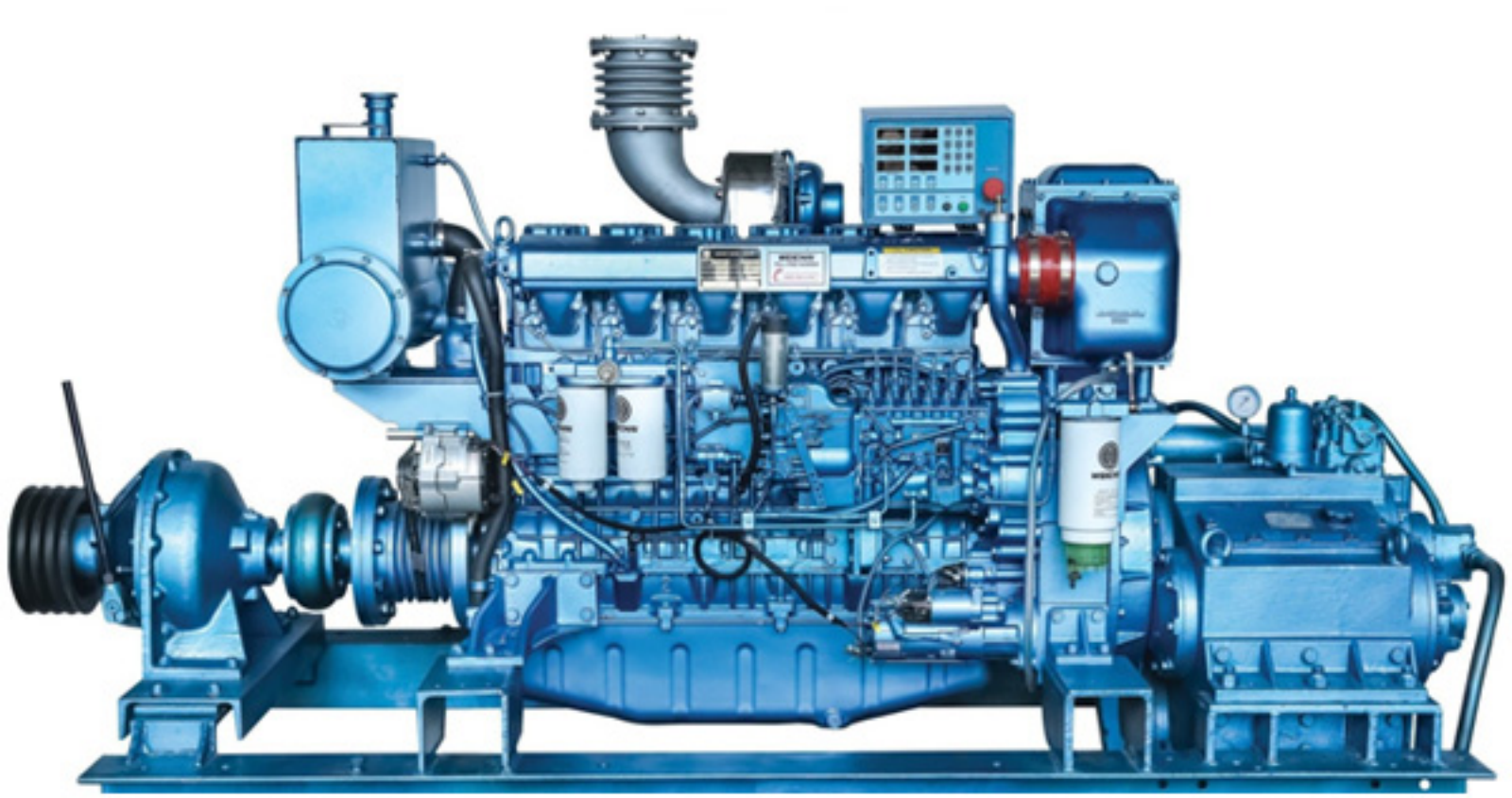
SERVICE MANUAL FOR ENGINE

WEICHAI 495



- Fuel system
- Lubricating system
- Cooling system
- Electric system

MOTO RIST

-2004 495 series diesel engine enterprise standard.

11. The No. of production license of this series diesel engine is: XK**06 - 205 - 00160**, XK**06 - 205 - 00161**, XK**06 - 205 - 00279**.

12. The position of safety warning marks:

(**1**) There's a guard against burning mark at the end of the cylinder cover which is beside the exhaust manifold of the diesel engine.

