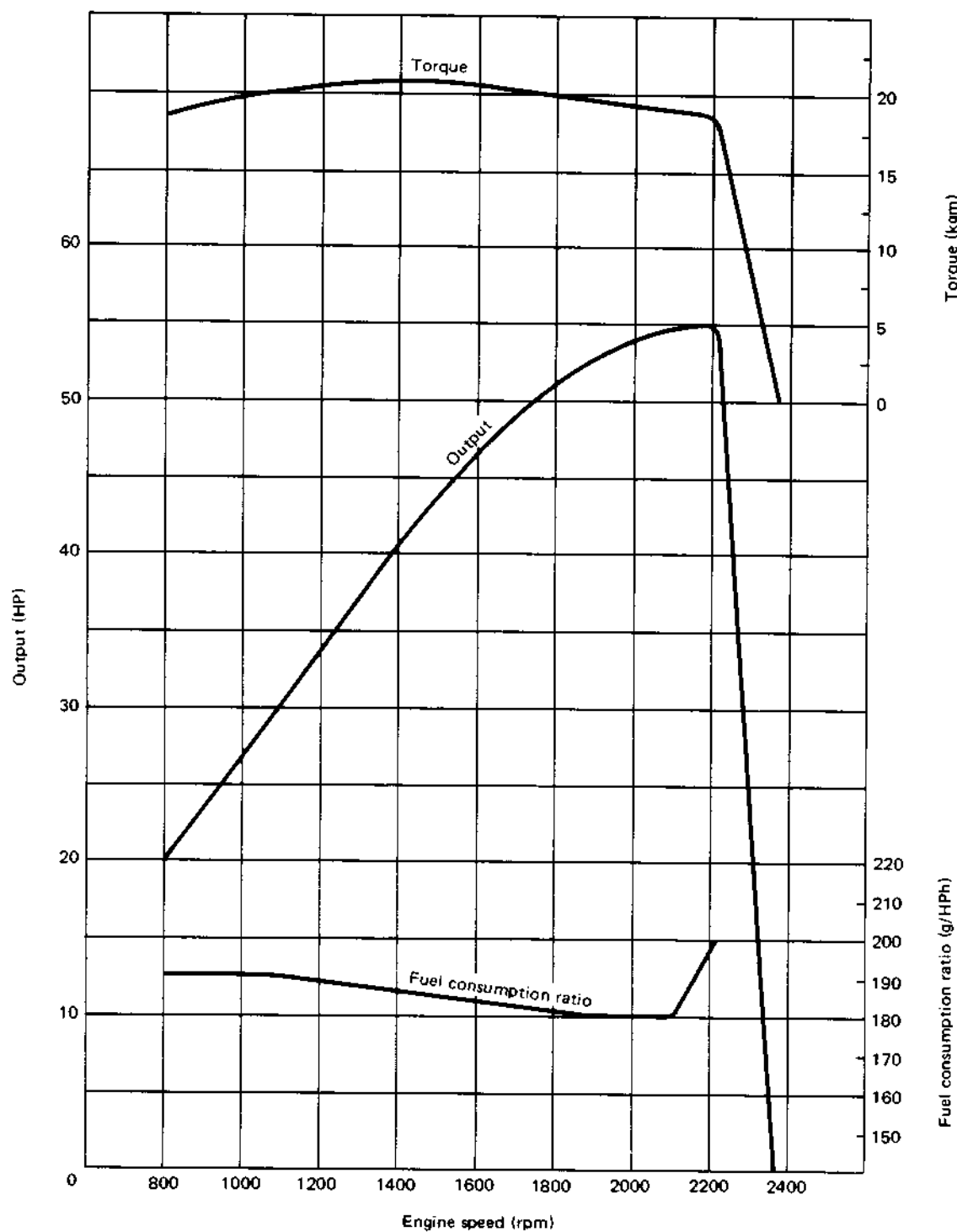


CONTENTS

	No. of page
01 GENERAL	01-001
11 STRUCTURE AND FUNCTION	11-001
2 TESTING AND ADJUSTING	12-001
3 DISASSEMBLY AND ASSEMBLY	13-001
4 MAINTENANCE STANDARD	14-001
5 REPAIR AND REPLACEMENT	15-001

4D95L-W-1 (For WA70-1)

