

# **KBM 80 Semi-Auto Vertical Drilling Machine**

## **Operational Instruction**

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## I 、 Outline

The drilling capacity of the Model Z5180B Semi-Auto Vertical Drilling Machine: The Max. diameter of drilling is 80mm on the steel of tensile strength  $\sigma_b=600\text{N/mm}^2$

The machine is applied to drilling, as well as for under-reaming, reaming, countersink, surface of spot-facing, boring and tapping. The semi-auto function of the machine can complete the operation of semi-auto circulation of drilling processing.

The machine features in fine structure, high precision & efficiency, moderate speed changing range, easy handle, novel model and convenient in use & maintenance. It is suitable for small patch workshop as well as for the operation of semi-auto circulation of drilling processing of the large batch workshop. Completed with the special tools, it is also used as the special-purpose combined machine.

The advantages of the machine are stated as the following:

This machine adopts the main spindle part of strengthened type and the machine overall arrangement of the moving worktable pattern.

The rigidity in structure and anti-vibration property are improved by the machine.

This machine adopts the main spindle structure of strengthened type. The radial rigidity of main spindle is improved prominently. This machine has the capacity of boring directly.

The inspection quota of the precision and the working precision of this machine are conformed with the regulations of international standard of ISO2772/I and ISO2772/II.

## II 、 The appearance of the machine.

Before use of the machine, all positions of handles and every handle's functions must be well known.

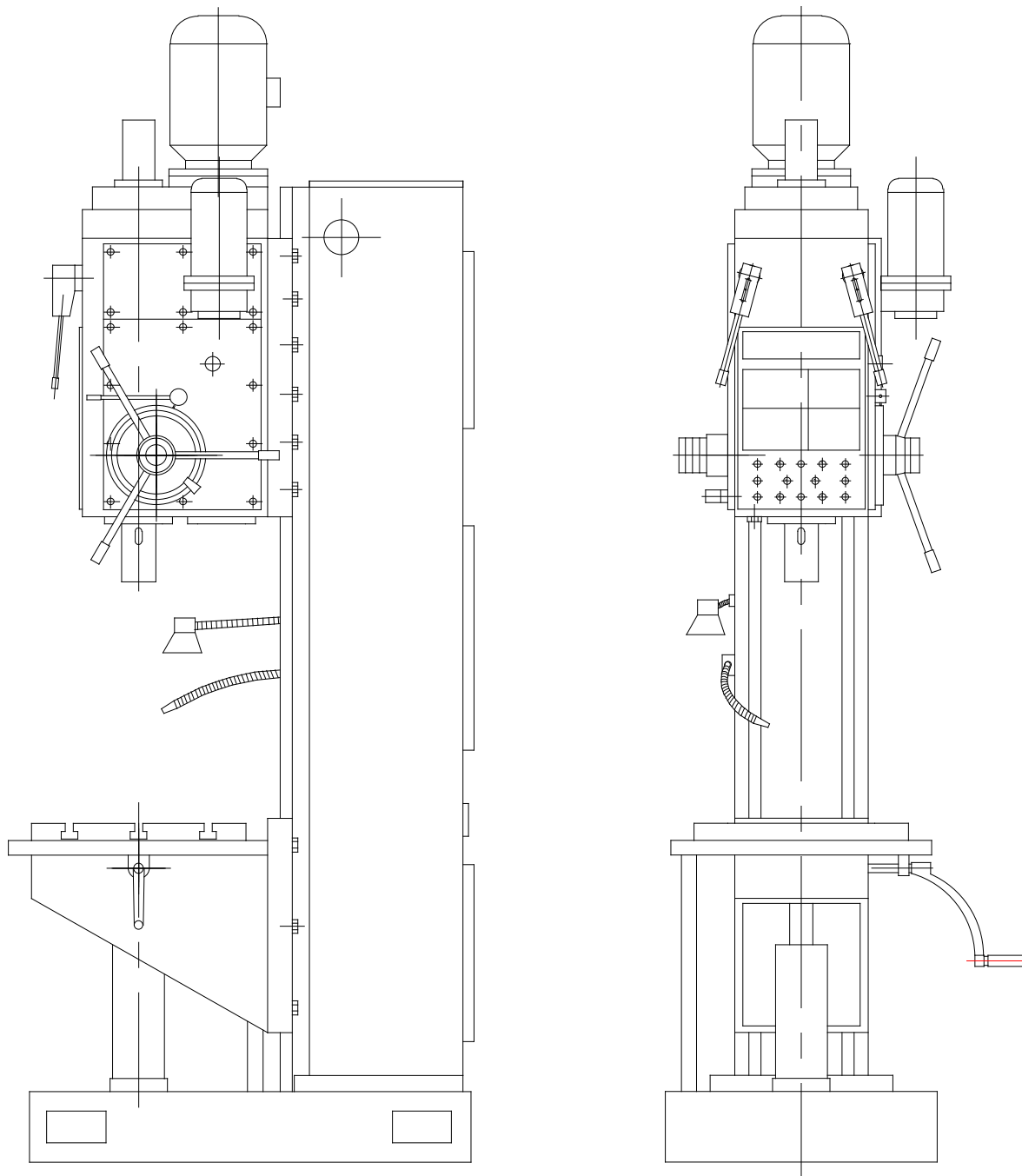


Diagram2-1 Before use of the machine

### III、Main specifications

- 1、 Max. dia. of drilling(on the steel of tensile strength 500-600MPa) ..... 80 mm
- 2、 Max. moment of torque ..... 800N.m
- 3、 Max.feed strength ..... 30000N
- 4、 Main Motor Power ..... 5.5kW
- 5、 Conicity of the Main Spindle ..... No.5 Morse Core
- 6、 Travel of Spindle ..... 250 mm
- 7、 Travel of the Main Spindle Case(Manual) ..... 260 mm
- 8、 Distance Between Centre Line of the Main Spindle to Guide Plane ..... 375 mm
- 9、 The Main Spindle Speed (9 Grades) ..... 40、 55、 82、 105、 150、 210、 280、 400、 570 r/min
- 10、 Feed (9 Grades) ..... 0.1、 0. 2、 0. 27、 0. 4、 0. 55、 0.78mm /R
- 11、 Area of Working Table ..... 550 × 650 mm
- 12、 Max. distance Between Main Spindle Plane to Working Table ..... 800 mm
- 13、 Travel of Working Table ..... 300 mm
- 14、 Working Area of Base ..... 600 × 580 mm
- 15、 Power of Rapid Motor ..... 0.55kW
- 16、 Flow of Coolant Pump ..... 25L/min
- 17、 External Dimension ..... 1260 × 1020 × 2820 mm
- 18、 Net Weight ..... 2500kg

### IV、 Suspension Carrying and Installation

When lifting the machine, the hoist cable shall fastened to the marked position on the packing. Upside down, side down or over tilt shall be avoided. No bump or shake is allowed. When moving by a slope, the slope angle shall not be greater than 15 degrees. When the packing of the machine is removed, remove the top cover first and then the side walls. Caution shall be taken to avoid damaging the machine when using a crow bar.

After the packing is removed, steel bar and steel wire shall be used to hoist the machine according to the drawing 4-1. The steel bar shall extend at least 300mm out of the machine. Soft wood or felt shall be used between the steel wire and machine.

The foundation shall be prepared according to the drawing Figure 4-2 before installation. Four anchor bolt holes of 150x150mm, 350mm deep shall be preserved when making the foundation. No crack or clearance is allowed on the surface of the foundation.

Sizing blocks shall be put under the six anchor bolts. Put the anchor bolts of the machine on the sizing blocks and check the horizontal level by leveling gauge. Then pouring cement to fix the anchor bolts. After the cement hardens, fasten the nut of the anchor bolt. The horizontal error should not exceed 0.04/1000.

Connecting the power and ground wire and clearing up the machine. Greasing or lubricating the machine according the lubricating drawing, checking the fasten screws and connection of cooling

pipe, the machine is then ready for tryout.

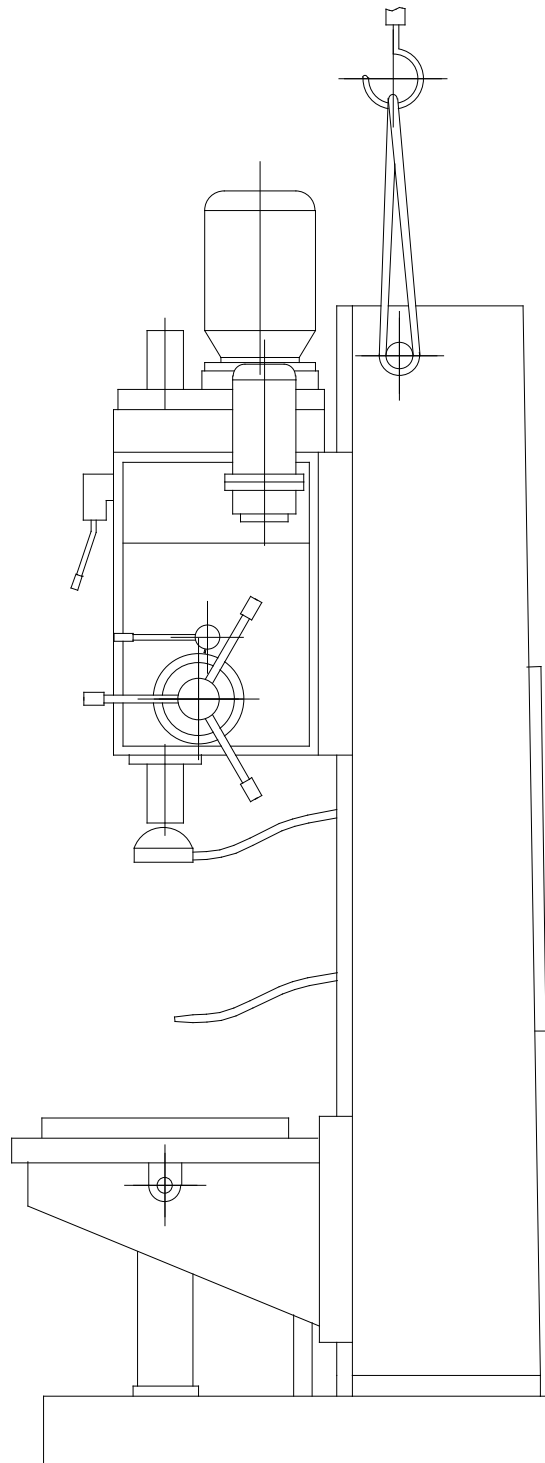


Diagram 4 - 1 Suspension Carrying Diagram of the Machine

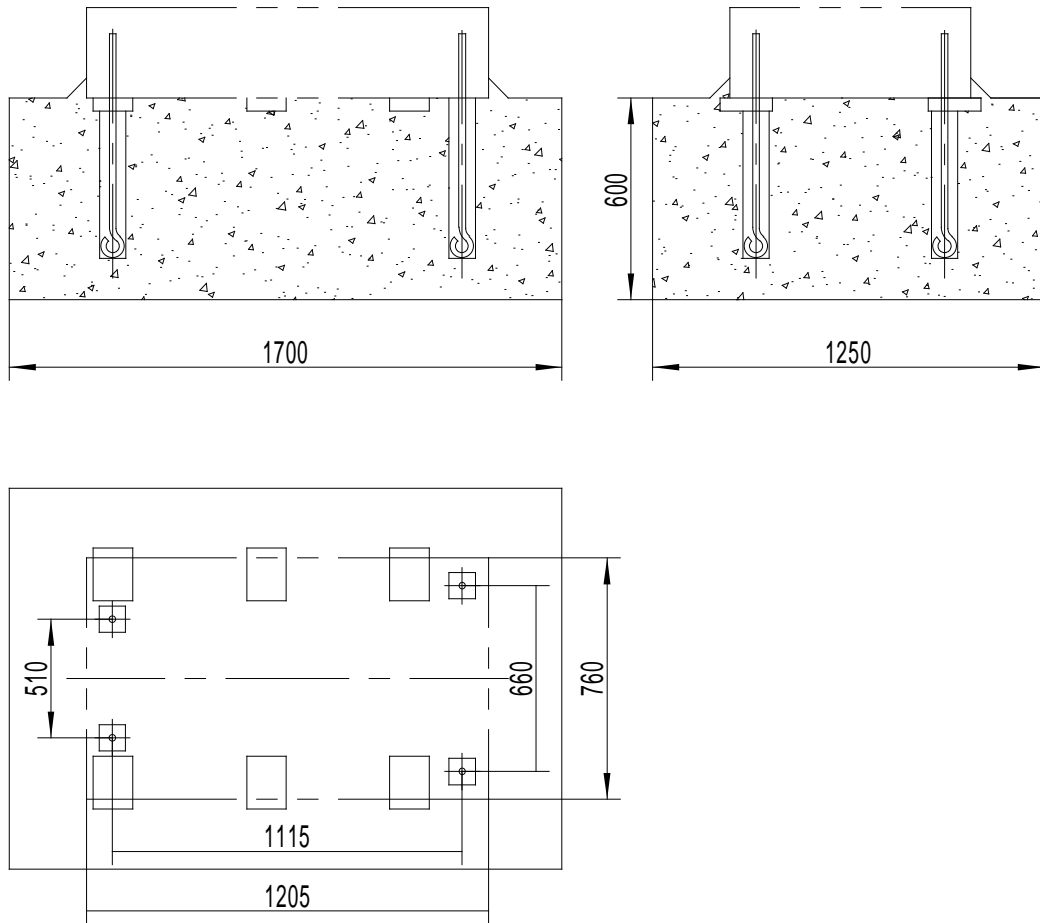


Diagram 4 -2 Foundation Diagram of machine (Depending on the type of soil)

V、 The transmission system (diagram 3) of the machine. The main movement is stated as follows respectively:

#### 5-1 The rotation of the main spindle (diagram 5-1)

The main motor transforms rotation movement through friction clutch to gear 1, which drives the gear 2 of the spindle I. Through two pair of gears on spindle I and III, spindle IV receives 9 steps of rotation speed.

