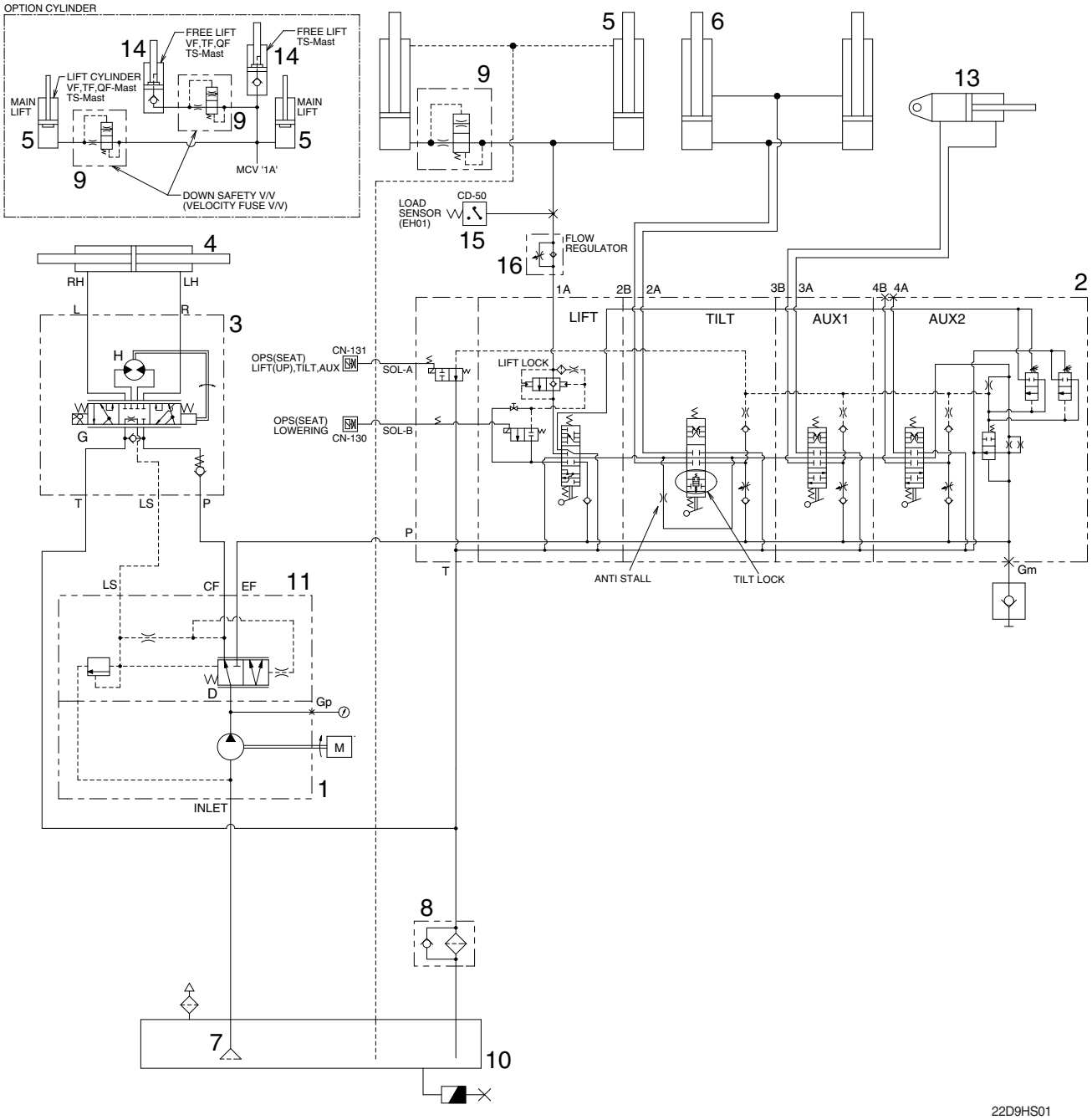
SECTION 6 HYDRAULIC SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. HYDRAULIC CIRCUIT

· NON-BOOSTER TYPE BRAKE (STANDARD)

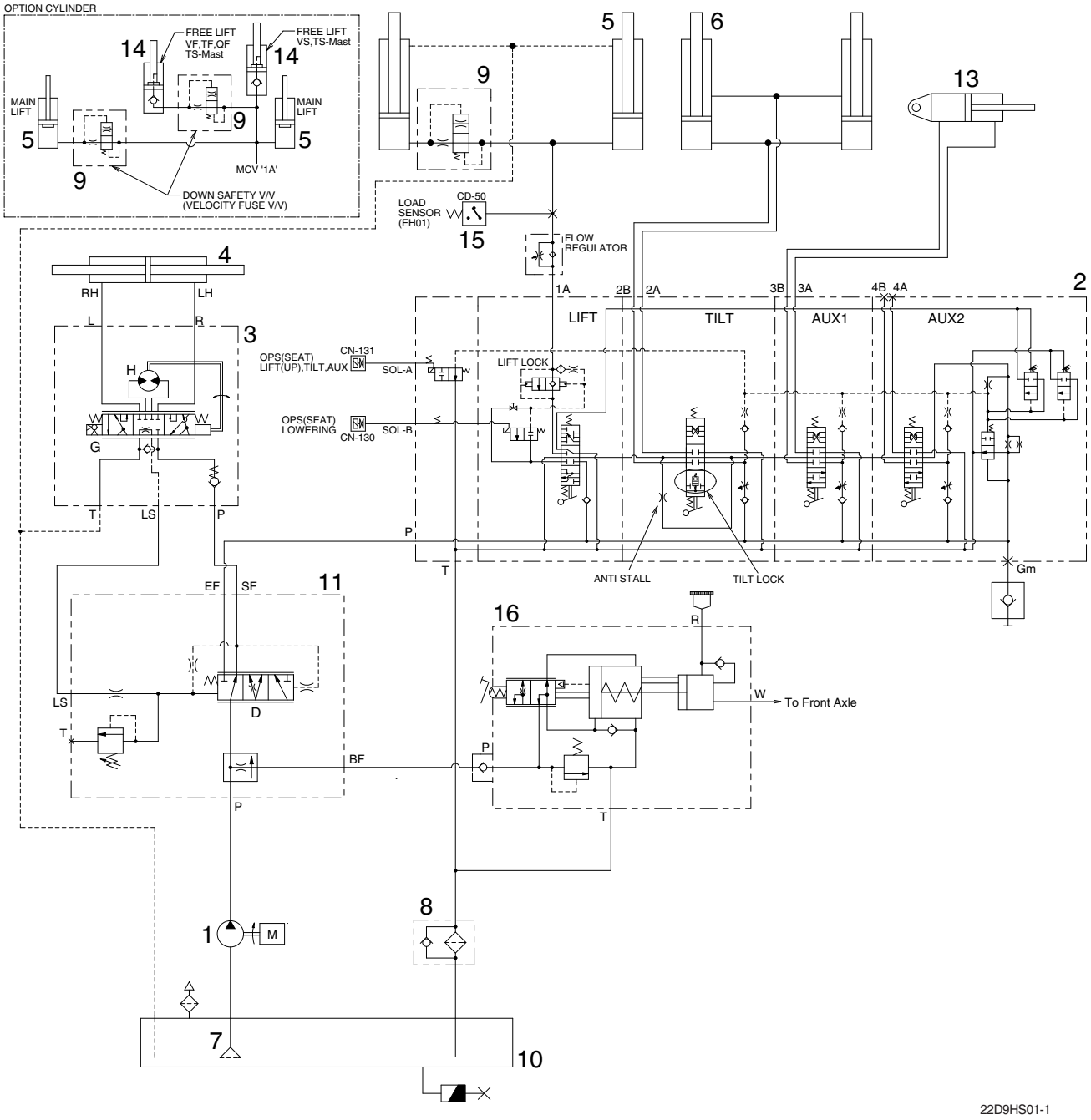


22D9HS01

1	Hydraulic gear pump	9	Down safety valve
2	Main control valve	10	Hydraulic tank
3	Steering unit	11	Priority valve
4	Steering cylinder	13	Side shift cylinder (option)
5	Lift cylinder	14	Free lift cylinder
6	Tilt cylinder	15	Load sensor
7	Suction strainer	16	Flow regulator
8	Return filter		

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

· BOOSTER TYPE BRAKE (OPTION)

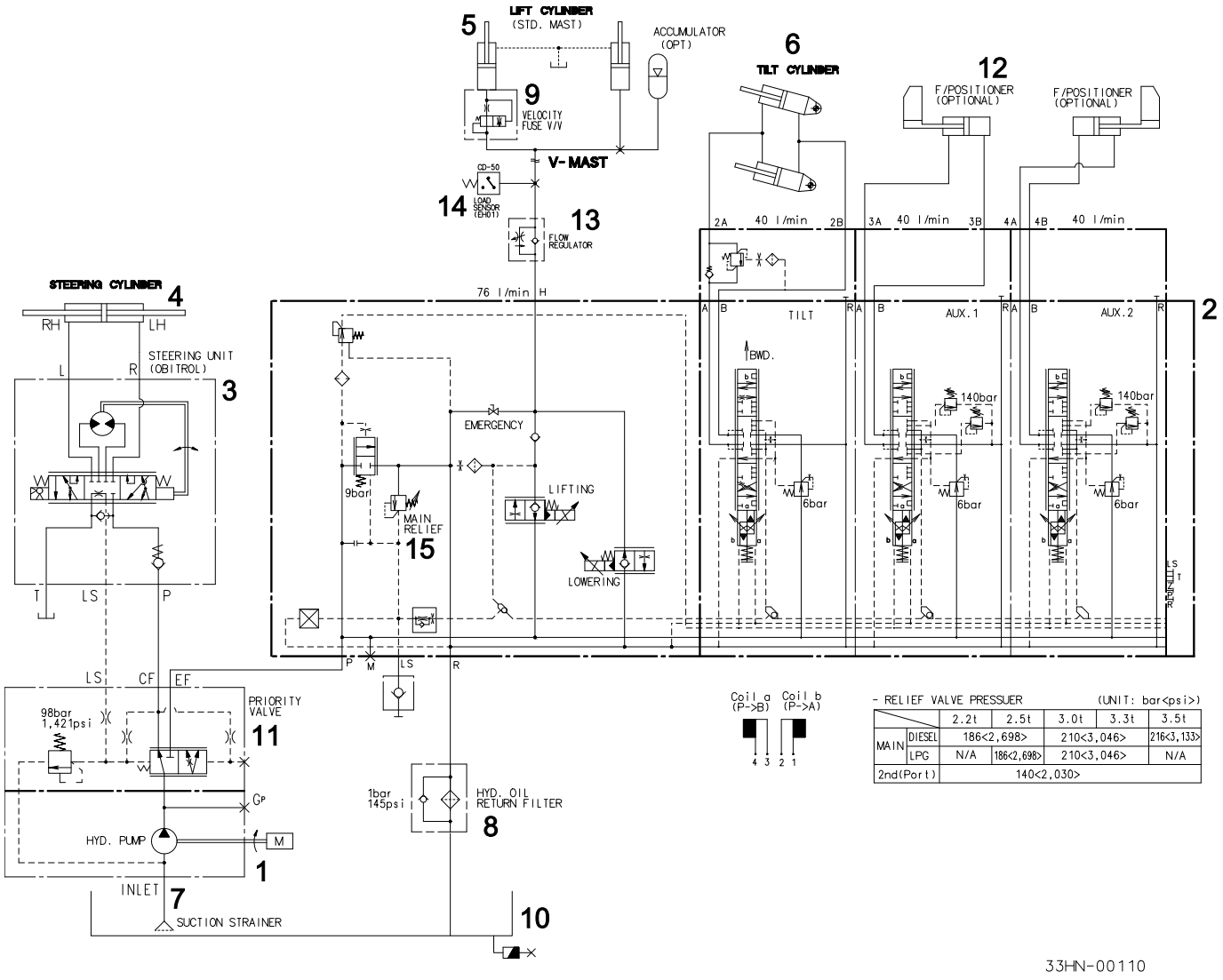


22D9HS01-1

1 Hydraulic gear pump
2 Main control valve
3 Steering unit
4 Steering cylinder
5 Lift cylinder
6 Tilt cylinder
7 Suction strainer
8 Return filter
9 Down safety valve
10 Hydraulic tank
11 Dual flow divider
13 Side shift cylinder (option)
14 Free lift cylinder
15 Load sensor
16 Brake valve

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

· FINGER TIP TYPE (OPTION)



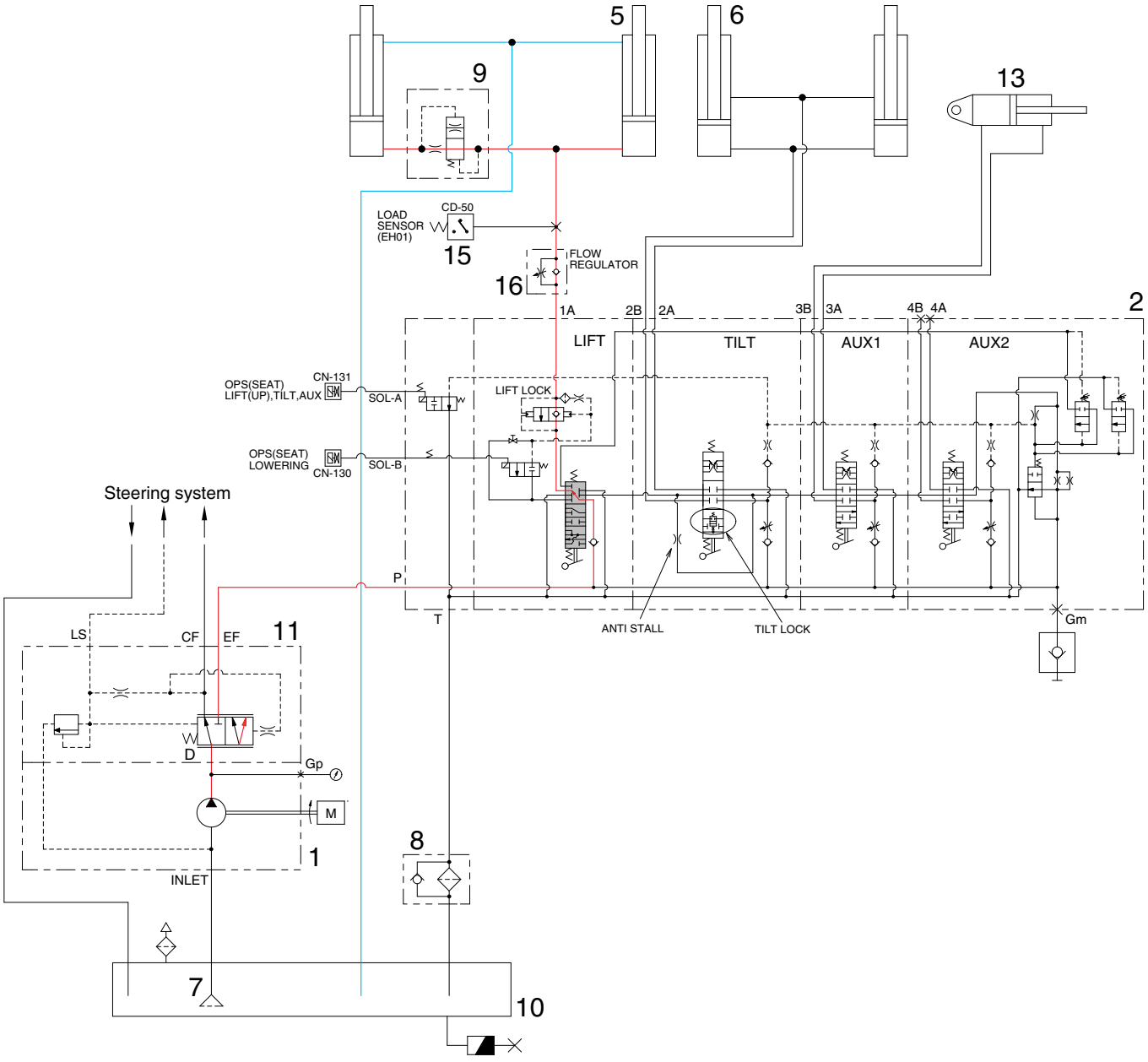
- RELIEF VALVE PRESSUER (UNIT: bar<psi>)

		2.2t	2.5t	3.0t	3.3t	3.5t
MAIN	DIESEL	186<2,698>		210<3,046>		216<3,133>
	LPG	N/A	186<2,698>	210<3,046>		N/A
2nd(Port)		140<2,030>				

1	Hydraulic gear pump	6	Tilt cylinder	11	Priority v/v
2	Main control valve	7	Suction strainer	12	Fork positioner
3	Steering unit	8	Return filter	13	Flow regulator
4	Steering cylinder	9	Velocity fuse v/v	14	Load sensor
5	Lift cylinder	10	Hydraulic tank	15	Main relief v/v

※ 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

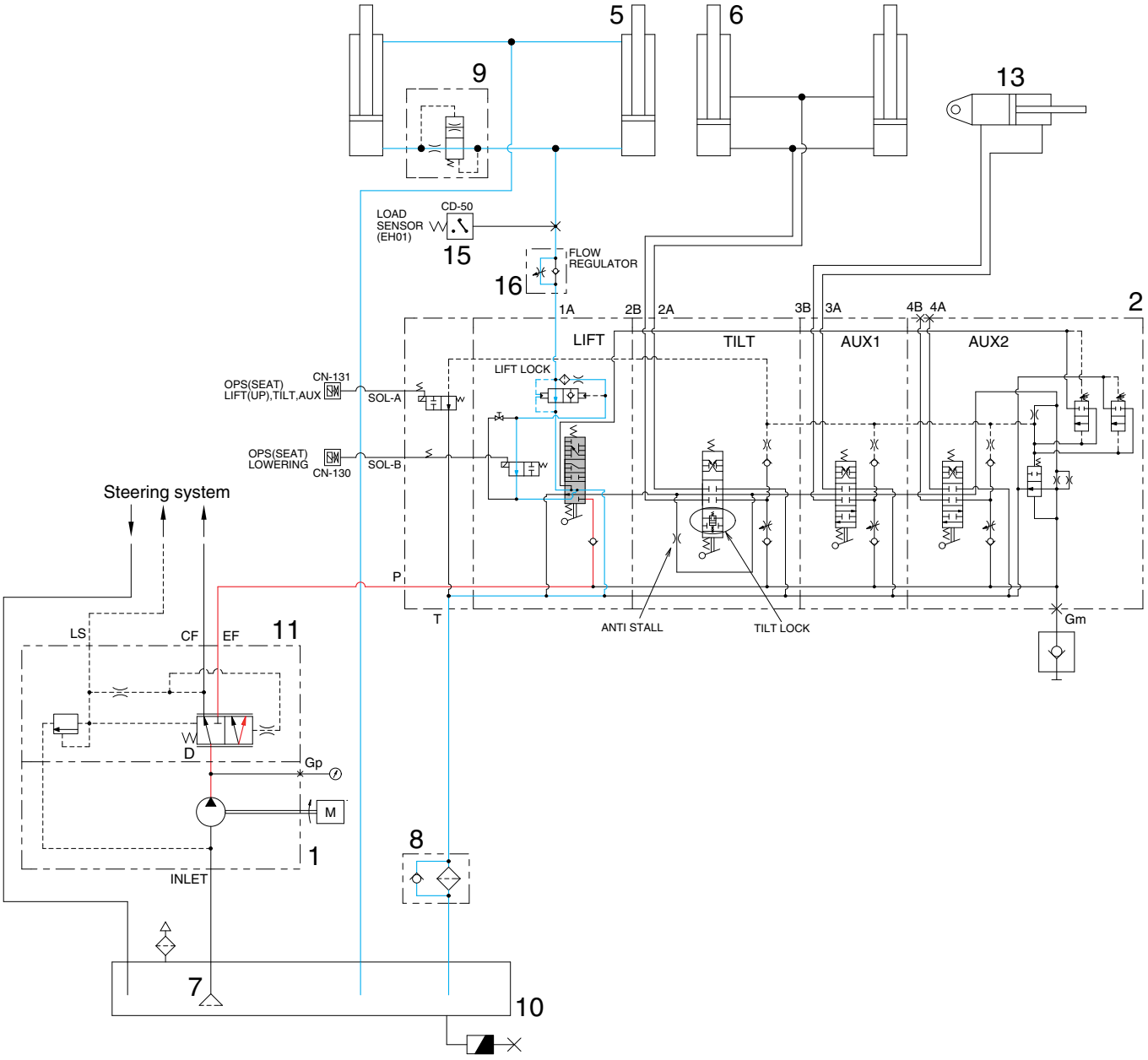


22D9HS03

When the lift control lever is pulled back, the spool on the first block 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 (5) by pushing the load check valve of the spool.
The oil from the small chamber of lift cylinder (5) returns to hydraulic oil tank (10) at the same time.
When this happens, the fork goes 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

