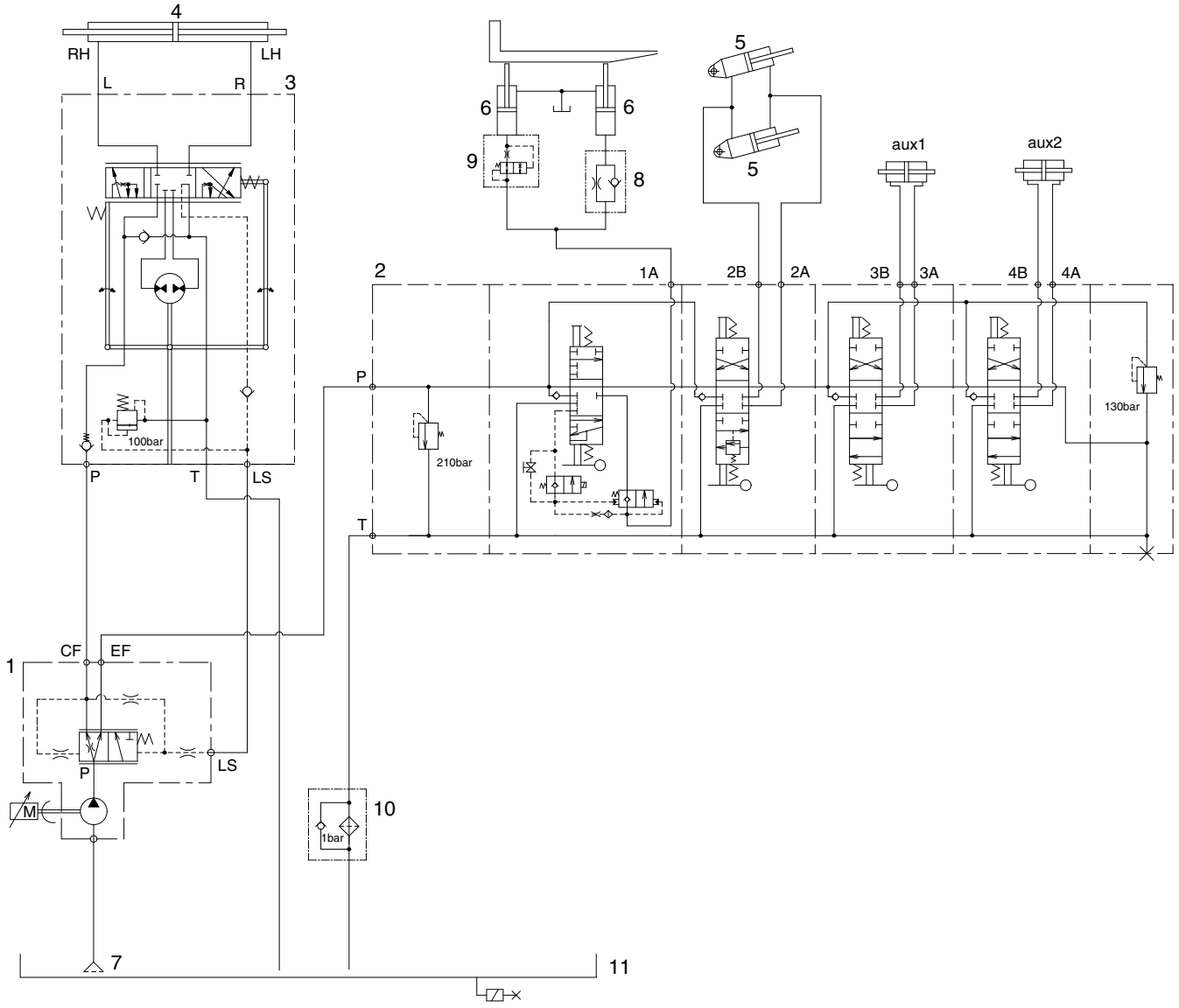
SECTION 6 HYDRAULIC SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. HYDRAULIC CIRCUIT

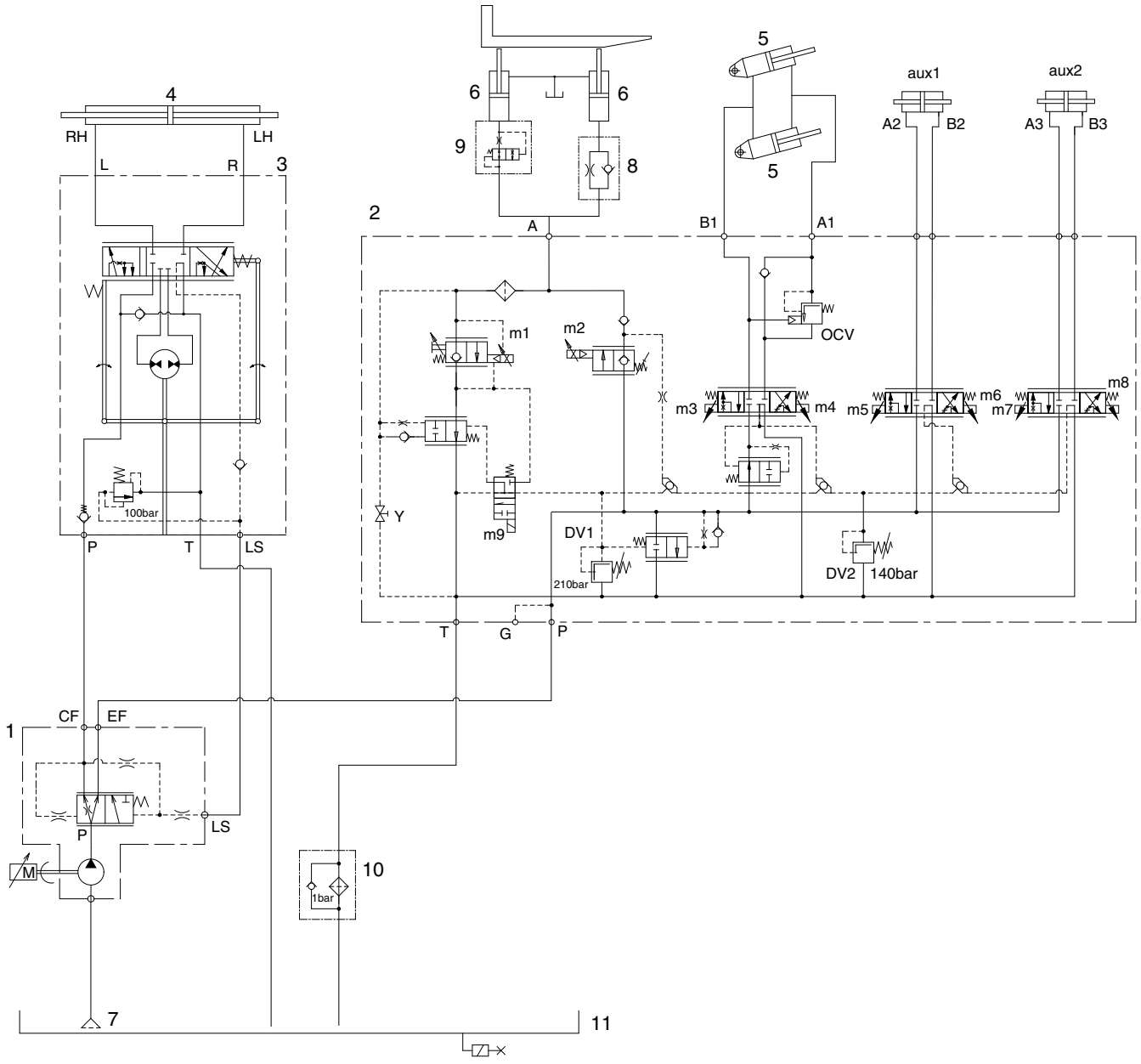
1) MANUAL LEVER TYPE



3ZBD-01000-001

1	Hydraulic gear pump with priority valve	7	Suction strainer
2	Main control valve	8	Down control valve
3	Steering unit	9	Down safety valve
4	Steering cylinder	10	Return filter
5	Tilt cylinder	11	Hydraulic oil tank
6	Lift cylinder		

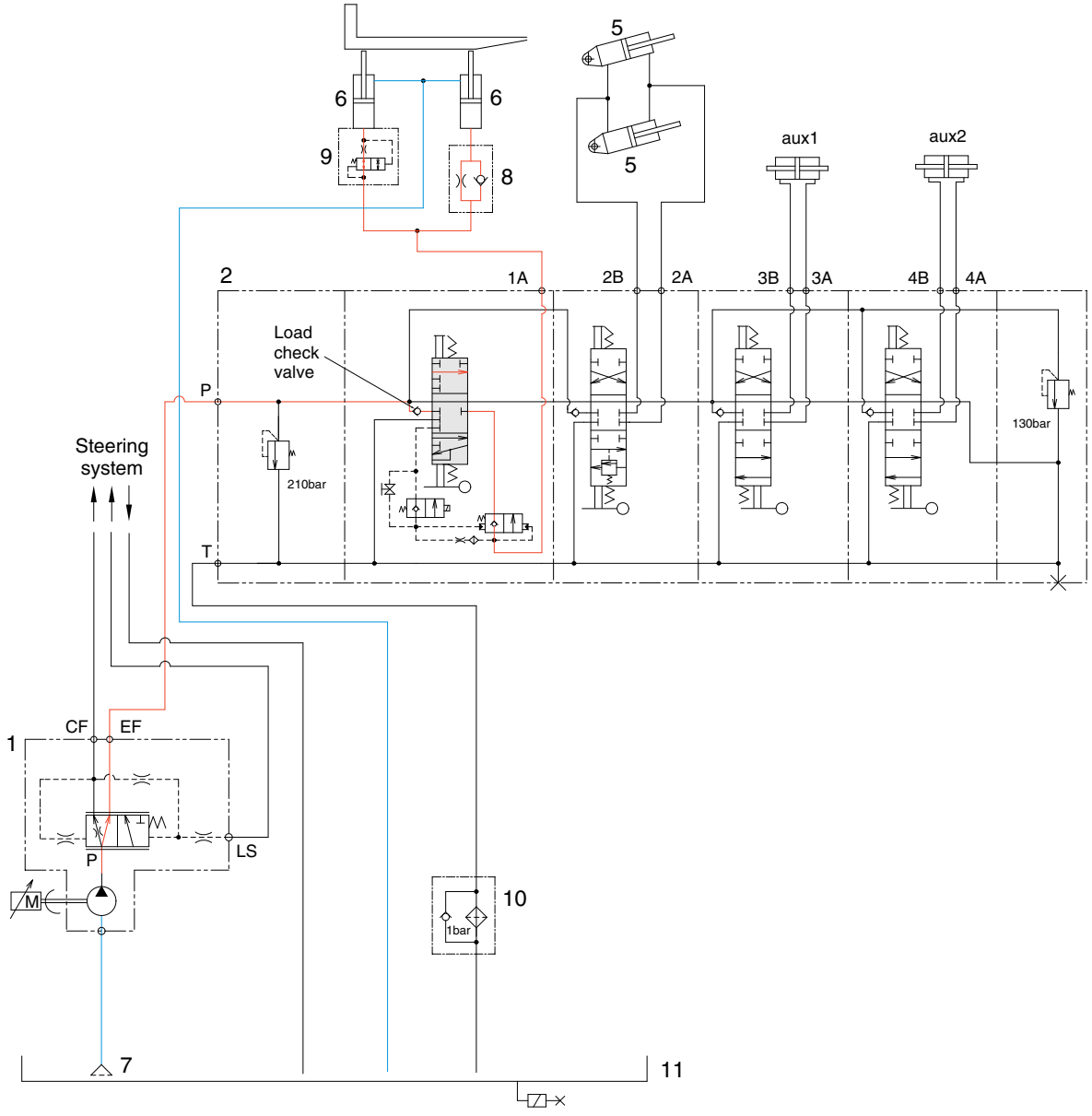
2) FINGERTIP TYPE



3ZBD-01000-002

1 Hydraulic gear pump with priority valve
2 Main control valve
3 Steering unit
4 Steering cylinder
5 Tilt cylinder
6 Lift cylinder
7 Suction strainer
8 Down control valve
9 Down safety valve
10 Return filter
11 Hydraulic oil tank

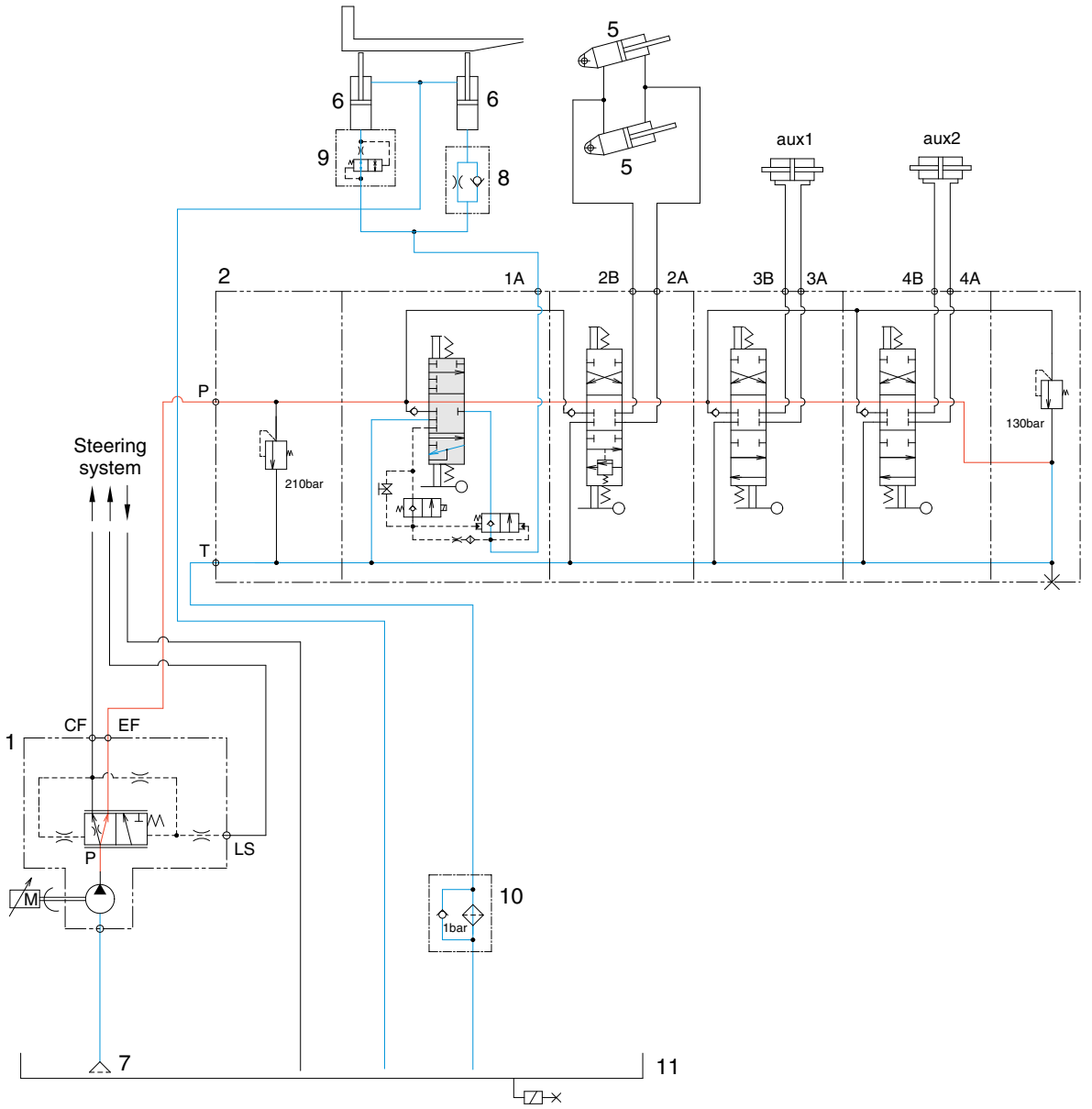
3) WHEN THE LIFT CONTROL LEVER IS IN THE LIFT POSITION



25BC9U6HS01

When the lift control lever is pulled back, the spool on the first block is moves to lift position.
The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of lift cylinder (6) by pushing the load check valve of the spool.
The oil from the small chamber of lift cylinder (6) returns to hydraulic oil tank (11) at the same time.
When this happens, the forks go up.