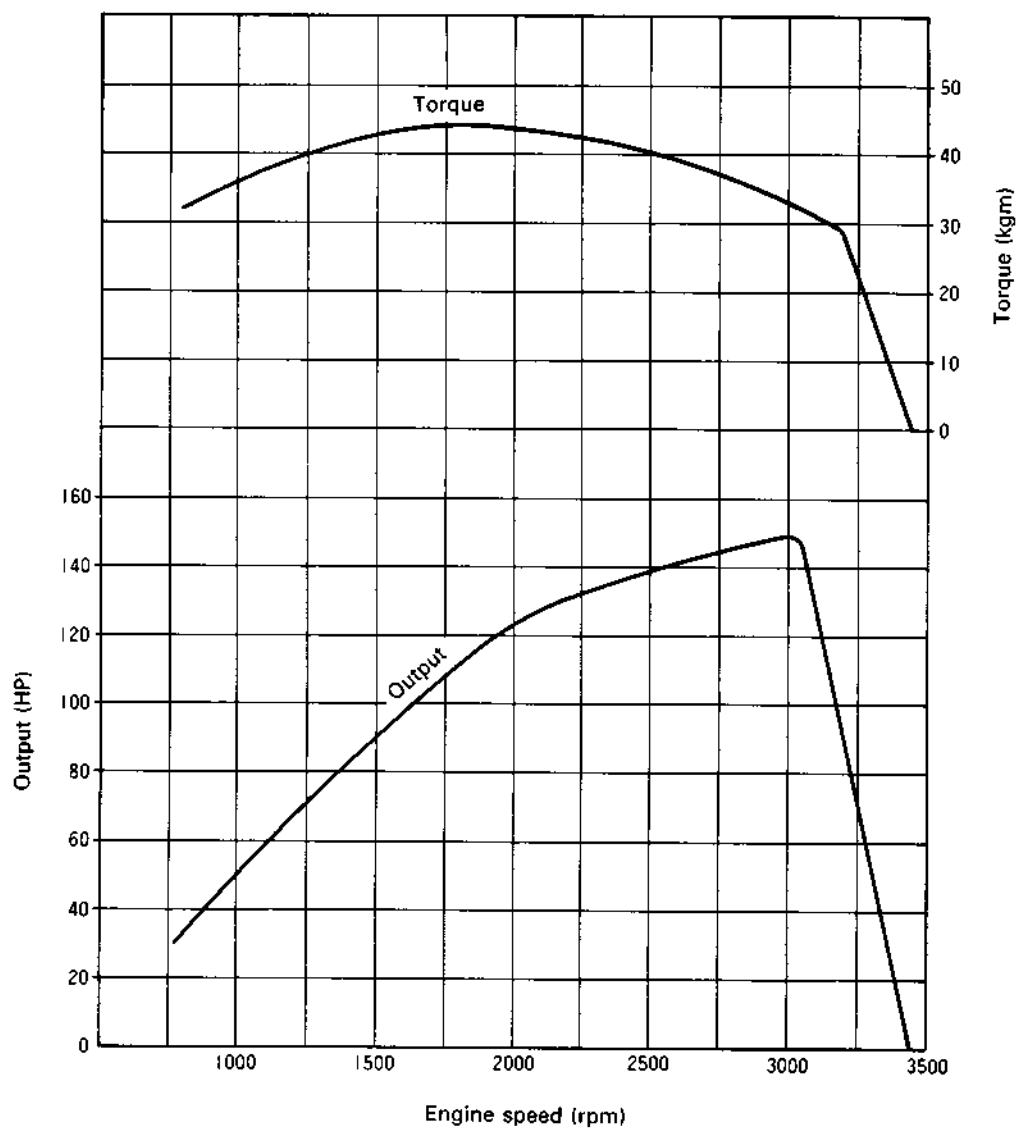
Flywheel horsepower: 55 HP/2,200 rpm
Maximum torque: 20.8 kgm/1,500 rpm
Minimum fuel consumption ratio: 180 g/HPh



F614601073

S6D95L-1 (For LW80-1)

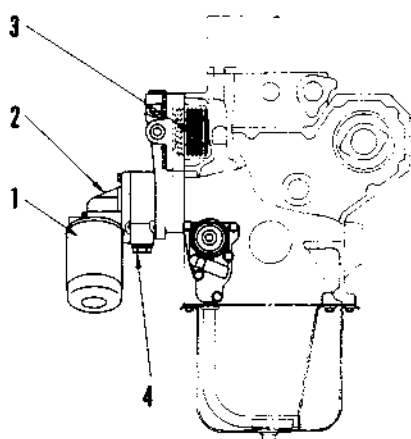
Flywheel horsepower: 110 kW (148 HP)/3,000 rpm
Maximum torque: 435 Nm (44.4 kgm)/1,800 rpm
Minimum fuel consumption ratio: 224 g/kWh (165 g/HPh)



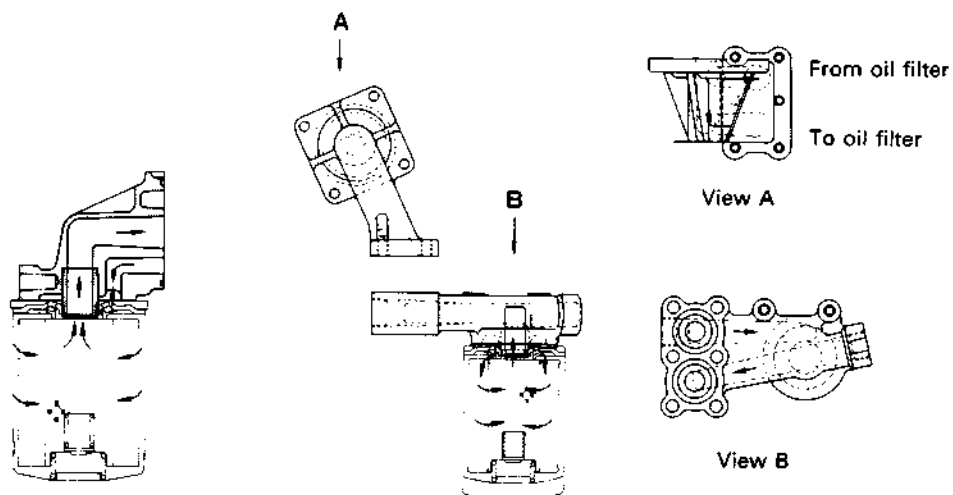
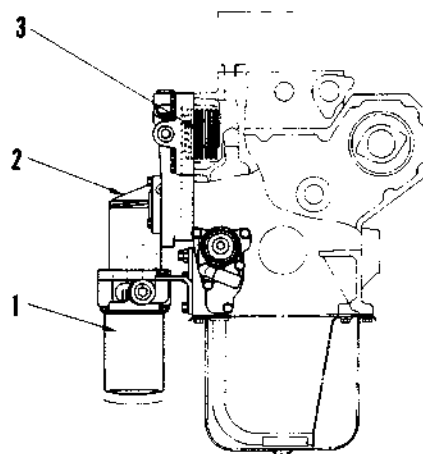
6206F964