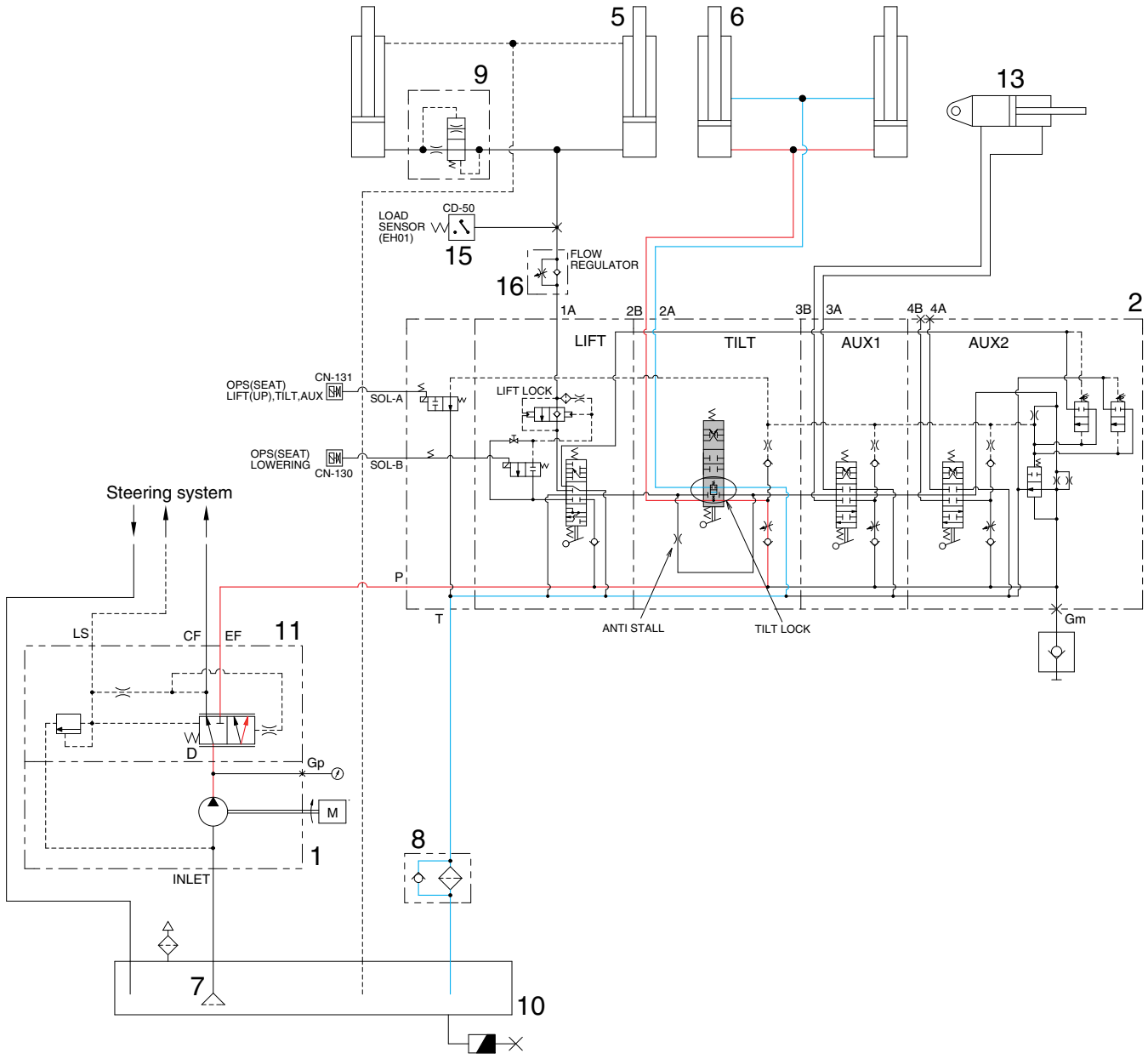


22D9HS04

When the lift control lever is pushed forward, the spool on the first block moves to lower position. The work port (1A) and the small and the large chamber of lift cylinder are connected to the return passage, so the fork 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



22D9HS05

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

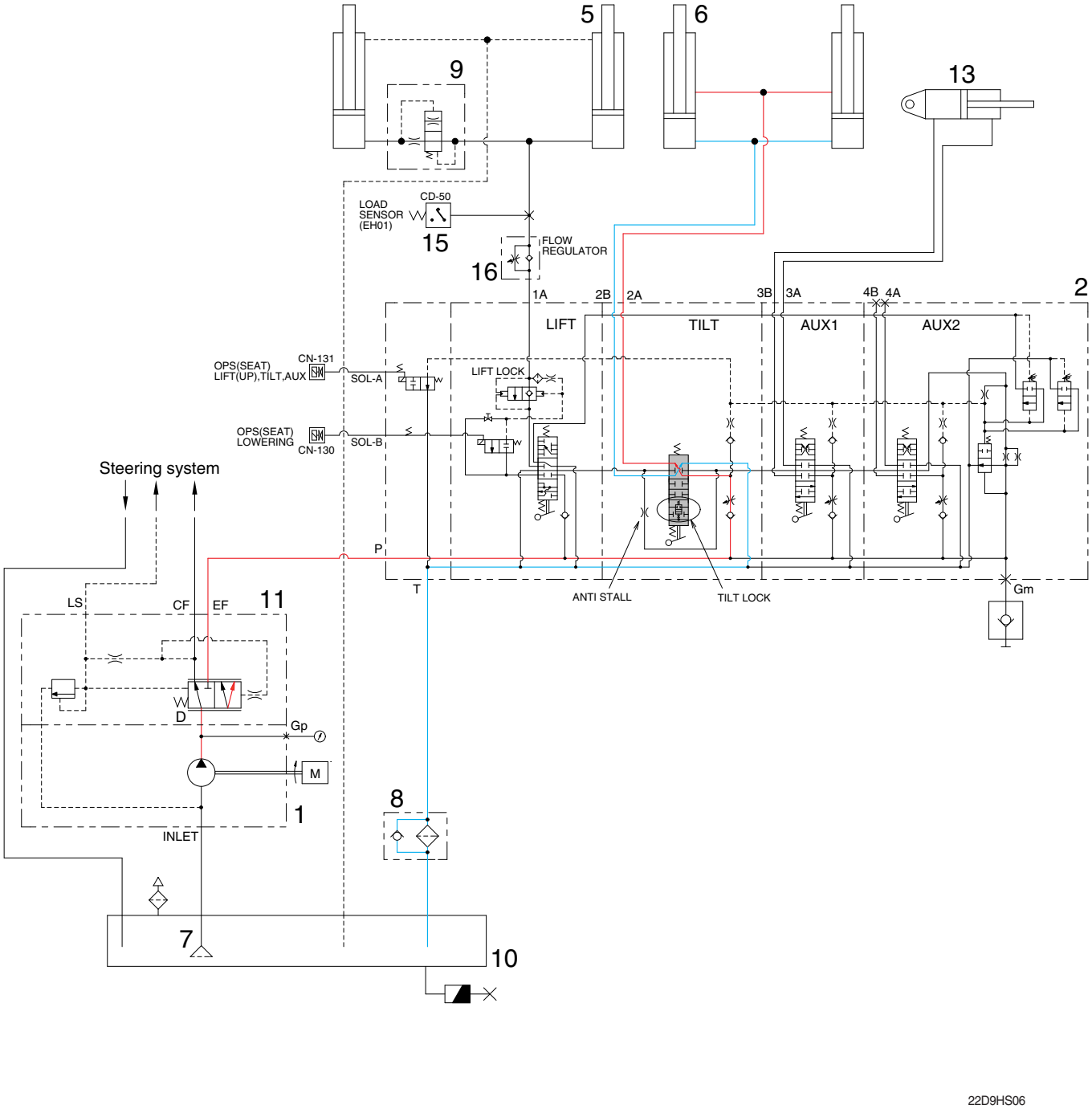
The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of tilt cylinder (6) by pushing the load check valve of the spool.

The oil at the small chamber of tilt cylinder (6) returns to hydraulic tank (10) 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



22D9HS06

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 (6) by pushing the load check valve of the spool.

The oil at the large chamber of tilt cylinder (6) returns to hydraulic tank (10) at the same time.

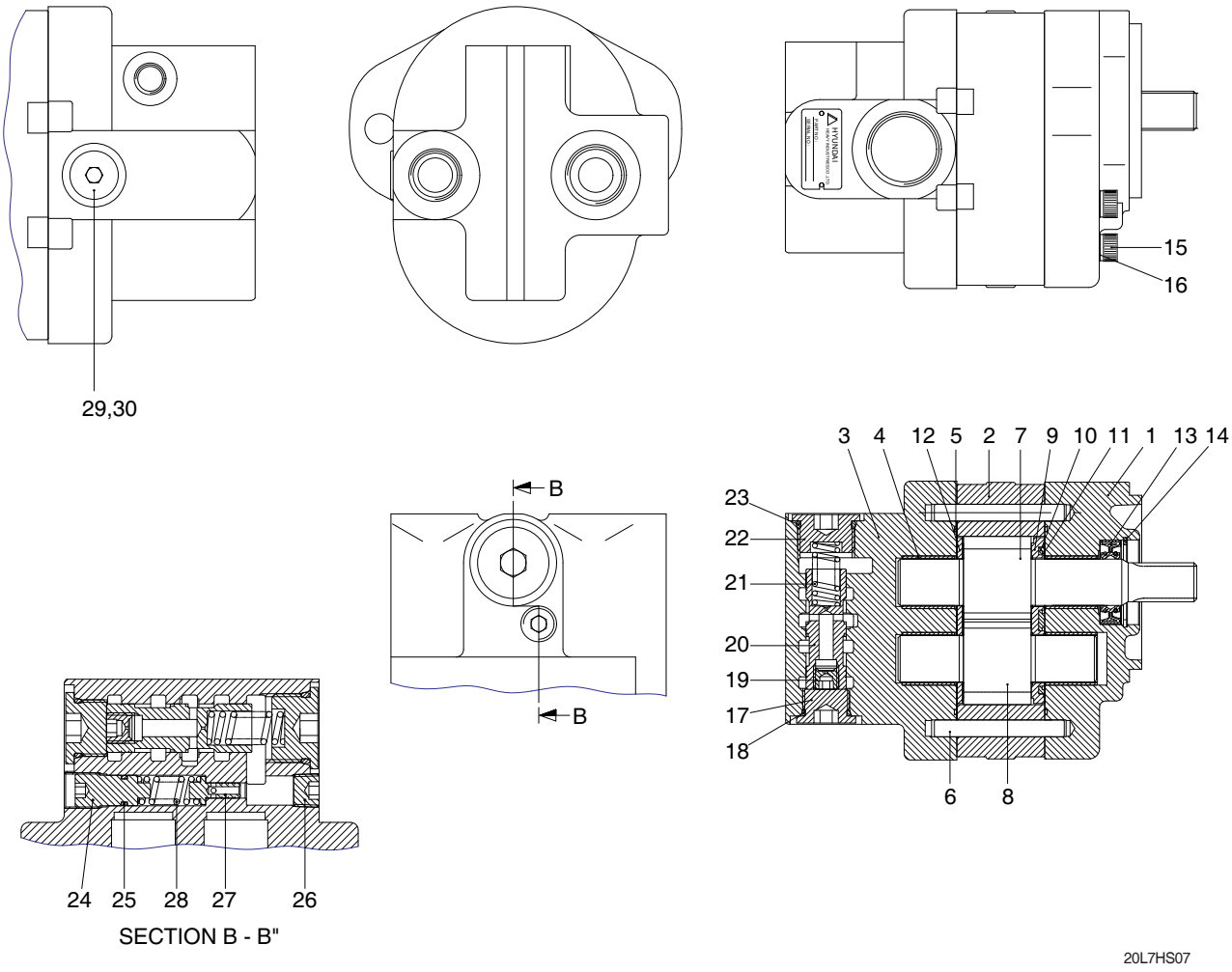
When this happens, the mast tilts backward.

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

2. HYDRAULIC GEAR PUMP

1) NON-BOOSTER TYPE

(1) Structure



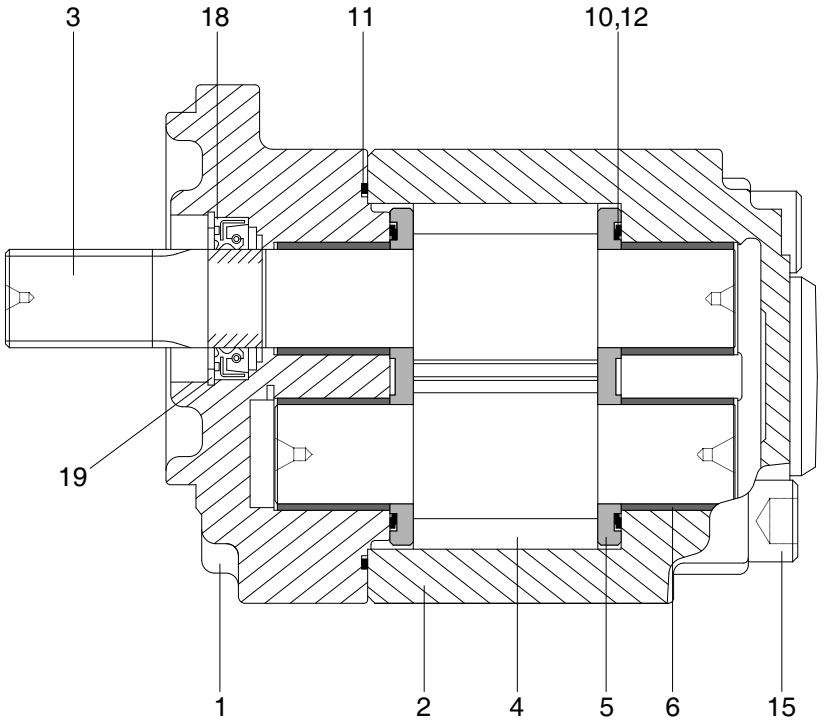
1	Housing	11	Back up ring	21	Spring
2	Body	12	Side plate	22	Plug
3	Body (priority valve)	13	Oil seal	23	O-ring
4	Bushing	14	Snap ring	24	Adjust screw
5	O-ring	15	Bolt	25	O-ring
6	Pin	16	Washer	26	Plug bolt
7	Drive gear	17	Plug	27	Poppet
8	Idle gear	18	O-ring	28	Relief spring
9	Side plate	19	Plug orifice	29	Plug
10	O-ring	20	Spool	30	O-ring

(2) Operation

This pump comprises of a main body, a priority valve body and a housing bolted together and equipped with a priority valve. The gear journals are supported by bushings (4) to give high volumetric and mechanical efficiencies.

2) BOOSTER TYPE

(1) Structure



22D9HS14-1

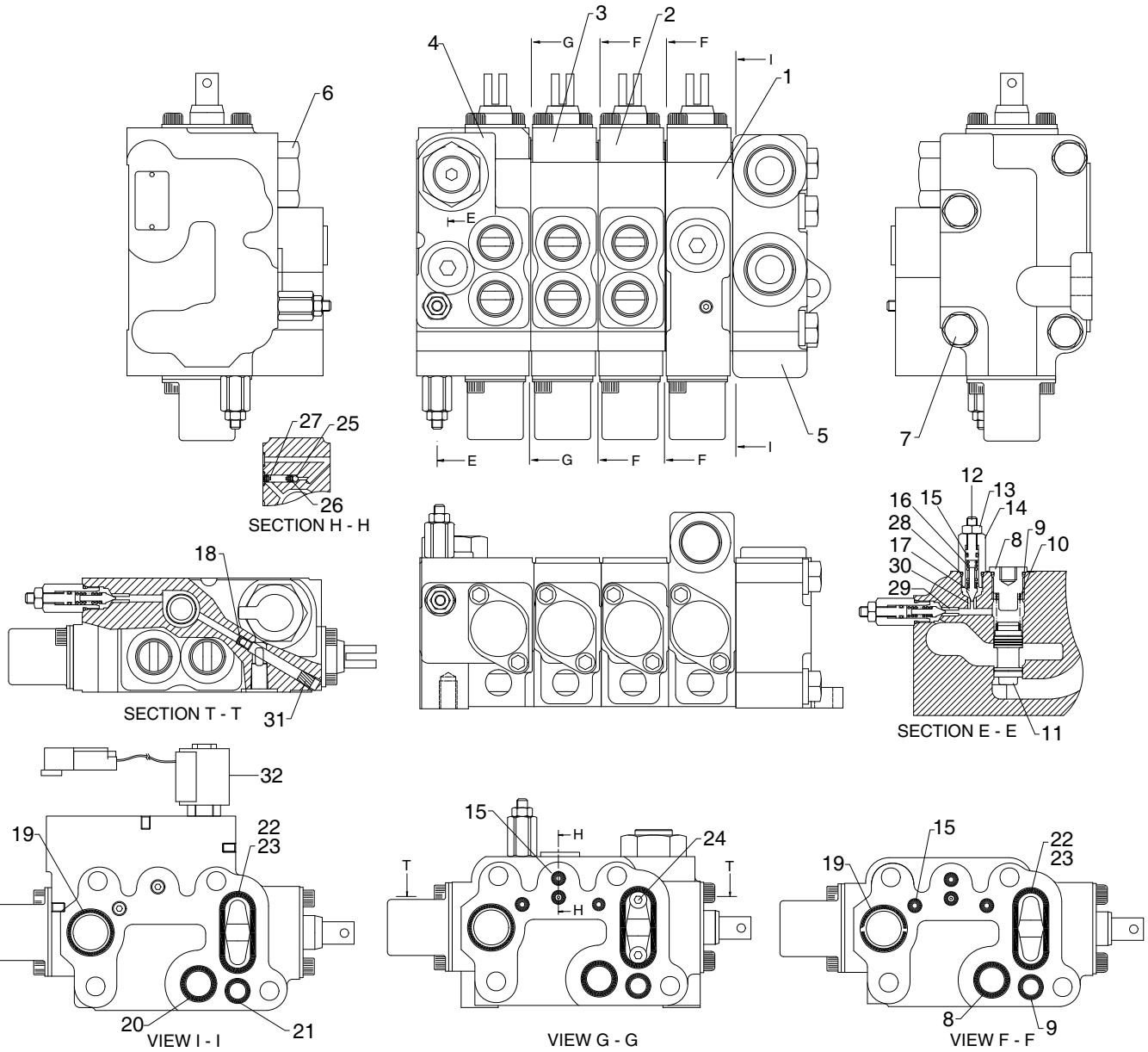
1	Front cover	5	Side gear	12	Back up ring
2	Body	6	Bushing	15	Bolt
3	Drive gear	10	Gasket (3-shaped)	18	Oil seal
4	Driven gear	11	O-ring	19	Retaining ring

(2) Operation

This pump comprises of a front cover and a body bolted together. The gear journals are supported by bushings (6) to give high volumetric and mechanical efficiencies.

