hydraulic press

Maintenance Manual

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1. Preface

This hydraulic press system is a mechanical device which consists of numerous precision components and through which power is transmitted by virtue of high-pressure mediums. Different from general mechanical transmission systems, this is fairly invisible and changeable in terms of faults.

Correctly using the machine and faithfully executing maintenance and safe operation rules is essential for extending its service life and guaranteeing work safety.

Objective of maintenance: it is designed to timely remove the defects and faults in the hydraulic press, ensure the machine is in stable and reliable working condition, providing protection for normal production.

Maintenance personnel shall first get familiar with the machine's structure, performance and operating procedure, and have a good grasp of its characteristics. Only when someone is familiar with the working principle of hydraulic system, the functions of basic loop and the structure of hydraulic components and has gathered

certain practical experience can he or she rapidly identify the causes for faults, accurately pinpoint the positions of faults and timely remove faults.

Moreover, in light of general usage, we offer several suggestions on maintenance and safe operation, and present common faults in system components as well as their solutions for your reference.

1-1 Suggestions on Maintenance and Safe Operation:

1-1-1. With respect to industrial oil, L—HM46/GB/T3141-1994 (ISO 6743/4 HM 46) hydraulic oil is recommended. It is antioxidative, antirust, antiwear, anti-foam and highly compatible with sealing elements. It is suitable for various medium and high-pressure hydraulic systems. The ambient temperature to which it is applicable is -10~+40℃. Operating oil temperature shall be 15~65℃. Excessively high oil temperature will accelerate its aging. (With use of oil at normal operating temperature, its kinematic viscosity shall not be lower than 27mm^2/S at 65℃ and not higher than 43mm^2/S at 15℃.) Oil injection into oil tank shall not be lower than 2/3 of oil leveler.

H M - N 4 6 antiwear hydraulic oil MOBIL: D.T.E 25

Texaco: Rando oil HD 46/CALTEX: Rando oil HD46

ESSO: Nuto h 46/ GULF: Harmony 46 AW

British Petroleum: Energol HLP 46/ Castrol: Hyspin AWS 46

SHELL: Tellus 46

1-1-2 Oil can't be injected into oil tank unless it is strictly filtered so that contaminants are prevented from entering oil tank. This is because contaminants will accelerate oxidation of working oil, lead to decreasing oil viscosity, speed up wear and tear of valves within hydraulic system, shorten the service life of hydraulic system. Oil injection into oil tank shall not be lower than oil leveler. (Oil cleanliness shall be controlled within the grade NAS10 (or 19/16)) Moisture shall be prevented from entering working oil since moisture will emulsify working oil and result in its deterioration.

Working oil from different manufacturers, and that with different designations or at

different grades from the same manufacturer shall not be mixed since such mixing will cause deterioration of additives in oil. (Attention: all the deteriorated working oil shall be replaced, while the newly added oil can't extend its service life.)

1-1-3 Oil filter and air filter shall be cleaned frequently with kerosene to prevent obstruction induced by particle impurities from affecting the flow of oil and air. Oil shall be replaced after three months of the machine's operation following its installation; subsequently, oil shall be replaced every twelve months of use or whenever hours of use reach 2,000h, with oil filter cleaned and oil filter accessories replaced. The condition of oil pipe joints shall be monitored on a daily basis to prevent seepage at pipe joints.

1-1-4 Eccentricity of concentrated load under nominal pressure is not allowed; excessive eccentric load is prone to cause column strain or other adverse phenomena.

1-1-5 Pressure gage shall be checked and calibrated once semiannually.

1-1-6 Lubricating oil shall be frequently injected into the sliding block; the exposed surfaces of columns and plungers shall be frequently cleaned. Machine oil shall be injected before each operation. Series N100 mechanical lubricating oil/4L under the standard GB443-89 is recommended for lubrication system. Where the machine is not in use for a long time, the machined surfaces shall be cleaned and applied with anti-rust oil

1-2. **Major Items of Regular Check**

Check point	Check item	Check cycle	Check method
Oil tank (including working oil)	Oil leak	Weekly	Visual check
	Oil quantity	Weekly	Visual check, digital display
	Oil cleanliness and character	Three months	Comparison, analysis
	Oil temperature	Daily	Oil temperature sensor
Oil pump	Pressure	Three months	Pressure gage
	Noise	Three months	Hearing or noise meter

	Surface temperature	Three months	Thermometer or tactile sense
	Leakage or air suction	Three months	(Pipe connection) visual check
Hydraulic cylinder	Seepage	Weekly	Visual check
	Loose	Weekly	Tactile sense
Coupling	Lubrication, wear and tear	One year	Visual check
Pressure controller	Set value and action	Three months	Accuracy and condition
Flow control valve	Set value and action	Three months	Accuracy and condition
Directional control valve	Action and wear	Three months	Seepage analysis
Filter (I)	Cleanliness	One month	Visual check
Filter (II)	Cleanliness	One month	Visual check
Cooler	Cooling capacity	One month	Thermometer or tactile sense
	Water leak	Three months	Refer to assay value of working oil
Oil pipe joint	Seepage	Weekly	Visual check
Pipe clamp	Loose	Weekly	Visual check

Attention: hydraulic oil shall be timely replaced under any of the following circumstances:

1. Water content>0.2%; 2. Total impurity content>0.2%;

3. Acid value reaches 1.5mgKOH/g; 4. Oil viscosity change rate at 40℃ exceeds 10%;

5. Excessive foam affects transmission power; 6. Water-soluble acid and base occurs

1-3. Abnormalities

Content	Abnormalities	Solution
The filter net at oil tank is blocked	The filter net at oil tank is blocked	Check the filter net at oil tank, clean or replace the filter net
The filter net at	The filter net at oil pipe is	Check the filter net at oil pipe, clean

oil pipe is blocked	blocked	or replace the filter net
Upper limit for buffering	The value of buffering ascent stop is set to be too high	Check the set value of buffering ascent stop, change the setting
Light blocking for electric eye	Electric eye is activated amid host machine's descent	Check and remove light blocker
Safety plug is not positioned	When host machine's descent is activated, safety plug is not positioned	1. Press "Emergency stop" 2. Press "Power supply assistance" 3. Press "Safety plug positioning"
Safety plug does not exit	When host machine ascends to the stop position, safety plug does not exit	1. Press "Emergency stop" 2. Press "Power supply assistance" 3. Press "Safety plug exiting"
Flat is not positioned	When flat returns to the unit, it does not return to the designated position	1. Check whether there are sundries within the unit 2. Check whether the positioning inductive switch is faulty PS: in case of inductive switch fault, notify repair personnel
Flat is not locked	When flat is locked, it is not in the designated position	1. Check whether there are sundries between the unit and flat 2. Check whether the locking inductive switch is faulty 3. Check whether the lifting locking system is faulty PS: in case of inductive switch fault, notify repair personnel
Flat bolt does not exit	Flat bolt does not exit	1. Check whether oil cylinder with flat bolt is activated 2. Check whether inductive switch of flat bolt is faulty 3. Check whether bolt system is faulty PS: in case of inductive switch fault, notify repair personnel
Flat bolt is not positioned	Flat bolt is not positioned	1. Check whether oil cylinder with flat bolt is activated 2. Check whether inductive switch of flat bolt is faulty 3. Check whether bolt system is faulty PS: in case of inductive switch fault, notify repair personnel
Flat does not	When flat exits, the lifting	1. Turn action mode to "Flat" for

ascend	locking is not in the upper limit	lifting locking action 2. Check whether the inductive switch of the upper limit for lifting locking is faulty 3. Check whether the lifting locking system is faulty PS: in case of inductive switch fault, notify repair personnel
The descent button of host machine has abnormal action	The descent button has abnormal action when host machine ascends	1. Check whether the button gets stuck 2. Check whether the line becomes problematic 3. Notify the manufacturer for repair
The battery within PLC is undervoltage	The battery within PLC shows excessively low voltage	Replace the battery within PLC
Oil temperature in main oil tank is excessively high	Oil temperature in main oil tank is excessively high	1. Check whether cooling motor is activated 2. Check whether cooler and cooling water are normal
The counter has reached the setting	The counter has reached the setting	Reset the counter
The ascent pressure of host machine is abnormal	The ascent pressure of host machine is abnormal	1. Check whether the ascent pressure switch of host machine is normal 2. Check whether flow aid valve action is normal 3. Check whether guide rail clearance is normal
The ascent pressure in mold stripping is abnormal	The ascent pressure in mold stripping is abnormal	1. Check whether pressure gage for mold stripping is normal 2. Check whether flow aid valve action is normal
Pressure amid host machine's descent pressurization is abnormal	Pressure amid host machine's pressurization is abnormal+*+	1. Check whether pressure gage of host machine is normal 2. Check whether flow aid valve action is normal
Light blocking action for electric eye is in process	Electric eye action	1. Check whether electric eye switch is turned on 2. Check whether there is light blocker

