SHOP MANUAL

KOMATSU

PC400LC-6 EXCEL

MACHINE MODEL	SERIAL NUMBER
PC400LC-6 EXCEL	**32933 and up**

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require. Materials and specifications are subject to change without notice.
- PC400LC-6 EXCEL mount the SA6D125-2 engine.
  For details of the engine, see the 125-2 Series Engine Shop Manual.

Printed in Japan 09-04(01)

Category	Komatsu code	Part No.	Q'ty	Container	Main applications, featuresr	
Molybdenum disulphide lubricant	LM-G	09940-00051	60 g	Can	• Used as lubricant for sliding portion (to prevent from squeaking).	
	LM-P	09940-00040	200 g	Tube	• Used to prevent seizure or scuffling of the thread when press fitting or shrink fitting. • Used as lubricant for linkage, bearings, etc.	
Grease	G2-LI	SYG2-400LI SYG2-350LI SYG2-400LI-A SYG2-160LI SYGA-160CNLI	Various	Various	• General purpose type	
	G2-CA	SYG2-400CA SYG2-350CA SYG2-400CA-A SYG2-160CA SYGA-160CNCA	Various	Various	• Used for normal temperature, light load bearing at places in contact with water or steam.	
	Molybdenum disulphide grease LM-G (G2-M)	SYG2-400M SYG2-400M-A SYGA-16CNM	400 g × 10 400 g × 20 16 kg	Bellows type Bellows type Can	• Used for heavy load portion	
	Hyper White Grease G2-T G0-T (*) *: For use in cold district	SYG2-400T-A SYG2-16CNT SYG0-400T-A (*) SYG0-16CNT (*)	400 g 16 kg	Bellows type Can	• Seizure resistance and heat resistance higher than molybdenum disulfide grease • Since this grease is white, it does not stand out against machine body.	
	Biogrease G2B G2-BT (*) *: For high temperature and large load	SYG2-400B SYGA-16CNB SYG2-400BT (*) SYGA-16CNBT (*)	400 g 16 kg	Bellows type Can	• Since this grease is decomposed by bacteria in short period, it has less effects on microorganisms, animals, and plants.	
Primer	SUNSTAR PAINT PRIMER 580 SUPER	417-926-3910	20 ml	Glass container	Adhesive for cab glass	• Used as primer for cab side (Using limit: 4 months)
	SUNSTAR GLASS PRIMER 580 SUPER		20 ml	Glass container		• Used as primer for glass side (Using limit: 4 months)
Adhesive	SUNSTAR PENGUINE SEAL 580 SUPER "S" or "W"		320 ml	Polyethylene container		• "S" is used for high-temperature season (April - October) and "W" for low-temperature season (November - April) as adhesive for glass. (Using limit: 4 months)
	Sika Japan, Sikaflex 256HV	20Y-54-39850	310 ml	Polyethylene container		• Used as adhesive for glass. (Using limit: 6 months)
Caulking material	SUNSTAR PENGUINE SEAL No. 2505	417-926-3920	320 ml	Polyethylene container		• Used to seal joints of glass parts. (Using limit: 4 months)
	SEKISUI SILICONE SEALANT	20Y-54-55130	333 ml	Polyethylene container		• Used to seal front window. (Using limit: 6 months)

Temperature

Fahrenheit-Centigrade Conversion ; a simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vice versa is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

1°C = 33.8°F

°C		°F	°C		°F	°C		°F	°C		°F
–40.4	**–40**	–40.0	–11.7	**11**	51.8	7.8	**46**	114.8	27.2	**81**	117.8
–37.2	**–35**	–31.0	–11.1	**12**	53.6	8.3	**47**	116.6	27.8	**82**	179.6
–34.4	**–30**	–22.0	–10.6	**13**	55.4	8.9	**48**	118.4	28.3	**83**	181.4
–31.7	**–25**	–13.0	–10.0	**14**	57.2	9.4	**49**	120.2	28.9	**84**	183.2
–28.9	**–20**	–4.0	–9.4	**15**	59.0	10.0	**50**	122.0	29.4	**85**	185.0
–28.3	**–19**	–2.2	–8.9	**16**	60.8	10.6	**51**	123.8	30.0	**86**	186.8
–27.8	**–18**	–0.4	–8.3	**17**	62.6	11.1	**52**	125.6	30.6	**87**	188.6
–27.2	**–17**	1.4	–7.8	**18**	64.4	11.7	**53**	127.4	31.1	**88**	190.4
–26.7	**–16**	3.2	–7.2	**19**	66.2	12.2	**54**	129.2	31.7	**89**	192.2
–26.1	**–15**	5.0	–6.7	**20**	68.0	12.8	**55**	131.0	32.2	**90**	194.0
–25.6	**–14**	6.8	–6.1	**21**	69.8	13.3	**56**	132.8	32.8	**91**	195.8
–25.0	**–13**	8.6	–5.6	**22**	71.6	13.9	**57**	134.6	33.3	**92**	197.6
–24.4	**–12**	10.4	–5.0	**23**	73.4	14.4	**58**	136.4	33.9	**93**	199.4
–23.9	**–11**	12.2	–4.4	**24**	75.2	15.0	**59**	138.2	34.4	**94**	201.2
–23.3	**–10**	14.0	–3.9	**25**	77.0	15.6	**0**	140.0	35.0	**95**	203.0
–22.8	**–9**	15.8	–3.3	**26**	78.8	16.1	**61**	141.8	35.6	**96**	204.8
–22.2	**–8**	17.6	–2.8	**27**	80.6	16.7	**62**	143.6	36.1	**97**	206.6
–21.7	**–7**	19.4	–2.2	**28**	82.4	17.2	**63**	145.4	36.7	**98**	208.4
–21.1	**–6**	21.2	–1.7	**29**	84.2	17.8	**64**	147.2	37.2	**99**	210.2
–20.6	**–5**	23.0	–1.1	**30**	86.0	18.3	**65**	149.0	37.8	**100**	212.0
–20.0	**–4**	24.8	–0.6	**31**	87.8	18.9	**66**	150.8	40.6	**105**	221.0
–19.4	**–3**	26.6	0	**32**	89.6	19.4	**67**	152.6	43.3	**110**	230.0
–18.9	**–2**	28.4	0.6	**33**	91.4	20.0	**68**	154.4	46.1	**115**	239.0
–18.3	**–1**	30.2	1.1	**34**	93.2	20.6	**69**	156.2	48.9	**120**	248.0
–17.8	**0**	32.0	1.7	**35**	95.0	21.1	**70**	158.0	51.7	**125**	257.0
–17.2	**1**	33.8	2.2	**36**	96.8	21.7	**71**	159.8	54.4	**130**	266.0
–16.7	**2**	35.6	2.8	**37**	98.6	22.2	**72**	161.6	57.2	**135**	275.0
–16.1	**3**	37.4	3.3	**38**	100.4	22.8	**73**	163.4	60.0	**140**	284.0
–15.6	**4**	39.2	3.9	**39**	102.2	23.3	**74**	165.2	62.7	**145**	293.0
–15.0	**5**	41.0	4.4	**40**	104.0	23.9	**75**	167.0	65.6	**150**	302.0
–14.4	**6**	42.8	5.0	**41**	105.8	24.4	**76**	168.8	68.3	**155**	311.0
–13.9	**7**	44.6	5.6	**42**	107.6	25.0	**77**	170.6	71.1	**160**	320.0
–13.3	**8**	46.4	6.1	**43**	109.4	25.6	**78**	172.4	73.9	**165**	329.0
–12.8	**9**	48.2	6.7	**44**	111.2	26.1	**79**	174.2	76.7	**170**	338.0
–12.2	**10**	50.0	7.2	**45**	113.0	26.7	**80**	176.0	79.4	**175**	347.0

10 STRUCTURE AND FUNCTION

TRACK SHOE

Standard shoe

Item \ Model	PC400-6 EXCEL	PC400LC-6 EXCEL
Shoe width (mm) (triple shoe)	600	600
Link pitch (mm)	228.6	228.6
No. of shoes (each side)	46	49

Selection of track shoe

- Select the most suitable track shoe from the following table

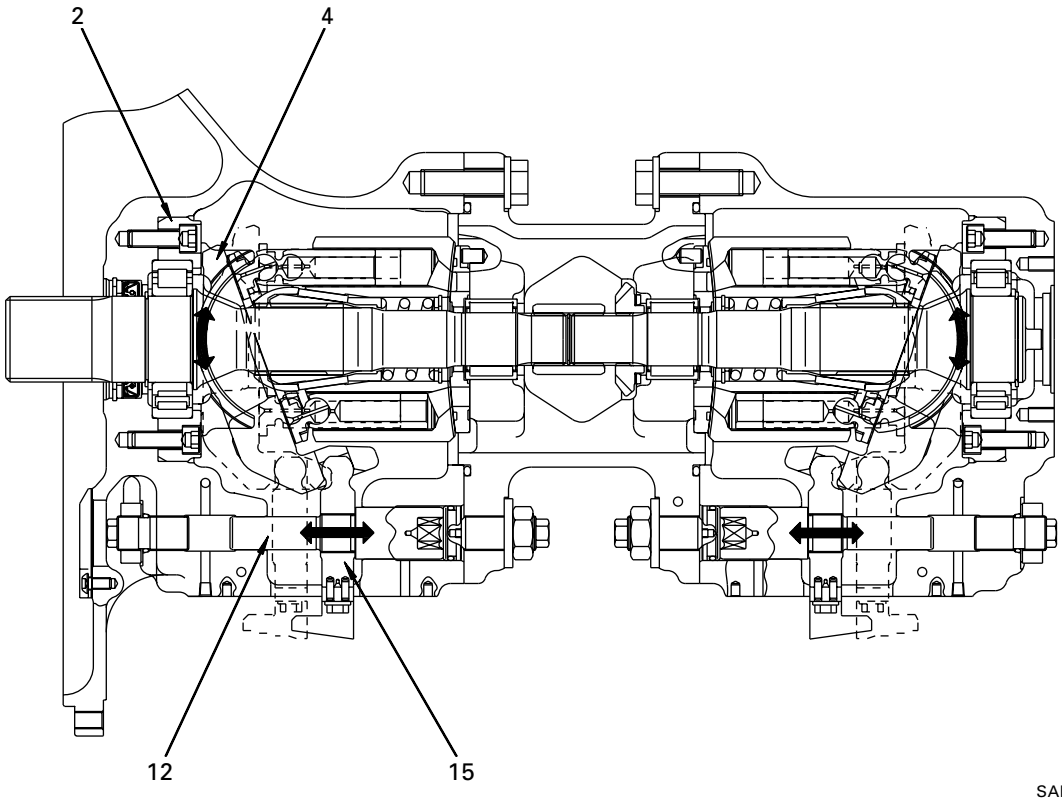
	PC400-6 EXCEL		PC400LC-6 EXCEL	
	Specifications	Category	Specifications	Category
Standard	600 mm triple	A	600 mm triple	A
Option	700 mm triple	B	700 mm triple	B
Option	800 mm triple	B	800 mm triple	B

Category	Use	Precautions when using
A	Rocky ground, normal river soil	• Travel in Lo speed when traveling on rough ground with obstacles such as large boulders and fallen trees.
B	Normal soil, soft land	• Cannot be used on rough ground where there are large obstacles such as boulders and fallen trees. • Travel in Hi speed only on flat ground; when it is impossible to avoid traveling over obstacles, lower the travel speed to approx. half of Lo speed.
C	Extremely soft ground (swampy ground)	• Use only for ground where “A” and “B” sink and are impossible to use. • Cannot be used on rough ground where there are large obstacles such as boulders and fallen trees • Travel in Hi speed only on flat ground; when it is impossible to avoid traveling over obstacles, lower the travel speed to approx. half of Lo speed.
D	Paved surface	• The shoes are flat, so they have low gradeability
E	Paved surface	• The shoes are made of rubber, so be careful when traveling on rough ground

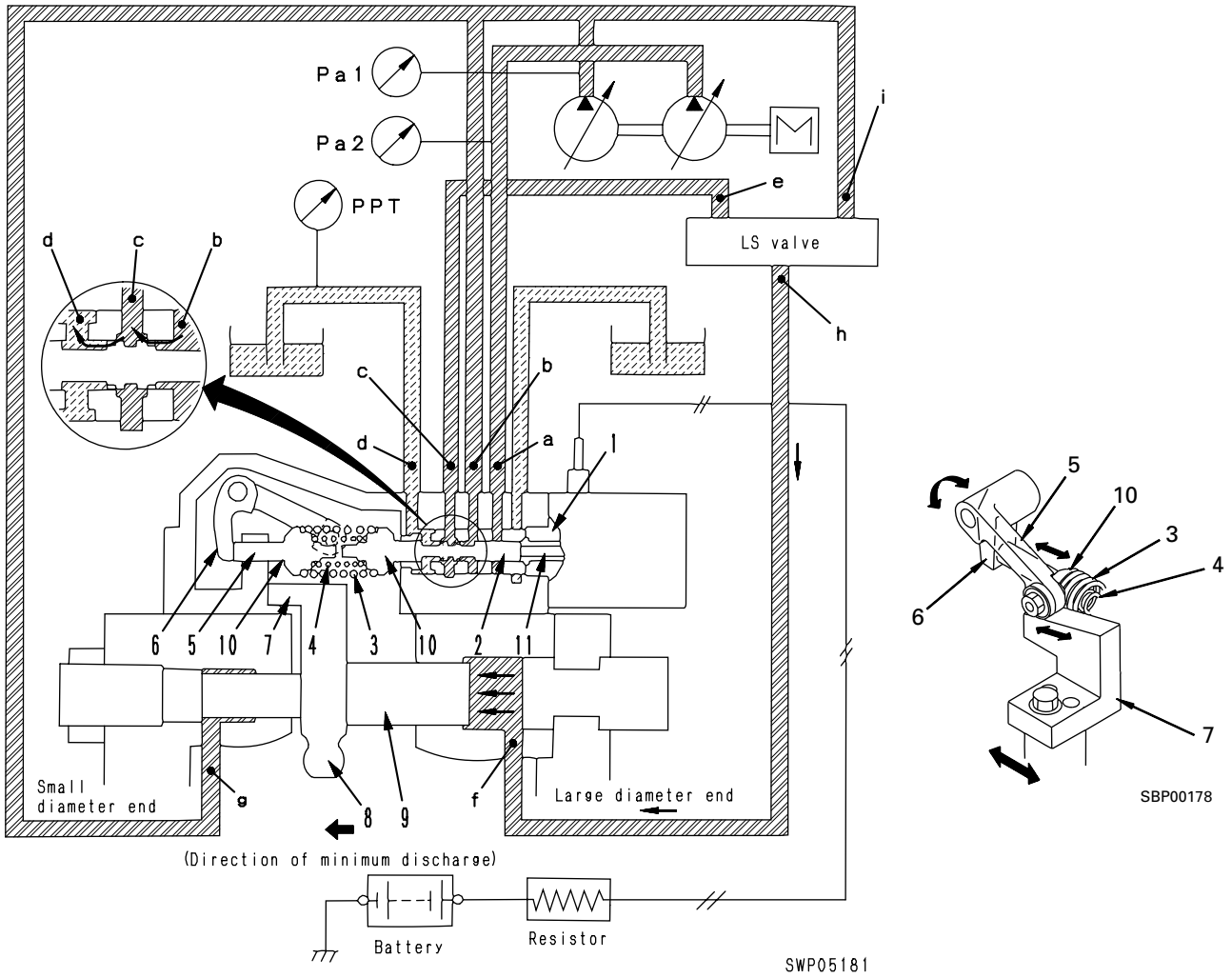
★ Categories “B” and “C” are wide shoes, so there are restrictions on their use. Therefore, before using, check the restrictions and consider carefully the conditions of use before recommending a suitable shoe width. If necessary, give the customer guidance in their use.

★ When selecting the shoe width, select the narrowest shoe possible within the range that will give no problem with flotation and ground pressure.
If a wider shoe than necessary is used, there will be a large load on the shoe, and this may lead to bending of the shoe, cracking of the links, breakage of the pins, loosening of the shoe bolts, or other problems.

2. Control of discharge amount



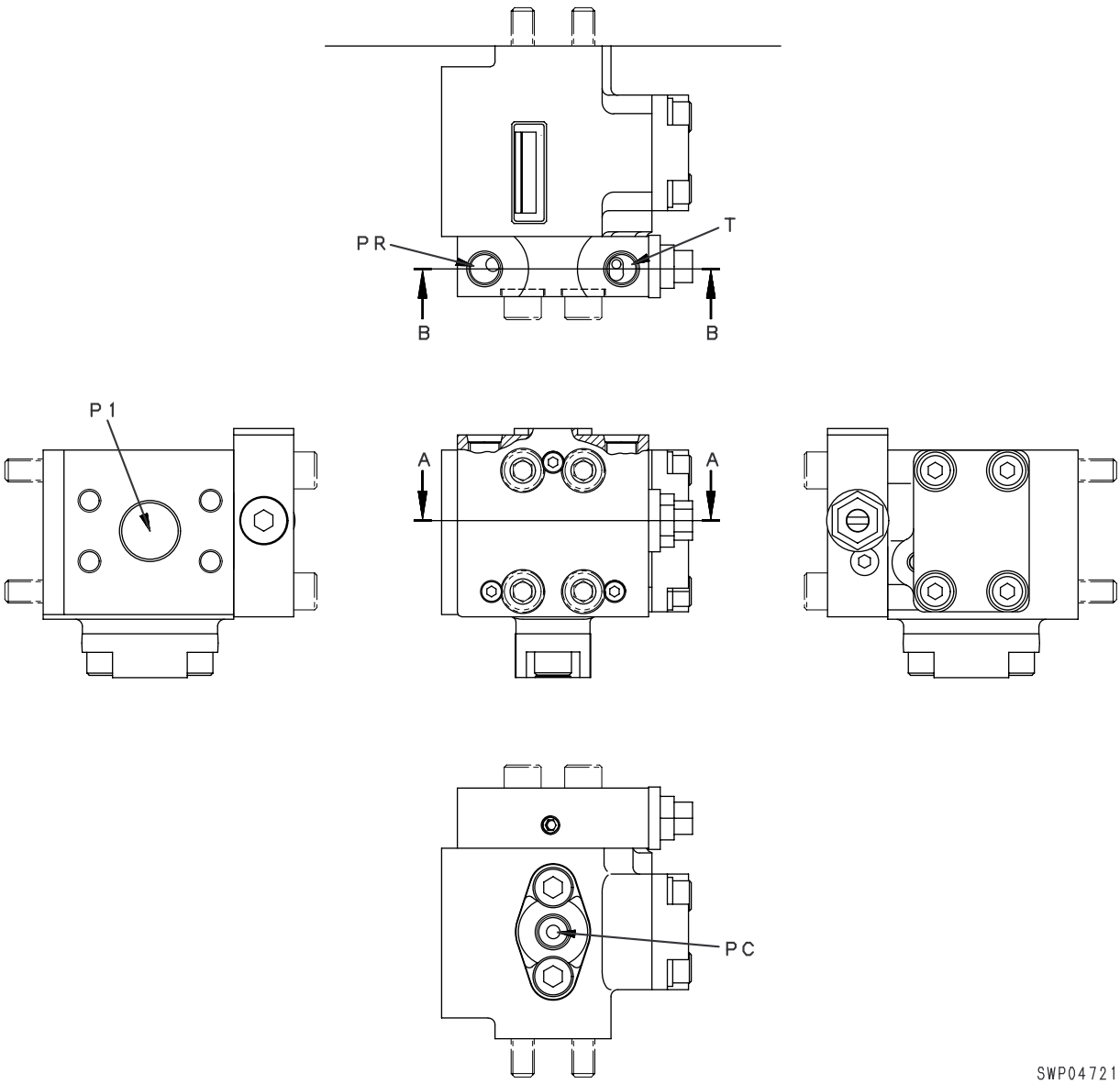
- If swash plate angle α becomes larger, the difference in volumes **E** and **F** becomes larger and discharge volume **Q** increases.
- Swash plate angle α is changed by servo piston (12).
- Servo piston (12) moves in a reciprocal movement ($\leftrightarrow$) according to the command from the control valve.
- This straight line movement is transmitted through rod (15) to rocker cam (4), and rocker cam (4), which is supported by the cylindrical surface to cradle (2), moves in a rocking movement on the cylindrical surface in ($\updownarrow$ direction).
- With servo piston (12), the area receiving the pressure is different on the left and right, so main pump discharge pressure (self pressure) **PP** is always connected to the chamber receiving the pressure on the small diameter piston side (the self-pressure is brought in). Output pressure **Pen** of the LS valve is brought to the chamber receiving the pressure at the large diameter piston end. The relationship in the size of self-pressure **PP** and the pressure at the small diameter piston end, and the ratio between the area receiving the pressure at the small diameter piston end and the large diameter piston end controls the movement of servo piston (12).



2) When load on actuator is small and pump discharge pressure is high

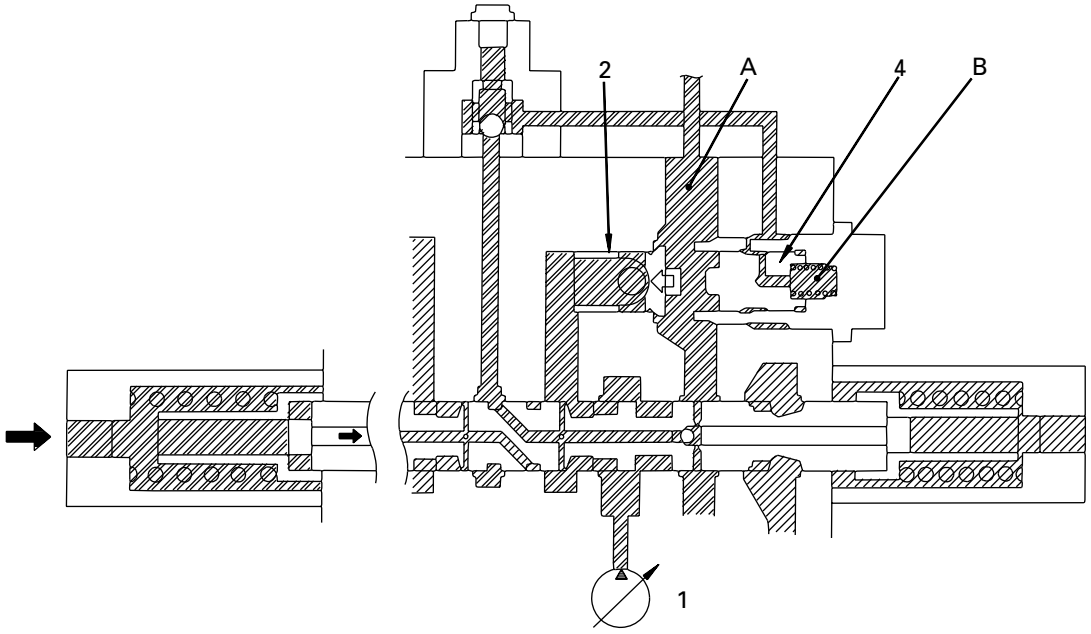
- When the load is large and pump discharge pressures **Pa1** and **Pa2** are high, the force pushing piston (2) to the left becomes larger and piston (2) moves to the position shown in the diagram above. When this happens, as shown in the diagram above, with the pressurized oil flowing from port **c** to the LS valve, part of the pressurized oil from port **b** flows out to port **d** and becomes approximately 2/5 of main pump pressure **Pa1**.
- When port **h** and port **e** of the LS valve are connected (see 1. LS valve), the pressure from port **f** enters the large piston diameter end of servo piston (9), and servo piston (9) stops.
- If main pump pressures **Pa1** and **Pa2** increase further and piston (2) moves further to the left, main pump pressure **Pa1** flows to port **c** and acts to make the discharge amount the minimum. When piston (9) moves to the left, piston (5) is moved to the right by cam (7) and lever (6). For this reason, springs (3) and (4) are compressed and push back piston (2). Because of this force, piston (2) cuts off the connection from port **b** to port **c**, and port **c** and port **d** are connected. As a result, the pressure at port **c** (= **f**) drops, and piston (9) stops moving to the left. The position in which piston (9) stops when this happens is further to the left than the position when main pump pressures **Pa1** and **Pa2** are low.