3. MAIN CONTROL VALVE

1) STRUCTURE (4- Spool)



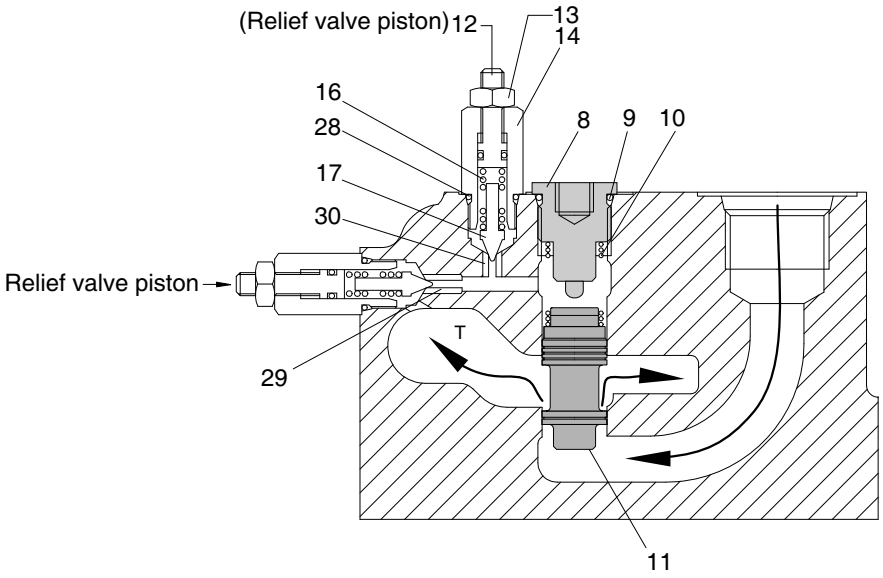
Port name	Size
Inlet port	1-1/16-12UN
Outlet port	1-1/16-12UN

20DEHS07

1	Lift block assy	12	Relief piston	22	O-ring
2	Tilt block assy	13	Nut	23	O-ring, retainer
3	Aux1 block assy	14	Relief plug	24	Plug
4	Work block assy	15	O-ring	25	Steel ball
5	PT block	16	Relief spring	26	Load sensor spring
6	Gauge plug assy	17	Pilot poppet	27	Load sensor spring
7	Long bolt	18	Plug	28	O-ring
8	Plug	19	O-ring	29	System relief seat
9	O-ring	20	O-ring	30	Secondary relief seat
10	Spring	21	O-ring	32	Solenoid valve assy
11	Spool				

2) INLET SECTION OPERATION

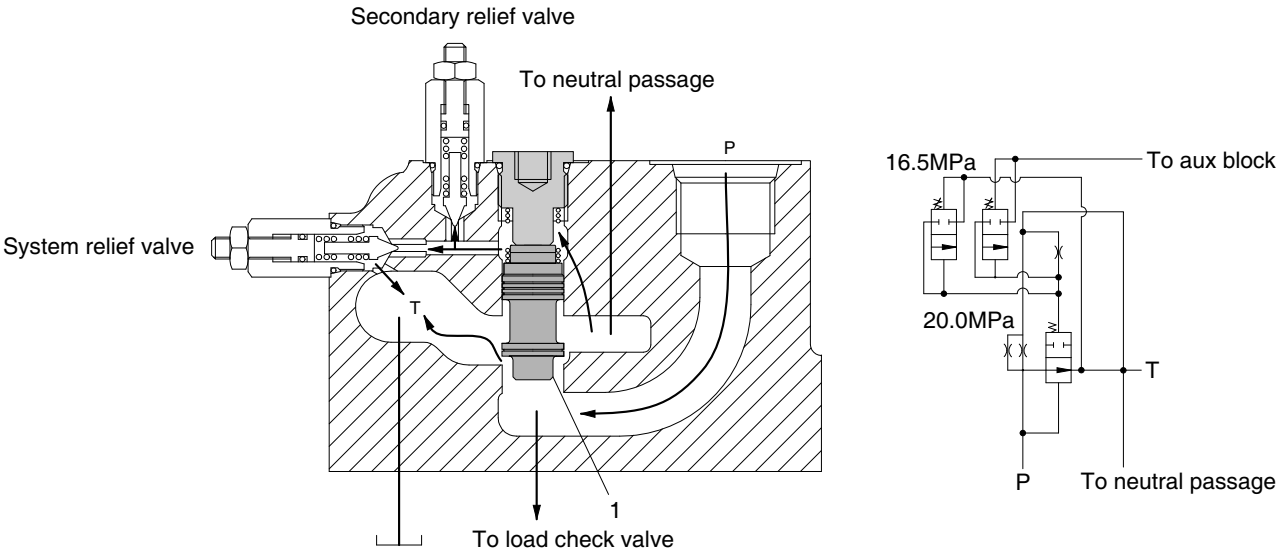
(1) Structure and description



20D7HS08

8	Plug	14	Relief plug
9	O-ring	16	Relief spring
10	Spring	17	Pilot poppet
11	Spool	28	O-ring
12	Relief piston	29	System relief seat
13	Nut	30	Secondary relief seat

(2) Operation

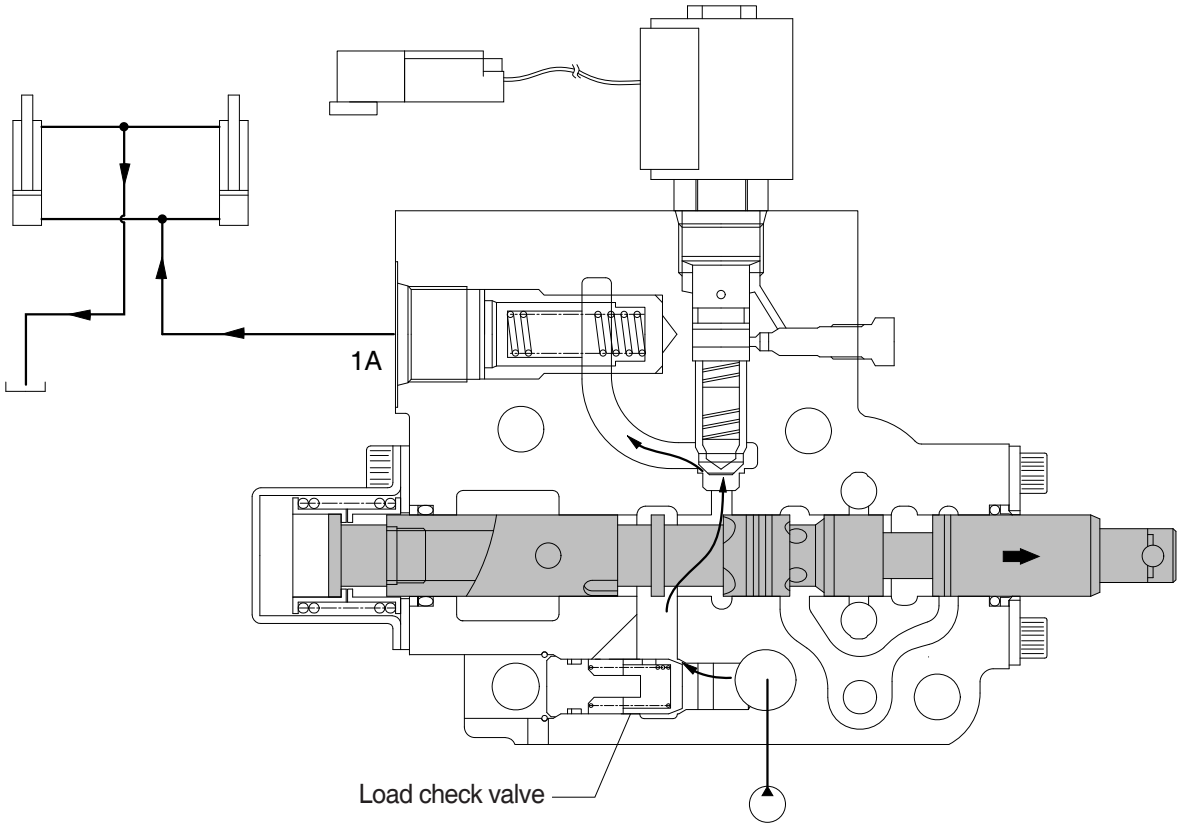


20D7HS15

Oil flows from P (pump) port to reservoir (T) by pushing hydrostat spool (1).
Before the center bypass line closed, hydrostat spool is keep opening, so pump port (P) and tank port (T) are always connected in operation to minimize heat generation.

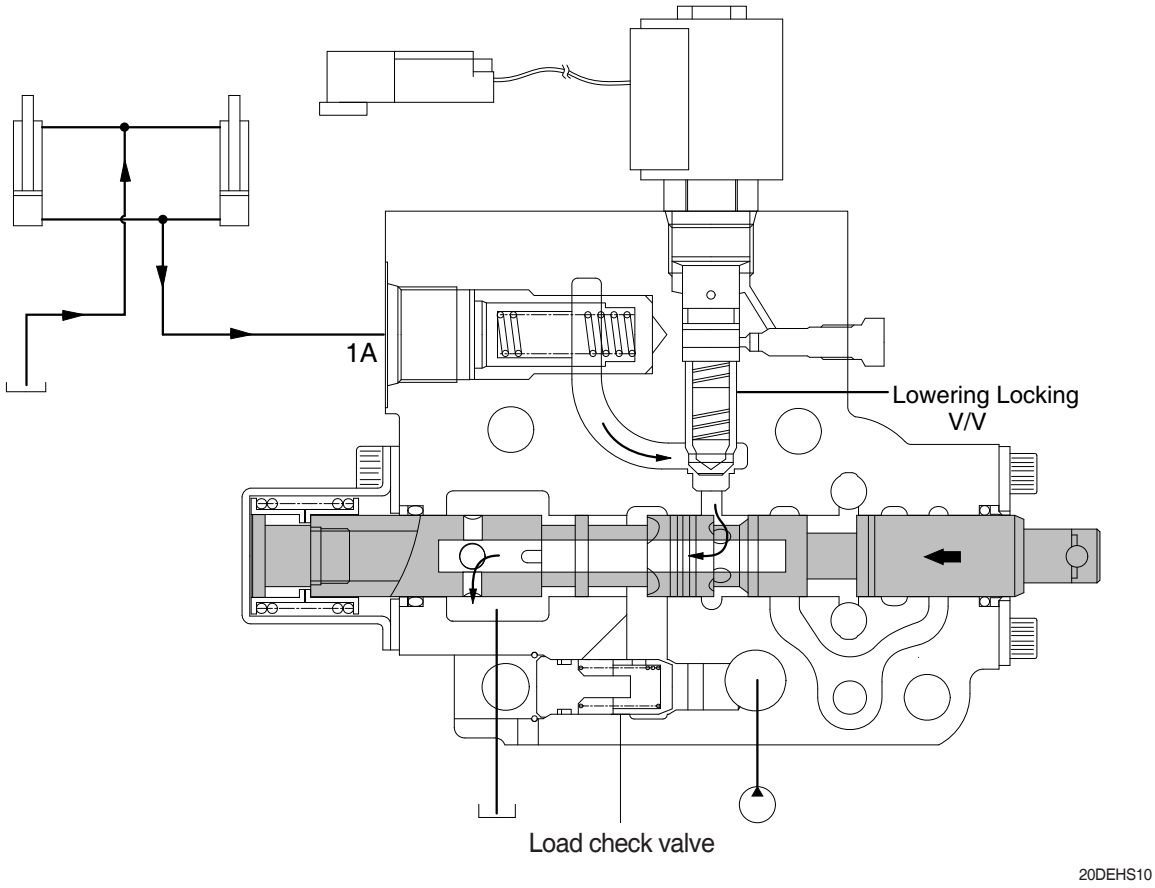
3) LIFT SECTION OPERATION

(1) Lift position



When the lift control lever is pulled back, the spool moves to the right and the neutral passage is closed.
The oil supplied from the pump pushes up the load check valve and flow into lift cylinder port (1A).
The pump pressure reaches proportionally the load of cylinder and fine control finished by shut off of the neutral passage.
The return oil from cylinder flows into the tank.

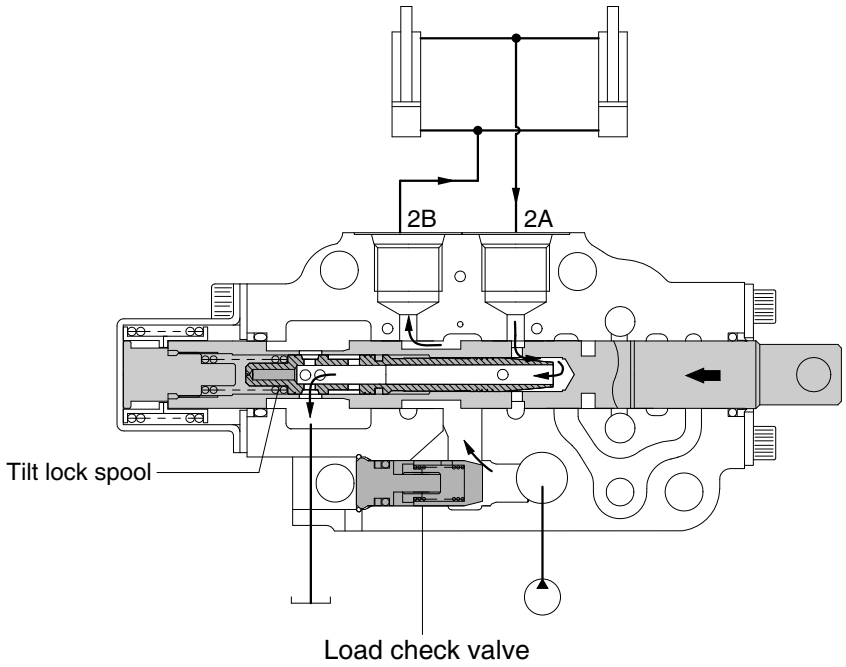
(2) Lower position



When the lift control lever is pushed forward, the spool moves to the left and the neutral passage is closed.
The spool moves to the lift lower position, opening up the neutral passage to tank and (1A) → T.
In lift lower position the fork drops due to its own weight.

4) TILT SECTION OPERATION

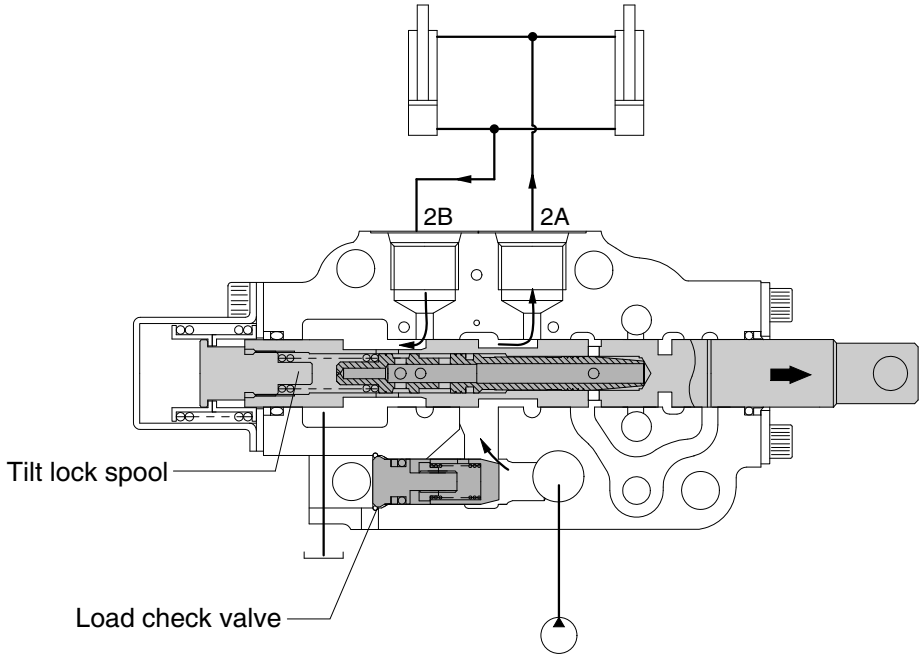
(1) Tilt forward position



20D7HS11

When the tilt control lever is pushed forward, the spool moves to the left and the neutral passage is closed.
The oil supplied from the pump pushes up the load check valve and flow into tilt cylinder port (2B).
The pump pressure reaches proportionally the load of cylinders and fine control finished by closing the neutral passage.
The return oil from cylinder port (2A) flows into the tank through the hole of the tilt lock spool.

(2) Tilt backward position



20D7HS12

When the tilt control lever is pulled back, the spool moves to the right and the neutral passage is closed.
The oil supplied from the pump pushes up the load check valve and flows into tilt cylinder port (2A).
The pump pressure reaches proportionally the load of cylinder and fine control finished by shut off of the neutral passage.
The return oil from cylinder port (2B) flows into the tank via the low pressure passage.

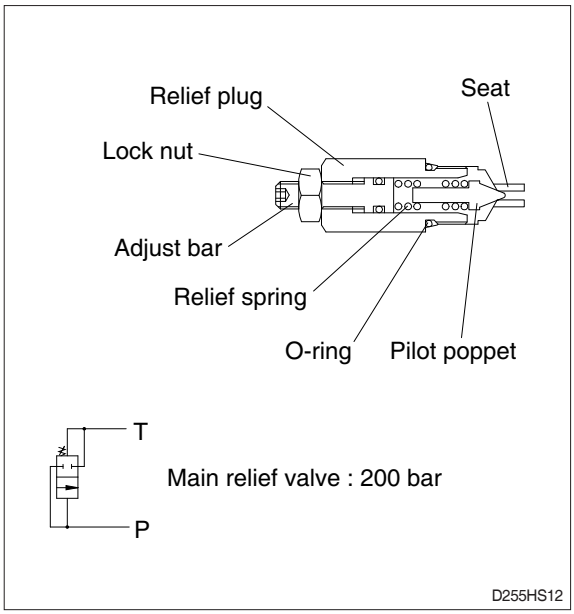
5) MAIN RELIEF VALVE

(1) Pressure setting

A good pressure gauge must be installed in the line which is in communication with the work port relief. A load must be applied in a manner to reach the set pressure of the relief unit.

