

CW61100E CW61125E CW61140E HORIZONTAL LATHE  
CW62100E CW62125E CW62140E GAP LATHE

# OPERATIONAL MANUAL

 **天水星火机床有限责任公司**  
Tianshui Spark Machine Tool Co., Ltd.

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CHAPTER 1	USAGE REQUIREMENTS AND SAFE MEASURES	Total 6
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<p>1. Technical training and practical operation</p> <p>1.1 Operator should attend technical training before practical operation.</p> <p>1.2 Before first operation operator should refer to operational manual so as to wholly know structure, performance, control, and maintenance of machine and so on.</p> <p>1.3 Before operation, operator should inspect whether each sliding surface of machine is clean or not, whether there is enough lubricant, and whether hydraulic and lubrication devices are normal.</p> <p>1.4 After a long-distance transportation, some devices may be loose. Therefore before operation please carefully inspect whether each screw is loose or not. Such as chuck screw, screw of strip clamp on saddle/tailstock, and fastening screw for change gear bracket. If some of them are loose, please fasten properly during modulation, then start machine.</p> <p>1.5 After a long-distance transportation, screw for wire-connecting terminal in electric cabinet may be loose. In order to avoid electric accident, please arrange electric operator to inspect electric cabinet.</p> <p>1.6 Before operation please release all emergency buttons.</p> <p>1.7 Starting long after break of machine, operator should start spindle after one minute's running of oil pump, which could ensure each place with enough lubricant. Machine speed should increase little by little after low speed running.</p>		

CHAPTER 1	USAGE REQUIREMENTS AND SAFE MEASURES	Total 6
		Page 2
<p>1.8 Speed-varying handle should be turned to proposed position according to machine nameplate. When gear in headstock or feedbox is in operation, changing running speed or feed rate is not allowed.</p> <p>1.9 When rapid traveling tool post, please to confirm crossed handle direction on apron coincides with traveling direction of tool post, then press button at end of handle.</p> <p>1.10 When holding workpiece with tailstock center, block pin of tailstock should be inserted into bed rack, at the same time, locking nut between bed and tailstock and locking handle of tailstock sleeve should also be fastened.</p> <p>1.11 When changing feedbox speed, handles for lead screw and feed rod should be in idle step. After finish change to connect lead screw and feed rod so as not to damage shift fork.</p> <p>1.12 When machining with center, center should be kept lubricating. If center is overheat, machine should be stopped instantly. Spoiled center is not allowed to use.</p> <p>1.13 When turning workpiece supported with center rest and follow rest, interface between center and workpiece should be lubricated.</p> <p>1.14 Lead screw is only for turning thread, feed rod is only allowed to rotate reversely, and otherwise override clutch would be useless.</p> <p>1.15 When mounting workpiece, it is recommendable to align and clamp workpiece at mode of point-movement spindle at low speed or idle step of spindle.</p>		

CHAPTER 1	USAGE REQUIREMENTS AND SAFE MEASURES	Total 6
		Page 3
<p>1.16. When machining workpiece with large eccentricity, firstly reasonable align and clamp. It is not allowed to turn without doing that.</p> <p>1.17 When connecting electric cabinet with outside power supply, please seriously do it as operational manual. Earthed protection should be conducted according to requirements (if electric cabinet is with earthed protection, earthed wire for machine may be unnecessary). Voltage of electric net should be within <math>AC440V \pm 15\%</math> to ensure normal work.</p> <p>2. Maintenance and reasonable usage</p> <p>2.1 Any article harm to machine is not allowed to be placed on finished surface and each guide way surface.</p> <p>2.2 Operator should regularly inject lubricant and change lubricant, and regularly inspect each outlet/inlet of oil tube against being plugged up.</p> <p>2.3 Operator should regularly clean oil tank and oil filter, and regularly get rid of sludge in cooling tank.</p> <p>2.4 When first operating machine, lubricant should be changed every month, thereafter change it every two months.</p> <p>2.5 After finishing work, guide way surface of machine should be coated with engine oil.</p>		

CHAPTER 1	USAGE REQUIREMENTS AND SAFE MEASURES	Total 6
		Page 4
<p>2.6 Operation of machine should be in good state, in case of unexpected situation such as abnormal noise, frog, overheat and spoilage of workpiece,, operator should report to related person, and stop machine to inspect.</p> <p>2.7 Operator should regularly inspect looseness of V-shaped belt to keep them with good work state.</p> <p>2.8 Machine maintenance should be performed after machine stops.</p> <p>2.9 Maintainer should clearly know machine component, and they should master enough knowledge about mechanics, electricity and hydraulics.</p> <p>2.10 When maintaining or changing electric element, power supply should be turned off.</p> <p>3. Requirement of machine usage</p> <p>3.1 Relative moisture: in normal case, it should be less than 85%.</p> <p>3.2 Environment temperature; 0℃~40℃</p> <p>3.3 Prevent machine against straight sunshine or thermal radiation.</p> <p>3.4 Prevent machine against abnormal vibration from outside.</p> <p>3.5 When machining cast-iron part, user should mount dust absorber to guarantee normal machine operation.</p> <p>4. Comply with guide, safety should be given to priority.</p> <p>4.1 Operator should be all attention when working. Smoking as working and operating machine after drunk are not allowed. Operator should be with safe.</p>		

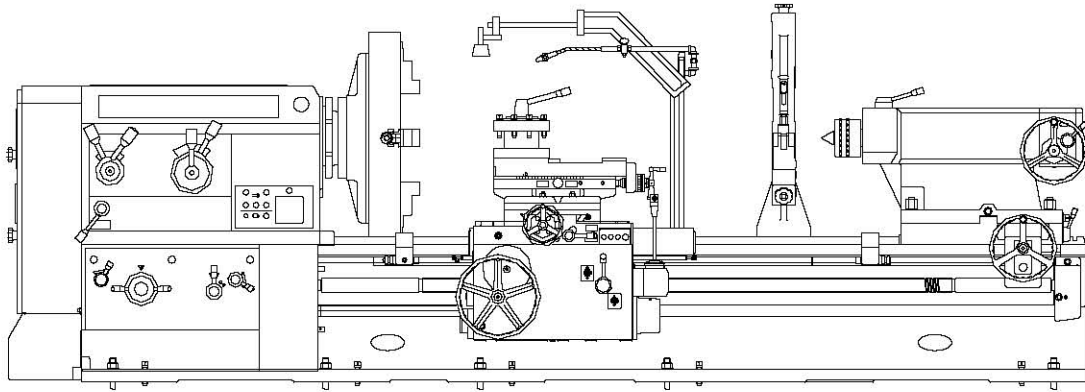
CHAPTER 1	USAGE REQUIREMENTS AND SAFE MEASURES	Total 6
		Page 5
<p>awareness at any time.</p> <p>4.2 When operating machine, necktie, watch, ring, jewelry and so on are not allowed to wear.</p> <p>4.3 Various spanners, tools and workpieces should be placed on place which is far from machine spindle, working table and traveling equipment of machine</p> <p>4.4 Floor around machine should be kept clean. Pile-up of iron chip, overflowing of engine oil and coolant over floor are not allowed, in order to avoid their interference.</p> <p>4.5 When running of machine, hand should be far from tool or traveling device.</p> <p>4.6 Before starting machine, workpiece and fixture should be firmly clamped.</p> <p>4.7 Machine running should be stopped when varying tool.</p> <p>4.8 Spindle brake adopts hydraulic cylinder to brake. When spindle stops, in common case rotary button for spindle brake should be in constant-brake position.</p> <p>4.9 When operating, protector of change gear should be closed, which could prevent operator from accident for suddenly cut-off of power.</p> <p>4.10 Operator should keep positions of all emergency-break button in mind in order to protect against all eventualities.</p> <p>4.11 Before work shift, the related operators should communicate with each other so as to guarantee safety.</p>		

CHAPTER 1	USAGE REQUIREMENTS AND SAFE MEASURES	Total 6
		Page 6
<p>This instruction briefly acquaints operator with machine performance, how to accurately operate, simple adjustment and maintenance. If for further information, please contact with producer.</p>		

Chapter 2	MACHINE APPLICATIONS AND ITS FEATURES	Total 2
		Page 1

## 2.1 Machine outline

It is shown as drawing 2.1.



DRAWING 2.1 MACHINE OUTLINE

## 2.2 Machine applications

This machine is suitable for various turning, such as cylinder, inner bore, end and various formed surfaces: metric thread, Whitworth thread, module thread and diametric thread. Singly mechanic top tool post may turning short taper( generating line of taper is less than 300mm), turning long taper is realized by combination of top tool post and longitudinal feed . Moreover, this machine may also drill, bore, trepan, forced turn with carbide cutter and machine various ferrous metal and non-ferrous metal.

## 2.3 Machine features

This machine has not only internal features of single oil pump, forced lubrication, rapid travel, end insurance, limited-travel cutting, large power, high speed, low



Chapter 2	MACHINE APPLICATIONS AND ITS FEATURES	Total 2
		Page 2
<p>noise, strong rigidity, good accuracy and accuracy persistence, but also external features of beautiful outline and compact arrangement. Furthermore, it also has advantages of integral handles, figurative nameplate, convenient operation, safety, reliability, user orientation. This machine has wide variety of attachments, some special attachments such as supporting roller, digital display device, taper-turning device, milling head and grinding head are available.</p>		

Chapter 3	MACHINE SPECIFICATIONS AND PARAMETERS				Total 5	
					Page 1	
3.1 Main specifications						
Machine model	CW61100E	CW62100E	CW61125E	CW62125E	CW61140E	CW62140E
Max. swing over bed			Φ1000mm	Φ1250mm	Φ1400mm	
Max. workpiece length	L=1500~16000mm					
Max. turning length	L'=L-200mm					
Max workpiece swing over tool post			Φ650mm	Φ900mm	Φ980mm	
Max. workpiece swing over bed concave			Φ1130mm	Φ1370mm	Φ1530mm	
Max. workpiece swing over bed gap			Φ1250mm	Φ1500mm	Φ1650mm	
Valid length of gap near chuck end	250mm					
Max. workpiece weight between centers	6000kg					
Load capacity of center rest	1500kg					
3.2 Headstock						
Spindle end	ISO(GB) A2-15					
Spindle bore diameter	Φ130mm					
Taper bore in front of spindle	Metric No.140					
Kinds of forward rotation of spindle	24 kinds					
Kinds of reverse rotation of spindle	12 kinds					
Spindle speed range(r/min):						
High-speed step n1						
Forward	4~400r/min					
Reverse	5~400r/min					

Chapter 3	MACHINE PARAMETERS AND SPECIFICATIONS	Total 5
		Page 2
Middle-speed step n2		
Forward		3.15~315r/min
Reverse		4~315r/min
Low-speed step n3		
Forward		2.5~250r/min
Reverse		3.15~250r/min
4-jaw chuck diameter		Φ1000mm
(For High-speed step or Low-speed step Headstock, and Φ 1250mm or Φ 1400mm 4-jaw chuck, can supply as require.)		
3.3 Feedbox		
Kinds of longitudinal and cross feed rate		56kinds
Range of longitudinal and cross feed rate (mm/r)		
Longitudinal		0.1~12mm/r
Cross (a half of longitudinal feed rate)		0.05~6 mm/r
Top tool post (a fourth of longitudinal feed rate)		0.025~3mm/r
Kinds of metric threads		56kinds
Range of metric thread pitch		1~120mm
Kinds of inch threads		56kinds
Range of tooth number per inch for inch threads		30~1/4 /inch
Kinds of module threads		56kinds
Range of module threads module		0.5~60mm

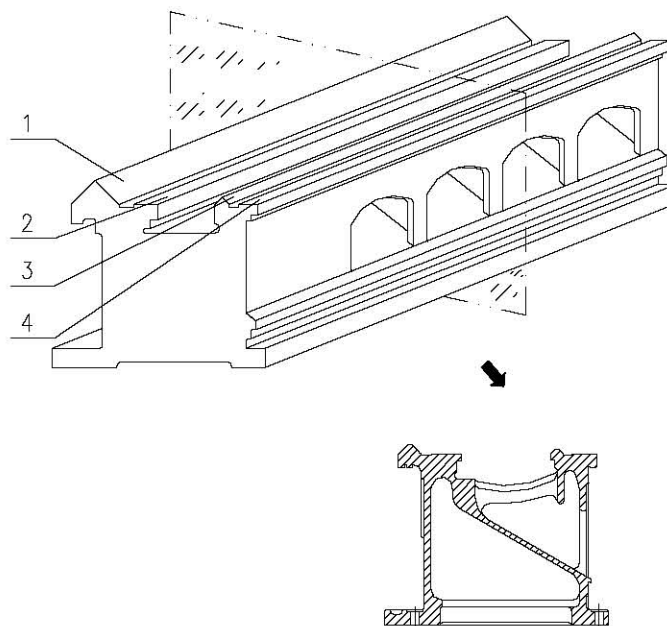
Chapter 3	MACHINE PARAMETERS AND SPECIFICATIONS	Total 5	
		Page 3	
Kinds of diametral pitch threads		56kinds	
Range of diametral pitch threads		60~0.5D.P	
3.4 Tool post			
Distance from tool-mounted base to spindle center		48mm	
Tool holder section( height x width)		45 x45mm	
Swiveling angle of tool post		± 90°	
Max. cross travel of tool post( big slider)	CW61100E	520mm	
	CW61125E	680mm	
	CW61140E	680mm	
Max. travel of top tool post		300mm	
Travel of tool post per span of top and low tool posts		0.05mm	
Rapid travel speed of tool post			
Longitudinal		3740mm/min	
Cross		1870mm/min	
Top tool post		935mm/min	
3.5 Tailstock			
Diameter of tailstock sleeve		Φ 160mm	
Max. travel of tailstock sleeve		300mm	