SELF-REDUCING PRESSURE VALVE



P1 : From front pump
T : To hydraulic tank
PC : —
PR : Supply to electromagnetic valve, PPC valve, solenoid valve

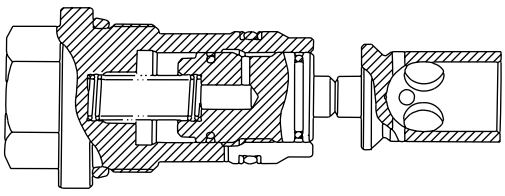
1A. Main relief valve (bucket group)
Set pressure: 34.8 ± 0.5 MPa {355 ± 5 kg/cm^2}
1B. Main relief valve (arm group)
Set pressure: 34.8 ± 0.5 MPa {355 ± 5 kg/cm^2}
2A. Unload valve (bucket group)
Clutch pressure: 2.9 ± 0.2 MPa {30 ± 2 kg/cm^2}
2B. Unload valve (arm group)
Clutch pressure: 2.9 ± 0.2 MPa {30 ± 2 kg/cm^2}
3. Pressure compensation valve
4A. Safety-suction valve
Set pressure: 28.4 ± 0.5 MPa {290 ± 5 kg/cm^2}
4B. Safety-suction valve
Set pressure: 35.8 ± 0.5 MPa {365 ± 5 kg/cm^2}
5. Safety-suction valve (for large flow)
Set pressure: 35.8 ± 0.5 MPa {365 ± 5 kg/cm^2}
6. Bucket spool
7. LS shuttle valve
8. R.H. travel spool
9. Suction valve
10. Boom Lo spool
11. Check valve (for boom regeneration circuit)
12. Swing spool
13. L.H. travel spool
14. Arm Lo spool
15. Check valve (for arm regeneration circuit)
16. Boom Hi spool
17. Arm Hi spool
18. LS select valve
19. Merge/flow divider valve



SLP00215

< For travel>

- No holding pressure is generated at port **A** in the travel circuit, so a pressure compensation valve without a shuttle valve is used.



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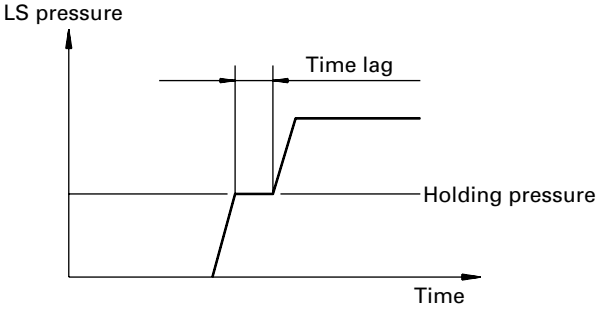
Reference: When there is no shuttle valve

- If there is no shuttle valve, piston (4) and valve (2) will separate. In this condition, if another actuator is operated, the piston acts as an accumulator, so there is a time lag.



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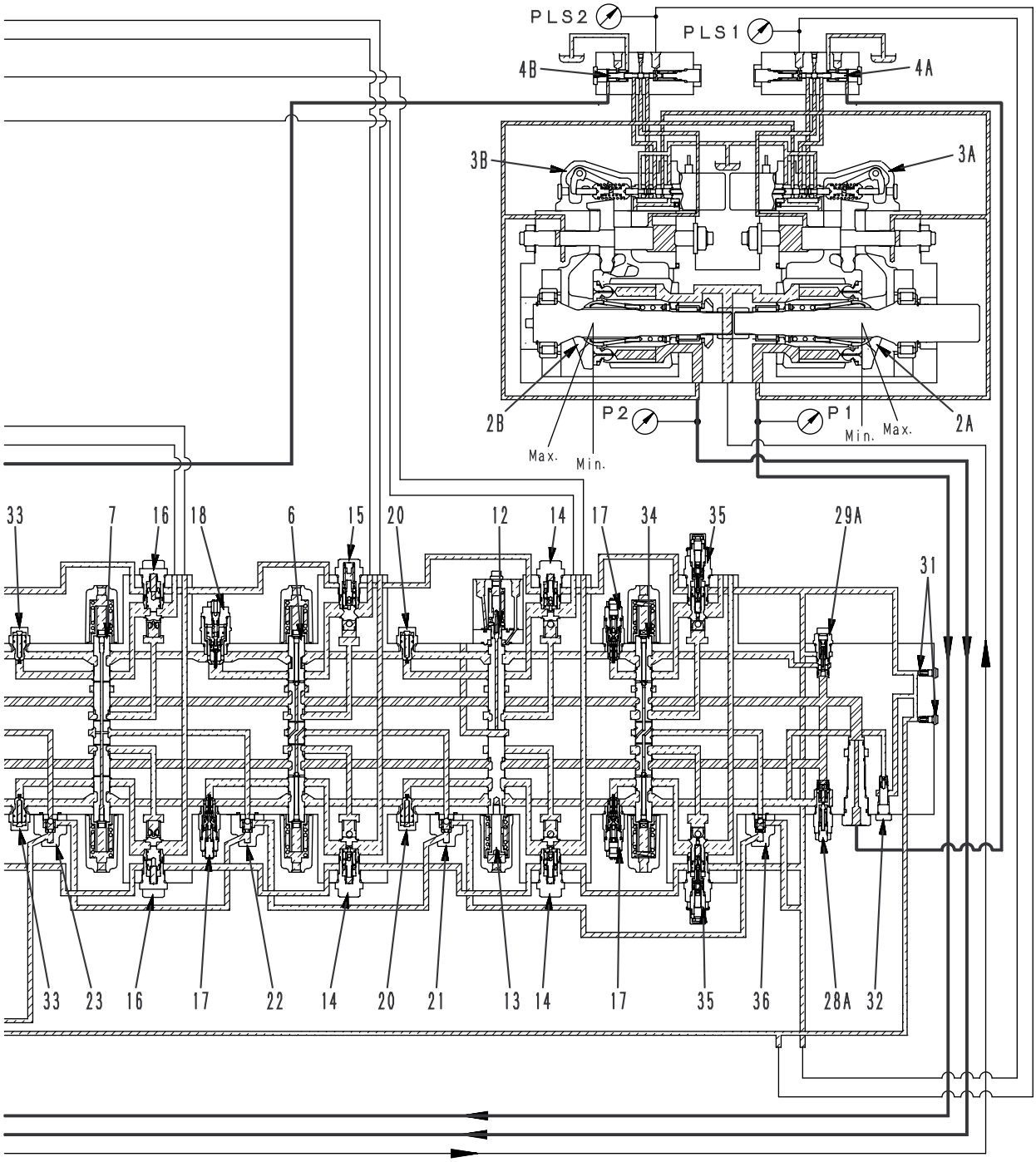
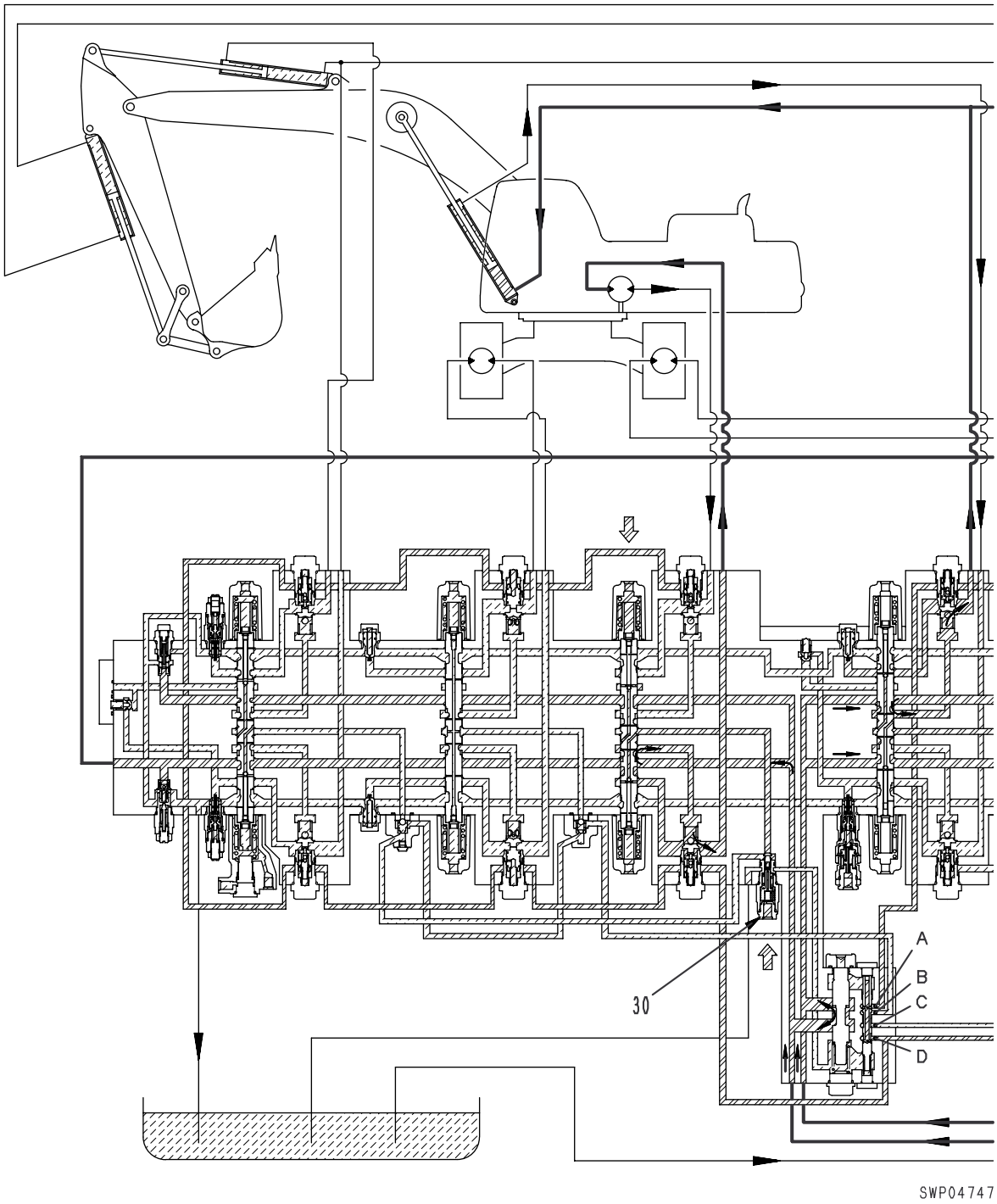

PLS2
PLS1
4B
4A
3B
3A
2B
P2
P1
2A
Max.
Min.
Min.
Max.
33
7
16
18
6
15
20
12
14
17
34
35
29A
31
33
23
16
17
22
14
20
21
13
14
17
35
36
28A
32

SWP04734

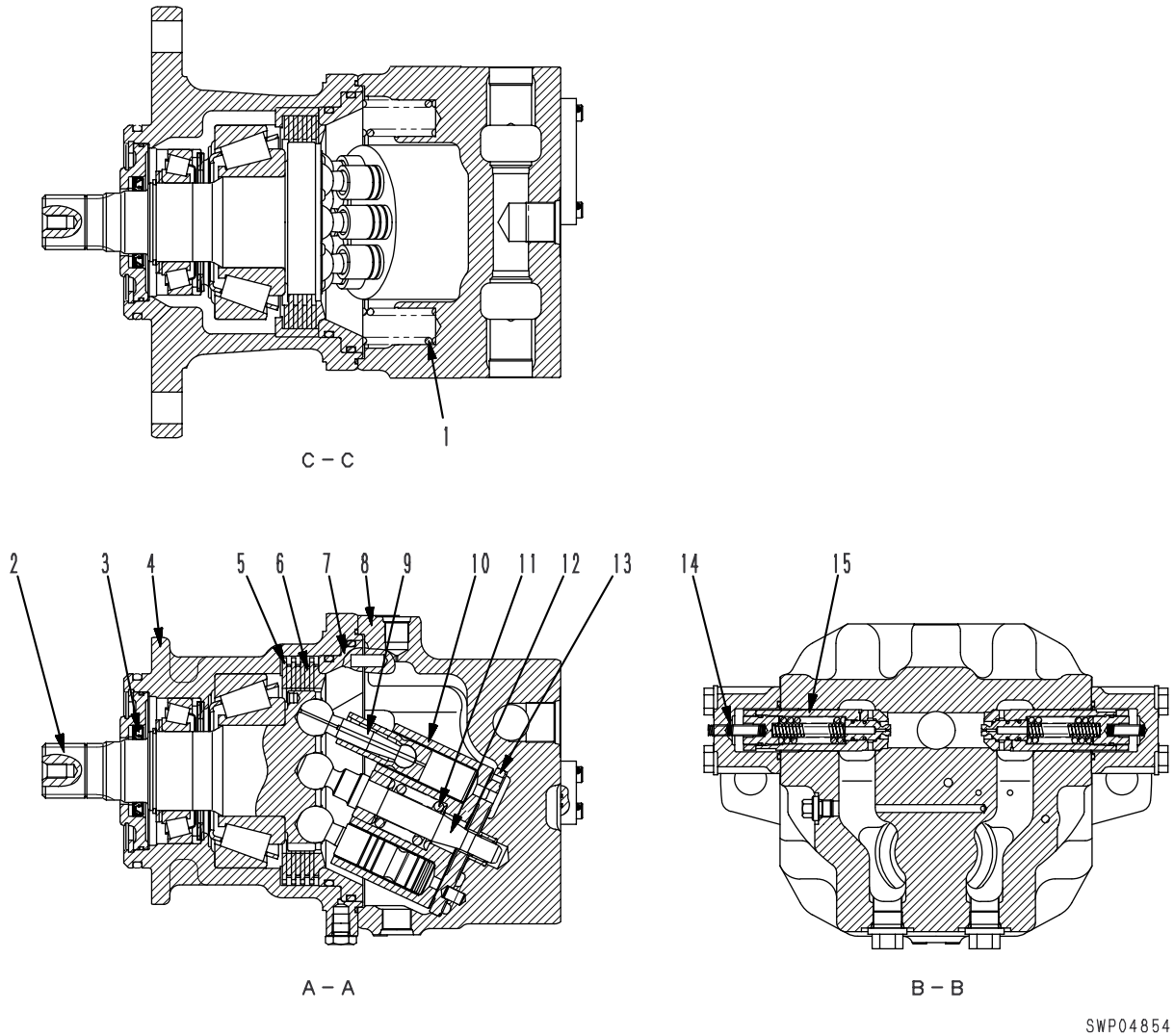
Operation (When pump flow merged, arm IN operated independently)

- When the arm IN is operated, unload valves (29A, 29B) are closed.
- The swash plate of the main pump is controlled (LS control) to match the total area of the meter-in opening of arm Lo spool (11) and arm Hi spool (13).
  (∆**PLS** = pump LS control pressure)
- When the spool meter-in opening comes near the maximum, both pumps are at the maximum swash plate angle.
  (When the pump discharge is the maximum, the maximum area of opening of the spool is also large, so the LS differential pressure is smaller than the LS control pressure and the swash plate angle is always at the maximum.)
  (∆**PLS** < pump LS control pressure)

When pump flow merged, swing + boom RAISE operated simultaneously



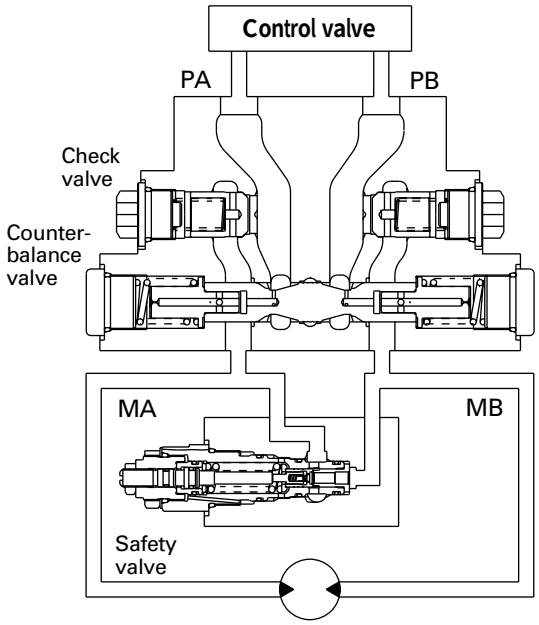
Connection of ports when pump flow is merged
Connected ports: A – D, B – C



1. Spring
2. Output shaft
3. Oil seal
4. Case
5. Plate
6. Disc
7. Brake piston
8. Housing
9. Piston assembly
10. Cylinder block
11. Spring
12. Center shaft
13. Valve plate
14. Suction valve spring
15. Suction-safety valve

Operation of brake valve

- The brake valve consists of a check valve, counterbalance valve, and safety valve in a circuit as shown in the diagram on the right. (Fig. 1)
- The function and operation of each component is as given below.



(Fig. 1)

SAP00262

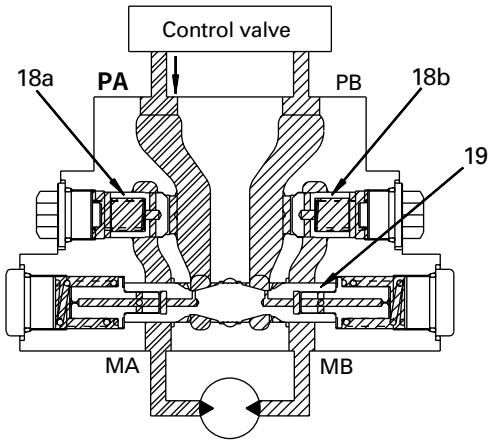
1) Counterbalance valve, check valve

Function

- When traveling downhill, the weight of the machine makes it try to travel faster than the speed of the motor.
  As a result, if the machine travels with the engine at low speed, the motor will rotate without load and the machine will run away, which is extremely dangerous.
  To prevent this, these valves act to make the machine travel according to the engine speed (pump discharge amount).

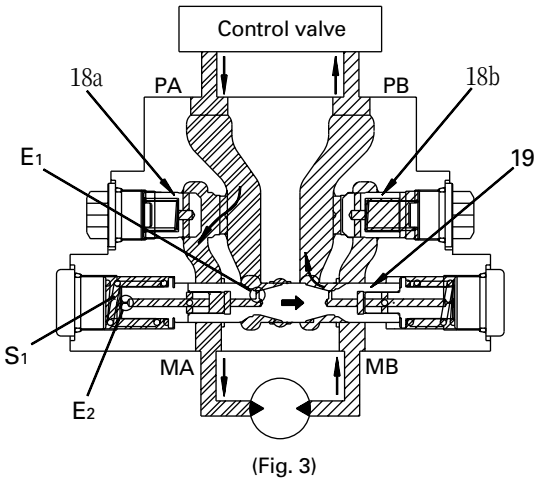
Operation when pressurized oil is supplied

- When the travel lever is operated, the pressurized oil from the control valve is supplied to port **PA**. It pushes open check valve (18a) and flows from motor inlet port **MA** to motor outlet port **MB**.
  However, the motor outlet port is closed by check valve (18b) and spool (19), so the pressure at the supply side rises. (Fig. 2).
- The pressurized oil at the supply side flows from orifice **E1** in spool (19) and orifice **E2** in the piston to chamber **S1**. When the pressure in chamber **S1** goes above the spool switching pressure, spool (19) is pushed to the right. As a result, port **MB** and port **PB** are connected, the outlet port side of the motor is opened, and the motor starts to rotate. (Fig. 3).



