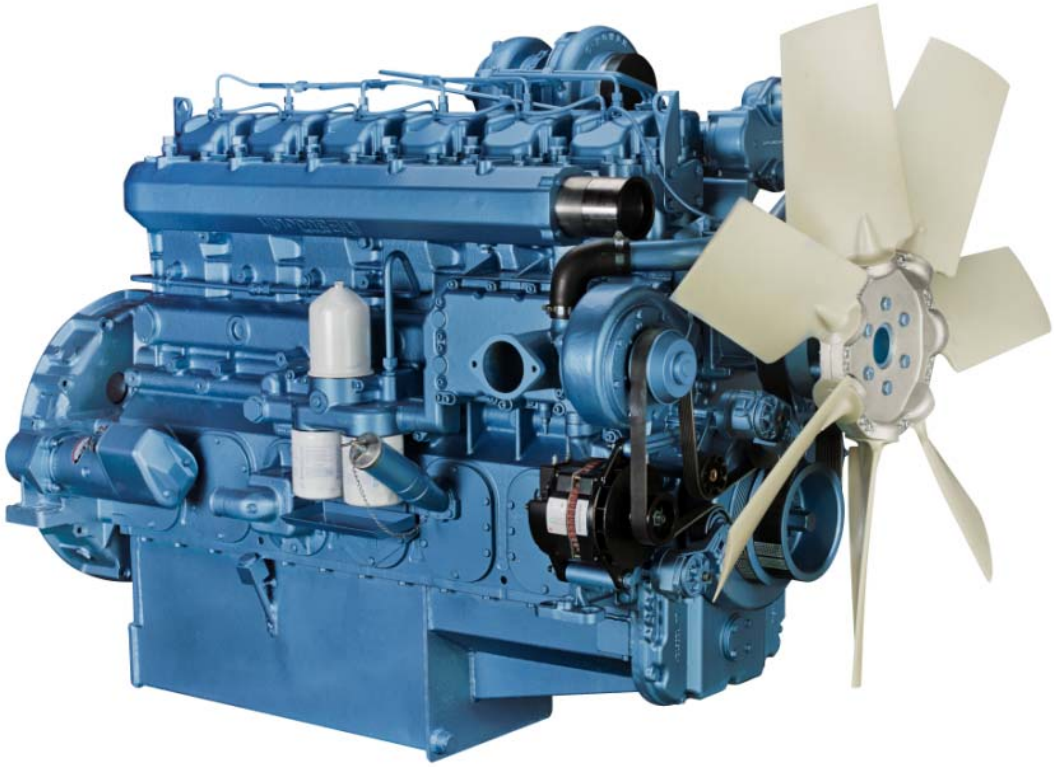
Operation and Maintenance Manual & User Service Guide for Industrial M26 Series Land Diesel Engine



Foreword

M26 series land diesel engine is of special power developed by Baudouin in accordance with the application features and requirements of land diesel engine based on M26 series marine diesel engine. This series diesel engine has advantages of compact structure, high reliability, advanced economic and technical indicators, quick startup, simple operation, convenient maintenance. This series of diesel engines are not limited to use for power generation, but other applications are not covered in this manual.

This manual introduces the operation, maintenance, troubleshooting and service guide of industrial M26 series land diesel engine for reference by relevant personnel.

In order to make the industrial M26 series land diesel engine serve users better and give full play to its effectiveness, users are recommended to know the detailed structure of the engine and master its maintenance and usage method. The service life of the diesel engine will be greatly extended if the users abide by the maintenance stipulations in this manual seriously.

With more and gradual improvement on industrial M26 series land diesel engine variants, users are recommended to timely follow the technical information released by our company. This manual is subject to change without informing. Users (or distributor) may obtain the latest product information by visiting the website www.baudouin-engine.com.

September, 2013

Precautions

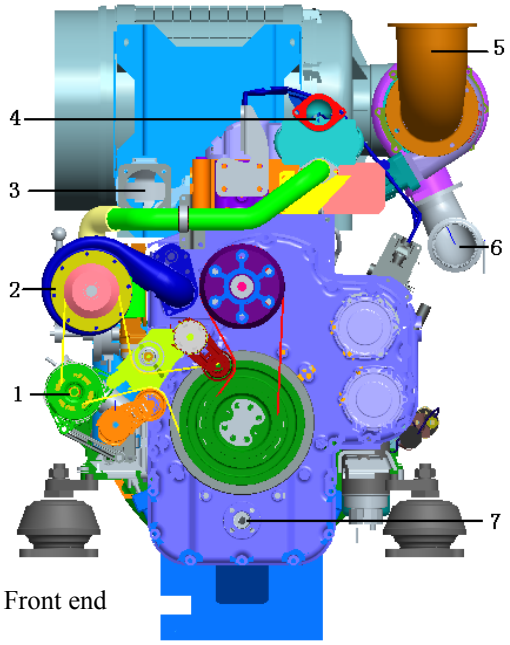
1. The engine has gone through the delivery tests according to the relevant specifications and the throttle has been sealed and limited; the seal shall not be removed to increase fuel injection without permission; The turbocharger rotor shaft is of precise high speed rotary part, it is strictly prohibited to be disassembled and impacted; the main bearing bolt and connecting rod bolt have strict torque and turning angle requirements, which shall not be loosened or disassembled by users without permission. Or else, it will void your warranty.
2. The connecting rod bolts are disposable, no second use is permitted.
3. The operator shall carefully read the operation and maintenance manual, get familiar with its structure and strictly abide by the technical operation and maintenance regulations herein.
4. Each time before starting the engine, it is required to check whether the coolant and the oil are sufficient.
5. When the user operates a new engine, a 50-hours run-in period is required, with maximum load no more than 80% of rated load and average load no more than 60%.
6. After cold starting, the engine speed should be increased slowly. No sudden running at high speed or long time idling is permitted. Sudden stop after running with high load is not allowed either. Instead, it should be run at idle speed for 5-10 min. before shutdown.
7. After shutdown of the engine, fully discharge the water without antifreeze additives form the water tank and the engine when the ambient temperature is possibly lower than 0℃.
8. It is prohibited to operate the engine without air filter to prevent the unfiltered air from entering the cylinder.
9. The fuel and oil for the engine should be the specified grades and special clean vessel filter screen should be used when filling. The fuel to be added should be precipitated more than 72 hours.
10. Check and maintenance of all components of the electrical system should be conducted by personnel familiar with electrical knowledge.
11. The oil seal period of the engine is only one year; check and take additional measures if the oil sealing time of the engine exceeds one year.
12. Feedback of engine quality information:

We will establish quality track archives for industrial M26 series land diesel engine, therefore users are expected to fill the information card and send it back to our company for contact with users conveniently.