Chapter 3	MACHINE PARAMETERS AND SPECIFICATIONS	Total 5
		Page 4
Taper of tailstock sleeve		Metric No.80
Cross movement of tailstock		$\pm 2.5\text{mm}$
Movement of tailstock sleeve per revolution of hand-wheel		
Rapid		8mm/r
Slow		0.4mm/r
3.6 Motor device		
Main motor	Y200L2-6, B3, 22KW, 1179r/min	
Rapid motor of apron	YDJ90L-4, 1.5KW, 1690r/min	
Rapid motor of tailstock	Y90S-6, 0.75KW, 1130r/min	
Motor of hydraulic oil pump	YS-8014, B14, 0.55KW, 1690r/min	
Cooling pump	JCB-45, 0.15KW, 45L/min	
Overall capacity of motor		24.95kw
3.7 Oil pump for lubrication		
Oil pump model		CB-B10
Work pressure of oil pump		250N/cm <sup>2</sup>
Output of oil pump		10L/min;
Speed of oil pump		1690r/min;
3.8 Overall machine size and weight(see table 3.1)		

Chapter 5	BED	Total 1
		Page 1

Bed structure is as drawing 5.1 shown. Bed section is enclosed, so bed has strong rigidity and good chip-conveying functions.

Section of bed guide way is rectangular and symmetric V-shaped. Large V-shaped guide way 1 and rectangular guide ways 4 combine one group, which is used for longitudinal travel of saddle. Small V-shaped guide way 3 and rectangular guide ways 2 combine the other group, which is used for longitudinal travel of tailstock. Guide-way (for specification  $L \leq 5000\text{mm}$ ) is ground after medium-frequency quench. Bed guide way has features of high accuracy, good lasting accuracy, small friction, smooth movement, fine guidance and long service time.



DRAWING 5.1 BED STRUCTURE

### 6.1 Headstock features

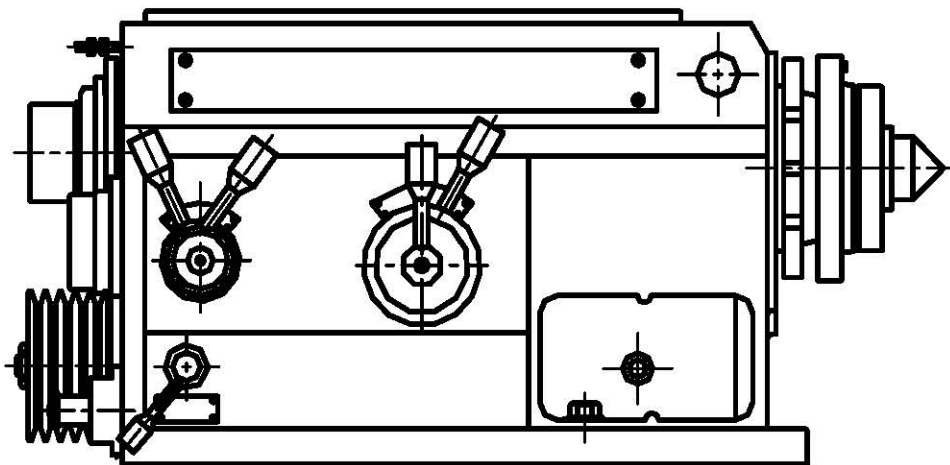
As drawing 6.1 shown, axes group in headstock are well arranged, which are easy for mounting, adjustment, control and maintenance.

Drive parts are located on optimum radial positions of spindle, and its axial locations are near to sensitive points, drive force has no effect on overhanging end of spindle, so spindle rigidity is greatly improved.

Spindle neck is thick, which guarantees good rigidity.

Spindle speed steps are very wide, so various technology requirements could be met.

Headstock adopts enclosed structure, which provides fine rigidity.



DRAWING 6.1 HEADSTOCK OUTLINE

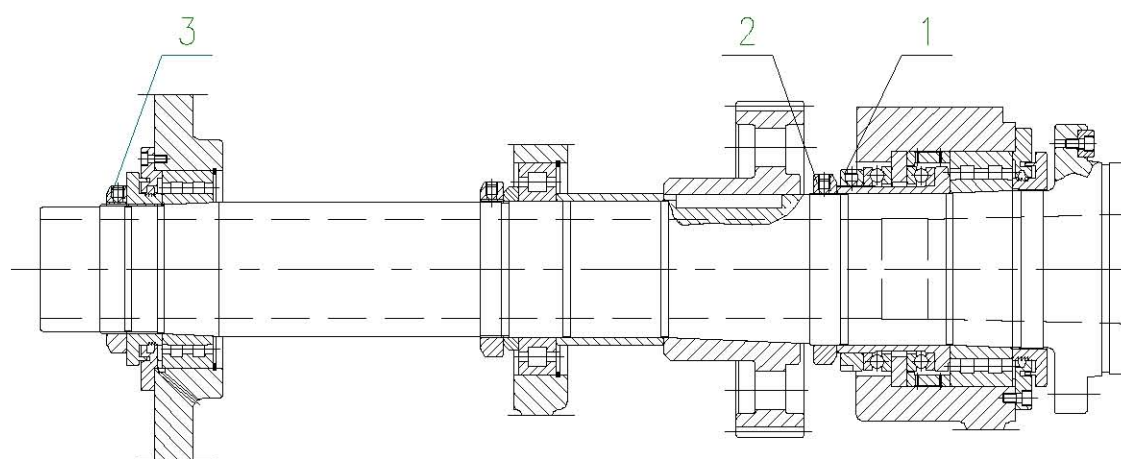
### 6.2 Spindle structure and its adjustment

Spindle structure is as drawing 6.2 shown. Spindle parts are mainly supported by

front and back supports, auxiliary supported by middle support. Front support includes bearing of 3182140 model and 2 bearings of 8144 model, which are respectively used for radial and axial positioning. And back support adopts bearing of 3182134 model for radial positioning. Middle support adopts bearing of 12736 model. With this kind of support mode, radial and axial rigidities and swiveling accuracy are well guaranteed, however, radial and axial backlashes should be adjusted respectively.

With nut 1, to adjust axial backlash of axial thrust bearing 8144. With nuts 2 and 3,

to respectively adjust radial backlashes of double-column cylindrical roller bearings NN3040kK and NN3034k used for front and back supports.



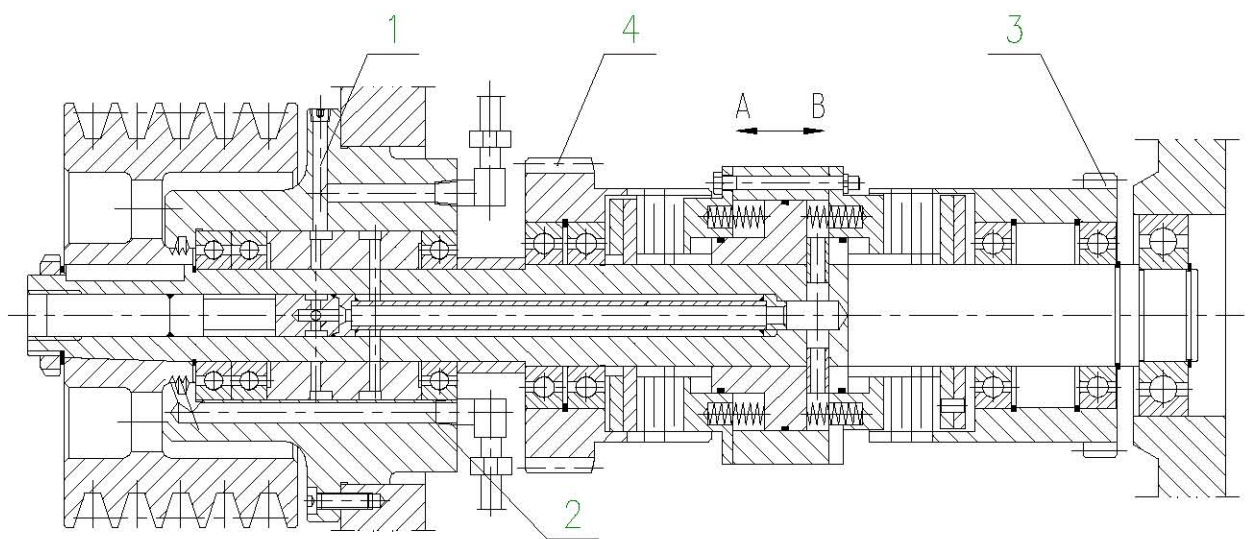
DRAWING 6.2 STRUCTURE OF SPINDLE WITH 3 SUPPORTS



Spindle end adopts short taper to position, which insures high positioning accuracy, Shorter overhang, fine rigidity and convenient mounting /dismount chuck.

### 6.3 Structure and direction shift of axis I

Axis I structure is as drawing 6.3 shown.



DRAWING 6.3      AXIS I STRUCTURE

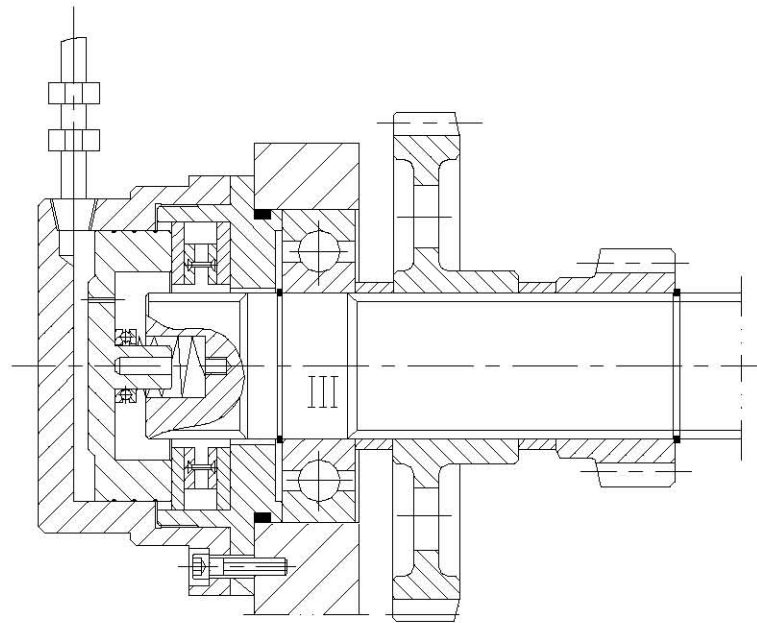
Axis I is mainly for speed change and direction shift of spindle, which is the first base group for spindle speed change. Spindle speed change is realized with sliding gears and multiple-disc clutch. Spindle speed range is very wide, and spindle speed change is easy, spindle could transmit strong power and torque.

Chapter 6	HEADSTOCK	Total 5
		Page 4
<p>Speed change and direction shift of axis I are controlled by mechanics, electrics and hydraulics. Forward and reverse rotations (or forward rotation at high speed) of spindle are realized as the following procedures: Firstly to pre-select with handle, then press button of control selector valve, and oil cylinder acts to press friction disc of axis I, then gears are driven.</p> <p>When speed-varying handle for forward and reverse rotation on front of headstock is in position of forward rotation, spindle could obtain 2 different speed of forward rotation: high speed 45/45 low speed 40/50</p> <p>It is as drawings 4.1 and 6.3 shown. When press button for forward rotation, oil inputs pipe1, cylinder moves toward direction B, then press friction disc to drive gear 3, so forward rotation of spindle at low speed is realized. When press button for reverse rotation, oil inputs pipe 2, cylinder moves toward direction A, then press friction disc to drive gear 4, so forward rotation of spindle at high speed is realized.</p> <p>When handle for shift of forward and reverse rotation on front of headstock is in position of reverse rotation, spindle could rotate forwardly or reverse. Hydraulic control for spindle is same as the above, when press button for forward rotation, spindle rotates forwardly, when press button for reverse rotation, spindle rotates reverse. In order to avoid disoperation, during forward rotation of spindle to change reverse rotation, firstly to press stop button, then press button for reverse</p>		

Chapter 6	HEADSTOCK	Total 5
		Page 5

Rotation, so spindle could rotate reverse.

