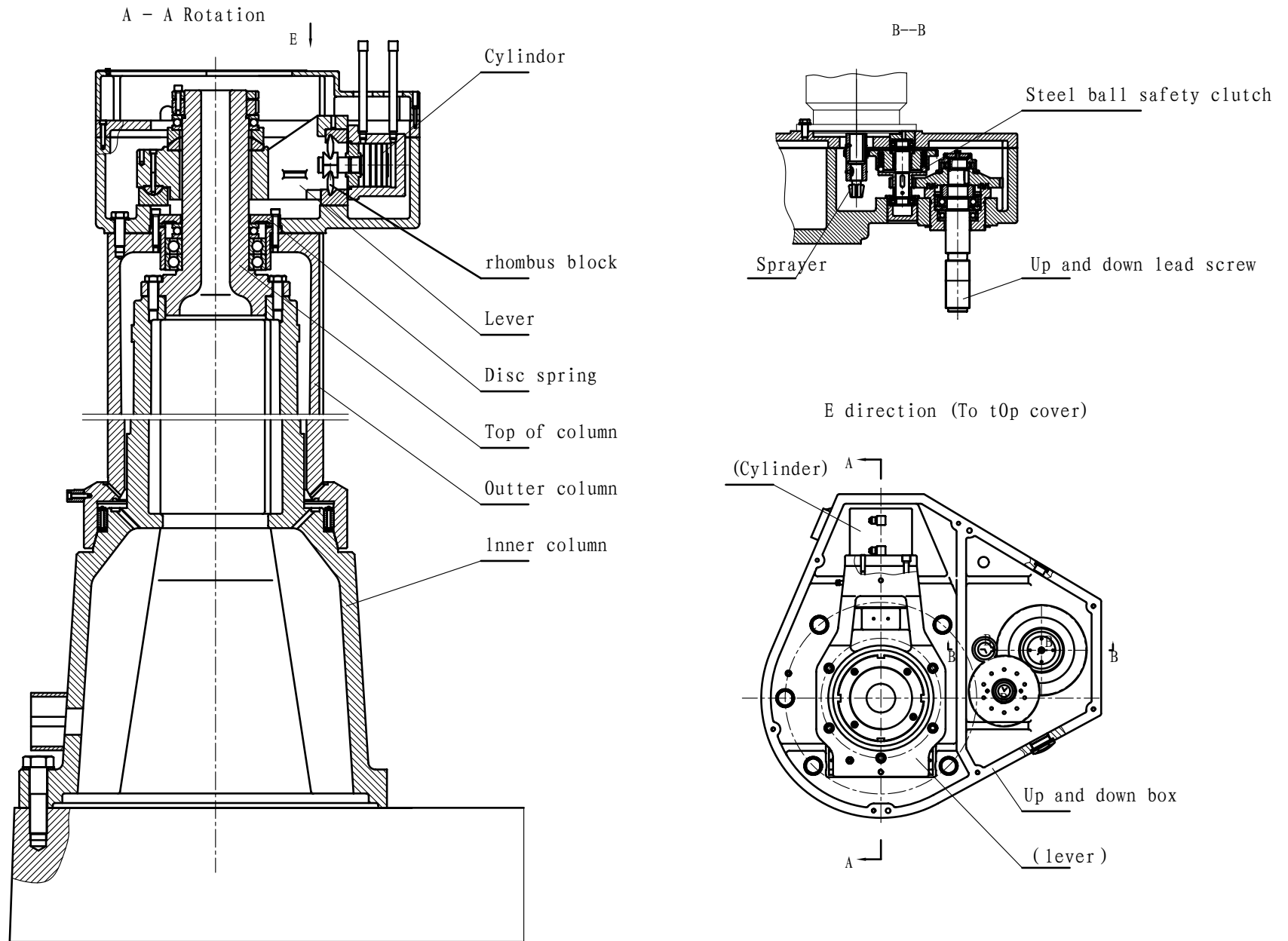


Diagram 12. Column clamping and rock arm up and down mechanism

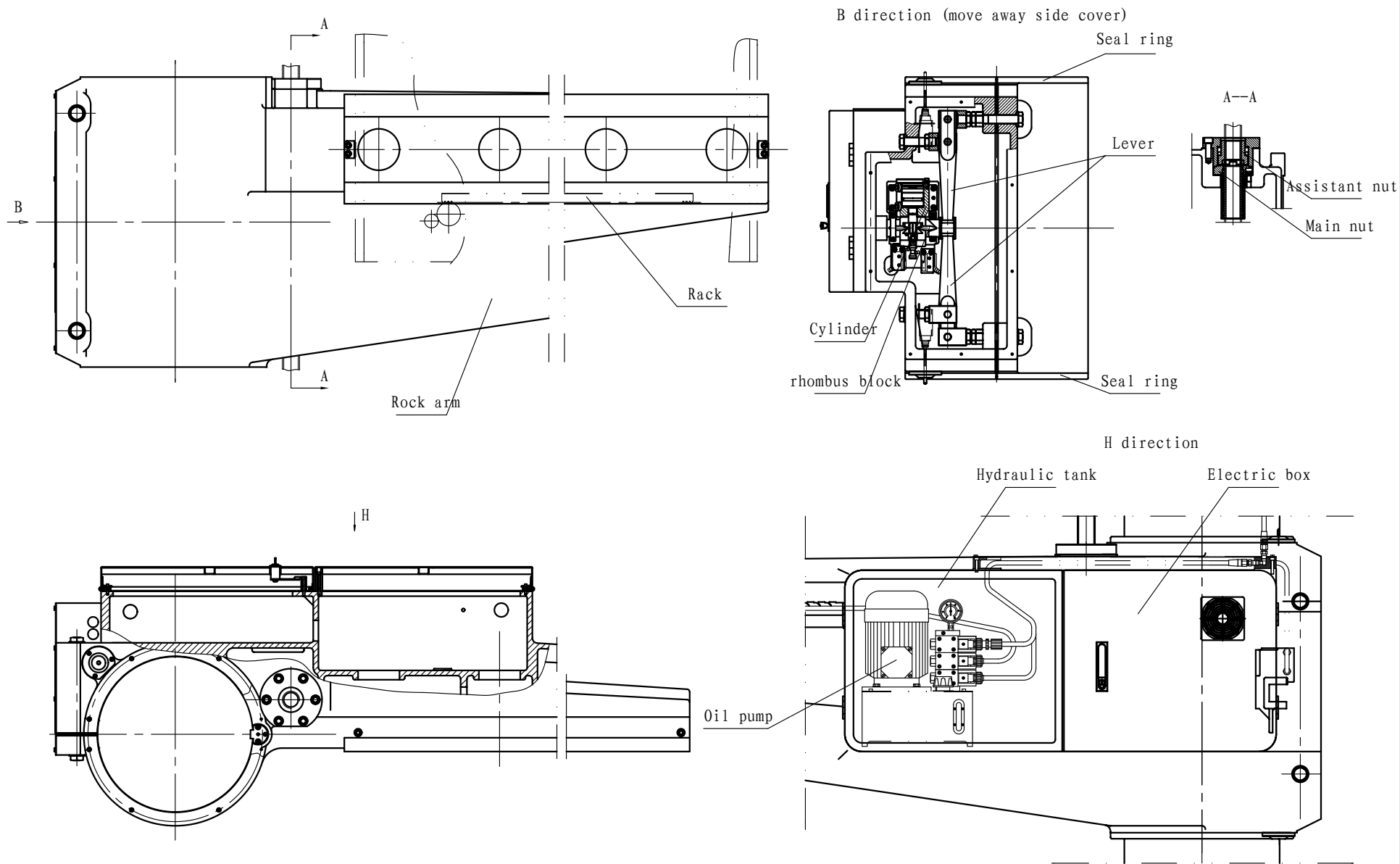


Diagram 13. Rock arm and its claming mechanism

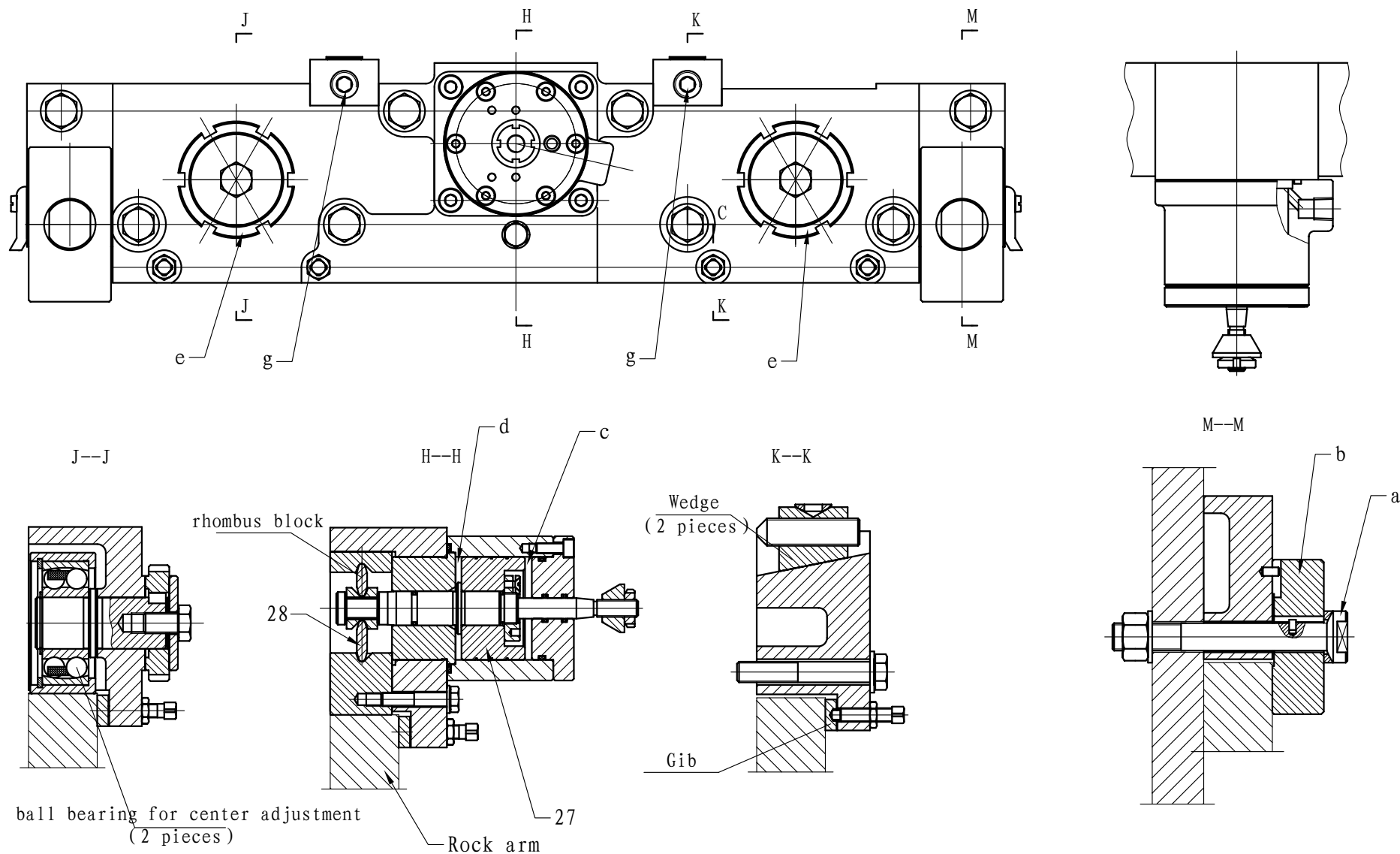


Diagram 14. Clamping mechanism of the spindle box

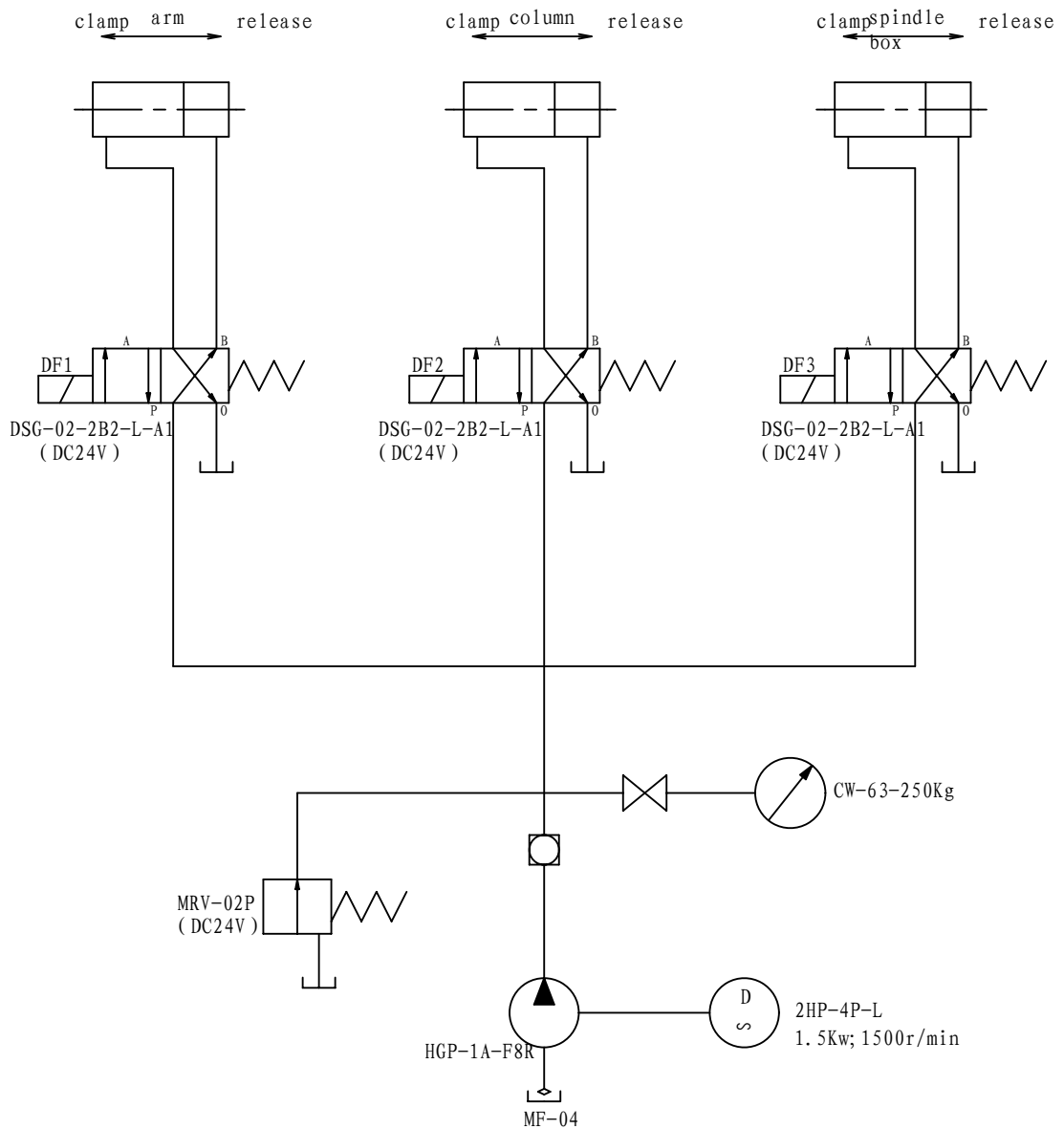


Diagram 9. Principle draw of hydraulic system for clamping purpose.

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 20): Turn on the main switch6(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) Moving once again the handle 11 to the forward or revise position, now the spindle could be started.

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 6(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.

6.2.3 Rock arm moving up or down

Turn left (or turn right) of the arm up or down selection switch 14(SX3), electric magnetic iron YA1 works, coil KM4 also works, the pump motor M3 running, arm release oil circuit is connected and arm starts to be released to the certain place, SQ3 is reset, SQ2 is pressed, KM2 (or KM3) contactor works, KM4 coil is off its power, oil pump motor M3 stops, up or down motor M2 works and brings the arm moving up (or moving 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.

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6.2.4 Unclamping and clamping of the column and spindle box

As per machine use request, there are four clamping or release status existed: a. clamping simultaneously; b: the spindle box is released and the column is clamped; c: the column is released and the spindle box is clamped; d. release simultaneously.

When the spindle box and the column are requested to be clamped simultaneously, the three positions selection switch 5 (SX2) shall be put in the middle position, push down the clamping button 10 (SB4), contactor KM4 works, oil pump motor M3 running, pressure oil comes into column cylinder and spindle box cylinder respectively, which pushes the piston and makes column and spindle box to be clamped simultaneously, the indicator lamps for spindle box and column release are off simultaneously, that means clamping action is finished and push button could be released.

When the spindle box and column are requested to be released simultaneously, put the three positions selection switch 5 (SX2) in the middle position, push down the release button 12 (SB3), solenoid valve YA2 and YA3 works, contactor KM4 also works, oil pump motor M3 running, that makes the spindle box and the column released simultaneously. The indicator lamps both for the spindle box and the column release are lighted simultaneously.