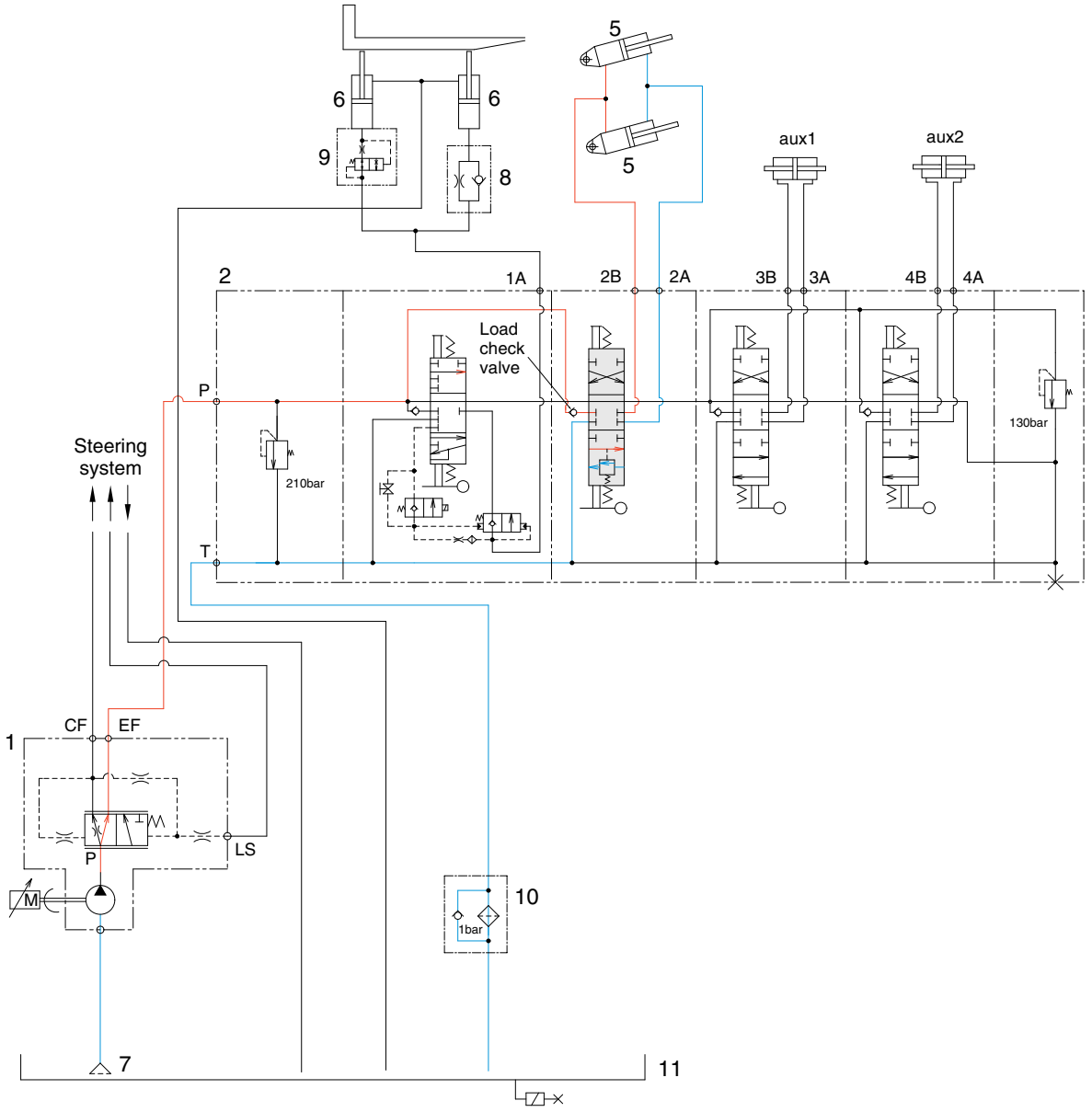
4) WHEN THE LIFT CONTROL LEVER IS IN THE LOWER POSITION



25BC9U6HS02

When the lift control lever is pushed forward, the spool on the first block is moved to lower position. The work port (1A) and the small chamber and the large chamber are connected to the return passage, so the forks will be lowered due to its own weight.

5) WHEN THE TILT CONTROL LEVER IS IN THE FORWARD POSITION



25BC9U6HS03

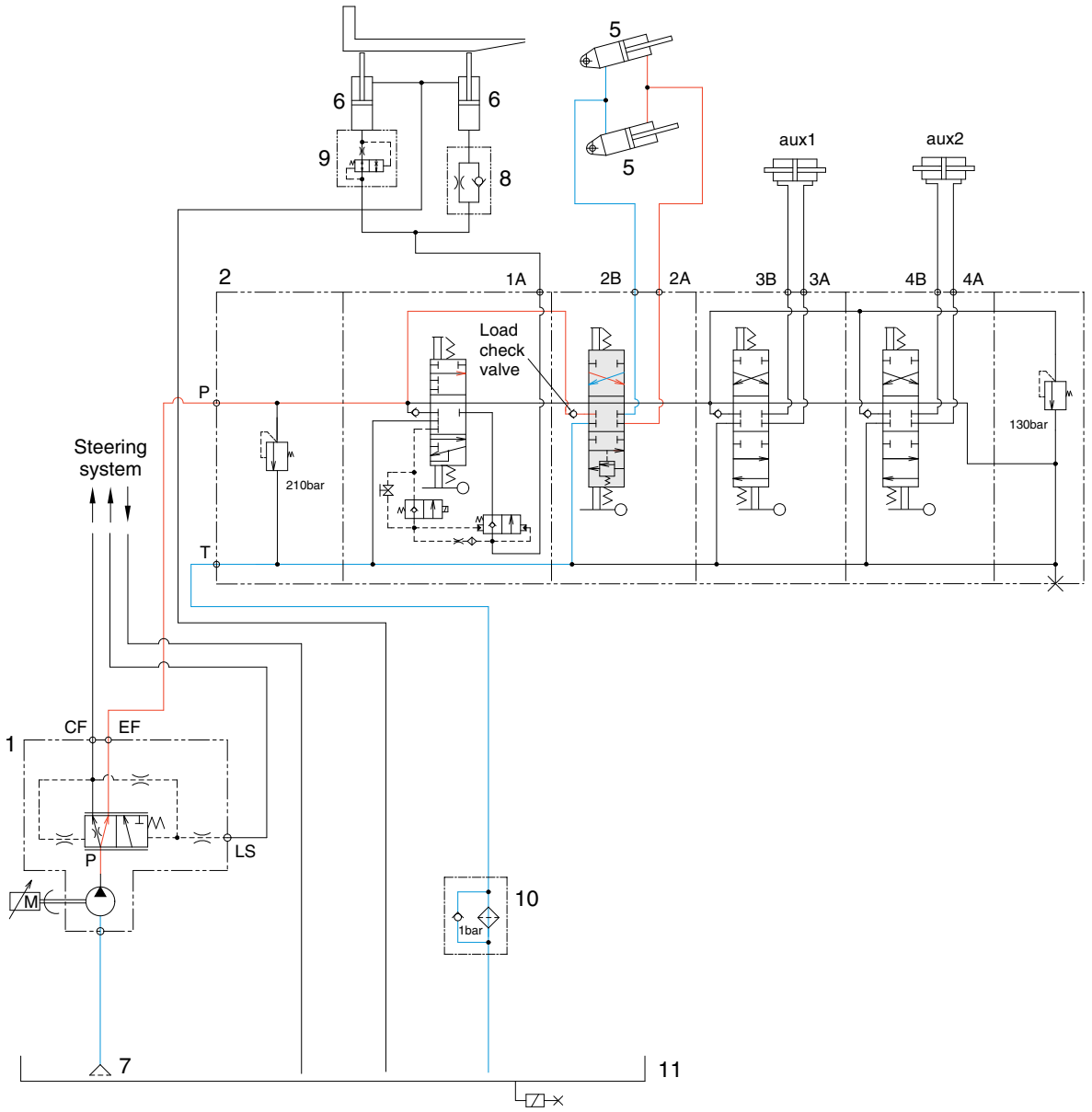
When the tilt control lever is pushed forward, the spool on the second block is moved to tilt forward position.

The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of tilt cylinder (5) by pushing the load check valve of the spool.

The oil at the small chamber of tilt cylinder (5) returns to hydraulic tank (11) through return filter (10) at the same time.

When this happens, the mast tilt forward.

6) WHEN THE TILT CONTROL LEVER IS IN THE BACKWARD POSITION



25BC9U6HS04

When the tilt control lever is pulled back, the spool on the second block is moved to tilt backward position.

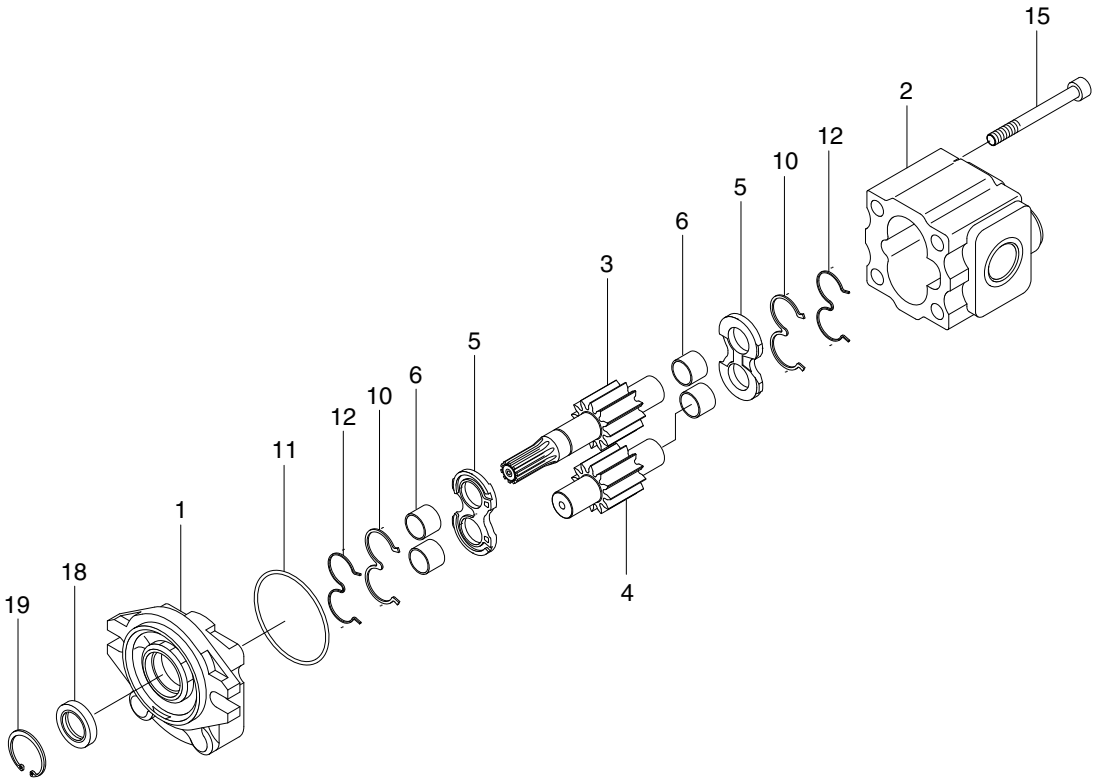
The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the small chamber of tilt cylinder (5) by pushing the load check valve of spool.

The oil at the large chamber of tilt cylinder (5) returns to hydraulic tank (11) through return filter (10) at the same time.

When this happens, the mast tilt backward.