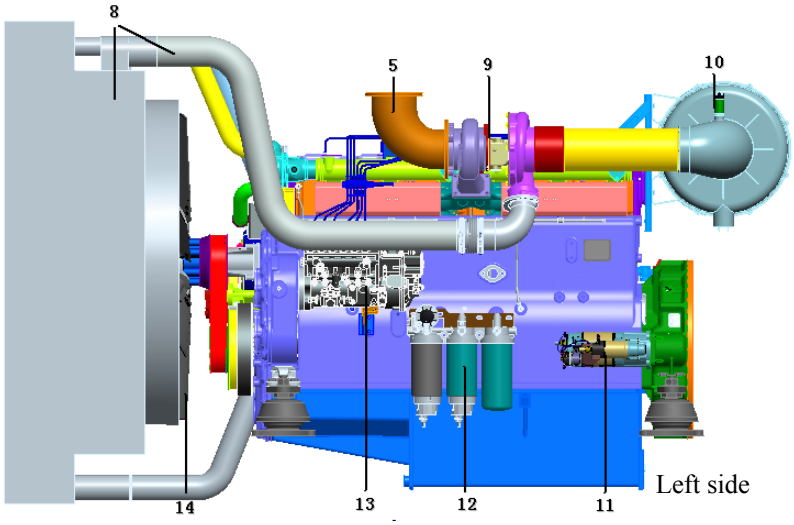
Content

Chapter I Industrial M26 Series Land Diesel Engine Overview

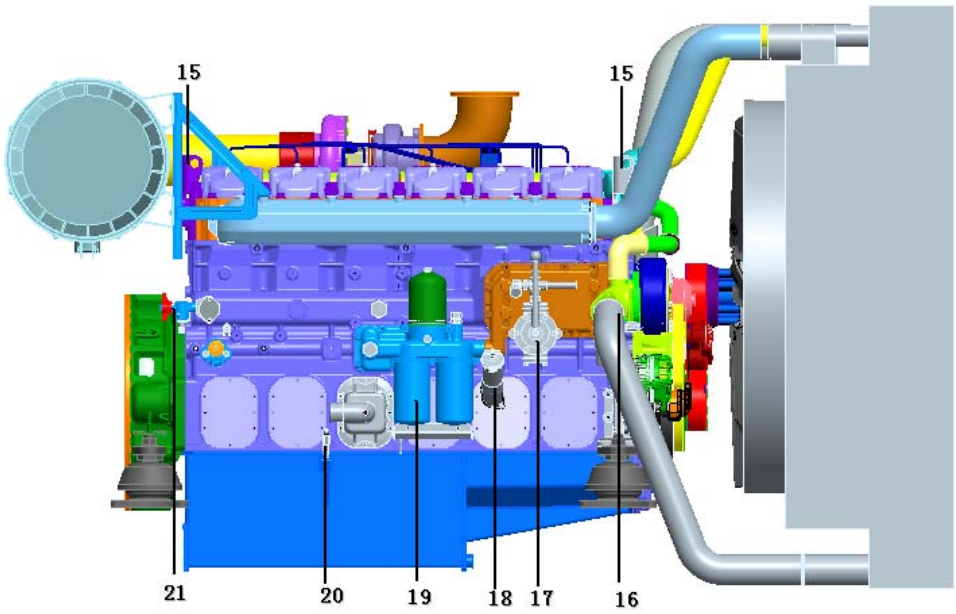
1. Schematic Diagrams of 6M26 Series Land Diesel Engine



1-Charging alternator; 2-Water pump; 3-Intake port (to intercooler outlet); 4-Water outlet (to water tank inlet); 5-Exhaust tailpipe; 6-Air compressor outlet (to intercooler inlet); 7-Fuel supply pump (optional)

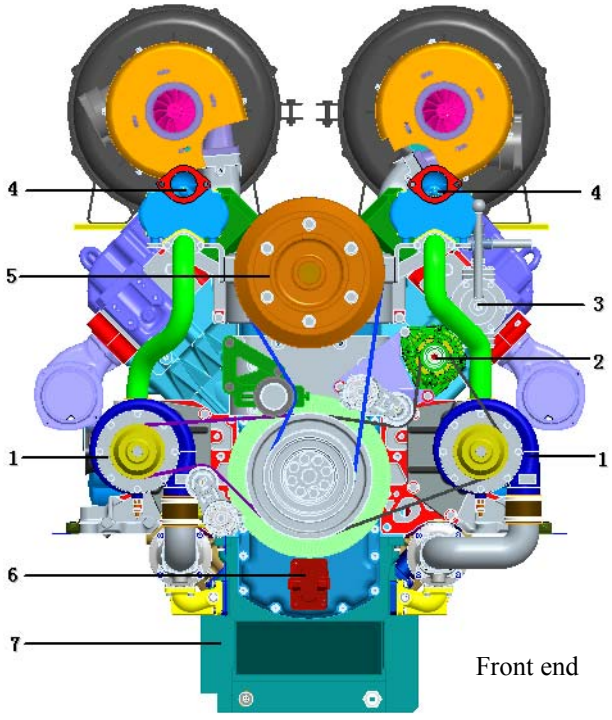


8-Radiator and pipelines (optional); 9-Turbocharger; 10-Air filter; 11-Starter; 12-Fuel filter; 13-Diesel pump; 14-Fan

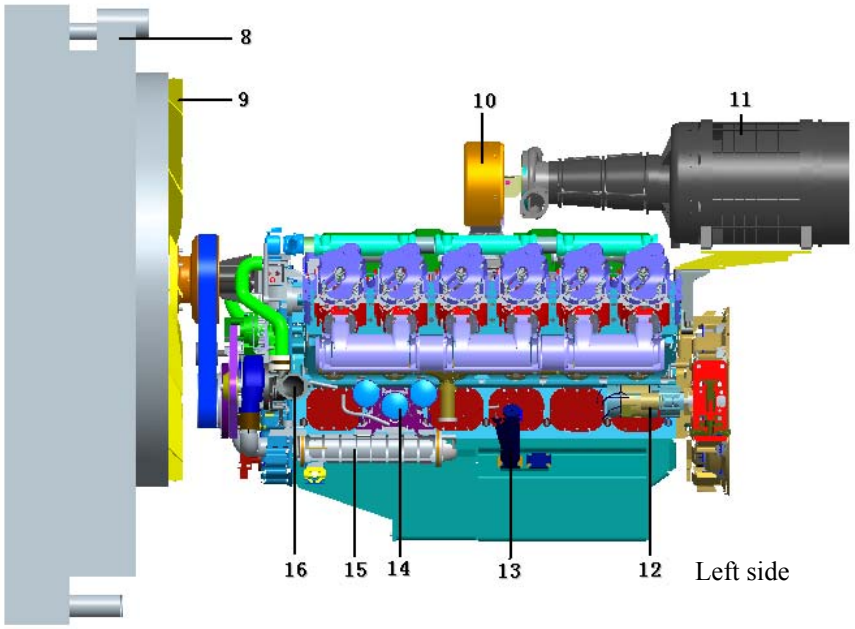


15-Lift rings; 16-Water pump inlet (to water tank outlet); 17-Hand oil pump;
18-Oil filler; 19-Oil filter; 20-Dipstick; 21-Water drain valve

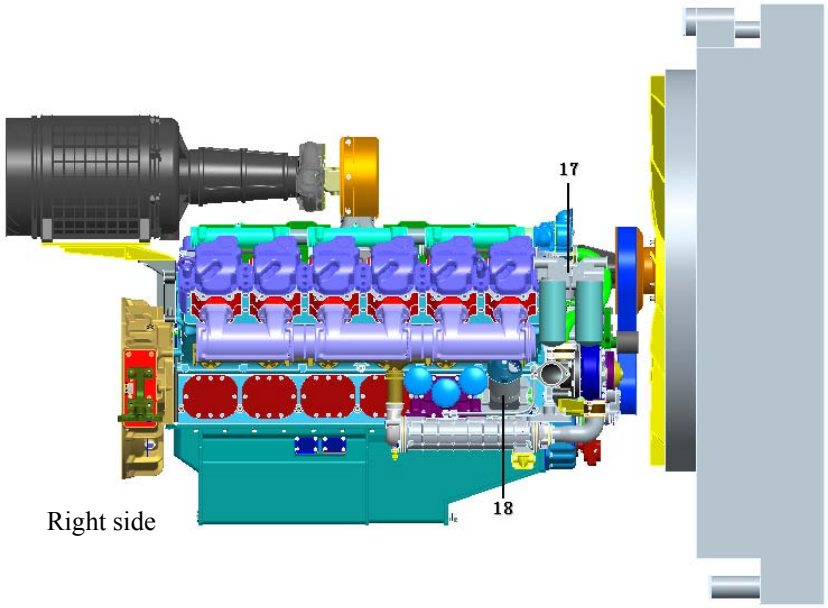
2. Schematic Diagrams of 12M26 Series Land Diesel Engine



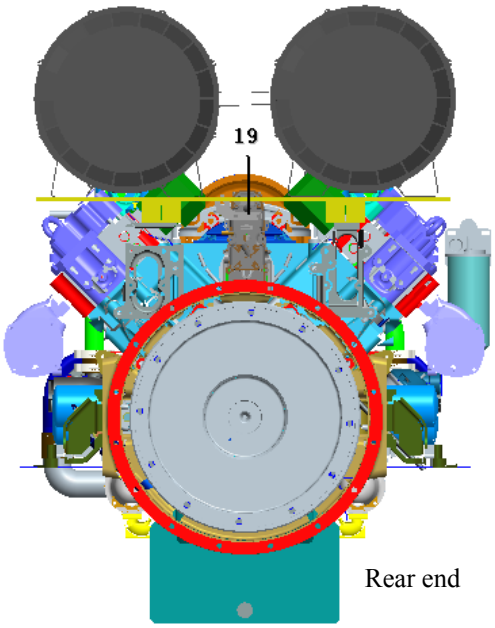
1-Water pump; 2-Alternator; 3-Hand oil pump; 4-Engine water outlet (to water tank inlet);
5-Fan pulley; 6-Fuel pre-supply pump; 7-Oil pan



8-Radiator and pipelines (optional); 9-Fan; 10-Turbocharger; 11-Air filter; 12-Starter; 13-Oil filler and dipstick; 14-Oil filter; 15-Oil cooler; 16-Water pump inlet (to water tank outlet)



17-Fuel filter; 18-Breather



19-Fuel pump

3. Tightening Torque and Method of Main Bolts of M26 Series Diesel Engine

3.1 Main bearing bolts and secondary bolts of main bearing cap

3.1.1 Before tightening, apply lubricating oil on the thread portion and pressure-bearing surface.

3.1.2 Pre-tighten all bolts with torque of 80Nm.

3.1.3 Tighten the bolts in two times according to the sequence (from A to N) shown in fig 1. The 1st time: 120Nm; the 2nd time: to 550Nm.