Emergency stop	Emergency stop occurs or main motor is not under normal operation or power supply assistance is not started	1. Check whether main motor is under normal operation 2. Check whether semi-automatic operating console is connected 3. Check whether the emergency stop button is faulty
Buffering amid flat action is not in the lower limit	When flat exits, buffering is not in the lower limit	1. Lower buffering to dead point 2. Check whether the inductive switch of the lower limit is faulty PS: in case of inductive switch fault, notify repair personnel
Host machine amid flat action is not in the upper limit	When flat exits, host machine is not in the upper limit	1. Elevate host machine to dead point 2. Check whether the inductive switch of the lower limit is faulty PS: in case of inductive switch fault, notify repair personnel
Motor overload	Motor overload or its phase loss	1. Check whether the voltage of main power supply is normal 2. Check whether THRI's set value is excessively low 3. Check whether overload occurs in contactor PS: in case of contactor fault, notify repair personnel
Abnormality in secondary descent of host machine	When host machine ascends, host machine's descent signal does not disappear	1. Press the "Emergency stop" button 2. Press the "Power supply assistance" button 3. Press the "Safety plug positioning" button

1-4. Common faults in components and solutions

1-4-1 Oil pump: it is an energy conversion device in hydraulic system. It provides the system with oil with certain pressure and flow quantity and converts

mechanical energy into liquid's pressure energy. Its common faults in daily use and solutions are shown below.

Fault	Cause		Solution
(I) There is no oil output from pump	1. Pump does not rotate	(1) Motor shaft does not rotate 1) Power supply is not connected 2) Electrical circuits and components are faulty	Conduct electrical check and remove faults
		(2) Motor becomes hot, tripping occurs 1) Overflow valve pressure is regulated to an excessively high level; with overloading, pump smothering occurs 2) Overflow valve's core gets stuck; central oil hole at valve core is blocked or damping hole at overflow valve is blocked, resulting in overpressure and overflow failure. 3) The one-way valve at pump outlet is reversely installed or valve core gets stuck, resulting in pump smothering. 4) Motor becomes faulty	1) Regulate the pressure value of overflow valve 2) Repair the valve 3) Repair the one-way valve 4) Repair or replace motor
		(3) Pump shaft or motor shaft has no connecting key 1) Broken 2) Not installed	1) Replace the key 2) Add a key

		(4) The sliding pair within pump gets stuck 1) Fit clearance is too small 2) Parts accuracy is low; assembly quality is low; the coaxiality deviation between gear and shaft is excessively high; plunger head gets stuck; vane perpendicularity is low; rotor's run-out tolerance is too large; rotor slot is wounded or vane shows wound scar and gets stuck after fracturing subject to pressure. 3) Oil is too dirty 4) Oil temperature is too high so that parts show thermal deformation 5) Pump's oil suction chamber gets stuck after entry of dirt	1) Take apart and repair, choose clearance according to requirements 2) Replace parts, conduct reassembling to ensure fit clearance meets requirements 3) Check oil quality, filter or replace oil 4) Check the cooling effect of cooler; check oil quantity in oil tank and inject oil to the oil level line 5) Take apart, clean, install an oil suction filter at oil suction port
	2.Reverse rotation of pump	Motor's rotation direction is incorrect 1) Electrical wiring is wrong 2) The rotation direction arrow on pump body is wrong	1) Correct electrical wiring 2) Correct the rotation direction arrow on pump body
	3.Pump shaft is still able to rotate	The inside of pump shaft is broken 1) Shaft quality is low 2) The sliding pair within pump gets stuck	1) Check the cause, replace the shaft 2) Treatment is shown in subparagraph 1 (4), paragraph (I) in this table

	4.There is no oil suction in pump	(1) Oil level in oil tank is too low (2) Oil suction filter is blocked (3) The valve on pump's oil suction pipe is not opened (4) Pump or oil suction pipe is poorly sealed (5) Pump's oil suction height exceeds standard; oil suction pipe is slender and long; there are too many elbows (6) The fineness of oil suction filter is too high; or oil flow area is too small (7) Oil viscosity is too high (8) Vane of vane pump does not extend out or gets stuck (9) The variable displacement mechanism of vane pump do not work smoothly so that eccentric amount is zero (10) The variable displacement mechanism of plunger pump does not work, for example, machining precision is low; assembly is poor; fit clearance is too small; frictional resistance within pump is too high; servo piston, variable piston and spring core shaft gets stuck; individual oil passages to the variable displacement mechanism are blocked; oil is too dirty; oil temperature is too high so that parts show thermal deformation, among others (11) There is no sealing between plunger pump cylinder block and oil distribution disc (for example, central spiring of plunger pump is broken) (12) There is no sealing between oil distribution disc of vane pump and pump body	(1) Inject oil to the oil level line (2) Clean or replace the filter element (3) Check and open the valve (4) Check and tighten the joint, tighten pump cover screw; apply grease to pump cover juncture and joint connection, or inject oil into pump's oil suction port (5) Decrease the oil suction height, replace the pipe, reduce elbows (6) Choose proper filter fineness, increase oil filter specification (7) Check oil viscosity, replace it with suitable oil; check heater's effect in winter (8) Take apart and clean, rationally choose the clearance, check oil quality, filter or replace oil (9) Replace or regulate the variable displacement mechanism (10) Take apart and check, repair or replace parts; rationally choose the clearance; filter or replace oil; check the cooler's effect; check the oil level within oil tank and inject oil to the oil level line (11) Replace the spring (12) Take apart and clean, conduct reassembling

(II) Loud noise occurs in pump	1.Air suction is severe	(1) Oil suction filter is partially blocked; oil suction resistance is too high (2) Oil suction pipe is too close to the ground (3) The position of oil suction is too high or liquid level in oil tank is too low (4) Pump and oil suction pipe orifice are poorly sealed (5) Oil viscosity is too high (6) Pump's rotation speed is too high (misuse) (7) The passage area of oil suction filter is too small (8) The auxiliary pump for non self-priming pump shows insufficient oil or is faulty (9) Air filter on oil tank is blocked (10) The oil seal on pump shaft fails	(1) Clean or replace the filter (2) Properly extend the length of oil suction pipe or regulate its position (3) Decrease the height of pump mounting or increase liquid level (4) Check the sealing at joint and junction surface, and tighten it (5) Check oil quality, choose oil viscosity according to requirements (6) Control it within the maximum rotation speed (7) Adopt the filter with a large oil passage area (8) Repair or replace the auxiliary pump (9) Clean or replace air filter (10) Replace
	2. Foam suction	(1) A certain amount of air is dissolved in oil and foam is generated during operation (2) Return oil eddy is strong and generates foam (3) There is air within pipe or pump case (4) The depth of oil suction pipe below oil surface is not enough	(1) A separating plate is added to oil tank; return oil undergoes defoaming via the separating plate and then is sucked; a defoaming agent is added to oil (2) There should be certain distance between oil suction pipe and return oil pipe; return oil pipe orifice shall be lower than oil surface (3) It is under no-load operation to remove air (4) Extend the length of oil suction pipe, inject oil into oil tank to increase its liquid level
	3.Oil hydraulic pump is under poor operation	(1) Pump bearing suffers severe wear or damaged (2) Pump parts are damaged or suffer wear and tear 1) The internal surface of stator ring suffers severe wear and tear 2) Gear accuracy is low, run-out tolerance is great	(1) Take apart and clean, replace 1) Replace stator ring 2) Repair or replace

