SM002
(S)6D95L-BE2

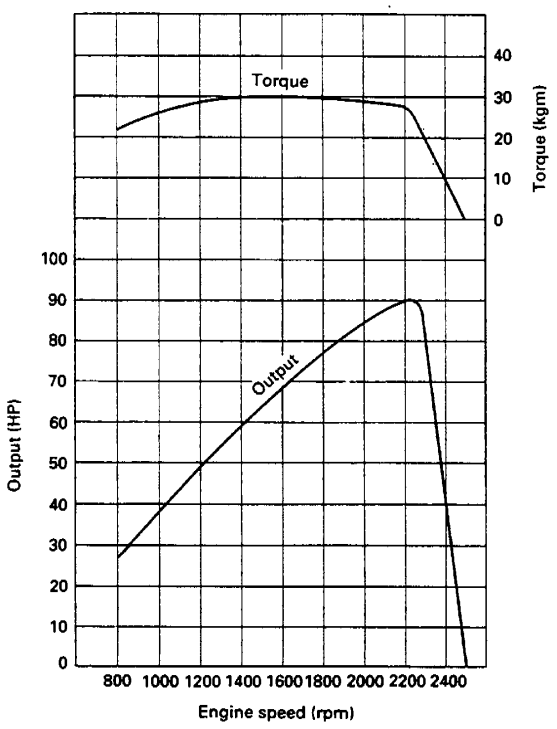
6D96L/S6D95L-1

DIESEL ENGINE

KOMATSU FORKLIFT USA

6D95L-1
(FD50/60/70-5)

Flywheel horsepower: 90 HP/2,250 rpm
Maximum torque: 30 kgm/1,500 rpm
Minimum fuel consumption ratio: 160 g/HPh

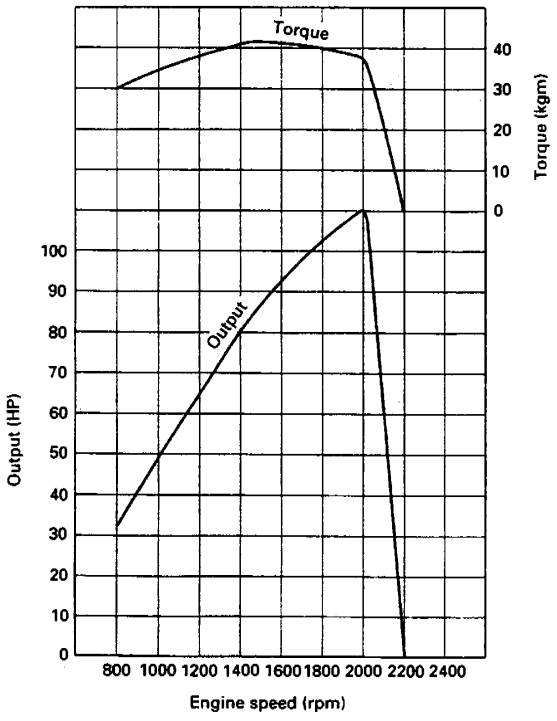


6D95L-1
(FD50/60/70-6)

Flywheel horsepower: 95 HP/2,250 rpm
Maximum torque: 32 kgm/1,500 rpm
Minimum fuel consumption ratio: 160 g/HPh

S6D95L-1
(FD60H/70H/80H-5)

Flywheel horsepower: 110 HP/2,000 rpm
Maximum torque: 41.5 kgm/1,500 rpm
Minimum fuel consumption ratio: 160 g/HPh



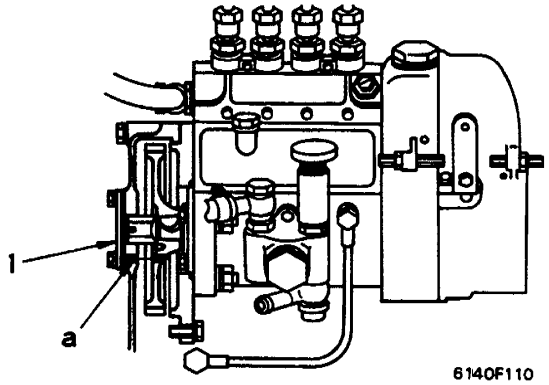
3. Remove cover (1) from the injection pump.

4. Install the injection pump to the engine with the injection pump holder and drive gear as one unit.
   When doing this, insert a pin (ϕ4 − 4.5, length: 80 mm) through the hole in portion (a) of the front gear cover to align the hole in the drive gear.

5. After installing, check that the pin is straight. Check that there is no misalignment between the hole in the injection pump holder and the mounting hole of the front gear cover, and that there is no problem inserting the bolt.

6. If the position is misaligned, repeat the procedure again from Step 4.

7. After tightening the bolts, check that the lines on the injection pump, injection pump holder, and front plate are aligned.

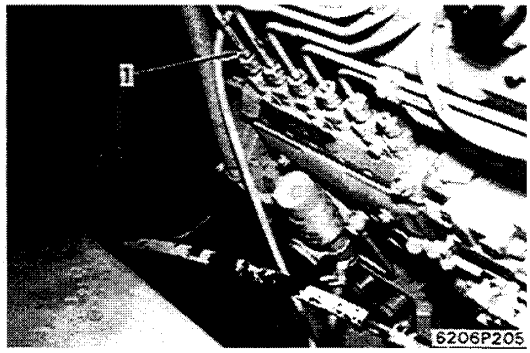


6140F110

DELIVERY VALVE method

- Except for injection pumps with a stepped lead plunger

1. Disconnect fuel injection tube (1) of No. 1 cylinder.

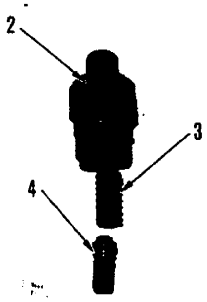


6206P205

2. Remove delivery valve holder (2).

3. Take out spring (3) and delivery valve (4), then install the delivery valve holder again.

4. Place the fuel control lever at the FULL position, then rotate the crankshaft slowly in the counterclockwise direction while operating the priming pump, and stop at the point where the fuel stops flowing from the delivery valve holder.