3.1.4 Tighten all secondary bolts of main bearing cap alternatively in two times according to the same sequence until the final tightening torque reaches 270Nm. (Only for 12M26 series diesel engine).

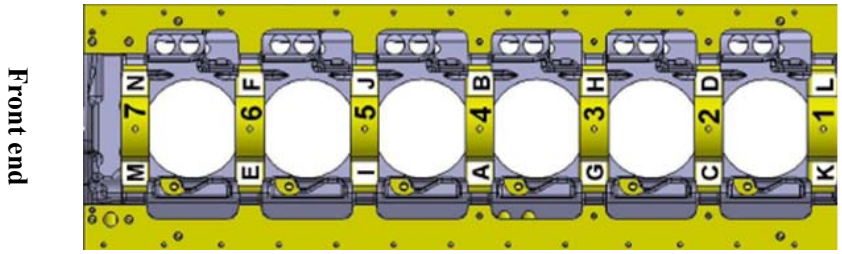


Figure 1

3.2 Cylinder head bolts

3.2.1 Tightening sequence

Tighten the cylinder head main bolts (M16×2) in sequence (from 1 to 24, see figure 2).

Tighten the cylinder head secondary bolts (M20×2) in sequence (from A to N, see figure 3).

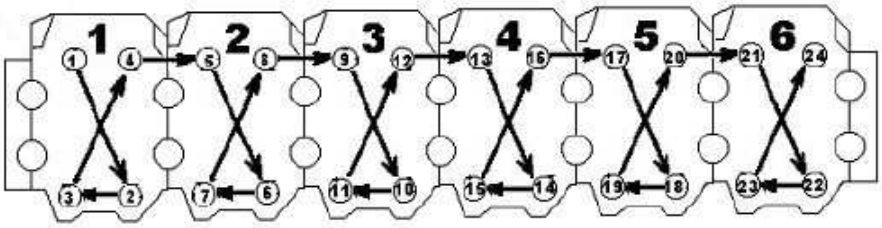


Figure 2

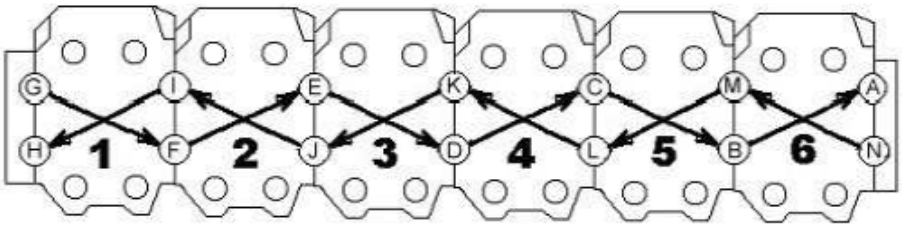


Figure 3

3.2.2 Tightening method

Apply lubricating oil on the thread portion and support surface of the bolts and screw down all the bolts; then reliably tighten according to the procedure below.

For the 1st time: pre-tighten main bolts according to sequence with the torque of 80Nm; then pre-tighten secondary bolts according to sequence with the torque of 80Nm.

For the 2nd time: tighten the main bolts by rotate 60° according to sequence; then tighten the secondary bolts by rotate 60° according to sequence.

For the 3rd time: tighten the main bolts by rotate 60° according to sequence; then tighten the secondary bolts by rotate 60° according to sequence.

For the 4th time: tighten the secondary bolts by rotate 60° according to sequence; then tighten the main bolts by rotate 45° according to sequence.

3.3 Connecting rod bolts

Apply lubricating oil on the thread portion and the bearing plane of connecting rod bolts, screw down the bolts and then tighten three times alternatively:

1st time: 70Nm; 2nd time: to 200Nm; 3rd time: to 350 Nm.

3.4 Flywheel bolts

Make gradual tightening in three times (as shown as figure 4); apply lubricating oil on the thread portion and the bearing surface:

For 6M26 engine: 1st time, 70Nm; 2nd time, to 200Nm; 3rd time, to 400Nm.

For 12M26 engine: 1st time, 70Nm; 2nd time, to 400Nm; 3rd time, to 640Nm.

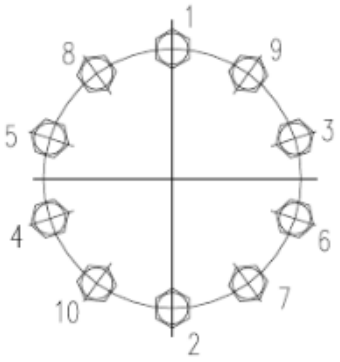


Figure 4

3.5 Flywheel housing fastening bolts: 180Nm, with Loctite 242 coated at the bolt places.

3.6 Front pulley fastening bolts: 190 Nm, with Loctite 242 coated at the bolt places.

3.7 Shock absorber bolts: 110Nm, with Loctite 242 coated at the bolt places.

3.8 Fuel injection pump intermediate gear fastening bolts: 65Nm, with Loctite 242 coated at the bolt places.

3.9 Fuel injection pump gear fastening bolts: 110Nm, with Loctite 242 coated at the bolt places.

3.10 Fuel injector tightening nuts: 120Nm, with Loctite 242 coated at the nut places.

3.11 Fuel injection pump camshaft nuts: 170Nm, with Loctite 242 coated at the nut places.

The recommended tightening torques for other bolts are shown in the table below:

Friction coefficient	0.125 (Galvanization)				0.14 (Polished)			
Strength level	6.9	8.8	10.9	12.9	6.9	8.8	10.9	12.9
Bolt size	Recommended torque N・m							
M4	2.3	2.7	3.8	4.6	2.4	2.9	4.1	4.9
M5	4.7	5.5	8.0	9.5	5.0	6.0	8.5	10
M6	8.0	9.5	13.0	16.0	8.5	10	14.0	17
M8	19	23	32	39	21	25	35	41
M10	39	46	64	77	41	49	69	83
M12	67	80	110	135	72	86	120	145
M14	105	125	180	215	115	135	190	230
M16	165	195	275	330	180	210	295	355
M18	225	270	390	455	245	290	405	485
M20	325	385	540	650	345	410	580	690
M22	435	510	720	870	465	550	780	930
M24	560	660	930	1100	600	710	1000	1200
M27	830	980	1400	1650	890	1050	1500	1800
M30	1100	1350	1850	2250	1200	1450	2000	2400
M8×1	21	25	35	42	23	27	38	45
M10×1.25	41	49	66	82	44	52	73	88
M12×1.25	74	88	125	150	80	95	135	155
M12×1.5	70	83	115	140	76	90	125	150
M14×1.5	115	140	195	235	125	150	210	250
M16×1.5	175	210	295	350	190	225	315	380
M18×1.5	255	305	425	510	275	325	460	550
M20×1.5	360	425	600	720	385	460	640	770
M22×1.5	480	570	800	960	520	610	860	1050
M24×1.5	610	720	100	1200	650	780	1100	1300
M27×1.5	890	1050	1500	1800	970	1150	1600	1950
M30×1.5	1250	1450	2050	2500	1350	1600	2250	2700

4. Power Definition and Operation Conditions of Diesel Engine for Power Generation

4.1 Power definition

4.1.1 Continuous Power (COP)

It is the maximum power of engine that operated continuously under a constant load with unlimited yearly operation time. It is the ISO standard power.

4.1.2 Prime Power (PRP)

It is the maximum power of engine that operated continuously under variable load with

unlimited yearly operation time. It is ISO standard power that 10% overload is available.

4.1.3 Emergency Standby Power (ESP)

The maximum power amidst a certain variable engine power series with yearly operation time reached 200h. It is ISO standard power under limited fuel consumption.

4.2 Operation conditions and applications of the Power

Operation conditions and applications of the diesel engine at different powers are shown in table 1.

Table 1

Power Category	Operation Conditions	Applications
Continuous Power (COP)	1. Unlimited yearly operation time; 2. Operating with 100% of rated load; 3. Without overload capacity.	Can be operated under high temperature and plateau conditions.
Prime Power (PRP)	1. Unlimited yearly operation time; 2. The average load rate shall not exceed 70% within each 250h running duration; 3. The yearly operation time with 100% of rated load shall not exceed 500h; 4. 1h overloaded operation with110% of rated power within 12h is allowed; the yearly cumulative overload operation time shall not exceed 25h.	It's used for the specified power output. If the utility power is reduced, the generating set can be connected to the utility grid.
Emergency Standby Power (ESP)	1. The yearly operation time shall not exceed 200h, including no more than 25h operation with 100% rated load yearly; 2. The average load rate shall not exceed 80% within 24h operation cycle; 3. Without overload capacity.	Provide emergency power supply during power interruption.
Note: 1. The continuous power is 0.85 times of the prime power; 2. The emergency standby power is 1.1 times of the prime power; the usage condition should be clearly described to the users when sales.		

