

SECTION 6 HYDRAULIC SYSTEM

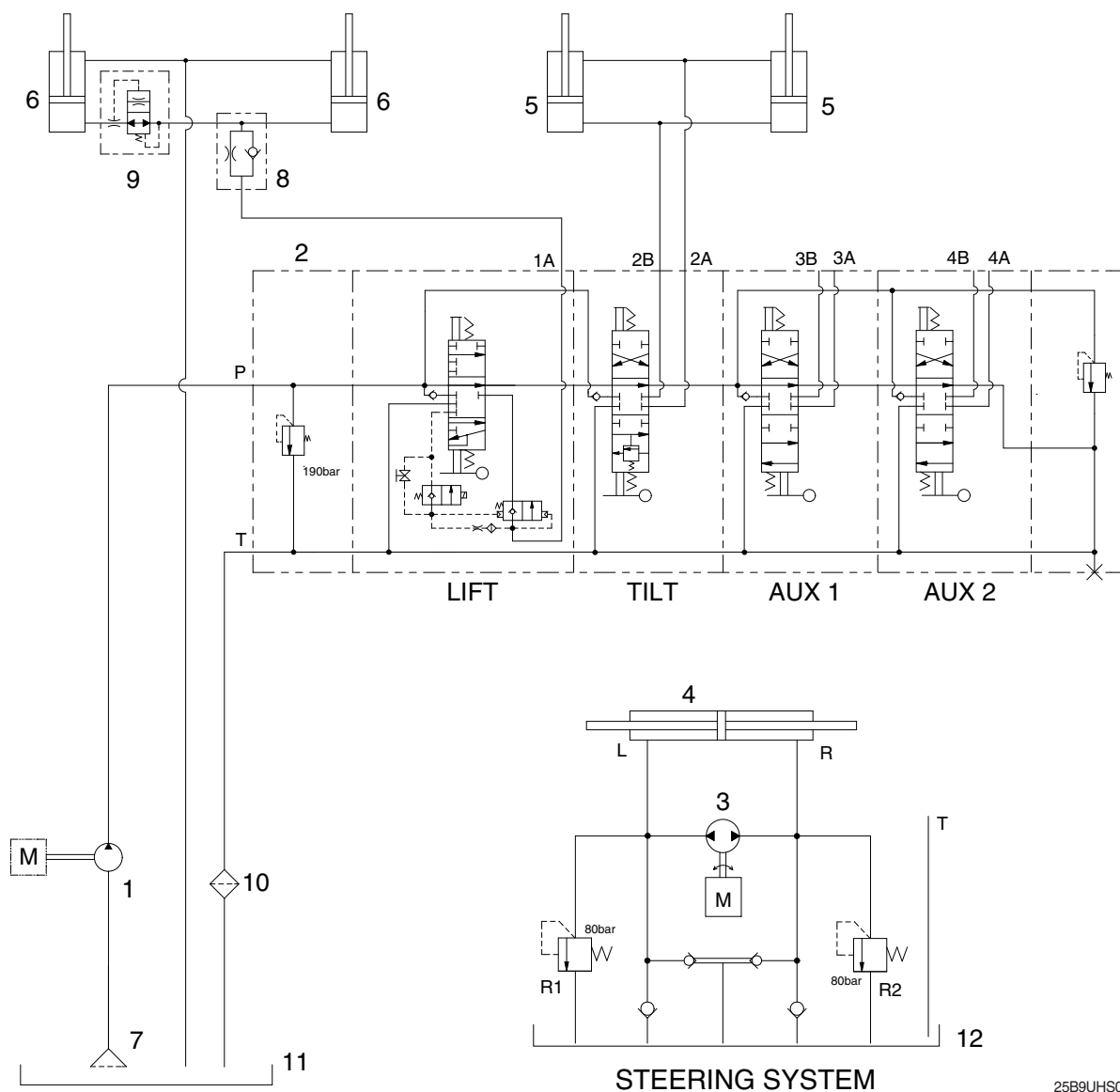
Group 1	Structure and function	6-1
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SECTION 6 HYDRAULIC SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. HYDRAULIC CIRCUIT

· MANUAL TYPE

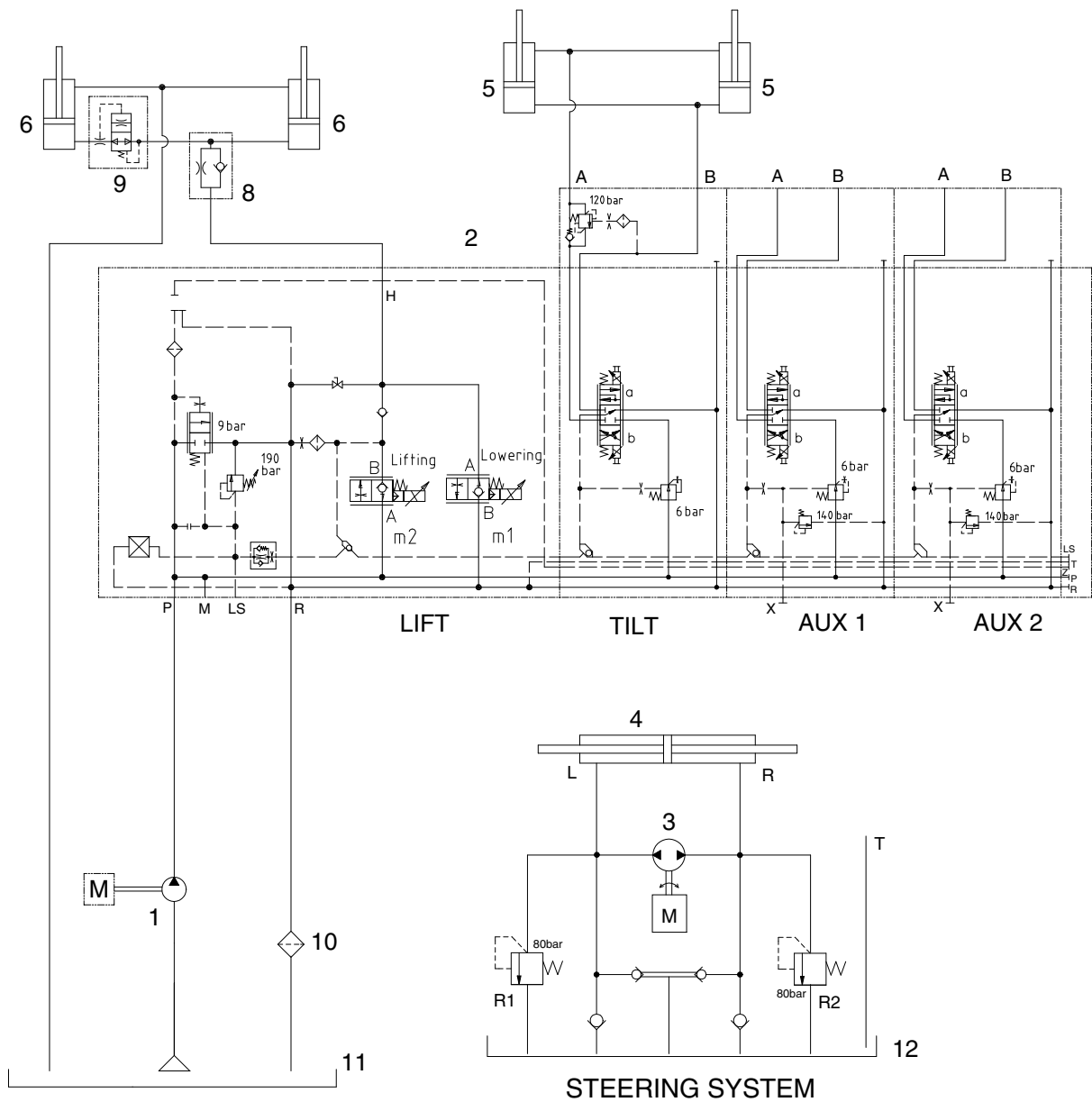


25B9UHS01

- | | | |
|-----------------------|----------------------|-----------------------|
| 1 Hydraulic gear pump | 5 Tilt cylinder | 9 Down safety valve |
| 2 Main control valve | 6 Lift cylinder | 10 Return filter |
| 3 Bidirectional pump | 7 Suction strainer | 11 Hydraulic oil tank |
| 4 Steering cylinder | 8 Down control valve | 12 Reservoir tank |

※ The circuit diagram may differ from the equipment, so please check before a repair.

FINGERTIP TYPE



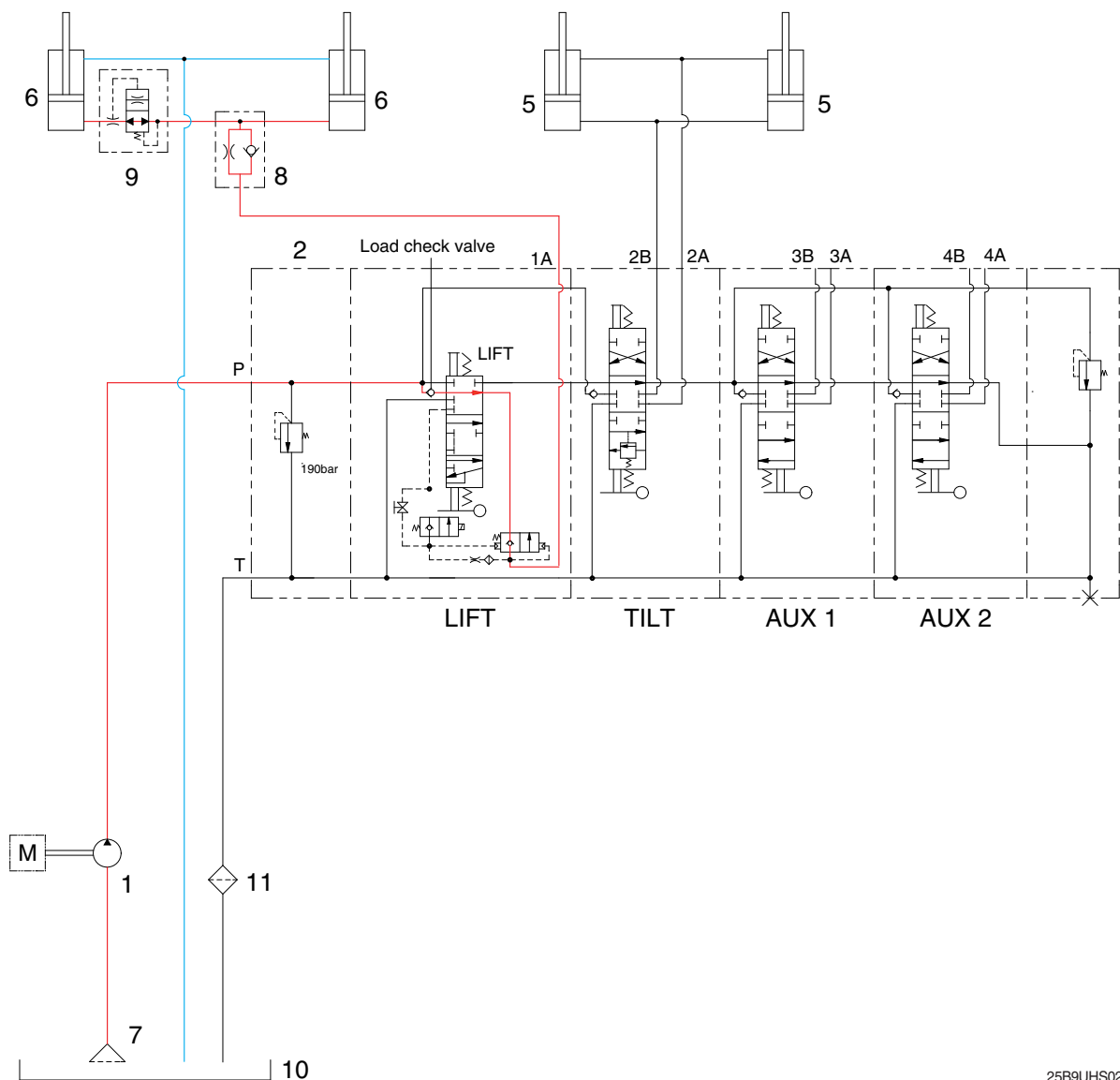
25B9UHS51

- | | | |
|-----------------------|----------------------|-----------------------|
| 1 Hydraulic gear pump | 5 Tilt cylinder | 9 Down safety valve |
| 2 Main control valve | 6 Lift cylinder | 10 Return filter |
| 3 Steering unit | 7 Suction strainer | 11 Hydraulic oil tank |
| 4 Steering cylinder | 8 Down control valve | 12 Reservoir tank |

※ The circuit diagram may differ from the equipment, so please check before a repair.

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

※ Descriptions are based on the manual type.



25B9UHS02

When the lift control lever is pulled back, the spool on the first block is moves to lift position.

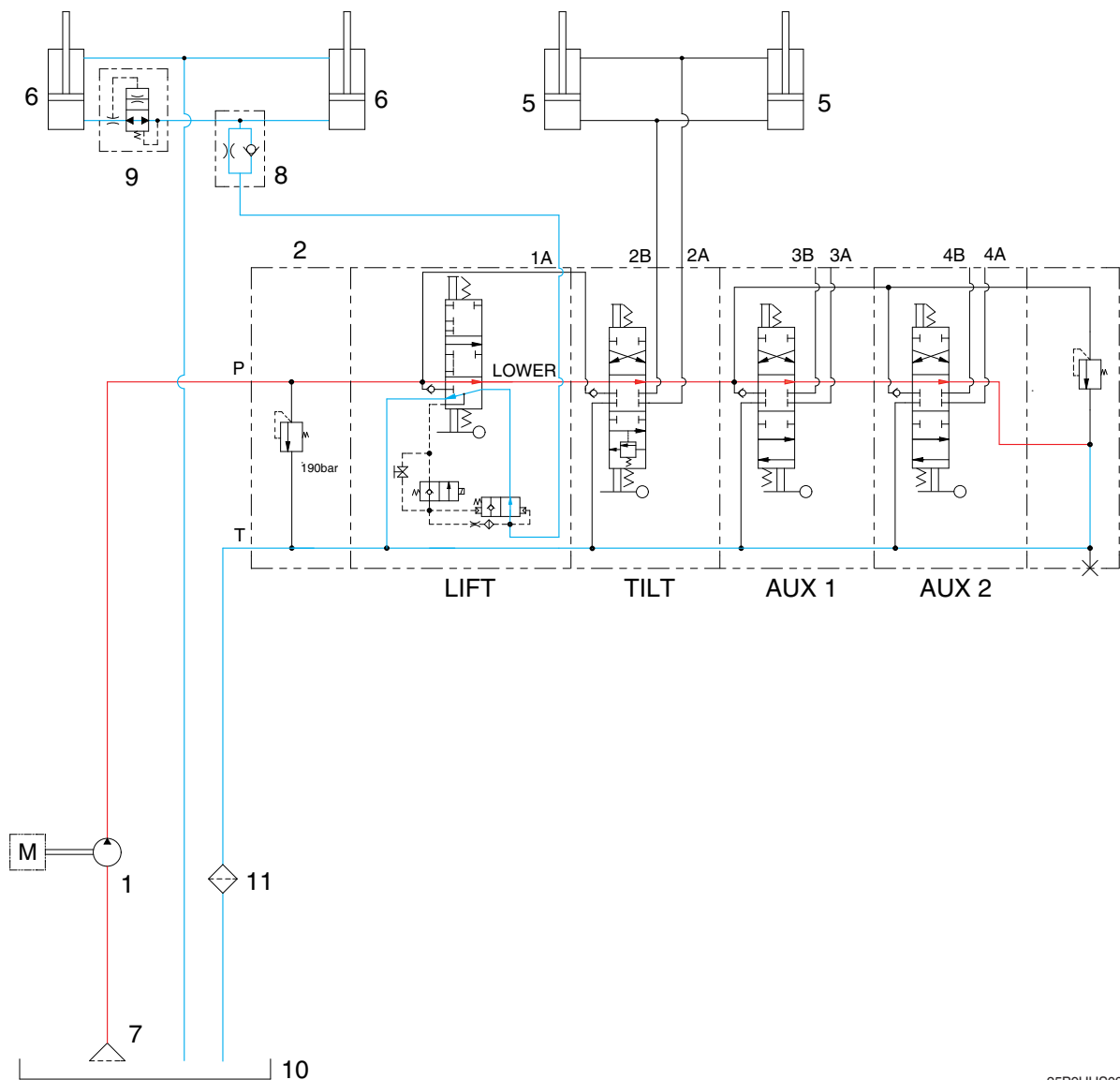
The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of lift cylinder (6) by pushing the load check valve of the spool.

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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

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

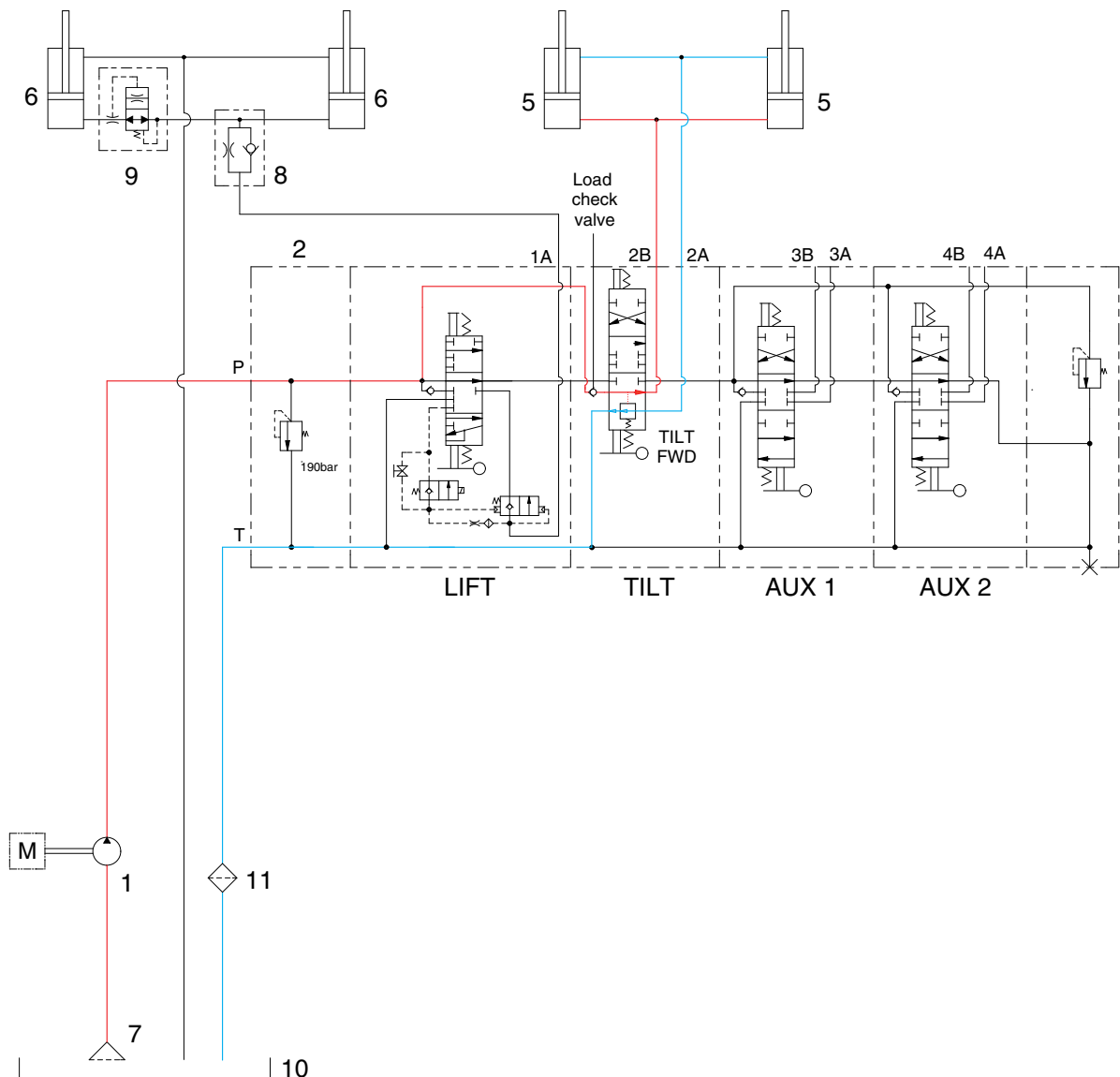


25B9UHS03

When the lift control lever is pushed forward, the spool on the first block is moved to lower position. The small chamber and the large chamber are connected to the hydraulic oil tank (11), so the forks will be lowered due to its own weight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