6150P210A

Special tool

No.	Part No.	Part name	Q'ty
A	790-501-5000	Engine repair stand	1
A_1	790-901-1250	Bracket	1
B	795-102-2102	Spring pusher	1
C	795-100-4710	Valve guide remover	1
D	795-240-2801	Flange puller	1
E	795-100-2800	Piston ring tool	1

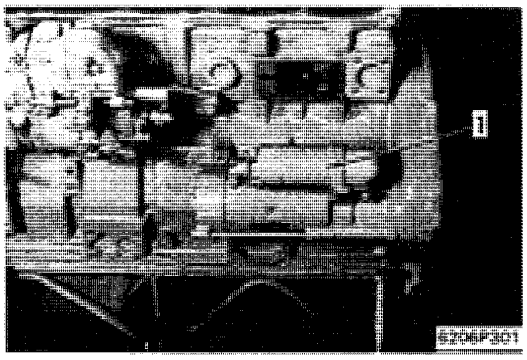
- **Prepartory work**
  1) Remove all dirt and mud from around the engine.
  2) Remove drain plug and drain oil from engine.

     Engine oil: Approx. 10.5 ℓ [2.8 gal (us)]

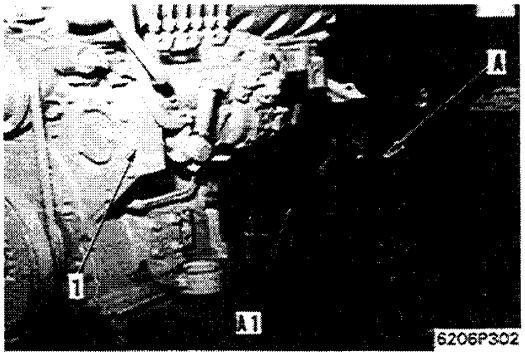
  3) Prepare a stable stand which will prevent the engine from falling over, then put the engine securely in the stand.

     kg Engine assembly: Approx. 410 kg (900 lbs) (The weight of the engine differs according to the model of machine on which it is mounted.)

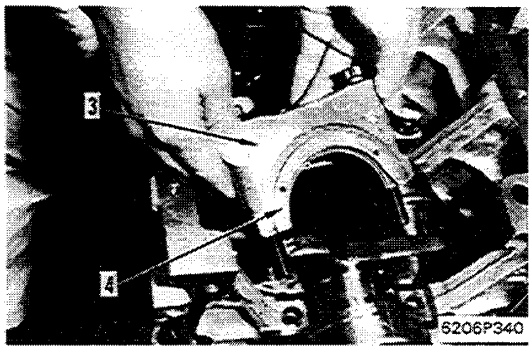
1. **Starting motor**
   Remove starting motor (1).



2. **Setting engine onto repair stand**
   1) Install bracket A_1 to engine assembly (1).
   2) Install engine assembly (1) onto engine repair stand A using bracket A_1.

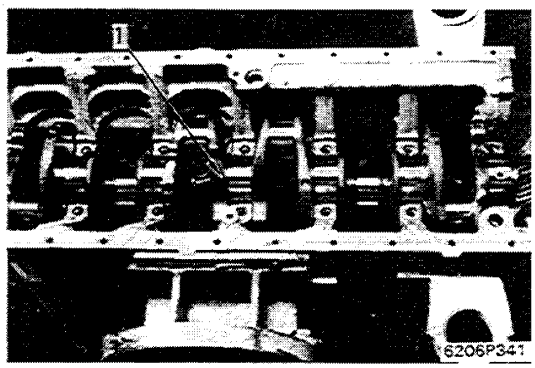


★ Thrust bearings (4) are assembled on both sides of cap (3) at the flywheel end, so after removing, mark to show the place of installation.

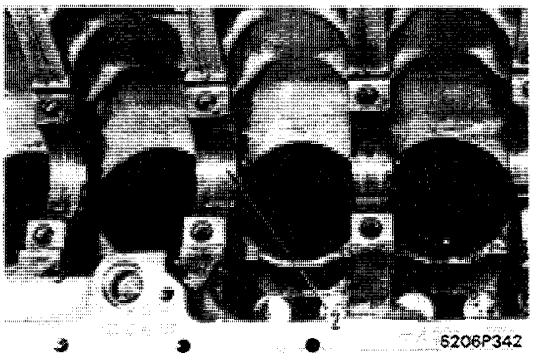


29. Crankshaft

1) Remove crankshaft (1).
   ★ Be careful not to hit the crankshaft against the cylinder block and damage the sliding surface.

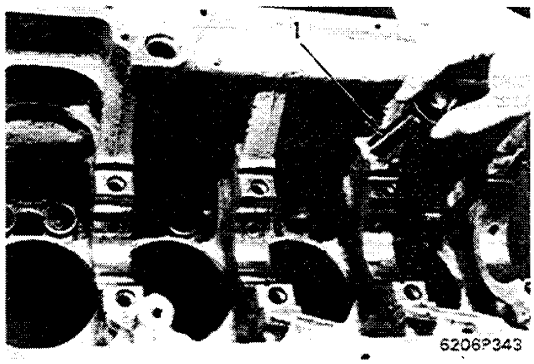


2) Remove upper main bearing (2).
   ★ Mark the main bearing and thrust bearing with tags to show the place of installation, and keep in a safe place in sets for each cap number.



30. Tappet

Remove tappet (1).

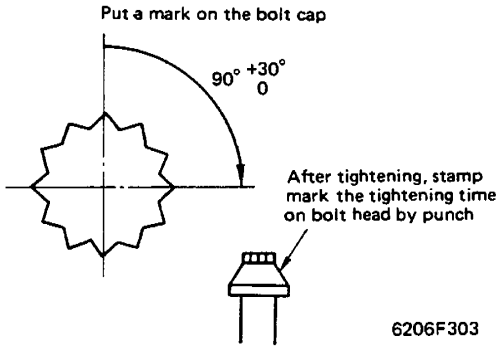


9) Tighten mounting bolts of connecting rod cap as follows.
★ Coat the connecting rod bolt thread and seat face with engine oil.

kgm Mounting bolt of connecting rod

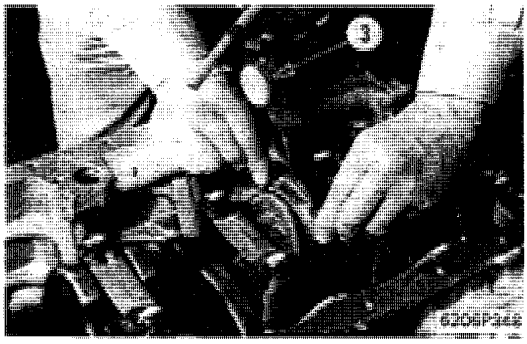
Unit: kgm (lb · ft)

Order	Target	Range
1st step	4.0 (29)	4.0 – 4.2 (29 – 30)
2nd step	Mark bolt head and cap seat with felt pen, then tighten to following angle.	
	90°	90° – 120°



★ The connecting rod bolts may be reused five times. Make a punch mark on the bolt head each time the bolts are used. if there are already five marks on the bolt head, replace with new bolts.
★ After assembling the connecting rods, check that crankshaft rotates smoothly.