2. HYDRAULIC GEAR PUMP

1) STRUCTURE

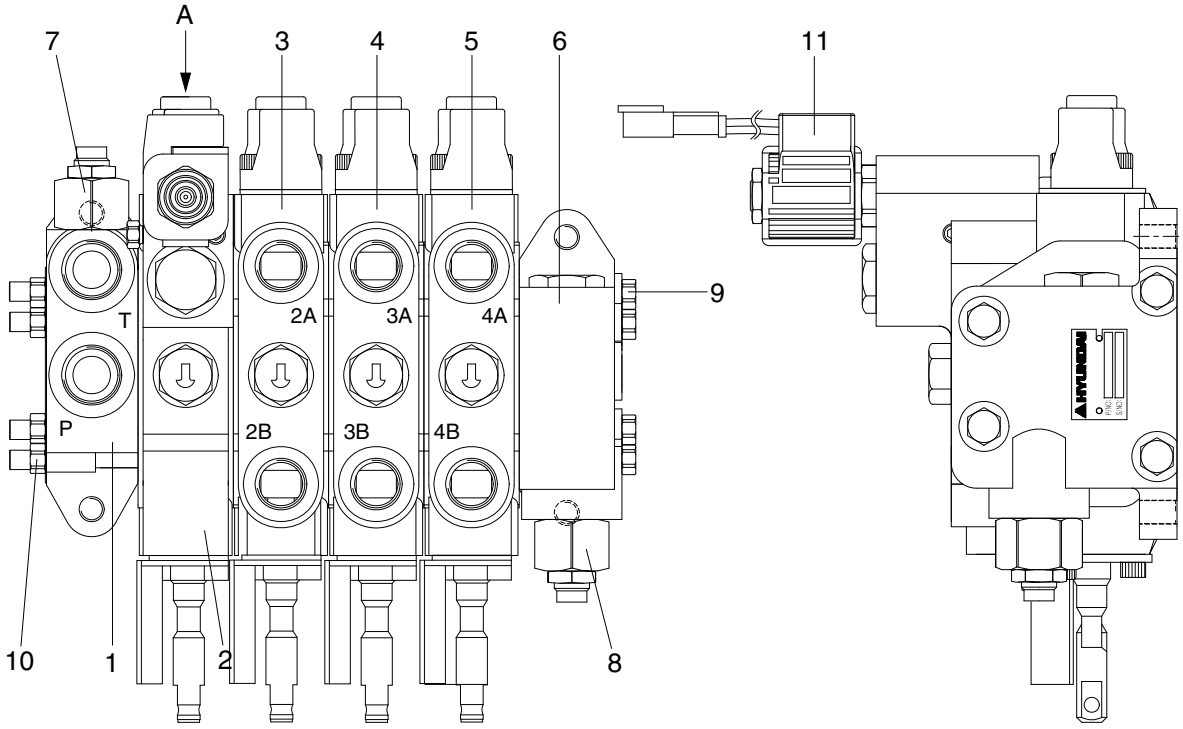


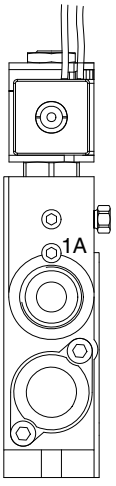
31HA-01530

1	Front cover	5	Side plate	12	Back up ring
2	Body	6	Bushing	15	Socket bolt
3	Drive gear	10	Gasket	18	Oil seal
4	Driven gear	11	Gasket	19	Retaining ring

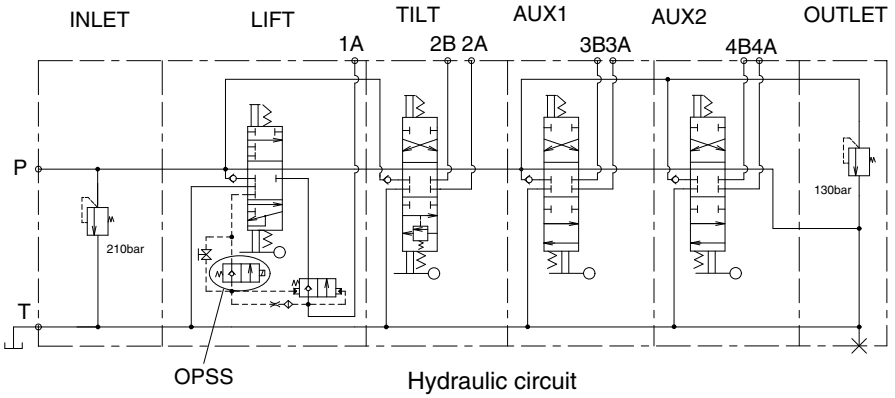
3. MAIN CONTROL VALVE (MANUAL)

1) STRUCTURE (4 Spool, with mast tilting, lifting and lowering OPSS)





VIEW A



Hydraulic circuit

Port name	Size	Port
Inlet port	7/8-14UNF	P
Outlet port	7/8-14UNF	T
Work port	7/8-14UNF	1A
Work port	3/4-16UNF	2A, 2B, 3A, 3B, 4A, 4B

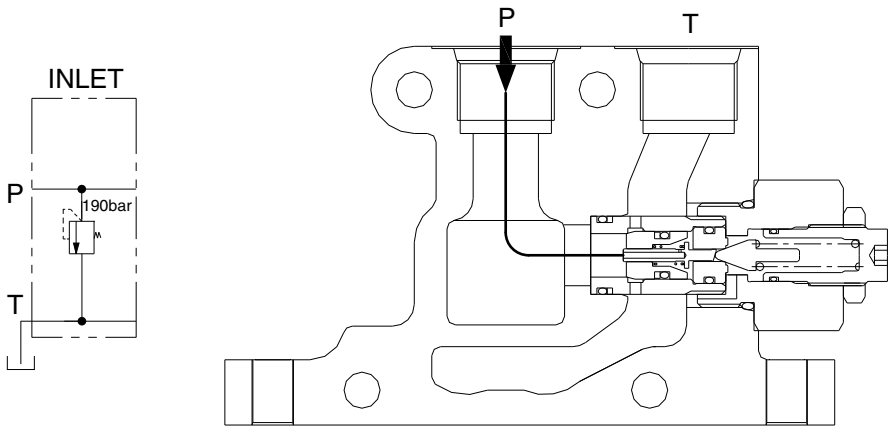
25BC9U6HS08

1	Inlet block assy	5	Aux 2 block assy	9	Long bolt
2	Lift block assy	6	Outlet block assy	10	Nut
3	Tilt block assy	7	Main relief valve assy	11	Solenoid valve
4	Aux 1 block assy	8	Auxiliary relief valve assy		

2) INLET SECTION

(1) Operation

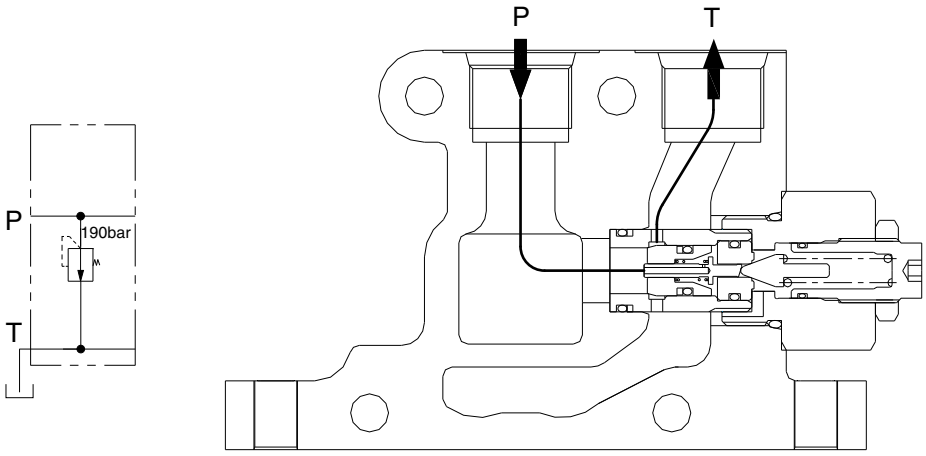
The inlet section contains the pump inlet connection and main relief valve.



22B7HS09

(2) Operation of relief valve at setting pressure

When the pressure at inlet reaches to setting pressure, the pilot poppet which is in the main relief valve is opened by pressure. At this condition the flow divert from the pump directly to the outlet tank.



22B7HS10

3) LIFT SECTION

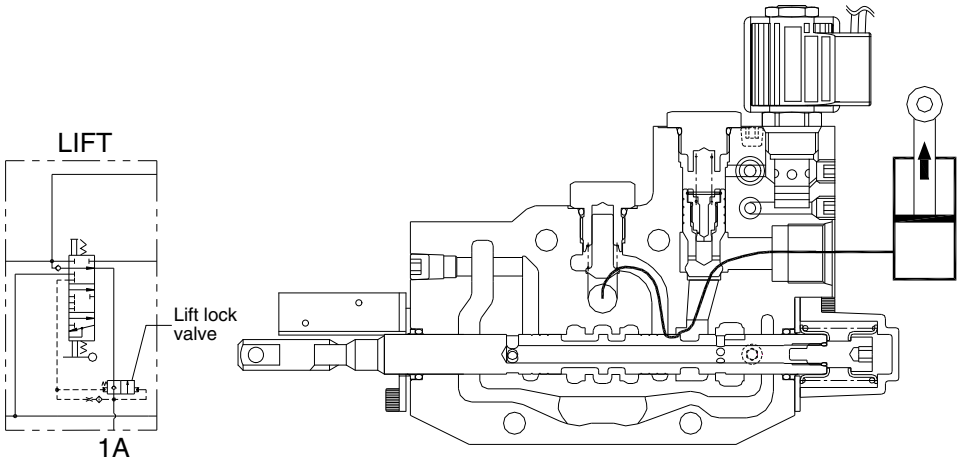
(1) Operation

The lift section has a single work port to direct flow to the lift cylinder. Only one work port is used, because the lift cylinder is single-acting (gravity returns the mast to the lowered position).

The lift section also contains part of the components which comprise the safety features. There is a lift lock check valve. At the neutral position, pressures in the lock valve are equalized across the lift lock poppet. In this manner, the spring bias keeps the lift lock valve closed and prevents lowering of the mast.

① Lifting

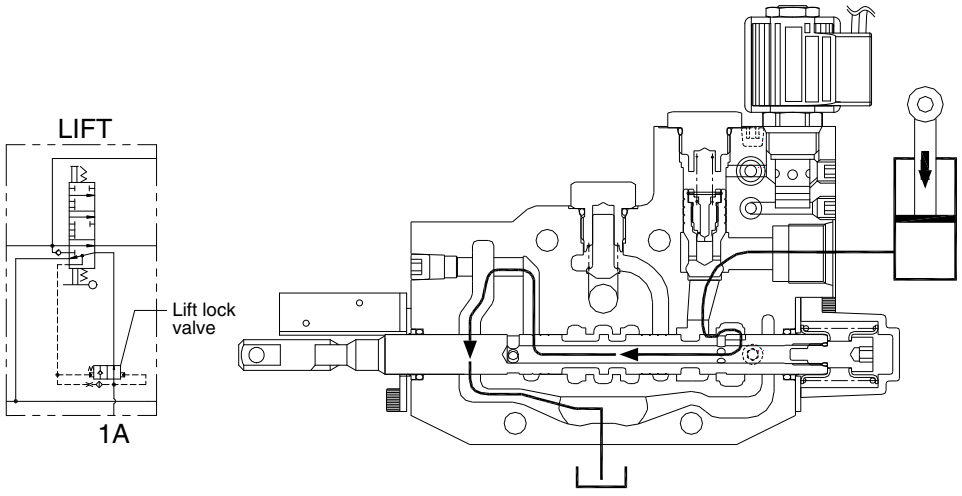
When the operator shifts the lever backwards, the spool is extended out of the valve, and this opens the internal fluid passages that lift the mast. Oil flows through the high pressure parallel cavity, past the load check valve, through the spool metering notches, past the lift lock check valve, and to the head side of the lift cylinder.



25BC9U6HS11

② Lowering

When the seated operator shifts the lever forwards, the spool retracts into the valve, and the oil is directed from the cylinder, past the lift lock check valve, past the spool metering notches, and to the common tank cavity.



25BC9U6HS12

Pressure is limited by the main relief valve.

4) TILT SECTION

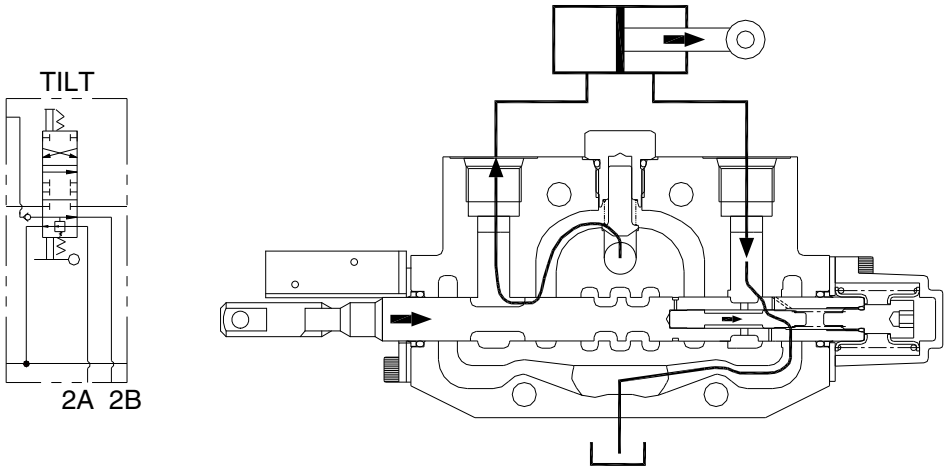
(1) Operation

The tilt spool contains an internal plunger which acts to stop tilt forward actuation when the battery power is off.

① Tilt forward

When the seated operator shifts the lever forward, pressure is applied to the head of the tilt cylinder, and the forks tilt forward. Oil is directed from the high pressure parallel passage past the load check valve, past the spool metering notches, and towards the cylinder head.

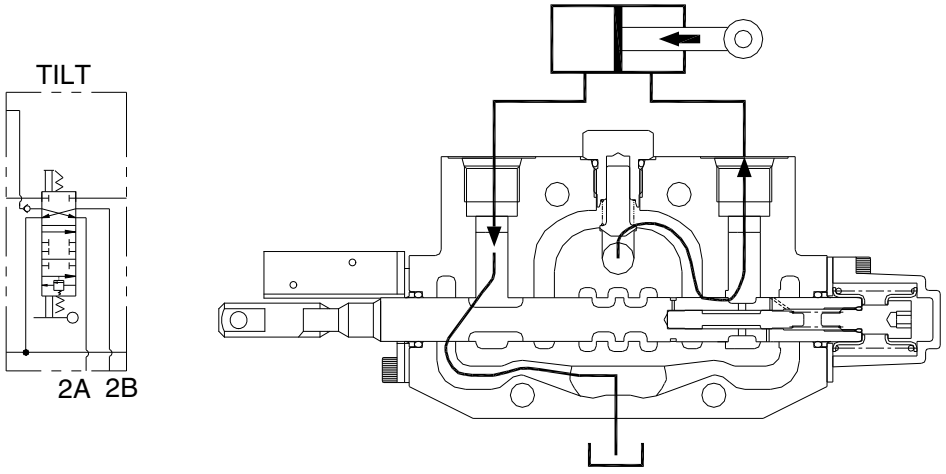
Simultaneously, the high pressure acts upon the end of the tilt lock plunger to move it towards the spring end of the spool. This plunger movement opens additional spool metering notches which control oil flow from the rod end of the cylinder to the tank return line.



