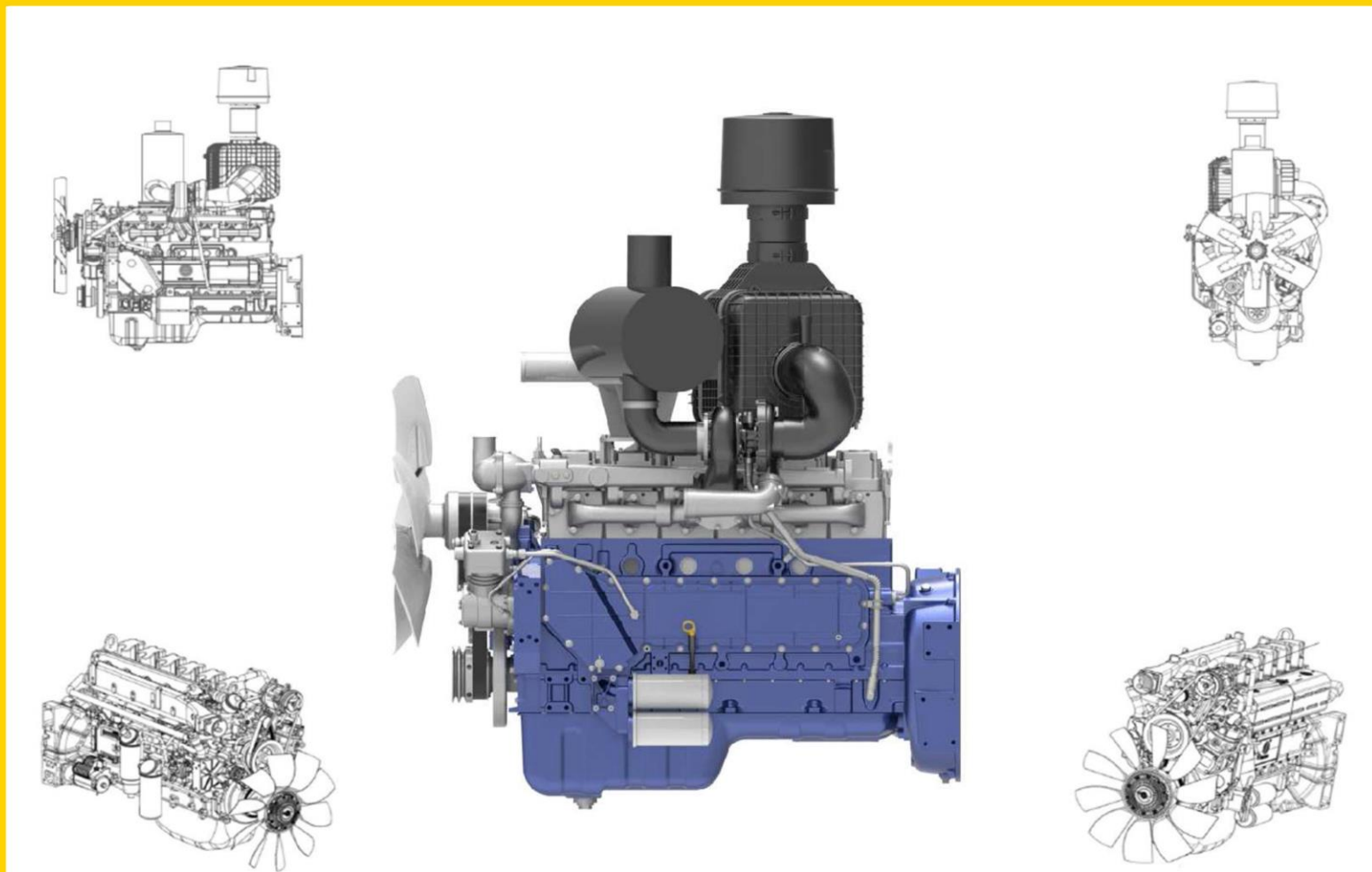




Service Manual

WEICHAI

WP10



Publ.NO. 2938002975

Service Manual for Weichai WP10 Engine

880*1230 mm 16 in-folio **18** printed sheet

2016-4 Version 1 Printed 1

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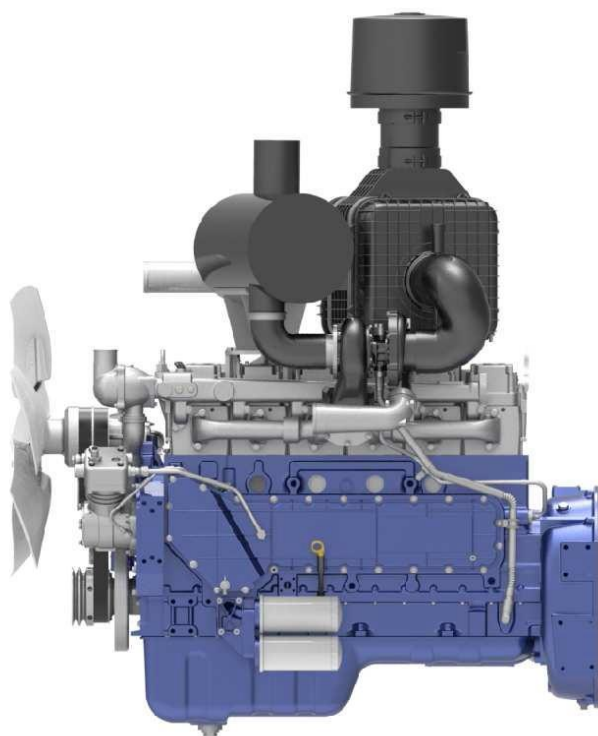
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Service Manual for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine



Outline Drawing for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine

Service Manual for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine

SPECIAL INSTRUCTIONS

- Before operating the diesel engine, the operator must carefully read the service manual for diesel engine and strictly comply with the operation and maintenance regulation in this Manual.
- The diesel engine has received delivery test as per the test specification. Never randomly adjust it as ECU data and increase the power of diesel engine.
- ECU, common rail fuel pump and fuel injector are precision parts, which should not be disassembled by the user.
- The supercharger rotor is high-speed rotating part. When the machine is running, any movable object (such as hand, tool and cotton yarn) is prohibited to approach the turbocharger to prevent personal injury or machine damage. The rotor assembly should not be disassembled.
- Main bearing bolt and connecting rod bolt of the diesel engine have strict torque and angle requirement, which should not be arbitrarily loosened and disassembled by the user. Refer to the table for tightening torque of main bolts of diesel engine in this Manual for relevant requirements. It should not be reused if the limited number of use is exceeded.
- Fill oil or fuel with grade meeting this Manual in the diesel engine. Filter the oil or fuel by a special filter element. The fuel will be precipitated over 72 hours. Before driving, be sure to fill fuel, coolant and oil as required.
- When using the new machine, the user should do breaking-in for 50h.
- The diesel engine doesn't work without air filter to prevent air entering the cylinder without filtering.
- After cold starting of diesel engine, keep it idle running and gradually speed up. Never suddenly speed up nor keep the idle speed for a long time; after running at high load, never immediately stop the vehicle (except special condition), but stop the vehicle after running at low speed for (5-10) min. If the running environment may be below 0°C and the coolant with antifreezing additive is not used in the machine, empty the coolant in the water tank and diesel engine.
- Be sure to regularly check the coolant. It's prohibited to use water and coolant of poor quality as the engine coolant. After stopping, if the running environment may be below 0°C and the coolant with antifreezing additive is not used in the machine, empty the coolant in the water tank and diesel engine.
- The repairing of electrical system components must be performed by professional technician of Weichai.
- The repairing of electronic control system components must be performed by professional technician of Weichai.
- To prevent corrosion, the diesel engine should be sealed before delivery. The oil seal period of diesel engine is one year. For over one year, check and take necessary supplementary measures.
- Please go to normal gas station to fill fuel of specified grade. Otherwise, Weichai will not provide three-guarantee service for any damage to the fuel system of diesel engine caused by fuel quality. Use non-road three-stage special diesel oil for non-road three-stage diesel engine. Otherwise, Weichai will assume no responsibility for any problem like excessive emission of diesel engine due to filling improper fuel.
- Please go to the service station specified by Weichai Power to do disassembly and repairing. In the repairing process, be sure to use spare parts specified by Weichai Power; otherwise, Weichai will assume no responsibility for diesel engine damage caused by using the spare parts other than the ones specified by the Weichai Power.

Service Manual for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine

FOREWORD

This series of diesel engine are high-speed diesel engine independently developed by Weichai Power Co., Ltd. This series of diesel engine are characterized by compact structure, reliable using, good technical indicators like performance, economy and emission, quick starting, simple operation and convenient maintenance and so on. Especially the advanced emission index can reach international advanced emission standard.

This Manual mainly includes attentions for use, maintenance method, common check and adjustment, common fault diagnosis and troubleshooting of WP10 Four-valve Non-road Three-stage Engineering Machine. During preparation, this Manual is systematic and comprehensive, simple and practical. It should be noted that judging the fault of diesel engine is a very meticulous work and requires certain knowledge and experience. Before finding out the basic cause, the diesel engine should not be disassembled generally; otherwise, the fault may not be eliminated, but more serious fault will be caused due to improper assembly after disassembly. Especially, for key parts like electronic control system, supercharger, etc. special instruments and equipment should be used for check and maintenance. Therefore, the user without experience and condition should not arbitrarily disassemble and adjust the diesel engine.

With the continuous increasing of diesel engine varieties, any modification should be done without further notice.

Suggestions and opinions for further improvement of product from the user are highly appreciated.

April 2016

Service Manual for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine

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Chapter I Instructions for Use of Diesel Engine

1.1 Outline drawing of diesel engine

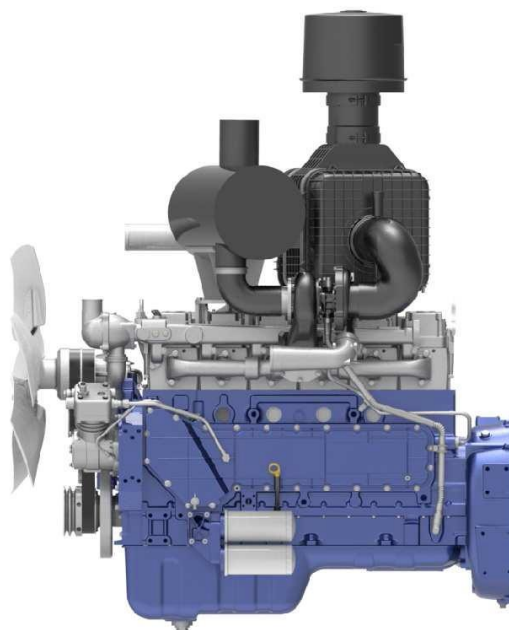


Fig. 1-1 Exhaust Side of WP10 Four-valve Non-road Three-stage Diesel Engine

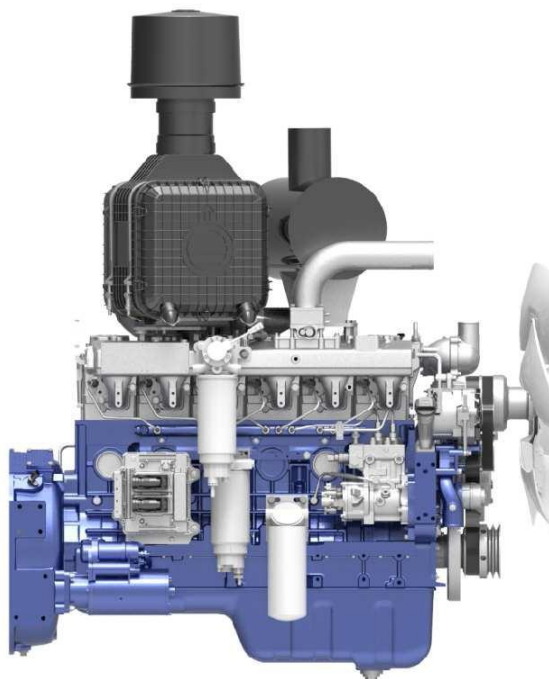


Fig. 1-2 Intake Side of WP10 Four-valve Non-road Three-stage Diesel Engine

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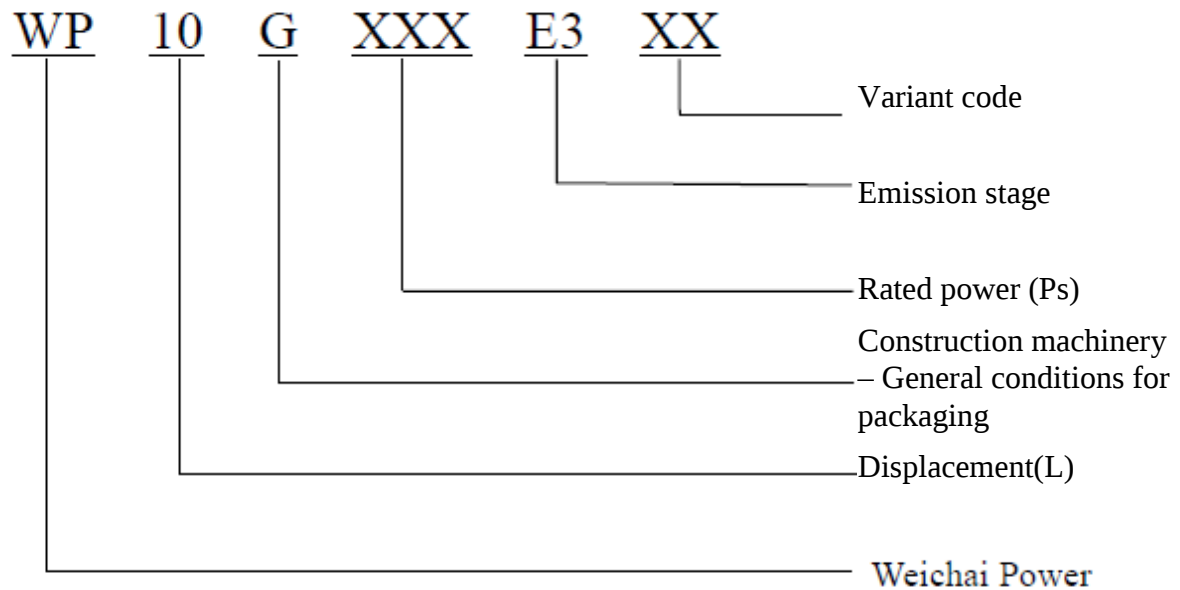
Fig. 1-3 Free End of WP10 Four-valve Non-road Three-stage Diesel Engine



Fig. 1-4 Flywheel End of WP10 Four-valve Non-road Three-stage Diesel Engine

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1.2 Definition of diesel engine models



1.3 Main technical performance parameters of diesel engine

Table 1-1 Main Performance Parameters of WP10 Four-valve Engineering Machine Three-stage Series Diesel Engine

Item		Technical Specifications	
Type		Supercharging and intercooling	
Cylinder bore/Stroke		126/130	
NO. WITH CYLS.		6	
Displacement(L)		9.726	
Compression ratio		17:1	
Ignition order		1-5-3-6-2-4	
Fuel oil system		High-pressure common rail	
Intake valve clearance (cold) (mm)		0.4±0.06	
Exhaust valve clearance (cold) (mm)		0.6±0.06	
Port timing		Intake valve open BTDC (22±5) °CA Intake valve close ABDC (22±5) °CA Exhaust valve open BBDC (60±5) °CA Exhaust valve close ATDC (22±5) °CA	
Starting method		Electric Starting	
Type of lubrication		Pressure lubrication	
Cooling Method		Water-cooling forced circulation	
Oil pressure (kPa)	Rated Point	350-580	
	Idle point	130-280	
Permissible trim degree(°)	Front/back	Long-term 10/10	Short-term 30/30
Permissible heeling degree (°)	Exhaust pipe/intake pipe side	Long-term 45/15	Short-term 45/30

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Diesel oil inlet temperature (°C)	38 ±3
Exhaust temperature (°C)	≤550
Intake temperature after inter-cooling (°C)	50-55
Capacity of lubricating oil pan (L)	24 (the actual filling volume should be subject to the oil dipstick)
Rotation direction of crankshaft (from the fan end)	Clockwise

1.4 Unpacking of diesel engine

After opening the packing case of diesel engine, the user should firstly count the diesel engine and its accessories as per the factory packing list, check the diesel engine for damage and connector for looseness. And then the user should do following operations:

- (1) Wipe antirust coating, anticorrosive agent, etc. on the exposed part;
- (2) Drain seal oil in the fuel filter and fuel system spare parts (it's allowed to start the engine with seal oil in the fuel system not discharged, but the engine operation under load is permitted only when the seal oil in the fuel system is exhausted, the normal diesel oil is supplied).

Attention: the oil seal period of diesel engine is one year. For over one year, check and take necessary supplementary measures.

- (3) Rotate the flywheel and spray solvent in the air inlet till the seal oil in the cylinder is drained.
- (4) Spray solvent in the supercharger intake and exhaust hole till the seal oil is drained.
- (5) As per the agreement between the manufacturer and user, fill oil in the oil pan as per regulations; for delivery of oil pan, fill up oil with running-in promoter. It's suggested that the user should drain the old oil and replace the new oil after running for 50h.
- (6) The ice point of special coolant of Weichai Power is -25°C, -35°C, -40°C, etc. Please select Weichai special coolant with different ice points as per local ambient temperature. In principle, the ice point should be about 10°C lower than the local temperature.

1.5 Lifting of diesel engine

When lifting, keep the crankshaft centerline of engine level and it's prohibited to incline or lift by one side (refer to Fig. 1-5). The lifting and lowering should below.

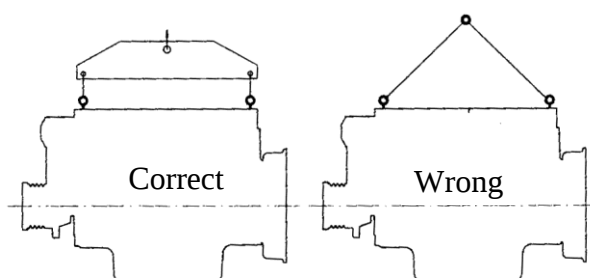


Fig. 1-5 Lifting Drawing of Diesel Engine

1.6 Assembly of diesel engine

For supporting installation, ensure that the crankshaft centerline of diesel engine is on the same axis with the input axis line of drive device (gearbox, transmission box or generator) and ensure that the crankshaft will not withstand the additional axial force caused by installation.

In the using process of diesel engine, the user should regularly perform above inspections, correct any nonconformance in time to ensure normal operation.

Service Manual for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine

1.7 Preparation before starting the diesel engine

(1) Check the coolant level

If the engine is assembled on the machine, but the coolant is insufficient, open the filler cap to fill the coolant. When opening the filler cap with pressure relief valve and exhaust button, if the engine is hot, be sure to press the exhaust button to completely exhaust air and then open the cap. It's prohibited to fill much coolant when the engine is hot; otherwise, the spare parts may be damaged due to high temperature change. If there is no coolant in abnormal condition, it's allowed to slowly fill cool water with moderate temperature and fill coolant from the filling hole till it overflows out. When the starting engine is running (1,000 r/min), keep filling coolant till the specified position and till the liquid level is stable, finally cover the filler cap.

(2) Check the fuel level

If the engine is assembled on the machine, turn on the power switch and check the fuel level of fuel gauge or check the fuel tank.

(3) Check the engine oil level

When the oil level is between the upper and lower scale line of oil gauge, if necessary, fill oil from the oil filler.

(4) Check whether the diesel engine accessories are reliably connected and eliminate abnormal phenomenon. Check whether the starting system circuit improperly connected and whether the battery is fully charged. Open the fuel tank valve, loosen the bleeder screw on the fuel coarse filter and exhaust air in the fuel system by the hand pump of the fuel pump.

1.8 Starting of diesel engine

(1) Turn on the power switch and electric key of the vehicle, turn the shift lever to the neutral position and start the engine.

(2) Press the clutch pedal and rotate the electric key to start the diesel engine. If the engine fails to start in (5-10) s, wait for 30s and repeat above starting process. If it's unable to start the engine for three consecutive times, stop starting the engine, find out the reason, eliminate the fault and start the engine. After the diesel engine starts, pay attention to the readings of all instruments; the oil pressure gauge shall immediately displays the pressure. Never keep the cold engine running at high speed but keep it idle running for a period of time. However, the idle running time should not be too long.

(3) Auxiliary starting device should be used for starting the diesel engine at low temperature. Operate the heating device by the relay so as to smoothly start it under -30°C.

1.9 Running of diesel engine

(1) After the diesel engine starts, keep it idle running for 3min and then increase the speed to (1,000-1,200) r/min. Add some load and enter the full-load operation when the water is higher than 60°C and oil temperature is higher than 50°C. The load and speed should be gradually increased to avoid sudden loading and unloading.

(2) In the breaking-in period of 50h, the diesel engine should be working under medium load. The diesel engine is not suitable for working under high load for a long time; otherwise, oil carry-over may occur.

(3) For normal use of diesel engine, it's permitted to keep continuous running at rated power and rated speed. After unloading, the diesel engine can stop after idle running for (1-2) min.

(4) Pay attention to the following reference and check parts below:

Pressure of main oil way of lubricating oil: (380-580) kPa; pressure at idle speed: (130-280)kPa;

Oil temperature of main oil way (75-105)°C;

Coolant water temperature (72-95)°C;

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Rear exhaust temperature of turbine $\leq 550^{\circ}\text{C}$.

Check the exhaust color to judge the working quality and load of fuel injector. If the smoke color is not good, stop the vehicle for inspection. Check the diesel engine for water, air and oil leakage; if any, stop the vehicle and eliminate the fault.

(5) The operator of diesel engine should know the following features:

① The fuel consumption is low when the torque is maximum and the fuel consumption rises with the speed rising.

② The engine power increases with the speed rising and reaches the rated power at rated speed.

(6) Attentions for running in cold weather:

① Fuel: select the diesel oil of different grades as per different outdoor temperature in winter.

② Lubricating oil: select lubricating oil of different viscosities as per the season.

③ Coolant: fill antifreezing additive in the cooling system and select different grades and proportion as per different outdoor temperature.

④ Starting: in winter, if necessary, adopt the auxiliary starter. After the diesel engine starts, keep it running at high speed after the oil pressure and water temperature are normal.

⑤ Battery: before cold season, be sure to check the electrolyte level, viscosity and unit voltage, if the diesel engine is not used for a long time and under low temperature, take down the battery and keep it in a warm room.

⑥ Parking: for parking in cold weather, firstly disassemble the load and keep it running at idle speed for (1-2) min. Stop the vehicle after water temperature and oil temperature are lowered. Pay attention that it's not allowed to drain the coolant with antifreezing additive after stopping. If there is no antifreezing additive in the coolant, be sure to open the water drain valve or water block at the body, oil cooler cover, radiator, water inlet, etc. to empty the coolant and prevent frost crack of engine.

Service Manual for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine

Chapter II Maintenance Guide for Diesel Engine

2.1 Fuel, lubricating oil, coolant and auxiliary material

2.1.1 Fuel

0# diesel oil (GB252) is used when the atmospheric temperature is above 5℃; generally -10# light diesel oil (GB252) is used when the temperature is above -5℃. -20 diesel oil is used when the using ambient temperature of diesel engine is lower than -15℃; and -35 diesel oil is selected when the ambient temperature is lower than -30℃.

Attention: The fuel must meet the regulation of Table D.1 in Appendix D of national standard GB 20891-2014.

2.1.2 Diesel engine lubricating oil

Weichai Power non-road three-stage series diesel engine adopts CH-4 oil and the specific standard is shown in Table 2-1.

Table 2-1 Specification for Selection of Weichai Power Special Oil

Type	Product Category		Packing Specification
Diesel engine oil	CH-4	10W/30 15W-40 20W-50	4L, 18L, 170kg

The viscosity of Weichai Power special oil should be selected as per the temperature with reference to Table 2-2.

Table 2-2 Corresponding Table of Viscosity and Ambient Temperature

SAE viscosity grade	Applicable ambient temperature (℃)
10W-30	-25-35
15W-40	-20-40
20W-50	-15-50

Attention:

- 1) Before starting the diesel engine, be sure to firstly check the oil level in the oil pan.
- 2) Never check the oil level when the diesel engine is running.
- 3) It's prohibited to mix Weichai Power special oil with oil of other manufacturers.

The filling quantity and filter element number of WP10 four-stroke model are shown in Table 2-3.

Table 2-3 Filling Quantity and Filter Element Number of Weichai Power WP10 Four-stroke Model

Model	Oil filling quantity (L)	No. of filter		
		Diesel Engine		
		Filter	Diesel oil filter	
			Coarse filter	Fine filter
WP10 four-stroke	25-28	2	2	1

2.1.3 Engine coolant

The ice point of special coolant of Weichai Power is -25℃, -35℃, -40℃, etc. Please select Weichai special coolant with different ice points as per local ambient temperature. In principle, the ice point

Service Manual for Diesel Engine of WP10 Four-valve Non-road Three-stage Engineering Machine

should be about 10°C lower than the local temperature. Please refer to Table 2-4.

Table 2-4 Weichai Power Special Heavy-duty Engine Coolant

Type	Product Category	Packing Specification
Heavy-duty engine coolant	HEC- II -25 HEC- II -35 HEC- II -40	4kg, 10kg

Attention:

- 1) Be sure to regularly check the coolant. To prevent corrosive damage, replace the coolant as per the condition.
- 2) It's prohibited to use water and coolant of poor quality as the engine coolant.

2.1.4 Auxiliary materials

Table 2-5 Auxiliary Materials

S/N	Name	Color	Usage and Application
1	Molykote Pulver (Fine molybdenum powder)	black	Apply it on the smooth metal surface to prevent occlusion. (such as cylinder sleeve external surface)
2	Molykote G_N_plus (oil MoS2)	dark grey	Play the lubrication function before the lubricating oil pressure is built up e.g.: apply it on the intake valve stem, etc.

Table 2-6 Reference Table of Gluing of Diesel Engine

Mark	Main application	List of Gluing Parts	Supplementary description
Weichai 242	Apply it on the thread surface to prevent looseness and apply medium force.	Timing gear housing stud Camshaft thrust plate bolt Camshaft timing gear bolt Intermediate idle pulley bolt Oil filter seat bolt Oil cooler bolt Air compressor shaft end thread Main oil way post plug screw Safety valve plug screw Main oil way pressure limiting valve thread Filter bolt	As an option, use DriLoc204 thread glue for pre-coating.
Weichai 262	Apply it on the thread surface to lock, seal and prevent looseness.	Cylinder head bolt	
Weichai 277	Sealing between core and hole	Bowl-shaped plug of sub-oil way Bowl-shaped plug of main oil way Bowl-shaped plug of cylinder block water chamber Bowl-shaped plug of camshaft hole Bowl-shaped plug of cylinder head Copper sleeve of cylinder head Bowl-shaped plug of intake pipe Oil-gas separator ventilating elbow to cylinder block	

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		Exhaust valve spring lower seat bottom pipe joint assembly to water pipe joint	
Weichai 510	Apply it on the bright metal surface for sealing	Matching surface between cylinder block and crankcase Matching surface between front and rear end, filter seat and crankcase	

2.2 Daily maintenance

2.2.1 Daily maintenance

- (1) Check the coolant level, oil level, fuel level; and check whether the lubricating grease is sufficient at the place required;
- (2) Check it for oil, water and gas leakage;
- (3) Check whether the connecting parts and accessories are properly and firmly connected;
- (4) Check whether the fan and belt is too tight or loose;
- (5) Check the oil pressure of diesel engine;
- (6) Check the water temperature of diesel engine;
- (7) Check whether the exhaust temperature, color, sound and vibration of diesel engine are normal and whether the speed is stable.

2.2.2 Daily maintenance

- (1) Check the coolant level and water temperature.

If the coolant is insufficient, open the filler cap to fill in coolant.

Attention: Open the filler cap, be sure to press the exhaust button to prevent personal injury due to hot coolant when the engine is hot.

- (2) Check the oil level

When the oil level is lower than the scale line of oil dipstick or higher than the upper scale of oil dipstick, it's not allowed to start the diesel engine.

After the diesel engine stops, check the oil level and wait for at least 5min, till the oil flows back to the oil pan

The oil dipstick level is shown in Fig. 2-1.

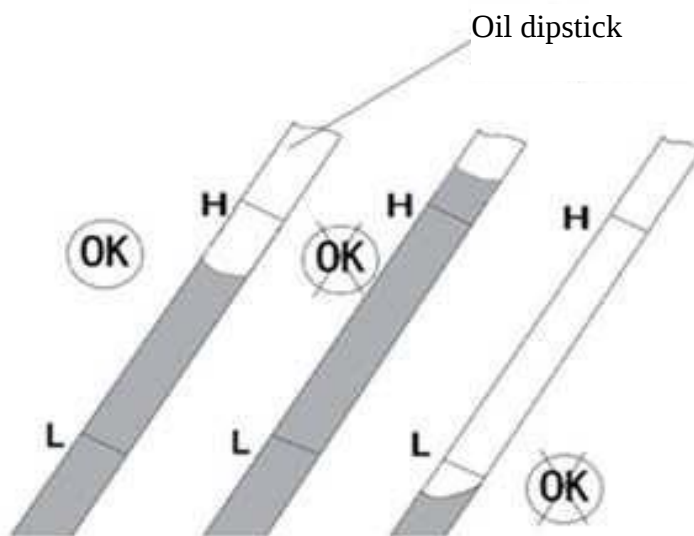


Fig. 2-1 Description of Markings of Oil Dipstick

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(3) Check the fuel level.

(4) Check three leakages.

The machine should be free of water, air and oil leakage.

(5) Check the fan.

Visually check the fan blade for damage and connecting bolt for fastening.

(6) Check the belt.

The belt is automatically tensioned by the belt pulley. The user can check the belt tension by pressing the belt by hands.

(7) Check whether the exhaust color is normal.

The normal exhaust color is light grey. Find out the reason for color change and eliminate the fault.

(8) Check whether the sound is normal.

(9) Check whether the speed and vibration are normal.

2.3 Maintenance content of all levels

(1) Replace the oil

Unscrew the drain plug at the bottom of oil pan, empty the oil and screw down the drain plug;

Open the filler cap and fill oil through the oil filler. Observe the scale of oil dipstick till the requirement is met and then assemble the filler cap.

Attention: The waste oil should be collected in specified container and put at the specified place.

(2) Replace the oil filter or filter element

① Disassemble the old oil filter;

② Fill up clean oil in the new filter;

③ Before assembling the new oil filter, apply the oil on the rubber mat;

④ After the rubber mat contacts the base, screw it down for 3/4-1 circle for sealing;

⑤ Start the diesel engine and check it for oil leakage.

(3) Check and adjust the intake and exhaust valve clearance

① When the diesel engine is in cold state, turn (as per running direction of diesel engine) it to 1#, 6# cylinder top dead center. At this time, the cutting on the flywheel is aligned with the pointer on the cover plate;

② Disassemble the valve rocker arm hood on the cylinder cover and judge the compression stroke of 1# or 6# cylinder (clearance between cylinder intake and exhaust valve of compression stroke and rocker arm);

③ Use the feeler gauge to check the clearance between valve bridge upper level and valve rocker arm. The intake valve clearance of WP10 diesel engine is 0.4mm; the exhaust valve clearance is 0.6mm. If the clearance is too big or small, adjust the adjusting bolt on the rocker arm to obtain above clearance;

④ After checking 1# cylinder or 6# cylinder, rotate it for 360° and keep the 6# or 1# cylinder at working stroke, check and adjust the remaining valve.

Table 2-7 Valve Clearance Adjusting Sequence

	1# cylinder	2# cylinder	3# cylinder	4# cylinder	5# cylinder	6# cylinder
Compression stroke of 1# cylinder	Intake and exhaust valve	Intake valve	Exhaust valve	Intake valve	Exhaust valve	It's unable to make adjustment
Compression stroke of 6# cylinder	It's unable to make adjustment	Exhaust valve	Intake valve	Exhaust valve	Intake valve	Intake and exhaust valve

(4) Replace the fuel filter element

① Disassemble old fuel filter element; If the water vessel on the coarse filter can be reused, take down the water vessel;

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- ② Lubricate the seal;
- ③ Screw down the filter by hands till the sealing is combined with the interface;
- ④ Keep twisting the filter (for about 3/4 circles) till the filter is firmly assembled by hands;
- ⑤ Exhaust air till no bubble appears;
- ⑥ Perform leakage test.

Attention: when replacing the spinning coarse filter or reassembling the fuel pipe, exhaust air in the coarse filter.

Exhaust steps of coarse filter (as shown in Fig. 2-2):

- ① Stop the engine;
- ② Unscrew the bleeder screw;
- ③ Inflate it by hand pump till oil flows out through the bleeder screw;
- ④ Tighten the bleeder screw again.



Fig. 2-2 Exhaust of Coarse Filter

Empty water from the water collector.

Attention: when the water collector is full or the spinning filter is replaced, empty the water collected.

Drainage steps of water collector (as shown in Fig. 2-3):

- ① Open the drain plug 2 at the bottom of water collector 1 to empty water;
- ② Tighten the drain plug again.

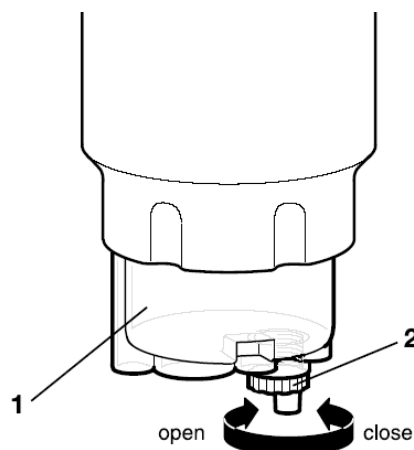


Fig. 2-3 Drainage of Water Collector

Steps for replacing the water collector (as shown in Fig. 2-4):

- ① Stop the engine;
- ② Empty water from the water collector;
- ③ If possible, disassemble the screw 1 of water collector by hands. If it's too tight, use the handling tool of new water collector;

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- ④ Add several drops of oil to lubricate the seal ring 2 of new water collector;
- ⑤ Manually insert the screw and tighten it by the tool;
- ⑥ If the water collector is used on a new spinning filter, check it for damage;
- ⑦ Install it by a torque wrench with torque of 20N.m.

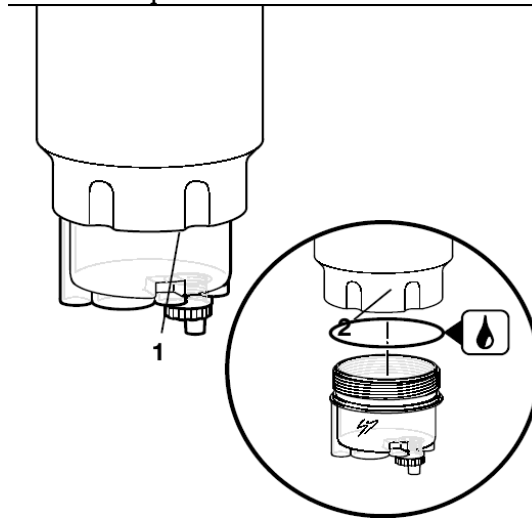


Fig. 2-4 Replacing the Water Collector

(5) Check the air intake system. Check the intake hose for aging and crack and check whether the hoop is loosened. If necessary, fasten or replace the part and ensure the air tightness of intake system.

(6) Check the air filter element. Type 1 93 dust filter

① Completely loosen the buckle connecting the rear cover and housing to take down the rear cover and completely clear away dust on the rear cover.

Attention: When stopping for inspection, clear away dust through the dedusting valve. If the dedusting valve is damaged or lost, replace it in time.

② Anticlockwise rotate the yellow seal cover and dismantle it, at this time, the external filter element is visible.

③ Hold the external filter element rear cover hanging nose by hands to extract out the external filter element from the air filter housing inner cavity.

④ Maintain the external filter element as per the maintenance instructions for air filter.

⑤ Before reassembling the external filter element, clean inner cavity of filter and dust in the inner cavity thread by a brush or cleaning cloth to ensure smooth thread and prevent dust entering the external filter element.

⑥ Assemble all spare parts in reverse order properly to ensure sealing and avoid missing parts.

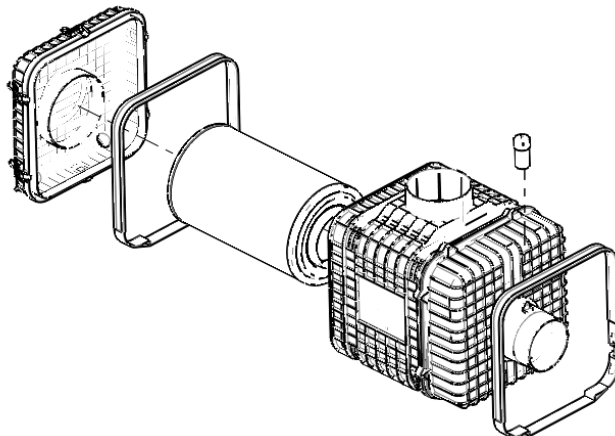


Fig. 2-5 93 Dust Filter

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2.4 Long-term storage maintenance

Attention: It's not allowed to start the diesel engine without air filter; otherwise dust and impurity may enter the diesel engine, which may cause early abrasion of diesel engine.

(1) Clean the diesel engine;

(2) Protection:

① After warm-up, empty the oil, clean the oil filter and add antirust oil;

② Empty the diesel oil and fill the antirust mixed oil;

③ Empty the water and fill the coolant with antirust agent;

④ Start the engine and keep it idle running for 15-25 minutes;

⑤ Empty the oil, fuel and coolant;

⑥ Protect other parts;

(3) Protection during storage, use cover or plastic cloth to block the oil, gas and water inlet; and use the meteorological anti-rust film to seal the whole diesel engine.

(4) For transportation, add the package.

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Chapter III Typical Faults and Troubleshooting of Diesel Engine

The three-stage diesel engine for WP10 four-stroke engineering machine is designed and manufactured under strict quality assurance system. Each diesel engine has received specified test. Meanwhile, the diesel engine is a type of precision machine and its function should be guaranteed permanently, which is closely related to normal maintenance. Early failure of diesel engine is generally caused by following reasons:

- (1) Operation against rules, improper management and use;
- (2) Never perform maintenance as per regulations even replace the maintenance with repairing;
- (3) The accessories are manufactured improperly, especially counterfeit and shoddy products purchased will greatly shorten the service life of diesel engine;
- (4) The fuel and lubricating oil grade are proper or disqualified.

3.1 Diagnosis method

Common diagnosis methods for diesel engine:

- (1) Observation method: observe the fault characteristics like smoke exhausting of diesel engine and judge the fault condition (Fig. 3-1);
- (2) Auscultation method: judge the fault part and degree as per the abnormal noise of diesel engine (Fig. 3-2);



Fig. 3-1 Observation Method



Fig. 3-2 Auscultation Method

- (3) Cylinder deactivation method: Stop one cylinder and judge whether the cylinder is faulty. The method is generally to stop supply oil to the cylinder that is suspected of fault, compare the engine state change before and after cylinder deactivation and further find out the faulty part or shrink the scope.
- (4) Comparison method: replace some assemblies or spare parts to confirm the fault.

Attention:

- ① Judging the fault of diesel engine is a very meticulous work. Before finding out the basic cause, the diesel engine should not be disassembled generally; otherwise, the fault may not be eliminated, but more serious fault will be caused due to improper assembly after disassembly.
- ② For key parts like high-pressure oil pump, supercharger, etc., check and maintenance should be done by the personnel with certain experience by special instruments and equipment. Therefore, the user without experience and condition should not arbitrarily disassemble and adjust the diesel engine.