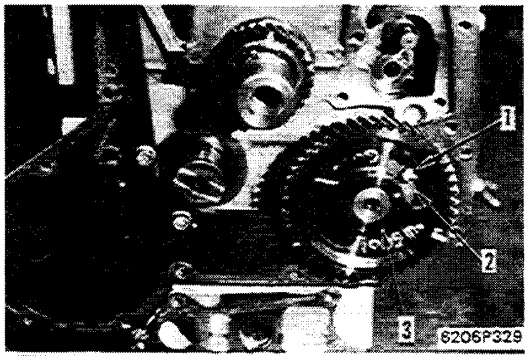
10) Measuring side clearance of connecting rod cap.
i) Turn over cylinder block so that oil pan faces up.
ii) Using dial gauge ③, measure side clearance of connecting rod cap.
★ Permissible range of side clearance:
0.20 – 0.40 mm
(0.008 – 0.016 in)



6. Camshaft assembly (Cam gear shrink-fitted type)
1) Insert camshaft assembly (3) into cylinder block.
★ Rotate the camshaft lightly when inserting to avoid damaging the bushing.
★ When inserting the camshaft assembly, insert thrust plate (2) from the side to install.

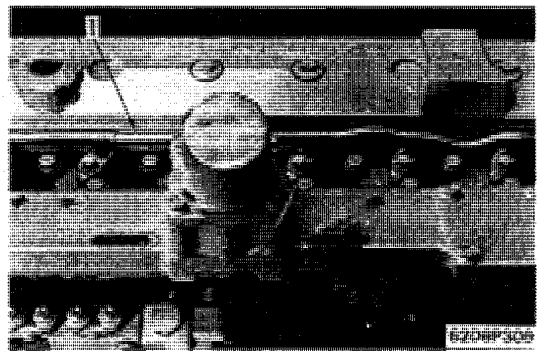
2) Tighten mounting bolts (1) of thrust plate through casting hole of gear to secure camshaft assembly.

kgm Mounting bolt of thrust plate:
1.9 ± 0.5 kgm
(14 ± 4 lb · ft)



23. Spill tube

Install spill tube (1).

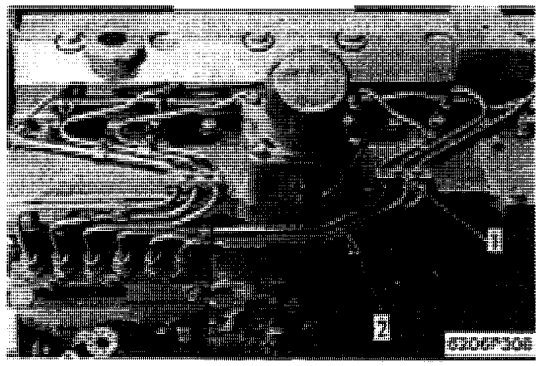


24. Fuel injection pipe

★ Before installing the fuel injection pipe, blow compressed air through it.

1) Install fuel injection pipe (2), then temporarily tighten sleeve nuts at both ends.
2) Align fuel injection pipes, then tighten clamps (1).
3) Fully tighten sleeve nuts of injection pipes.

Sleeve nut: 2.3 ± 0.2 kgm (17 ± 1.5 lb · ft)

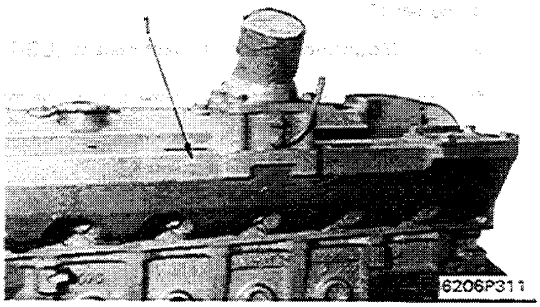


25. Intake manifold

Coat mounting surface with gasket sealant, then install intake manifold (1).

Mounting surface: Gasket sealant (LG-7)

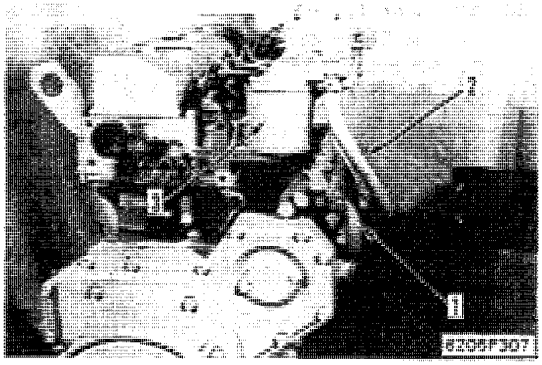
Mounting bolt: 4.1 ± 0.6 kgm (30 ± 4 lb · ft)

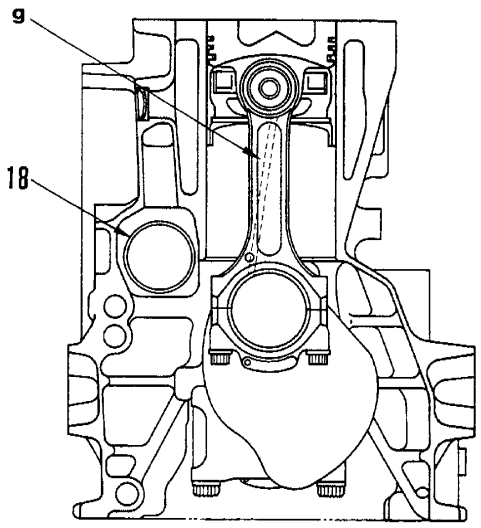


26. Fuel filter

1) Install fuel filter (3) to bracket.
2) Fit gaskets to both faces of joints of fuel hoses (2) and (1), then connect with joint bolts.