When spindle box individually release is required, put the selection switch 5 (SX2) in the right position, the column shall be in clamping status.

When column individually release is required, put the selection switch 5 (SX2) in the left position, the spindle box shall be in clamping status.

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

Turn on the select switch 8(SX1), the coolant pump works simultaneously with the machine spindle. Coolant pump will be stopped to work when machine spindle 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.

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 $\pm 5\%$ required by the electric motor. Maintenance of electric equipment is absolutely important in order to keep machine works well.

6.5 Electric components

Code	Name	Type and specification	Quantity
QF1	Breaker	GV2-ME20	1
QF2	Breaker	GV2-ME10	1
QF3	Breaker	GV2-ME08	1
QF4	Breaker	GV2-ME04	1
QS1	Instruction switch	JCH13 - 20	1
SB1	Emergency stop button	LA42J-02/R	1
SA1,2,3	Button	LXP1(3SE3)020-0A	3
SB2	Button	CP1-10B-10	1
SB5,6	Button	CP1-10G-10	2
SX1	Selection switch	C2SS2-10B-10	1
SX2	Selection switch	C3SS1-10B-20	1
SX3	Selection switch	C3SS2-10B-20	1
SQ1-1, SQ1-2	Switch	SND6166-SP-C	2
SQ2, SQ3	Limit switch	LXW5-11G2/F	2
SQ4	Door switch	JWM6-11	1
SQ5	Emergency stop switch	LXP1-020-0A	1
SQ7	Limit switch	XCKN2102P20C	1
SQ8	Limit switch	XCKN2102P20C	1
U1	PLC	TM218LDA40DRN	1
KM1	Contactoer	LC1D18B7C (AC24V) 50Hz	1
KM2-5	Contactoer	LC1E1201B5N (AC24V) 50Hz	4
HL1	Signal lamp	AD17-16 AC24V	3
EL1	Illuminator	25W AC24V	1
T1	Transformer	JBK5-250H 400/24,24,9,220	1
QL1	Bridge rectifier	QL5A200V	1
QL2-4	Bridge rectifier	QL10A200V	3
INV1	Frequency converter	ATV320U75N4B	1
RVP1, S1	Speed meter	RSD-27	1

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Code	Name	Type and specification	Quantity
RW1	Potential resistance, knob	WTH-1, 1K, KYZ32-16-6J	1 for each
M6	Fan	12025/24V	1
	Fan mesh enclosure	125 x125 filter cover	1

7 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 aproxmately 7.8L.

The volume of lubricant under spindle box are aproxmately 6.2L.

The volume of lubricant of 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

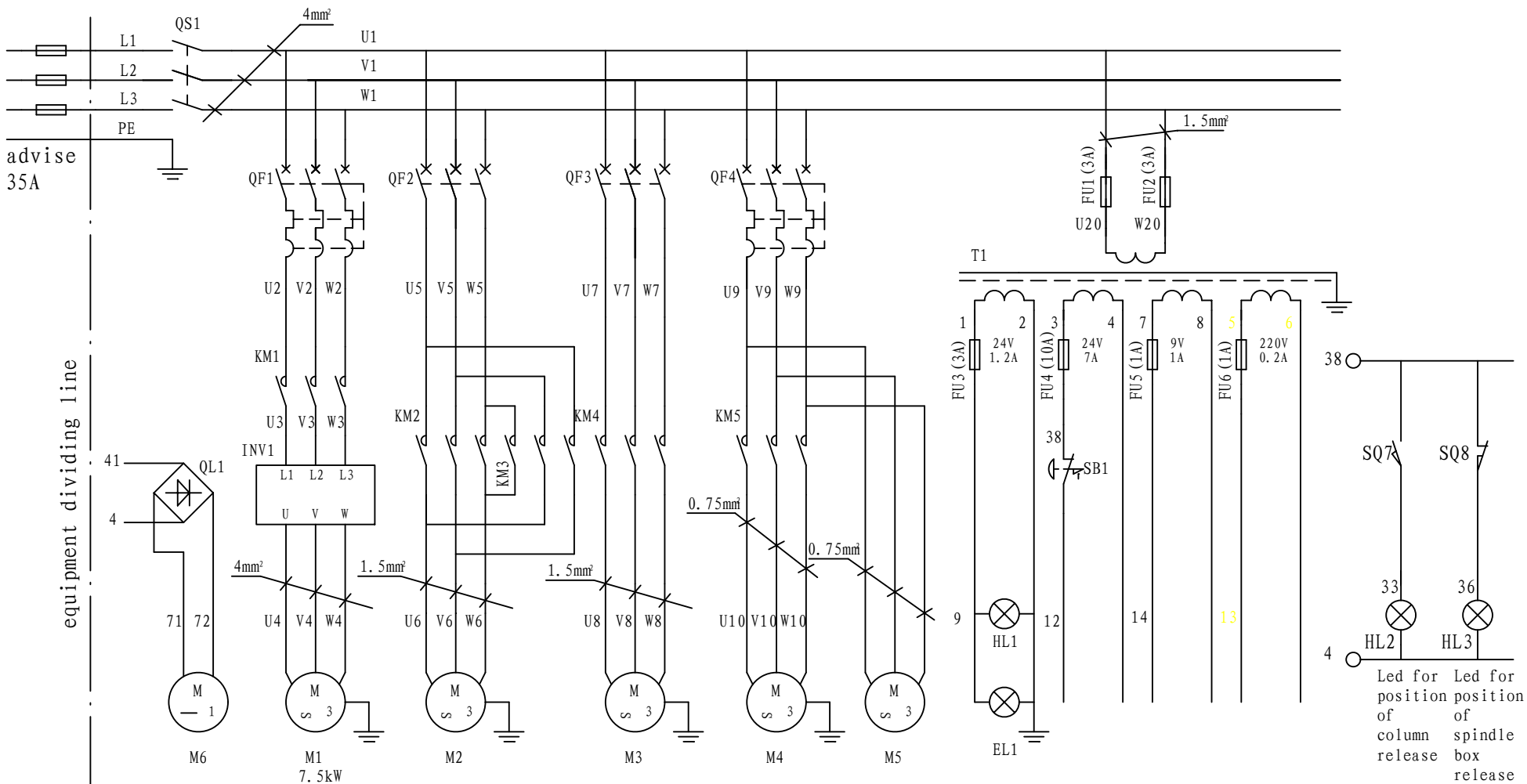
Domestic made No.20 oil is equivalent to ISO VG33

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.