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



25B9UHS04

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

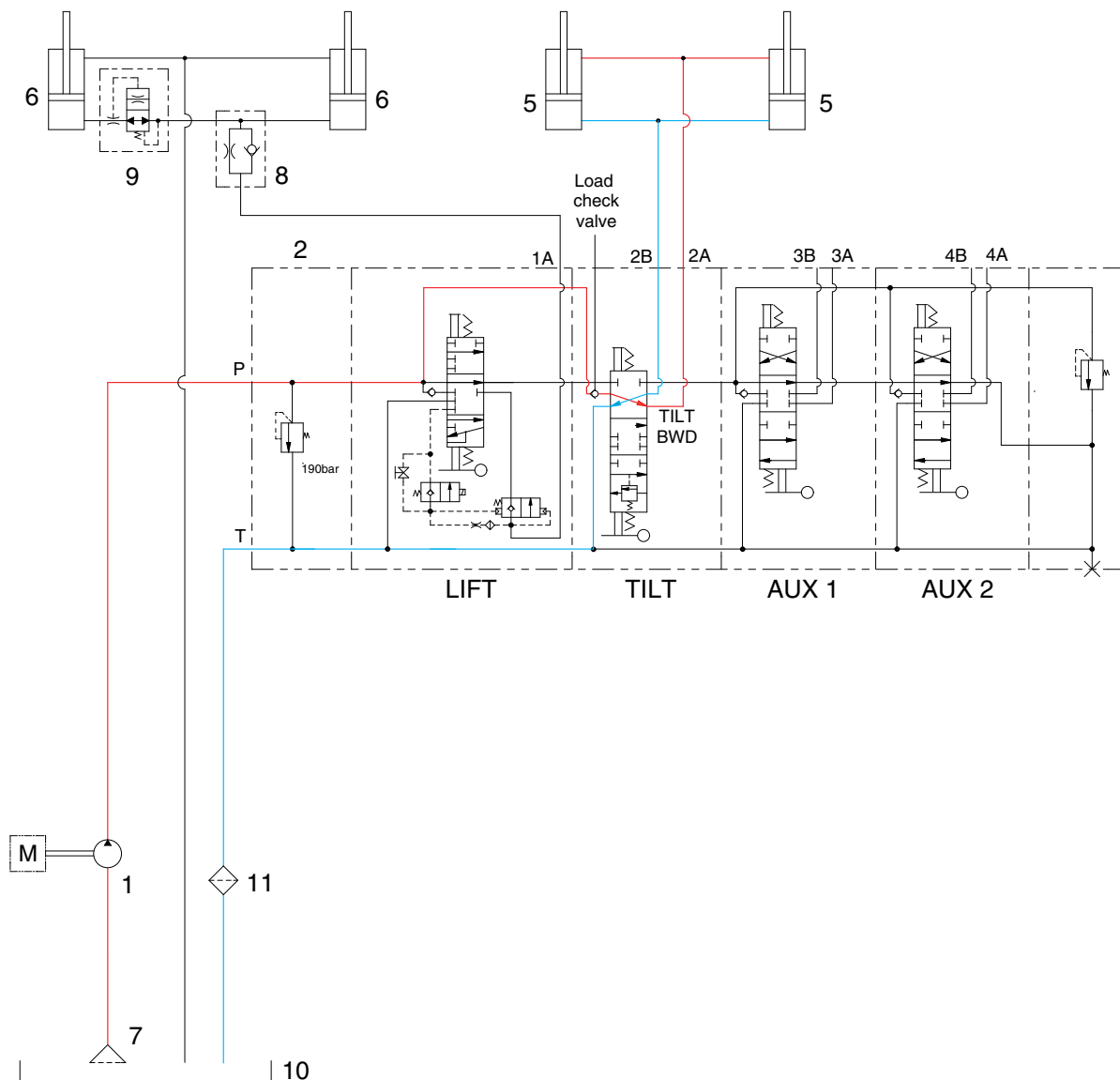
The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of tilt cylinder (5) by pushing the load check valve of the spool.

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

When this happens, the mast tilt forward.

※ The circuit diagram may differ from the equipment, so please check before a repair.

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



25B9UHS05

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.

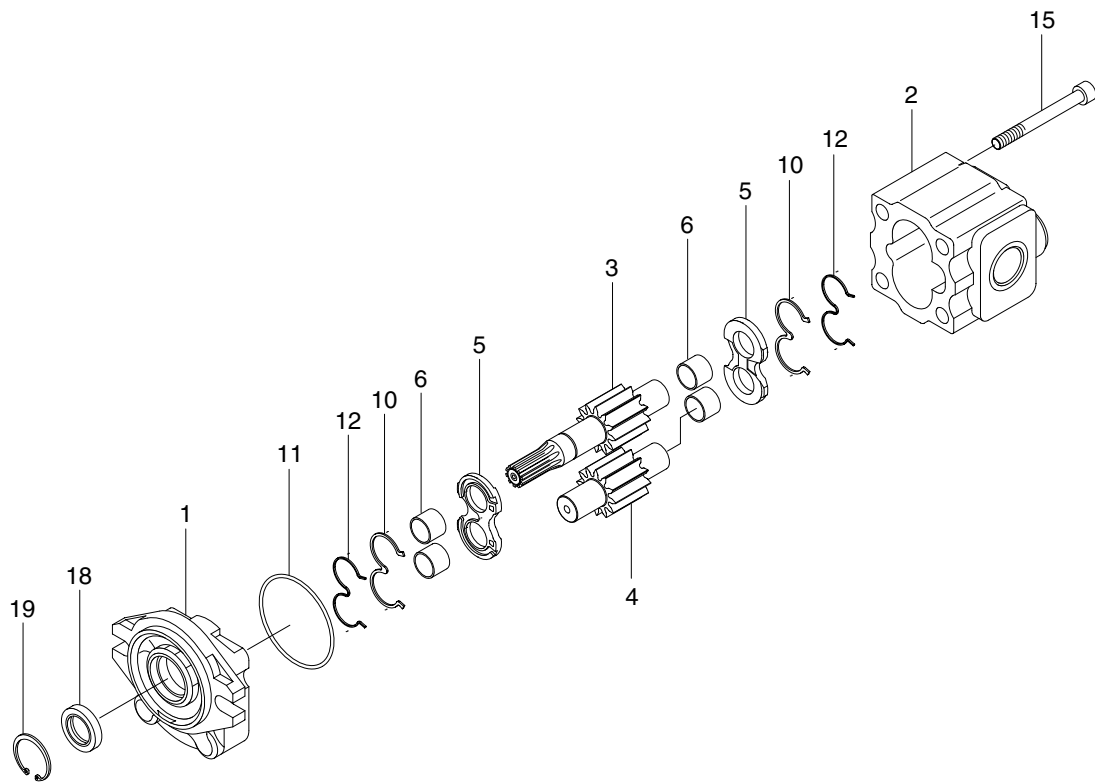
The oil at the large chamber of tilt cylinder (5) returns to hydraulic tank (11) at the same time.

When this happens, the mast tilt backward.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. HYDRAULIC GEAR PUMP

1) STRUCTURE

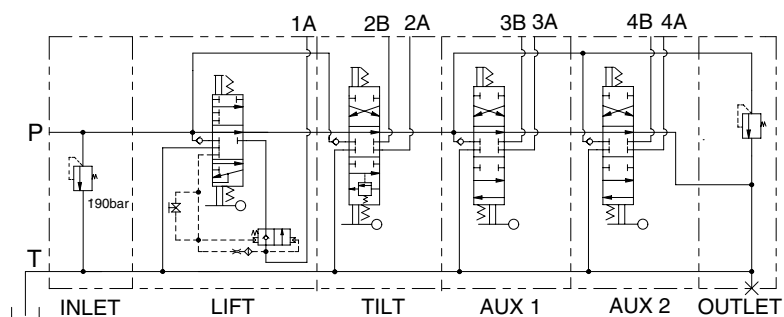
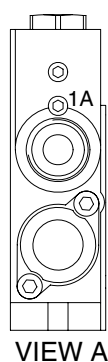
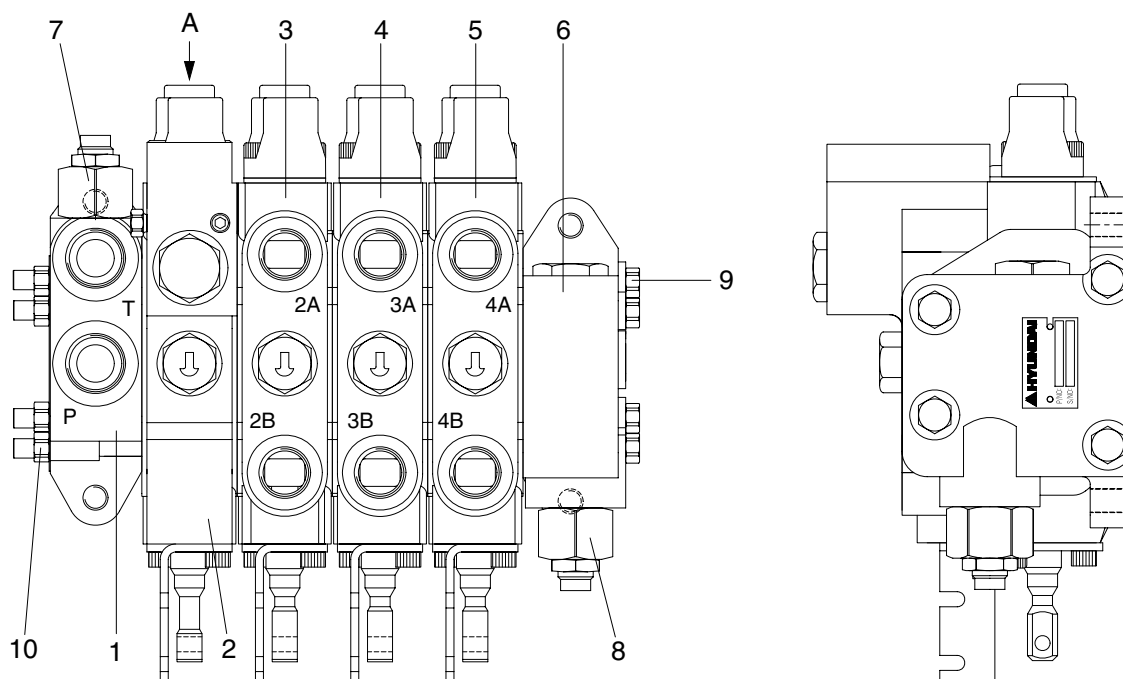


31HA-01530

- | | | | | | |
|---|-------------|----|------------|----|----------------|
| 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 TYPE)

1) STRUCTURE (4 Spool, without OPSS)

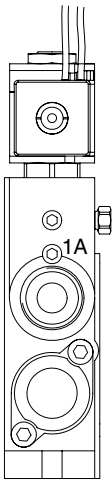
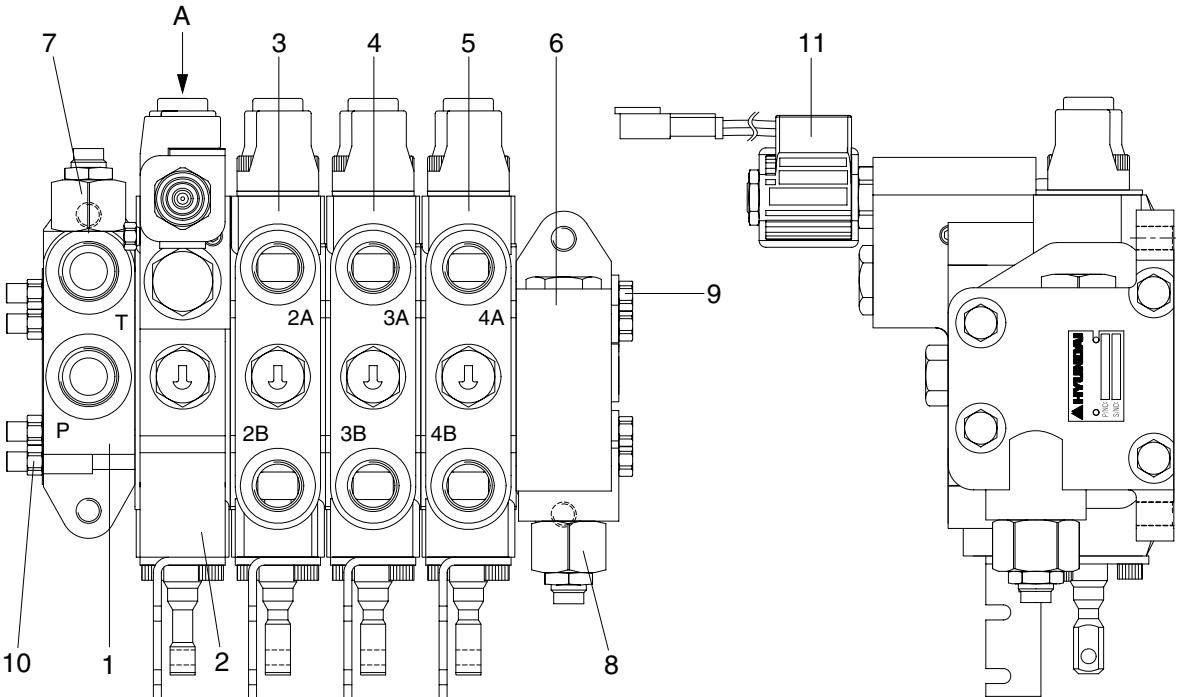


Port name	Size	Port
Inlet port	7/8-14UNF	P
Outlet port	7/8-14UNF	T
Work port	7/8-14UNF	1A
Work port	3/4-16UNF	2A, 2B, 3A, 3B, 4A, 4B

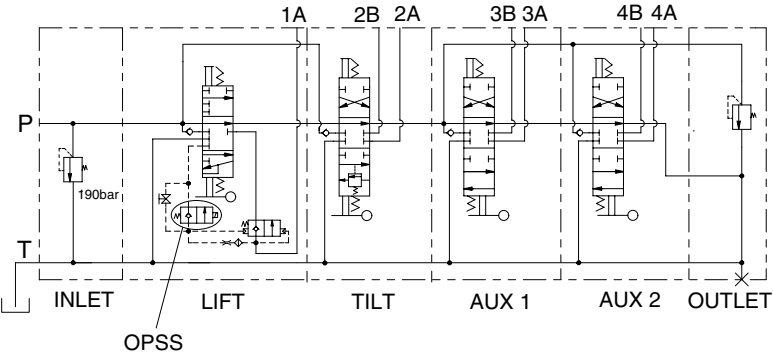
25B9UHS06

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

STRUCTURE (4 Spool, with OPSS)



VIEW A



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

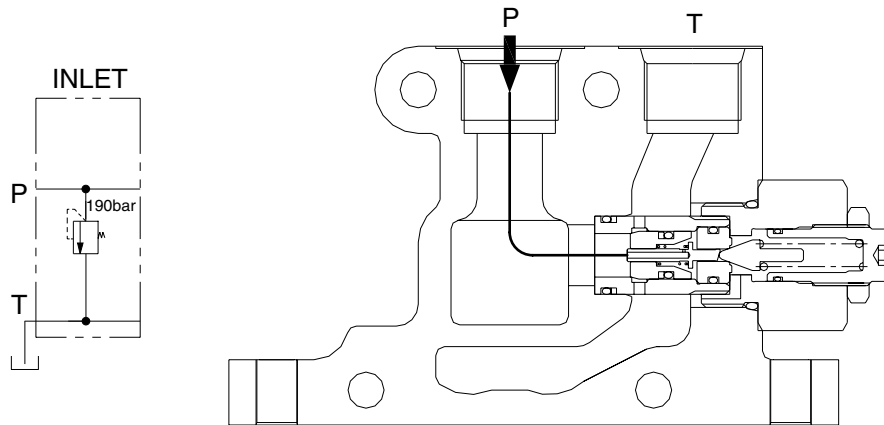
25B9UHS07

- | | | | | | |
|---|------------------|---|-----------------------------|----|----------------|
| 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

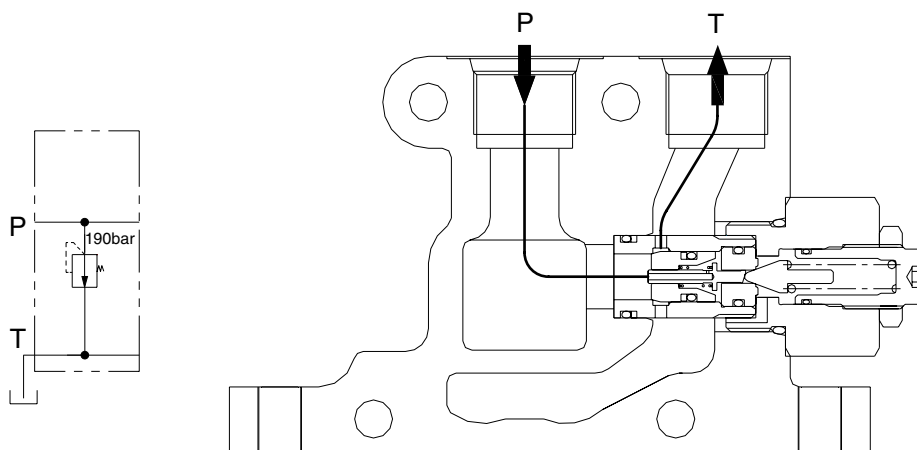
The inlet section contains the pump inlet connection and main relief valve.



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 (WITHOUT OPSS)

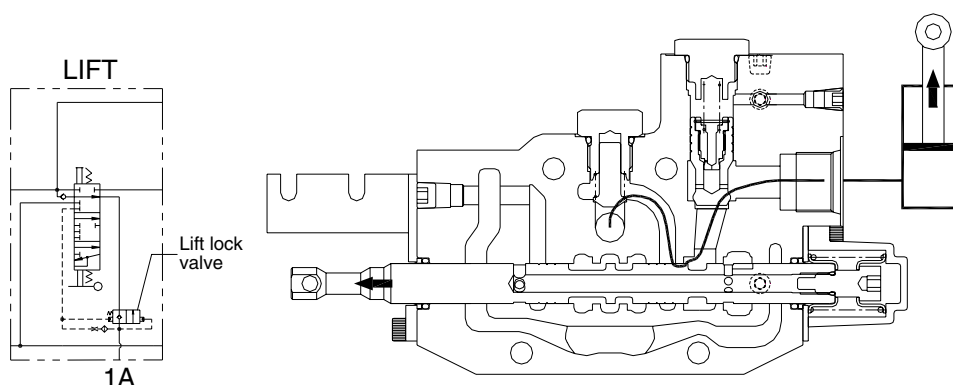
(1) Operation

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

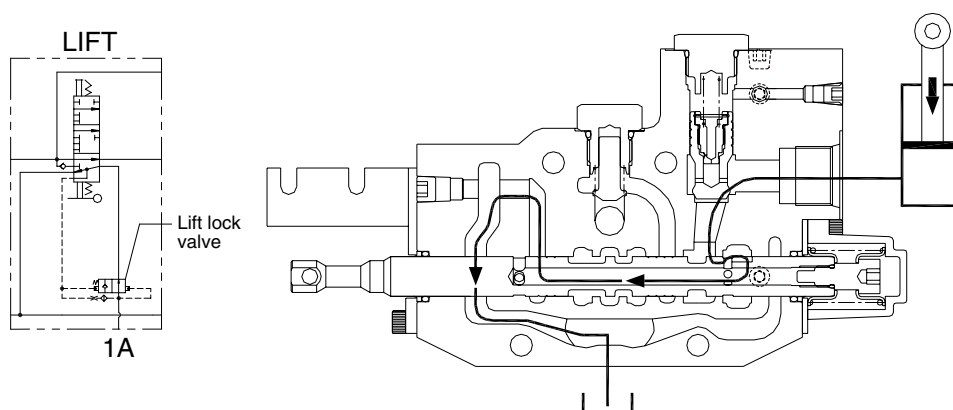
When the operator shifts the lever backwards, the spool is extended out of the valve, and this opens the internal fluid passages that lift the mast. Oil flows through the high pressure parallel cavity, past the load check valve, through the spool metering notches, past the lift lock check valve, and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



22B7HS11

② Lowering

When the 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.



22B7HS12

Pressure is limited by the main relief valve.