	4.Pump's structural factors	(1) Severe trapped oil phenomenon generates great flow pulsation and pressure pulsation flow pulsation 1) Unload groove is poorly designed 2) Machining precision is low (2) The variable displacement mechanism of variable pump works poorly (clearance is too small; machining precision is low; oil is too dirty etc.) (3) The pressure distributing valve at two-stage vane pump is abnormal. (Clearance is too small; machining precision is low; oil is too dirty etc.)	1) Improve design, enhance the unloading capacity 2) Increase the machining precision (2) Take apart and clean, repair, conduct reassembling to meet the performance requirement; filter or replace oil (3) Take apart and clean, repair, conduct reassembling to meet the performance requirement; filter or replace oil
	5.Poor installation of pump	(1) The coaxiality between pump shaft and motor shaft is low (2) Coupling is poorly installed; the coaxiality is low and it is loose	(1) Reinstall it to meet technical requirement; generally, the coaxiality shall be within 0.1mm (2) Reinstall it to meet technical requirement, and tighten coupling
(III) Insufficient oil quantity from pump	1.Low volumetric efficiency	(1) The sliding parts within pump suffer severe wear and tear 1) The end face of oil distribution disc for vane pump suffers severe wear and tear 2) Gear's end face and side plate suffer severe wear and tear 3) Gear pump undergoes bearing damage so that pump body hole suffers severe wear and tear 4) Plunger pump's plunger and pump body hole suffer severe wear and tear 5) Oil distribution disc of plunger pump and end face of cylinder block suffer severe wear and tear	(1) Take apart and clean, repair and replace 1) Grind the end face of oil distribution disc 2) Grind, repair or replace 3) Replace the bearing and repair 4) Replace the plunger and make treatment to the required clearance; clean and then reassemble 5) Grind two end faces to meet the requirement, clean and then reassemble

		(2) Poor installation of pump 1) There is excessively large clearance between stator and rotor, between plunger and cylinder block, between gear and pump body, between gear and side plate 2) The screws at vane pump, gear pump cover show uneven tightening torque or become loose 3) Vane and rotor are reversely installed	1) Reassemble, choose clearance according to technical requirement 2) Retighten screws and make them subject to uniform strength of forces 3) Correct the direction, reassemble
		(3) Oil viscosity is too low (for example, oil designation or oil temperature is too high)	(3) Replace oil, identify the cause for excessively high oil temperature, work out cooling measures
	2.Air suction in pump	See 1, 2 in paragraph (II) in this table	See 1, 2 in paragraph (II) in this table
	3.The mechanism within pump works poorly	See 4 in paragraph (II) in this table	See 4 in paragraph (II) in this table
	4.Insufficient oil supply	The auxiliary pump for non self-priming pump shows insufficient oil supply or becomes faulty	Repair or replace the auxiliary pump
(IV) Pressure is insufficient or pressure rise is not large	1.Severe oil leak	See 1 in paragraph (III) in this table	See 1 in paragraph (III) in this table
	2.The power of driving mechanism is too small	(1) Motor's output power is too small 1) Design is irrational 2) Motor becomes faulty (2) The output power of mechanical driving mechanism is too small	1) Calculate motor power; in case of insufficiency, replace it 2) Check motor and remove faults (2) Calculate the driving power and replace the driving mechanism

	3.The chosen pump displacement is too large or pressure is regulated to a excessively high level	The power of the driving mechanism or motor becomes insufficient	Recalculate the fit pressure, flow and power to make it rational
(V) Pressure is unstable, flow is unstable	1. Air suction in pump	See 1, 2 in paragraph (II) in this table	See 1, 2 in paragraph (II) in this table
	2. Oil is too dirty	Individual vanes get stuck within rotor slot or it is difficult for them to extend out	Filter or replace oil
	3.Poor installation of pump	(1) Individual vanes show excessively large clearance within rotor slot, thus high-pressure oil flows to the low pressure chamber (2) Individual vanes show excessively small clearance within rotor slot, resulting in getting stuck or making it difficult to extend out (3) There is excessively large clearance between individual plunger and cylinder block hole, leading to large oil leak	(1) Take apart and clean, repair or replace vanes, rationally choose clearance (2) Make repair to make vanes move flexibly (3) Make repair to make clearance reach the requirement
	4.The servo variable displacement mechanism fails without variable	(1) Servo piston gets stuck	Remove the cause for getting stuck
		(2) Variable piston gets stuck	Remove the cause for getting stuck
		(3) Variable head does not flexibly rotate	Remove the cause for inflexible rotation
		(4) One-way valve spring is broken	Replace the spring
	5. Oil supply fluctuates	The auxiliary pump for non self-priming pump becomes faulty	Repair or replace the auxiliary pump

(VI) Abnormal heating	1.Poor installation	(1) Clerance is improperly chosen (for example, there is excessively small clearance between plunger and cylinder block, between vane and rotor slot, between stator and rotor, between gear and slide plate, thus the sliding parts becomes too hot and are burnt (2) Assembling quality is low; the coaxiality of drive part fails to meet technical requirement, and "disproportional force" occurs in operation (3) Bearing quality is low or it is damaged during assembling, or it is not cleaned during installation, causing "disproportional force" in operation (4) The lubricating oil discharge outlet which passes through bearing is unsmooth 1) The screw plug at return oil port is not opened (without pipe connected) 2) At the time of installation, oil passage is not fully cleaned and is blocked by dirt 3) At the time of installation, there are too many return oil pipe elbows or flattening occurs	(1) Take apart and clean, measure the clearance, reregulate it to generate the required clearance (2) Take apart and clean, reassemble it to meet technical requirements (3) Take apart, check, replace the bearing, reassemble 1) Properly install return oil pipe 2) Clean the pipe 3) Replace the pipe, reduce pipe heads
	2.Low oil quality	(1) The viscosity-temperature characteristics of oil are poor; there are great changes in viscosity (2) There is a great deal of moisture in oil, thus lubrication is poor (3) Oil pollution is severe	(1) Hydraulic oil is chosen according to rules (2) Replace it with qualified oil, clean the inside of oil tank (3) Replace oil
	3.Pipe faults	(1) Oil drain pipe is flattened or blocked (2) Oil drain pipe is too small in diameter and fails to meet oil drainage requirement (3) Oil suction pipe is too small in diameter, oil suction resistance is high	(1) Clean, replace (2) Revise design, change pipes (3) Add pipes in large diameter, reduce elbows, lower oil suction resistance

	4.Subject to impact from external conditions	External heat sources are high, heat dissipation condition is poor	Eliminate impact from external conditions, adopt new heat insulation measures
	5.Internal leakage is large; volumetric efficiency is too low and thus it becomes hot	See 1 in paragraph (III) in this table	See 1 in paragraph (III) in this table
(VII) Oil leak occurs at oil seal	1.Poor installation	(1) Seal lip is reversely installed (2) Skeleton spring comes off 1) Shaft's chamfer is improper; seal lip is opened so that spring comes off 2) Spring comes off due to carelessness in shaft mounting (3) There are foreign matters at seal lip (4) Seal lip is damaged at the time of passing through spline shaft (5) Oil seal is installed obliquely 1) The inside dimension of groove is too small 2) Groove chamfer is too small (6) Assembling causes severe deformation of oil seal (7) Seal lip curls 1) Shaft chamfer is too small 2) Shaft chamfer is too coarse	(1) Remove and reassemble, during which the lip shall not be damaged. Replace it in case of deformation or damage 1) Remachine according to machining drawing 2) Reinstall (3) Remove and clean, reassemble (4) Replace, reinstall 1) Check groove size, remachine according to rules 2) Remachine according to rules (6) Check groove size and chamfer (7) Check the size and roughness of shaft chamfer; use abrasive cloth to polish chamfer; apply grease to chamfer amid assembling