Chapter II Operation and Maintenance of Industrial M26 Series Land Diesel Engine

1. Fuel, Lubricating Oil and Coolant for the Diesel Engine

1.1 Lubricating oil

1.1.1 Quality grade

The oil is usually graded with API or GB standard according to its quality and characteristics.

Applicable oils are:

API grade: CF-4, CH-4

GB grade: CF-4, CH-4

To replace the low quality oil with high quality oil is allowed.

1.1.2 Viscosity

Refer to table 1-1 when selecting the oil viscosity.

Table 1-1 Correlation Table of Oil Viscosity and Ambient Temperature

	SAE viscosity grade	Applicable ambient temperature (℃)
Lubricating oil	5W/30	-30～35
	10W/30	-25～35
	15W/40	-20～40
	20W/50	-15～50

Note: It's firmly required to check the oil level height inside the oil sump before starting the engine.

Do not check the oil level height when the engine is running.

The oil with different quality grade cannot be used by mixing.

1.1.3 Oil pan capacity

6M26	50L	**12M26**	113L

1.2 Fuel

The engine uses the light diesel as its fuel;

Quality level: Specified fuel grade should be used and the sulfur content should be no more than 1%.

Diesel fuel grades below are allowed to be used:

GB252 0, -10, -20, -35, -50

DIN 51601

NATO CODES F54, F57, F76

BS 2869: A1, A2 (pay attention to sulfur content for A2)

ASTM D975-81: 1-D, 2-D

W-F-800C: DF-A, DF-1, DF-2

The diesel fuel grades should be selected according to ambient temperature.

When the ambient temperature is higher than 5℃, the 0# diesel fuel (GB252-94) is recommended.

Wax may be precipitated from the diesel fuel at low temperature and lead to poor liquidity of diesel fuel, fuel system blockage and diesel engine failure. Therefore, please use winter diesel fuel when the ambient temperature is lower than 0℃. According to GB252 diesel fuel standard, it is recommended to use -10# diesel fuel when the ambient temperature is higher than -5℃, to use -20#, -35# and -50# diesel fuel when the ambient temperature is above -14℃, -29℃ and -44℃ respectively.

1.3 Coolant

The cooling water for the diesel engine must be softened water and anticorrosive agent and long-acting antifreeze should be added.

1.3.1 Long-acting antifreeze

The long-acting antifreeze is capable of antirusting and antifreezing; the compounding ratio of long-acting antifreeze should be referred to the relevant antifreeze manual. The recommended domestic long-acting antifreezes are shown in table 2-1.

Table 2-1 Domestic long-acting antifreeze

Item / Designation	JFL-318	JFL-336	JFL-345
Ethylene glycol content %	33	50	56
Specific gravity (15.6℃)	1.05	1.074	1.082
Boiling point ℃]	104.5±1	108.5±1	110.0±1
Freezing point ℃	-18±1	-36±1	-45±1
Adaptable lowest temperature ℃	-10	-26	-35

Attention:

1. When the temperature is lower than 0℃, regularly check the antifreeze concentration. The antifreeze concentration should be checked once per 1000h; or at least, it should be checked once every 3 months; besides, it should be replaced once every two years to prevent corrosive damage.
2. When it's used in the region where the temperature is always above 0℃, the water after anti-rust and anti-scale treatment may be used as the coolant. It is prohibited to use the unprocessed water as the diesel engine coolant.

1.3.2 Anticorrosive agent

When the ambient temperature is high than 5℃ (in summer and autumn or the region where the temperature is relatively high), anticorrosive agent may be added in the cooling water (NL emulsified antirust agent or LQS comprehensive protective agent). Its compounding ratio with softened water is shown in the separate manual.

1.3.3 Cooling water

The cooling water constituents should be as shown in table 2-2.

Table 2-2 Cooling water constituents

Water property	min.	max.	
PH value	6.5	8.5	Only the cooling water conforming to such properties can be used by mixing with long-acting antifreeze and anticorrosive agent.
Chloride ion content, mg/dm^3	-	100	
Carbonate content, mg/dm^3	-	100	
Total anion content, mg/dm^3	-	150	
Total hardness when using long-acting antifreeze, mg/dm^3	3	12	
Carbonate hardness, mg/dm^3	3	-	
Total hardness when using anticorrosive agent (its value is subject to the supplier's recommendation) , mg/dm^3	0	10	

Note: the inner galvanized pipe is not suitable for carrying anticorrosive agent; therefore, it shall not be served as the cooling pipe.

Water heater can be equipped so that the users can operate the engine with load in a short time.

1.4 Disposal of used oils

The used oil should be recycled with special vessel. Since the oil, fuel and coolant are toxic, do not drink them or get touch with the skin.

2. Installation and Connection of the Engine

2.1 Hoisting of the engine

△Attention

Incorrect hoisting will damage the engine.

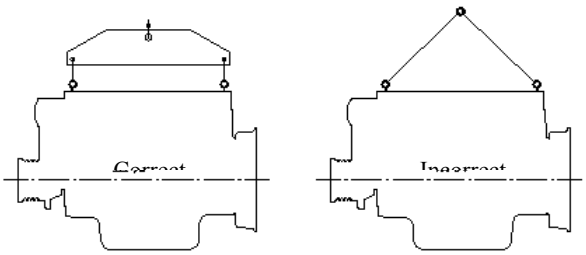


Figure A

Prior to using the hoisting device, make sure that it has been checked and authorized to use by relevant personnel. The front and rear end of each diesel engine are separately equipped with one special lifting lug (ring). Tightly fix the hook of the hoisting device to the lifting lug (ring) of the engine; the hook and the chain shall not touch other components of the engine; slowly lift it and adjust the gravity center and then make hoisting and conveying. It is recommended to use the sling chain shown as shown in figure A. During lifting, the engine crankshaft is horizontal while two chains are parallel. Do not work or stay under the lifted engine.

2.2 Installation of the engine

Use the elastic coupling to ensure coaxiality of the engine crankshaft center line and the input shaft axial line of transmission device (gearbox, transmission) and the crankshaft should be free from additional axial force arising from installation.

2.3 Installation if engine periphery system

For the exhaust pipeline of the engine, excessive bendings should be avoided and the middle of the pipeline should be equipped with the expansion joint and additional support should be placed. The inner diameter of the exhaust pipeline should be no less than 120mm and the exhaust back pressure should be no more than 6kPa.

The outdoor exhaust pipe port should be protected with rainproof cover.

The outdoor inlet pipe port should also be protected with rainproof cover to prevent rainwater from entering the intake system.

The fuel tank capacity shall sustain the engine working 8h under rated load, and the fuel tank outlet should not be lower than the fuel inlet of supply pump. The inner diameter of the fuel pipeline should be no less than 12 mm.

3. Requirements for Operation of the Diesel Engine and Precautions

3.1 Preparations before usage

3.1.1 Unpacking

After the diesel engine package box is opened, the user shall check the diesel engine and its accessories according to the packing list; check the appearance of the engine and check that the connected parts are firmly fixed before proceeding to the work below:

a. Clean rust proof layer and anticorrosive of the exposed parts.

b. Check if the water and oil plugs are in good condition and the completeness of water temperature and oil temperature sensors; the self-supplied parts should be available.

Note: Do not start the diesel engine before it's correctly installed and connected to the final position. When the diesel engine operates in the closed environment, ventilation should be ensured; what's more, the exhaust should be discharged to the atmosphere.

3.1.2 Oil filling

a. The oil shall conform to the specified requirements, or it may lead to inadequate oil pressure as well as abnormal wear and startup difficulty of the engine; the oil must be very clean.

b. Tighten the drain plug.

c. Open the cap to fill oil. The oil should be filtered with filter screen in filling.

d. Install the engine horizontally; pull out the dipstick and check the oil level height. For the first time, oil should be filled to the upper limit mark of dipstick.

e. Tighten the oil cap.

Note: Check the oil level height each time before starting the engine.

3.1.3 Fuel filling

1. The fuel used shall conform to provisions.

2. The fuel must be clean; before filling, make a static storage more than 72 hours. The fuel should be filled into the tank after passing through the filter screen.