#### 6.4 Brake device for spindle



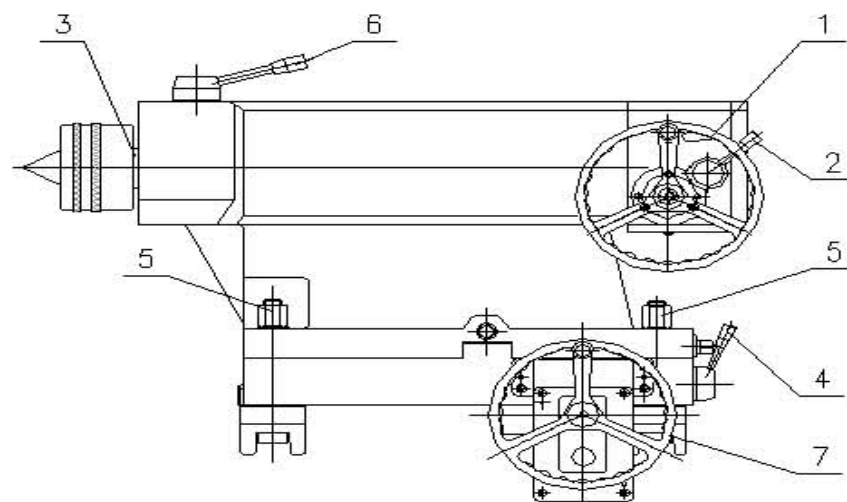
DRAWING 6.4 BRAKE DEVICE FOR SPINDLE

It is as drawing 6.4 shown. When brake device for spindle is on end of axis III, it adopts friction discs controlled by hydraulic control, it has features of sensitive brake, rapid speed, safe and reliability. When to brake spindle, firstly to press button for spindle stop, then turn rotary button to brake position, so spindle brakes automatically. Otherwise, spindle would not go on rotating for inertia until energy is used up. When spindle speed is over 160r/min, rotary button for brake should be turned intermittently, proceed brake in point-move mode, after spindle speed lowers, turn rotary button for brake to brake position, to do that could prevent axis III from sprain for powerful rotation inertia so as to lower service time of friction disc.

Chapter 7	TAILSTOCK	Total 2
		Page 1

### 7.1 Tailstock features

It is as drawing 7.1 shown. Axial travel of tailstock sleeve includes 2 steps of high and low speed. When handle 2 turns to 1:1 position, tailstock sleeve axially travels 8mm per revolution of handle 1. While handle 2 turns to 1:20 position, tailstock sleeve axially travels 0.4mm per revolution of handle 1.



DRAWING 7.1 TAILSTOCK OUTLINE

Taper bore of tailstock sleeve is Metric no.80, and with taper sleeve 3. Tailstock taper uses center of Morse no. 6 ( or tools for drilling, core-drilling or reaming). If to take out center, move tailstock sleeve backward, then screw would knock center out. If continue to move backward, stepped face of screw would knock taper sleeve 3.

When holding workpiece, in order to prevent tailstock and bed from relative sliding, blocking pin is mounted on tailstock support, screw down nut 5 to fasten

Chapter 7	TAILSTOCK	Total 2
		Page 2
<p>Tailstock on bed. When tailstock is holding workpiece, handle 4 of locking pin should point at that position where blocking pin could insert into rack of bed, at the same time, nut 5 and handle 6 for locking sleeve should be fastened.</p> <p>When tailstock need to travel longitudinally (especially mechanical rapid travel), firstly to screw off nut(looseness should be proper), and loosen handle 4 of locking pin and touch-stop stopper between saddle and tailstock, then travel tailstock mechanically.</p>		

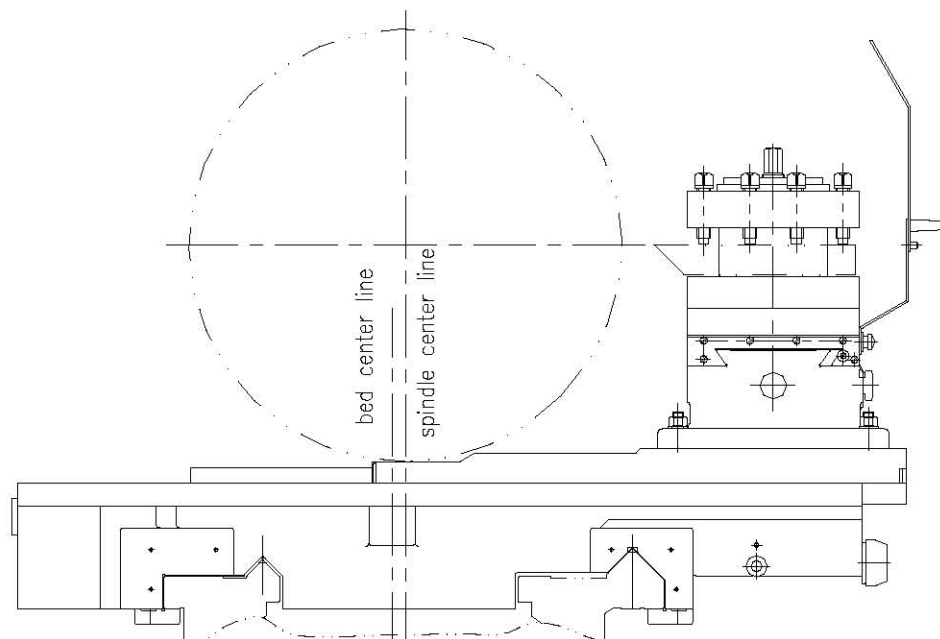
Chapter 8	SADDLE AND TOOL POST	Total 4
		Page 1

### 8.1 Features of saddle and tool post

Structure of saddle and tool post is as drawing 8.1 shown. Tool post of this machine has manual and mechanical functions.

Guide ways of saddle are coated with soft strip made of polyvinyl fluoride. So saddle has features of good anti-weariness, fine vibration absorption, smooth movement, easy and labor-saving operation.

Tool post adopts taper pin to position, which has features of simple structure, accurate positioning, reliability and high accuracy.



DRAWING 8.1 OUTLINE OF SADDLE AND TOOL POST

### 8.2 Mechanical taper-turning device

Top tool post could mechanical turn taper whose generating line length is less than 300mm, when turning this kind of taper, rotary angle of upper tool post

Chapter 8	SADDEL AND TOOL POST	Total 4
		Page 2

should coincide with taper of taper.

When taper length is more than 300mm, turning could be realized with combined motion of longitudinal feed of saddle and feed of top tool post. When turning this kind of taper, cover for crossed slot of single handle on right of apron should make rotation of  $45^\circ$ , to do that forms a included angle of  $45^\circ$  between direction of crossed slot and direction of longitudinal feed. Before rotating that cover stated above, spring pin on side of cover should be pressed firstly, after rotating to proposed position, spring would automatic spring up to position.

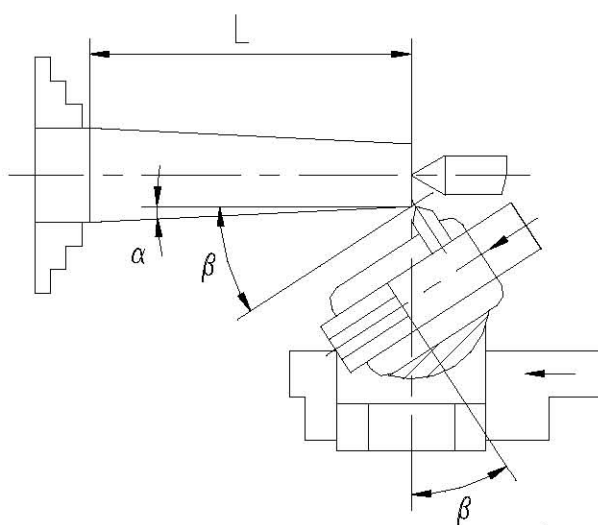
### 8.3 Calculation of angle of tool post and taper-turning length

It is as drawing 8.2 shown, calculation of angle  $\beta$  is as follows:

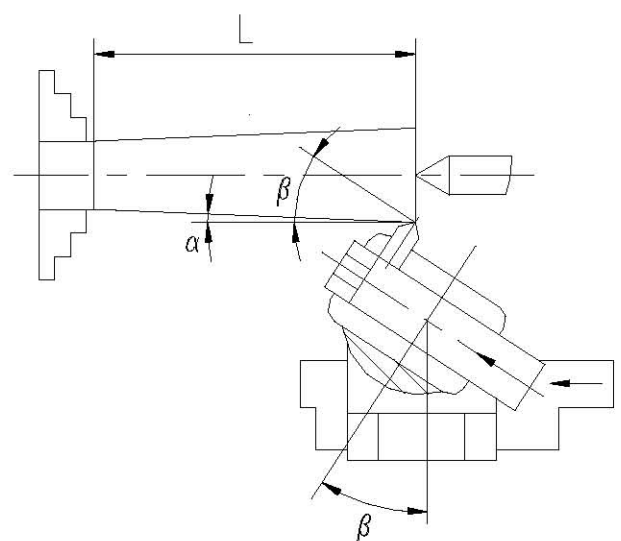
$$\beta = \arcsin(4 \sin \alpha) + \alpha \text{ (deg)} \dots \dots \dots \text{equation(1)}$$

Calculation of max. turning length after a tool setting:

$$L = 300 \times (4 \pm \cos \beta) \text{ (mm)} \dots \dots \dots \text{equation(2)}$$



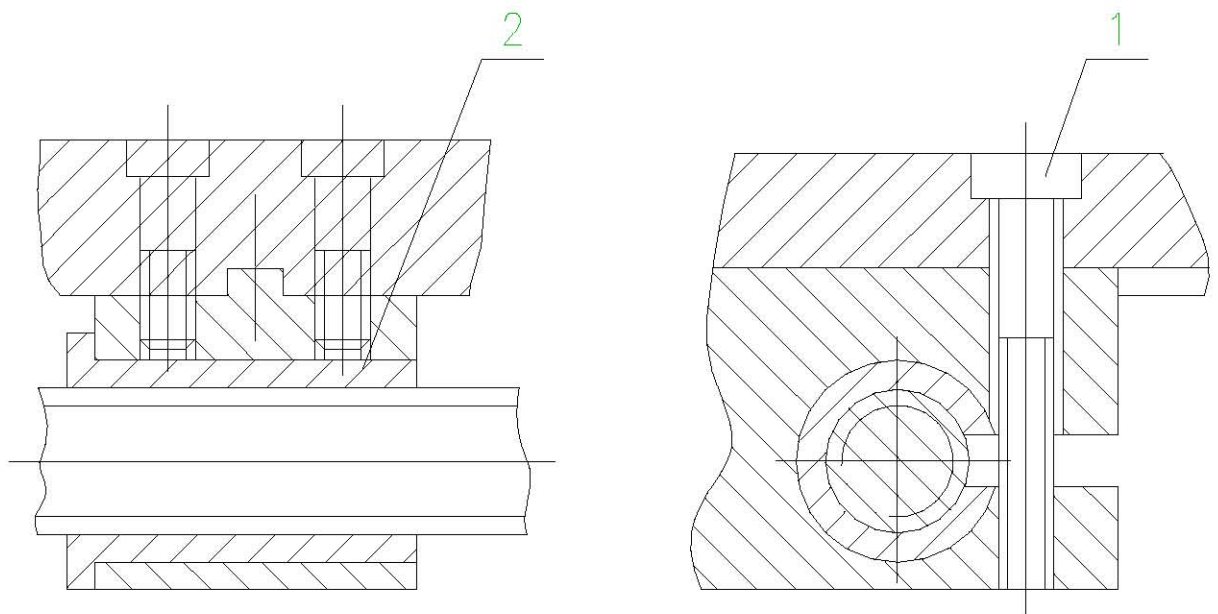
a. forward taper-turning



b. backward taper-turning

#### 8.4 Adjustment of nut clearance

It is as drawing 8.3 shown. Nut of lead screw on slide is split, when appear overlarge clearance for wear between lead screw and nut, fasten screw 1 to make nut 2 be with elastic deformation, so as to eliminate clearance between lead screw and nut.