LIFT SECTION (WITH OPSS)

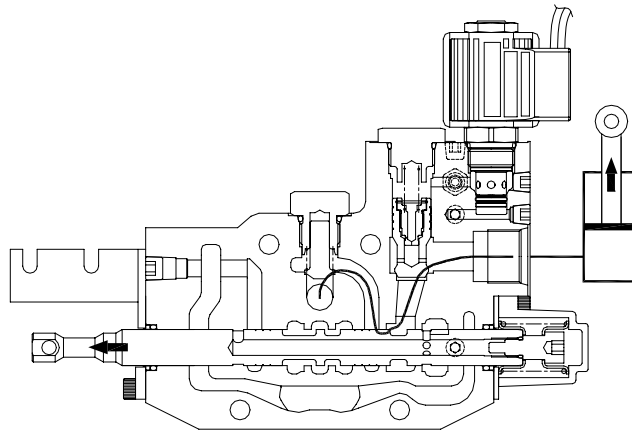
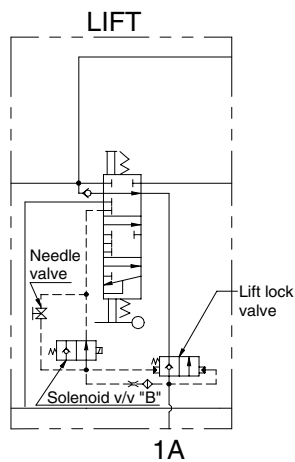
(1) Operation

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

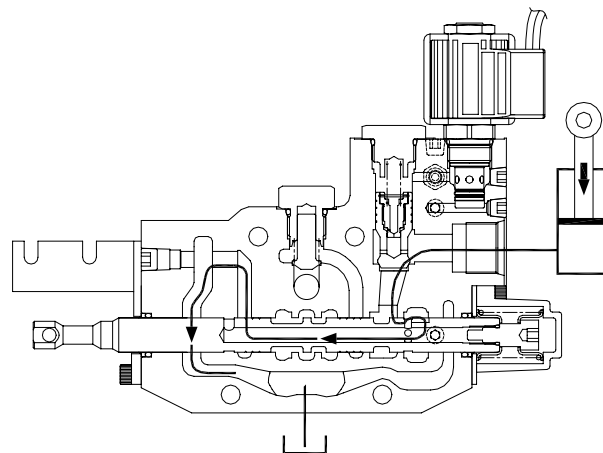
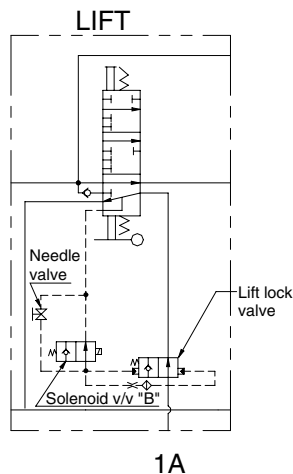
When the operator shifts the lever backwards, the spool is extended out of the valve, and this opens the internal fluid passages that lift the mast. Oil flows through the high pressure parallel cavity, past the load check valve, through the spool metering notches, past the lift lock check valve, and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



22B7HS11S

② Lowering

When the 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.



22B7HS12S

Pressure is limited by the main relief valve.

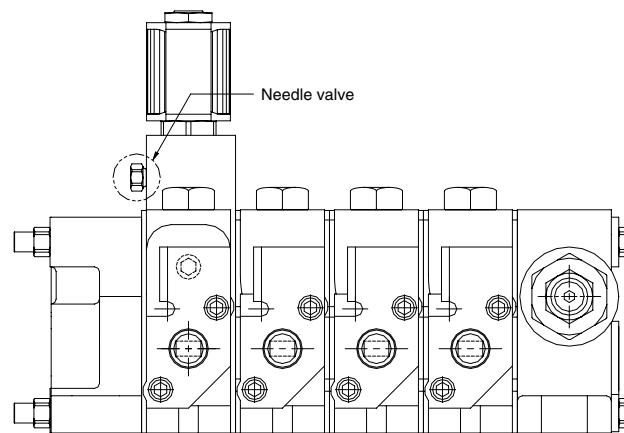
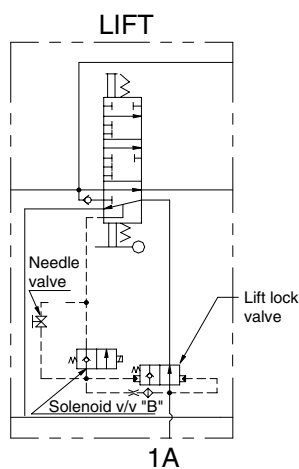
③ Secondary lowering method

A secondary lowering method is available in the event of the loss of battery power that is needed to energize the normally closed solenoid valve.

Important note : Before opening the secondary needle valve, make sure personnel and equipment are safely positioned to avoid accidents. Be careful to operate this secondary valve slowly, as heavy loads may be suspended.

A manual valve (needle valve) is located on the lift section, and it can be operated by opening the vehicle cowl and rotating the manual valve (needle valve) counterclockwise with a wrench.

Open the manual valve (needle valve) approximately 2~3 turns (do not rotate more than 4 turns). Then shift the lift spool slowly for controlled lowering. This should be just enough for slow, controlled movement of the mast.



22B7HS12AS

Pressure is limited by the main relief valve.

4) TILT SECTION

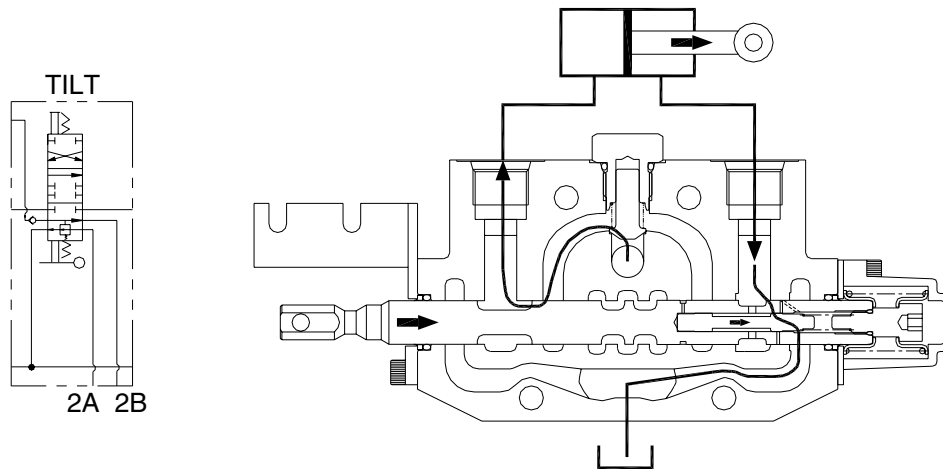
(1) Operation

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.

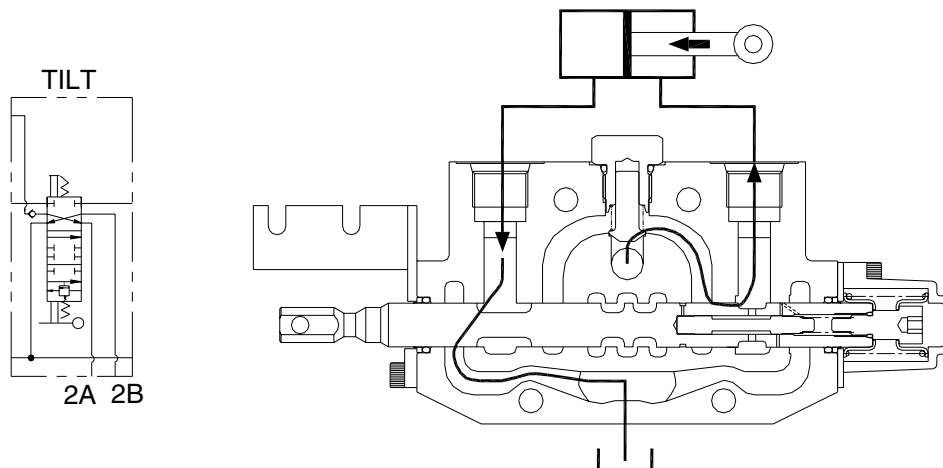
Simultaneously, the high pressure acts upon the end of the tilt lock plunger to move it towards the spring end of the spool. This plunger movement opens additional spool metering notches which control oil flow from the rod end of the cylinder to the tank return line.



22B7HS13

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.



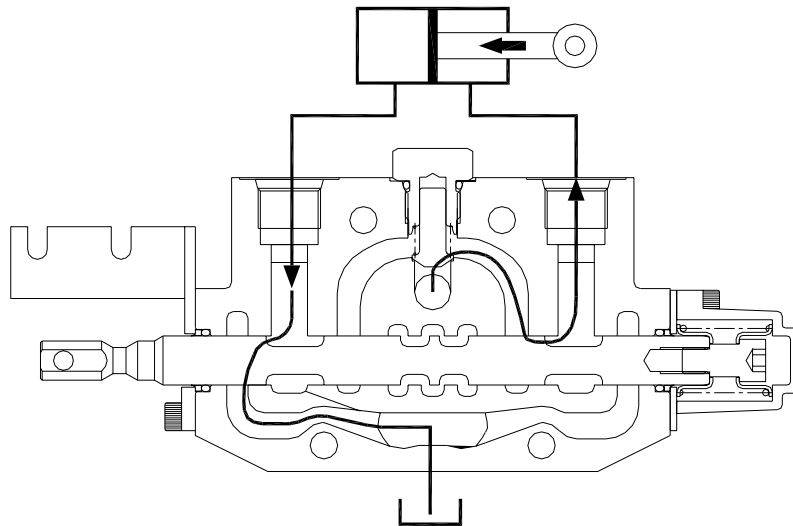
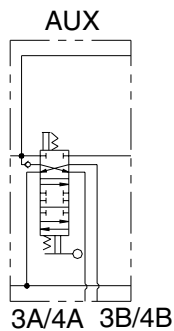
22B7HS14

Pressure is limited by the main relief valve.

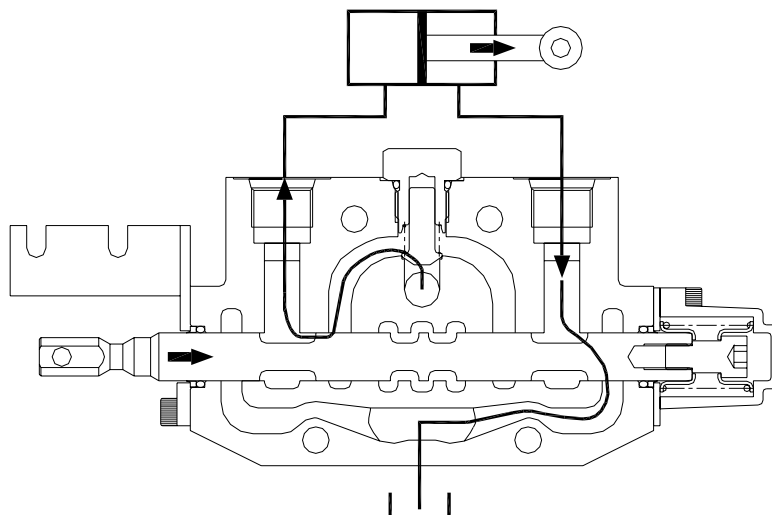
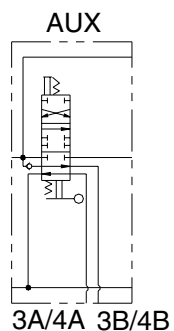
5) AUXILIARY SECTIONS

(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.



22B7HS15



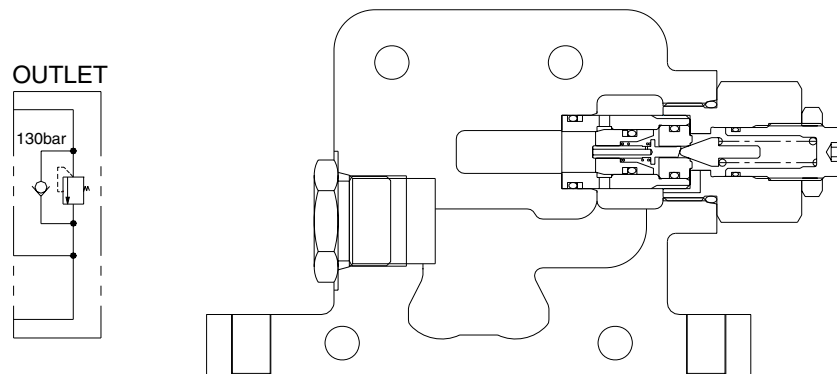
22B7HS16

Pressure is limited by the secondary main relief valve.

6) OUTLET SECTION

(1) Operation

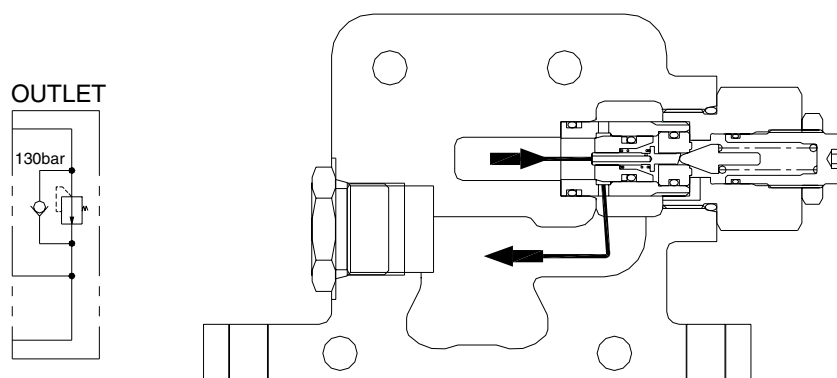
The outlet section contains the tank port and the secondary relief valve (with built-in anti-cavitation feature).



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.

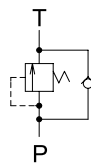
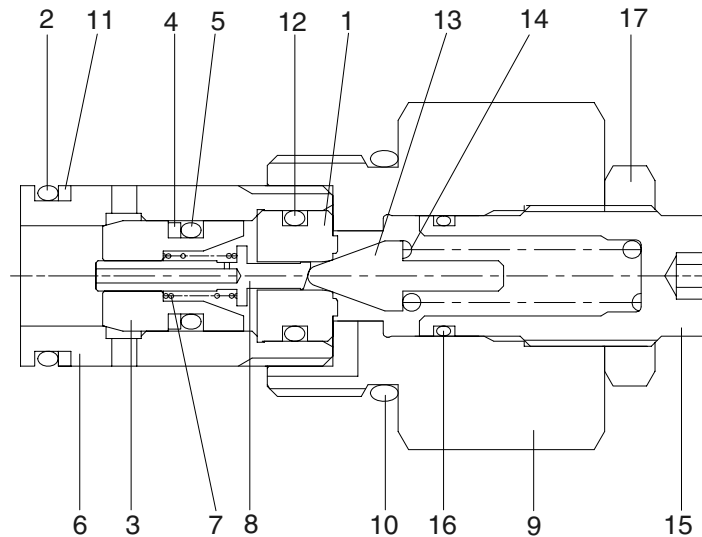


22B7HS18

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/cm² in accordance with 1 revolution of adjust bolt.



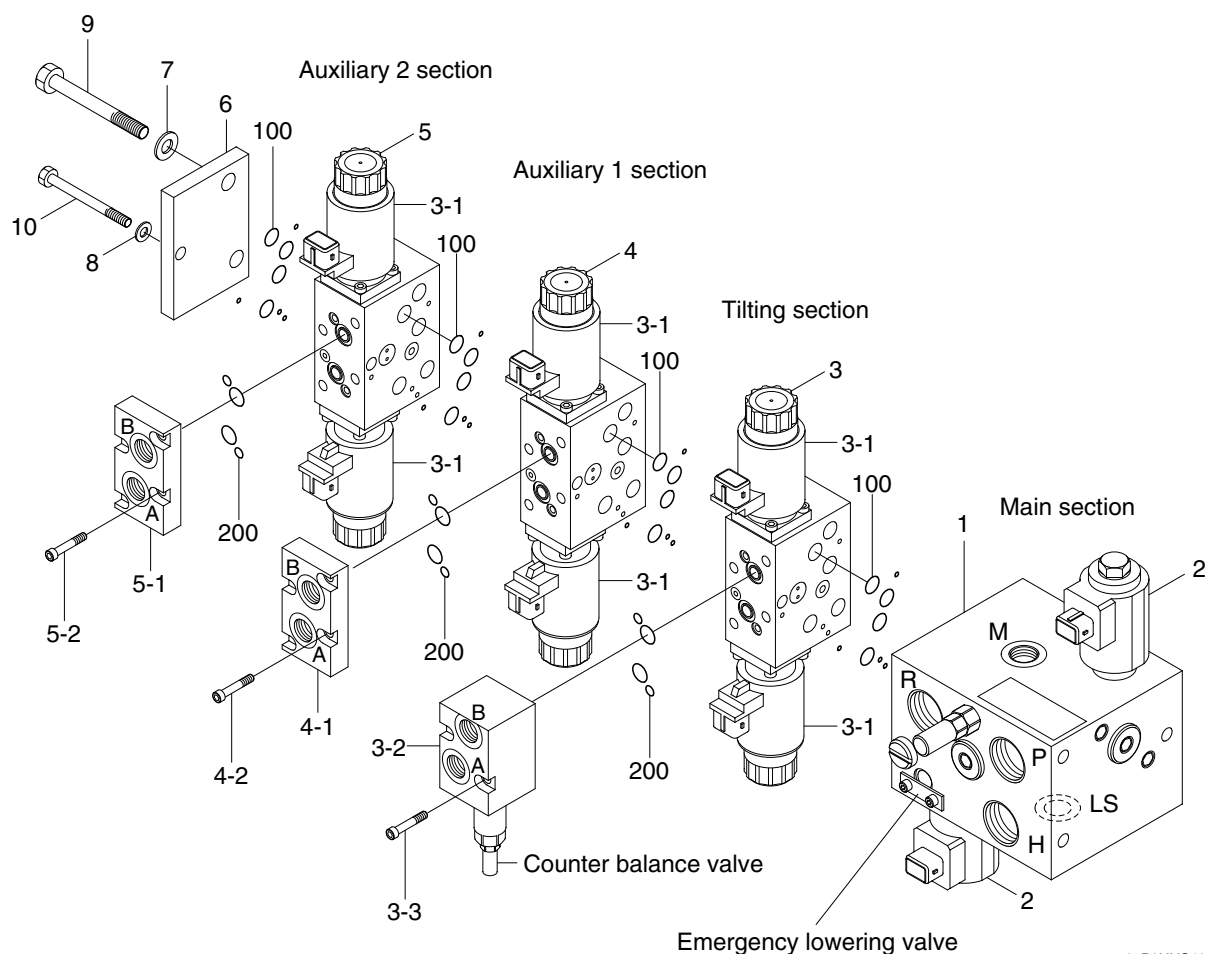
- Main relief valve : 190 kgf/cm²
- Secondary main relief valve : 130 kgf/cm²
(For 3,4 spool only)

22B7HS20

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 TYPE)

1) STRUCTURE

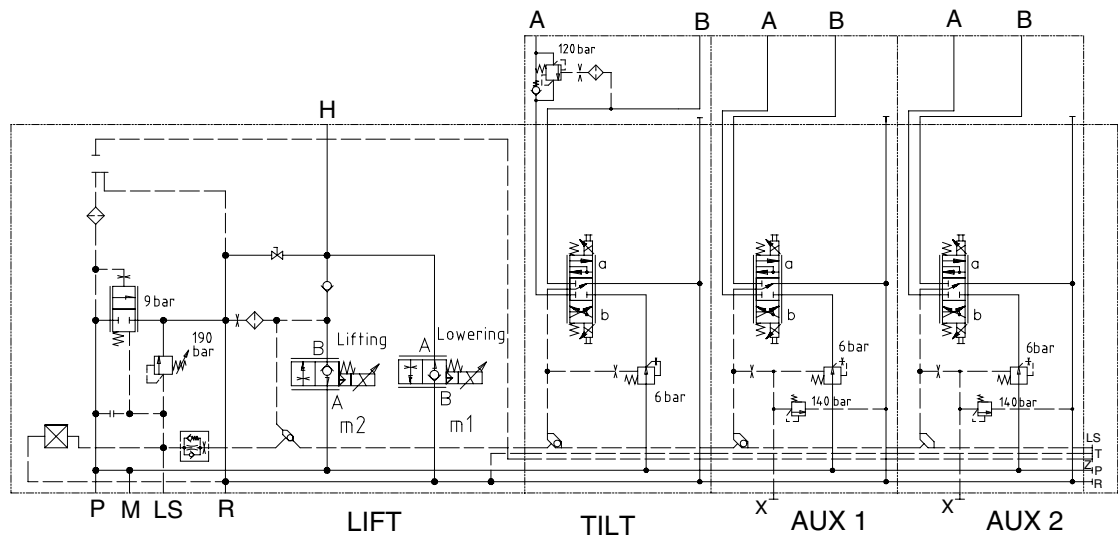


25B9UHS40

Port name	Size	Port
Inlet port	1 1/16-12UNF	P
Outlet port	1 1/16-12UNF	R
Work port	1 1/16-12UNF	H
Work port	3/4-16 UNF	A, B
-	7/16-20UNF	M, LS

- | | | |
|--------------------------------|--------------------------------|------------------------------|
| 1 Main block | 4-1 Ancillary block | 8 Washer |
| 2 Solenoid valve (lift) | 4-2 Socket head screw | 9 Socket head screw |
| 3 Solenoid valve (tilt) | 5 Solenoid valve (auxiliary 2) | 10 Socket head screw |
| 3-1 Coil amp | 5-1 Ancillary block | 100 Section seal kit |
| 3-2 Block | 5-2 Socket head screw | 200 Ancillary block seal kit |
| 3-3 Socket head screw | 6 End plate | |
| 4 Solenoid valve (auxiliary 1) | 7 Washer | |

2) HYDRAULIC CIRCUIT



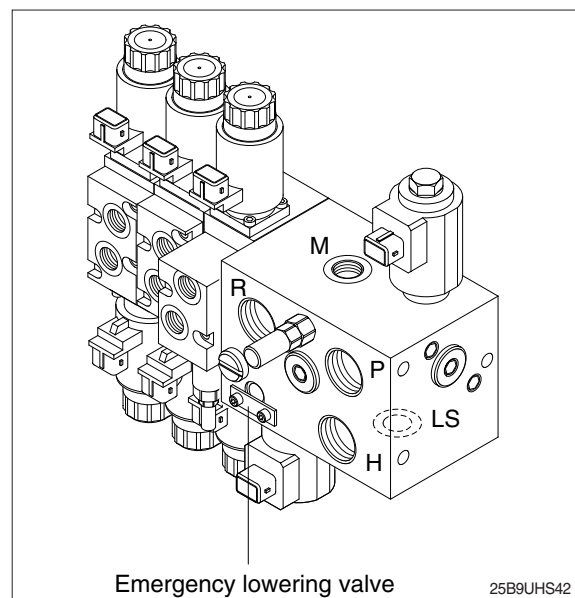
25B9UHS41

Port name	Size	Port
Inlet port	1 1/16-12UNF	P
Outlet port	1 1/16-12UNF	R
Work port	1 1/16-12UNF	H
Work port	3/4-16 UNF	A, B
-	7/16-20UNF	M, LS

3) EMERGENCY LOWERING

In case of the mast cannot be lowered due to a problem in the controller, active the emergency lowering valve on the valve block with hexagonal wrench.