Note: Check the fuel level each time before starting the engine.

3.1.4 Air bleeding of fuel system

a. Loosen half a turn of fuel outlet screw on the fuel delivery pump. Operate the hand pump of the fuel delivery pump till there is fuel coming out of the outlet; then tighten the fuel screw.

b. Loosen the air bleeding screw of the fuel filter. Operate hand pump of the fuel delivery pump till there is diesel fuel coming out. Then tighten the air bleeding screw.

c. Loosen fuel screw of return hole on fuel pump; operate hand pump of the fuel delivery pump till there is diesel fuel coming out; then tighten the air bleeding screw.

d. Continue to operate hand pump and check the fuel pipe for leaks and then tighten the hand pump if there is no leakage.

3.1.5 Coolant adding

The coolant is prepared with softened clean water, anticorrosive or antifreeze; the preparation must strictly abide by the provisions of the additive manufacturer.

Add coolant from the water inlet of radiator or heat exchanger and release the air in cooling circulation system.

Note: Check coolant level each time before starting the engine.

3.2 Operation precautions

3.2.1 Engine startup

△Warning !

Don't operate the engine in the locations with presence or possible generation of inflammable gas. If not, the inflammable gas will be sucked in by the intake system and lead to engine acceleration or over speed and thus cause fire, explosion and significant property loss. The engine owner and operator are responsible for its safety operation under the harsh environment.

Before starting, rotate the engine flywheel several revolutions to confirm that the crankshaft can be turned freely. Put the speed regulation lever of the injection pump in the middle position and switch on the power supply.

Do not start the engine before making sure that the equipment and the environment are safe. When the engine fails to start in 10s, release the start button immediately and make secondary start 1 min later. If it fails to start in three consecutive times, stop starting, and start again after troubleshooting.

3.2.2 Engine operation

△Attention

After the engine is started, operate it under idle speed for 2-3 min. and check the oil pressure (it should no less than 200kPa, if it's inadequate stop the engine immediately); when the cooling water temperature is lower than 60℃, don't operate the engine at high speed with high load suddenly, otherwise, the wear resistance and reliability of the engine will be adversely affected.

If the engine coolant temperature is lower than 60℃, the unburned fuel will wash away the lubricating oil on the cylinder wall and dilute that in the crankcase. The thinner in the fuel will affect the quality of lubricating oil and shorten engine lifetime, so try to shorten idle speed running time to prevent such a situation.

Do not operate the engine at idle speed or with no-load for a long time.

The operation at idle speed or with no-load for more than 10 min. will damage the engine, since the temperature in the combustion chamber is too low to make the fuel burning

completely. And thus will lead to carbon deposit surrounding the fuel injector nozzle and piston ring and valve sticking.

During engine operation, frequently check coolant temperature, oil temperature and oil pressure to ensure that the engine speed, oil pressure and oil temperature etc conform to technical specifications. For M26 series land diesel engine, it is required that: coolant outlet temperature should be ≤95℃, main oil passage temperature should be ≤105℃, and oil pressure should be 400-650kPa (giving alarm if the oil pressure is lower than 200kPa). An early alarm will be given for the majority of faults. Detect the variations of the engine in terms of performance, sound and appearance through watching and listening; and such variations will indicate that the engine requires service or maintenance. **Some anomalies are as follows: engine misfire (i.e. abnormal shutdown), abnormal vibration, abnormal noise, sudden variation on engine temperature or operation pressure, too heavy smoke exhaust, power loss, increased oil consumption, increased fuel consumption and three leakages (water, oil and gas leakage).**

Check three leakages of the engine each time after operation.

Check the lubricating oil level: subject to the tested height 5 min. after the engine is stopped.

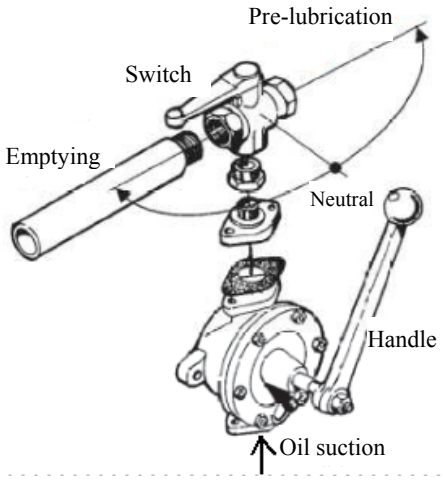
△Description

The structure and function of M26 series diesel engine hand pre-supply oil pump:

- **Function: it may realize pre-lubrication before startup.**

Pump oil by pulling the handle back and forth: There are three switch positions for controlling oil outlet direction.

1) Neutral position: the oil outlet is closed. When the hand oil pump is not used, the switch should be at the neutral position.



2) Pre-lubrication position: before starting the engine, switch to pre-lubrication position and pull the handle back and forth to **supply oil to the engine bearing, bearing bush and several other friction pairs** and discharge the air inside the oil pump to realize rapid lubrication after engine startup. This operation may reduce friction, extend service life of the engine and achieve smooth startup of diesel engine.

3) Emptying position: suck out the oil in the oil pan and discharge it out of the engine. It's used when replacing oil in the oil pan.

3.2.3 Engine stop

A sudden stop under the full load should be prevented. Before stopping, reduce the load and the speed first and operate the engine at idle speed or low speed and small load for 3-5 min. for cooling of the piston, cylinder head, cylinder liner, bushing and turbocharger to avoid cylinder scuffing, bearing burnt and several other issues. It's particularly important for the turbocharged engine. The high temperature exhaust has strong influence on the bearing and the oil seal of turbocharger. The heat arising out of the engine operation is taken away by the circulating oil; if the engine suddenly stops, the turbocharger temperature will rise greatly and the overheating will cause the bearing be seized up or the oil seal become failure.

Turn the key switch to "off" position or press down the stop button to stop operation of the diesel engine till the flywheel stops or the dashboard speed shows zero.

For the engine used in winter, if there is no antifreeze in the circulation water, discharge the cooling water inside the engine after shutdown to prevent engine damage. The drain valve is located at the bottom of the oil cooler. The cooling water inside the radiator should be discharged through the drain plug on the radiator.

3.3 Operation environment

The diesel engine can be normally started when the ambient temperature is above -15℃; if the ambient temperature is between -15℃ and -35℃, auxiliary start device should be used for normal starting of diesel engine. If it's used in the area where the altitude and temperature is

relatively high, the engine power may reduce. The engine should stay far away from the combustible and explosive environment.

4. Maintenance Specifications for Baudouin Industrial Diesel Engine

The correct operation will extend the engine lifetime, and obtain better performance as well as more economic benefits. The maintenance cycle in table below is used for the general industrial engines; however, you should make your own maintenance cycle table according to the operation environment and working conditions. If the engine is operated under severe environment, the maintenance cycle should be shortened.

4.1 Diesel engine maintenance cycle

First maintenance (P)	New engine operated 30-50h
Level 1 maintenance (WD1)	operating every 250h
Level 2 maintenance (WD2)	operating every 500h
Level 3 maintenance (WD3)	operating every 1000h
Level 4 maintenance (WD4)	operating every 3000h

4.2 Daily maintenance of diesel engine

4.2.1 Pay close attention to oil temperature, oil pressure and water outlet temperature so that the engine may operate with specified water/oil temperature and oil pressure.

4.2.2 Check the appearance of the engine. Operate the engine for 8-10 min. and check whether there is any oil, water or gas leakage or abnormal noise of the engine. The anomalies detected should be timely removed.

4.2.3 Check fuel, fresh water coolant and oil capacities after engine stops; Refill if necessary.

4.2.4 Remove the water in 1st stage fuel filter.

4.2.5 Check the appearance of the transmission belt. Replace the worn belt or belt with cracks; if the belt surface is polished or shining, it means the belt may skid. Correct mounting and tensioning may make pulley and belt wear evenly. Check the tension of belt and adjust if necessary.

4.2.6 Check cooling fan blades. The fan blade fault may lead to personal injury. Never pull or lever the fan; or else, it may damage the fan blade and lead to fan faults. Before starting, check the cooling fan to see whether there is crack, rivet loosening and blade bending and loosening; check the fan and ensure solid installation; if necessary, tighten the bolts.

4.2.7 If the ambient temperature may be possibly lower than 0℃ and there is no antifreeze in the diesel engine cooling water, fully drain the cooling water from the engine to prevent freezing rupture of the engine component.