25BC9U6HS13

② Tilt Back

When the seated operator shifts the lever back, the high pressure oil from the parallel passage is directed past the load check valve, past the spool metering notches, and to the rod side of the cylinder. Exhaust oil from the head side of the cylinder is directed past the spool metering notches to tank.



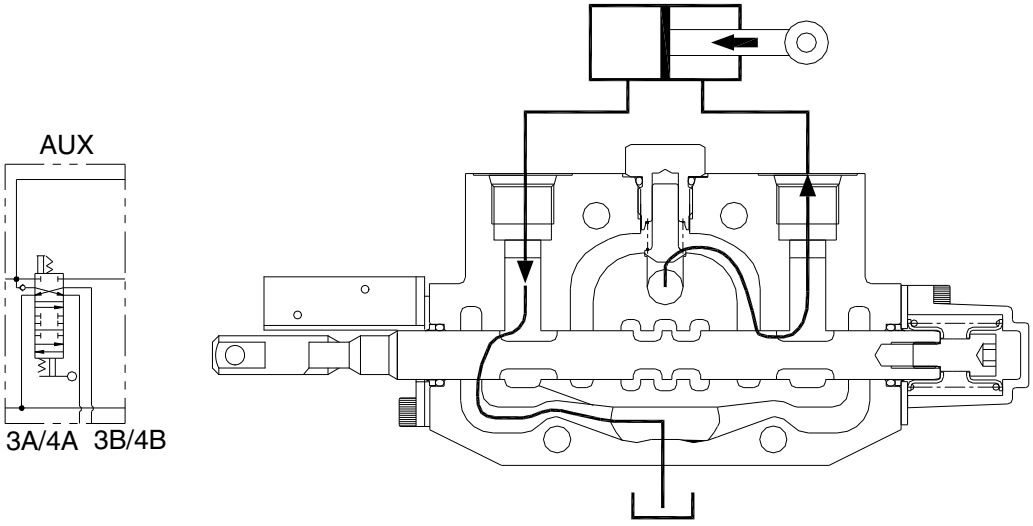
25BC9U6HS14

Pressure is limited by the main relief valve.

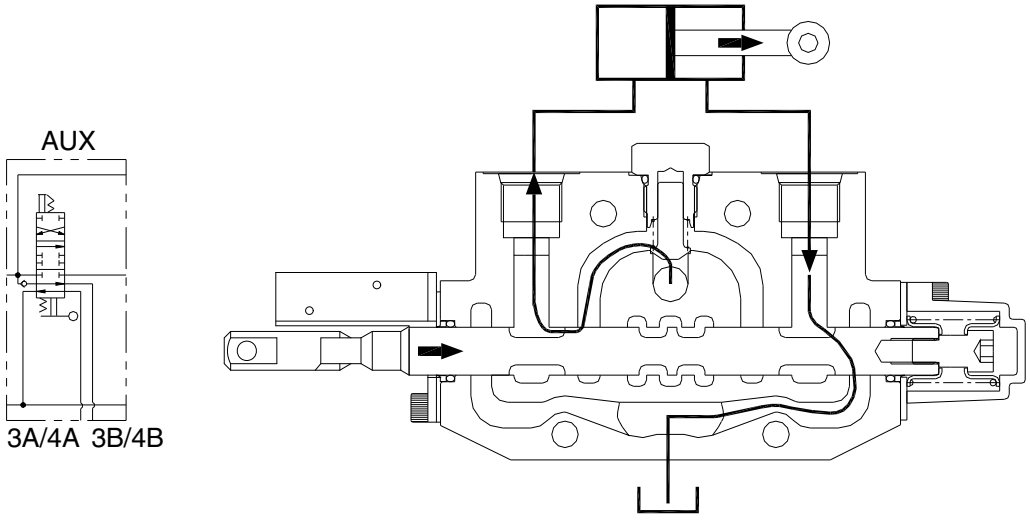
5) AUXILIARY SECTIONS

(1) Operation

Many different functions can be controlled by the auxiliary spool sections. In general, one work port is pressurized by high pressure oil from the parallel passage, past the load check valve, past the metering notches, and to the cylinder. Simultaneously, oil from the other work port is directed across the spool metering notches to tank.



25BC9U6HS15



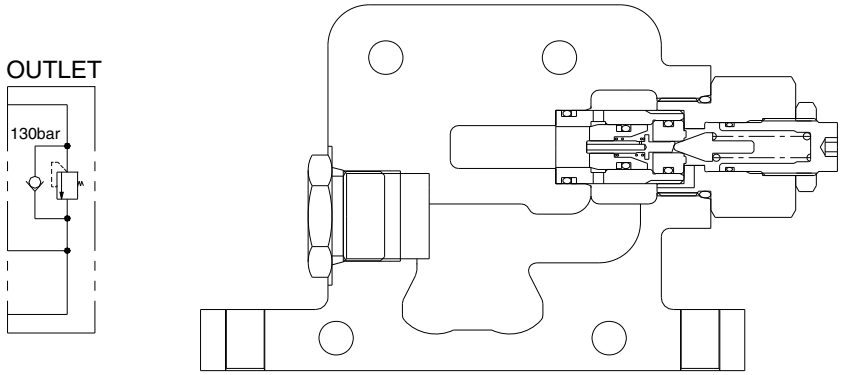
25BC9U6HS16

Pressure is limited by the secondary main relief valve.

6) OUTLET SECTION

(1) Operation

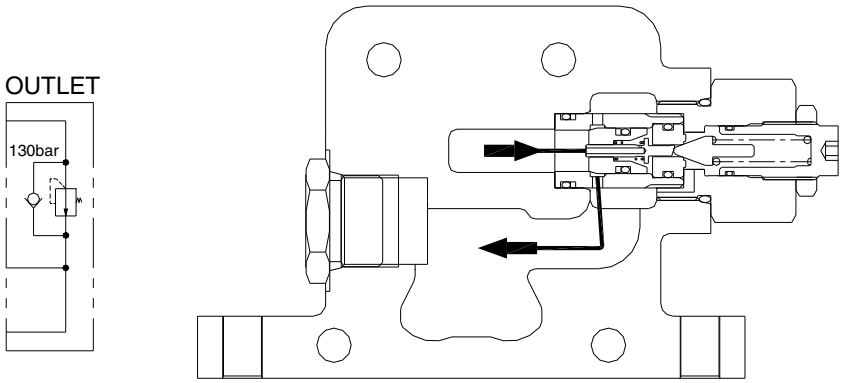
The outlet section contains the tank port and the secondary relief valve (with built-in anti-cavitation feature).



22B7HS17

(2) Operation of relief valve at setting pressure

When the pressure at outlet reaches to setting pressure, the pilot poppet which is in the main relief valve is opened by pressure. At this condition the flow divert from the pump directly to the tank line.

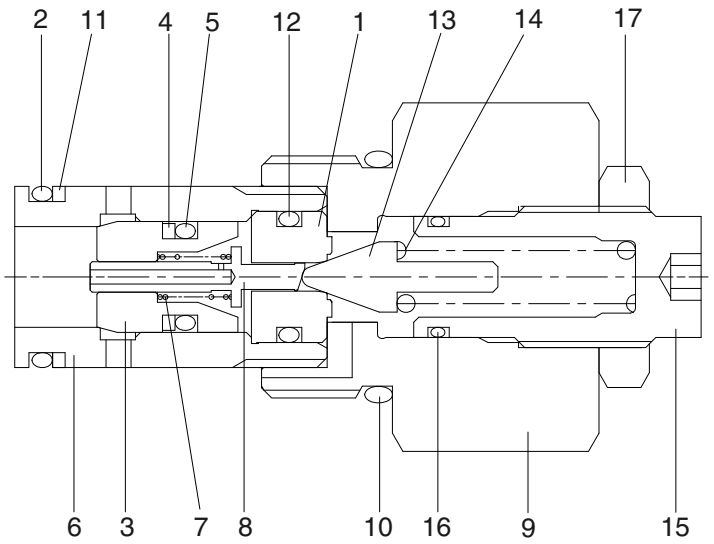


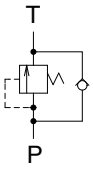
22B7HS18

7) MAIN RELIEF VALVE

This valve is a type of pilot piston to prevent hydraulic components and pipes from being broken by high pressure so, it keeps under pressure limited.

Relief valve pressure varies by 130 kgf/cm^2 in accordance with 1 revolution of adjust bolt.



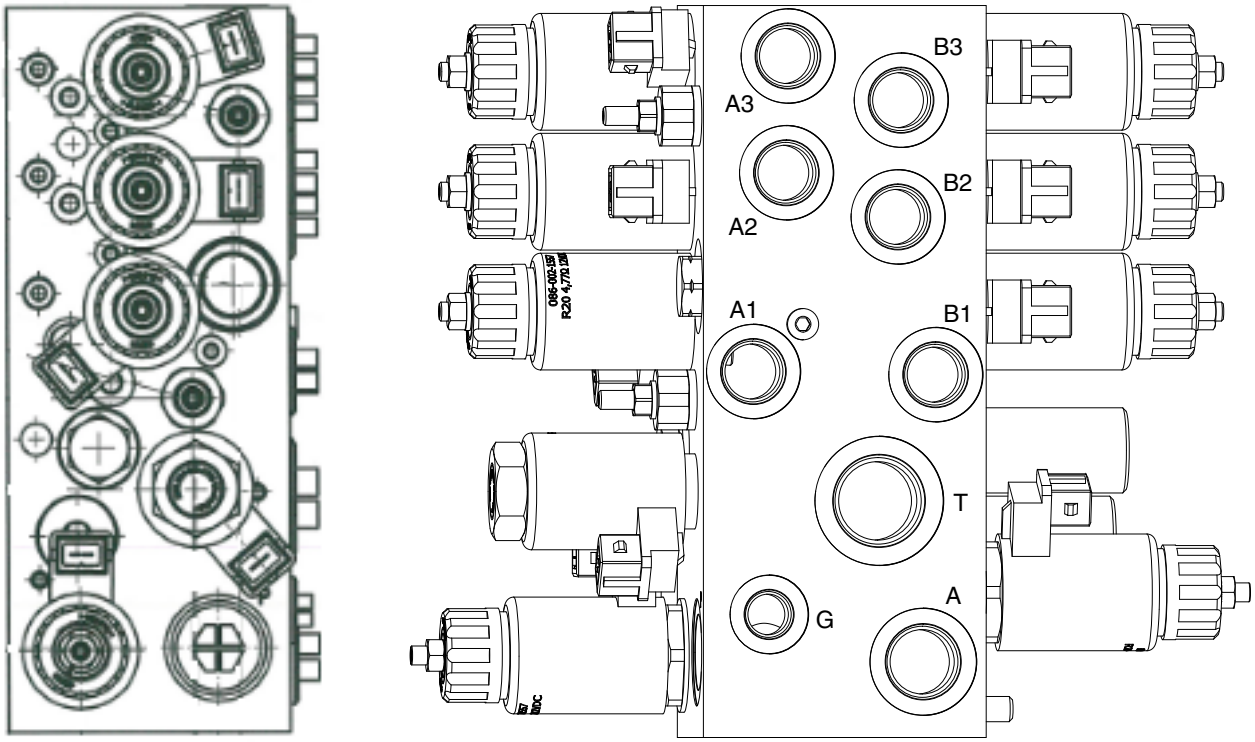


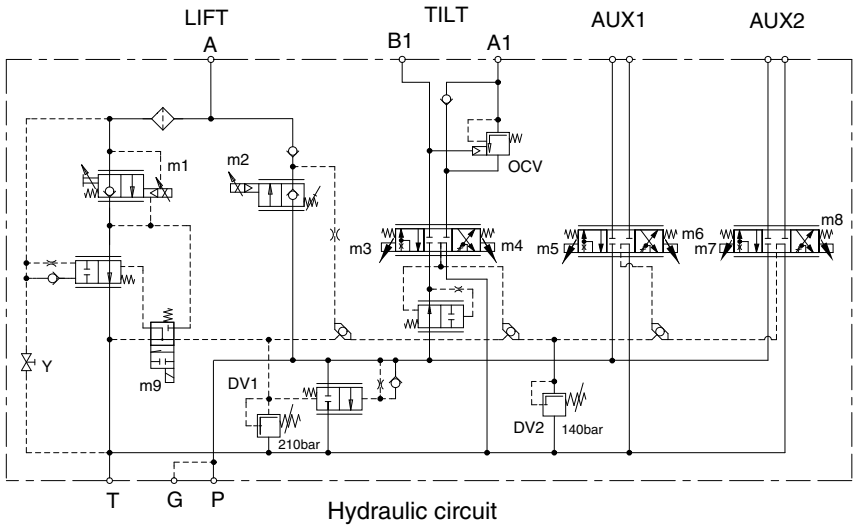
- Main relief valve : 210 kgf/cm^2
- Secondary main relief valve : 130 kgf/cm^2 (for 3, 4 spool only)

25BC9U6HS17

1	Pilot seat	7	Main spring	13	Pilot poppet
2	O-ring	8	Piston	14	Pilot spring
3	Main poppet	9	Body	15	Adjust screw
4	Back up ring	10	O-ring	16	O-ring
5	O-ring	11	Back up ring	17	Lock nut
6	Socket	12	O-ring		

4. MAIN CONTROL VALVE (FINGERTIP)





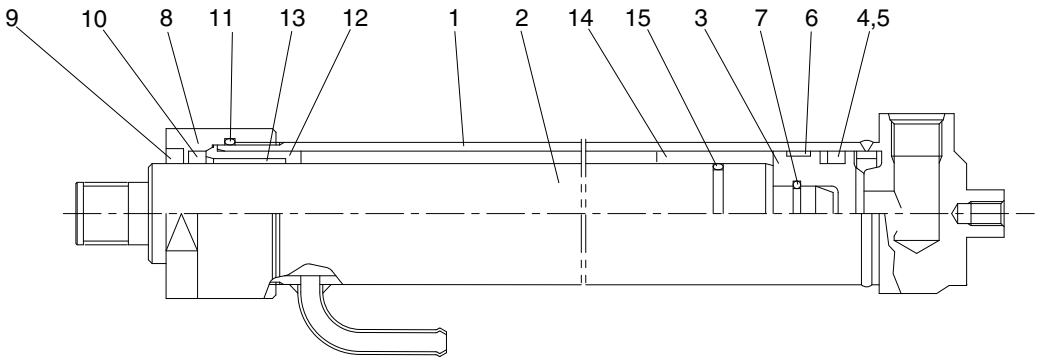
Hydraulic circuit

25BC9U6HS09

Port name	Size	Port
Inlet port	7/8-14UNF	P
Outlet port	1 1/16-12UN	T
Work port	7/8-14UNF	A
Work port	3/4-16UNF	2A, 2B, 3A, 3B, 4A, 4B
Gauge port	9/16-18UNF	G