#### 5-2 Feed movement of the main spindle

When the main spindle is rotating, the gear 16 on spindle IV transforms the rotation movement to gear V and then to gear VI. Through two pairs of gears on the spindle VII and IX, the rotation movement can be transformed into six steps speed. The rotation is then transformed to gear 44 through gear 28 on the spindle XI. When the electromagnetic clutch is on, the rotation is transformed through worm 34 and worm gear 33 to the horizontal spindle 37. The force is then transformed to gear 32 and gives the main spindle six steps feeding speeds.

#### 5-3 Semi automatic recycle

Since the machine works in semi-automatic recycle, it is installed with a rapid transmission system driven by 0.55kw rapid motor to accomplish the semi-automatic recycle of rapid approach to work piece, work feed, rapid withdraw and stop. The rapid movement is generated by the rapid motor, transmitted to gear 43 through gear 40,39 and 38. When the electromagnetic clutch on the spindle XI is in off position, the feeding transmission system is cut off. The movement is passed to horizontal shaft the worm gear 34 and worm 33, and then gives the main shaft a feeding speed of 3 meters per minute through gear 37 and gear rack 32. The semi-automatic recycle is accomplished by electric control of the rapid motor rotating in clockwise or counter clockwise direction and the turn on/off of the electromagnetic clutch.

#### 5-4 Elevating and descending of main spindle box.

The elevating and descending of the main spindle box is accomplished by rotating worm gear 46 and worm 44 by handle grip to drive gear 45 and gear rack 47. In addition, gear 36 mounted on the horizontal shaft is used to rotate dial disc and bump block disc through gear 35. The semi-automatic recycle is accomplished through bump block and electromagnetic switch. At the same time, the turbine spring mounted on inner gear 35 is used to balance main spindle through gear 36, gear 37 and gear rack 32.

#### 5-5 Elevating and descending of worktable

To elevate or descend the worktable, use hand grip to turn taper gears 49 & 48 and drive lead screw 50 & lead thread 51.



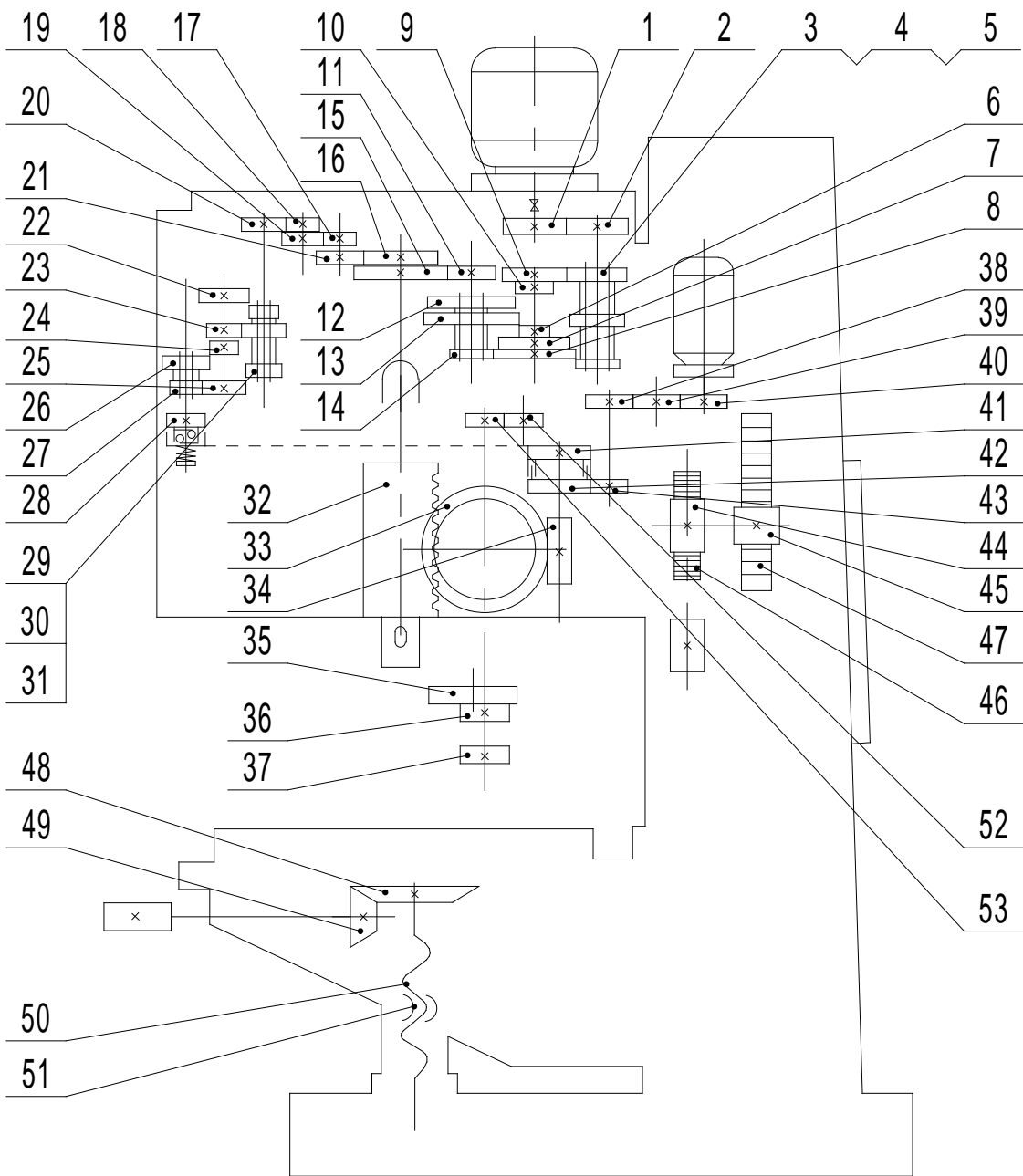


Diagram5—1 Transmission System Diagram

List5-1

Items	Series No.	Modulus	Tooth or count of head	Deflection Coefficient & Spiral angle	Rim width	Material	Heat treatment	No. of part
Main Speed Change	1	3.5	22		17	40Cr	G48	1111
	2	3.5	38		15	40Cr	G48	1109
	3	3	29		15	40Cr	G48	1103
	4	3	23		15	40Cr	G48	
	5	3	18	+0.33	15	40Cr	G48	
	6	3	17	+0.33	20	40Cr	G48	1106
	7	3	47		15	40Cr	G48	1105
	8	3	52	-0.33	15	40Cr	G48	1104
	9	3	41		15	40Cr	G48	1108
	10	3	33		15	40Cr	G48	1107
	11	4	24		18	40Cr	G48	1115
	12	3	46		15	40Cr	G48	1122
	13	3	61		15	40Cr	G48	1123
	14	3	27	+0.33	15	40Cr	G48	1124
	15	4	48		18	40Cr	G48	1120
Speed Change Mechanism of Feed	16	2	56		10	45	G48	1119
	17	2	21		10	45	G48	2103
	18	2	35		10	45	G48	2105
	19	2	42		10	45	G48	
	20	2	33		10	45	G48	2107
	21	2	54		10	45	G48	2102
	22	2	47		10	45	G48	2111
	23	2	27		11	45	G48	2112
	24	2	22		10	45	G48	2113
	25	2	33		11	45	G48	2119
	26	2	44		11	45	G48	2114

List5-1

Items	Series No.	Modulus	Tooth or count of head	Deflection Coefficient & Spiral angle	Rim width	Material	Heat treatment	No. of part
Speed Change Mechanism of Feed	27	2	33		11	45	G48	2114
	28	2.5	18		12	40Cr	G48	2118
	29	2	18		11	45	G48	2120
	30	2	38		11	45	G48	
	31	2	32		11	45	G48	
Feed Mechanism	32	4	23			40Cr	T235	6102
	33	4	60	$3^{\circ} 48' 52''$	40	QT800		3011
	34	4	1	$3^{\circ} 48' 52''$	90	40Cr	T235	3029
	35	2	39		12	45	T250	3117
	36	2	19		12	45		3116
	37	4	14		133	40Cr	T235 G52	3101
	38	2	34		12	45	G48	3138
	39	2	34		12	45	G48	3137
	40	2	34		12	45	G48	3136
	41	2.5	52		12	45	G48	3133
	42	2	60		13.5	45	G48	3130
43	2	22		12	45		3131	
The Elevating and descending of main spindle case	44	2.5	62	$3^{\circ} 10' 47''$	30	QT800	G48	3025
	45	3	18		15	45	T235	3128
	46	2.5	1	$3^{\circ} 10' 47''$	80	45	T235	3127
	47	3	32		21	45	T235	7127
The Elevating and descending of working table	48	3.5	42	$74^{\circ} 3'$	26	45		7124
	49	3.5	12	$15^{\circ} 57'$	26	45		7121
	50	3	1	T55×8	402	45		7117
	51	3	1	T55×8	100	HT200		7014

## VI、 Operation of Machine

Before use of the machine, all positions of handle and their functions must be well known.  
See the diagram 6—1 and list 6- 1

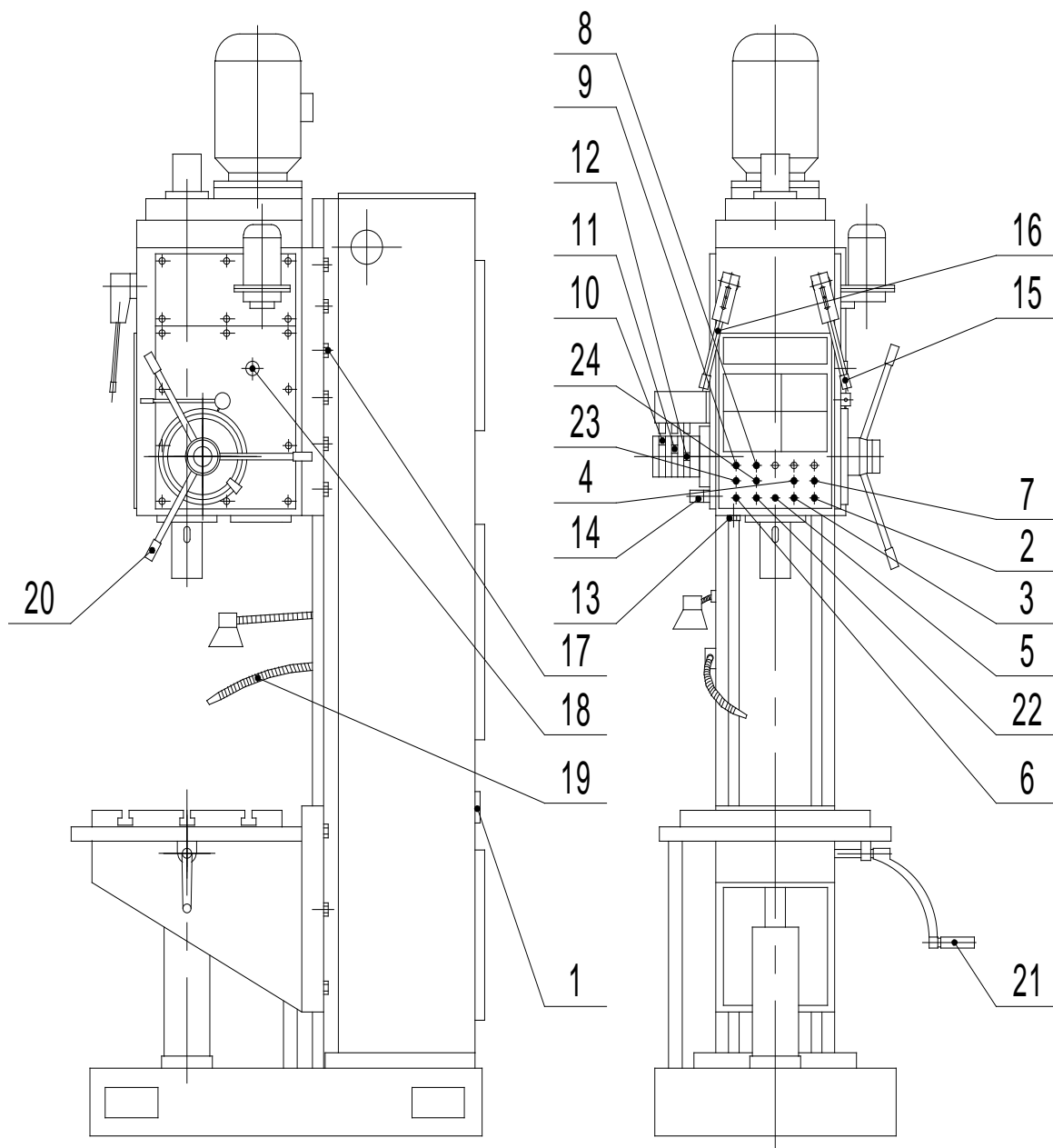


Diagram 6—1 Operation diagram of the machine

### Sheet 6-1 List of Control Parts

No.	Name	Applications
1	Power Switch	Turn ON/OFF Power
2	Emergency Button	Switch off & braking main shaft
3	Manual/Auto switch	Selection of manual control or semi-auto recycle control
4	Circulating Starting button	Starting semi-auto periodical control model
5	Negative rotation button of main shaft	Connect Negative rotation
6	Positive rotation button of main shaft	Connect Positive rotation
7	Selection switch for cooling system	Control the switch of the cooling pump
8	Rapid withdraw button for main shaft	Turn-on the rapid withdraw of main shaft
9	Rapid forward button for main shaft	Turn-on the rapid forward of main shaft
10	Working bump block	Change rapid forwarding into working feeding
11	Rapid withdraw bump block	Change working feeding into rapid forwarding
12	Cycling stop bump block	Change rapid withdraw into stop state
13	Balancing load of main shaft adjust square toes	Adjusting balancing load of shaft
14	Ascending & descending palm end of main shaft	Elevating the main shaft manually.
15	Feeding gear change hand lever	Exchange amount of main shaft feed
16	Main gear change hand lever	Exchange rotating speed of main shaft
17	Clamping bolt for headstock	Clamping or loosening the headstock
18	Knurling plunger	Adjusting fuse connector by twisting-off the plunger.
19	Cooling fluid adjusting moving-spray cup	Adjusting fluxing of cooling liquid
20	Main operation handle	Manual feed & auto-feed
21	Handle for Movable worktable	Adjust up & down of worktable
22	Stop Button	Switch off & braking main shaft
23	Positive rotation button of main shaft	Connect Positive rotation
24	Negative rotation button of main shaft	Connect Negative rotation