	2.Shaft and groove are poorly machined	(1) Shaft is incorrectly machined 1) Shaft neck is unsuitable so that oil seal lip suffers wear and tear and becomes hot 2) Shaft chamfer does not meet requirements so that oil seal lip is damaged and spring comes off 3) The appearance of shaft neck shows turning or grinding mark 4) The surface of shaft neck is coarse so that the edge of oil seal lip suffers accelerating wear and tear (2) Groove is incorrectly machined 1) Groove size is too small so that oil seal is installed obliquely 2) Groove size is too large so that oil leaks from periphery 3) Groove surface has scratches or other defects so that oil leaks from periphery	1) Check the size, replace the shaft. Commonly, the tolerance at oil seal is h8 2) Remachine shaft chamfer 3) Re-treat, remove grinding mark 4) Conduct remachining to comply with drawing (2) Replace pump cover, treat the groove to meet requirements
	3.Oil seal is defective	The quality of oil seal is low, it is less resistant to oil or less compatible with hydraulic oil; it goes bad, becomes aging and fails, causing oil leak	Replace it with the compatible oil-seal rubber part
	4.Volumetric efficiency is too low	See 1 in paragraph (III) in this table	See 1 in paragraph (III) in this table
	5.Oil drain hole is blocked	After oil drain hole is blocked, oil drain pressure increases, thus excessive deformation of seal lip occurs, contact surface increases, and friction gives rise to thermal ageing, oil seal fails, causing oil leak	Clean oil hole, replace oil seal
	6.External oil drain pipe is too small in diameter or pipe is too long	It is difficult to drain oil, and oil drain pressure increases	Properly increase pipe diameter or shorten the length of oil drain pipe

	7.Oil drain pipe is not connected	Oil drain pipe is not opened or connected	Open screw plug, connect oil drain pipe

1-4-2. Overflow valve: it plays the following roles in the system: 1. Constant pressure valve, for example, the control cover plate for pump head is used to control the maximum pressure of pressure oil from oil pump; 2. Safety valve; 3. It enables unloading from the system, saving energy. Common faults in daily use and solutions are shown below:

Fault	Cause		Solution
(I) Pressure can't be adjusted upward	1. Main valve is faulty	(1) The damping hole at main valve core is blocked (at the time of assembling, main valve core is not cleaned, oil is too dirty) (2) Main valve core gets stuck in the opening position (for example, parts accuracy is low; assembling quality is low; oil is too dirty) (3) As main valve core is reset, the spring is broken or bended, thus main valve core can't be reset	(1) Clean damping hole to make it smooth; filter or replace oil (2) Dismantle, repair, reassemble; the tightening force of valve cover tightening screw shall be uniform; filter or replace oil (3) Replace the spring
	2.Pilot valve is faulty	(1) The pressure adjusting spring is broken (2) The pressure adjusting spring is unavailable (3) Cone valve or steel ball is unavailable (4) Cone valve is damaged	(1) Replace the spring (2) Install (3) Install (4) Replace

	3. Electromagnetic valve at remote chamber orifice is faulty or remote control orifice is not added with screwed plug and directly extends to oil tank	(1) Electromagnetic valve is not connected to power supply (normally open) (2) Sliding valve gets stuck (3) Electromagnet coil is burnt or iron core gets stuck (4) Electrical wiring is faulty	(1) Check electrical wiring, connect power supply (2) Repair, replace (3) Replace (4) Repair
	4.Incorrect installation	Oil inlet and outlet are incorrectly installed	Correct it
	5.Hydraulic pump is faulty	(1) There is excessively large clearance amid the sliding pair (such as gear pump, plunger pump) (2) Most vanes of vane pump get stuck within rotor slot (3) Vanes and rotor are reversely installed	(1) Deal with clearance to reach the appropriate value (2) Clean, deal with clearance to reach the appropriate value (3) Correct the direction
(II) Pressure can't be adjusted to a high level	1.Main valve is faulty (if main valve is cone valve)	(1) The conical surface of main valve cone is poorly sealed 1) The conical surface of main valve cone suffers wear and tear or is not round 2) The conical surface of valve seat suffers wear and tear or is not round 3) There is dirt on conical surface 4) The conical surface of main valve cone and that of valve seat are not concentric 5) Main valve core gets stuck in operation; valve core can't be tightly combined with valve seat (2) Leak occurs at main valve gland (for example, sealing gasket is damaged; assembling is poor; gland screws are loose)	1) Replace, conduct running-in 2) Replace, conduct running-in 3) Clean, conduct running-in 4) Make repair to make it fit 5) Make repair to make it fit (2) Take apart, repair, replace sealing gasket, reassemble, and ensure uniform tightening force of screw

	2.Pilot valve is faulty	(1) The pressure adjusting spring is bended or too weak or too short (2) The juncture between cone valve and valve seat is poorly sealed (for example, cone valve and valve seat suffer wear and tear; the contact surface of cone valve is not round; the contact surface is too wide so that dirt enters it or it is glued)	(1) Replace the spring (2) Repair, replace, clean it make it meet requirements
(III) Pressure suddenly rises	1.Main valve is faulty	Main valve core does not work flexibly, and suddenly gets stuck in a closed state (for example, the accuracy of parts machining is low; the assembling quality is low; oil is too dirty)	Repair, replace parts, filter or replace oil
	2.Pilot valve is faulty	(I) The junction surface between pilot valve core and valve seat is suddenly glued, making separation impossible (2) The pressure adjusting spring is bended, making it get stuck	(1) Clean, repair or replace oil (2) Replace the spring
(IV) Pressure suddenly drops	1.Main valve is faulty	(1) The damping hole at main valve core suddenly gets stuck (2) Main valve core does not work swiftly and suddenly gets stuck in a closed state (for example, the accuracy of parts machining is low; the assembling quality is low; oil is too dirty) (3) The sealing gasket at main valve cover is suddenly damaged	(1) Clean, filter or replace oil (2) Repair, replace parts, filter or replace oil (3) Replace sealing element
	2. Pilot valve is faulty	(1) Pilot valve core is suddenly damaged (2) The pressure adjusting spring is suddenly broken	(1) Replace valve core (2) Replace the spring
	3.The electromagnetic valve at remote chamber orifice is faulty	Electromagnet is suddenly disconnected from power supply, thus unloading occurs at overflow valve	Check and remove electrical faults

(V) Pressure fluctuates (unstable)	1.Main valve is faulty	(I) Main valve core does not flexibly work; sometimes, it gets stuck (2) The damping hole at main valve core is sometimes blocked, sometimes unblocked (3) The contact between the conical surface of main valve core and that of valve seat is poor, with uneven wear and tear (4) The diameter of damping hole is too large, thus the damping effect is poor	(1) Repair, replace parts. The tightening force of gland screw shall be uniform (2) Take apart, clean, check oil quality, replace oil (3) Repair or replace parts (4) Properly reduce the diameter of damping hole
	2.Pilot valve is faulty	(1) The pressure adjusting spring is bended (2) The contact between cone valve and cone valve seat is poor; wear and tear is not uniform (3) Pressure adjusting screw generates pressure change because lock nut becomes loose	(1) Replace the spring (2) Repair or replace parts (3) After pressure adjustment, tighten lock nut
(VI) Vibration and noise	1. Main valve is faulty	The radial force of main valve core is unbalanced in operation, so performance is unstable 1) The geometric accuracy of valve body and main valve core is low; burr occurs at edges 2) There is dirt within valve body, so fit clearance increases or is not uniform	1) Check parts accuracy, replace the parts inconsistent with requirements, and remove burr at edges 2) Check, replace parts

	2.Pilot valve is faulty	(1) The contact between cone valve and valve seat is poor; the roundness of peripheral surface is low; roughness value is high, thus the pressure adjusting spring is subject to unbalanced forces, cone valve oscillation exacerbates, and scream occurs (2) The axial line of pressure adjusting spring is less perpendicular to end face, so needle valve tilts, making contact uneven (3) The pressure adjusting spring tilts toward one side on the locating rod (4) Valve seat is assembled deflectively (5) The pressure adjusting spring features side bending	(1) Control the error in the roundness of oil seal surface within 0.005～0.01mm (2) Increase the accuracy of cone valve. The roughness shall reach R_a0.4μm (3) Replace the spring (4) Improve the assembling quality (5) Replace the spring
	3.There is air within the system	Air is sucked by pump or there is air within the system	Remove air
	4.Valve is misused	Flow exceeds the allowable value	Use within the scope of rated flow
	5.Oil return is not smooth	The resistance in return oil pipe is too high; or return oil filter is blocked; or return oil pipe is close to the bottom surface of oil tank	Properly increase pipe diameter, reduce elbows. The distance between return oil pipe orifice and the bottom surface of oil tank shall be more than twice pipe diameter; replace filter element
	6.Pipe diameter at remote control orifice is improperly chosen	The pipe from remote control orifice of overflow valve to electromagnetic valve shall not be too large in diameter; otherwise, vibration occurs	Generally, pipe diameter shall be 6mm