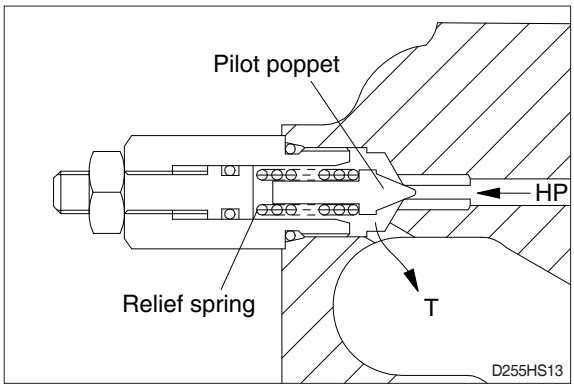
Procedure

① Loosen lock nut.
② Set adjusting bar to desired pressure setting.
③ Tighten lock nut.
④ Retest in similar manner as above.

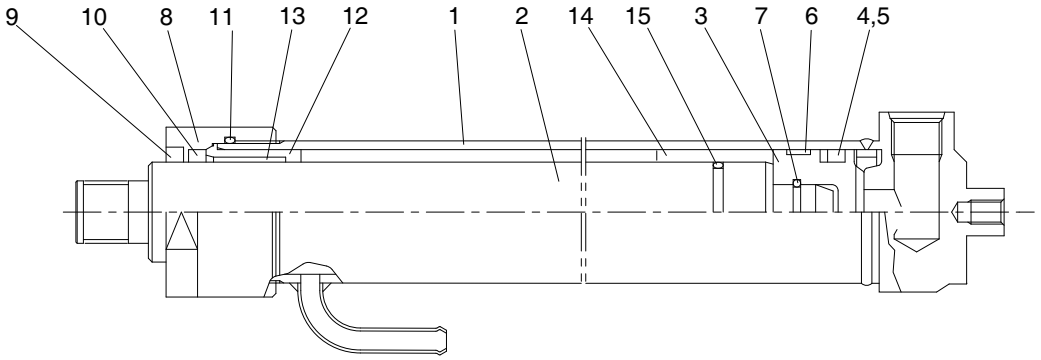


(2) Operation

Pressurized oil over the relief pressure pushes pilot poppet and flows to tank passage, therefore the system pressure keeps under the adjusted relief pressure.



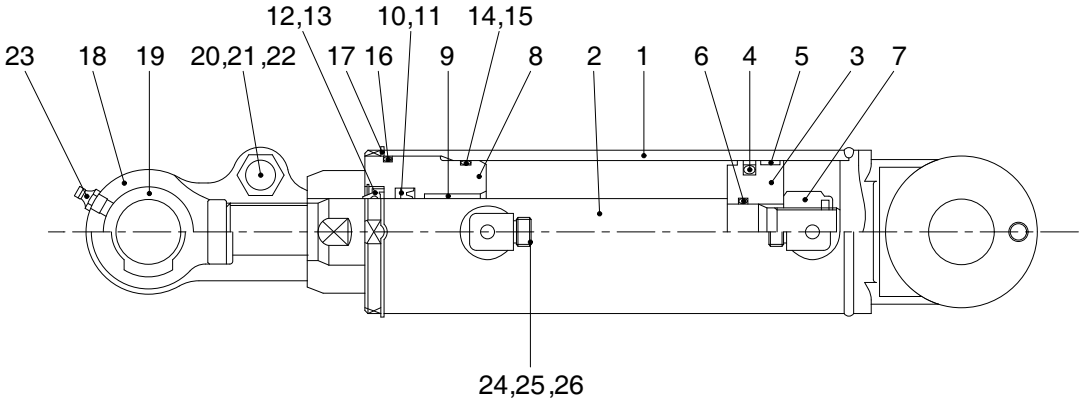
4. LIFT CYLINDER



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

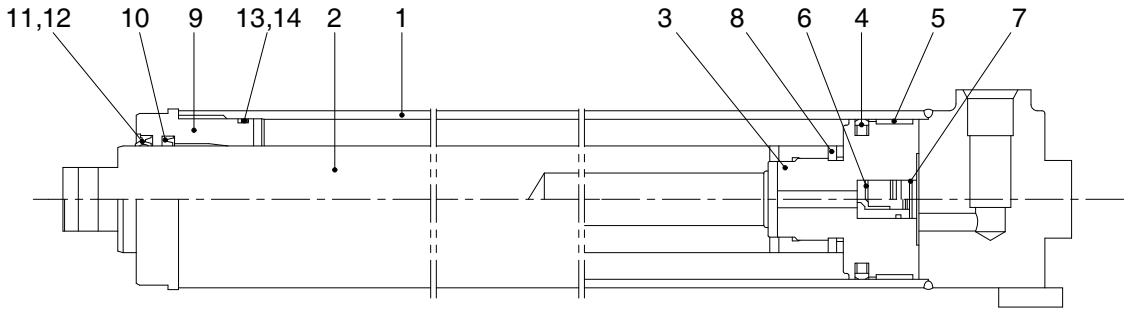
5. TILT CYLINDER



22D9HS19

1	Tube assembly	10	U-packing	19	Spherical bearing
2	Rod	11	Backup ring	20	Hex 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 niple
6	O-ring	15	Backup ring	24	Dust cap
7	Nylon nut	16	O-ring	25	O-ring
8	Rod cover	17	Washer	26	O-ring
9	Rod bushing	18	Eye		

6. FREE LIFT CYLINDER



22D9HS20

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

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 1m 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
- Mast substantially vertical.
- Rated capacity load.

·Hydraulic drift

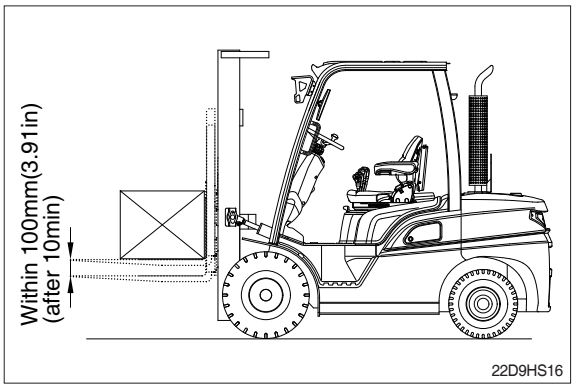
- Down (Downward movement of forks)
: Within 100 mm (3.9 in)
- Forward (Extension of tilt cylinder)
: Within 5°

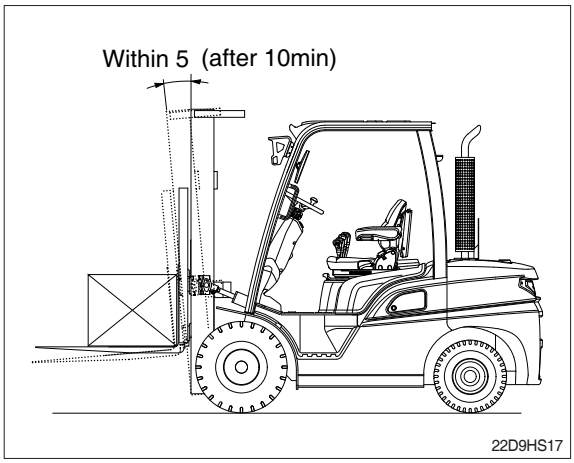
(3) If the hydraulic drift is more than the specified value, replace the control valve or cylinder packing.

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

mm (in)

Standard	Under 0.6 (0.02)

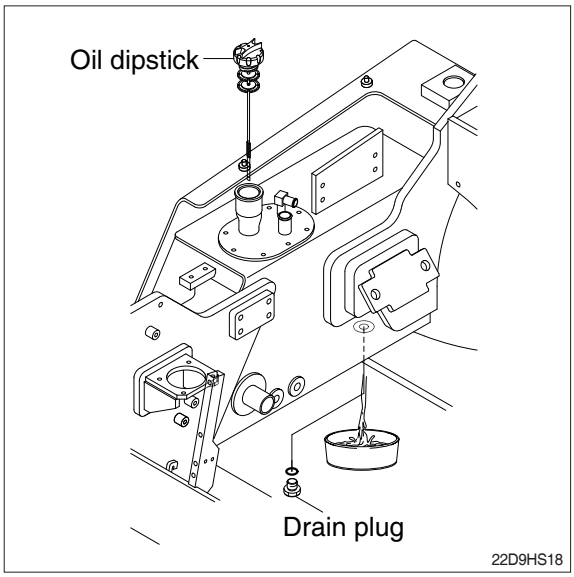




2) HYDRAULIC OIL

(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).



3) CONTROL VALVE

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

Check that oil pressure is 200 kgf/cm^2.

(2845 psi)

2. TROUBLESHOOTING

1) SYSTEM

Problem	Cause	Remedy
Large fork lowering speed.	·Seal inside control valve defective. ·Oil leaks from joint or hose. ·Seal inside cylinder defective.	·Replace spool or valve body. ·Replace. ·Replace packing.
Large spontaneous tilt of mast.	·Tilting backward : Check valve defective. ·Tilting forward : tilt lock valve defective. ·Oil leaks from joint or hose. ·Seal inside cylinder defective.	·Clean or replace. ·Clean or replace. ·Replace. ·Replace seal.
Slow fork lifting or slow mast tilting.	·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.	·Add oil. ·Bleed air. ·Replace. ·Clean filter. ·Adjust relief valve. ·Replace packing. ·Change to SAE10W, class CJ engine oil. ·Adjust roll to rail clearance. ·Replace spool or valve body. ·Replace spool or valve body.
Hydraulic system makes abnormal sounds.	·Excessive restriction of oil flow pump suction side. ·Gear or bearing in hydraulic pump defective.	·Clean filter. ·Replace gear or bearing.
Control valve lever is locked	·Foreign matter jammed between spool and valve body. ·Valve body defective.	·Clean. ·Tighten body mounting bolts uniformly.
High oil temperature.	·Lack of hydraulic oil. ·High oil viscosity. ·Oil filter clogged.	·Add oil. ·Change to SAE10W, class CJ engine oil. ·Clean filter.

2) HYDRAULIC GEAR PUMP

Problem	Cause	Remedy
Pump does not develop full pressure.	·System relief valve set too low or leaking. ·Oil viscosity too low. ·Pump is worn out.	·Check system relief valve for proper setting. ·Change to proper viscosity oil. ·Repair or replace pump.
Pump will not pump oil.	·Reservoir low or empty. ·Suction strainer clogged.	·Fill reservoir to proper level. ·Clean suction strainer.
Noisy pump caused by cavitation.	·Oil too thick. ·Oil filter plugged. ·Suction line plugged or too small.	·Change to proper viscosity. ·Clean filters. ·Clean line and check for proper size.
Oil heating.	·Oil supply low. ·Contaminated oil. ·Setting of relief valve too high or too low. ·Oil viscosity too low.	·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.	·Low oil level. ·Air leaking into suction line. ·Wrong kind of oil.	·Fill reservoir to proper level. ·Tighten fittings, check condition of line. ·Drain reservoir, fill with non-foaming oil.
Shaft seal leakage.	·Worn shaft seal. ·Worn shaft in seal area.	·Replace shaft seal. ·Replace drive shaft and seal.

3) MAIN RELIEF VALVE

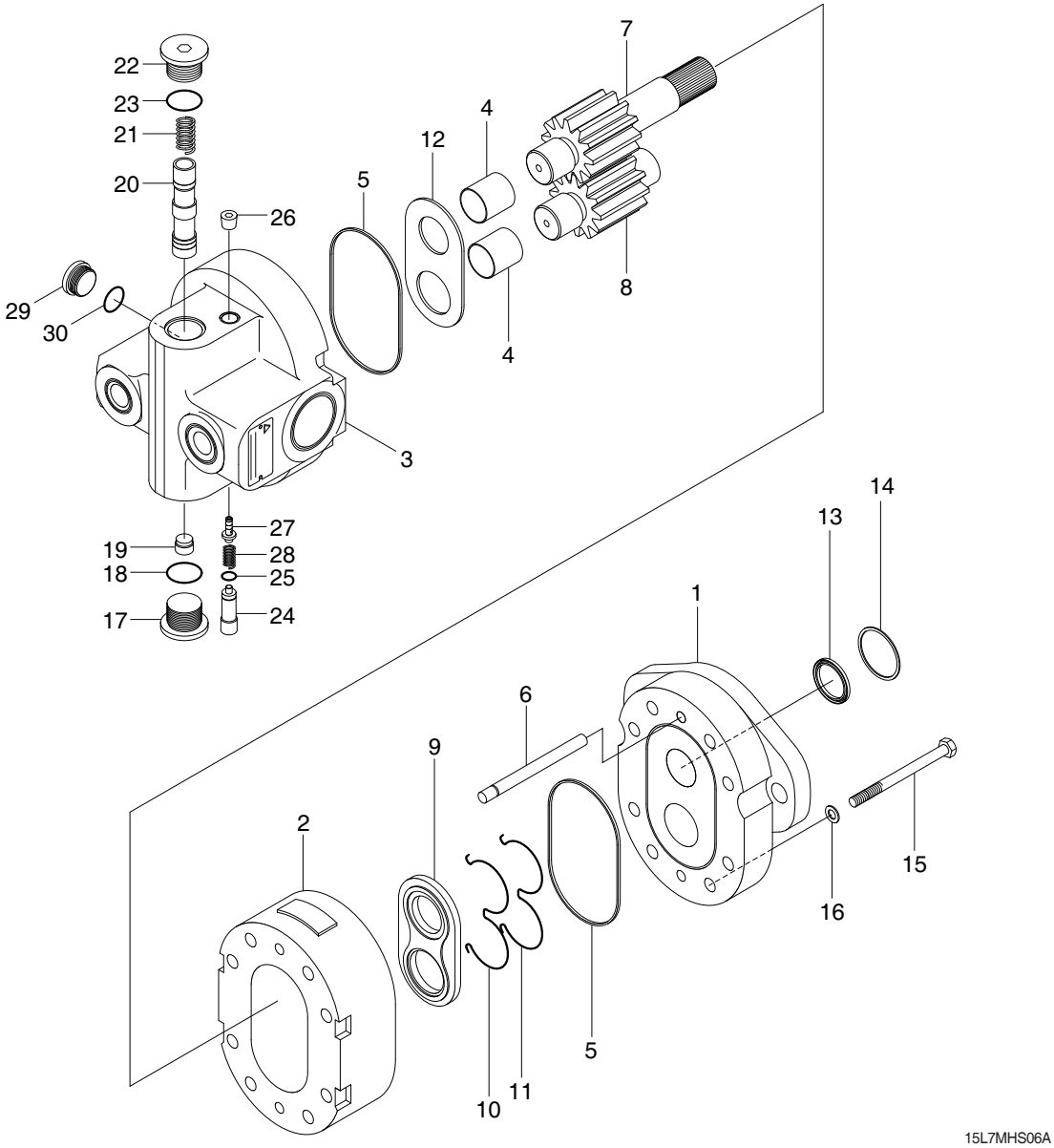
Problem	Cause	Remedy
Can't get pressure	·Poppet stuck open or contamination under seat.	·Check for foreign matter between poppets and their mating parts. Parts must slide freely.
Erratic pressure	·Pilot poppet seat damaged.	·Replace the relief valve. ·Clean and remove surface marks for free movement.
Pressure setting not correct	·Normal wear. Lock nut & adjust screw loose.	·See page 6-16 for How to set pressure on work main relief.
Leaks	·Damaged seats. ·Worn O-rings. ·Parts sticking due to contamination.	·Replace the relief valve. ·Install seal and spring kit. ·Disassemble and clean.

4) LIFT CYLINDER

Problem	Cause	Remedy
Oil leaks out from gland 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 gland 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.

1. HYDRAULIC GEAR PUMP (NON-BOOSTER TYPE)

1) STRUCTURE



1	Housing	11	Back up ring	21	Spring
2	Body	12	Side plate	22	Plug
3	Body (priority valve)	13	Oil seal	23	O-ring
4	Bushing	14	Snap ring	24	Adjust screw
5	O-ring	15	Bolt	25	O-ring
6	Pin	16	Washer	26	Plug bolt
7	Drive gear	17	Plug	27	Poppet
8	Idle gear	18	O-ring	28	Relief spring
9	Side plate	19	Plug orifice	29	Plug
10	O-ring	20	Spool	30	O-ring

2) DISASSEMBLY

(1) Clamping pump

① Clamping pump in a vice with pump shaft facing up.
(Do not chuck the aluminum parts such as body and housing.)

② Mark V by permanent marker pen.
This will assure proper reassembly.

PUMP101

(2) Housing

① Loosen 8 bolts and remove housing.

② Pry off snap ring for hole and remove oil seal from housing.

③ Remove O-ring from housing.

PUMP102

(3) Gear

① Mark at the end of the idle gear by permanent marker pen before removing gear set. This will assure proper reassembly.

PUMP103

② Dissemble gear set and side plate from body.

③ Dissemble E-type ring and backup ring from side plate.

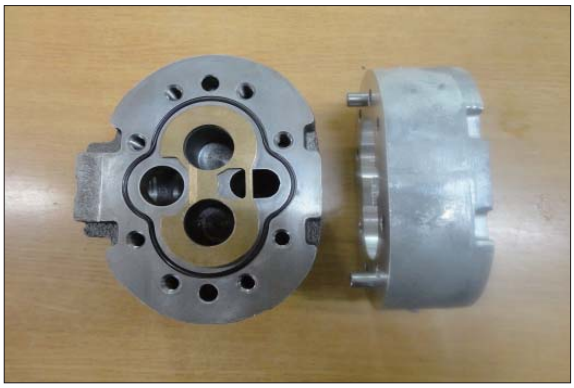
PUMP104

(4) Body and rear cover

① Loosen the vice and remove body and bronze side plate from rear cover.

② Remove O-ring from rear cover.

③ Disassemble pin from body.



PUMP105

(5) Priority valve

① Loosen the plug at the side of drive gear, be careful not to bounce out spring.

② Take out spring.

③ Loosen plug opposite side and draw out spool carefully.

PUMP106

(6) Relief valve

※ Do not disassemble relief valve when pressure setting and caulking is not possible.

① Loosen adjust screw, be careful not to bounce out spring.

② Take out spring and draw out poppet.

③ Loosen plug for port of gage mounting.

④ Remove O-ring from plug and adjust screw.

3) ASSEMBLY

(1) Preparation

① Clean all parts and dry them with compressed air thoroughly.

② Check the permanent mark.

③ Apply grease O-ring, oil seal, E-type ring and side plate lightly.

(2) Priority valve

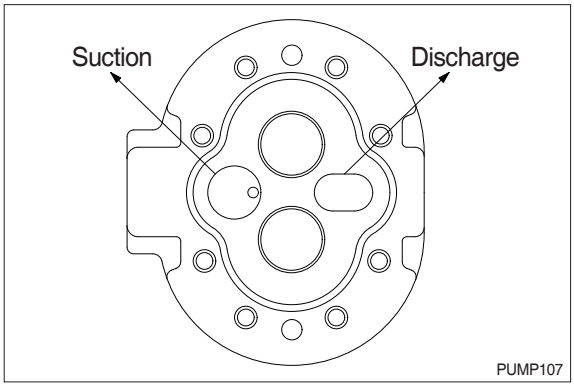
· **Relief valve : if disassembled**

① Fit O-ring on plug and adjust screw.

② Tighten plug for port of gage mounting. (Tightening torque : 35 Nm)

③ Assemble poppet, spring and adjust screw into body in that order.

④ Install relief valve to the machine after final assembling and set the relief pressure and caulk 3 places (equivalent), not to loosen.