Joint bolt: 2.3 ± 0.2 kgm (17 ± 1.5 lb · ft)





Section A—A

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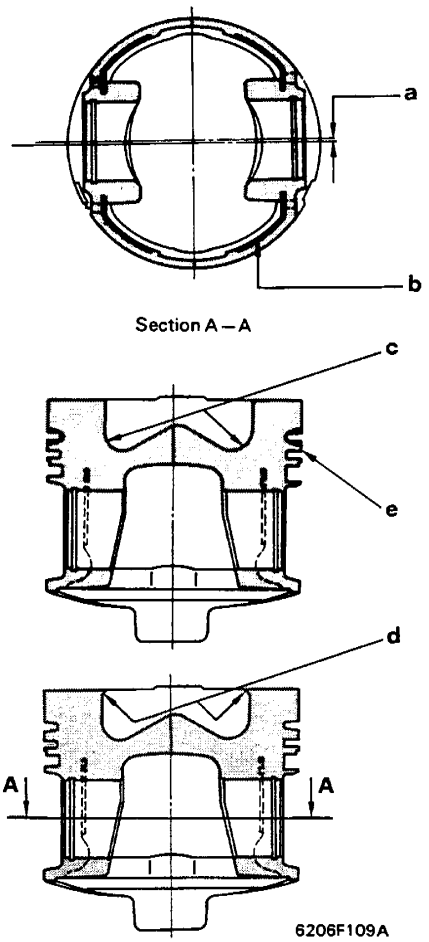

Section A—A

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CRANKSHAFT

- Stamp forging

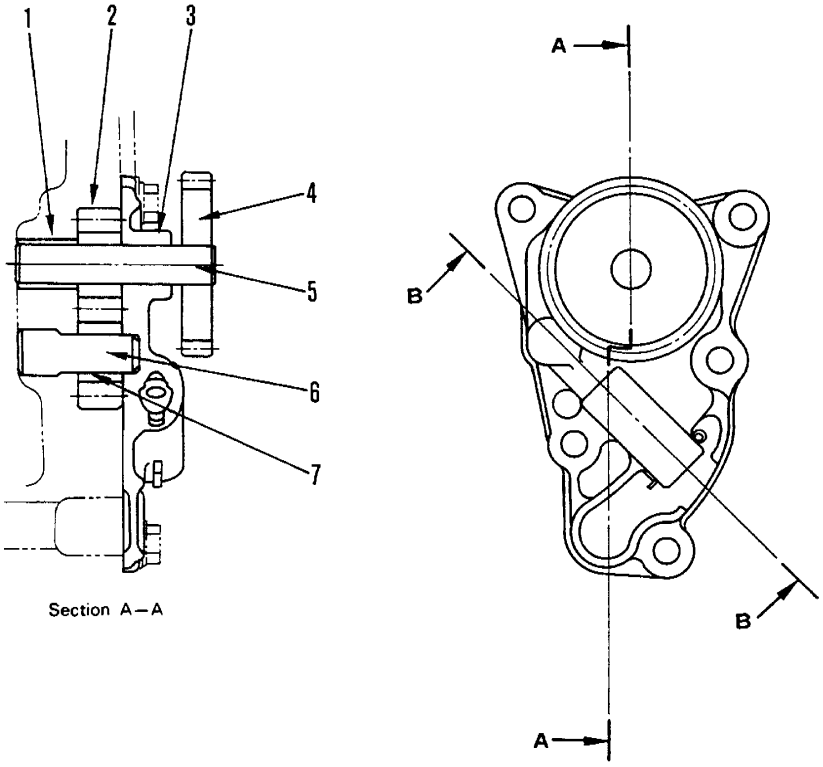
PISTON

- Reentrant combustion chamber for direct fuel injection (FD35/40/45-5, FD35Z/40Z-5)
- Trochoidal combustion chamber
- Offset (1.0 mm between pin hole center and piston center)
- Auto-thermatic
  (Control thermal expansion by steel strut which is build in piston to achieve a smaller clearance between piston and cylinder)
- Two sizes of pistons (S-mark and L-mark) are available.
  (Depending on the dimensions of the piston outside diameter.)
  For detail, see 50. INSPECTION STANDARD.

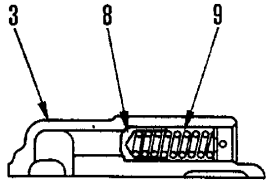
PISTON RING

Engine	Top ring	Second ring	Oil ring
6D95L -1	Flat barrel face, Hard chrome plating	Flat inner cut tappered face, Parkerizing treatment	M-shape steel ring, Hard chrome plating with coil expander
S6D95L -1	Keystone barrel face, Hard chrome plating	Flat inner cut tappered face, Parkerizing treatment	M-shape steel ring, Hard chrome plating with coil expander

OIL PUMP



Section A—A



Section B—B

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1. Bushing
2. Drive gear (No. of teeth: 7)
3. Pump cover
4. Oil pump drive gear (No. of teeth: 21)
5. Drive shaft
6. Driven shaft
7. Driven gear (No. of teeth: 7)
8. Regulator valve
9. Valve spring

OIL PUMP

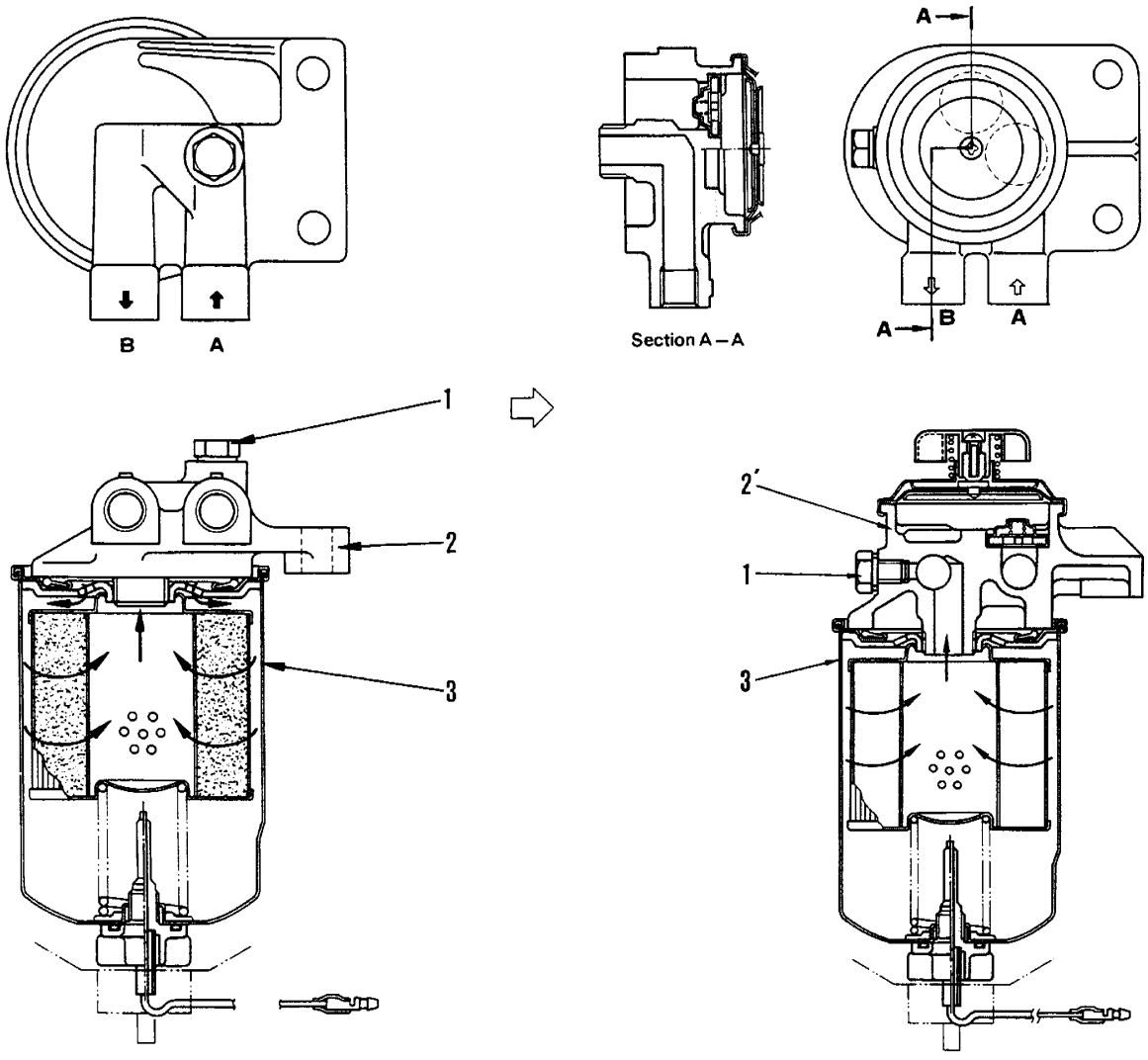
- Type: Gear type
- Pump speed: Engine speed x 1.143