Main Power	main swith	Spindle motor	Upand down motor	Oil pump motor	Pump moto	Codant for spindle motor	Electric power	Indication	
	Coolant for frequency conversion							Indication of column release	Indication of spindle box release

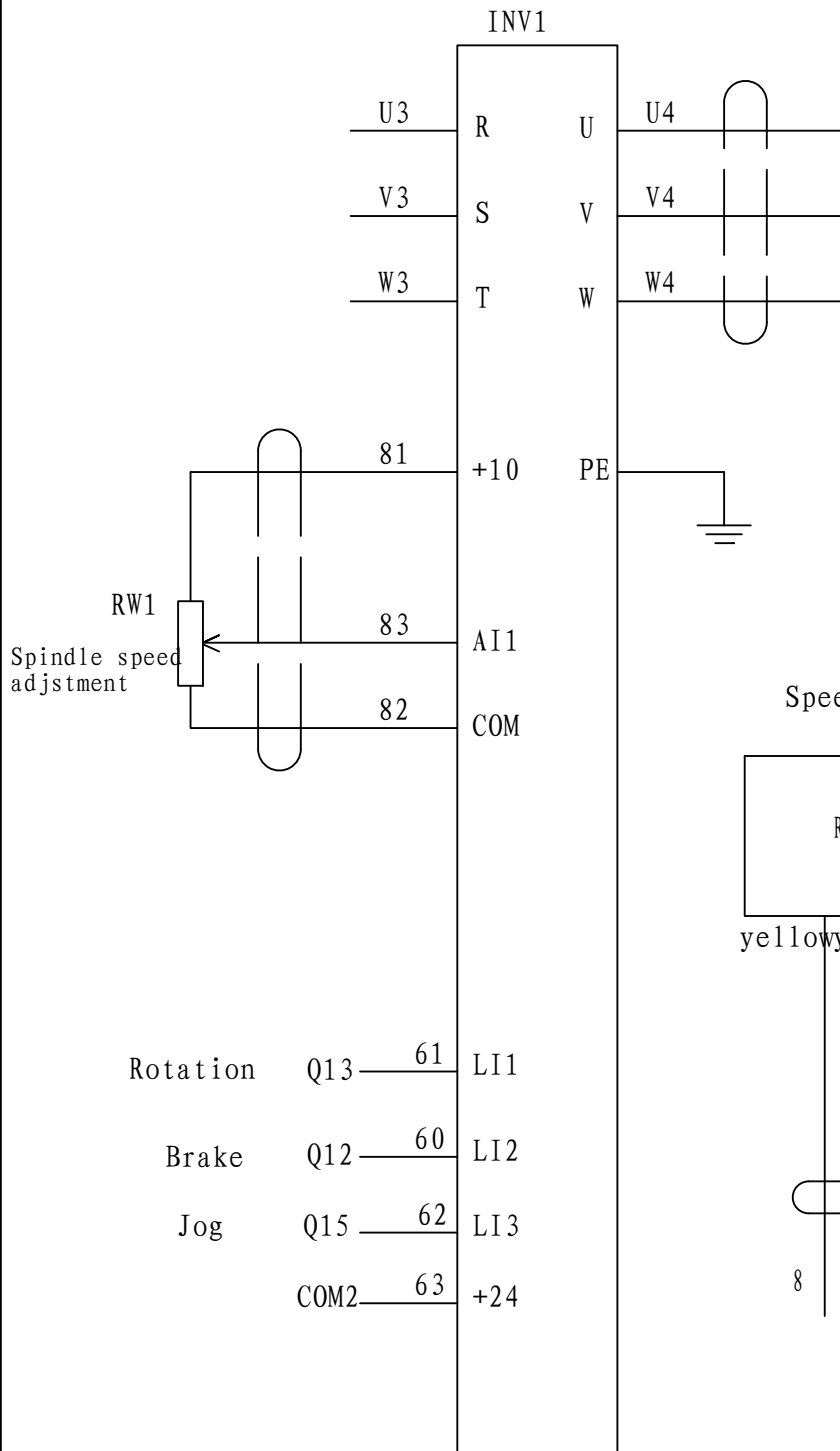
3 φ AC400V 50Hz



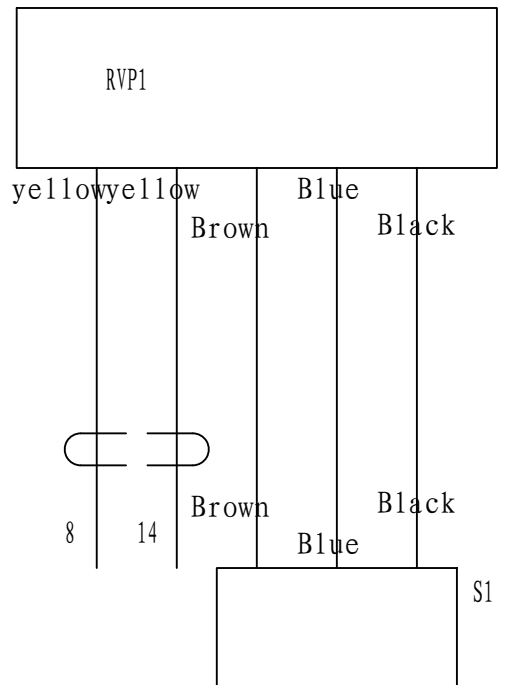
Attention: The diameter of the line without indicating is 0.275mm .

Diagram (16-1). Electrical principle drawing

Frequency conversion wiring drawing

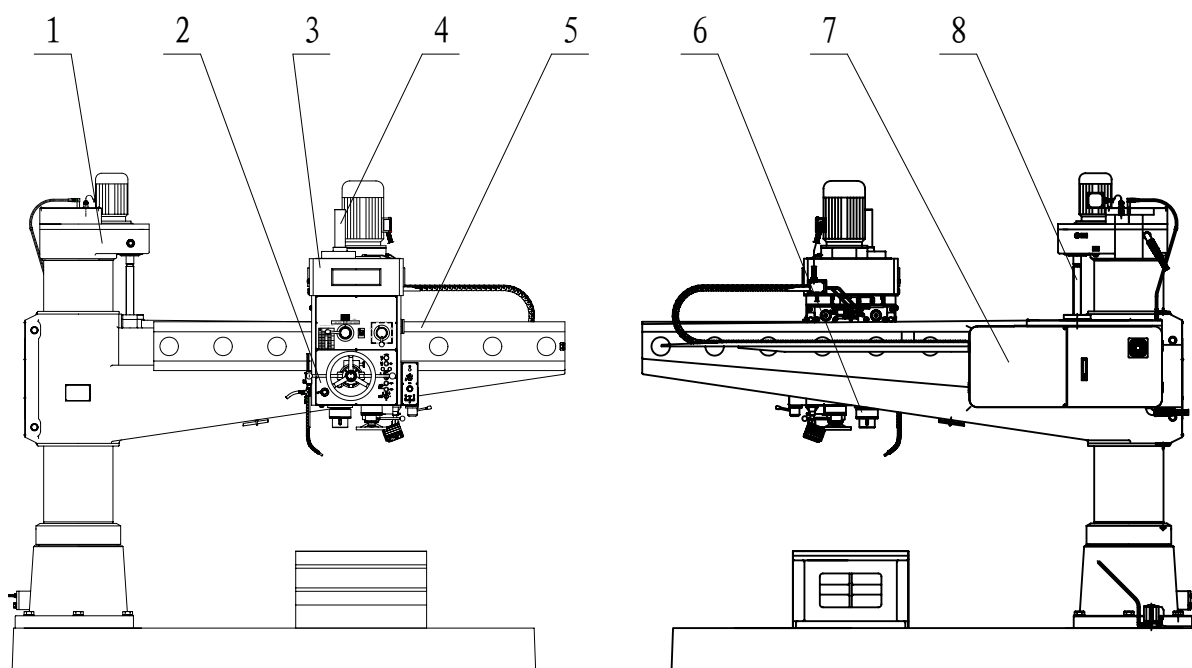


Speed meter wiring drawing



Attention: The diameter of the line without indicating is 0.75mm².