(Fig. 2)

SAP00263



(Fig. 3)

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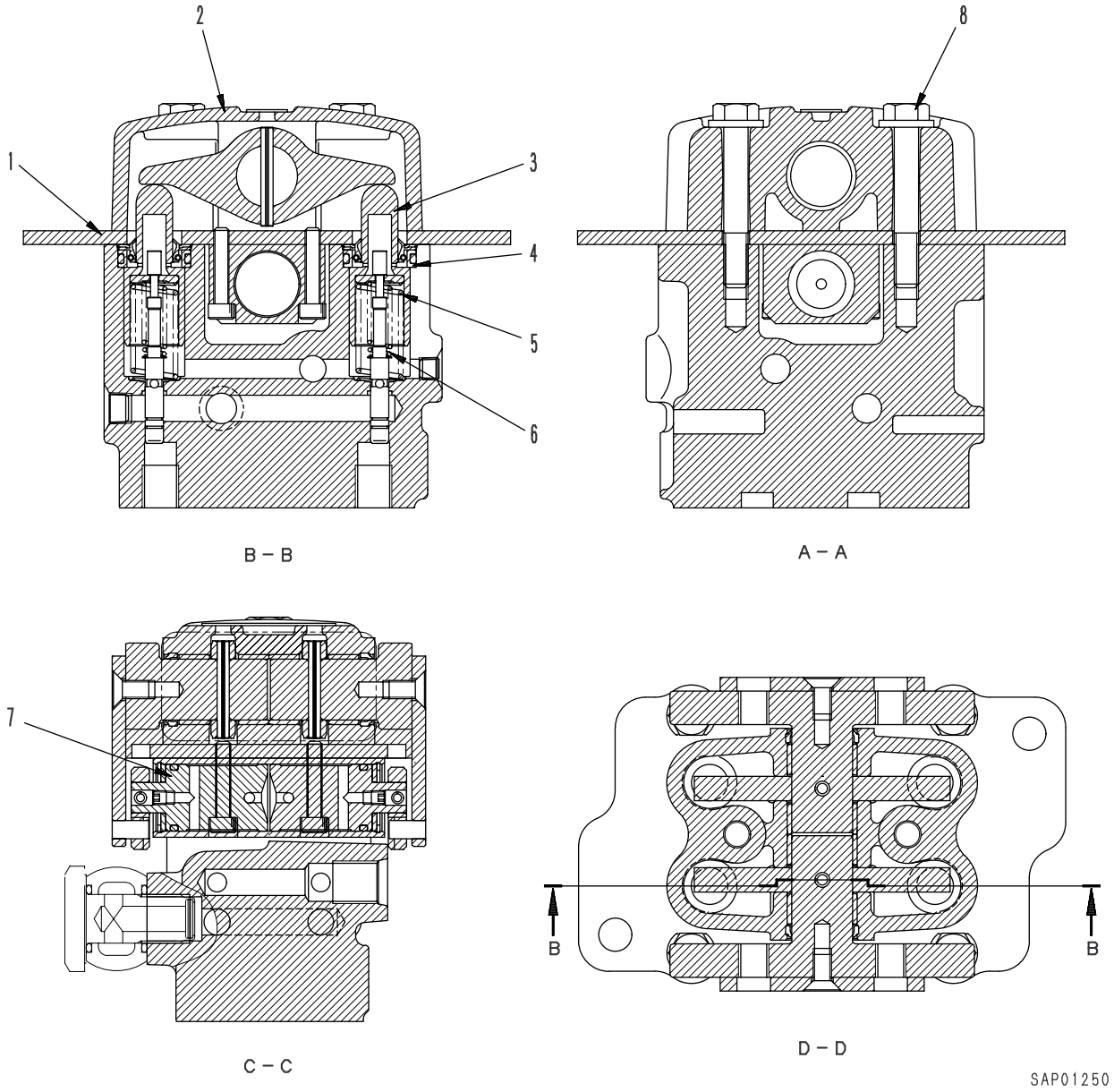
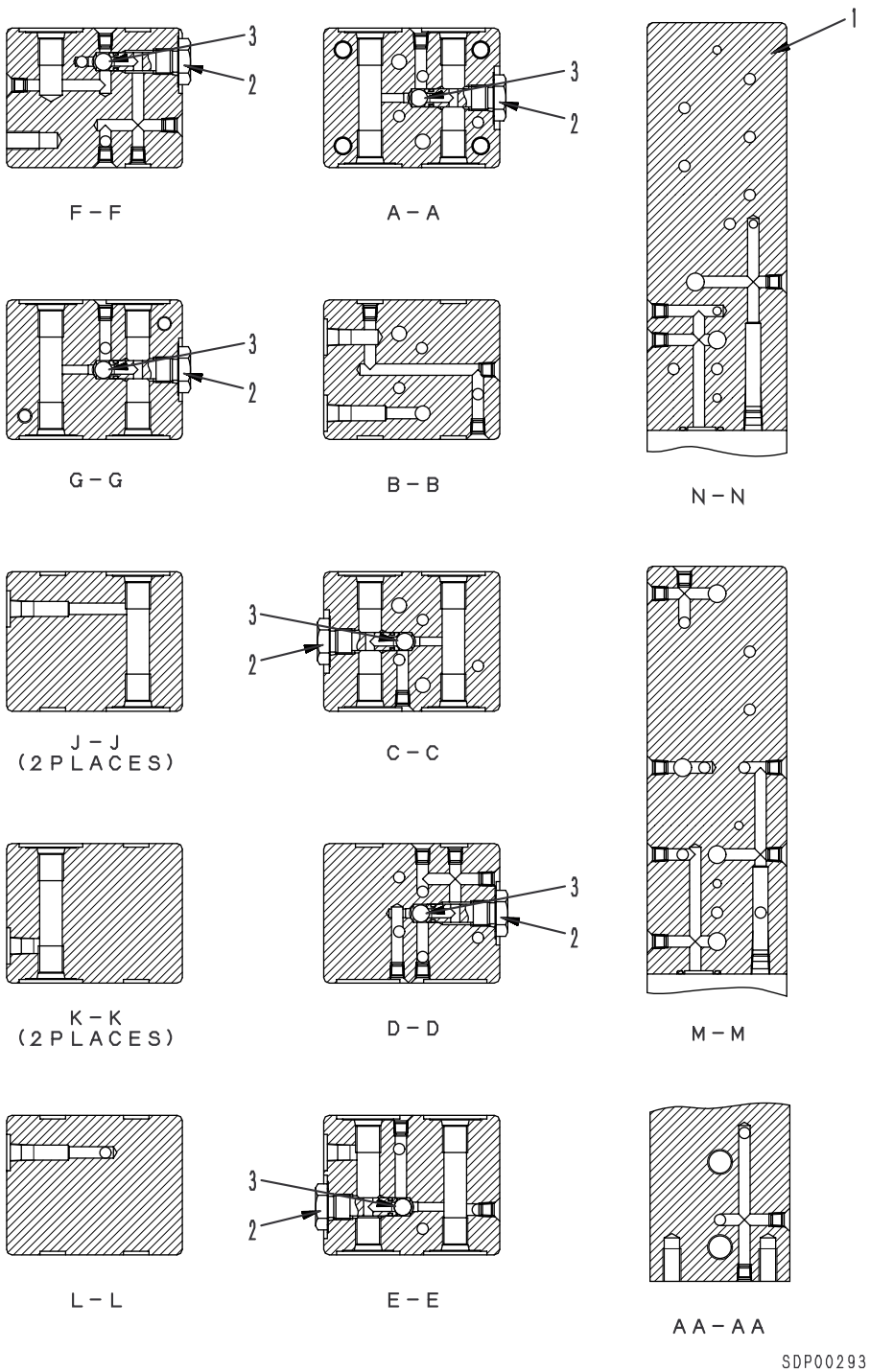


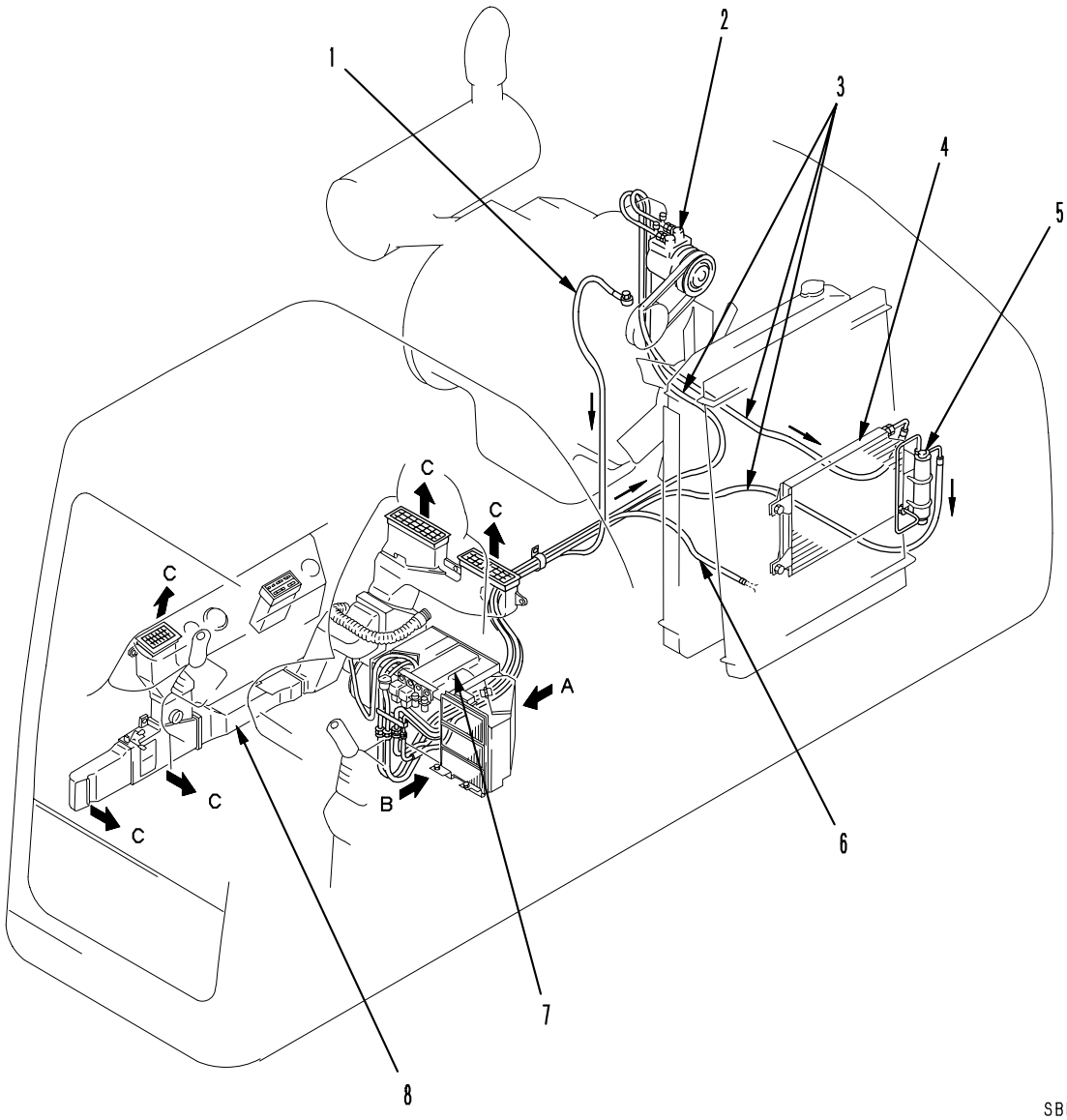
1. Plate
2. Body
3. Piston
4. Collar
5. Metering spring
6. Centering spring
7. Valve
8. Bolt



1. Body
2. Plug
3. Ball

AIR CONDITIONER

AIR CONDITIONER PIPING

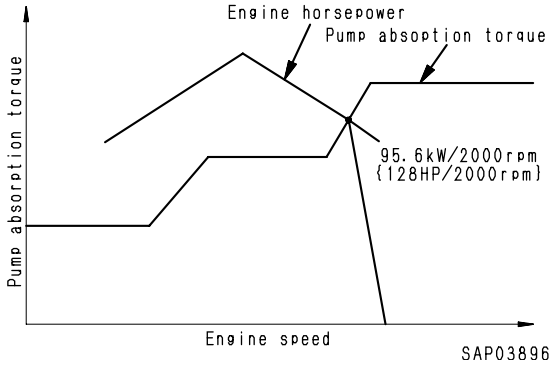


1. Hot water pickup piping
2. Air conditioner compressor
3. Refrigerant piping
4. Condenser
5. Receiver tank
6. Hot water return piping
7. Air conditioner unit
8. Duct

A: Fresh air
B: Recirculated air
C: Hot air/cold air

Function

- The pump controller sets the pump absorption torque to match the engine speed.
- When the engine is running at high speed, it raises the pump absorption torque to boost the productivity. When the engine is running at low speed, it throttles the pump absorption torque to prevent the engine from stalling.



STANDARD VALUE TABLE FOR ENGINE RELATED PARTS

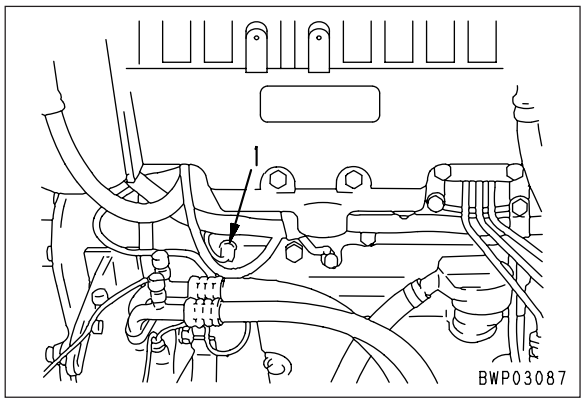
Applicable model				PC400, 400LC-6 EXCEL	
Engine				SA6D125E-2	
Item	Measurement conditions		Unit	Standard value for new machine	Service limit value
Engine speed	High idling		rpm	2,150 ± 70	2,150 ± 50
	Low idling			700 $^{+90}_{-10}$	850 $^{+90}_{-10}$
	Rated speed			1,950	—
Air supply pressure (boost pressure)	At rated speed		kPa {mmHg}	Min. 107 {Min. 800}	Min. 107 {Min. 800}
Exhaust gas color	At sudden acceleration		Bosch index	Max. 5.5	7.5
	At high idling			Max. 1.0	2.0
Valve clearance (normal temperaure)	Intake valve		mm	0.33	—
	Exhaust valve			0.71	—
Compression pressure (SAE oil)	Oil temperature: 40 – 60°C Engine speed: 200 – 250rpm		MPa {kg/cm^2}	Min. 2.9 {30}	2.0 {20}
Blowby pressure (SAE oil)	(Water temperature: Operating range) At rated output		kPa {mmH$_2$O}	Max. 0.98 {Max. 100}	1.96 {200}
Oil pressure	(Water temperature: Operating range)		kPa {kg/cm^2}		
	At high idling (SAE30)			294 – 490 {3.0 – 5.0}	207 {2.1}
	At high idling (SAE10W)			245 – 441 {2.5 – 4.5}	176 {1.8}
	At low idling (SAE30)			Min. 118 {Min. 1.2}	69 {0.7}
	At low idling (SAE10W)			Min. 98 {Min. 1.0}	0.07 {0.7}
Oil temperature	Whole speed range (inside oil pan)		°C	80 – 120	120
Fuel injection timing	Before top dead center		° (degree)	16 ± 1	16 ± 1
Belt tension	Deflection when pressed with finger force of approx. 58.8N {6 kg}	Fan pulley - alternator	mm	8	6 – 10
		Crankshaft pulley - air conditioner compressor		15 – 18	15 – 18

System	Name of component		Connector No.	Inspection method	Judgement table	Measurement conditions
Control system	Pump regulator	Power supply voltage	C01 C02	Measure voltage	If the condition is as shown in the table below, it is normal Between (1) – (8): 20 – 30 V	1) Turn starting switch ON. 2) Insert T–adapter.
		TVC solenoid	C01 C02	Measure current	If the condition is as shown in the table below, it is normal Between (7) and (13): 150 ± 60 mA	1) Turn starting switch ON. 2) Set fuel control lever to FULL. 3) Turn pump prolix switch OFF. 4) Place all levers at neutral.
		Machine selection	C01 C02	Continuity	If the condition is as shown in the table below, it is normal Between (5), (6) and (10): Continuity	1) Turn starting switch OFF. 2) Disconnect connector. 3) Connect T–adapter to wiring harness end.
		Kerosene mode	C01 C02	Continuity	If the condition is as shown in the table below, it is normal In normal mode: Between (11) – (10): No continuity In kerosene mode: Between (11) – (10): Continuity	1) Turn starting switch OFF. 2) Disconnect connector. 3) Connect T-adapter to wiring harness end.
Machine monitor system	Alternator		Between alternator terminal R and chassis	Measure voltage	When engine is running (half throttle or above) →27.5 – 29.5 V ★ If the battery is old, or after starting in cold areas, the voltage may not rise for some time.	1) Start engine.
	Water temperature sensor		P07 (male)	Measure resistance	If the condition is as shown in the table below, it is normal Normal temperature (25°C): Approx. 37 – 50 kΩ 100°C: Approx. 3.5 – 4.0 kΩ	1) Turn starting switch OFF. 2) Disconnect connector P07. 3) Insert T–adapter into connector at sensor end.
	Engine oil pressure switch		Terminal	Measure resistance	If the condition is as shown in the table below, it is normal Engine oil pressure above 70 kPa (0.7 kg/cm²): Min. 1 MΩ Engine oil pressure below 30 kPa (0.3 kg/cm²): Max. 1 Ω	1) Install oil pressure measuring gauge. 2) Remove wiring harness terminal. 3) Start engine. 4) Put tester in contact between sensor terminal screw and chassis.

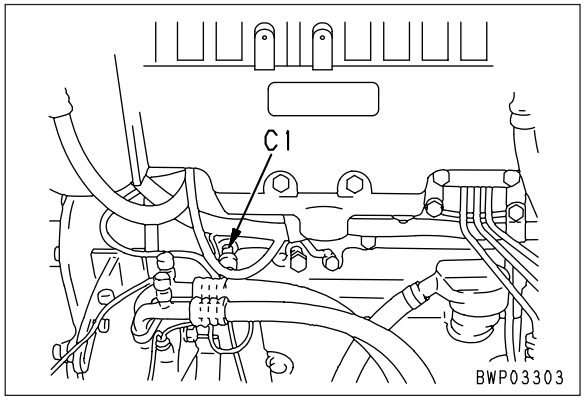
MEASURING ENGINE OIL PRESSURE

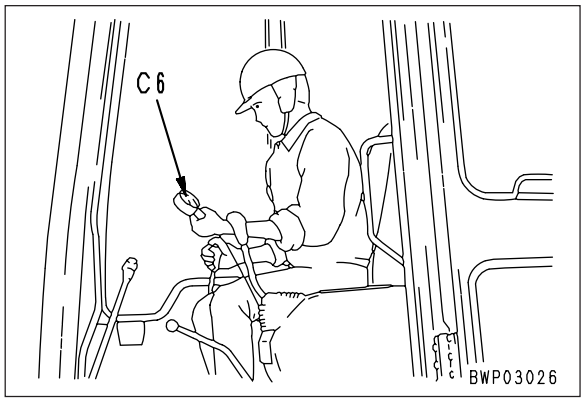
★ Measure the engine oil pressure under the following conditions.
- Water temperature: Within operating range

1. Remove engine oil pressure switch (1), then install the nipple **C1** and oil pressure gauge **C6** (1.0 MPa {10 kg/cm^2}).



2. Start the engine, and measure the oil pressure with the engine at low idling and at high idling.



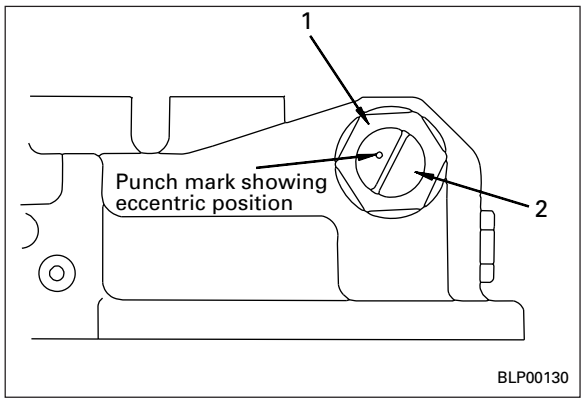


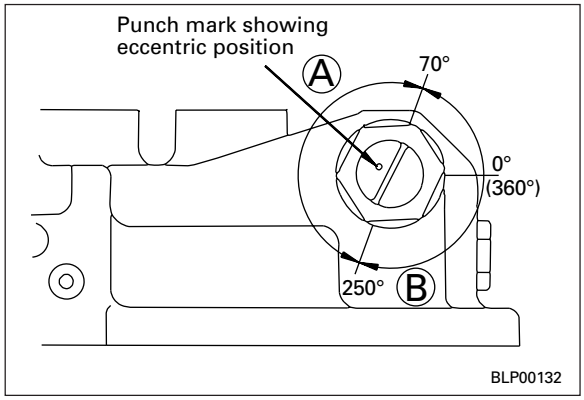
Adjusting

★ If the load becomes larger, the engine speed will drop. Or if the engine speed remains normal, the work equipment speed will drop. In such cases, if the pump discharge pressure and LS differential pressure are normal, adjust the TVC valve as follows.

1. Loosen locknut (1), and turn screw (2) to adjust.
- ★ The direction to turn differs according to the position of the eccentric position punch mark on the screw, so check the mark before turning.
- ★ Turn the screw as follows.
  - If work equipment is slow, turn in INCREASE direction
  - If engine speed drops, turn in DECREASE direction.

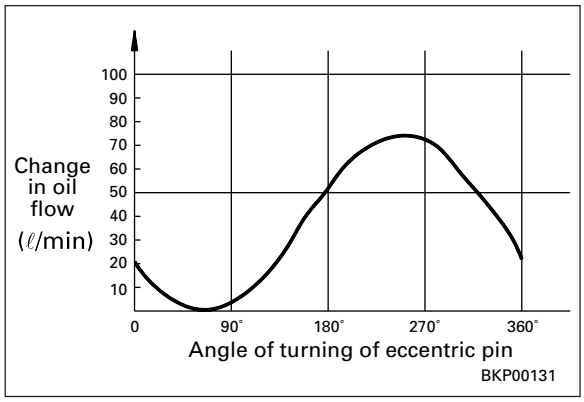
Punch mark	Increase	Decrease
Range Ⓐ	Within 90° in counterclockwise direction	Within 90° in clockwise direction
Range Ⓑ	Within 90° in clockwise direction	Within 90° in counterclockwise direction





2. After completing the adjustment, tighten locknut (1).
kgm Locknut : **24.5 – 34.3 Nm {2.5 – 3.5 kgm}**

Note: The screw is an eccentric cam, so if it is turned from the 0 position in the graph, the stroke of the servo piston (change in oil flow) will move as shown in the graph.
If it is turned one full turn, it will return to the original position, but the screw will become looser, so there will be play in the screw.
Therefore, turn the screw a maximum of 90° to the left or right from the position set when the machine was shipped.



TESTING LOCATIONS CAUSING HYDRAULIC DRIFT OF WORK EQUIPMENT

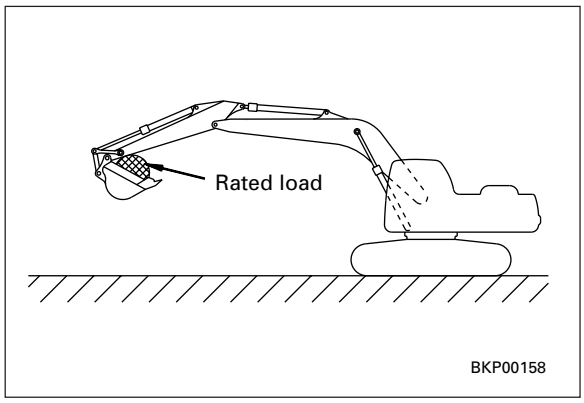
★ If there is any hydraulic drift in the work equipment (cylinders), check as follows to determine if the cause is in the cylinder packing or in the control valve.