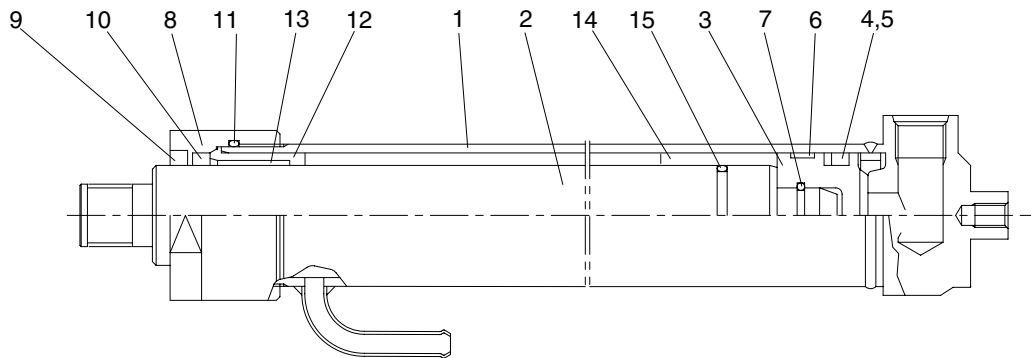
- (1) Turn off the emergency switch.
- (2) Open the emergency lowering valve using a hexagonal wrench. Slowly lower the mast and the load carriage.
- (3) After lowering, close the emergency lowering valve.



25B9UHS42

5. LIFT CYLINDER

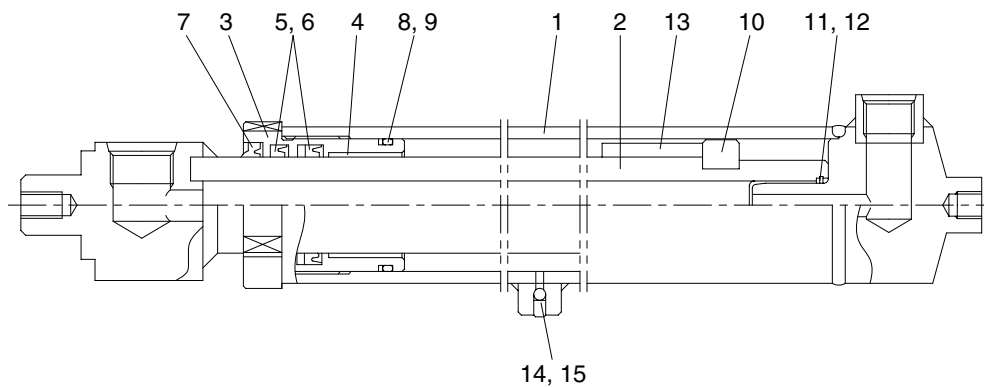
1) V MAST



D255HS18

- | | | |
|-----------------|------------------|---------------|
| 1 Tube assembly | 6 Wear ring | 11 O-ring |
| 2 Rod | 7 Retaining ring | 12 Guide |
| 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 |

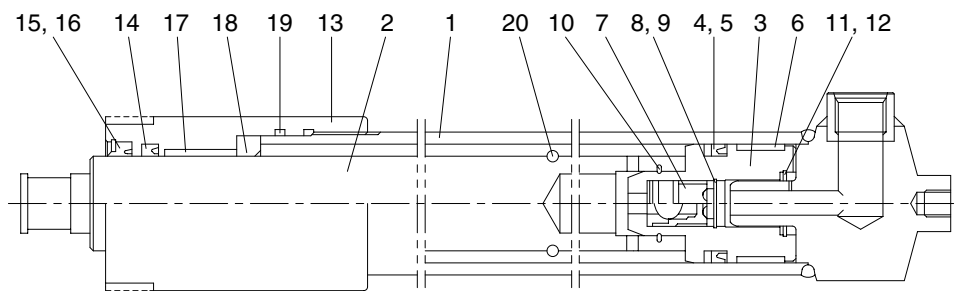
2) VF MAST



22B9FHS20

- | | | |
|-----------------|----------------|-------------------|
| 1 Tube assembly | 6 Back up ring | 11 Cushion seal |
| 2 Rod assy | 7 Dust wiper | 12 Retaining ring |
| 3 Rod cover | 8 O-ring | 13 Spacer |
| 4 Rod bushing | 9 Back up ring | 14 Steel ball |
| 5 U-packing | 10 Piston ring | 15 Set screw |

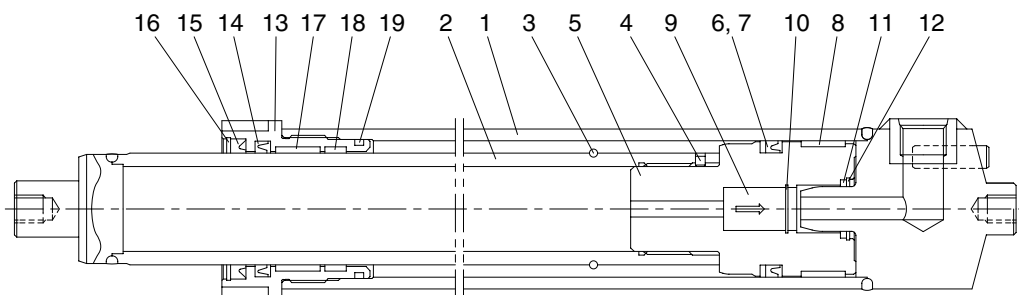
3) TF AND TS-MAST



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 | |

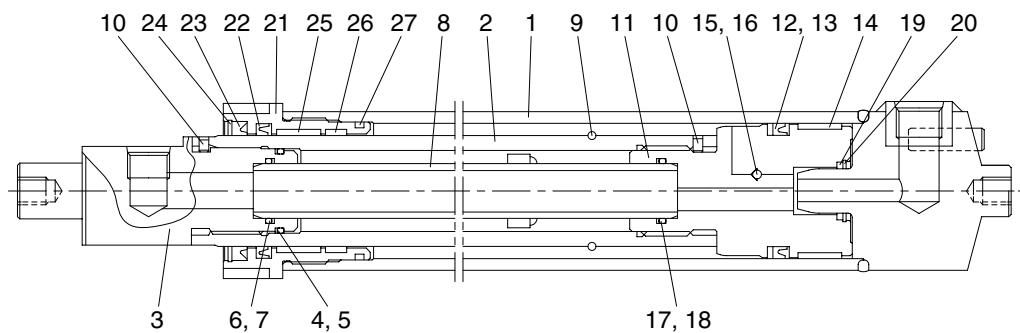
4) QF-MAST (LH)



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 | |

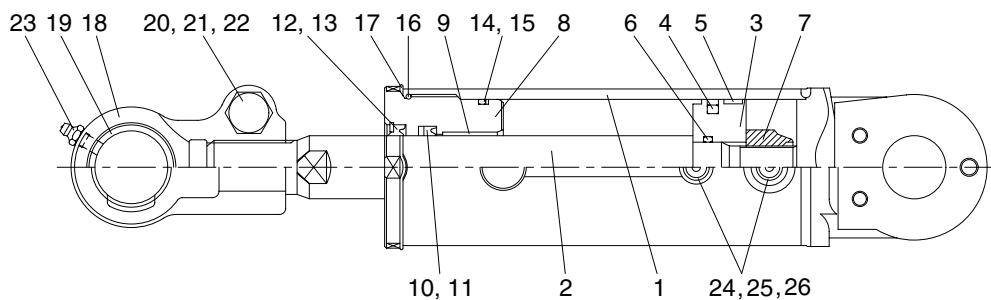
5) TF AND TS-MAST



22B9FHS23

1 Tube assembly	10 Set screw	19 Cushion seal
2 Rod	11 Piston	20 Retaining ring
3 Rod end	12 Back up ring	21 Rod cover
4 O-ring	13 U-packing	22 U-packing
5 Back up ring	14 Wear ring	23 Dust wiper
6 O-ring	15 Check valve	24 Retaining ring
7 Back up ring	16 Retaining ring	25 Wear ring
8 Inner rod assembly	17 O-ring	26 Dust ring
9 Stop ring	18 Back up ring	27 O-ring

6. TILT CYLINDER

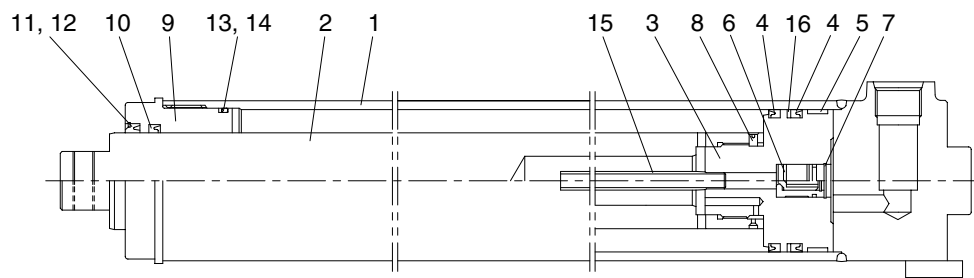


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1 Tube assembly	10 U-packing	19 Spherical bearing
2 Rod	11 Back up ring	20 Hexagon bolt
3 Piston	12 Dust wiper	21 Spring washer
4 Piston seal	13 Stop ring	22 Lock nut
5 Wear ring	14 O-ring	23 Grease nipple
6 O-ring	15 Back up ring	24 Dust cap
7 Nylon nut	16 O-ring	25 O-ring
8 Rod cover	17 Lock washer	26 O-ring
9 Rod bushing	18 Rod eye	

7. FREE LIFT CYLINDER

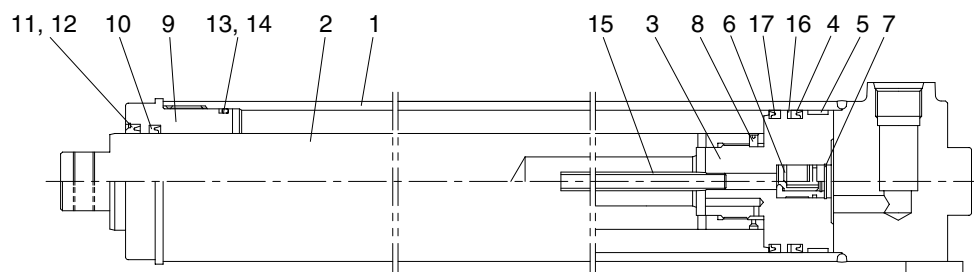
1) VF-MAST AND TF MAST (30/32/35B-9U)



37B1-07732

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

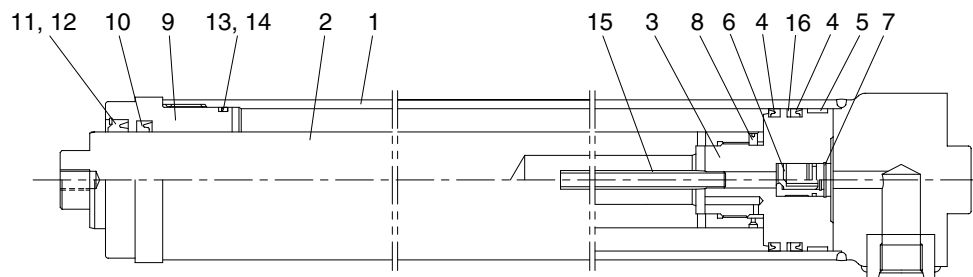
2) TF-MAST (25B-9U)



37B1-07612

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

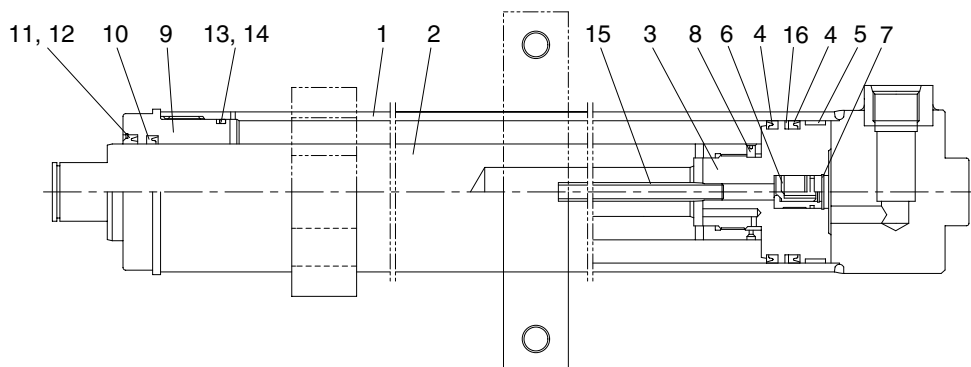
3) TS-MAST



3AHN-80202

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

4) QF-MAST



3CHN-07503

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

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

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

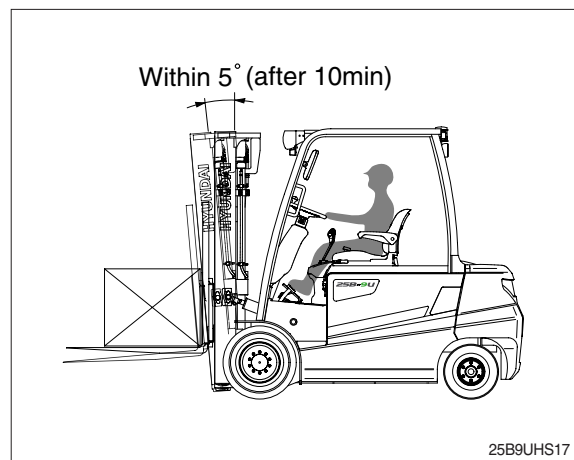
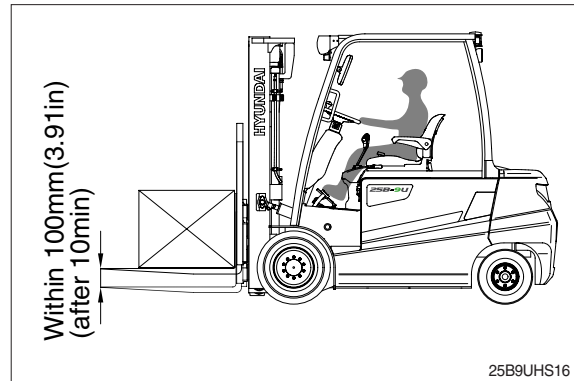
- Hydraulic oil : Normal operating temp
(50 °C)

- Mast substantially vertical.
- Rated capacity load.

· Hydraulic drift

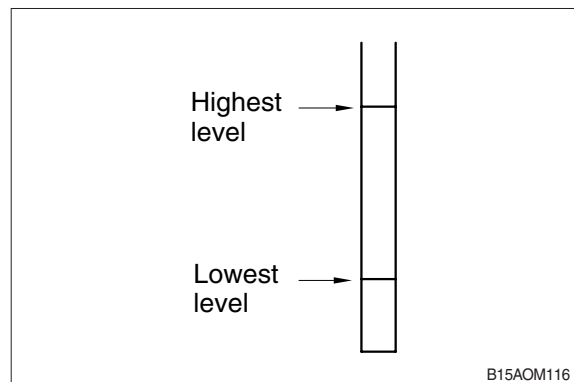
- Down (Downward movement of forks)
: Within 100 mm (3.9 in)
 - Forward (Extension of tilt cylinder)
: Within 5°
- (3) If the hydraulic drift is more than the specified value, replace the control valve or cylinder packing.
- Check that clearance between tilt cylinder bushing and mounting pin is within 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)



3) MAIN CONTROL VALVE

- (1) Raise forks to maximum height and measure oil pressure.
Check that oil pressure is 190 kgf/cm² (2700 psi).

2. TROUBLESHOOTING

1) SYSTEM

Problem	Cause	Remedy
Large fork lowering speed	<ul style="list-style-type: none"> Seal inside control valve defective. Oil leaks from joint or hose. Seal inside cylinder defective. 	<ul style="list-style-type: none"> Replace spool or valve body. Replace. Replace packing.
Large spontaneous tilt of mast	<ul style="list-style-type: none"> Tilting backward : Check valve defective. Tilting forward : tilt lock valve defective. Oil leaks from joint or hose. Seal inside cylinder defective. 	<ul style="list-style-type: none"> Clean or replace. Clean or replace. Replace. Replace seal.
Slow fork lifting or slow mast tilting	<ul style="list-style-type: none"> Lack of hydraulic oil. Hydraulic oil mixed with air. Oil leaks from joint or hose. Excessive restriction of oil flow on pump suction side. Relief valve fails to keep specified pressure. Poor sealing inside cylinder. High hydraulic oil viscosity. Mast fails to move smoothly. Oil leaks from lift control valve spool. Oil leaks from tilt control valve spool. 	<ul style="list-style-type: none"> Add oil. Bleed air. Replace. Clean filter. Adjust relief valve. Replace packing. Change to ISO VG46. Adjust roll to rail clearance. Replace spool or valve body. Replace spool or valve body.
Hydraulic system makes abnormal sounds	<ul style="list-style-type: none"> Excessive restriction of oil flow pump suction side. Gear or bearing in hydraulic pump defective. 	<ul style="list-style-type: none"> Clean filter. Replace gear or bearing.
Control valve lever is locked	<ul style="list-style-type: none"> Foreign matter jammed between spool and valve body. Valve body defective. 	<ul style="list-style-type: none"> Clean. Tighten body mounting bolts uniformly.
High oil temperature	<ul style="list-style-type: none"> Lack of hydraulic oil. High oil viscosity. Oil filter clogged. 	<ul style="list-style-type: none"> Add oil. Change to ISO VG46. Clean filter.

2) HYDRAULIC GEAR PUMP

Problem	Cause	Remedy
Pump does not develop full pressure	<ul style="list-style-type: none"> · System relief valve set too low or leaking. · Oil viscosity too low. · Pump is worn out. 	<ul style="list-style-type: none"> · Check system relief valve for proper setting. · Change to proper viscosity oil. · Repair or replace pump.
Pump will not pump oil	<ul style="list-style-type: none"> · Reservoir low or empty. · Suction strainer clogged. 	<ul style="list-style-type: none"> · Fill reservoir to proper level. · Clean suction strainer.
Noisy pump caused by cavitation	<ul style="list-style-type: none"> · Oil too thick. · Oil filter plugged. · Suction line plugged or too small. 	<ul style="list-style-type: none"> · Change to proper viscosity. · Clean filters. · Clean line and check for proper size.
Oil heating	<ul style="list-style-type: none"> · Oil supply low. · Contaminated oil. · Setting of relief valve too high or too low. · Oil viscosity too low. 	<ul style="list-style-type: none"> · Fill reservoir to proper level. · Drain reservoir and refill with clean oil. · Set to correct pressure. · Drain reservoir and fill with proper viscosity.
Foaming oil	<ul style="list-style-type: none"> · Low oil level. · Air leaking into suction line. · Wrong kind of oil. 	<ul style="list-style-type: none"> · Fill reservoir to proper level. · Tighten fittings, check condition of line. · Drain reservoir, fill with non-foaming oil.
Shaft seal leakage	<ul style="list-style-type: none"> · Worn shaft seal. · Worn shaft in seal area. 	<ul style="list-style-type: none"> · Replace shaft seal. · Replace drive shaft and seal.