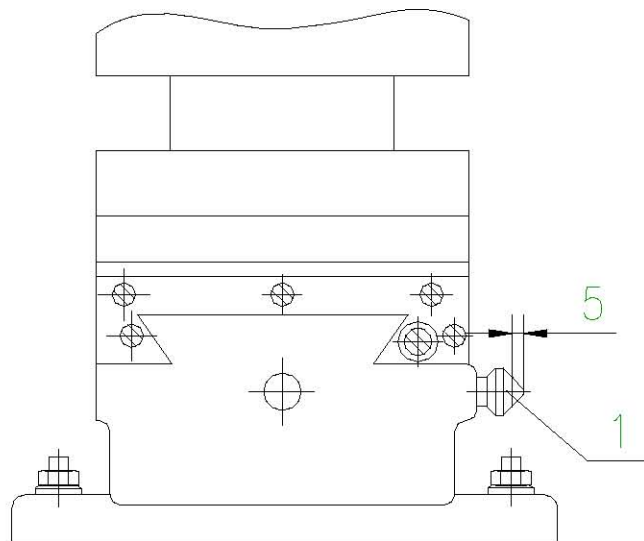


DRAWING 8.3 STRUCTURE OF SLIDE NUT



### 8.5 Shift between mechanical and manual feeds for top tool post

As drawing 8.4 shown, with rotary button 1 to change modes between mechanical and manual feed for middle tool post. When changing, pull rotary button 1 out about 5mm, and make a rotation of  $180^\circ$ , then rotary button automatically resets, tool post changes manual feed to mechanic feed.

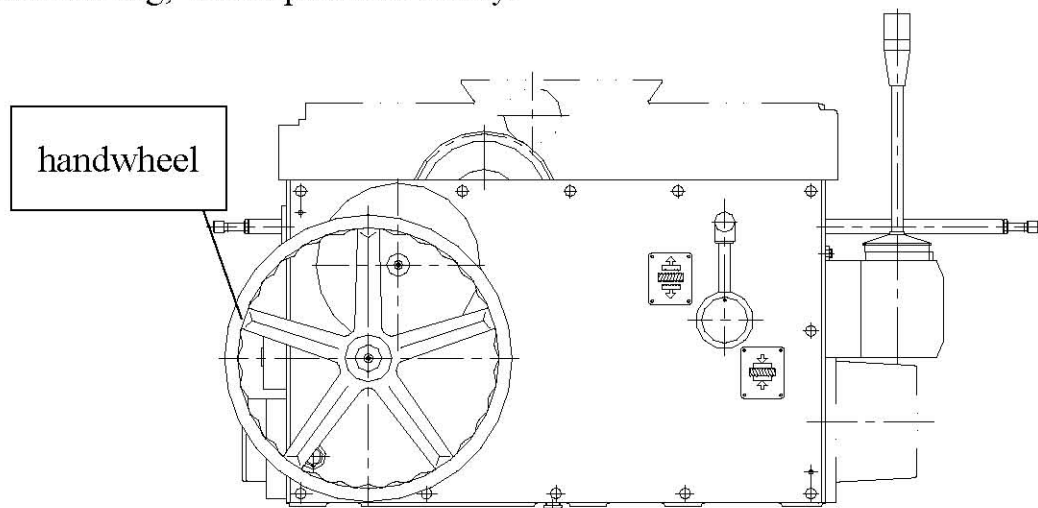


DRAWING 8.4 TOP TOOL POST

### 9.1 Apron features

Aprons of engine lathes of serial CWE are as drawing 9.1 shown, which have features of simple structure, flexible operation, safety and reliability.

Longitudinal/cross common/rapid feed are all controlled by single handle which could move around. One handle is used for controlling split nut. These two handles are interlocking, which provides safety.



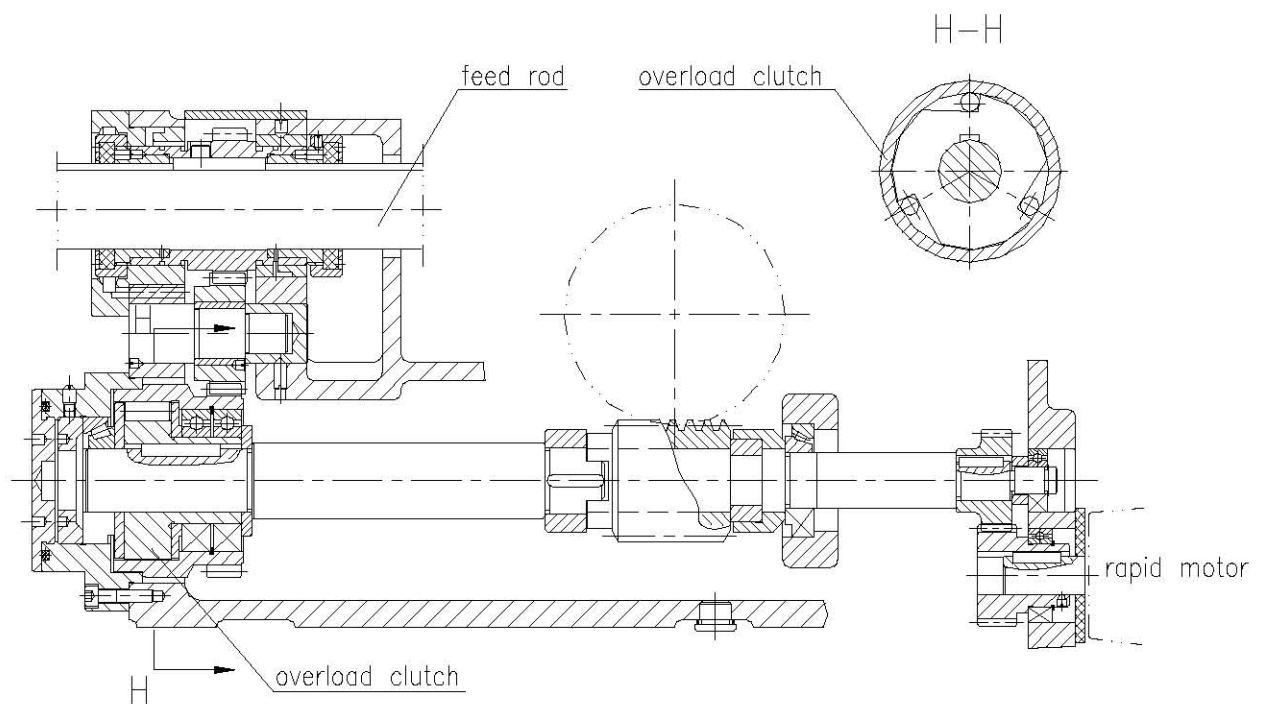
DRAWING 9.1 APRON OUTLIN

Notice: Don't reach your hand into the space of handwheel when the saddle movement quickly.

Chapter 9	APRON	Total 3
		Page 2

## 9.2 Rapid device of apron

Apron is with device for longitudinal /cross rapid travel, which is driven by single motor. In order to prevent feed system and rapid travel from interference, left of worm axis in apron case is mounted with overload clutch, as drawing 9.2 shown.

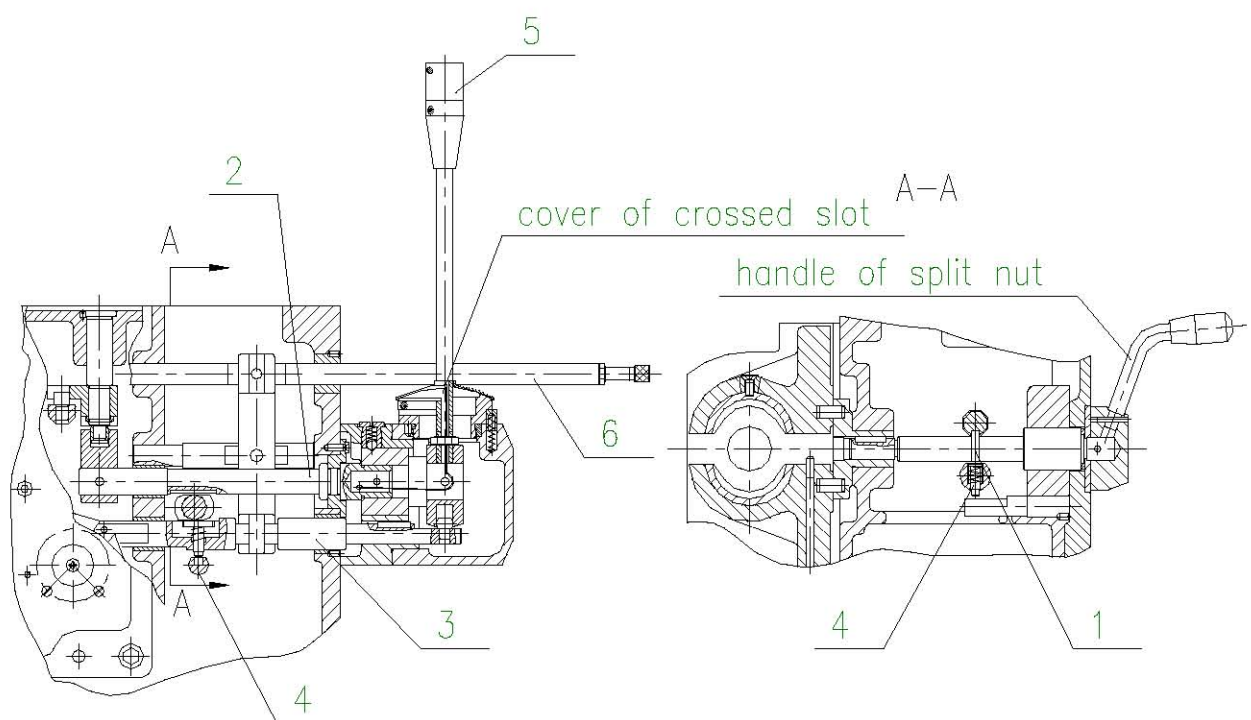


DRAWING 9.2 RAPID DEVIEC OF APRON

## 9.3 Interlocking device for lead screw and feed rod

In order to prevent lead screw and feed rod from rotating simultaneously, interlocking device is mounted in apron. As drawing 9.3 shown, when lead screw is connected and clasp nut is closed, cams on axis 1 are inserted into slots of axis 2 and axis 3 respectively, and pin 4 is inserted into slot. At the same time, single handle 5 could only be in middle of crossed slot, not travel about, so feed rod

could be locked. When single handle 5 is at any direction of crossed slot, because certain position of axis 2 or axis 3 offsets or rotates, then cams on axis 1 could not insert into slots of axis 2 and axis 3. Therefore, clasp nut could not close, the purpose for locking lead screw after having connected with feed rod is reached, which insures machine safety.



### DRAWING 9.3 INTERLOCKING DEVICE FOR LEAD SCREW AND FEED ROD

#### 9.4 Longitudinal limit device of apron

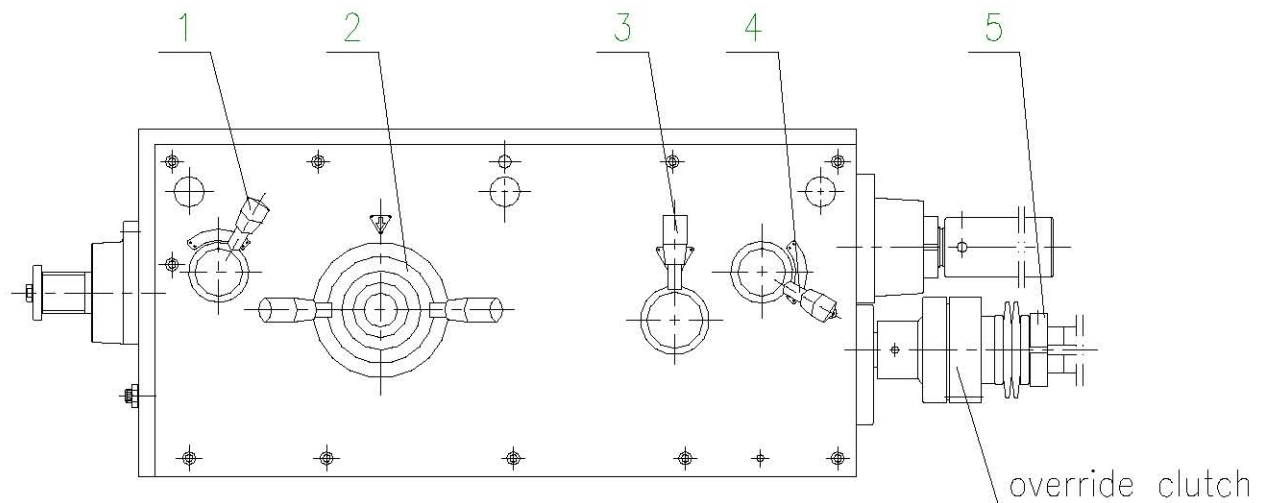
Place 2 movable stoppers before and behind of saddle, then use 2 socket head screws to fasten stoppers on v-shaped guide ways of bed.

When apron feeds or moves backward, touch-stop stick 6(drawing 9.3) contacts with stopper, then push lever in apron and make feed handle 5 reset, so limit travel and safety are reached.