5. LIFT CYLINDER

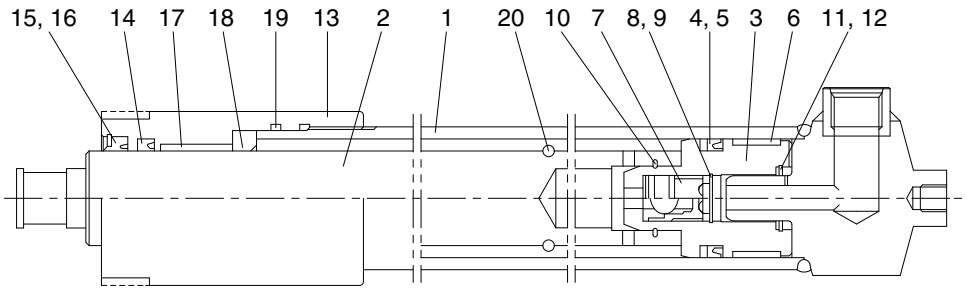
1) V MAST



D255HS18

1	Tube	6	Wear ring	11	O-ring
2	Rod	7	Retaining ring	12	Stopper
3	Piston	8	Gland	13	DU bushing
4	Piston seal	9	Dust wiper	14	Spacer
5	Back up ring	10	Rod seal	15	O-ring

2) TF MAST

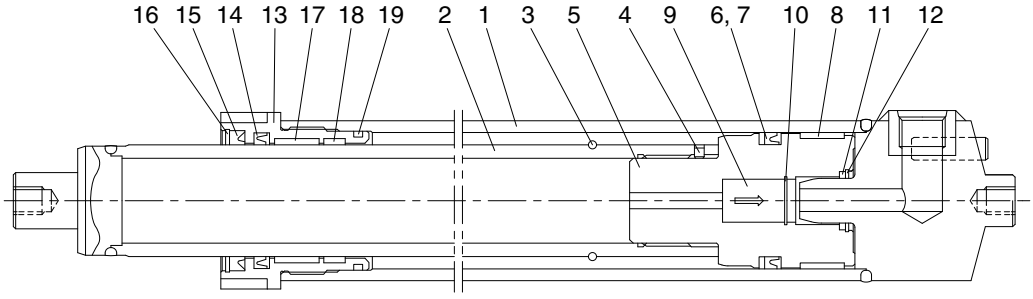


22B9FHS21

1	Tube assembly	8	Spacer	15	Dust wiper
2	Rod	9	Retaining ring	16	Retaining ring
3	Piston	10	Stop ring	17	Rod bushing
4	U-packing	11	Cushion seal	18	Spacer
5	Back up ring	12	Retaining ring	19	O-ring
6	Wear ring	13	Rod cover	20	Stop ring
7	Check valve	14	U-packing		

※ Seal kit : 4 ~ 6, 14, 15, 19

3) QF-MAST (LH)



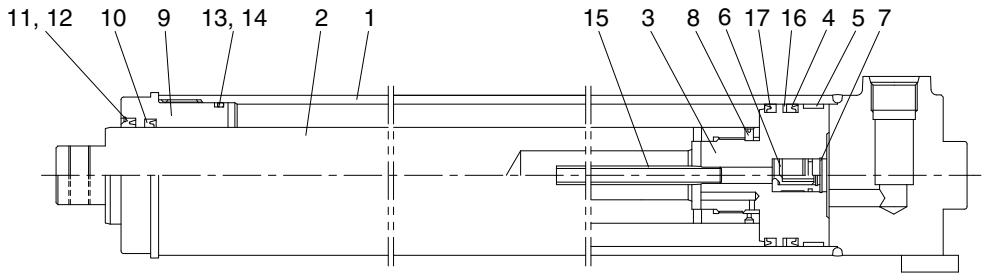
22B9FHS22

1	Tube assembly	8	Wear ring	15	Dust wiper
2	Rod assembly	9	Check valve	16	Retaining ring
3	Stop ring	10	Retaining ring	17	Wear ring
4	Set screw	11	Cushion seal	18	Dust ring
5	Piston	12	Retaining ring	19	O-ring
6	U-packing	13	Rod cover		
7	Back up ring	14	U-packing		

※ Seal kit : 6 ~ 8, 14, 15, 17 ~ 19

6. FREE LIFT CYLINDER

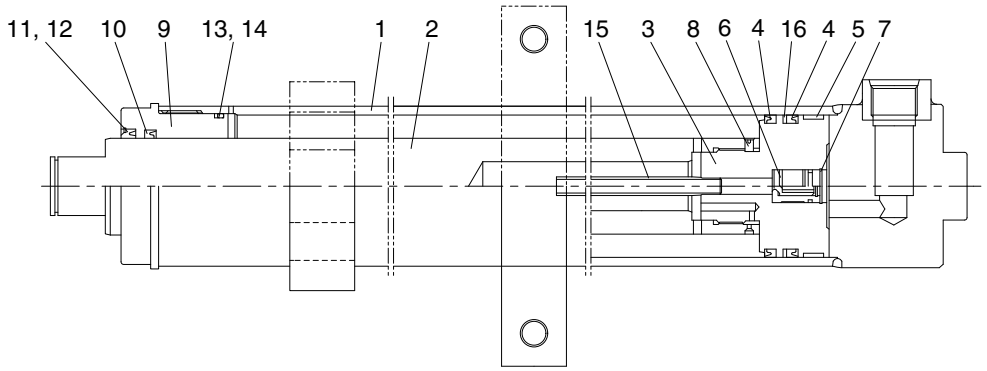
1) TF MAST



37B1-07612

1	Tube assembly	7	Retainer ring	13	O-ring
2	Rod	8	Set screw	14	Backup ring
3	Piston	9	Rod cover	15	Pipe
4	U packing	10	U packing	16	Backup ring
5	Abrasion ring	11	Dust wiper	17	U packing
6	Check valve	12	Retainer ring		

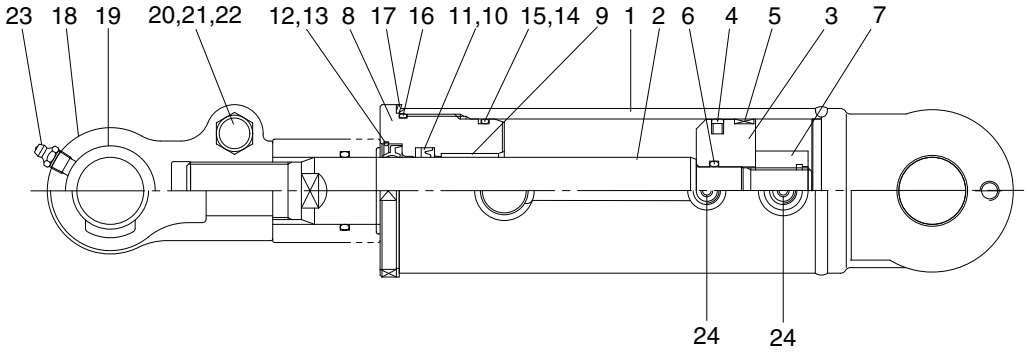
2) QF MAST



3CHN-07503

1	Tube assembly	7	Retainer ring	13	O-ring
2	Rod	8	Set screw	14	Backup ring
3	Piston	9	Rod cover	15	Pipe
4	U packing	10	U packing	16	Backup ring
5	Abrasion ring	11	Dust wiper		
6	Check valve	12	Retainer ring		

7. TILT CYLINDER



22B7HS24

1	Tube	9	DU bushing	17	Lock washer
2	Rod	10	U-packing	18	Rod eye
3	Piston	11	Back up ring	19	Spherical bearing
4	Piston seal	12	Wiper ring	20	Hexagon bolt
5	Dust wiper	13	Stop ring	21	Spring washer
6	O-ring	14	O-ring	22	Lock nut
7	Nylon nut	15	Back up ring	23	Grease nipple
8	Rod cover	16	O-ring	24	O-ring

1. OPERATIONAL CHECKS

1) CHECK ITEM

(1) Check visually for deformation, cracks or damage of rod.

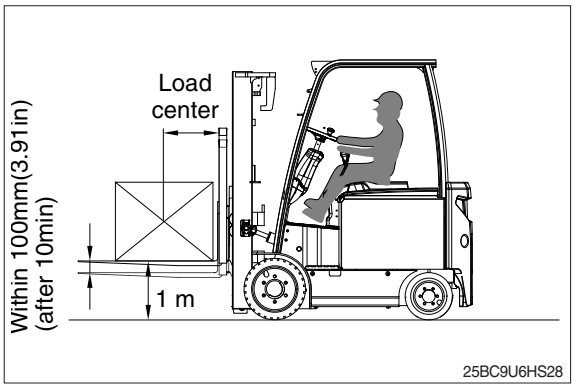
(2) Set mast vertical and raise 1 m from ground. Wait for 10 minutes and measure hydraulic drift (amount forks move down and amount mast tilts forward).

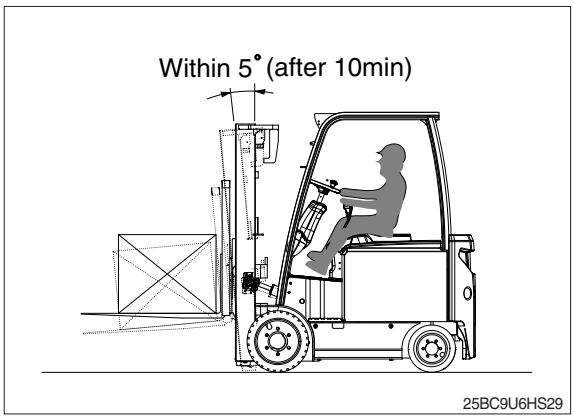
· **Check condition**

- Hydraulic oil : Normal operating temp (45±5°C)
- Mast substantially vertical.
- Rated capacity load.

· **Hydraulic drift**

- Down (Downward movement of forks)
: Within 100 mm (3.9 in)
- Forward (Extension of tilt cylinder)
: Within 5°





(3) If the hydraulic drift is more than the specified value, replace the control valve or cylinder packing.

Check that clearance between tilt cylinder bushing and mounting pin is within standard range.

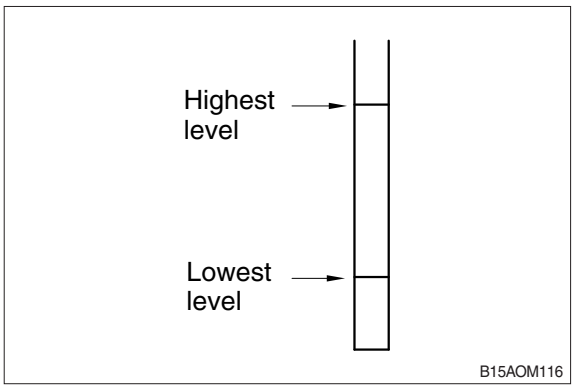
mm (in)

Standard	Under 0.6 (0.02)

2) HYDRAULIC OIL

(1) Using dipstick, measure oil level, and oil if necessary.

(2) When changing hydraulic oil, clean suction strainer(screwed into outlet port pipe) and line filter(screwed into inlet pipe). Line filter uses paper element, so replace periodically(every 6 months or 1000 hours)



3) MAIN CONTROL VALVE

(1) Raise forks to maximum height and measure oil pressure.

Check that oil pressure is 210 kgf/cm^2 .
(2987 psi)

2. FAILURE DIAGNOSIS AND TROUBLESHOOTING

1) HYDRAULIC SYSTEM

Trouble	Possible cause	Troubleshooting
Sudden drop of forks	· Defective seal inside control valve · Oil leak from joint or hose. · Defective seal inside cylinder.	· Replacing spool or valve body. · Replacing · Packing exchange.
Large tilting angle by tare weight of mast	· Leaning backward : Defective check valve. · Leaning forward : Defective tilting lock valve. · Oil leak from joint or hose. · Defective seal inside cylinder.	· Cleaning or replacing. · Cleaning or replacing. · Replacing. · Seal replacing.
Slow speed of fork lifting or mast tilting	· Insufficient hydraulic oil. · Intrusion of air in hydraulic oil. · Oil leak from joint or hose. · Excessive restriction on oil flow on pump suction. · Relief valve failed in keeping at specified pressure. · Defective seal inside cylinder. · High viscosity of hydraulic oil · Mast not moving smoothly. · Oil leak on lift control valve spool. · Oil leak on tilting control valve spool.	· Oil making up. · Air bleeding · Replacing. · Filter cleaning. · Relief valve adjusting. · Packing exchange. · Replacing with ISO VG46. · Adjusting rolls in rail interval · Replacing spool or valve body. · Replacing spool or valve body.
Abnormal noise from hydraulic system	· Excessive restriction on oil flow on pump suction. · Defective hydraulic pump gear or bearing.	· Filter cleaning. · Gear or bearing replacing.
Control valve lever locked	· Foreign substance between spool and valve body. · Defective valve body.	· Cleaning. · Evenly tightening body mounting bolt.
Rise of oil temperature	· Insufficient hydraulic oil. · High viscosity of hydraulic oil. · Oil filter clogged.	· Oil making up. · Replacing with ISO VG46. · Filter cleaning.