6-1 The machine has two operation mode, manual high speed and semi-automatic recycle. When the auto/manual switch is turned to “manual” position, the machine manually adjusts the bump block of the semi-automatic recycle in steps; when the switch is turned to “Auto” position, the machine operates in semi-automatic recycle.

6-2 When the machine is in manual mode, the main spindle movements of fast approach, fast withdraw, clockwise rotation and counter clockwise rotation are controlled by push buttons 8,9,5 and

6 respectively. Except clockwise and counter clockwise rotation, other movements are touch button control, that is when the buttons are pushed, the main spindle stops and brakes.

### 6-3 Manual adjustment of feeding

The select switch shall be turned to adjust position. Press and hold button 9 to move down the spindle rapidly. When main spindle reaches the position, release button and it stops. The bump block adjusting is performed by main handle grip. Press button 8 to withdraw main spindle rapidly.

### 6-4 Operation in semi-automatic recycle

#### 6-4-1 Adjustment of bump block

Turn the manual/auto switch to “manual” position, adjust positions of bump block 10 and 11 according to the actual size of the work-piece. Bump block 12 is fixed on the initial position on the main spindle which is set according to the dial disc at the right of the bump block. The bump block position can be checked by main handle grip and specimen. When the bump block touches the stroke switch, the indicator shall light. Bump block 10 controls the transfer from rapid feed to working feed while bump block 11 controls the transfer from working feed to rapid withdraw. The recycle stop bump block stops main spindle when it reaches the original position. It is recommended that when adjusting the feed control bump block, 3-5mm over bump shall be reserved, that is to say the actual stroke adjusted shall be 3-5mm less than the theoretical length in order to prevent the cutting tool bump into the work-piece.

#### 6-4-2 Recycle start

Turn the manual/auto switch to “auto” position. Press and hold recycle button 4, according to the setting of bump blocks 10, 11 and 12, the main spindle will perform the semi-automatic recycle of rapid approaching, feeding and clockwise rotation, rapid withdraw to the original position after reaching the preset cut depth and stopping.

Note: when the rapid feed button 8 or rapid withdraw button 9 are pressed, operator’s hand shall be clear off the moving area of the main handle 20.

### 6-5 Elevating and descending of main spindle box

#### 6-5-1 Loose the clamp bolt 17 of the main spindle box

6-5-2 Use handle grip to rotate square head 14 of the main spindle box to elevate or descend the spindle box.

6-5-3 When the main spindle box reaches position, fasten the clamp bolt.

### 6-6 Changing of main spindle rotation speed and feeding

The changing of main speed and feeding speed are performed by handle. Main spindle rotating

speed is changed by left handle 16, while feeding speed is changed by right handle 15. The main speed changing handle can move into three positions from front to back and four positions from left to right. The third position from left is “0” position. When checking or replacing the cutting tools, the handle shall be moved into the “0” position, thus the main spindle can be turned easily by hand. Feed speed change handle can move into two position from front to back and three position from left to right. The corresponding value of main spindle rotating speed and feeding speed at each position can be read out at the speed changing plate on the panel.

The panel gives recommended cutting speed table when high speed steel drill is used. The rotating speed of the main spindle can be determined according to cutting speed and diameters from the table.

#### Control of coolant

When the coolant switch 7 is turn to left side of supply, the coolant pump starts with the clockwise rotating of the main spindle and stops when the main spindle stops. When coolant is not required, turn the switch 4 to the middle position of non-supply. When continuous cooling is required, turn the switch to the right side position.

#### Remove of cutting tool

Special remove wrench is supplied in the accessories of the machine. Insert the wrench into the round part of the cutting tool remove hole, turn counter clockwise to remove the cutting tool easily from the countersunk of the main spindle.

### VII、Lubrication of Machine

The lubricated positions、 the varieties of lubricating oil and lubricating cycle are seen in diagram. 7-1 and sheet 7- 1.

sheet 7- 1

No.	Lubricating parts	Method	Grease	times	cycle
1	Bearings of main motor	Manual	1# calcium base grease	2	once every 6 months
2	Spindle case	Oil pump	20# machine oil	1	often
3	Bearings of cooling pump	Manual	1# calcium base grease	2	once every 6 months
4	Bearings of main shaft	Manual	1# calcium base grease	2	once every 6 months
5	Bearings of rapid motor	Manual	1# calcium base grease	2	once every 6 months
6	Elevating shaft of worktable	Manual	20# machine oil	1	Once every week
7	Bearings & conical gears	Manual	20# machine oil	2	Once every week

The lubricant or grease used in this machine shall be clean non-acid type and free of water or other impurities. The lubricant of the main spindle box is sucked by plunger pump and injected to the upper gear on the spindle I. The lubricant is then splashed by high speed gear to each lubricating position. There is oil filler hole on the main spindle box. Turn the plug screw to fill oil. The filling amount of lubricating oil shall be to the half height of the standard oil level when the machine is shutdown. There is an observation hole on the right side of the top cover of the main spindle box to check operation of the lubricating system. A outlet hole is set at the bottom of the main spindle box. When replacing the lubricant, remove the plug screw and drain the lubricant.

The first replacement of lubricant shall be performed one month after the machine is used. After that, change the lubricant every 3 months to 6 months. When the lubricant is changed, drain up the spindle box, clean with kerosene and then fill new lubricant.

The surface of main spindle sleeve and guide rail of vertical column shall be cleaned everyday. There is lubricating hole at the upper and lower bearings of the spindle sleeve which can be greased by grease gun. Turn off the power, remove carefully the front panel of the main spindle box, the lubricating hole for the bearings is located in the inner wall of the spindle box.

During the operation of the machine, watch frequently through the observation hole to check if there is lubricant flow, and thus can determine if the lubricating system works normally.

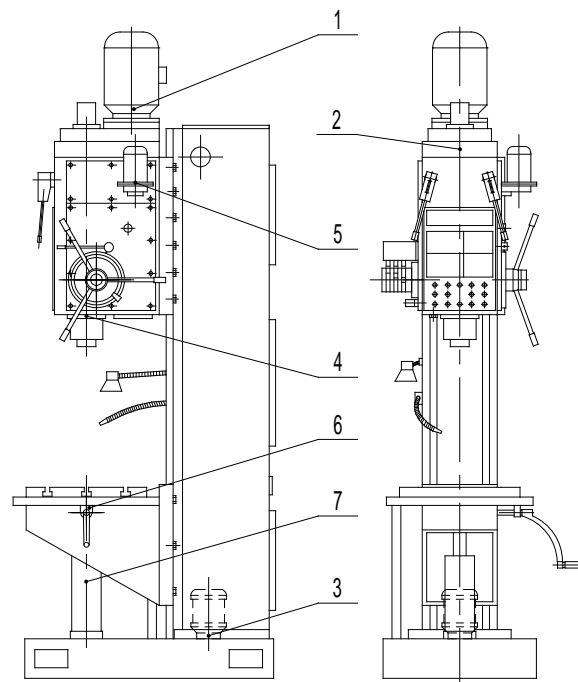


Diagram 7-1 Lubricating diagram of the machine



## VIII. Electrical System

8-1. The power source is AC 400V 50Hz . The operation is completed by three sets of motors.

M1: Motor for Rotary of main shaft & work piece feeding

M2: Motor for up & down of main shaft rapidly

M3 Cooling pump

8-2. The electric parts are installed inner–rear part of the column. Operational buttons are installed front part of plate

8-3 Operation in semi-automatic recycle: refer to electric diagram and circuit drawing;

Turn the manual/auto switch SA2 to “auto” position, and turn on original switch SQ3 and KA2. Press down recycle button SB4 and KM4 and the main spindle moves down rapidly. When the main spindle approached the work-piece, it pushes down SQ1, and KA1 is turn on. Turn off KM4 and turn on KM1, YC1, the main spindle rotates in clockwise direction and feeding. When feeding movement reaches the set position, SQ2 is pushed down, KT3 is on and YC1 is off. KM5 is connected in delay time. The main spindle withdraws rapidly and pushes down SQ1, turn off KM1. When it reaches original position, KM5 is turned off and KA2 is on. The semi-automatic recycle is finished.

During the semi-automatic recycle, if the cooling control switch is turned to auto position, lubricating system starts when main spindle rotates and turns off when main spindle stops.

### 8-4 Manual operation

Turn the manual/auto switch to manual position, following operations can be performed

A: Press down SB2, KM1 is on, the main spindle rotates clock-wisely, electromagnetic YC1 is on

B: press down SB3, KM2 is on, the main spindle rotates counter clock-wisely, electro-magnetic YC1 is on.

Press SB5, KM4 is on, main spindle moves down rapidly in steps, care shall be taken to avoid bump of cutting tool and work-piece.

Press SB6, KM5 is on, main spindle moves up rapidly and stops when pushes SQ3.

Press SB1, all motors stop rotation.

### 8-5 Tapping

Turn the switch SA2 to middle position, following operations can be performed

a: Put the main handle to manual feed mode, move the main spindle down to approach the tapping work-piece,

press switch SQ1, the main spindle rotates in clockwise direction and starts tapping operation.

b: When it finishes tapping, press SQ2, the main spindle stops. After delay for a while, turn on counter clockwise rotation of the spindle. When the main spindle comes out of the work-piece, manually turn the spindle to its original position by handle. The tapping operation is finished.

#### 8-6 Control of lubricant

If the lubricant control switch is turned to middle position, the lubricant is turn off all the time. If it is turned to auto side, the lubricant sprays out automatically when main spindle rotates and turns off when main spindle stops. If the switch is turned to manual position, the lubricant turns on no matter the main spindle rotates or stops.