3) MAIN RELIEF VALVE

Problem	Cause	Remedy
Can't get pressure	<ul style="list-style-type: none"> · Poppet D, E or K stuck open or contamination under seat. 	<ul style="list-style-type: none"> · Check for foreign matter between poppets D, E or K and their mating parts. Parts must slide freely.
Erratic pressure	<ul style="list-style-type: none"> · Pilot poppet seat damaged. · Poppet C sticking in D. 	<ul style="list-style-type: none"> · Replace the relief valve. · Clean and remove surface marks for free movement.
Pressure setting not correct	<ul style="list-style-type: none"> · Normal wear. Lock nut & adjust screw loose. 	<ul style="list-style-type: none"> · See *Test of main control valve.
Leaks	<ul style="list-style-type: none"> · Damaged seats. · Worn O-rings. · Parts sticking due to contamination. 	<ul style="list-style-type: none"> · 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, tighten or loosen the adjusting screw 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	<ul style="list-style-type: none"> · Foreign matters on packing. · Unallowable score on rod. · Unusual distortion of dust seal. · Chrome plating is striped. 	<ul style="list-style-type: none"> · Replace packing. · Smooth rod surface with an oil stone. · Replace dust seal. · Replace rod.
Oil leaks out from cylinder rod cover thread	<ul style="list-style-type: none"> · O-ring damaged. 	<ul style="list-style-type: none"> · Replace O-ring.
Rod spontaneously retract	<ul style="list-style-type: none"> · Scores on inner surface of tube. · Unallowable score on the inner surface of tube. · Foreign matters in piston seal. 	<ul style="list-style-type: none"> · Smooth rod surface with an oil stone. · Replace cylinder tube. · Replace piston seal.
Wear (clearance between cylinder tube and wear ring)	<ul style="list-style-type: none"> · Excessive clearance between cylinder tube and wear ring. 	<ul style="list-style-type: none"> · Replace wear ring.
Abnormal noise is produced during tilting operation	<ul style="list-style-type: none"> · Insufficient lubrication of anchor pin or worn bushing and pin. · Bent tilt cylinder rod. 	<ul style="list-style-type: none"> · 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 or 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.

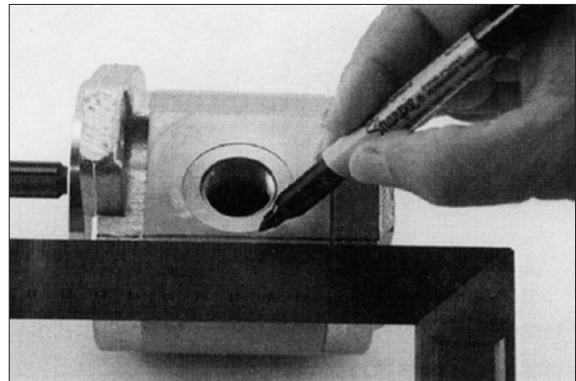
Always respect the direction of rotation when assembling components.

1. HYDRAULIC GEAR PUMP

※ Tools required

- Metric socket set
- Internal snap ring pliers
- Shaft seal sleeve
- Torque wrench

- (1) It is very important to work in a clean work area when repairing hydraulic products. Plug ports and wash exterior of pump with a proper cleaning solvent before continuing.
- (2) Remove port plugs and drain oil from pump.
- (3) Use a permanent marker pen to mark a line across the mounting flange, gear housing and end cover. This will assure proper reassembly and rotation of pump.
- (4) Remove key from drive shaft if applicable.



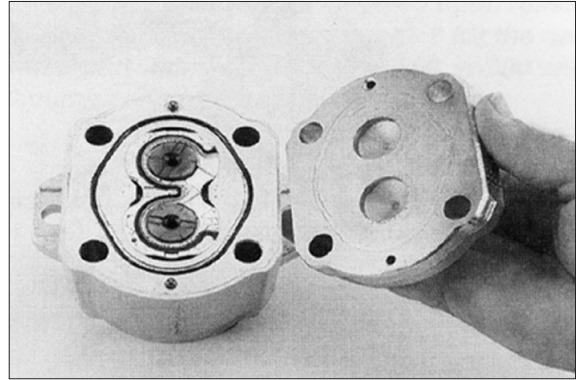
PUMP 01

- (5) Clamp mounting flange in a protected jaw vise with pump shaft facing down.
- (6) Loosen the four metric hexagon head bolts.
- (7) Remove pump from vise and place on clean work bench, remove the four hexagon head bolts and spacers applicable.



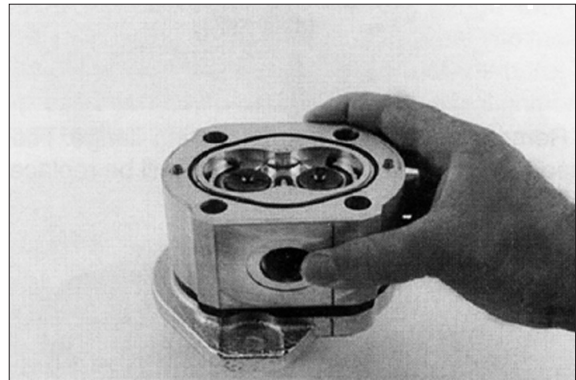
PUMP 02

(8) Lift and remove end cover.



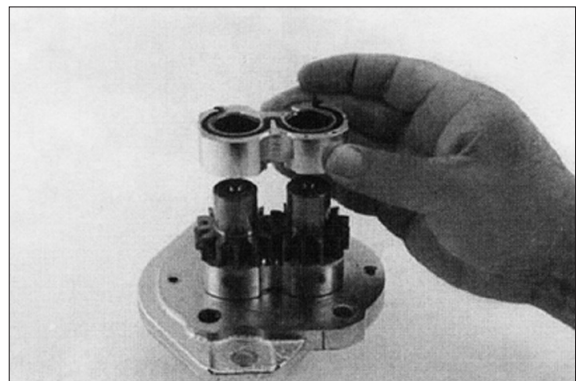
PUMP 03

(9) Carefully remove gear housing and place on work bench. Make sure the rear bearing block remains on the drive and idler shafts.



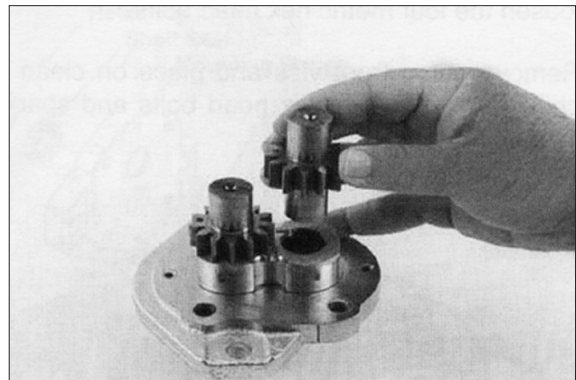
PUMP 04

(10) Remove rear bearing block from drive and idler shafts.



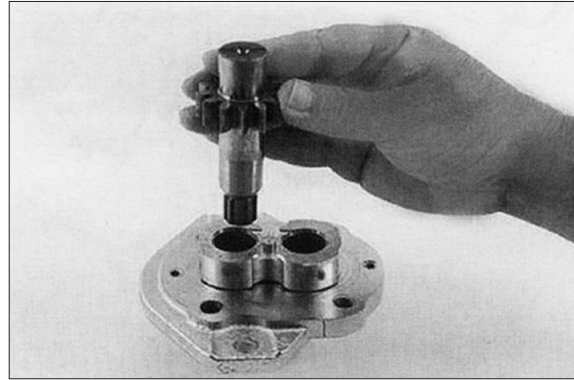
PUMP 05

(11) Remove idler shaft from bearing block.



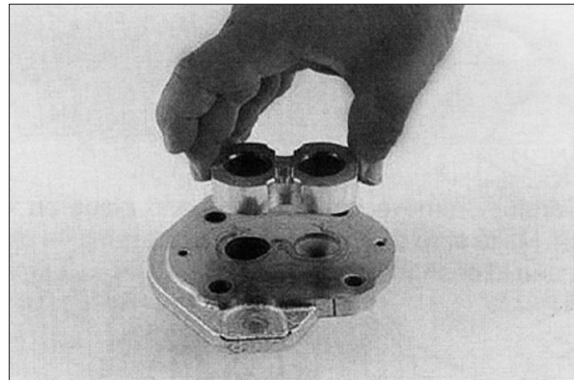
PUMP 06

- (12) Remove drive shaft from mounting flange.
There is no need to protect the shaft seal
as it will be replaced as a new item.



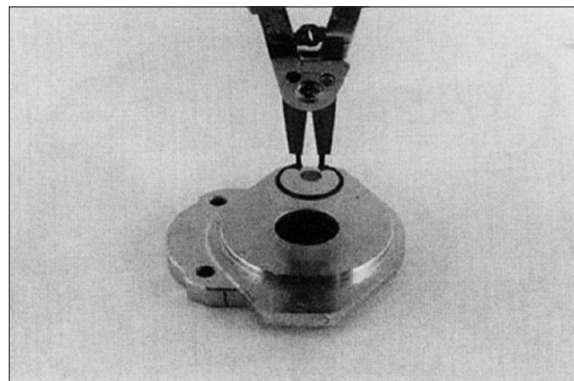
PUMP 07

- (13) Remove the front bearing block.



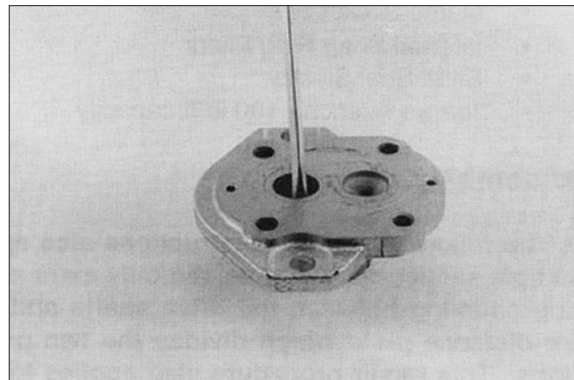
PUMP 08

- (14) Turn mounting flange over, with shaft seal up, and remove the retaining ring with proper snap ring pliers.



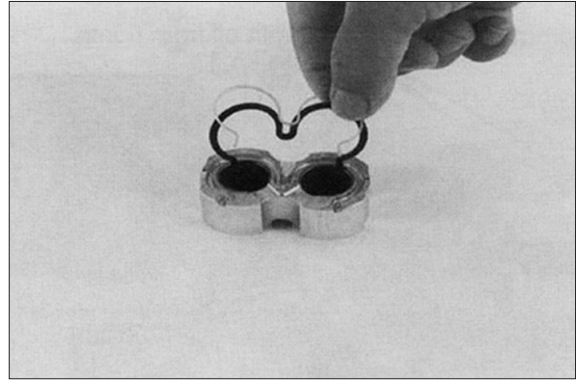
PUMP 09

- (15) Remove the oil seal from mounting flange, be careful not to mar or scratch the seal bore.
- (16) Remove the dowel pins from the gear housing. Do not lose pins.



PUMP 10

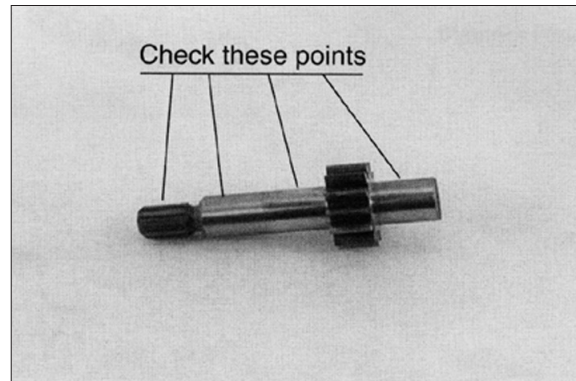
- (17) Remove seals from both bearing blocks and discard.



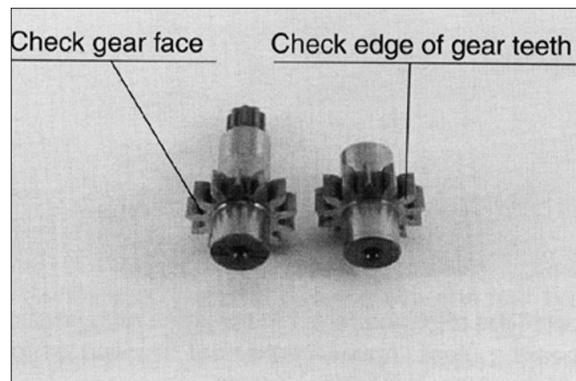
PUMP 11

2) INSPECT PARTS FOR WEAR

- (1) Clean and dry all parts thoroughly prior to inspection. It is not necessary to inspect the seals as they will be replaced as new items.
- (2) Check drive shaft spline for twisted or broken teeth, check keyed drive shaft for broken or chipped keyway. No marks or grooves on shaft in seal area, some discoloration of shaft is allowable.
- (3) Inspect both the drive gear shaft and idler gear shafts at the bearing points and seal area for rough surfaces and excessive wear.
- (4) Inspect gear face for scoring or excessive wear. If the face edge of gear teeth are sharp, they will mill into the bearing blocks. If wear has occurred, the parts are unusable.



PUMP 12



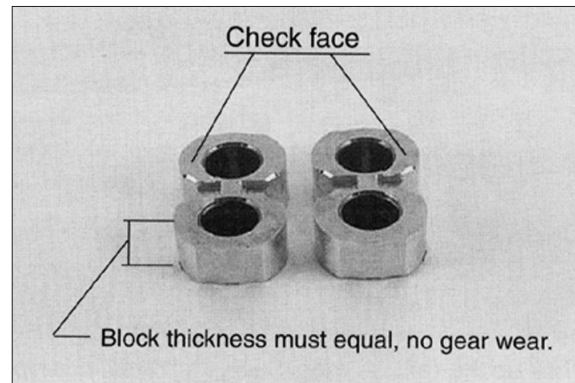
PUMP 13

- (5) Inspect bearing blocks for excessive wear or scoring on the surfaces which are in contact with the gears. Also inspect the bearings for excessive wear or scoring.
- (6) Inspect the area inside the gear housing. It is normal for the surface inside the gear housing to show a clean "wipe" on the inside surface on the intake side. There should not be excessive wear or deep scratches and gouges.

※ **General information**

It is important that the relationship of the mounting flange, bearing blocks and gear housing is correct. Failure to properly assemble this pump will result with little or no flow at rated pressure.

- ※ **This pump is not bi-rotational.**

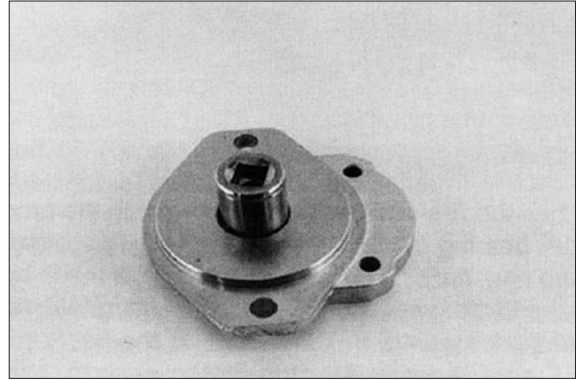


PUMP 14

3) ASSEMBLY

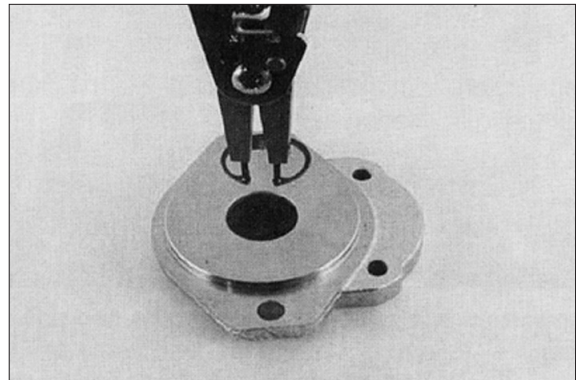
※ New seals should be installed upon reassembly of pump.

- (1) Install new shaft seal in mounting flange with part number side facing outboard. Press the seal into the seal bore until the seal reaches the bottom of the bore. Uniform pressure must be used to prevent misalignment or damage to the seal.



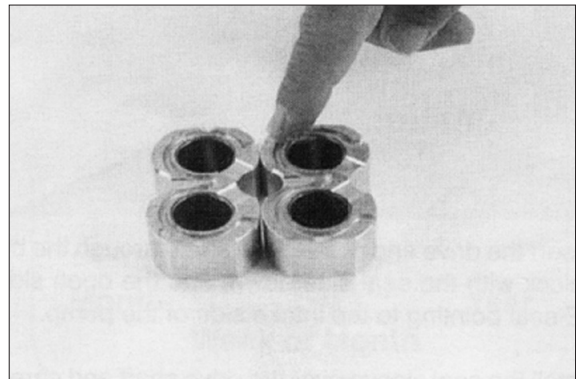
PUMP 15

- (2) Install retaining ring in groove in seal bore of mounting flange.



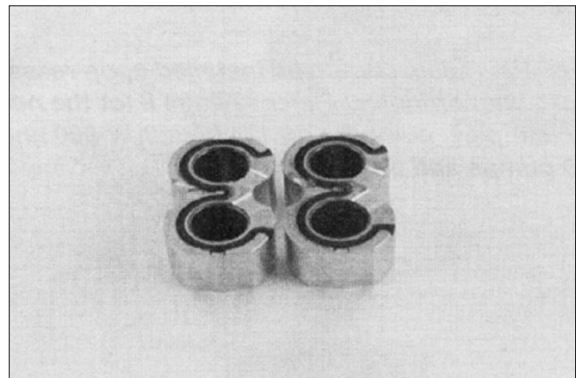
PUMP 16

- (3) Place front and back bearing blocks on a clean surface with the E-seal grooves facing up. Apply a light coating of petroleum jelly in the grooves. Also coat the E-seal and backup with the petroleum jelly, this will help keep the seals in place during assembly.



PUMP 17

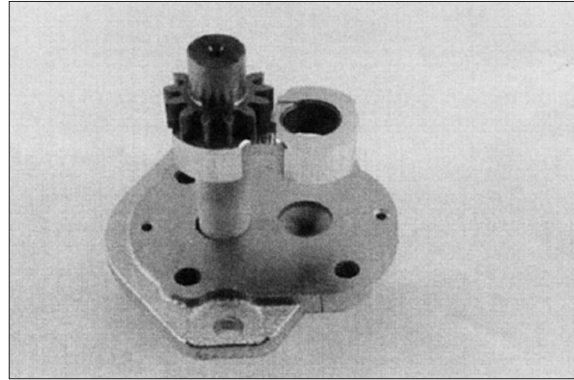
- (4) Place the E-seals, flat side outward, into the grooves in both bearing blocks. Follow by carefully placing the backup ring, flat side outward, in the groove made by the E-seal and the groove in the bearing block.
- (5) Place mounting flange, with shaft seal side down, on a clean flat surface.
- (6) Apply a light coating of petroleum jelly to the exposed face of the front bearing block.



PUMP 18

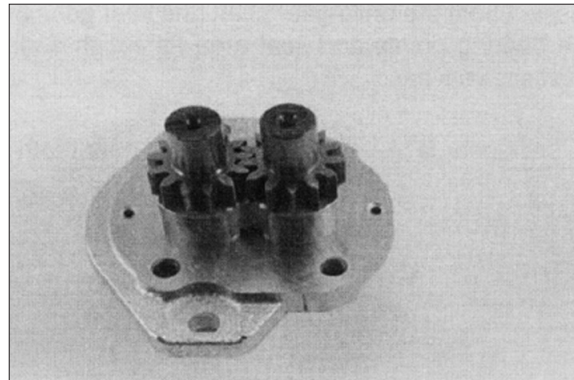
(7) Insert the drive end of the drive shaft through the bearing block with the seal side down, and the open side of the E-seal pointing to the intake side of the pump.

(8) Install the seal sleeve over the drive shaft and carefully slide the drive shaft through the shaft seal. Remove the seal sleeve from shaft.