2) HYDRAULIC GEAR PUMP

Trouble	Possible cause	Troubleshooting
Oil leak from oil seal	· Backlashing · Abnormally high pressure on suction port · Seal damaged by foreign substance · Damage or abrasion of seal of shaft · Defective centering of shaft	· Rotating pump in correct direction · Keeping pressure proper · Replacing oil seal with new part · Centering adjustment. · Pump replacing.
Oil leak on cover or body interface	· Bolt loosened or damaged on cover and body · Deterioration or damage of oil seal by thermosetting of gasket	· Bolt fastening or keeping pressure proper. · Replacing gasket with new part · Pump replacing.
Oil leak on port	· Port fitting damaged or loosened · Port seal damaged · Port damaged	· Port tightening and keeping design pressure intact · Port seal replacing · Pump replacing
Discharge flow insufficient, or pressure not established	· Insufficient oil in tank · Internal oil leak by abnormally high pressure, or improper oil viscosity · Capability degraded by oil contamination · Cavitation by negative pressure · Internal part destructed · Backlashing	· Suppling oil of proper type and capacity into tank, and cooling system replacing. · Exchanging contaminated oil. · Using suction pipe of proper length and width, and replacing filter to prevent negative pressure. · Suction valve opening · Pump replacing · Rotating pump in correct direction, and preventing abnormally high temperature on suction side.
Rise of tank or oil temperature	· Abnormal heat generated by frequent operation of pressure control valve · Internal part destructed	· Setting to proper pressure. · Pump replacing.
Noise and vibration	· Poor mounting · Cavitation · Air induced · Vibration of piping or mounted flange · Chattering of relief valve · Internal part destructed	· Centering adjustment · Using suction pipe of proper length and width, and replacing filter to prevent negative pressure. · Filling tank with oil, and preventing air inducing with suction pipe. · Reinforcing pipe and mounting flange, and preventing resonance. · Replacing relieve valve. · Pump replacing.

※ Capability of disassembled pump may not be restored after reassembling.

※ If pump is destructed, replace the assembly.

※ If it is inevitable to disassemble pump, consult with the authorized shop or dealer of Hyundai.

3) MAIN RELIEF VALVE

Problem	Cause	Remedy
Can't get pressure	· Poppet D, E or K stuck open or contamination under seat.	· Check for foreign matter between poppets D, E or K and their mating parts. Parts must slide freely.
Erratic pressure	· Pilot poppet seat damaged. · Poppet C sticking in D.	· Replace the relief valve. · Clean and remove surface marks for free movement.
Pressure setting not correct	· Normal wear. Lock nut & adjust screw loose.	· See ★Test of main control valve.
Leaks	· Damaged seats. · Worn O-rings. · Parts sticking due to contamination.	· Replace the relief valve. · Install seal and spring kit. · Disassemble and clean.

★ A good pressure gauge must be installed in the line which is in communication with the main relief. A load must be applied in a manner to reach the set pressure of the main relief unit.
Then, follow these steps :

- Loosen lock nut.
- Set adjusting nut to desired pressure setting.
- If desired pressure setting cannot be achieved, add or remove shims as required.
- Tighten lock nut.
- Retest in similar manner as above.

4) LIFT CYLINDER

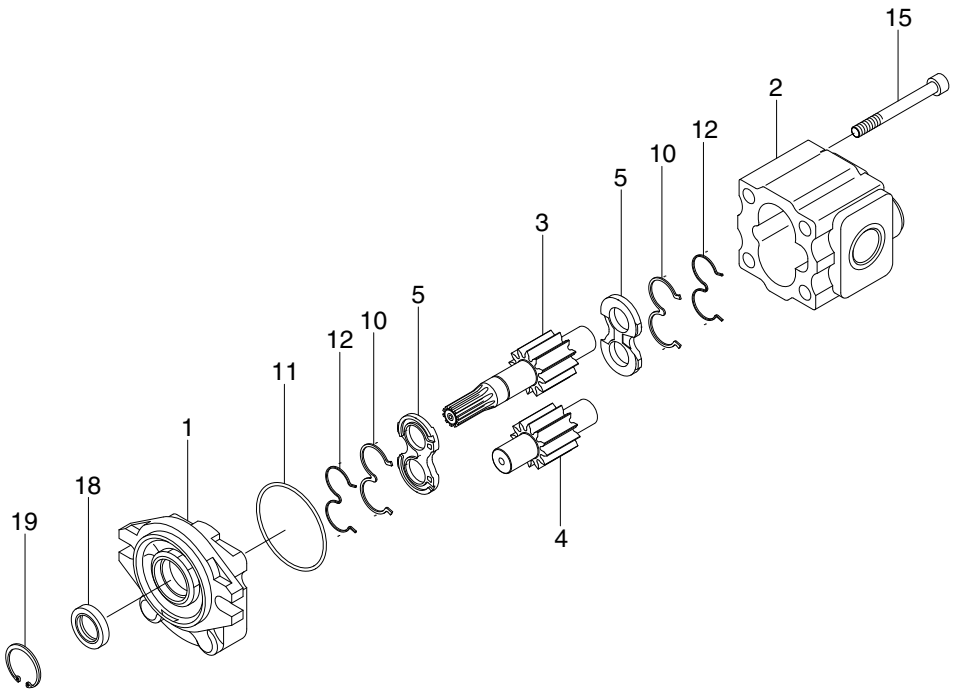
Problem	Cause	Remedy
Oil leaks out from rod cover through rod	· Foreign matters on packing. · Unallowable score on rod. · Unusual distortion of dust seal. · Chrome plating is striped.	· Replace packing. · Smooth rod surface with an oil stone. · Replace dust seal. · Replace rod.
Oil leaks out from cylinder rod cover thread	· O-ring damaged.	· Replace O-ring.
Rod spontaneously retract	· Scores on inner surface of tube. · Unallowable score on the inner surface of tube. · Foreign matters in piston seal.	· Smooth rod surface with an oil stone. · Replace cylinder tube. · Replace piston seal.
Wear (clearance between cylinder tube and wear ring)	· Excessive clearance between cylinder tube and wear ring.	· Replace wear ring.
Abnormal noise is produced during tilting operation	· Insufficient lubrication of anchor pin or worn bushing and pin. · Bent tilt cylinder rod.	· Lubricate or replace. · Replace.

GROUP 3 DISASSEMBLY AND ASSEMBLY

Check immediately that any spare parts you receive have not been damaged in shipment.
Always work in a clean environment.
Wash all components in solvent and blow dry with compressed air before refitting.
Take care not to damage rubber seals.
Avoid damaging precision machined surfaces.
Components should fit into their housings without excessive force. If force is necessary, this normally means that the component does not have the correct dimensional tolerances of is aligned incorrectly.
When hand pressure is insufficient, only use press or rubber hammer to fit components.
Never strike components with steel hammers.
Steel bush must be fitted only with a suitable press.
Do not use hammers to fit bearings.
Always respect the direction of rotation when assembling components.

1. HYDRAULIC GEAR PUMP

1) STRUCTURE



15BRXHS26

1	Front cover	5	Side plate	12	Backup ring
2	Body	6	Bushing	15	Bolt
3	Driving gear	10	Gasket	18	Oil seal
4	Inverted gear	11	O-ring	19	Retaining ring

※ Seal kit : 10 (2EA), 11 (1EA), 12 (2EA), 18 (1EA), 19 (1EA)

2) DISASSEMBLY AND ASSEMBLY

(1) Safety Precautions

※ When pump installation, piping, disassembly for repair and inspection, etc. are required, they shall be performed by the technical expert or performed through instruction by the technical expert.

※ Stop the system operation including the pump for removing the pump, and remove the pipings and devices after the surface of the pump is cooled completely to approximately 40 □ or less. If not, there may be risk of oil leakage or burn.

※ Pump shall not be used when the appropriate performance is not shown after re-assembly. Use by force may damage the device or the system.

※ Discharge the oil when disposing the pump, and handle as industrial waste.

※ Follow the safety regulations for safe use of the pump.

(2) Disassembling

※ Check for oil leakage on the oil seal, pump body and cover joint before disassembling the pump.

⚠ Remove the rust, dust and foreign substances on the shaft end and pump body. If not, the parts may be damaged, or it may penetrate into the pump during reassembly for inappropriate diagnosis of the pump.

※ Pump has a symmetrical part. For proper reassembly, the parts are marked through the method indicated on the disassembly procedure before disassembling the pump. Oil paint that does not damage the parts is used for this purpose.

※ Disassembly is a method of discovering the cause of issues. The pump disassembly procedure is followed.

※ Prepare the new packing, gasket and oil seal before the disassembly.

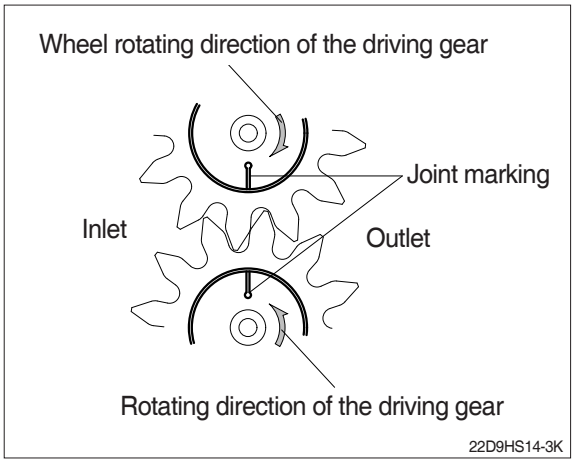
① Fix the front cover mounting part with a vice to enable the body side to be facing upwards.

② Mark the contact section of the front cover (1) and body (2) before the disassembly.

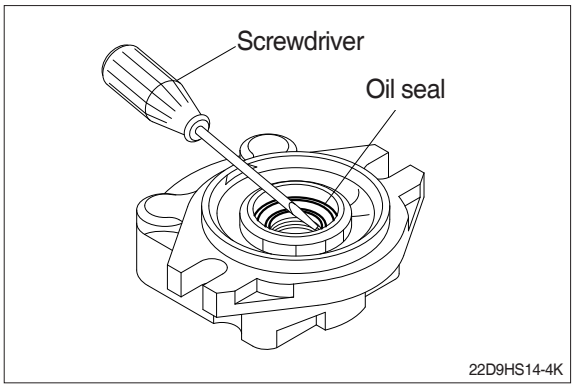
③ Loosen 4 bolts (15) and start the disassembly of the parts in order starting from the body. The following instructions shall be followed.

④ Mark the shaft end on the body side.

⑤ One pair of the side plate (5), type 3 gasket (10) and backup ring (12) is assembled on another direction, so each pair is attached with a tag to distinguish the place of use. (These are indicated as F and B on the diagram.)



⑥ After disassembling the C-type retaining ring, the end of screwdriver is inserted into the oil seal for disassembly.



(3) Assembling

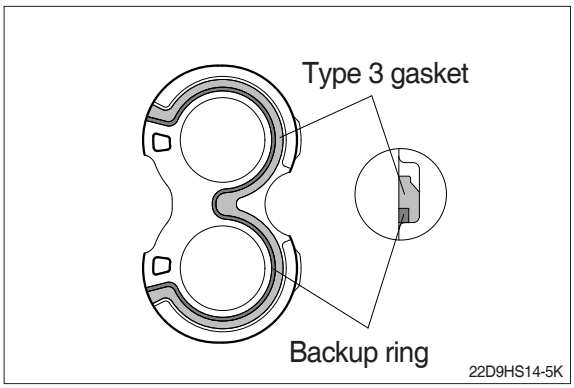
① These parts (10, 11, 12, 18, 19) are replaced with new parts.

② Each part must be removed with dust before the reassembly.

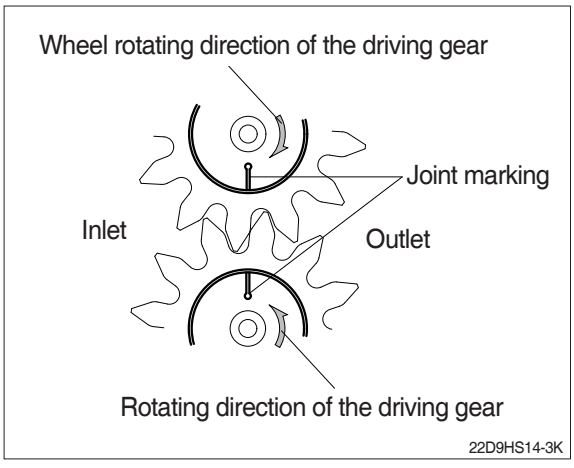
③ The body is placed on the work bench while the holes for the gear are facing upwards.

④ Parts are reassembled in order except for the oil seal, retaining ring and bolt.

· Grease is used to fix the type 3 gasket (1) and backup ring (12) to the side plate (5) to prevent the twisting or interlocking.



· Driving gear and inverted gear are fixed according to the joint mark.

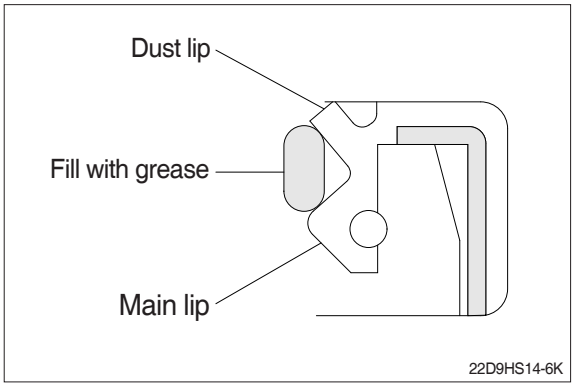


⑤ Turn the assembled pup to have the front cover facing down, and the mounting parts are fixed to the vice.

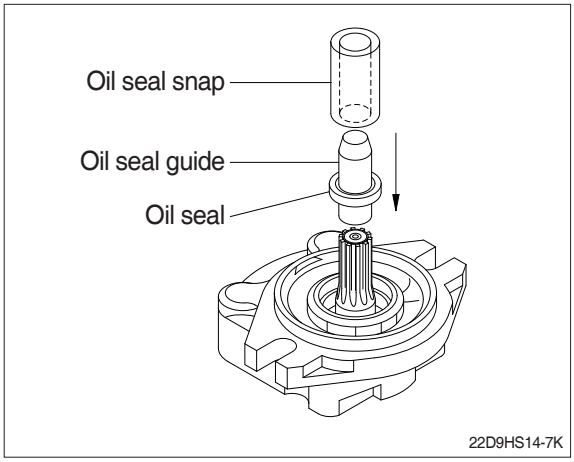
⑥ Fasten 4 bolts in 9.0~9.5 kgf·m torque.

⑦ Turn the assembled pump again to have the front cover facing up, and fix the body on the vice.

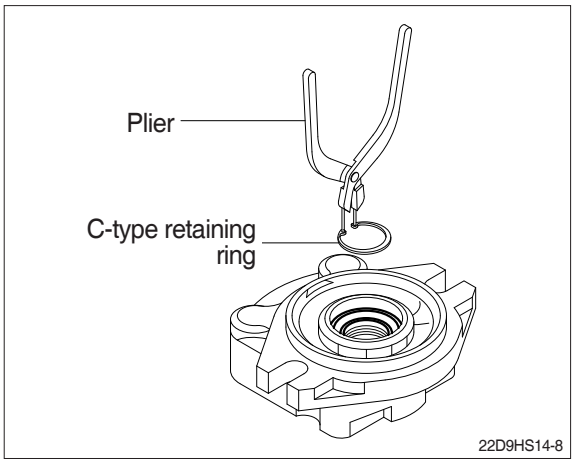
⑧ Fill with grease on the grooved part between the main lip and dust lip on the oil seal.