REGULATOR VALVE

- Set pressure: 6.0 ± 0.5 kg/cm² (85 ± 7 psi) [6 ± 0.5 bar]

FUEL FILTER

WITH DISTRIBUTOR TYPE INJECTION PUMP



1. Air bleed plug
2. Bracket
2'. Bracket with hand priming pump
3. Cartridge

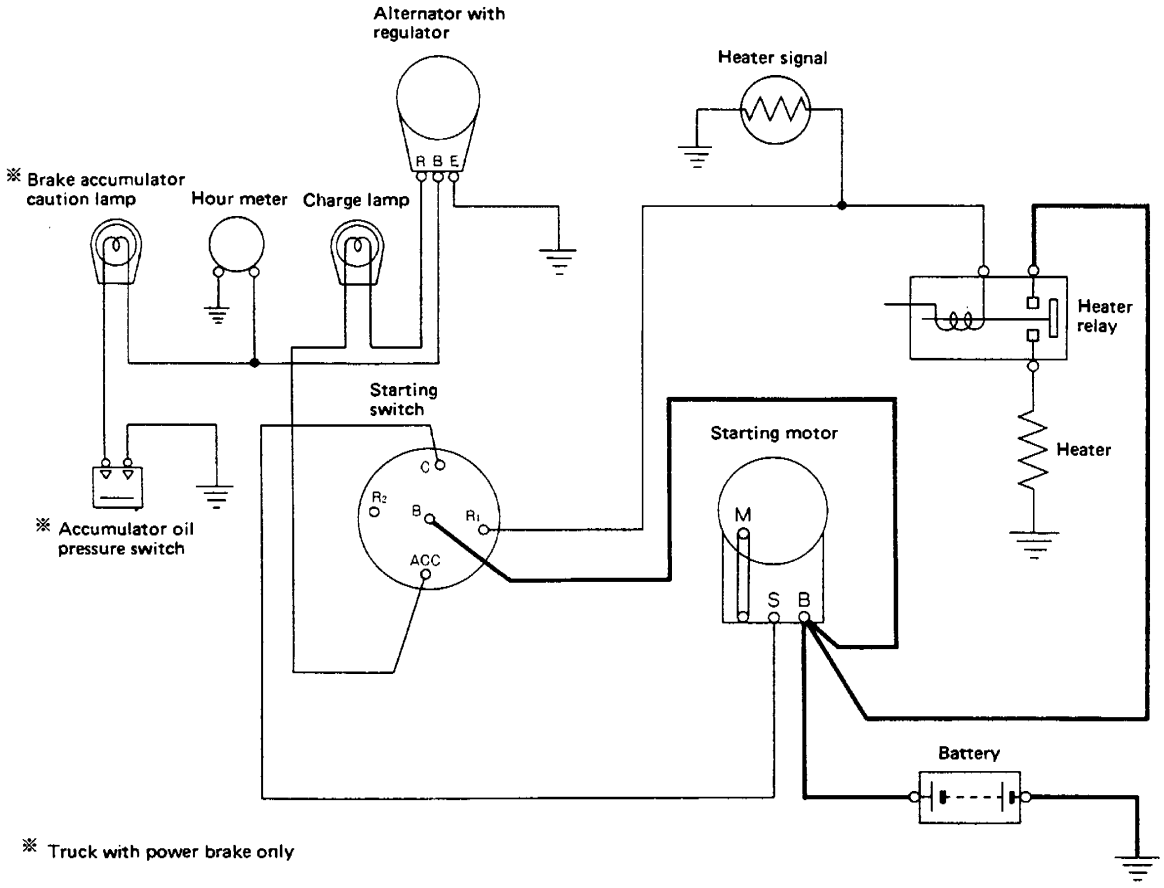
A. Fuel inlet (from feed pump)
B. Fuel outlet (to injection pump)

FUEL FILTER

- Filtration area: 0.15 m^2 (1.61 ft^2)