#### 8-7 Indicating lamp on the panel of the machine

A: HL1 lights showing the machine is feeding

B: HL2 lights showing feeding is finished and withdraw rapidly

C: HL3 lights showing machine is feeding and recycle can start

#### List of Electrical Parts

No.	electrical Code	Model and specification	Name and use	Model & Specifications	pag.	Row
1	M1	IE2/5. 5kW, 400V	Main Motor	HengShui Electric Mtors Co.,Ltd	1	D2
2	M2	0. 37kW, 400V	Mini-size Three Phases Motor		1	D3
3	M3	SP8100 90W 3Ph 400V/50Hz	Cooling Pump	FuJian Zhangtie	1	D4
4	QS	JFD11-32 25A	Combined Switch	JUCHE	1	B2
5	QF	OSMC32N3D32	Closer	Schneider	1	B2
6	FA1	OSMC32N1C2	Single-Closer	Schneider	1	B4
7	FA2	OSMC32N1C16	Single-Closer	Schneider	1	B5
8	FA3	OSMC32N1D6	Single-Closer	Schneider	1	B5
9	FA4	OSMC32N1D6	Single-Closer	Schneider	2	B1
10	FA5	OSMC32N1C4	Single-Closer	Schneider	2	B9

11	FA6	OSMC32N1C4	Single-Closer	Schneider	2	B10
12	FR1	LRD021C	Overheat Relay	Schneider	1	C2
13	FR2	LRD07C	Overheat Relay	Schneider	1	C3
14	FR3	LRD03C	Overheat Relay	Schneider	1	C4
15	KM1, KM2	LC1D18B7C 24V	AC Contactor	Schneider	2	E4
16	KM3	LC1D12B7C 24V	AC Contactor	Schneider	2	E6
17	KM4	LC1D09B7C 24V	AC Contactor	Schneider	2	E1
18	KM5	LC1D09B7C 24V	AC Contactor	Schneider	2	E2
19	KM6	LC1D09B7C 24V	AC Contactor	Schneider	2	E6
20	KM7	LC1D09B7C 24V	AC Contactor	Schneider	2	E3
21	KM8, KM9	LC1D18B7C 24V	AC Contactor	Schneider	2	E7
22	KA1—KA4	CAD32B7 24V	Middle Relay	Schneider	2	E8
23	KT1, KT2	CAD32B7/LADR2 24V	Delay Relay	Schneider	2	E5
24	KT3, KT4	CAD32B7/LADT2 24V	Time relay	Schneider	2	E8
25	KT5	CAD32B7/LADT2 24V	Time relay	Schneider	2	E5
26	SB1	XB2BR42C	Fungus type Button	Schneider	2	B2
27	SB2	XB2B	Position rotation Botton	Schneider	2	C4
28	SB3	XB2B	Negative rotation Botton	Schneider	2	C4
29	SB4	XB2B	Cycle start button	Schneider	2	C2
30	SB5	XB2B	Fast forward button	Schneider		D2
31	SB6	XB2B	Fast rewward button	Schneider		D2
32	SB7	XB2B	Stop button	Schneider	2	C3
33	SB8	XB2B	Is inching button	Schneider	2	C4
34	SB9	XB2B	Reversal pint move	Schneider	2	C4
35	SA1	XB2BD45C	Cool pre-select	Schneider	2	
36	SA2	XB2BD45C	Three-position Rotary Knob	Schneider	2	
37	HL1–HL3	XD1 24V	Light Indicator	Schneider	2	D9
38	EL	24V 3W	Lamp for Machine Tool	KNUTH	2	D10

39	VC	ZPQ1V-2, 20A, 100W	Rectifier Stack		1	B5
40	YC1	DLM10-6A, 24V	Electro-magnetism Clutch		1	C6
41	SQ1-SQ3	JW2-11Z/3	Stroke Switch	CHNT	2	C8
42	R1	RJ-1, 150 $\Omega$ , 3W-5W	Metal Film Resistance		1	C5
43	V1	IN4007, 1A, 700V	Diode		1	C5
44	TC1	JBK5-150, 400/28V	Control Transformer	JUCHE	1	B4
45	TC2	JBK5-250, 400V/24V	Control Transformer	JUCHE	2	B9