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3.2 General fault causes and solutions of diesel engine

3.2.1 The diesel engine is unable to start

Fault cause	Solutions
1. Air in the fuel system	Exhaust air, check the joint airtightness and repair it
2. Fuel injection pump fault	Check the plunger and oil drain valve, repair or replace damaged parts.
3. Fuel injector fault	Check the atomization of fuel injector
4. Air distribution or oil supply pipe damage or oil leakage	Check and adjust
5. High-pressure oil pipe damage and oil leakage	Repair and replace
6. Insufficient compression pressure of cylinder	Check the valve air tightness, cylinder gasket air tightness, piston ring abrasion, repair or replace it Replace
7. Too low temperature	Add auxiliary starting device

3.2.2 The vehicle stops right after startup

Fault cause	Solutions
1. Fuel filter blockage	Disassemble the filter body, clear internal pollutant and water, if necessary, replace the filter element
2. Air in the fuel system	Check the oil pipe and joint air tightness, check whether the bleeder screw is tightened and exhaust remaining air Gas
3. Poor fuel quality and too much water content	Clean the filter and replace the fuel
4. Too low idle speed	Adjust again

3.2.3 Underpower

Fault cause	Solutions
1. Air intake blockage (air filter blockage)	Check the air filter, intake pipe, clean or replace the filter element
2. Too high exhaust back pressure	Check the valve timing, check the exhaust pipe for blockage, adjust and repair it
3. Insufficient pressure of supercharging system	Check and eliminate the leakage at the pipe connection part
4. Abnormal working of supercharger	Replace the assembly
4.1 Fouling of compressor and turbine flow pass	Clean or replace
4.2 Floating bearing failure	Replace
4.3 Carbon deposit and oil sludge at the back clearance of turbine and compressor	Clean
5. Fuel pipe oil leakage or blockage	Check the oil pipe and joint airtightness, the filter pollution degree and fuel pipe, repair or clear the fouling and replace the filter element

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6. Poor fuel quality	Clean the oil tank, filter parts and oil pipe and replace the fuel
7. Excessive abrasion of fuel injection pump or governor	Repair or change a new one.
8. Poor atomization of injection nozzle	Check the fuel injection pressure, carbon deposit in the injection nozzle, adjust and repair it
9. Wrong air distribution or oil supply timing	Check and adjust it
10. Too high oil level of oil pan	Check the oil dipstick and drain excessive oil
11. Air leakage of cylinder gasket	For warm-up, check the compression pressure and replace the damaged cylinder gasket
12. Piston ring abrasion and fracture, too big clearance of bearing bush	Replace the worn parts or overhaul the engine
13. Cylinder sleeve or piston abrasion or scuffing	Replace the worn parts or overhaul the engine

3.2.4 Large fuel consumption

Fault cause	Solutions
1. Intake pipe blockage	Check the air filter and intake pipe and clean it
2. Too high exhaust back pressure	Check the exhaust pipe and brake valve and clean it
3. Poor fuel quality	Replace the fuel as per regulations
4. Fuel pipe blockage	Check and repair
5. Oil leakage of fuel pipe	Check and repair
6. Poor atomization of fuel injector	Check and adjust or repair
7. Wrong air distribution or oil supply timing	Adjust the valve clearance and advance angle of fuel supply as per regulations
8. Air leakage of cylinder gasket	Check the compression pressure
9. Too big clearance of bearing bush and the engine needs repairing	Check and overhaul
10. Piston cylinder expansion	Replace the cylinder sleeve, piston and piston ring
11. Insufficient pressure of supercharging system	Check and eliminate the leakage at the pipe and connection part
12. Abnormal working of supercharger	Check and replace it.

3.2.5 Black smoke in the exhaust gas

Fault cause	Solutions
1. Intake pipe blockage or high exhaust back pressure	Clean
2. Poor fuel quality	Was hand replace
3. Wrong air distribution or oil supply timing	Make adjustment as per regulations
4. Poor atomization of injection nozzle	Check, repair or replace
5. Too much fuel in the fuel injection pump	Check and adjust
6. Insufficient pressure of supercharging system	Check and eliminate the leakage at the pipe and connection part

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7.Abnormal working of supercharger	Check and replace the assembly
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3.2.6 White and blue smoke in the exhaust gas

Fault cause	Solutions
1.Poor fuel quality and fuel with much water	Replace the fuel
2.Too low temperature of cooling water	Check the working temperature of thermometer, if necessary, replace it
3.Wrong air distribution or oil supply timing	Check and adjust
4.Poor atomization of injection nozzle	Check and repair
5.Low compression pressure, incomplete combustion or piston cylinder expansion	Check the piston ring, cylinder sleeve, cylinder gasket, and repair it
6.Improper matching of piston ring and cylinder sleeve	Keep matching
7.Piston ring opening not staggered	Adjust and assemble
8.Piston oil ring failure	Replace
9.Too big fit clearance of piston and cylinder sleeve	Repair and replace
10.Supercharger seal ring abrasion	Check and replace
11.Abrasion of supercharger thrust bearing	Check and replace
12.Supercharger oil return pipe blockage	Wash or repair

3.2.7 Too much oil at the air inlet and intake pipe of supercharger

Fault cause	Solutions
1.Supercharger seal failure	Repair or replace the supercharger
2. Oil-gas separator failure	Replace
3.Too high level of oil pan and excessive oil in it	Check and discharge appropriate oil as per regulations

3.2.8 Unstable speed

Fault cause	Solutions
1.Poor fuel quality or fuel with water or wax	Replace the fuel
2.Air in the fuel suction pipe	Check the oil pipe and joint airtightness and exhaust air
3. Uneven oil supply	Check and adjust (to be done by professional factory)
4.Unstable atomization of injection nozzle	Check and repair
5.Spraying vibration of supercharger	Check and clean the compressor passage, discharge the fouling and carbon deposit in the exhaust passage.
6. Supercharger bearing damage	Replace

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3.2.9 Too low oil pressure

Fault cause	Solutions
1. Too low oil level or oil shortage of oil pan	Check the oil level and check it for oil leakage, and fill oil
2. Main oil way pressure adjusting valve fault	Check the valve, clean and repair it
3. Blockage or fracture of filter, oil pip, joint gasket, etc.	Check and clean the compressor passage, discharge the fouling and carbon deposit in the exhaust passage.
4. The oil grade fails to meet the regulations	Replace the oil as per regulations and select the oil of proper grade
5. Oil pump oil inlet leakage	Check the oil pipe and joint, repair or replace it
6. The cooling system temperature is too high and the oil temperature is too high	Check the cooling system work and correct it
7. The oil filter resistance is too big	Replace a new filter element
8. Oil cooler blockage	Check and clean
9. Main oil way blockage	Check and clean
10. Too big clearance of bearing bush or bearing bush damage	Check and replace it.
11. Excessive abrasion of parts and overhaul needed	Check the working hour of engine and perform overhaul

3.2.10 Too high temperature of cooling water

Fault cause	Solutions
1. Too low level of water tank	Check it for water leakage, and fill water
2. Water tank blockage	Check the water tank, clean or repair it
3. Water pump belt loosened	Adjust the tension force as per regulations
4. Water pump gasket damage and water pump impeller abrasion	Check, repair or replace
5. Thermostat fault	Replace
6. Water pipe damage and air in the pipe	Check the water pipe, joint, gasket, etc. and replace the damaged parts
7. Too low oil level or oil shortage of oil pan	Check the oil level and check it for oil leakage, and fill oil

3.2.11 Fast abrasion of parts

Fault cause	Solutions
1. The air filter element is disqualified or broken	Check and replace qualified filter element
2. Short circuit of air intake system	Check the intake tube, gasket and connecting pipe sleeve, repair or replace it
3. Too low oil level or oil shortage of oil pan	Check the oil level and check it for oil leakage, and fill oil
4. Oil way blockage	Clean the oil way
5. The oil grade fails to meet the regulation	Replace the oil as per regulations
6. Fracture or abrasion of piston ring	Replace the damaged parts

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7. Abrasion or scuffing of cylinder sleeve or piston	Disassemble and check the piston and cylinder sleeve, repair or replace it
8. The oil filter element is not replaced in time	Replace it as per requirements
9. Excessive abrasion of parts and overhaul needed	Check the mileage and confirm overhaul
10. The crankshaft is not concentric with the building axis	Check the mounting support and repair it
11. The oil quality fails to meet the requirement	Adopt the oil grade meeting the standard

3.2.12 Big noise

Fault cause	Solutions
1. Poor fuel quality	Replace the fuel
2. Too low cooling water temperature	Check the thermometer, if necessary, replace it
3. Wrong distribution or oil supply timing	Check, repair and adjust
4. The atomization of nozzle is too poor.	Check, repair and adjust
5. Too high volume of fuel injection pump	Check and adjust (to be done by professional factory)
6. Shock absorber abrasion	Check it for damage, check the connecting bolt condition and replace the damaged parts
7. Valve air leakage or improper adjustment	Disassemble, check and adjust the valve
8. Too big gear clearance or tooth fracture	Check and replace the damaged parts
9. Cylinder sleeve or piston abrasion or scuffing	Check, repair or replace
10. Push rod bending or fracture	Replace
11. Piston ring fracture or abrasion	Check or replace the damaged parts

3.2.13 The starter motor doesn't work

Fault cause	Solutions
1. Low battery charge	Check, charge or replace the battery
2. Poor contact of connecting wire	Clean the wire and screw down the binding post
3. Fuses blowing	Replace the fuse
4. Poor contact of electric brush	Clean the surface of electric brush or replace the electric brush
5. Short circuit of starter motor	Repair the motor or replace the assembly

3.2.14 Starting motor is short of power

Fault cause	Solutions
1. Low battery charge	Charge or replace the battery
2. Abrasion of bearing sleeve	Replace the assembly
3. Poor contact of electric brush	Clean the surface of electric brush or replace the electric brush

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4. The commutator is not clean or burnt	Clear the oil stain and use abrasive paper to polish or replace the assembly
5. Terminal desoldering	Weld it again
6. Poor contact of switch	Check the switch and repair it
7. Slipping of clutch due to abrasion	Adjust the working torque of clutch or replace the assembly

3.2.15 The generator fails to completely generate electricity

Fault cause	Solutions
1. Wire open circuit and short circuit and joint loosened	Check the generator and ammeter wiring and repair it
2. Rotor and stator coil open circuit, short circuit or grounding	Repair or replace the assembly
3. Rectifier tube damage	Replace the assembly
4. Pole paper insulation damage and wire disconnected	Repair
5. Too low voltage of adjuster	Repair
6. Adjustor contact burnt	Repair or replace the assembly

3.2.16 Insufficient charging of generator

Fault cause	Solutions
1. Wire open circuit and short circuit and joint loosened	Repair
2. Rotor and stator coil open circuit, short circuit or grounding	Repair or replace the assembly
3. Looseness of generator belt	Check and adjust the belt tension
4. Generator rectifier tube damage and battery in poor contact	Repair
5. Too low voltage of adjuster	Adjust
6. The magnetic field coil or resistance wire of adjuster is disconnected	Repair or replace it
7. The battery electrolyte is too little or the battery is old	Fill electrolyte or replace the battery

3.2.17 Unstable charging current

Fault cause	Solutions
1. Stator or rotor coil to be subject to open circuit and short circuit	Repair or replace it
2. Poor contact of electric brush	Repair
3. Looseness and poor contact of wiring post	Repair
4. Damage of voltage adjuster	Repair
5. Improper adjustment of voltage	Check and adjust

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3.2.18 Excessive charging of generator

Fault cause	Solutions
1. Short circuit occurs in the battery	Repair or replace it
2. Too high voltage of adjuster	Repair and adjust
3. Poor grounding of adjuster	Repair
4. Adjuster contact malfunction, pollution, voltage coil or resistance wire disconnected	Repair or replace it

3.2.19 There is abnormal noise from the engine

Fault cause	Solutions
1. The generator is improperly assembled	Repair
2. Damaged bearing	Replace them
3. Rotary part touches the fixed part	Repair or replace it
4. Rectifier short circuit	Replace
5. Stator coil short circuit	Repair or replace it

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Chapter IV Disassembly and Assembly of Engine

4.1 Overview

Disassembly and assembly of engine should be done in strict line with this Manual. Pay attention to operation of danger signs and safety signs in this Manual to ensure personal safety and avoid accident.

The disassembly steps of diesel engine are contrary to the assembly steps. For no special instructions, the Service Manual only selects one for description.

4.1.1 Danger signs



The sign is worldly recognized warning sign. In this Manual, the sign is used to emphasize the importance of following information. Confirm that you know the consequence of danger and the prevention method. Behavior violating the warning information may cause property loss, personal injury even personal casualty.

The common danger signs are usually used for general warning. In this Manual, the warning information can be classified into different types as per the dangerous consequence levels (minor wound, serious injury and death).

The warning sign represents a potential hazard. If it's not avoided, it may cause serious injury and death or great property loss.

The warning sign represents a potential hazard. If it's not avoided, it may cause light injury or property loss. The warning sign is also used for warning of dangerous operation.

Various attentions provided in the Manual describe how to correctly operate and safely use the engine of our company. However, just reading this Manual can't eliminate various potential hazards. Correctly understanding the information in the attentions can help the correct use.

Warning information in this Manual doesn't cover usage in all possible conditions! If the using procedure and method exceeds the recommended scope of the Manual, please confirm that the operation may not bring any hazard to you, others and the equipment.

4.1.2 Safety signs

Pics	Definition
	Wear hand protective device
	Wear ear protective device
	Wear eye protective device
	Wear head protective device
	Wear foot protective device
	Wear protective mask

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	Wear protective clothing
	No Open Flame
	No Smoking
	Mobile phone prohibited
	Danger: battery acid fluid
	Danger: live cable, electric shock danger
	Flammable substance
	Keep away from hanging heavy objects
	Fire extinguisher nearby

In the using process of engine, there are many potential hazards without warning. Therefore, the Manual is unable to give warning for potential hazards. If the using procedure is not in the recommended scope, ensure that the procedure may not cause any material loss.

4.1.3 Tools used

Pics	Definition
	2.5mm hexagon wrench
	5mm hexagon wrench
	8mm sleeve
	Slotted screwdriver
	Special tools
	10mm flat hexagon wrench

If the methods or tools used are not in the recommended scope of this Manual, the user must ensure the personal safety and avoid causing life risk to the user or others. The user should also ensure that the using and maintenance method may not cause damage risk or safety hazard.

4.1.4 Attentions for health protection

The following “attentions for health protection” aims to lower the pollution risk.

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- (1) Avoid contacting the used oil for a long time.
- (2) If possible, please wear the protective clothing and waterproof gloves.
- (3) Never put the oily stained rag in the pocket.
- (4) Avoid polluting the clothes (especially underwear) by oil.
- (5) Frequently clean working clothes, throw away clothes and shoes with oil that is unable to be cleaned.
- (6) In case of cutting and injury, please immediately take emergency measures.
- (7) Before working, be sure to apply protective cream. When the skin contacts mineral oil, the oil may be easily removed.
- (8) Wash hands by soap and hot water or sanitizer and fingernail brush to remove all dirt. If the grease secreted by the skin is washed, the product with lanum can replace the grease secreted by the skin naturally, which is good for moistening the skin.
- (9) Never clean the skin by gasoline, kerosene, fuel, thinner or solvent.
- (10) If you feel uncomfortable, immediately go to the doctor.
- (11) If possible, before handling the part, wipe off oil on the part.
- (12) When there is risk to eyes, please wear safety goggles or protective mask. Be sure to provide eye flushing liquid at the reachable place.
- (13) When repairing the engine, oil or other liquid should not be splashed on the ground. If the hydrocarbon or other liquid is accidentally leaked, take necessary measures to hinder the area so as to keep the environment clean and protect the personnel from injury.
- (14) For handling, storage and recovery of hydrocarbon, ethylene, ethylene glycol or petroleum must comply with the safety and environment standard executed by the country.

4.1.5 Environmental protection measures

For disposal of exhaust oil and hydrocarbon, please comply with relevant environmental protection laws and regulations. Please consult local officials for details.

4.1.6 Attentions for disassembly and assembly of engine

Most accidents relating to use, maintenance and repairing of engine may be caused by the safety rules and basic attentions are not abided by. Therefore, you should know the dangers and take corresponding preventive measures to avoid the accident. To operate, maintain and repair the engine, the operator should receive corresponding training and possess applicable skills and apply proper tools.

Violating relevant instructions of this Manual may cause serious accident, even endanger the life. Weichai Power Co., Ltd. is unable to foresee all potential hazards. Weichai Power Co., Ltd. is unable to foresee all potential hazards. Meanwhile, rules and descriptions specified in this Manual are not exhaustive.

Before maintenance or repairing, please put the signboard of “Do not use” or similar sign on the starter switch.

Before using the barring rod, take necessary preventive measures:

Ensure that the repairing site and surrounding environment is suitable for safe operation.

Keep the surrounding area of repairing workshop or engine clean.

Before working, please pick off the ring, necklace and watch. Please wear proper working clothes.

Before working, please verify the validity period of corresponding protective devices (glasses, gloves, shoes, mask, working clothes, helmet, etc.).

Never use faulty or improper tools.

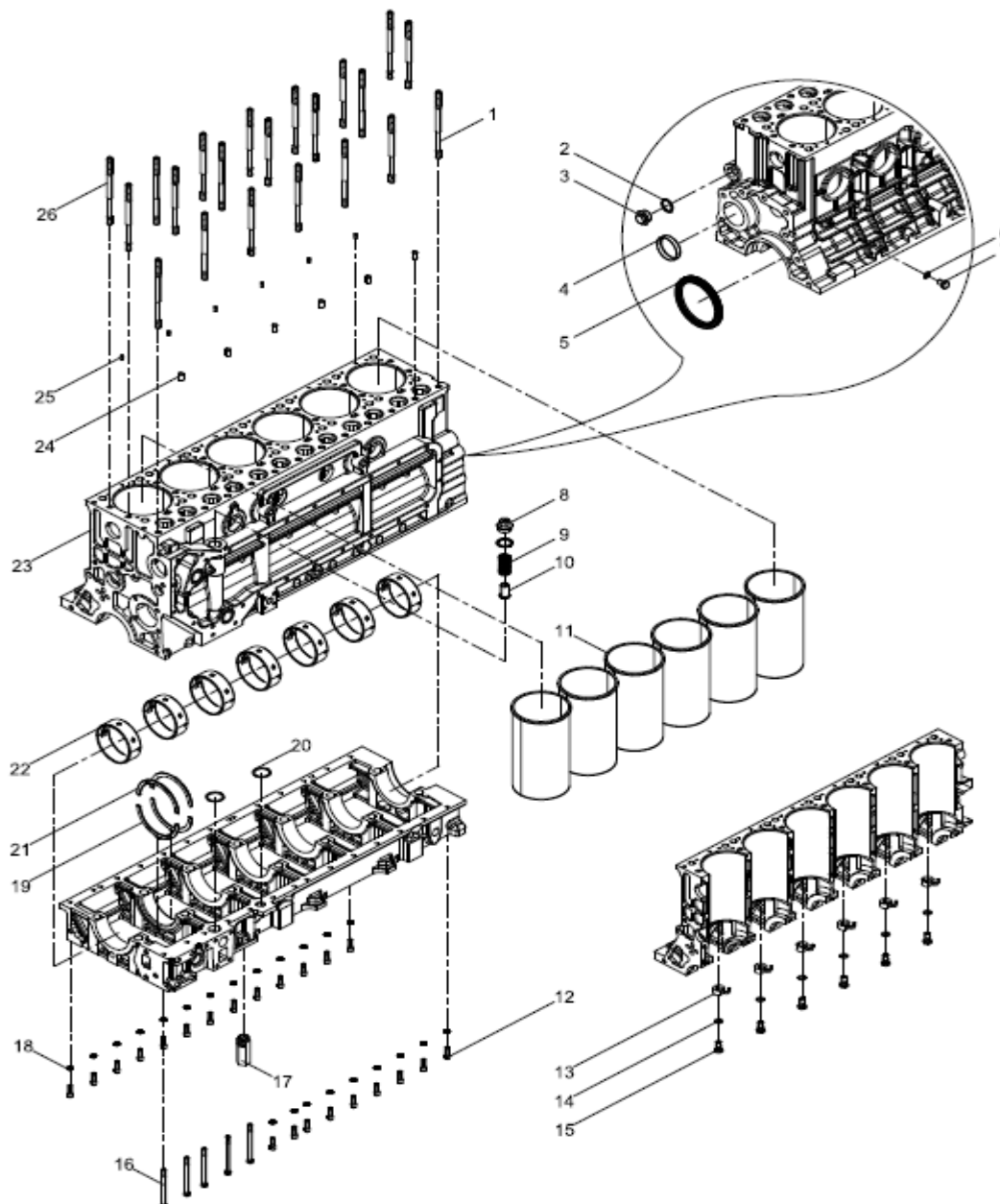
In the maintenance or repairing process, please shut down the engine.

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4.2 Block assembly

4.2.1 Disassembly and assembly of block assembly

a. Disassembly drawing



1, 26-cylinder head bolt; 2-composite gasket; 3, 8-hexagon plug screw; 4-bowl-shaped plug; 5-rear oil seal; 6-seal washer; 7-plug screw; 8-hexagon plug screw; 9-safety valve spring; 10-safety valve; 11-cylinder sleeve; 12-inner hexagon cylindrical head bolt; 13-nozzle assembly; 14-seal washer; 15-hollow bolt; 16-hexagon bolt; 17-main oil way pressure limiting valve assembly; 18-self-locking washer; 19, 21-thrust plate; 20-seal ring; 22-main bushing assembly; 23-cylinder block; 24-cylindrical pin; 25-elastic cylindrical pin

Fig. 4-1 Disassembly Drawing for Block Assembly

b Preparation before disassembly

- 1) Equipment: sleeve wrench, copper hammer, etc.;
- 2) Preparation before disassembly: disassemble the gearbox, clutch, flywheel, flywheel housing, gear chamber and oil pan.

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c Disassembly

- 1) Disassemble main oil way plug screw (2, 3);
- 2) Disassemble the cylinder sleeve (11);
- 3) Disassemble the cylinder sleeve bolt (1, 26);
- 4) Disassemble the tightening bolts (12, 16) around the crankcase;
- 5) Disassemble the main bearing bolt (14);
- 6) Disassemble the seal ring (20).

d Assembly

The assembly steps are contrary to the disassembly steps.

e Key points of maintenance

Key point 1:

Tightening torques	(22-29)Nm	Level 8.8
Tightening torques	(29-35)Nm	Level 10.9

Key point 2:

Symmetrically tighten main bearing bolt as per the sequence in Fig. 4-2. Before assembling, apply clean lubricating oil to the supporting face of crankcase and thread of main bearing bolt.

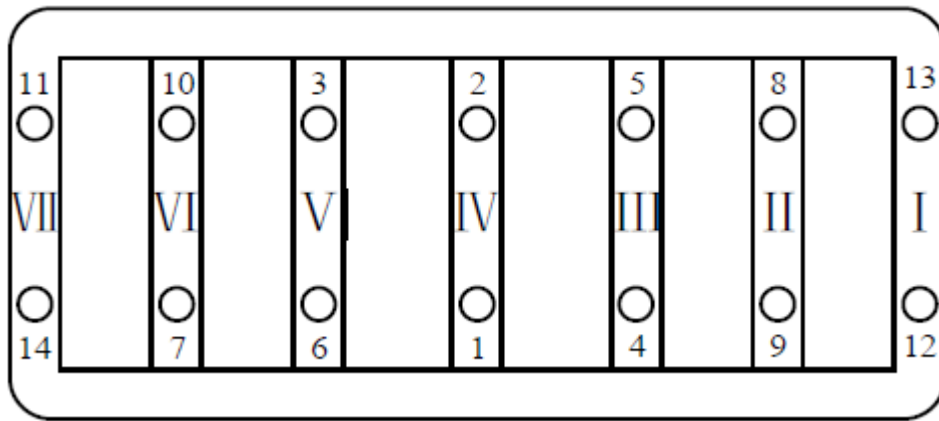


Fig. 4-2 Tightening Sequence of Main Bearing Bolt

Tightening torques	(265±25) Nm
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Key point 3:

The cylinder head bolt should be tightened as per the sequence in Fig. 4-3, which can be reused for 2 times.

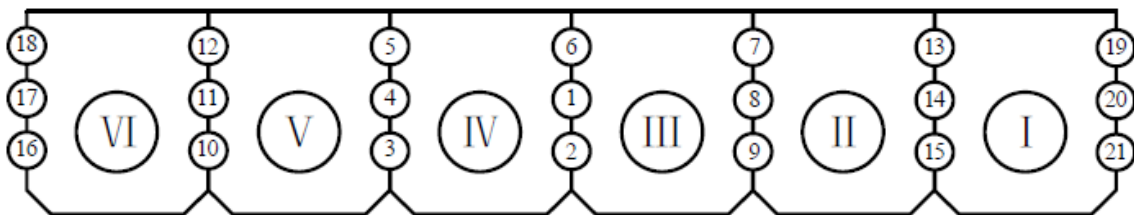


Fig. 4-3 Tightening Sequence of Cylinder Head Bolt

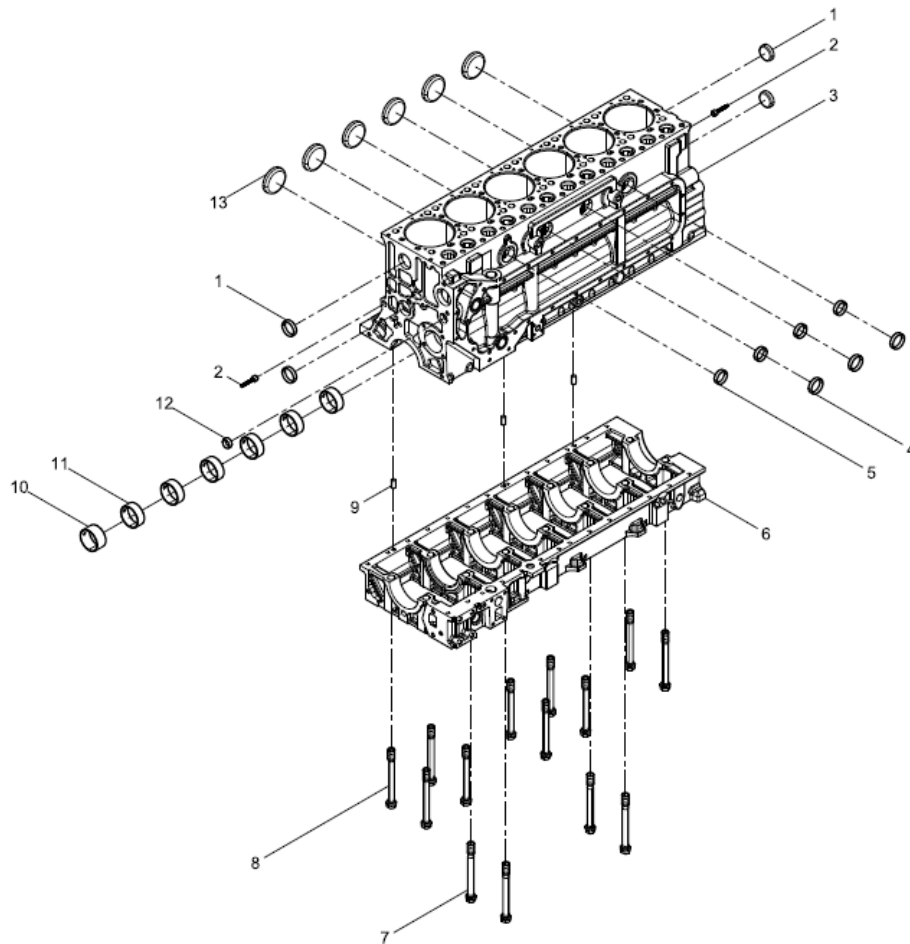
Key point 4:

Before assembling, carefully check the cylinder sleeve for crack defect, clean the cylinder sleeve, press it to the cylinder hole by a special tool and apply molybdenum powder on the external surface of cylinder sleeve.

4.2.2 Disassembly and assembly of cylinder block pre-assembly

a. Disassembly drawing

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1, 4, 5, 12, 13-bowl-shaped plug; 2-pulling rivet; 3-cylinder block; 6-crankcase; 7, 8-main bearing bolt; 9-inner thread cylindrical pin; 10, 11-camshaft bush

Fig. 4-4 Disassembly Drawing for Cylinder Block Pre-assembly

b Preparation before disassembly

1) Equipment: sleeve wrench, copper hammer, etc.;

2) Preparation before disassembly: disassemble the gearbox, clutch, flywheel, flywheel housing, gear chamber and oil pan.

c Disassembly

1) Disassemble the camshaft bush (10, 11);

2) Disassemble the main bearing bolt and tightening bolt of crankcase;

3) Disassemble the crankcase (6).

4) Disassemble the inner thread cylindrical pin (9);

d Assembly

The assembly steps are contrary to the disassembly steps.

e Key points of maintenance

Key point 1:

Disassemble the camshaft bush by a special tool. Pay attention to protecting other bushes in the disassembly process.

Key point 2:

Before assembling, carefully check the inner surface of camshaft bush for scratch, if necessary, replace it. The oil hole of camshaft bush should be aligned with the bottom oil hole of body camshaft.

Key point 3:

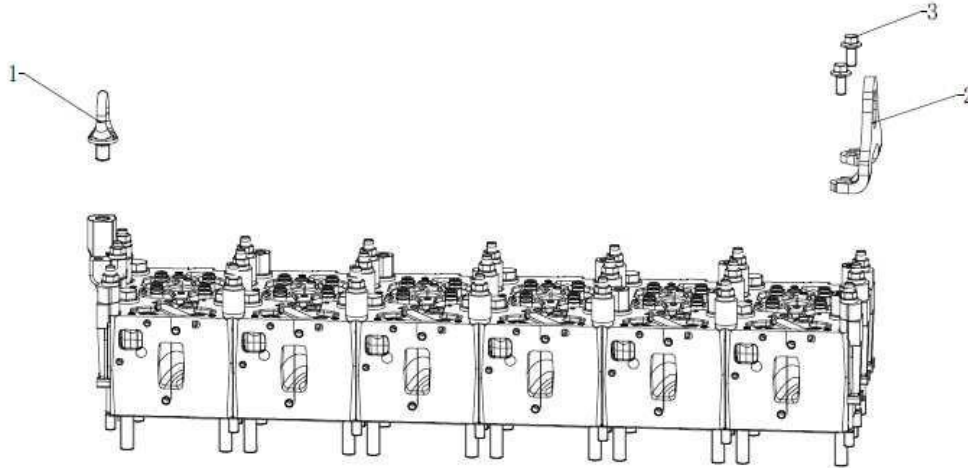
Before assembling, clean the upper surface of crankcase and apply sealant to the upper surface of

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crankcase.

4.2.3 Disassembly and assembly of engine lifting ring

a. Disassembly drawing



1-hanger bolt; 2-hanger plate; 3-hexagon flange bolt
Fig. 4-5 Disassembly Drawing for Hanger Assembly

b Disassembly

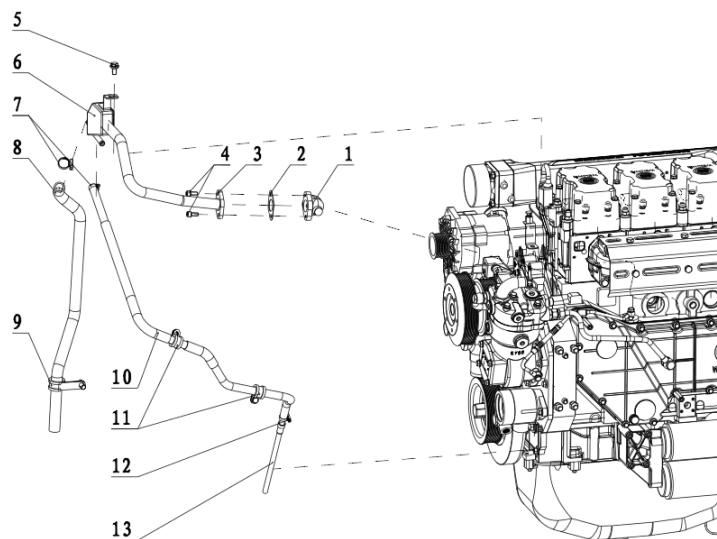
Loosen and take down the hanger bolt and hanger plate bolt at two ends of engine.

c Assembly

- 1) Check the hanger bolt and hanger plate for integrity;
- 2) Assemble and tighten the hanger bolt and hanger plate bolt at two ends of engine.

4.2.4 Disassembly and assembly of oil-gas separator

a. Disassembly drawing



1-oil-gas separator intake pipe joint; 2-flange gasket; 3-flange (welded with the oil-gas separator); 4-bolt; 5-fixing bolt; 6-oil-gas separator; 7-clamp; 8-oil-gas separator outlet pipe; 9-pipe clamp and bolt; 10-oil-gas separator oil return pipe; 11-pipe clamp and bolt; 12-clamp; 13-oil return pipe

Fig. 4-6 Disassembly Drawing for Oil-gas Separator

b Preparation before disassembly

- 1) Equipment: sleeve wrench or pneumatic wrench, open spanner;

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2) Preparation before disassembly: disassemble the part hindering the oil-gas separator.

c Disassembly

- 1) Disassemble the bolt on the cylinder head hanger clamping block for fastening the oil-gas separator;
- 2) Disassemble the clamp for fixing the oil-gas separator and its outlet pipe and oil return pipe, and disassemble all hoses;
- 3) Disassemble the fixing bolts of pipe clamps of oil-gas separator outlet pipe and oil return pipe to take down the outlet pipe; disassemble the clamp of oil-gas separator, oil return hose and oil return pipe to take down the oil return hose;
- 4) To disassemble and check the oil return pipe in the oil pan, loosen the oil return pipe and then take down the oil return pipe;
- 5) The oil-gas separator assembly should be disassembled as per Fig. 4-3.

d Assembly

- 1) Assemble the oil-gas separator housing and the bolt for fixing the oil-gas separator on the hanger clip;
- 2) To disassemble the connecting pipe at the end of oil return pipe of oil-gas separator, insert the connecting pipe in the corresponding position of crankcase and tighten the sleeve to complete assembly;
- 3) Assemble the pipe clip and clamp of oil-gas separator outlet pipe, oil return pipe and oil pan oil return pipe.

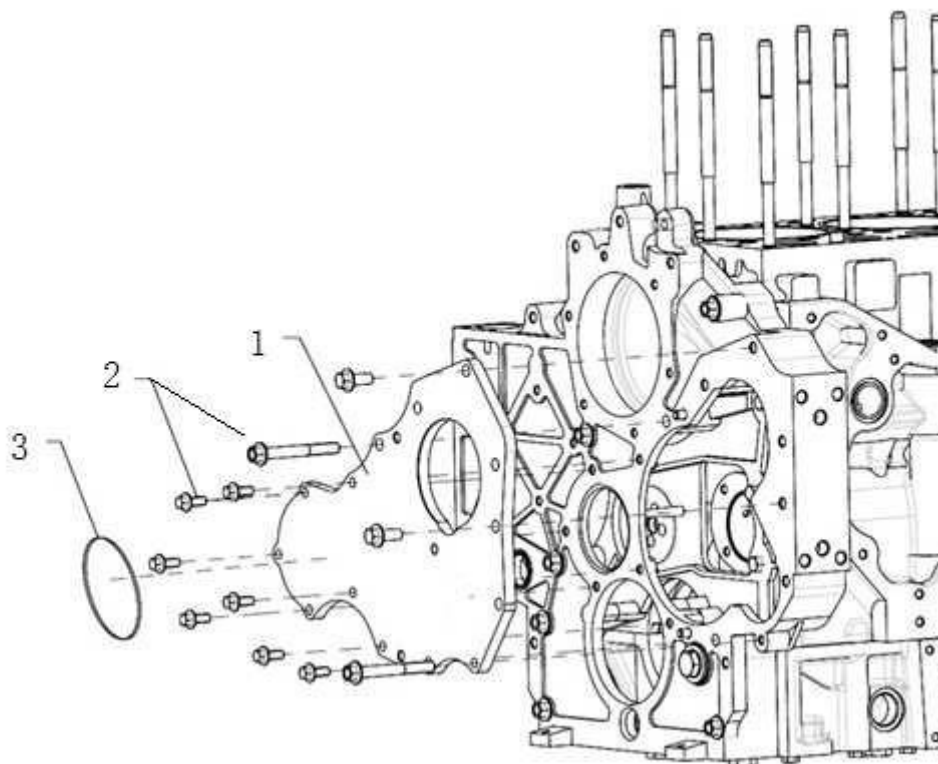
e Key points of maintenance

- 1) Check the part appearance, check the part for damage, crack, etc., and check the hose for hardening and fracture and other failure modes; if so, replace corresponding parts;
- 2) Inflate the oil-gas separator intake pipe to check whether the air flow in the oil-gas separator is smooth, if not, fill high pressure air in the pipe joint of oil-gas separator to clear away impurity, oil stain in the oil-gas separator for cleaning. After the above operations, if the oil-gas separator is still unsmooth, replace a new oil-gas separator;
- 3) As per Fig. 4-3, maintain correct position of hoses and interfaces and pay attention to that the rotation angle of hose and the fixing position during assembly match with the diesel engine.

4.2.5 Disassembly and assembly of front end cover

a. Disassembly drawing

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1-front end cover; 2-flange bolt; 3-O-ring

Fig. 4-7 Disassembly Drawing for Front End Cover

b Preparation before disassembly

- 1) Equipment: sleeve wrench;
- 2) Preparation before disassembly: disassemble the front accessories of diesel engine.

c Disassembly

- 1) Disassemble the fastening bolt (2) and O-ring (3) of front end cover;
- 2) Disassemble the front end cover (1).

d Assembly

The assembly steps are contrary to the disassembly steps.

e Key points of maintenance

Key point 1:

Disassemble the front end cover and put it in clean environment. Before assembly, check whether there is big dirt in the front end cover and ensure clean front end cover.

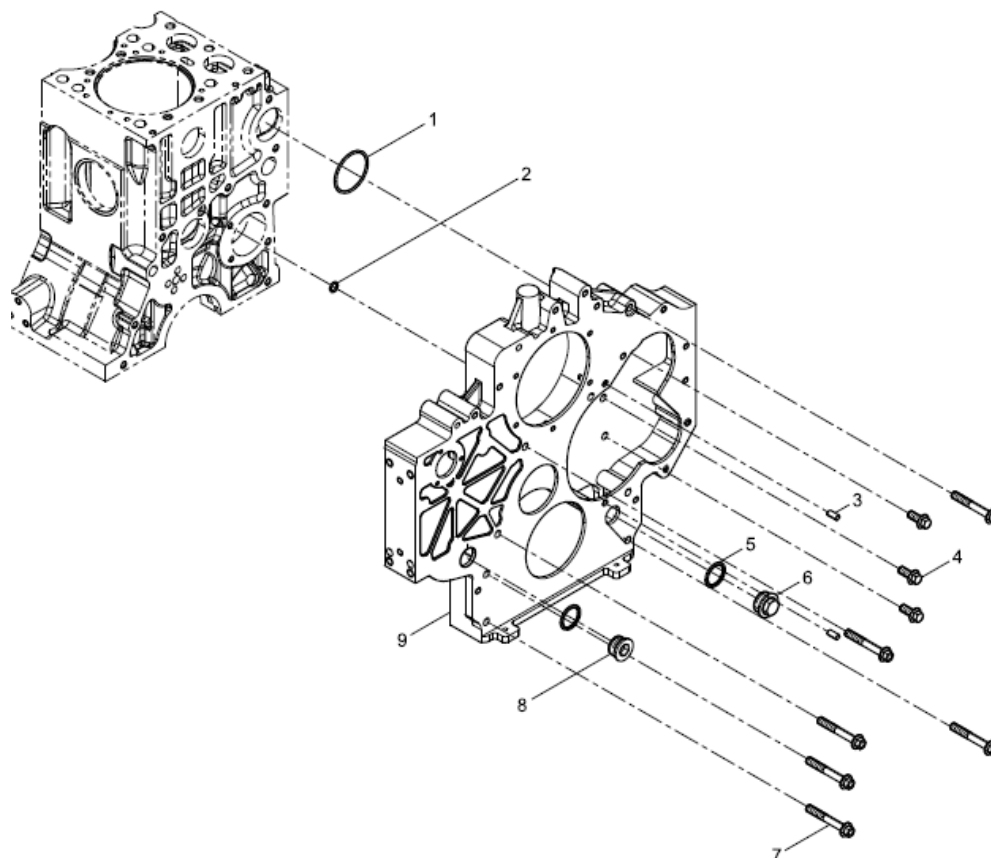
Key point 2:

Apply sealant between front end cover and gear chamber; pay attention to evenness of gluing and put the gasket flatly.

4.2.6 Disassembly and assembly of gear chamber

a. Disassembly drawing

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1-seal ring; 2-seal ring; 3-cylindrical pin; 4-hexagon flange bolt; 5-composite gasket; 6-hexagon plug screw; 7-hexagon flange bolt; 8-hexagon plug screw; 9-timing gear chamber

Fig. 4-8 Disassembly Drawing for Gear Chamber

b Preparation before disassembly

- 1) Equipment: sleeve wrench;
- 2) Preparation before disassembly: disassemble the front accessories of diesel engine.

c Disassembly

- 1) Disassemble the fastening bolt (4) (7) of gear chamber;
- 2) Disassemble the plug screw and composite gasket (5, 6);
- 3) Disassemble the intermediate gear shaft;
- 4) Disassemble the oil pump intermediate gear shaft and oil pump intermediate gear bolt;
- 5) Disassemble the gear chamber (9);
- 6) Disassemble the seal ring (1, 2)

d Assembly

The assembly steps are contrary to the disassembly steps.

e Key points of maintenance

Key point 1: Assembly

Tighten the fastening bolt of gear chamber in a symmetrical and cross manner as per Fig. 4-9. The tightening torque is (44-58) N.m.

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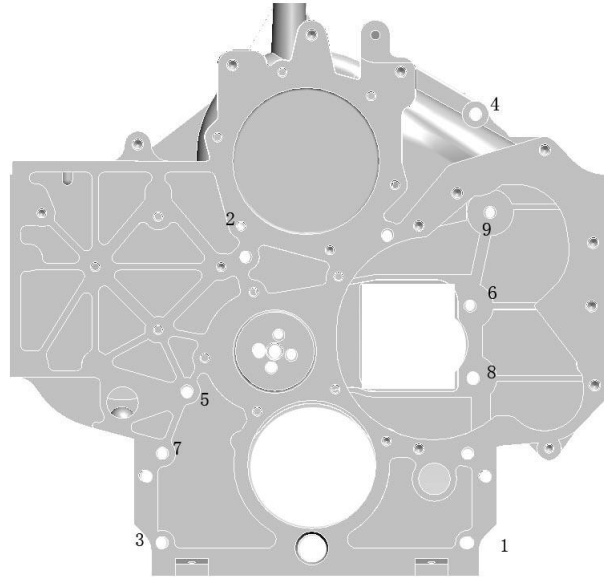


Fig. 4-9 Tightening Sequence of Gear Chamber

Key point 2: Assembly

Before assembling the seal ring, check the seal ring for scratch and other defects, if so, replace a new seal ring in time. During assembly, apply oil to the seal ring, completely press it in the groove to prevent scratching the seal ring by the groove.