OIL FILTER MOUNT (For PC200, 220-5)

(Engine No. up to 83350)



(Engine No. 83351 and up)

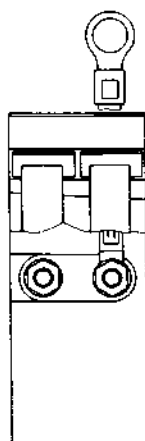
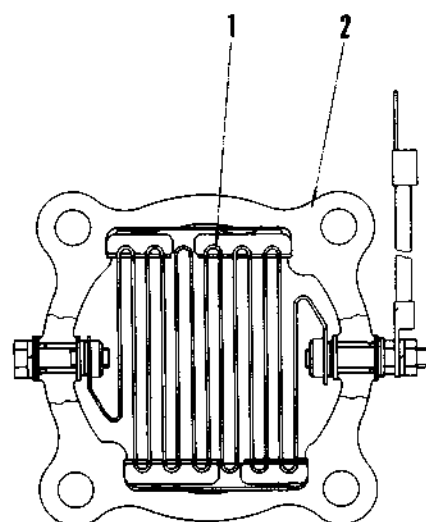


6206F876

1. Cartridge
2. Head
3. Oil cooler
4. Safety valve (cold spec.)

ELECTRICAL INTAKE AIR HEATER

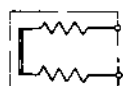
ELECTRICAL HEATER (DIRECT FUEL INJECTION TYPE)



1. Heater coil
2. Housing

Specification

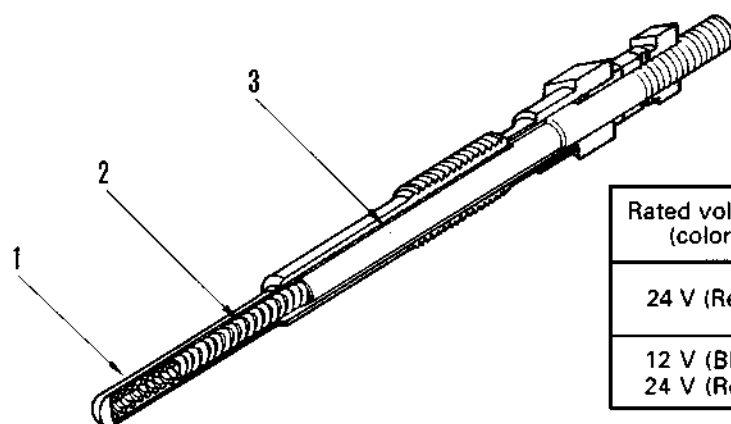
- Rated voltage: DC24V
- Rated current: 110A (when 22 V)



Wiring diagram

6136F025

(BIMETAL TYPE GLOW PLUG)



1. Sheath (Fe-Cr)
2. Coil (Fe)
3. Insulator

Rated voltage (color)	Type	Name
24 V (Red)	Standard type	Self-control type ceramic glow plug
12 V (Blue) 24 V (Red)	Quick type	Bimetal type glow plug

F614601049

Pump Assembly Number
6206-71-1320 (101692-3001)

(): Manufacturer's part No.

Injection Pump Type	Pump Manufacturer
PES-6A	DIESEL KIKI

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
GD300A-2		6D95L-1	10018 and up

Injection Timing

Rotating direction	Clockwise viewed from drive end
Injection order	1-5-3-6-2-4
Injection interval	$60^{\circ} \pm 30'$
Plunger pre-stroke mm	3.6 ± 0.05
Delivery valve retraction volume mm ³ /st	51

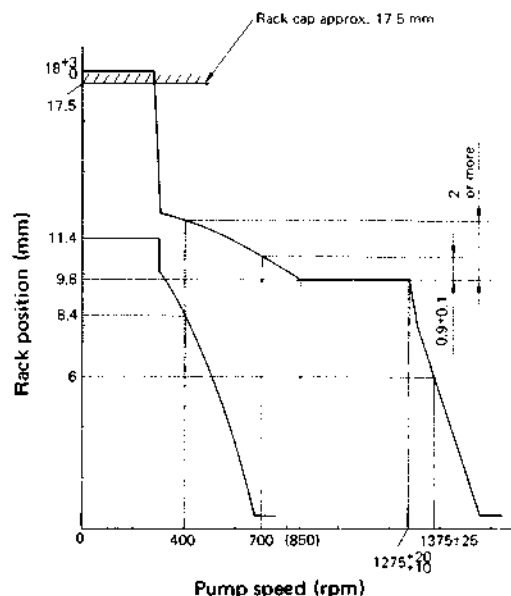
Engine specification

Rated horsepower	HP/rpm	84/2,550
Maximum torque	kgm/rpm	31/1,400
High idling	rpm	2,700 to 2,800
Low idling	rpm	800 to 850
Pump tester capacity for Service standard		Motor 7.5 KW