Chapter 10	FEEDBOX	Total 2
		Page 1

### 10.1 Feedbox features

Feedbox of engine lathe of CWE serial adopts device of double-axis sliding gears, Among them, 8 gears for pitch modulation, 4 basic gears, so this kind of gearbox has wide pitch range. Basic group is controlled by cam, it has features of easy operation, the smallest travel for sliding gears, regular serial pitches. Feedbox adopts case-shaped structure, which insures strong rigidity and fine technique. See drawing 10.1.



DRAWING 10.1 FEEDBOX OUTLINE

- 1----- handle for shift between metric and inch threads      2-----handle for adjusting pitch and feed rate      3---- handle for adjusting pitch and feed rate  
 4----- handle for connecting feed rod/lead screw      5-----adjusting nut

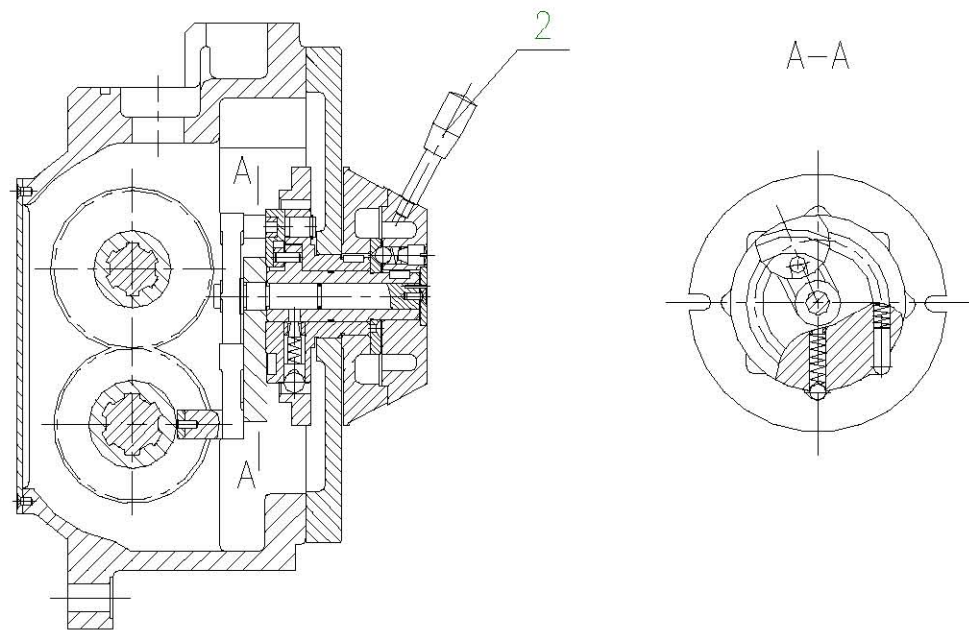
Thread kind change adopts double change device of sliding gears device and change gears, which features of simple structure and high drive accuracy. Gear change equations are as follows:

Metric thread:  $J = tz/IT$  equation(3)

Module thread	$J=\pi m z / I T$	equation(4)
Inch thread	$J=25.4 z / I T N$	equation(5)
Diametral pitch thread	$J=25.4 \pi z / I T P$	equation(6)
<div> <div>J – transmitting ratio of change gear</div> <div>N-thread number of workpiece per inch</div> <div>T –lead screw pitch(mm)</div> <div>P- diametral pitch of workpiece</div> </div> <div> <div>I-feed transmitting ratio</div> <div>m-module(mm)</div> <div>Z-number of threads</div> <div>t- workpiece pitch (mm)</div> </div>		

10.2 Adjustment of thread and feed rate

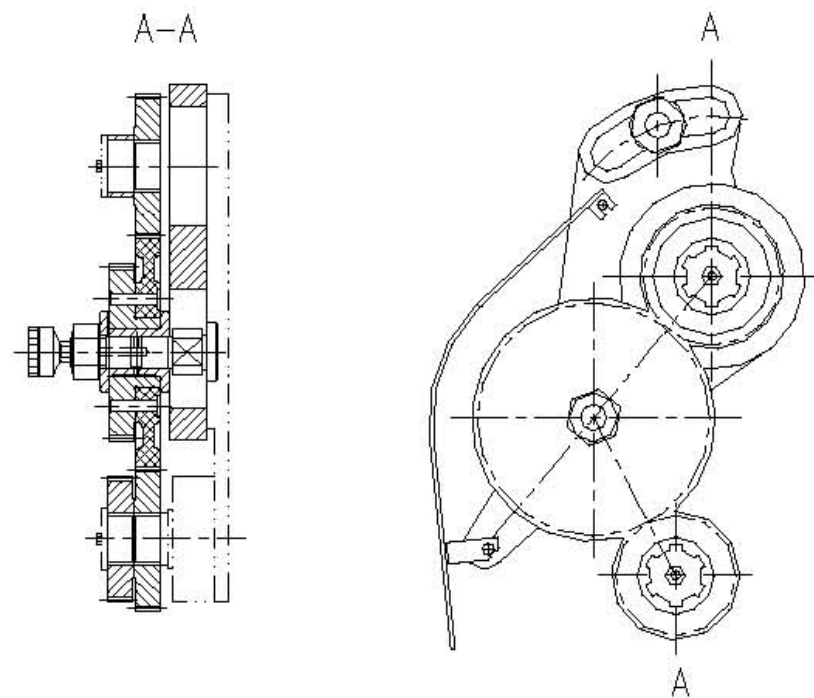
It is as drawing 10.2 shown. Firstly anticlockwise turn handle 2 until the proposed position on nameplate of handle housing points to indicating mark on cover, then clockwise turn handle 2 about 2~3 degree. With combination of handles 1,3 and 4 (see drawing 10.1), various pitches and feed rate could be reached. How to change various thread specifications and feed rate refers to table 18.2 in this manual. And how to adjust change gears used for thread and feed see table 11.1.



DRAWING 10.2 ADJUSTMENT FOR THREAD AND FEED RATE

## 11.1 Change gear device

Change gears not only transmit feed force source, but also turn various threads. See drawing 11.1.



DRAWING 11.1 CHANGE GEAR

## 11.2 Arrange of change gears for various threads and feeds, please see table 11.1

change gears for metric(mm), inch(")thread and common feed rate (S)			change gears for module(m $\pi$ ), diametral pitch (D,P) thread			change gears for refining feed rate (refined rate : 0.645)		
CW61100E	CW61125E	CW61140E	CW61100E	CW61125E	CW61140E	CW61100E	CW61125E	CW61140E



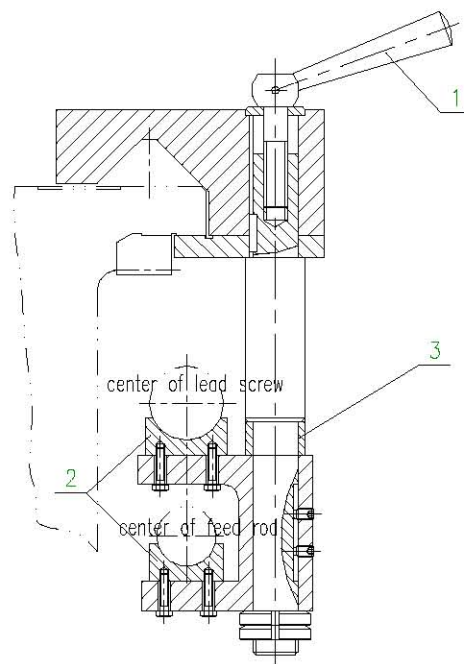
CHAPTER 12	SAFETY PROTECTION	Total 1
		Page 1
<p>1. In apron is mounted with touch-stop device(see drawing 9.3). During apron travels, when touch-stop stick touches stopper fastened on bed, push lever in apron to reset feed handle, so feed stops. This device not only takes effect of terminal protection, but also limits travel for cutting, and positioning accuracy is within <math>\pm 1\text{mm}</math>. In every possible way to avoid use of this device when apron rapidly travels, so as to improve its service life.</p> <p>2. There is overload clutch between feedbox and feed rod(see drawing 10.1), it is used for transmitting torque with friction disc. When load is overlarge, friction disc slips, feed rod stops, so system safety is insured. With adjusting nut 5 to adjust torque transmitted from overload clutch.</p> <p>3. In order to insure safety when turning thread, bakelite wheel is mounted on change gear device. When thread-turning is overload, bakelite wheel is broken, and drive train from headstock to feed is cut off, so system safety is guaranteed.</p> <p>4. On tool post is mounted with cutting protector, it protects operation from scalding stemmed from iron chip. Operator may adjust its position according to real situation.</p> <p>5. On electric cabinet is mounted with power-cut-off device interlocking with mechanics when opening door of electric cabinet.</p>		



This bracket is user for supporting lead screw and feed rod of lathe longer than 5m.

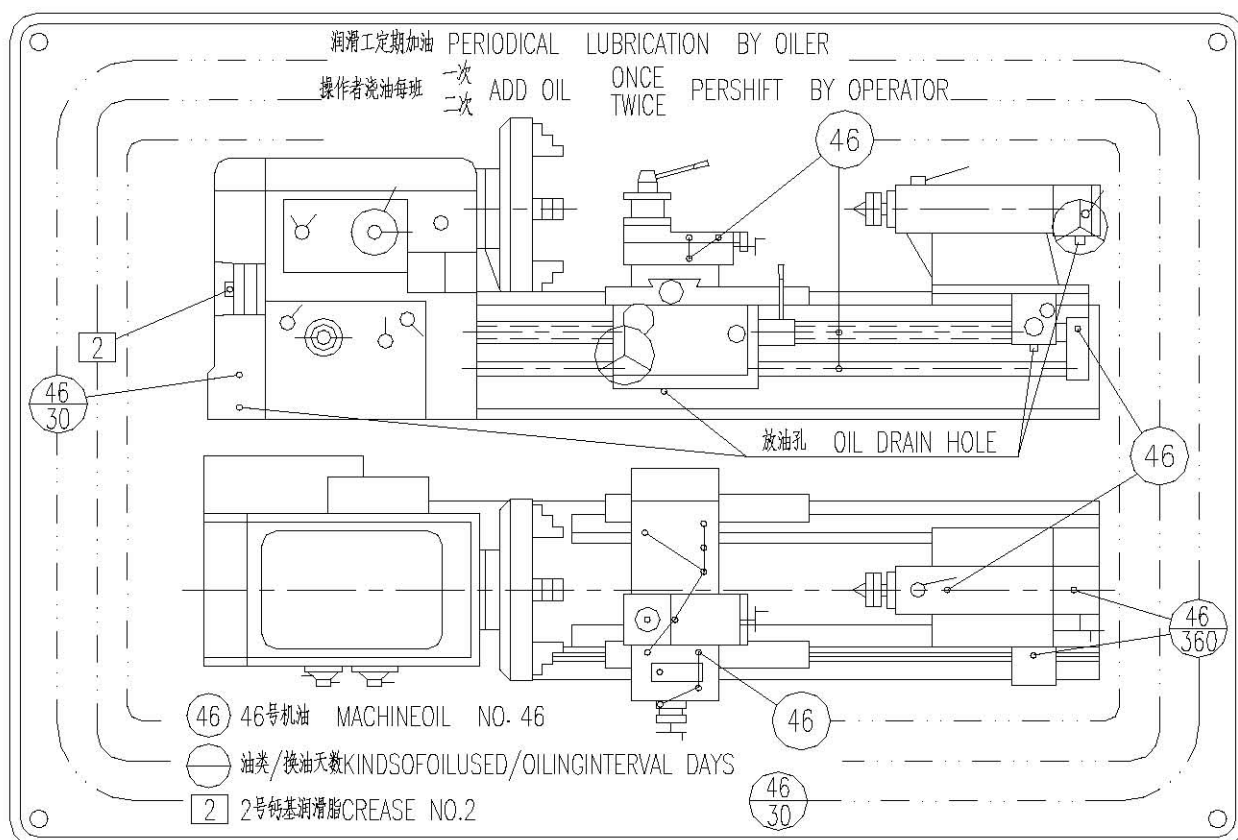
This bracket is positioned by rectangular guide way, two bushes support lead screw and feed rod, it is as drawing 13.1 shown. When rotate handle 1, workpiece 2 may move up and down, then support and release lead screw and feed rod. In case of withdrawing bracket from bed, rotate handle 1, until workpiece 2 lower 20mm to withdraw bracket.

In case bush in this bracket wears, operator may adjust backlash between bush and lead screw/feed rod with adjusting length of workpiece 3. Therefore, this bracket features of easy operation and convenient maintenance.