Key point 3: Disassembly

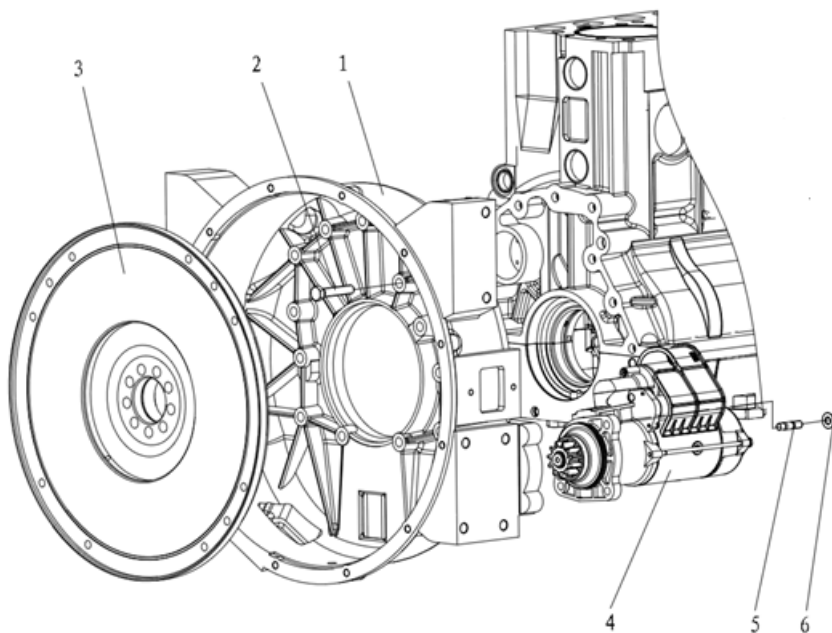
To disassemble the gear chamber, firstly take down the fastening bolt of gear chamber, and disassemble intermediate gear shaft and oil pump intermediate gear shaft. Put the gear chamber disassembled in clean environment.

Key point 4: Assembly

Firstly assemble the intermediate gear shaft in the intermediate gear and put it in the gear chamber; apply the sealant to the back of gear chamber and press in the seal ring.

4.2.7 Disassembly and assembly of flywheel housing

a. Disassembly drawing



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1-flywheel housing; 2-flywheel bolt; 3-flywheel; 4-starter; 5-stud; 6-nut

Fig. 4-10 Disassembly Drawing for Flywheel Housing

b Preparation before disassembly

- 1) Equipment: sleeve wrench;
- 2) Preparation before disassembly: disassemble the gearbox and clutch and flywheel.

c Disassembly

- 1) Unscrew the starter fixing nut (6) and take down the starter (4);
- 2) Unscrew the flywheel housing fixing bolt (2);
- 3) Take down the flywheel housing (1).

d Assembly

- 1) Apply the sealant to surrounding of oil chamber;
- 2) Assemble the flywheel housing (1) on the body;
- 3) Tighten the flywheel housing fixing bolt (2);
- 4) Assemble the starter (4) on the flywheel housing and tighten the starter fixing bolt (6).

e Key points of maintenance

Key point 1:

Symmetrically tighten the flywheel housing bolt as per the sequence in the figure below. Apply oil to the bolt flange before assembly. The flywheel housing bolt can be reused for 2 times. Tightening torque: (110-140)Nm.



Fig. 4-11 Tightening Sequence of Flywheel Housing Bolt

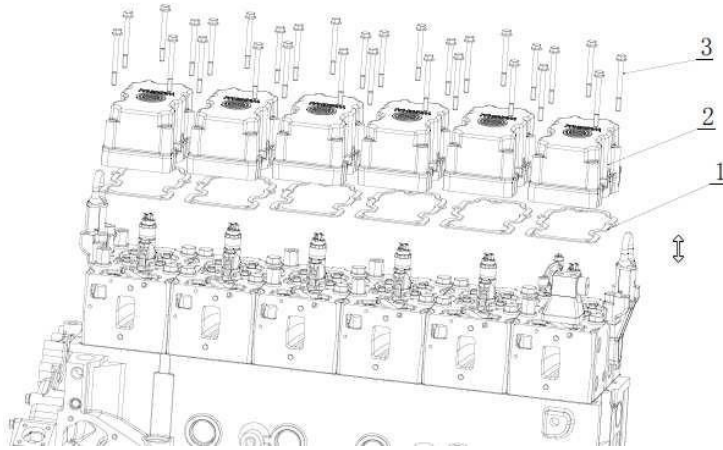
Key point 2:

Evenly apply sealant to the matching surface of cylinder block and flywheel housing, lift the flywheel housing and avoid collision.

4.2.8 Disassembly and assembly of cylinder head cover

a. Disassembly drawing

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1-cylinder head cover gasket; 2-cylinder head cover; 3-cylinder head cover bolt

Fig. 4-12 Disassembly Drawing for Cylinder Head Cover

b. Preparation before disassembly

- 1) Equipment: sleeve wrench or pneumatic wrench
- 2) Preparation before disassembly: Firmly fix the engine and disassemble parts on the cylinder head cover.

c Disassembly

- 1) Orderly loosen the cylinder head cover bolts;
- 2) Take out the cylinder head cover and cylinder head cover gasket upward, as shown in Fig. 4-12;
- 3) Put the cylinder head cover and cylinder head cover gasket at proper position for inspection.

d Assembly

- 1) The cylinder head cover gasket can only be used for one time. Replace new parts in the repairing process. Before assembling the cylinder head cover gasket, check the cylinder head cover gasket for manufacturing and using defect and damage;
- 2) Clean the upper surface of cylinder head cover and assemble the cylinder head cover gasket correctly and orderly;
- 3) Clean the cylinder head cover and assemble it on the cylinder head correctly and orderly;
- 4) Assemble the cylinder head cover bolt and tighten it. Assemble the supporting block and support at corresponding position as per Fig. 4-12 and tighten the bolt.

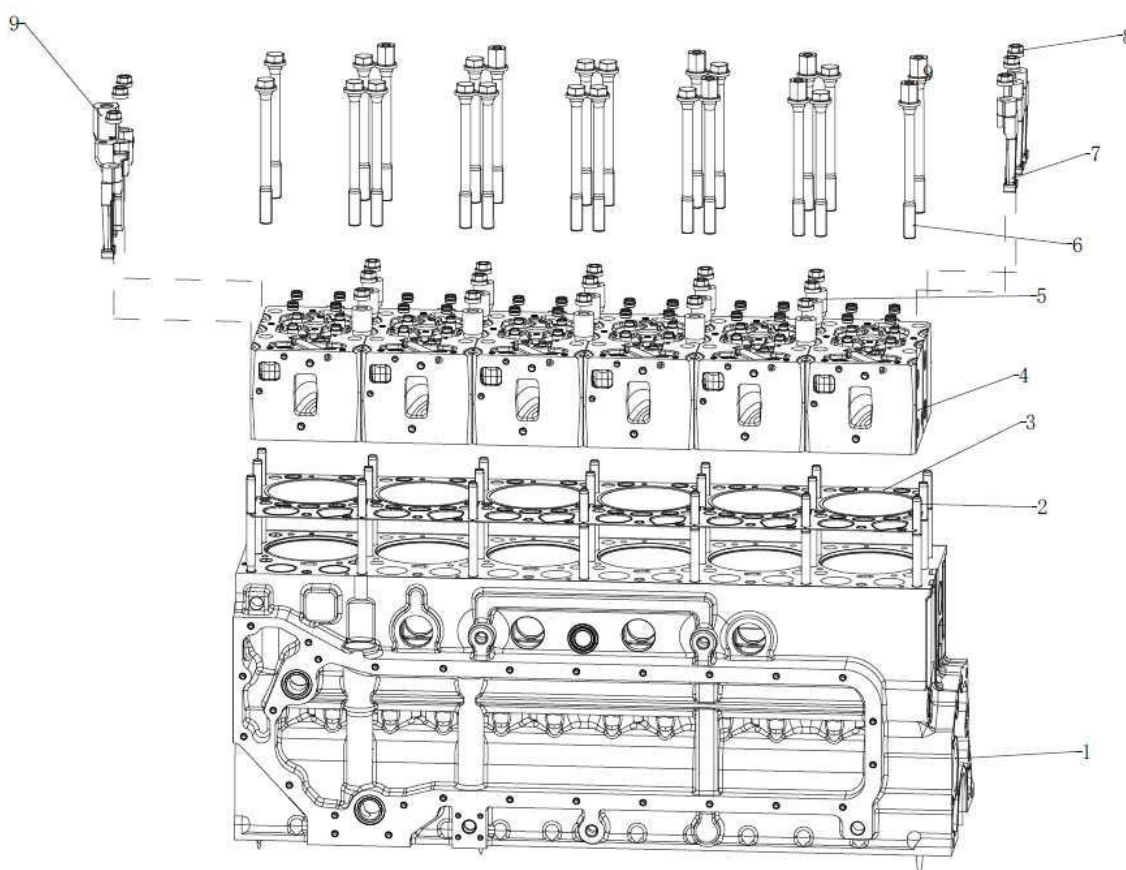
e Key points of maintenance

- 1) Check the cylinder head cover for crack and other damages, if any, replace new cylinder head cover;
- 2) If the cylinder head cover gasket is leaked, check the failure condition of cylinder head cover gasket and the abrasion degree between upper surface of cylinder head and lower sealing surface of cylinder head cover. If there is oil leakage, replace a new cylinder head cover gasket, and check it for oil leakage.

4.2.9 Disassembly and assembly of cylinder head

a. Disassembly drawing

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1-cylinder block; 2-cylinder head bolt; 3-cylinder head gasket; 4-cylinder head subassembly; 5-clamping block; 6-cylinder head main bolt; 7-clamping block; 8-flanged nut; 9-lifting ring clamping block;

Fig. 4-13 Disassembly Drawing for Cylinder Head

b Preparation before disassembly

- 1) Equipment: sleeve wrench or pneumatic wrench, torque wrench, open spanner;
- 2) Preparation before disassembly: Disassemble the cylinder head cover, intake pipe, exhaust pipe, water outlet pipe, high pressure oil pipe, high pressure connector, oil-gas separator and other parts fixed on the cylinder head or that may hinder the disassembly of cylinder head.

c Disassembly

- 1) Loosen and take down the hanger bolt and hanger plate at two ends of engine.
- 2) Loosen the cylinder head bolt nut and take down the clamping block. Three structures of clamping block: cylindrical clamping block assembled between two cylinder heads and installed on a bolt; clamping block assembled at two ends of engine; clamping block assembled on a cylinder head and two bolts for connecting the hanger connecting piece; clamping block assembled at two ends of engine and installed on a cylinder head and bolt;
- 3) Loosen the cylinder head main bolt, take out the main bolt and put it at proper position;
- 4) Disassemble the fuel injector. As the fuel injector nozzle protrudes out the bottom plane of cylinder head, before disassembling the cylinder head, be sure to disassemble the fuel injector; otherwise, the fuel injector head may be damaged when the cylinder head is put in place;
- 5) Disassemble the cylinder head and put it on the paperboard to avoid abrasion of upper surface and other sealing surfaces of the combustion chamber. To disassemble several cylinder heads, mark the cylinder serial number on the cylinder head for subsequent analysis and problem solution.
- 6) Disassemble the cylinder head gasket. To disassemble several cylinder gaskets, mark the cylinder serial number on the cylinder head for subsequent analysis and problem solution;

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- 7) To replace the cylinder head bolt or do inspection, disassemble the cylinder head bolt;
- 8) Disassemble the rocker arm seat, intake and exhaust valve and other valve mechanism;
- 9) To check or replace the valve stem seal sleeve, disassemble the valve stem seal sleeve. Disassemble the valve stem seal sleeve by a special tool or clamp the outer wall of valve stem seal sleeve by a caliper, rotate it to take down the valve stem seal sleeve. The valve stem seal sleeve disassembled should be abandoned rather than reused.

d Assembly

- 1) Assembly of cylinder head bolt;

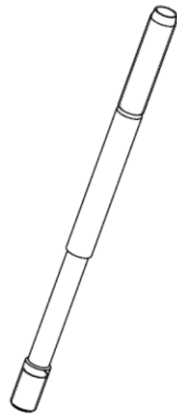


Fig. 4-14 Cylinder Head Bolt

- ① The cylinder head bolt can be used for 2 times; after which, please replace a new one;
 - ② Apply anaerobic type screw thread locking agent 262 to the screwing-in end (the end with shorter thread) of cylinder head bolt at the first row of oil cooler cover assembly and apply pre-applied glue to other bolts;
 - ③ Clean the thread hole on the cylinder block;
 - ④ Tighten the bolt, tightening bolt : (76-102)N m.
- 2) Assembly of cylinder head gasket

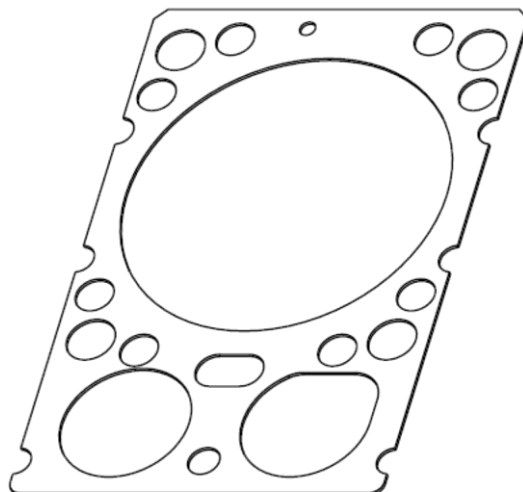


Fig. 4-15 Cylinder Head Gasket

- ① The cylinder head gasket can be used only once. For repairing, be sure replace a new one;
- ② Clean the inner wall of cylinder sleeve and apply clean lubricating oil. Clean the upper surface of body and properly put the cylinder head gasket as per corresponding pin hole;
- ③ Check whether the holes of cylinder head gasket are aligned with the holes of cylinder and check

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whether the cylinder head gasket is properly assembled.

3) Assembly of valve stem seal sleeve

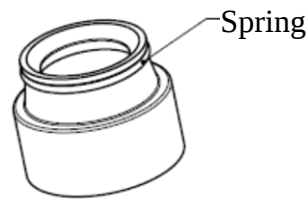


Fig. 4-16 Valve Stem Seal Sleeve

- ① The valve stem seal sleeve can be used only once. For repairing, be sure replace a new one;
- ② Check the valve stem seal sleeve for defect and valve stem seal sleeve spring for integrity;
- ③ Assemble the valve stem seal sleeve on the valve guide;
- ④ Apply lubricating oil to the valve stem seal sleeve edge;
- ⑤ Use the valve stem seal sleeve assembly tool and rubber hammer to knock the valve stem seal sleeve.

Guide seal assembly tool

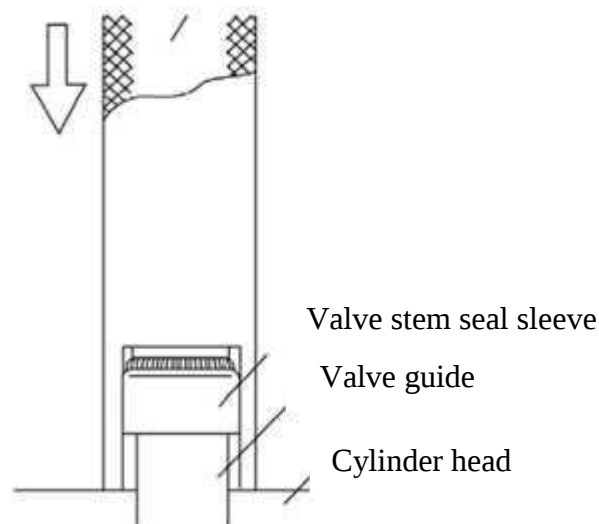


Fig. 4-17 Assembly of Valve Stem Seal Sleeve

4) Assembly of cylinder head

- ① Carefully clean the cylinder head, ensure that there is no dust, scrap, sand and other dirt, further clean the lower surface of cylinder head;
- ② Check whether there is foreign matter in the cylinder head air and water passage; check whether there is foreign matter in the cylinder and whether the cylinder head gasket and lower surface are clean;

③ The cylinder head should be fixed by pin-surface before the cylinder head bolt is tightened;

④ Assemble the cylinder head.

5) Assembly of clamping block

① Clean the clamping block;

② Apply clean lubricating oil to the supporting surface of clamping block, orderly assemble the block on the cylinder head as per the disassembly position, apply proper oil to avoid lubricating oil flowing to the cylinder head gap;

③ For assembling the clamping block, the groove should in the same direction as the cylinder head gap;

④ Manually screw down the cylinder head bolt nut in the cylinder head.

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6) Assembly of cylinder head bolt

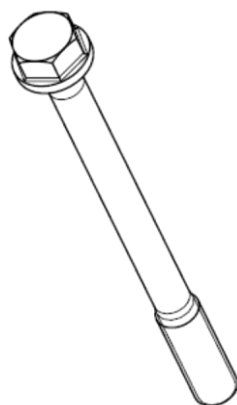


Fig. 4-18 Cylinder Head Main Bolt

- ① The cylinder head main bolt can be used for 3 times;
- ② Align the cylinder head orderly, apply proper clean lubricating oil to the cylinder head main bolt thread and shoulder bearing surface, and flanged nut, respectively assemble them on the cylinder head, cylinder head bolt and clamping block. The cylinder head main bolt is shown in Fig. 4-18;
- ③ Tighten the cylinder head main bolt and cylinder head bolt nut to (30-50)N m by a torque wrench;
- ④ Knock all clamping blocks to put them in place;
- ⑤ Use the torque wrench to orderly screw down the bolt nut by the torque of 100N.m and mark the nut;
- ⑥ Use the torque wrench to orderly screw down the main bolt by the torque of 200N.m and mark the bolt;
- ⑦ Use the torque wrench to orderly screw down the auxiliary bolt nut for 90 ° and mark the new nut position;
- ⑧ Use the torque wrench to orderly screw down the main bolt nut for 90 ° and mark the new position;
- ⑨ Use the torque wrench to orderly screw down the auxiliary bolt nut for 90 ° and obtain the torque of (120-160)N.m;
- ⑩ Use the torque wrench to orderly screw down the main bolt for 90 ° and obtain the torque of (240-340)N.m; The tightening sequence of cylinder head bolt is shown in Fig. 4-19. The cylinder head bolt number is 1-21, and the cylinder head main bolt number is 22-45.

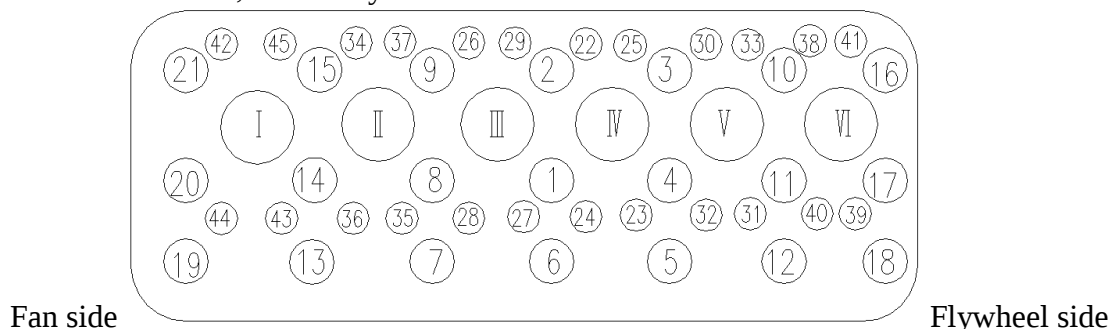


Fig. 4-19 Tightening Sequence of Cylinder Head Bolt

e Key points of maintenance

- 1) Before disassembly the cylinder head, check the cylinder head for water, oil and air leakage and other abnormal conditions. If so, replace a new cylinder head gasket to check whether the problem is solved. For the disassembly and assembly method of cylinder head gasket, refer to this section;
- 2) Carefully check the change changing and crack of cylinder, if any crack, perform dye penetration inspection;
- 3) Before disassembling the valve mechanism, check the valve sinkage. The valve sinkage is the

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vertical distance from the valve bottom to the bottom plane of cylinder head. The difference between valve sinkage measured value and valve sinkage required value can reflect the abrasion degree of valve and valve seat. Measure the valve sinkage by a depth micrometer as shown in Fig. 4-20:

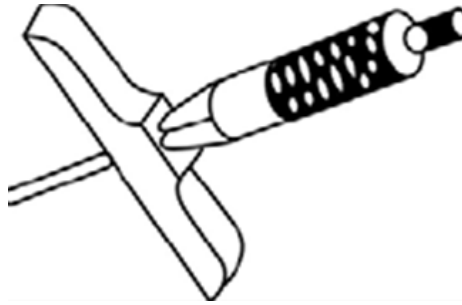


Fig. 4-20 Depth Micrometer

For required value of valve sinkage, refer to Table4-1. If the valve sinkage exceeds permissible scope, confirm the abrasion condition of valve and valve seat. Assemble unused valve, measure the valve sinkage and check the abrasion condition of valve seat. If the valve sinkage still exceeds the required value, replace the cylinder head to ensure reliability of diesel engine. If the valve sinkage doesn't exceed permissible scope, disassemble the valve and check the sealing surface of valve and valve seat ring. Check the valve and valve seat sealing surface for obvious abrasion and abnormal damage.

Table 4-1 Required Value of Valve Sinkage

	Required value of valve sinkage (mm)
Air suction	-0.2-0.2
Venting of gas	-0.2-0.2

4) After disassembling the valve mechanism, check the internal condition of intake and exhaust passage of cylinder head for water leakage, if so, do cleaning and perform dye penetrant inspection to confirm the position and replace the new cylinder head.

5) Clean the cylinder head, mainly clean the surface of combustion chamber, valve seat, intake and exhaust valve, intake and exhaust passage, remove the surface carbon deposit and adhesive and check the surface condition.

6) Check the inner diameter of valve guide. The inner diameter of valve guide is the contact surface of valve guide and valve movement. If the inner diameter of valve guide exceeds the permissible abrasion, it may influence the guide effect of valve and lower the working reliability of diesel engine. Measure the inner diameter of valve guide by the inner diameter micrometer. The permissible inner diameter of valve guide is (9-9.015)mm. If the permissible scope is exceeded, replace the cylinder head to ensure the working reliability of diesel engine.

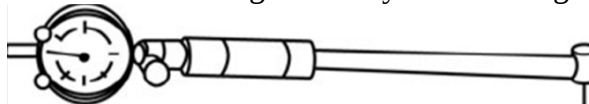


Fig. 4-2 Inner Diameter Micrometer

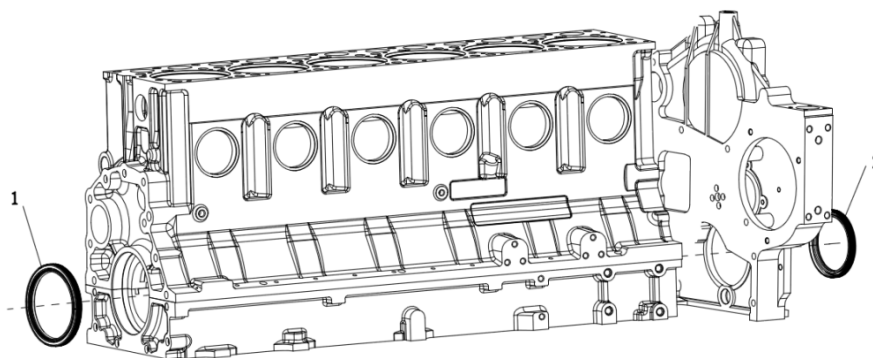
7) Disassemble the cylinder head gasket and check the cylinder head gasket for visible damage and analyze the cause. No matter whether the cylinder head gasket has defect, replace a new gasket.

8) Before disassembly, check the valve stem seal sleeve rubber lip for breakage, the spring for failure and other abnormal conditions. For repairing, replace a new valve stem seal.

4.2.10 Disassembly and assembly of front and rear oil seal

a. Disassembly drawing

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1-rear oil seal; 2-front oil seal

Fig. 4-22 Disassembly Drawing for Front and Rear Oil Seal

b Preparation before disassembly

- 1) Equipment: wrench sleeve, oil seal tool;
- 2) Preparation before disassembly: disassemble the crankcase and flywheel housing.

c Disassembly

- 1) Disassemble the gear chamber;
- 2) Disassemble the front oil seal (2);
- 3) Disassemble the crankcase;
- 4) Disassemble the rear oil seal (1).

d Assembly

The assembly steps are contrary to the disassembly steps.

e Key points of maintenance

Key point 1: Assembly

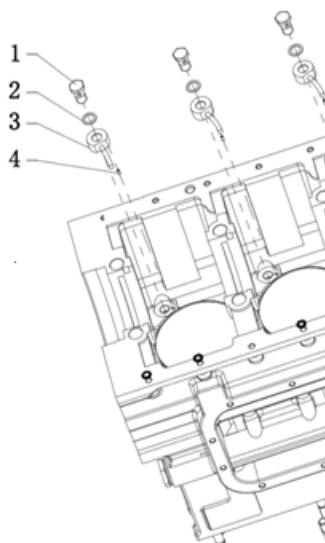
Before assembling the oil seal, clean the mounting hole and oil seal and no dirt is allowed. Assemble the oil seal by a special tool and press in the oil seal stably. Before assembly, apply lubricating oil to the oil seal and pressing tool.

Key point 2: Disassembly

The oil seal disassembled cannot be used again.

4.2.11 Disassembly and assembly of piston nozzle

a Disassembly drawing



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1-hollow bolt; 2-washer; 3-nozzle assembly; 4-elastic cylindrical pin

Fig. 4-23 Disassembly Drawing for Piston Nozzle

b Preparation before disassembly

- 1) Equipment: sleeve wrench;
- 2) Preparation before disassembly: disassemble the crankcase and crankshaft and so on.

c Disassembly

- 1) Disassemble the hollow bolt;
- 2) Disassemble the nozzle assembly;
- 3) Disassemble the elastic cylindrical pin.

d Assembly

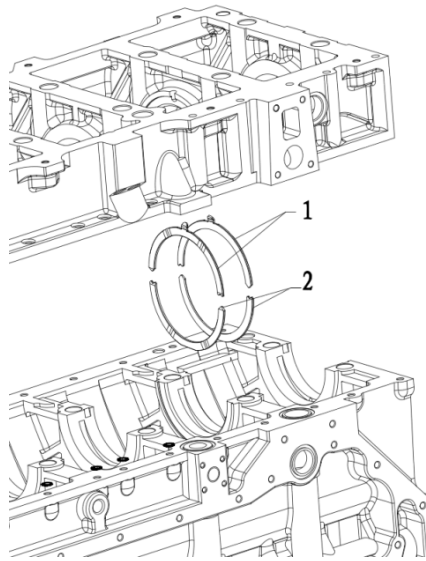
The assembly steps are contrary to the disassembly steps.

e Key points of maintenance

- 1) The tightening torque of hollow bolt is (20-30)N•m.
- 2) Check the locating pin for breakage, if necessary, replace it. Align the locating pin with the body pin hole, slightly knock the nozzle by the copper hammer and completely assemble the locating pin in the pin hole.

4.2.12 Disassembly and assembly of thrust plate

a. Disassembly drawing



1-lower thrust plate; 2-upper thrust plate

Fig. 4-24 Disassembly Drawing for Thrust Plate

b Preparation before disassembly

- 1) Equipment: sleeve wrench
- 2) Preparation before disassembly: disassemble the crankcase and crankshaft and so on.

c Disassembly

- 1) Disassemble the crankcase;
- 2) Disassemble the crankshaft;
- 3) Disassemble the thrust plate (1, 2).

d Assembly

- 1) Assemble the crankshaft;
- 2) Assemble the upper thrust plate (2);
- 3) Assemble the lower thrust plate (1).

e Key points of maintenance

Key point 1: Assembly

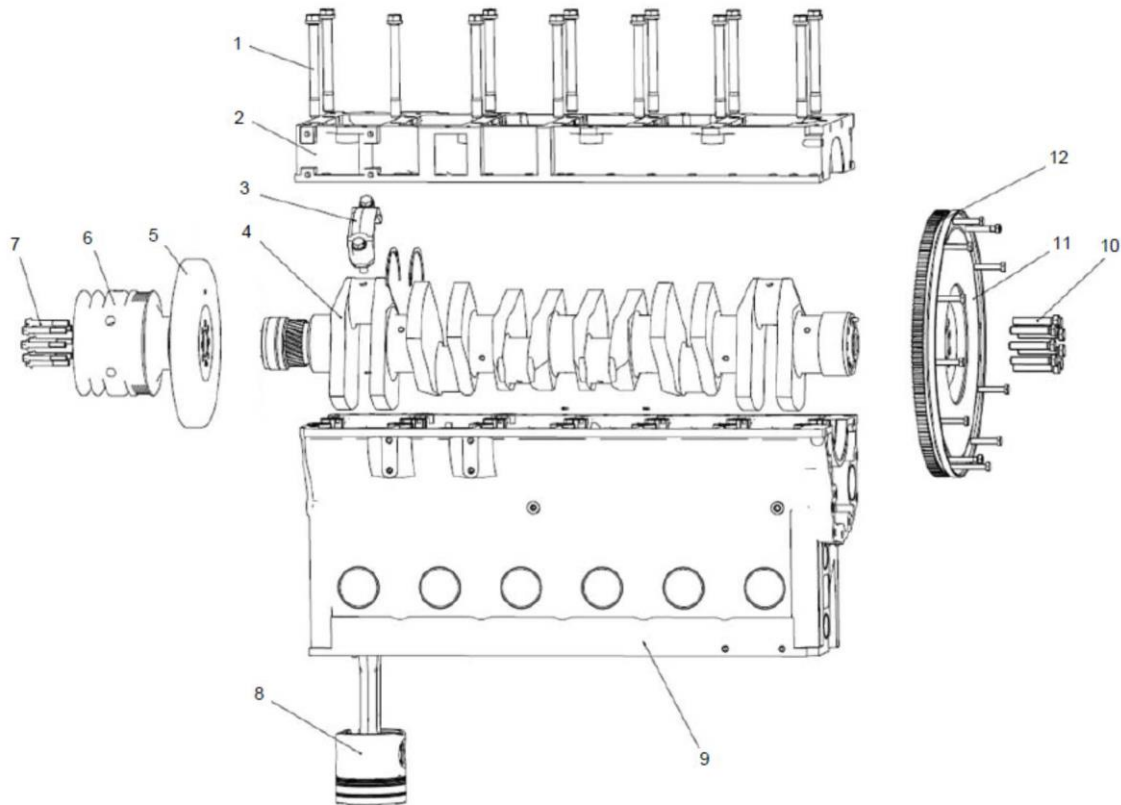
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The thrust plate should be used in pair. During assembly, firstly assemble the crankshaft in the body, assemble the upper thrust plate (without ear), apply lubricating grease to the lower thrust plate, paste it on the crankcase and assemble it with the crankcase. Keep the thrust plate oil groove outward.

4.3 Crank-connecting rod mechanism

4.3.1 Disassembly and assembly of crank-connecting rod mechanism

a. Disassembly drawing



1-main bearing bolt; 2-crankcase; 3 big end cap of connecting rod; 4-crankshaft assembly; 5-torsional absorber; 6-crankshaft pulley; 7-pulley bolt; 8-piston-connecting rod assembly; 9-block; 10-flywheel bolt; 11-flywheel; 12-flywheel gear ring

Fig. 4-3 Assembly and Disassembly Drawing for Crankshaft System

b Disassembly

- 1) Keep the engine crankcase upward, disassemble the main bearing bolts and put them orderly;
- 2) Take down the crankshaft and flywheel and take out the front and back thrust plate and flywheel end bearing. Take out the oil seal; unscrew front pulley bolt and take down the pulley and shock absorber. Put the crankshaft on the bracket (for long-term placing, the crankshaft should be vertically placed).
- 3) Put all parts disassembled by category.

c Assembly

- 1) Wipe the bottom hole of cylinder block;
 - 2) Clean the bottom hole of upper bearing bush cylinder block and clear the impurity at the bushing opening;
- ① Before pressing the upper bearing bush, strictly check it for damage, if any; abandon it rather than do repairing for reuse.

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- ② After assembling the upper bearing bush, align it with the oil hole and groove with the cylinder block. The one with deviation exceeds $1/5-1/4$ of the oil hole should not be assembled. The upper bearing bush should be completely fitted with the bottom hole of cylinder block.
- 3) Apply proper clean lubricating oil to the inner surface of upper bearing bush;
- 4) Apply oil to the lower plane of cylinder block and wipe it. The lower surface of cylinder block should be free of grease.
- 5) Apply the gluing line on the lower plane of cylinder block, evenly and continuously apply the sealant by the rubber roll;
- 6) Lift the crankshaft and blow the oil hole by the compressed air and wipe the main journal and connecting rod journal by a towel, and slightly lower it down to the cylinder block. In this process, the crankshaft should not be damaged.
- 7) Wipe the upper thrust plate and press it in the cylinder block. The oil groove of upper thrust plate should be outward (toward the crankshaft).
- 8) On the basis of ensuring flat oil seal without torsion and deformation, use a special tool to put the oil seal flatly in the seal ring groove at the lower level of the cylinder block.
- 9) Press the lower main journal and lower thrust place in the crankcase (keep the oil groove face the crankshaft) and assemble the crankcase.
- 10) Apply clean lubricating oil at the bolt supporting surface of crankcase and thread of main bearing bolt; loosen the main bearing bolt and then tighten all main bearing bolts as per the sequence shown in Fig.4-26.

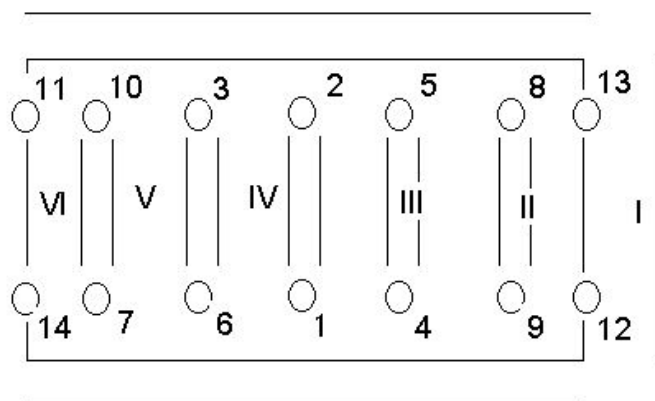


Fig. 4-4 Tightening Sequence of Main Bearing Bolt

- 11) Use the pneumatic wrench with low torque to tighten the bolt for the first time, apply the torque of 80 N.m for the second time and (250-280) N.m for the third time. Complete the crankshaft assembly.

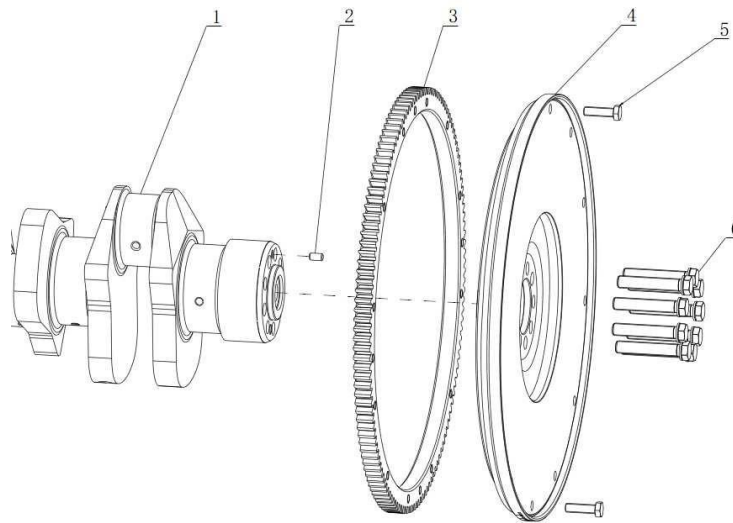
d Key points of check and maintenance

- 1) Check the round part of main journal and connecting rod neck for crack. For the connection of crankshaft and bearing bush, check and dredge the oil duct and check it for crack and other abnormalities.
- 2) Check the abrasion condition of main journal and connecting rod journal; and check it for line shape, metal peeling and crack.
- 3) Check the abrasion condition of front and rear oil seal.
- 4) Check the main bearing bolt for thread damage and other failure modes.
- 5) Check the flange bolt hole for crack.
- 6) Check the abrasion degree of crankshaft journal, bending and torsion condition of crankshaft.

4.3.2 Disassembly and assembly of flywheel and gear ring

a. Disassembly drawing

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1-crankshaft; 2-locating pin; 3-flywheel gear ring; 4-flywheel; 5-bolt; 6-flywheel bolt;
Fig. 4-27 Assembly and Disassembly Drawing for Flywheel

b Disassembly

The disassembly steps are contrary to the assembly steps.

c Assembly

- 1) Tighten the flywheel gear ring and the flywheel by the bolt.
- 2) Insert the cylindrical pin to the crankshaft rear end and be sure to insert it to the bottom.
- 3) Insert the flywheel guide rod in the crankshaft thread hole, assemble the flywheel components and tighten the flywheel bolt diagonally.
 - ① Apply lubricating oil to the flywheel bolt thread and pressure bearing surface.
 - ② Flywheel bolt: M14x1.5 (9).

Manually tighten: apply lubricating oil to the thread and bearing surface, insert the flywheel bolt in the thread hole and tighten it diagonally. The tightening torque is 60^{+20}_0 N m ; rotate two angles of $90^\circ \pm 5^\circ$ and the torque reaches (230-280)N m. After rotation, if the torque is not reached, replace it. Repeat the operation for 2 times.

Tighten it by the automatic wrench: apply lubricating oil to the thread and bearing surface, insert the flywheel bolt in the thread hole and tighten it diagonally.

The tightening torque is 60N m; rotate the angle of $160^\circ \pm 5^\circ$; the torque reaches (230-300)N m. After rotation, if the torque is not reached, replace it. Repeat the operation for 2 times. Complete the flywheel assembly.

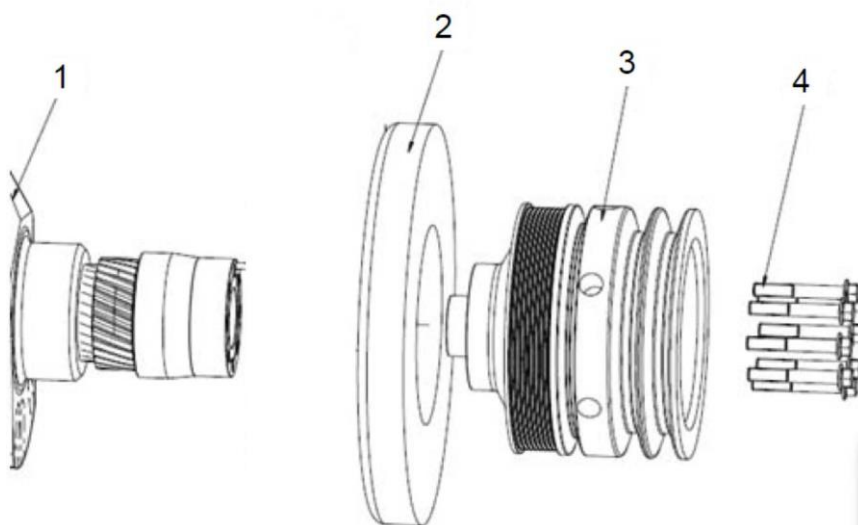
d Key points of check and maintenance

- 1) Check the flywheel bolt for thread damage and other failure modes;
- 2) Check the flywheel surface for crushing;
- 3) Check the flywheel gear ring for damage.

4.3.3 Disassembly and assembly of shock absorber and crankshaft pulley

a. Disassembly drawing

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1-crankshaft assembly; 2-shock absorber; 3-crankshaft pulley; 4-hexagon flange bolt

Fig. 4-5 Assembly and Disassembly Drawing for Shock Absorber and Crankshaft Pulley

b Disassembly

Unscrew the pulley bolt and take down the pulley, absorber and signal panel orderly.

c Assembly

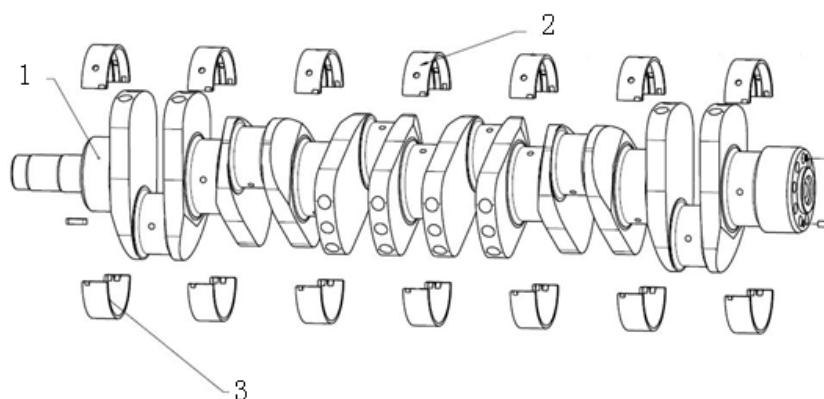
After assembling the timing gear, assemble the signal panel, shock absorber and pulley orderly, and tighten them on the crankshaft flange by the pulley bolt.

d Key points of check and maintenance

- 1) Check the absorber for collision and deformation;
- 2) Check the crankshaft pulley for damage and the bolt tightening part for crushing;;
- 3) Check the pulley bolt for damage.