Calibration Standard

Conditions				Service standard			Manufacturer standard		
- Service standard indicates data using calibration test parts. - Manufacturer standard is data for factory test.				Nozzle part no.			6207-11-3130 (105017-0090)		
				Nozzle holder part no.			6207-11-3110 (105048-3060)		
				Injection pipe (O/D x I/D x length) mm			6 x 1.6 x 600		
				Test oil			ASTM D975 No. 2 diesel fuel or equivalent		
				Oil temperature °C			43 to 47		
				Nozzle opening pressure kg/cm ²			175		
				Transfer pump pressure kg/cm ²			1.6		
Injection volume				Service standard (cc/1000st)			Manufacturer standard (cc/1000st)		
- Rack positions B to E are the reference volume when adjusting the injection volume. - Marks * are average volumes.	Rack point	Rack position (mm)	Pump speed (rpm)	Basis	Allowance	Maximum variance between cylinder	Basis	Allowance	Maximum variance between cylinder
	Basic point	9.8	1275	31.5	Each cyl. 30.5 to 32.5	± 0.7875	34.3	Each cyl.	
	B	Approx. 10.5	400	10.5	* 9.5 to 11.5	± 1.575	10.5	*	
	C				*			*	
	D				*			*	
	E				*			*	

Governor performance (400 – 1275 rpm)



SEBH4598

Pump Assembly Number

6206-71-1252 (10695-3622)

(): Manufacturer's part No.

Injection Pump Type	Pump Manufacturer
PES-A	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D31E, P-20(A)		6D95L-1	
D31PL, PLL, S-20			
D31Q, AM, SM-20			

Injection Timing

Rotating direction	Clockwise viewed from drive end
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	$60^\circ \pm 30'$
Plunger pre-stroke mm	3.6 ± 0.05
Delivery valve retraction volume mm ³ /st	51

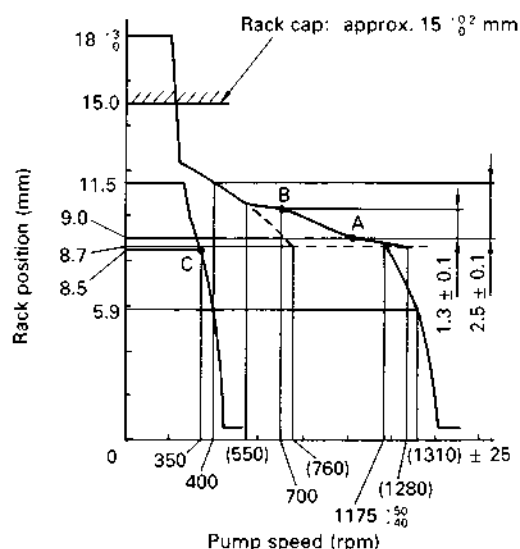
Engine specification

Rated horsepower	HP/rpm	70/2350
Maximum torque	kgm/rpm	27/1400
High idling	rpm	2535 to 2635
Low idling	rpm	700 to 750

Pump tester capacity for Service standard	Motor 7.5 kW
---	--------------

Calibration Standard

Conditions				Service standard			Manufacturer standard		
- Service standard indicates data using calibration test parts. - Manufacturer standard is data for factory test.				Nozzle part no.			(105780-0000)		
				Nozzle holder part no.			(105780-2080)		
				Injection pipe (O/D x I/D x length) mm			6 x 2 x 600		
				Test oil			ASTM D975 No. 2 diesel fuel or equivalent		
				Oil temperature °C			43 to 47		
				Nozzle opening pressure kg/cm ²			175		
				Transfer pump pressure kg/cm ²			1.6		
Injection volume				Service standard (cc/1000st)			Manufacturer standard (cc/1000st)		
- Rack positions B to E are the reference volume when adjusting the injection volume. - Marks * are average volumes.	Rack point	Rack position (mm)	Pump speed (rpm)	Basis	Allowance	Maximum variance between cylinder	Basis	Allowance	Maximum variance between cylinder
	Basic point	9.0	1175	29.6	Each cyl. 28.6 to 30.6	±2.5	30.6	Each cyl.	
	B	10.3	700	(32)	* (30 to 34)		(43.4)	*	
	C	Approx. 8.5	350		*	±15	10.5	*	
	D	Approx. 8.5	500	8	* 7 to 9	±15		*	
	E				*			*	

Governor performance

Pump Assembly Number

6205-71-1520(PC120-6)
6205-71-1320(PC128UU-1)

(): Manufacturer's part No.