4.3 Main works should be carried out during check and maintenance

Working items	First maintenance	Routine Inspection	WD1	WD2	WD3	WD4
Replace engine oil and oil filter element	▲		▲	▲	▲	▲
Replace fuel filter			▲	▲	▲	▲
Check and regulate valve clearance	▲		▲	▲	▲	▲
Check coolant volume and refilling	▲	▲	▲	▲	▲	▲
Check the water pump for leaks	▲		▲	▲	▲	▲
Clean fuel pump coarse strainer			▲	▲	▲	▲
Tighten intake pipeline and hose	▲		▲	▲	▲	▲
Wash and clear oil cooler core					▲	▲
Wash and clear intercooler core					▲	▲
Wash and clear fan and water tank					▲	▲
Wash or replace air filter element				▲	▲	▲
Check and tighten belt	▲	▲	▲	▲	▲	▲
Check fuel injection pump in the maintenance station						▲

Note: ▲denotes necessity of maintenance

Description: The above maintenance cycle is calculated based on a yearly operation time of 1,500 hours; if the yearly operation time of the engine doesn't exceed 500 hours, the maintenance cycle should be 0.5 times of the above maintenance cycle.

4.4 Spare parts and oil products

The users shall purchase special Baudouin spare parts and oils (grade CF-4 15W-40) to ensure good equipment operation and extended service life.

4.5 Maintenance specifications

In case of faults appearing during the warranty period of the engine, timely call Baudouin service hotline 400-618-3066 for repair; the calling center shall timely assign Authorized Service Center for Baudouin Engine for service. If the spare parts used are not Baudouin special parts or maintenance is not conducted in the authorized service center, Baudouin shall not responsible for the losses caused.

5. Analysis of Common Faults and Troubleshooting

5.1 The engine can't be started

SN	Reason	Troubleshooting
1	Improper use	
	(1)Electric starter engine, the battery electricity is insufficient.	Conduct maintenance according to the manual for free -maintenance battery
	(2) Starting handle not in starting position	Tighten the starting handle in place
	(3) Engine is loaded	Unloading
	(4) Engine oil with high viscosity and poor fluidity	According to ambient temperature, choose the corresponding oil or heating it
	(5) Air enters into the fuel system	Fully bleed the air in the fuel system
	(6) The fuel containing water	Check fuel tank and open plug at the bottom of diesel filter to drain water
	(7) Improper selected diesel fuel	Make selection according to local season
2	Fuel system	
	(1) Fuel pipe connector leakage	Check and tighten the connector
	(2) Fuel pipe blocked	Check, clean or blow the clogging.
	(3) Diesel filter blocked	Replace or clean filter element
	(4) Bad injector spraying	Adjust and repair the injector; if necessary, replace the needle valve coupling
	(5) Incorrect fuel supply advance angle	Adjust
	(6) Fuel pump or injector damaged	Repair or replace
3	Others	
	(1) Inlet and outlet valve are leaked	Repair and adjust valve clearance
	(2) Cylinder leaked	Check all cylinder gaskets and tighten cylinder head nuts
	(3) Valve spring is fractured	Replace
	(4) Piston ring leaked	Replace with new piston rings
	(5) Piston is stuck in cylinder	Disassemble and repair
	(6) There is water accumulated in the cylinder	Disassemble the cylinder head, remove water and find out the reasons

5.2 The engine fails to give specified power

SN	Reason	Troubleshooting
1	Improper use	
	(1) Speed is lower	Adjust to rated speed
	(2) The local altitude or ambient temperature is too high	Make correction according to the environment conditions referring the power correction table (table 1)
2	Fuel system	
	(1) Injector failure (nozzle blocked, bad spraying, inadequate injection pressure and incorrect nozzle extension length out of the cylinder head)	Adjust or repair the injector according to specification
	(2) Uneven fuel supply or pump does not work	Adjust fuel injection or repair the injection pump
	(3) Injection pump wear; inadequate fuel supply	Properly move out the limit screw of fuel pump control rack, increase fuel injection or replace with a new plunger coupling
	(4) Diesel filter blocked, insufficient fuel supply pump pressure, the check valve of fuel supply pump is fractured or worn; the spring is fractured.	Check, clean or make regulation or replacement
	(5) Improper selected diesel fuel	Select fuel with specified grade according to local season (ambient temperature)
	(6) Incorrect fuel supply advance angle	Check and adjust
3	Valve train	
	(1) Air filter, compressor of turbocharger and intercooler are not clean	Disassemble and clean them
	(2) External exhaust pipe does not meet the requirements, exhaust back pressure is too high	Design and install external exhaust pipe according to the specifications
	(3) Inlet and outlet valves are leaking	Check and repair them
	(4) Wrong intake or exhaust timing	Check and adjust
4	Others	
	(1) Compression pressure is insufficient (incorrect compression ratio or piston rings are severely worn)	Check, adjust or replace the piston
	(2) Piston and cylinder head galling or other wear part failure	Disassemble the cylinder head, check the inner surface of cylinder liner or other wear parts and make timely repair or replacement
	(3) Insufficient engine cooling	Check belt tensioning and various cooling system components or remove water scale
	(4) Bad bearing lubrication and overheating	Repair or clean the lubrication system

5.3 Smoke emission

SN	Reason	Troubleshooting
1	Greyish white smoke	

	(1) The engine is too cold	Increase water inlet temperature
	(2) Water leaks inside cylinder	Disassemble the exhaust pipe or cylinder head to check
	(3) Incomplete combustion	Check the injector or compression pressure inside cylinder
2	Taupe smoke	
	(1) The engine load is too high	Reduce the load
	(2) Too much fuel supply of individual cylinder of injection pump	Adjust according to the method in 5.4
	(3) Injector failure (such as nozzle drips fuel which leads to intermittent smoke emission)	Check the injector or repair (replace) the nozzle
	(4) Insufficient advance angle of fuel supply (exhaust with black smoke or flame)	Adjust the fuel supply advance angle according to specification
3	Azure smoke	
	(1) The oil enters into the combustion chamber when the engine is cool	Increase the water inlet temperature
	(2) The new engine operated for a short time	Increase the run-in time
	(3) Piston ring worn	Check and repair

5.4 Abnormal noise or vibration during diesel engine operation

SN	Reason	Troubleshooting
1	Too early injection or uneven cylinder fuel supply leads to clear and rhythmic metallic knocking sound, which is particularly strong during starting or at low speed	Adjust fuel supply advance angle or fuel injection evenness
2	Generate rhythmic slight knocking sound due to over big clearance of the inlet or outlet valve	Adjust valve clearance
3	Increase load without engine warm-up; generate knocking sound due to relatively big clearance between piston and cylinder liner	Remove load and idling warm-up run
4	Knocking noise arising from over wear among piston, piston ring and cylinder liner	Replace the corresponding component
5	Over wear of the crankshaft journal and bearing shell so that knocking sound may be heard along the whole length of the cylinder block	Check and repair or replace
6	Over high compression ratio, rough running, big vibration	Adjust compression ratio according to the specification
7	Over small inlet and outlet valve clearances or incorrect intake and exhaust valve timings lead to impacting of the valve and the piston	Adjust valve clearance or valve timing
8	Individual cylinder does not work and thus diesel engine vibration increased	Check fuel system and eliminate fault
9	Valve broke (generating sudden and violent knock due to valve cotter damaged, valve falling or piston ruptured)	Immediately stop the engine and make checking

10	Air leakage hiss at cylinder head gasket	Check cylinder head nut tightness or replace the cylinder gasket
11	Knocking noise from over worn gears	Check and replace
12	The engine fastening bolts loosened or damaged, thus the vibration increased	Fastening or replace the bolts
13	Diesel engine crankshaft is not coaxial to the connected work device, thus the vibration increased	Check and adjust
14	The uneven foundation deforms the common chassis	Check and adjust

5.5 Unstable engine running

SN	Reason	Troubleshooting
1	Frequent load variation of the engine	Check load output
2	Intermittent firing of individual cylinder; cylinder knock arising from rapid combustion of accumulated oil in the cylinder	Check the fuel system
3	Inconsistent fuel amount and injection time of the diesel pump cylinders	Check and adjust
4	There is air in the fuel system	Check and bleed the air
5	Containing water in the fuel system	Check fuel and drain the water
6	The Timing gear moves back and forth	Check tightness of the gear

5.6 Water pump doesn't suck water or water supply is inadequate

SN	Reason	Troubleshooting
1	Air enters water pump or suction pipe	Add water to remove air
2	Water pipe blocked or froze (cold season)	Clear or add hot water or pre-add antifreeze
3	Gas leakage arising from water pump sealing device or gasket damage	Repair or replace
4	Water pump belt too loose	Check and adjust
5	Serious scaling in water pump of diesel engine	Remove the incrustation
6	Water pump suction head too big	Install water pump according to specifications