4.3.4 Disassembly and assembly of crankshaft bearing bush

a. Disassembly drawing



1-crankshaft; 2-main bearing upper bush; 3-main bearing lower bush

Fig. 4-29 Assembly and Disassembly Drawing for Crankshaft Bearing Bush

b Disassembly

Push the bearing bush out from the side and mark the bearing bush disassembled and align it with the base hole of body and crankcase.

c Assembly

- 1) Firstly clean and wipe the main bearing bush and assembly bottom hole.
- 2) If no new bearing bush is replaced, assemble the original bearing bush in the body (upper bush) and crankcase (lower bush)orderly. Pay attention to distinguishing the upper and lower bush. The one with oil groove is upper bush. If the new bush is replaced, directly assemble it. During

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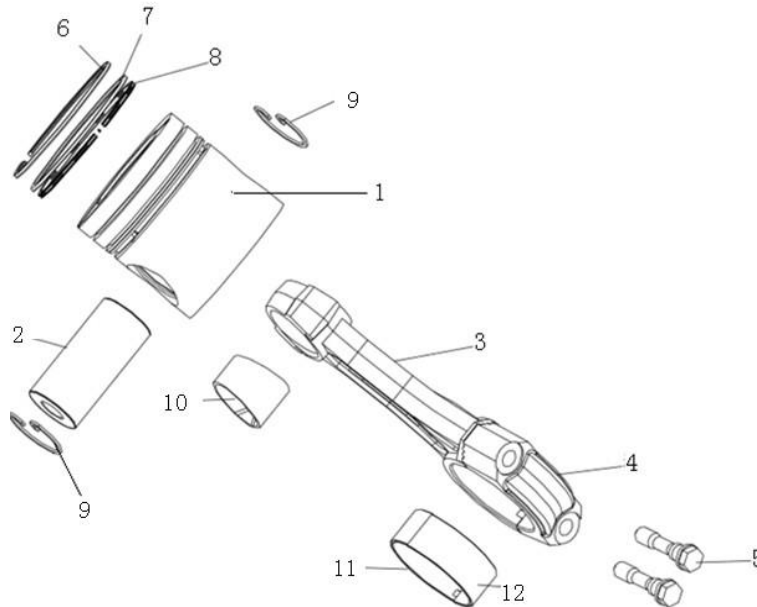
assembly, pay attention to align the lip and apply little oil.

d Key points of check and maintenance

- 1) Clean the bearing bush and check the abrasion condition of bearing bush.
- 2) Check the bearing bush for metal peeling off, locating pin damage and horizontal crack.

4.3.5 Disassembly and assembly of piston-connecting rod assembly

a. Disassembly drawing



1-piston; 2-piston pin; 3-connecting rod body; 4-connecting rod cap; 5-connecting rod bolt; 6-trapezoidal surface ring; 7-tortioned taper ring; 8-spiral spring loaded oil ring; 9-piston pin retainer ring; 10-connecting rod bushing; 11-connecting rod upper bush; 12-connecting rod lower bush

Fig. 4-30 Disassembly Drawing for Piston-Connecting Rod Assembly

b Disassembly

- 1) Make inspection before disassembly. Check the axial clearance of connecting rod, and the tightening torque of connecting rod bolt.
- 2) Lower the engine inclined side, turn the piston to be dismantled to the lower dead center, disassemble the connecting rod bolt and connecting cover;
- 3) Turn it to the upper dead center and knock it out by a hammer. Be careful to avoid clamping the cylinder block by the big end of connecting rod.
- 4) Disassemble other pistons by the same method. Number the piston, connecting rod bolt and connecting rod cap and put it orderly.
- 5) Use the internal circlip pliers to carefully disassemble the elastic washer at both sides of piston and push the piston out and take down the connecting rod body. Number the piston pin and connecting rod body and put it orderly.
- 6) Use the piston ring assembly pliers to respectively disassemble the top ring, second ring and oil ring and mark it respectively.
- 7) Disassemble the connecting rod upper and lower bush, number it at the back and put it orderly.

c Assembly

The connecting rod and piston of the same machine should be at the same quality group; the connecting rod body and connecting rod cap must be used together.

- 1) Use the internal circlip pliers to assemble the elastic washer in the piston retainer ring groove, rotate the stopper ring and completely assemble it. The retainer ring angle surface should be inward. The retainer ring opening should be at 30 ° to the piston centerline. As shown in Fig. 4-30;

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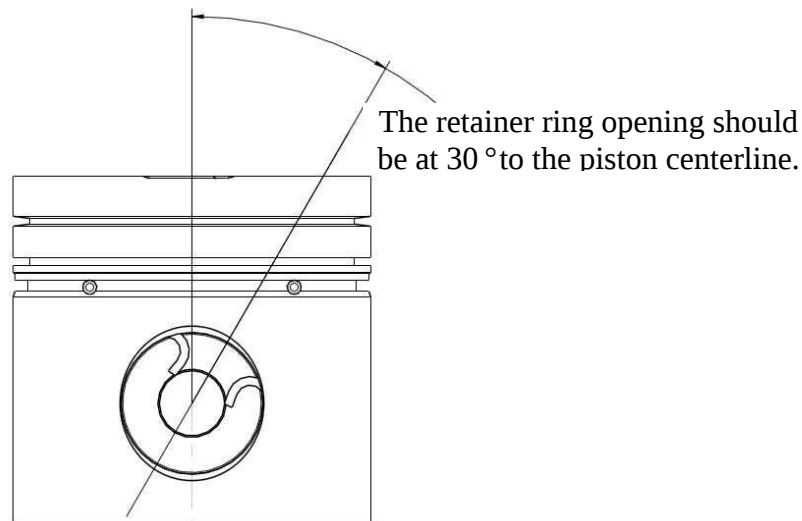


Fig. 4-6 Schematic Diagram for Assembly of Piston Pin Circlip

- 2) Insert the small end of connecting rod in the inner cavity of piston, align the small end of connecting rod with the piston pinhole and assemble the piston pin finally assemble the piston pin retainer ring of the other side. Apply proper clean lubricating oil before assembling the small end hole of connecting rod and piston pin. Pay attention that the oblique incision direction should be the same with the oil inlet of piston cooling oil way.
- 3) Properly arrange the piston connecting rod components as per the cylinder number and use the piston ring assembly pliers to assemble the oil ring, second compression ring and top compression ring in the piston ring groove. The “TOP” of piston ring is upward and the piston ring and freely rotate in the ring groove.
- 4) Wipe the inner wall of cylinder, crankshaft connecting lever, and piston connecting rod component and apply clean lubricating oil to the kinematic pair parts.
- 5) Adjust the ring opening direction: assemble the top ring opening at the position 30° deviating from the centerline of piston pin; the second ring opening and top ring opening should be staggered for 120° . The oil ring opening and top and second compression ring should be staggered for 120° , which should be at the perpendicular bisector of piston ring centerline. As shown in Fig. 4-32

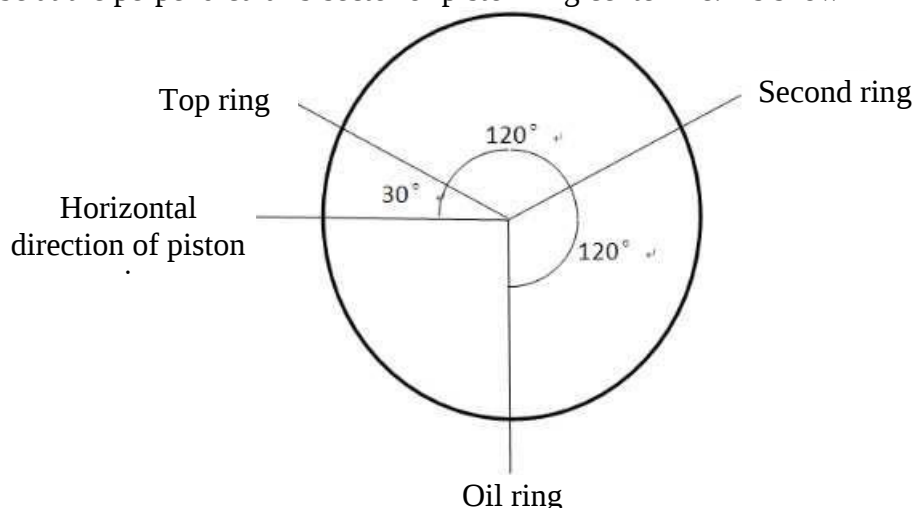


Fig. 4-32 Schematic Diagram for Opening Angle of Piston Ring Assembly

- 6) Turn the vehicle to make 1# and 6# cylinder near the lower dead center. Assemble the 1# and 6# cylinder piston part and loosely assemble the connecting rod bolt. The piston fuel injection gap is in the same side with the piston cooling nozzle on the block. The piston cylinder number is the same as the cylinder number. The connecting rod cap and connecting rod body should be used jointly. Apply clean lubricating oil before assembling the connecting rod bolt.

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Tighten the connecting rod bolt: firstly twist it and then apply the torque of $(80 \pm 10) \text{ N} \cdot \text{m}$ to tighten it finally rotate it for 45° .

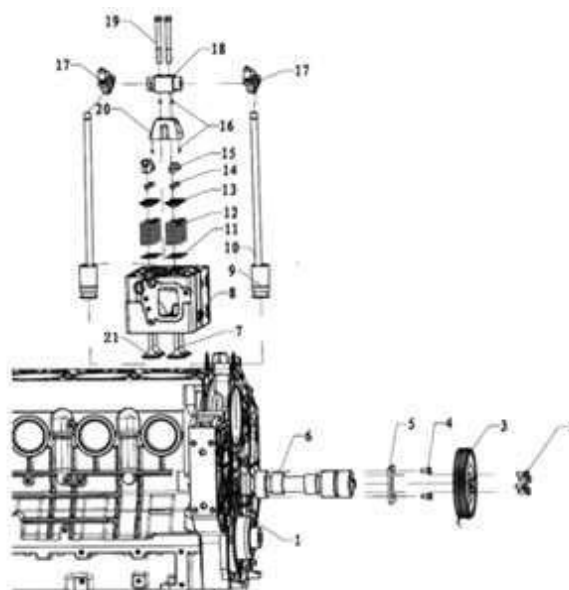
d Key points of check and maintenance

- 1) Check the circular bead and piston pin seat at the piston combustion chamber throat for crack. Check the skirt section and head of piston for scuffing; and check whether the piston pin hole is normally abraded.
- 2) Check the piston ring for abnormal blockage in the piston ring groove;
- 3) Check whether the external circle of piston ring is abnormally abraded and check whether the upper and lower end of piston ring is abnormally abraded.
- 4) Check whether the external circle of piston pin is abnormally abraded.
- 5) Check the bottom hole of big end, stem body and small head oil hole of connecting rod for crack; check whether the connecting rod busing alloy is abnormally abraded or peeling off; check whether the side of connecting rod is abnormally abraded and check the bending condition of connecting rod.
- 6) Check the abrasion condition of connecting rod bearing bush and check the alloy layer for color fading, peeling, slipping, etc.

4.4 Valve mechanism

4.4.1 Disassembly and assembly of valve mechanism

a. Disassembly drawing



1-gear chamber; 2-hexagon bolt; 3-camshaft timing gear; 4-hexagon bolt; 5-thrust plate; 6-camshaft assembly; 7-intake valve; 8-cylinder head; 9-valve tappet; 10-push rod; 11-valve spring lower seat; 12-valve spring; 13-valve spring upper seat; 14-valve lock clamp; 15-valve bridge; 16-dowel; 17-rocker arm assembly; 18-rocker arm shaft assembly; 19-hexagon bolt; 20-rocker arm support; 21-exhaust valve

Fig. 4-33 Assembly and Disassembly Drawing for Valve Mechanism

b Disassembly

- 1) Disassemble the rocker arm and rocker shaft; refer to the disassembly steps for rocker arm and rocker shaft for details;
- 2) Disassemble the intake and exhaust valve; refer to the disassembly steps for intake and exhaust valve for details;
- 3) Disassemble the tappet and push rod; refer to the disassembly steps for tappet and push rod for

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details;

4) Disassemble the camshaft and camshaft timing gear; refer to the disassembly steps for camshaft and camshaft timing gear for details;

5) Disassemble the intermediate gear; refer to the disassembly steps for intermediate gear for details.

c Assembly

1) Assemble the intermediate gear; refer to the assembly steps for intermediate gear for details;

2) Assemble the camshaft and camshaft timing gear; refer to the assembly steps for camshaft and camshaft timing gear for details;

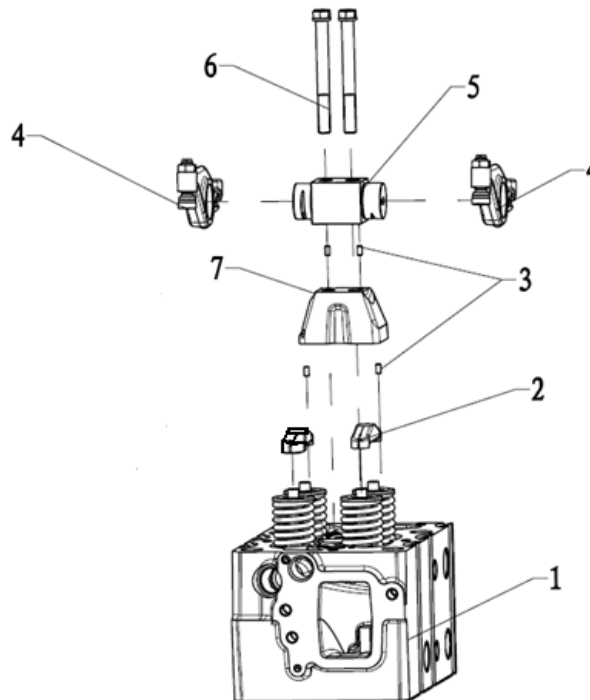
3) Assemble the tappet and push rod; refer to the assembly steps for tappet and push rod for details;

4) Assemble the intake and exhaust valve; refer to the assembly steps for intake and exhaust valve for details;

5) Assemble the rocker arm and rocker shaft; refer to the assembly steps for rocker arm and rocker shaft for details;

4.4.2 Disassembly and assembly of rocker arm and rockshaft

a. Disassembly drawing



1-cylinder head; 2-valve bridge; 3-cylindrical pin; 4-rocker arm assembly; 5-rockshaft assembly; 6-hexagon bolt; 7-rocker arm support

Fig. 4-34 Assembly and Disassembly Drawing for Rocker Arm and Rockshaft

b Preparation before disassembly

1) Equipment: torque wrench, small wrench, oil can and lubricating oil.

2) Preparation before disassembly: Fix the engine on the disassembly rack. After disassembling the rocker arm cover, disassemble the rocker arm and rockshaft.

c Disassembly

1) Rotate the crankshaft and observe whether the rocker arm can rotate freely;

2) Measure the valve clearance and check the valve clearance for change;

3) If the rocker arm rotation is not flexible or the valve clearance is great, loosen the hexagon bolt (6) and slightly take down the rocker arm assembly (5) rocker arm assembly (4), rocker arm support

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(7) and mark it to avoid mixing the rocker arms of different cylinders.

d Assembly

- 1) Put the rocker arm on the operating platform, screw in the adjusting bolt on the rocker arm and loosen the nut for inspection;
- 2) Insert the cylindrical pin in the pin hole at the lower surface of rockshaft and press the cylindrical pin to the bottom. The cylindrical pin should be free of crack;
- 3) Insert the hexagon bolt in two M5 holes at two sides of rockshaft assembly (5), never use the bolt without glue, apply 271 sealant, keep the bolt head recessed in the side of rockshaft (0-1)mm;
- 4) Assemble the rockshaft support (7) and rockshaft assembly (5), closely connect the rocker arm support (7) and rockshaft assembly (5), apply little lubricating oil on the rockshaft assembly, assemble the rockshaft assembly (4), flexibly rotate the rocker arm assembly (4) and insert two hexagon bolts in the rockshaft assembly (5);
- 5) After assembling the valve stem, put the valve bridge (2) on the intake and exhaust valve respectively; refer to assembly process of valve stem for details;
- 6) Assemble the rocker arm assembly (4) and tighten it, align the pin hole at lower side of rocker arm support and the upper level of cylinder head and completely put it in place; put the rocker arm ball pin in the valve stem round hole;
- 7) Tighten the rockshaft assembly bolt (5).

Attention: Check and adjust the intake and exhaust valve clearance.

- 1) Turn it to the top dead center of a cylinder, align the flywheel scale line with the flywheel housing scale line to judge the compression top dead center of a cylinder;
- 2) Adjust the intake and exhaust valve clearance of cylinder 1, 2 and 4, and exhaust valve clearance of cylinder 1, 3 and 5; the intake valve clearance is (0.38 ± 0.03) mm; the exhaust valve clearance is (0.58 ± 0.03) mm; the tightening torque of adjusting nut of intake and exhaust valve is (45 ± 5) N m,
- 3) Assemble the jigger fixing device on the flywheel housing and fasten two external hexagon nuts, turn it to the top dead center of cylinder 6;
- 4) Adjust the intake valve clearance of cylinder 3, 5 and 6 and exhaust valve clearance of cylinder 2, 4 and 6. The cylinder 6 piston is at the top dead center of explosion. The intake valve clearance is (0.38 ± 0.03) mm and the exhaust valve clearance is (0.58 ± 0.03) mm;
- 5) Check the valve timing in cold state.

Valve clearance adjustment is added in routine maintenance for the first 100h, and the cycle is 1000h

e Key points of maintenance

Key point 1: check after disassembly

- 1) Clean the rocker arm and observe the rocker arm appearance for crack and other defects.
- 2) Check the rocker arm inner hole for abrasion and scratch and measure its diameter.
- 3) Check the ball pin and rocker arm for abrasion.
- 4) Check the oil way for smoothness.
- 5) Measure the diameter of rocker arm and rockshaft and calculate the fit clearance.
- 6) Check the rockshaft assembly for abrasion, and check the rockshaft support for crack and abrasion.
- 7) Check the EVB support for crack and EVB adjusting bolt for integrity.

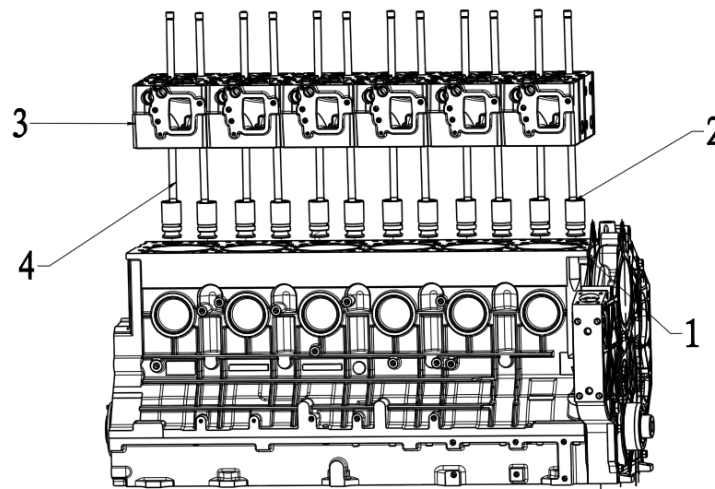
Key point 2: Assembly

Apply little lubricating oil on the rockshaft, assemble the rocker arm assembly (4), flexibly rotate the rocker arm assembly (4) and insert (5) two hexagon bolts (6) in the rockshaft assembly.

4.3.3 Disassembly and assembly of tappet and push rod

a. Disassembly drawing

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1-body; 2-tappet; 3-cylinder head; 4-push rod

Fig. 4-35 Disassembly Drawing for Tappet and Push Rod

b Preparation before disassembly

- 1) Equipment: Tappet installation tool, lubricating oil can;
- 2) Preparation before disassembly: After disassembling the cylinder head cover, loosen the rockshaft assembly fixing hexagon bolt, disassemble the tappet (4). Disassemble the cylinder head and then the tappet (2).

c Disassembly

- 1) After disassembling the rocker arm and rocker shaft, directly take out the push rod (4) and put it orderly;
- 2) After disassembling the cylinder head (refer to the disassembly steps for cylinder head for details), take out the tappet (2) and put it orderly.

d Assembly

- 1) Check whether the tappet (2) and push rod (4) are faulty, if any, replace them. Before assembling the tappet (2), be sure to blow off by the compressed air and check the oil hole for smoothness;
- 2) Evenly apply clean lubricating oil to the valve tappet (2) external circle and bottom;
- 3) Assemble the tappet in the tappet hole by the tappet installation tool. Avoid damaging the tappet and tappet hole in the assembly process;
- 4) After assembling the cylinder head (refer to the assembly steps for cylinder head for details), blow off the push rod by the compressed air and check the oil hole for smoothness;
- 5) Apply clean lubricating oil to tappet (4) and be sure to maintain sufficient lubricating oil at the ball head and concave head;
- 6) Assemble the push rod (4) and keep the ball surface of push rod downward.

e Key points of maintenance

Key point 1: After disassembly, check

- 1) whether the push rod and tappet are clean;
- 2) Check the tappet and push rod oil way for smoothness;
- 3) Check the push rod for bending and external surface for abrasion;
- 4) Check the push rod ball head and concave head for abrasion;
- 5) Check the tappet surface and bottom for abrasion;
- 6) Check the concave head in the tappet for abrasion.

Key point 2: Assembly

- 1) Evenly apply clean lubricating oil to the valve tappet (2) external circle and bottom;
- 2) Apply clean lubricating oil to push rod (4) and be sure to maintain sufficient lubricating oil at the

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ball head and concave head.

4.4.4 Disassembly and assembly of intermediate gear

a. Disassembly drawing

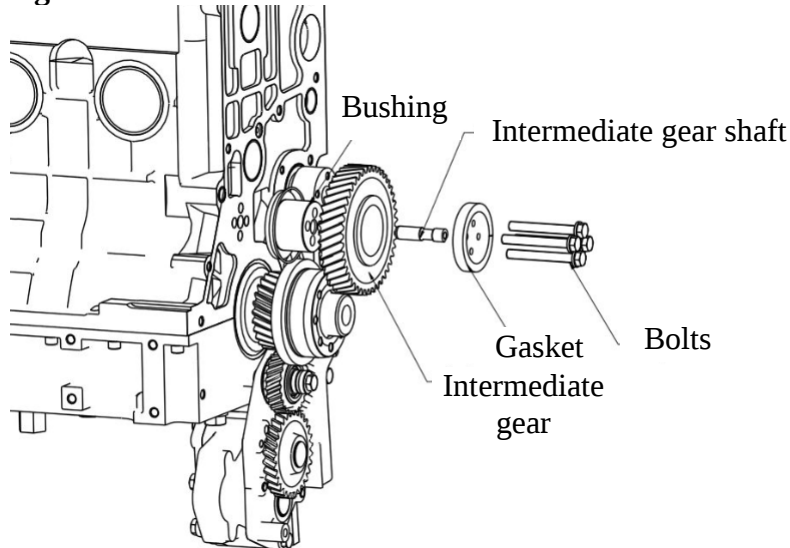


Fig. 4-76 Disassembly Drawing for Intermediate Gear

c Disassembly

- 1) Disassemble the air compressor; refer to the disassembly steps for vehicle accessory system for details;
- 2) Disassemble the fuel injection pump; refer to the disassembly steps for fuel system for details;
- 3) Disassemble the camshaft timing gear; refer to the disassembly steps for valve system for details;
- 4) Check the intermediate gear mounting bolt mark to confirm whether the bolt is rotating. Disassemble 4 M10 hexagon bolts of intermediate gear to take down the gasket. Insert a M8 bolt in the gear intermediate shaft and pull out the shaft. Prevent the falling off of intermediate shaft;
- 5) Disassemble the intermediate gear assembly and intermediate gear shaft with the gear chamber and take it out from the opening of gear chamber.

d Assembly

- 1) Orderly assemble the oil pump, crankshaft and oil pump intermediate gear assembly;
- 2) Assemble the gear chamber. Before assembling the gear chamber, put the intermediate gear shaft in the intermediate gear assembly (intermediate gear, bush), keep the surface with "V" on the intermediate gear outward ("V" may not be hindered by the intermediate gear shaft). Put the intermediate gear assembly and intermediate gear shaft at the intermediate gear position in the gear chamber, assemble the diesel engine upside down; otherwise, the intermediate gear assembly and intermediate gear shaft will fall off.

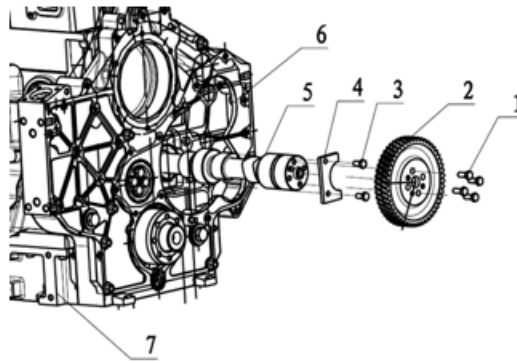
e Key points of maintenance

- 1) Check whether the bolt thread is good;
- 2) Check all gears for teeth falling and breakage, check whether the bolt bearing surface for crushing and thread hole or through-hole of gear for deformation;
- 3) Check the intermediate gear shaft and intermediate gear liner for abnormal abrasion. Check whether all oil holes are blocked by dirt.

4.4.5 Disassembly and assembly of camshaft

a. Disassembly drawing

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1-hexagon bolt; 2-camshaft timing gear; 3-hexagon bolt; 4-thrust plate; 5-camshaft assembly; 6-gear chamber; 7-body;

Fig. 4-8 Disassembly Drawing for Camshaft and Camshaft Timing Gear

b Preparation before disassembly

- 1) Equipment: Dial indicator, torque wrench, lubricating oil can, lubricating oil, towel camshaft guide tools.
- 2) Preparation before disassembly: The disassembly should be performed on the assembly platform. Disassemble the flywheel housing, camshaft and camshaft timing gear.

c Disassembly

- 1) Rotate the crankshaft and check the camshaft assembly (5) and timing gear (2) for flexibility without blockage;
- 2) Use the dial gauge to check whether there is axial movement of camshaft;
- 3) Check the side clearance of timing gear (2);
- 4) On the engine assembly and disassembly platform, rotate the crankshaft to keep the camshaft timing gear at the top dead center of cylinder 1. Check whether the camshaft timing gear fixing hexagon bolt (1) is loosened; disassemble the camshaft timing gear hexagon bolt (1); disassemble the timing gear (2);
- 5) Disassemble the camshaft thrust plate hexagon bolt (3), thrust plate (4) and camshaft assembly (5).

d Assembly

After disassembly, check the camshaft assembly (5) and timing gear (2). In case of abrasion or big deviation of other parameters, do repairing or replace a new camshaft.

- 1) Use a towel to clean the camshaft hole and check the camshaft hole for damage. Apply proper lubricating oil to the inner circle of camshaft bush by the oil can. If the camshaft hole is damaged, it should not be reused by repairing.
- 2) Put the camshaft guide tool and camshaft lubricating sleeve in the camshaft hole, clean the camshaft and check it for damage. Align the cylinder at the end of guide tool with the cylinder at the camshaft head, insert the camshaft assembly (5) in the camshaft hole. After assembling the camshaft, take down the camshaft guide tool and camshaft sliding sleeve. Avoid damaging the camshaft bush when inserting the camshaft.
- 3) Assemble the camshaft thrust plate (4), apply clean lubricating oil at two sides of camshaft thrust plate (4), and rotate the camshaft. The camshaft can be rotated flexibly. Apply 242 sealant to the thrust plate bolt thread and tighten it.
- 4) Polish the cylinder rear end, apply oil and clean it. The matching surface should be flat and clean. Insert the cylindrical pin in the crankshaft rear end, assemble the flywheel housing connecting plate and tighten four fastening bolts;
- 5) Apply special glue of connecting plate and the glue line should be continuous and even;
- 6) Fasten the camshaft thrust plate and timing gear on the camshaft by the bolt.

e Key points of maintenance

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Key point 1: check

1) Check the cam surface contacting the tappet for abrasion. Check the main journal for blockage and abrasion;

2) Check the timing gear fastening hexagon bolt for bending and deformation. Check the camshaft timing gear and compressor drive gear for clamping or serious abrasion of teeth.

Key point 2: Assembly

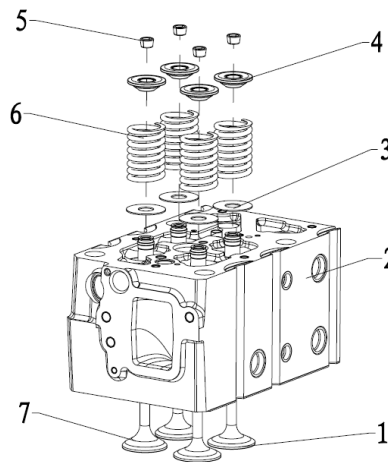
1) If the camshaft hole is damaged, it should not be reused by repairing.

2) Avoid damaging the camshaft bush when inserting the camshaft;

3) Apply 242 sealant to the thrust plate bolt thread and tighten it.

4.4.6 Disassembly and assembly of valve

a. Disassembly drawing



1-intake valve; 2-cylinder head; 3-valve spring lower seat; 4-valve spring upper seat; 5-valve lock clamp; 6-valve spring; 7-exhaust valve

Fig. 4-9 Disassembly Drawing for Valve

b Preparation before disassembly

1) Equipment: valve spring compressor or valve overhead pliers or other tools pressing the valve spring.

2) Preparation before disassembly: disassemble the rockshaft, take down the cylinder head from the body and disassemble the valve.

c Disassembly

1) Use the valve spring compressor or valve overhead pliers or other tools to press the valve spring upper seat (4), take out the valve lock clamp (5) and take out the valve spring upper seat (4) and valve spring (6);

2) Take out the intake and exhaust valve (1) (7) from the valve seat.

d Assembly

1) If the valve is abraded or there is serious sintering, replace a new valve.

2) Evenly apply the molybdenum disulfide cream to the intake and exhaust valve stem, and assemble the intake and exhaust valve (1) (7) on the cylinder head to ensure smooth sliding of intake and exhaust valve in the guide without blockage;

3) Insert the locating pin on the upper surface of cylinder head, insert three pins to the bottom of each cylinder head;

4) Assemble the intake valve spring lower seat, put the valve stem protective sleeve on the intake and exhaust valve guide, assemble the valve stem seal sleeve. Before assembly, be sure to check whether the internal spring of valve stem seal sleeve is complete.

5) Assemble the valve spring (6);

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6) Assemble the valve spring upper seat, press the valve spring (6) and assemble the valve lock clamp (5);

7) After assembling the valve lock clamp, use the rubber hammer to slightly knock the intake and exhaust valve to place. If the valve lock clamp or valve spring upper seat (4) is not in place, find out the cause and eliminate the fault.

e Key points of maintenance

Key point 1: Check after disassembly

- 1) Check the valve stem and valve stem end for abrasion;
- 2) Check the valve conical surface for abrasion or damage;
- 3) Check the valve conical surface and valve arc for carbon deposit and abrasion.

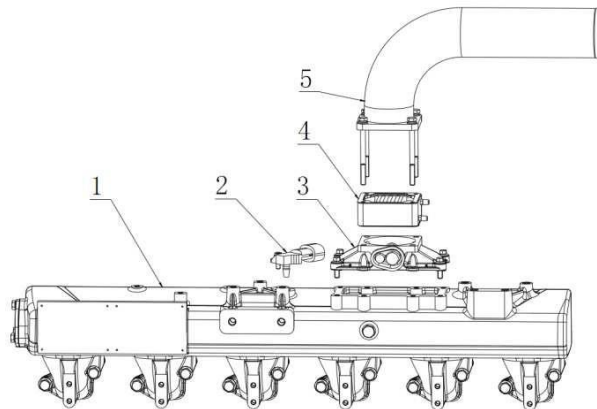
Key point 2: Assembly

- 1) Ensure that the intake and exhaust valve can slide in the guide smoothly;
- 2) Before assembly, be sure to check whether the internal spring of valve stem seal sleeve is properly assembled.

4.5 Intake and exhaust system

4.5.1 Disassembly and assembly of intake and exhaust system

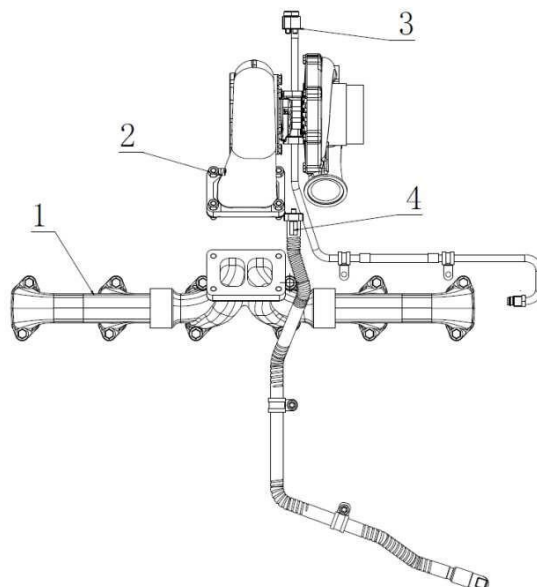
a. Disassembly drawing



1-intake pipe assembly; 2-intake temperature pressure sensor; 3-intake connecting pipe; 4-heater; 5-intake connecting pipe

Fig. 4-39 Disassembly Drawing for Intake Side of Intake and Exhaust System

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1-exhaust pipe; 2-supercharger; 3-supercharger oil inlet pipe assembly; 4-supercharger oil return pipe assembly

Fig. 4-40 Disassembly Drawing for Exhaust Side of Intake and Exhaust System

b Disassembly

The disassembly steps are contrary to the assembly steps.

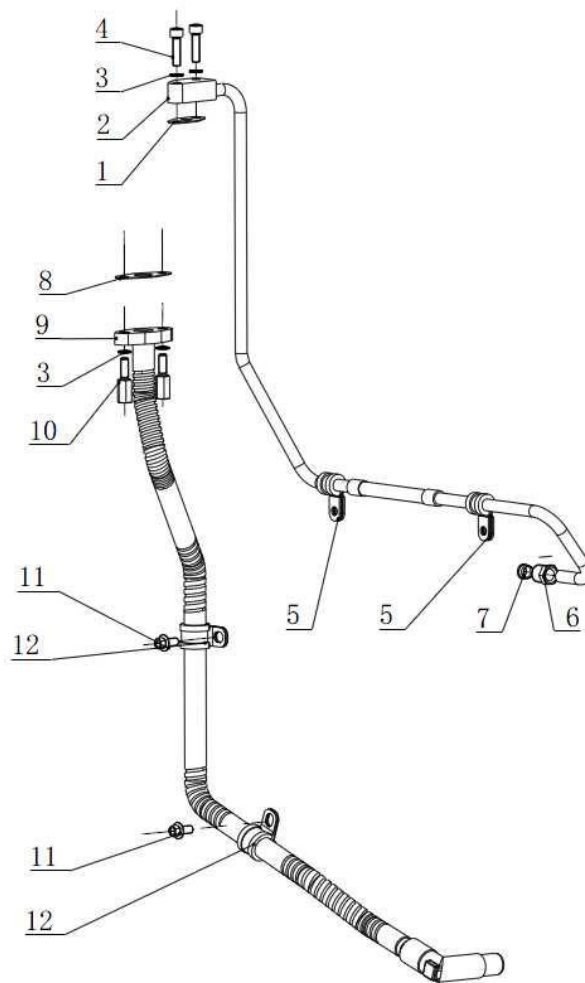
d Assembly

- 1) Assemble the intake pipe and intake side parts as per the assembly steps for intake pipe.
- 2) Assemble the exhaust pipe and exhaust side parts as per the assembly steps for exhaust pipe.
- 3) Assemble the supercharger and other parts as per the assembly steps for supercharger.
- 4) Assemble the supercharger oil inlet pipe assembly and supercharger oil return pipe assembly as per the assembly steps for the supercharger oil inlet and return pipe and fasten the oil pipe assembly by the clamp at the position shown in the figure.

4.5.2 Disassembly and assembly of supercharger oil inlet and return pipe

a. Disassembly drawing

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1-supercharger oil inlet pipe gasket; 2-supercharger oil inlet pipe assembly; 3-self-locking washer; 4-inner hexagon cylindrical head bolt; 5-pipe clamp assembly; 6-pipe joint nut; 7-sleeve; 8-supercharger oil return pipe gasket; 9-supercharger oil return pipe assembly; 10-oil return pipe bolt; 11-hexagon flange bolt; 12-single pipe clamp sub-assembly;

Fig. 4-41 Disassembly Drawing for Supercharger Lubricating Oil Pipe Assembly

b Preparation before disassembly

1) Equipment: pneumatic wrench, inner hexagon wrench, sleeve, copper hammer, lubricating oil, brush;

2) Preparation before disassembly: Disassemble other peripheral parts on the supercharger.

c Disassembly

The disassembly steps are contrary to the assembly steps.

d Assembly

1) Assemble (2) isolated by (1) at the supercharger oil inlet pipe, assemble (4) isolated by (3) and successively put (6), (7) at the lower entry of (2) and screw (6) in the body main oil way plug screw, use the wrench to tighten (6) and use the inner hexagon wrench to tighten (4);

2) Assemble (5) at (2) shown in the figure and fasten it by the bolt corresponding to the oil cooler cover;

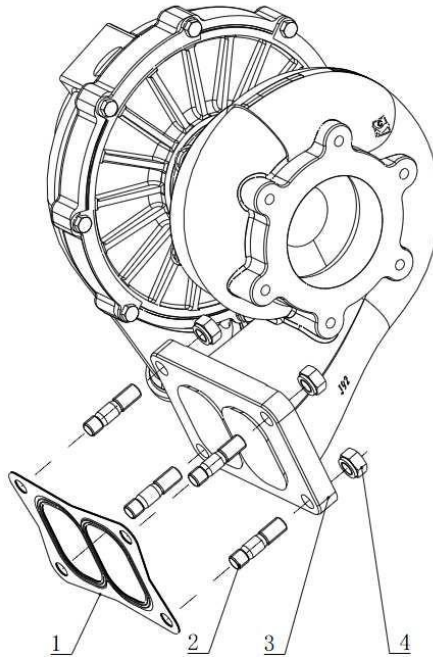
3) Assemble (9) isolated by (8) at the supercharger oil return pipe and assemble the (10) isolated by (3); press the lower joint of (9) in the body by a copper hammer and fasten (10) by the pneumatic wrench;

4) Assemble (12) at the (9) shown in the figure and tighten it by (11).

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4.5.3 Disassembly and assembly of supercharger

a. Disassembly drawing



1-supercharger gasket; 2-stud; 3-supercharger; 4-2 type metal hexagon locknut

Fig. 4-42 Disassembly Drawing for Supercharger Assembly

b Preparation before disassembly

- 1) Equipment: pneumatic wrench and sleeve;
- 2) Preparation before disassembly: Disassemble other peripheral parts on the supercharger.

c Disassembly

The disassembly steps are contrary to the assembly steps.

d Assembly

Assemble (1) with the front row manifold, assemble (2) and (3) on the exhaust pipe and use the wrench to fasten (4).

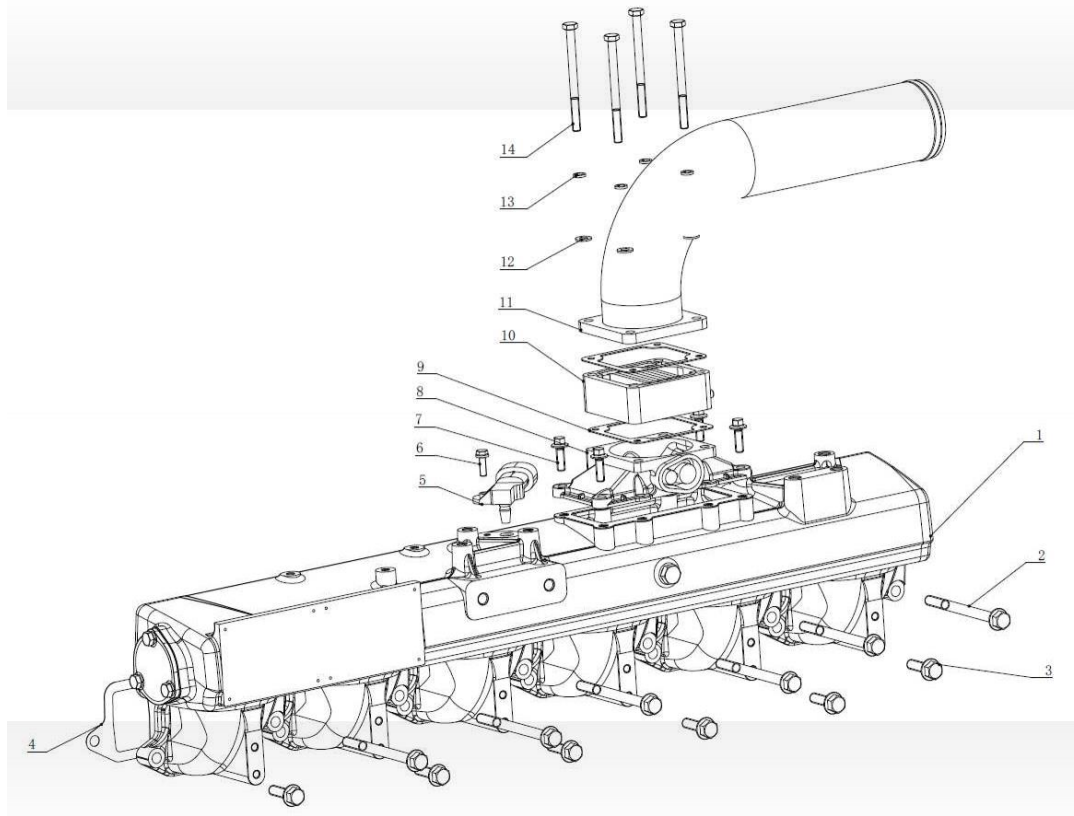
e Key points of maintenance

For assembly and disassembly of supercharger, seal the oil and gas interface to prevent impurity pollution.