Injection Pump Type	Pump Manufacturer
PES-4A	ZEXEL (DIESEL KIKI)

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
PC120-6		S4D95L-1	
PC128UU-1			

Injection Timing

Rotating direction	Clockwise viewed from drive end
Injection order	1-2-4-3
Injection interval	$90^\circ \pm 30'$
Plunger pre-stroke mm	3.2 ± 0.05
Delivery valve retraction volume mm ³ /st	51

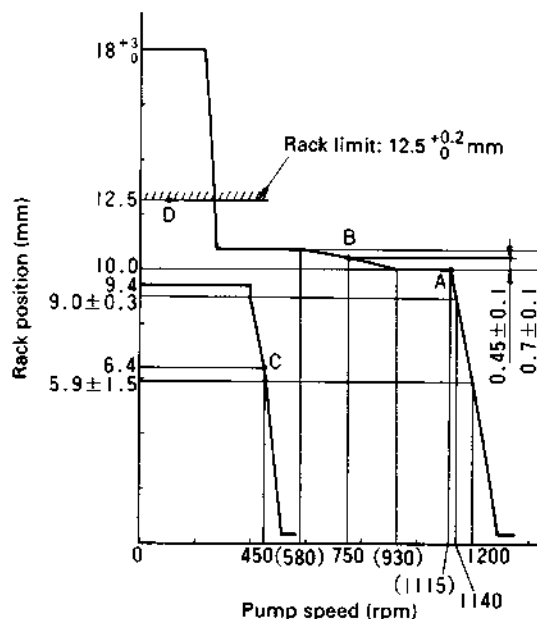
Engine specification

Rated horsepower kW(HP)/rpm	62.5(83.8)/2200
Maximum torque Nm(kgm)/rpm	299(30.5)/1500
High idling rpm	2340 - 2460
Low idling rpm	900 - 950

Pump tester capacity for Service standard	Motor 7.5 kW
---	--------------

Calibration Standard

Conditions				Service standard			Manufacturer standard		
• Service standard indicates data using calibration test parts (Nozzle, Nozzle holder and injection pipe) • Manufacturer standard is data using factory test parts (For reference)	Nozzle part no.			(105780-0000)			6206-11-3130 (105017-0140)		
	Nozzle holder part no.			(105780-2080)			6207-11-3110 (105048-3060)		
	Injection pipe (O/D x I/D x length) mm			6 x 2 x 600			6 x 1.6 x 600		
	Test oil			ASTM D975 No. 2 diesel fuel or equivalent					
	Oil temperature °C			43 – 47					
	Nozzle opening pressure MPa(kg/cm ²)			17.2 (175)			19.6 (200)		
	Transfer pump pressure MPa(kg/cm ²)			0.16 (1.6)			0.16 (1.6)		
Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000st)			Manufacturer standard (cc/1000st)		
				Basis	Allowance	Maximum variance between cylinder	Basis	Allowance	Maximum variance between cylinder
• Rack positions B to E are the reference volume when adjusting the injection volume. • Marks ★ are average volumes.	Basic point	10.0	1100	73.5	Each cyl.		65.2	Each cyl.	
	B	10.45	750	63.2	★		77.5	★	
	C	6.4	450	10.5	★		10.5	★	
	D				★			★	
	E				★			★	

Governor performance (450 - 1100 rpm)

6206F1012

- ★ The values given for the output and torque are with the fan removed, so they differ from those of the specification.
- ★ Values are standardized under the following conditions: Air cleaner installed; alternator idling; and air compressor (if installed) open.
- ★ Dynamometers are given for the case of the arm length is 716 mm.
- ★ Fuel used: ASTM D975 No. 1 or No. 2 diesel fuel.
- ★ Lubrication oil used: CLASS-CD SAE30.

Output (HP)	Torque (kgm)	Fuel consumption (sec./100 cc)	Coolant temperature (°C)	Lubrication oil temperature (°C)	Lubrication oil pressure (kg/cm ²)	Exhaust temperature (°C) (t=Intake temp. - 20°C)
74.2 - 78.8	—	Min. 22.8	70 - 80	80 - 110	3.5 - 7.0	Max. 650 + 3t
—	28.5 - 31.5	—	70 - 80	80 - 110	—	Max. 650 + 3t
0	0	—	70 - 80	80 - 110	—	—
0	0	—	70 - 80	Min. 80	Min. 1.0	—
84.8 - 89.9	—	Min. 19.2	70 - 80	80 - 115	3.5 - 7.0	Max. 650 + 3t
—	31.5 - 34.5	—	70 - 80	80 - 115	—	Max. 650 + 3t
0	0	—	70 - 80	80 - 115	—	—
0	0	—	70 - 80	Min. 80	Min. 1.0	—
87.6 - 92.5	—	Min. 19.5	70 - 80	80 - 115	3.5 - 7.0	Max. 650 + 3t
—	31.2 - 33.2	—	70 - 80	80 - 115	—	Max. 650 + 3t
0	0	—	70 - 80	80 - 115	—	—
0	0	—	70 - 80	Min. 80	Min. 1.5	—
65.1 - 68.9 75.5 - 80.2	— —	Min. 27.4 Min. 23.8	70 - 85 70 - 80	80 - 115 80 - 115	3.0 - 5.5 3.0 - 5.5	Max. 700 + 3t Max. 700 + 3t
0	0	—	70 - 85	80 - 115	—	—
0	0	—	70 - 85	80 - 115	—	—
0	0	—	70 - 85	Min. 80	Min. 1.5	—
71.9 - 76.0 84.4 - 88.4	— —	Min. 24.8 Min. 21.6	70 - 85 70 - 85	80 - 115 80 - 115	3.0 - 5.5 3.0 - 5.5	Max. 700 + 3t Max. 700 + 3t
0	0	—	70 - 85	80 - 115	—	—
0	0	—	70 - 85	80 - 115	—	—
0	0	—	70 - 85	Min. 80	Min. 1.5	—