· **Priority valve**

① Insert spool into spring groove from idle gear side of body carefully and tighten plug. (Tightening torque : 80 Nm)

② Put spring the other side and tighten plug. (Tightening torque : 100 Nm)

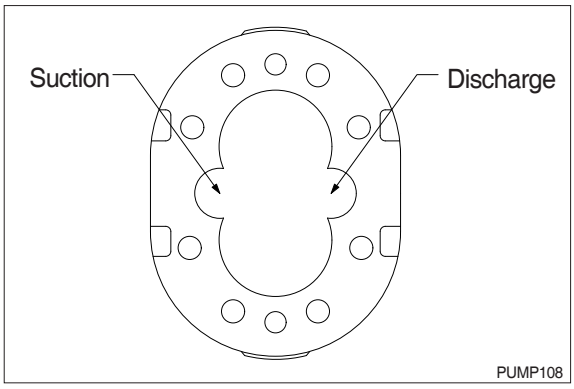
(3) Rear cover and body

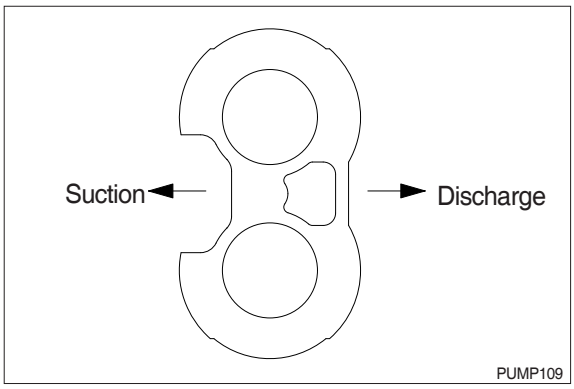
① Assemble pin into body.

② Assemble O-ring on the groove of rear cover.

③ Place the bronze face of side plate contact with gear on rear cover.
Insert side plate into body and adjust pin by pressing after adjusting pin hole of rear cover and pin of body.

④ Confirm the direction of rear cover, bronze side plate and body same as drawing.





(4) Gear

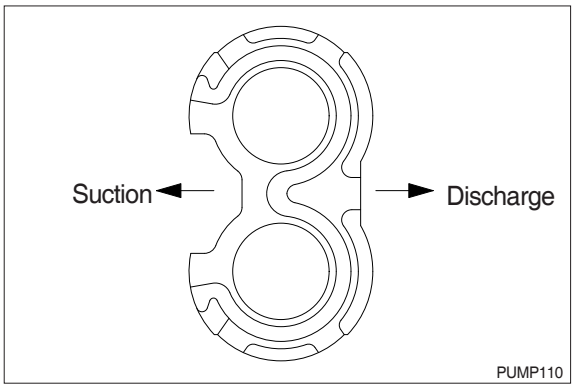
① Place body up.

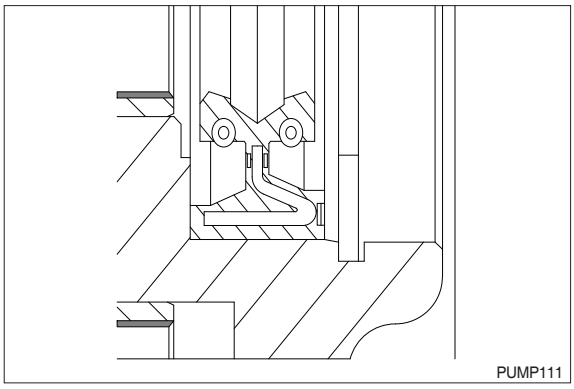
② Place peck center of idle gear up and assemble drive gear and idle gear to body.

③ Fit E-type ring and backup ring and combine side plate with gear set.

④ Confirm the direction of side plate same as drawing.

⑤ Confirm the face of backup ring side contact with housing.





(5) Housing

① Press fit oil seal with same direction as drawing carefully and fit snap ring.

② Fit O-ring into groove of housing.

③ Insert drive gear into housing and combine housing with body pressing lightly after confirmed pin position.

④ Tighten bolt with washer zigzag lightly, be careful not to leave O-ring its place.

⑤ Clamp rear cover in a vice.

⑥ Tighten bolt zigzag with tightening torque 35~38 Nm.

(6) Inspection

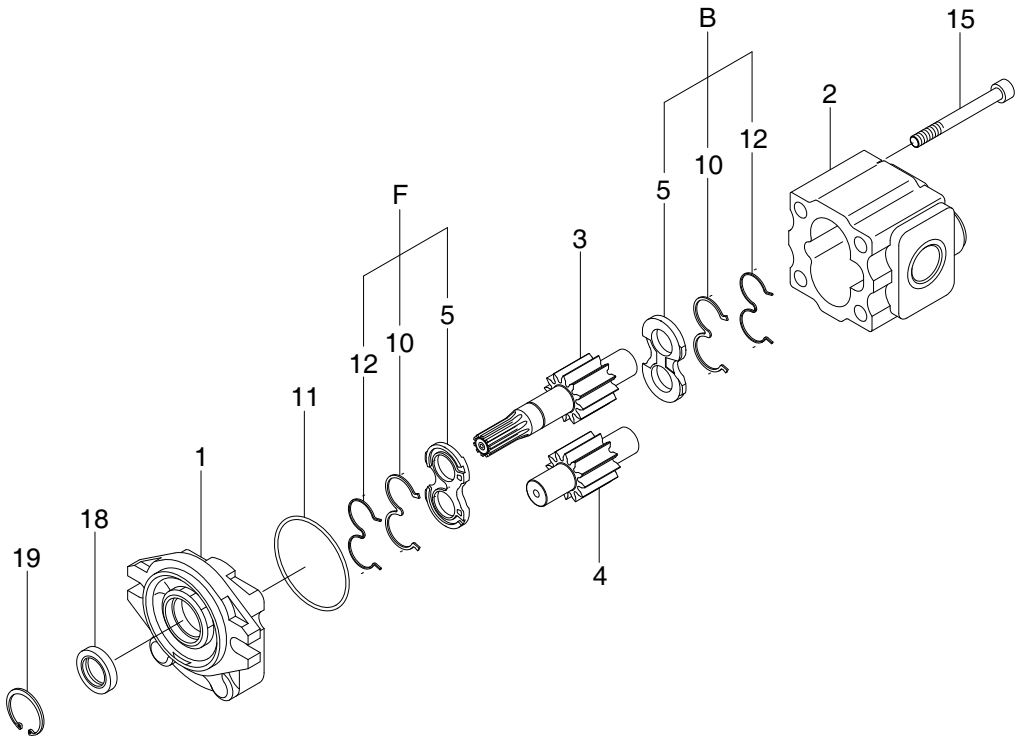
① Clamp drive gear shaft in a vice.

② Rotate the gear pump.

③ Confirm rotation smoothly.

1-1. HYDRAULIC GEAR PUMP (BOOSTER TYPE)

1) STRUCTURE



22D9HS14-2

1	Front cover	5	Side gear	12	Back up ring
2	Body	6	Bushing	15	Bolt
3	Drive gear	10	Gasket (3-shaped)	18	Oil seal
4	Driven gear	11	O-ring	19	Retaining ring

2) DISASSEMBLY AND ASSEMBLY

(1) Safety precautions

※ The installation, piping, maintenance disassembling, inspection, etc. of this product are requsted to be executed by the workers who have technical knowledge, or under the instruction of such workers.

※ For detaching, interrupt the operation of system including this product and detach it for the piping and equipment after the temperature on the surface of product has been cooled down completely (approx 40˚C or less).
Otherwise, there is a danger of an oil leak or getting burned.

※ When the reassembled product fails to recover its performance, do not attempt to use it.
If it is used forcibly, the equipment or system may be broken.

※ When disaposing the product, discharge the oil and dispose, it as an industrial waste.

※ To use the product safely, be sure to relevant laws regarding safety.

(2) Disassembly

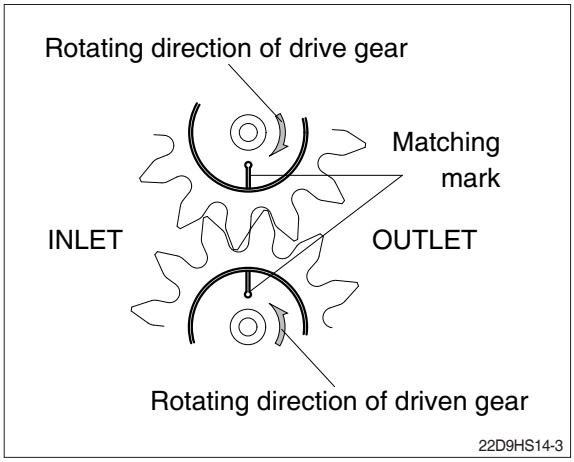
① Fix the mounting parts of front cover with the body side up to the vice.

② Mark on the joints between the front cover (1) and body (2) before disassembling.

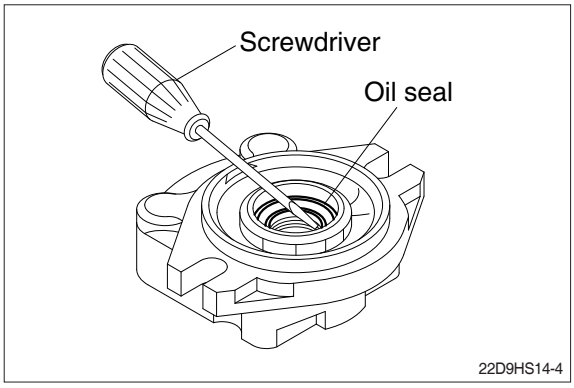
③ Remove the four bolts (15) and disassemble the parts in order starting with the body.
Please see the instructions below.

④ Mark on the shaft ends of the body side.

⑤ Since the pair of side plates (5), 3-shape gaskets (10) and back-ups (12) are assembled in different directions, put the tag on each pair to distinguish where the part is used for. (They are shown as "F" and "B" in the exploded view drawing.)



⑥ After removing the C-shape retaining ring, apply the end of screwdriver, etc. to the inner side of oil seal to detach.



(3) Assembly

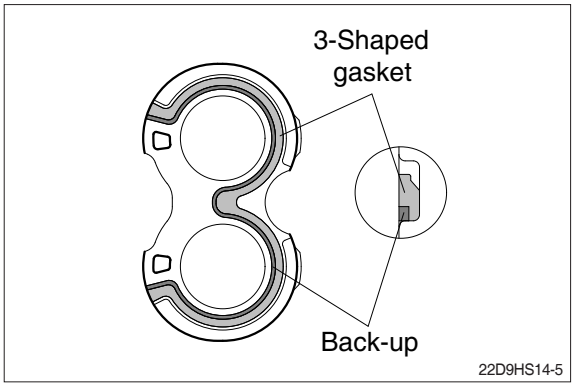
① Replace these items (10, 11, 12, 18, 19) with new ones.

② Clean each part to remove dust before reassembling.

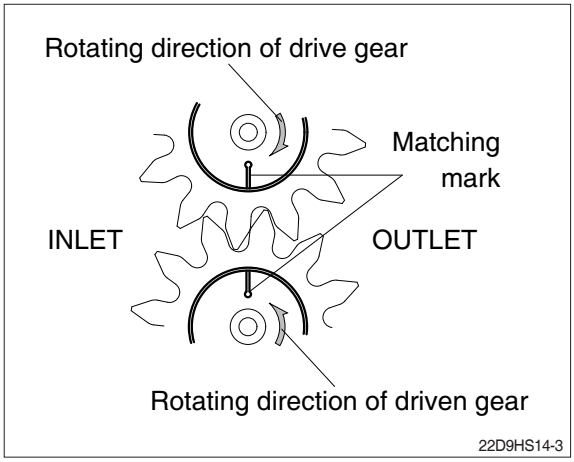
③ Put the body (2) on the worktable with its hole for the gear up.

④ Reassemble the parts in order except for oil seal, retaining ring and bolts.

· Fix the 3-shaped gasket (10) and back-up (12) to the side plate (5) by using grease to prevent them from being twisted or caughts.



· Fix the drive gear and driven gear by matching each mark.

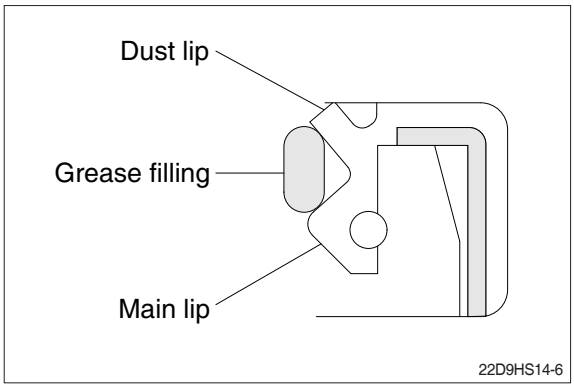


⑤ Invert the assembled pump to make the front cover down and fix the mounting parts to the vice.

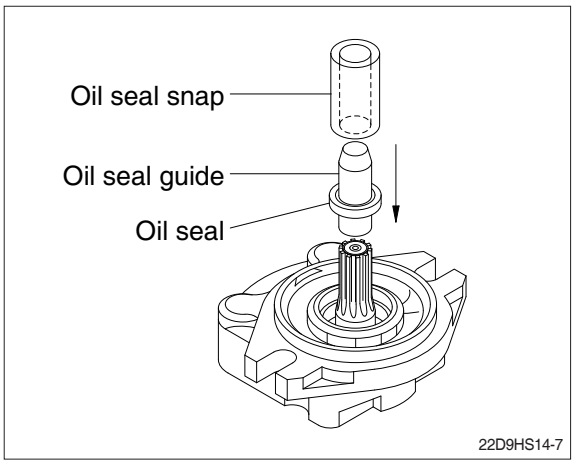
⑥ Tighten 4 bolts evenly by 9.0~9.5 kgf·m (65.1~68.7 lbf·ft) torque.

⑦ Invert the assembled pump again to make the front cover up and fix the body to the vice.

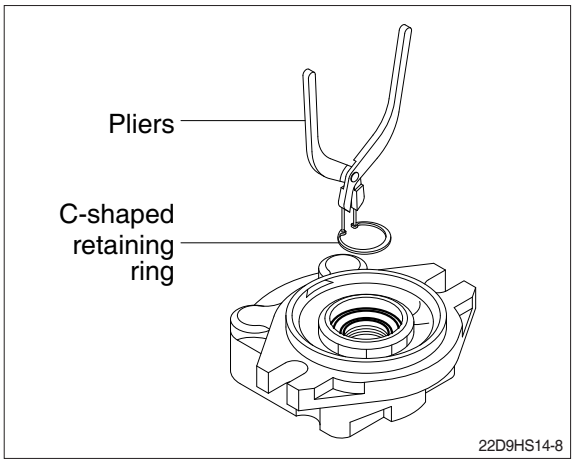
⑧ Fill the dent between the main lip and dust lip of oil seal with grease.



⑨ Fill the oil seal into the hole by using the oil seal guide and oil seal snap.



⑩ Attach the C-shaped retaining ring for hole.



3) TROUBLESHOOTING

Status	Possible factors	Solutions
Leakage from the oil seal	·Reverse rotation. ·Abnormal high pressure in the inlet. ·Seal lips damaged by wastes. ·Sealed parts of the shaft damaged or worn out. ·Poor shaft centering.	·Rotate the pump to the right way. ·Keep the designated pressure. ·Replace the oil seal with new one. ·Adjust centering. ·Change the pump.
Oil leakage from the joint of cover or body	·Looseness of the bolts or breakage of the cover and body. ·Degradation or damage of the oil seal caused hy heat curing of the gasket.	·Tighten bolt and keep the designated pressure. ·Replace the gasket with new one. ·Change the pump.
Oil leakage from port	·Looseness of breakage of the port fittings. ·Breakage of the seals for fittings. ·Breakage of the ports.	·Tighten the fittings and keep the designated pressure. ·Replace the seals for fittings with new ones. ·Change the pump.
Reduction of the oil amount getting out from the outlet or no pressure produced	·Shortage of the oil in the tank. ·Intermal leakage due to abnormal high-temperature or inappropriate viscosity of oil. ·Degradation of the performance due to the oil contamination. ·Cavitations due to negative pressure. ·Breakage of the internal parts. ·Reverse rotation.	·Apply the appropriate kind and amount of oil in the tank and change the cooling system. ·Change the contamination oil. ·Make sure if the the appropriate length and width of inlet pipe are applied and avoid prducing negative pressure by replacing the filter with new one. ·Open the inlet valve. ·Change the pump. ·Rotate the pump to the pump to the right way and avoid prducing the abnormal high-temperature in the inlet.
Rising temperature of pump or oil	·Abnormal generation of heat due to the frequent operation of the pressure control valves. ·Lack of capacity or breakdown of the cooling system. ·Damage of the internal parts.	·Set the pressure appropriately. ·Change the cooling system. ·Change the pump.
Noise and vibration	·Poor installation. ·Cavitations. ·Intake of air. ·Vibration of the pipes and mounting flanges. ·Chattering of the relief valves. ·Damage of the internal parts.	·Adjust centering. ·Make sure if the the appropriate length and width of inlet pipe are applied and avoid prducing negative pressure by replacing the filter with new one. ·Fill the tank with oil and avoid taking air into the inlet pipes. ·Reinforce the pipes and mounting flange and prevent resonating. ·Replace the relief valve with new one. ·Change the pump.

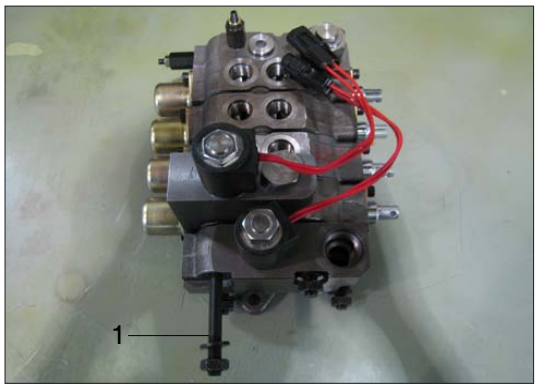
※ Once you disassemble the pump, its performance may not recover after the reassembly.

※ Change the assembly if the pump breaks down.

※ If the disassembly is inevitable, you need to consult the Hyundai service center or dealer.

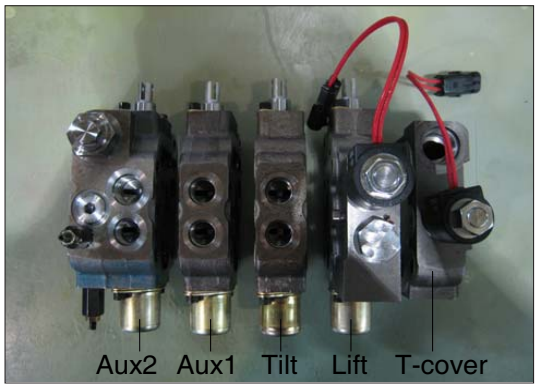
2. MAIN CONTROL VALVE

1) Remove bolt (1) to separate the valve section.
·Bolt torque (1) : 4.0 $^{+0.6}_{0}$ kgf·m



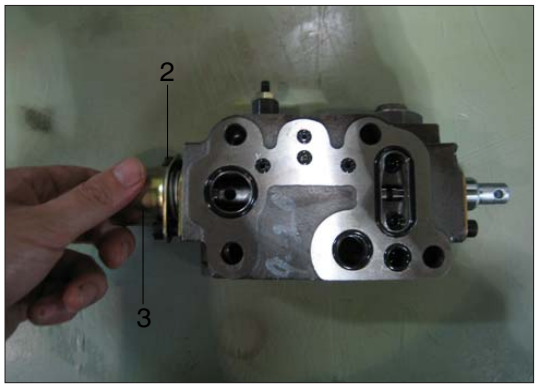
20D7MCV01

2) Divide the valve body.