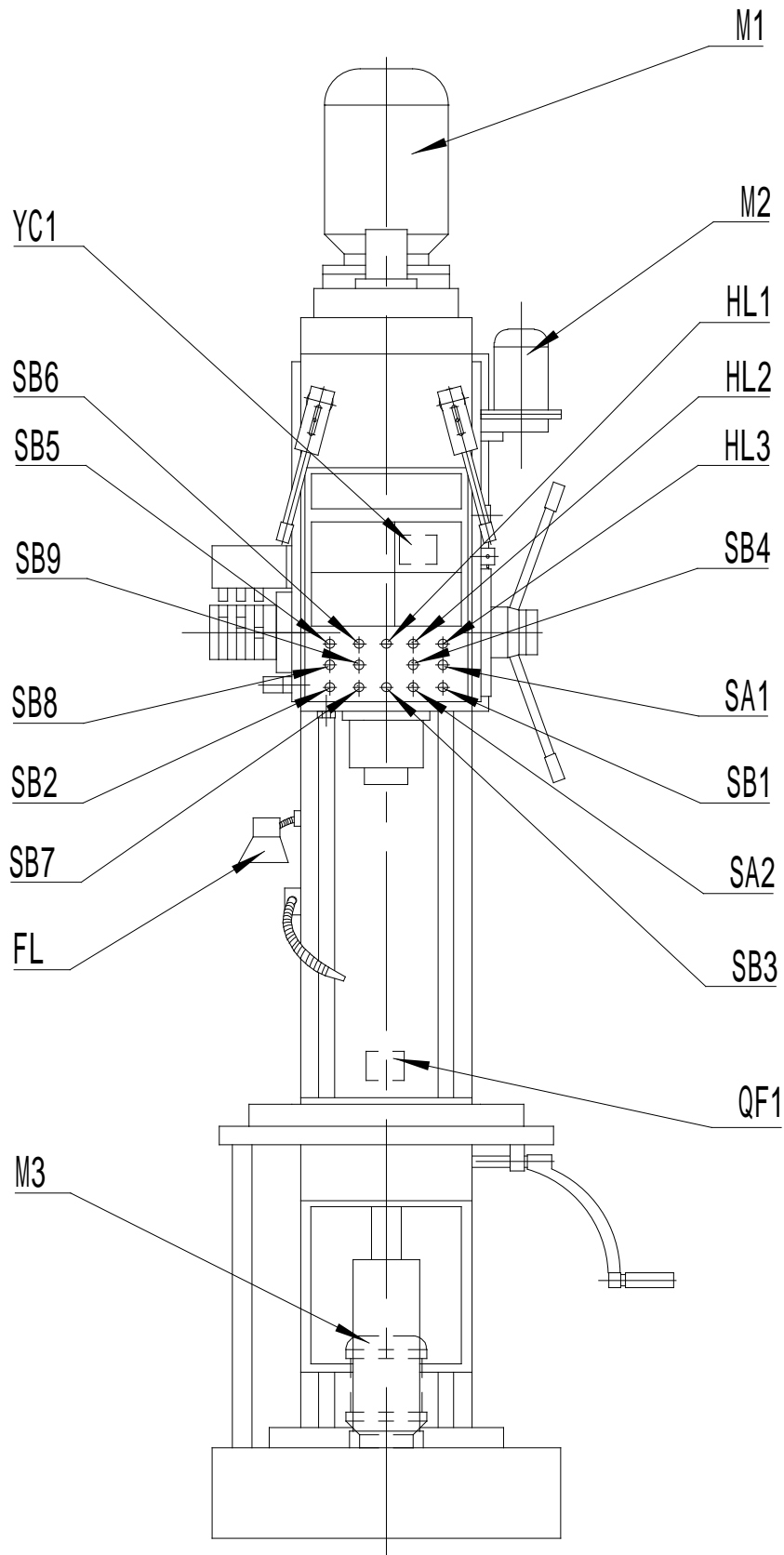


Fig 8-1 Installation Diagram For Electric Parts

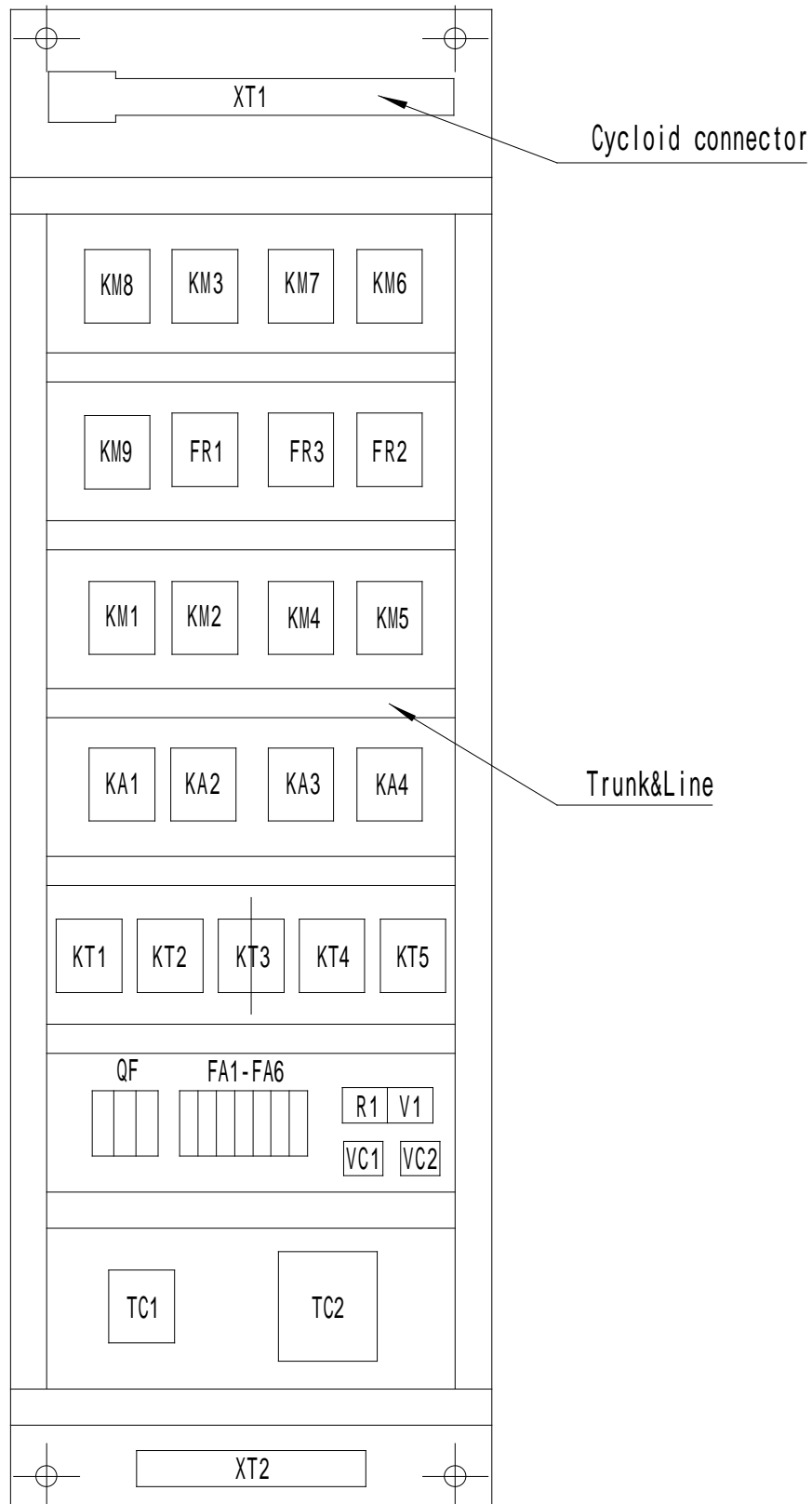


Diagram.8-2 Installation Diagram Of Electrical plate

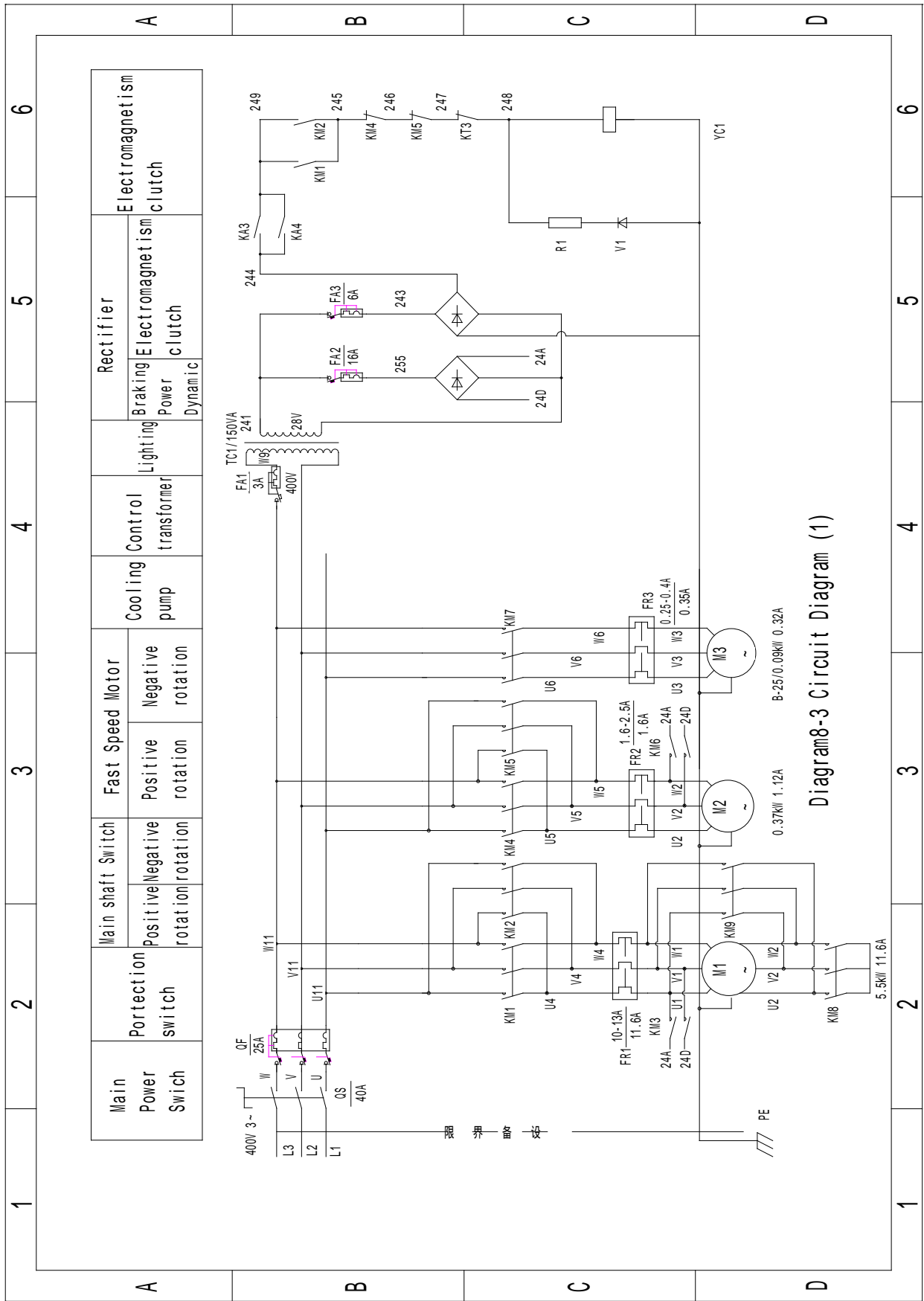
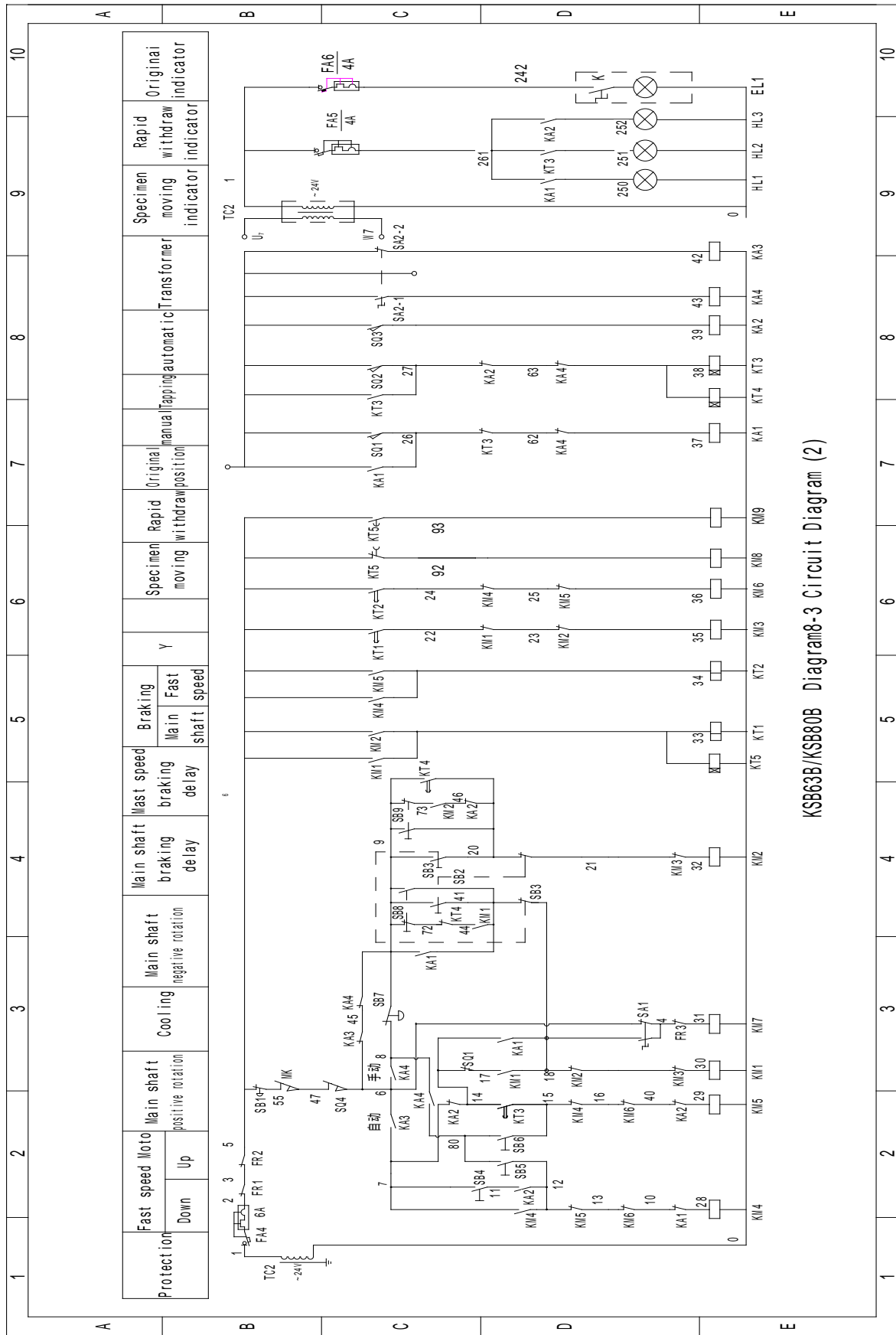


Diagram8-3 Circuit Diagram (1)



KSB63B/KSB80B Diagram 8-3 Circuit Diagram (2)



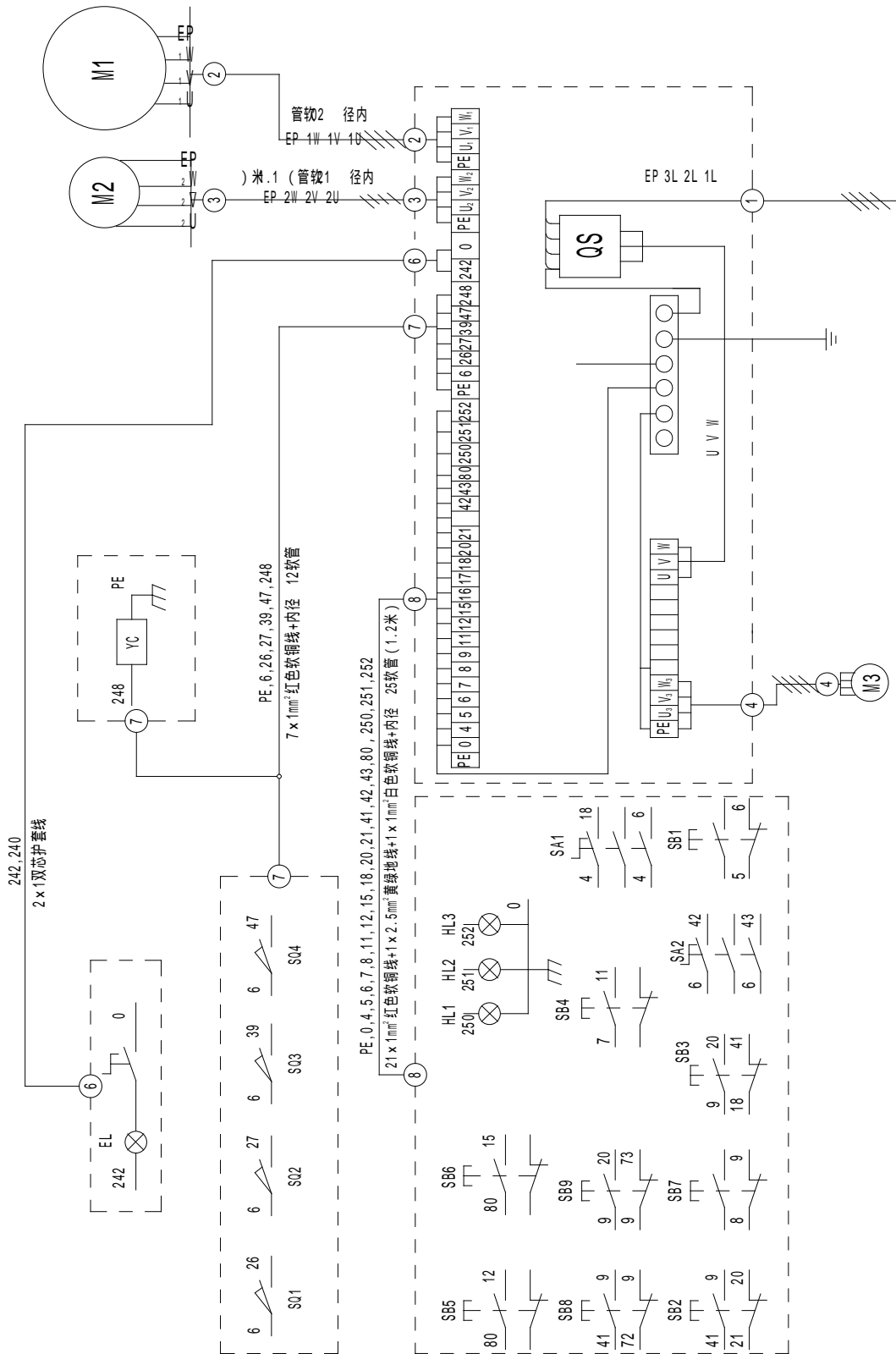


Diagram8-4 The Wire Connecting Diagram

## IX、 Maintenance and adjustment

In order to extend its service life, attention shall be paid to cleaning of the machine and lubricating according to requirements. The electric device shall be connected tightly without oxidation and checked once every month.

Adjustment of safety connector part:

The safety resisting force of the safety connector part is preset before delivery. It is not necessary to adjust it until overhauling. When the main spindle resisting force is under than 30000N, it should work normally. When the resisting force of the main spindle exceeds 25% of the rated resisting force, the safety connector part must declutch.

When adjusting the safety connector part, remove the knurled plug screw(Fig 6-1) on the right cover of the main spindle box. Find the nut under the spring at the bottom of the connector part shaft and turn it to adjust the safety resisting force.

Adjustment of balance swirl spring of the main spindle: The weight of the main spindle is balanced by the swirl spring. The spring can be adjusted by turning the balance square 13(Fig 6-1). The adjustment of the spring can be checked by handle 20(Fig6-1) in the following method. Turn the handle to a certain angle, turn the handle in positive and negative position( the machine shall be powered off), if the force are similar, it shows the main spindle is balanced.

## X、 Roll Bearing of the Machine

The distribution diagram of the roll bearing see diagram 10-1

The Detailed List of the Roll Bearing, see list 10-1

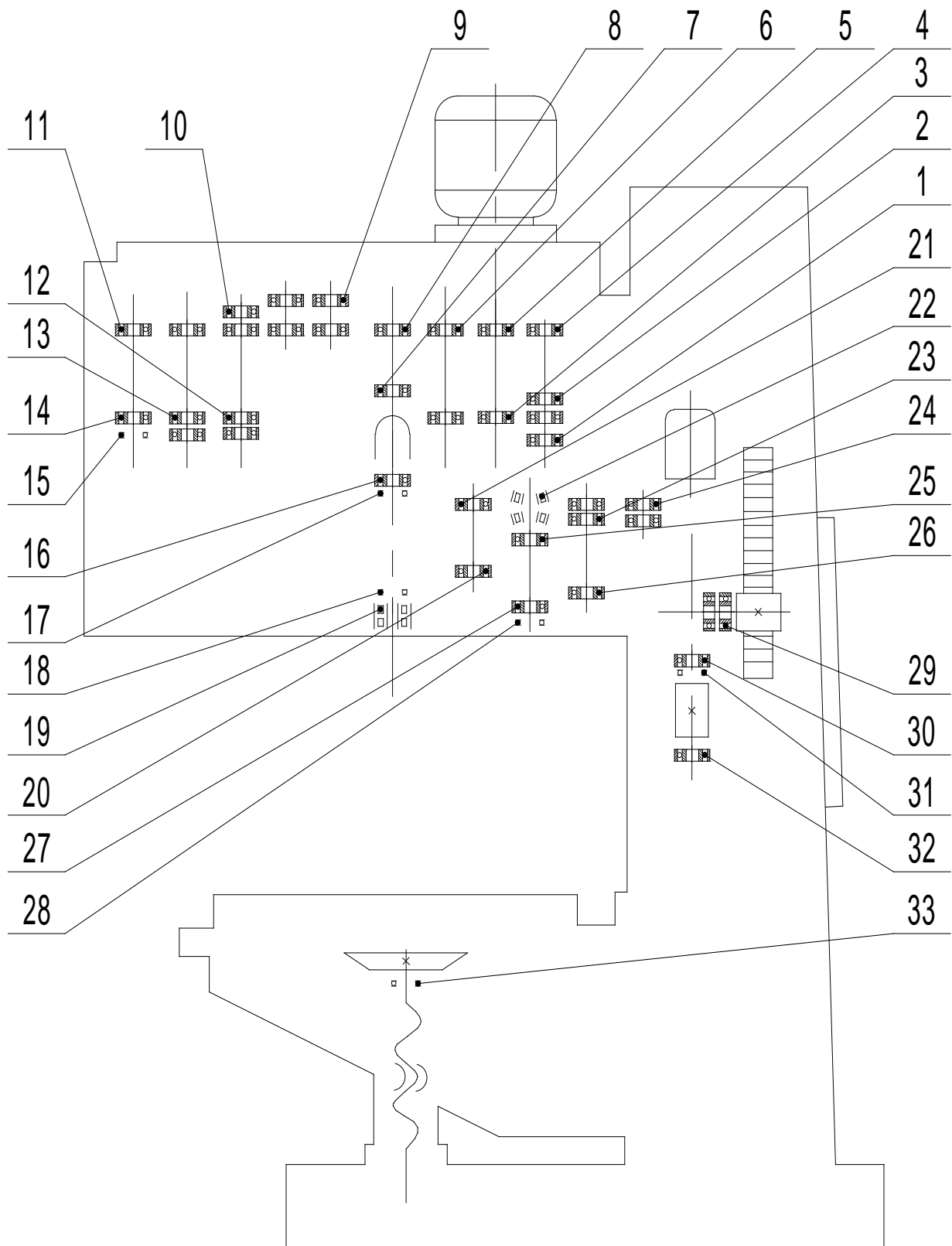


Diagram10-1 The distribution diagram of the roll bearing see

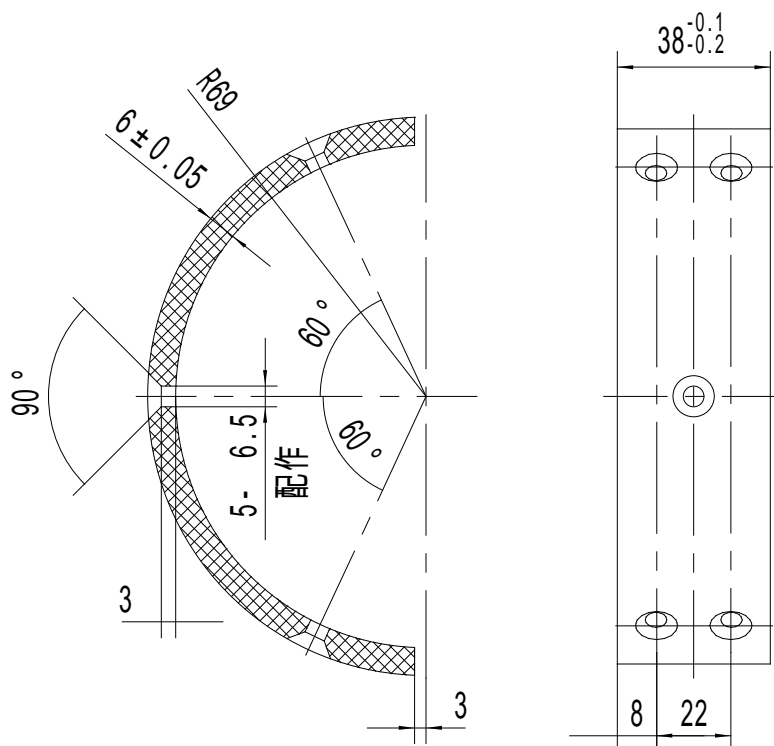
List 10-1 The Detailed List of the Roll Bearing