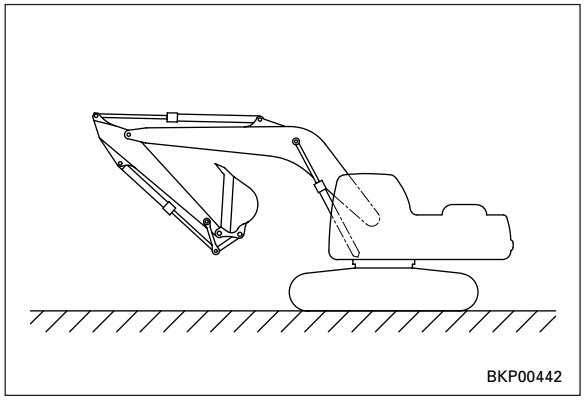
1. Checking for defective cylinder packing

1) Checking boom and bucket cylinders
   i) Set in the same posture as when measuring hydraulic drift, and stop the engine. (See standard values for chassis related parts.)
   ii) Operate the boom control lever to RAISE or the bucket control lever to CURL.
      • If the lowering speed increases, the packing is defective.
      • If there is no change, the boom lock valve (boom) or the control valve (bucket) is defective.
2) Checking arm cylinder
   i) Operate the arm cylinder to move the arm in fully, then stop the engine.
   ii) Operate the control lever to arm IN.
      • If the lowering speed increases, the packing is defective.
      • If there is no change, the control valve is defective.
      ★ If the pressure in the accumulator has dropped, run the engine for approx. 10 seconds to charge the accumulator again before operating.

[Reference] If the cause of the hydraulic drift is in the packing, and the above operation is carried out, the downward movement becomes faster for the following reasons.

1) If the work equipment is set to the above posture (holding pressure applied to the bottom end), the oil at the bottom end leaks to the head end. However, the volume at the head end is smaller than the volume at the bottom end by the volume of the rod, so the internal pressure at the head end increases because of the oil flowing in from the bottom end.
2) When the internal pressure at the head end increases, the pressure at the bottom end also rises in proportion to this. The balance is maintained at a certain pressure (this differs according to the amount of leakage) by repeating this procedure.
3) When the pressure is balanced, the downward movement becomes slower. If the lever is then operated according to the procedure given above, the circuit at the head end is opened to the drain circuit (the bottom end is closed by the check valve), so the oil at the head end flows to the drain circuit and the downward movement becomes faster.





TROUBLESHOOTING

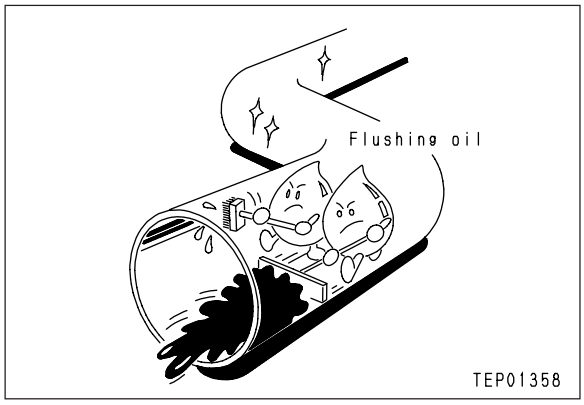
5) Change hydraulic oil when the temperature is high.

When hydraulic oil or other oil is warm, it flows easily. In addition, the sludge can also be drained out easily from the circuit together with the oil, so it is best to change the oil when it is still warm. When changing the oil, as much as possible of the old hydraulic oil must be drained out. (Drain the oil from the hydraulic tank; also drain the oil from the filter and from the drain plug in the circuit.) If any old oil is left, the contaminants and sludge in it will mix with the new oil and will shorten the life of the hydraulic oil.

6) Flushing operations

After disassembling and assembling the equipment, or changing the oil, use flushing oil to remove the contaminants, sludge, and old oil from the hydraulic circuit.

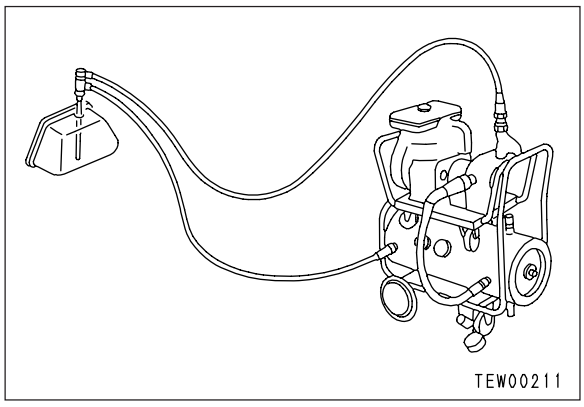
Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.

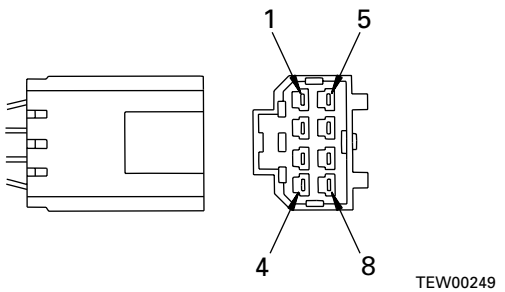
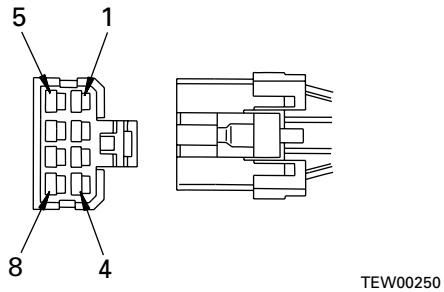
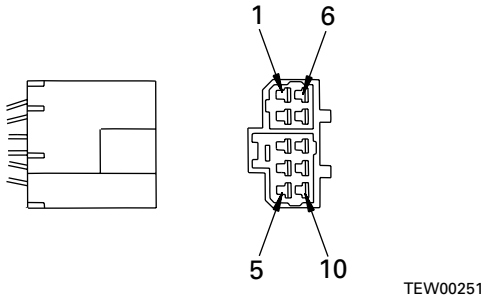
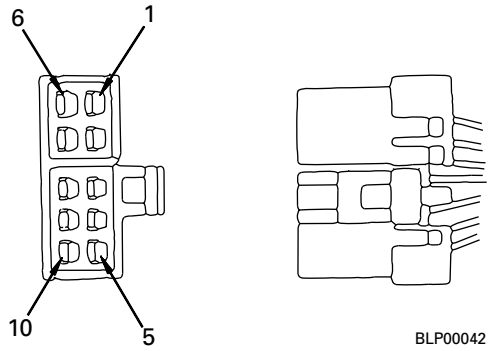
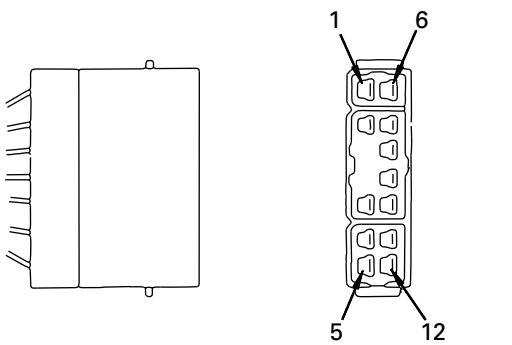
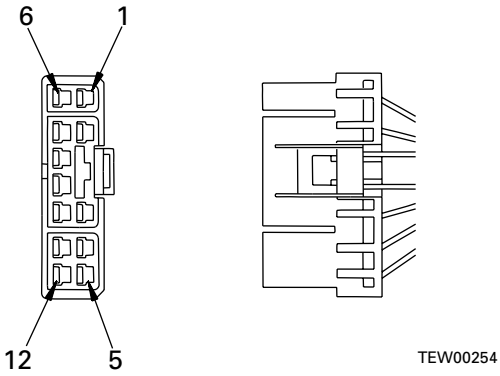
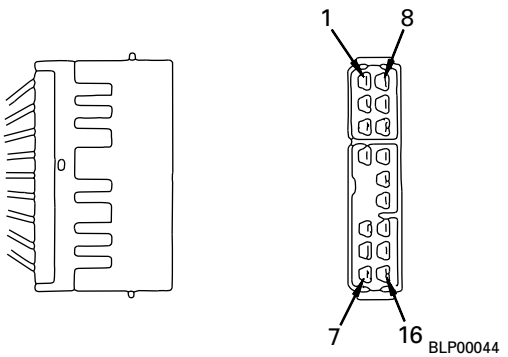
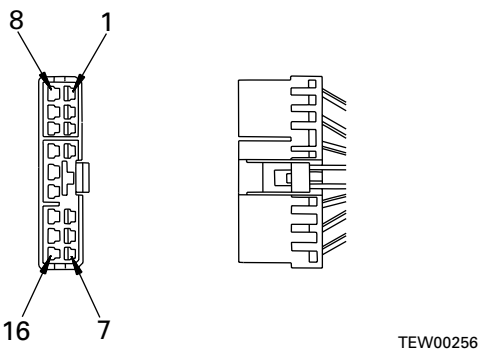


7) Cleaning operations

After repairing the hydraulic equipment (pump, control valve, etc.) or when running the machine, carry out oil cleaning to remove the sludge or contaminants in the hydraulic oil circuit.

The oil cleaning equipment is used to remove the ultrafine (about 3μ) particles that the filter built into the hydraulic equipment cannot remove, so it is an extremely effective device.



No. of pins	S type connector	
	Male (female housing)	Female (male housing)
8	 TEW00249	 TEW00250
10	 TEW00251	 BLP00042
12	 BLP00043	 TEW00254
16	 BLP00044	 TEW00256

METHOD OF USING TROUBLESHOOTING CHARTS

This troubleshooting chart is divided into three sections: **questions, check items, and troubleshooting.** The questions and check items are used to pinpoint high probability causes that can be located from the failure symptoms or simple inspeciton without using troubleshooting tools.

Next, troubleshooting tools or direct inspection are used to check the high probability causes to make final confirmation.

[Questions]

Sections Ⓐ + Ⓑ in the chart on the right corresponds to the items where answers can be obtained from the user. The items in Ⓑ are items that can be obtained from the user, depending on the user's level.

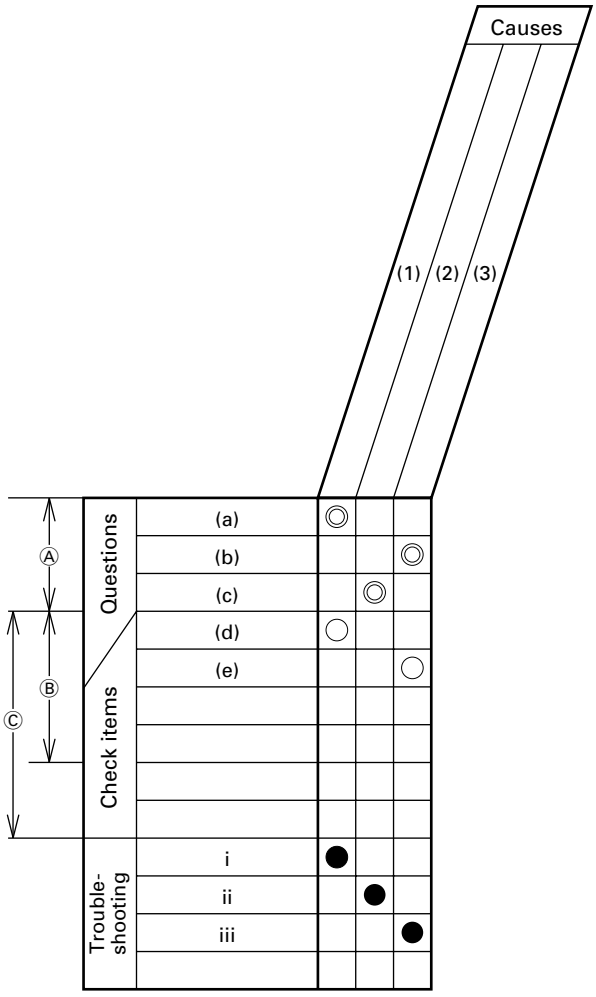
[Check items]

The serviceman carries out simple inspection to narrow down the causes. The items under Ⓒ in the chart on the right correspond to this.

The serviceman narrows down the causes from information Ⓐ that he has obtained from the user and the results of Ⓒ that he has obtained from his own inspection.

[Troubleshooting]

Troubleshooting is carried out in the order of probability, starting with the causes that have been marked as having the highest probability from information gained from **[Questions]** and **[Check items]**.



S-5 Engine does not rotate smoothly (hunting)

★ General causes why engine does not rotate smoothly
- Air in fuel system
- Defective governor mechanism

Legend
◯ : Possible causes (judging from Questions and check items)
◎ : Most probable causes (judging from Questions and Check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

			Causes: Defective operation of governor	Defective adjustment of governor	Defective operation of control rack	Low idling speed is too low	Clogged feed pump strainer	Clogged fuel filter, strainer	Clogged, air in circuit between fuel tank and feed pump	Clogged, air in circuit between feed pump and nozzle	Clogged air breather hole in fuel tank cap
Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period					△	△			
	Condition of hunting	Occurs at a certain speed range	◎	◎	◎	◯					
		Occurs at low idling	◯			◎	◯	◯	◯	◯	
		Occurs even when speed is raised	◯	◯	◯						◯
	Replacement of filters has not been carried out according to Operation Manual						◎	◎			
Check items	Rust, water are found when fuel tank is drained						◯	◯			
	Leakage from fuel piping								◎	◎	
	When feed pump is operated,										
	1) No response, light, return is quick								◎	◎	
	2) No response, light, return is normal								◎		
	Engine speed sometimes rises too far		◎	◎							
	Engine is sometimes difficult to stop		◎		◎						
	Seal on injection pump has come off			◎		◎					
Troubleshooting	When governor lever is moved it is found to be stiff		●		●						
	When injection pump is tested, governor is found to be improperly adjusted			●							
	When control rack is pushed, it is found to be heavy, or does not return				●						
	When fuel cap is inspected directly, it is found to be clogged					●					●
	When feed pump strainer is inspected directly, it is found to be clogged						●				
	When fuel filter, strainer are inspected directly, they are found to be clogged							●			
	Remedy		Adjust	Adjust	Adjust	Adjust	Clean	Clean	Correct	Correct	Clean

S-15 Abnormal noise is made

★ Judge if the noise is an internal noise or an external noise.

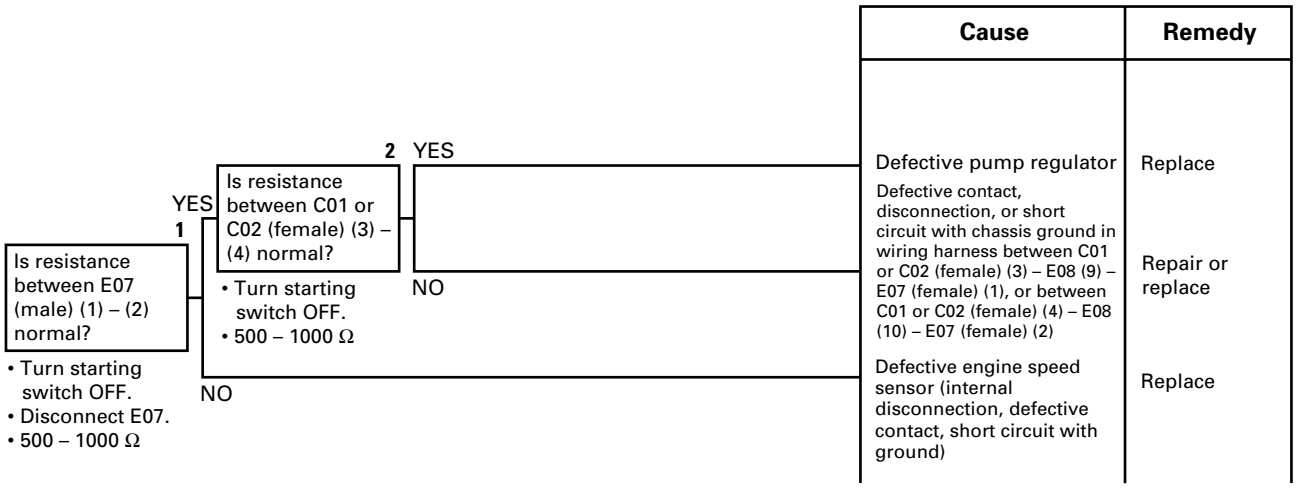
General causes why abnormal noise is made
- Abnormality due to defective parts
- Abnormal combustion
- Air sucked in from intake system

Legend
◯ : Possible causes (judging from Questions and check items)
◎ : Most probable causes (judging from Questions and Check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

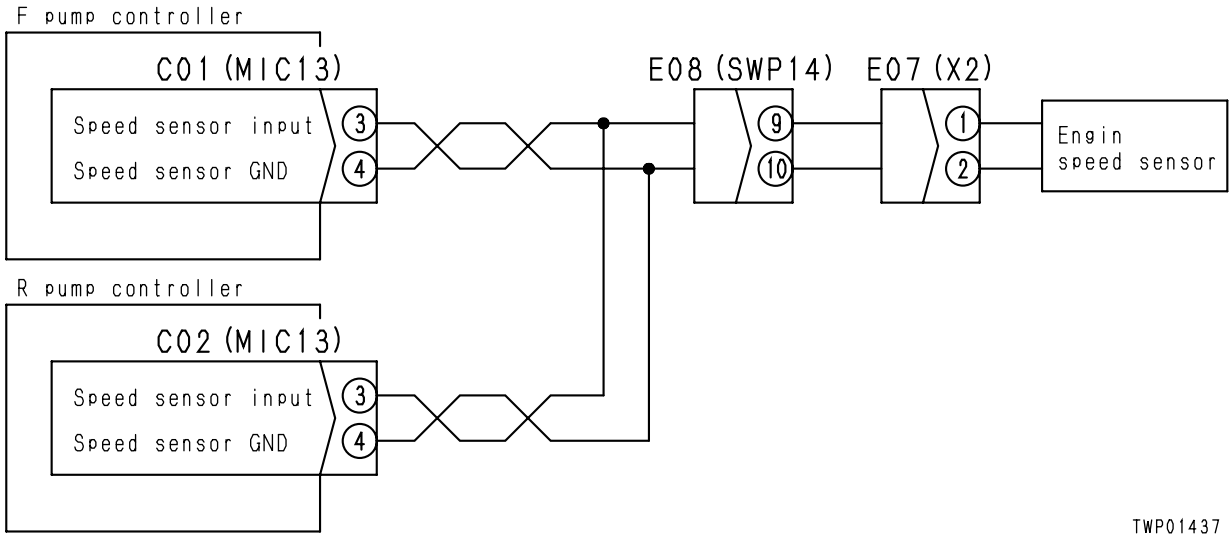
			Causes: Excessive wear of piston ring, cylinder liner	Seized turbocharger, interference	Missing, seized bushing	Clogged, seized injection nozzle	Defective injection pump (rack, plunger seized)	Defective injection pump (excessive injection)	Deformed fan, fan belt interference	Defective adjustment of valve clearance	Broken dynamic valve system (valve, rocker lever, etc.)	Improper gear train backlash	Leakage of air between turbocharger and head	Defect inside muffler (dividing board out of position)
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period	△											
	Condition of abnormal noise	Gradually occurred	◯						◯					
		Suddenly occurred		◯	◯						◯			
	Non-specified fuel is being used					◯	◯							
	Engine oil must be added more frequently		◎											
	Color of exhaust gas	Blue under light load	◎											
		Black		◎						◯			◯	
Check items	Metal particles are found in oil filter		◎		◎									
	Blow-by gas is excessive		◎											
	Noise of interference is heard from around turbocharger			◎										
	Engine pickup is poor and combustion is abnormal					◎								
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	◯							
	Seal on injection pump has come off							◎						
	Abnormal noise is loud when accelerating engine					◯	◯	◯	◯	◯		◯		
	Clanging sound is heard from around cylinder head									◎	◎			
	Leakage of air between turbocharger and head, loose clamp												◎	
	Vibrating noise is heard from around muffler													◎
Troubleshooting	When compression pressure is measured, it is found to be low		●											
	When turbocharger is rotated by hand, it is found to be heavy			●										
	Remove gear cover and inspect directly				●							●		
	Speed does not change when operation of certain cylinders is stopped					●								
	When control rack is pushed, it is found to be heavy, or does not return						●							
	Injection pump test shows that injection amount is incorrect							●						
	Fan is deformed, belt is loose								●					
	When valve clearance is checked, it is found to be outside standard value									●				
	Remove cylinder head cover and inspect directly										●			
	When muffler is removed, abnormal noise disappears													●
	Remedy		Replace	Replace	Replace	Replace	Replace	Adjust	Correct	Adjust	Replace	Replace	Replace	Replace

E-4 Error code display pattern [2-2] (disconnection in engine speed sensor) is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the pump regulator LED stops flashing, the problem has been removed.**
★ **If the starting switch has been turned OFF after the abnormality occurred, turn it ON again and check that the pump regulator LED is flashing. (If it is not flashing but is lighted up, the problem has been removed.)**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



E-4 Related electric circuit diagram



E-9 Abnormality in travel speed solenoid system

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.
★ Check that fuse 2 is normal.

a) Travel speed does not change to Hi (travel speed stays in Lo)
[When travel speed solenoid does not work]