4.5.4 Disassembly and assembly of intake pipe

a. Disassembly drawing

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1-intake pipe; 2-hexagon flange bolt; 3-hexagon bolt; 4-intake pipe gasket; 5-intake temperature pressure sensor; 6-hexagon flange bolt; 7-hexagon flange bolt; 8-intake connecting pipe; 9-gasket; 10-heater; 11-intake connecting pipe 12-flat washer; 13-wave spring washer; 14-hexagon bolt

Fig. 4-43 Disassembly Drawing for Intake Pipe Assembly

b Preparation before disassembly

Equipment: pneumatic wrench and sleeve;

c Disassembly

The disassembly steps are contrary to the assembly steps.

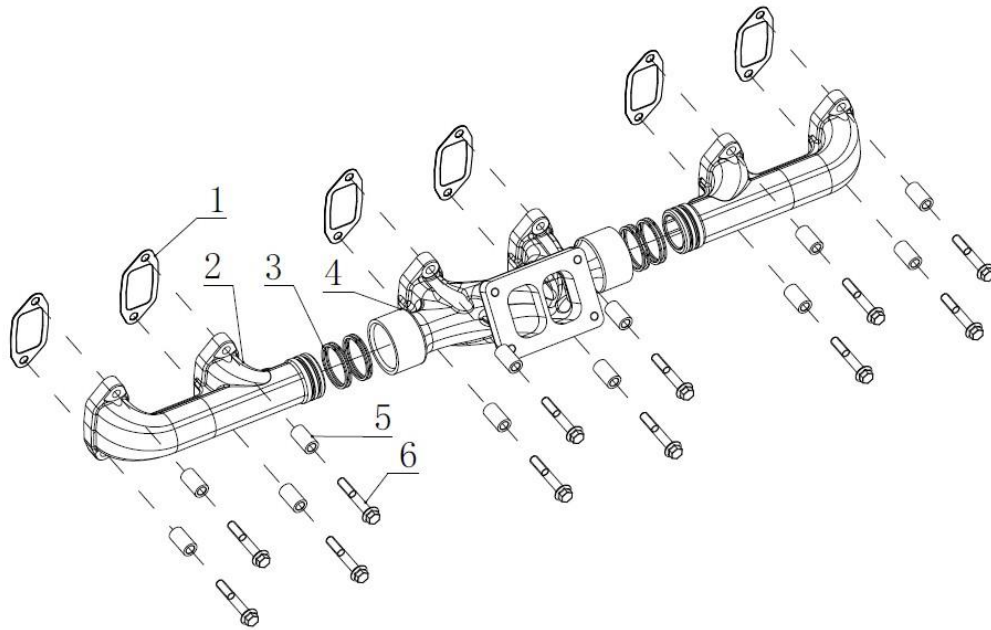
d Assembly

- 1) Loosely assemble (1) isolated by (4) on the cylinder head by (2) and (3) and tighten it by the pneumatic wrench;
- 2) Assemble (8) on the intake pipe (1) by (7) and tighten it;
- 3) Insert (10) and (11) through (12) and (13) by (14) isolated by (9), assemble them on the intake connecting pipe (8) and tighten them.

4.5.5 Disassembly and assembly of exhaust pipe

a. Disassembly drawing

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1-exhaust pipe gasket; 2-exhaust manifold; 3-exhaust pipe seal ring; 4-exhaust manifold; 5-sleeve;
6-exhaust pipe bolt

Fig. 4-44 Disassembly Drawing for Exhaust Pipe Assembly

b Preparation before disassembly

Equipment: pneumatic wrench and sleeve;

c Disassembly

The disassembly steps are contrary to the assembly steps.

d Assembly

- 1) Insert (4) through (5) by (6) isolated by (1) and loosely assemble it on the cylinder head;
- 2) Orderly assemble 4 (3) in the groove of (2);
- 3) Insert (2) behind the assembled groove through (5) by (6) isolated by (1) and loosely assemble it on the cylinder head. Symmetrically tighten it by the sleeve wrench. Use the torque wrench to test the torque of $(65-80)\text{N}\cdot\text{m}$. The exhaust pipe bolt can be used for 2 times.

4.6 Fuel system

4.6.1 Disassembly and assembly of fuel system

a. Assembly drawing

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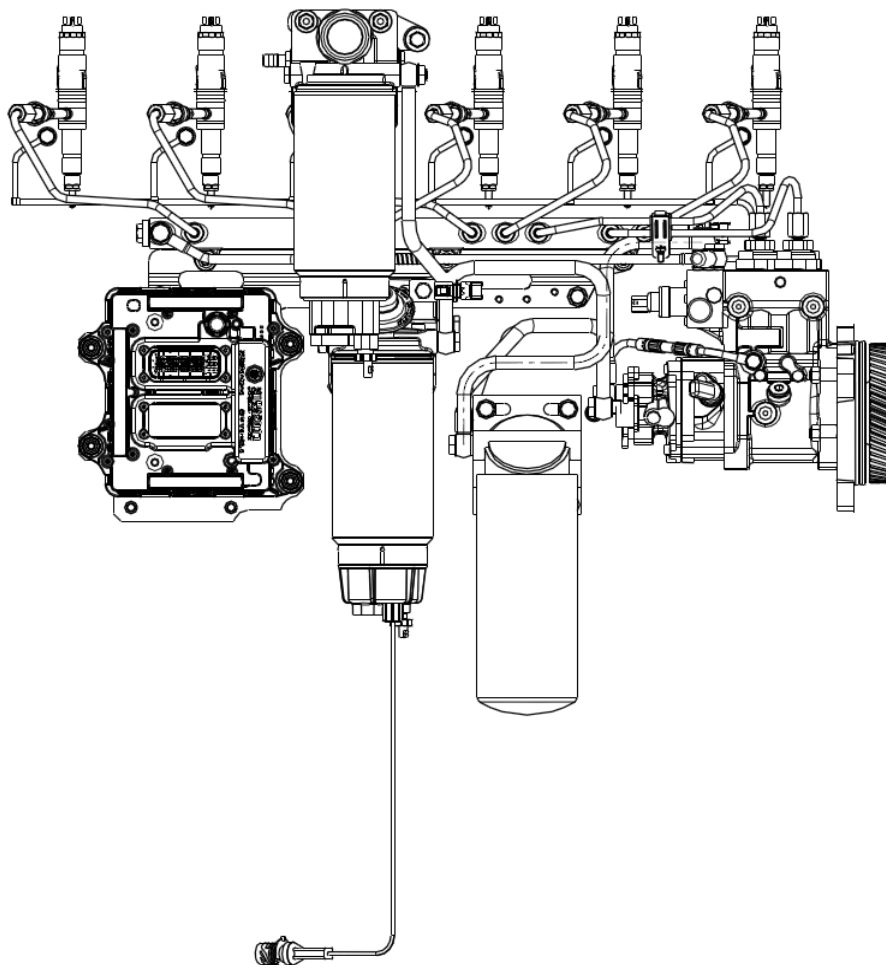


Fig. 4-45 Assembly Drawing for Fuel System

b Disassembly

- 1) Disassemble the harness;
- 2) Disassemble the low pressure pipe;
- 3) Disassemble the high pressure pipe;
- 4) Disassemble the fuel injector;
- 5) Disassemble ECU;
- 6) Disassemble the filter;
- 7) Disassemble the high pressure oil pump.

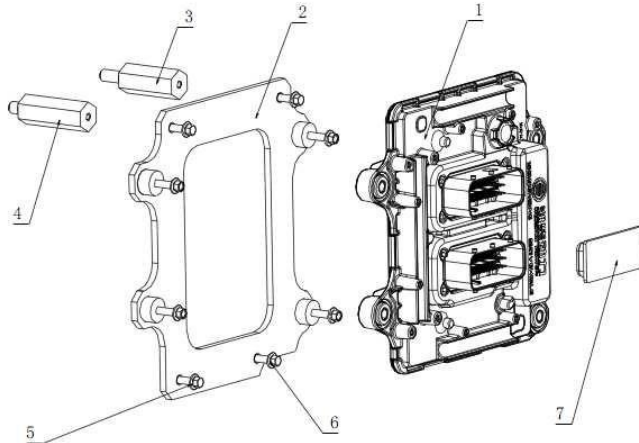
c Assembly

The assembly steps are contrary to the disassembly steps.

4.6.2 Disassembly and assembly of ECU

a. Disassembly drawing

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1-ECU; 2-ECU support; 3-fixing bolt; 4-fixing screw; 5-hexagon flange bolt; 6-hexagon flange bolt; 7-ECU cover

Fig. 4-46 Disassembly Drawing for ECU

b Disassembly

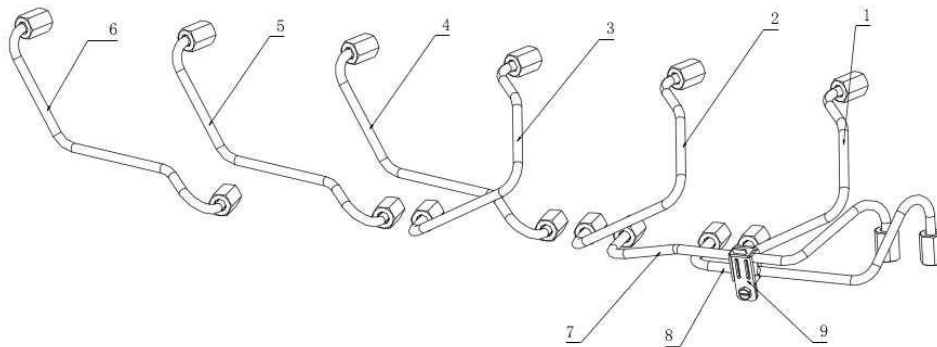
- 1) Disassemble four bolts fixing the ECU;
- 2) Disassemble the ECU;
- 3) Disassemble four bolts fixing the ECU support;
- 4) Disassemble the ECU support;
- 5) Disassemble two fixing bolts supporting the ECU.

c Assembly

The assembly steps are contrary to the disassembly steps.

4.6.3 Disassembly and assembly of high pressure oil pipe

a. Disassembly drawing



1-1# cylinder high pressure oil pipe assembly; 2-2# cylinder high pressure oil pipe assembly; 3-3# cylinder high pressure oil pipe assembly; 4-4# cylinder high pressure oil pipe assembly; 5-5# cylinder high pressure oil pipe assembly; 6-6# cylinder high pressure oil pipe assembly; 7-pump to rail high pressure oil pipe assembly; 8-pump to rail high pressure oil pipe assembly; 9-pipe clamp

Fig. 4-47 Assembly Drawing for High Pressure Oil Pipe

b Disassembly

- 1) Disassemble the fixed high pressure oil pipe support;
- 2) Disassemble the high pressure oil pipe.

c Assembly

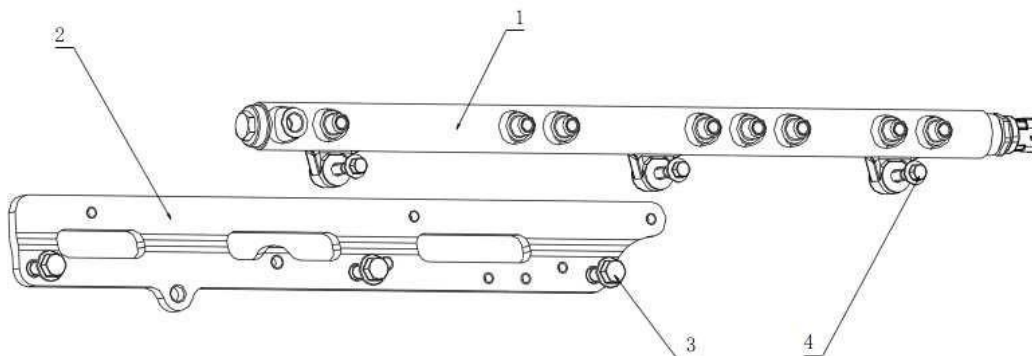
The assembly steps are contrary to the disassembly steps.

Attention: The tightening torque of high pressure oil pipe retaining nut is (30-40)N•m at the fuel injector end, and (30-40)N•m at the rail and oil pump end.

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4.6.4 Disassembly and assembly of common rail pipe

a. Disassembly drawing



1-common rail pipe; 2-common rail support; 3-hexagon flange bolt; 4-hexagon flange bolt
Fig. 4-10 Disassembly Drawing for Common Rail Pipe

b Disassembly

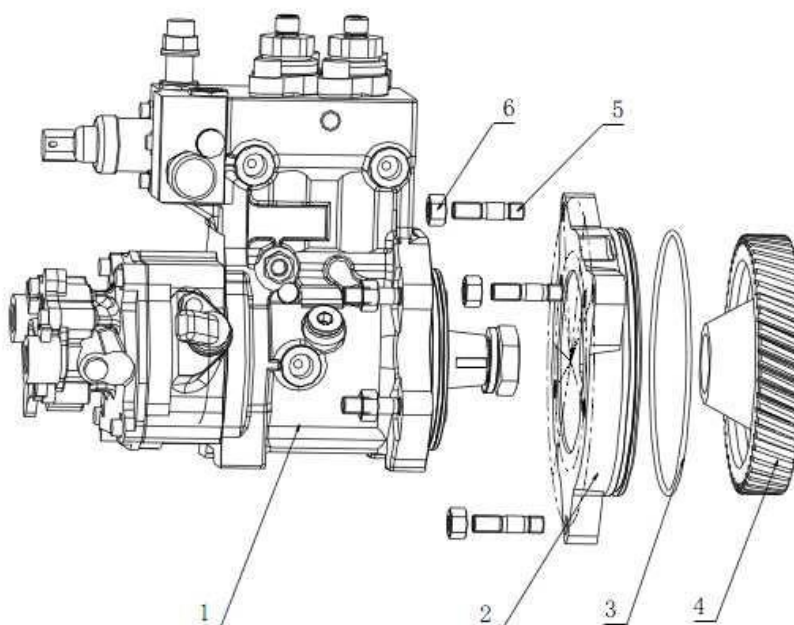
- 1) Disassemble three bolts fixing the common rail pipe.
- 2) Disassemble the common rail pipe.
- 3) Disassemble three hexagon bolts fixing the support and body.
- 4) Disassemble the fixing support.

c Assembly

The assembly steps are contrary to the disassembly steps.

4.6.5 Disassembly and assembly of fuel injection pump

a. Disassembly drawing



1-fuel injection pump; 2-fuel injection pump flange; 3-O-ring; 4-fuel injection pump gear; 5-stud;
6-hexagon nut

Fig. 4-11 Disassembly Drawing for Fuel Injection Pump

b Disassembly

- 1) Disassemble the hexagon nut between fuel injection pump flange and gear chamber;
- 2) Disassemble the fuel injection pump and gear assembly from the engine;

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- 3) Disassemble the fuel injection pump locknut;
- 4) Disassemble the hexagon bolt between fuel injection pump and flange;
- 5) Disassemble the fuel injection pump flange.

c Disassembly steps for fuel injection pump

- 1) Assemble the fuel injection pump flange and apply little lubricating oil to the rubber ring of fuel injection pump.
- 2) Assemble the hexagon bolt between fuel injection pump and flange;
- 3) Assemble the fuel injection pump gear. The fuel injection pump gear locknut is M24×1.5: tighten it to (250-300)N·m at one time.
- 4) Rotate the flywheel; rotate the fuel injection pump gear when the diesel engine reaches the compression top dead center of 1# cylinder; and assemble the fuel injection pump assembly when the fuel injection pump gear scale is aligned with the fuel injection pump flange. From the observation window in the front of gear chamber, the fuel injection pump gear scale should be aligned with the gear chamber scale.
- 5) Assemble the hexagon nut between fuel injection pump flange and gear chamber;

c Key points of check and maintenance

For the fuel injection pump structure, refer to Fig. 4-51 rotate the flywheel; rotate the fuel injection pump gear when the diesel engine reaches the compression top dead center of 1# cylinder; and the fuel injection pump gear scale is aligned with the gear chamber scale.

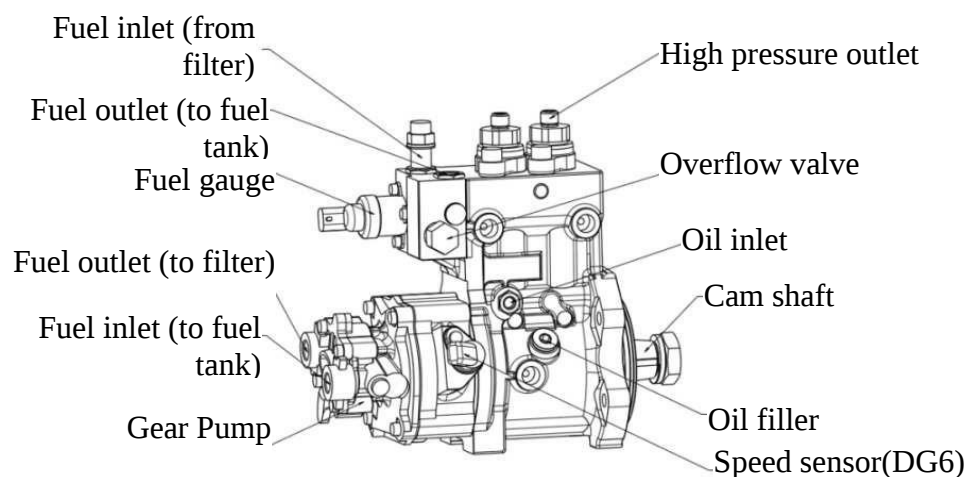
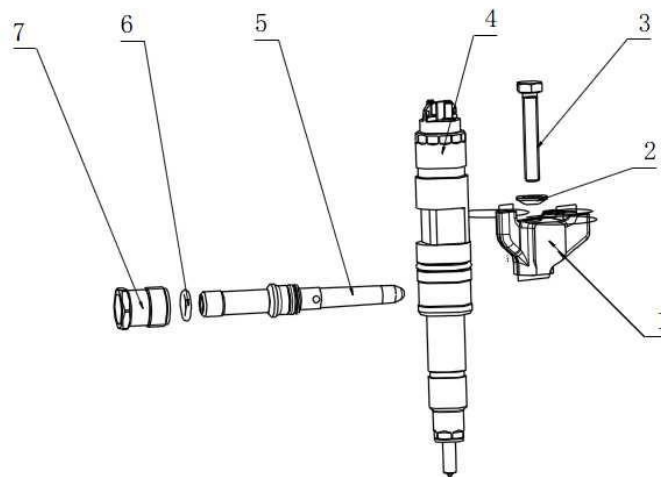


Fig. 4-50 Fuel Injection Pump Structure

4.6.6 Disassembly and assembly of Fuel Injector

a. Disassembly drawing

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1-fuel injector pressing block; 2-ball washer; 3-hexagon bolt; 4-fuel injector; 5-high pressure joint;
6-O-ring; 7-locknut;

Fig. 4-51 Disassembly Drawing for Fuel Injector

b Disassembly

- 1) Disassemble the hexagon bolt fixing the fuel injector pressing block.
- 2) Disassemble the fuel injector pressing block and fixing block.
- 3) Loosen the high pressure joint locknut.
- 4) Take out the fuel injector assembly from the cylinder head.

c Assembly

- 1) Fuel injector and high pressure joint O-ring, high pressure joint thread and nut and joint matching surface During assembly, be sure to apply lubricating oil.
- 2) Disassemble the protective cap before assembly.
- 3) Put the fuel injector in the cylinder head, tighten the clamping bolt of fuel injector by the torque of 3N.m.
- 4) Loosen the fuel injector clamping bolt and apply axial force of 0kN to the fuel injector.
- 5) Pre-tighten the high pressure joint (nut) by the torque of (15-20)N.m.
- 6) Tighten the clamping bolt of fuel injector by the torque of $8N \cdot m + 90^\circ$.
- 7) Tighten the high pressure joint (nut) by the torque of (50-55)N.m.
- 8) High pressure joint, O-ring and seal ring can only be used once. After assembly, check the leakproofness of O-ring and seal washer.

d Key points of maintenance

Bosche fuel injector nozzle can only be replaced at Bosche special service station. Weichai fuel injector nozzle should be replaced at Weichai special service station.

Fuel injector nameplate engraving:

Position: at the solenoid valve on the top of fuel injector

Engraving specification: 1st line: fuel injector model like WPCRIN2

2nd line: Weichai part number like 612630090055

3rd line: Bosche part number like 0445120391.

Attention: the fuel injector of different part numbers should not be exchanged.

4.7 Cooling system

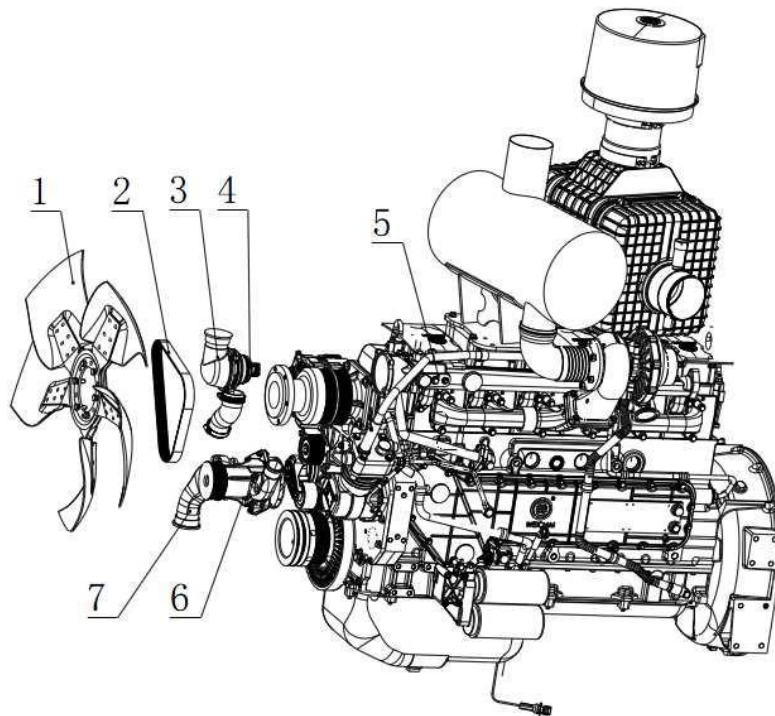
4.7.1 Disassembly and assembly of cooling system

a. Disassembly drawing

The cooling system is to ensure continuous operation of diesel engine under proper temperature.

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The forced circulation cooling is to reach the operating temperature quickly. It consists of water pump, fan, expansion tank, water tank and thermostat.



1-fan, 2-poly V-belt, 3-thermostat cover, 4-thermostat, 5-water outlet pipe, 6-water pump, 7-water pump inlet pipe

Fig. 4-52 Schematic Diagram for Disassembly of Cooling System

b Disassembly

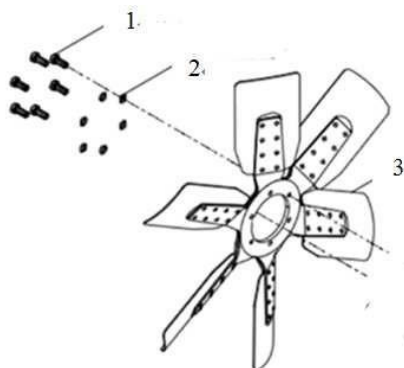
- 1) Disassemble the fan, poly V-belt and tensioning wheel.
- 2) Disassemble the water pump and coolant hose. Refer to the disassembly steps for water pump for details.
- 3) Disassemble the thermostat. Refer to the disassembly steps for thermostat for details. Disassemble the water inlet pipe.
- 4) Disassemble the water outlet pipe.

c Assembly

The assembly steps are contrary to the disassembly steps.

4.7.2 Disassembly and assembly of fan

a. Disassembly drawing



1-hexagon bolt; 2-spring washer; 3-fan;

Fig. 4-53 Disassembly Drawing for Fan and Wheel Hub Assembly

b Disassembly

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- 1) Disassemble the hexagon bolt and spring washer connecting the fan and fan pulley.
- 2) Disassemble the fan.

c Assembly

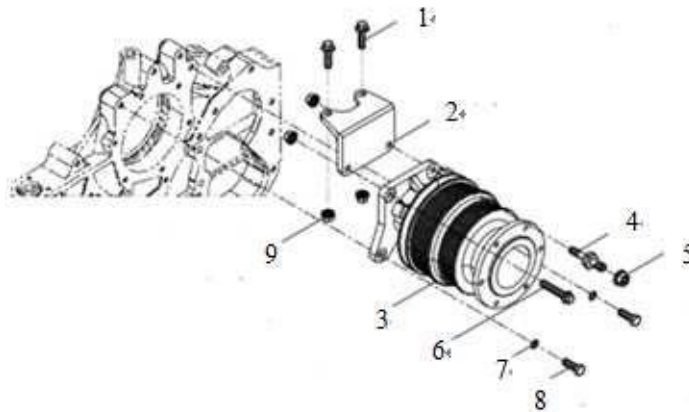
- 1) Before assembly, firstly check the hexagon bolt and spring washer of fan to ensure no manufacturing and using defects and damage.
- 2) The assembly steps are contrary to the disassembly steps.

d Key points of maintenance

Check the fan, hexagon bolt and spring washer for crack and other damages.

4.7.3 Disassembly and assembly of fan support

a. Disassembly drawing



1-hexagon flange bolt; 2-fixed support; 3-fan support assembly; 4-bolt; 5-hexagon flange nut;
6-hexagon flange bolt; 7-wave spring washer; 8-hexagon bolt; 9-hexagon flange nut;

Fig. 4-54 Disassembly Drawing for Fan Support

b Disassembly

- 1) Disassemble the hexagon flange bearing toothed nut, bolt, hexagon bolt, wave washer and hexagon flange toothed bolt at right.
- 2) Disassemble the fan support assembly.
- 3) Disassemble the hexagon flange bearing toothed nut and hexagon flange bearing toothed bolt at left.
- 4) Disassemble the fixing support.

c Assembly

- 1) Before assembly, firstly check the fan support assembly, fixed support, hexagon flange bearing toothed nut, bolt, hexagon bolt, wave washer and hexagon flange toothed bolt to ensure no manufacturing and using defects and damage.
- 2) The assembly steps are contrary to the disassembly steps.

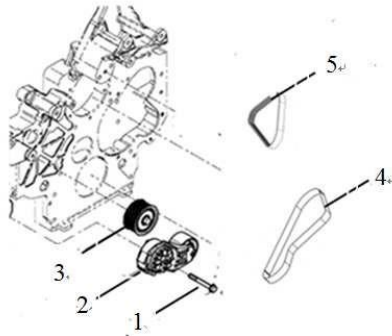
d Key points of maintenance

Check the fan support assembly, fixed support, hexagon flange bearing toothed nut, bolt, hexagon bolt, wave washer and hexagon flange toothed bolt for crack and other defects.

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4.7.4 Disassembly and assembly of tensioning wheel and belt

a. Disassembly drawing



1-hexagon flange bolt; 2-tensioning wheel; 3-idle wheel; 4-poly V-belt; 5-poly V-belt

Fig. 4-55 Disassembly Drawing for Tensioning Wheel and Belt

b Disassembly

- 1) Use the open spanner to clamp the welding nut on the automatic tensioning wheel to rotate the belt tensioning wheel. Keep two small holes of tensioning wheel in axial alignment and the tensioning wheel may not return to original position, and disassemble the poly V-belt.
- 2) Use the wrench to unscrew the hexagon flange bolt on the tensioning wheel so as to disassemble the automatic tensioning wheel.

c Assembly

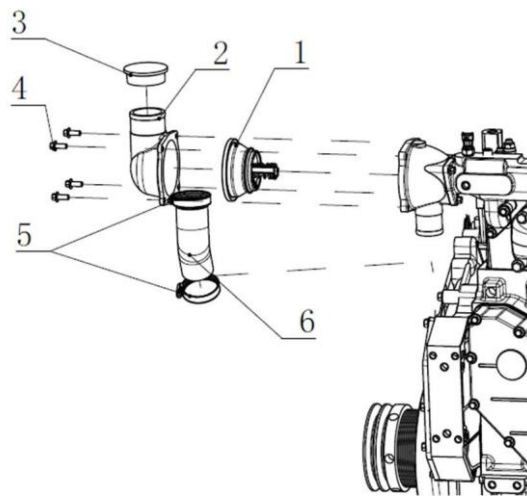
- 1) Before assembly, check the tensioning wheel, idle wheel, bolt, washer and belt to ensure no manufacturing and using defects and damage.
- 2) The assembly steps are contrary to the disassembly steps.

Key points of maintenance

- 1) After assembly, the belt wedge must be in corresponding groove of pulley.
- 2) Check whether the locating block is close to the free position after the tensioning wheel arm tightens the belt, if so, replace the belt.

4.7.5 Disassembly and assembly of thermostat

a. Disassembly drawing



1-inbuilt thermostat; 2-thermostat cover; 3-blanking cap; 4-hexagon flange bolt; 5-clamp; 6-coolant connecting hose

Fig. 4-56 Disassembly Drawing for Thermostat

b Disassembly

- 1) Disassemble two clamps connecting the lower coolant connecting hose and water pump inlet

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pipe and thermostat;

2) Disassemble the fastening bolt of thermostat cover to take down the thermostat cover and thermostat.

c Assembly

1) Before assembly, check the clamp, hose, thermostat, thermostat cover and hexagon flange bolt to ensure no manufacturing and using defects and damage.

2) Clean the water outlet pipe and water pump inlet pipe to ensure no impurity;

3) The assembly steps are contrary to the disassembly steps.

d Key points of maintenance

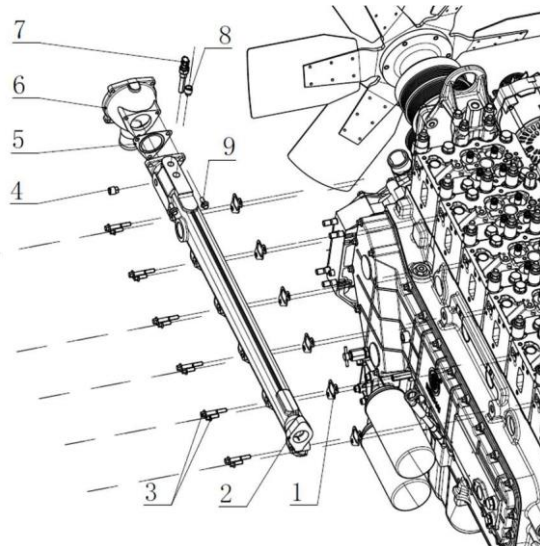
1) Check two clamps for failure, if so, replace a good clamp;

2) Check the coolant connecting hose for crack, if so, replace a good coolant connecting hose;

3) Check the thermostat for crack, abnormal abrasion and other defects, if so, replace a good thermostat.

4.7.6 Disassembly and assembly of water outlet pipe

a. Disassembly drawing



1-water outlet pipe gasket; 2-water outlet pipe; 3-water outlet pipe bolt; 4-square taper plug; 5-gasket; 6-thermostat body; 7-temperature sensor; 8-square taper plug; 9-hexagon flange bolt

Fig. 4-57 Disassembly Drawing for Water Outlet Pipe

b Preparation before disassembly

Equipment: sleeve wrench or pneumatic wrench, open spanner

c Disassembly

1) Firstly disassemble the sensor harness on the water outlet pipe and disassemble the clamp connecting the coolant connecting hose;

2) Orderly unscrew the fixing bolt of water outlet pipe;

3) Take down the water outlet pipe and gasket;

4) For further disassembly, disassemble the fastening bolt of thermostat;

5) Take down the thermostat body and gasket.

d Assembly

1) Orderly assemble the gasket and thermostat body on the water outlet pipe and tighten the bolt;

2) The water outlet pipe gasket can only be used for one time and should be replaced in the repairing process;

3) Clean the water outlet pipe matching surface, assemble it on the cylinder head and assemble the fastening bolt;

4) Screw down the fastening bolt;

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5) Assemble the sensor harness on the water outlet pipe, etc.

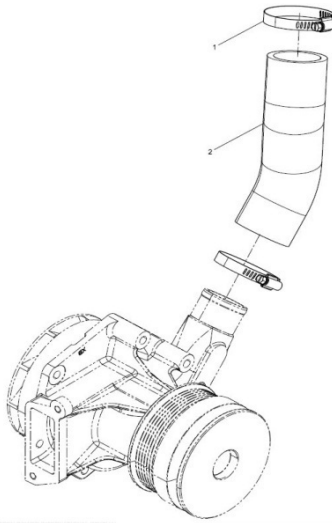
e Key points of maintenance

1) Before disassembly, check the water outlet pipe for water leakage; check the water outlet pipe for crack, abrasion, corrosion and other defects, if so, replace the water outlet pipe, analyze the cause for corrosion influencing the reliability and replace a new water outlet pipe;

2) If the joint is leaked, replace the joint and tighten it, check it for water leakage; if the thread is damaged, replace a new water outlet pipe.

4.7.7 Disassembly and assembly of water pump inlet pipe

a. Disassembly drawing



1-coolant connecting hose; 2-clamp

Fig. 4-58 Disassembly Drawing for Water Pump Inlet Pipe Assembly

b Disassembly

1) Disassemble the clamp 1.

2) Disassemble the coolant connecting hose.

c Assembly

1) Before assembly, firstly check the coolant connecting hose and clamp to ensure no manufacturing and using defects and damage.

2) The assembly steps are contrary to the disassembly steps.

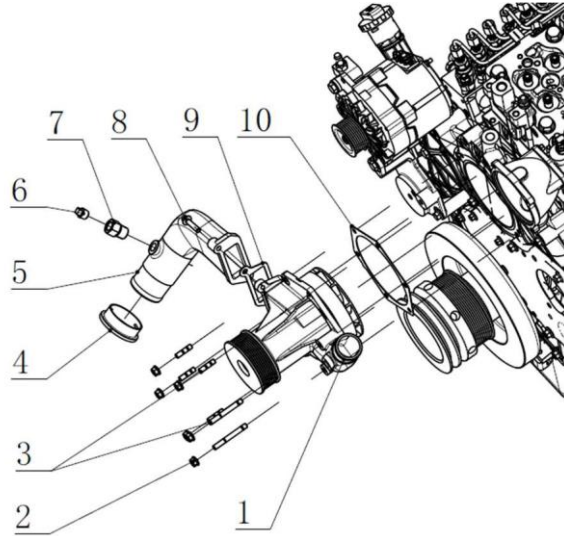
d Key points of maintenance

Check the coolant connecting hose and clamp for crack and other defects.

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4.7.8 Disassembly and assembly of water pump

a. Disassembly drawing



1-water pump; 2-hexagon flange bearing toothed nut; 3-stud; 4-blanking cap; 5-water inlet pipe joint; 6-square taper plug; 7-adapter; 8-hexagon flange bearing toothed bolt; 9-water pipe joint gasket; 10-water pump gasket

Fig. 4-59 Assembly and Disassembly Drawing of Water Pump

b Disassembly

As shown in Fig. 4-59:

- 1) Disassemble the hexagon flange nut on the water pump.
- 2) Disassemble the stud.
- 3) Disassemble the water pump.
- 4) Take down the water pump gasket.

c Assembly

- 1) Before assembly, firstly check the nut, stud, water pump gasket and water pump to ensure no manufacturing and using defects and damage.
- 2) Clean the inner cavity of gear chamber connecting the water pump.
- 3) The assembly steps are contrary to the disassembly steps.

d Key points of maintenance

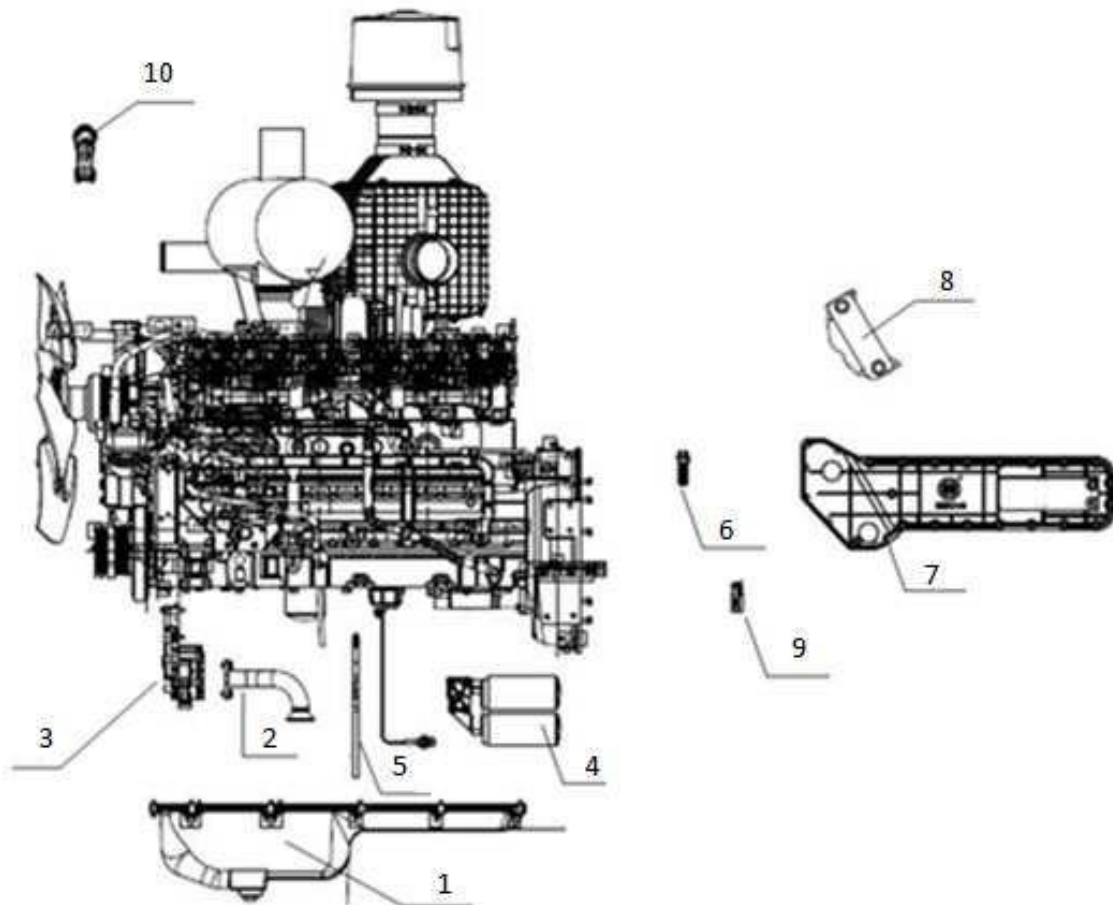
- 1) Check the pipe water pump gasket for fracture and other defects, if so , replace a good water pump gasket.
- 2) Check the stud and nut for thread scratch and other defects, if so, replace good stud and nut.
- 3) Check the water pump for crack and other defects, if so, replace a good water pump.

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4.8 Lubrication system

4.8.1 Disassembly and assembly of lubrication system

a. Disassembly drawing



1-oil pan; 2-suction filter; 3-oil pump; 4-oil filter; 5-oil dipstick; 6-oil cooler bypass valve;
7-oil cooler cover; 8-oil cooler; 9-main oil way pressure limiting valve; 10-oil filling pipe

Fig. 4-60 Schematic Diagram for Assembly of Lubrication System

b Disassembly

- 1) Disassemble the oil pan; refer to the disassembly steps for body assembly.
- 2) Disassemble the suction filter.
- 3) Disassemble the oil pump intermediate gear assembly.
- 4) Disassemble the oil pump.
- 5) Disassemble the main oil way pressure limiting valve.
- 6) Disassemble the oil filter.
- 7) Loosen the hollow bolt at the water intake of oil cooler and hexagon bolt on the oil dipstick assembly and disassemble the oil cooler cover.
- 8) Disassemble the oil cooler.
- 9) Disassemble the oil cooler bypass valve.