1-4-3. Flow control valve: it can accurately regulate and stabilize the flow in oil passage, change the velocity of the actuating element. Common faults in daily use and solutions are shown below:

Fault	Cause		Solution
(I) There is no flow change when throttle valve handle is regulated	1.Pressure-compensated valve is not activated	The core of pressure-compensated valve gets stuck in the closed position 1) The geometric accuracy of valve core and valve sleeve is low, clearance is too small 2) The spring features side bending, or is deformed, making valve core get stuck 3) The spring is too weak	1) Check the accuracy, deal with clearance to make it meet requirements, enable flexible movement 2) Replace the spring 3) Replace the spring
	2.Throttle valve is faulty	(1) Oil is too dirty, making throttle orifice blocked (2) Handle and throttle valve core are not assembled in the proper position (3) Connection at throttle valve core fails or is unkeyed (4) Throttle valve core gets stuck because fit clearance is too small or deformation occurs (5) Regulating rod thread is blocked by dirt, causing poor regulation	(1) Check oil quality, filter oil (2) Check the cause, reassemble (3) Replace the key or add a key (4) Clean, deal with clearance or replace parts (5) Take apart, clean
	3.There is no oil supply for the system	No reversing takes place at the reversing valve core	Check and remove the cause

(II) The movement velocity of the actuating element is unstable (flow is unstable)	1.Pressure-compensated valve is faulty	(1) The core of pressure-compensated valve does not work swiftly 1) Valve core gets stuck 2) As damping at compensating valve is small, hole is sometimes blocked, sometimes unblocked 3) The spring features side bending, or is deformed, or the spring's end face is not perpendicular to spring axis (2) The core of pressure-compensated valve gets stuck in the full open position 1) The damping at compensating valve is small, hole is blocked 2) The geometric accuracy of valve core and valve sleeve is low, fit clearance is too small 3) The spring features side bending, or is deformed, making valve core get stuck	1) Make repair to enable flexible movement 2) Clean the damping hole. Where oil is too dirty, replace it 3) Replace the spring 1) Clean the damping hole. Where oil is too dirty, replace it 2) Make repair to enable flexible movement 3) Replace the spring
	2.Throttle valve is faulty	(1) There is dirt at throttle orifice, making it sometimes blocked or sometimes unblocked (2) The changes in external load of simple throttle valve will cause flow changes	(1) Take apart, clean, check oil quality. Where oil is unqualified, replace it (2) For the system with great changes in external load or which requires extremely stable movement velocity of actuating element, adopt a speed regulating valve
	3.Oil quality deteriorates	(1) Oil temperature is too high, resulting in changes in flow at throttle orifice (2) The compensating rod of flow control valve with temperature compensation shows low sensitivity and has been damaged (3) Oil is too dirty, making throttle orifice or damping hole blocked	(1) Check the cause for temperature rise, lower oil temperature, and control it within the required scope (2) Adopt the compensating rod made of materials highly sensitive to temperature; replace the damaged one (3) Clean, check oil quality. Replace the unqualified one
	4.One-way valve is faulty	In the flow control valve with one-way valve, one-way valve shows poor sealing	Grind one-way valve to improve sealing

	5.Pipe vibration	(1) There is air within the system (2) The adjusted position changes due to pipe vibration	(1) Fully discharge air (2) After adjustment, lock it with a locking device
	6.Leak	Internal leak and external leak make flow unstable, thus the operating speed of the actuating element is not uniform	Eliminate leak, or replace component

1-4-4. Directional control valve: it is a valve that enables communication and reversing of hydraulic oil flow in the system, as well as pressure unloading and sequential action control. Common faults in daily use and solutions are shown below:

Fault	Cause		Solution
(I) Main valve core is not activated	1.Electromagnet is faulty	(1) Electromagnet coil is burnt (2) Electromagnet's driving force is insufficient or magnetic leakage occurs (3) Electrical wiring is faulty (4) Control signal is unavailable for electromagnet (5) Electromagnet core gets stuck	(1) Check the cause, repair or replace (2) Check the cause, repair or replace (3) Remove faults (4) After checking, add control signal (5) Check or replace
	2.Pilot solenoid valve is faulty	(1) Valve core and valve body hole get stuck (for example, the geometric accuracy of parts is low; fitting between valve core and valve hole is too tight; oil is too dirty) (2) The spring features side bending, making slide valve get stuck	(1) Deal with fit clearance to make it meet requirements, enable flexible movement of valve core; filer or replace oil (2) Replace the spring
	3.Main valve core gets stuck	(1) The geometric accuracy of valve core and valve body is low (2) Fitting between valve core and valve hole is too tight (3) Burr occurs on the surface of valve core	(1) Repair, deal with clearance to make it meet requirements (2) Repair, deal with clearance to make it meet requirements (3) Remove burr, wash

	4.Hydraulic-control oil passage is faulty	(1) There is no oil in control oil passage 1) No reversing occurs at electromagnetic valve of control oil passage 2) Control oil passage is blocked (2) Pressure in control oil passage is insufficient 1) Oil leak occurs at valve end cover 2) The throttle valve at one side of oil drain chamber with slide valve is regulated to be too small or blocked	(1) 1) Check and remove the cause 2) Check, clean, and make control oil passage smooth (2) 1) Tighten end cover screw 2) Clean throttle valve and make proper regulation
	5.Oil goes bad or oil temperature is too high	(1) Oil is too dirty so that valve core gets stuck (2) Oil temperature is too high, so parts suffer thermal deformation and subsequently get stuck (3) Oil temperature is too high, and oil generates colloids which stick valve core and make it get stuck (4) Oil viscosity is too high so that it is difficult for valve core to move and it gets stuck	(1) Filter or replace (2) Check and remove the cause for excessively high oil temperature (3) Clean, eliminate excessively high oil temperature (4) Replace it with suitable oil
	6.Poor installation	Valve body is deformed 1) The tightening torque of mounting screw is not uniform 2) "Disproportional force" comes from the pipe connected on valve body	1) Re-tighten the screw, and make it subject to uniform strength of forces 2) Reinstall
	7.Reset spring does not meet requirements	(1) Spring force is too strong (2) The spring features side bending, making valve core get stuck (3) The spring is broken and can't be reset	Replace it with suitable spring
(II) After reversing of valve core, its flow is insufficient	Valve opening is insufficient	(1) Push rod in electromagnetic valve is too short (2) The geometric accuracy of valve core and valve body is low; clearance is too small, it gets stuck while moving, thus it is not put in place (3) The spring is too weak, thrust force is insufficient, making valve	(1) Replace it with push rod at a suitable length (2) Deal with it to make it meet requirements (3) Replace it with suitable spring

		core stroke not in place	
(III) Pressure drop is excessive	Valve parameters are improperly chosen	Actual flow exceeds rated flow	Use within the scope of rated flow
(IV) It is not easy to adjust the reversing speed of hydraulic-control reversing valve core	Adjustable device is faulty	(1) One-way valve is poorly sealed (2) The machining accuracy of throttle valve is low, making it unable to adjust minimum flow (3) Oil leak occurs at valve cover of oil drain chamber (4) The regulation performance of needle throttle valve is poor	(1) Repair or replace (2) Repair or replace (3) Replace sealing element, tighten screws (4) Adopt triangular groove throttle valve
(V) Electromagnet is overheated or coil is burnt	1.Electromagnet is faulty	(1) Coil insulation is poor (2) Electromagnet core is unsuitable and does not properly function (3) Voltage is too low or unstable	(1) Replace (2) Replace (3) Change in voltage shall be within 10% of rated voltage
	2.Load changes	(1) Reversing pressure exceeds the specified one (2) Reversing flow exceeds the specified one (3) Back pressure at return oil port is too high	(1) Reduce pressure (2) Replace it with suitable electro-hydraulic directional control valve (3) Adjust back pressure to keep it within the specified value
	3.Poor assembling	The coaxiality between electromagnet core and valve core axis is low	Reassemble it to ensure high coaxiality
(VI) Attractive force of electromagnet is insufficient	Poor assembling	(1) Push rod is too long (2) The contact surface of electromagnet core is uneven or contact is poor	(1) Make push rod become the one with suitable length (2) Remove faults, reassemble it to meet requirements