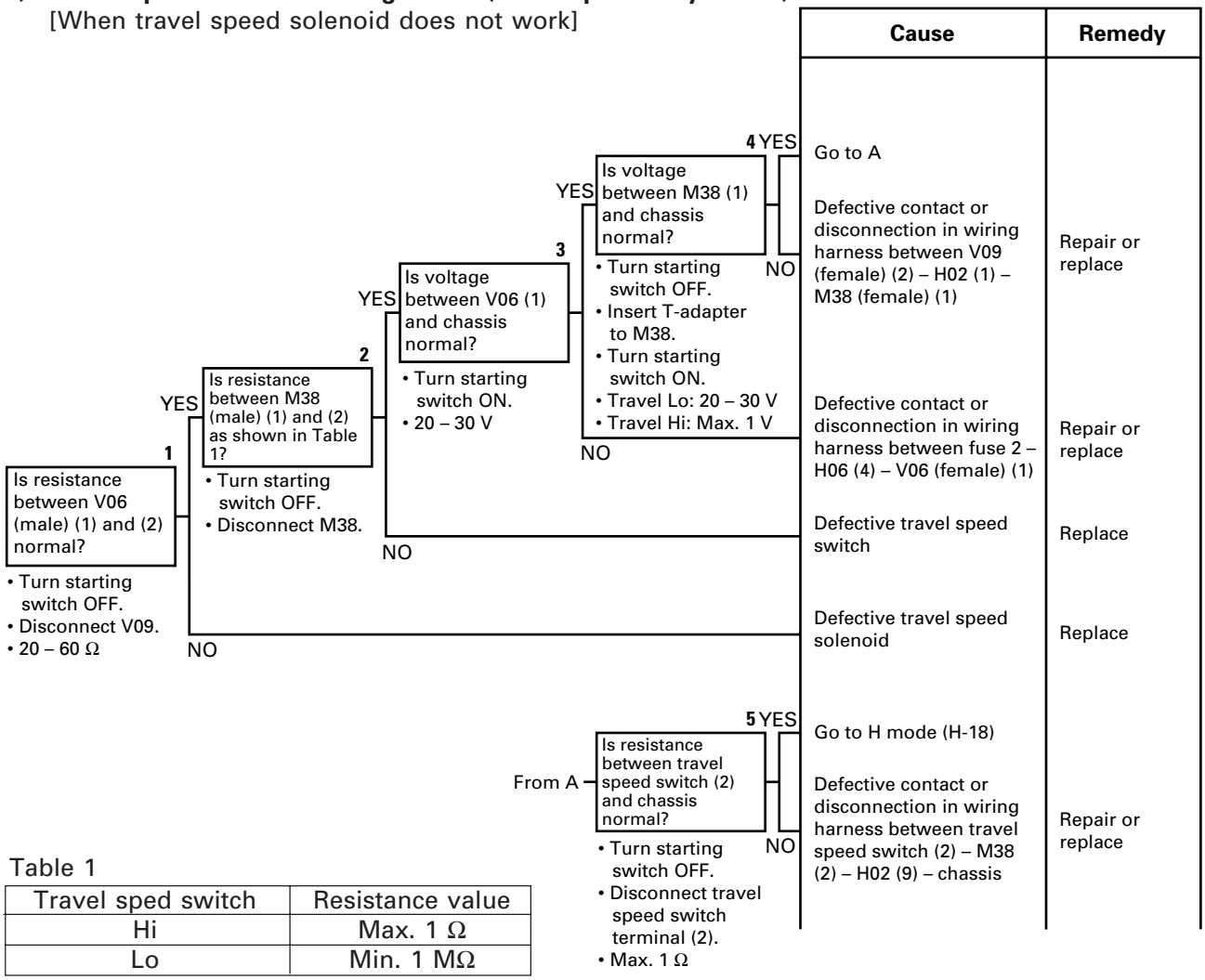
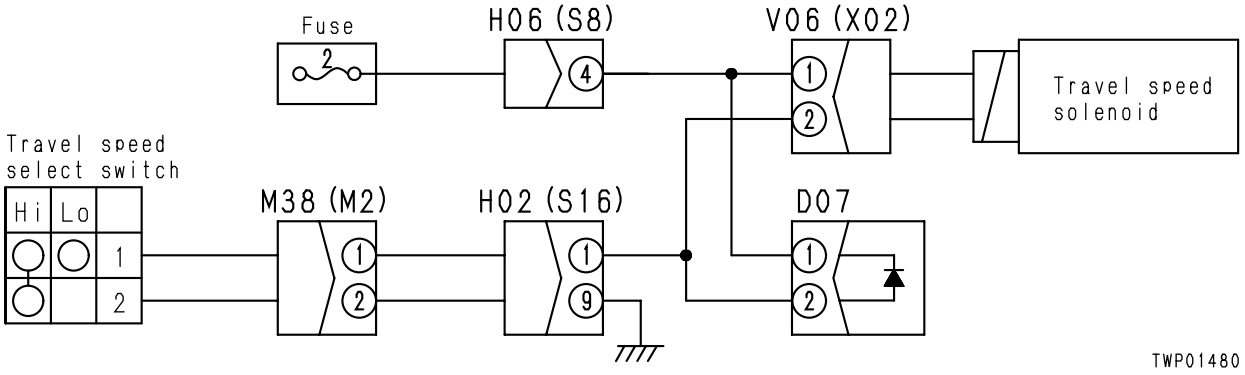


Table 1

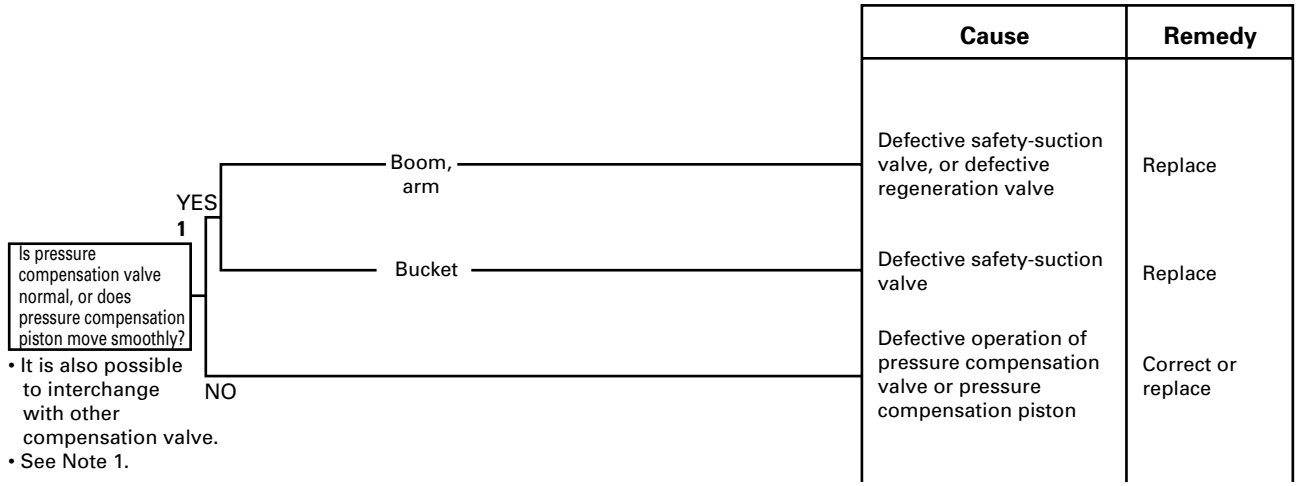
Travel sped switch	Resistance value
Hi	Max. 1 Ω
Lo	Min. 1 MΩ

E-9 a) Related electric circuit diagram



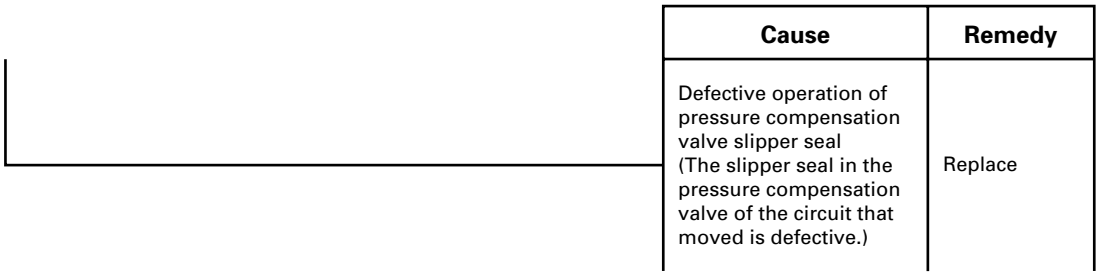
Cause	Remedy
Defective adjustment of TVC valve	Adjust
Defective servo assembly (defective TVC valve)	Repair or replace
Defective piston pump	Repair or replace
Defective servo assembly (defective LS valve)	Repair or replace
Defective piston pump (servo piston)	Repair or replace
Defective operation of main relief assembly (valve which becomes normal when adjusted)	Adjust
Defective operation of unload valve (valve which becomes normal when replaced)	Replace
Defective operation of main relief valve	Replace
Defective hydraulic equipment in self-reducing valve output circuit (See TESTING AND ADJUSTING)	Repair or replace

H-11 Excessive time lag (engine at low idling)



Note 1: After inspection, do not forget to return the interchanged valves to the original position.

H-12 Other equipment moves when single circuit is relieved



H-13 In compound operations, work equipment with larger load is slow

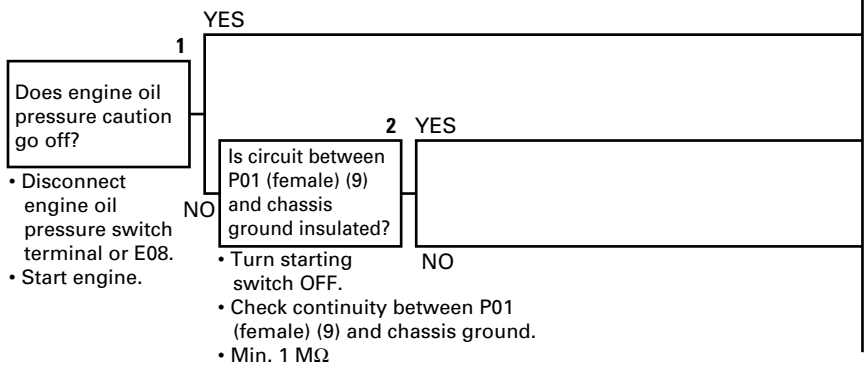
Cause	Remedy
Defective operation of pressure compensation valve	Replace (replace pressure compensation valve on side where load is lower)

	Combination of compound operation	Side where load is larger
1	Boom RAISE + arm IN	Boom RAISE
2	Boom RAISE + arm OUT	Arm OUT
3	Boom RAISE + bucket CURL	Boom RAISE
4	Arm OUT + bucket CURL	Arm OUT
5	Boom LOWER + arm OUT	Arm OUT

Cause	Remedy
Defective swing motor assembly	Replace
Defective operation of LS shuttle valve (all LS shuttles)	Repair or replace
Defective operation of swing motor safety-suction valve	Repair or replace
Defective operation of pressure compensation valve or compensation piston	Repair or replace
Defective operation of control valve spool for swing	Repair or replace
Defective operation of PPC shuttle valve	Repair or replace
Defective PPC valve	Replace

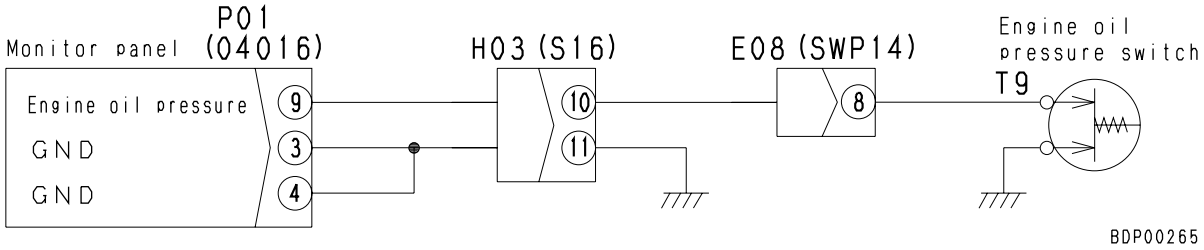
M-8 Engine oil pressure caution lamp lights up when engine is running (engine oil pressure is normal)

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



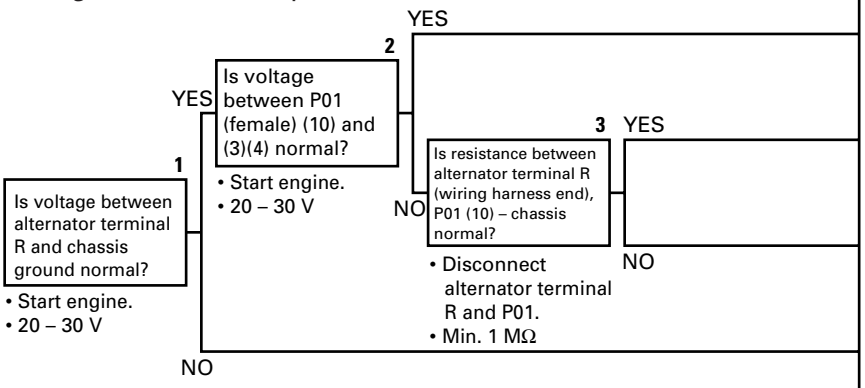
Cause	Remedy
Defective engine oil pressure sensor switch	Replace
Defective monitor panel	Replace
Contact of chassis wiring harness with wiring harness between P01 (female) (9) – H03 (10) – E08 (male) (8)	Repair or replace

M-8 Related electric circuit diagram



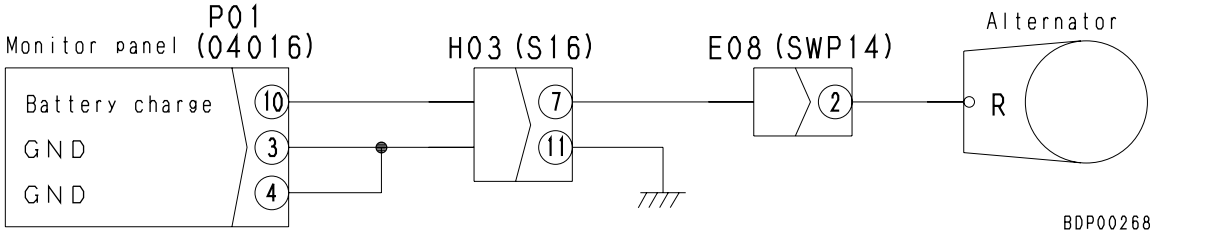
M-9 Charge caution lamp lights up when engine is running

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



Cause	Remedy
Defective monitor panel	Replace
Contact of chassis ground with wiring harness between P01 (female) (10) – H03 (7) – E08 (2) – alternator terminal R	Repair or replace
Defective contact or disconnection in wiring harness between P01 (female) (10) – H03 (7) – E08 (2) – alternator terminal R	Repair or replace
Defective generation of electricity by alternator	Replace

M-9 Related electric circuit diagram

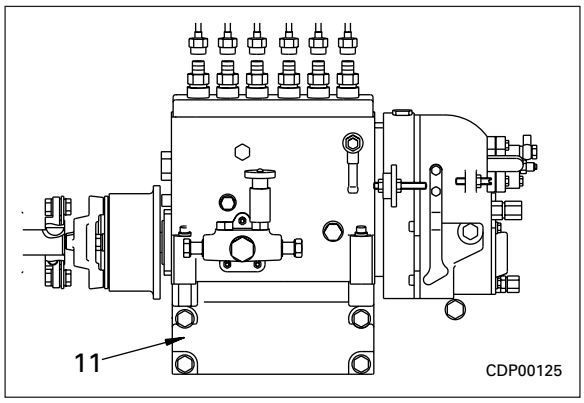


30 DISASSEMBLY AND ASSEMBLY

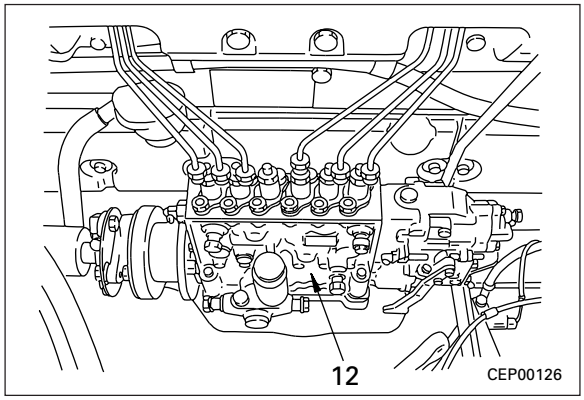
Component	Symbol		Part No.	Part Name	Necessity	Q'ty	New/ remodel	Sketch	Nature of work, remarks	
Hydraulic cylinder assembly	U	4	790-201-1702	Push tool kit		1			Disassembly, assembly	Press fitting of coil bushing
			• 790-201-1861	• Push tool		1				Boom, bucket
			• 790-101-5021	• Grip		1				
			• 01010-50816	• Bolt		1				
			• 790-445-4210	• Push tool		1				Arm (PC400-6)
			• 790-101-5421	• Grip		1				
			• 01010-51240	• Bolt		1				
			• 791-863-1130	• Push tool		1				Arm (PC450-6)
			• 790-101-5221	• Grip		1				
			• 01010-51225	• Bolt		1				
		5	790-201-1500	Push tool kit		1		seal		Installation of dust
			• 790-201-1670	• Plate		1				Boom, bucket
			• 790-101-5021	• Grip		1				
			• 01010-50816	• Bolt		1				
			• 790-201-1970	• Plate		1	N			Arm (PC400-6)
			• 790-201-1680	• Plate		1				Arm (PC450-6)
		6	790-102-4300	Wrench assembly		1				Removal and installation of piston
			790-102-4310	Pin		1				
Work equipment assembly, boom assembly	V		796-670-1100	Remover assembly		1	N		Removal, installation	Removal of boom foot pin
			• 796-670-1110	• Sleeve		1	N			
			• 796-670-1120	• Plate		1	N			
			• 796-670-1130	• Screw		1	N			
			• 791-775-1150	• Adapter		1				
			• 01643-33080	• Washer		1				
			• 01803-13034	• Nut		1				
			790-101-4000	Puller		1				
			790-101-1102	Pump		1				
Components related to air conditioner	X		799-703-1200	Service tool kit		1			Removal, installation	Charging with freon gas (R134a)
			799-703-1100	Vacuum pump (100V)		1				
			799-703-1100	Vacuum pump (220V)		1				
			799-703-1120	Vacuum pump (240V)		1				
			799-703-1400	Gas leak detector		1				

10. Remove engine undercover, then remove bracket (11) from below.

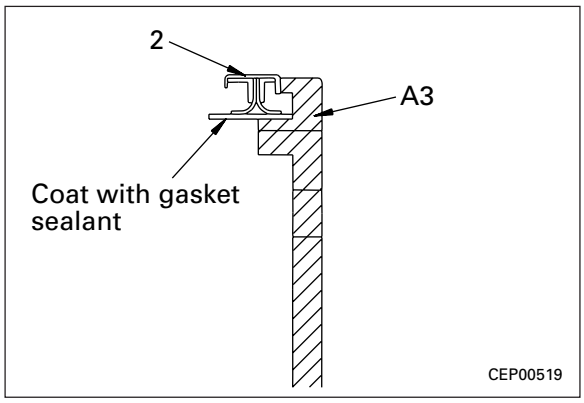
⚠ The bracket is secured by a dowel pin, so be extremely careful to ensure safety and hold it securely by hand to prevent it from falling when it is removed.



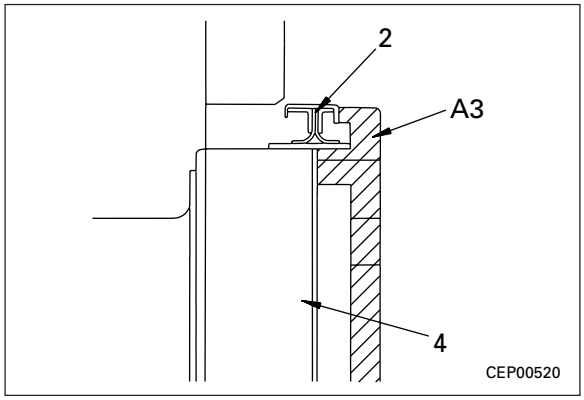
11. Pull out coupling portion slowly from shaft then pull fuel injection pump assembly (12) up to remove.



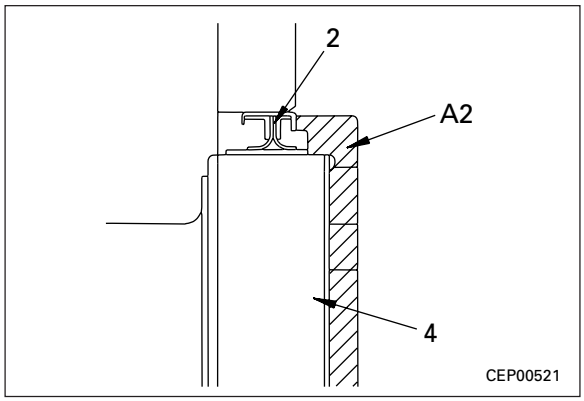
1) Set sleeve/seal (2) to tool **A3**.
   Inside surface of sleeve:
   Gasket sealant (LG-7)



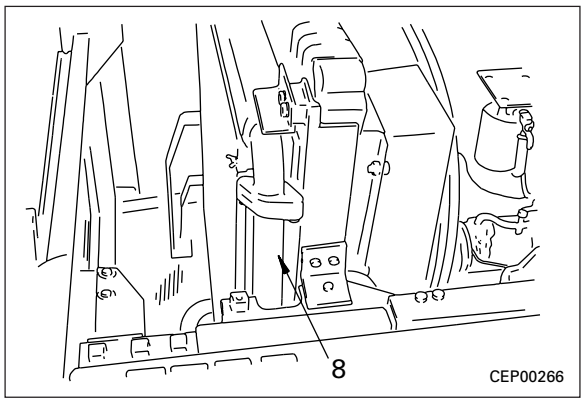
2) Put sleeve of seal in contact with end face of crankshaft, then tighten bolts of tool **A3** uniformly until end face of tool **A3** contacts end face of crankshaft (4) to press fit sleeve/seal (2).



3) Remove tool **A3** and install tool **A2**.
4) Tighten bolts of tool **A2** uniformly until end face of tool **A2** contacts end face of crankshaft (4) to press fit sleeve/seal (2).
   ★ After press fitting the seal, remove all the remains of the red sealant on the outside circumference.

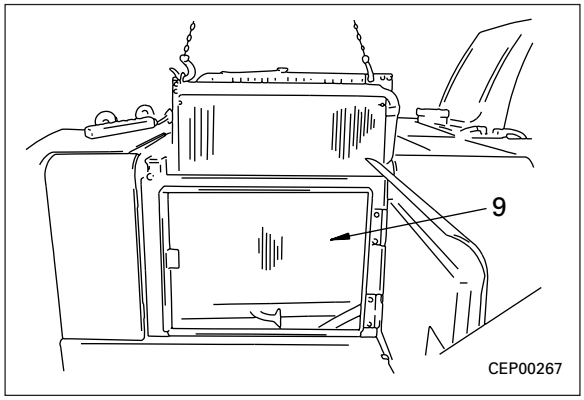


6. Disconnect cooler inlet tube (8).



7. Sling hydraulic cooler assembly (9), remove mounting bolts (bottom: left and right; top: left and right), then lift off hydraulic cooler assembly (9).

kg Hydraulic cooler assembly: **110 kg**



INSTALLATION OF HYDRAULIC COOLER ASSEMBLY

- Carry out installation in the reverse order to removal.

- **Refilling with oil (hydraulic tank)**
  ★ Add oil through the oil filler to the specified level.
  Run the engine to circulate the oil through the system. Then check the oil level again.

REMOVAL OF CENTER SWIVEL JOINT ASSEMBLY

PC400-6 Serial No.: 32001 – 32249

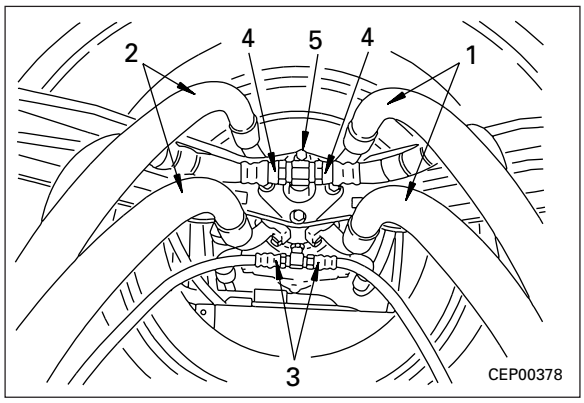
⚠ Release the remaining pressure in the hydraulic circuit.
For details, see TESTING AND ADJUSTING, Releasing remaining pressure from hydraulic circuit.