5.7 The oil pressure is too low

SN	Reason	Troubleshooting
1	Inferior oil (which shows gradual decrease of oil pressure with engine operation)	Select oil according to specifications
2	The engine over heat, oil is diluted	Troubleshoot according to section 5.8
3	Oil filter blocked	Clean
4	Oil pipe joint loosened or air enters oil pipeline	Check and fasten
5	Diesel fuel is mixed into the oil	Replace and find out the reason

6	The oil pump pressure regulation valve spring fractured	Replace
7	Too little oil in the tank or the suction head of oil pump is excessive big	Refill oil, or reinstall the oil pump or oil tank
8	Too big clearance between connecting rod bearing and main bearing	Check and replace

5.8 Diesel engine overheating

SN	Reason	Troubleshooting
1	Cooling water is insufficient	Troubleshoot according to section 5.6
2	Water inlet temperature is too high	Reduce the water inlet temperature
3	The oil pressure is too low	Troubleshoot according to section 5.7
4	Engine is overloaded	Reduce load and find out reasons
5	Fuel injection is too late	Check and adjust
6	Piston ring leaking	Check and replace
7	Too tight bearing matching	Check and properly repair
8	Ambient temperature is too high	Correct the power and reduce load

Attached table 1 Correction Coefficient of Engine Power

When the engine is operated below an altitude of 1000m, no correction is required since the engine power drop relatively small; when operating above an altitude of 2000m, due to reduced air intake and turbocharger speed limit, the power of engine has obvious variation, the power of engine or engine set should be corrected; the correction coefficient should be as per the table below:

Altitude (m)	Atmospheric pressure (kPa)	Atmospheric temperature ℃									
		0	5	10	15	20	25	30	35	40	45
0	101.35	1.02	1.02	1.01	1.00	1.00	1.00	1.00	0.99	0.98	0.97
200	98.66	1.02	1.01	1.01	1.00	1.00	1.00	1.00	0.99	0.98	0.97
400	96.66	1.01	1.01	1.00	1.00	1.00	1.00	1.00	0.99	0.98	0.96
600	94.39	1.01	1.00	1.00	1.00	1.00	1.00	0.99	0.98	0.97	0.95
800	92.13	1.00	0.99	0.99	0.99	0.99	0.98	0.97	0.97	0.96	0.94
1000	89.86	0.99	0.99	0.98	0.98	0.98	0.97	0.96	0.96	0.95	0.93
1500	84.53	0.98	0.97	0.96	0.96	0.95	0.94	0.93	0.92	0.91	0.89
2000	79.46	0.96	0.94	0.93	0.92	0.92	0.91	0.90	0.87	0.86	0.82
2500	74.66	0.91	0.89	0.89	0.88	0.88	0.86	0.84	0.82	0.81	0.78
3000	70.13	0.86	0.85	0.84	0.84	0.83	0.82	0.79	0.78	0.76	0.73
3500	65.73	0.83	0.82	0.81	0.79	0.77	0.76	0.74	0.73	0.72	0.68
4000	61.59	0.79	0.78	0.76	0.74	0.72	0.71	0.69	0.68	0.67	0.65

Chapter Ⅲ User Service Guide

Baudouin Product Warranty Card (for users)

Item	Contents	Item	Contents
Model		Your name	
Ordering No.		Postcode	
Serial No.		Address	
Purchasing date		Business phone	
Dealer		Home phone	

Dear users:

You are welcome to use Baudouin product! We are grateful for your profound love for Baudouin product!

In order to correctly use and maintain the engine, please carefully read the operation and maintenance manual and conduct operation strictly abiding by relevant specifications; in case of engine fault, please contact Baudouin Maintenance and Service Center or Baudouin Power Co., Ltd Customer Service Center as soon as possible, and we will provide you with efficient and effective maintenance service.

"Maintenance Registration Form" should be filled in by the maintenance service center and then saved by the user.

Baudouin Power Co., Ltd

Address: 197A, East Fushou Street, High-tech Industrial Development Zone, Weifang, Shandong, PRC

Postcode: 261205

Website: www.baudouin.net.cn
www.baudouin-engine.com
www.moteurs-baudouin.fr

Engine sales line: +86 0536-8197532

Parts sales line: +86 0536-2297980

Service hotline:

400 free service hotline: +86 400-6183066

800 free service hotline: +86 800-8603066

Customer service center: +86 0536-8235369 (Fax)

Complaints Hotline: +86 0536-2297322

Maintenance Registration Form (filled by the maintenance personnel)

Item	Contents	Item	Contents
Model		User's name	
Ordering No.		Postcode	
Serial No.		Address	
Purchasing date		Business phone	
Dealer		Home phone	

Maintenance Service Center name	Date	Warranty items	Components replaced	Quantity	Maintenance personnel (sign/seal)	User (sign/seal)

Warranty Description

1. "Domestic repairs"

The user needs to dial hotline +86 400 618 3066 or +86 800 860 3066.

Customer Service Center 800, 400 service hotline, adopts around-the-clock duty system to provide efficient and effective quality service for customers. The service centers of Baudouin Power all over the country and authorized service centers adopts around-the-clock service, "where there is Baudouin product, there is Baudouin service."

2. "Overseas service" repairs

The user may dial Baudouin International Service Department service hotline: +86

0536-8197520

Or fax +86 0536-8098063 to declare for repair.

Warranty Service Period for Baudouin Industrial Diesel Engine

I. Warranty service principle

1. For the industrial diesel engine, Baudouin adopts product Warranty service with respect to damage arising from product quality within its period and subject to normal usage and maintenance according to relevant requirements.
2. In case of the engine fault, repair firstly or replace the corresponding component.
3. For replacement of whole engine, certain conditions should be met and then make approval according to whole engine replacement procedures.

II. Warranty period of industrial engines

1. The Warranty period should be calculated based on the Baudouin diesel engine sales invoice date; the Warranty period lasts for 18 months or operation duration of 1,500 hours, subject to whichever comes first. If there are support agreements between Baudouin and complete equipment vendor, both sides shall implement the support agreement.

If the generating set is sold to the end users after the engine sales invoice has been issued for 6 months, the "Warranty extension under special circumstances" shall prevail so that the Warranty may be properly extended. "Warranty period extension information feedback" should be faxed to the Industrial Engine Service Department +86 0536-8235369-4 within ten days

after the generating set is sold for extension confirmation. Industrial Engine Service Department shall make feedback in 2 business days. If the conditions are met, the information will be input in the service system and the Warranty period of the diesel engine will be extended accordingly.

2. The Warranty period on retail terminal product

The start point of the Warranty period for retail terminal user is subject to the sales invoice date; the Warranty period is one year or operation duration of 1,500 hours, subject to whichever comes first.

3. For the delivered Baudouin product, if the inventory time is more than one year, prior to usage, the user should ask Baudouin Industrial Engine Sales Company to arrange Baudouin authorized maintenance center for paid maintenance; or else, the Warranty will become invalid.

Warranty Service Period of the Engine

<table>
<tr><td colspan="3">Applications of the engine</td><td colspan="3">Warranty period</td></tr>
<tr><td colspan="3">Power generation, pump power, air compressor power, etc</td><td colspan="3">18 months or an operation duration of 1,500h, subject to whichever comes first</td></tr>
<tr><td colspan="6">The following components are basic parts. If there is original manufacture defects (such as slag blowholes, etc), the warranty period is 24 months after delivery</td></tr>
<tr><td>1</td><td>Cylinder block</td><td>2</td><td>Crankshaft</td><td>3</td><td>Connecting rod</td></tr>
<tr><td>4</td><td>Camshaft</td><td>5</td><td>Crankcase</td><td>6</td><td>Timing gear chamber</td></tr>
<tr><td>7</td><td>Cylinder head</td><td>8</td><td>Flywheel</td><td></td><td>Flywheel housing</td></tr>
<tr><td colspan="6">The following components are very important parts, which warranty period is 18 months or an operation duration of 1,500h, subject to whichever comes first</td></tr>
<tr><td>1</td><td>Injection pump</td><td>2</td><td>Cylinder head</td><td>3</td><td>Cylinder liner</td></tr>
<tr><td>4</td><td>Oil cooler</td><td>5</td><td>Sea water and fresh water heat exchanger</td><td>6</td><td>Oil pump</td></tr>
<tr><td>7</td><td>Piston</td><td>8</td><td>Sea water pump</td><td>9</td><td>Fresh water pump</td></tr>
<tr><td>10</td><td>Piston ring</td><td>11</td><td>Intake and exhaust manifolds</td><td>12</td><td>Thrust plate</td></tr>
<tr><td>13</td><td>Piston pin</td><td>14</td><td>Rear oil seal, crankshaft</td><td>15</td><td>Metallic pipe connector</td></tr>
<tr><td>16</td><td>Connecting rod bearing shell</td><td>17</td><td>Piston pin circlip</td><td>18</td><td>Oil-gas separator</td></tr>
<tr><td>19</td><td>Main bearing shell</td><td>20</td><td>Engine front and rear brackets</td><td>21</td><td>Water tank with fan</td></tr>
<tr><td>22</td><td>Camshaft bearing bush</td><td>23</td><td>Crankshaft pulley</td><td>24</td><td>High pressure fuel pipe</td></tr>
<tr><td>25</td><td>valve</td><td>26</td><td>Metallic water pipes</td><td>27</td><td>Fuel anti-leakage alarm device</td></tr>
</table>