Diagnosis lamp indication

- Lit
- Out
- ◐ Quick flashing (0.25 second)
- ◑ Slow flashing (2 seconds)
- ◒ Simultaneous flashing
- ◓ Alternate flashing
- ◔ Alternate quick flashing

Indication type	Diagnosis lamp indication	
	Green	Red
Controller system	●	●
Governor servo system	◐	◐
Rack sensor system	◐	●
Overrun	○	●
1st speed sensor (engine)	◒	◒
2nd speed sensor (Fuel injection pump)	◒	◓
Low idling speed control dial	●	◒
Droop changeover dial	●	◐
Load current signal	○	◒
No indication	○	○
Normal indication	●	○

24. Oil pump

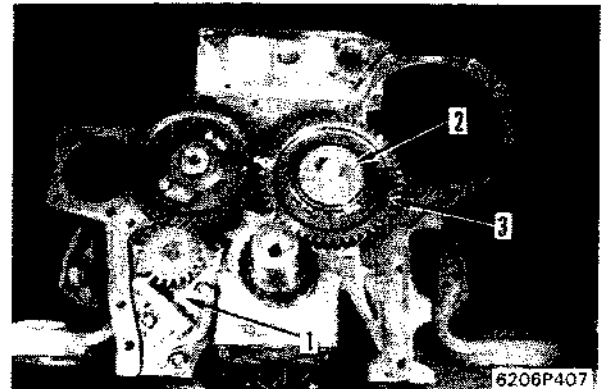
Remove oil pump (1).

25. Idler gear

1) Remove plate (2).

2) Remove idler (3).

★ If a PTO is installed, the idler gear bushing uses a bearing.

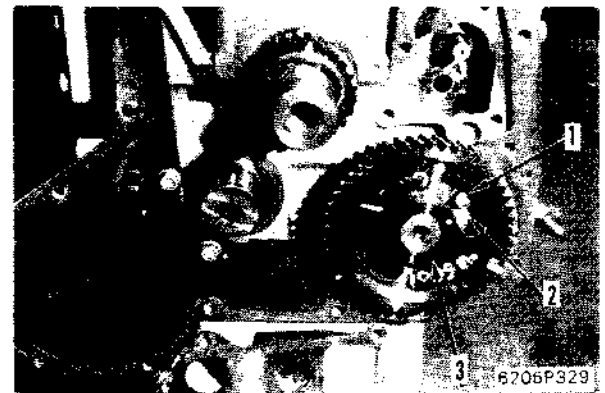
**26. Camshaft assembly**

1) Turn over cylinder block, so that cylinder head mounting face is facing down.

2) Remove mounting bolts (1) through casting hole in gear.

3) Remove camshaft assembly (3) together with thrust plate (2).

★ When removing, rotate the camshaft lightly and be careful not to damage the bushing.

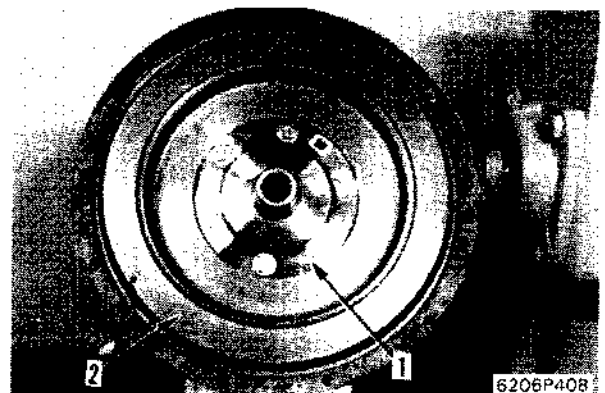
**27. Flywheel**

1) Remove coupling (1).

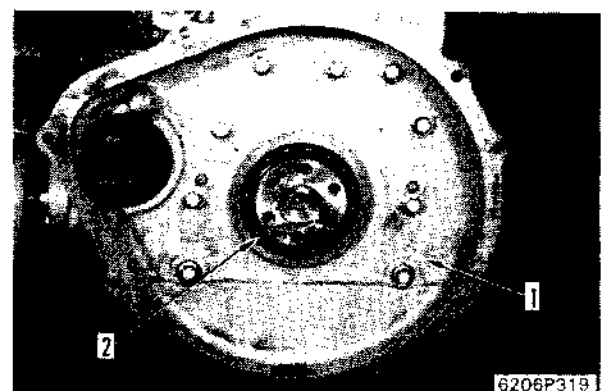
2) Remove flywheel (2).



The pilot is short, so the flywheel may come off suddenly.

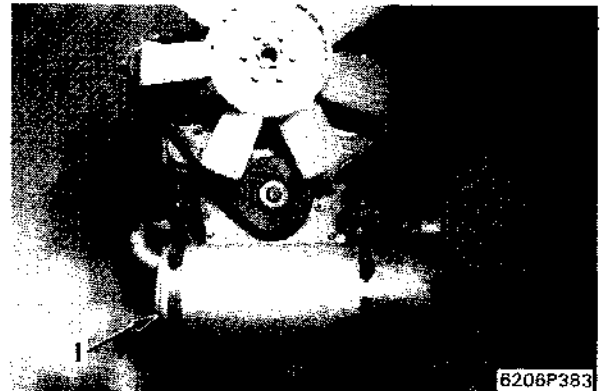
**28. Flywheel housing**

1) Remove flywheel housing (1).