Diagram (16-3). Electrical principle drawing



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 17. Lubrication places

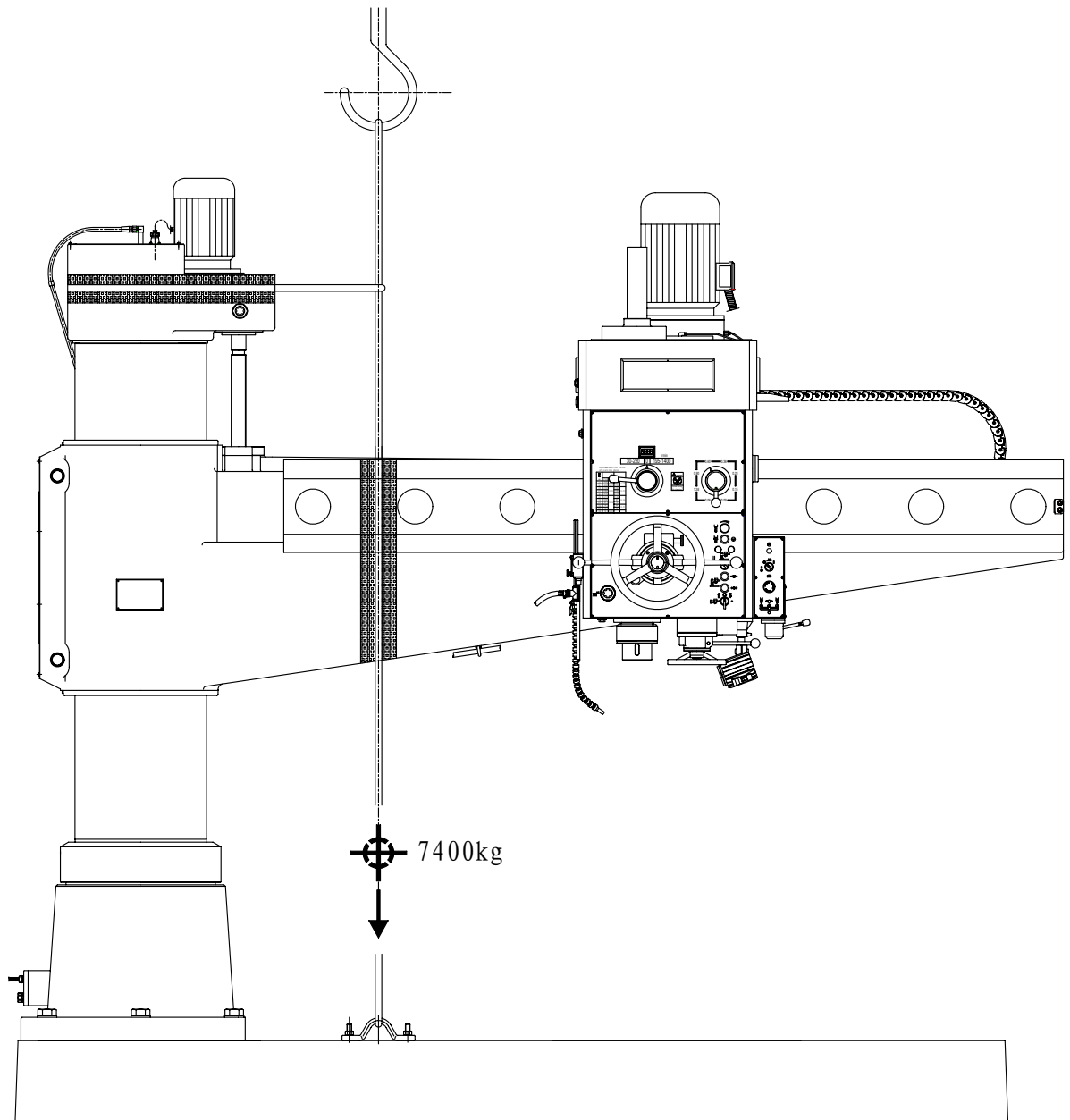
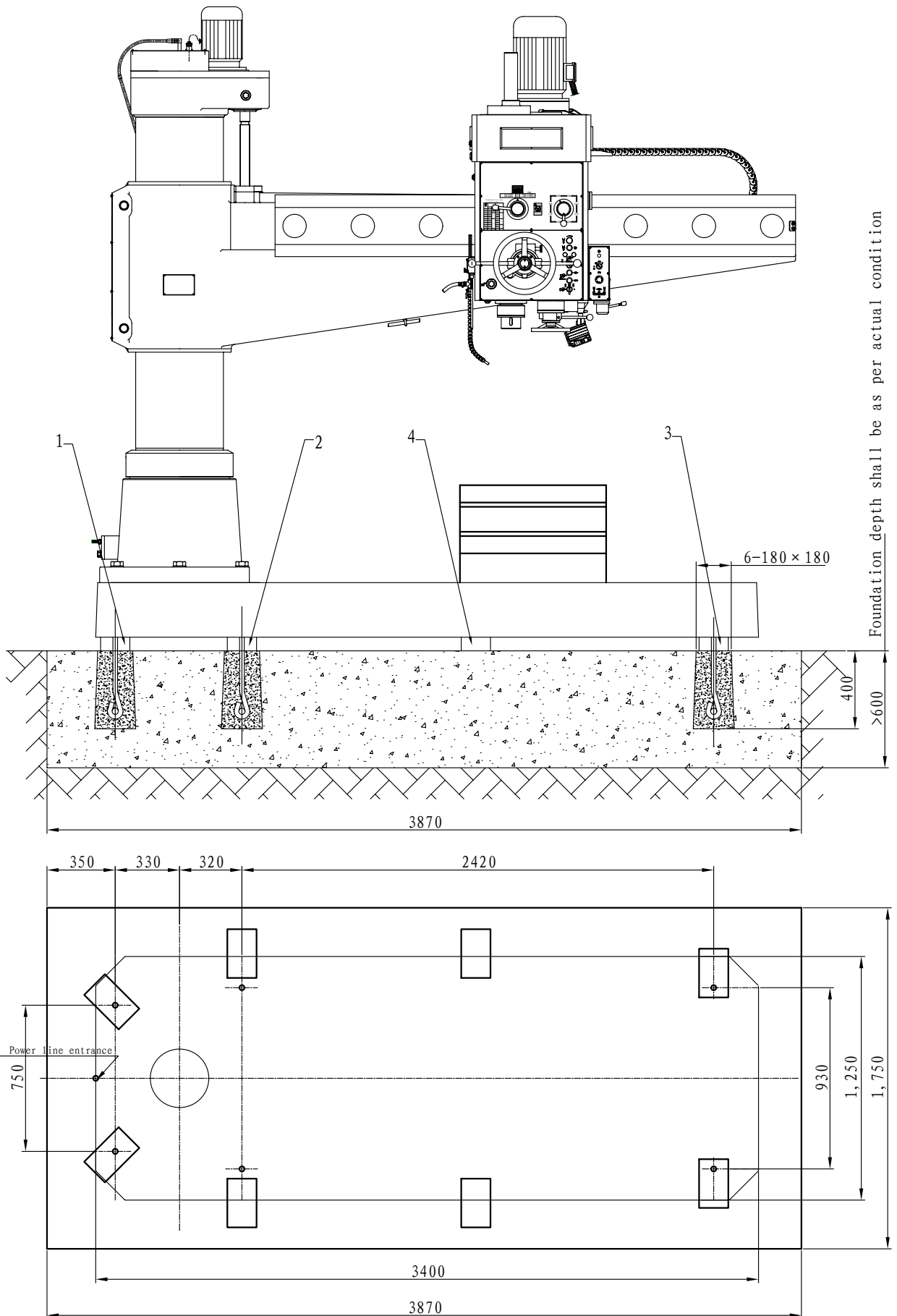


Diagram 18. Hoisting drawing



Foundation depth shall be as per actual condition

Diagram 19. Foundation drawing

7.2 Coolant system:

Cooling of tools is realized by coolant offered a special electric coolant pump. Coolant tank is an inner chamber in the left side of the machine base (under the column); the rate of flow is controlled by an adjustment valve in the left down side of the spindle box.

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 “ \perp ”.

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.

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9. Machine operation:

9.1 Location and purpose of operating handles, buttons and switches. (refer to the diagram 20 and table 4)

List for the handles, buttons and switches Table 4

No.	Description	No.	Description
1	Lever for spindle speed change	11	Lever for spindle forward, revise, stop or brake.
2	Handle for feed rate change	12	Release button
3	Knob for speed change	13	Lever for disconnect or connect of power feed.
4	Button for spindle jog	14	Button for the arm up or down
5	Select switch for column or spindle box clamping or release	15	Lever for micro feed
6	Main power switch	16	Knob for micro adjustment of dial
7	Indicator lamp for power supply	17	Limit switch for fixed cutting distance
8	Switch of coolant pump	18	Handle for spindle box movement
9	Button for emergency stop	19	Button for emergency stop
10	Clamping button	20	Lever for power feed of spindle move and connection

9.2 Speed change, start or stop of the spindle

The handle 1 is for high or low speed range selection or in idle position. The knob 3 is for step less speed adjustment and its actual spindle speed could be read out from the speed display. Stop the machine when speed range changes as it will be done by gears. Turn the spindle by manual or jog the button 4 if spindle speed change feels difficult. There are four positions for the handle 11. The spindle will be running in forward direction if the handle 11 moving forward to the operator's direction. The spindle will be running in reverse direction if the handle 11 moving forward to the opposite direction of the operator's position. The spindle will be stopped if the handle 11 moving to the middle position and the spindle will be brake if lift up the handle 9 in the middle position.

9.3 Feed rate change

Moving handle 2, the spindle feed rate is available directly from the dial indicator.

Stop the machine first when feed rate needs to be changed because feed rate change is realized by gear transmission. Operation method for the feed rate change is the same as that of spindle speed change.

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 wheel 16 and turn it.

Attention: The handle 13 could not be moved down when micro feed is required. Otherwise power feed will be made and the hand wheel 15 will be turned quickly.

9.5 Cutting depth adjustment

Definition for cutting depth means spindle feed will be stopped when the cutting tool feeds to the preset depth. This could be used both for manual feeding and for power feeding.

Method for presetting of cutting depth: Manually moving down the handle 20 until cutting tool touches the surface of work piece. Pull out knob 17 turn knob 16 and make it away from the dial, turn the dial to the required cutting depth and line up at "0" with the vernier cursor, the dial could be micro adjusted and fixed by knob 16, push the knob 17. Therefore when power feed to the preset depth, the handle 13 will automatically moving up and feed will be stopped.

For the manual feed, if feed depth presetting is required, the same way could be used but should be in the manual feed status.

9.6 Tapping:

For the tapping, no power feed is allowed and pull out the knob 17 is requested. Before tapping, chamfering at the entrance of the holes is required. Turn the handle 20 and make tap approaching to work piece, give proper force to the handle 20 based on the diameter of the tap in order to let tap easily coming into the hole. Make the spindle running in reverse direction when required depth of tapping is reached, at the same time, moving the handle 11 in reverse direction with proper force on it and the tap will be away from the work piece. That's finished the tapping job.

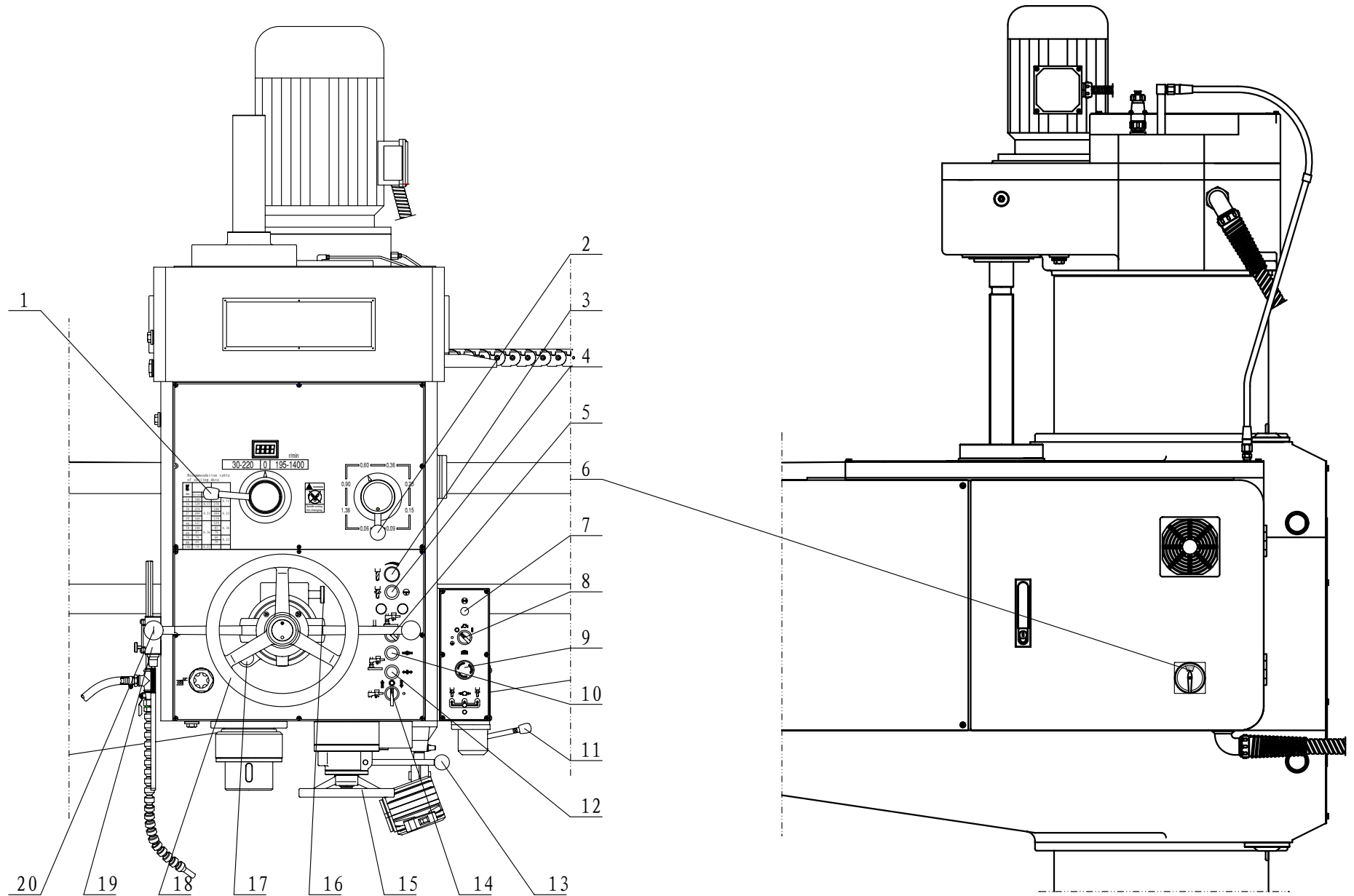


Diagram 20. Machine Operation sketch

9.7 Clamping and unclamping of the column and spindle box

The clamping and unclamping of the column and spindle box could be realized Simultaneously and of cause could be done individually. The simultaneous action could be done when place the select switch 5 in the middle position. The select switch 5 on the left position is for column action and for the right position is for spindle box action. Clamping or unclamping could be decided by pushing button 14 or button 12 after select switch 5 was placed.

