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**Technical requirements for completion and acceptance of
vehicle engines overhaul**

汽车发动机大修竣工出厂技术条件

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Technical requirements for completion and acceptance of vehicle engines overhaul

1 Scope

This document specifies the basic requirements, main component requirements, assembly requirements, completion inspection requirements, test methods and quality assurance for vehicle engines overhaul.

This document applies to the engines of passenger vehicles and goods vehicles, which are fueled by gasoline and diesel, that have been overhauled and left out of the factory; it is used as a reference for engines that use other types of fuels.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB 3847, Limits and measurement methods for emissions from diesel vehicles under free acceleration and lugdown cycle

GB/T 5624, Motor vehicle maintenance and repair terms

GB/T 18276, Test-bed methods and evaluating index of dynamic property of motor vehicles

GB 18285, Limits and measurement methods for emissions from gasoline vehicles under two-speed idle conditions and short driving mode conditions

GB/T 18297, Performance test code for road vehicle engines

GB/T 18566, Inspection and evaluation method of fuel consumption for road transport vehicle

JT/T 1132 (all parts), Vehicle maintenance and repair electronic archives system

3 Terms and definitions

Terms and definitions determined by GB/T 5624 and the following ones are applicable to this document.

3.1

Engines overhaul

An operation to restore the operational capability of the engine, by repairing or replacing individual parts, to eliminate the failure or hidden danger that occurs or is found in the operation or maintenance process of the engine.

3.2

Passenger vehicle

A motor vehicle with more than 9 seats, including the driver's seat, that is designed and manufactured mainly for the carriage of passengers and their carry-on luggage.

3.3

Goods vehicle

Truck

A vehicle that is designed and manufactured primarily for the carriage of goods or for towing trailers, also including:

- a) A vehicle whose main purpose is to carry goods, although it is equipped with special equipment or appliances;
- b) A vehicle that is converted from a non-enclosed truck, and is not a special operation vehicle, although it is equipped with special equipment or appliances.

Note: Enclosed truck refers to a goods vehicle whose cargo-carrying structure is a closed box and is integrated with the cab, and whose body structure is one-box or two-box.

[Source: GB 7258-2017, 3.2.2]

4 Basic requirements

4.1 When the engine is disassembled, secondary damage or damage to the components shall be avoided.

4.2 The main bearing cap and connecting rod bearing cap shall be marked before disassembly and shall not be mixed.

4.3 After dismantling, the parts and assemblies shall be cleaned, and shall be free of oil stains, carbon deposits, scale deposit, rust, etc.

5.2.5 The valve guide shall be free from damage, cracking, eccentric wear and loosening.

5.3 Crankshaft flywheel set

5.3.1 The crankshaft, main bearing cover, flywheel, flywheel ring gear, torsional shock absorber and other parts and assemblies shall be in good condition without obvious damage or deformation.

5.3.2 The bending and twisting deformation of the crankshaft shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.3.3 The crankshaft shall be free of hidden defects, and should be inspected by methods such as dyeing or magnetic flaw detecting.

5.3.4 The surfaces of the crankshaft main journal and connecting rod journal shall be free from cracks, strains and ablation; the diameter, roundness, cylindricity and circular runout of the crankshaft journal and connecting rod journal shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.3.5 The flywheel ring gear shall be free of missing gear, twisting and deformation; the wear amount of the flywheel working face shall not exceed the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.4 Piston connecting rod set

5.4.1 Parts and assemblies such as pistons, connecting rods, connecting rod bearing caps shall be in good condition without obvious damage or deformation; parts and assemblies such as pistons and connecting rods shall be free of hidden defects.

5.4.2 The piston shall be free from ablation, falling off, carbon deposits, etc.; the wear amount of the piston pin hole and piston skirt shall not exceed the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.4.3 The surface of the piston pin shall be free of cracks, erosions and spots; the diameter, roundness and cylindricity of the piston pin shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.4.4 The bending and twisting deformation of the connecting rod shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.5 Valve mechanism

5.5.1 Parts and assemblies, such as camshaft, valve rocker, valve, valve spring, valve tappet, timing gear, timing pulley or sprocket, variable valve timing mechanism, timing chain, tensioner, shall be in good condition without obvious damage or deformation.

5.5.2 The cam shall be free from scratches, pitting corrosion and falling off; the camshaft diameter, circular runout, cam height, and cam wear amount shall meet the requirements of automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.5.3 Parts and assemblies such as camshafts and valves shall be free of hidden defects, and should be inspected by methods such as dyeing or magnetic flaw detecting.

5.5.4 The bottom surface of the valve lifter shall be free of concave wear and eccentric wear.

5.5.5 The width of the valve working surface shall be uniform, and free from ablation, cracking, spots, pits, grooves, etc.; the valve stem shall be free from bending and abrasion.

5.5.6 The valve spring shall be free from cracks and fractures. In the free state, the stiffness, unsupported length of the valve spring, and the verticality of the spring bearing to the center line shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.6 Other requirements.

5.6.1 The casing of the cooling water pump shall be free from cracks and deformation; the impeller, pump shaft, water seal and bearing shall be free from loosening, abrasion and deformation.