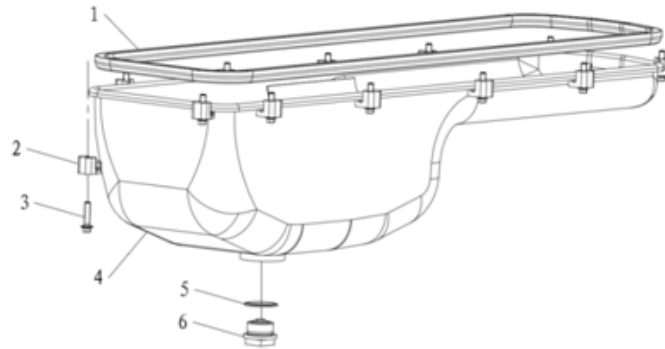
c Assembly

The assembly steps are contrary to the disassembly steps.

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4.8.2 Disassembly and assembly of oil pan

a. Disassembly drawing



1-seal gasket; 2-oil pan supporting block; 3-hexagon flange bolt; 4-oil pan; 5-washer; 6-magnetic plug

Fig. 4-61 Disassembly Drawing for Oil Pan

b Disassembly

- 1) Turn over the diesel engine and keep the oil pan upward (Key point 1);
- 2) Disassemble the fastening bolt of oil pan (Key point 2);
- 3) Disassemble the oil pan supporting block;
- 4) Disassemble the oil pan and sealing gasket;
- 5) Disassemble the magnetic plug and composite gasket.

c Assembly

The assembly steps are contrary to the disassembly steps of oil pan.

d Key points of maintenance

Key point 1: Disassembly

Before disassembling the oil pan, empty the oil. Put the oil container below the drain plug of oil pan and use the plug wrench to loosen the drain plug and drain the oil.

Key point 2: Assembly

Tighten the fastening bolt of oil pan in the order shown in Fig. 4-62. The tightening torque is (22-29)N•m.

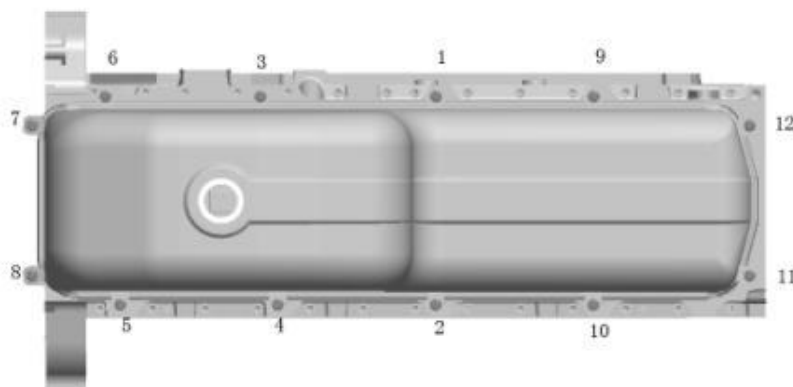
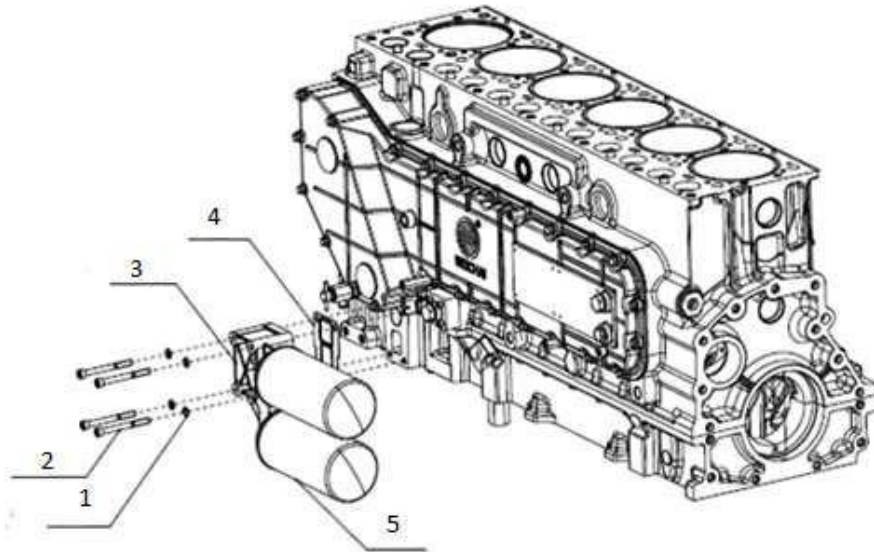


Fig. 4-62 Tightening Sequence of Fastening Bolt of Oil Pan

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4.8.3 Disassembly and assembly of oil filter

a. Disassembly drawing



1-wave spring washer; 2-inner hexagon cylindrical screw; 3-oil filter seat; 4-oil filter seat gasket; 5-spin-on oil filter

Fig. 4-63 Disassembly Drawing for Oil Filter

b Disassembly

As shown in Fig. 4-63:

Loosen 4 bolts on the oil filter to take down the oil filter assembly and oil filter gasket.

c Assembly

- 1) Before assembly, check the oil filter seat gasket and oil filter assembly to ensure no manufacturing and using defects and damage.
- 2) Clean the matching surface of oil filter assembly and body.
- 3) Assemble the oil filter seat gasket and oil filter assembly.
- 4) Assemble the wave spring washer and bolt and tighten the bolt.

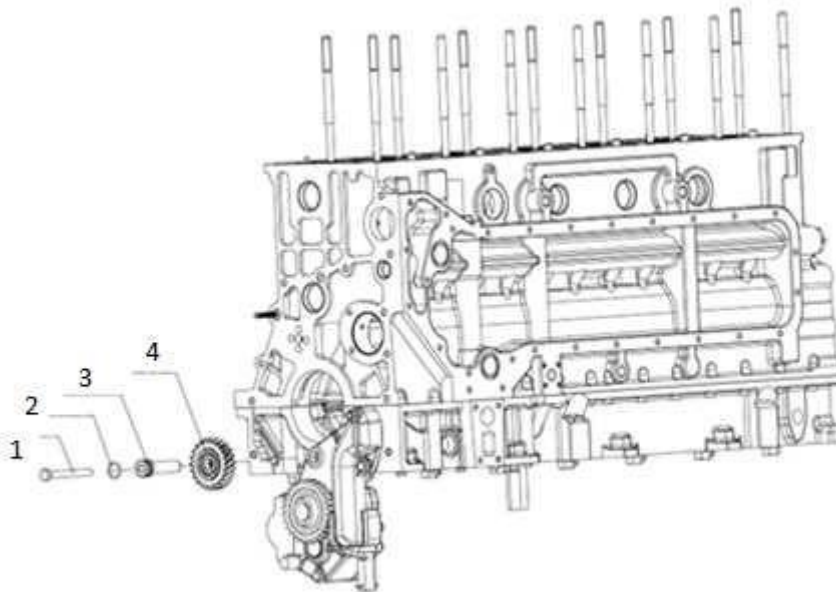
d Key points of maintenance

- 1) Check the oil filter assembly for damage, if so, replace the oil filter assembly.
- 2) Check the oil filter seat gasket for damage, if so, replace the oil filter gasket.

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4.8.4 Disassembly and assembly of oil pump intermediate gear assembly

a. Disassembly drawing



1-hexagon bolt; 2-seal ring; 3-intermediate gear shaft; 4-oil pump intermediate gear assembly

Fig. 4-64 Assembly and Disassembly Drawing for Oil Pump Intermediate Gear Assembly

b Disassembly

- 1) Loosen and take down the hexagon bolt;
- 2) Use a special tool to disassemble the intermediate gear shaft and take down the oil pump intermediate gear assembly.

c Assembly

- 1) Before assembly, firstly check oil pump intermediate gear assembly, intermediate gear shaft, hexagon bolt and seal ring to ensure no manufacturing and using defects and damage.
- 2) Clean the matching surface of crankcase and oil pump intermediate gear assembly and the oil pump intermediate gear assembly;
- 3) Assemble the seal ring on the intermediate gear;
- 4) Assemble the oil pump intermediate gear (keep the convex surface inward);
- 5) Assemble the intermediate gear shaft;
- 6) Assemble the hexagon bolt and tighten it.

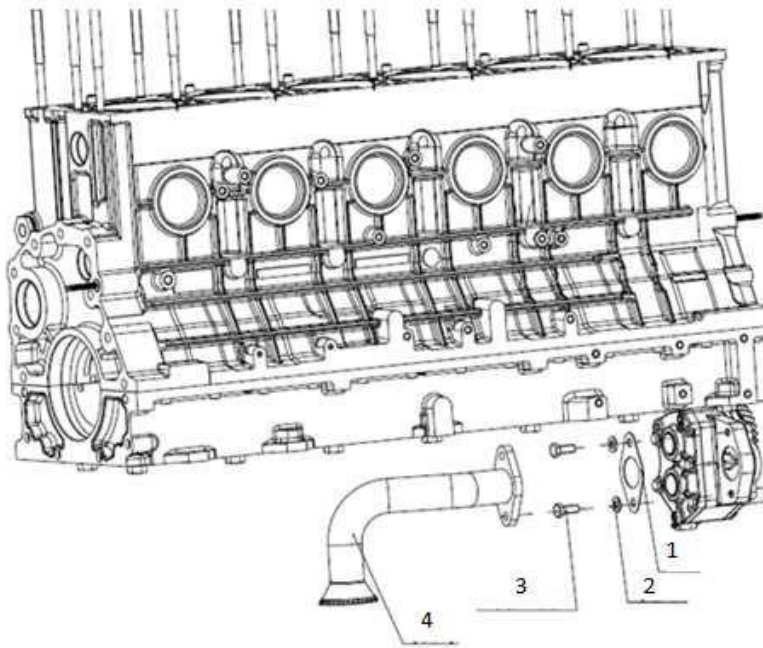
d Key points of maintenance

- 1) Check the oil pump intermediate gear and intermediate gear shaft for crack and other defects, if so, replace good oil pump intermediate gear and intermediate gear shaft;
- 2) Check the seal ring for fracture, if so, replace a good seal ring.

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4.8.5 Disassembly and assembly of suction filter

a. Disassembly drawing



1-gasket; 2-flat washer; 3-hexagon bolt; 4-suction filter

Fig. 4-65 Assembly and Disassembly Drawing for Suction Filter

b Disassembly

Loosen two hexagon bolts on the suction filter to take down the suction filter and gasket, as shown in the figure.

c Assembly

- 1) Before assembly, check the suction filter and gasket to ensure no manufacturing and using defects and damage.
- 2) Clean the matching surface between suction filter and oil pump and the inner cavity of suction filter.
- 3) Assemble the gasket and suction filter.
- 4) Assemble the hexagon bolt and tighten it.

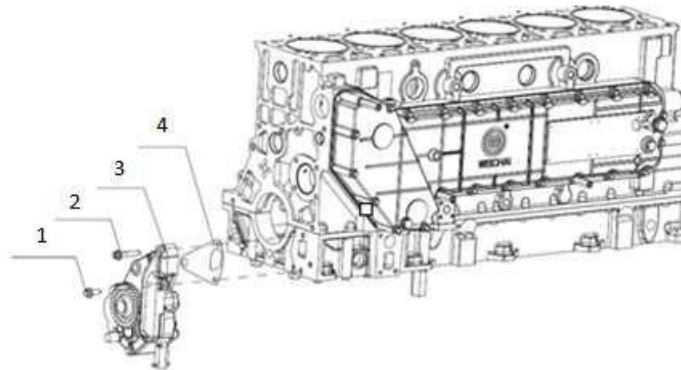
d Key points of maintenance

Check the suction filter and gasket for crack and other defects, if so, replace a new suction filter and gasket.

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4.8.6 Disassembly and assembly of oil pump

a. Disassembly drawing



1-hexagon flange bolt; 2-hexagon flange bolt; 3-oil pump; 4-oil pump gasket

Fig. 4-66 Assembly and Disassembly Drawing for Oil Pump

b Disassembly

Loosen two hexagon flange toothed bolts on the oil pump to take down the oil pump and oil pump gasket, as shown in the figure.

c Assembly

- 1) Before assembly, firstly check the oil pump and oil pump gasket to ensure no manufacturing and using defects and damage.
- 2) Clean the matching surface between oil pump and crankcase;
- 3) Assemble the oil pump gasket;
- 4) Assemble the oil pump;
- 5) Assemble two hexagon flange toothed bolts and tighten them.

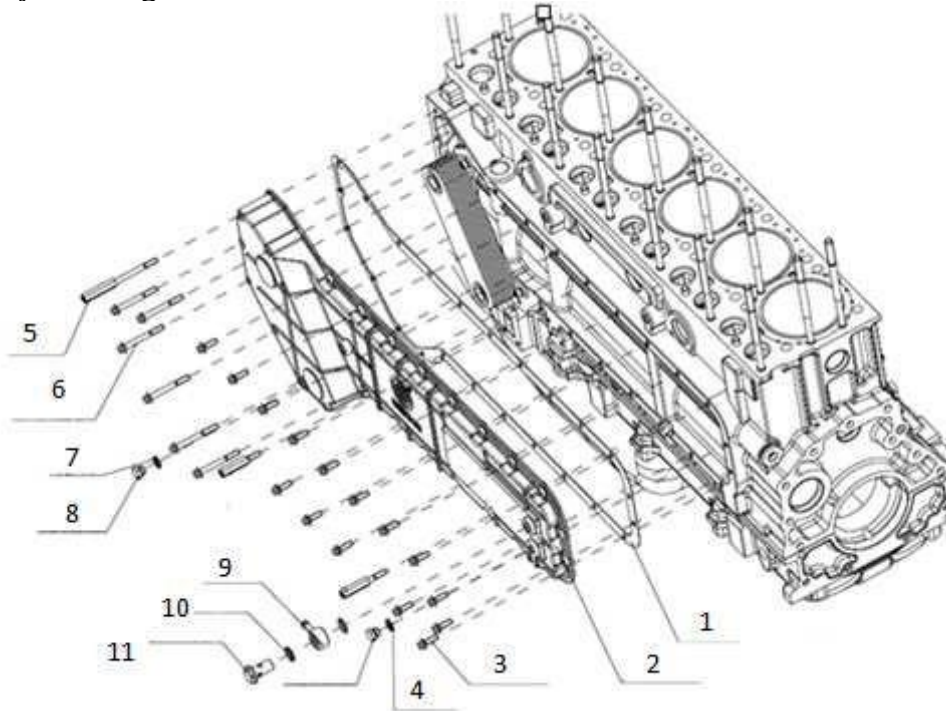
d Key points of maintenance

- 1) Check the oil pump for crack and other defects and check whether the inner cavity is smooth, if so, replace the oil pump;
- 2) In case of oil leakage, check the oil pump gasket for failure, and replace the oil pump gasket.

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4.8.7 Disassembly and assembly of oil cooler cover

a. Disassembly drawing



1-oil cooler cover gasket; 2-oil cooler cover; 3-hexagon flange bolt; 4-seal gasket; 5-supporting block; 6-hexagon flange bolt; 7-seal gasket; 8-hexagon plug; 9-water outlet joint; 10-seal gasket; 11-hollow bolt

Fig. 4-67 Assembly and Disassembly Drawing for Oil Cooler Cover

b Disassembly

Before disassembly, drain the coolant in the engine and orderly loosen the bolts on the oil cooler cover to disassemble the oil cooler cover and gasket.

c Assembly

- 1) Before assembling the oil cooler cover gasket, firstly check the oil cooler cover gasket and oil cooler cover to ensure no manufacturing and using defects and damages;
- 2) Clean the matching surface between oil cooler cover and body and assemble the oil cooler cover gasket;
- 3) Assemble the oil cooler cover gasket bolt and tighten it.

d Key points of maintenance

- 1) Check the oil cooler cover body for crack and other defects, if so, replace the oil cooler cover;
- 2) Check the oil cooler cover gasket. In case of water leakage, check the oil cooler cover gasket for failure, and replace a new oil cooler cover gasket.

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4.8.8 Disassembly and assembly of oil cooler

a. Disassembly drawing

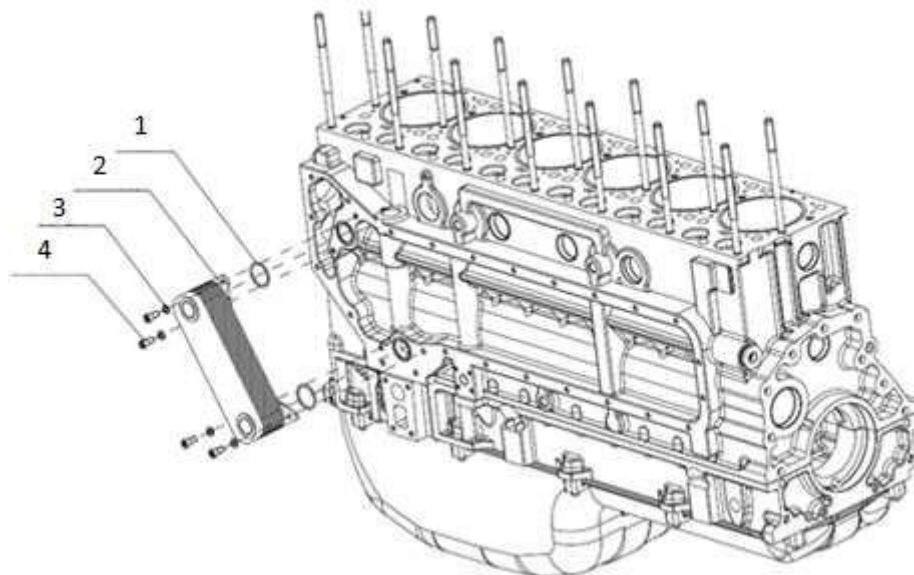


Fig. 4-68 Assembly and Disassembly Drawing for Oil Cooler

b Disassembly

Loosen 4 bolts on the oil cooler to take down the oil cooler and seal ring, as shown in the figure.

c Assembly

- 1) Before assembly, firstly check the oil cooler to ensure no manufacturing and using defects and damage.
- 2) Clean the matching surface between oil cooler and body;
- 3) Assemble the seal ring and oil cooler;
- 4) Assemble the wave spring washer and bolt and tighten the bolt

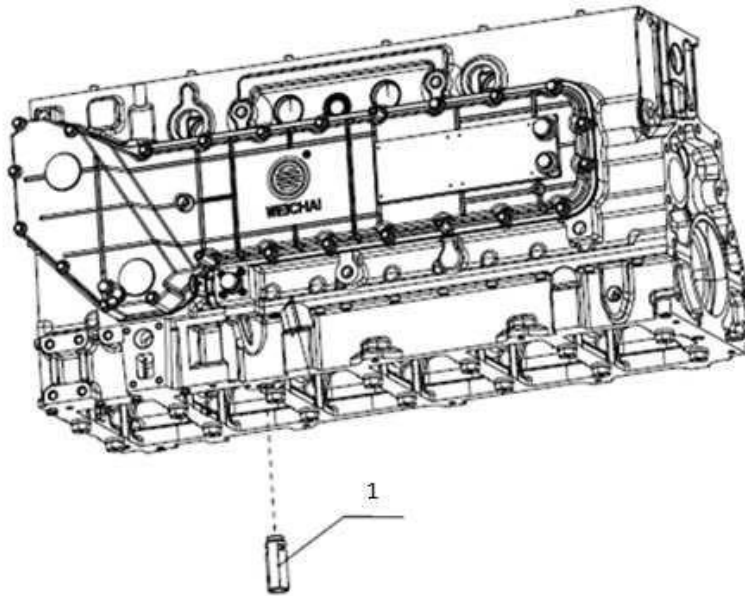
d Key points of maintenance

Check the oil cooler for crack and other defects, if so, replace the oil cooler;

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4.8.9 Disassembly and assembly of main oil way pressure limiting valve

a. Disassembly drawing



1-main oil way pressure limiting valve

Fig. 4-69 Assembly and Disassembly Drawing for Main Oil Way Pressure Limiting Valve

b Disassembly

Loosen and taken down the main oil way pressure limiting valve.

c Assembly

- 1) Before assembly, firstly check the main oil way pressure limiting valve to ensure no manufacturing and using defects and damage.
- 2) Clean the body main oil way pressure limiting valve hole and pressure limiting valve.
- 3) Apply sealant to the thread of main oil way pressure limiting valve.
- 4) Assemble the main oil way pressure limiting valve and tighten it.

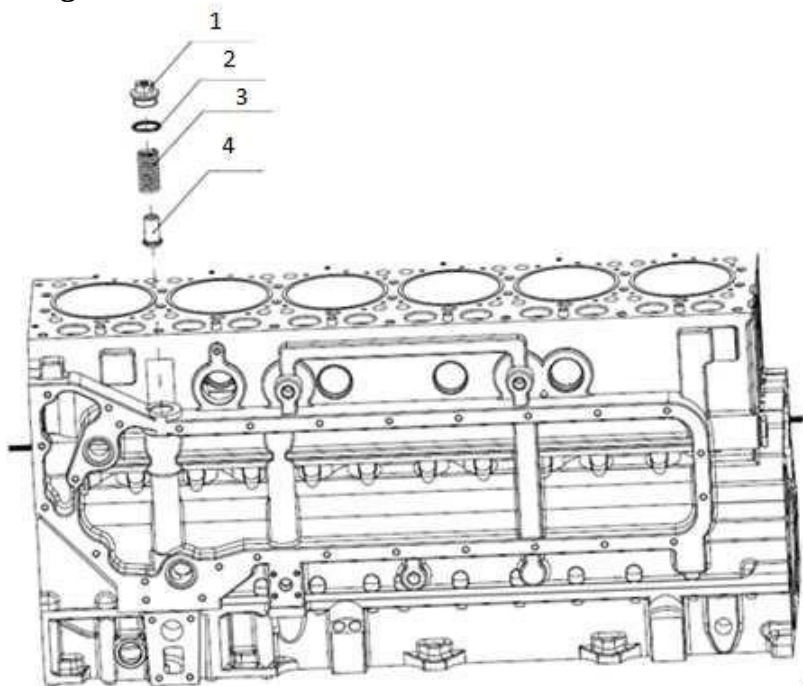
d Key points of maintenance

- 1) Check the elasticity of main oil way pressure limiting valve for normality, if not, replace a new main oil way pressure limiting valve.
- 2) Check the main oil way pressure limiting valve for crack and other defects, if so, replace a new main oil way pressure limiting valve.

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4.8.10 Disassembly and assembly of oil cooler bypass valve

a. Disassembly drawing



1-hexagon plug; 2-composite washer; 3-spring; 4-valve element

Fig. 4-70 Assembly and Disassembly Drawing for Oil Cooler Bypass Valve

b Disassembly

Loosen and take down the hexagon plug and orderly take down the composite washer, safety valve spring and safety valve, as shown in the figure.

c Assembly

- 1) Before assembly, firstly check the safety valve, safety valve spring, composite gasket and hexagon plug to ensure no manufacturing and using defects and damage.
- 2) Clean the oil cooler bypass valve and oil cooler bypass valve hole on the body.
- 3) Orderly assemble the safety valve, safety valve spring and composite washer.
- 4) Assemble the hexagon plug and tighten it.

d Key points of maintenance

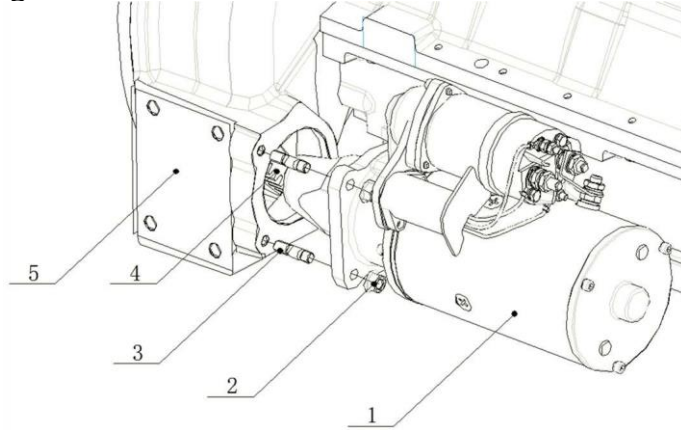
- 1) Check the elasticity of safety valve spring for normality, if not, replace a new safety valve spring.
- 2) Check the safety valve, hexagon plug, composite washer for crack and other defects, if so, replace new parts.

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4.9 Starting system

4.9.1 Disassembly and assembly of starting system

a. Disassembly drawing



1-starter, 2-hexagon flange bolt, 3-stud, 4-gear ring, 5-flywheel housing

Fig. 4-71 Disassembly Drawing for Starter

b Preparation before disassembly

- 1) Equipment: common open spanner
- 2) Preparation before disassembly: Disconnect the wiring of starter, battery and starting switch

c Disassembly

- 1) Use the open spanner to disassemble 3 hexagon flange nuts (2)
- 2) Firmly hold the starter (1) by two hands to take it down in the direction parallel to the starter.

d Assembly

- 1) Firmly hold the starter (1) by two hands to assemble it in the mounting hole of flywheel housing (5) in the direction parallel to the starter and keep the relay of starter (1) upward.
- 2) Assemble 3 hexagon flange nuts and use the open spanner to lock them.

e Key points of maintenance

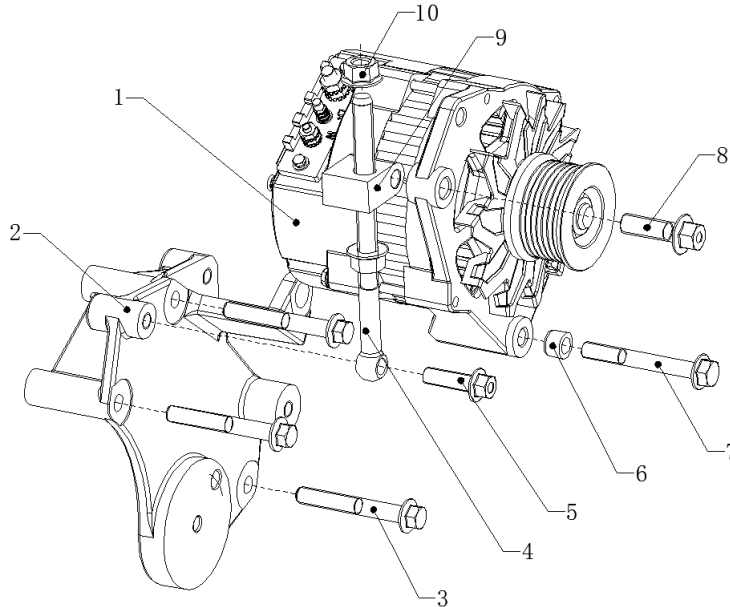
- 1) During maintenance, properly protect the wiring terminal and harness to avoid collision and dragging the terminal and harness.
- 2) During assembly, check the insulation sheath, sleeve and gasket for integrity and damage, if so, replace them. The terminal 30 of starter should not be short to the housing.

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4.10 Vehicle accessory system

4.10.1 Disassembly and assembly of generator

a. Disassembly drawing



1-generator, 2-generator support, 3-hexagon flange bolt, 4-tightening bolt, 5-hexagon flange bolt, 6-clamping block 7-hexagon flange bolt, 8-hexagon flange bolt, 9-tensioning block, 10-hexagon flange lock nut

Fig. 4-72 Disassembly Drawing for Generator Assembly

b Preparation before disassembly

- 1) Equipment: common open spanner or sleeve wrench
- 2) Preparation before disassembly: Disconnect the wiring of generator and battery and vehicle, and disassemble the fan

c Disassembly

- 1) Disassemble the hexagon flange lock nut (10) above the tensioning block (9) and unscrew the hexagon flange locknut below the tensioning block to lightly take down the belt;
- 2) Disassemble the hexagon flange bolt (8) to take down the tensioning block (9);
- 3) Disassemble the hexagon flange bolt (7) and clamping block (6) to take down the generator (1).

d Assembly

- 1) Put the generator (1) on the generator support (2), use the hexagon flange bolt (7) and clamping block (6) to loosely assemble the generator (1) locating hitching leg on the generator support (2);
- 2) Put the tensioning block (9) on the tightening bolt (4), and use the hexagon flange bolt (8) to loosely assemble the generator (1) adjusting hitching leg on the tensioning block (9);
- 3) Assemble the bolt, use the wrench to unscrew the lower hexagon locknut (10) till the belt reaches proper tension force, orderly fasten the hexagon flange bolt (7) and hexagon flange bolt (8);
- 4) Assemble the upper hexagon flange locknut (10) on the tightening bolt (4) and press it on the tensioning block (9).

e Key points of maintenance

During assembly, check the insulation sleeve and gasket for integrity and damage, if so, replace them. The positive pole of generator should not be short to the housing; otherwise, the generator should not be assembled to avoid serious accident.

Key point 1: generator fault judgment during maintenance, test the vehicle to judge whether the generator is faulty. Tool: test lamp. Test method is shown in Fig. 4-73.

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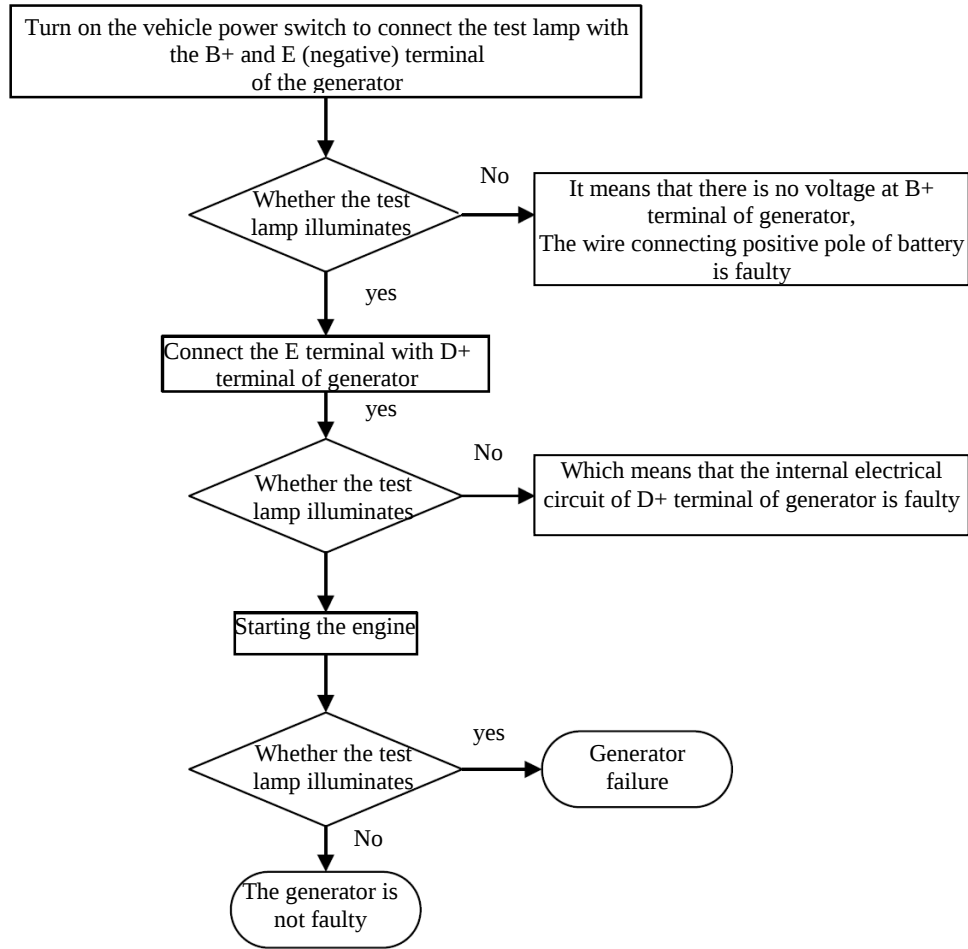


Fig. 4-73 Flowchart for Judging Generator Fault

Key point 2: Fault diagnosis and troubleshooting of charging system

a) Charging fault

Fault 1: Charging fault		
Vehicle Phenomenon	Troubleshoot	Fault Handling
(1) When the engine is working, the charging indicator doesn't go out.	a Check whether the voltage to ground of generator excitation end is 1-3V;	① If the voltage of generator indicator is very low, it means that the power of excitation line indicator is too low or the wire is virtually connected. Adjust the indicator power or check the wire plug and connecting points. ② If the terminal voltage of generator indicator is zero, it means that there is short circuit to ground at the excitation wire generator terminal, check the circuit. ③ If the terminal voltage of generator indicator is battery voltage, it means that the excitation circuit is faulty, and the generator governor and excitation pipe may be damaged. Be sure to modify the excitation circuit and connect the repaired generator.
	b Check whether the voltage to ground of generator output terminal B+ is the	① If the voltage to ground of terminal B+ is zero, check whether the positive and negative leads from generator to battery are connected. ② If the voltage to ground of terminal B+ is lower than the battery voltage, check all joints of positive and

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	battery voltage of about 24V	negative lead from the generator to the battery for looseness or the battery for damage. Recommended detection method: connect a 2W indicator between generator output terminal B+ and excitation terminal D+/L to observe the working condition of indicator and eliminate fault: Eliminate the fault: ① If the indicator brightness is normal, and the indicator goes out after the engine is started. The generator output voltage is 27-28.5V; the vehicle excitation line is faulty and needs repairing. ② If the indicator brightness is normal and the indicator doesn't go out after the engine is started, the generator output voltage is 27-28.5V; the generator adjuster is faulty and needs repairing. ③ If the indicator brightness is normal and the indicator doesn't go out after the engine is started, the generator output voltage is battery voltage; the generator adjuster, rectifier bridge, stator or internal wiring may be faulty and need repairing or replacing.
(2) The key is at ON and the charging indicator doesn't illuminate	a Check the charging indicator b Check the excitation circuit for open circuit	① Check whether the generator indicator has voltage to ground, if no, replace the indicator or check the circuit. ② If yes, it means that the generator speed governor or rotor is faulty, repair or replace the motor.
(3) When the engine is at idle speed, the charging indicator doesn't go out but goes out at high speed Off	a The indicator power is low or the parallel excitation resistance is loosened b The engine idle speed is too low	① It's suggested using 2-6w bulb or repairing the circuit ② Adjust the idle speed of engine

b) Too low charging voltage

Fault 2: Too low charging voltage		
Vehicle Phenomenon	Troubleshoot	Fault Handling
The battery charging is always insufficient. The charging voltage is low and the voltage drop at open load is obvious.	Learn whether the generator output power and vehicle appliance are properly matched.	Measure the B+ terminal voltage of generator, which is generally between 27.8 and 28.4. If the voltage is normal, it means that the voltmeter or voltmeter sampling point is faulty and needs repairing or replacing.
	a Check the voltmeter for damage.	① The idle speed of motor should be higher than 1,600RPM.
	b Check the generator speed.	② The speed of generator driving the air conditioner working at high power should be ≥ 2000 rpm or the voltage should be about 27V.
	c Check the quality and	① Check the generator and relevant wheel system belt quality, and be sure to replace the belt with coking, tooth

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	tensioning condition of generator and relevant wheel system drive belt.	loss, fracture, deformation, sinking, etc. ②Tighten the generator and relevant wheel system belt ★Attention: if the belt that needs to replace the belt is dual belt driving, be sure to replace the two belts!
	d Check the generator belt pulley	if it's loose, tighten it.
	e Check whether the wire is properly used and measure the generator and battery terminal voltage Compressor installation	①For working at high load, if the voltage difference is higher than 1V (if the wire is thin, the voltage drop is great), replace the wire Within 35A, $S \geq 6\text{mm}^2$ Within 70A, $S \geq 12\text{mm}^2$ Within 100A, $S \geq 20\text{mm}^2$ Within 150A, $S \geq 25\text{mm}^2$ ② For working at high load, the wire or connector is hot, replace the wire or connector.
The battery charging is always insufficient. The charging voltage is low and the voltage drop at open load is obvious.	f Check whether the wire and bolt connection of charging system is loosened, oxidized, virtually connected and generates high heat hot	①The lead with oxidized surface should be assembled after the grounding bolt housing surface is polished. ②Tighten the loose nut and wiring piece and tighten the connector again. ★Attention: For the reassembled or tightened part, after the engine is running for 3-5 minutes under high load, check whether it's very hot.
	g Test the phase output voltage of generator (about a half of output voltage of terminal B+)	If the phase terminal (W/R/AC) output voltage is quite different from the normal output value, the generator rectifier bridge or stator is faulty, repair or replace it.
	h Check whether the battery charging is normal ?	After charging of 10 minutes, if the charging current drops to about 10A, and the charging current is always 30-90A, it means that the battery is damaged and needs repairing or replacing.

c) Too high charging voltage

Fault 3: Too high charging voltage		
Vehicle Phenomenon	Troubleshoot	Fault Handling
The voltmeter shows high voltage	a Check the voltmeter for damage.	Measure the B+ terminal voltage of generator, which is generally between 27 and 28.4V. If the voltage is normal, it means that the voltmeter calibration value error is big and needs repairing or replacing.
	b Check the wire and connecting part of charging system and check the wiring bolt for	① For poor contact and loose wire, tighten it and tighten the connector again. ②For short circuit, connect the wire again.

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	looseness, virtual connection and overheat, and check whether the wire and generator housing is short circuit.	
	c Check the battery for normal working.	① Observe whether the charging current of battery changes (from 50A to within 10A) greatly in short time in the charging process, if not, replace the battery as quickly as possible; ② Observe whether the battery surface is clean and dry, the wiring pole and clamp are properly matched; if damaged, be sure to replace it as quickly as possible.
	d Test the phase output voltage of generator (about half of B+ terminal output voltage)	If the phase terminal (W/R/AC) output voltage is quite different from the normal output value, the voltage drop is great when the generator has load. The generator rectifier bridge or stator is faulty and needs repairing or replacing.
	e Complete above checks, if the above faults are not Solved	Replace the generator adjuster, rotor or machine.

d) Unstable charging voltage

Fault 4: Unstable charging voltage		
Vehicle Phenomenon	Troubleshoot	Fault Handling
When the engine is working properly, the voltmeter indicates charging but the pointer swings left and right so it's unable to see the reading clearly (or the charging indicator illuminates and goes out intermittently)	a Generator or relevant wheel system belt is too loose and bouncing	Tighten the generator and relevant wheel system belt
	b The connection of charging wire is loose and in poor contact	Check the connectors fastening the charging wire
	c The collector ring has dirt or the electric brush is excessively abraded or the electric brush spring is too soft and broken	Clear the dirt or replace the electric brush and electric brush spring
	d Adjuster damage	Replace the regulator.

e) Abnormal noise of generator

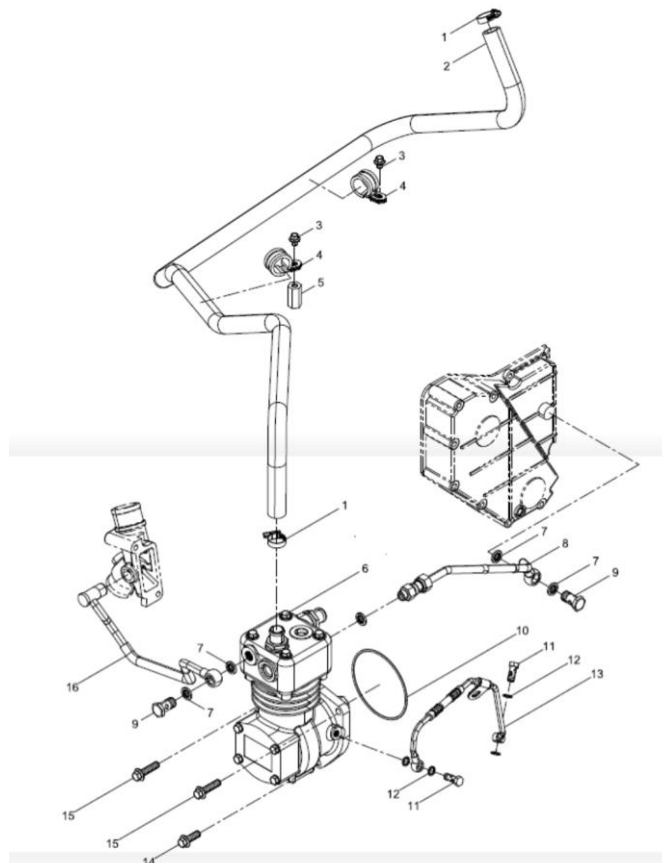
Fault 5: Abnormal noise of generator		
Vehicle Phenomenon	Troubleshoot	Fault Handling
Abnormal noise in the running process of generator	a The generator fixing support is deformed or the external machines are too close	Improve the mounting bracket strength and adjust the mounting state Status
	b The generator belt is loose and slipping	Replace the engine belt
	c The generator belt pulley is loose	Tightening pulley

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	d The generator shaft is lacking of oil or damaged	Replace the generator bearing
	e Deep abnormal noise in the generator	The stator coil is short circuit, so replace it
	f Howling in the generator varies with the speed	is the noise generated by stator iron core vibration replace the stator component.

4.10.2 Disassembly and assembly of air compressor

a. Disassembly drawing



1-clamp; 2-air compressor outlet pipe; 3-hexagon flange bearing toothed bolt; 4-single pipe clamp assembly; 5-supporting block; 6-air compressor assembly; 7-seal washer; 8-air compressor water inlet pipe; 9-hollow bolt; 10-seal ring; 11-hollow bolt; 12-seal washer; 13-air compressor lubricating pipe assembly; 14-hexagon flange bearing toothed bolt; 15-hexagon flange bearing toothed bolt; 16-air compressor water return pipe

Fig. 4-74 Exploded Drawing for Assembly of Air Compressor

b Disassembly

- 1) Disassemble the air compressor intake pipe, water inlet pipe, water outlet pipe and oil inlet pipe;
- 2) Disassemble 3 hexagon bolts on the air compressor flange to take down the air compressor.

c Key points of maintenance

- 1) No air from the air compressor

Fault phenomenon:

No compressed air from the air compressor.