No	Name	Code	Specifications	Grade	Quantity
1	Slot Ball bearing	6304:	20 × 52 × 15		1
2	Slot Ball bearing	6206:	30 × 62 × 16		2
3	Slot Ball bearing	6207:	35 × 72 × 17		2
4	Slot Ball bearing	6306:	30 × 72 × 19		1
5	Slot Ball bearing	6307:	35 × 80 × 21		1
6	Slot Ball bearing	6209:	45 × 85 × 19		1
7	Slot Ball bearing	6015:	75 × 115 × 20		1
8	Slot Ball bearing	6016:	80 × 125 × 22		1
9	Slot Ball bearing	6004:	20 × 42 × 12		4
10	Slot Ball bearing	6004:	20 × 42 × 12		2
11	Slot Ball bearing	6304:	20 × 52 × 15		2
12	Slot Ball bearing	6003:	17 × 35 × 10		2
13	Slot Ball bearing	6004:	20 × 42 × 12		2
14	Slot Ball bearing	6205:	25 × 52 × 15		1
15	Thrust ball bearing	51205:	25 × 47 × 15		1
16	Slot Ball bearing	6013:	65 × 100 × 18	P5	1
17	Thrust ball bearing	51113:	65 × 90 × 18	P5	1
18	Thrust ball bearing	51216:	80 × 115 × 28	P5	1
19	Double way cylindrical roll bearing	NN3017K:	85 × 130 × 34	P5	1
20	Slot Ball bearing	6211:	55 × 100 × 21		1
21	Slot Ball bearing	6209:	45 × 85 × 19		1
22	Cone roll bearing	32205:	25 × 52 × 18		2
23	Slot Ball bearing	6004:	20 × 42 × 12		2
24	Slot Ball bearing	6003:	17 × 35 × 10		2
25	Slot Ball bearing	6206:	30 × 62 × 16		1
26	Slot Ball bearing	6204:	20 × 47 × 14		1
27	Slot Ball bearing	6306:	30 × 72 × 19		1
28	Thrust ball bearing	51306:	30 × 60 × 21		1
29	Slot Ball bearing	6206:	30 × 62 × 16		2
30	Slot Ball bearing	6004:	20 × 42 × 12		1
31	Thrust ball bearing	51305:	25 × 52 × 18		1
32	Slot Ball bearing	160505:	25 × 52 × 18		1
33	Thrust ball bearing	51207:	35 × 62 × 18		1

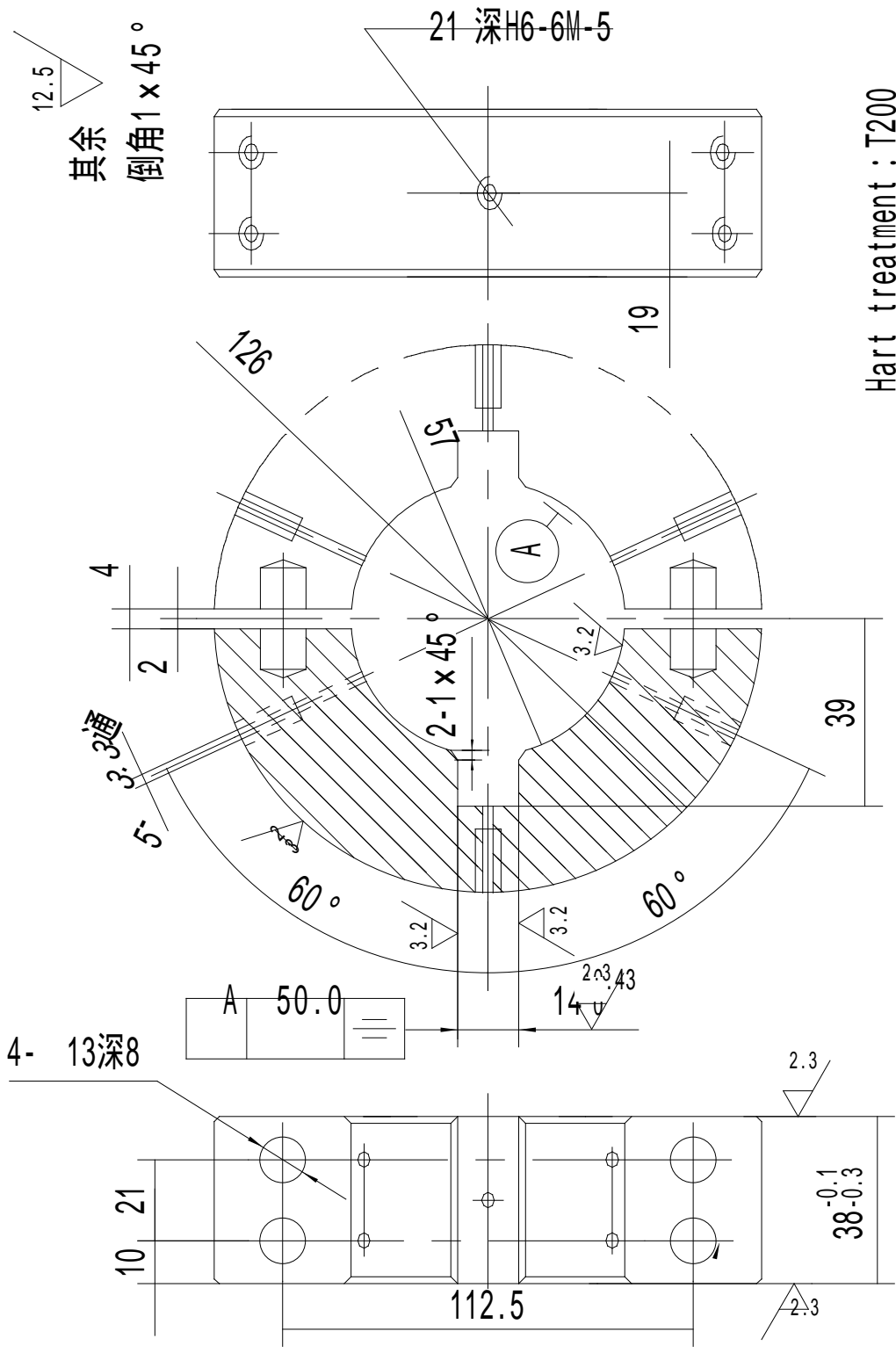
### XI、 The Detailed List of Spare Parts

No. of part	Name	Material	Piece	Remark
1201	Brake wafer	Asbestos resin brakes	2	Two parts combined together
1112	Centrifugal block	45	2	
4112	Pivot	45	1	
4119	Slip block	45	2	
4111	Shifting yoke	45	1	
4109	Shifting yoke	45	1	
4016	Slip block	HT200	2	

### XII、 Diagram of Spare Parts.

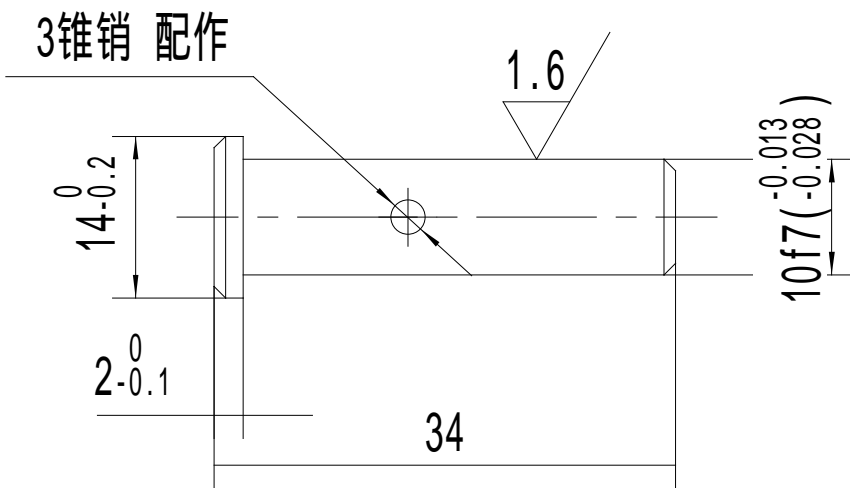


No. of diagram	Name	Material
1201	Break ribbon	Asbestos resin brake ribbon



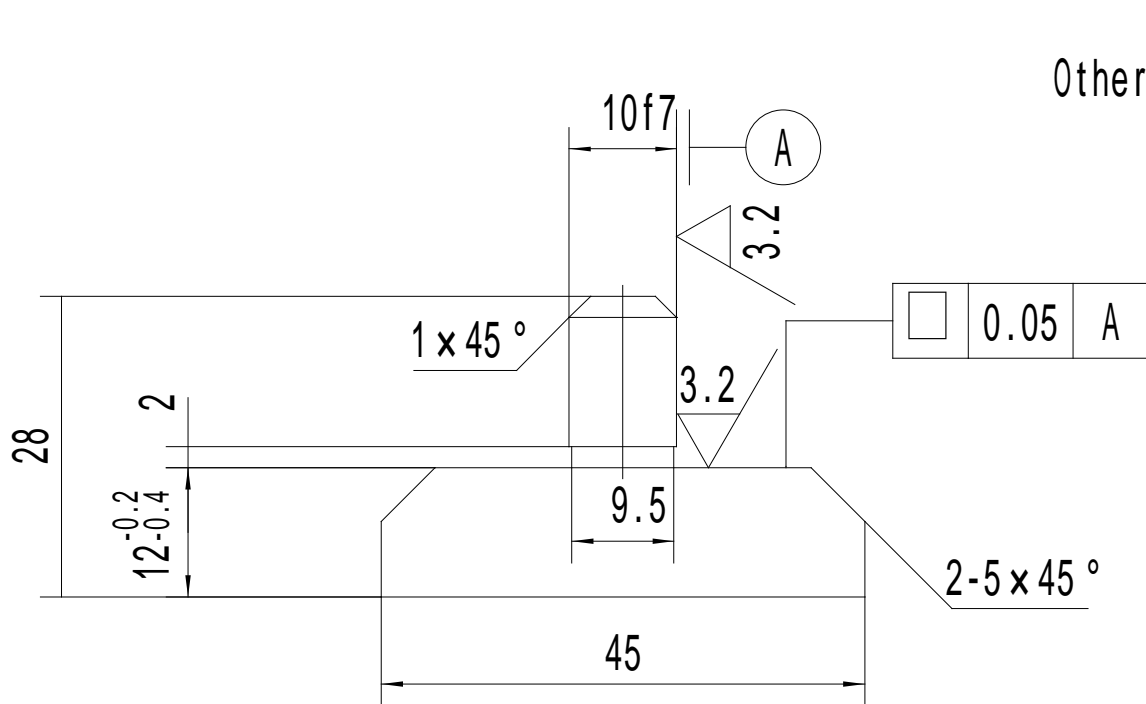
No. of diagram	Name	Material
1112	Centrifugal block	45