DRAWING 13.1 MANUAL BRACKET STRUCTION

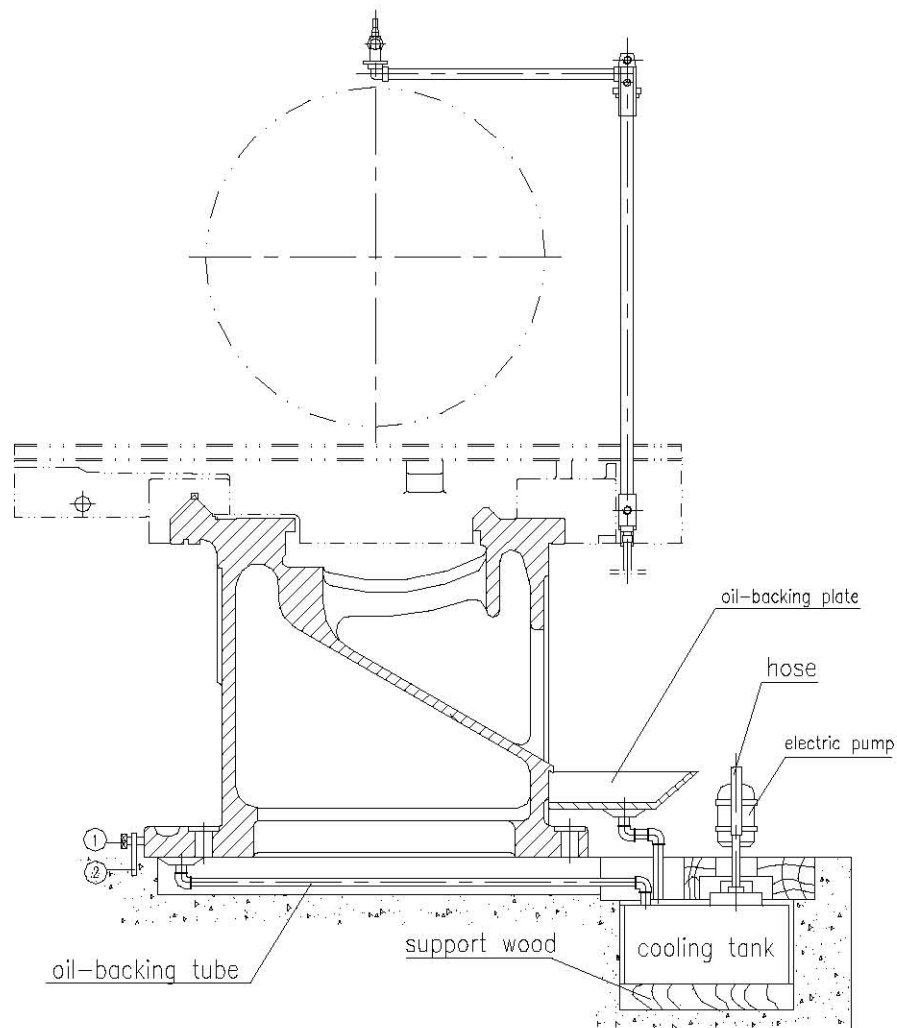
Lubrication system of this system adopts external-circulated forced lubrication, oil mist lubrication and oil-input lubrication(including input grease). In order to improve service life of machine and insure normal operation of machine, operator must regularly input oil and change oil according to drawing 14.1.



DRAWING 14.1 MACHINE LUBRICATION

Cooling system of this machine includes coolant tank, electric pump, soft and hard tubes, valve, nozzle and so on.

Because of oil-backing tube is buried under the earth, and coolant tank beside machine is also under earth, so working environment is easily to remain cleanness, see drawing 16.1.



DRAWING 16.1 MACHINE FOUNDATION AND OIL-BACKING TUBES

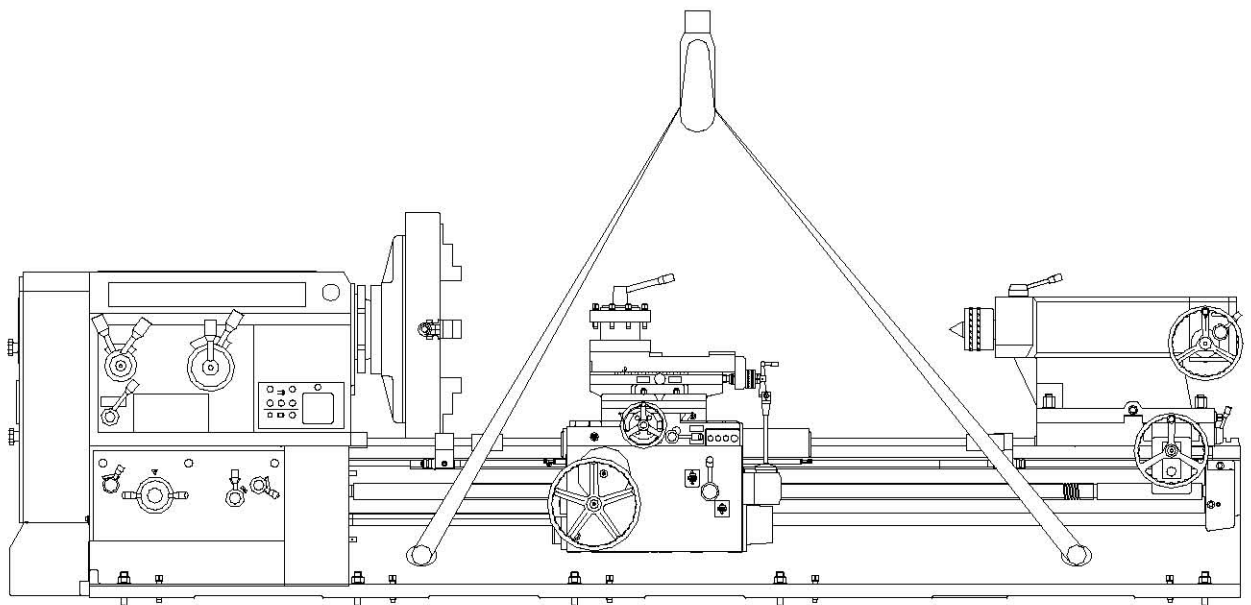
CHAPTER 16	COOLING SYSTEM	Total 3
		Page 2
<p data-bbox="252 300 715 338">16.1 Coolant usage instruction</p> <p data-bbox="252 383 1517 674">Coolant tank includes two cavities for coolant and pump. Coolant filter screen could be easily drawn out for cleanness. Furthermore, on inlet of cooling pump is also mounted with filter. The filter screen and filter should be timely inspected and cleaned after some time of usage.</p> <p data-bbox="252 712 1517 840">Observe the coolant gauge on front of coolant tank. When coolant lowers, please add coolant timely.</p> <p data-bbox="252 878 1517 1086">When coolant is polluted, please timely change. Demount the plug on the bottom of coolant tank to expel the waste coolant, and clean tank, then pour in new, clean coolant.</p> <p data-bbox="252 1124 858 1171">16.2 Usage instruction on cooling pump</p> <p data-bbox="252 1209 863 1256">16.2.1 Direct pump start at rated voltage</p> <p data-bbox="252 1294 1337 1341">16.2.2 Pump continuous operates at rated power in case of the situation:</p> <p data-bbox="252 1379 890 1426">16.2.2.1 Sea level is not more than 1000m</p> <p data-bbox="252 1464 1182 1512">16.2.2.2 Cooling medium temperature is not more than +40°C</p> <p data-bbox="252 1550 1066 1597">16.2.2.3 The driven load is not more than rated power</p> <p data-bbox="252 1635 1517 1843">16.2.3 Before operation, please inspect whether the insulation resistance between the electric pump winding and earth, and between windings is low than 10MΩ. If low, please dry it.</p> <p data-bbox="252 1881 1326 1928">16.2.4 Pump should be stored in dry store against harmful air intrusion.</p>		

CHAPTER 16	COOLING SYSTEM	Total 3
		Page 3
<p>16.2.5 Pump should be at clean state, bearing should be cleaned one time each year, and lubrication grease should be relative changed.</p> <p>16.2.6 Pump mainly transfers soap water, soda water, milky coolant, light mineral and other liquid without serious corrosion.</p> <p>16.2.7 If abnormal phenomena such as over-low flow, and mistaken rotation direction appears when pump operates, please stop pump and insect.</p> <p>16.2.8 Before operation inspect whether rotating shaft is flexible or vane collision</p> <p>16.2.9 Pump rotation direction should coincide with arrow-head direction. If contrary, please adjust power wire connection.</p> <p>16.2.10 Please release heat that is not harmful for motor.</p>		

### 17.1 Transportation of machine

When lifting case with machine with lifter, steel wire should be used as mark on case. When transporting and lifting, bottom and side of case should be against overlage vibration. When demounting case, operator should inspect external situation of machine, and inventory attachments and tools as packing list of this Machine.

When lifting machine, steel rod of  $\phi 80 \sim \phi 90\text{mm}$  thick, 1500~1800mm long should insert into lifting holes on two sides of bed respectively, then hang steel wire from steel rod, and place soft wood between steel wire and machine. When lifting machine, operator should travel saddle to adjust machine balance.

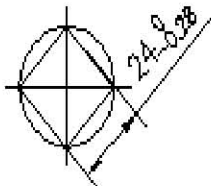
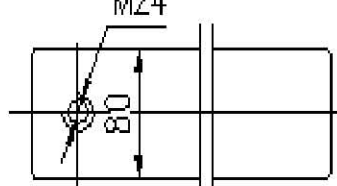
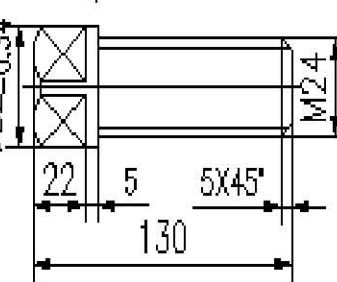
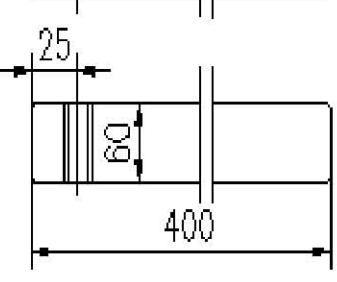


DRAWING 17.1 MACHINE LIFTING

## 17.2 Machine installment

When max. workpiece length is less than 5m, side-holding and raiser block are unnecessary, what is needed is to place a steel plate of 60mm x 60mm x 10 mm under each adjustable screw. When max. workpiece length is more than 6m, side-holding block should be beside bed. When max. workpiece length is more than 8m, raiser block is necessary.

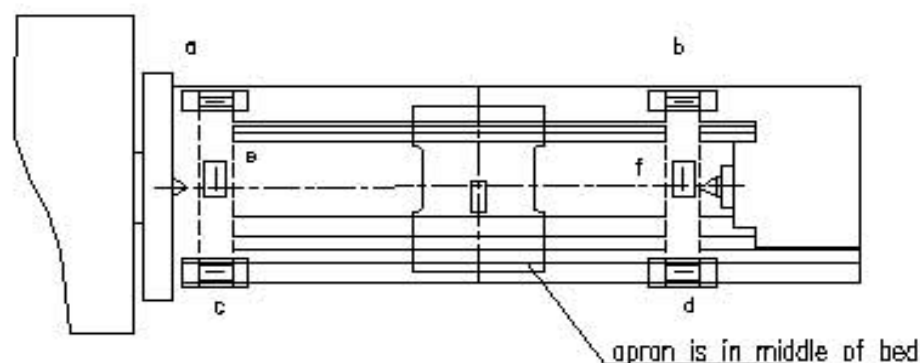
Side-holding block is as drawing 17.2 shown. Workpieces of 1 and 2 should be made by user according to drawing 17.3.

part no.	material		part no.	material	
1	45		2	45	
specification	6m ~ 14m		specification	6m ~ 14m	
amount	N		amount	N	

DRAWING 17.2 WORKPIECE FOR MOUNTING

CHAPTER 17	MACHINE TRANSPORTATION, INSTALLMENT AND TEST RUN	Total 5 Page 4
<p>Before delivery, machine has passed through all inspection and test. Because correct installment directly affects machine accuracy, operator should notice the followings: when installing machine, foundation should be done firstly as requirement in drawing 17.3(foundation depth is dependent on local earth quality), and oil-backing tube should be installed. Then place adjustable raiser block or backing plate in proper place of foundation, and place machine on foundation, and level with leveler of 0.02/1000mm as requirements in drawing 17.4 . Leveler for ab should be placed on plain guide way, and its readout should be less than 0.08/1000mm. Leveler for cd should be placed on straddle supporter, and its readout is no more than 0.08/1000mm. Leveler for ef should also be placed on straddle supporter(straddle supporter is straddling on guide ways for saddle), and its readout is no more than 0.06/1000mm. If not up to standard, adjust machine with anchor screw. If still not up to standard, inspect linearity of relative guide way and spindle parallelism, till accuracy is up to defined allowance of acceptance certificate. Then uniformly screw down anchor screw, then clean surroundings of foundation, and cover cooling tank with wood board.</p>		





**DRAWING 17.4 INSPECTION OF INSTALLATION ACCURACY**

#### 17.4 Machine test run

After finishing installment, operator should clean away anti-rust grease with kerosene and cotton yarn, and coat anti-rust grease on each machining surface. To scrape machine with emery cloth or hard article is not allowed. Before test run or operating machine, operator should carefully know machine structure, how to control and lubrication instruction, manual inspect working state of each device, inspect whether electric system is good. After switching-in of power( pay more attention to rotary direction of motor), operator should inspect working state of each device in case of idle running. After confirming everything is normal, operator may operate machine.