ELECTRICAL SYSTEM

STARTING AND CHARGING CIRUIT



※ Truck with power brake only

6D95L-1 (with distributor type pump)			
FD35Z/40Z-5 FD35/40/45-5		SD23/25-3	
Standard value	Permissible value	Standard value	Permissible value
2350 $^{+25}_{-50}$	2350 ± 50	2350 ± 50	2350 ± 50
700 ± 25	700 ± 25	700 ± 25	700 ± 25
Min. 150	—	Min. 150	—
Min. 100	—	Min. 100	—
Max. 380	762	Max. 380	762
—	—	—	—
Min. 75	Min. 75	Min. 75	Min. 75
Max. 650	700	Max. 650	700
Max. 4.0	6.0	Max. 4.0	6.0
Max. 2.5	3.5	Max. 2.5	3.5
0.35 (0.0138) 0.50 (0.0197)	— — — —	0.35 (0.0138) 0.50 (0.0197)	— — — —
Min. 30 (Min. 430) [Min. 29]	20 (280) [20]	Min. 30 (Min. 430) [Min. 29]	20 (280) [20]
Max. 100	200	Max. 100	200
3.5 — 7.0 (50 — 100) [3.4 — 6.9] Min. 1.0 (Min. 14) [Min. 0.98]	2.5 (36) [2.5] 0.7 (10) [0.67]	3.5 — 7.0 (50 — 100) [3.4 — 6.9] Min. 1.0 (Min. 14) [Min. 0.98]	2.5 (36) [2.5] 0.7 (10) [0.67]
90 — 110	120	90 — 110	120
Max. 0.5	1.0	Max. 0.5	1.0
225 $^{+15}_{+5}$ (3200 $^{+210}_{+70}$) [220 $^{+15}_{+5}$]	188 (2670) [184]	200 $^{+15}_{+5}$ (2845 $^{+210}_{+70}$) [196 $^{+15}_{+5}$]	168 (2390) [165]
6 ± 1	6 ± 1	12 ± 1	12 ± 1
70 — 80	100	70 — 80	100
74.5 — 77.5 90 —	74.5 — 77.5 — 8 (0.3)	74.5 — 77.5 90 —	74.5 — 77.5 — 8
0.9 (13) [0.9]	0.9 (13) [0.9]	0.9 (3.0) [0.9]	0.9 (3.0) [0.9]
1818 ± 55	1818 ± 55	1818 ± 55	1818 ± 55
8 (0.3)	6 — 10 (0.2 — 0.4)	8 (0.3)	6 — 10 (0.2 — 0.4)
—	—	—	—
—	—	—	—

PERFORMANCE TEST

RUN-IN STANDARD

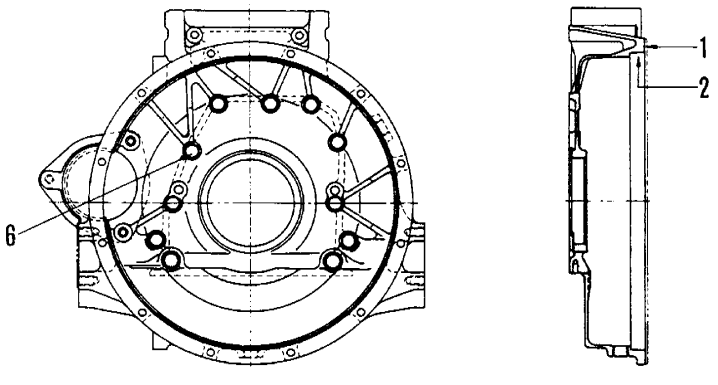
- Load are given for the case the dynamometer arm length is 716 mm. This list shows the standard on condition that the fan is removed.

Engine model	Applicable machine	Item		Order				
				1	2	3	4	5
6D95L-1	FD35Z/40Z-4 FD35/40/45-4 FD33S/35S/ 40S/45S-4 SD23/25-3 FD30/40/45-5E	Running time	min.	2	10	2	2	10
		Engine speed	rpm	700	1,070	1,500	1,820	2,150
		Load	kg (lbs)	0 (0)	19 (42)	26 (57)	33 (73)	37 (82)
		Output	HP	0	20	40	60	80
	FD35Z/40Z-5 FD35/40/45-5	Running time	min.	2	10	2	2	10
		Engine speed	rpm	700	1,070	1,500	1,820	2,150
		Load	kg (lbs)	0 (0)	19 (42)	26 (57)	33 (73)	37 (82)
		Output	HP	0	20	40	60	80
	FD50E/60E 70E-5 FD50E/60E 70E-6	Running time	min.	2	10	2	3	10
		Engine speed	rpm	700	1,070	1,500	1,820	2,150
		Load	kg (lbs)	0 (0)	19 (42)	26 (57)	33 (73)	37 (82)
		Output	HP	0	20	40	60	80
	FD50/60/ 70-5 FD50/60/ 70-6	Running time	min.	2	10	2	3	10
		Engine speed	rpm	700	1,000	1,200	1,600	2,250
		Load	kg (lbs)	0 (0)	10 (22)	20 (44)	40 (88)	40 (88)
		Output	HP	0	10	24	64	88
S6D95L-1	FD60H/70H/ 80H-5	Running time	min.	2	10	2	3	10
		Engine speed	rpm	700	1,000	1,200	1,600	2,000
		Load	kg (lbs)	0 (0)	10 (22)	20 (44)	40 (88)	55 (121)
		Output	HP	0	10	24	64	110

Unit: mm (in)