5.6.2 The temperature at which the thermostat is opened and fully opened, and the lift when fully opened shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

5.6.3 The oil pressure regulating valve, bypass valve, safety valve, crankcase ventilation valve, etc. shall not be stuck.

5.6.4 The oil circuit of the supercharger shall be unobstructed, and there shall be no oil leakage or air leakage; the surface of the impeller blades shall be free from carbon deposits; the impeller shall rotate flexibly without abnormal vibration.

5.6.5 The models of sensors and actuators related to the electronic control system shall match the model being repaired.

5.6.6 The wiring harness of the engine shall be free from damage, short circuit and open circuit; the waterproof seal shall be intact; the terminals of the plug connector shall not be bent, broken or missing.

requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

6.3.2 The replaced piston shall be the same set of piston of the same type; when the piston is replaced, a piston pin of standard diameter shall be used.

6.3.3 The connecting rod bushing shall be selected according to the diameter of the piston pin and the size of the connecting rod bearing hole.

6.3.4 The installation sequence and installation direction of the piston ring shall be correct; the installation position and installation direction of the piston connecting rod set shall be correct.

6.4 Valve mechanism

6.4.1 The installation position, sequence and axial clearance of the camshaft shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

6.4.2 The fit clearance between valve stem and valve guide, and between valve tappet and guide shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

6.4.3 The valve clearance shall be adjusted and measured according to the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

6.4.4 The cylinder block and the cylinder head shall be assembled at room temperature; the fastening sequence, method and torque of the cylinder head bolts shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

6.4.5 The timing marks on the timing gear and the transmission mechanism shall be aligned; the valve timing shall be correct; the meshing clearance of the timing gear shall be uniform.

6.4.6 The tension of timing belt and transmission belt shall be adjusted correctly.

6.5 Other requirements

6.5.1 The injection timing shall be adjusted correctly.

6.5.2 The high- and low-pressure oil circuit pressure of the engine shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

- c) The vacuum degree of the intake pipe shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

7.13 During acceleration and deceleration conditions, the engine speed shall transit smoothly without shaking, knocking, tempering, and firing.

7.14 Under the rated speed condition, the engine shall run smoothly without overheating and abnormal noise.

7.15 The oil pressure shall meet the requirements of the automobile maintenance technical information which is disclosed by the automobile manufacturer.

7.16 The pressure in the crankcase shall not exceed the atmospheric pressure at the time of measurement.

7.17 The dynamic property shall meet the requirements of GB/T 18276 for output power of driving wheels.

7.18 The emission performance shall meet the requirements of GB 3847 or GB 18285.

7.19 The fuel economy shall meet the requirements of GB/T 18566.

8 Test methods

8.1 Assembly inspection method

8.1.1 Fluorescence inspection

Spray a fluorescent penetrant of good permeability on the surface of the part to be tested; wash off the fluorescent substance on the surface after 30 minutes; then, use magnesium oxide dry powder to clean it; use an ultraviolet lamp to irradiate the part to be tested, and the fluorescent substance glows and shows cracks.

8.1.2 Flatness of cylinder block and cylinder head

Use a knife-edge ruler to stick to the inspected plane; use a thickness gauge to measure the clearance between the knife-edge ruler and the inspected plane; the maximum clearance is the flatness of the inspected plane.

8.1.3 Roundness and cylindricity of the cylinder

At the section near the top dead center, near the bottom dead center and in the middle of the cylinder, respectively measure the diameter of the cylinder along the axial and vertical directions of the crankshaft. Half of the size difference in two directions of the same section is the roundness of the position; the maximum roundness of the three

positions is the roundness of the cylinder; half of the difference between the maximum and minimum diameters of the cylinder is the cylindricity of the cylinder.

8.1.4 Circular runout

Use a V-shaped frame to set up the shaft to be measured; slowly rotate the shaft to be measured; use a dial indicator to measure the maximum runout of the journal of each shaft to be measured.

8.1.5 Axial clearance of the crankshaft

Pry the crankshaft back and forth; use a dial indicator to measure the active clearance of the crank plane.

8.1.6 Bending and twisting of the connecting rod

Connecting rod calibrators and thickness gauges shall be used to measure the bending and twisting of the connecting rod.

Use a support shaft to fix the connecting rod on the connecting rod calibrator from the connecting rod main bearing hole; install the mandrel on the piston pin hole of the connecting rod; close the three-point gauge to the mandrel; measure the clearance between the three measuring points and the plate; the measurement schematic diagram is shown in Figure 1:

- a) Where the two lower measuring points are in contact with the plate, the clearance between the upper measuring point and the plate is the bending of the connecting rod;
- b) Where only one lower measuring point is in contact with the plate, and the clearance between the other lower measuring point and the plate is twice the clearance between the upper measuring point and the plate, the clearance between the lower measuring point and the plate is the twisting of the connecting rod;
- c) Where one lower measuring point is in contact with the plate, but the clearance of the other lower measuring point is not equal to twice the clearance of the upper measuring point, the clearance between the lower measuring point and the plate is the twisting of the connecting rod, and the difference BETWEEN the clearance between the upper measuring point and the plate AND half the clearance between the lower measuring point and the plate is the bending of the connecting rod.

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