Others  $\frac{12.5}{\nabla}$

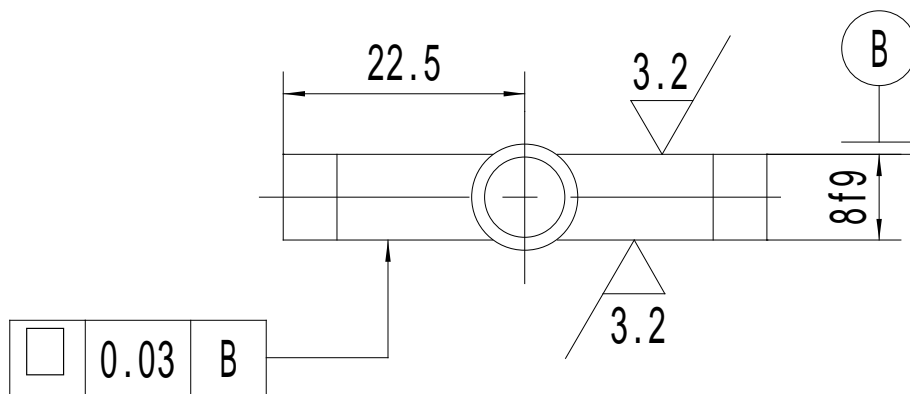


Hert treatment : T235

No.of diagram	Name	Material
4112	Pivot	45

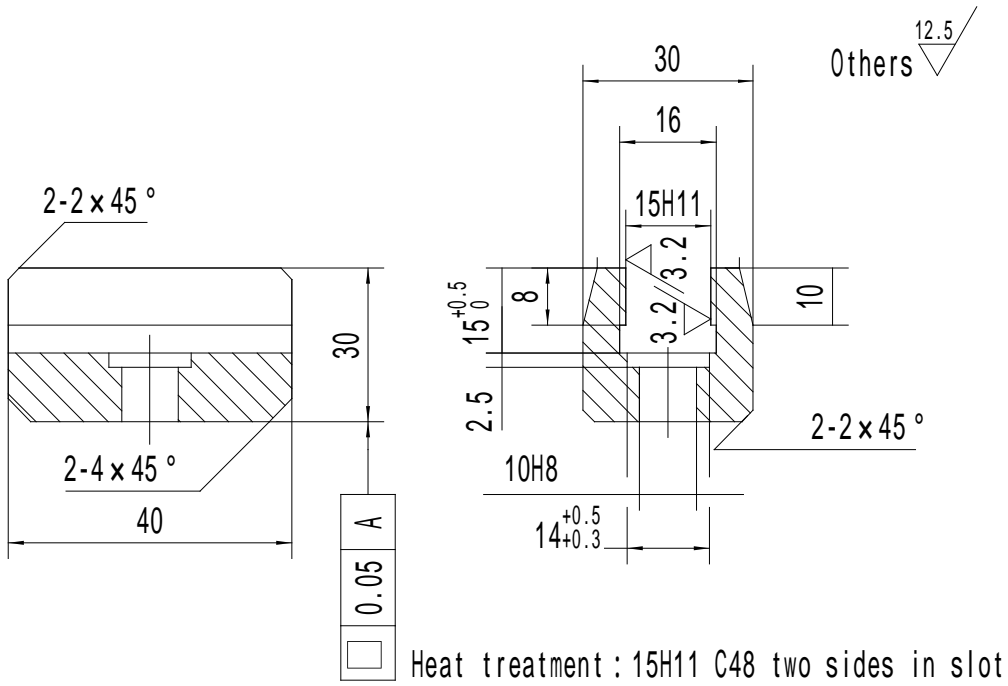


Other  $\frac{12.5}{\nabla}$

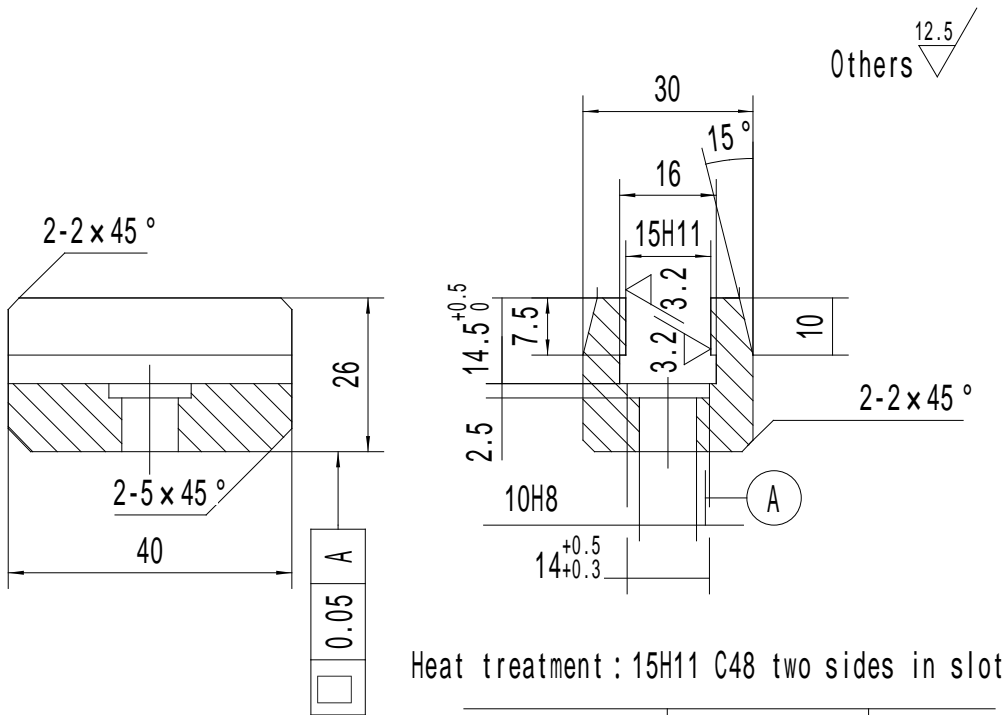


No. of diagram	Name	Material
4119	Slip block	HT200



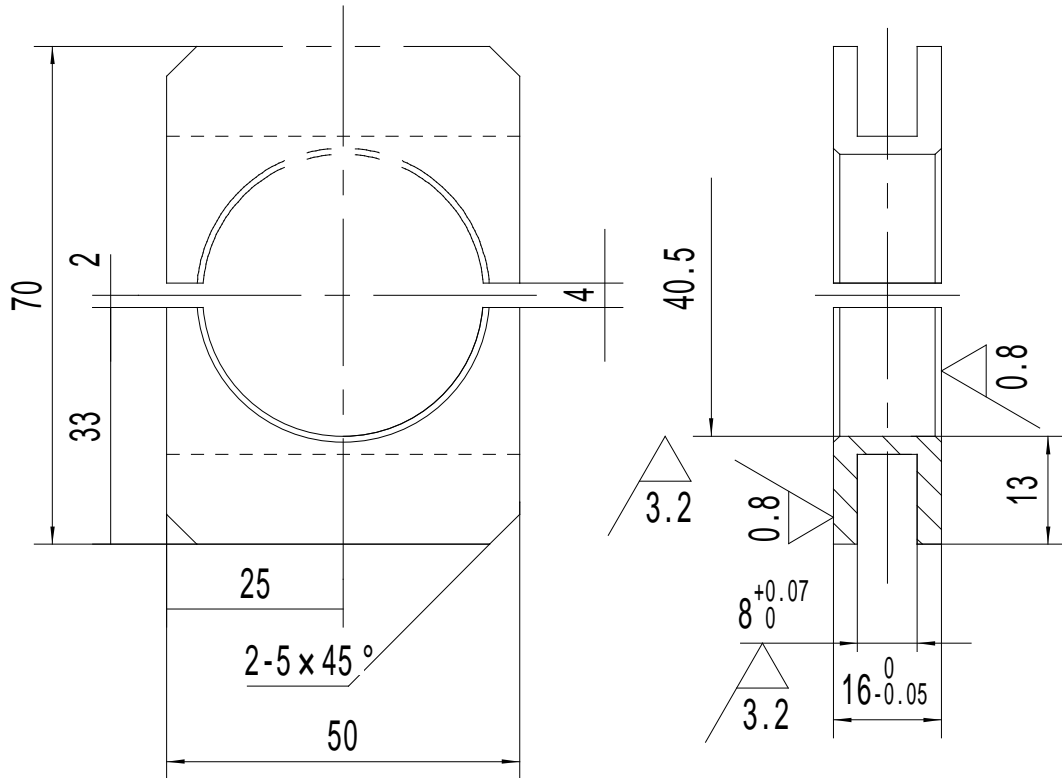


No.of diagram	Name	Material
4111	Shifting yoke	45



No.of diagram	Name	Material
4109	Shifting yoke	45

Other  $\frac{12.5}{\nabla}$