⑨ Use the oil seal guide and oil seal snap to assemble the oil seal on the body.



⑩ Insert the C-type retaining ring on the hole.



2. MAIN CONTROL VALVE

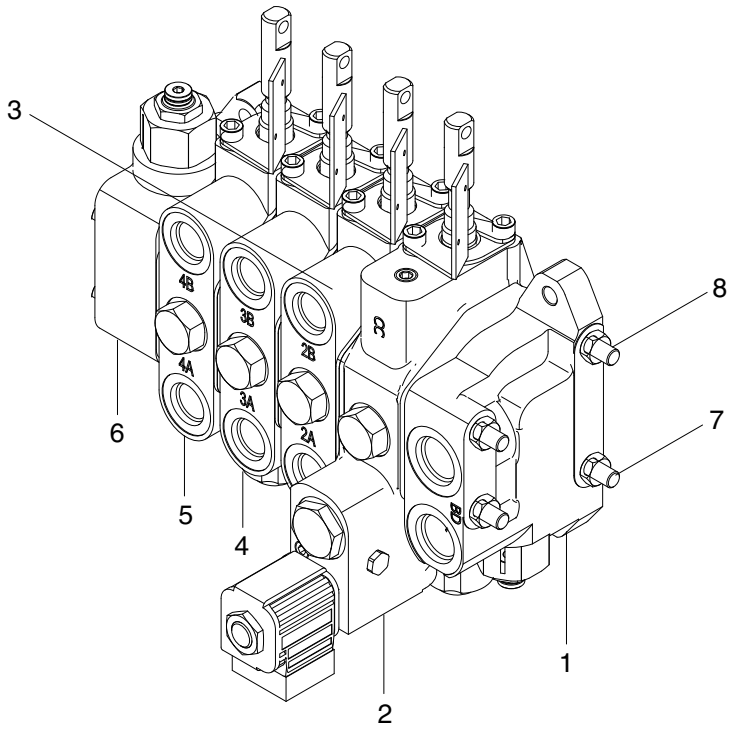
※ 4-spool, ISO type and non-application of the OPSS are used as the standard for description.

1) ASSEMBLY

(1) General

① The work space for assembly must be clean without any contamination.
② Flat working surface (Within 0.2 ㎜) is used for bolting with the valve section.
③ Calibrated torque wrench and instrument are used.
④ Refer to the component manual for the details of the components.

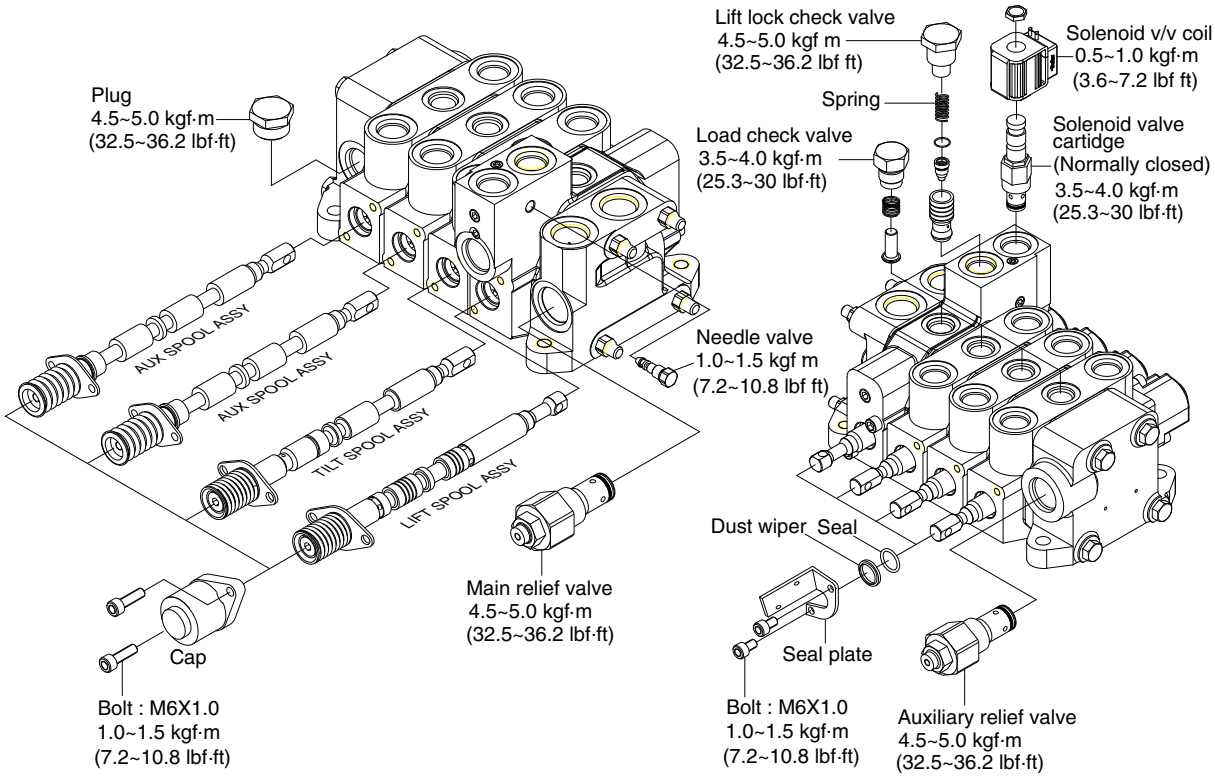
(2) Sub-block



1 Inlet block assy
2 Lilt block assy
3 Tilt block assy
4 Aux 1 block assy
5 Aux 2 block assy
6 Outlet block asy
7 Long bolt
8 Nut

25BC9U6HS30

① All O-rings are assembled to the appropriate groove between the spool sections.
② All work ports must be facing up and spool ends must be in the same direction to place the valve section, and all sections are placed on the flat (Within 0.2 ㎜) surface.
③ Tie rod is inserted through the drill hole on each housing.
④ Caution is required on preventing the damage of the sealing surface or seal to press with the section.
⑤ Nut is inserted on all tie rod ends for fastening in the diagonal direction in 2.4~2.9 ㎏f·m torque. It is checked periodically whether the valve is maintained horizontally while the torque is applied.



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(3) Inlet section

① Install the main relief valve assembly into the lower side cavity of the inlet section, as illustrated. Torque to 4.5~5.0 kgf · m (32.5~36.2 lbf · ft).

② Install the plug assembly in the tank port of the inlet section. Torque to 4.5~5.0 kgf · m (32.5~36.2 lbf · ft)

(4) Lift section

① The spool assembly should already consist of the lift spool, the return spring, one spring seat on either end of the spring, the seal plate, a spool seal, and a dust wiper. All of these are assembled on the end of the spool opposite the clevis.

② Insert the clevis end of the spool into the right-hand side of the spool bore(the tallest end of the housing). Place the spool cap over the spool and spring assembly and connect the cap to the housing using two bolts. Torque both bolts alternatively until a torque of 1.0~1.5 kgf · m (7.2~10.8 lbf · ft) is reached on both bolts.

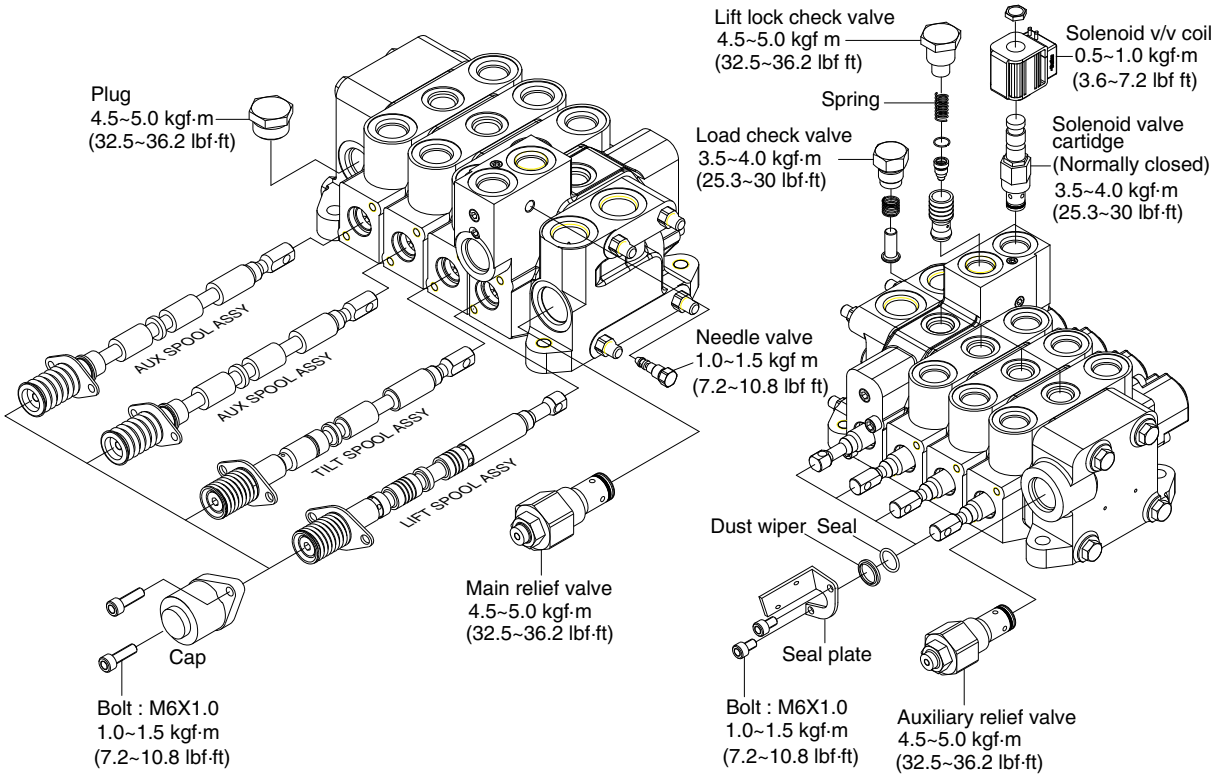
③ Install the second spool seal and dust wiper over the clevis end of the spool and retain with a seal plate and two bolts. Torque both bolts alternatively until a torque of 1.0~1.5 kgf · m (7.2~10.8 lbf · ft) is reached on both bolts.

④ The load check assembly is inserted into the top center cavity. Torque to 3.5~4.0 kgf · m (25.3~30 lbf · ft)

⑤ The normally closed solenoid is installed in the rightmost cavity on the top of the section. Torque to 3.5~4.0 kgf · m (25.3~30 lbf · ft)

⑥ Install the lift lock check valve assembly in the remaining open cavity in the top of the housing. Torque to 4.5~5.0 kgf · m(32.5~36.2 lbf · ft)

⑦ Install the needle valve subassembly in the cavity on the inlet-facing surface of the housing. Torque to 1.0~1.5 kgf · m (7.2~10.8 lbf · ft)



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(5) Tilt section

① The spool assembly should already consist of the tilt spool(with tilt plunger and spring inserted into the bore on the spring end), the return spring, one spring seat on either end of the spring, the seal plate, a spool seal, and a dust wiper. All of these are assembled on the end of the spool opposite the clevis.

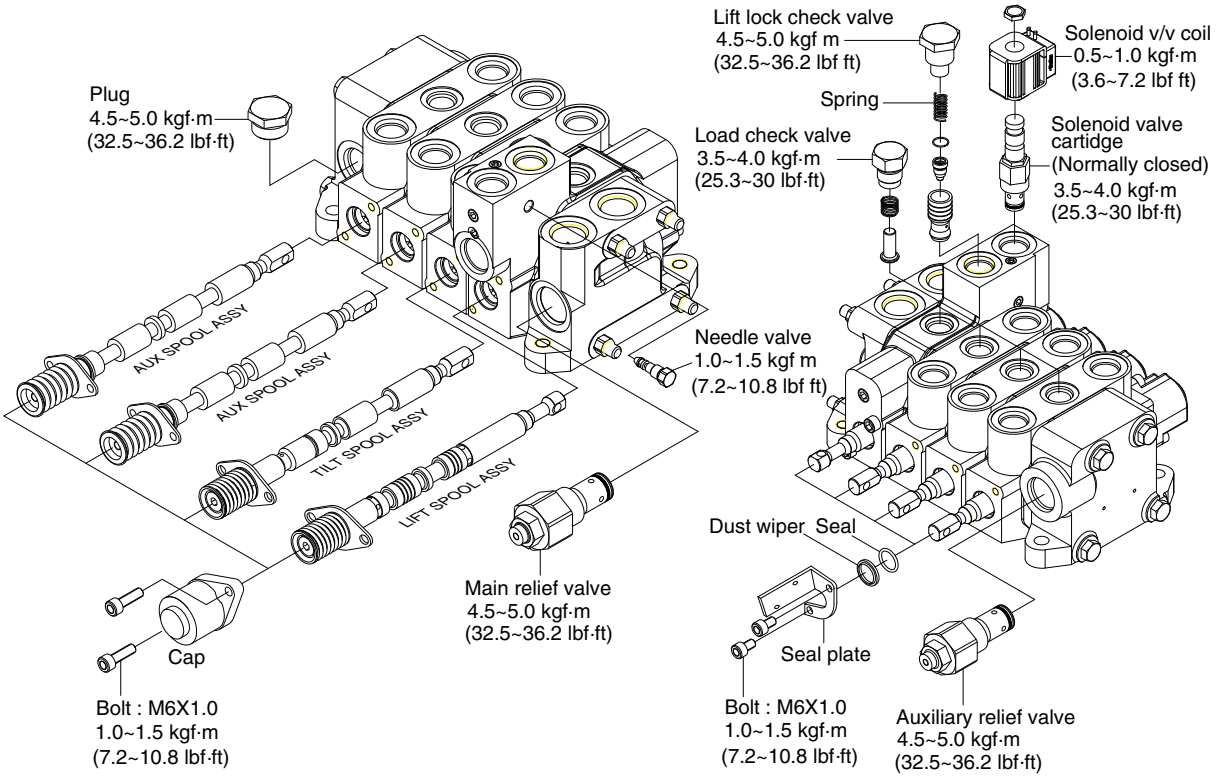
② Insert the clevis end of the spool into the right-hand side of the spool bore(the tallest end of the housing). Place the spool cap over the spool and spring assembly and connect the cap to the housing using two bolts. Torque both bolts alternatively until a torque of 1.0~1.5 kgf · m (7.2~10.8 lbf · ft) is reached on both bolts.