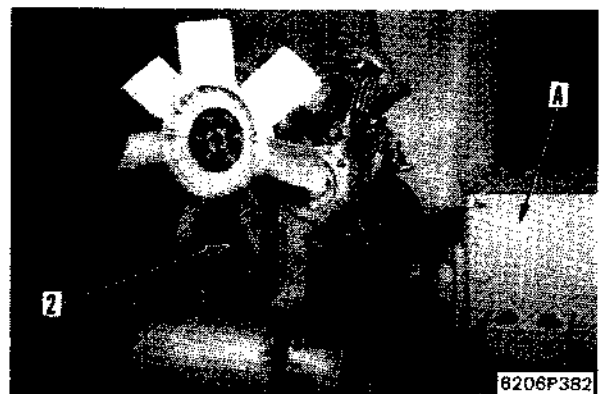


33. Muffler

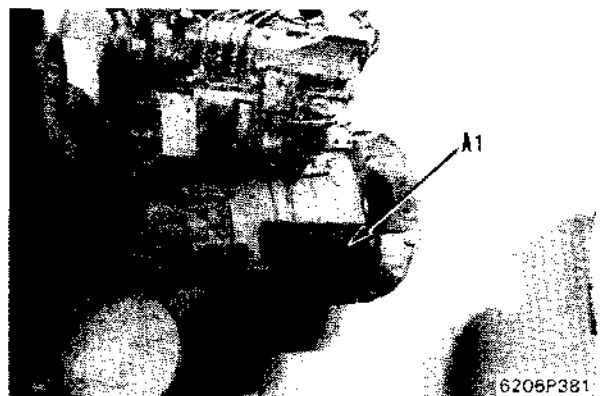
Install muffler (1).

**34. Lowering engine**

1) Sling engine assembly (2), disconnect engine from unit repair stand A, then lower engine on to a stable stand.



2) Remove bracket A1 from engine.



3) Fit O-ring and install starting motor (1).



- 2) When No. 1 cylinder is at compression top dead center, adjust the valves marked ●. Then rotate the crankshaft in the normal direction, and when No. 6 cylinder is at compression top dead center, adjust the valves marked ○.

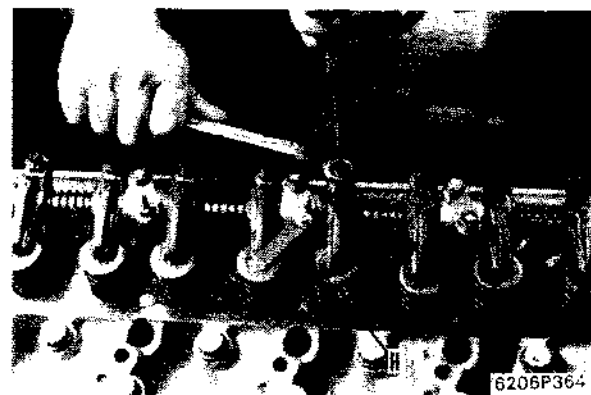
★ Valve arrangement chart

Cylinder No.	1	2	3	4	5	6
Intake valve	●	●	○	●	○	●
Exhaust valve	○	○	●	○	●	○

- ★ To adjust, insert feeler gauge H between rocker arm and valve stem and turn adjustment screw until clearance is a sliding fit. Then tighten locknut to hold adjustment screw in position.

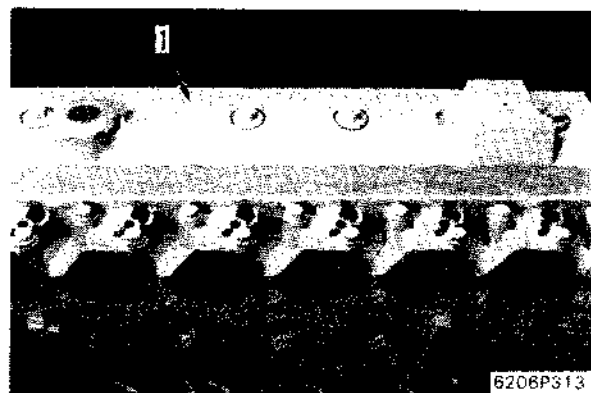
 Locknut: 4.5 ± 0.5 kgm

- ★ After adjusting No. 1 cylinder at compression top dead center, it is also possible to turn the crankshaft 120° each time and adjust the valve clearance of each cylinder according to the firing order.
- ★ Firing order: 1 - 5 - 3 - 6 - 2 - 4



21. Cylinder head cover

Fit O-ring and install cylinder head cover (1).