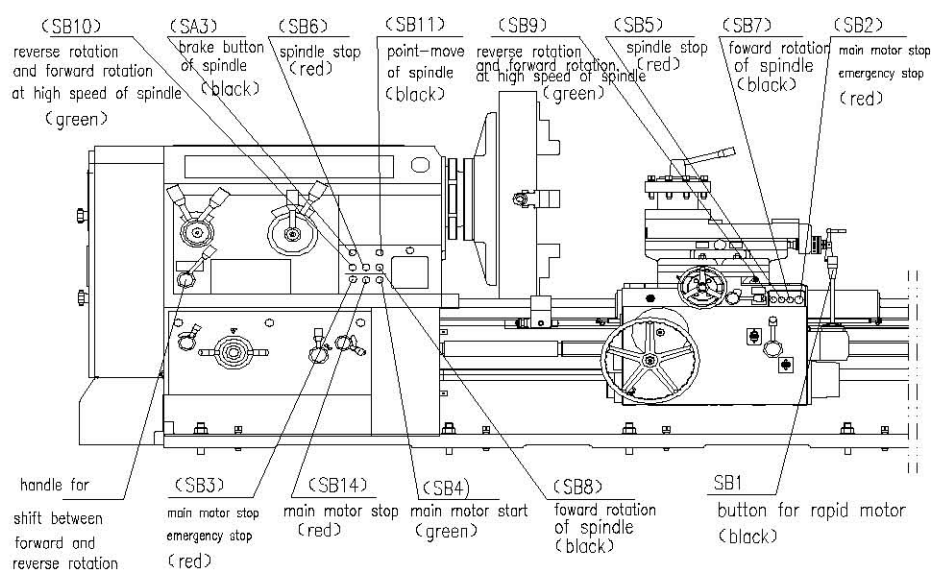
CHAPTER 18	ADJUSTMENT OF MACHINE SPEED AND FEED RATE	Total 3
		Page 1
<p>Speed change of spindle is reached by combination of buttons and handles on headstock, relationship between spindle speed and work capacity sees table 18.1.</p> <p>Change of various threads and feed rate is reached by combination of handle for coarse pitch, shift handle for left and right threads on headstock, and handles on feedbox. For detailed information refers to table 18.2.</p>		

CHAPTER 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 1
<p data-bbox="252 300 804 338">19.1 Instruction on electric control</p> <p data-bbox="252 383 1509 674">This machine uses power of 60Hz, 3 phases and 440V. Power inlet should adopt BVR 3x16mm<sup>2</sup> (black soft wire of polyvinyl chloride). Copper core wire of 10mm<sup>2</sup> for earthing protection connects with earthing bolt outside the electric cabinet. Control power is 110V, power for electromagnet is 24V.</p> <p data-bbox="252 714 1509 1173">Main motor M1 adopts Y-<math>\Delta</math> starting mode, after operating main motor M1, electromagnetic selector valves of YA1 and YA2 control correspondent spool valves to make spindle forward, reverse rotate by pressing buttons for forward and reverse rotation. When press button for spindle stop, electromagnetic selector valve YA3 controls spool valve to realize spindle brake (when rotary button SA3 for brake is in position of brake).</p> <p data-bbox="252 1214 1509 1673">When handle for shift of forward, reverse rotation on front of headstock is in position of forward rotation(see drawing 19.1), high-speed forward rotation could reach without stopping running(not press stop buttons of SB5 or SB6, directly press button SB9 or SB10 for reverse rotation). When spindle stops, with master switch (rotary button SA3 for spindle brake) to select which state spindle is in (brake of release).</p>		

With button SB1 on longitudinal and cross feed control handle of apron, rapid travel of saddle or tool post can be realized. Red mushroom buttons SB2 and SB3 for emergency stop on operational panel of headstock and saddle are for emergency state and stop in case of accident.

### 19.2 Instruction on electric operation

Operational procedure for electric system refers to drawings 19.2 and 19.3. Firstly, switch on main power switch QF1 on left-up of electric cabinet, then switch on oil pump switch QF2 on right side of electric cabinet to make oil pump operate normally. And press button SB4 for main motor to start main motor. When to stop main motor, press buttons SB14.



DRAWING 19.1 CONTROL BUTTONS

CHAPTER 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 3
<p>According to work requirements, press button SB7 /SB8 for forward rotation of spindle or button SB9/SB10 for reverse rotation to select work state. Turn handle for shift between forward and reverse rotation on front of headstock to make it be in position of forward rotation, then press button for high-speed forward rotation of spindle (same as button of SB9 or SB10 for reverse rotation) to forward rotate spindle at high speed without stopping. When handle for shift between forward and reverse rotation is in position of reverse rotation, press button SB7 or SB8 for forward rotation of spindle to make spindle forward rotate, press button SB9 or SB10 for reverse rotation of spindle to make it reverse rotate. If to shift between forward rotation and reverse rotation, operator must press stop button SB5 or SB6 firstly, then press button for reverse rotation to make spindle reverse rotate.</p> <p>If to stop spindle, firstly press button SB5 or SB6 for spindle stop, then make rotary button SA3 be in brake position, so spindle brakes and stops.</p> <p>Press button SB11 for point-moving of spindle to make it point move.</p> <p>Generally speaking, rotary button SA3 for spindle brake should be in position of brake.</p> <p>In case of accident, press emergency stop button SB2 or SB3 to cut off power of main motor and rapid motor, and forced brake spindle.</p>		

CHAPTER 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 4
<p>Tailstock is electric. Electric tailstock is equipped with small operational panel; SB12 and SB13 control forward and backward point moving of tailstock respectively.</p>		

CHAPTER 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 7

### 19.3 Instruction on electric protection

Electric cabinet is with cutting off power supply by mechanic interlock when opening door of electric cabinet.

Automatic air switches of main power and oil pump motor are with thermal release and electromagnetic release protecting devices, which are used for avoiding short circuit and overload.

Fuse in electric circuit is for avoiding short circuit.

Main motor is with thermal relay to avoid overload.

Travel switch SQ1 could cut off power supply of electric cabinet on back of machine headstock when opening door of electric cabinet (when the door of electric cabinet is open, main motor could not start).

Considering this machine is export product ,so it is required to add proper dryer in electric cabinet for long-distance marine transportation.

### 19.4 Main elements of electric system

This machine adopts universal electric products, tables 19.1 and 19.2 respectively list main electric elements mounted in machine and electric cabinet, which is convenient for user' s maintenance and spares storage.

Chapter 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 8

Table 19.1 Electric elements mounted on machine

serial no.	name and application	amount	model and specification	supplier	remark
HL1	signal lamp	1	AD16-22D/WH26K; 110V; pure white	Shanghai ergong	for headstock
PA	ampere meter	1	KLY-T144-80/5A.2 80A	Shanghai Kangbili	for headstock
SB1	rapid button	1	LA9 black	changjiang electric	for saddle
SB2	button for emergency stop	1	XB2BS8445C red muchshroom-shaped head	Schnider	for saddle
SB3	button for emergency stop	1	XB2BS8445C red muchshroom-shaped head	Schnider	for headstock
SB4	button for main motor start	1	ZB2BA3C green	Schnider	for headstock
SB5	button for spindle stop	1	ZB2BA4C red	Schnider	for saddle
SB6	button for spindle stop	1	ZB2BA4C red	Schnider	for headstock
SB7	button for forward rotation of spindle	1	ZB2BA2C black	Schnider	for saddle
SB8	button for forward rotation of spindle	1	ZB2BA2C black	Schnider	for headstock
SB9	button for reverse rotation of spindle	1	ZB2BA3C green	Schnider	for saddle
SB10	button for reverse rotation of spindle	1	ZB2BA3C green	Schnider	for headstock
SB11	button for point-move of spindle	1	ZB2BA2C black	Schnider	for headstock
SB14	button for main motor stop	1	ZB2BA4C red	Schnider	for headstock
SA3	rotary button for spindle brake	1	XB2BD25C black	Schnider	for headstock
SB12, 13	button for tailstock forward/backward	2	ZB2BA2C black	Schnider	for tailstock
M1	main motor	1	Y200L2-6; B3; 22kW	Jiaxing	
M2	cooling pump motor	1	JCB-45; 0.15kW, 45L/min	Nantong	
M3	oil pump motor	1	YS-8014; B14; 0.55kW	Dalian yong chen	
M4	rapid motor	1	YDJ90L-4; B5; 1.5kW	Dalian yong chen	
M5	tailstock motor	1	Y90S-6; B5; 0.75kW	Jiaxing	
YA3	electromagnetic valve	1 set	SWH-G02-C4-DC24V-20	Taiwan Vitory	
YA1, 2	electromagnetic valve	1 set	SWH-G02-B2-DC24V-20	Taiwan Vitory	
EL1	lighting lamp	1	JC36-B	Shanghai Xinhua	
	bulb	1	H3/24V, 50W		
SQ1, 2	travel switch	2	XCK-P102	Schnider	



Chapter 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 9

Table 19.2 Electric elements mounted in electric cabinet

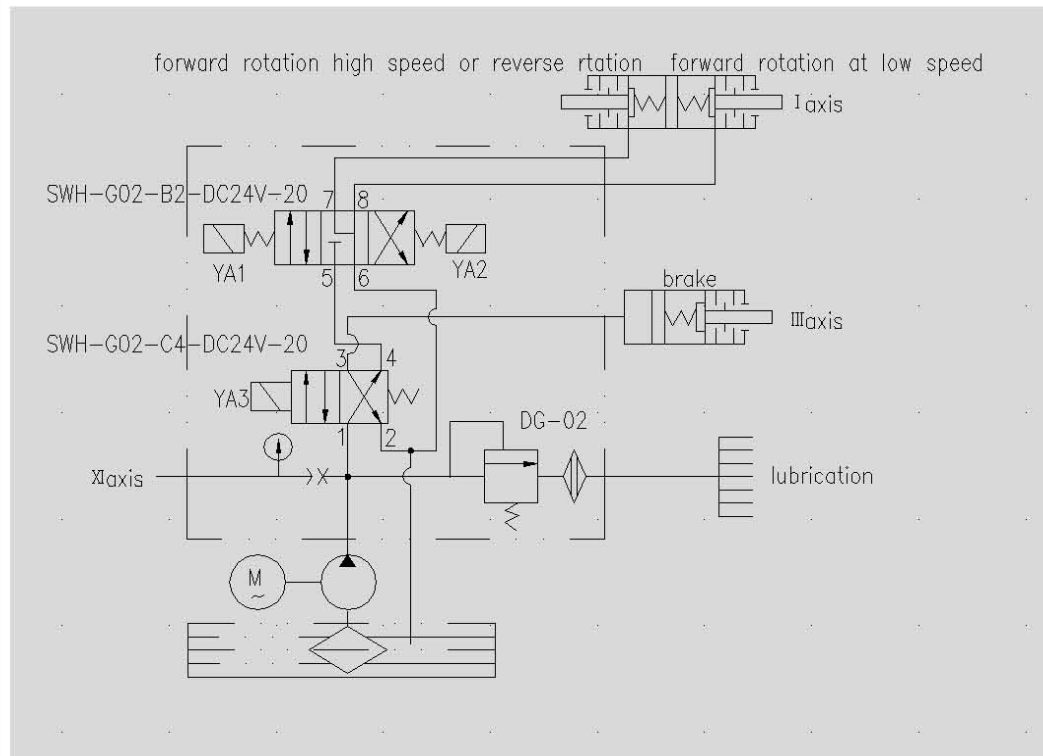
serial no.	name and application	amount	model and specification	supplier	remark
QF1	automatic air switch (power supply switch)	1	NSD100E/100 AX ERH AC440V,60HZ, 75A	Schnider	
QF2	automatic air switch (oil pump switch)	1	M611 AC440V, 60HZ; 1~1.6A	Shanghaiyuefeng	
QF3	automatic air switch	1	GV2-M07C air switch 1.6~2.5A	Schnider	
QF4	automatic air switch	1	GV2-M08C air switch 2.5~4A	Schnider	
QF5	automatic air switch	1	GV2-M04C air switch 0.4~0.63A	Schnider	
TC	control transformer	1	JBK3-630 ; 440V/220V 110V/24V; 110V, 260VA ; 220V,210VA; 24V, 160VA	Shanghaiyuefeng	
SA1	switch group	1	HZ5-10/1.7 ; L02 ; 10A	3-pole Shanghaiyuefeng	for cooling pump
SA2	switch group	1	HZ5-10/1.7 ; L01 ; 10A	2-pole Shanghaiyuefeng	for lighting
KM1	AC contact	1	LC1-4011F7C coil voltage AC110V 60HZ	Schnider	for control of rapid motor
KM2.3.4	AC contact	3	LC1-0901F7C coil voltage AC110V 60HZ	Schnider	for control of main motor
KM5.6	AC contact	2	LC1-5011F7C coil voltage AC110V 60HZ	Schnider	for control of tailstock motor
KA1.2.3	intermediate relay	3	CA2-DN22FC coil voltage AC110V 60HZ	Schnider	
FR1	thermal relay	1	LR2-D2353C( 23-32A)	Schnider	for main motor protection
KT	control relay	1	CA2-DN22FC AC110V 60HZ	Schnider	for combination
	auxiliary contact for time delay	1	LA2-DT2C 0.1~30S	Schnider	
	auxiliary contact	1	LA1-DN22C	Schnider	
	auxiliary contact	1	LA8-DN11C	Schnider	
QF6	single-pole air switch	1	C65-1P 4A AC24V 60HZ	Schnider	
QF7	single-pole air switch	1	C65-1P 4A AC220V 60HZ	Schnider	
QF8	single-pole air switch	1	C65-1P 4A AC110V 60HZ	Schnider	
TA	mutual current induction	1	KLY-P62/30-80/5A	Shanghai Kangbili	
	24V regulated power	1	S-100-24 4.5A	Taiwan Mingwei	