(**2**) There's a guard against fire mark at the oil filler.

(**3**) There's a guard against twinning mark on the inlet manifold.

(**4**) There's a flywheel rotating direction mark on the flywheel housing.

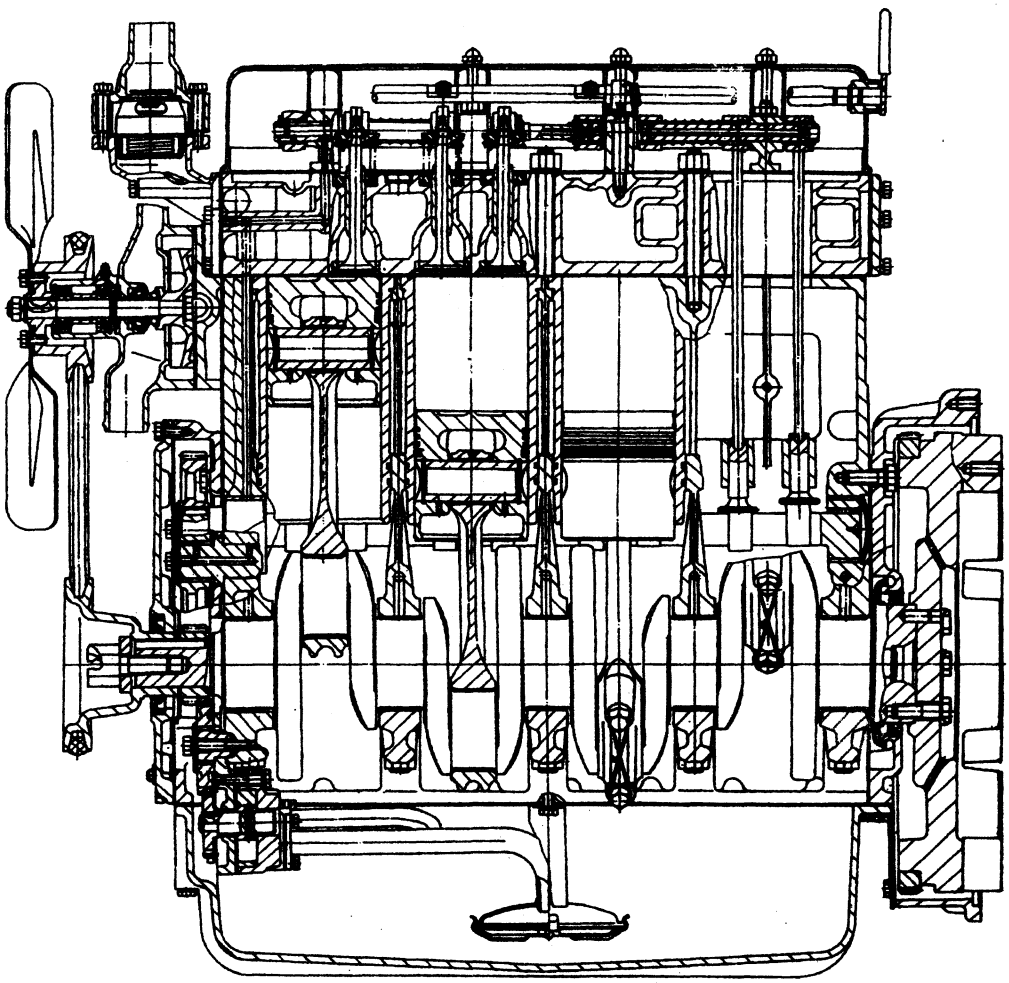


Fig. 1a Longitudinal sectional drawing for 495 diesel engine

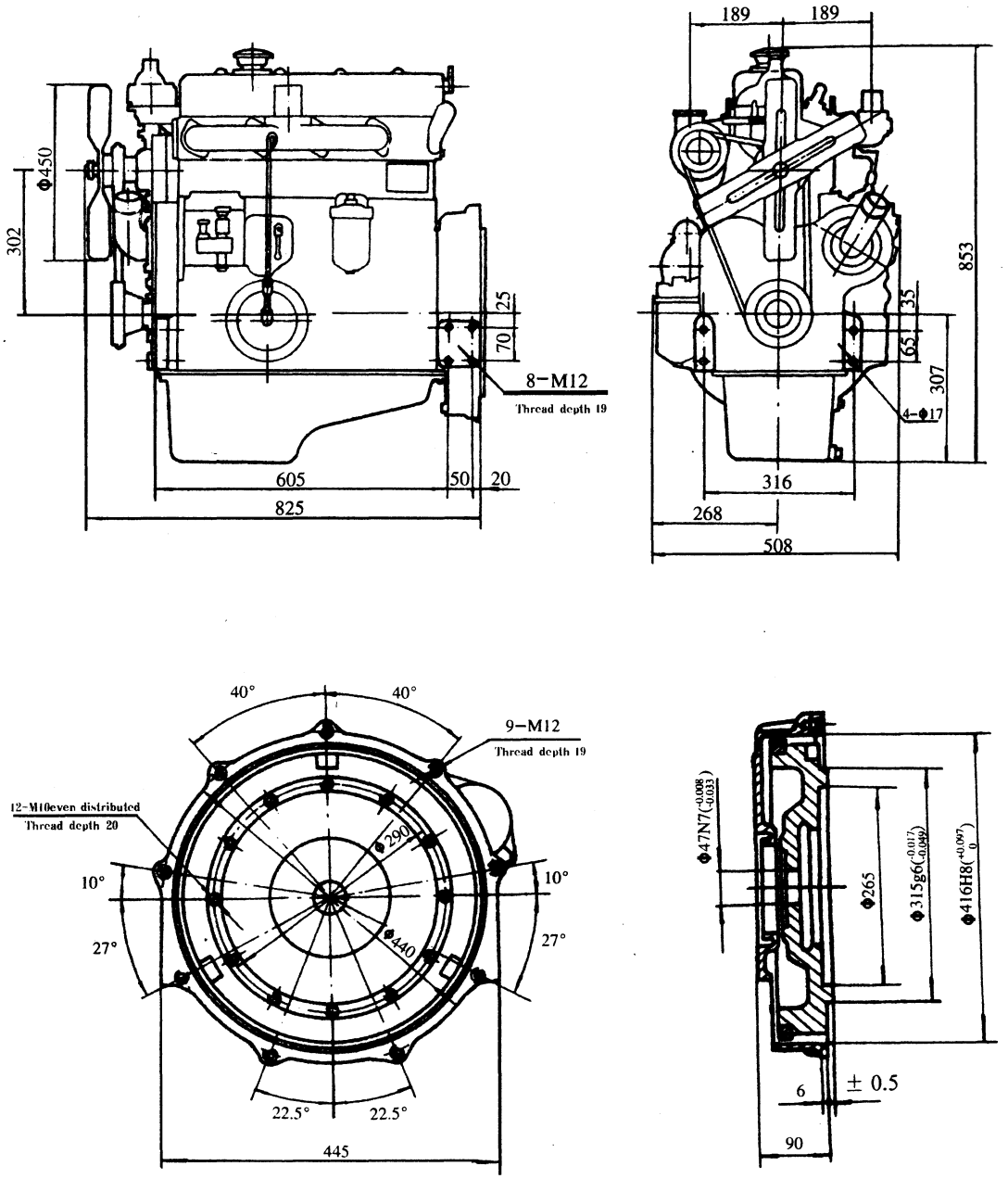
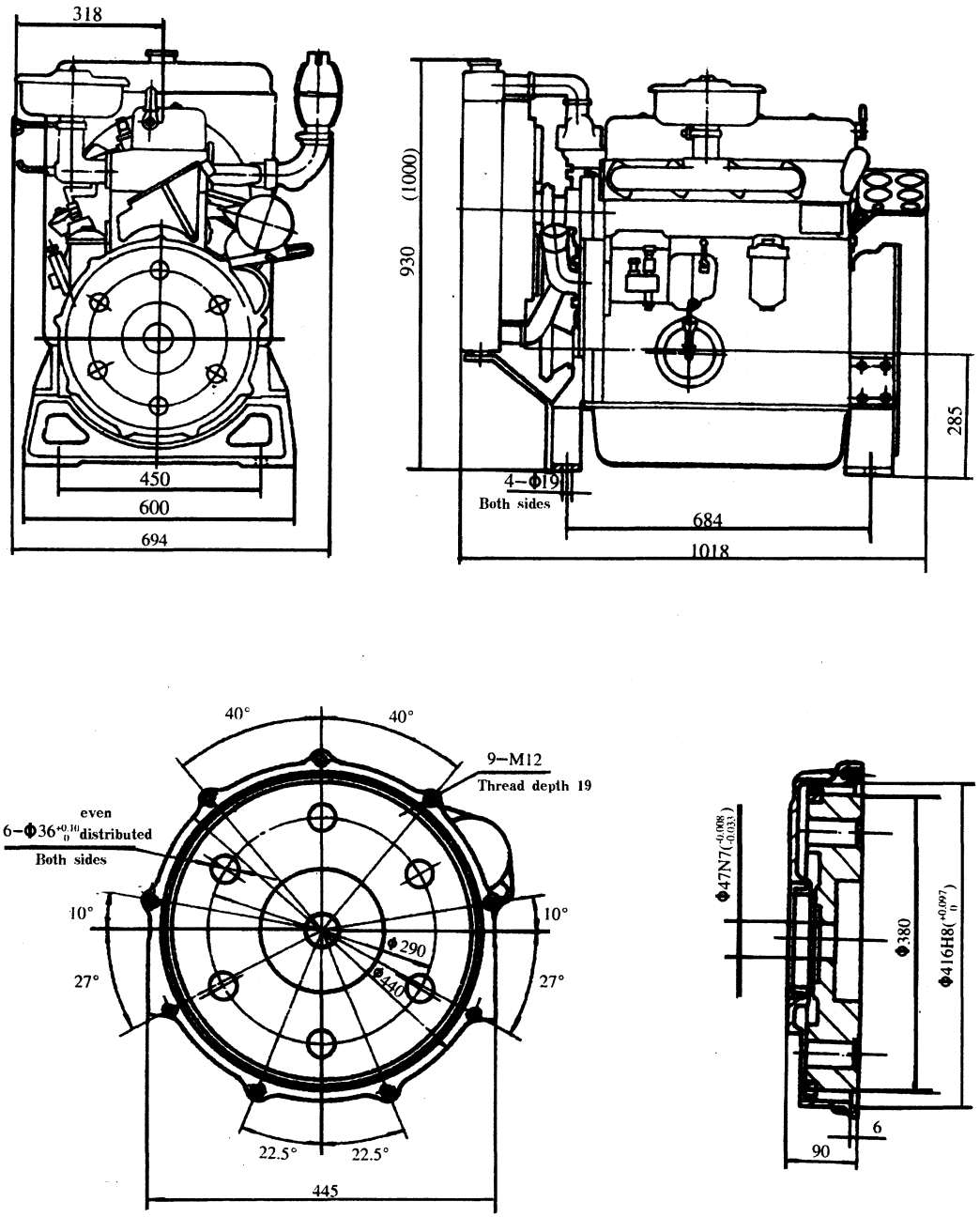


Fig. 4 Outline drawing for 495G1, 495G9, K4100G1 diesel engine

* The air cleaner, exhaust manifold & oil gauge of 495G9 are the same as those of 495 (see Fig. 2)



Note: The dimension in the brackets is the length of 4100D

Fig. 11 Outline drawing for 495D, 495D1, 495D2, K4100D diesel engine

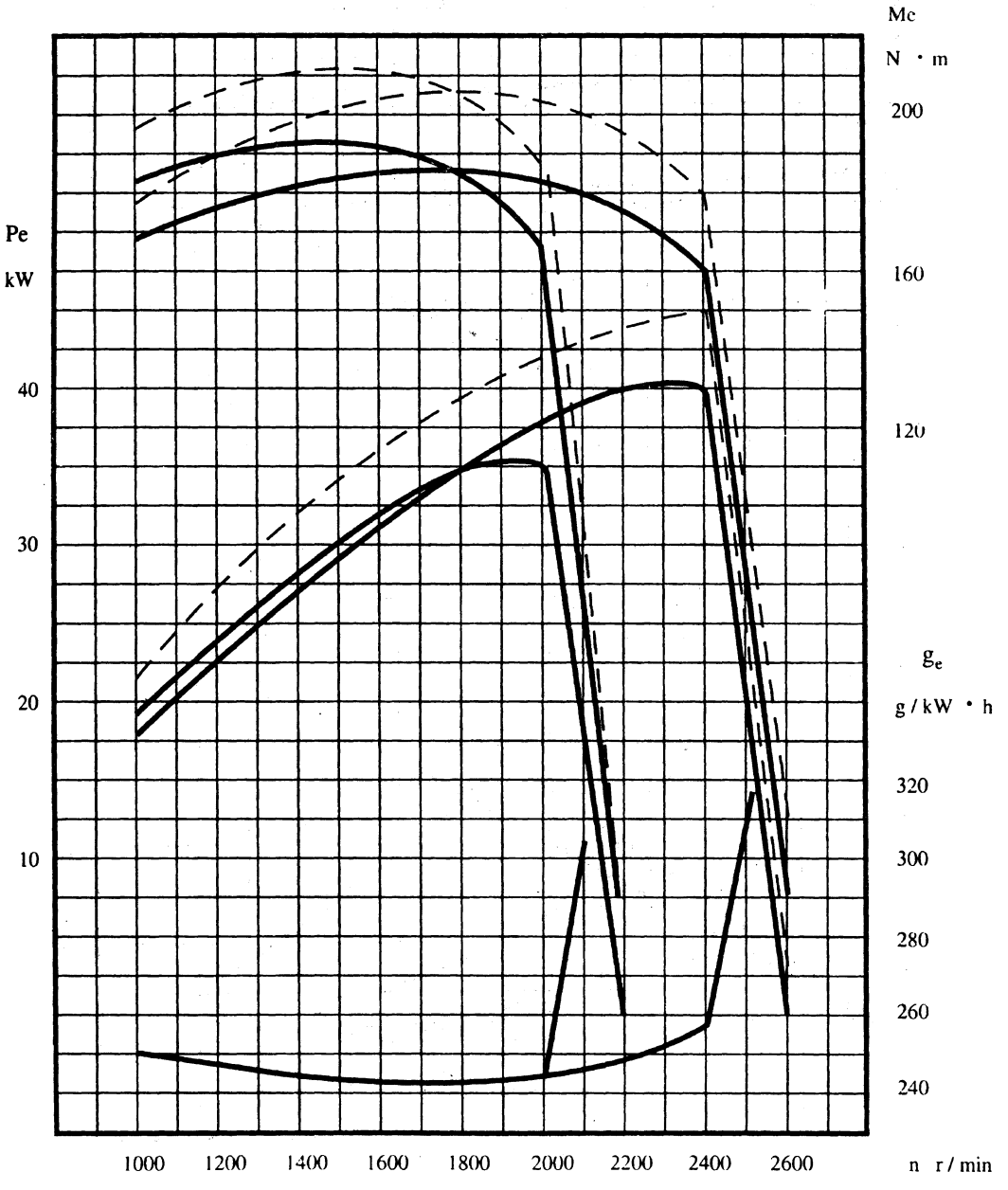


Fig. 17 Speed and speed adjusted characteristic curve for 2000, 2400r/min diesel engine used for engineering machines

No.	Item \ Model		495G6	495G7	495G11
1	Type		Four strokes, Water Cooling, Inline, Swirl combustion chamber		
2	Cylinder No. —Bore × Stroke(mm)		4—95 × 115		
3	Total Displacement of Piston(L)		3.26		
4	Pressure Ratio		19:1		
5	Firing Order		1—3—4—2		
6	Air Intake Mode		Naturally Aspirated		
7	Rated Working Condition	15min Output/Speed(KW/r/min)			51.5/2800
		1h Output/Speed(KW/r/min)			
		12H Output/Speed(KW/r/min)	35.3/2000	30/1800	
8	Highest Idling Speed(r/min)		≤2200	≤1980	≤3080
9	Lowest Idling Stable SPeed(r/min)		≤550		
10	Max Torque/Speed(N * m/r/min)		194/1500		197/1960
11	Rated Working Condition	Average Effective Pressure(Kpa)	650	614	677
12		Fuel Consumption Rate(g/KW.h)	≤258.4		≤253.0 *
13		Oil Consumption Rate(g/Kw.h)	≤2.04		
14		Exhaust temperature(℃)	≤470		≤650
15	Crankshaft Ratating Direction		ounter clockwise(Facing to the power output end)		
16	Cooling Mode		Forced Water Cooling		
17	Lubricating Mode		Compound type with pressure and splash		
18	Starting Mode		Electric starting		
19	Net Mass(kg)		340	480	320

* This volume is minimum fuel consumption of external characteristic.

Chapter II Main Construction, Adjustment and Maintenance of the Diesel Engine

1. Cylinder Block Assembly

Cylinder block is of a rectangle gantry type. Cylinder liners of wet type are fitted in the cylinder block and rested at its upper shoulder. The top surface of the liners should be higher than the top surface of the block 0.03 – 0.08mm.

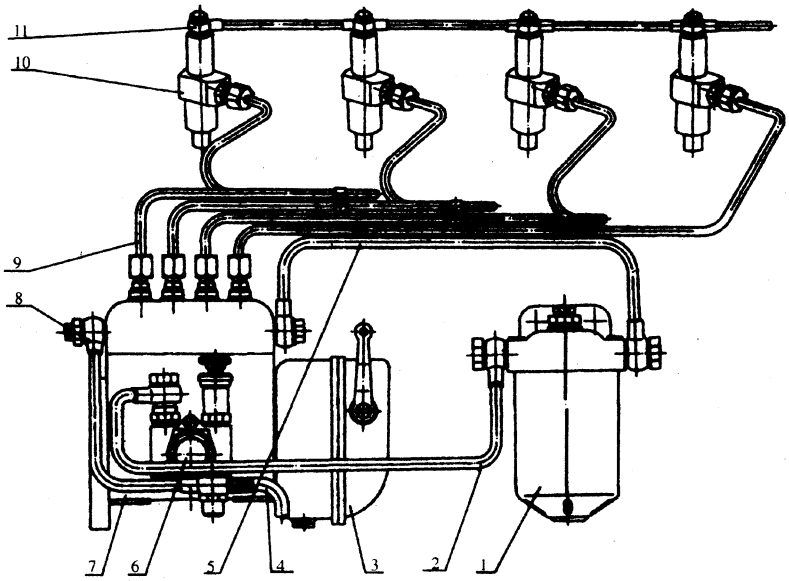
The main bearing caps are located by locating sleeves and machined in pair with the corresponding bearing seats on the crankcase, so that the caps can't be interchanged or turned inside out. Therefore, the bearing cap is marked with number and arrowhead, and the direction of the arrowhead is forward. The main rod bearing is made of steel – backed aluminum alloy which is very thin, so it can't be lapped. Before installing, we should apply adequate clean engine oil on the crankshaft.

There are two bolts on one main bearing cap, so they should be tightened evenly by many times one by one in regulated torque, and should use tightening gaskets to lock it.

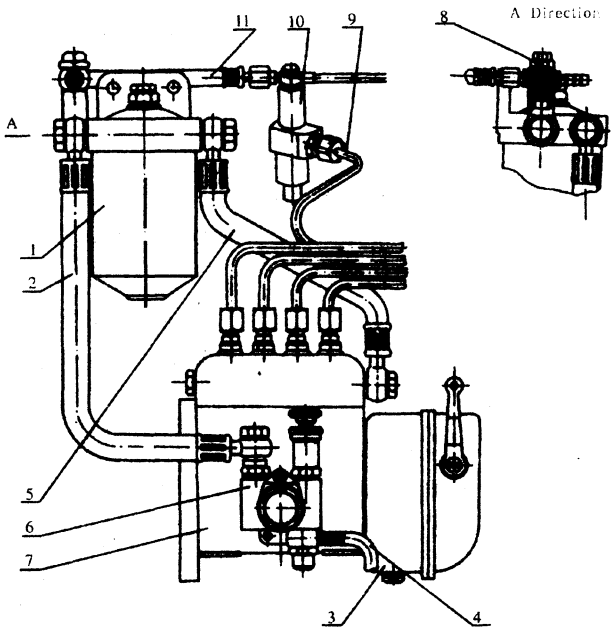
In the process of using, you shouldn't make the crankshaft receive additional power.

2. Cylinder Head Assembly

Cylinder head is a single piece casting structure, with independent intake and exhaust ports on both sides. The combustion chamber is whirl chamber. The insert, with a slant throat of kidney shape cross – section and a small comical hole inside, is pressed into the bottom of the swirl chamber. The small conical hole should be aligned with the nozzle center line in installation of the insert so as to make the engine easy to start. Intake & exhaust valve and valve seat have been run – in when using, so remember the number of cylinder when disassembly and assembly. When sealing condition between valve and valve seat is not good, lapping is necessary, and should be cleaned before assembly. After long time operation, the width of valve seat contacting area may be over 2.5mm, we can ream the valve seat by means of a 15°and 75°special reamer with a guide rod of 9mm in diameter (Please refer to Fig. 1.) and 45°reamer articulated contact area when necessary (ZH4100 intake valve seat ring should adopt 60°reamer) . The valve seat must be renewed if the level of the valve head is lower than that of the cylinder head bottom surface by more than 3.5mm after the valve seat being reconditioned. Before a new valve seat is pressed into the cylinder head, a interference of 0.086 – 0.150mm in diameter



a. Fuel injection pump fuel returning



b. Fuel filter fuel returning

Fig. 5 Fuel System

1. Fuel filter 2. Fuel filter inlet pipe 3. Governor 4. Fuel delivery pump inlet pipe
5. Fuel injection pump 6. Fuel delivery pump 7. Fuel injection pump 8. Return pipe
9. High pressure fuel pipe 10. Injector 11. Injector fuel return pipe
12. Fuel ring 13. Fuel supply 14. Pre – heater

AREA	Winter In Cold Area	All Year In Common Area	Summer In The South
TEMPERATURE(℃)	-5 ~ -15	0 ~30	>30
OIL BRAND	20W/40	30	40

The lubricating oil must be filtered before it is filled into diesel engine, other brand lubricating oil is forbidden to be used for engine so as to protect the parts such as bearing and piston ring from being darmaged.

2.3 Cooling Water

The diesel engine should adopt clear soft water such as tap water, rain water and river water , etc. . If hard water is adopted such as well water and spring water which contains much more minerals, the hard water should be softened, of there will be scale on the water passage of the engine and block the water, weaken the cooling effect and recult in the engine too hot.

One of below methods can be used to soften water:

(1) boiled, precipitated and filtered before used.

(2) Fill 20g Na_3PO_3 on each 10kg water, precipitated and piston ring fom being damaged.

When the temperature is below 0℃, antifreeze mixture can be used for cooling medium. The antifreeze mixture can be mixed with water and alcohol according to the below ratio.

Volume ratio of antifreeze mixture(%)		Ice point of antifreeze mixture℃	
water	alcohol	denatured alcohol	water alcohol
90	10	-3	-5
80	20	-7	-12
70	30	-12	-19
60	40	-19	-29
50	50	-28	-50

When compound and fill the antifreeze mixtrue, pay attention to:
(1) The antifrezed mixture is poisonous, never drink it.

4.5 Dismantle and check the cylinder head. Test the valve seal, wipe off the carbon deposit, burnish the valve according the conditions.

4.6 Check the fasten situation of the cylinder head bolt, main bearing bolt, connecting rod bolt. For the bolts which tightening torque is insufficient, then tighten it to the set point value.

4.7 Check the water pump, replace the lubricating grease, if necessary, replace the water seal.

4.8 Check the dynamo, starting motor, clean, repair and fill new lubricationg grease.

4.9 Check the injection pump, adjust the fuel lead angle, and adjust the injection pump according the conditions.

4.10 Test the air compressor, burnish the valve according the situation, and clean the carbon deposit.

4.11 Check the clutch, clean the inside dust deposit, oil dirt, and replace the lubricating grease.

4.12 Check the turbocharger, clean the parts, wipe off the cabon deposit, and test the rotor freedom allowance.

5. Technique maintenance on winter using

If the temperature maybe lower than5℃, the engine must be maintained specially.

5.1 Must use the winter used oil and fuel, note the damp in the fuel so as to protect the fuel passage from being jammed.

5.2 It's better to fill the antifreeze fluid to the cooling system, or must drain off the cooling water after its lemperature is lower than 40 – 50℃.

5.3 On the cold dseason or area, it's better to prevent the diesel engine(or vehicle from being deposit in the open air, or when starting, it's need to heat the cooling water to preheat the engine body.

CHAPTER V Troubleshooting

1. Start failures

Touble cause and its feature	Remedy
1.1 Troubles in fuel system	1.1
(1) Jammed in the fuel s	(1) Dismantle and clean

(5) Cylinder blows by
(6) Uneven fuel delivery to each cylinder
①Uneven fuel delivery to each cylinder in injection pump
②Injector sprays not well or the mate be choked
③The plunger of the injection pump worn out or the spring broken

(4) Check and adjust the governor
(5) Check the tightening torque of the cylinder head bolt and the seal of thecylinder head gasket
(6)①Check and adjust
②check the spray quality of the injector, replace the mate if necessary
③Check and replace

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3. Output is insufficient or drops suddenly

Trouble cause and its feature	Remedy
(1) Air filter choked	1. Clean or replace filter element
(2) Valve spring or push rod broken	2. Check and replace
(3) Valve lash is incorrect	3. Check and adjust
(4) Compress pressure is insufficient	4. Handle according to 1.2 5. Check and adjust
(5) Fuel delivery advance angle is incorrect	6. Handle a ccoyding to (1), (2), (3) in 1.1
(6) Air trapped in the fuel system or thd system is choked	7. Check the plunger of the injection pump and fuel outlet valve
(7) Fueldelivery is insufficient	8. Check, clean and adjust the pressure
(8) Injector spray not well	9. Test and repair the governor
(9) Governotr works abnormally	10. Test and repair thd cooling sys – tem, wipe off the scale
(10) Engine overbeated	11. Clean off the carbon deposit
(11) Too much carbon deposited inside the engine	12. Find out the fault and eliminate it.
(12) Exhaust manifold not expedite	

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4. Abnormal noise during engine operation

Trouble cause and its featre	Remedy
(1) Injecting time is too early to	1. Adjust the fuel delivery advance

(2) Fuel sprays too much	(2) Adjust the fuel delivery amount of the fuel injection pump
(3) Injecting time is too late, late burning is heavyp	(3) Adjust the fuel delivery advance angle
(4) Valve lash is incorrect or valve seal is not good	(4) Adjust the valve lash and seal, eliminate the foult
(5) Air filter choked	(5) Clean the filter element

6. Insufficient oil pressure

Trouble cause and its feature	Remedy
1. Oil pressure gauge is in trouble or the connecting pipe choked	1. Replace the pressure gauge or dredge the passage
2. Too little oil in the sump	2. Fill oil to the stipulated level
3. Too thin oil	3. Inspect oil grade, check whether the oil be thinned out with fuel or oil temperature too high, eliminate it
4. Oil pump driving and driven gear worn out	4. Replace driveing and driven gear
5. Strainer screen and oil filter element blocked	5. Clean or replace
6. Pressure limiting valve and pressure regulating valve spring broken	6. Inspect and replace
7. Oil passage choked or oil leaks	7. Checkand eliminate
8. Lash between the bearings too large	8. Test the matching lash

7. Oil temperature too high

Trouble cause and its feature	Remedy
1. Engine is over – loaded	1. Adjust the load
2. oil is insufficient or overmuch	2. Add or reduce the oil according the stipulation
3. Piston ring leaks heavily	3. Replace piston ring or cylinder liner
4. Oil cooler choked inside, dirt	4. Check and clean

(4) Fuel inlet and outlet connector screw is loose	(4) Tighten, replace parts
5. Fuel atomized not well	5.
(1) Needle valve is distorted or worn out	(1) Replace
(2) Bad seal of the needle valve	(2) Repair or replace
(4) Needle valve blocked	(4) Clean or replace

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12. Governor malfunction

Trouble cause and its feature	Remedy
1. Unsteady speed	1.
(1) Too large of camshaft axile lash	(1) Readjust
(2) Cylinders fuel supply uneven to much	(2) Readjust
(3) Fly – weight assembly installed improperly , too large stagger of fly hammer bracket shaft	(3) Recheck and assemble
(4) Fuel cock worn out or bad seal	(4) Repair or replace
2. Too high idling speed	2.
(1) Operating handle lever no rea – ches its positon	(1) Inspect and adjust
(2) Tooth rod is not flexible	(2) Readjust or repair
3. Speed floating	3.
(1) Speed adjusted spring distorted	(1) Replace the speed adjusted sping Check and tighten
(2) Fly hammer assembly loosen	(3) Repair and eliminate
(3) Too large friction resistance inside the governor	
(4) Too Large axile lash of the injection pump camshaft	(4) Readjust
4. Overrunning of the engine	4.
(1) Toothe rod is not flexible	(1) Readjust and repair
(2) Lubricated not well, shaft sleeve of the governor burned out.	(2) Check and repair
(3) Fly hammer assembly loosened	(3) check and tighten
(4) High speed limit screw loosened	(4) Readjust

APPENDIX:

The wearing in of the diesel engine

The time of wearing in should not less than 60 hours. The load and time of wearing in is as follows:

Load	Operation time	
Idling speed	10 minutes	Check the pressure of lubricating oil and whether there is abnormal noise etc.
25%	2 h	
50%	15 h	
75%	30 h	
100%	15 h	

During the period of wearing in, the throttle should be fully opened. The load numeral value can be gained according to the load estimation of the matched belt, however, we must obey the principle of increasing load gradually from low load.

Due to the different fitting machines, such as tractors, vehicles, engineering machines, generating sets and harvesters etc., the wearing in should meet the different requirements for the usage. The diesel engine used for agricultural machines, for example, the diesel engine used for water pump, thresher and grinder etc., which have power take out equipment have already wearied in preliminarily, so customers can reduce the wearing in time properly.