22. Nozzle holder

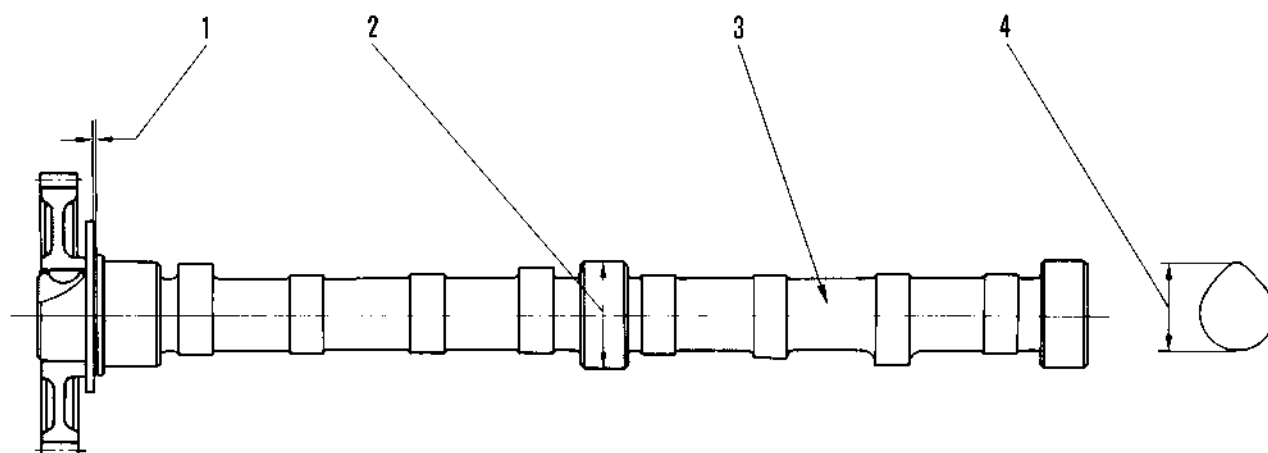
Fit gasket and install nozzle holder (1).

 Mounting bolt: 4.5 ± 0.5 kgm

- ★ When remove the nozzle holder, replace the seat gasket with new one.
- ★ Insert the spill tube before installing the nozzle holder.



4D95S-1
4D95L-1
S4D95L-1
SA4D95L-1
4D95L-W-1
4D95S-W-1
 (with bushing for No. 1, No. 2 and No. 3 journals)

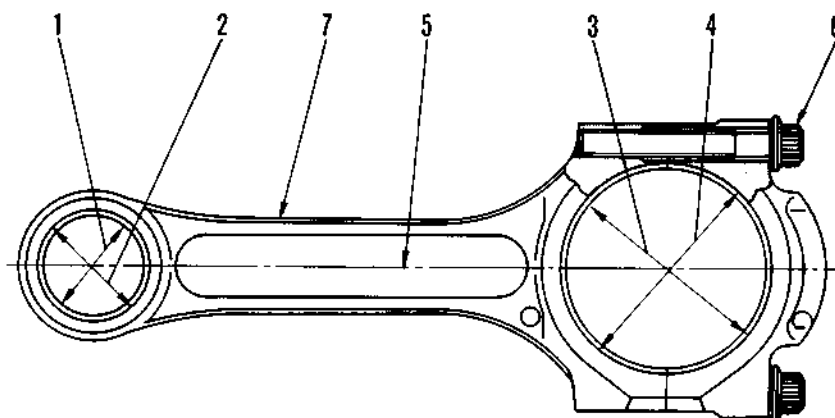


6204F406

Unit: mm

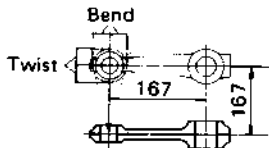
No.	Check item	Criteria						Remedy
1	End play	Standard			Repair limit			Replace thrust plate
		0.150 – 0.350			0.50			
2	Clearance between camshaft and bushing	Journal	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing
				Shaft	Hole			
		No. 1 No. 2 No. 3	50.5	–0.080 –0.110	+0.030 –0.040	0.040 – 0.140	0.25	
3	Bend of camshaft	Repair limit: 0.03 (Total indicated runout)						
4	Cam height	Cam	Standard size	Tolerance		Repair limit		Replace camshaft
		Intake	43.24 (4D95S-1 S(A)4D95L-1: 42.69)	±0.10		42.7 (4D95S-1 S(A)4D95L-1: 42.2)		
		Exhaust	43.44 (4D95S-1 S(A)4D95L-1: 43.04)			42.9 (4D95S-1 S(A)4D95L-1: 42.5)		

CONNECTING ROD



6206F414A

Unit: mm

No.	Check item	Criteria					Remedy
1	Clearance between connecting rod bushing and piston pin (carry out reaming after press fitting)	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing (semi-finished part supplied as replacement part)
			Shaft	Hole			
		30	0 -0.006	+0.033 +0.020	0.020 - 0.039	0.10	
2	Inside diameter of connecting rod bushing hole	Standard		Tolerance		Replace connecting rod	
		33		+0.025 0			
3	Inside diameter of connecting rod bearing		Standard size	Tolerance	Repair limit	Replace connecting rod bearing	
		STD	57.00	+0.095 +0.045	57.20		
		0.25 U.S.	56.75		56.95		
		0.50 U.S.	56.50		56.70		
		0.75 U.S.	56.25		56.45		
		1.00 U.S.	56.00		56.20		
4	Inside diameter of connecting rod bearing hole	Standard		Tolerance		Replace Connecting rod	
		61		+0.025 0			
5	Bend and twist of connecting rod				Standard	Repair limit	Replace Connecting rod
				Bend	Max. 0.20	0.25	
				Twist	Max. 0.30	0.35	
6	Tightening torque of connecting rod cap mounting bolts (Coat bolt threads and washers with engine oil)	Order		Target Nm (kgm)		Range Nm (kgm)	
		1st step		39.2 (4)		37.2 - 41.2 (3.8 - 4.2)	
		2nd step		Retighten with 90°		90° - 120°	