Causes:

- ① The air compressor relief valve is blocked. The valve is deformed or broken;

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② Too much carbon deposit at the intake and exhaust port.

Fault judgment and solutions:

- ① Check the relief valve assembly, clean and replace the faulty parts;
- ② Disassemble and check the cylinder head, check the valve block and replace the deformed and broken valve block;
- ③ Disassemble and check the cylinder head and clean the valve base plate and valve block.

2) Insufficient air pressure

Fault phenomenon:

When the engine is running, the air compressor supplies air to the air storage tank and the air pressure gauges shows that the starting pressure is not reached.

Causes:

- ① Pressure gauge malfunction;
- ② The driving belt between the air compressor and engine is too loose and slipping or the pipe between air compressor and air storage tank is broken or the joint is leaked;
- ③ The oil-water separator, pipe or air filter are blocked by too much deposits;
- ④ The air compressor exhaust valve block is not tightly sealed, the spring is too soft or broken, the air compressor cylinder head bolt is loose or with blister and the cylinder head gasket is broken, resulting in air leakage;
- ⑤ The excessive abrasion of air compressor cylinder sleeve and piston and piston ring results in air leakage.

Fault judgment and solutions:

- ① Observe the pressure gauge, if it indicates insufficient pressure, keep the engine running at medium speed for several minutes, if the pressure still doesn't rise or rises slowly, when the brake pedal is pressed, the bleeding sound is loud, it means that the pressure gauge is damaged and it should be repaired;
- ② If there is no bleeding sound or small sound in the above test, check the air compressor belt for looseness, check the air compressor to air storage tank and control valve intake pipe and joint for looseness, breakage or air leakage;
- ③ If the air compressor doesn't supply air to the air storage tank, check whether the oil-water separator and air filter and pipe are blocked by too much dirt, if so, clear the dirt;
- ④ If it's still unable to find the fault cause after above inspections, further check the air compressor exhaust valve for air leakage, whether the spring is too soft or broken, whether the cylinder head has blister, whether the gasket is damaged; find out the fault, and replace or repair the damaged parts;
- ⑤ Check the air compressor cylinder sleeve and piston ring for excessive abrasion;
- ⑥ Check whether the installation direction of unloading valve is consistent with the arrow direction and make adjustment.

3) Air compressor oil pumping

Fault phenomenon:

If there is oil overflowing from the air filter and exhaust port, there is much oil overflowing from the air storage tank during (wet) water drainage.

Causes:

- ① The suction is blocked or the intake filtration is poor;
- ② The oil return is blocked;
- ③ The air compressor cylinder sleeve and piston and piston ring are excessively abraded or the oil ring is reversely assembled and blocked, resulting in lubricating oil overflowing;
- ④ The air compressor is not completely cool;
- ⑤ The dirt is not usually drained out from the air storage tank;
- ⑥ The air compressor is working for too long time;
- ⑦ The engine crankcase pressure is too high;

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- ⑧ The engine oil pressure is too high;
- ⑨ The lubricating oil is deteriorated;
- ⑩ The air compressor has defect.

Fault judgment and solutions:

- ① Check the air compressor filter, in case of damage, defect or dirty air filter element, replace the damaged parts in time; check the air compressor intake pipe for distortion or deformation to ensure minimum inner diameter of intake pipe;

Table 4-2 Minimum Inner Diameter of Intake Pipe Joint and Intake Pipe

Theoretical exhaust (m ³ /h)	Inner diameter of joint (mm)	Inner diameter of pipe joint (mm)	Inner diameter of pipe (mm)	Pipe length (mm)
≤17	Φ14	Φ14	Φ18	≤500
>17-20	Φ16	Φ16	Φ20	
>20-30	Φ18	Φ18	Φ22	
>30-40	Φ20	Φ20	Φ24	
>40-50	Φ22	Φ22	Φ26	
>50-60	Φ24	Φ24	Φ28	

$$Q_0 = \pi \times \frac{d^2}{4} \times$$

Note: the theoretical exhaust $\times$ piston stroke $\times n \div 10^9 \times$ piston number, n is the rated speed of air compressor, d is the cylinder bore.

- ② Ensure that the inner diameter of exhaust pipe is bigger than the minimum inner diameter required;

Table 4-3 Minimum Inner Diameter of Exhaust Pipe

Compressed air systems	Load circulation	Pipe length	Inner diameter of pipe
Single-cylinder air compressor (standard load circulation)	≤25%	≥3.6m	13mm
Single-cylinder air compressor (high load circulation)	25%-35%	3.6m-4.6m	16mm
Two-cylinder compressor (all load circulation)	≤35%	≥4.6m	22mm

- ③ Check and measure the abrasion and damage and assembly condition of air compressor cylinder sleeve and piston ring, if the abrasion is excessive, replace them;
- ④ As for the air cooling part of air compressor, clear the oil stain, ash or dirt accumulated on the cooling fin. Replace any damaged part; and check the cooling fin for damage and replace the damaged part. As for the water cooling part of air compressor, check the proper size of cooling pipe (suggested minimum diameter of pipe is 9.5mm), check the coolant flowing condition of air compressor; when adjusting the speed of engine, the minimum permissible flow is 5L/min. If the coolant flow is slow, check the rust, torsion and limiting factor of cooling pipe and accessory;
- ⑤ Check that the water temperature should not exceed 93℃. Check the air valve on the air reservoir to ensure normal operation. It's suggested assembling automatic exhaust valve on the vehicle. Configure air drying device before the air reservoir;
- ⑥ When the brake pedal is not pressed, the leakage should not exceed the 6.9kPa pressure drop per minute and when the brake pedal is pressed, the leakage should be 20.7kPa per minute. In case of serious leakage, check the system leakage and do repairing. Check whether the unloading system works properly and do repairing;
- ⑦ Check whether the engine crankcase pressure is too high, replace or repair the ventilation equipment of crankcase. The looseness or partial lifting of oil dipstick indicates pressure problem of crankcase;

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- ⑧ Check the lubrication pressure of engine (at the air compressor oil inlet) and compare it with the rated pressure;
- ⑨ Replace qualified lubricating oil;
- ⑩ Only above causes are confirmed, can the air compressor be replaced or repaired.

4) Abnormal noise of air compressor

Fault phenomenon:

Metal clash, even knocking or friction howling.

Causes:

- ① The connecting rod bearing is excessively abraded, the connecting bolt is loose, the connecting rod bushing is excessively abraded, spindle is excessively abraded or damaged, resulting in knocking sound;
- ② The belt is too loose, main and slave belt groove are not consistent, resulting in slipping and howling;
- ③ After the air compressor is running, no oil is supplied immediately, dry friction of metal results in howling;
- ④ The fixed bolt is loose;
- ⑤ The gear fastening nut is loose, resulting big gear gap and knocking sound;
- ⑥ There is impurity on the piston top.

Fault judgment and solutions:

- ① Check the connecting rod bush, connecting rod bushing and main bearing bush for abrasion, damage or burnt, check the connecting rod bolt for looseness, and check the air compressor main oil way for smoothness; it's suggested replacing the bush, bushing, main bearing bush under excessive abrasion or damage, tighten the connecting rod bolt (torque of (35-40)N.m), align the compression hollow oil hole with the air compressor oil inlet pipe; dredge the main oil way. During assembly, pay attention to main shaft bearing;
- ② Check whether the main driving and driven pulley grooves are consistent, if not, please replace them and adjust the belt tightness (press the belt by the thumb to 10mm);
- ③ Check the lubricating oil inlet pressure and oil pipe for damage and blockage; if the pressure is insufficient, immediately adjust, clean and replace the faulty pipe; check the oil quality and impurity content in the lubricating oil, compare it with the standard, if the standard is exceeded, immediately replace it; check whether the air compressor supplies oil, if not, immediately make comprehensive inspection;
- ④ Check whether the air compressor fixing bolt is loose and tighten it;
- ⑤ For gear driving air compressor, check the gear for looseness or the gear assembly condition, tighten the loose nut and replace it if there is any matching problem;
- ⑥ Clean the foreign matter.

5) Air compressor bush burning

Fault phenomenon:

The belt driving air compressor spindle is blocked; the gear driving air compressor bearing bush or connecting rod bush is very loose.

Causes:

- ① The lubricating oil is deteriorated or there are many impurities;
- ② There is insufficient oil supply or no oil supply;
- ③ The bearing bush displacement interrupts the oil way in the air compressor;
- ④ The bearing bush and connecting rod bush are damaged or the fit clearance is too small.

Fault judgment and solutions:

- ① Check the lubricating oil quality and impurity content, compare it with the standard, immediately replace it if the standard is exceeded;
- ② Check the lubricating oil inlet pressure and oil pipe for damage and blockage; if the pressure is insufficient, immediately adjust, clean and replace the faulty pipe;

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③ Check the bearing bush assembly position; the bearing bush oil hole must be aligned with the tank oil hole;

④ Check the bearing bush or connecting rod bush for burning or damage. When cleaning or replacing the bush, check the crankshaft for damage or abrasion, replace it if the standard is exceeded;

⑤ Check and adjust the bearing bush clearance.

6) Oil leakage of air compressor

Fault phenomenon:

The lubricating oil overflows out from the air compressor.

Causes:

① The oil seal falls off or the oil seal is faulty, resulting in leakage;

② The spindle is loose, resulting in leakage of oil seal;

③ The matching surface is leaked; the oil inlet and return pipe joint is loose;

④ The belt is too tight, resulting in abrasion of main bearing bush;

⑤ Casting or processing defects.

Fault judgment and solutions:

① Check the oil seal for fracture, and inner lip for no crack or turnup. With any of above conditions, replace it; Check the matching surface between oil seal and spindle for scratch and defect, if so, replace it. Check whether the oil return is smooth, the unsmooth oil return may cause too high pressure to crankcase, resulting in oil seal leakage or falling off, be sure to maintain minimum diameter of oil return pipe without distortion, bending and for smooth oil return. Check the oil seal and tank matching dimension, replace it if the standard is not met;

② Forcefully move the spindle to check whether the neck clearance is too big, if so, replace the bush and oil seal;

③ Check the sealing condition of matching part seal gasket, repair or replace the seal gasket; check the oil inlet and return joint bolt and tank thread and tighten the bolt;

④ Check and re-adjust the belt tightness and press it by the thumb to 10mm;

⑤ Check the tank for casting or processing defect *whether the oil return hole at the tank assembly position is smooth), repair or replace the faulty part.

7) Air compressor overheating

Fault phenomenon:

The air compressor exhaust temperature is too high; the running part is hot.

Causes:

① The relief valve or unloading valve doesn't work, resulting in constant running of air compressor;

② The brake system suffers serious leakage, resulting in constant running of air compressor;

③ Insufficient oil supply or scuffing at the running part.

Fault judgment and solutions:

① When intake unloading, check the relief valve for blockage, if so, clean or replace the faulty part; For exhaust unloading, check the unloading valve for blockage or clamping, repair or replace the faulty part;

② Check the brake system part and pipe and replace the damaged part;

③ Poor lubrication, small clearance or scuffing between piston and cylinder sleeve may cause overheating, check, repair or replace the faulty part.

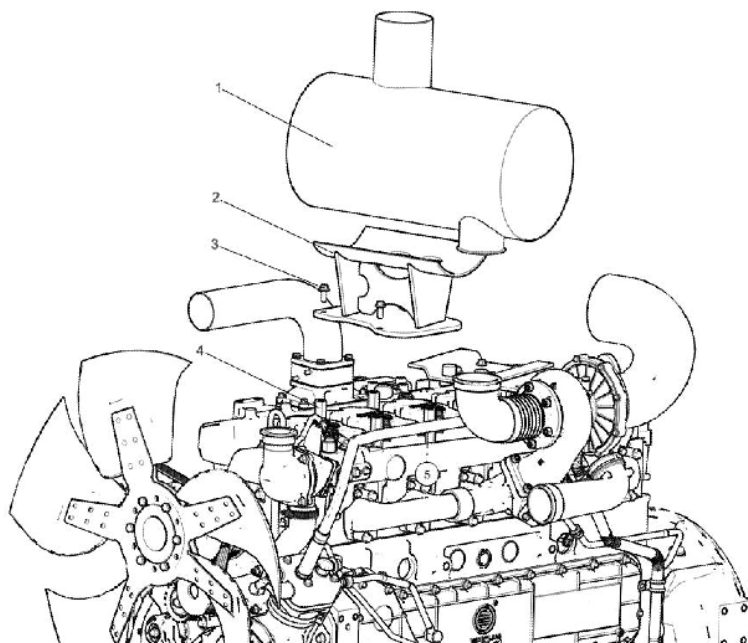
d Assembly

The assembly steps are contrary to the disassembly steps.

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4.10.3 Disassembly and assembly of silencer

a. Disassembly drawing



1-silencer; 2-silencer support; 3-hexagon flange bolt; 4-supporting block
Fig. 4-75 Exploded Drawing for Assembly of Silencer

b Disassembly

- 1) Disassemble the clip and silencer;
- 2) Disassemble 4 hexagon flange bolts on the silencer support and take down the silencer support.

c Assembly

The assembly steps are contrary to the disassembly steps.

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Appendix A DTC Table

Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
004	DFC_AccPe dBrkPlaus	The accelerator and brake signal is unbelievable	91	7	P0013	P2299	225	Accelerator brake pedal and	The engine is occasionally lack of power	The accelerator pedal and brake pedal are pressed at the same time	Clear the fault code and remind the driver of not pressing the remote accelerator pedal and brake pedal at the same time
007	DFC_AirHt StickOn	Intake heating normally on fault	2898	7	P0014	P2609	322	Intake heating grille, control relay	Intake heating malfunctions/harness burnt	1. Intake heating relay is not connected 2. Intake heating relay is short circuit	1. Connect the intake heating relay 2. Check the heating relay circuit for open circuit or short circuit
008	DFC_APP12Plaus	The two-time signal relation between accelerator pedal 1 and accelerator pedal 2 is unbelievable	520252	2	P000C	P2135	221	Accelerator pedal 1 and accelerator pedal 2	The accelerator malfunctions and the engine is running at 1,000 rpm	When using single modulus accelerator, at low idle speed, the deviation of accelerator pedal voltage signal is too big	1. Check the accelerator pedal for normality and replace the accelerator pedal 2. Check the accelerator pedal circuit and connector for short circuit and open circuit 3. Check the accelerator circuit for interference by other circuit
009	DFC_APP1SRCMax	Accelerator pedal 1. The voltage is higher than the upper threshold	91	3	P000A	P0123	221	Accelerator pedal 1	Limp home	Accelerator pedal or harness connector is damaged Bad	1. Whether the voltage of pedal 1 pin (X1-07) is higher than 4599mV and short to 5V power supply; 2. When the pedal 1 is pressed, whether the voltage of pedal 1 changes, if not, replace the pedal 1
010	DFC_APP1SRCMin	The voltage of accelerator pedal 1 is lower than the lower threshold	91	4	P000B	P0122	221	Accelerator pedal 1	Limp home	The accelerator or harness connector is damaged	1. Whether the voltage of pedal 1 pin (X1-07) is lower than 260mV and short to ground 2. When the pedal 1 is pressed, whether the voltage of pedal 1 changes, if not, check whether the pedal 1 is properly connected or replace pedal 1
012	DFC_APP2SRCMax	Accelerator pedal 2. The voltage is higher than the upper threshold	29	3	P000D	P0223	221	Accelerator pedal 2	Limp home	Accelerator pedal or harness connector is damaged Bad	1. Whether the voltage of pedal 2 pin (X1-08) is higher than 3621mV and short to 5V power supply; 2. When pedal 2 is pressed, whether the voltage of pedal 2 changes, if not, replace pedal 2
013	DFC_APP2 SRCMin	The voltage of accelerator pedal 2 is lower than the lower threshold	29	4	P000E	P0222	221	Accelerator pedal 2	Limp home	The accelerator or harness connector is damaged	1. Whether the voltage of pedal 2 pin (X1-08) is lower than 68mV and short to ground; 2. When the

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
											pedal 2 is pressed, whether the voltage of pedal 2 changes, if not, check whether the pedal 2 is properly connected or replace pedal 2;
014	DFC_APSC DNPL	Atmospheric pressure sensor signal is unbelievable	102	2	P0012	P006D	231	Intake pressure sensor or ambient pressure sensor	Storage fault code, it may be underpower	When parking, the intake pressure is 200hPa higher or 200hPa lower than the atmospheric pressure	1. Check whether the atmospheric pressure is consistent with the local atmospheric pressure, if it's quite different, replace ECU; 2. Check whether the intake pressure is consistent with the local atmospheric pressure, if it's quite different, replace the sensor;
015	DFC_APSC DSRCMax	The voltage of atmospheric pressure sensor is higher than the upper threshold	108	3	P0010	P2229	232	Barometric pressure sensor	At plateau, it's lack of power and there is black smoke	ECU inside The atmospheric pressure sensor is damaged	Replace ECU
016	DFC_APSC DSRCMin	The voltage of atmospheric pressure sensor is lower than the lower threshold	108	4	P0011	P2228	232	Barometric pressure sensor	At plateau, it's lack of power and there is black smoke	ECU inside The atmospheric pressure sensor is damaged	Replace ECU
017	DFC_ArHtl OpenLoad	Intake heater open circuit	289 8	5	P001B	P0110	321	Intake heating relay	Intake heating failure	Intake heating relay is not connected or open circuit	1. Check whether the intake heating relay circuit is properly connected with ECU (X1-37); 2. Check whether the intake heating relay is damaged.
018	DFC_ArHtl SCBat	The intake heater is short to power supply	289 8	3	P0019	P0113	321	Intake heating relay	Intake heating failure	The intake heating relay wiring is faulty	1. Check whether the intake heating relay control terminal X1-37 is short to power supply
019	DFC_ArHtl SCGnd	The intake heater is short to ground	289 8	4	P001A	P0112	321	Intake heating relay	Intake heating failure	The intake heating relay wiring is faulty	1. Check whether the intake heating relay control terminal X1-37 is short to ground
020	DFC_BattC DSRCMax	The original voltage of battery is lower than the lower threshold	168	4	P0020	P0562	124	Generator, battery	The engine is unable to start	The battery voltage is too high	1. Power off to check the battery voltage, it's normal if the battery voltage is 23-28V; 2. Power off and unplug the ECU vehicle connector and battery power line to check the circuit continuity, it's normal if the resistance is 0 Ω ; 3. Power on to check the voltage to ground of ECU positive pole, it's normal if the voltage is -24V.
021	DFC_BattC DSRCMin	The original	168	3	P001F	P0563	124	Generator, battery	ECU doesn't work	The battery	1. Power off to

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
		voltage of battery is higher than the upper threshold							properly and the engine stops working	voltage is too low	check the battery voltage, it's normal if the battery voltage is 23-28V; 2. Power off and unplug the ECU vehicle connector and battery power line to check the circuit continuity, it's normal if the resistance is 0Ω; 3. Power on to check the voltage to ground of ECU positive pole, it's normal if the voltage is -24V.
023	DFC_BPSC DSRCMax	The voltage of intake pressure sensor is higher than the upper threshold	102	3	P001C	P0238	231	Intake air pressure sensor	Limp home	The sensor or harness connector damaged	1. X2-68 pin and sensor are not properly connected 2. X2-68 pin is short to power line above 5V
024	DFC_BPSC DSRCMin	The voltage of intake pressure sensor is lower than the lower threshold	102	4	P001D	P0237	231	Intake air pressure sensor	Limp home	The sensor or harness connector damaged	X2-68 pin is short to ground wire
027	DFC_BrkC DNpl	The brake signal is unbelievable	597	2	P0022	P0504	223	Brake or brake harness	1. It's unable to judge the brake 2. It's unable to realize cruising 3. Brake override system failure	1. Main and auxiliary brake switch harness is faulty 2. The main and auxiliary brake signal is asynchronous	Check the main and auxiliary brake (when the main brake is pressed, X1-61 terminal is 24v, when the auxiliary brake is pressed, X1-62 terminal is 0V, check whether the two are synchronous) and relative harness (check whether connector X1-61 and X1-62 are connected)
029	DFC_Clg DynTst	The rising amplitude of cooling water temperature fails to reach the minimum value in certain time.	110	18	P002A	P0116	242	Engine water temperature	Engine torque limit	Water temperature sensor error	Check the engine temperature sensor harness or replace the water temperature sensor
030	DFC_ClgA bsTst	The cooling water temperature fails to reach the minimum value in certain time.	110	17	P0029	P0116	242	Engine water temperature	Engine torque limit	Water temperature sensor error	Check the engine temperature sensor harness or replace the water temperature sensor
033	DFC_Conv CDNpl	The clutch state signal is unbelievable	598	2	P002C	P0704	222	A Clutch	The clutch is unable to exit from cruising, after three driving cruise	The clutch switch is in poor contact	Check the clutch switch, ECU pin (X1-53) and circuit
034	DFC_CoVe hPrfmLimAct	OBD torque limit activation error	520 198	11	P00E6	P1007	511	Emission fault	OBD torque The limiter works	Emission fault	1. Check whether post-processing parts work properly
035	DFC_CSLp CDNoLoad	Cold start indicator is open circuit	626	5	P0025	P0381	332	Intake heating lamp	Intake heating lamp doesn't work	Intake heating lamp is not connected or open circuit	1. Check whether the intake heating lamp is connected or damaged; 2. Check whether the circuit is connected with ECU (X1-40)
036	DFC_CSLp CDSCBat	Cold start	626	3	P0023	P0381	332	Intake heating	Intake heating lamp	The intake	Check whether

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
		indicator is short to power supply						lamp	doesn't work	heating lamp circuit is faulty	the intake heating lamp X1-40 is short to power supply
037	DFC_CSLp CDSCGnd	Cold start indicator is short to ground	626	4	P0024	P0381	332	Intake heating lamp	Intake heating lamp doesn't work	The intake heating lamp circuit is faulty	Check whether the intake heating lamp signal terminal X1-40 is short to ground
038	DFC_CTSC DNpl	The cooling water temperature and oil temperature signal are unbelievable	110	2	P0028	P0116	241	Engine water temperature and oil temperature	Storage fault code	Sensor or harness fault	Check the sensor or harness
039	DFC_CTSC DOvrTemp	The water temperature sensor works properly but the water temperature exceeds the threshold	110	15	P00DD	P0217	242	Engine water temperature	Storage fault code	Sensor wiring or part	Check the sensor wiring or part
040	DFC_CTSC DSRCMax	The voltage of cooling water temperature sensor is higher than the upper threshold	110	3	P0026	P0118	241	Water temperature sensor	Engine torque limit	The sensor or harness connector is damaged	1. X2-27 pin and sensor are not properly connected 2. X2-27 pin is short to power line above 5V
041	DFC_CTSC DSRCMin	The voltage of cooling water temperature sensor is lower than the lower threshold	110	4	P0027	P0117	241	Water temperature sensor	Engine torque limit	The sensor or harness connector is damaged	X2-27 pin is short to ground wire
042	DFC_ECBt CDPfausLock	The vehicle ON/OFF button is stuck.	520 203	5	P002F	P2536	343	Vehicle start switch	Vehicle start function doesn't work	Vehicle stop switch is pressed for a long time	Check whether the switch is blocked and check the circuit for short circuit
044	DFC_EngM CaS1NoSig	Camshaft signal loss	420 1	12	P0033	P0340	123	Camshaft Speed Sensors	Starting difficulty underpower	1. The camshaft speed sensor is damaged; 2. It's short circuit	1. Replace the camshaft speed sensor; 2. Replacing harness Replace the harness
045	DFC_EngM CaSPer	Camshaft cycle error	420 1	2	P0031	P0341	123	Camshaft Speed Sensors	Starting difficulty underpower	1. The camshaft speed sensor is damaged; 2. It's short circuit	1. Replace the camshaft speed sensor; 2. Replacing harness Replace the harness
046	DFC_EngM CaSSyn	Camshaft synchronization error	420 1	11	P0032	P0341	123	Camshaft Speed Sensors	Starting difficulty underpower	1. The camshaft speed sensor is damaged; 2. It's short circuit	1. Replace the camshaft speed sensor; 2. Replacing harness Replace the harness
047	DFC_EngM CaSSynCrS	Camshaft and crankshaft synchronization error	420 1	13	P0035	P0340	123	Camshaft Speed Sensors	Starting difficulty underpower	1. The camshaft speed sensor is damaged; 2. It's short circuit	1. Replace the camshaft speed sensor; 2. Replacing harness Replace the harness
048	DFC_EngM CrS1NoSig	Camshaft signal loss	420 3	12	P0036	P0335	122	Crankshaft speed sensor	Starting difficulty underpower of engine	1. The crankshaft and camshaft are improperly assembled; 2. The crankshaft speed sensor is damaged; 3. Crankshaft speed sensor is improperly assembled; 4. The harness is disconnected; 5. Flywheel processing problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the crankshaft and camshaft phase; 4. Check the crankshaft speed sensor assembly line 5. Flywheel gear ring processing quality
049	DFC_EngM CrSSyn	Crankshaft synchronization error	420 3	3	P0039	P0336	122	Crankshaft speed sensor	Starting difficulty underpower of engine	1. The crankshaft and camshaft are improperly	1. Replace the crankshaft speed sensor; 2. Replace the

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
										assembled; 2. The crankshaft speed sensor is damaged; 3. The crankshaft speed sensor is improperly assembled; 4. The harness is disconnected; 5. Flywheel processing problem	harness; 3. Adjust the crankshaft and camshaft phase; 4. Check the crankshaft speed sensor assembly harness and flywheel gear ring processing quality
050	DFC_EngM CrSToothNr	Crankshaft tooth number error	420 3	4	P0038	P0336	122	Crankshaft speed sensor	Starting difficulty underpower of engine	1. The crankshaft and camshaft are improperly assembled; 2. The crankshaft speed sensor is damaged; 3. The crankshaft speed sensor is improperly assembled; 4. The harness is disconnected; 5. Flywheel processing problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the crankshaft and camshaft phase; 4. Check the crankshaft speed sensor assembly harness and flywheel gear ring processing quality
051	DFC_EngM CrSToothPe r	Crankshaft gear cycle error	420 3	2	P003A	P0336	122	Crankshaft speed sensor	Starting difficulty underpower of engine	1. The crankshaft and camshaft are improperly assembled; 2. The crankshaft speed sensor is damaged; 3. The crankshaft speed sensor is improperly assembled; 4. The harness is disconnected; 5. Flywheel processing problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the crankshaft and camshaft phase; 4. Check the crankshaft speed sensor assembly harness and flywheel gear ring processing quality
052	DFC_EngMOfsCaSCrS SRMax	The signal deviation between crankshaft and camshaft exceeds the threshold	420 1	14	P003B	P0340	123	Crankshaft speed sensor	Starting difficulty underpower of engine	1. The crankshaft and camshaft are improperly assembled; 2. The crankshaft speed sensor is damaged; 3. The crankshaft speed sensor is improperly assembled; 4. The harness is disconnected; 5. Flywheel processing problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the crankshaft and camshaft phase; 4. Check the crankshaft speed sensor assembly harness and flywheel gear ring processing quality
053	DFC_EngPr tOvrSpd	Engine speed exceeds the limit	176 9	11	P003C	P0219	513	Engine controller	Engine limp home	The engine speed exceeds the maximum permissible speed	Power off and restart.
057	DFC_ExFIC DOpenLoad	Exhaust brake butterfly valve is open circuit	520 208	5	P0042	P0475	311	Exhaust brake Solenoid valve (X1-20)	Exhaust brake malfunctions	The exhaust brake solenoid valve is not properly connected	1. Check whether the exhaust brake valve wire is properly connected with ECU (X1-20); 2. Check whether the exhaust brake valve is damaged.
058	DFC_ExFIC DSCBat	The exhaust brake butterfly valve is short to power supply.	520 208	3	P0040	P0478	311	Exhaust brake Solenoid valve (X1-20)	Exhaust brake malfunctions	The exhaust brake wire is short to power supply.	1. Check whether the exhaust brake valve control terminal X1-20 is short to power

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
											supply
059	DFC_ExtFIC DSCGnd	The exhaust brake butterfly valve is short to ground	520 208	4	P0041	P0477	311	Exhaust brake Solenoid valve (X1-20)	The exhaust brake valve doesn't work	The exhaust brake wire is short to ground	1. Check whether the exhaust brake control terminal X1-20 is short to ground
060	DFC_FanC D1OpenLoad	Fan executor (PWM wave) open circuit	481 5	7	P0047	P0481	312	Electromagnetic fan	Electromagnetic fan malfunctions	The electromagnetic fan relay 1 is not properly connected	1. Check whether the electromagnetic fan wire is properly connected with ECU (X2-76); 2. The electromagnetic fan is damaged.
061	DFC_FanC D1SCBat	Fan executor (PWM wave) is short to power supply	481 5	9	P0045	P0694	312	Electromagnetic fan	Electromagnetic fan malfunctions	The electromagnetic fan relay 1 is short to power supply	1. Check the electromagnetic fan; 2. Check whether the fan control terminal X2-76 is short to power supply; 3. Check whether the electromagnetic fan is damaged.
062	DFC_FanC D1SCGnd	Fan executor (PWM wave) is short to ground	481 5	10	P0046	P0693	312	Electromagnetic fan	The electromagnetic fan is always working	The electromagnetic fan relay 1 is short to ground	Check whether the fan control terminal X2-76 is short to ground
063	DFC_FanC D2OpenLoad	Fan executor (digital signal) open circuit	481 5	5	P004A	P0480	312	Electromagnetic fan	Electromagnetic fan malfunctions	The electromagnetic fan relay 2 is not properly connected	1. Check whether the electromagnetic fan wire is properly connected with ECU (X2-40); 2. The electromagnetic fan is damaged.
064	DFC_FanC D2SCBat	Fan executor (digital signal) is short to power supply	481 5	3	P0048	P0692	312	Electromagnetic fan	Electromagnetic fan malfunctions	The electromagnetic fan relay 2 is short to power supply	1. Check the electromagnetic fan; 2. Check whether the fan control terminal X2-40 is short to power supply; 3. Check whether the electromagnetic fan is damaged.
065	DFC_FanC D2SCGnd	Fan executor (digital signal) is short to ground	481 5	4	P0049	P0691	312	Electromagnetic fan	The electromagnetic fan is always working	The electromagnetic fan relay 2 is short to ground	Check whether the fan control terminal X2-40 is short to ground
066	DFC_FanC DSpMax	The cooling fan speed is higher than the upper threshold	163 9	3	P004B	P0495	316	Electronic control silicon oil fan	The fan speed is not accurate	The sensor is damaged or the data is unmatched	1. Check whether the electronic control silicon oil fan speed sensor is damaged; 2. Check whether the transmission ratio of fan and crankshaft is too big; 3. Check the data.
067	DFC_FanC DSpMin	The cooling fan speed is lower than the lower threshold	163 9	4	P004C	P0494	316	Electronic control silicon oil fan	The fan speed is not accurate	The sensor is damaged or the data is unmatched	1. Check whether the electronic control silicon oil fan speed sensor is damaged; 2. Check whether the transmission ratio of fan and crankshaft is too small;

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
											3. Check the data.
077	DFC_FlSys WtDet	The oil with water sensor detects water in oil	520 264	11	P0056	P2269	211	Coarse filter or fuel water content	Water content in diesel oil of engine is high	Coarse filter water cup level is High	Fuel coarse filter water cup drains water
078	DFC_FrmM ngAPPMMax Err	The bus receiver accelerator signal exceeds the limit	522 064	19	U0007	U0107	426	CAN bus	The accelerator signal replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
079	DFC_FrmM ngCM1DLC	CAN receiving frame CM1 data error	522 056	14	U004C	U0136	561	CAN bus	CM1 message Receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
080	DFC_FrmM ngCM1TO	CAN receiving frame CM1 timeout error	522 056	19	U004D	U0136	562	CAN bus	CM1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
081	DFC_FrmM ngDashDspl DLC	CAN receiving frame DashDspl data error	522 052	14	U0044	U0132	561	CAN bus	DashDspl Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
082	DFC_FrmM ngDashDspl TO	CAN receiving frame DashDspl Timeout error	522 052	19	U0045	U0132	562	CAN bus	DashDspl Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
083	DFC_FrmM ngDEC1DLC	CAN receiving frame DEC1 data error	522 062	14	U003F	U0101	561	CAN bus	DEC1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
084	DFC_FrmM ngDEC1TO	DEC1 message receiving timeout	522 062	19	U0005	U0107	437	CAN bus	DEC1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
085	DFC_FrmM ngEBC1DLC	CAN receiving frame EBC1 data length error	522 013	14	U0016	U0103	228	CAN bus	EBC1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
086	DFC_FrmM ngEBC1TO	CAN receiving frame EBC1 Timeout error	522 013	19	U0015	U0129	413	CAN bus	EBC1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
088	DFC_FrmM ngEBC2TO	Timeout error	522 015	19	U0019	U0129	413	CAN bus	EBC2 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
089	DFC_FrmM ngEGF1DLC	CAN receiving frame EGF1 data error	522 053	14	U0046	U0133	561	CAN bus	EGF1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
090	DFC_FrmM ngEGF1TO	CAN receiving frame EGF1 timeout error	522 053	19	U0047	U0133	562	CAN bus	EGF1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
091	DFC_FrmM ngEngTemp 2DLC	CAN receiving frame Engfemp 2data error	522 020	14	U0029	U0100	561	CAN bus	Engfemp 2message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
092	DFC_FrmM ngEngTemp 2TO	CAN receiving frame Engfemp 2timeout error	522 020	19	U002A	U0100	562	CAN bus	Engfemp 2message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected

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093	DFC_FrmM ngERC1DR DLC	CAN receiving frame ERC1DR data error	522 021	14	U002D	U0100	561	CAN bus	ERC1DR Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
094	DFC_FrmM ngERC1DR TO	CAN receiving frame ERC1DR Timeout error	522 021	19	U002E	U0100	562	CAN bus	ERC1DR Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
095	DFC_FrmM ngEfc1DL C	ETC1 message data length error	522 022	14	U0002	U0103	425	CAN bus	ETC1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
096	DFC_FrmM ngEfc1TO	ETC1 message receiving timeout	522 022	19	U0001	U0103	425	CAN bus	ETC1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
097	DFC_FrmM ngEfc2DL C	CAN receiving frame ETC2 data error	522 023	14	U002B	U0291	425	CAN bus	ETC2 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
098	DFC_FrmM ngEfc2TO	CAN receiving frame ETC2 Timeout error	522 023	19	U002C	U0291	425	CAN bus	ETC2 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
099	DFC_FrmM ngEfc7DL C	CAN receiving frame ETC7 data error	522 063	14	U003E	U0102	561	CAN bus	ETC7 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
100	DFC_FrmM ngEfc7TO	ETC7 message receiving timeout	522 063	19	U0006	U0108	425	CAN bus	ETC7 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
101	DFC_FrmM ngHRVD D LC	CAN receiving frame HRVD data error	522 051	14	U0042	U0131	561	CAN bus	HRVD message information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
102	DFC_FrmM ngHRVDf O	CAN receiving frame HRVD Timeout error	522 051	19	U0043	U0131	562	CAN bus	HRVD message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
103	DFC_FrmM ngRemAPP MaxErr	The bus receiver remote accelerator signal exceeds the limit	522 065	19	U0008	U0107	427	CAN bus	Remote accelerator signal replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
104	DFC_FrmM ngRxCCVS DLC	RxCCVS Message data length error	522 030	14	U0004	U0100	478	CAN bus	RxCCVS Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
105	DFC_FrmM ngRxCCVS TO	RxCCVS Message receiving timeout	522 030	19	U0003	U0104	460	CAN bus	RxCCVS Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
106	DFC_FrmM ngTRF1DL C	CAN receiving frame TRF1 data error	520 217	14	U004A	U0135	561	CAN bus	TRF1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
107	DFC_FrmM ngTRF1TO	CAN receiving frame TRF1 Timeout error	520 217	19	U004B	U0135	562	CAN bus or lock controller	TRF1 message receiving information replacement value; the engine is unable to start or limp home;	Bus error; controller disconnected; the loan is not paid in time	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected; 3.