(VII) Shock and vibration	1.Reversing shock	(1) Due to large electromagnet, large-diameter solenoid directional valve is fast in suction, thus inducing shock (2) In terms of hydraulically operated direction control valve, control flow is too large, and valve core moves too fast, thus inducing shock (3) One-way valve steel ball is unavailable in one-way throttle valve or steel ball is broken, producing no damping effect	(1) Where it is necessary to adopt large-diameter reversing valve, electro-hydraulic reversing valve is preferred (2) Narrow the throttle orifice of throttle valve, reduce the movement speed of valve core (3) Repair one-way throttle valve
	2.Vibration	The screws for fastening electromagnet become loose	Tighten screws, and add lock washer

1-4-5. Hydraulic-control one-way valve: it can be opened by controlling oil pressure so that oil freely flows in two directions. Common faults in daily use and solutions are shown below:

Fault	Cause		Solution
(I) There is no sealing in the reverse direction, causing leak	One-way valve is not sealed	(I) One-way valve gets stuck in the full open position 1) Fitting between valve core and valve hole is too tight 2) The spring features side bending, or is deformed, too weak (2) The contact between the conical surface of one-way valve and that of valve seat is not uniform 1) The coaxiality between valve core and valve seat is low 2) Outer diameter of valve core and conical surface are not concentric 3) Outer diameter of valve seat and conical surface are not concentric 4) Oil is too dirty	(1) 1) Make repair to enable flexible movement of valve core 2) Replace the spring (2) 1) Repair or replace 2) Repair or replace 3) Repair or replace 4) Filter oil or replace
(II) It can't be opened in the reverse direction	One-way valve can't be opened	(1) Control pressure is too low (2) Severe oil leak occurs at control pipe joint or pipe is bended, flattened, making oil unsmooth (3) Control valve core gets stuck (for example, machining accuracy	(1) Increase control pressure, making it reach the required value (2) Tighten the joint, eliminate oil leak or replace pipe (3) Clean, repair, enable flexible movement of valve core

		is low; oil is too dirty) (4) Oil leak occurs at end cover of control valve (5) One-way valve gets stuck (for example, the spring is bended; the machining accuracy of one-way valve is low; oil is too dirty)	(4) Tighten end cover screws, and ensure the tightening torque is uniform (5) Clean, repair, enable flexible movement of valve core; replace the spring; filter or replace oil

1-4-6. Hydraulic cylinder: its role in hydraulic system lies in converting hydraulic energy into mechanical energy and enabling straight reciprocating motion of machine. Common faults in daily use and solutions are shown below:

Fault	Cause		Solution
(I) Piston rod can't be activated	1.Pressure is insufficient	(1) Oil does not enter hydraulic cylinder 1) Reversing does not occur in reversing valve 2) There is no oil supply from the system (2) Though oil is available, there is no pressure 1) The system, mainly pump or overflow valve, is faulty 2) Internal leak is severe; piston breaks away from piston rod; sealing element is severely damaged (3) Pressure does not reach the specified value 1) Sealing element becomes ageing and fails; seal ring lip is reversely installed or damaged 2) Piston ring is damaged 3) The system's set pressure is too low 4) The pressure regulating valve is faulty 5) As the regulating valve's flow is too small, when leak in hydraulic cylinder increases, flow is insufficient, resulting in insufficient pressure	1) Check and remove the cause for absence of reversing in reversing valve 2) Check and remove the cause for faults in hydraulic pump and main hydraulic valve 1) Check and remove the cause for faults in pump or overflow valve 2) Tighten piston and piston rod, replace sealing element 1) Replace sealing element, and correctly install one 2) Replace piston rod 3) Readjust pressure until it reaches the required value 4) Check and remove the cause 5) The regulating valve's flow shall exceed leak in hydraulic cylinder

	2.Pressure has reached the requirement but it is still not activated	(1) Hydraulic cylinder is structurally problematic 1) Piston's end face and that of cylinder barrel cling to each other, working area is insufficient, so it can't be activated 2) The one-way valve loop on cylinder barrel with buffer device is blocked by piston (2) "Disproportional force" occurs in movement of piston rod 1) The fit clearance between cylinder barrel and piston, between guide sleeve and piston rod is too small 2) The fit clearance between piston rod and textolite guide sleeve is too small 3) Hydraulic cylinder is poorly assembled (for example, the coaxiality between piston rod, piston and cylinder cover is low; the degree of parallelism between hydraulic cylinder and working bench is low) (3) The causes from hydraulic loop are mainly as follows: oil in back pressure chamber of hydraulic cylinder is not connected to oil tank; the throttle orifice of speed regulating valve on return oil loop is regulated to be too small or the reversing valve connecting return oil is not activated	1) The end face shall be provided with an oil groove to ensure working fluid fast flows into piston's working end face 2) The positions of cylinder barrel's oil inlet and outlet shall not meet piston's end face 1) Check fit clearance, and conduct running-in to reach the specified value 2) Check fit clearance, mend the guide sleeve hole to reach the required fit clearance 3) Reassemble and install. The unqualified parts shall be replaced Check and remove the cause
(II) Speed fails to reach the specified value	1.Severe internal leak	(1) Sealing element is severely damaged (2) Oil viscosity is too low (3) Oil temperature is too high	(1) Replace the sealing element (2) Replace it with the hydraulic oil with suitable viscosity (3) Check and remove the cause
	2.External load is too large	(1) Design is incorrect, the chosen pressure is too low (2) Process and use are incorrect, so external load exceeds the preset value	(1) Make calculation and then replace components, upward regulate working pressure (2) Use according to the specified value for the equipment

	3. "Disproportional force" occurs in piston movement	(1) The machining accuracy is low; the conicity and roundness of cylinder barrel hole are extremely low (2) The assembling quality is low 1) The coaxiality between piston, piston rod and cylinder cover is low 2) The degree of parallelism between hydraulic cylinder and working bench is low 3) The fit clearance between piston rod and guide sleeve is too small	Check the size of parts, replace the irrepairable parts 1) Reassemble it according to requirements 2) Reassemble it according to requirements 3) Check fit clearance, mend the guide sleeve hole, make it reach the required fit clearance
	4.Dirt enters the sliding part	(1) Oil is too dirty (2) Dust ring is damaged (3) It is not cleaned or dirt is introduced during assembling	(1) Filter or replace oil (2) Replace dust ring (3) Take apart, clean. Cleaning shall be conducted during assembling
	5.When piston works at end stroke, speed decreases dramatically	(1) The throttle orifice of cushioning regulating valve is regulated to be too small. At the time of entering the cushioning stroke, piston may stop or its speed may decrease dramatically (2) The throttle orifice of stationary cushioning device is too small in diameter (3) The clearance between the stationary cushioning throttle ring on cylinder cover and buffer plunger is too small	(1) The opening degree of cushioning throttle valve shall be properly regulated and it can produce a cushioning effect (2) Properly increase the diameter of throttle hole (3) Properly increase the clearance
	6.When piston moves halfway, speed decreased or it stops	(1) The machining accuracy of cylinder barrel's inner diameter is low; the surface is rough, thus internal leak increases (2) Cylinder wall swells. When piston passes through the swell, internal leak increases	(1) Repair or replace cylinder barrel (2) Replace cylinder barrel