PUMP 19

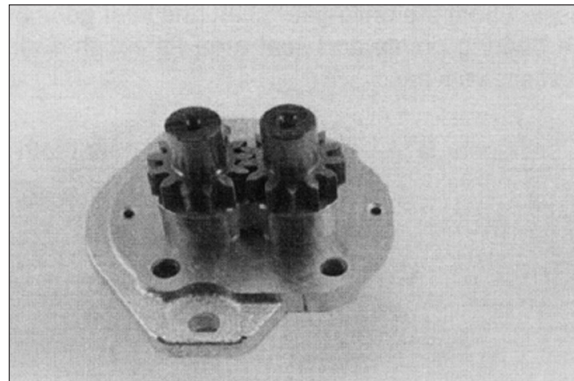
(9) Install the idler gear shaft in the remaining position in the bearing block. Apply a light coat of clean oil to the face of the drive and idler gears.



PUMP 20

(10) Pick up the rear bearing block, with seal side up and with open end of the E-seal facing the intake side of the pump, place over the drive and idler gear shafts.

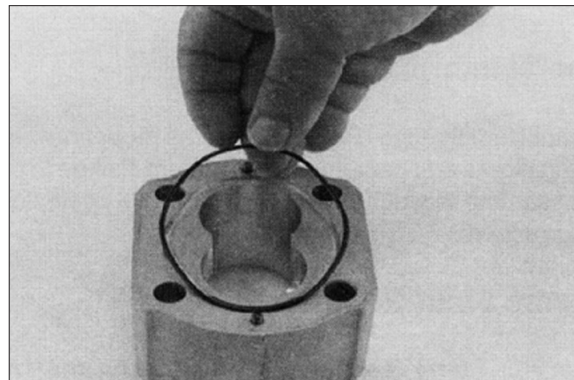
(11) Install two dowel pins in the holes in the mounting flange or two long dowel pins through gear housing if pump is a multiple section pump.



PUMP 21

(12) To install the O-rings in the gear housing, apply a light coating of petroleum jelly in the grooves on both sides of the gear housing.

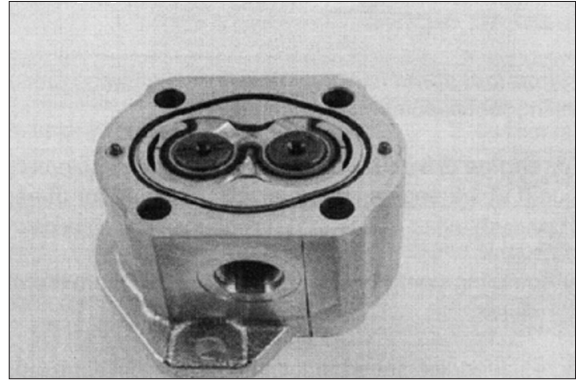
Also coat the new O-ring and install them in the grooves.



PUMP 22

- (13) Gently slide the gear housing over the rear bearing block assembly, slide housing down until the housing engages the dowel pins. Press firmly in place with hands, do not force or use any tool.

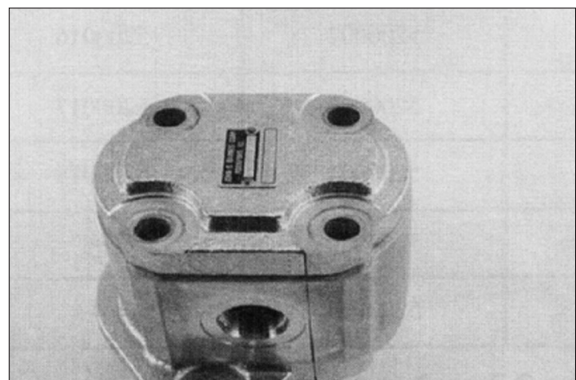
Check to make sure the intake port in the housing is on the same side as the open end of the E-seal and that the marked lines on the mounting flange and gear housing are in alignment.



PUMP 23

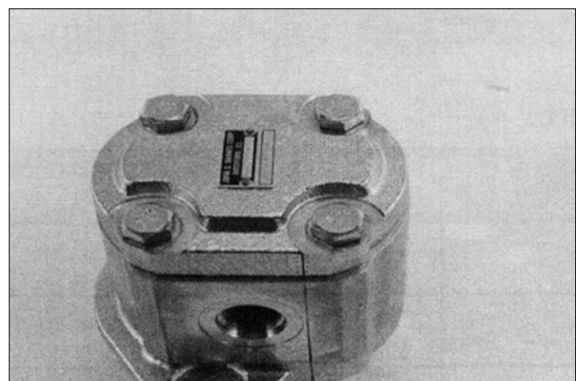
- (14) The surface of the rear bearing block should be slightly below the face of the gear housing. If the bearing block sits higher than the rear face of the gear housing then the E-seal or O-ring have shifted out of the groove. If this is the case, remove the gear housing and check for proper seal installation.

- (15) Install the two remaining dowel pins in the rear of the gear housing and place the end cover over the back of the pump.



PUMP 24

- (16) Install the four spacers and hexagon head bolts through the bolt holes in the end cover, hand tighten.



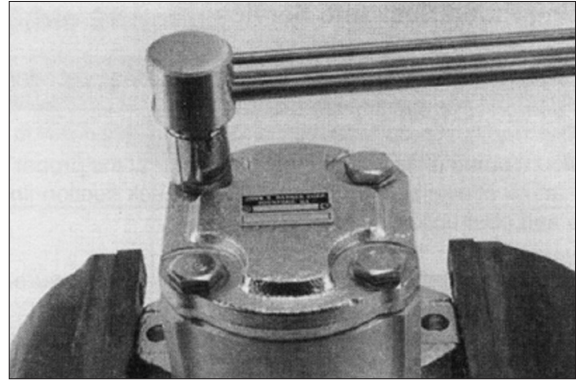
PUMP 25

- (17) Place mounting flange of the pump back in the protected jawed vise and alternately torque the bolts.

· Tighten torque : 3.0~4.0 kgf · m
(22~29 lbf · ft)

- (18) Remove pump from vise.

- (19) Place a small amount of clean oil in the inlet of the pump and rotate the drive shaft away from the inlet one revolution. If the drive shaft binds, disassemble the pump and check for assembly problems, then reassemble the pump.



PUMP 26

2. MAIN CONTROL VALVE (MANUAL TYPE)

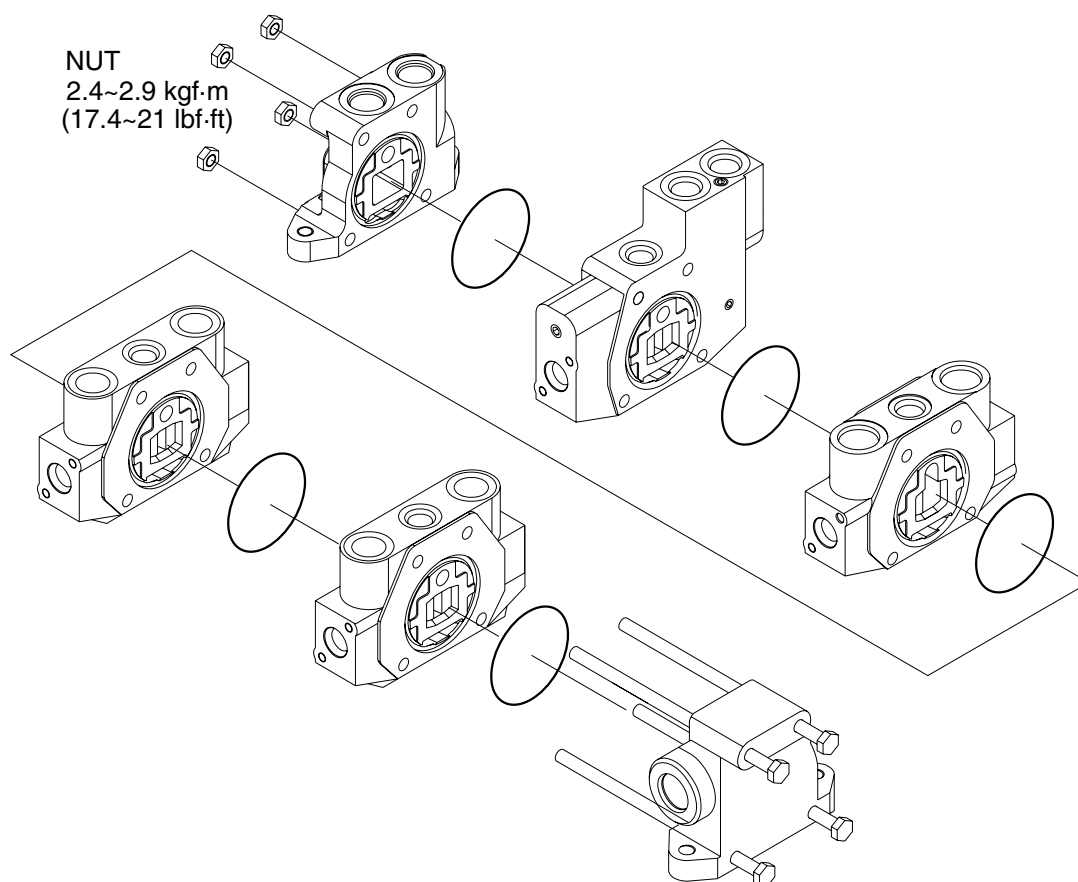
※ Descriptions are based on the OPSS type.

1) ASSEMBLY

(1) General

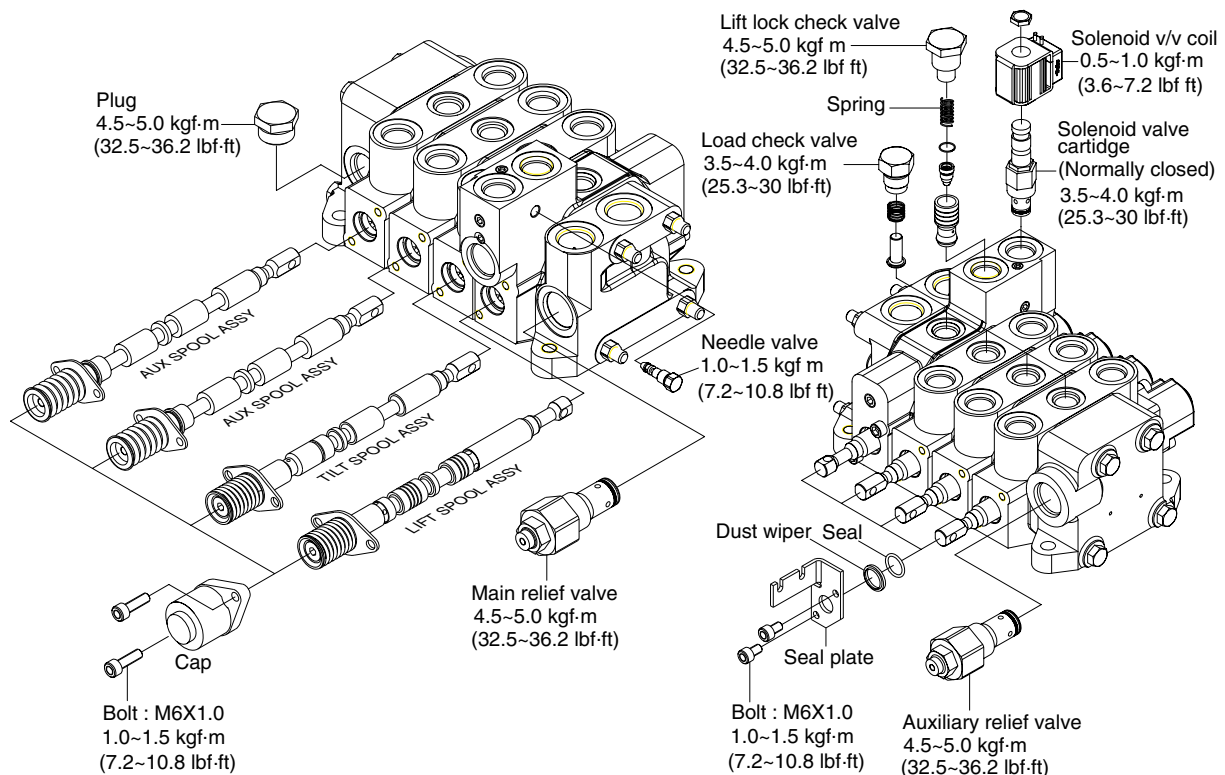
- ① Ensure that the assembly area will be clean and free of contamination.
- ② Use a flat (within 0.2 mm) work surface when bolting the valve sections together.
- ③ Use calibrated torque wrenches and instrumentation.
- ④ Additional auxiliary valve sections may be added to the main control valve in a similar manner as indicated below.

(2) Block sub assembly



22B7HS21

- ① Attach all the O-rings to the appropriate grooves between the spool sections.
- ② Stack the valve sections such that all the work ports are facing up, the spool ends are all in the
- ③ same direction, and they are resting on a flat (within 0.2 mm), uniform surface.
- ④ Insert all the tie rods through the drilled holes in each of the housings.
Press the sections together, being carefully not to damage sealing surfaces or seals.
- ⑤ Install nuts to both ends of all tie rods and progressively torque in a circular pattern until reaching a torque of 2.4~2.9 kgf · m (17.4~21 lbf · ft) on all tie rods. Periodically, make sure that the valve remains flat while applying torque.



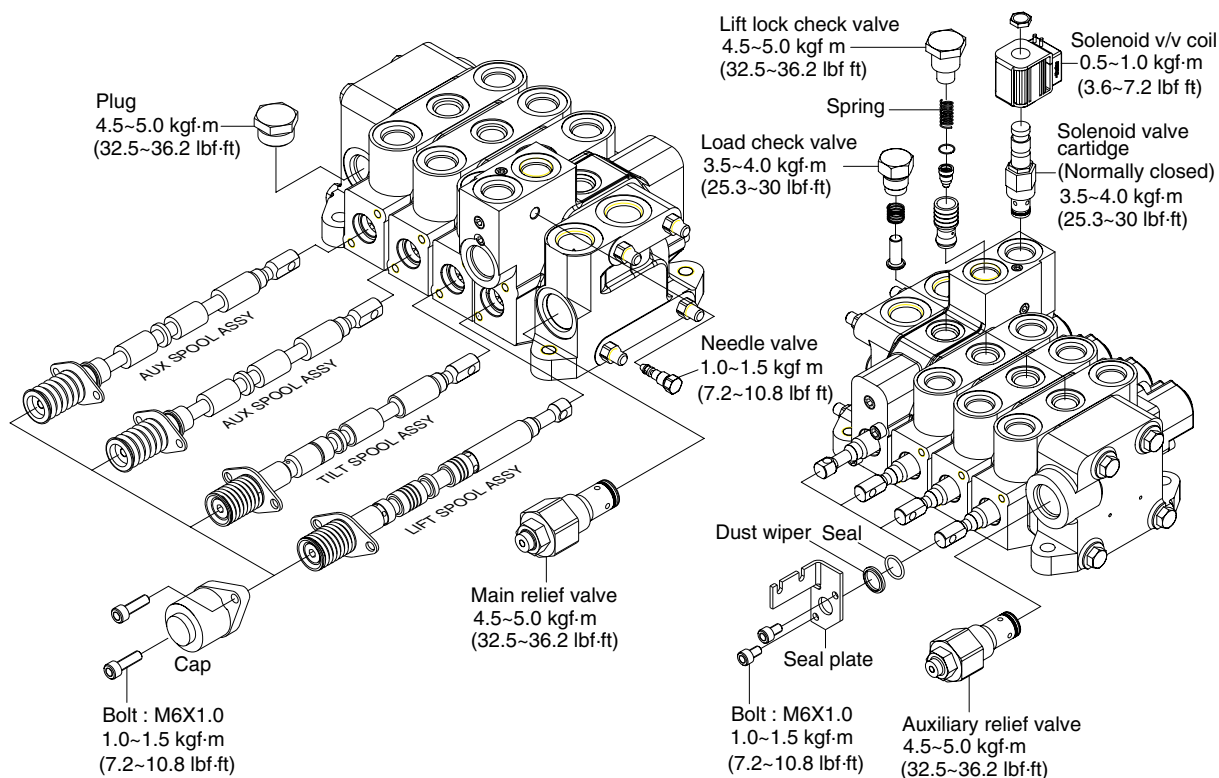
15BT9HS25S

(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

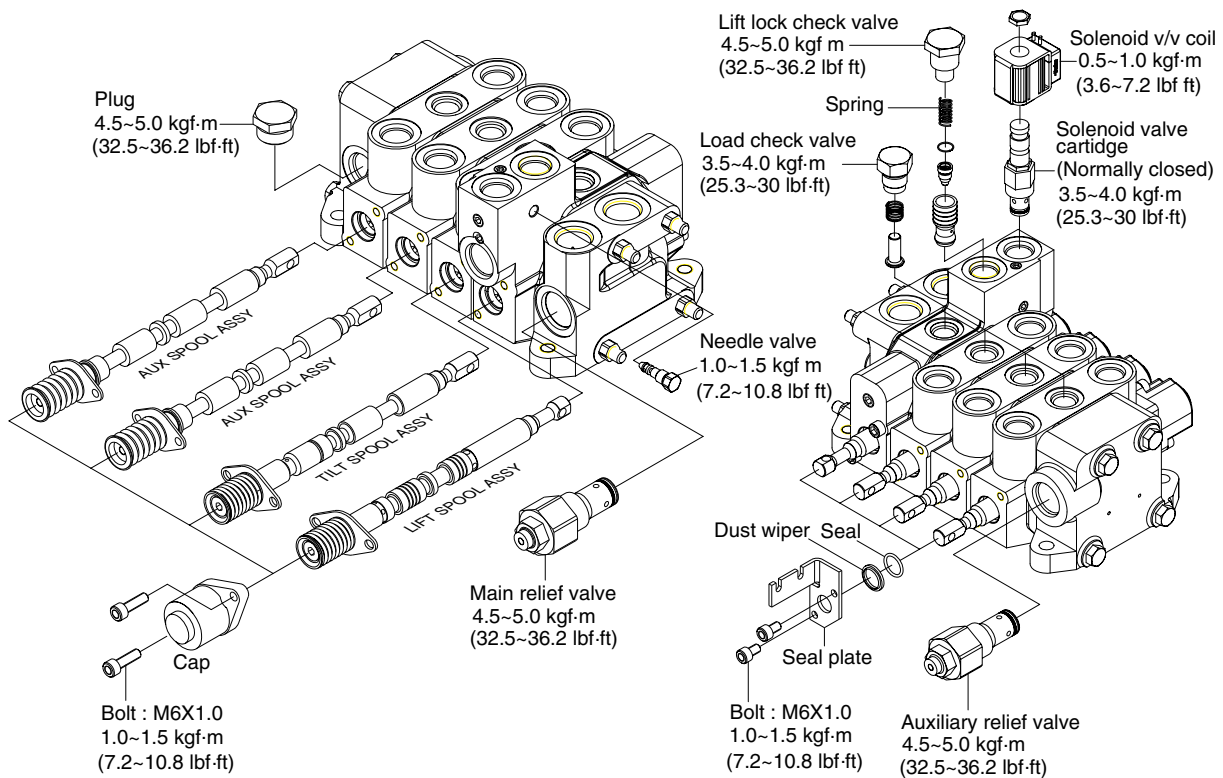
- ① The spool assembly should already consist of the lift spool, the return spring, one spring seat on either end of the spring, the seal plate, a spool seal, and a dust wiper. All of these are assembled on the end of the spool opposite the clevis.
- ② Insert the clevis end of the spool into the right-hand 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)



15BT9HS25S

(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).