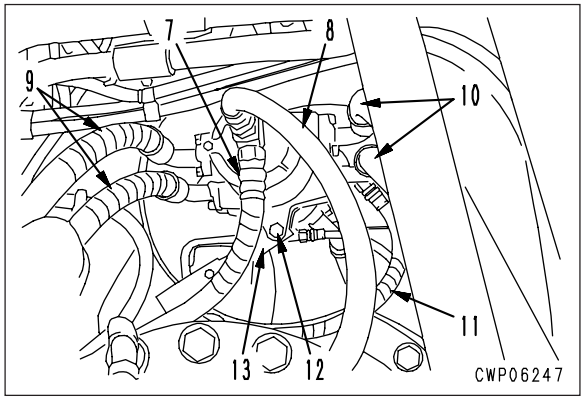
⚠ Loosen the hydraulic tank oil filler cap slowly to release the pressure inside the hydraulic tank.

★ Mark all the piping with tags to prevent mistakes in the mounting position when installing.

1. Disconnect travel motor hoses (1) and (2).
2. Disconnect speed selector hose (3).
3. Disconnect drain hose (4), and remove elbow (5).
   ★ Install a blind plug in the drain hose.
4. Disconnect drain hoses (7) and (8).
   ★ Install a blind plug in the drain hose.
5. Disconnect travel hoses (9) and (10), and speed selector hose (11).
6. Pull out pin (12), and disconnect plate (13).
7. Sling center swivel joint assembly (14), remove mounting bolts from below, then lift off.

kg Center swivel joint assembly: **40 kg**





INSTALLATION OF CENTER SWIVEL JOINT ASSEMBLY

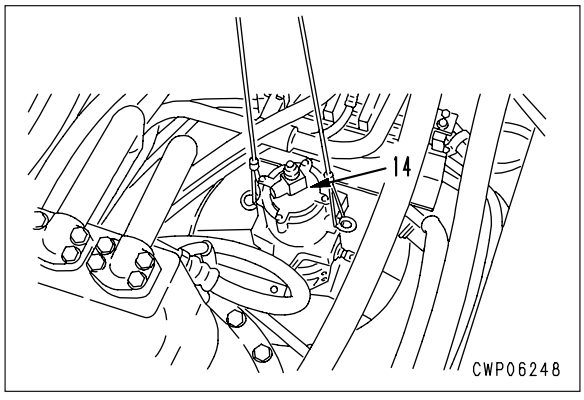
PC400-6 Serial No.: 32001 – 32249

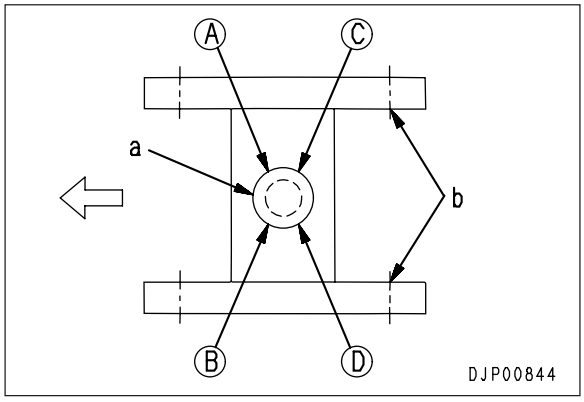
- Carry out installation in the reverse order to removal.

※ 1
★ Assemble the center swivel as shown in the diagram below.

- **Refilling with oil (hydraulic tank)**
  ★ Add oil through the oil filler to the specified level.
  Run the engine to circulate the oil through the system. Then check the oil level again.

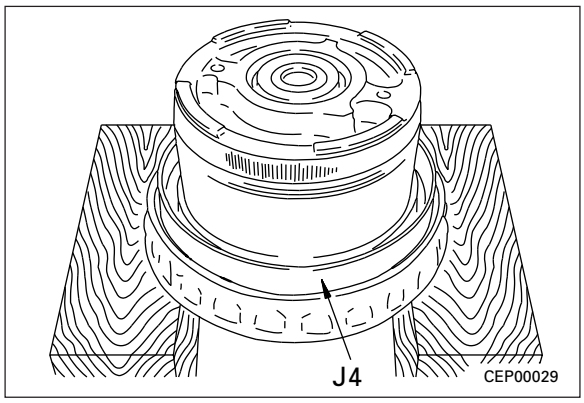
- **Bleeding air**
  ★ Bleed the air from the travel motor.
  For details, see TESTING AND ADJUSTING, Bleeding air.

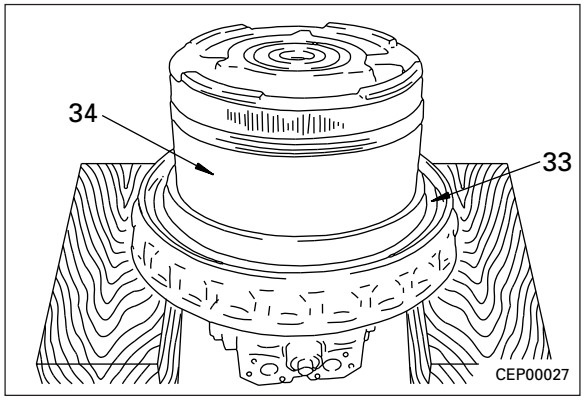




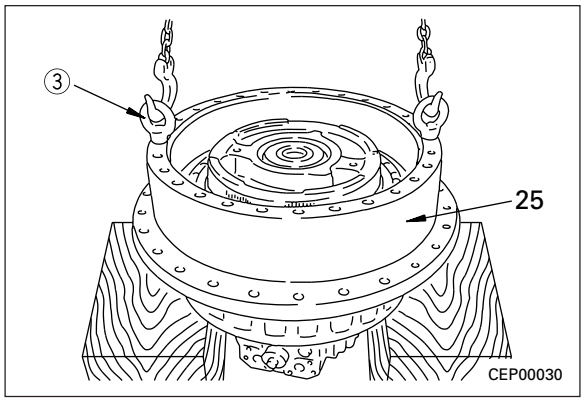
a: Center swivel
b: Sprocket

4) Using tool **J4**, install floating seal (33) to cage (34).
   - ★ Remove all oil and grease from the O-ring and O-ring contact surface, and dry the parts before installing the floating seal.
   - ★ After installing the floating seal, check that the angle of the floating seal is within 1 mm.
   - ★ After installing the floating seal, coat the sliding surface thinly with engine oil.



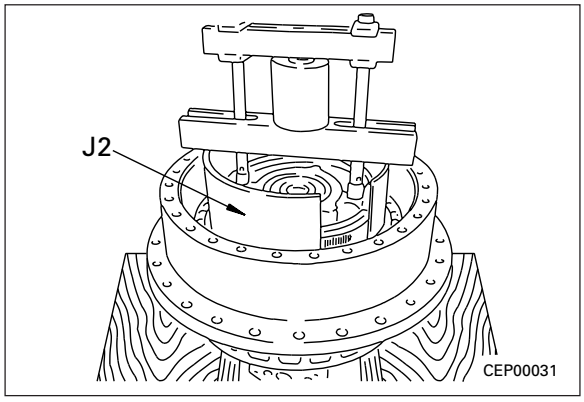


5) Using eyebolts ③, set hub assembly (25) to travel motor, then using push tool, tap to press fit bearing portion.



2. Nut

1) Install nut as follows.
   i) Using tool **J2**, push inner race portion of bearing.
   - ★ Pushing force:
     21.6 – 25.5 kN {2.2 – 2.6 ton}
   - ★ Rotate the hub 2 – 3 times before applying the pushing force to the bearing inner race.



ASSEMBLY OF TRAVEL MOTOR ASSEMBLY

Precautions when assembling

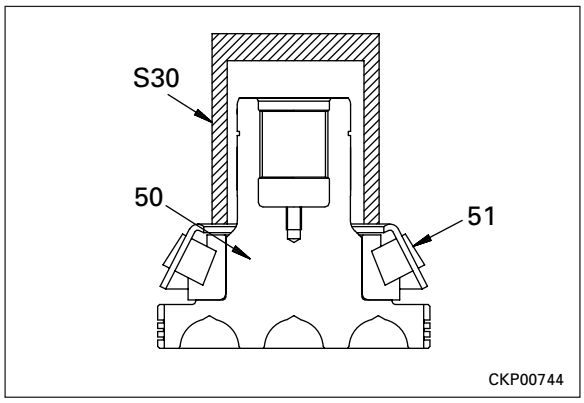
1) Clean all parts, remove all burrs, and check for dirt or damage.
2) Coat the rotating and sliding surfaces of all parts with engine oil (EO10-CD) before installing.
3) Before coating any part with thread tightener, remove all oil and grease from the thread and tap hole, and dry completely.

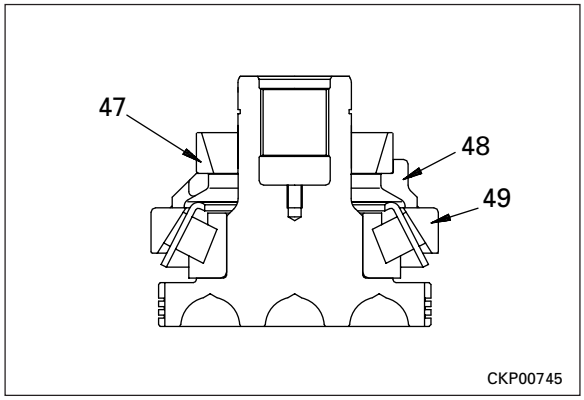
1. Drive shaft assembly

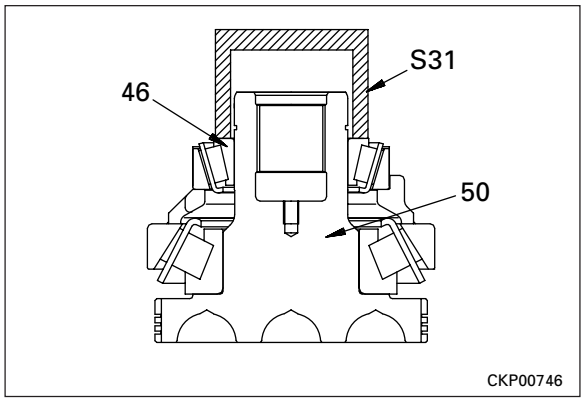
1) Using tool **S30**, press fit main bearing (51) to drive shaft (50).
   - ★ Press fit until the end face of the inner race is in tight contact with the end face of the drive shaft.
   - ★ Press-fitting load : **47.6 kN {4,850 kg}**

   Press-fitting surface of bearing : **Lubricating oil (EO10-CD)**
2) Install main bearing outer race (49), retainer (48), and sub bearing outer race (47).
3) Using tool **S31**, press fit sub bearing inner race (46) to drive shaft (50).
   - ★ Press fit until the roller of the inner race is in tight contact with the outer race.
   - ★ Press-fitting load : **11.8 kN {1,208 kg}**

   Press-fitting surface of bearing : **Lubricating oil (EO10-CD)**

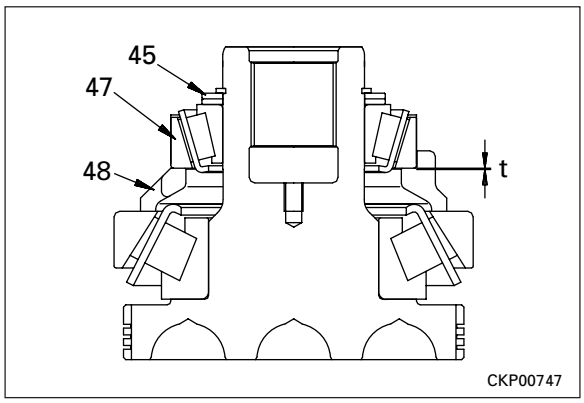






2. Adjusting end play of shaft

1) Select 2 spacers (45) as follows, and adjust clearance "**t**" between retainer (48) and sub bearing outer race (47) to make clearance of 0.05 – 0.25 mm.



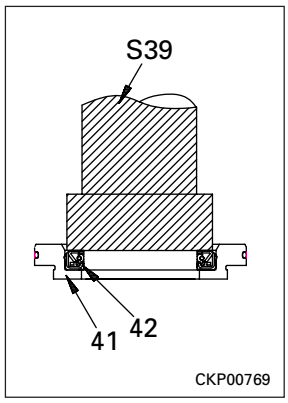
12. Oil seal

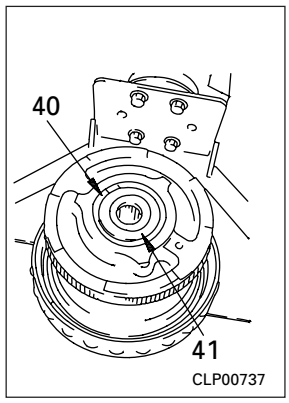
1) Using tool **S39**, press fit oil seal (42) to cover (41).

Lip of oil seal : **Grease (G2-LI-S)**

2) Install cover (41), and secure with snap ring (40).

★ Check that the snap ring is fitted securely in the mounting groove.

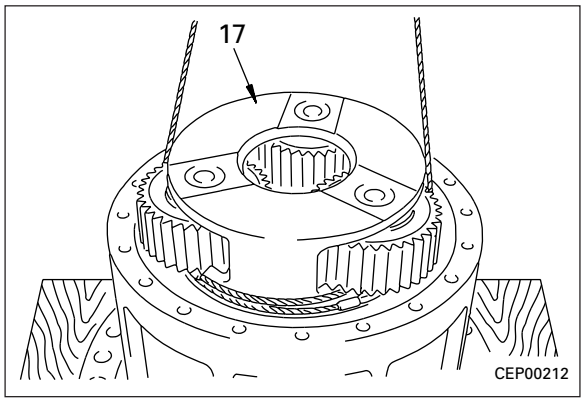




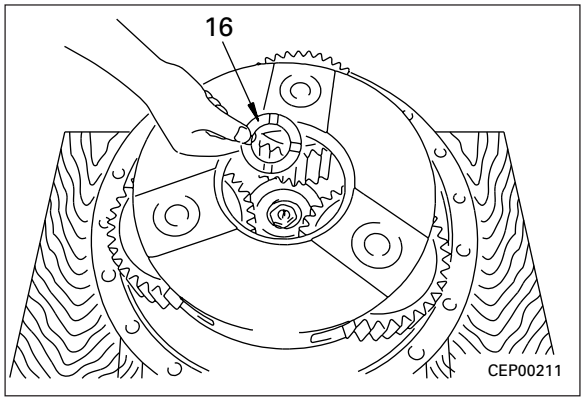
13. Checking performance

Carry out a bench test to check the performance.

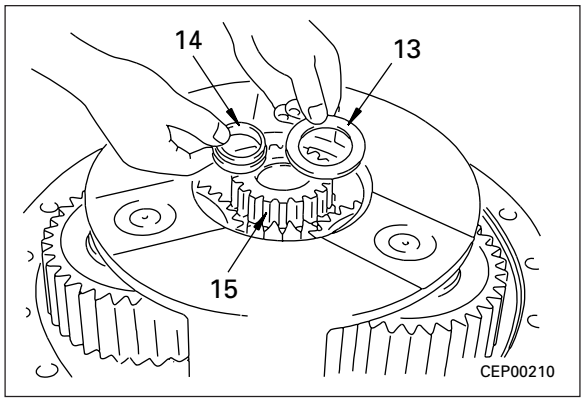
5. No. 2 carrier assembly
Raise No. 2 carrier assembly (17) and install.



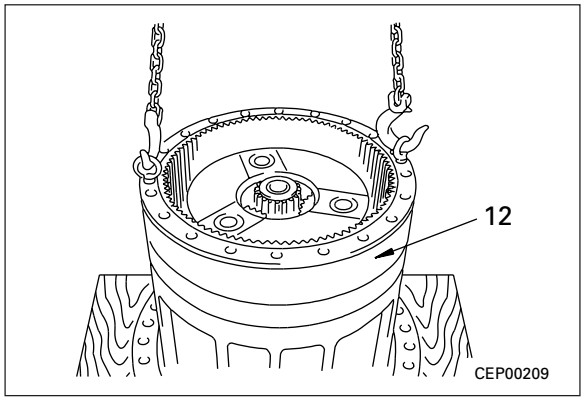
6. No. 2 sun gear
1) Assemble thrust washer (16).



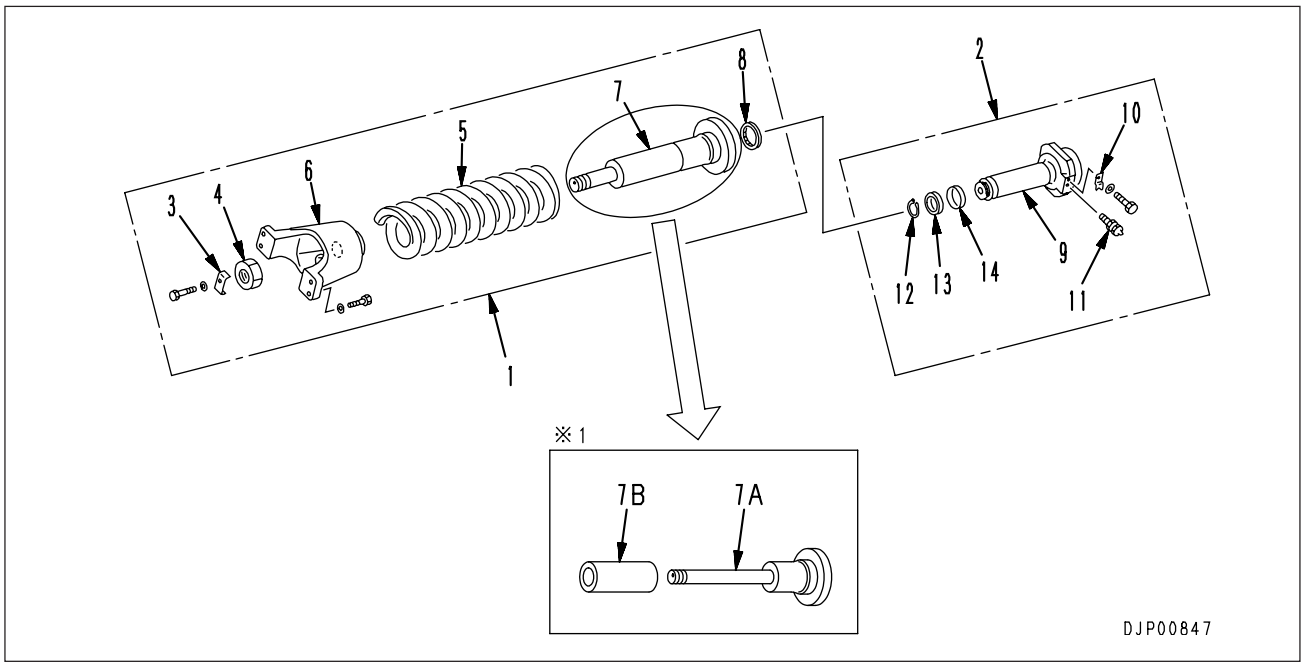
2) Install No. 2 sun gear (15) to No. 2 carrier, then install collar (14) and thrust washer (13).



7. Ring gear
Raise ring gear (12) and install.
★ Align with the drain hole and assemble.
Mating surface of ring gear and case:
Gasket sealant (LG-6)



DISASSEMBLY OF RECOIL SPRING ASSEMBLY

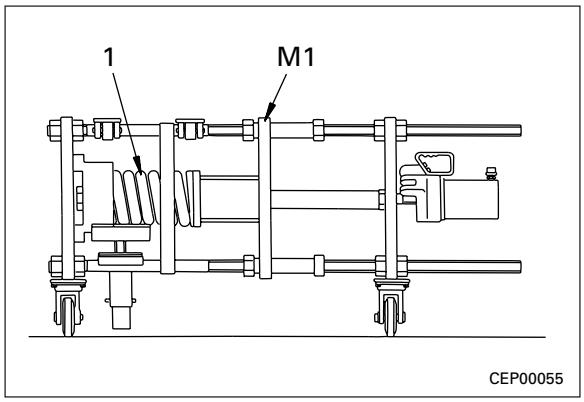


※1. PC400-6 Serial No.: 32250 and up

1. Remove piston assembly (2) from recoil spring assembly (1).

2. Disassembly of recoil spring assembly

1) Set tool **M1** to recoil spring assembly (1).
   ⚠ The recoil spring is under large installed load, so be sure to set the tool properly. Failure to do this is dangerous.
   ★ Installed load of spring:
   238.9 kN {24,375 kg}
2) Apply hydraulic pressure slowly to compress spring, then remove lock plate (3), and remove nut (4).
   ★ Compress the spring to a point where the nut becomes loose.
   ★ Free length of spring: Approx. 857 mm
3) Remove yoke (6), cylinder (7A), collar (7B), and dust seal (8) from spring (5).
   ★ Collar (7B):
   PC400-6 Serial No.: 32250 and up

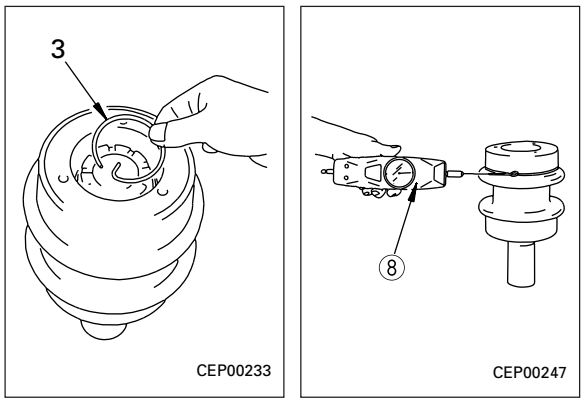


3. Disassembly of piston assembly

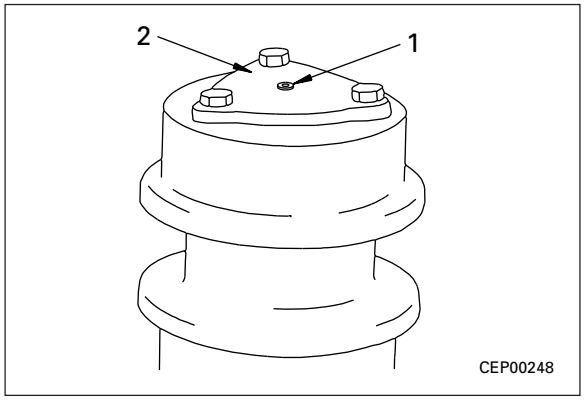
1) Remove lock plate (10) from piston (9), then remove valve (11).
2) Remove snap ring (12), then remove U-packing (13) and ring (14).