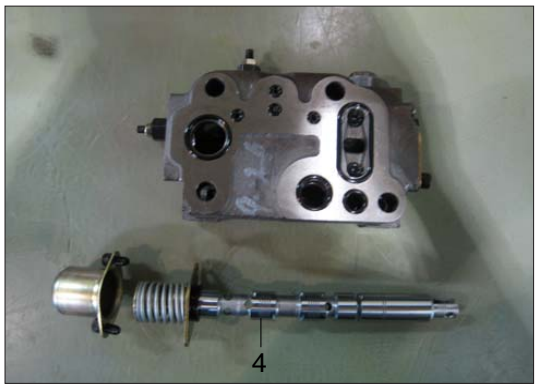
20D7MCV02

3) Remove dust cap (3) and bolt (2) from the valve body.
·Bolt torque (2) : 1.2 kgf·m



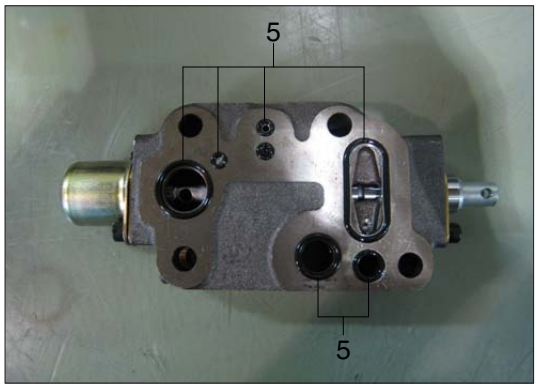
20D7MCV03

4) Remove attachment spool (4) from the valve body.



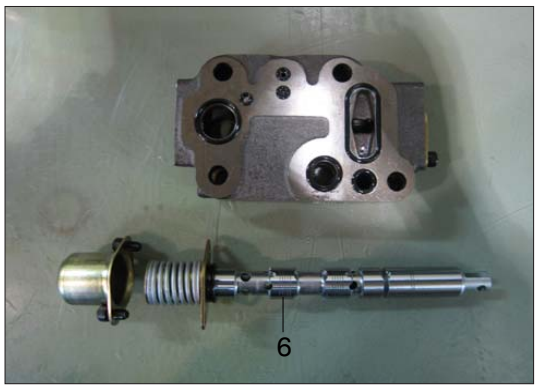
20D7MCV04

5) Remove O-ring seals (5) from the valve body.



20D7MCV05

6) Remove tilt spool (6) from the valve body.

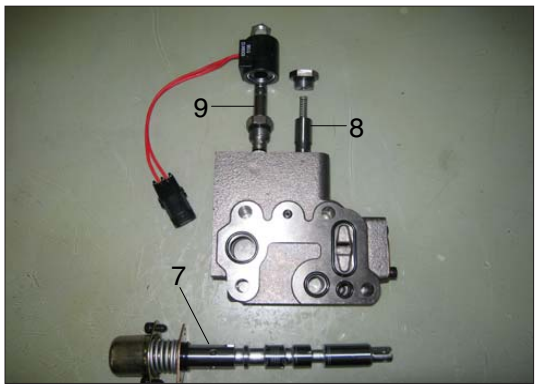


20D7MCV06

7) Remove lift spool (7) from the valve body.

8) Remove lock poppet (8) from the valve body.

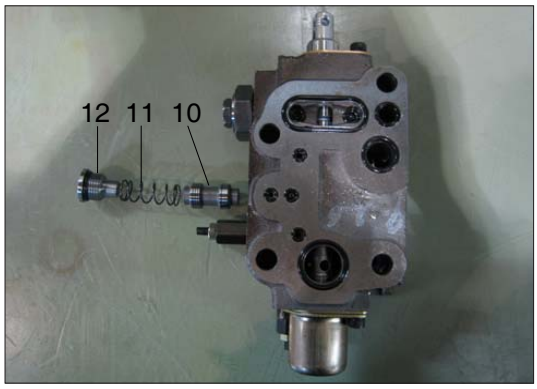
9) Remove normal close solenoid valve (9, Opt) from the valve body.



20D7MCV07

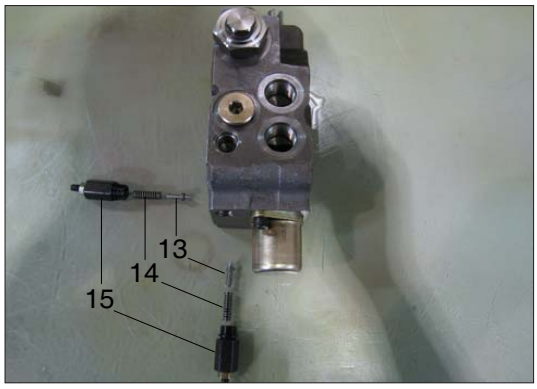
10) Remove plug (12) and spring (11).

11) Remove hydrostat (10).



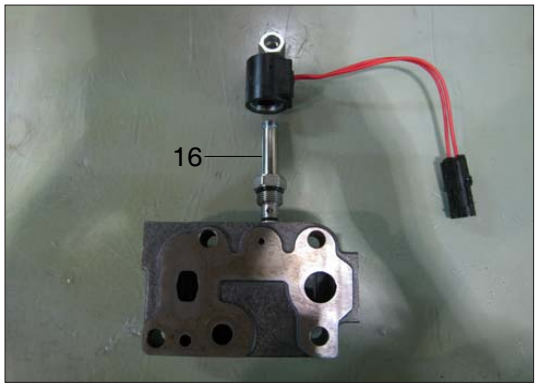
20D7MCV08

12) Remove relief plugs (15), springs (14) and poppets (13).
·Relief plugs torque (15) : 2.5 kgf·m



20D7MCV09

13) Remove normal open solenoid valve (16, Opt) from the valve body.

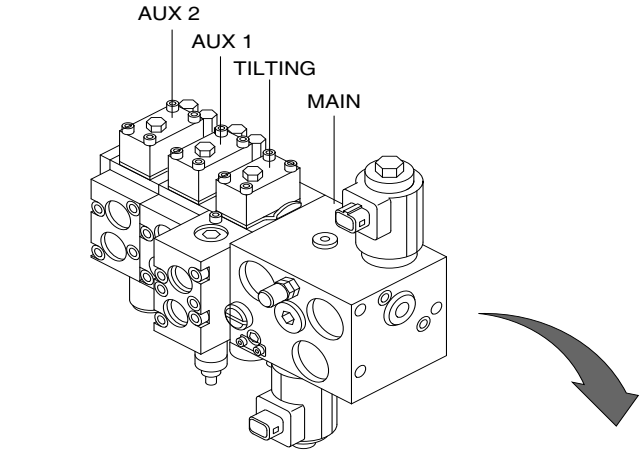


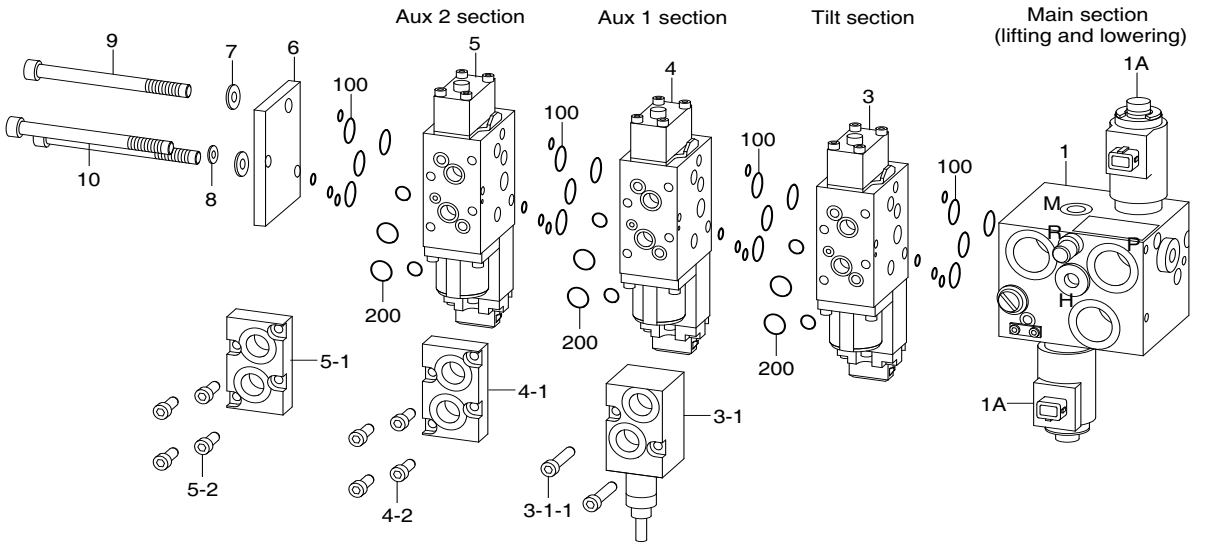
20D7MCV10

14) Assembly procedure of the main control valve is the reverse order of the removal procedure.

2-1. MAIN CONTROL VALVE (FINGERTIP, OPT)

1) STRUCTURE





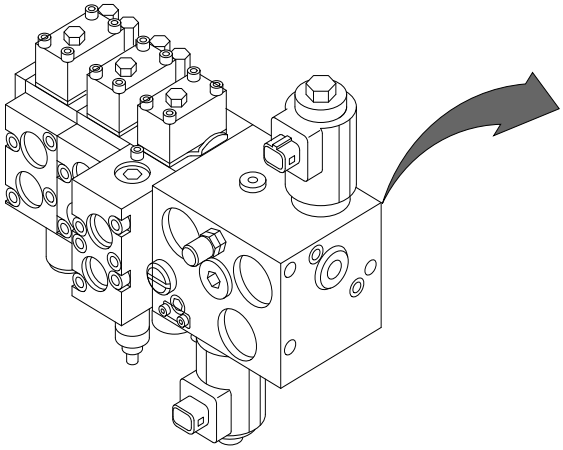
25L7AFT01

※ Tightening torque

- Item (3-1-1, 4-2, 5-2,10) : 0.97 kgf·m (7.0 lbf.ft)
- Item (9) : 2.35 kgf·m (16.9 lbf.ft)

1	Main block	4-1	Block	7	Plain washer
1A	Solenoid valve (lift)	4-2	Socket head screw	8	Plain washer
3	Tilt block	5	Aux block (auxiliary 2)	9	Tension rod
3-1	Adapter	5-1	Block	10	Tension rod
3-1-1	Socket head screw	5-2	Socket head screw	100	Section seal kit
4	Aux block (auxiliary 1)	6	End plate	200	Section seal kit

2) MAIN SECTION



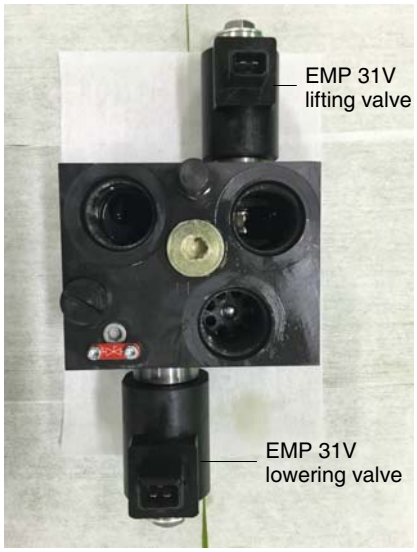
25L7AFT02

※ Flow rate : 100 lpm

※ Maximum pressure : 250 bar

(1) Lifting and lowering valve

① Main section

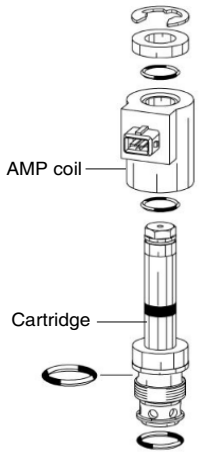


25L7AFT03

② EMP solenoid valve

25L7AFT04

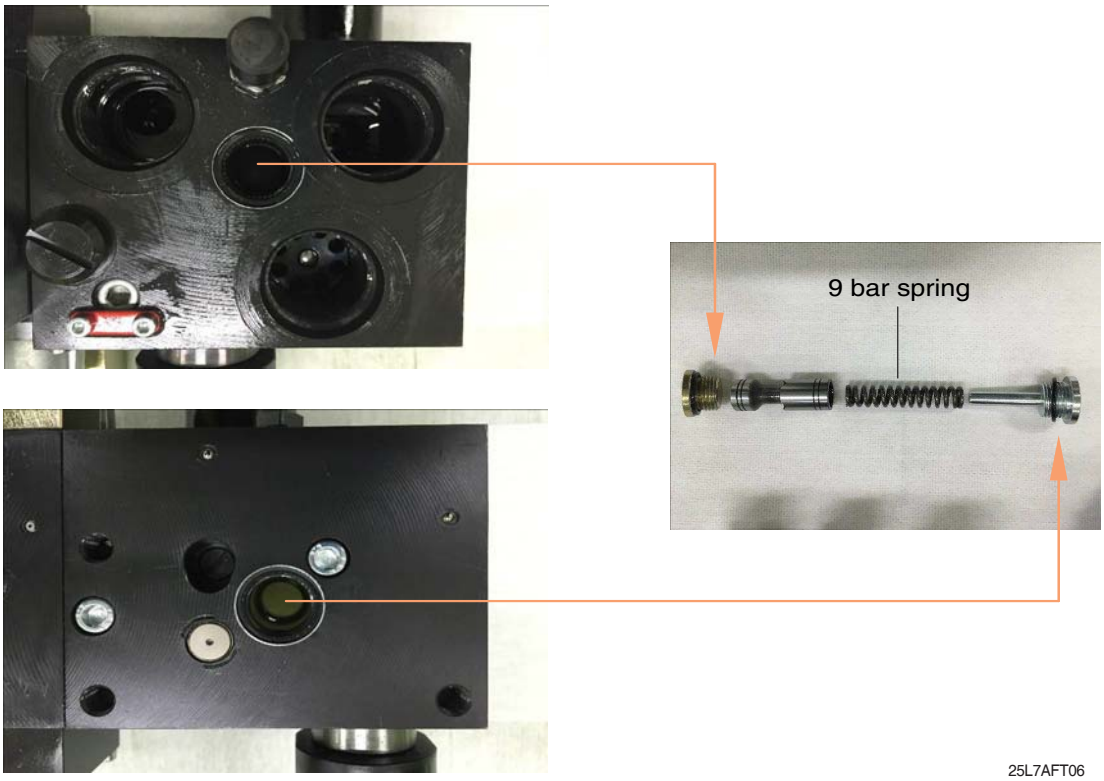
※ Tightening torque
6.12 kgf·m (44.2 lbf·ft)



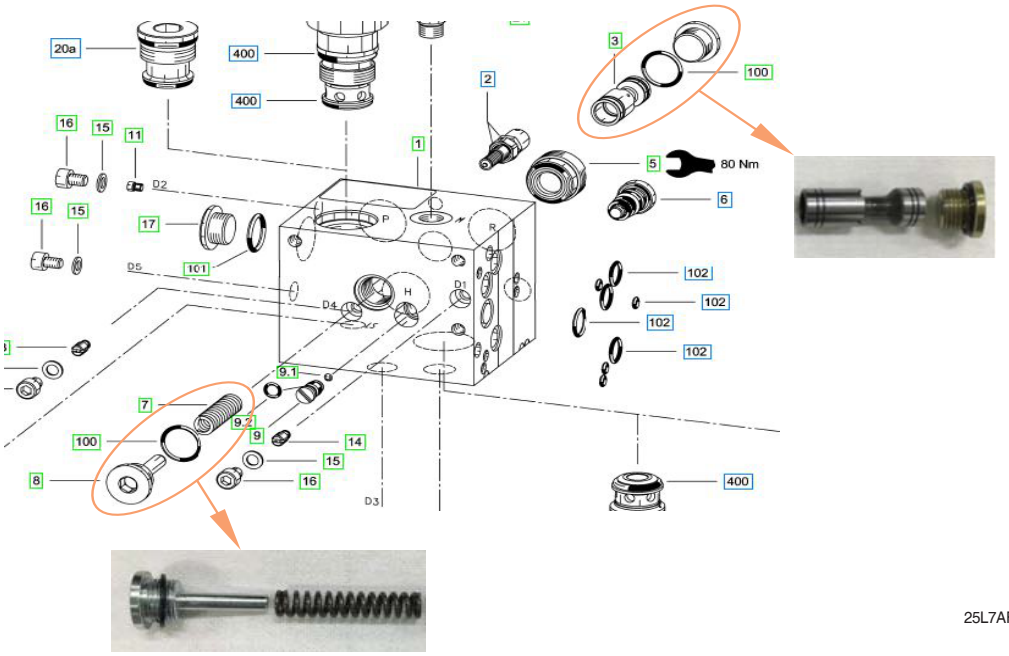
25L7AFT05

※ 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) 3-way controller



25L7AFT06

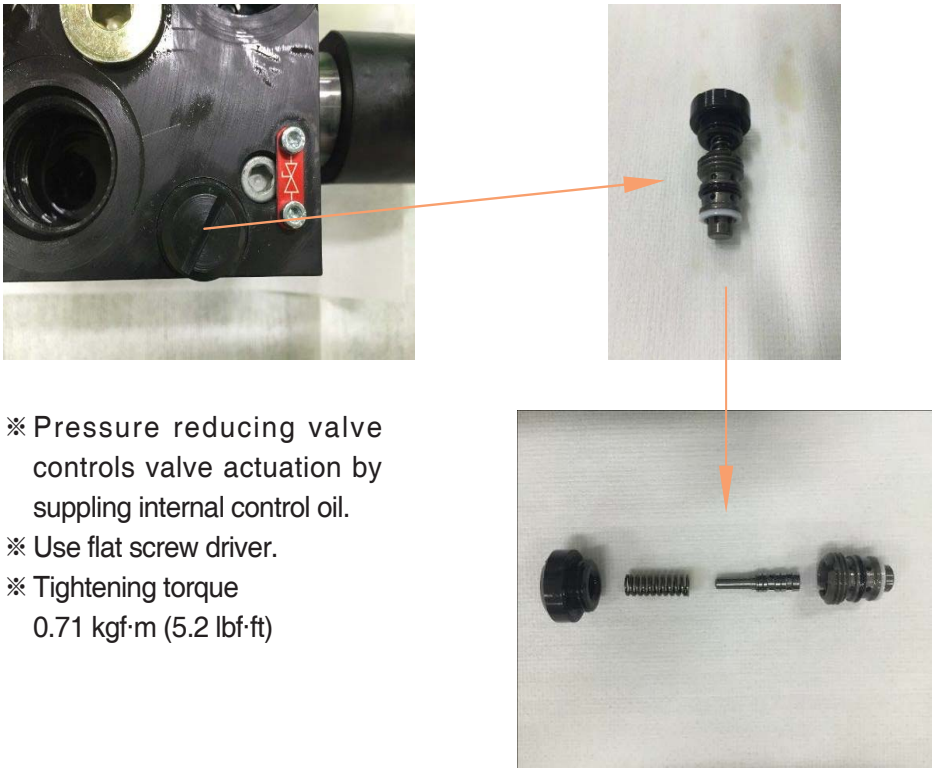


25L7AFT07

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

(3) Pressure Reducing valve & G damping screw

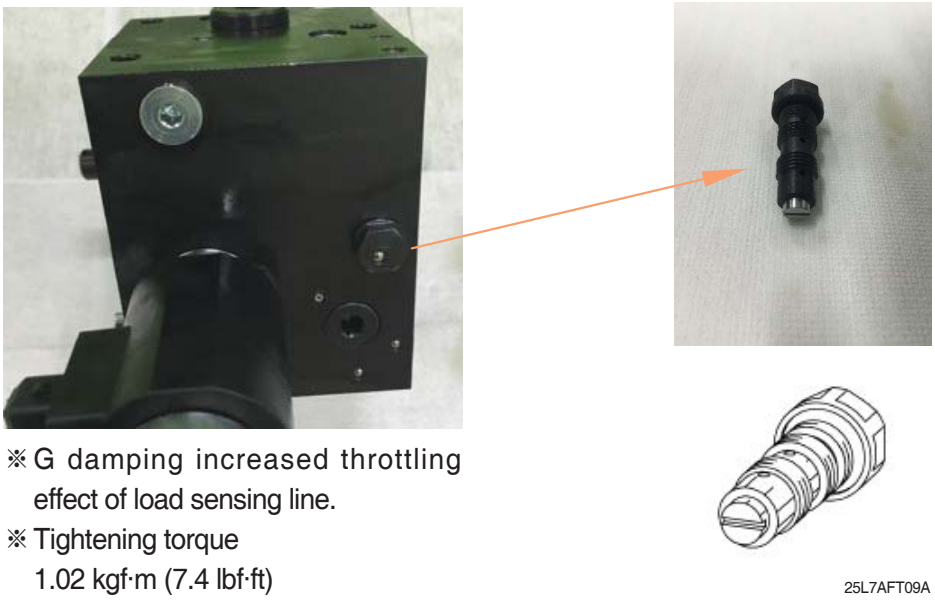
① Pressure reducing valve



※ Pressure reducing valve controls valve actuation by suppling internal control oil.
※ Use flat screw driver.
※ Tightening torque
0.71 kgf·m (5.2 lbf·ft)