Remark: As the rock ram up and down movement and its clamping or unclamping is interlocked, therefore, no buttons for clamping or unclamping are available.

9.8 Turn round of the rock ram

The rock ram turn round (push or pull) could only be possible when unclamping of column is available. Note: Rock ram turning continuously in one direction is not allowed as it will break wires at inner column, therefore $\pm 180^\circ$ turning is permitted only. As the torque for the turn round of the rock ram is not over 30N, so no strong force in pushing or in pulling is recommended in order to avoid accident caused by big inertia force. Meanwhile, no one standing at the end of the rock ram will be allowed.

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 etc shall be considered, as it will influence cutting force.

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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 loosening 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 panel 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 panel 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

Frequency Conversion Radial Drilling

Machine Model: JRD-2100

Certificate of Inspection

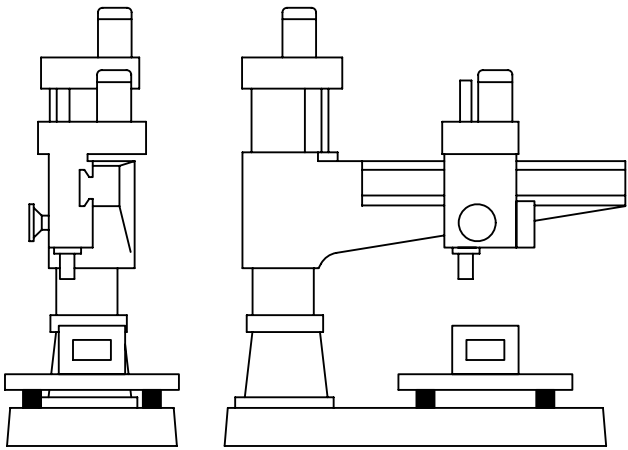
Certificate of Inspection

Total 3

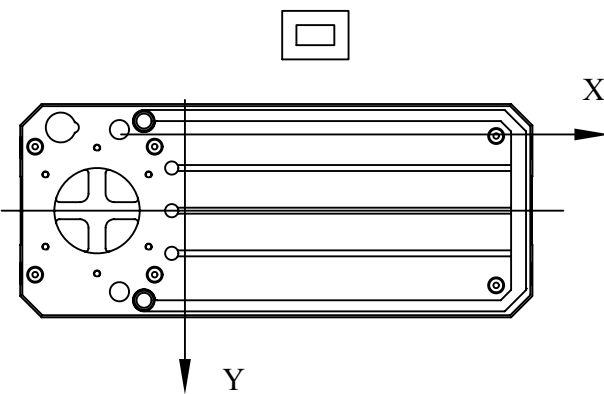
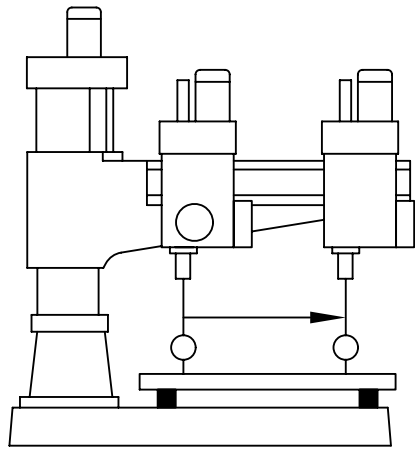
page 1

Accuracy test record

Pre-adjustment

No.	Sketch	Items	Accuracy	
			Permitted (mm)	Actual
G0		Leveling the bottom table	0.10/1000	

Geometric accuracy test

No.	Sketch	Items	Accuracy	
			Permitted (mm)	Actual
G1		Planeness of the bottom table	0.10mm in 1000mm at any place (Straight or hollow)	
G2		Parallelism when spindle box moving to the bottom table	0.30mm in 1000mm at any place	

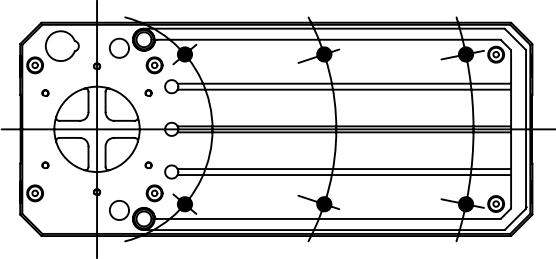
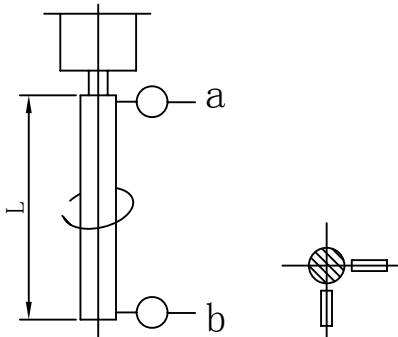
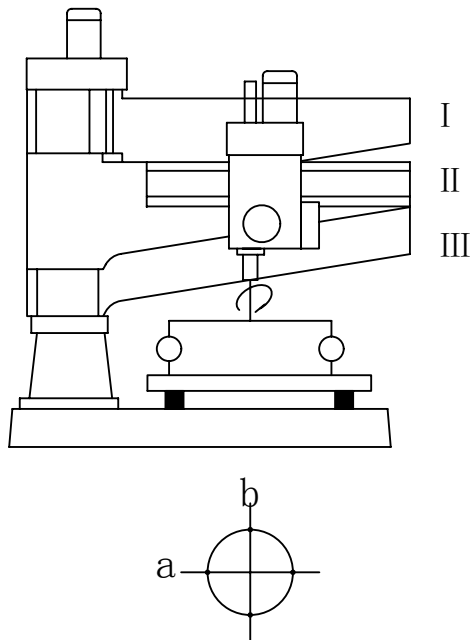
Certificate of Inspection

Total 3

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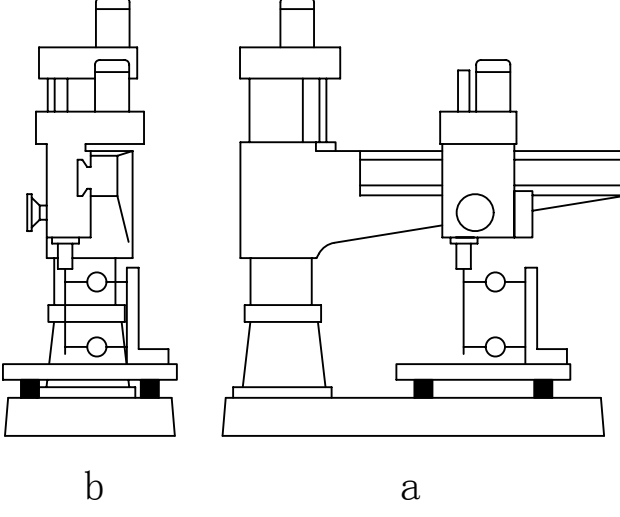
Accuracy test record

Geometric accuracy test

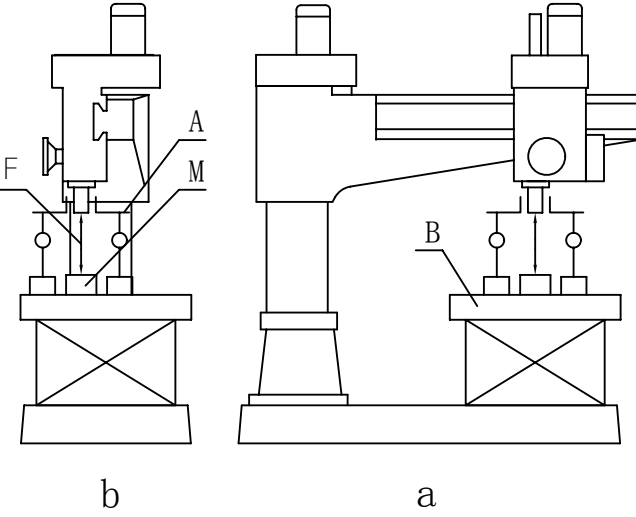
No.	Sketch	Items	Accuracy	
			Permitted (mm)	Actual
G3		Parallelism between spindle box to the bottom table when rock arm moving in 3 equidistance	0.05mm at any 300mm length	
G4		Run out for the center line of spindle taper hole: a) near spindle end face b) 300mm away from spindle end face	a) 0.025 b) 0.05	
G5		Perpendicularity between spindle running axis to the bottom table	0.20/1000*	

* Distance between two touch points of the test probe

Accuracy test record
Geometric accuracy test

No.	Sketch	Items	Accuracy	
			Permitted (mm)	Actual
G6		Perpendicularity when spindle moving to the bottom table a) in horizontal plane b) in cross plane	a) 0.10/300 b) 0.05/300	