15BT9HS25S

(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

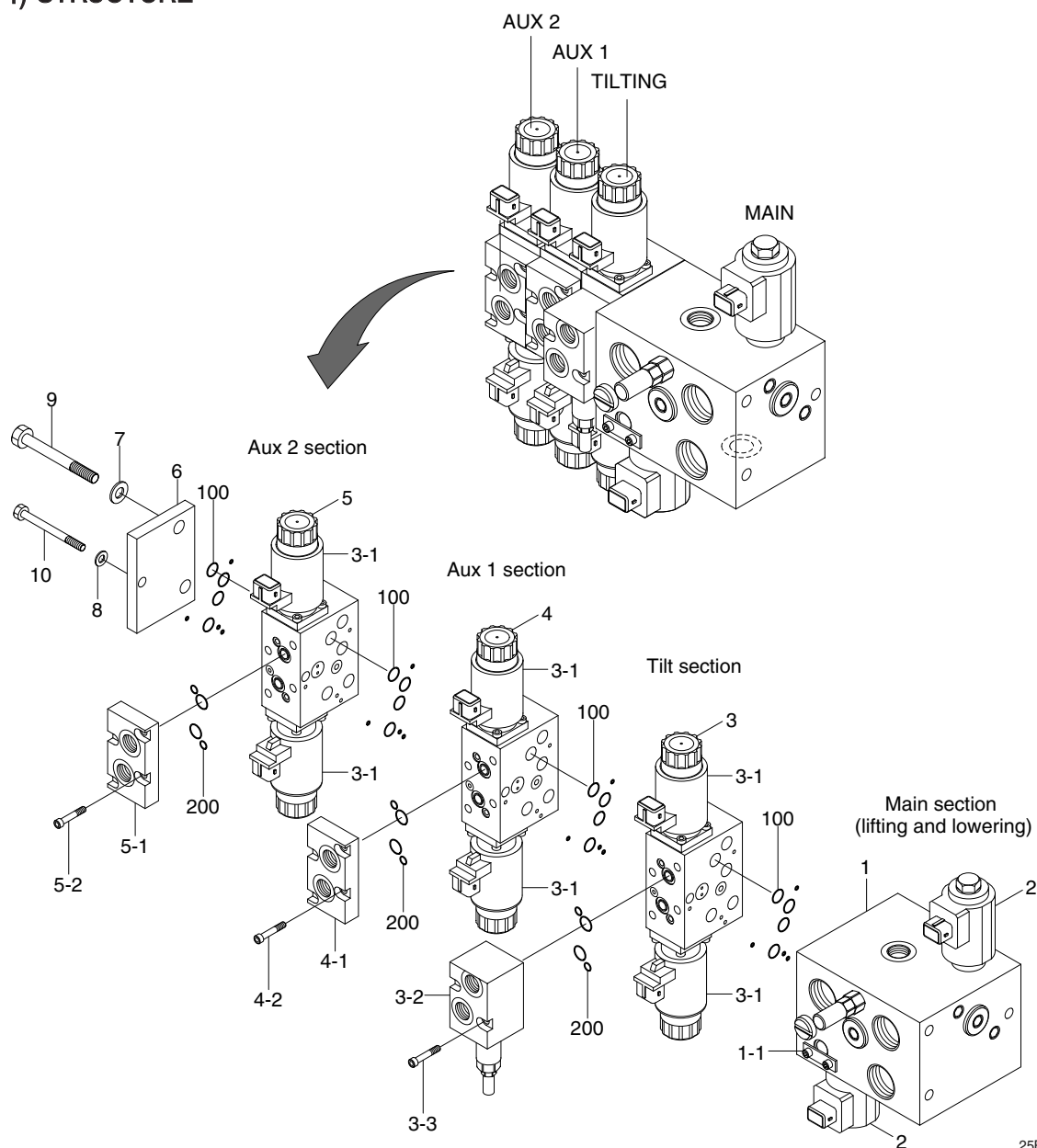
- ① Subassemblies (such as relief valves, check valves, and spools) may be removed without having to loosen the tie rods and disassembling the entire valve.
- ② Disassemble the valve sections on a flat working surface.
- ③ Ensure that the disassembly area will be clean and free of contamination.
- ④ 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 handling them to avoid damage or the introduction of contamination that could adversely affect performance.

3. MAIN CONTROL VALVE (FINGERTIP, OPT)

1) STRUCTURE



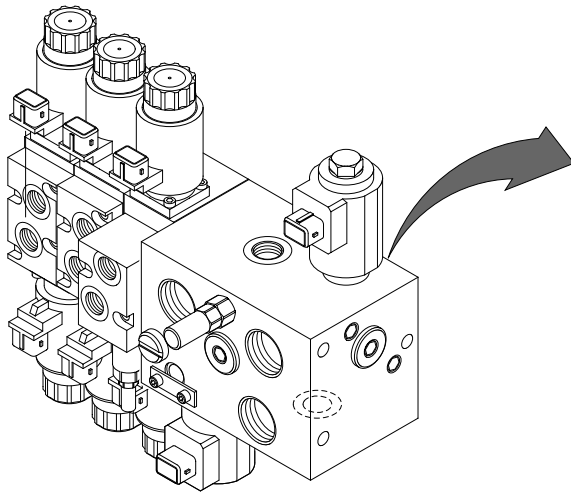
25B9UFT01

※ Tightening torque

- Item (3-3, 4-2, 5-2) : 0.61 kgf·m (4.4 lbf.ft)
- Item (9) : 2.3 kgf·m (17.0 lbf.ft)
- Item (10) : 0.97 kgf·m (7.0 lbf.ft)

1	Main block	4-1	Ancillary block	8	Washer
2	Solenoid valve (lift)	4-2	Socket head screw	9	Socket head screw
3	Solenoid valve (tilt)	5	Solenoid valve (auxiliary 2)	10	Socket head screw
3-1	Coil amp	5-1	Ancillary block	100	Section seal kit
3-2	Block	5-2	Socket head screw	200	Ancillary block
3-3	Socket head screw	6	End plate		
4	Solenoid valve (auxiliary 1)	7	Washer		

2) MAIN SECTION

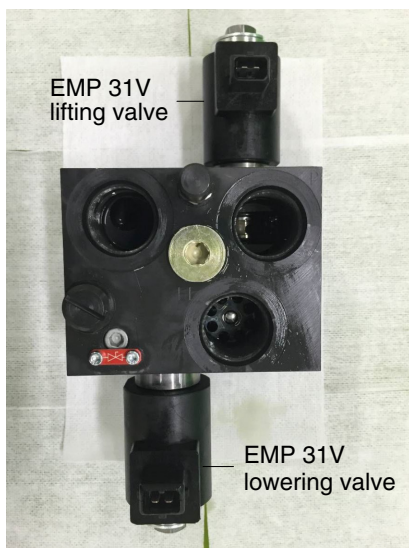


25B9UFT02

- ※ Flow rate : 80 lpm
- ※ Maximum pressure : 250 bar
- ※ Setting pressure : 190 bar

(1) Lifting and lowering valve

① Main section



25B9UFT03

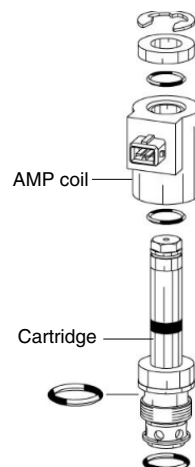
※ When it can't control lifting & lowering, need to check EMP valve. Because of contamination material EMP valve often can't operate properly that means valve poppet and seat opened.

② EMP solenoid valve



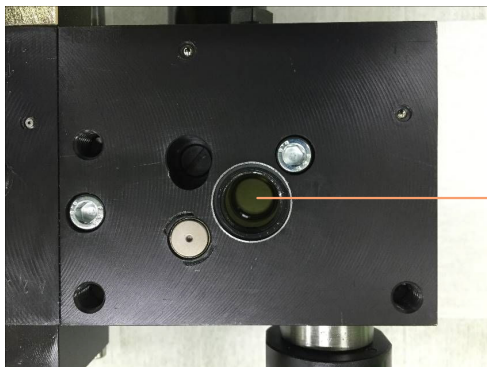
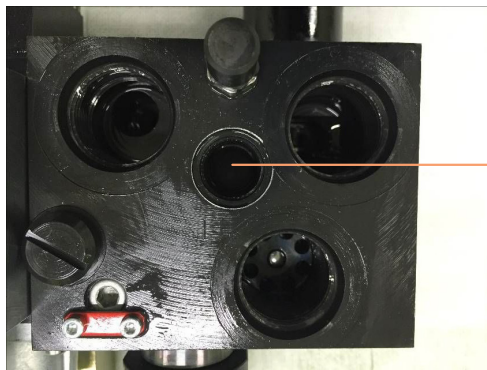
25L7AFT04

- ※ Tightening torque
6.1 kgf·m (44.3 lbf·ft)



25L7AFT05

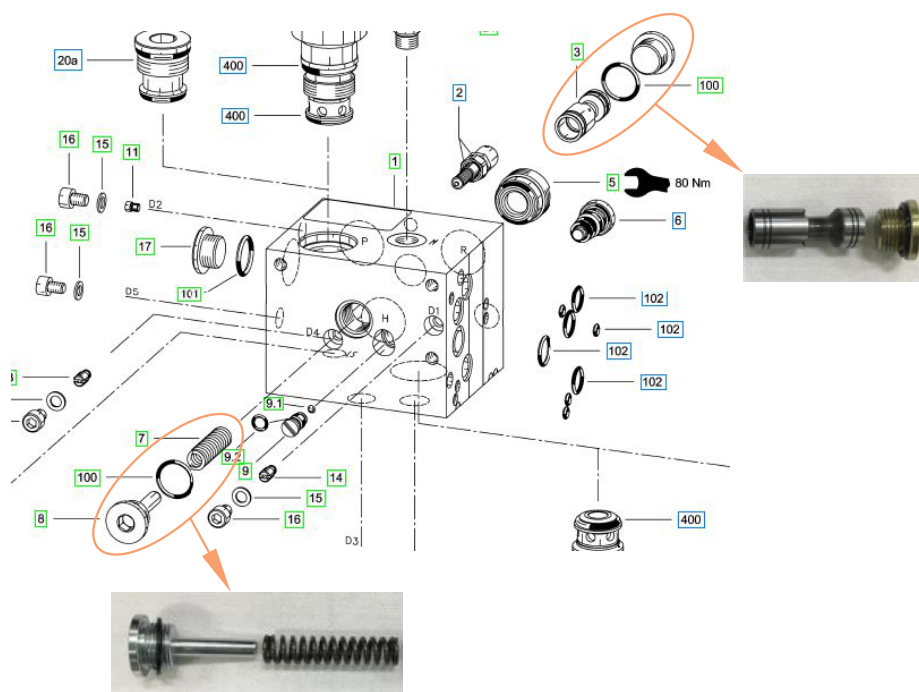
(2) 3-way controller



25L7AFT06

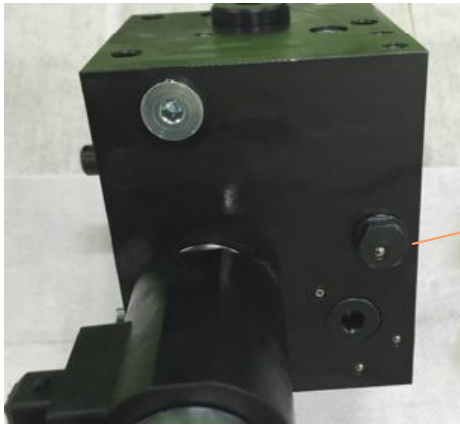


※ During unloading, supplied oil by the pump return to tank keeping 9 bar of system pressure.



25L7AFT07

(3) S damping screw

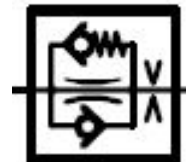


※ S damping

Integrated combination of orifice, check valve, pre-load valve (approx. 25 bar).

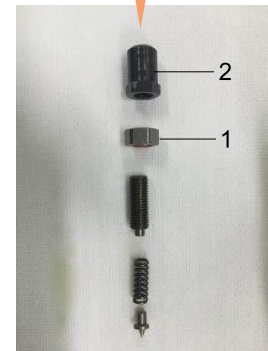
※ Tightening torque

1.02 kgf·m (7.4 lbf·ft)



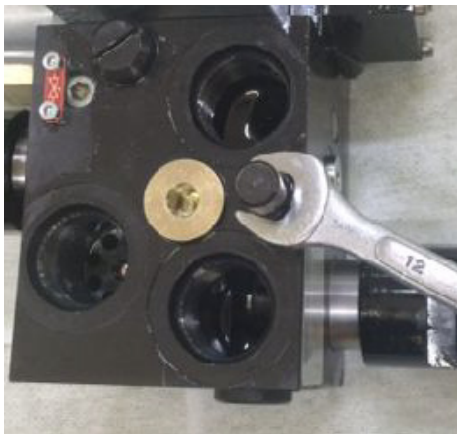
25L7AFT09

(4) Pressure relief valve



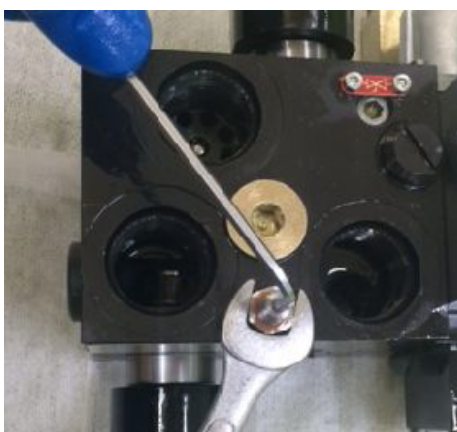
25L7AFT10

- ※ Relief valve
- Control the main system pressure.





25L7AFT11

- ※ Use with a 12 mm spanner.
- ※ Tightening torque (1)
- 1.43 kgf·m (10.3 lbf·ft)



25L7AFT12

- ※ Use with a 3 mm wrench.
- ※ Tightening torque (2)
- 1.43 kgf·m (10.3 lbf·ft)

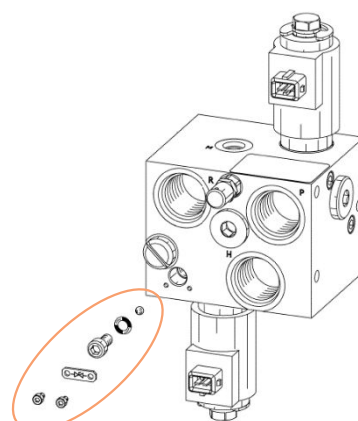
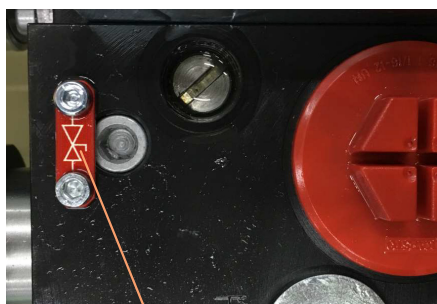
 = Pressure increases
 = Pressure decreases

25L7AFT13

- ※ Rotating clockwise to increase setting pressure with a wrench.
- ※ 80 bar increase and decrease per 1 turn.

(5) Emergency lowering valve and shuttle valve

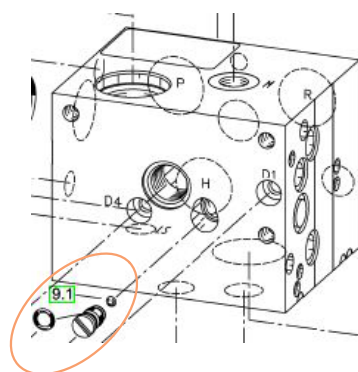
① Emergency lowering valve



25B9UFT14

※ When need to force lowering, rotate counter clockwise increasingly with emergency lowering valve.

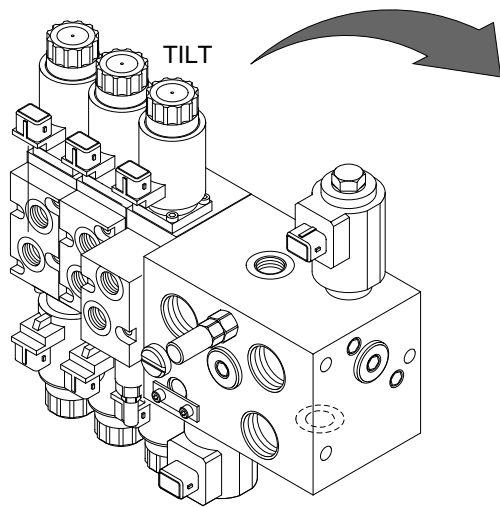
② Shuttle valve



25L7AFT15

※ Transfer bigger load pressure through shuttle valve.
 ※ Use a flat screw driver.

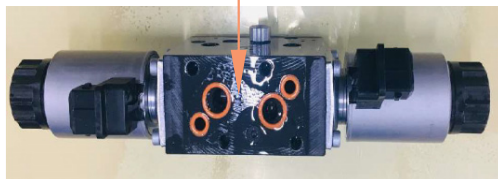
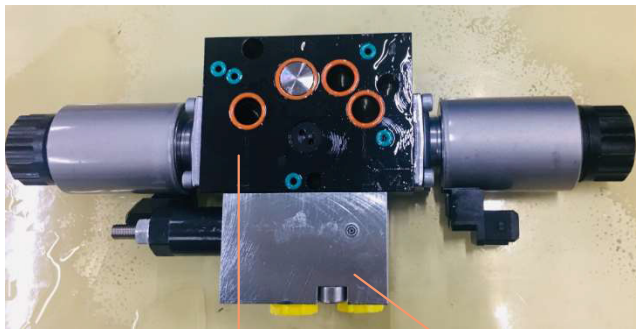
3) TILT SECTION



25B9UFT16

- ※ Flow rate : 16 lpm
- ※ Load holding pressure : 120 bar

(1) Proportional directional valve



① Valve section block



② Counter balance valve block

25B9UFT17

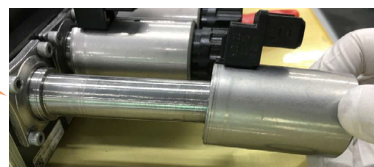
(2) Disassembly valve section



① Disassemble spool

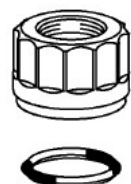


② Disassemble coil



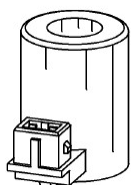
25B9UFT18

③ Disassembling process



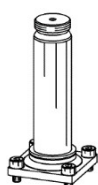
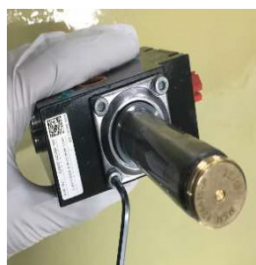
25B9UFT19

a. Release cap.



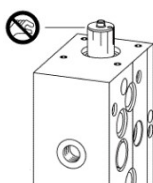
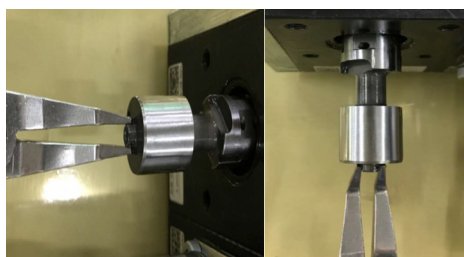
25B9UFT20

b. Release oil part.



25B9UFT21

c. Release actuation system.



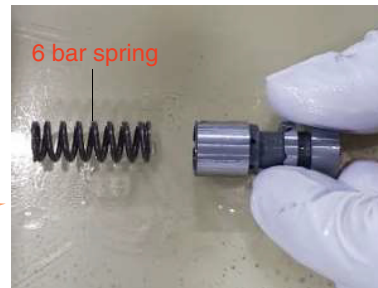
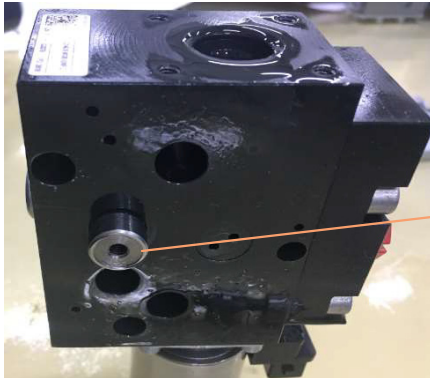
25B9UFT22

d. Pull out spool.

- ※ Do not use finger.
- ※ Use tool like picture (long nose plier).

(3) 2 way controller and shuttle valve

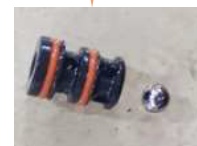
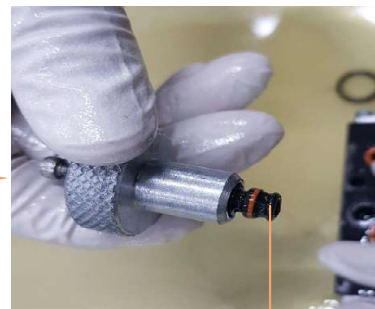
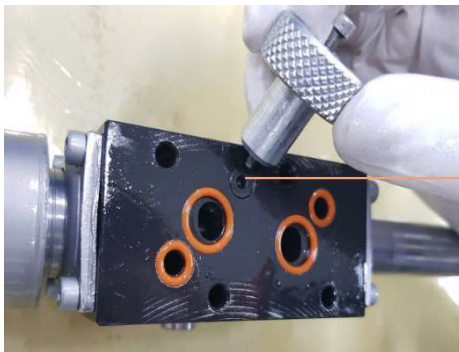
① 2 way controller (6 bar)



25B9UFT24

- ※ Pull out 2 way controller by fingers directly
- ※ 2 way controller make it keep 6 bar regardless of load change between in and out of spool.