28	Valve spring	29	Intermediate gear shaft	30	Oil pump transmission shaft
31	Valve spring retainer	32	Fuel injector (without nozzle)	33	Flywheel ring gear
34	Valve port	35	Injection pump bracket	36	Connecting rod bolt
37	Valve guide	38	Fuel pump coupling	39	Oil filter seat
40	Valve cover	41	Various spacer blocks and cover plates	42	Air filter (without filter element)
43	Tappet	44	Metallic oil pipes	45	Diesel filter (without filter element)
46	Push rod	47	Muffler	48	Oil filter (without filter element)
49	Intake/exhaust valve rocker arms	50	Silicone oil shock absorber	51	Oil strainer (without filter element)
52	Rocker arm bracket	53	Fan bracket	54	Oil dipstick assembly
55	Rocker shaft	56	Hand oil pump	57	Cooling nozzle
58	Oil pan	59	Various gears	60	Various bearings
61	Intercooler	62	Starting valve	63	Oil pressure limiting valve
64	Air bottle assembly	65	Air bottle head and valve	66	Pulley coupling
67	ECU(electronic control unit)	68	Common rail	69	Gear chamber front cover
70	Upper and lower rear covers	71	Oil radiator cover plate	72	Distributor disc
The following components are ordinary parts, which warranty period is 12 months or the operation duration of 750h, subject to whatever comes first					
1	Pneumatic starter	2	Tensioner	3	Crankshaft front seal
4	Pneumatic starting relief valve	5	Oil pump transmission shaft seal	6	Fuel return pipe, Injector
7	Pneumatic starting lubricator	8	Delivery pump	9	Gaskets, intake/exhaust manifolds
10	Hand oil pump	11	Turbocharger gasket	12	Expansion joint
13	Oil dipstick	14	Fan	15	Fuel injector bush
16	Thermostat	17	Oil pan gasket	18	Bowl shaped plug
19	Various O-ring seals	20	Various mechanical instruments	21	Various bolts and screws
22	Various braided hoses	23	Electronic speed regulator	24	Control panel, Electronic speed regulator
The following components are electrical parts, which warranty period is 12 months or the operation duration of 750h, subject to whichever comes first					
1	Starter	2	Various sensors	3	Electric pre-supply oil pump
4	Generator	5	Various electrical instruments	6	Solenoid valve

7	Engine wiring harness	8	Monitor assembly	9	Stop electromagnet
10	Relay	11	Battery	12	
The following components are wearing parts, which warranty period is 7months after delivered from Baudouin factory or the operation duration of 50h, subject to whichever comes first					
1	Belt	2	Plunger coupling, Fuel injection pump	3	Injector nozzle couplings
4	Clamp	5	Various spiral filter elements	6	
7		8		9	

Note: In case of diesel engine timer failure, calculate Warranty period according to 10h per day.

Warranty Service Provisions for Baudouin Industrial Engine Spare Parts

Quality assurance and 'Warranty' commitments on spare parts: Under normal use and maintenance of the spare parts, if product quality problem do exist within 'Warranty' period, they will apply to the terms of warranty service provisions and the authorized maintenance station of Baudouin of user's physical location shall be responsible for service.

I. Warranty service provisions for spare parts

For the spare parts purchased from Baudouin company, the warranty period for spare parts is subject to the sales invoice date of Baudouin center warehouse or Baudouin authorized maintenance and service center or the date on sales list printed by Baudouin spare parts system.

1.1 No warranty service for wearing parts with lower value

Gaskets: All gaskets except cylinder head gasket;

Filter elements: Air filter element, diesel filter element, oil filter element, etc;

Rubber products: Cylinder liner watertight ring, various sealing rings, oil pan gasket, etc;

Sensors: Water temperature sensor, oil pressure sensor, etc;

Couple parts: Fuel injection nozzle couple parts, fuel injection pump plunger and barrel assembly, etc;

Fasteners: Clamp, clip, etc;

Separate purchased bolts: Such as connecting rod bolt, cylinder head bolt, main bearing bolt, etc.

1.2 The warranty period for wearing parts and electrical parts is three months

Components below are wear parts or electric parts					
1	Starter	2	Belt	3	Start pre-heating device
4	Alternator	5	Electronic throttle pedal	6	AC compressor
7	Fuel system protector (excluding filter element)	8	Diesel engine wiring harness	9	Fuel efficient switch
10	Thermostat	11	Clamp	12	Monitor assembly
13	Solenoid valve	14	Electric oil pre-supply pump	15	Relay
16	Battery	17	Piston ring	18	Piston
19	Cylinder liner				

1.3 The warranty period of important and ordinary component is 6 months

Components below are important and ordinary parts					
1	Cylinder head	2	Gear shaft	3	Crankshaft balance mechanism
4	Idle speed lifting device	5	Gear ring	6	Crankshaft rear oil seal
7	Turbocharger	8	Oil pump	9	Metallic oil pipe
10	Fan	11	Intake/exhaust manifolds	12	Metallic water pipe
13	Piston pin	14	Oil pan	15	Metallic pipe connector
16	Connecting rod bearing shell	17	Front and rear engine brackets	18	SCR tank
19	Main bearing shell	20	Belt pulley	21	Oil-gas separator
22	Camshaft bearing bush	23	Flange	24	ECU
25	Delivery pump	26	Telematics	27	Common rail
28	Valve	29	Injection pump	30	High pressure fuel pipe
31	Valve spring	32	Fuel injector	33	Cooling nozzle
34	Valve spring retainer	35	Shock absorber	36	Oil dipstick pipe assembly
37	Valve port	38	Strainer	39	Diesel filter
40	Valve guide	41	Air compressor	42	Oil filter seat
43	Valve cover	44	Various spacer blocks and cover plates	45	Flywheel
46	Tappet	47	Cylinder head gasket	48	Thrust plate
49	Push rod	50	Water pump	51	Pressure limiting valve
52	Intake/exhaust valve rocker arms	53	Oil radiator	54	Oil dipstick
55	Rocker arm bracket	56	Fan bracket	57	Piston pin circlip
58	Rocker shaft	59	Silicone oil fan clutch	60	Magnetic fan clutch
61	WEVB system	62	Gear	63	Tensioner
64	Steering pump	65	Fuel injector bush	66	Bowl shaped plug
67	Crankshaft front oil seal	68	Other oil seals	69	Various rubber hoses
70	Injector return pipe	71	Hand oil pump	72	Delivery pump

1.4 The warranty period of basic components is 12 months

In case of quality problem appears during the warranty period, the warranty service labor cost shall be borne by Baudouin provided that the market manager of Service Center makes field confirmation and retains valid picture.

Components below are basic parts					
1	Cylinder block	2	Connecting rod	3	Flywheel housing
4	Crankshaft	5	Camshaft	6	Timing gear chamber
7	Cylinder head	8			

II. No warranty service for the following situations

2.1 Diesel engine faults due to improper operation, maintenance and matching. Post-purchase damage arising from: (a) own transportation and rough handling, operating conditions beyond the scope specified by the product manual, unreasonable matching, over speed and overload operation, etc; (b) running-in and maintenance do not abide by the manual; (c) use unsatisfactory inferior fuel/oil, antifreeze, fuel/oil/air filters etc.

2.2 Faults arising from self modifying, adjusting and dissembling of components and parts which are not allowed according to the product manual.

2.3 Oil, antifreeze, filter element, hose, belt, fuel injector coupling, etc replaced and consumed in normal use and maintenance.

2.4 No warranty card, invoice or other documents demonstrating that the products are still within the warranty period.

2.5 The product model and type on the warranty card or invoice are not consistent to that claimed for warranty service, or the warranty card or invoice is altered.

2.6 The original damage state is changed without authorization, thus the fault reason fails to be technically identified.

2.7 Fault arising from **wrong operation.**

2.8 Damages due to force majeure, such as war, natural disaster, etc.

2.9 Diesel engine is damaged due to traffic accident.

2.10 Change the product applications without authorization.