6. Install ring (3).

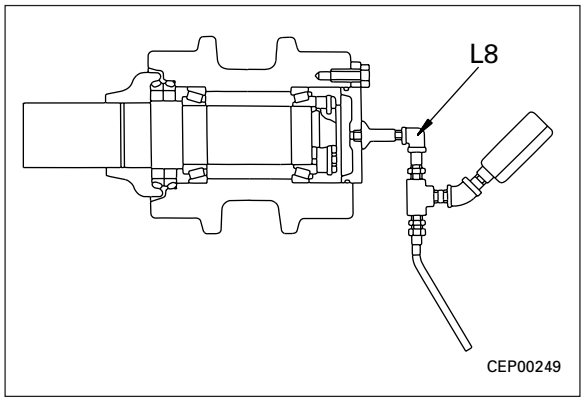
7. Using push-pull scale ⑧, check that roller rotates smoothly.



8. Fit O-ring and install cover (2).



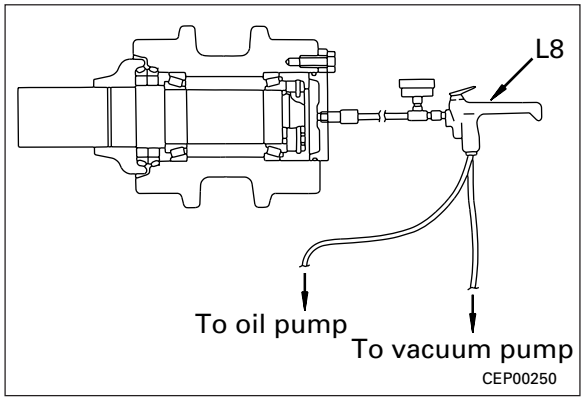
9. Using tool **L8**, apply standard pressure to roller oil filler port, and check for leakage of air from seal.
- ★ Standard pressure: 0.1 MPa {1 kg/cm²}
- ★ Method of checking
  The standard pressure shall be maintained for 10 seconds and the indicator of the gauge shall not go down.



10. Using tool **L8**, fill carrier roller assembly with oil, then tighten plug (1).

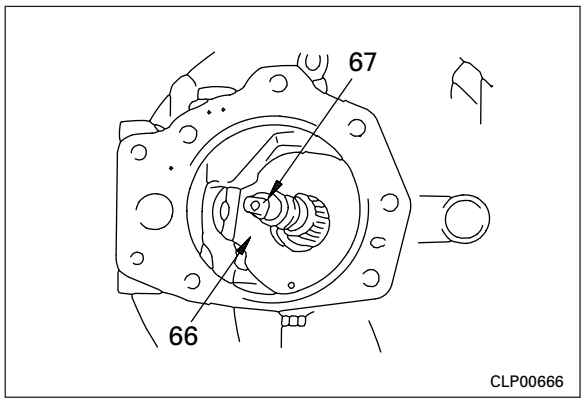
Carrier roller oil: **450 – 500 cc (EO30-CD)**

kgm Plug: **14.7 ± 4.9 Nm {1.5 ± 0.5 kgm}**

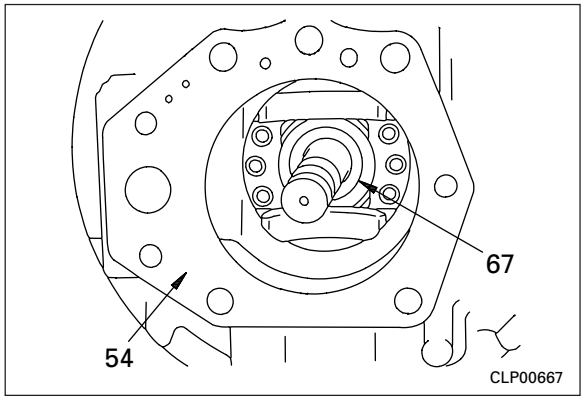


8. Shaft, cradle assembly

1) Remove rocker cam (66) from shaft and cradle assembly (67).

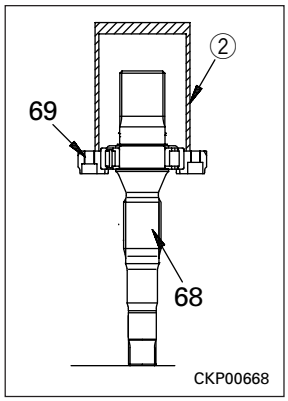


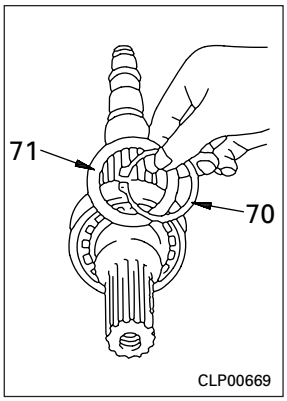
2) Remove 6 bolts, then remove shaft and cradle assembly (67) from front pump case (54).



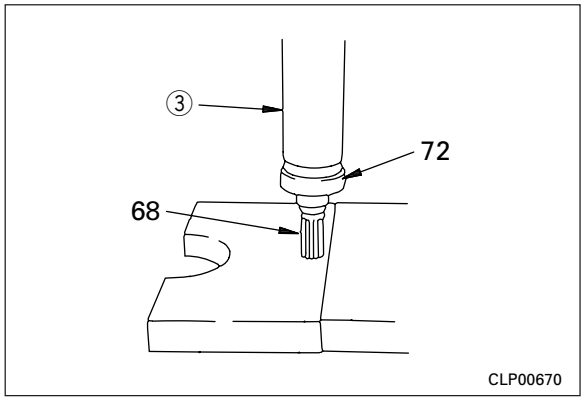
- **Disassembly of shaft, cradle assembly**

1) Push cradle (69) with push tool ② to remove it from shaft (68). When removing, be careful to keep cradle (69) straight.
2) Remove snap ring (70), then remove washer (71).

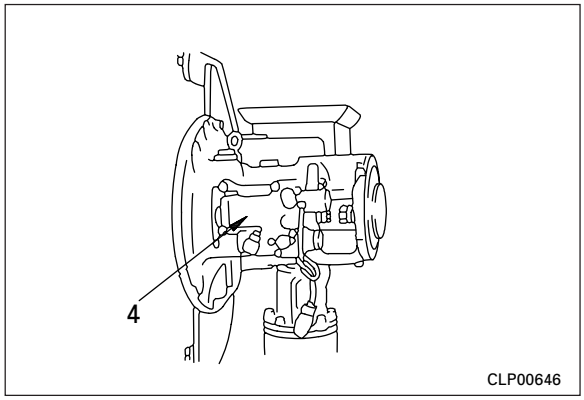




3) Using push tool ③, remove bearing (72) from shaft (68).
   - ★ Bearing (72) divides into the flange ring and the bearing, so be careful not to lose either part.
   - ★ Check the installation direction of the bearing.



- Assemble orifice (34), and install spacer (33), filter (32), and O-ring.
  kgm Orifice (34):
  9.8 ± 1.9 Nm {1.0 ± 0.2 kgm}
  2) After completion of assembly, carry out bench test of servo valve assembly (4) as an individual part to check performance, and carry out adjustment.
  3) Install 2 knock pins to pump end.
  4) Fit O-ring and filter to servo valve assembly (4) and install to pump case.
     ★ Install the filter so that the mesh end is at the front face end of the valve body.
     ★ Be extremely careful that the O-ring and filter do not fall out.
     ★ Tighten the mounting bolts gradually in turn on opposite sides.
     kgm Mounting bolt:
     66.2 ± 7.4 Nm {6.75 ± 0.75 kgm}
     Mating surface of servo valve:
     Gasket sealant (LG-7 or LG-5)



- **Assembly of rear pump assembly**

12. Shaft, cradle assembly
Same operation as in Item 1. (Set pump case to tool **S3-4**.)

13. Rocker cam
Same operation as in Item 2.

14. Servo piston assembly
Same operation as in Item 3.

15. Positioning minimum swash plate angle
Same operation as in Item 4.

16. Cylinder block, piston assembly
Same operation as in Item 5.

17. Positioning maximum swash plate angle
Same operation as in Item 7.

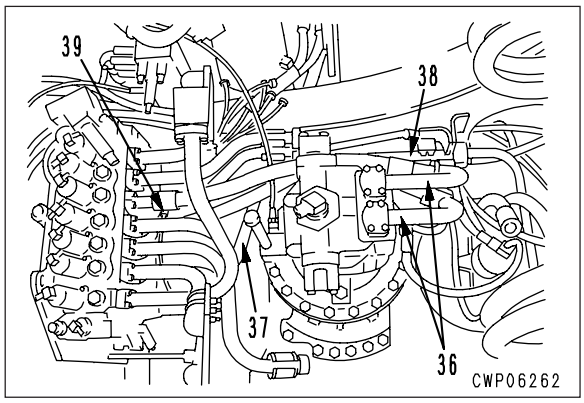
18. Servo piston spring
Same operation as in Item 10.

19. Servo valve assembly
Same operation as in Item 11.

25. Remove swing motor hoses (36).

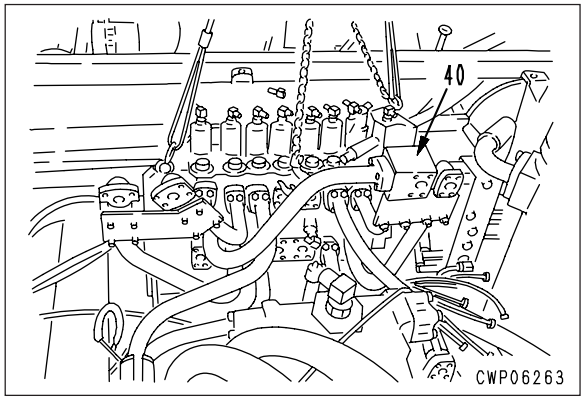
26. Remove boom tubes (37) and (38).

27. Disconnect LS select valve hose (39).



28. Sling control valve assembly (40), then remove mounting bolts, and lift off control valve assembly.
★ Move slightly to the front and pass through the bracket to lift off.

kg Control valve assembly: **260 kg**



INSTALLATION OF CONTROL VALVE ASSEMBLY

- Carry out installation in the reverse order to removal.

- **Refilling with oil (hydraulic tank)**
  ★ Add oil through the oil filler to the specified level.
  Run the engine to circulate the oil through the system. Then check the oil level again.

★ Check the spools and valves for dirt, damage, or burrs. Coat the sliding surfaces of all parts with engine oil before installing.

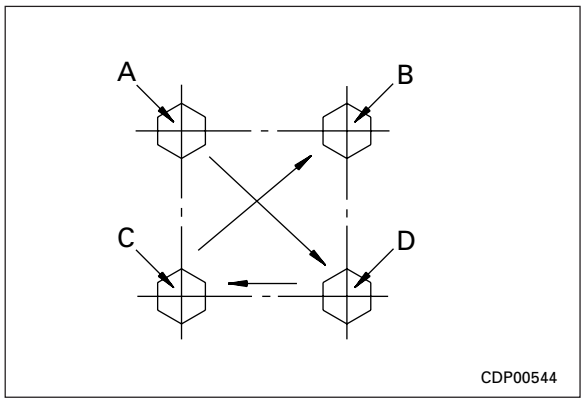
1. Covers

Install valve (106), and covers (89) and (90) to valve body.

★ Check that there is no damage to the O-ring, then install securely to the mating surface of the cover and valve.

★ Tighten the mounting bolts of covers (89) and (90) in the order shown in the diagram on the right.

kgm Cover mounting bolt:
166.6 ± 9.8 Nm {17 ± 1 kgm}

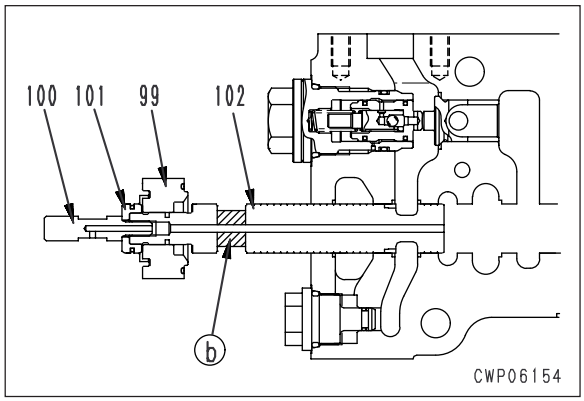


2. Boom Hi, arm Hi control valve spools

• **Boom Hi control valve spool**

★ Check the mounting position of the spring and spool assembly carefully before installing.

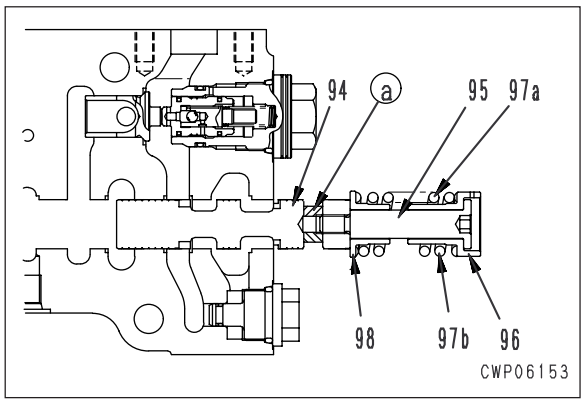
1) Fit seal to spool (102), and install seal to valve (101).
2) Assemble spool (102) to position shown in diagram on right, install plate (99) and valve (101) to spool (102), then hold position ⓑ shown in diagram on right with a wrench (width across flats: 24mm), and tighten plug (41).
   kgm Plug: **13.2 ± 1.5 Nm {1.35 ± 0.15 kgm}**
3) Push spool assembly into body, fit spring (105), then fit O-ring to case (104) and install.
   kgm Case mounting bolt:
   30.9 ± 3.4 Nm {3.15 ± 0.35 kgm}



• **Arm Hi control valve spool**

★ Check the mounting position of the spring and spool assembly carefully before installing.

1) Assemble spool (94) to position shown in diagram on right, install retainer (98), springs (97a) and (97b), and retainer (96), then install plug (95).
2) Hold spool (94) at position ⓐ shown in diagram on right with a wrench (width across flats: 24mm), and tighten plug (32).
   kgm Plug: **17.2 ± 2.5 Nm {1.75 ± 0.25 kgm}**
3) Push spool assembly into body, then fit O-ring to case (103) and install.
   kgm Case mounting bolt:
   30.9 ± 3.4 Nm {3.15 ± 0.35 kgm}



DISASSEMBLY OF WORK EQUIPMENT PPC VALVE ASSEMBLY

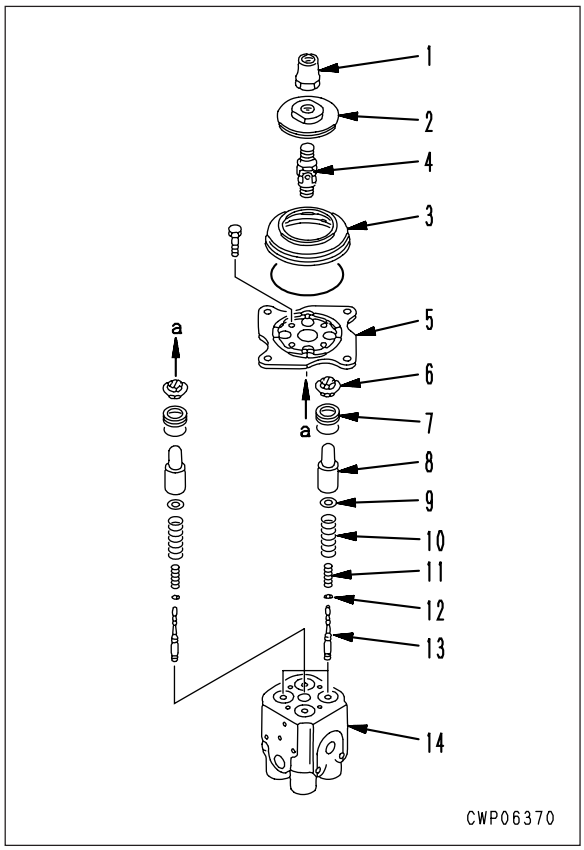
1. Remove nut (1), then remove disc (2) and boot (3).

2. Remove bolts, then remove plate (5).
★ Do not remove joint (4) unless it is to be replaced.

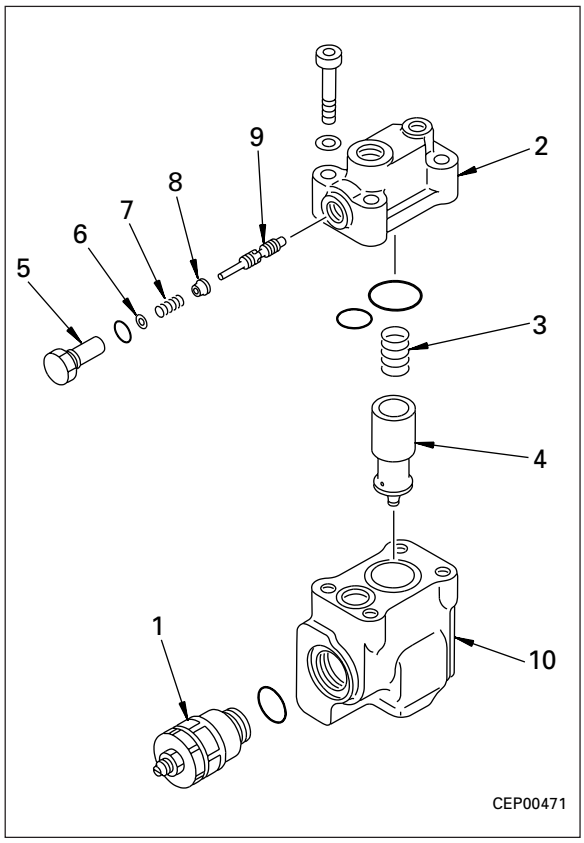
3. Remove seal (6) and collar (7).

4. Pull out piston (8), and remove retainer (9), springs (10) and (11), and shim (12).
★ Spring (10) consists of two springs each of two types with different installed loads, so check the mounting position (hydraulic port) and mark with tags to prevent mistakes when installing.

5. Pull out valve (13) from body (14).



DISASSEMBLY OF BOOM LOCK VALVE ASSEMBLY



1. Remove safety valve assembly (1).
★ The safety valve assembly cannot be adjusted when it is mounted on the machine, so do not disassemble it.

2. Remove body (2), then remove spring (3) and check valve (4).

3. Remove plug (5), then remove spacer (6), spring (7), seat (8), and spool (9).

ASSEMBLY OF BOOM LOCK VALVE ASSEMBLY

★ Coat the sliding parts with engine oil before assembling.

1. Assemble spool (9), seat (8), spring (7), and washer (6) to body (2), then fit O-ring and install plug (5).
kgm Plug: **39.2 ± 4.9 Nm {4.0 ± 0.5 kgm}**

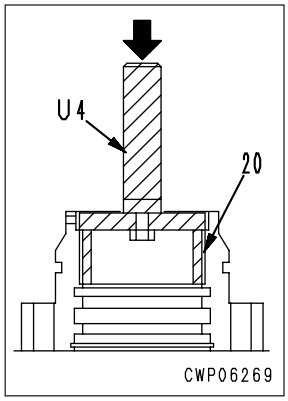
2. Assemble check valve (4) and spring (3) to body (10), then fit O-ring and install body (2).

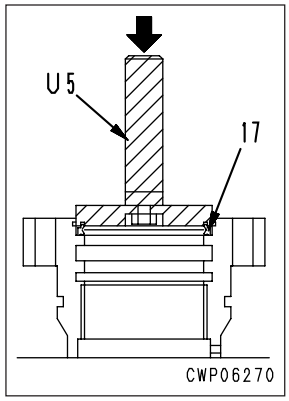
3. Fit O-ring and install safety valve assembly (1).
kgm Safety valve:
225.5 ± 9.8 Nm {23 ± 1 kgm}

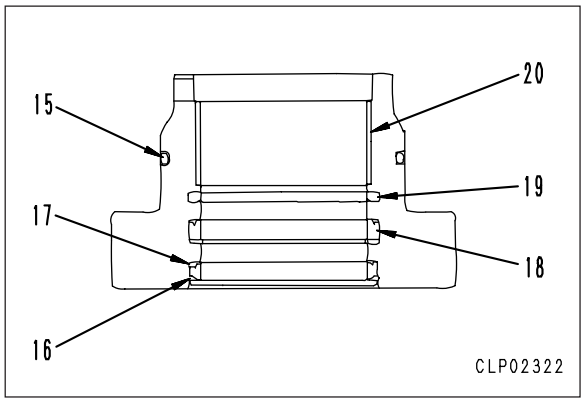
ASSEMBLY OF HYDRAULIC CYLINDER ASSEMBLY

★ Be careful not to damage the packings, dust seals, and O-rings.
★ Do not try to force the backup ring into position. Warm it in warm water (50 – 60°C) before fitting it.

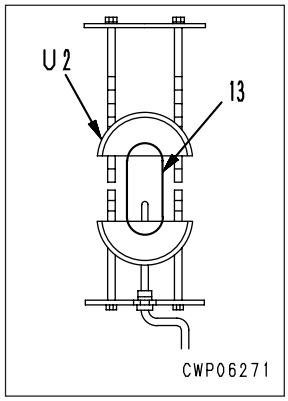
1. Assembly of cylinder head assembly
1) Using tool **U4**, press fit bushing (20).
2) Assemble buffer ring (19).
3) Assemble rod packing (18).
4) Using tool **U5**, install dust seal (17), and secure with snap ring (16).
5) Install backup ring and O-ring (15).

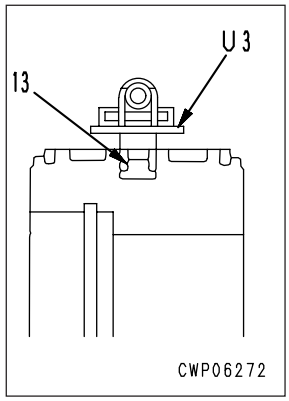




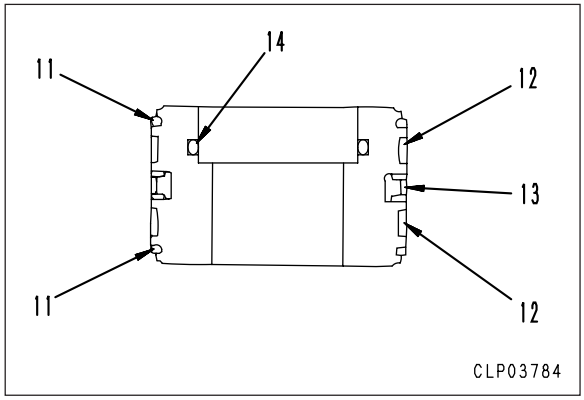


2. Assembly of piston assembly
1) Using tool **U2**, expand piston ring (13).
★ Set the piston ring on tool **U2**, and turn the handle 8 – 10 times to expand the ring.
2) Set tool **U3** in position, and compress piston ring (13).