Working accuracy test

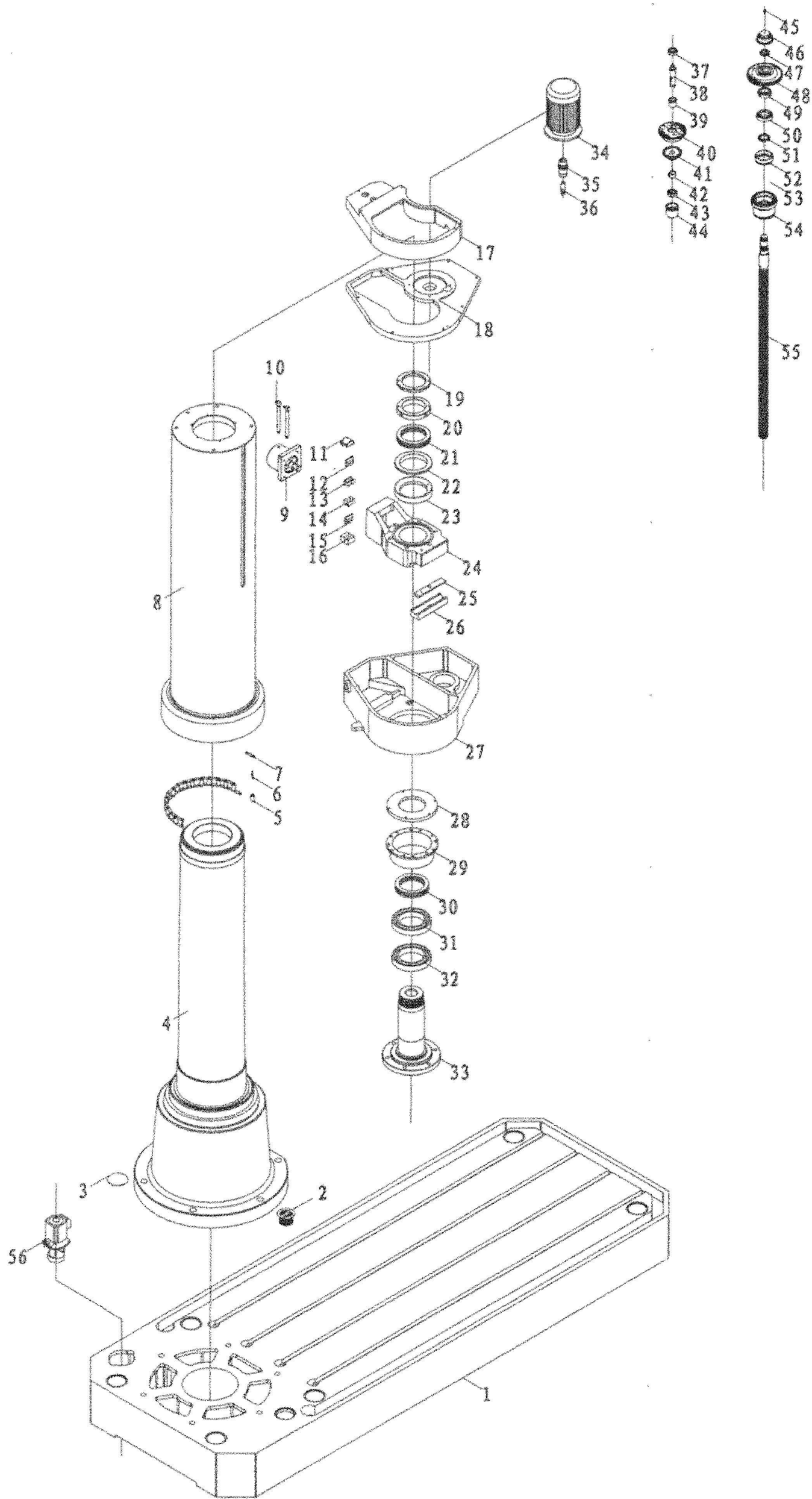
No.	Sketch	Items	Accuracy	
			Permitted (mm)	Actual
P1	 <p> A. Special tester mounted on the spindle end face B. Plate to be used for test meter (enough rigidity avoid deformation) C. Test meter D. Axial load exerted directly to the spindle end face. F=16000N </p>	Perpendicularity between spindle axis to working table surface when spindle in axial force. a) in horizontal plane b) in cross plane	3/1000	

Frequency Conversion Radial Drilling Machine

Model: JRD-2100

Ancillary page of Operation Manual

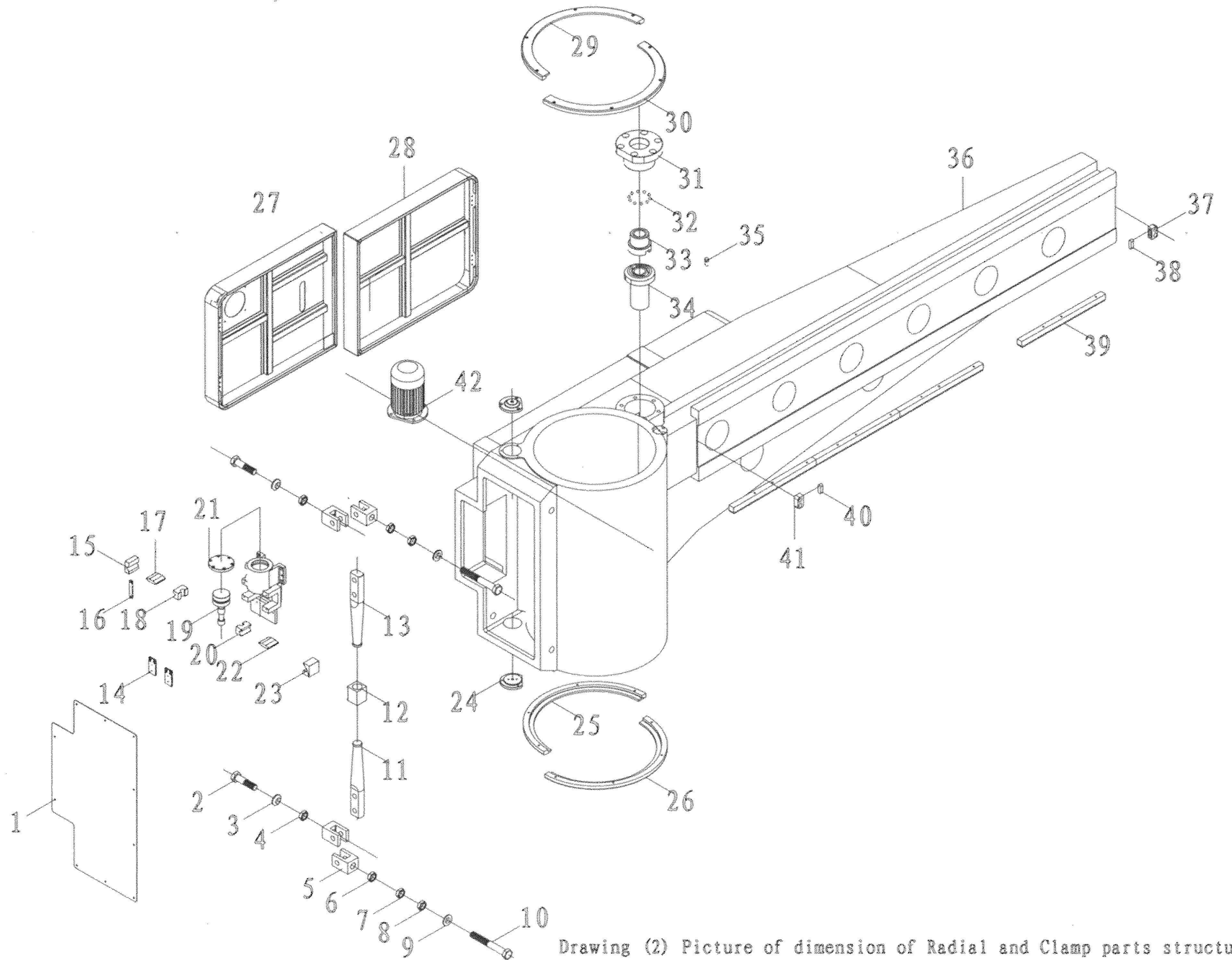
Drawing (1) Picture of dimension of Column and Radial parts structure



Contrast for the parts number of JRD-2100 Column and Radial

Index No.	Part No.	Description	Size	Qty.
1	JRD2100-I001	Base (25)		1
2	JRD2100-I002	Filter		1
3	JRD2100-I003	Cover		7
4	JRD2100-I004	Inner column		1
5	JRD2100-I005	Roller		32
6	JRD2100-I006	Shaft		31
7	JRD2100-I007	Link		45
8	JRD2100-I008	Column		1
9	JRD2100-I009	Hydro-cylinder		1
10	JRD2100-I010	Joint		2
11	JRD2100-I011	Semi-circle block		1
12	JRD2100-I012	Block		1
13	JRD2100-I013	Clamping block		1
14	JRD2100-I014	Clamping block		1
15	JRD2100-I015	Block		1
16	JRD2100-I016	Block		1
17	JRD2100-I017	Cover		1
18	JRD2100-I018	Cover		1
19	JRD2100-I019	Round nut		1
20	JRD2100-I020	Round nut		1
21	JRD2100-I021	Thust ball bearing		1
22	JRD2100-I022	Washer		1
23	JRD2100-I023	Washer		1
24	JRD2100-I024	Lever		1
25	JRD2100-I025	Block		1
26	JRD2100-I026	Block		1
27	JRD2100-I027	Up and down movement box		1
28	JRD2100-I028	Spring		1
29	JRD2100-I029	Sleeve		1
30	JRD2100-I030	Thrust ball bearing		1
31	JRD2100-I031	Deep groove ball bearing		1
32	JRD2100-I032	Deep groove ball bearing		1
33	JRD2100-I033	Column yop		1
34	JRD2100-I034	Lift Motor	YU100L4A(2.2kW)	1
35	JRD2100-I035	Gear		1
36	JRD2100-I036	Splash device		1
37	JRD2100-I037	Deep groove ball bearing	180205K	1
38	JRD2100-I038	Shaft		1
39	JRD2100-I039	Shaft sleeve	11013/ ZB3070	1
40	JRD2100-I040	Gear	12022/ ZB3070	1
41	JRD2100-I041	Engagement clutch	12030/ ZB3070	1
42	JRD2100-I042	Sleeve	12031/ ZB3070	1
43	JRD2100-I043	Deep groove ball bearing	205	1
44	JRD2100-I044	Bearing seat		1
45	JRD2100-I045	Hexagon bolt	M6×25	1
46	JRD2100-I046	Shield		1
47	JRD2100-I047	Round nut	M39×1.5	1
48	JRD2100-I048	Gear		1
49	JRD2100-I049	Round nut		1

Index No.	Part No.	Description	Size	Qty.
50	JRD2100-I050	Deep groove ball bearing	209	1
51	JRD2100-I051	Washer		1
52	JRD2100-I052	Bearing sleeve		1
53	JRD2100-I053	Thrust ball bearing	8210	1
54	JRD2100-I054	Bearing seat		1
55	JRD2100-I055	Lead screw		1
56	GHD-25-2-06	Pump motor	Y56-2	1