③ Install the second spool seal and dust wiper over the clevis end of the spool and retain with a seal plate and two bolts. Torque both bolts alternatively until a torque of 1.0~1.5kgf · m(7.2~10.8lbf · ft) is reached on both bolts.

④ The load check assembly is inserted into the top center cavity. Torque to 3.5~4.0 kgf · m (25.3~30 lbf · ft).

⑤ Install the anti-cavitation check valve in the housing cavity on the clevis end directly above the spool assembly. Torque to 4.5~5.0 kgf · m (32.5~36.2 lbf · ft).

⑥ Install the plug in the housing cavity above the spool assembly. Torque to 3.5~4.0 kgf · m (25.3~30 lbf · ft).



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(6) Auxiliary section

※ Same procedure for all aux sections, but spool assembly components may vary.

① The spool assembly should already consist of the proper aux spool, the return spring, one spring seat on either end of the spring, the seal plate, a spool seal, and a dust wiper. All of these are assembled on the end of the spool opposite the clevis.

② Insert the clevis end of the spool into the right-hand side of the spool bore (the tallest end of the housing). Place the spool cap over the spool and spring assembly and connect the cap to the housing using two bolts. Torque both bolts alternatively until a torque of 1.0~1.5 kgf · m (7.2~10.8 lbf · ft) is reached on both bolts.

③ Install the second spool seal and dust wiper over the clevis end of the spool and retain with a seal plate and two bolts. Torque both bolts alternatively until a torque of 1.0~1.5 kgf · m(7.2~10.8 lbf · ft) is reached on both bolts.

④ The load check assembly is inserted into the top center cavity. Torque to 3.5~4.0 kgf · m (25.3~30 lbf · ft).

(7) Outlet section

① Install the secondary main relief valve into the cavity on the clevis end of the housing. Torque to 4.5~5.0 kgf · m (32.5~36.2 lbf · ft)

2) DISASSEMBLY

(1) General

① Subassemblies (such as relief valves, check valves, and spools) may be removed without having to loosen the tie rods and disassembling the entire valve.

② Disassemble the valve sections on a flat working surface.

③ Ensure that the disassembly area will be clean and free of contamination.

④ Keep the disassembly area neat to avoid loss or damage of parts.

(2) Disassembly

① Loosen the tie rod nuts and remove the tie rods from the valve sections.

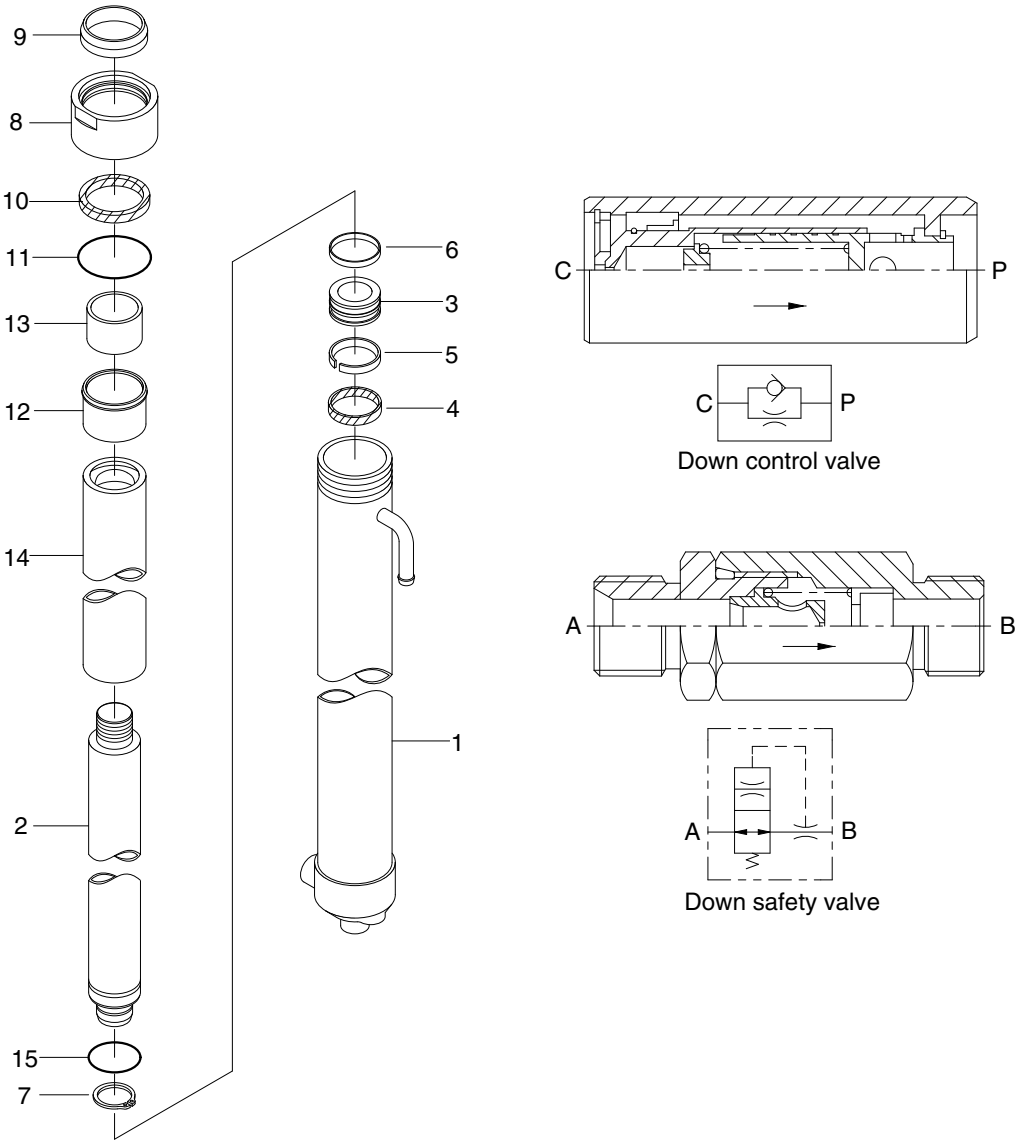
② Remove O-rings between valve sections and set aside to avoid damage.

③ Spools, relief valves, load check valves, lift lock poppet, solenoid valves, and plugs can all be removed from the valve sections. Refer to the associated assembly procedures, above, for specific torque and handling details. Inspect and repair or replace the assemblies as complete units, as may be necessary.

④ Valve components are precision items, and care must be taken when handing them to avoid damage or the introduction of contamination that could adversely affect performance.

4. LIFT CYLINDER

1) STRUCTURE

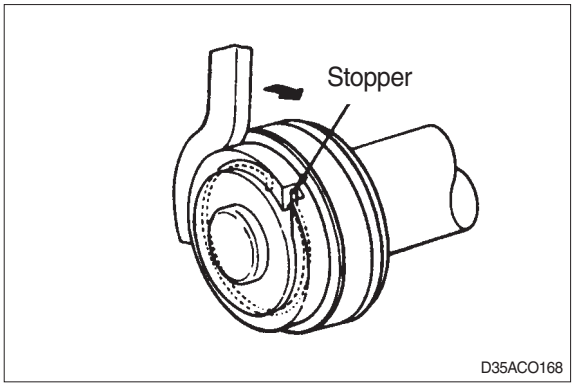


22B7HS26

1	Tube	6	Wear ring	11	O-ring
2	Rod	7	Retaining ring	12	Stopper
3	Piston	8	Gland	13	DU bushing
4	Piston seal	9	Dust wiper	14	Spacer
5	Back up ring	10	Rod seal	15	O-ring

2) DISASSEMBLY

(1) Hold the cylinder tube in a vice, loosen the cylinder head and remove it.
Remove the spacer from the cylinder tube and knock out the bushing. Hook a wrench in the hole in the retainer at the piston end and turn. Lever up the edge of the stopper, then turn the stopper in again and the stopper can be removed.



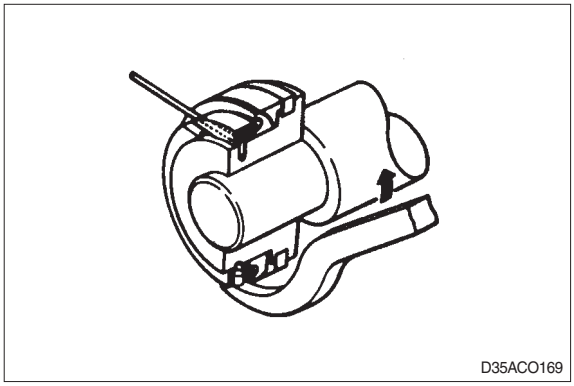
3) CHECK AND INSPECTION

mm (in)

Check item	Standard size	Repair limit	Remedy
Clearance between cylinder rod & bushing	0.072~0.288 (0.003~0.011)	0.5 (0.020)	Replace bushing
Clearance between piston ring & tube	0.05~0.030 (0.002~0.012)	0.5 (0.020)	Replace piston ring

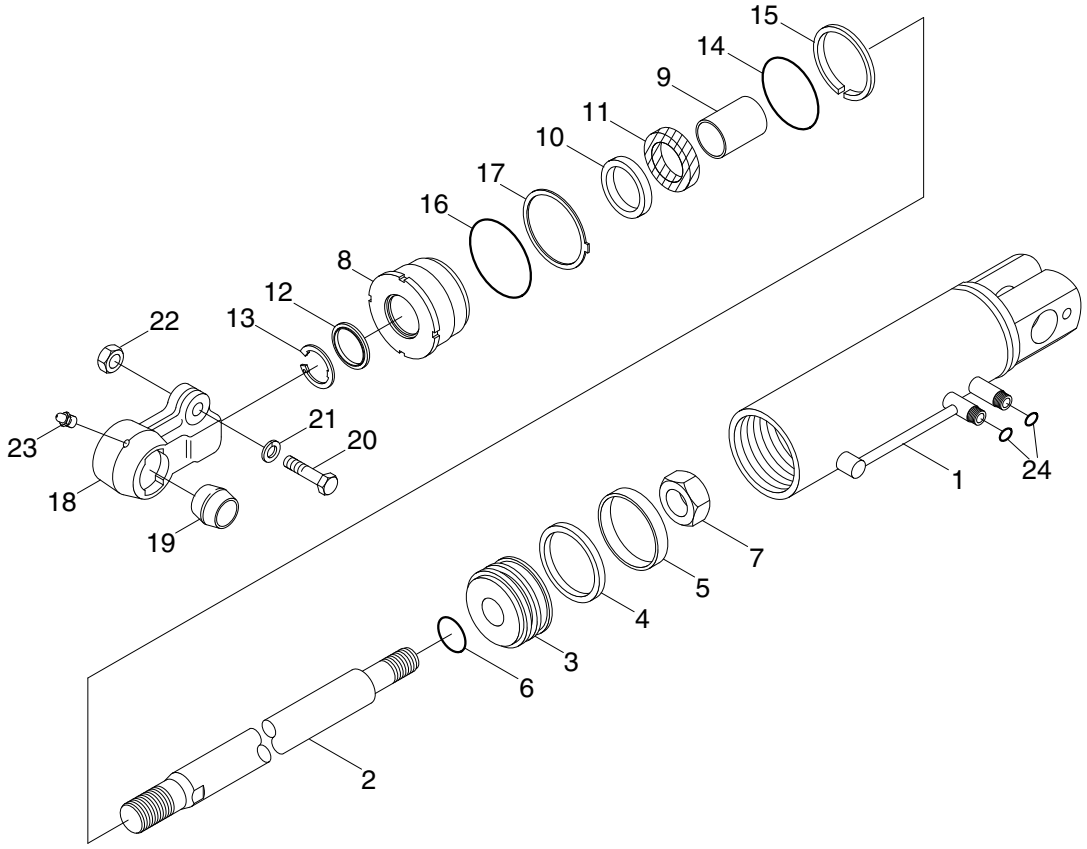
4) ASSEMBLY

(1) Soak the piston ring in hydraulic oil at a temperature of 40 to 50°C, expand the inside diameter and assemble on the piston. Install a piston seal.
Bend the edge of the stopper and rotate it to install the stopper completely.



5. TILT CYLINDER

1) STRUCTURE

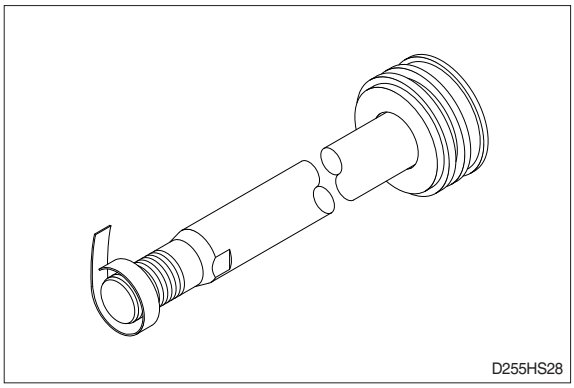


22B7HS23

1	Tube	9	DU bushing	17	Lock washer
2	Rod	10	U-packing	18	Rod eye
3	Piston	11	Back up ring	19	Spherical bearing
4	Piston seal	12	Wiper ring	20	Hexagon bolt
5	Dust wiper	13	Stop ring	21	Spring washer
6	O-ring	14	O-ring	22	Lock nut
7	Nylon nut	15	Back up ring	23	Grease nipple
8	Rod cover	16	O-ring	24	O-ring

2) DISASSEMBLY

(1) Hold the parallel parts of the cylinder tube bottom in a vice and mark the rod cover end to show how much it is screwed in, then remove the rod cover. Next, hook a wrench into the notch at the rod cover and remove the rod cover from cylinder tube. When doing this, wind tape round the threaded part of the rod and be careful not to damage the dust seal and rod seal inside rod cover.



3) CHECK AND INSPECTION

mm (in)

Check item	Standard size	Repair limit	Remedy
Clearance between cylinder rod & bushing	0.072~0.288 (0.003~0.011)	0.5 (0.020)	Replace bushing
Clearance between rod cover bushing & pin	0.10~0.35 (0.004~0.014)	0.6 (0.024)	Replace bushing