② Shuttle valve

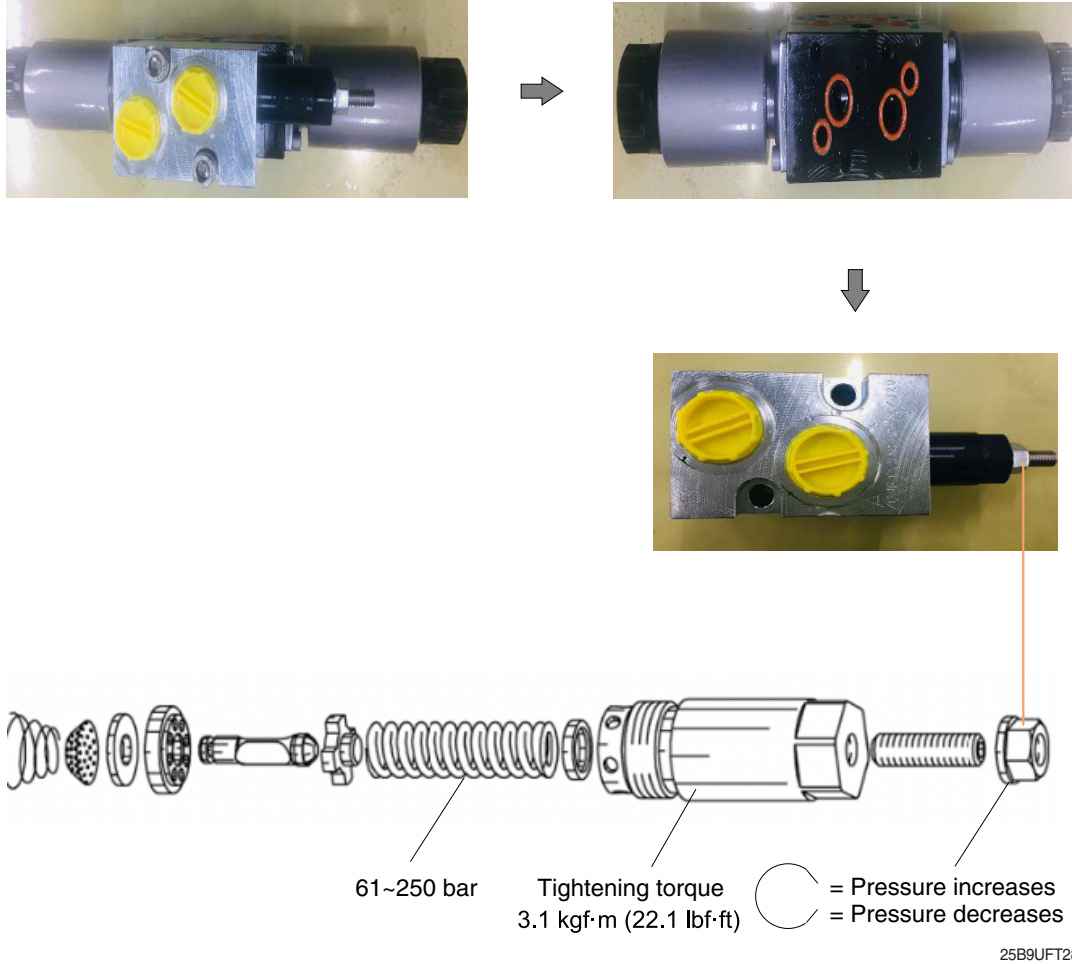


25B9UFT25

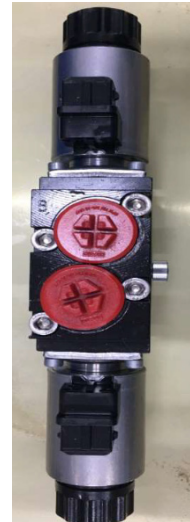
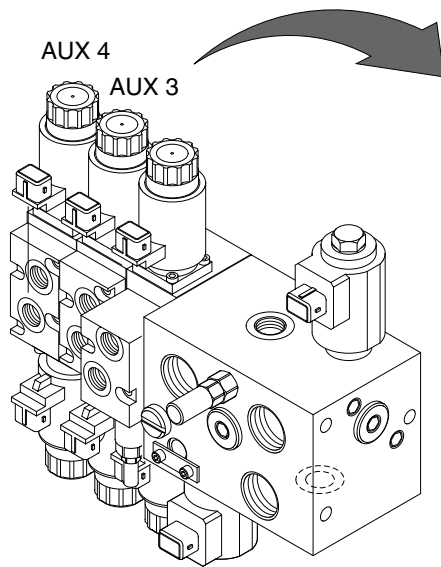
- ※ Transfer bigger load pressure through shuttle valve.
- ※ Fix 3 mm bolt and pull out.

(4) Counter balance valve

※ Counter balance valve needs during tilting out operation.



4) AUXILIARY SECTION



25B9UFT29

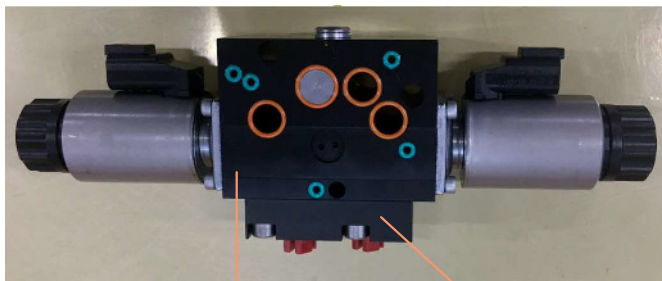
※ Flow rate

AUX 1 : 10 lpm, AUX 2 : 25 lpm

※ Pressure limit

AUX 1 : 140 bar, AUX 2 : 140 bar

(1) Proportional directional valve



① Valve section block

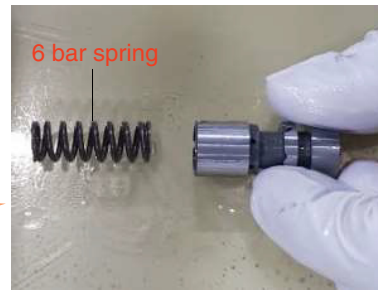
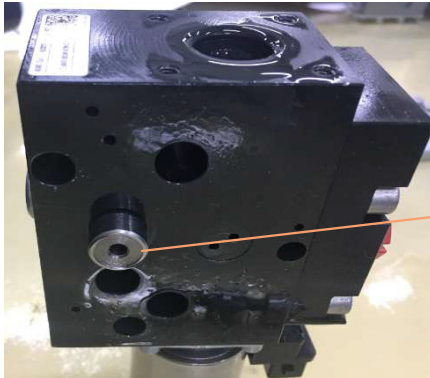


25B9UFT30

② Ancillary block

(2) 2 way controller and shuttle valve

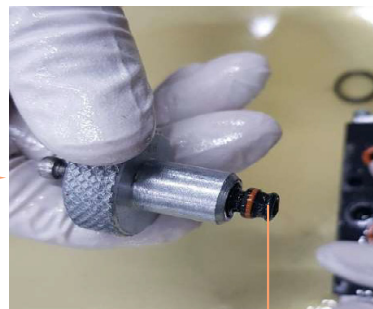
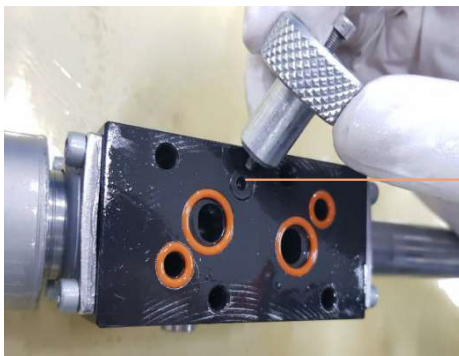
① 2 way controller (6 bar)



25B9UFT24

- ※ Pull out 2 way controller by fingers directly.
- ※ 2 way controller make it keep 6 bar regardless of load change between in and out of spool.

② Shuttle valve

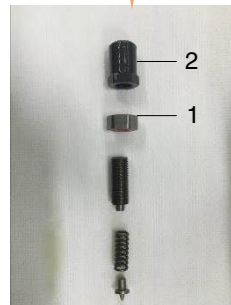


25B9UFT25

- ※ Transfer bigger load pressure through shuttle valve.
- ※ Fix 3 mm bolt and pull out.

(3) Second relief valve

- ※ Controlling individual section pressure, rotating clockwise to increase setting pressure with wrench.
- ※ 80 bar increase and decrease per 1 turn.



25B9UFT26

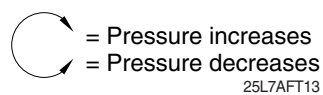


- ※ Use with a 12 mm spanner.
- ※ Tightening torque (1)
1.43 kgf·m (10.3 lbf·ft)



25B9UFT27

- ※ Use with a 3 mm wrench.
- ※ Tightening torque (2)
1.43 kgf·m (10.3 lbf·ft)



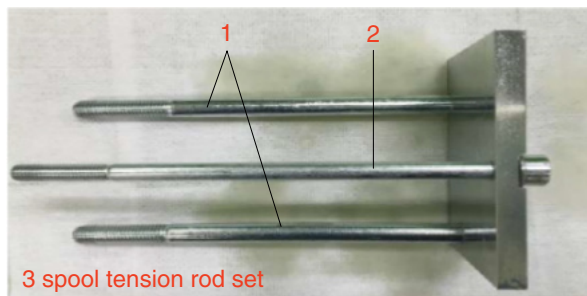
25L7AFT13

5) ADD SECTION PART

(1) Disassembly



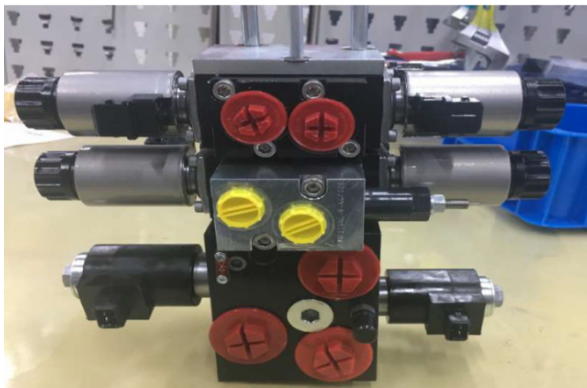
25B9UFT31



25B9UFT32

※ Tightening torque

- Item 1 (2 EA) : 2.3 kgf·m (17.0 lbf·ft)
- Item 2 (1 EA) : 0.97 kgf·m (7.0 lbf·ft)



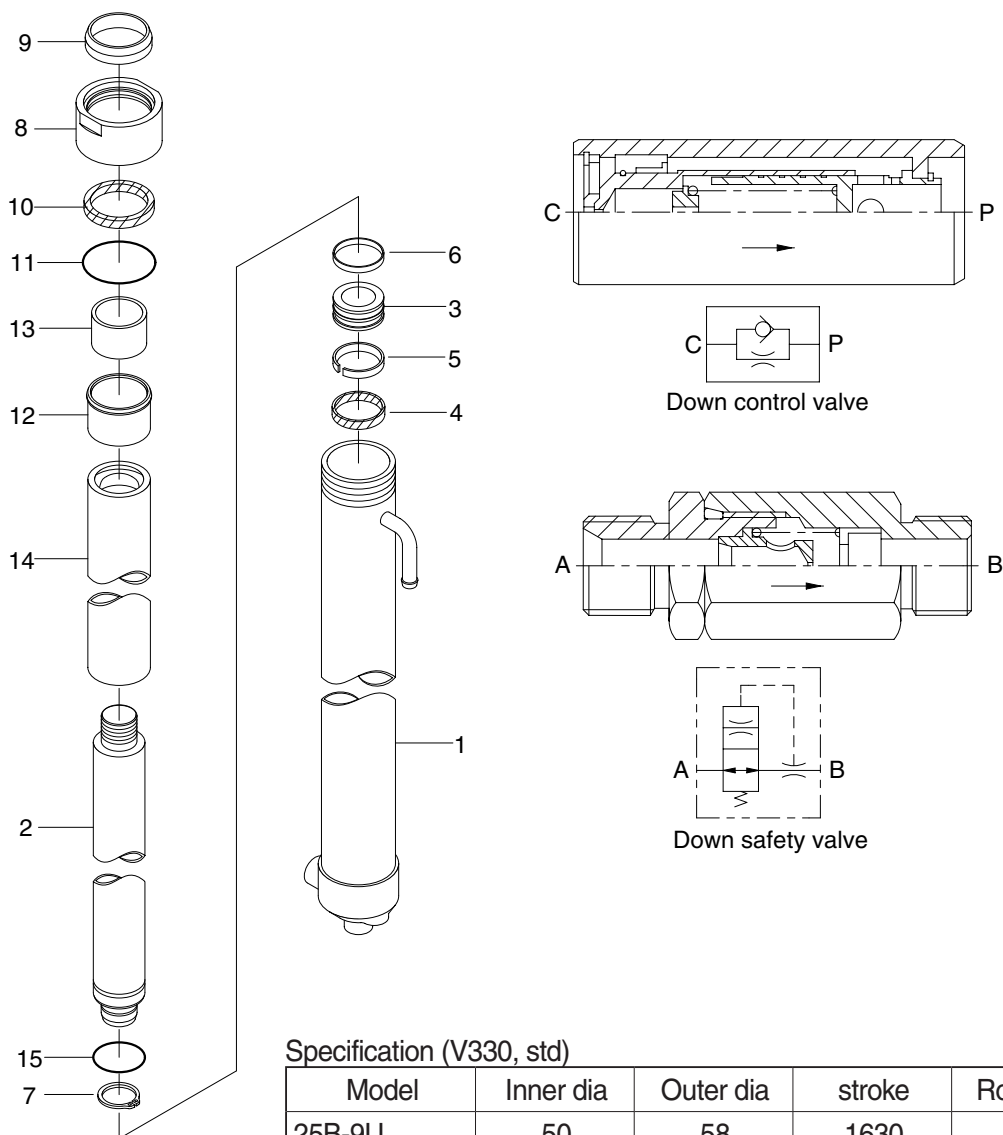
25B9UFT33

※ From 4 spool to 3 spool.

※ When it needs to disassemble section valve, it's possible to release tension rod sets.

4. LIFT CYLINDER

1) STRUCTURE



Specification (V330, std)

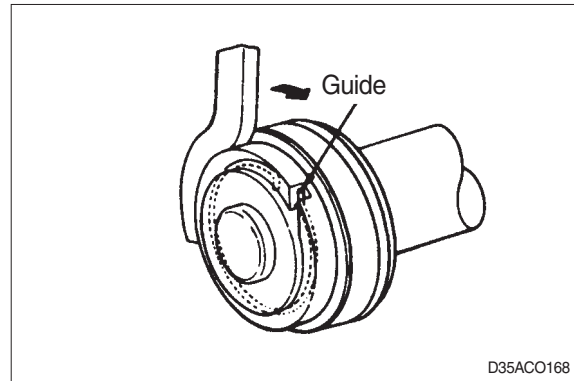
Model	Inner dia	Outer dia	stroke	Unit (in)
				Rod o/dia
25B-9U	50	58	1630	40
30/32/35B-9U	55	63	1630	45

25B9UHS26

- | | | |
|----------------|------------------|---------------|
| 1 Tube assy | 6 Wear ring | 11 O-ring |
| 2 Rod | 7 Retaining ring | 12 Guide |
| 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 guide, then turn the guide in again and the guide can be removed.



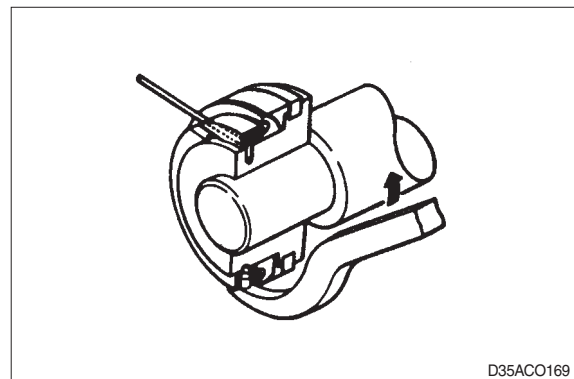
3) CHECK AND INSPECTION

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

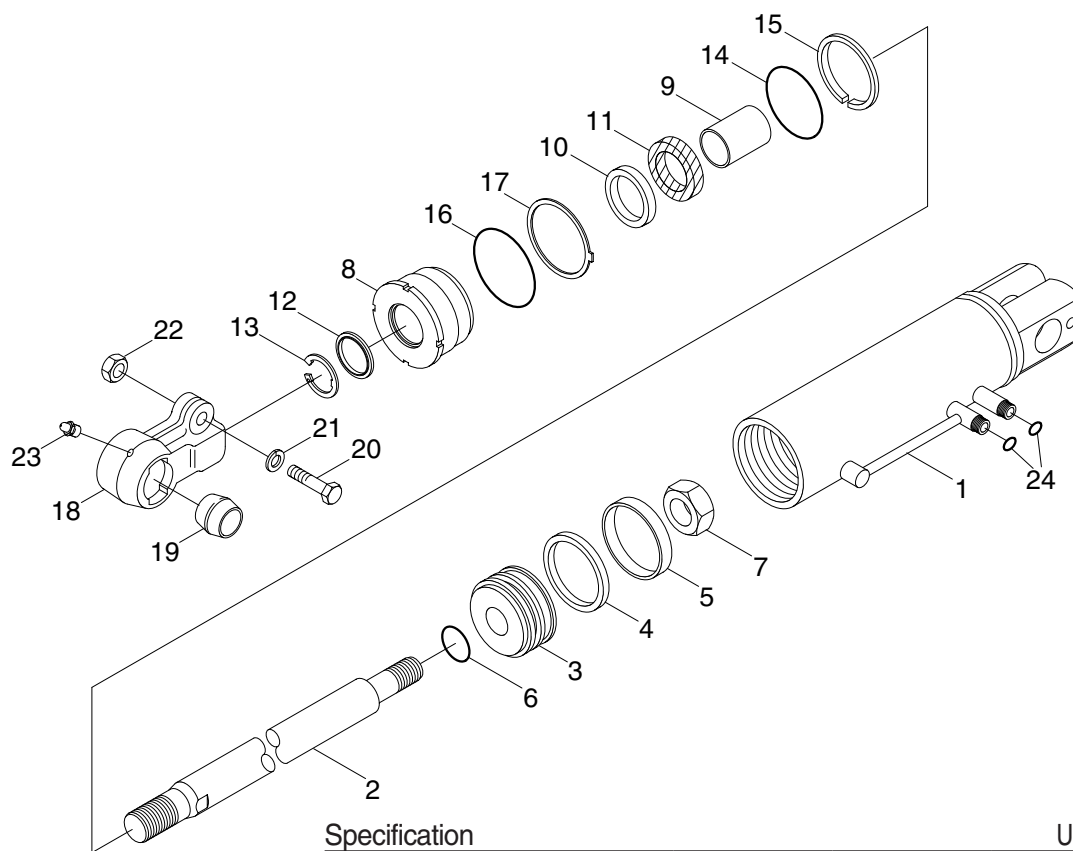
4) ASSEMBLY

- (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 guide and rotate it to install the guide completely.



5. TILT CYLINDER

1) STRUCTURE



Specification

Unit : mm

Model	Inner dia	Outer dia	Stroke	Rod o/dia
All	75	88	148	35

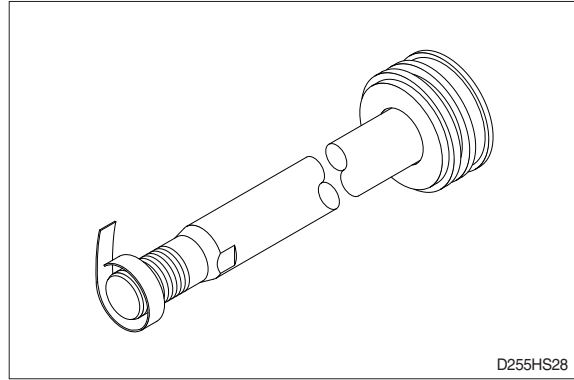
22B7HS23

- | | | |
|---------------|-----------------|----------------------|
| 1 Tube assy | 10 U-packing | 19 Spherical bearing |
| 2 Rod | 11 Back up ring | 20 Hexagon bolt |
| 3 Piston | 12 Dust wiper | 21 Spring washer |
| 4 Piston seal | 13 Stop ring | 22 Lock nut |
| 5 Wear ring | 14 O-ring | 23 Grease nipple |
| 6 O-ring | 15 Back up ring | 24 Dust cap |
| 7 Nylon nut | 16 O-ring | 25 O-ring |
| 8 Rod cover | 17 Lock washer | 26 O-ring |
| 9 Rod bushing | 18 Rod eye | |

2) DISASSEMBLY

- (1) Hold the parallel parts of the cylinder tube bottom in a vice and mark the rod head end to show how much it is screwed in, then remove the rod head. Next, hook a wrench into the notch at the cylinder head and remove the cylinder head 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 cylinder head.



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 head bushing & pin	0.10~0.35 (0.004~0.014)	0.6 (0.024)	Replace bushing