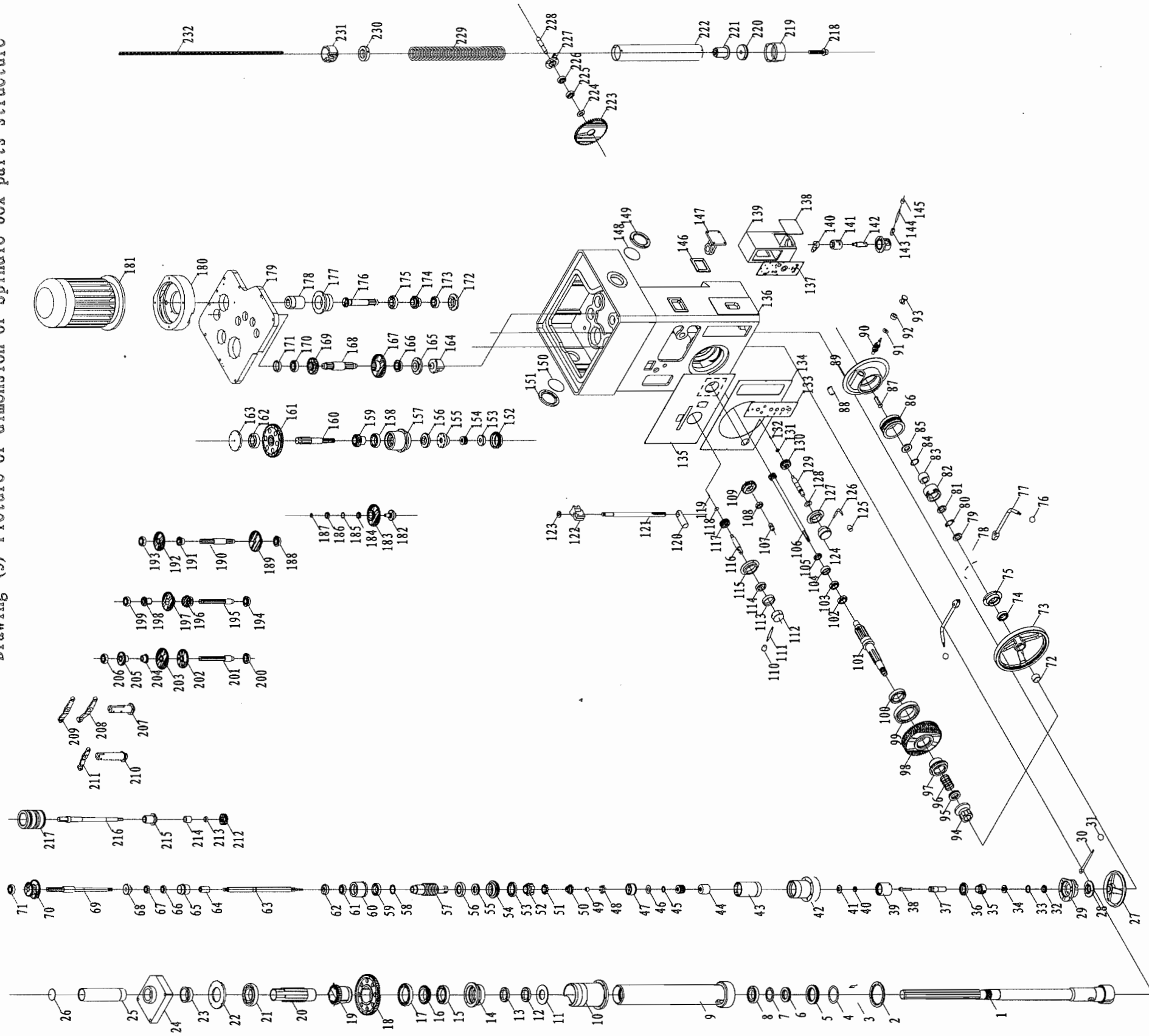


Drawing (2) Picture of dimension of Radial and Clamp parts structure

Contrast for the parts number of JRD-2100 Radial and Clamping

Index No.	Part No.	Description	Size	Qty.
1	JRD2100-II001	Cover		1
2	JRD2100-II002	Bolt		2
3	JRD2100-II003	Washer	24	2
4	JRD2100-II004	Hexagon thin nut	M24	2
5	JRD2100-II005	Pull rod		4
6	JRD2100-II006	Hexagon thin nut	M24	2
7	JRD2100-II007	Hexagon thin nut	M24	2
8	JRD2100-II008	Hexagon nut	M24	2
9	JRD2100-II009	Washer	24	2
10	JRD2100-II010	Bolt		2
11	JRD2100-II011	Lever		1
12	JRD2100-II012	Sleeve		1
13	JRD2100-II013	Lever		1
14	JRD2100-II014	Plate		2
15	JRD2100-II015	Block		1
16	JRD2100-II016	Patand		1
17	JRD2100-II017	Block		1
18	JRD2100-II018	Block		1
19	JRD2100-II019	Piston		1
20	JRD2100-II020	Clamping block		1
21	JRD2100-II021	Cover		1
22	JRD2100-II022	Block		1
23	JRD2100-II023	Block		1
24	JRD2100-II024	Switch cover		2
25	JRD2100-II025	Sealing ring		1
26	JRD2100-II026	Sealing ring		1
27	JRD2100-II027	The elevtrical box door		1
28	JRD2100-II028	Cover of door		1
29	JRD2100-II029	Sealing ring		1
30	JRD2100-II030	Sealing ring		1
31	JRD2100-II031	Cover		1
32	JRD2100-II032	Ball	10V.b	24
33	JRD2100-II033	Nut		1
34	JRD2100-II034	Nut		1
35	JRD2100-II035	Stop pin		1
36	JRD2100-II036	Arm		1
37	JRD2100-II037	Limited block		1
38	JRD2100-II038	Block		1
39	JRD2100-II039	Rack		5
40	JRD2100-II040	Block		1
41	JRD2100-II041	Limited block		1
42	JRD2100-II042	Oil pump motor	YU90S4A	1

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



Contrast for the parts number of JRD-2100 Spindle box

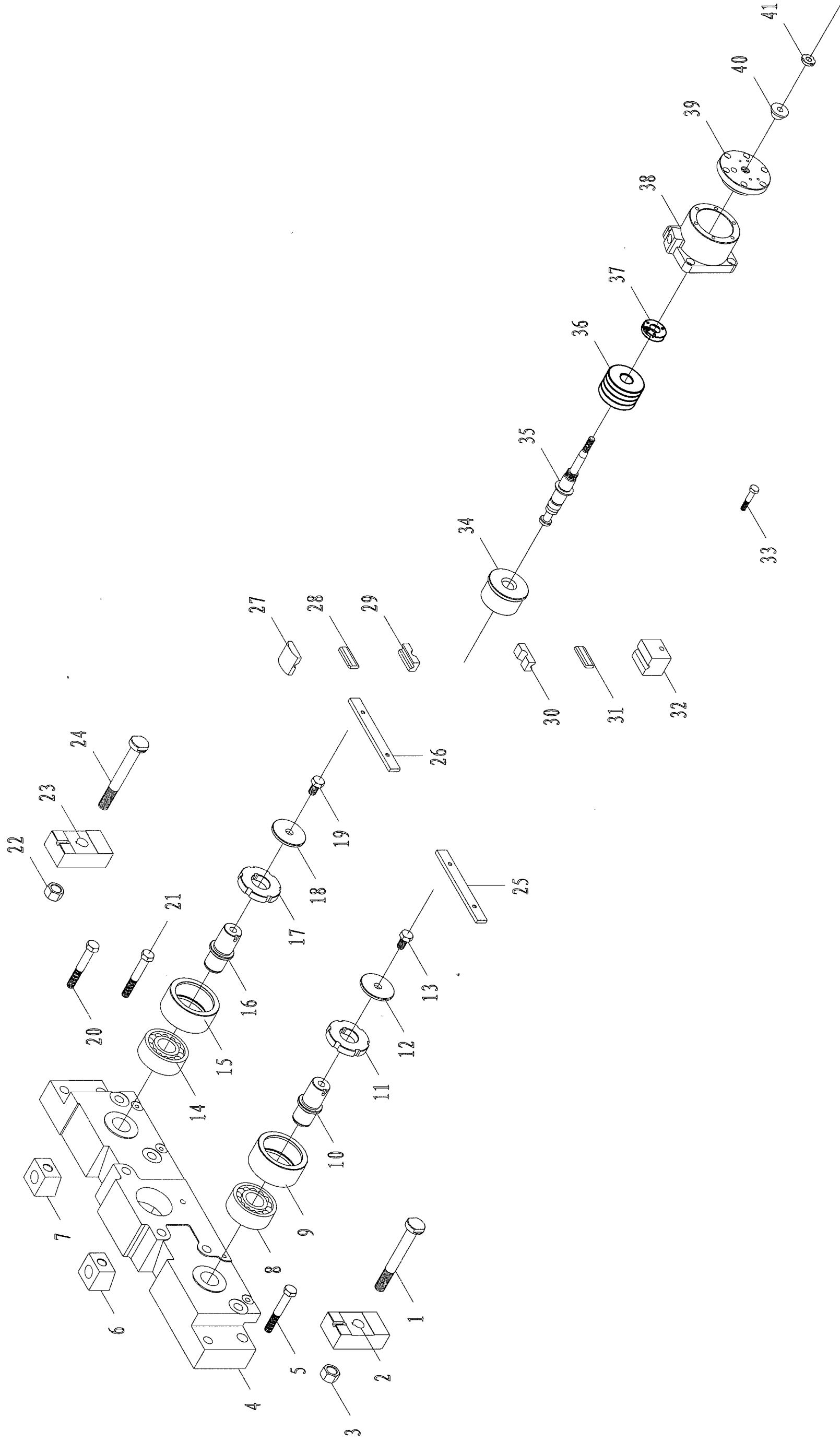
Index No.	Part No.	Description	Size	Qty.
1	JRD2100-III001	Spindle		1
2	JRD2100-III002	Bearing cover		1
3	JRD2100-III003	Cylindrical roller bearing	DNN3015/W33	1
4	JRD2100-III004	Wahser		1
5	JRD2100-III005	Thrust ball bearing	D8115	1
6	JRD2100-III006	Thrust ball bearing	E8111	1
7	JRD2100-III007	Mat		1
8	JRD2100-III008	Deep groove ball bearing	D180111K	1
9	JRD2100-III009	Spindle quill		1
10	JRD2100-III010	Guide sleeve		1
11	JRD2100-III011	Cover		1
12	JRD2100-III012	Nut		1
13	JRD2100-III013	Nut		1
14	JRD2100-III014	Bearing seat		1
15	JRD2100-III015	Deep groove ball bearing	113	1
16	JRD2100-III016	Feed gear		1
17	JRD2100-III017	Deep groove ball bearing	1000917	1
18	JRD2100-III018	Gear		1
19	JRD2100-III019	Gear		1
20	JRD2100-III020	Spline sleeve		1
21	JRD2100-III021	Deep groove ball bearing	213	1
22	JRD2100-III022	Bearing cap		1
23	JRD2100-III023	Signal panel		1
24	JRD2100-III024	Cover		1
25	JRD2100-III025	Protecting cover		1
26	JRD2100-III026	Cover		1
27	JRD2100-III027	Hand wheel		1
28	JRD2100-III028	Cover		1
29	JRD2100-III029	Fulcrum bearing		1
30	JRD2100-III030	handgrip		1
31	JRD2100-III031	Handle globe	M10×32	1
32	JRD2100-III032	Deep groove ball bearing	1180905K	1
33	JRD2100-III033	Sleeve		1
34	JRD2100-III034	Thrust ball bearing	81005	1
35	JRD2100-III035	Geared sleeve		1
36	JRD2100-III036	Deep groove ball bearing	7000108	1
37	JRD2100-III037	Sleeve		1
38	JRD2100-III038	Pin		1
39	JRD2100-III039	Gear sleeve		1
40	JRD2100-III040	Thrust ball bearing	8102	1
41	JRD2100-III041	Sleeve		1
42	JRD2100-III042	Sleeve		1
43	JRD2100-III043	Sleeve		1
44	JRD2100-III044	Sleeve		1
45	JRD2100-III045	Spring		14
46	JRD2100-III046	Washer		1
47	JRD2100-III047	Geared sleeve		1
48	JRD2100-III048	Ball	11	1

Index No.	Part No.	Description	Size	Qty.
49	JRD2100-III049	Sleeve		1
50	JRD2100-III050	Clutch		1
51	JRD2100-III051	Deep groove ball bearing	7000106	1
52	JRD2100-III052	Connection sleeve		1
53	JRD2100-III053	Deep groove ball bearing	7000110	1
54	JRD2100-III054	Cover		1
55	JRD2100-III055	Thrust ball bearing	8108	1
56	JRD2100-III056	Supporting cover		1
57	JRD2100-III057	Worm shaft		1
58	JRD2100-III058	Adjustable washer		1
59	JRD2100-III059	Deep groove ball bearing	180108K	1
60	JRD2100-III060	Sleeve		1
61	JRD2100-III061	Deep groove ball bearing	180205K	1
62	JRD2100-III062	Nut		1
63	JRD2100-III063	Spline shaft		1
64	JRD2100-III064	Spline sleeve		1
65	JRD2100-III065	Bearing seat		1
66	JRD2100-III066	Deep groove ball bearing	180104K	1
67	JRD2100-III067	Deep groove ball bearing	180104K	1
68	JRD2100-III068	Sleeve		1
69	JRD2100-III069	Spline shaft		1
70	JRD2100-III070	Feed gear		1
71	JRD2100-III071	Deep groove ball bearing		1
72	JRD2100-III072	Nut		1
73	JRD2100-III073	Hand wheel		1
74	JRD2100-III074	Deep groove ball bearing	180107K	1
75	JRD2100-III075	Supporting seat		1
76	JRD2100-III076	Handle globe	M12×40	2
77	JRD2100-III077	Handgrip		2
78	JRD2100-III078	Supporting seat		1
79	JRD2100-III079	Round nut	M33×1.5	1
80	JRD2100-III080	Washer	33	1
81	JRD2100-III081	Round nut	M33×1.5	1
82	JRD2100-III082	Sleeve		1
83	JRD2100-III083	Supporting sleeve		1
84	JRD2100-III084	Ball	8	18
85	JRD2100-III085	Washer		1
86	JRD2100-III086	Worm gear		1
87	JRD2100-III087	Shaft		1
88	JRD2100-III088	Vernier		1
89	JRD2100-III089	Dial		1
90	JRD2100-III090	Worm		1
91	JRD2100-III091	Washer		1
92	JRD2100-III092	Supporting sleeve		1
93	JRD2100-III093	Knob		1
94	JRD2100-III094	Clutch		1
95	JRD2100-III095	Thrust ball bearing	8109	1
96	JRD2100-III096	Spring		1
97	JRD2100-III097	clutch		1
98	JRD2100-III098	Worm		1
99	JRD2100-III099	Deep groove ball bearing	180119K	1