No. of diagram	Name	Material
4016	Slip block	HT200

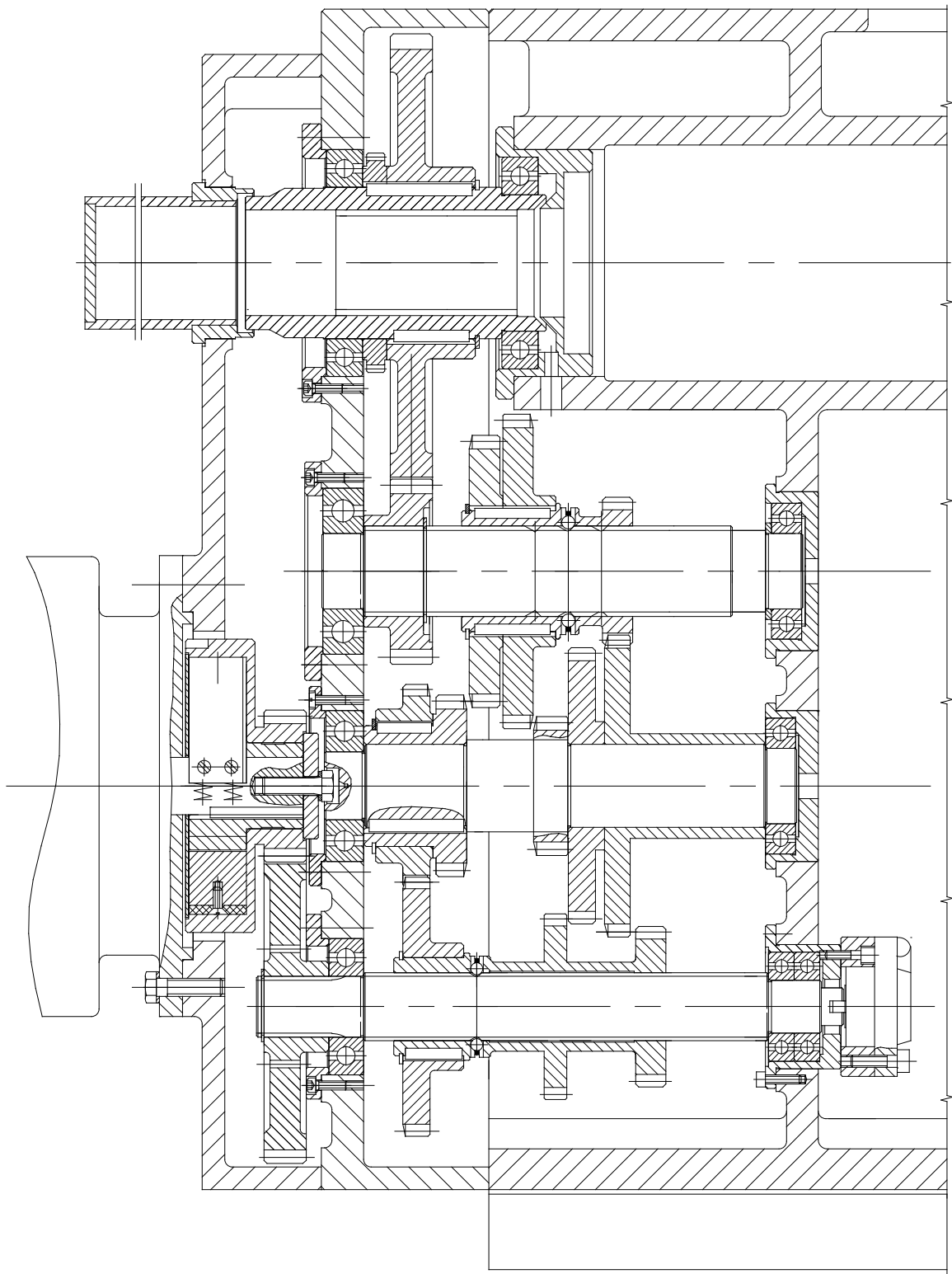


Diagram13-1 Main Speed Change

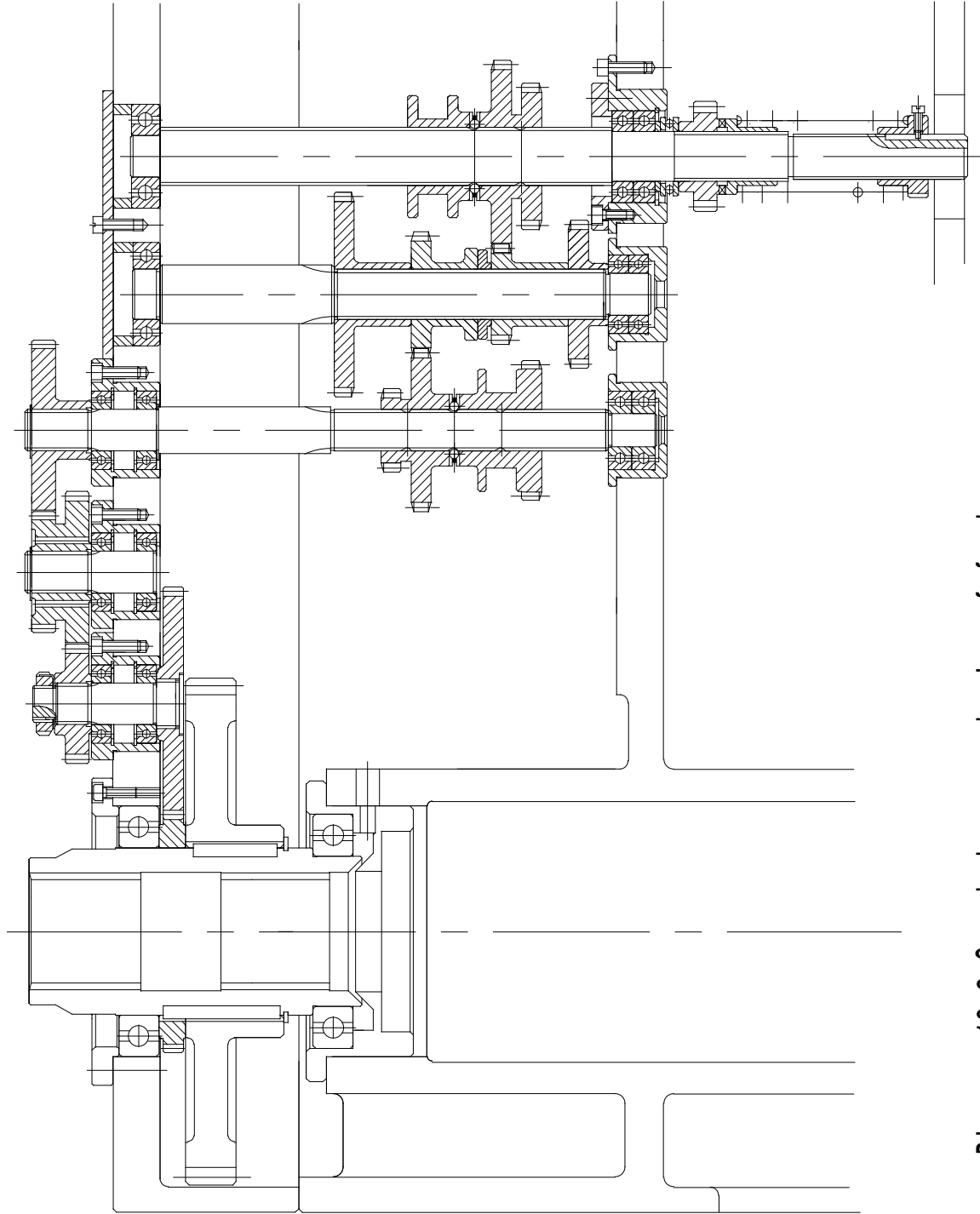


Diagram 13-2 Speed change mechanism of feed

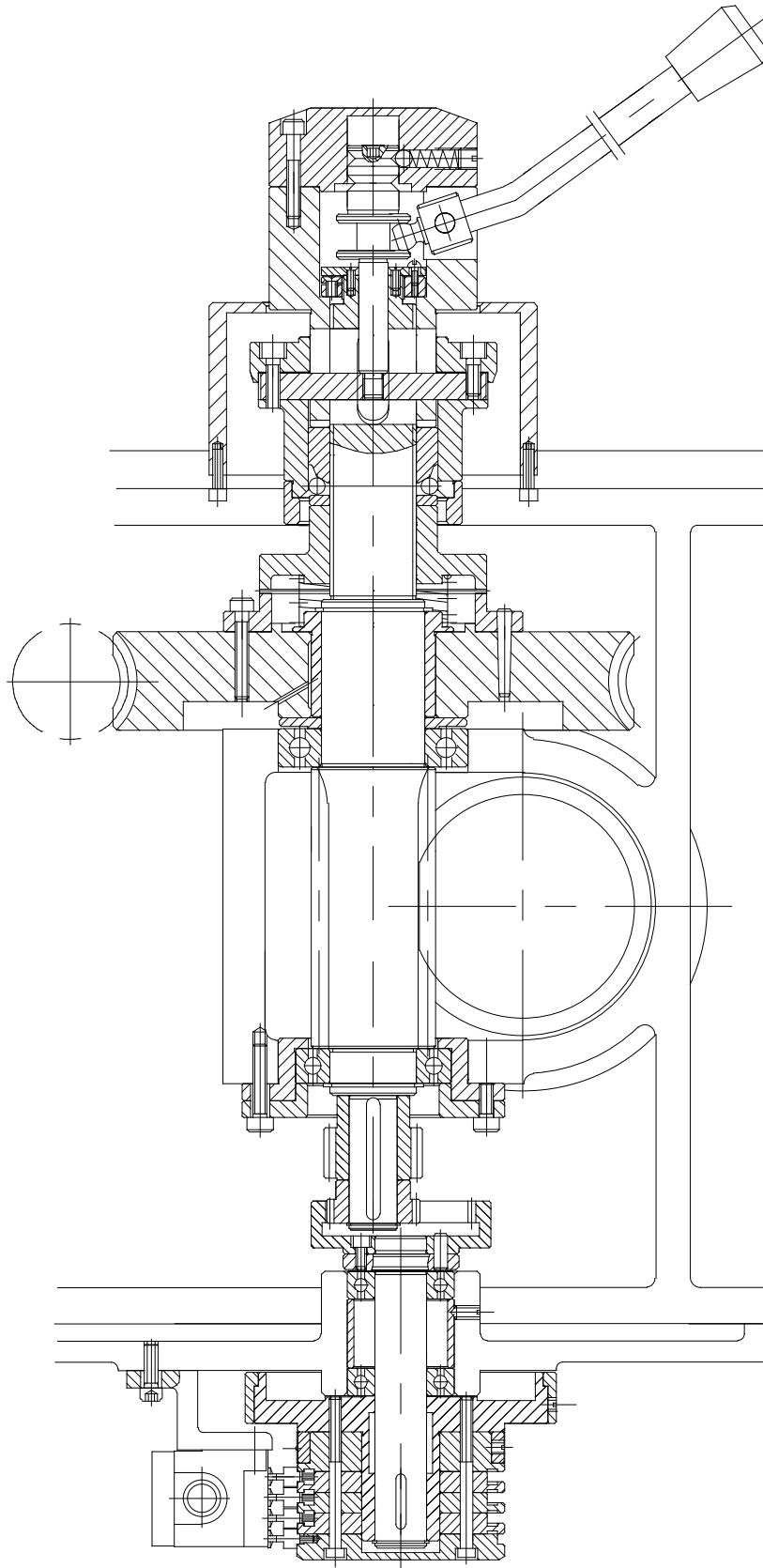


Diagram 13-3 Assemble of Horizontal Spindle

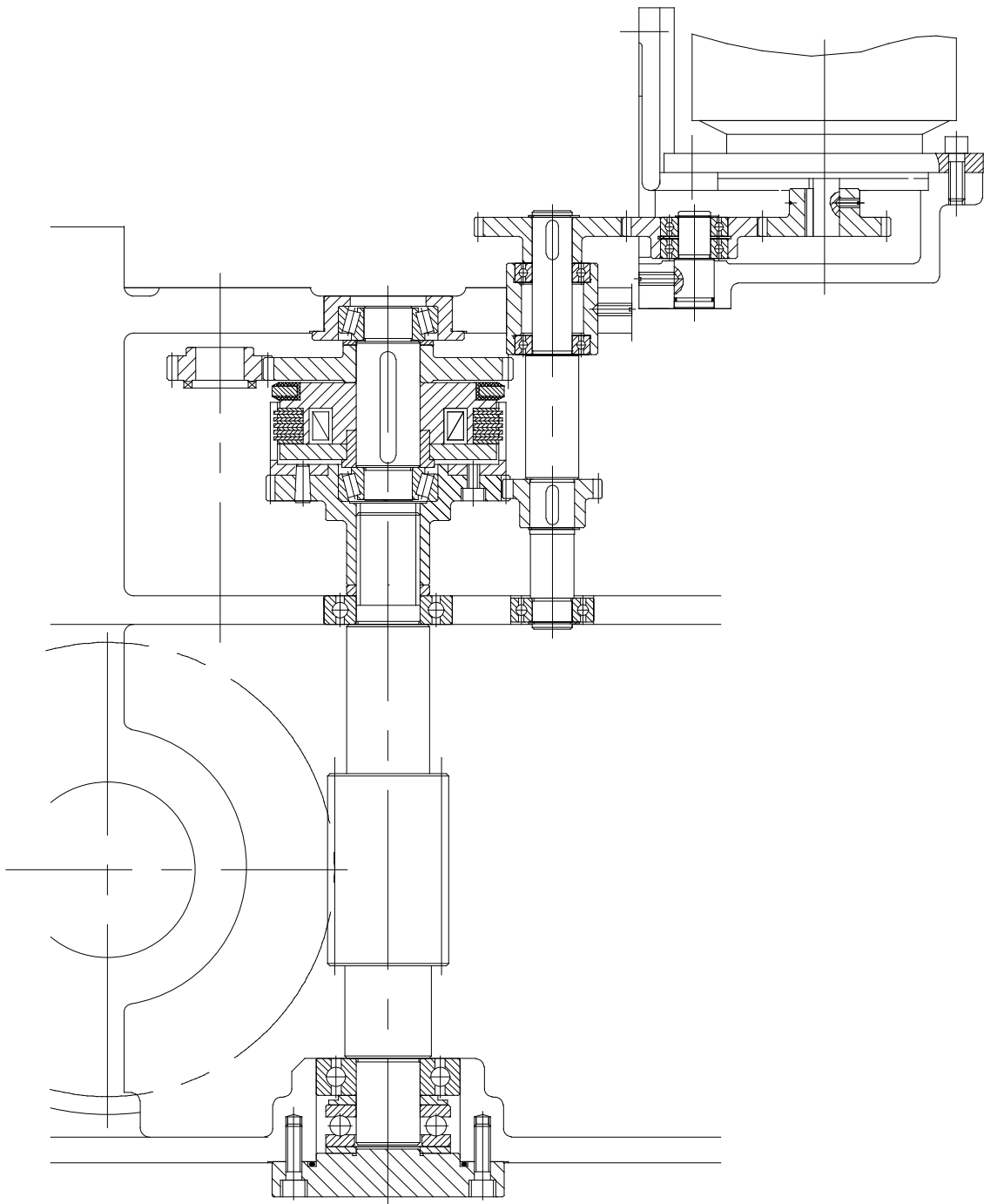


Diagram13-4 Assemble of the Worm Spindle

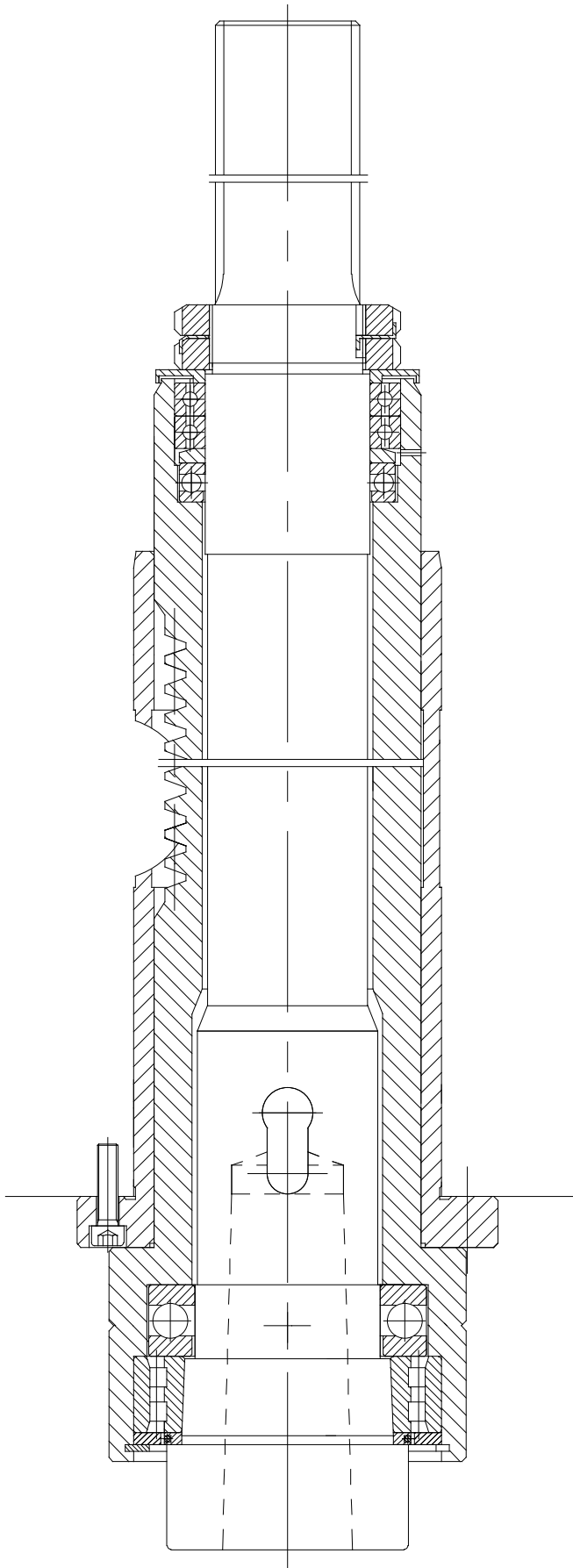


Diagram 13-5 Assemble of the spindle