<table>
<tr><th>No.</th><th>Check item</th><th>Criteria</th><th>Remedy</th></tr>
<tr><td>1</td><td>Selection of pistons</td><td>There are both S-size and L-size pistons for each size of piston in the 95 series of engines. Select the size of pistons according to the followings.
• When using the Standard (STD) piston, use the size of pistons indicated by the stamped mark (S or L) on the top surface of the cylinder block.
• When using the Over Size (O.S.) piston, measure inside diameter of cylinder at points 40 mm, 100 mm and 160 mm from the cylinder block top face. Then select S-size or L-size piston according to the smallest of the three inside diameters.
<table><tr><th>Piston size</th><th>Standard size</th><th>Cylinder inside diameter [Range]</th><th>Selected piston size</th></tr><tr><td rowspan="2">0.25 O.S.</td><td rowspan="2">95.25 (3.7500)</td><td>$95.25\ ^{0}_{+0.011}\ (3.7500\ ^{0}_{+0.0004})$
[95.250 – 95.261 (3.7500 – 3.7504)]</td><td>S-size piston</td></tr><tr><td>$95.25\ ^{+0.011}_{+0.022}\ (3.7500\ ^{+0.0004}_{+0.0009})$
[95.261 – 95.272 (3.7504 – 3.7509)]</td><td>L-size piston</td></tr><tr><td rowspan="2">0.50 O.S.</td><td rowspan="2">95.50 (3.7598)</td><td>$95.50\ ^{0}_{+0.011}\ (3.7598\ ^{0}_{+0.0004})$
[95.500 – 95.511 (3.7598 – 3.7603)]</td><td>S-size piston</td></tr><tr><td>$95.50\ ^{+0.011}_{+0.022}\ (3.7598\ ^{+0.0004}_{+0.0008})$
[95.511 – 95.522 (3.7603 – 3.7607)]</td><td>L-size piston</td></tr></table></td><td>When changing the piston size, correct the stamped mark (S or L) on the cylinder block top face</td></tr>
<tr><td>2</td><td>Distortion of cylinder head mounting surface</td><td><table><tr><th>Standard</th><th>Repair limit</th></tr><tr><td>0 – 0.08 (0 – 0.0031)</td><td>0.15 (0.059)</td></tr></table></td><td>Repair by graiding</td></tr>
<tr><td rowspan="3">3</td><td>Inside diameter of main bearing hole</td><td><table><tr><th>Standard</th><th>Tolerance</th></tr><tr><td>74 (2.9)</td><td>+0.019 (+0.0007)
–0.005 (–0.0002)</td></tr></table></td><td rowspan="3">Repair or replace cylinder block</td></tr>
<tr><td>Roundness of main bearing hole</td><td>Repair limit: 0.005 (0.0002)</td></tr>
<tr><td>Straighteness of main bearing holes</td><td>Repair limit: 0.010 (0.0004)</td></tr>
<tr><td>4</td><td>Inside diameter of main bearing</td><td><table><tr><th></th><th>Standard size</th><th>Tolerance</th><th>Repair limit</th></tr><tr><td>STD</td><td>70.00 (2.756)</td><td rowspan="5">+0.103 (+0.0041)
+0.053 (+0.0021)</td><td>70.20 (2.764)</td></tr><tr><td>0.25 U.S.</td><td>69.75 (2.746)</td><td>69.95 (2.754)</td></tr><tr><td>0.50 U.S.</td><td>69.50 (2.736)</td><td>69.70 (2.744)</td></tr><tr><td>0.75 U.S.</td><td>69.25 (2.726)</td><td>69.45 (2.734)</td></tr><tr><td>1.00 U.S.</td><td>69.00 (2.717)</td><td>69.20 (2.724)</td></tr></table></td><td>Replace main bearing</td></tr>
<tr><td>5</td><td>Inside diameter of cam bushing hole</td><td><table><tr><th>Standard</th><th>Tolerance</th></tr><tr><td>53.5 (2.1063)</td><td>+0.030 (+0.0012)
0</td></tr></table></td><td>Rapair or replace cylinder block</td></tr>
<tr><td>6</td><td>Inside diameter of cam bushing</td><td><table><tr><th>Standard</th><th>Tolerance</th><th>Repair limit</th></tr><tr><td>50.5 (1.988)</td><td>+0.020 (+0.0008)
–0.050 (–0.0020)</td><td>50.60 (1.992)</td></tr></table></td><td>Replace</td></tr>
<tr><td>7</td><td>Tightening torque of main bearing cap mounting bolts
(Coat bolt threads and washers with engine oil)</td><td><table><tr><th>Order</th><th>Target</th><th>Range</th></tr><tr><td>1st step</td><td>11.5 kgm (83 lbft)</td><td>11 – 12 kgm (80 – 87 lbft)</td></tr><tr><td>2nd step</td><td>0</td><td>Loosen completely</td></tr><tr><td>3rd step</td><td>13.5 kgm (98 lbft)</td><td>13 – 14 kgm (94.0 – 101 lbft)</td></tr></table></td><td>Retighten</td></tr>
</table>

FLYWHEEL AND FLYWHEEL HOUSING



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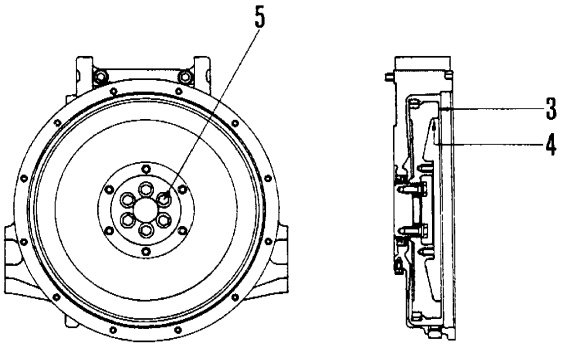

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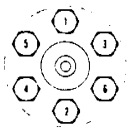
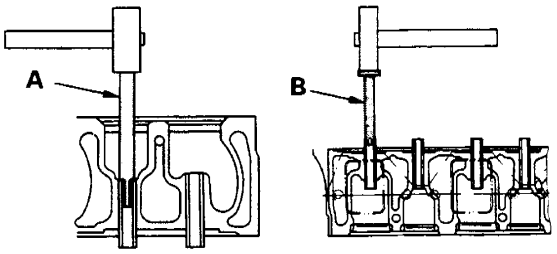
Unit: mm (in)

No.	Check item	Criteria				Remedy
1	Face runout of flywheel housing	Repair limit: 0.35 (0.0138)				Repair by reassembling
2	Radial runout of flywheel housing	Repair limit: 0.30 (0.0118)				
3	Face runout of flywheel	Repair limit: 0.20 (0.0079)				
4	Radial runout of flywheel	Repair limit: 0.15 (0.0059)				
5	Tightening torque of flywheel mounting bolts (Coat bolt threads and washers with engine oil)		Order	Target	Range	Retighten
			1st step	11 kgm (80 lbft)	10 – 12 kgm (72 – 87 lbft)	
			2nd step	19.5 kgm (141 lbft)	19 – 20 kgm (137 – 145 lbft)	
6	Tightening torque of flywheel housing mounting bolts	7 ± 0.5 kgm (51 ± 4 lbft)				

REPLACING VALVE GUIDE

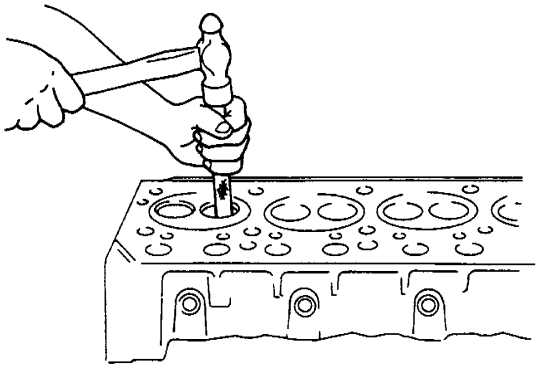
Special tools required

No.	Part No.	Part Name	Q'ty
A	795-100-4710	Valve guide remover	1
B	795-100-4720	Valve guide driver	1



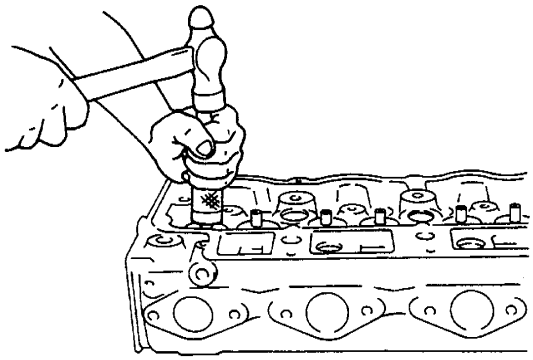
1. REMOVING VALVE GUIDE

Insert tool A from the top surface of the cylinder head, put it in contact with the valve guide, then hit with a hammer to remove.