CHAPTER 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 10
<p>19.5 Common failure and removal</p> <p>1) Switch in QF1, machine gets power, HL1 power indicator brightens, then all air switches switch in, machine can work. If indicator brightens, machine control button does not response, inspect whether the door of electric cabinet on back of headstock is closed or not (because the travel switch SQ1 in electric cabinet door could power off when open electric cabinet door). If electric cabinet door has already closed, inspect whether air switch QF2 for oil pump motor is closed or not.</p> <p>2) After some period of oil pump motor operation, QF2 switches off, which might be caused by overload of oil pump motor. Please inspect whether oil circuit and electromagnetic valve is plugged up.</p> <p>3) Air switch QF5 of cooling motor has already switched in, while cooling motor does not work. Inspect whether rotary button SA1 on electric cabinet is switched in or not.</p> <p>4) If single-pole air switches QF7, QF8 have already switched off, it might be caused by short circuit in control circuit. Please inspect control circuit.</p> <p>5) Each button could take effect only if switch in emergency stop buttons SB2 and SB3 .If emergency situation appears, Please press emergency stop button.</p> <p>6) If buttons SB12 and SB13 no response, inspect whether air switch QF3 for tailstock motor is switched in or not, single-pole switch QF8 on transformer is switched in or not, and emergency stop buttons SB2 and SB3 are switched in or</p>		

CHAPTER 19	ELECTRIC SYSTEM AND ELECTRIC DEVICE	Total 11
		Page 11
<p>not .If all these above requirements are meted , it is still no response after press SB12/SB13, please inspect whether contact KM5/KM6 is sucked. If suck, while tailstock does not move, it might be some problems with mechanics or tailstock motor.</p>		

CHAPTER 20	HYDRAULIC SYSTEM	Total 7 Page 1
<p>20.1 Function of hydraulic system:</p> <p>It is used for control of forward, reverse rotation of spindle, brake, lubrication of gear and bearing in headstock and feedbox.</p> <p>20.2 Work theory of hydraulic system:</p> <p>Hydraulic system is composed of two electromagnetic selector valves SWH-G02-B2-DC24V-20, SWH-G02-C4-DC24V-20 relief valve, oil filter and pressure meter and so on. As drawing 20.1 shown.</p> <p>Work theory: Electromagnets YA1, YA2, YA3 control selector valve and make it be in different positions, so as to reach forward/reverse rotation, or forward rotation at high speed and brake. Spindle start and spindle brake controlled by hydraulic system are interlocking, so safety and reliability of machine are insured.</p> <p>Normal work pressure of gear pump CB-B10 is 0.8~1.2 Mpa, nominal output is 10L/min. In case oil output decreases by 30%, this system could still work and lubricate normally.</p> <p>After starting motor of gear pump, pressure oil inputs tubes through oil filter. In case YA3 is switched on, pressure oil inputs brake cylinder through tubes 1-3, and brakes axis III. At this time YA1 and YA2 controlled by electrics are interlocking with YA3, so accident caused by mistaken operation could be avoided. After YA3 is cut off, axis III brakes, pressure oil backs oil tank through 3-2. In case any o f YA1 and YA2 is cut off, pressure oil make spindle rotate forward and reverse</p>		

through 1-4-5-7(or 8), after power supply is cut off, Oil backs oil tank through 7-6(or 8-6).



DRAWING 20.1 HYDRAULIC THEORY

## 20.5 Maintenance for hydraulic system

### 20.5.1 Hydraulic oil usage:

Vane pump: use hydraulic oil of L-HH32 L-HH46

Gear pump: use hydraulic oil of L-HH32 L-HH46

When use hydraulic oil please note the followings:

- 1) As for long- used hydraulic oil, oxidation and thermal stability are key factors for defining temperature limit. Therefore, please use hydraulic oil at initial oxidation temperature for long time.

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<p>2) Hydraulic oil should not be polluted during storage, transportation and pouring in.</p> <p>3) Periodic take sample from hydraulic oil and inspect, and set up periodic renewal system: After some time interval, take sample from hydraulic oil and analyze. If the pollution level is not up to standard, please renew it. And before renewal, the whole hydraulic system should be cleaned up.</p> <p>4) Oil storage in oil tank should be abundant, and which should be favorable for system heat release.</p> <p>5) System should be at sealed state, in case of leakage please remove instantly.</p>		
20.5.2 Hydraulic system maintenance		
<p>20.5.2.1 Periodic renewal of hydraulic oil: In common case, the first oil renewal should be done 3 months or 500 hours after operation. Thereafter every 2000 hours or a year renew one time. And during renewal, new oil should be poured in after being filtered.</p>		
<p>20.5.2.2 Periodic renewal of filter element: In common case, to change filter element should be 500 hours after operation. Or according to filter pressure difference before maintenance to evaluate whether renew or not.</p>		
20.5.2.3 Periodic clean oil pump inlet.		
<p>20.5.2.4 Inspect the acidity of hydraulic oil and other pollutant. According the smell of hydraulic oil, whether modification or not could be roughly</p>		

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<p>Confirmed.</p> <p>20.5.2.5 Maintain the system leakage</p> <p>20.5.2.6 Ensure no outside material enters into oil tank through cover, filter plug, seal washer and other inlet/outlet.</p> <p>20.6 Common failure and removal</p> <p>20.6.1 Common failure and removal about hydraulic pump, see table 20.1.</p> <p>20.6.2 Common failure and removal about relief valve, see table 20.2.</p> <p>20.6.3 Common failure and removal about selector valve, see table 20.3.</p> <p>20.6.4 Common failure and removal about oil temperature overheat, see table 20.4.</p>		

Table 20.1 Common failure and removal about hydraulic pump

Failure	Failure analysis	Removal
oil breakup	1.Incorrect motor rotation direction	1.Inspect rotating direction of motor
insufficient oil output	2.Oil-sucking tube or filter is plugged up.	2. Clean tube, filter and renew oil.
without enough pressure	3. Overlarge axial/radial clearance.	3. Inspect and change the relative parts.
	4.Connection leakage, air enters into.	4.Screw down each screw against leakage and air access.
	5 Overlarge oil viscosity or overlarge oil temperature rise	5. Correct oil selecian, control temperature rise.
Serious noise	1. Oil-sucking tube or filter is plugged up or small filter capacity.	1. Clean filter make oil tube get through.
	2. Oil-sucking tube seal leakage or bubble in oil	2. Add some oil at connection position or seal. If noise lowers, screw down juncture or change seal. Oil-backing tube inlet should be lower than oil lever, and be at some distance from oil-sucking tube.
Severe pressure fluctuation	3.Eccentricity between pump and coupling.	3.Adjust and meke it centric.
	4.Low oil level	4.Add oil.
	5.Low oil temperature or high viscosity.	5.Heat oil up to proper temperature.
	6.Damage of pump bearing	6. Inspect (touch by hand) temperature rise of pump bearing.
Leakage of pump journal seal	Liquid resistance of leakage tube is overlarge, which results in pump pressure is more than the allowed pressue value of oil seal.	Inspect whether the oil drainage outlet on piston pump connects with oil tank directly through single oil tube. If the oil drainage tubes on few sets of piston pumps paralld connects with a main tube with same diameter then connects with oil tank, or oil drainage tube on piston pump connects with main oil-backing tube, please correct. It is better to connect a pressure gauge on oil drainage outlet of pump for inspection of pressure in pump. And its value should be less than 0.08MPa.



Table 20.2 Common failure and removal about relief valve

Failure	Failure analysis	Removal
pressure fluctuation	1. Spring is bend or too soft	1.Renew spring.
	2. Not good contact between taper valve and valve housing	2. If taper valve is new, demount it and adjust nut, then push guiding rod few times to make it be with good contact, or renew taper valve.
	3. Not good seal between steel ball and valve housing	3. Inspect roundness of steel ball, renew steel ball, lap valve housing.
	4. Spool valve is deformed	4.Renew or lap spool valve.
invalid adjustment	1. Spring is breakup or not mounted	1.Inspect, renew or mount spring.
	2. Resistance hole is plugged.	2.Clean resistance hole.
	3. Spool valve is blocked.	3.Demount, inspect and adjust.
	4. Oil inlet and outlet are mistaken mounted.	4.Inspect oil source.
	5. Taper valve is not mounted.	5.Inspect and mount.
serious oil leakage	1. Not good contact between taper valve/steel ball and valve housing.	1. As taper valve/steel ball is worn, renew them.
	2. Overlarge fit clearance between spool valve and valve housing	2. Inspect clearance between valve and valve housing.
	3. Pipe juncture is not screw down.	3. Screw down connection screw.
	4.Seal is damaged.	4.Inspect and renew seal.
noise and vibration	1.Nut is loosened.	1.Fasten nut.
	2.Spring is deformed.	2.Inspect and renew spring.
	3. Spool valve fit is overtight.	3.Lap spool valve make it flexible.
	4.Not sensitive action of main spool valve.	4.Inspect centricity between spool valve and shell.
	5.Taper valve is worn.	5.Renew taper valve.
	6. In oil tube is with air.	6.Expel air.
	7.Flow is more than the allowed.	7.Renew the relative valve for flow.
	8.Resonant vibration with other valve.	8. Slightly adjust the rated pressure valve of valve (If rated pressure valve difference is within 0.5Mpa, it is easy for resonant vibration.

Table 20.3 Common failure and removal about selector valve

Failure	Failure analysis	Removal
Failure of direction shift of spool valve	1.Spool valve is blocked firmly.	1.Demount, clean dirt and burr.
	2.Deformation of valve.	2. Adjust mounting screw of valve to make pressure even or lap valve hole.
	3. Breakup of aligning spring with middle position	3.Renew spring.
	4.Not enough control pressure.	4.Inspect centricity between spool valve and shell.
	5. Electromagnet coil is burnt out or not enough push of electromagnet	5.Inspect, adjust and renew.
	6.Failure of electric circuit.	6.Remove failure.
	7. No oil or plugged-up of oil circuit controlled by hydraulic selector valve	7.Inspect cause and remove.
Noise from direction valve controlled by electromagnet	1.Spool valve is blocked or friction is overlarge.	1.Lap or adjust spool valve.
	2. Electromagnet could not reach the limit.	2.Adjust electromagnet height.
	3. Unevenness of contact surface of electromagnetic core or not good contact	3. Eliminate dirt and adjust electromagnetic core.

Table 20.4 Common failure and removal about overhigh oil temperature

Failure	Failure analysis	Removal
As system need not pressure oil, oil still backs to oil tank at setting pressure of relief valve	Not accurate action of deloading oil circuit.	Inspect whether electric circuit, action of electromagnet and deloading valve are normal or not.
Insufficient cooling	1. Failure of coolant supply or fan failure	1.Remove failure.
	2. There is deposit in cooling tube.	2.Eliminate deposit.
Overheat of hydraulic pump	1. Power loss from wear	1.Repair or renew.
	2. Oil with viscosity not proper for system	2. Select oil with viscosity proper for this system and add it to recommended level.
Too fast oil circulation	Overflow oil level of oil tank	Add oil to recommended level.
Overlarge resistance of oil	The inner diameter of tube is not matched with required flow or inner diameter of valve is not enough.	Mount proper tube or valve, or lower power