25L7AFT08

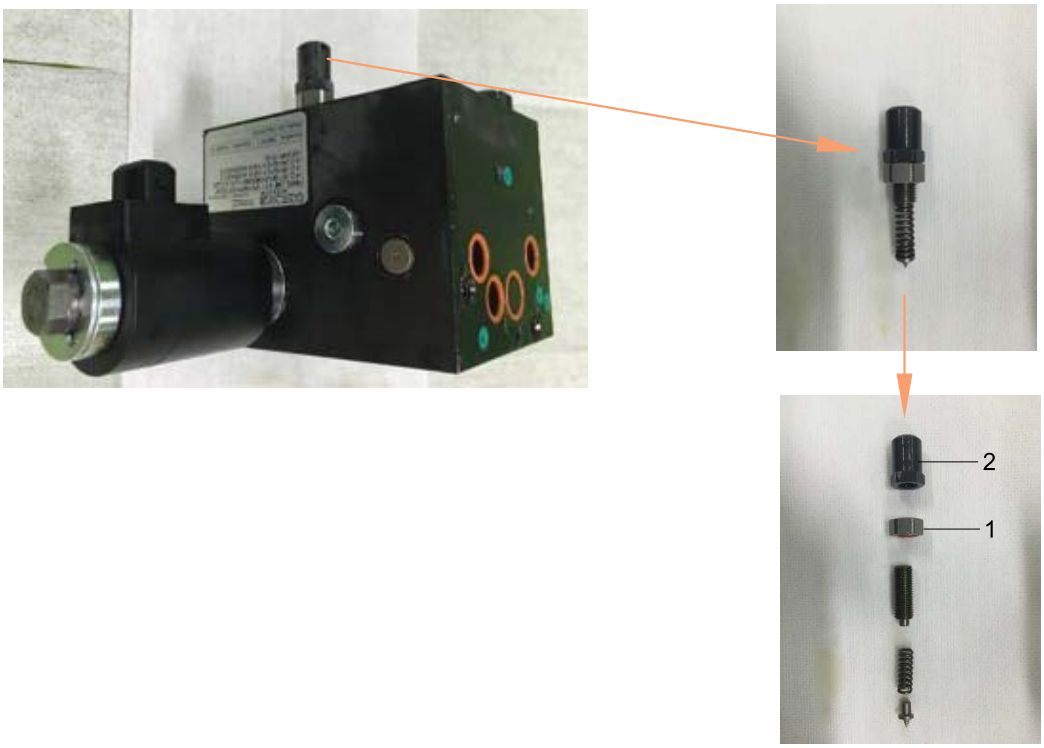
② G damping screw



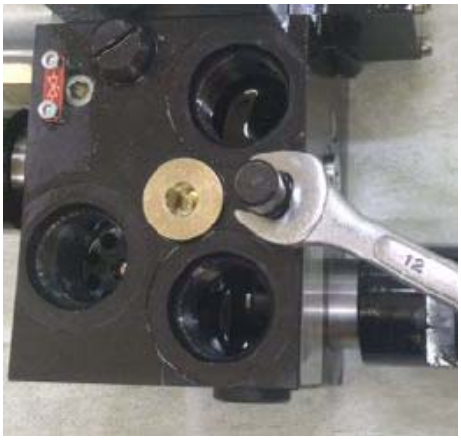
※ G damping increased throttling effect of load sensing line.
※ Tightening torque
1.02 kgf·m (7.4 lbf·ft)

25L7AFT09A

(4) Pressure relief valve

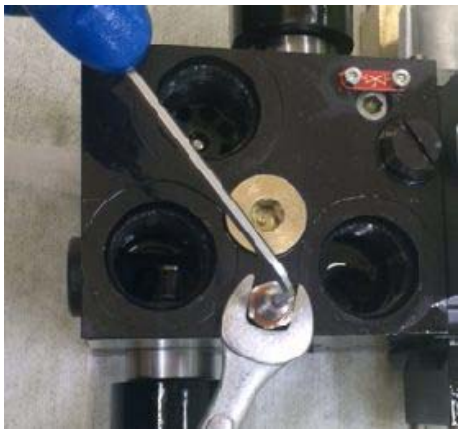


25L7AFT10



25L7AFT11

※ Use with a 12 mm spanner.
※ Tightening torque (2)
1.43 kgf·m (10.3 lbf·ft)



25L7AFT12

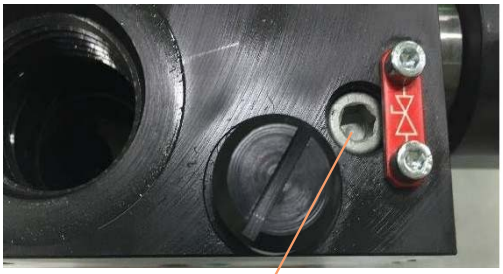
※ Use with a 3 mm wrench.
※ Tightening torque (1)
1.43 kgf·m (10.3 lbf·ft)

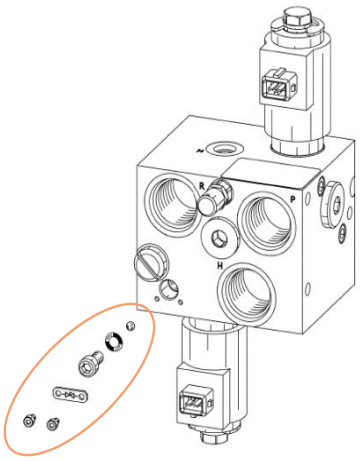
= Pressure increases
= Pressure decreases

※ 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

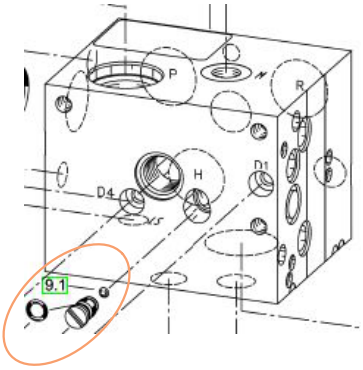




25B9UFT14

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

② Shuttle valve

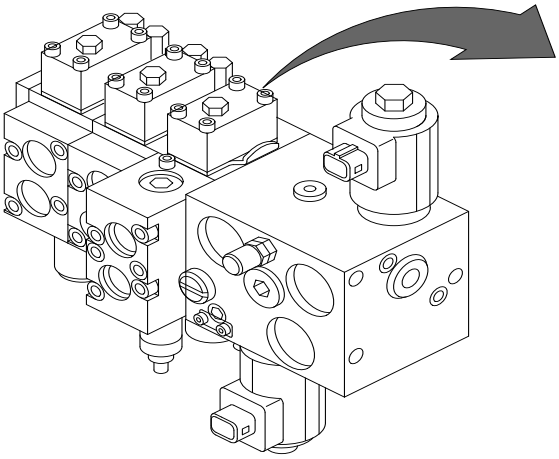


25L7AFT15

※ Transfer bigger load pressure through shuttle valve.

※ Use a flat screw driver.

3) TILT SECTION

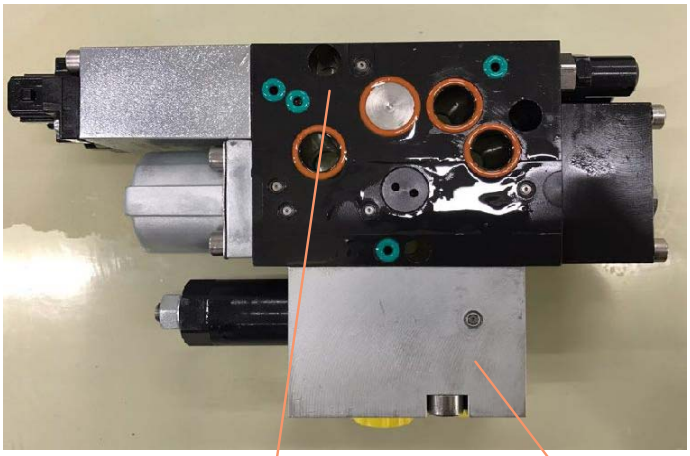


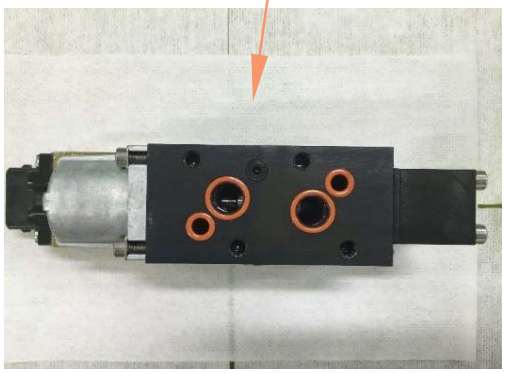
25L7AFT16

※ Flow rate : 40 lpm

※ Load holding pressure : 210 bar

(1) Proportional directional valve





① Valve section block

25L7AFT17

② Counter balance valve block

(2) Disassembly valve section

① Disassemble spool

※ All block type, 40lpm

② Disassemble coil

25L7AFT18

※ AMP 4 pin coil

③ Disassembling process

a. Release spring cap.

25L7AFT19

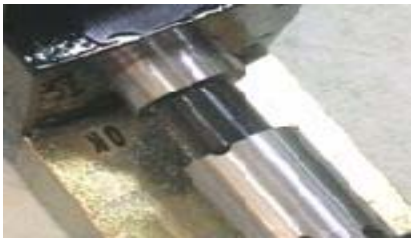
b. Release spring cap completely.

25L7AFT20

c. Release lever block.

25L7AFT21

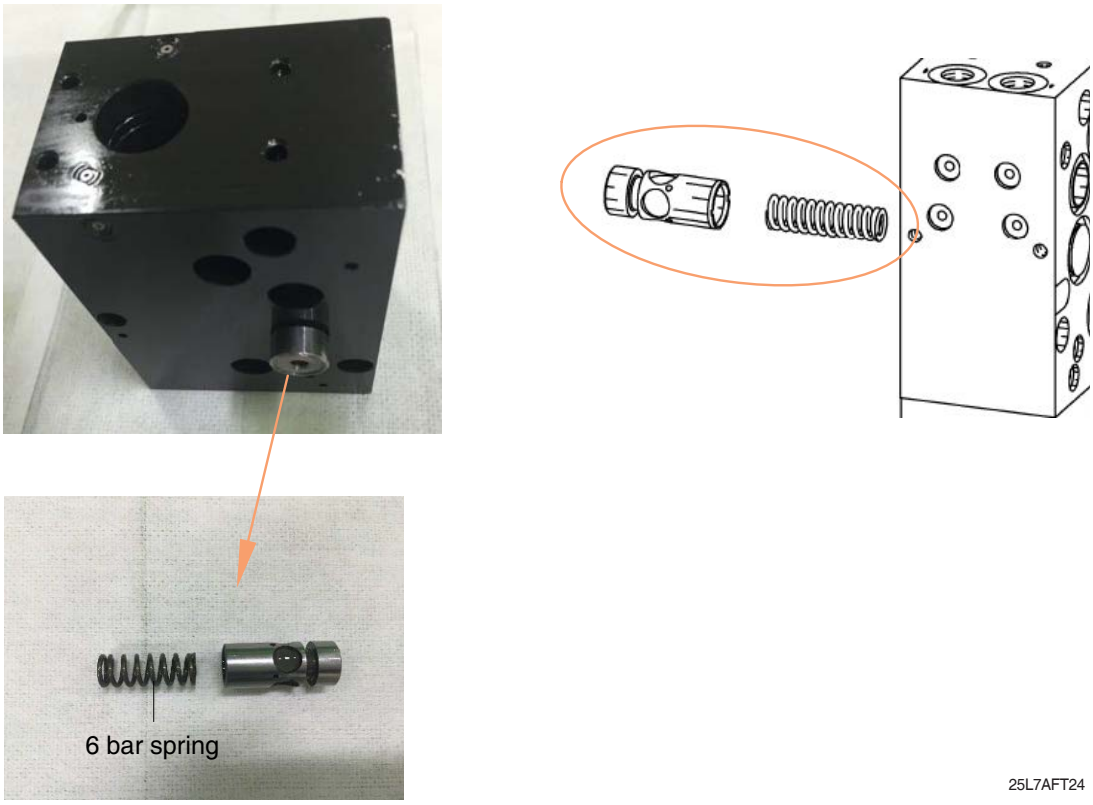
d. Pull out spool.



25L7AFT22

(3) 2 way controller and shuttle valve

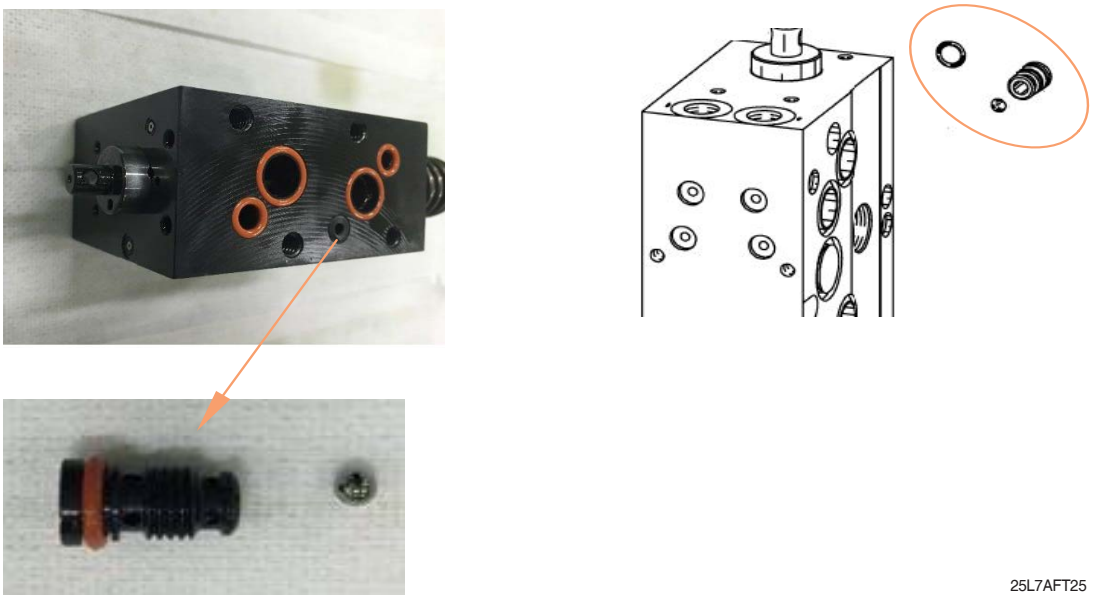
① 2 way controller (6 bar)



25L7AFT24

※ 2 way controller make it keep 6 bar regardless of load change between in and out of spool.

② Shuttle valve

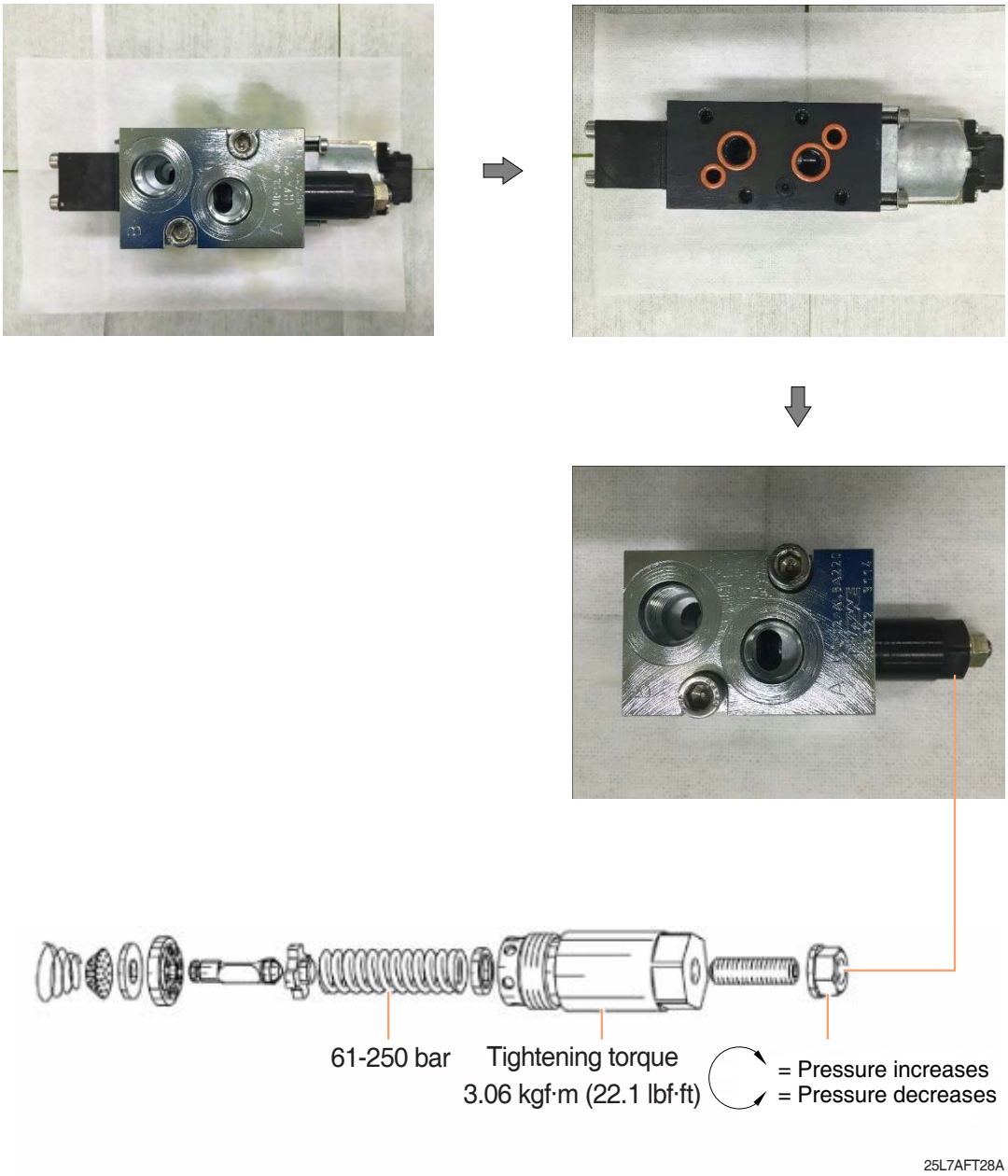


25L7AFT25

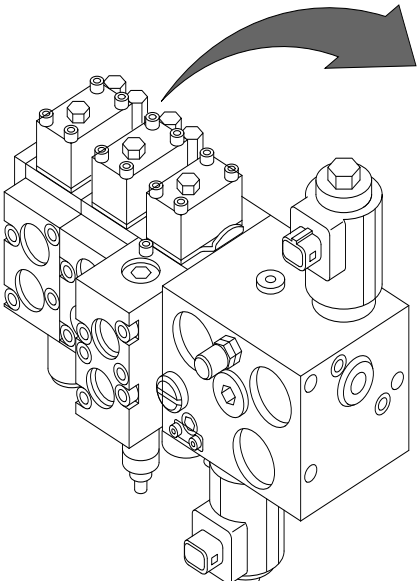
※ Transfer bigger load pressure through shuttle valve.
※ Fix 4 mm bolt and pull out.