(III) Hydraulic cylinder generates crawl	1. "Disproportional force" occurs when piston rod of hydraulic cylinder moves	See 3 in paragraph (II) in this table	See 3 in paragraph (II) in this table
	2.Air enters cylinder	(1) There is air in new hydraulic cylinder, the repaired hydraulic cylinder or the cylinder of the equipment which is not in use for a long time, or the air in hydraulic cylinder pipe is not fully discharged (2) There is back pressure within the cylinder, so air is externally sucked (3) The volume of the pipe between cylinder and reversing valve is much larger than that within hydraulic cylinder. When hydraulic cylinder works, oil in this pipe is not fully discharged, thus it is difficult to fully discharge air (4) Pump sucks air (see the faults in hydraulic pump) (5) Air enters oil (see the faults in hydraulic pump)	(1) No-load large-stroke reciprocating motion occurs until air is fully discharged (2) First use grease to seal the junction surface and joint. Where air suction improves, tighten tightening screw and joint (3) Add an exhaust valve in a high position at the pipe close to hydraulic cylinder; open the exhaust valve, in which case, piston moves for many times in full stroke, close the exhaust valve after air is fully discharged See the solutions for removing the faults in hydraulic pump (4) See the solutions for removing the faults in hydraulic pump
(IV) Buffer device is faulty	1.Buffer action is excessive	(1) The throttle orifice of the cushioning regulating valve is too small (2) "Disproportional force" comes from buffer plunger (for example, the clearance between plunger head and buffering ring is too small; piston tilts or is eccentric) (3) There is dirt between plunger head and buffering ring (4) The clearance between the plunger head of stationary cushioning device and bushing is too small	(1) Regulate throttle orifice to the suitable position and tighten it (2) Take apart, clean, properly increase clearance. The unqualified parts shall be replaced (3) Remove burr and clean it (4) Properly increase clearance

	2.Buffer action fails	(1) The cushioning regulating valve is in the full open state (2) Inertial energy is too large (3) The cushioning regulating valve can't enable regulation (4) One-way valve is in the full open state or one-way valve seat is not fully sealed (5) The sealing element on piston is damaged. When pressure in the cushioning chamber increases, working liquid flows backwards from this chamber to the side of working pressure, thus piston does not slow down (6) There are wound scars on plunger head or the internal surface of bushing (7) The buffering ring on cylinder cover comes off (8) The length and angle of buffer plunger's conical surface are improper	(1) Adjust it to the suitable position and tighten it (2) Design a suitable cushioning mechanism (3) Repair or replace (4) Check the size, replace cone valve core or steel ball, replace the spring, make repair (5) Replace sealing element (6) Repair or replace (7) Replace the buffering ring (8) Correct
	3."Crawl" occurs at cushioning stroke	(1) Machining is poor, for example, The perpendicularity of cylinder cover, piston's end face does not meet requirements. The clearance between piston and cylinder barrel is not uniform at full length; cylinder cover and cylinder barrel are not concentric: The deviation between inner diameter of cylinder barrel and center line of cylinder cover is large; the perpendicularity of piston and nut's end face does not meet requirement, thus causing deflection of piston rod (2) Assembling is poor, for example, buffer plunger and the hole for buffering ring are eccentric or tilt	(1) Carefully check each part. The unqualified parts shall not be used (2) Reassemble it to ensure quality

(V) External leak occurs	1.Assembling is poor	(1) When hydraulic cylinder is assembled, end cover is assembled deflectively; piston rod and cylinder barrel are not concentric, thus it is difficult for piston rod to extend out, accelerating wear and tear of sealing element (2) The degree of parallelism between hydraulic cylinder and guide surface of working bench is low, so it is difficult for piston to extend out, accelerating wear and tear of sealing element (3) Sealing element is incorrectly installed, for example, sealing element is scratched, cut off; seal lip is reversely installed; the lip is damaged or the size of shaft chamfer is incorrect; sealing element is incorrectly or not installed (4) No sealing gland is installed 1) Gland is installed deflectively 2) Tightening screws are not subject to uniform strength of forces 3) Tightening screws are too long, making the gland unable to properly work	(1) Take apart, check, reassemble (2) Take apart, check, reassemble, replace sealing element (3) Replace and reinstall sealing element 1) Reinstall 2) Reinstall, tighten screws to make them subject to uniform strength of forces 3) Rationally choose screw length according to the depth of screw hole
	2.Quality problem occurs in sealing element	(1) While kept for too long, sealing element becomes naturally ageing and fails (2) It is improperly kept, deformed or damaged (3) Adhesive performance is poor, adhesive is not resistant to oil or adhesive is less compatible with oil (4) Product quality is low; size is incorrect; tolerance does not meet requirement	Replace

	3.The quality of piston rod and groove machining is low	(1) The surface of piston rod is rough; the chamfer of piston rod head does not meet requirements or it has no chamfer (2) The size and accuracy of groove do not meet requirements 1) Design drawing is incorrect 2) The size and machining of groove does not reach the standard 3) The accuracy of groove is low; much burr occurs	(1) Surface roughness shall be R_a0.2μm, and chamfering shall be conducted according to requirements (2) 1) Design the groove according to relevant standard 2) Check the size, and correct it to the required size 3) Correct and remove burr
	4.Oil viscosity is too low	(1) Wrong oil is used (2) The oil is mixed with those with other designations	Replace it with suitable oil
	5.Oil temperature is too high	(1) The resistance at oil inlet and outlet of hydraulic cylinder is too high (2) Ambient environment temperature is too high (3) Faults occur in pump or cooler	(1) Check whether oil inlet is smooth (2) Take heat insulation measures (3) Check and remove the cause
	6. High-frequency vibration	(1) Tightening screws are loose (2) Pipe joints are loose (3) There is shift in installation position	(1) Regularly tighten screws (2) Regularly tighten joints (3) Regularly tighten mounting screws
	7.Piston rod is damaged	(1) Dust ring becomes ageing and fails, and suffers invasion by sand, cuttings and other dirt (2) The fitting between guide sleeve and piston rod is too tight, so the moving surface becomes overheated, and chrome coating on the surface of piston rod comes off, making it damaged	(1) Clean and replace dust ring, repair the damaged surface of piston rod (2) Check, clean, use scraper to mend the inner diameter of guide sleeve, reaching the fit clearance

1-4-7. Resonation, vibration and noise: resonation, vibration and noise in the hydraulic press result from multiple factors. Daily maintenance contributes to reducing the probability of their occurrence. Common faults in daily use and solutions are shown below:

Fault and cause	Solution	Fault and cause	Solution

1.Noise and vibration in pump cause resonation in pipes and oil tank	1.Pump's oil inlet and outlet are connected by hoses 2. Pump shall not be installed on oil tank. Motor and pump shall be separately installed on the base and separated from oil tank 3. Enhance hydraulic pump, reduce the number of revolutions of motor 4. Install shock absorbing materials below pump foundation and oil tank 5. Choose low-noise pump, use vertical motor to immerse hydraulic pump in oil	4.Noise from intense oil flow within pipes	1. Adopt a larger-diameter pipe to control flow within the allowable scope 2. Reduce elbows, more adopt bent pipes with small curvature 3. Use rubber hoses 4. Refrain from adopting square bend or tee-junction at the site with disorderly oil flow 5. Adopt silencer and energy accumulator
2.System resonation induced by valve spring	1. Change the mounting position of spring 2. Change the rigidity of spring 3. Change overflow valve to the form of external oil leak 4. Adopt remotely-controlled overflow valve 5. Fully discharge the air in loop 6. Change the length, size, material and thickness of pipes 7. Increase pipe clamps to prevent pipe vibration 8. Install throttle valve in certain position of pipe	5.Resonant sound occurs in oil tank	1. Thicken box board 2. Add ribbed slabs to side plate and base plate 3. Change the shape or position of oil return pipe ends
		6.Impact noise from valve reversing	1. Lower the control pressure of reversing in electro-hydraulic valve 2. Add throttle valve to control pipe or return oil pipe 3. Choose the components with pilot unloading function 4. Adopt electrical control method so that more than two valves can't be reversed concurrently
3.Vibration induced by entry of air into hydraulic cylinder	1. Better discharge air 2. Apply ferrous disulfide lubricating grease to hydraulic cylinder piston and sealing liner	7. Malfunctioning of overflow valve, unloading valve, hydraulic-control one-way valve, balance valve causes pipe vibration and noise	1. Install throttle valve in the proper position 2. Change the form of external leak 3. Renovate the loop 4. Add pipe clamps