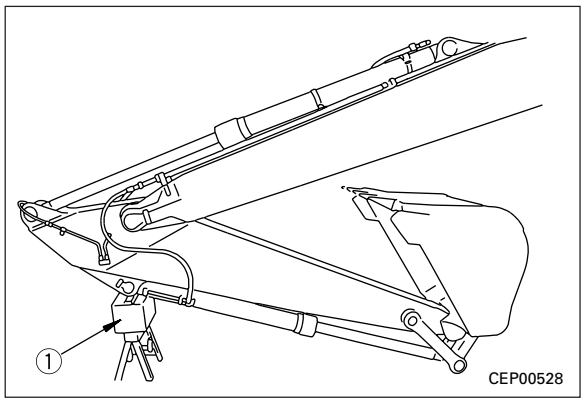


3) Install backup ring and O-ring (14).
4) Assemble wear ring (12).
5) Assemble ring (11).
★ Be careful not to open the end gap of the ring too wide.
Ring groove : **Grease (G2-LI)**



REMOVAL OF BUCKET, ARM ASSEMBLY

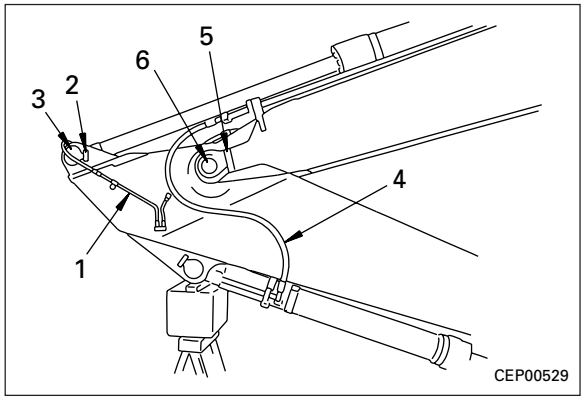
⚠ Extend the bucket cylinder piston rod to the end of the CURL stroke, and the arm cylinder piston rod to a point approx. 200 mm before the end of the IN stroke. Then lower the work equipment completely to the ground, and set the safety lock lever to the LOCK position.



1. Set block ① to bucket cylinder bottom mounting boss portion of arm.

2. Disconnect grease hose (1).

3. Remove plate (2), then remove arm cylinder head pin (3). ※ 1



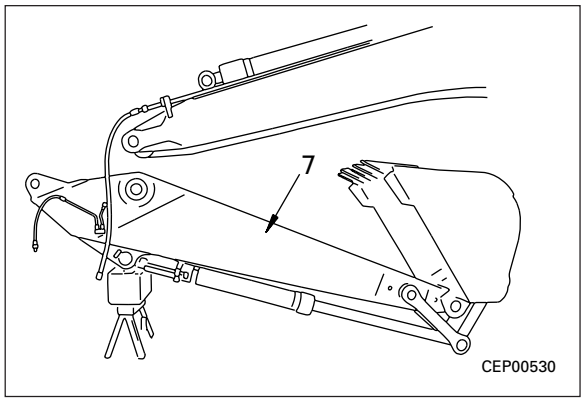
4. Start engine, and retract piston rod, then tie piston rod with wire to prevent it from coming out.

⚠ Release the remaining pressure in the hydraulic circuit.
For details, see TESTING AND ADJUSTING, Releasing remaining pressure in hydraulic circuit.

5. Disconnect 2 bucket cylinder hoses (4).

6. Remove plate (5), then remove connecting pin (6) between arm and boom. ※ 2

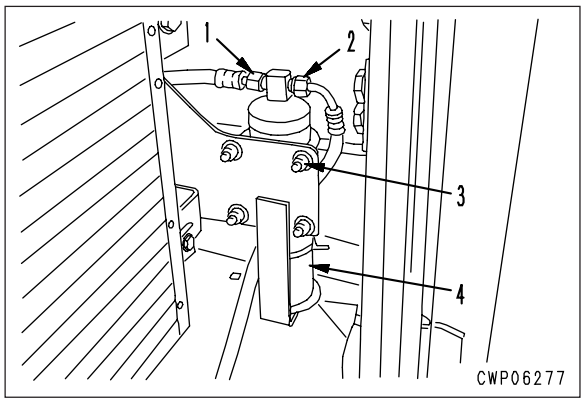
★ There are shims installed, so check the number, thickness, and position, and keep in a safe place.



7. Start engine, then raise boom, and swing to remove bucket and arm assembly (7).

kg Bucket, arm assembly: **3450 kg**

REMOVAL OF RECEIVER TANK ASSEMBLY



⚠ Disconnect the cable from the negative (–) terminal of the battery.
⚠ Collect refrigerant (R134a).
For details, see REMOVAL OF AIR CONDITIONER COMPRESSOR ASSEMBLY.

1. Open air conditioner condenser side cover.
2. Disconnect hose (1) going to air conditioner unit.
3. Disconnect hose (2) coming from air conditioner condenser. ※ 1
4. Remove 2 U-bolts (3), then remove receiver tank assembly (4).

INSTALLATION OF RECEIVER TANK ASSEMBLY

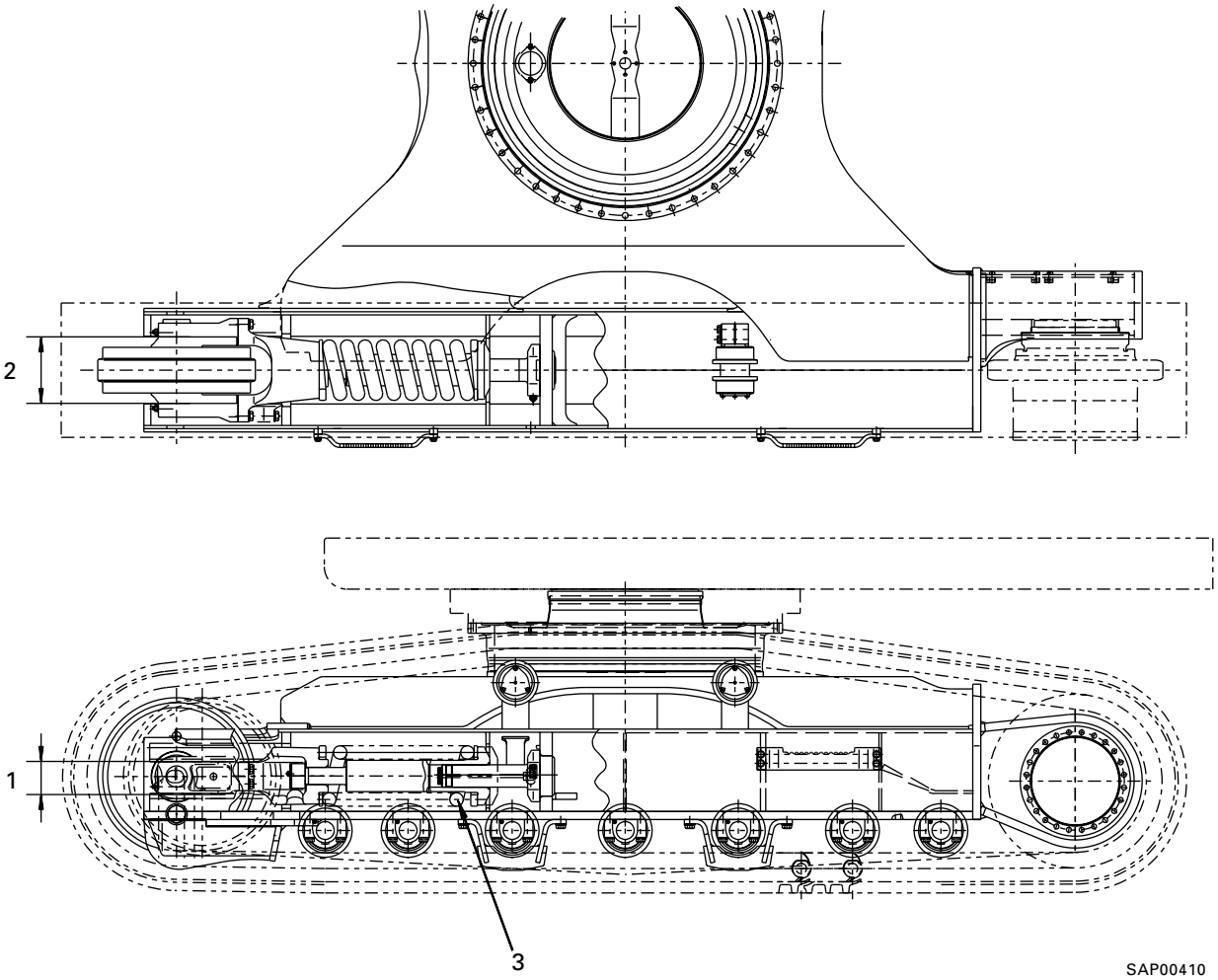
- Carry out installation in the reverse order to removal.

※ 1
★ Check that the O-rings are not damaged or deteriorated, then connect the hoses.

- **Charging air conditioner with gas**
★ Using tool **X**, charge the air conditioner circuit with refrigerant (R134a).

TRACK FRAME AND RECOIL SPRING

★ The diagram shows the PC400-6 EXCEL.



Unit: mm

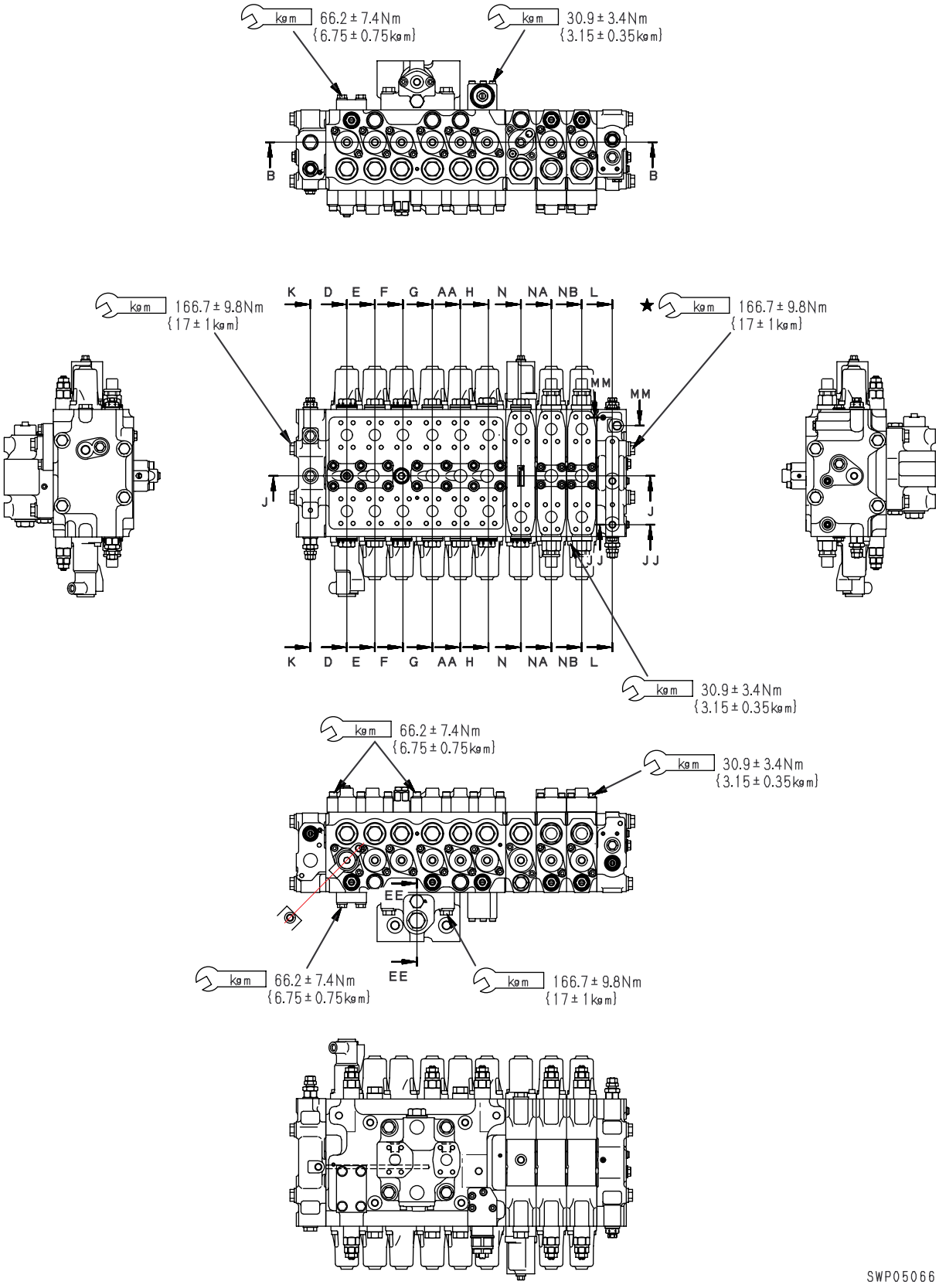
No.	Check item	Criteria				Remedy
			Standard size	Tolerance	Repair limit	
1	Top-to-bottom width of idler guide	Track frame	148	+2 −1	152	Rebuild or replace
		Idler support	145	±0.5	143	
2	Left-to-right width of idler guide	Track frame	302	+3 −1	307	
		Idler support	297	—	295	
3	Recoil spring	Standard size			Repair limit	Replace
		Free length x OD	Installed length	Installed load	Free length	Installed load
		857 x 270	707	239 kN (24,375 kg)	—	191 kN (19,500 kg)

CONTROL VALVE

9-spool valve (1/6)

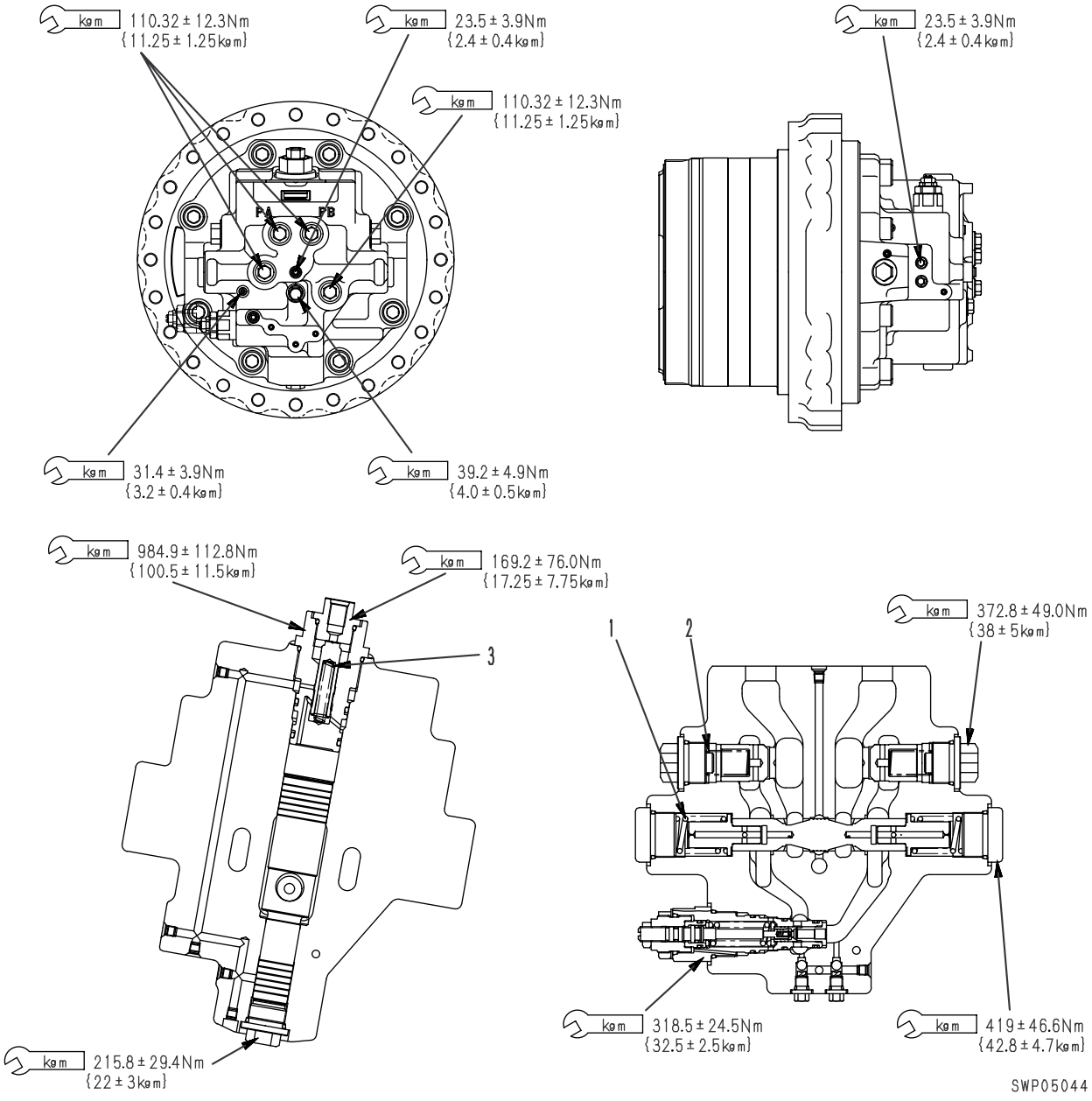
★ For details of the 8 and 7-spool valves, see 9-SPOOL VALVE.

When tightening the bolts at the places marked ★, always use 2 washers on top of each other.



TRAVEL MOTOR

KMV280ADT

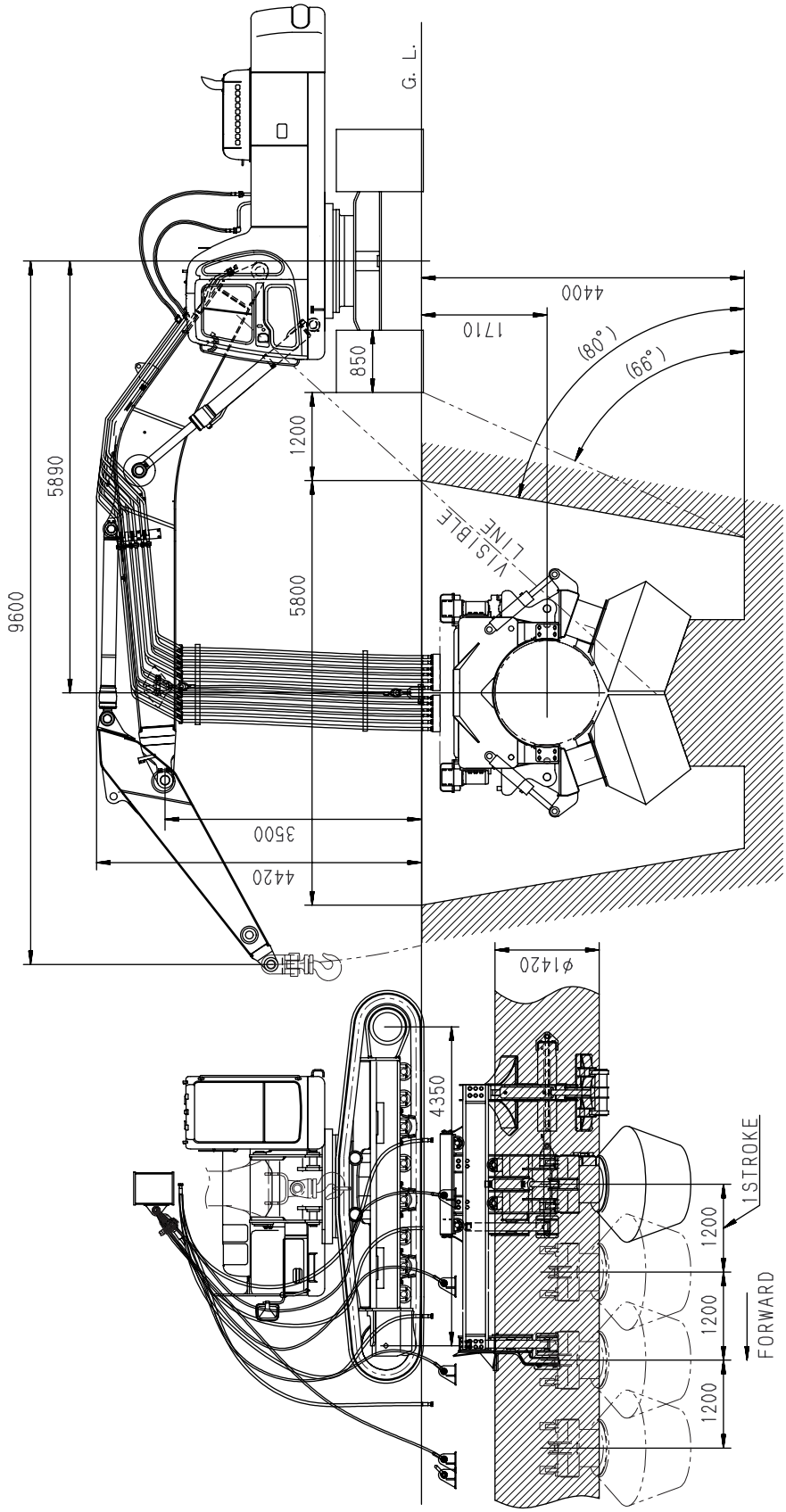


Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free length x OD	Installed length	Installed load	Free length	Installed load	Replace spring if there is damage or deformation
		58.43 x 30.0	42.0	426.3 N (43.5 kg)	—	341.0 N (34.8 kg)	
2	Check valve spring	62.5 x 20.0	35.0	3.5 N (0.36 kg)	—	2.8 N (0.29 kg)	
3	Regulator piston spring	53.1 x 14.3	50.0	75.5 N (7.7 kg)	—	60.8 N (6.2 kg)	

Unit: mm

No.	Check item		Criteria					Remedy
		Name of cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston rod and bushing	Boom	110	–0.036 –0.090	+0.261 +0.047	0.083 – 0.351	0.451	Replace bushing
		Arm	120	–0.036 –0.090	+0.263 +0.048	0.083 – 0.353	0.453	
		Bucket	110	–0.036 –0.090	+0.261 +0.047	0.083 – 0.351	0.451	
2	Clearance between piston rod support shaft and bushing	Boom	110	—	+0.457 +0.370	—	1.0	Replace pin, bushing
		Arm	110	—	+0.457 +0.370	—	1.0	
		Bucket	100	—	+0.457 +0.370	—	1.0	
3	Clearance between cylinder bottom support shaft and bushing	Boom	100	—	+0.161 +0.074	—	1.0	
		Arm	110	—	+0.457 +0.370	—	1.0	
		Bucket	100	—	+0.457 +0.370	—	1.0	



AJ376020

PIPE LOOPER at working

2) Cutter rotation has poor speed or lacks of power.