2. PRESS FITTING VALVE GUIDE

1) Press fit the valve guide until the top of tool B contacts the cylinder head.
   ★ After press fitting, insert the valve, and if the valve does not enter smoothly, machine the hole with a reamer ($\phi 8\ ^{+0.015}_{0}$ mm).



2) Measure the protrusion of the valve guide and check that it is within the standard range.
   ★ Valve guide protrusion
   Tolerance: 14.5 ± 0.2 mm

ENGINE
70 TROUBLESHOOTING

S-2 Engine does not start

① Engine does not turn

General causes why engine does not turn
- Internal parts of engine seized
  - ★ If internal parts of the engine are seized, carry out troubleshooting for "Engine stops during operations".
- Failure in power train
- Defective electrical system

			Causes: Defective wiring of starting circuit	Defective or deteriorated battery	Defective starting motor	Broken ring gear	Defective safety relay or safety switch	Defective battery relay	Defective battery terminal connection	Defective fuel cut solenoid valve	Defective adjustment of engine stop motor wire	Defective engine stop motor	Defective starting switch
Questions	Confirm recent repair history												
	Degree of use	Operated for long period		△		△							
	Condition of horn when starting switch is turned ON	Horn does not sound	◎					○					○
		Horn sound level is low		◎									
Check items	When starting switch is turned to START, pinion moves out, but	Rotating speed is slow		◎									
		Makes grating noise			◎	◎							
		Soon disengages again					◎						
		Makes rattling noise and does not turn		○	○		○						
	When starting switch is turned to START, pinion does not move out		◎	○									○
	When starting switch is turned to ON, there is no clicking sound		Carry out troubleshooting for defective wiring of starting circuit	○				◎					
	Battery terminal is loose								◎				
	When starting switch is turned to ON, linkage does not move									◎	◎	◎	
	When battery is checked, battery electrolyte is found to be low			○									
Troubleshooting	Specific gravity of electrolyte, voltage of battery is low			●									
	For the following conditions 1) — 5), turn the starting switch OFF, connect the cord, and carry out troubleshooting at ON												
	1) When terminal B and terminal C of starting switch are connected, engine starts												●
	2) When ternimal B and terminal C of starting motor are connected, engine starts				●								
	3) When terminal B and terminal C of safety relay are connected, engine starts					●							
	4) When terminal of safety switch and terminal B of starting motor are connected, engine starts					●							
	5) There is no 24V voltage between terminal b and terminal E of battery relay						●						
	When ring gear is inspected directly, tooth surface is found to be chipped				●								
	Does not move even when fuel cut solenoid linkage is disconnected								●				
	Does not move even when engine stop motor linkage is disconnected									●	●		
		Remedy	—	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Adjust	Replace	Replace

S-5 Engine does not rotate smoothly (with in-line type pump)

General causes why engine does not rotate smoothly (hunting)

- Air in fuel system
- Defective governor mechanism
- Defective electrically controlled throttle mechanism
  (electrically controlled throttle type)
  ★ If there is no hunting when the electrically controlled throttle rod is disconnected, carry out troubleshooting for the electrical system.

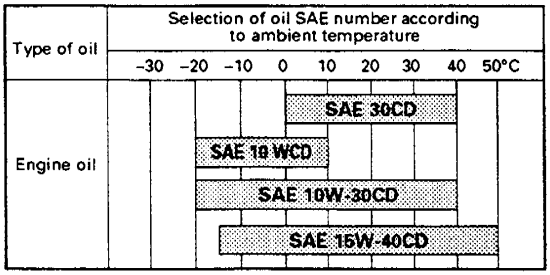
			Causes: Defective operation of governor	Defective adjustment of governor	Defective operation of control rack	Low speed is too low	Lack of fuel	Clogged feed pump strainer	Clogged fuel filter, strainer	Clogged, air in circuit between fuel tank and feed pump	Clogged, air in circuit between feed pump and nozzle	Clogged fuel tank air breather hole
Questions	Confirm recent repair history											
	Degree of use	Operated for long period					△	△				
	Condition of hunting	Occurs at fixed speed range	◎	◎	◎	○						
		Occurs at low idling	○			◎		○	○	○	○	
		Occurs even when speed is raised	○	○	○							○
		Occurs on slopes					◎					
	Fuel tank is found to be empty						◎					
	Replacement of filters has not been carried out according to operation manual							◎	◎			
	Rust is found when fuel is drained							○	○			
Check items	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 high		◎	◎								
	Sometimes is difficult to stop engine		◎		◎							
	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	Add	Claen	Clean	Repair	Repair	Clean

S-12 Oil pressure lamp lights up (drop in oil pressure)

General causes why oil pressure lamp lights up

- Leakage, clogging, wear of lubricating system
- Defective oil pressure control
- Use of improper oil (improper viscosity)
- Deterioration of oil due to overheating

★ Standards for engine oil selection



			Causes: Clogged oil filter	Worn bearing journal	Clogged strainer inside oil pan	Clogged, broken oil pipe inside oil pan	Broken suction pipe brazing	Defective oil pump	Insufficient oil in oil pan	Defective regulator valve	Defective relief valve	Leaking, crushed hydraulic piping	Defective oil level sensor	Defective oil pressure sensor	Water, fuel in oil
Questions	Confirm recent repair history														
	Degree of use	Operated for long period	△	△				△							
	Replacement of filters has not been carried out according to operation manual		◎												
	Caution lamp lights up		◎							○					
	Non-specified fuel has been used		◎	○											
Check items	Condition when oil pressure lamp lights up	Lights up at low idling		◎						○					
		Lights up at low, high idling			◎	◎	◎	◎	○	○	○				
		Lights up on sloes							◎						
		Sometimes lights up								◎	◎		○	○	
	There is clogging, leakage from hydraulic piping (external)											◎			
	Oil level sensor lamp lights up								◎				◎		
	When oil level in oil pan is checked, it is found to be low								◎						
	Metal particles are found when oil is drained			○											
	Metal particles are stuck to oil filter element			○				○							
	Oil is cloudy white or smells of diesel oil														○
Troubleshooting	When oil filter is inspected directly, it is found to be clogged		●	●											
	Remove oil pan and check directly				●	●	●								
	Oil pump rotation is heavy, there is play							●							
	There is catching of relief valve, regulator valve, spring, valve guide is broken									●	●				
	When oil level sensor is replaced, oil pressure sensor lamp goes out												●		
	When oil pressure is measured, it is found to be within standard value													●	Carry out troubleshooting for "Oil level rises".
		Remedy	Clean	Clean	Clean	Clean	Repair	Replace	Add	Adjust	Adjust	Repair	Replace	Replace	—