1-4-8. Solutions for excessively high oil temperature in the system: Common faults in daily use and solutions are shown below:

Fault and cause	Solution
1. The preset pressure is too high	Properly adjust the pressure
2. Components in unloading loop, including overflow valve, unloading valve, pressure relay, malfunction	Correct malfunction of components
3. The set values of components in unloading loop are improper; pressure relief time is too short	Reset, extend the pressure relief time
4. Valve leakage is great; pressure relief time is too short	Repair the valves with great leakage; refrain from adopting large-diameter valves
5. In the case of high pressure and small flow, low pressure and large flow, overflowing shall not be conducted by overflow valves	Change the loop, adopt unloading valves and variable pumps
6. Due to low viscosity or faults in pump, internal leakage within pump increases, resulting in increasing temperature of pump case	Change oil, make repair, change hydraulic pump
7. Oil in oil tank is insufficient	Increase oil, enlarge oil tank
8. The structure of oil tank is irrational	Improve the structure so that temperature rise surrounding oil tank is uniform
9. The volume of energy accumulator is insufficient or it is faulty	Adopt large energy accumulator, repair energy accumulator i
10. It is necessary to install cooler; the volume of cooler is insufficient; cooler is faulty; water inlet valve malfunctions, water quantity is insufficient; automatic regulating device for oil temperature is faulty	Install cooler, enlarge cooler, address faults in cooler, repair valves, increase water quantity, repair the temperature regulating device
11. Throttling is excessive at remote control orifice of overflow valve; residual pressure for unloading is high	Make proper adjustment
12. Resistance in pipes is high	Adopt suitable pipe diameter
13. There is an impact from heat sources nearby, radiant heat is great	Adopt reflective boards made of heat insulating materials or change the venue for arrangement; put in place ventilation and cooling devices, choose suitable working oil

1-4-9. Solutions for great hydraulic shock in the system: Common faults in daily use and solutions are shown below:

Fault and cause		Solution
Reversing causes shock	Instantaneous shutdown, startup amid revering leads to mutual conversion of kinetic energy or potential energy, resulting in hydraulic shock	1. Extend the reversing time 2. Design valve core with buffer 3. Enlarge pipe diameter, short pipes
Sudden braking of hydraulic cylinder during movement causes hydraulic shock	As momentum and inertia are great during movement of hydraulic cylinder, sudden braking causes great increase in pressure, resulting in hydraulic shock	1. Install small safety valves with quick response and high sensitivity at oil inlet and outlet of hydraulic cylinder 2. Minimize the system's working pressure at the time of satisfying driving force, or properly increase the system's back pressure 3. Install a bladder type energy accumulator near hydraulic cylinder
Hydraulic shock occurs when hydraulic cylinder reaches the endpoint	Momentum and inertia induced by movement of hydraulic cylinder collide with cylinder block, resulting in shock	1. Install shock absorbers at both ends of hydraulic cylinder 2. Install small overflow valves with quick response and high sensitivity at oil inlet and outlet of hydraulic cylinder 3. Install stroke (switch) valves

1-4-10. Solutions for abnormal actions in the system: Common faults in daily use and solutions are shown below:

Fault and cause		Solution
The normal actuating elements of the system are not activated	Electromagnet in electromagnetic valve is faulty	Remove or replace
	Limiting or sequencing device (mechanical, electrical or hydraulic) does not work or is incorrectly adjusted	Adjust, repair or replace
	Mechanical faults	Remove
	No command signal is available	Search, repair
	Amplifier does not work or is incorrectly adjusted	Adjust, repair or replace
	Valve does not work	Adjust, repair or replace
	Cylinder or motor is damaged	Repair or replace
The action of actuating element is too slow	Output flow from pump is insufficient or system leakage is excessive	Check, repair or replace

	Oil viscosity is too high or too low	Check, adjust or replace
	Valve's control pressure is insufficient or the damping hole in valve is blocked	Clean, adjust
	External load is excessive	Check, adjust
	Amplifier fails or is incorrectly adjusted	Adjust, repair or replace
	Valve core gets stuck	Clean, filter or replace oil
	Cylinder or motor suffers severe wear and tear	Repair or replace
Actions are irregular	Pressure is abnormal	See Solutions in paragraph 5.3
	Oil is mixed with air	Inject oil, discharge air
	Command signal is unstable	Search, repair
	Amplifier fails or is incorrectly adjusted	Adjust, repair or replace
	Sensor feedback fails	Repair or replace
	Valve core gets stuck	Clean, filter oil
	Cylinder or motor suffers wear and tear or is damaged	Repair or replace

1-4-11. Solutions for faults in hydraulic control system

Faults in hydraulic control system	Solution
(1) The actuating element is not activated after control signal is input into the system	1) Check whether the system's oil pressure is normal; judge the operation of hydraulic pump and overflow valve 2) Check whether the actuating element gets stuck 3) Check whether input and output electrical signals of amplifier are normal; judge its operation 4) Check whether hydraulic output is normal when there is input of and change in electrical signal of electro-hydraulic servo valve, thus judge whether electro-hydraulic servo valve is normal. Servo valve faults are generally addressed by the manufacturer.
(2) The actuating element moves in a certain direction to the greatest extent after control signal is input into the system	1) Check whether sensor is connected to the system 2) Check whether output signal of sensor and servo amplifier are incorrectly connected as positive feedback 3) Check whether internal feedback fault occurs in servo valve
(3) The zero position of actuating element is incorrect	1) Check whether the zeroing offset signal of servo valve is normally regulated 2) Check whether servo valve zeroing is normal 3) Check whether flutter signal of servo valve is normally regulated
(4) Oscillation occurs in	1) Check whether the magnification times of servo amplifier is

actuating element	regulated to be excessively high 2) Check whether output signal of sensor is normal 3) Check whether the system's oil pressure is too high
(5) The actuating element fails to catch up with changes in input signal	1) Check whether the magnification times of servo amplifier is regulated to be excessively low 2) Check whether the system's oil pressure is too low 3) Check whether the clearance between the actuating element and movement mechanism is too large
(6) Crawl occurs in the actuating element	1) The air in oil passage has not yet been fully discharged 2) The frictional force of moving parts is too large 3) Oil source pressure is not sufficient

2. After-sales Service

The equipment provided by the Company is covered by one-year warranty service as from arrival at user's workshop building. In case of non-human fault amid normal use, the user can require the Company to provide free technical support or personnel service.

Any of the following circumstances does not fall within free warranty:

2-1. Faults caused by operation inconsistent with instructions;

2-2. Man-made damage caused by collision, knocking and smashing;

2-3. Faults caused by unauthorized dismantling, assembling, repair;

2-4. Faults caused by accidents, misuse, abuse and deliberate damage;

2-5. Hydraulic system faults induced by valve wear and tear resulting from working medium pollution

2-6. Equipment damage caused by short circuit of external line.

For the products beyond the warranty period or free warranty, the After-sales Service Department of the Company will provide you with considerate services at reasonably low price.

The equipment purchased by you from the Company is covered by lifetime maintenance.

The manufacturer is entitled to change equipment setting and its functions without prior notice.

This manual offers the example of Product Maintenance Record Form for your equipment. Please make record during equipment maintenance so that we render faster services to you.

The content of this manual has been carefully checked. In case of any mistakes and omissions in printing, the Company reserves the right of final interpretation.

User feedback:

Thank you for using the equipment provided by the Company. As we are true to the tenet of making customers satisfied, in order to more timely render maintenance and consulting services to you and help you handle problems in use, please keep in mind our contact means.

Pingtang Industrial Zone, Dongwu Town, Yinzhou District, Ningbo City, Zhejiang Province (Li Shutang)

Ningbo Hengli Hydraulic Co., Ltd.

Tel/fax: 0574-55876868 Website: WWW.hilead.cn

Equipment model:	Date of purchase:
Maintenance item:	
Diagnosis conclusion:	
Solution:	
Maintenance result:	

Maintenance personnel: