



226B 系列船用柴油机

使用保养说明书及用户服务指南

**Operation & Maintenance
Manual and Service Manual
226B Series Marine Diesel Engine**

13033046

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柴油机有限公司



Explanation for Starting Date of Engine Guarantee

1、 After the product equipped with Weichai diesel engine sold, the sales contract information should be input to Weichai CRM system by the dealer (or agent) in time according to the requirements of Weichai, the date of sale is the date of regulating finished for the diesel engine. If the guarantee service of the engine is needed, the starting date of guarantee should be according to the sales time stated in sales contract.

2、 If failure to input to sales contract, the purchase invoice should be provided by user and the starting date of guarantee is the date stated in invoices.

3、 If failure to input to sales contract and the purchase invoice can not be provided by user, the starting date of guarantee should be as follows:

For the marine (generating) engine set or single engine, the guarantee starts from 1 month after they have been delivered from Weichai warehouse.

4、 So as the loss which been caused by the dealer (or agent) who failed to input the sale contract in time according to the requirements of Weichai, the dealer (or agent) should bear the loss of users and related responsibility.



Foreword

First, thank you for your selecting and using the 226B series marine diesel engine produced and manufactured by Weifang Weichai-Deutsch Diesel Engine Co.,Ltd.

226B series marine diesel engine is a high-speed diesel engine produced and manufactured by Weifang Weichai-Deutsch Diesel Engine Co.,Ltd that was a joint venture established by Weifang Diesel Engine Factory and German Deutch Company. This series of diesel engine is of features such as compact structure, reliable operation, excellent power and economic technical indexes, advanced emission index, rapid starting, simple operating and convenient maintenance, this kind of engine is an ideal propulsion power and secondary engine for the small boats and ships of inland river shipping and fishing etc.

This manual introduces the main technical parameters, performance indexes, structural features and precautions during operation and maintenance for 226B series marine primary and secondary engines. When using this engine, the customer must follow various requirements in this manual, so as to, ensure the reliable operation and long service life of the diesel engine .

Before the maintenance, disassembling and reassembling of the diesel engine, the customer should carefully read "Illustrated Parts List for Deutsch 226B Series Marine Diesel Engine" to familiarize with the basic structure of various systems of the diesel engine.

This manual introduces the basic engine models of 226B series marine diesel engine. For relevant information about other engine models that are not listed in the basic engine models, the customers can conduct consultation through telephone or fax printed on the "Customer Information Feedback Opinion Card".

With uninterrupted development of the product, its structure will be improved. The partial contents of this manual could be slightly different



from actual situations. Before this manual is revised, notice will not be given. In order to obtain newest product information, we hope that the customers will pay a close attention to various technical information issued by our company and to visit Weichai website www.weichai.com. For important contents, please contact timely the technical departments of Weichai-Deusch Company or sale department of Weichai Power Co.,Ltd and obtain confirmation so as to avoid unnecessary troubles for your normal use and maintenance work.

In this manual, the factors which constitute personal danger to the customer are all marked through the method of boldface type in a frame to prompt the customer to pay attention.

In which

DANGER: Indicates high danger, which could result in a serious harm to the human body and high-degree vigilance shall be kept.

WARNING: Indicates medium danger, which could result in a medium harm to the human body and vigilance shall be kept.

ATTENTION: Indicates light danger, which could result in a light harm to the human body and an attention shall be paid.

Our company welcomes customer to put forward the opinions and suggestions for the improvement of products. Please send the "Customer Information Feedback Opinion Card" attached at the end of this manual to Marketing Department of Weifang Weichai-Deusch Diesel Engine Co.,Ltd.

Weifang Weichai-Deusch Diesel Engine Co.,Ltd.

Mar .2009



Special Attention

- Before operating, the operator must carefully read the operation and maintenance manual for the diesel engine, strictly observe the operating and maintenance rules in this manual.
- In order to protect your legal right and interests, the customer is strictly prohibited to remove the lead seal of the fuel injection pump without permission.
- The supercharger rotor is a precision high-speed rotating component. Any movable object (for example, hand, tool, cotton yarn etc) is strictly prohibited to approach the inlet of the turbo supercharger while the machine is running, so as to avoid personal injury or machine damage. The rotor assembly can only be removed by the turbo supercharger factory or the specialized service station authorized by Weichai Power Co., Ltd.
- The link bolt is a disposable use bolt. It can not be reused.
- The brand of the oil or fuel charged into the diesel engine must meet the stipulations in this operating manual, and it must be filtered and through a precipitation over 72 hours. Before starting the engine each time, make sure that the charged amount of the coolant and the oil meets the requirements.
- When the customer uses a new engine, the test run of engine shall be conducted for 50 hour.
- After the diesel engine is started from a cold state, do not increase its speed quickly and run at high speed and do not run the engine at idle for a long-time. After running with heavy load, do not shutdown the engine immediately (except for emergency case), but run it at low speed for 5-10 minutes, then shutdown it.
- After engine shutdown,, if the environmental temperature could be lower than 0°C, and the coolant without anti-freeze additive, drain the coolant in the water tank and in the diesel engine Completely.
- The inspection and repair of components in the electric system must be carried out by professional electrical technicians.



Points for Attention

1.This diesel engine has been strictly tested as per ex-work test criterion when the diesel engine was delivered from the factory, and the maximum fuel quantity and the highest rotating speed were also limited by lead seal. The customers shall not remove the lead seal at will to increase fuel quantity. Otherwise, our factory will not be responsible for three guarantee services (i.e., guarantee for repair, refund and change the goods sold to customers).

2.The diesel engine is prohibited to work at the condition without air filter to prevent the air to enter into the cylinder without passing through filter.

3.The preservation period for the diesel engine is one year. All diesel engines with preservation period exceeding one year shall be inspected and the necessary supplementary measures shall be taken.

4.Refer to Table 4 for the nominal power and its power correction for the diesel engine, which shall be as per GB/T 6072.1-2000.

5.Quality information feedback for diesel engine:

Our company executes quality tracking filing for 226B series diesel engine products. The customer is kindly requested to fill in and to send the "Customer Information Feedback Opinion Card" back to our company.

6.When maintaining and replacing the components of the diesel engine, you must buy and use the products which are appraised and approved by the primary engine factory, so as to ensure the performance and reliability



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Chapter 1 Technical general of diesel engine

1.1 General of Diesel Engine

226B series marine diesel engine is a straight-line, 4-stroke direct-injection, double circulation, water cooling diesel engine. According to the purpose, it is classified into marine primary engine and secondary engine.

According to the number of cylinders, they are classified into 3-cylinder diesel engine, 4-cylinder diesel engine and 6-cylinder diesel engine.

According to air inlet modes, they are divided into natural air inlet, supercharger and supercharger inter-cooler.

According to starting modes, they can be divided into electric motor starting, air motor starting and double motor starting.

The flywheel end of the diesel engine is the rear end (power output end), the belt pulley end (torsional absorber end) is the front end. In order to meet the demands for fishing boats and partial inland river ships and boats, the front end of the diesel engine can be allowed to output 100% of rated power, but make sure that the sum of outputs of front end and rear end will not exceed the rated power of the diesel engine.

1.2 226B Main Technical Specifications and Parameters

Item	Parameter		
Type	4-strokes, water cooling, straight-line, direct injection, wet type cylinder sleeve		
Cylinder Qty	3	4	6
Cylinder diameter/ Travel mm	105/120		
Total displacement L	3.12	4.16	6.24
Rated power KW	35-60	60-80	90-162
Rated rotating speed r/min	1500/1800/2100/2500	1500/1800/2100/2500	1500/1800/2100/ 2300/2500
Oil consumption rat g/kw h	≤1.36		
Average effective pressure kPa	3000 (Lower limit 2500)		
Idle r/min	650±30/750±50		
Stable speed-adjusting rate %	10		
Inlet air mode	Natural inlet/superch- -arger	supercharger	supercharger/superch- -arger with intercooler
Oil capacity(oil sump)L	7.25	13	19
Oil pressure kPa	300—600		
Idle oil pressure kPa	≥120		
Allowable max oil temp- -erature °C	110		
Allowable max cooling water outlet temperature °C	95		
Max exhaust temperature after turbine °C	550		
Starting mode	Electric starting		
Crankshaft rotation direction (viewing from flywheel end)	Anti—clockwise		
External dimensions (L*W*H)	See outline drawing		
Purpose kg	460	550	790

1.3 Tightening Torques and Tightening Method for Main Bolts

Table 1-3

SN	Description of bolt	Bolt size	Torque (N m)	
			Min (min)	Max (max)
1	Cylinder head bolt	M14-10.9 M14-12.9	Use 30 Nm for pre-tightening, turn 120°, then turn 120° Again.	
2	Main bearing bolt	M14-10.9	1. Use 70Nm for pre-tighting 2. Turn 90° again	
3	Fastening nuts of air inlet and exhaust tube	M10-10	45	50
4	Flywheel bolt	M16-12.9	300	310
5	Crankshaft hub fastening bolt	M16-10.9	240	250
		M16-12.9	300	310
6	Belt pulley fastening bolts on hub	M10-8.8	45	50
		M10-10.9	65	70
		M12-8.8	85	90
7	Absorber fastening bolt	M10-12.9	80	85
		M10-10.9	65	70
8	Camshaft gear fastening bolt, and camshaft gear and fuel injection pump gear fastening bolt	Durlok M8-12.9	55	60
		M10*1.25-10.9	85	90
		M10-10.9	65	70
9	Fastening nut for the gear mounted on fuel injection pump camshaft	M14*1.5	85	100
		M18*1.5	100	110
10	Connecting rod bolt	M12*1.5-12.9	1. Use 30Nm for pre-tighting 2. Turn 60° again	
11	Fly wheel casing fastening bolt, other fastening bolts and studs	M12-12.9	140	145
		M12-10.9	110	120
		M10-12.9	80	85
		M10-10.9	60	65
12	Oil sump fastening bolt	M8-8.8	20	25
		M8-10.9	30	35
13	Level 2 balancing mechanism fastening bolt	M10-8.8	35	40
14	Oil pump fastening bolt, stud with self-locking nut	Durlok M8-12.9	30	40
		M8-8.8	20	25
15	Rocker arm seat mounting bolt	M10-8.8	40	45
16	Rocker arm adjusting nut	M9*1	20	25
17	Cylinder head hood fastening bolt	M8-8.8	10	15
18	Fastening Fuel injection pump oil delivery valve seat		33	37
19	High pressure oil pipe fastening nut		10	15
20	Injector fastening nut	M12*1.5	20	25
		M14*1.5	20	25
21	Injector fastening bolt(10.9 grade)	M10*1.25	65	70
22	A.C. generator belt pulley fastening nut	M14	35	40

Chapter 2 fuel,oil,coolant and auxiliary materials used for diesel engine

2.1 Fuel

2.1.1 Quality grade

When the diesel engine uses light diesel fuel as the engine fuel, it shall use fuel of stipulated brand; its sulfur content is not allowed to exceed 0.5%.

2.1.2 Selection for brands

Summer: RC-0GB252 (0# diesel fuel)

Winter: RC-10GB252 (-10# diesel fuel)

When the lowest environmental temperature in winter reaches -14°C , select and use -20# diesel fuel. When the lowest environmental temperature reaches -29°C , select and use -30# diesel fuel, when the lowest environmental temperature reaches -44°C , select and use -50# diesel fuel.

Improper diesel fuel brand or too dirty diesel fuel could result in trouble and damage to the diesel engine.

Therefore, select and use the proper diesel fuel brand and ensure the quality and cleanliness of the fuel.

The diesel fuel must be precipitated over 72 hours.

When the diesel fuel is charged, fuel filling apparatus, must be clean, the fuel barrel should not be rocked.

The fuel tank and the filter should be cleaned at suitable time interval.

The fuel tank shall be reliably protected and fixed to prevent damage and fuel leakage resulted from vibration and shock.

Warning	The position of fueling port and air vent outlet shall be far away from high temperature surface and electric element so as to prevent fire danger.
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2.2 Oil

2.2.1 Quality grade

Oil is classified based on its quality and characteristics, usually use API or GB standard grade (oil standard GB/T7631)

Oil allowable to be used:

API grade: CD, CD-II, CE.

GB grade: CD, CD-II, CE.

This diesel engine can select CD grade oil, it is allowed to use higher quality oil instead of lower quality oil.

2.2.2 Viscosity

Since the viscosity of the oil is dependent on the temperature quite a lot, refer to Fig.2-1, select the most suitable oil according to the ambient temperature(°C)

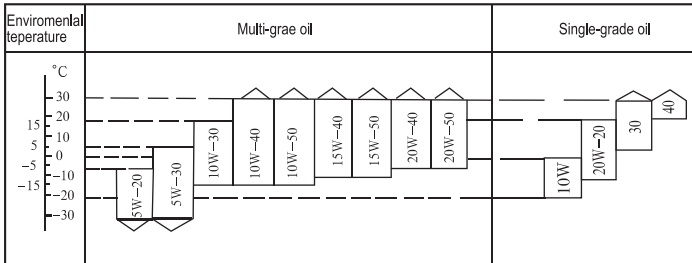


Fig.2-1 Selection of Lubricating Oil Brand

When environmental temperature is above -15°C, use CD grade 15W/40 oil. When environmental temperature is below -15°C, use 5W/20 oil. Using multi-grade oil can avoid oil replacement when the season is changed and can make fuel consumption rate to drop.

Recommend to use the appropriate Weichai Power 15W-40 lubricating oil which is concocted with high-quality imported base oil and well-chosen additive. The Weichai Power 15W-40 lubricating oil is unified served by respective Weichai service centre at a national unified price.

It is not allowed to blend the oils with different brands for use.

Attention	Do not check the lubricating oil level when the engine is running to avoid injury to people.
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2.3 Coolant

The coolant with demineralized water and anti-corrosive agent and long-effective anti-freeze liquid should be used for the diesel engine.

2.3.1 Long-effective anti-freeze liquid

The long-effective anti-freeze liquid is of anNtirust and antifreeze capability. For the mixing ratio of the long-effective anti-freeze liquid, please refer to the instructions regarding the antifreeze liquid. For domestic long-effective anti-freeze liquid, see Table 2-1.

Table 2-1 Domestic Long-effective anti-freeze liquid

Items \ Tupes	JFL-318	JFL-336	JFL-345
Ethylene glycol content %	33	50	56
Specific gravity (15.6°C)	1.05	1.074	1.082
Boiling point°C	104.5±1	108.5±1	110.0±1
Freezing point°C	-18±1	-36±1	-45±1
Applicable selected minimum air temp.°C	-10	-26	-35

When the air temperature is lower than 0°C, the antifreeze liquid concentration shall be periodically inspected. The inspection time for the concentration of antifreeze liquid is 1000 hours once, but at least an inspection shall be done once per season. In order to prevent corrosive damage, antifreeze liquid shall be replaced once every two years.

For the districts where the temperature is above 0°C all the year, the water that is anti-rusting and anti-dirtying treated can be used as the coolant. The water that not treated is forbidden to be used as the coolant for the engine.

2.3.2 Anticorrosive Agent

When the environmental temperature is higher than 5°C, (in summer and autumn or in the districts where air temperature is higher), the cooling water can be added with an anti-corrosive agent (Type NL emulsified anti-rusting agent or LQS comprehensive protective agent). For the mixing ratio of it with softened water, refer to respective instructions.

2.3.3 Cooling Water

The water used for cooling the diesel engine (inner circulating water) must be clean water with low hardness. Seawater, salty water, alkali water, spring water etc hard water is not applicable. The tap water in most of cities can be used only after dechlorination treatment.

The compositions of the cooling water shall meet the requirements in Table 2-2

Water Quality	Min	Max	<p>Only the cooling water in conformity with this water quality of composition can be mixed with long-effective antifreeze and antirust.</p> <p>Since zinc material is relatively poor in its corrosion-resistance, inner zinc-plated tube is not suitable to be used as cooling water pipe.</p>
PH value	6.5	8.5	
ion content of chloride mg/dm ³	—	100	
Content of carbonate	—	100	
Content of total anion	—	150	
Total hardness when using long-effective anti-freeze liquid.	3	12	
Carbonate hardness	3	—	
Total hardness when using anti-corrosive agent(as for the value, pay attention to the value in supplier's instruction)	0	10	

2.4 The characteristics of Weichai special oil

2.4.1 Good ingredients are the guarantee of high-quality oil

Imported hydrocracking base oil and compound additives are favorable to guarantee the good quality of lubricating oil.

2.4.2 Under normal use, oil drain interval can be extended by 3500-7000 kilometers (CH-4 can be extended by 10000 kilometers)

Outstanding high-temperature oxidation resistance and good Total Base Number (TBN) retention can extend oil drain interval.

2.4.3 Professional protection can extend the engine life

Professional lubricating oil for high-power and high-load engines, which can extend the engine life (special oil can be extended the engine life by 30~40%), has been developed based on a great deal of engine performance and endurance tests.

2.4.4 Better performance requirements

The engine performance can be improved in terms of abrasion resistance, TBN retention, oxidation resistance, soot dispersion capacity, fuel control as well as shear stability and the precipitate in turbocharger can be reduced.

2.4.5 Saving energy

The energy-saving formula "low viscosity+ multi-polarity+ friction modifier" is the guarantee of high-viscosity index and good film strength and flexibility of Weichai special oil, which can ensure smooth operation, low operation resistance and low fuel consumption of engines (fuel consumption reduced by 3~8%).

2.4.6 Protecting environment: low ash, low sulphur and low phosphorous

The ash content is controlled within 1.0% in order to extend the life of Diesel Particulate Filter <DPF>; the sulphur content is within 0.4% to prevent the deactivation of oxidation catalyst <DOC> and reduce particulates; the phosphorus content is within 0.12% to prevent the deactivation of oxidation catalyst <DOC> and NOX control system; and volatility can be controlled within 13%.

2.5 Some commonly used special oil products of Weichai Power

Type	Class	Specification	Packaging capacity
diesel engine oil	WP-E1 (CD)	15W/40 20W/50 10W/30	4L , 18L , 200L
	WP-E2 (CF-4)	15W/40 20W/50 10W/30	4L , 18L , 200L
	WP-E3 (CH-4)	5W/30 15W/40 20W/50 10W/30	4L , 18L , 200L
	WP-E4 (CI-4)	15W/40	4L , 18L
hautomobiles	GL-5	85W/90 80W/90	4L , 18L
engine coolant (antifreeze)	-25 -35		4KG , 18KG

2.6 Weichai special oil for different engine models

Type	Standard No. of special oil	Major applied engine models
high-speed engines, high-power and medium-speed engines	WP-E1 (CD)	medium-speed engine sets
	WP-E2 (CF-4)	Euro I and Euro II engines, construction machinery such as 50, 30 loaders; WVD618 series engines, WVD615 series engines; 226B and medium-speed engines; Heavy-duty trucks with a load capacity of above 15 tonnes
	WP-E3 (CH-4)	Euro III engines; Landking engines; heavy-duty trucks with super large tonnage; coaches; WP4, WP6 (180 ~ 240HP), WP10 (240 ~ 360HP), WP12 (400 ~ 480HP), WD10, WD12.
	WP-E4 (CI-4)	National IV engines (including heavy-duty trucks with super large tonnage)
gas engines	CNG	compressed natural gas engines; coaches and gensets equipped with compressed natural gas engines

2.7 How to choose appropriate viscosity

	SAE viscosity level	Applicable temperature (°C)
lubricating oil	5W/30	-30~35
	10W/30	-25~35
	15W/40	-20~40
	20W/50	-15~50
gear oil	85W/90	-15~49
	80W/90	-25~49
	85W/140(above 85W/90)	-15~49

2.8 Auxiliary Material

2.8.1 During maintenance of engine, the sealant and adhesive with Loctite 510, 242, 275, 648, 270080 etc specifications will be used, you can purchase them from Shandong Yantai Loctite Anaerobic Sealant Co.,Ltd, and the address of the company is Yantai Economic & Technological Development Zone, Shandong Province.

2.8.2 Fine molybdenum power can be supplied by Benxi Niuxintai Chemical Plant, Liaoning Province.

Chapter 3 Installation and Connection of Diesel Engine

3.1 Lifting of Diesel Engine

Incorrect lifting could damage the diesel engine during the lifting and transportation.

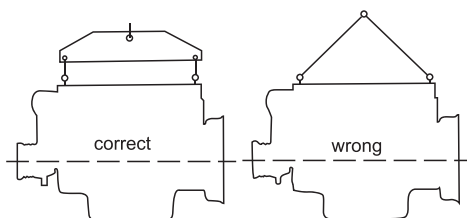


Fig. 3-1 Schematic Diagram of Diesel Engine Lifting

There are two special cylinder head bolts on each diesel engine for lifting and transportation of the diesel engine. On the top of the hex head end face of the cylinder head bolts, there are M14 screw rods, the hoisting rings are mounted on the screw rods. When lifting and transportation are conducted, it is suggested to adopt the hoisting tool as shown in left diagram of Fig. 3-1, when lifting the diesel engine up, the crankshaft of the diesel engine shall be kept at horizontal state. It is strictly prohibited to hoist in oblique or single side way. Lifting or lowering the diesel engine shall be slow.

Warning: It is not practicable to adopt only one cable for hoisting in triangle (as shown in the right diagram of Fig. 3-1). Because the slings, cylinder head bolts and hoisting rings are not in a straight line at this time, the lifting will make the cylinder head bolts damage, even broken, causing the damage of diesel engine.

3.2 Installation of Diesel Engine (Sets)

226B series diesel engines are mainly used as fixed power units for

ship power and electricity generating, drainage and irrigation etc, when it is use, the diesel engine, gearbox, generator or power output device shall be integrated into one unit.

226B series diesel engine outputs the power from the flywheel end, when the diesel engine is installed as the ship primary engine, it shall meet the regulations and special standards stipulated by the ship inspection department. When the diesel engine is matched with other equipment, elastic coupling is adopted and ensure that the crankshaft centerline is coaxial with the input shaft of the crankcase, and the crankshaft does not bear additional axial force resulted from installation. Concrete requirements for coaxiality are as below:

The coaxiality of the diesel engine flywheel with input coupling of the gearbox shall be less than 0.20mm, the endface run-out shall also be less than 0.2mm. The rigid connection is adopted between the unit output shaft and the intermediate shaft or tail shaft, its coaxiality shall be less than 0.08mm, the back dip angle of the unit centerline with the ship body horizontal line shall be less than 5 °.

When the diesel engine is used for other purposes, the diesel engine and the generator or power output device must adopt elastic connection. If a flexible coupling is used, its coaxiality and enface parallelism shall be less than 0.15 mm. The installation of common foundation for the engine set on the ship's deck adopts bolt fastening instead of welding mode. When installing, use a level gauge to measure the levelness, and use flat puddings to level up, to make the unit to be at horizontal status. If the generator units to be installed are more than 2 units and they need parallel connection, special distribution equipment shall be provided to ensure the consistency of the frequencies and phase sequences of two units in parallel connected.

During the diesel engine use, the customer shall periodically inspect the device as per above- mentioned requirements. If any problems are

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During the diesel engine use, the customer shall periodically inspect the device as per above- mentioned requirements. If any problems are

found, they shall be corrected in time so as to ensure normal running of the devices.

3.3 Installation of Externally-Connected System of Diesel Engine

(1) The exhaust pipe of the diesel engine shall be connected to outdoor; the exhaust pipeline shall be as short as possible and shall avoid excessive bends. The expansion joints should be installed at the pipeline intermediate locations, the pipeline shall have additional supports. For non-supercharger, the specified inner diameter of the pipe shall not be greater than 100mm, for the supercharger the specified inner diameter of the pipe shall not be greater than 140mm, the exhaust back pressure is not greater than 300 mm water column.

(2) The exhaust pipe outlet at outside door shall be equipped with a rainproof hood. In order to make the condensed water in the exhaust pipe to drain out smoothly, a drain valve can be mounted at the lowest location of the exhaust pipe.

(3) The air inlet port located outside door shall be equipped with a waterproof cap to prevent rainwater and sea wave from entering in the intake system.

(4) The capacity of the fuel tank shall meet the 8 hours operation of diesel engine at rated load conditions. The location shall ensure that the fuel tank outlet is not lower than the fuel delivery pump inlet of the fuel injection pump; the fuel pipeline diameter is not less xx mm.

(5) The fuel charging port on the externally connected fuel tank of the marine diesel engine shall be equipped with a filter device to avoid impurities entering. The distance between the oil tank and the diesel engine shall not be greater than xx m, the sucking distance of the oil pump shall be within xx m, and the capacity of the oil tank shall not be less than xx L.

Chapter 4 Application and Operation of Diesel Engine

4.1 Preparation and Inspection before Use

Do not start the diesel engine before it is correctly installed and connected to its final location. When the diesel engine is operating in a closed environment, keep good ventilation so as to ensure that the waste gas to be discharged to the atmospheric air.

(1) Oiling

a. The oil shall meet the specified requirements. Otherwise, the oil pressure will be insufficient and causing part wearing and difficulty in starting. The oil must be very clean. It is recommended to use Weichai special-purpose CD/15W-40 oil.

b. Tightening the oil drain screw plug.

c. Open the oiling cap 1, charge the oil. When charging oil, the oil should be filtered through a filter strainer.

d. The diesel engine should be placed at a horizontal location, pull the dipstick out to inspect the oil level. If necessary, the oil can be charged to the upper limit of the dipstick.

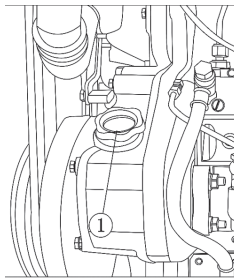


Fig 4-1 Oil Cap Location

e. Tighten up the oiling cap

(2) Fueling:

a. The diesel fuel to be used shall meet the specifications.

b. Pay attention to the diesel fuel. Before charging, the diesel fuel shall be deposited for over 72 hours at a stationary condition. The diesel fuel shall be filled in the fuel tank through a built-in filter strainer.

(3) Coolant replenishment:

The coolant is prepared with softened clean water and anti-corrosive agent, long-effective anti-freeze liquid. When preparing it, obey strictly the stipulations given by the additive production factory.

Note: Frequent adding water and often changing water can result in the scale formation in the cooling system. Therefore, the leakage of cooling system shall be repaired as quickly as possible. When adding water, add the softened clean water and avoid changing the coolant as much as possible. The coolant drained from the water tank can be reused after it is filtered through fabric or fine net. For the marine diesel engine, the water can be added into the cooling system from the water-supply chamber of the seawater/fresh water heat exchanger

(4) Fuel system deflation

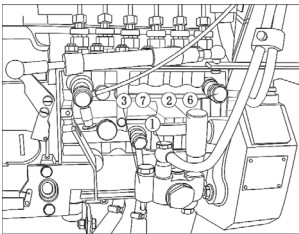


Fig 4-2 Schematic Diagram of Oil Pump

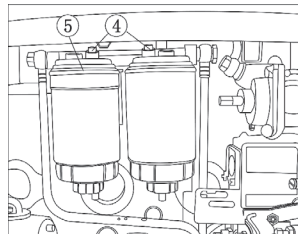


Fig 4-3 Fuel Filter

a. Unscrew the screw 1 at the fuel output port of the fuel delivery pump for half a turn, press the hand pump 2 of the oil delivery pump 3 up and

down, until the diesel fuel overflows out, and tighten the screw.

b. Loosen the air-discharging screw 4 on the fuel filter 5. Pass the hand pump up and down, until the diesel fuel overflows out, tighten the air-discharging screw.

c. Loosen the air-discharging screw 6 on the fuel injection pump 7. Press the hand pump of the fuel delivery pump up and down, until the diesel fuel overflows out; tighten the air-discharging screw.

d. Continue to press the hand pump up and down, inspect the fuel pipeline for any leakage, and then tighten the hand pump.

(5) Preparing compressed air

When the compressed air starting or air motor starting is adopted, first fill the air to the starting air cylinder till the pressure in the cylinder to be above 1.5Mpa.

(6) Battery charging

When electric starting is adopted, charge the battery first. When the battery is used, refer to the battery operating instruction.

The gas produced in battery charging is explosive. No smoking is allowed in the vicinity of the battery.

Keep all flames and sparks far away from the battery. The acid in the battery is strong corrosive, if it splashes on the eye or on the skin, immediately wash it with a lot of water.

(7) Inspection by turning flywheel

First use a lever to rotate the flywheel for several turns; make sure that there are no other objects on the diesel engine and that it is in unloading status, then get ready for starting the diesel engine

4.2 Precautions during Use

(1) Starting work and precautions

When adopting air motor for starting: The starting handle shall be first placed at the starting position, then turn and open the control small valve and central big valve on the starting air cylinder, then open the switch valve

of the air motor, the diesel engine will be immediately started. After starting, first close the switch valve of the motor, and then immediately close all valves on the air cylinder in turn.

If the air motor gear has not been turned out, close the valve and inspect the air motor. If the flywheel can rotate, but starting is failed within 15 seconds, immediately close the valve, stop the fuel injection and check the reason.

When adopting electric motor for starting: The starting handle shall be first placed at the starting position, then turn on the battery switch in proper order. Insert the electric key to open; press the starting pushbutton, to make starting circuits to be connected one after another, the diesel engine will be started. After starting, release the pushbutton to make the starting circuits to be rapidly disconnected, and turn the electric key to turn off the switch.

If the diesel engine has not been started after the pushbutton is pressed within 15 seconds, release the pushbutton and wait for 2 minutes, conduct starting again. If the engine can not be started up for continuous three times, check the engine to find out the problems.

After the diesel engine is started up, first run the engine for 2-3min at idle, at this time the oil pressure should be higher than 120 kPa. When the cooling water temperature is less than 60°C, it is prohibited to run the engine at a great load and high speed, Otherwise, the wear ability and reliability of the engine will be affected.

When the diesel engine is within running-in period, it is only suitable for working at the load below medium.

The oil level inspection of the diesel engine: The inspection of 5 minutes after engine shutdown is taken as standard. For the diesel engine working with load, before it is shutdown, first reduce its load and speed, the run the engine at idle for 5-10 min.

(2) Normal running conditions and precautions during running

Normal running conditions:

a. The work environment meets the stipulation, the filter is clean and externally connected exhaust pipe meets the stipulation.

b. Select the fuel and oil which meet specified brands and use the cooling water which meets the conditions according to the seasons.

c. Load of diesel engine shall meet the stipulation, when the environmental conditions change, correction shall be done as per the stipulation, so as to ensure that the diesel engine runs at a safe load.

Precautions during normal running:

a. Check the oil pressure and the cooling water temperature to see if they are within specified ranges.

b. Often pay attention to the oil consumption change and exhaust color so as to distinguish the working performance and operation change of the injector.

c. Make sure that the diesel engine operates at a normal safe load condition, to avoid the overload operation of diesel engine.

Attention: when the diesel engine is overheat (such as overload or cooling system trouble etc.), never fill cold water into the engine so as to avoid the engine from bursting.

(3) Precautions when starting up and running at cold environment

Under a cold climate condition the starting is more difficult. When starting up, the customer can take one or several measures based on actual conditions:

a) Use the fuel and oil which adapt the environmental temperature.

b) Fill hot water with 60—80°C into the engine, and charge the oil which has been heated to about 40°C.

c) When conducting electric starting, thermal insulating and heating measures should be taken to ensure the battery to have an enough capacity.

Attention: In order to avoid the diesel engine from damaging, when the diesel engine is working, the cable connecting the diesel engine pressure

regulator and the cable connecting the positive pole of the battery are not allowed to be removed. Different from the DC generator, it is strictly prohibited to check the voltage of the AC generator through momentary grounding.

For the diesel engine in which the cooling water has not been added with long-effective anti-freeze liquid, when it is used in the cold days, the cooling water must be drained off after engine shutdown so as to prevent the diesel engine from being broken due to freezing.

The drain port is at the oil cooler. After the drainage screw plug on the oil cooler is removed, the cooling water in the diesel engine can be drained off.

Chapter 5 Periodic Inspection and Technical Maintenance for Diesel Engine

During operation period of the diesel engine, write and fill in the operation records day by day for periodic inspection. In order to ensure reliable operation and to extend service life, a strictly technical maintenance system shall be set up.

5.1 New Engine Maintenance

After the new diesel engine is put into operation for 100 hours, carry out the following work

- (1). Clean the engine base, all oil filters, and oil tank and replace the oil.
- (2). Clean the diesel fuel filter, wipe out the dirty oil on the cylinder head.
- (3). Inspect if all fasteners and connecting parts are loose.

5.2 Routine Maintenance

- (1). Inspect the lube oil (or grease) in the oil cup. Replenish it if necessary,
- (2). Inspect if the oil in the fuel injection pump and in the governor body are at the specified level, if it is not sufficient, replenish the oil to specified amount.
- (3). Inspect leakage conditions for fuel, oil, air and water, and eliminate the leakages.
- (4). Clear off the greasy dirt, water and dust on the surfaces of the diesel engine and its attached equipment.
- (5). after every 100 hours:
 - (a) Turn the centre rotating shaft of the oil filter for several revolutions.
 - (b) Replace the oil in the inner camber of the fuel injection pump; add the oil up to dipstick marking.
 - (c) Open the drainage screw plug at the bottom of the diesel fuel filter, to remove the accumulated water and dirt.
 - (d) Inspect if all instruments work normally.
 - (e) Sum up and inspect the operating records.

5.3 Inspection Period

(1). Maintenance time table

a.After the maintenance is done as the following time, the operation is not necessary to be repeated:

Table 5-1

Work item	Running time (h)		Running time (h)
	30	125	
Inspect belt and tension	30	125	
Replace the oil and the filter element of the oil filter	30	125	
Inspect the air valve clearance	30	125	

b.as per the following time, repeatedly conduct maintenance operation:

Table 5-2

Work item	Running time (h)			
	250	500	1000	
Clean the cartridge of the air filter(*)	×			The work shall be done in advance where the dust is more.
Inspect and tension V-belt	×			
Inspect crude water pump impeller	×			Only for marine diesel engine
Inspect zinc positive pole	×			Only for marine diesel engine
Replace the oil and oil filter	×			
Inspect air valve gap	×			
Replace the diesel fuel filter	×			
Clean the crankcase ventilation device	×			Only used for the condition where the crankcase ventilation does not

(*) for the wet type air filter used by the marine diesel engine, the cartridge must be cleaned after operating for 200 hours.

c.Maintenance at stand-by status:

Table 5-3

Time	Maintenance requirements
Every month	Test run once
6 months	If the operating time has not reached 500 h after running for 6 months, the maintenance operation required during this period must be executed, i.e., execute "maintenance operation required for running 500 h" in table 11.
After 12 months	If the operating time has not reached 1000 h after running for 12 months, the maintenance operation required during this period must be executed, i.e., execute "maintenance operation required for running 1000 h" in Table 11

(2). Inspection and Repair

The work reliability of the diesel engine will be affected due to the wearing of components and corrosion. In order to avoid the abnormal operation of diesel engine, we recommend that all-round inspection and repair should be carried out according to the table below. The first overhaul shall be executed after the diesel engine running for 2000 hrs or after 2 years (if running time has not reached 200 hrs).

Table 5-4

Item	Running time (h)
Inspect the injector	2000
Inspect the compression pressure of piston	
Inspect the bearing clearance of water pump	5000
Inspect the supercharger	5000

Item	Running time (h)
Inspect the fuel injection pump	5000
Inspect the cylinder head	5000
Inspect the cylinder sleeve	5000
Clean the water cavity of water cooler exhaust pipe and inspect the rusting	10000
Inspect the connecting rod bearing and main bearing	10000
Inspect the piston	10000
Inspect the crankshaft	10000
Inspect the camshaft	10000
Inspect the level 2 balancing mechanism	10000
Inspect the drive gear	10000
Thoroughly inspect the fuel injection pump	10000
Replace the oil pump	10000
Replace the water pump	10000
Replace the front and rear oil seals of crankshaft	10000
Replace the shock absorber	10000

Above inspection and service shall be conducted by skilled specialized persons.

5.4 Long-Term Storage Maintenance

(1). Cleaning the diesel engine

Before the diesel engine is stored, all rusting shall be removed through suitable methods, all locations where are treated by the protective agent (such as lubricating oil pipeline, furl system, supercharger etc) should be thoroughly cleaned.

(2). Protective procedures

a. Remove the cover at short face of the air inlet pipe; use a pressure nozzle to spray anti-rust oil into the intake pipe. When spraying oil, use a hand to turn the crankshaft so as to open the air valve, and to make anti-rust oil to seep in the combustion chamber. Once all preservation and storing work is completed, the crankshaft shall not be turned again; so as to prevent the oil film adhered on the cylinder wall from scratching off.

b. Drain all fuel and oil liquids in the diesel engine. Drain the anti-rust liquid or use a pump to withdraw the anti-rust liquid from the engine base. Drain the emulsified liquid from the cooling system, all liquid drainage valves are kept open.

c. Dismount the rocker arm hood; spray anti-rust oil to the air valve spring and rocker arm.

d. All machining parts and easily-rusted parts of the diesel engine should be applied with the protective oil.

After above procedures are completed, the engine can be stored.

(3) Protection measures during storage

In order to prevent moisture in the air and foreign matters from entering into the diesel engine, during transportation and storage period, put the covers to seal the openings of air inlet, exhaust and cooling water pipes of the diesel engine, and use a plastic hood to cover the diesel engine.

Chapter 6 Analysis and Remedies for Common Troubles

6.1 Diesel engine can not be started

Table 6-1

SN	Causes	Remedy
1	Application	
	(1) For pneumatic starting engines: The air pressure in the starting air bottle is not sufficient or is not at the optimum starting position.	The pressure in the air bottle should be often kept above 2MPa. Before starting, rotate the engine to about 15 ° after top dead center of any cylinder.
	(2) For electric starting engines: the battery power is not sufficient.	Check the specific weight of battery electrolyte (it should be at 1.28~1.30). In winter or cold regions, take measures to keep the temperature of battery or use the temperature-keeping (low temperature) battery.
	(3) The starting handle is not at the starting position.	Turn the engine starting handle tightly at the starting position
	(4) Diesel engine is loaded.	Unload
	(5) The oil viscosity is high, and the fluidity is bad.	Use proper oil or heat oil according to the ambient temperature.
	(6) There is air in the fuel system.	Before starting, release completely gas from the system.
	(7) There is water in diesel fuel.	Check the fuel tank; open the drain plug at the bottom of diesel fuel filter to drain water.
	(8) The bleed screw of fuel injector is not tightened, no fuel injection.	Tighten it in clockwise direction.
	(9) The selected diesel fuel is improper.	Use fuel suitable for the region and season.
2.	Fuel system	
	(1) Fuel leakage at the union of fuel pipe.	Check and tighten the union.
	(2) Fuel pipe is blocked.	Check and clean or blow it through.
	(3) The diesel fuel filter is blocked.	Remove the filter element for cleaning or replace.
	(4) The atomization of fuel injector is poor.	Adjust, check and repair the fuel injector, replace the matched pair of needle valve if required.

	(5) The fuel supply advance angle is incorrect.	Adjust as specified.
	(6) The injection pump or fuel injector are damaged	Check and repair or replace.
3	Miscellaneous	
	(1) The air inlet and outlet valve leak	Repair the valves by lapping and re-adjust valve clearance.
	(2) The cylinder leaks	Check the cylinder gasket and tighten the nut of cylinder head.
	(3) Valve spring is broken.	Replace.
	(4) Piston ring leaks	Replace.
	(5) Piston is jammed in cylinder.	Remove and repair.
	(6) Water accumulated in cylinder	Check the cylinder gasket and tighten the nut of cylinder head
	(7) For pneumatic starting engines: the timing of air distribution disc is wrong	Remove and reassemble.

6.2 Diesel Engine does not Generate Prescribed Power

Table 6-2

SN	Causes	Remedy
1	Application	
	(1) The rotating speed is low	Adjust to rated rotating speed.
	(2) The altitude above sea level is too high or ambient temperature is too high.	Refer to the Appendix "Power Correction" Table; and correct it in accordance with environmental conditions.
2	Fuel system	
	(1) Fuel injector fails (spraying orifice is blocked; the atomization is poor, fuel injection pressure is not sufficient and height of nozzle from the cylinder cover is incorrect.	Adjust, check and repair the fuel injector as specified.
	(2) Fuel delivery of injection pump is not uniform or some slave cylinders do not operate.	Adjust the fuel quantity or check and repair the injection pump.
	(3) Injection pump is worn, the fuel supply is not sufficient.	Screw out appropriately the limiting screw of regulating rack rod of injection pump, to increase the fuel quantity or replace the plunger pair.

SN	Causes	Remedy
	(4) Diesel fuel filter is blocked, fuel pressure of transfer pump is not sufficient, check valve of transfer pump is broken or worn, or its spring is broken (or the position of diesel fuel tank is too low, or the speed governing mechanism operation is abnormal).	Check, clean and adjust or replace.
	(5) Diesel fuel is improper.	Use specified brand in accordance with regions and seasons (ambient temperature).
	(6) Fuel supply advance angle is incorrect.	Check and adjust.
3	Valve system	
	(1) The air filter, supercharger compressor and intercooler are not clean.	Remove and clean.

6.3 Exhaust Smoking

Table 6-3

SN	Causes	Remedy
1	Grayish white smoke	
	(1) The diesel engine is too cold	Increase water temperature
	(2) Water leakage is found in the cylinder	Remove the exhaust pipe or cylinder head and check.
	(3) The combustion in the cylinder is incomplete.	Check fuel injector or compression pressure in the cylinder.
2	Gray brown smoke	
	(1) The load of diesel engine is too high.	Reduce the load.
	(2) Some fuel-spraying branch pump pumps too much fuel	Adjust as per Chapter 3.
	(3) Fuel injector fails (for example, fuel dribble of nozzle, the intermittent smoking of exhaust).	Check the fuel injector or replace or repair the head of injection nozzle.
	(4) The fuel supply advance is not sufficient (exhaust has black smoke or flame).	Adjust the fuel supply advance angle as specified.
3	Gray brown smoke	
	(1) When the engine is cold, the engine oil gets into the combustion chamber.	Increase the water temperature
	(2) A new is just started.	Increase the run-in time
	(3) Piston ring is worn.	Check and repair

6.4 Abnormal Noise or Vibration While Diesel Engine is Running.

Table 6-4

SN	Causes	Remedy
1	The fuel spraying is too early or the fuel supply to various cylinders is not uniform, causing the clear and rhythmic knocking sound, it is more violent during the starting or at low speed.	Adjust the fuel supply advance angle, adjust the uniformity of fuel quantity.
2	The clearances of air inlet and outlet valves are too big, and rhythmic light knocking sound is heard.	Adjust air valve clearance.
3	Heavy load is applied when the diesel engine is not warmed-up, knocking sound is produced due to big clearance between the piston and cylinder sleeve	Unload the engine; warm up the engine at idle speed.
4	Piston, piston ring and cylinder sleeve are excessively worn, producing the knocking sound.	Replace the relevant parts.
5	Crankshaft journal and liner are excessively worn; and knocking sound can be heard along entire length of the engine body	Check and repair or replace
6	The compression ratio is too high, rough running, big vibration	Adjust the compression ratio as specified.
7	The clearance of the air inlet or exhaust valves is too small or the timing of air inlet and outlet is incorrect, as a result, the valve strikes against the piston top.	Adjust the compression ratio as specified.
8	Individual cylinder does not operate; the diesel engine vibration is aggravated	Check the fuel system and remove the trouble.
9	The air valve is broken (or air valve lock clamp is damaged, air valve drops down or piston is ruptured, giving a sudden and strong impact sound).	Immediately shutdown and check the engine.
10	Howling sound due to air leakage can be heard at cylinder head gasket area.	Check the tightness of nut at cylinder head or replace the cylinder gasket.
11	Knocking sound is heard due to excessive wear of gears.	Check and replace.
12	Some fixing bolts of diesel engine are loose or damaged, the vibration is aggravated.	Tighten or replace the bolts.
13	Vibration is aggravated due to eccentricity of diesel engine and the operating machine connected.	Check and adjust.
14	Foundation is not flat and level; the common base of engine set is deformed.	Check and adjust.

6.5 Unstable Running of Diesel Engine

Table 6-5

SN	Causes	Remedy
1	The movement of governor flying iron, etc. is not flexible, or the clearance is too big due to the wear.	Check to see whether there is jamming phenomenon, repair or replace as specified.
2	The buffer clip of governor loses the elasticity or is broken, making the regulating rack rod vibrate and the rotating speed unstable.	Check or replace
3	The rotating speed of diesel engine is too low. When it runs at intermediate speed, the governor (two systems) of land engine can not function automatically.	Increase to rated rotating speed.
4	The load of diesel engine changes too frequent.	Check the output condition of load.
5	Some cylinders are ignited intermittently, resulting in cylinder knocking because of accumulated fuel bursts abruptly inside the cylinder.	Check the fuel system.
6	The fuel quantity sprayed by the branch pump and the fuel spraying time are inconsistent.	Check and adjust.
7	There is air in the fuel system.	Check and bleed air.
8	There is water in the fuel system	Check the fuel and drain the water.
9	Check the fuel and drain the water.	Check the fixation condition of gear.

6.6 Water Pump Does Not Pump Water or Water Feed Is Not Enough

Table 6-6

SN	Causes	Remedy
1	There is air inside the water pump or the water-sucking pipe.	Pour water inside to expel the air.
2	The water pipe is blocked or iced (in cold season).	Clean or add hot water, or pre-add anti-freeze liquid.
3	The sealing device or sealing gasket of water pump is damaged, there is air leakage.	Check and repair or replace.
4	The belt of water pump is too loose.	Check and adjust.
5	Water pump of diesel engine is seriously scaled	Remove scale
6	Suction lift of water pump is too long	Install the water pump as specified.

6.7 Oil Pressure is too Low

Table 6-7

SN	Causes	Remedy
1	The oil quality is poor (the phenomenon is that the engine oil pressure reduces gradually the diesel engine continues to run).	Use the oil as per specification.
2	The diesel engine is overheated, the oil becomes thinner.	Handle it as per Section 8 of this Chapter.
3	Oil filter is blocked.	Clean.
4	Oil leakage due to loose connection of oil pipeline, or air in the pipeline.	Check and fix.

5	There is diesel fuel in oil.	Replace oil and find out the cause.
6	The spring of the pressure-regulating valve of oil pump is broken.	Replace.
7	The oil quantity in the oil tank is too less or the suction range of oil pump is too long.	Replenish oil or reinstall the oil pump and oil tank.
8	The clearance between the connecting-rod bearing and main bearing is too big.	Check and replace

6.8 Diesel Engine Overheat

Table 6-8

SN	Causes	Remedy
1	The cooling water quantity is insufficient.	Handle it as per Section 6 of this Chapter
2	The inlet water temperature is too high	Reduce the inlet water temperature
3	The engine oil pressure is too low	Handle it as per Section 7 of this Chapter
4	The diesel engine is overloaded	Reduce the load and find out the cause
5	The oil spraying is too later	Check and adjust
6	Air leakage of piston ring	Check and replace
7	The bearing fit is too tight.	Check and repair by lapping as appropriate
8	Ambient temperature is too high	Carry out the power correction as per the attached Table, reduce the load.

Appendix table 2 Power Correction Coefficient

P_e , kW	T_e , °C	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
110		0.97322	0.97487	0.97650	0.97813	0.97975	0.98136	0.98297	0.98456	0.98615	0.98773	0.98930	0.99086	0.99242	0.99397	0.99551	0.99704
108		0.97572	0.97737	0.97902	0.98065	0.98227	0.98389	0.98550	0.98710	0.98869	0.99027	0.99185	0.99341	0.99497	0.99652	0.99807	0.99960
106		0.97828	0.97993	0.98158	0.98322	0.98485	0.98647	0.98808	0.98968	0.99128	0.99286	0.99444	0.99602	0.99758	0.99914	1.00068	1.00222
104		0.98089	0.98255	0.98420	0.98584	0.98748	0.98910	0.99072	0.99232	0.99392	0.99552	0.99710	0.99868	1.00024	1.00180	1.00336	1.00490
102		0.98336	0.98523	0.98688	0.98853	0.99016	0.99187	0.99341	0.99503	0.99663	0.99823	0.99981	1.00139	1.00297	1.00453	1.00609	1.00764
100		0.98629	0.98796	0.98962	0.99127	0.99291	0.99455	0.99617	0.99779	0.99940	1.00100	1.00259	1.00417	1.00575	1.00732	1.00888	1.01043
98		0.98909	0.99076	0.99242	0.99408	0.99573	0.99736	0.99899	1.00061	1.00223	1.00383	1.00543	1.00702	1.00860	1.01017	1.01174	1.01330
96		0.99195	0.99362	0.99529	0.99695	0.99860	1.00025	1.00188	1.00351	1.00513	1.00673	1.00834	1.00993	1.01151	1.01309	1.01466	1.01622
94		0.99487	0.99656	0.99823	0.99990	1.00155	1.00320	1.00484	1.00647	1.00809	1.00971	1.01131	1.01291	1.01450	1.01608	1.01766	1.01922
92		0.99787	0.99956	1.00124	1.00291	1.00457	1.00622	1.00787	1.00950	1.01113	1.01275	1.01438	1.01596	1.01756	1.01915	1.02073	1.02230
90		1.00085	1.00264	1.00433	1.00600	1.00767	1.00933	1.01097	1.01262	1.01425	1.01587	1.01749	1.01910	1.02070	1.02229	1.02387	1.02545
88		1.00410	1.00580	1.00749	1.00917	1.01084	1.01251	1.01416	1.01581	1.01744	1.01907	1.02069	1.02231	1.02391	1.02551	1.02710	1.02868
86		1.00734	1.00904	1.01074	1.01242	1.01410	1.01577	1.01743	1.01908	1.02072	1.02236	1.02398	1.02560	1.02721	1.02881	1.03041	1.03200
84		1.01066	1.01237	1.01407	1.01577	1.01745	1.01912	1.02079	1.02244	1.02408	1.02573	1.02736	1.02899	1.03060	1.03221	1.03381	1.03540
82		1.01408	1.01579	1.01750	1.01920	1.02089	1.02257	1.02424	1.02590	1.02755	1.02920	1.03084	1.03246	1.03409	1.03570	1.03730	1.03889
80		1.01759	1.01931	1.02102	1.02273	1.02442	1.02611	1.02778	1.02945	1.03111	1.03276	1.03441	1.03604	1.03767	1.03928	1.04089	1.04250

Note: The temperature in the table is inlet air temperature, the air pressure is dry air pressure (not equal to atmospheric pressure).
The temperature range of this table is 10~40 °C, the air pressure range is 80~110MPa, all the test should take this range into account by adopting necessary measure or choosing time.Corrected power: $P_{e0} = a_d \cdot P_e$ (where: P_{e0} =corrected power, P_e =measured power, a_d =correction coefficient)

Chapter II Service Manual

Dear customers:

Welcome to use the products of Weichai Power, and thank you for your great support to our products.

In order to guide you to operate the engine correctly, please read the Operation and Maintenance Manual carefully and abide by the operations rules in the manual. If the engine was failed, please contact Weichai Maintenance and Service Center or Weichai User Service Center as soon as possible. We will offer effective service to you timely.

“Maintenance Record Table” should be filled by Maintenance and Service Centre in repair and preserved by user.

1.Weichai Power Warranty Card (for user)

Item	Content	Item	Content
User Name		User Postcode	
User Phone		User Mobile Phone	
User Address			
Distributor		Distributor Tel.	
Distributor Address			
Engine Model		Engine Order No.	
Engine ID No.		Purchased Date	
Construction machinery manufacturer		Construction machinery Model	

2. Warranty Explanation

1. Service promises

In the service region of Weichai Maintenance and Service Centre, after received information from users and verifying that service is needed, our maintenance team shall get to the place within 24 hours in which the service centre is located, within 48 hours for city areas, and within 72 hours for remote areas.

(remote areas or force majeure factors excluded)

2. Special attention

- The engine operator must read the Operation and Maintenance Manual carefully and abide by the operation rules in the Manual, and pay attention to the warning directions and marks.

- The engine has been tested strictly in accordance with the test stipulations before delivery. The throttle has been sealed. It is forbidden to dismantle the seal optionally and to enlarge the throttle. Otherwise, Weichai will not be responsible for free repair.

- Some bolts of the engine are strictly specified for torque requirement and times of use. It is forbidden to loosen main bearing bolts and connecting rod bolts. See Operation and Maintenance Manual for detail.

- Before using a new engine, a 50-hour commissioning should be performed.

- After the engine is started from a cold state, do not increase the engine speed suddenly, and do not run at idle speed for a long time.

- After the engine is stopped, if the ambient temperature was lower than 0°C and no antifreeze is used, the water in water tank and in diesel engine should be drained off.

- It is forbidden to operate the engine without a air cleaner and try to prevent unfiltered air from entering into the cylinder. In severe working conditions, clean or replace the air filter element more frequently, so as to prevent early abrasion of engine.

- Applied fuel and lubricating oil must be in accordance with specified grades and filtered by strainer, and a special clean container should be used. The fuel should be settled for more than 72 hours.

3. The principle and stipulation of warranty service

- The principle of warranty Service

The engine purchased by users or fitted on other machinery, in case of using and maintaining normally within the guarantee period, the damage or trouble caused by manufacture and assembly etc. should be paid by our company.

- Time limit of warranty service (shown in appendix table)

(1) For the end product of our company, the starting date of warranty period is in accordance with the date on our sales invoice, warranty card or the formal invoice of the distributor (It should be within the 12-month oil seal period of the engine).

(2) For the matching products, the starting date of guarantee period is in accordance with the date on sales invoice or warranty card of the matched product (It should be within the 12-month oil seal period of the engine).

4. Following conditions are excluded by warranty

- Early wear and trouble arising from improper operation and maintenance, e.g.: damages from careless load and unload during transportation the engine by users, operation conditions beyond the specified range in the operation manual, over-speed or over-load operation; run-in, inspection, adjustment and tightening not abiding by the operation manual, improper match, usage of incorrect fuel, oil or antifreeze etc.

- Troubles arising from refitting, adjusting and disassembling the positions and parts that are not allowed to adjust and disassemble casually according to the product specification.

- Oil, antifreeze, filter element, hose and belt etc. for normal operation and maintenance are not in the range of warranty service

- No warranty card or valid invoice, or no evidence that proves the product is in warranty period.

- The specification and model of product in the guarantee card or invoice differs from that of the requested product for three guarantees, or the card and invoice was altered.

- Instead of maintaining the original damaged situation after trouble occurs, user treats the trouble presumptuously and the reason or trouble can not be verified.

Weichai Power Regulations on Quality Assurance for Diesel Engine used in Marine Electric Machinery

Serial number	Product models		Quality assurance period	Notes	
I. Whole diesel engine					
1	Diesel engine used in vessels, diesel generator and other power facilities.		12 months or 1500 hours	Subject to the date when they are actually purchased, which shall be evidenced by the sales invoice, warranty card, or reading on the meter. Subject to quality assurance period or the specified number of kilometers (or hours), whichever expires early.	
II. Diesel engine components					
1	Base components	Engine body, crankshaft, engine seat, connecting rod.	2 years or 3000 hours (only limited to defects in production process, such as sand oil).		
2	Important components	Cylinder head, flywheel, flywheel housing, timing gear chamber, connecting rod bolt, piston, piston ring, piston pin, main spindle bush, camshaft bush, camshaft, cylinder liner, valve, valve spring, valve seat, valve guide, valve shroud, tappet, lifter, rocker arm and rocker arm shaft, WEVB system, various gears, gear shaft, tension wheel, gear ring, oil pump, intake/exhaust pipe, front/rear support bracket, belt pulley, flange, water tank, high-pressure fuel pump, fuel injection valve, oil pump bracket, coupler, air-compressor, various covering and backing plates, water pump, oil cooler, fan bracket, silicon oil clutch, pressure limiting valve, vibration damper, crankshaft balancing mechanism, rear oil seal, various oil and water pipes and joints, power steering pump, thermostat, oil-gas separator, cylinder cushion, ECU, common-rail pipe, high-pressure fuel pipe, air filter body, oil filter body, muffler, thrust plate, suction filter, idle speed boost, oil dip rod tube, cooling oil nozzle, front and various other oil seals, turbocharger, intake pipe gasket, exhaust pipe gasket, turbocharger gasket, valve gasket, rubber hose, oil injector's return pipe, fuel supply pump, oil level gauge, fan, waterproof and oil proof rubber rings, bowl-shaped plug, starter, power generator, meters and instruments, various sensors, accelerator pedal, wire harness, electro-magnetic valve, flame preheating device	According to the above quality assurance period for the whole diesel engine.		
3	Vulnerable components	Belt, fan shroud, oil nozzle, plunger coupled parts, other gaskets, various weaved hose, hoop.	1 month		
<p>Notes:</p> <p>1. If the timing meter for marine diesel engine is damaged, the quality assurance period shall be calculated at 15 hours/day.</p> <p>2. The warranty period may be calculated from the date when the diesel engine is readjusted and tested, but under no circumstances shall such date go beyond half a year after purchasing such engine.</p>					

Overseas Service Center of weichai power Company Limited

No.	Country	Staffer	Tel.
1	Iran	Liu Xiting Zhong Lei	0098-21-22344130 0098-9122146779
2	sudan	wang zimao	00249922868539 00249183233846
3	russia	xue yuhui	0079267520188
4	singapore	dai lancheng	0065-96234801
5	vietnam	zhang yan	0084904315108
6	angola	song xiangming	00244924771275
7	kazksatan	xia jianing	0077071130129
8	bengal	liu ningyu	008801711542654
9	india	li kongjiang wang yuhe	0091-9790789138
10	algeria	zhou jingwei	00213552950194
11	south africa	ma tianliang	0027-787114346
12	mongolia	liu weijun	00976-99911097
13	kenya	cao lei	00254722467613
14	syria	sun jiyun	0096399602551
15	UAE	hanjie	00971502827836
16	thailand	zhang yanjian	0066830860868
17	cuba	huangjingui	005372604631
18	Saudi Arabia	wang xianwei	00966530683181
19	Nigeria	chen weichao	13515405118



Maintenance Record Table (Filled by service member)

Item	Content	Item	Content
User Name		User Postcode	
User Phone		User Mobile Phone	
User Address			
Distributor		Distributor Telephone	
Distributor Address			
Engine Model		Engine Order No.	
Engine ID No.		Purchased Date	
Construction machinery manufacturer		Construction machinery Model	

Service Centre	Date	warranty Item	Parts Changed	Quantity	Signed by Service Member	Signed by User



Service Centre	Date	warranty Item	Parts Changed	Quantity	Signed by Service Member	Signed by User

Please fill in this card carefully, and mail to User Service Centre of Weichai Power Company Limited. Our company will regards users as the first, and respect and adopt users' valuable suggestions.

Weichai Power Product warranty Card (for company)

Item	Content	Item	Content
User		User Postcode	
User Phone		User Mobile Phone	
User Address			
Distributor		Distributor Telephone	
Distributor Address			
Engine Model		Engine Order No.	
Engine ID No.		Purchased Date	
Construction machinery manufacturer		Construction machinery Model	

User Satisfaction Degree Examination Table

Project	Item	Very satisfying	satisfying	Acceptable	Dissatisfying	Disappointing
Quality of object	Appearance					
	Performance					
	Reliability					
Quality of delivery	Completeness of entire engine					
	Attached spare parts and tools					
	Attached documents					
	Time of delivery					
	Timeliness of service					
Quality of service	Service quality					
	Service attitude					
Others	Customer interruption					
	Returns goods					
	Extra transportation					
	Other suggestions from users					
Signed by customer						
Date:						
Maintenance and Service Centre of Weichai Power Company Limited Address: No.26 Minsheng East Street, Weifang, Shandong, China Tel: 0086-5368197520 Fax: 0086-5362297520						

Note: Column for comments by customer to be clicked by the mark "√"

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本材料供用户参考使用，产品参数如有变更，恕不另行通知，请以产品实物为准。

This manual is for reference only,
product parameters are subject to alteration
without notice, whichever is the physical product.