Index No.	Part No.	Description	Size	Qty.
100	JRD2100-III100	Deep groove ball bearing	180112K	1
101	JRD2100-III101	Horizontal shaft		1
102	JRD2100-III102	Deep groove ball bearing	180106K	1
103	JRD2100-III103	Deep groove ball bearing	180106K	1
104	JRD2100-III104	Bearing seat		1
105	JRD2100-III105	Deep groove ball bearing	7000105	1
106	JRD2100-III106	Gear		1
107	JRD2100-III107	Shaft		1
108	JRD2100-III108	Deep groove ball bearing	180104K	1
109	JRD2100-III109	Gear		1
110	JRD2100-III110	Handle sleeve	M10×32	1
111	JRD2100-III111	Handle		1
112	JRD2100-III112	Handle seat		1
113	JRD2100-III113	Taper reduction sleeve		1
114	JRD2100-III114	Positioning plate		1
115	JRD2100-III115	Indicating dial		1
116	JRD2100-III116	Shaft		1
117	JRD2100-III117	Gear		1
118	JRD2100-III118	Washer		1
119	JRD2100-III119	Socket cap screw	M6×12	1
120	JRD2100-III120	Positioning shaft		1
121	JRD2100-III121	Rack		1
122	JRD2100-III122	Fork		1
123	JRD2100-III123	Round nut	M20×1.5	1
124	JRD2100-III124	Handle seat		1
125	JRD2100-III125	Handle sleeve	M10×32	1
126	JRD2100-III126	Handle		1
127	JRD2100-III127	Indicating dial		1
128	JRD2100-III128	Cover		1
129	JRD2100-III129	Handle shaft		1
130	JRD2100-III130	Gear		1
131	JRD2100-III131	Washer		1
132	JRD2100-III132	Socket cap screw	M6×12	1
133	JRD2100-III133	Panel		1
134	JRD2100-III134	Brand (below)		1
135	JRD2100-III135	Brand (above)		1
136	JRD2100-III136	Spindle box		1
137	JRD2100-III137	Switch panel		1
138	JRD2100-III138	Cover plate		1
139	JRD2100-III139	Switch box		1
140	JRD2100-III140	Lever		1
141	JRD2100-III141	Sleeve		1
142	JRD2100-III142	Shaft		1
143	JRD2100-III143	Lever		1
144	JRD2100-III144	Handle		1
145	JRD2100-III145	Handle sleeve	M8×25	1
146	JRD2100-III146	Washer		1
147	JRD2100-III147	Supporting frame		1
148	JRD2100-III148	Cover		1
149	JRD2100-III149	Ring		1
150	JRD2100-III150	Cover		1

Index No.	Part No.	Description	Size	Qty.
151	JRD2100-III151	Ring		1
152	JRD2100-III152	Cover		1
153	JRD2100-III153	Round nut		1
154	JRD2100-III154	Spring	45×22.4×2.5×3.5	8
155	JRD2100-III155	Clutch seat (below)		1
156	JRD2100-III156	Clutch seat (above)		1
157	JRD2100-III157	Bearing seat		1
158	JRD2100-III158	Deep groove ball bearing	109	1
159	JRD2100-III159	Gear		1
160	JRD2100-III160	spline shaft		1
161	JRD2100-III161	Gear		1
162	JRD2100-III162	Deep groove ball bearing	307	1
163	JRD2100-III163	Bearing cover		1
164	JRD2100-III164	Oil pump	SBRB-6	1
165	JRD2100-III165	Pump seat		1
166	JRD2100-III166	Deep groove ball bearing	50206	1
167	JRD2100-III167	Gear		1
168	JRD2100-III168	spline shaft		1
169	JRD2100-III169	Gear		1
170	JRD2100-III170	Deep groove ball bearing	206	1
171	JRD2100-III171	Washer		1
172	JRD2100-III172	Cover		1
173	JRD2100-III173	Deep groove ball bearing	206	1
174	JRD2100-III174	Gear		1
175	JRD2100-III175	Deep groove ball bearing	207	1
176	JRD2100-III176	Shaft		1
177	JRD2100-III177	Bearing seat		1
178	JRD2100-III178	Gear sleeve		1
179	JRD2100-III179	Spindle box cover		1
180	JRD2100-III180	Motor base		1
181	JRD2100-III181	Motor	YUBP132M4(7.5KW)	1
182	JRD2100-III182	Gear shaft		1
183	JRD2100-III183	Feed gear		1
184	JRD2100-III184	Deep groove ball bearing	103	1
185	JRD2100-III185	Bushing		1
186	JRD2100-III186	Deep groove ball bearing	103	1
187	JRD2100-III187	Washer		1
188	JRD2100-III188	Deep groove ball bearing	50304	1
189	JRD2100-III189	Feed gear		1
190	JRD2100-III190	Spline shaft		1
191	JRD2100-III191	Feed gear		1
192	JRD2100-III192	Feed gear		1
193	JRD2100-III193	Deep groove ball bearing	205	1
194	JRD2100-III194	Deep groove ball bearing	50304	1
195	JRD2100-III195	Spline shaft		1
196	JRD2100-III196	Feed gear		1
197	JRD2100-III197	Feed gear		1
198	JRD2100-III198	Feed gear		1
199	JRD2100-III199	Deep groove ball bearing	205	1
200	JRD2100-III200	Deep groove ball bearing	50304	1
201	JRD2100-III201	Spline shaft		1

Index No.	Part No.	Description	Size	Qty.
202	JRD2100-III202	Feed gear		1
203	JRD2100-III203	Feed gear		1
204	JRD2100-III204	Spline shaft		1
205	JRD2100-III205	Spline shaft		1
206	JRD2100-III206	Deep groove ball bearing	205	1
207	JRD2100-III207	Fork shaft		1
208	JRD2100-III208	Lever (B)		1
209	JRD2100-III209	Lever (A)		1
210	JRD2100-III210	Fork shaft		1
211	JRD2100-III211	lever (C)		1
212	JRD2100-III212	Gear		1
213	JRD2100-III213	Sleeve		1
214	JRD2100-III214	Bushing		1
215	JRD2100-III215	Supporting sleeve		1
216	JRD2100-III216	Shaft		1
217	JRD2100-III217	Cam		1
218	JRD2100-III218	Screw		1
219	JRD2100-III219	Cover		1
220	JRD2100-III220	Screw		1
221	JRD2100-III221	Supporting seat		1
222	JRD2100-III222	Sleeve		1
223	JRD2100-III223	Gear		1
224	JRD2100-III224	Sleeve		1
225	JRD2100-III225	Deep groove ball bearing	180303K	1
226	JRD2100-III226	Deep groove ball bearing	180303K	1
227	JRD2100-III227	Cam		1
228	JRD2100-III228	shaft		1
229	JRD2100-III229	Spring		1
230	JRD2100-III230	Ring		1
231	JRD2100-III231	Rack		1
232	JRD2100-III232	Chain	12.7×8.5×8.2	1



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

Contrast for the parts number of JRD-2100 Hydraulic pressure clamp

Index No.	Part No.	Description	Size	Qty.
1	JRD2100-IV001	Ball stud		1
2	JRD2100-IV002	Pressing plate		1
3	JRD2100-IV003	Hexagon nut	M16	1
4	JRD2100-IV004	Bracket		1
5	JRD2100-IV005	Hexagon bolt	M12×80	1
6	JRD2100-IV006	Wedge		1
7	JRD2100-IV007	Wedge		1
8	JRD2100-IV008	Bearing	1606	1
9	JRD2100-IV009	Wheel		1
10	JRD2100-IV010	Eccentric shaft		1
11	JRD2100-IV011	Adjustable ring		1
12	JRD2100-IV012	Ring		1
13	JRD2100-IV013	Hexagon bolt	M12×20	1
14	JRD2100-IV014	Self-aligning ball bearing	1606	1
15	JRD2100-IV015	Wheel		1
16	JRD2100-IV016	Eccentric shaft		1
17	JRD2100-IV017	Adjustable ring		1
18	JRD2100-IV018	Washer		1
19	JRD2100-IV019	Hexagon bolt	M12×20	1
20	JRD2100-IV020	Hexagon bolt	M12×80	1
21	JRD2100-IV021	Hexagon bolt	M12×80	1
22	JRD2100-IV022	Hexagon nut	M16	1
23	JRD2100-IV023	Pressing plate		1
24	JRD2100-IV024	Ball head bolt		1
25	JRD2100-IV025	Panel		1
26	JRD2100-IV026	Panel		1
27	JRD2100-IV027	Block		1
28	JRD2100-IV028	Block		1
29	JRD2100-IV029	Block		1
30	JRD2100-IV030	Block		1
31	JRD2100-IV031	Block		1
32	JRD2100-IV032	Block		1
33	JRD2100-IV033	Hexagon bolt	M12×40	1
34	JRD2100-IV034	Bushing		1
35	JRD2100-IV035	Piston rod		1
36	JRD2100-IV036	Piston		1
37	JRD2100-IV037	Round nut	M18×1.5	1
38	JRD2100-IV038	Cylinder		1
39	JRD2100-IV039	Oil pump cover		1
40	JRD2100-IV040	Connecting plate		1
41	JRD2100-IV041	Round nut		1

V. Accessories Parts List

Part No.	Description	Size	Qty.
.....JRD2100-AC01	Box type working table	850×580×500	1
.....JRD2100-AC02	Drill chuck	B16 3-16mm	1
.....JRD1600DRTAC03	Connecting rod for drill chuck	MT4/B16	1
.....JRD2100-AC04	Intermediate taper adaptor sleeve	MT4/MT2	1
.....JRD1600DRTAC05	Intermediate taper adaptor sleeve	MT4/MT3	1
.....JRD1600DRTAC06	Intermediate taper adaptor sleeve	MT5/MT4	1
.....JRD2100-AC07	Intermediate taper adaptor sleeve	MT6/MT5	1
.....JRD2100-AC08	Wedge for taper adaptor sleeve	MK4	1
.....JRD2100-AC09	Wedge for taper adaptor sleeve	MK5-6	1
.....JRD2100-AC10	Foundation bolt	M30x600mm	6
.....JRD1600DRTAC09	Bolts for T slot	M24x120mm	2
.....JRD2100-AC11	Tool disassemble spanner		1
.....JRD1600DRTAC13	Fuse	1A,3A,5A,10A... Each	2
.....JRD2100-AC12	Inclinable working table.....		1



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