(4) Counter balance valve

※ Counter balance valve needs during tilting out operation.



4) AUXILIARY SECTION

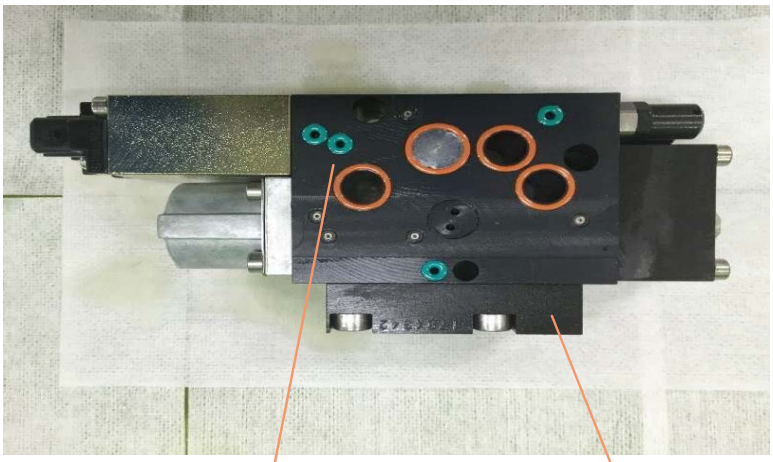


25L7AFT29

※ Flow rate : 40 lpm

※ Pressure limit aux section : 140 bar

(1) Proportional directional valve



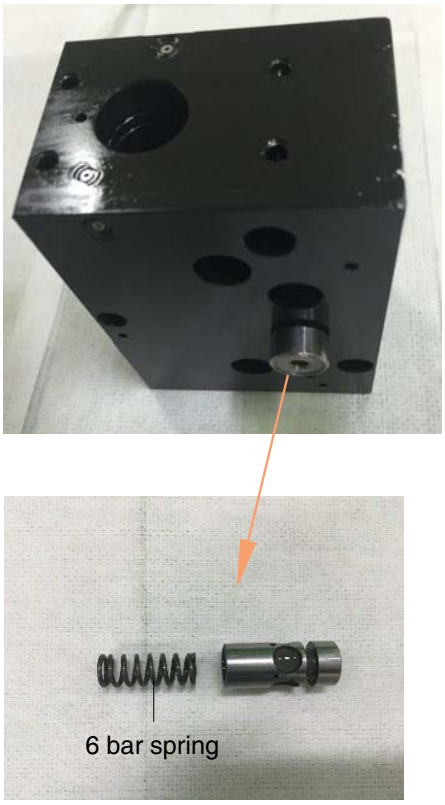
① Valve section block

② Ancillary block

25L7AFT30

(2) 2 way controller and shuttle valve

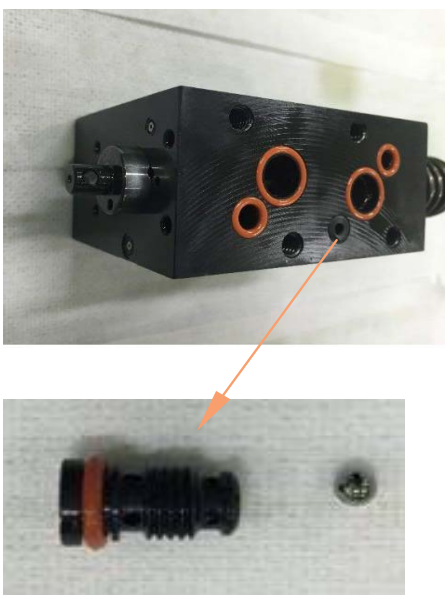
① 2 way controller (6 bar)



25L7AFT24

※ 2 way controller make it keep 6 bar regardless of load change between in and out of spool.

② Shuttle valve



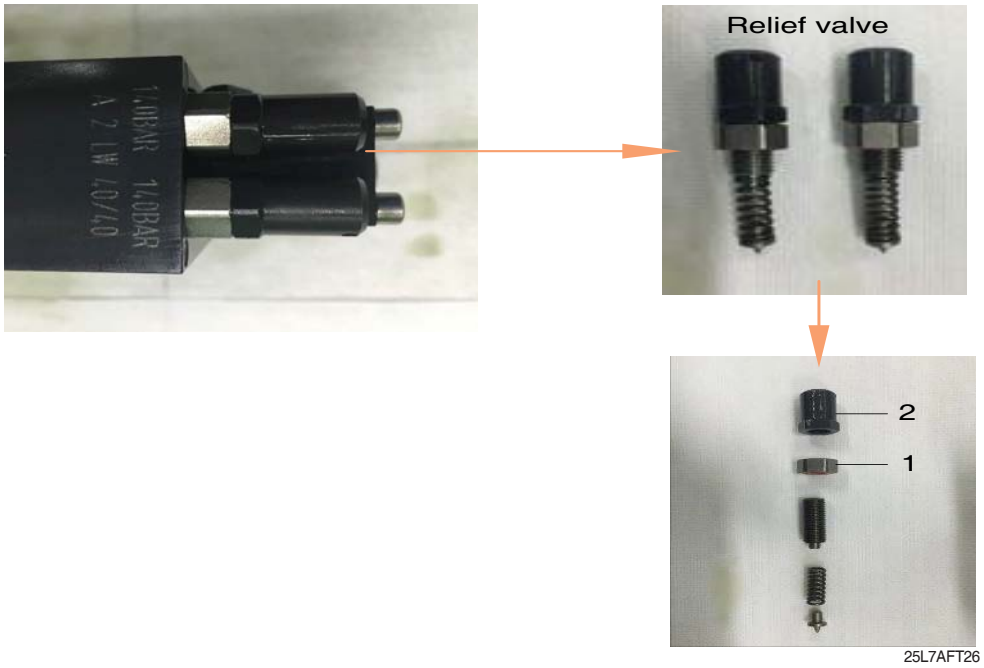
25L7AFT25

※ Transfer bigger load pressure through shuttle valve.
※ Fix 4 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.



25L7AFT26

※ Use with a 12 mm spanner.

※ Tightening torque (1)
1.43 kgf·m (10.3 lbf·ft)

25L7AFT27

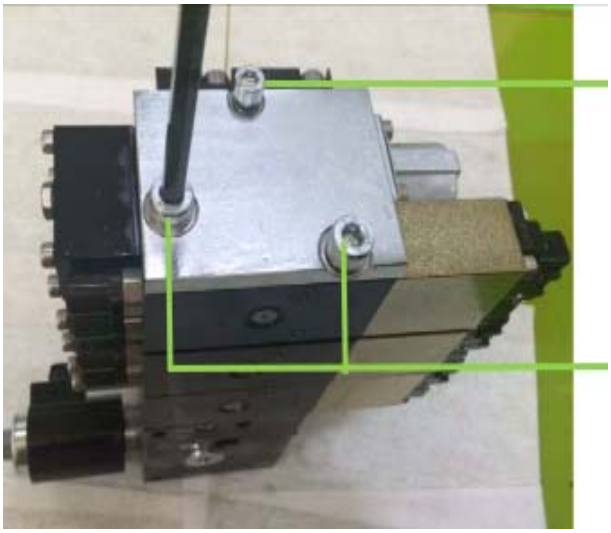
※ Use with a 3 mm wrench.

※ Tightening torque (2)
1.43 kgf·m (10.3 lbf·ft)

= Pressure increases
= Pressure decreases

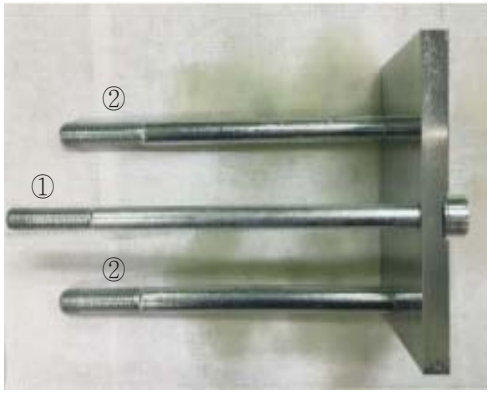
5) ADD SECTION PART

(1) Disassembly



① Tightening torque
0.97 kgf·m (7.0 lbf·ft)

② Tightening torque
2.35 kgf·m (16.9 lbf·ft)

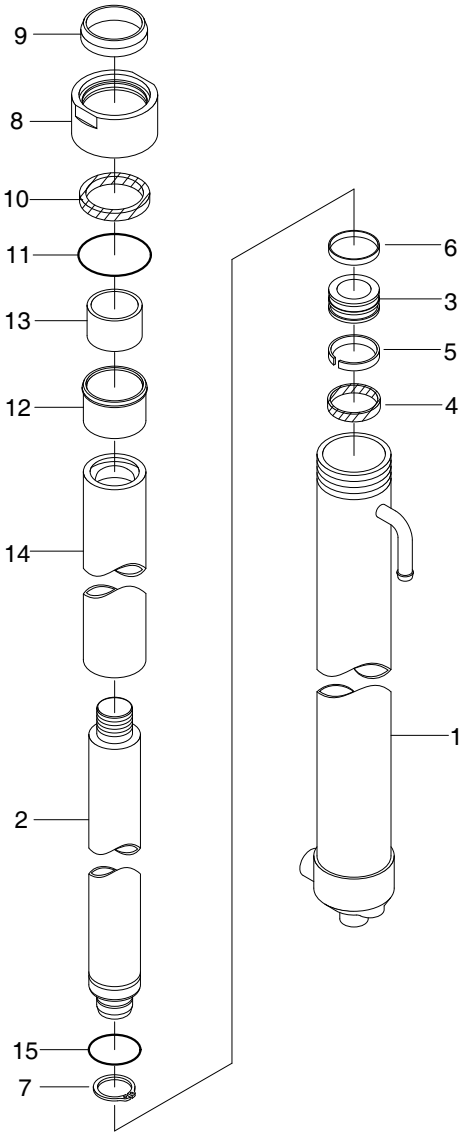


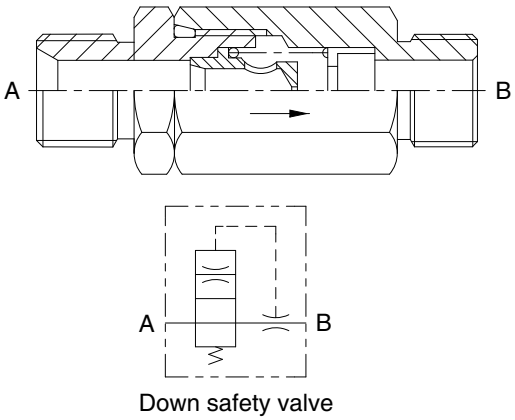
40B9HS02

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

3. LIFT CYLINDER

1) STRUCTURE





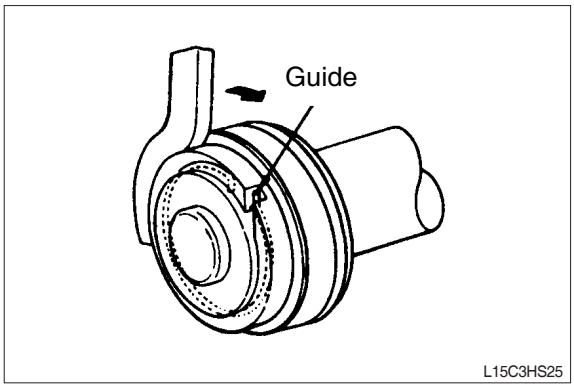
Down safety valve

20D7HS19

1	Tube assy	6	Wear ring	11	O-ring
2	Rod assy	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.



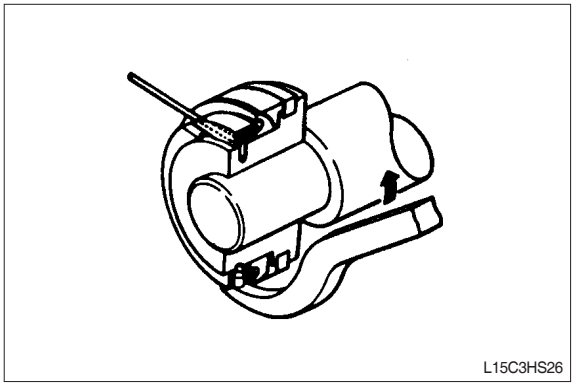
3) CHECK AND INSPECTION

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

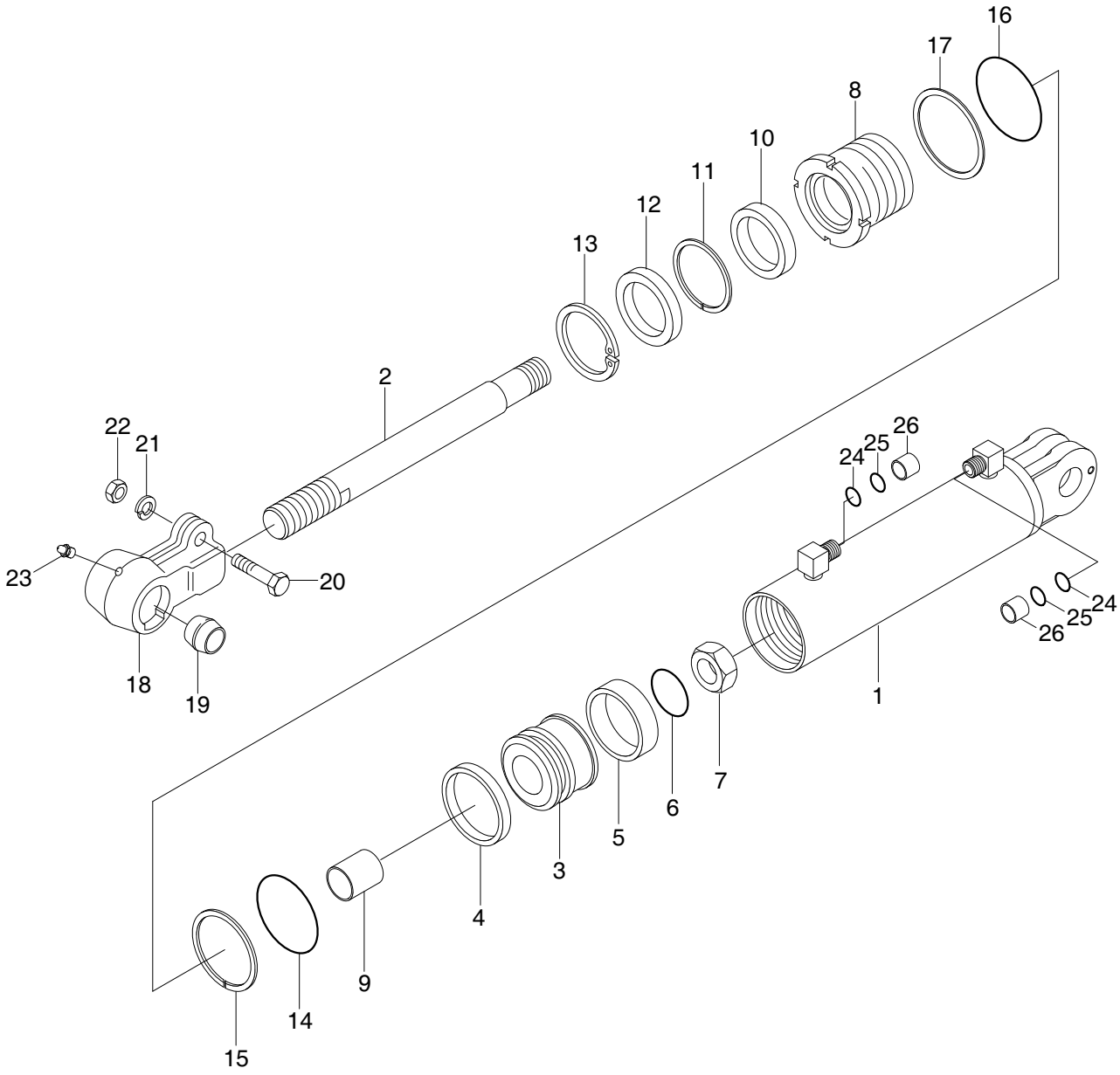
4) ASSEMBLY

(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.



4. TILT CYLINDER

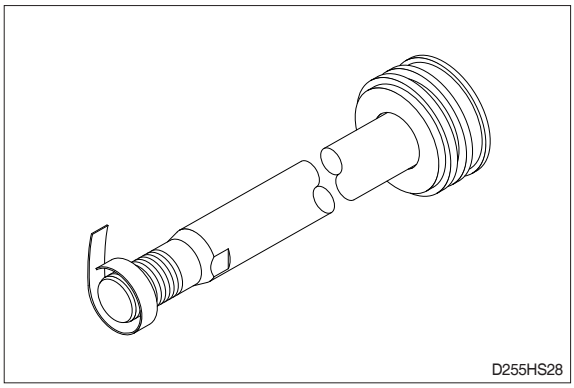
1) STRUCTURE



1	Tube assembly	10	U-packing	19	Spherical bearing
2	Rod	11	Backup ring	20	Hex 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 niple
6	O-ring	15	Backup ring	24	O-ring
7	Nylon nut	16	O-ring	25	O-ring
8	Rod cover	17	Washer	26	Dust cap
9	Rod bushing	18	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