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											Pay the loan in time The Loan
108	DFC_FrmM ngTSC1AE DLC	CAN receiving frame TSC1AE data error	522 035	14	U0027	U0121	414	CAN bus	TSC1AE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
109	DFC_FrmM ngTSC1AE TO	CAN receiving frame TSC1AE Timeout error	522 035	19	U0028	U0121	414	CAN bus	TSC1AE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
110	DFC_FrmM ngTSC1AR DLC	CAN receiving frame TSC1AR data error	522 036	14	U0023	U0121	414	CAN bus	TSC1AR Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
111	DFC_FrmM ngTSC1AR TO	CAN receiving frame TSC1AR Timeout error	522 036	19	U0024	U0121	414	CAN bus	TSC1AR Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
112	DFC_FrmM ngTSC1DE DLC	CAN receiving frame TSC1DE data error	522 037	14	U0025	U0121	415	CAN bus	TSC1DE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
113	DFC_FrmM ngTSC1DE TO	CAN receiving frame TSC1DE Timeout error	522 037	19	U0026	U0121	415	CAN bus	TSC1DE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
114	DFC_FrmM ngTSC1DR DLC	CAN receiving frame TSC1DR data error	522 038	14	U0021	U0121	415	CAN bus	TSC1DR Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
115	DFC_FrmM ngTSC1DR TO	CAN receiving frame TSC1DR Timeout error	522 038	19	U0022	U0121	415	CAN bus	TSC1DR Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
116	DFC_FrmM ngTSC1PE DLC	CANTOT SC1PE data error	522 039	14	U0009	U0121	416	CAN bus	TSC1PE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
117	DFC_FrmM ngTSC1PE TO	CANTOT SC1PE communication error	522 039	19	U000A	U0121	416	CAN bus	TSC1PE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
118	DFC_FrmM ngTSC1TE DLC	CANTOT SC1TE data error	522 040	14	U000B	U0121	417	CAN bus	TSC1TE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
119	DFC_FrmM ngTSC1TE TO	CANTOT SC1TE timeout error	522 040	19	U000C	U0121	417	CAN bus	TSC1TE Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
120	DFC_FrmM ngTSC1TR DLC	CANTOT SC1TR data error	522 041	14	U000D	U0121	417	CAN bus	TSC1TR Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
121	DFC_FrmM ngTSC1TR TO	CANTOT SC1TR timeout error	522 041	19	U000E	U0121	417	CAN bus	TSC1TR Message receiving information replacement value	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
122	DFC_FrmM ngTSC1VE DLC	CANTOT SC1VE data error	522 042	14	U000F	U0121	418	CAN bus	TSC1VE Message receiving information	Bus controller error; disconnected, etc.	1. Disconnect and re-connect it; 2. Check

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									replacement value	etc.	whether the harness CAN is disconnected
123	DFC_FrmM ngTSC1VE TO	CANTOT SC1VE timeout error	522 042	19	U0010	U0121	418	CAN bus	TSC1VE Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
124	DFC_FrmM ngTSC1VR DLC	CANTOT SC1VR data error	522 043	14	U0011	U0121	418	CAN bus	TSC1VR Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
125	DFC_FrmM ngTSC1VR TO	CANTOT SC1VR timeout error	522 043	19	U0012	U0121	418	CAN bus	TSC1VR Message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
128	DFC_Gearb xIncMax	The upshift clearance is too long	520 221	2	P0069	U0404	227	Shift lever	None	The shift lever is loose	Check the shift lever and ECU pin (X1-54)
129	DFC_Gen1 FlSysWtOp enLoad	(Oil with water indicator) is open circuit	624	12	P006C	P1625	334	(Oil with water) indicator	(Oil with water) indicator malfunctions	The indicator is not properly connected	1. Check whether the indicator is properly connected with ECU (X1-23); 2. Refers to Check whether the indicator is damaged.
130	DFC_Gen1 FlSysWtSC Bat	(Oil with water indicator) is short to power supply	624	3	P006A	P1623	334	(Oil with water) indicator	(Oil with water) indicator malfunctions	The indicator is short to power supply	1. Check whether the indicator X1-23 is Short to power supply
131	DFC_Gen1 FlSysWtSC Gnd	(Oil with water indicator) is short to ground	624	4	P006B	P1624	334	(Oil with water) indicator	(Oil with water) indicator is always illuminating	The indicator is short to ground	1. Check whether the indicator X1-23 is short to ground
132	DFC_HpTst	High pressure test error	520 223	20	P00C4	P160C	522	The hydraulic pressure of fuel system Device (high pressure oil pump, high pressure oil rail, etc.)	HOLD	High pressure oil pump or high pressure oil rail fault	Replace the high pressure oil pump or high pressure oil Rail
133	DFC_HWE MonEEPROM RdErr	EEPROM Read error	280 2	14	P006D	P062F	117	EEPROM	ECU fault storage fault code	ECU inside WRONG	Power off to restart it and replace ECU
134	DFC_HWE MonEEPROM WrtErr	EEPROM Write error	280 2	12	P006E	P062F	117	EEPROM	If the reading data is wrong, adopt the replacement value and storage fault code	ECU inside WRONG	Power off to restart it and replace ECU
135	DFC_IATS CDSRCMax	The voltage of intake temperature sensor is higher than the upper threshold	105	3	P006F	P0098	233	进气温度传感器 Air intake temperature sensor	It influences the engine combustion, even generates black smoke or underpower, etc.	The harness is damaged. The joint is damaged; the intake temperature sensor is damaged.	1. Check whether the intake temperature sensor is normal; 2. Use the multimeter to measure the voltage (higher than 4978mV) of intake temperature sensor pin after intercooling; and judge whether it's short to external power supply; 3. Check relevant harness and connector for damage, resulting in short circuit or open circuit
136	DFC_IATS CDSRCMin	The voltage of intake temperature sensor is lower than the lower threshold	105	4	P0070	P0097	233	Air intake temperature sensor	It influences the engine combustion, even generates black smoke or underpower, etc.	The harness is damaged. The joint is damaged; the intake temperature sensor is	1. Check whether the intake temperature sensor after intercooling is normal; 2. Use

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
										damaged.	the multimeter to measure the voltage (lower than 137mV) of intake temperature sensor pin after intercooling; and judge whether it's short to ground; 3. Check relevant harness and connector for damage, resulting in short circuit or open circuit
139	DFC_InjIni AsicErr	INJdriver1 C initialization version error	507	9	P009C	P1131	147	INJ chip	Reading data error, ECU malfunctions	ECU inside Fault	Power off to restart or replace ECU
140	DFC_InjIni EnaErr	INJdriver1 C initialization error after powering on	507	10	P009D	P1132	147	INJ chip	Reading data error, ECU malfunctions	ECU inside Fault	Power off to restart or replace ECU
143	DFC_InjPw rDrvDis	INJdriver1 C power-on error again	507	11	P009E	P1133	147	INJ chip	Reading data error, ECU malfunctions	ECU inside Fault	Power off to restart or replace ECU
144	DFC_InjVlv Cyl1AHSS CBat	The high end of fuel injector 1 is short to power supply	141 3	15	P0076	P0286	141	The fuel injector 1 (high end: X2-12; low end: X2-13)	Engine is lack of cylinder	Whether the high end of fuel injector is short to power supply	1. Check whether the high end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
146	DFC_InjVlv Cyl1ALSSC Bat	The low end of fuel injector 1 is short to power supply	141 3	16	P0074	P0280	141	The fuel injector 1 (high end: X2-12; low end: X2-13)	Engine is lack of cylinder	Whether the low end of fuel injector is short to power supply	1. Check whether the low end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
148	DFC_InjVlv Cyl1BNoLoad	Fuel injector 1 open circuit	141 3	5	P007A	P0201	141	The fuel injector 1 (high end: X2-12; low end: X2-13)	Engine is lack of cylinder	The high end or low end of fuel injector is not properly connected	1. Check whether the fuel injector wiring terminal is firmly connected; 2. Check whether the harness plug is properly connected with ECU pin
149	DFC_InjVlv Cyl1ERR	1# cylinder fuel injector error	141 3	11	P0057	P0292	141	The fuel injector 1 (high end: X2-12; low end: X2-13)	Engine is lack of cylinder	Unknown error type	1. Check whether the high end or low end of fuel injector is short to ground and power supply; 2. Check whether the high end or low end of fuel injector is short circuit; 3. Replace the connector or fuel injector
150	DFC_InjVlv Cyl1MNoLoad	As Bank 1# cylinder and other cylinder is open circuit or short to weak power supply	141 3	6	P0177	P02AA	141	Fuel injector 1	The engine is lack of cylinder and the alarm light illuminates	The fuel injector harness is damaged or not properly connected; the fuel injector is faulty	1. Check whether the fuel injector is short to power supply; 2. Check whether the fuel injector and other cylinder is open circuit; 3. Replace the fuel injector; 4. Check the harness and connector

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152	DFC_InjVlv Cyl1SCG	1# cylinder fuel injector is short to ground	141 3	7	P0059	P0262	141	The fuel injector 1 (high end: X2-12; low end: X2-13)	Engine is lack of cylinder	The high end or low end of fuel injector is short to ground	1. Check whether the high end of fuel injector is short to ground; 2. Check whether the low end of fuel injector is short to ground; 3. Replace the fuel injector
153	DFC_InjVlv Cyl1SCL	The high end and low end of fuel injector 1 is short circuit	141 3	4	P0078	P0261	141	The fuel injector 1 (high end: X2-12; low end: X2-13)	Engine is lack of cylinder	The high end and low end of fuel injector is short circuit	1. Check whether the high end or low end of fuel injector is short circuit; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
154	DFC_InjVlv Cyl2AHSS CBat	The high end of fuel injector 2 is short to power supply	141 4	15	P007D	P0287	142	The fuel injector 2 (high end: X2-14; low end: X2-15)	Engine is lack of cylinder	Whether the high end of fuel injector is short to power supply	1. Check whether the high end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
156	DFC_InjVlv Cyl2ALSSC Bat	The low end of fuel injector 2 is short to power supply	141 4	16	P007B	P0281	142	The fuel injector 2 (high end: X2-14; low end: X2-15)	Engine is lack of cylinder	Whether the low end of fuel injector is short to power supply	1. Check whether the low end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
158	DFC_InjVlv Cyl2BNoLoad	Fuel injector 2 open circuit	141 4	5	P0080	P0202	142	The fuel injector 2 (high end: X2-14; low end: X2-15)	Engine is lack of cylinder	The high end or low end of fuel injector is not properly connected	1. Check whether the fuel injector wiring terminal is firmly connected; 2. Check whether the harness plug is properly connected with ECU pin
159	DFC_InjVlv Cyl2ERR	2# cylinder fuel injector error	141 4	11	P005A	P0293	142	The fuel injector 2 (high end: X2-14; low end: X2-15)	Engine is lack of cylinder	Unknown error type	1. Check whether the high end or low end of fuel injector is short to ground and power supply; 2. Check whether the high end or low end of fuel injector is short circuit; 3. Replace the connector or fuel injector
160	DFC_InjVlv Cyl2MNoLoad	As Bank 2# cylinder and other cylinder is open circuit or short to weak power supply	141 4	6	P0178	P02AB	142	Fuel injector 2	The engine is lack of cylinder and the alarm light illuminates	The fuel injector harness is damaged or not properly connected; the fuel injector is faulty	1. Check whether the fuel injector is short to power supply; 2. Check whether the fuel injector and other cylinder is open circuit; 3. Replace the fuel injector; 4. Check the harness and connector
162	DFC_InjVlv Cyl2SCG	2# cylinder fuel injector is short to ground	141 4	7	P005C	P0265	142	The fuel injector 2 (high end: X2-14; low end: X2-15)	Engine is lack of cylinder	The high end or low end of fuel injector is short to ground	1. Check whether the high end of fuel injector is short to ground; 2. Check whether

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
											the low end of fuel injector is short to ground; 3. Replace the fuel injector
163	DFC_InjVlv Cyl2SCL	The high end and low end of fuel injector 2 is short circuit	141 4	4	P007F	P0264	142	The fuel injector 2 (high end: X2-14; low end: X2-15)	Engine is lack of cylinder	The high end and low end of fuel injector is short circuit	1. Check whether the high end or low end of fuel injector is short circuit; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
164	DFC_InjVlv Cyl3AHSS CBat	The high end of fuel injector 3 is short to power supply	141 5	15	P0083	P0288	143	The fuel injector 3 (high end: X2-16; low end: X2-17)	Engine is lack of cylinder	Whether the high end of fuel injector is short to power supply	1. Check whether the high end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
166	DFC_InjVlv Cyl3ALSSC Bat	The low end of fuel injector 3 is short to power supply	141 5	16	P0081	P0282	143	The fuel injector 3 (high end: X2-16; low end: X2-17)	Engine is lack of cylinder	Whether the low end of fuel injector is short to power supply	1. Check whether the low end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
168	DFC_InjVlv Cyl3BNoLoad	Fuel injector 3 open circuit	141 5	5	P0086	P0203	143	The fuel injector 3 (high end: X2-16; low end: X2-17)	Engine is lack of cylinder	The high end or low end of fuel injector is not properly connected	1. Check whether the fuel injector wiring terminal is firmly connected; 2. Check whether the harness plug is properly connected with ECU pin
169	DFC_InjVlv Cyl3ERR	3# cylinder fuel injector error	141 5	11	P005D	P0294	143	The fuel injector 3 (high end: X2-16; low end: X2-17)	Engine is lack of cylinder	Unknown error type	1. Check whether the high end or low end of fuel injector is short to ground and power supply; 2. Check whether the high end or low end of fuel injector is short circuit; 3. Replace the connector or fuel injector
170	DFC_InjVlv Cyl3MNoLoad	As Bank 3# cylinder and other cylinder is open circuit or short to weak power supply	141 5	6	P0179	P02AC	143	Fuel injector 3	The engine is lack of cylinder and the alarm light illuminates	The fuel injector harness is damaged or not properly connected; the fuel injector is faulty	1. Check whether the fuel injector is short to power supply; 2. Check whether the fuel injector and other cylinder is open circuit; 3. Replace the fuel injector; 4. Check the harness and connector
172	DFC_InjVlv Cyl3SCG	3# cylinder fuel injector is short to ground	141 5	7	P005F	P0268	143	The fuel injector 3 (high end: X2-16; low end: X2-17)	Engine is lack of cylinder	The high end or low end of fuel injector is short to ground	1. Check whether the high end of fuel injector is short to ground; 2. Check whether the low end of fuel injector is short to ground; 3. Replace the fuel injector
173	DFC_InjVlv Cyl3SCL	The high end	141 5	4	P0085	P0267	143	The fuel injector 3	Engine is lack of	The high end	1. Check

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		and low end of fuel injector 3 is short circuit						(high end: X2-16; low end: X2-17)	cylinder	and low end of fuel injector is short circuit	whether the high end or low end of fuel injector is short circuit; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
174	DFC_InjVlv Cyl4AHSS CBat	The high end of fuel injector 4 is short to power supply	1416	15	P0089	P0289	144	The fuel injector 4 (high end: X2-18; low end: X2-19)	Engine is lack of cylinder	Whether the high end of fuel injector is short to power supply	1. Check whether the high end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
176	DFC_InjVlv Cyl4ALSSC Bat	The low end of fuel injector 4 is short to power supply	1416	16	P0087	P0283	144	The fuel injector 3 (high end: X2-16; low end: X2-17)	Engine is lack of cylinder	Whether the low end of fuel injector is short to power supply	1. Check whether the low end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
178	DFC_InjVlv Cyl4BNoLoad	Fuel injector 4 open circuit	1416	5	P008C	P0204	144	The fuel injector 4 (high end: X2-18; low end: X2-19)	Engine is lack of cylinder	The high end or low end of fuel injector is not properly connected	1. Check whether the fuel injector wiring terminal is firmly connected; 2. Check whether the harness plug is properly connected with ECU pin
179	DFC_InjVlv Cyl4ERR	4# cylinder fuel injector error	1416	11	P0060	P0295	144	The fuel injector 4 (high end: X2-18; low end: X2-19)	Engine is lack of cylinder	Unknown error type	1. Check whether the high end or low end of fuel injector is short to ground and power supply; 2. Check whether the high end or low end of fuel injector is short circuit; 3. Replace the connector or fuel injector
180	DFC_InjVlv Cyl4MNoLoad	As Bank 4# cylinder and other cylinder is open circuit or short to weak power supply	1416	6	P017A	P02AD	144	Fuel injector 4	The engine is lack of cylinder and the alarm light illuminates	The fuel injector harness is damaged or not properly connected; the fuel injector is faulty	1. Check whether the fuel injector is short to power supply; 2. Check whether the fuel injector and other cylinder is open circuit; 3. Replace the fuel injector; 4. Check the harness and connector
182	DFC_InjVlv Cyl4SCG	4# cylinder fuel injector is short to ground	1416	7	P0062	P0271	144	The fuel injector 4 (high end: X2-18; low end: X2-19)	Engine is lack of cylinder	The high end or low end of fuel injector is short to ground	1. Check whether the high end of fuel injector is short to ground; 2. Check whether the low end of fuel injector is short to ground; 3. Replace the fuel injector
183	DFC_InjVlv Cyl4SCL	The high end and low end of fuel injector 4 is short circuit	1416	4	P008B	P0270	144	Fuel injector 4 (high end: X2-18; low end: X2-19)	Engine is lack of cylinder	The high end and low end of fuel injector is short circuit	1. Check whether the high end or low end of fuel injector is short circuit; 2. Check the fuel injector or

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											connector for damage; 3. Replace the fuel injector
184	DFC_InjVlv Cyl5AHSS CBat	The high end of fuel injector 5 is short to power supply	141 7	15	P008F	P0290	145	The fuel injector 5 (high end: X2-20; low end: X2-21)	Engine is lack of cylinder	Whether the high end of fuel injector is short to power supply	1. Check whether the high end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
186	DFC_InjVlv Cyl5ALSSC Bat	The low end of fuel injector 5 is short to power supply	141 7	16	P008D	P0284	145	The fuel injector 5 (high end: X2-20; low end: X2-21)	Engine is lack of cylinder	Whether the low end of fuel injector is short to power supply	1. Check whether the low end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
188	DFC_InjVlv Cyl5BNoLoad	Fuel injector 5 open circuit	141 7	5	P0093	P0205	145	The fuel injector 5 (high end: X2-20; low end: X2-21)	Engine is lack of cylinder	The high end or low end of fuel injector is not properly connected	1. Check whether the fuel injector wiring terminal is firmly connected; 2. Check whether the harness plug is properly connected with ECU pin
189	DFC_InjVlv Cyl5ERR	5# cylinder fuel injector error	141 7	11	P0063	P0296	145	The fuel injector 5 (high end: X2-20; low end: X2-21)	Engine is lack of cylinder	Unknown error type	1. Check whether the high end or low end of fuel injector is short to ground and power supply; 2. Check whether the high end or low end of fuel injector is short circuit; 3. Replace the connector or fuel injector
190	DFC_InjVlv Cyl5MNoLoad	As Bank 5# cylinder and other cylinder is open circuit or short to weak power supply	141 7	6	P017B	P02AE	145	Fuel injector 5	The engine is lack of cylinder and the alarm light illuminates	The fuel injector harness is damaged or not properly connected; the fuel injector is faulty	1. Check whether the fuel injector is short to power supply; 2. Check whether the fuel injector and other cylinder is open circuit; 3. Replace the fuel injector; 4. Check the harness and connector
192	DFC_InjVlv Cyl5SCG	5# cylinder fuel injector is short to ground	141 7	7	P0065	P0274	145	The fuel injector 5 (high end: X2-20; low end: X2-21)	Engine is lack of cylinder	The high end or low end of fuel injector is short to ground	1. Check whether the high end of fuel injector is short to ground; 2. Check whether the low end of fuel injector is short to ground; 3. Replace the fuel injector
193	DFC_InjVlv Cyl5SCL	The high end and low end of fuel injector 5 is short circuit	141 7	4	P0091	P0273	145	The fuel injector 5 (high end: X2-20; low end: X2-21)	Engine is lack of cylinder	The high end and low end of fuel injector is short circuit	1. Check whether the high end or low end of fuel injector is short circuit; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
194	DFC_InjVlv Cyl6AHSS	The high end of fuel injector 6 is	141 8	15	P0096	P0291	146	The fuel injector 6 (high end: X2-22;	Engine is lack of cylinder	Whether the high end of fuel	1. Check whether the high

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	CBat	short to power supply						low end: X2-24)		injector is short to power supply	end of fuel injector is short to power supply; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
196	DFC_InjVlv Cyl6ALSSC Bat	The low end of fuel injector 6 is short to power supply short to power supply	141 8	16	P0094	P0285	146	Fuel injector 5 (high end: X2-20; low end: X2-21)	Engine is lack of cylinder	Whether the low end of fuel injector is short to power supply	1. Check whether the low end of fuel injector is short circuit; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
198	DFC_InjVlv Cyl6BNoLoad	Fuel injector 6 open circuit	141 8	5	P009A	P0206	146	The fuel injector 6 (high end: X2-22; low end: X2-27)	Engine is lack of cylinder	The high end or low end of fuel injector is not properly connected	1. Check whether the fuel injector wiring terminal is firmly connected; 2. Check whether the harness plug is properly connected with ECU pin
199	DFC_InjVlv Cyl6ERR	6# cylinder fuel injector error	141 8	11	P0066	P0297	146	The fuel injector 6 (high end: X2-22; low end: X2-23)	Engine is lack of cylinder	Unknown error type	1. Check whether the high end or low end of fuel injector is short to ground and power supply; 2. Check whether the high end or low end of fuel injector is short circuit; 3. Replace the connector or fuel injector
200	DFC_InjVlv Cyl6MNoLoad	As Bank 6# cylinder and other cylinder is open circuit or short to weak power supply	141 8	6	P017C	P02AF	146	Fuel injector 6	The engine is lack of cylinder and the alarm light illuminates	The fuel injector harness is damaged or not properly connected; the fuel injector is faulty	1. Check whether the fuel injector is short to power supply; 2. Check whether the fuel injector and other cylinder is open circuit; 3. Replace the fuel injector; 4. Check the harness and connector
202	DFC_InjVlv Cyl6SCG	6# cylinder fuel injector is short to ground	141 8	7	P0068	P0277	146	The fuel injector 6 (high end: X2-22; low end: X2-23)	Engine is lack of cylinder	The high end or low end of fuel injector is short to ground	1. Check whether the high end of fuel injector is short to ground; 2. Check whether the low end of fuel injector is short to ground; 3. Replace the fuel injector
203	DFC_InjVlv Cyl6SCL	The high end and low end of fuel injector 6 is short circuit	141 8	4	P0098	P0276	146	The fuel injector 6 (high end: X2-22; low end: X2-26)	Engine is lack of cylinder	The high end and low end of fuel injector is short circuit	1. Check whether the high end or low end of fuel injector is short circuit; 2. Check the fuel injector or connector for damage; 3. Replace the fuel injector
204	DFC_MeUn CDNoLoad	Fuel gauge open circuit	144 2	7	P00C5	P0251	133	Fuel gauge	Engine limp home	Fuel gauge is not properly connected	1. Insert the fuel gauge connector; 2. Check whether the harness is disconnected. (X2-06);
205	DFC_MeUn CDSCBat	The fuel gauge	144 2	9	P00C6	P0254	133	Fuel gauge	Engine limp home	X2-06 Terminal	1. Unplug the

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		is short to power supply								is short to power supply	fuel gauge connector and measure the voltage of X2-06 of 3.5V;
206	DFC_MeUn CDSCGnd	The fuel gauge is short to ground	144 2	10	P00C7	P0253	133	Fuel gauge	Engine limp home	X2-06 Terminal circuit short to ground	1. Unplug the fuel gauge connector and measure the voltage of X2-06 of 3.5V;
207	DFC_MFLv CrCtlMode	Cruising signal is unbelievable (switch combination failure)	596	2	P00A0	P0575	341	Cruising switch	The cruising function is faulty	A switch is pressed for a long time; over two switches are pressed at the same time;	Check the circuit or switch (off: X1-63; reset: X1-64; up: X1-68; down: X1-51)
208	DFC_MILN oLoad	OBD lamp open circuit	520 219	5	P00A3	P0650	331	MIL lamp is OFF	MIL lamp is OFF	MIL lamp is not properly connected	1. Check whether MIL lamp is properly connected with ECU (X1-39); 2. Check whether the lamp is damaged. Breakage.
209	DFC_MILS CBat	OBD lamp is short to power supply	520 219	3	P00A1	P0650	331	MIL lamp is OFF	MIL lamp is OFF	MIL lamp is Short to power supply	1. Check whether the MIL lamp control terminal X1-39 is short to power supply
210	DFC_MILS CGnd	OBD lamp is short to ground	520 219	4	P00A2	P0650	331	MIL is always illuminating	MIL is always illuminating	MIL lamp is short to ground	1. Check whether the MIL lamp control terminal X1-39 is short to ground
224	DFC MSS CDNpl	The multi-state switch signal is unbelievable	976	19	P00A6	P253E	345	Econ-switch	Econ-switch malfunctions	Econ-switch is aging or the resistance is not matched	Replace a new econ-switch
225	DFC MSS CDSRCMax	The voltage of multi-state switch exceeds the upper threshold	976	3	P00A4	P251C	345	Econ-switch	Econ-switch malfunctions	The econ-switch is not properly connected or damaged	1. Disassemble the econ-switch and measure the voltage of ECU terminal X1-13 of 5V; 2. Check the connection between X1-13, X1-31 and econ-switch pin;
226	DFC_MSS CDsRcMin	The voltage of multi-state switch exceeds the lower threshold	976	4	P00A5	P251B	345	Econ-switch	Econ-switch malfunctions	The connector or switch is damaged	1. Measure the voltage of ECU terminal X1-13 of 5V; 2. Check whether the switch resistance is normal
230	DFC_OPSC DLow	Excessively low oil pressure	100	17	P00AD	P0524	243	Oil Pressure Sensor	Underpower	Excessively low oil pressure	1. Start the engine and use the diagnostic apparatus to test whether the oil pressure is lower than the permissible value of 1600hPa; 2. Replace the oil pressure sensor; 3. Check whether the oil pump and oil way relief valve are damaged;
231	DFC_OPSC DNpl	The oil pressure is too high or oil temperature signal is unbelievable	100	15	P00AC	P0523	243	Oil Pressure Sensor	Underpower	Sensor or harness fault	1. Power off to measure whether ECU sensor connector and oil pressure sensor connector are connected; 2. Power off and unplug the oil pressure sensor

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											connector to measure the voltage to ground of connector; it's normal if the voltage is ~0V;
232	DFC_OPSC DSRCMax	The voltage of oil pressure sensor is higher than the upper threshold	100	16	P00AA	P0523	243	Oil Pressure Sensor	Underpower	The sensor is not connected or short to power supply of 5V	1. X2-67 pin and sensor are not properly connected 2. X2-67 pin is short to power line above 5V; 3. Check the connector or sensor
233	DFC_OPSC DSRCMin	The voltage of oil pressure sensor is lower than the lower limit	100	18	P00AB	P0522	243	Oil Pressure Sensor	Underpower	The sensor is short to ground	1. X2-67 pin is short to ground; 2. Check the connector or sensor
234	DFC_OTSC D1Npl	The oil temperature sensor signal is unbelievable	175	15	P00B1	P0196	244	Oil temperature sensor	Save the flash code	The oil temperature exceeds the permissible 125 °C	1. Check whether the actual oil temperature is too high 2. Replace the oil temperature sensor
235	DFC_OTSC DSRCMax	The voltage of oil temperature sensor is higher than the upper threshold	175	3	P00AE	P0198	244	Oil temperature sensor	Underpower	The sensor is not connected or short to power supply of 5V	1. X2-25 pin and sensor are not properly connected 2. X2-25 pin is short to power line above 5V; 3. Check the connector or sensor
236	DFC_OTSC DSRCMin	The voltage of oil temperature sensor is lower than the lower threshold	175	4	P00AF	P0197	244	Oil temperature sensor	Underpower	The sensor is short to ground	1. X2-25 pin is short to ground; 2. Check the connector or sensor
242	DFC_PRV MonwearNumMax	The opening time of common rail relief valve exceeds the maximum number required by the technical requirement	520 241	11	P00CB	P0089	134	Common rail pipe	Engine limp home	1. High and low pressure oil way fault; 2. Rail Pressure sensor fault; 3. Fuel gauge fault	1. Check the high and low pressure oil way; 2. Confirm whether the rail pressure sensor is normal; 3. Confirm whether the fuel gauge is normal;
243	DFC_PRV Opn	Common rail relief valve is opened	520 241	14	P00C8	P0089	135	High and low pressure oil way; fuel gauge; rail pressure sensor	Engine performance is limited	The pressure of common rail pipe exceeds the permissible value	Check whether the oil return pipe is bending or blocked Check the flow metering unit is normally open and check the rail pressure sensor
244	DFC_PRVT iOpnMax	The opening time of pressure limiting valve exceeds the limit	520 241	0	P00C9	P0089	136	High and low pressure oil way; fuel gauge; rail pressure sensor	Engine performance is limited	1. High and low pressure oil way fault; 2. Rail Pressure sensor fault; 3. Fuel gauge fault	1. Check the high and low pressure oil way; 2. Confirm whether the rail pressure sensor is normal; 3. Confirm whether the fuel gauge is normal;
247	DFC_RailC DSRCMax	The voltage of rail pressure sensor is higher than the upper threshold	157	3	P00CC	P0193	131	Rail pressure sensor	Limp home	The rail pressure sensor is damaged or the harness is damaged and staggered	1. X2-66 pin and sensor are not properly connected 2. The X2-66 pin is short to power line above 5V
248	DFC_RailC DSRCMaxSop	Interruption acquisition mode; the voltage of rail pressure sensor	157	3	P0184	P0193	131	Rail pressure sensor	Limp home	The rail pressure sensor is damaged or the harness is damaged and	1. X2-66 pin and sensor are not properly connected 2. The X2-66

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		is higher than the upper threshold								staggered	pin is short to power line above 5V
249	DFC_RailC DSRCMin	The voltage of rail pressure sensor is lower than the lower threshold	157	4	P00CD	P0192	131	Rail pressure sensor	Limp home	The rail pressure sensor is damaged or the harness is damaged and staggered	X2-66 pin is short to ground wire
250	DFC_RailC DSRCMinS oP	Interruption acquisition mode rail pressure The voltage of sensor is lower than the lower threshold	157	4	P0185	P0192	131	Rail pressure sensor	Limp home	The rail pressure sensor is damaged or The harness is damaged or staggered	X2-66 pin is short to ground wire
252	DFC_RailM eUn10MeUnQHi	The fuel in fuel gauge exceeds the threshold	520 243	7	P00D8	P0251	252	High and low pressure oil way and relevant part fault	Engine performance is limited	High and low pressure oil way and relevant part	1. Check the high and low pressure oil way; 2. Check the rail pressure sensor; 3. Check the fuel gauge; 4. Checking fuel injectors
254	DFC_RailM eUn1OfsMaxQHi	The rail pressure deviation exceeds the upper threshold and the fuel injection volume exceeds the limit	520 243	0	P00D1	P0251	251	High and low pressure oil way and relevant part fault	Engine performance is limited	High and low pressure oil way and relevant part	1. Check the high and low pressure oil way; 2. Check the rail pressure sensor; 3. Check the fuel gauge; 4. Checking fuel injectors
255	DFC_RailM eUn2OfsMinQLo	The rail pressure deviation is lower than the lower threshold and the fuel injection volume is lower than the threshold.	520 243	1	P00D2	P0251	255	High and low pressure oil way and relevant part fault	Engine performance is limited	High and low pressure oil way and relevant part	1. Check the high and low pressure oil way; 2. Check the rail pressure sensor; 3. Check the fuel gauge; 4. Checking fuel injectors
256	DFC_RailM eUn3PkLo	The rail pressure peak is lower than the lower threshold	520 243	20	P00D3	P0087	256	High and low pressure oil way and relevant part fault	Engine performance is limited	High and low pressure oil way and relevant part	1. Check the high and low pressure oil way; 2. Check the rail pressure sensor; 3. Check the fuel gauge; 4. Checking fuel injectors
257	DFC_RailM eUn4PkHi	The rail pressure peak is higher than the upper threshold	520 243	21	P00D4	P0088	271	High and low pressure oil way and relevant part fault	Engine performance is limited	High and low pressure oil way and relevant part	1. Check the high and low pressure oil way; 2. Check the rail pressure sensor; 3. Check the fuel gauge; 4. Checking fuel injectors
259	DFC_RailM eUn7MeUnSetPlaus	At over-speed mode, the fuel gauge setting is unbelievable	520 243	23	P00D6	P1050	273	High and low pressure oil way and relevant part fault	Engine performance is limited	High and low pressure oil way and relevant part	1. Check the high and low pressure oil way; 2. Check the rail pressure sensor; 3. Check the fuel gauge; 4. Checking fuel injectors
260	DFC_RailM eUn8LowIdlMeUnMont r	At idle speed, the fuel gauge monitor is faulty	520 243	24	P00D7	P0251	274	High and low pressure oil way and relevant part fault	Engine performance is limited	High and low pressure oil way and relevant part	1. Check the high and low pressure oil way; 2. Check the rail pressure sensor; 3. Check the fuel gauge; 4. Checking fuel injectors
261	DFC_RmtA pp1SRCMax	The output voltage of remote accelerator pedal 1 is higher than the upper limit	520 277	3	P00E0	P1501	229	Remote accelerator pedal 1	Limp home	The remote accelerator pedal or its harness connector is damaged	Check the harness connector or replace the remote accelerator pedal
262	DFC_RmtA pp1SRCMin	The output voltage of remote accelerator pedal 1 is lower than	520 277	4	P00E1	P1503	229	Remote accelerator pedal 1	Limp home	The remote accelerator pedal or its harness connector is damaged	Check the harness connector or replace the remote

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		the lower limit									accelerator pedal
263	DFC_RmtA pp2SRCMax	The output voltage of remote accelerator pedal 2 is higher than the upper threshold	520 278	3	P00E2	P1502	229	Remote accelerator pedal 2	Limp home	The remote accelerator pedal or its harness connector is damaged	Check the harness connector or replace the remote accelerator pedal
264	DFC_RmtA pp2SRCMin	The output voltage of remote accelerator pedal 2 is lower than the lower threshold	520 278	4	P00E3	P1504	229	Remote accelerator pedal 2	Limp home	The remote accelerator pedal or its harness connector is damaged	Check the harness connector or replace the remote accelerator pedal
265	DFC_SSpM on1SRCMax	The voltage of sensor power supply 1 exceeds the upper threshold	350 9	3	P00B2	P0643	112	ECU sensor power supply 1	the output of sensor power supply 1 is abnormal	The engine is lack of power and there is black smoke	1. The harness or joint is damaged; 2. Replace ECU
266	DFC_SSpM on1SRCMin	The voltage of sensor power supply 1 is lower than the lower threshold	350 9	4	P00B3	P0643	112	ECU sensor power supply 1	the output of sensor power supply 1 is abnormal	The engine is lack of power and there is black smoke	1. The harness or joint is damaged; 2. Replace ECU
267	DFC_SSpM on2SRCMax	The voltage of sensor power supply 2 is higher than the upper threshold	351 0	3	P00B4	P0653	112	ECU sensor power supply 2	The output of sensor power supply 2 is abnormal	The engine is lack of power and there is black smoke	1. The harness or joint is damaged; 2. Replace ECU
268	DFC_SSpM on2SRCMin	The voltage of sensor power supply 2 is lower than the lower threshold	351 0	4	P00B5	P0653	112	ECU sensor power supply 2	The output of sensor power supply 2 is abnormal	The engine is lack of power and there is black smoke	1. The harness or joint is damaged; 2. Replace ECU
269	DFC_SSpM on3SRCMax	The voltage of sensor power supply 3 is higher than the upper threshold	351 1	3	P00B6	P0699	112	ECU sensor power supply 3	The output of sensor power supply 3 is abnormal	The engine is lack of power and there is black smoke	1. The harness or joint is damaged; 2. Replace ECU
270	DFC_SSpM on3SRCMin	The voltage of sensor power supply 3 is lower than the lower threshold	351 1	4	P00B7	P0699	112	ECU sensor power supply 3	The output of sensor power supply 3 is abnormal	The engine is lack of power and there is black smoke	1. The harness or joint is damaged; 2. Replace ECU
273	DFC_SfGP rslCkmo D1	Locking and locking mode 1	522 014	1	P00F4	U1001	412	Locking controller of CAN bus	The engine is unable to start or limp home;	1. The loan is not paid in time; 2. CAN Bus Error	1. The loan is paid in time; 2. Restart the CAN bus
274	DFC_SfGP rslCkmo D2	Locking and locking mode 2	522 014	2	P00F5	U1002	413	Locking controller of CAN bus	The engine is unable to start or limp home	1. The loan is not paid in time; 2. CAN Bus Error	1. The loan is paid in time; 2. Restart the CAN bus
277	DFC_SttC DLSSCBat	The low end of starting motor relay is short to power supply	167 5	3	P00DA	P0617	121	Starting relay	The engine is unable to start	The starting relay harness is damaged or connected wrongly	1. Check whether the starting relay control terminal X1-22 is short to power supply
278	DFC_SttC DLSSCGnd	The low end of starting motor relay is short to ground	167 5	4	P00DB	P0616	121	Starting relay	The engine is unable to start	The starting relay harness is damaged or connected wrongly	1. Check whether the starting relay control terminal X1-22 is short to ground
279	DFC_SttC DNoLoad	The starting motor relay is open circuit	167 5	5	P00DC	P0615	121	Starting relay and its harness	The engine is unable to start	The starting relay harness is open circuit or connected wrongly the starting relay is Damaged	1. Check whether the starting relay wire is properly connected with ECU (X1-22); 2. Check whether the starting relay is damaged.
280	DFC_T50C DTimeOut	T50 connection time exceeds the limit	520 253	11	P00B8	P2530	345	T50 switch	It's unable to start the engine	T50 close time exceeds 20s	1. Check whether T50 switch can be properly disconnected; 2. Check whether T50 pin (X1-58) and harness are short to power supply
281	DFC_TECU SRCMax	The voltage of ECU temperature sensor is lower than the lower threshold	113 6	4	P002E	P0668	119	ECU temperaturesensor	ECU inside The temperature should be normal value or default value	The voltage signal of ECU temperature sensor is higher than 4930mv	Replace ECU

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
282	DFC_TECU SRCMin	The voltage of ECU temperature sensor is higher than the upper threshold	113 6	3	P002D	P0669	119	ECU temperaturesensor	ECU inside The temperature should be normal value or default value	The voltage signal of ECU temperature sensor is lower than 440mv	Replace ECU
298	DFC_VSSC D1Max	The speed 1 is higher than the maximum threshold	84	0	P00B9	P0279	224	Speed sensor	The ECU speed default is 0 Save the flash code	The speed exceeds 170km/h	1. Verify whether the speed exceeds 170km/h, if not; 2. Check whether the speed sensor is properly assembled; 3. Whether the speed sensor is interfered with by other harness and parts (like instrument), which may influence the speed signal stability and result in speed error
299	DFC_VSSC D1Npl	The speed 1 and fuel injection volume and engine speed are unbelievable	84	2	P00BA	P0501	224	Speed sensor	The ECU speed default is 0 Save the flash code	The maximum line voltage of speed signal is <4.7V or the minimum line voltage of speed signal is >4.36V	1. Check whether the speed sensor is properly assembled, which may cause low maximum voltage or high minimum voltage; 2. Check whether the speed sensor is interfered with by other harness and part (like instrument), which may cause low maximum voltage or high minimum voltage;
303	DFC_WrnO penLoad	Alarm light open circuit	520 250	5	P00C0	P1604	333	Alarm light	It is unable to illuminate	The warming lamp is not properly assembled	1. Check whether the alarm light wire is properly connected with ECU (X1-35); 2. Whether the alarm light is damaged.
304	DFC_WrnS CBat	The alarm light is short to power supply.	520 250	3	P00BE	P1606	333	Alarm light	It is unable to illuminate	The alarm light control terminal is short to power supply	1. Check whether the alarm light control terminal X1-35 is short to power supply
305	DFC_WrnS CGnd	The alarm light is short to ground	520 250	4	P00BF	P1607	333	Alarm light	The light is on normally	The alarm light control terminal is short to ground	1. Check whether the alarm light control terminal X1-35 is short to ground
306	DFC_WtLv SRCIMax	The original voltage of oil with water sensor is higher than the upper threshold	520 264	3	P00E4	P2267	214	Oil with water sensor	Oil with water monitor malfunctions	The sensor is damaged or the harness is damaged and staggered	1. X1-12 pin and sensor are not properly connected 2. X1-12 pin is short to power line above 5V
307	DFC_WtLv SRCIMin	The original voltage of oil with water sensor is lower than the lower threshold	520 264	4	P00E5	P2266	214	Oil with water sensor	Oil with water monitor malfunctions	The sensor is damaged or the harness is damaged and staggered	X2-12 pin is short to ground wire
308	DFC_NetM ngCANOf f	CAN communication error	522 000	12	U0017	U0073	411	CAN bus	CAN Bus Communication fault	CAN module in ECU is damaged the nitrogen-	1. Check CAN bus 0 (X1-42/X1-43

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Index	DFC Name	Chinese definition	SPN	FMI	DTCM	P-CODE	Flash code	Related parts	Problem	Cause	Solutions
										oxygen sensor is not properly connected	and all relevant joints for short circuit and open circuit (X1-42 to ground 2.7V, X1-43 to ground 2.5V)
309	DFC_RmtA PP12Plaus	The 2-time relation of remote accelerator 2 is unbelievable	520 253	2	P0190	P1505	229	Remote accelerator pedal 1, remote accelerator pedal 2	The remote accelerator pedal malfunctions	When the single modulus remote accelerator is used, at idle speed, the voltage signal deviation of remote accelerator pedal is too big	1. Check whether the remote accelerator pedal is normal and replace the remote accelerator pedal 2. Check the remote accelerator pedal relevant circuit and connector for short circuit and open circuit 3. Check whether the remote accelerator line is interfered with by other lines
310	DFC_RmtA ccPedBrkPlaus	Check the remote accelerator and brake credibility	520 277	7	P0191	P2299	226	Remote accelerator pedal and brake pedal	The engine is occasionally lack of power	The remote accelerator pedal and brake pedal are pressed at the same time	Clear the fault code and remind the driver of not pressing the remote accelerator pedal and brake pedal at the same time
311	DFC_Com GPSKeyErr	key message fault	520 218	14	U0056	U0138	561	GPS controller	The engine is unable to start or limp home;	Artificial factors	Contact the owner to confirm whether the GPS module is original
312	DFC_Com GPSMsgTo	key message timeout	520 218	19	U0057	U0138	562	CAN bus	The engine is unable to start or limp home;	CAN Bus WRONG	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
314	DFC_Com GPSDrvCycIdle	When T15 is not powered on, the time of engine speed of 0 exceeds certain value	520 218	0	U0058	U0138	563	None	The engine is unable to start or limp home;	Artificial factors	Clear the fault and remind the owner of proper operation
315	DFC_FrmM ngTCO1TO	TCO1 message timeout	522 032	14	U005A	U0100	236	CAN bus	TCO1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
316	DFC_FrmM ngTCO1DLC	TCO1 message Message data length has error	522 032	19	U005B	U0100	468	CAN bus	TCO1 message receiving information replacement value	Bus error; controller disconnected, etc.	1. Disconnect and re-connect it; 2. Check whether the harness CAN is disconnected
320	DFC_Gear DetErr	The switch fails to work properly when the ECU is powered on and at idle speed	520 202	5	P0195	PD403	342	Shift lever	None	The shift lever is loose	Check the shift lever and ECU pin (X1-54)

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Appendix B Fit Clearance of Main Parts of Diesel Engine

(Reference)

S/N	Item	Theoretical value (mm)	
1	Main bearing clearance	Dafeng Industry, Anda	0.05-0.124
		Yantai Dafeng	0.1-0.114
2	Connecting rod bearing clearance	0.059-0.135	
3	Crankshaft end play	0.102-0.305	
4	Axial clearance of connecting rod plane	0.15-0.35	
5	Working clearance of piston ring opening in cold state		
	Top ring	0.35-0.55	
	Second ring	0.4-0.6	
	Oil ring	0.2-0.4	
6	Piston ring end clearance in cold state		
	Top ring		
	Second ring	0.08-0.115	
	Oil ring	0.04-0.075	
7	Clearance between camshafts	0.1-0.4	
8	Camshaft bearing clearance	0.04-0.12	
9	Valve clearance intake/exhaust (cold)	0.4/0.6	

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Appendix C Evaluation Criteria for Abrasion of Main Friction Pair of Diesel Engine

(Reference)

	Wear limit	Limit clearance
Close clearance of top ring	1.70	-
Height of top ring	0.10	-
Close clearance of second ring	1.50	-
Height of second ring	0.10	-
Close clearance of oil ring	1.50	-
Height of oil ring	0.15	-
Outer diameter of piston skirt	0.25	0.60
Inside diameter of the cylinder liner	0.50	
Outer diameter of piston pin	0.04	0.10
Inner diameter of piston pin hole	0.08	
Inner diameter of connecting rod small end liner	0.08	
Outer diameter of camshaft main journal	0.06	0.10
Inner diameter of camshaft liner	0.06	
Height of cam peach tip	2.00	-
Outer diameter of cam base circle	0.05	-
Outer diameter of crankshaft connecting rod journal	0.12	0.15
Inner diameter of connecting rod bearing	0.10	
Outer diameter of crankshaft main journal	0.08	0.15
Inner diameter of main bearing	0.10	
Thickness of thrust bearing	0.40	-
Intake valve sinkage	$0.04 \cdot d_{(1)}$	
Intake valve seal ring	0.75	
Intake valve-seat ring	0.75	
Exhaust valve sinkage	$0.04 \cdot d_{(1)}$	
Exhaust valve seal ring	0.85	
Exhaust valve seat insert	0.85	
Inner diameter of intake valve stem guide	0.06	0.1
Outer diameter of intake valve stem	0.06	
Inner diameter of exhaust valve stem guide	0.06	0.1
Outer diameter of exhaust valve rod	0.06	
Inner diameter of rockshaft liner	0.10	

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Outer diameter of rockshaft	0.05	0.12
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