QSB6.7-M400 Engine Operation Manual

Foreword

Welcome to use this engine product. This manual is designed to provide you with key information on the correct operation, daily maintenance, troubleshooting and safety precautions of the engine, helping you standardize operations, extend the engine service life and ensure operational safety.
Please read this manual carefully before operating the engine and follow the requirements strictly; if you have any questions or encounter abnormal conditions during use, please contact after-sales service personnel in a timely manner.
This manual applies to all models of this engine series. For special configurations or model differences, specific instructions will be given in the corresponding chapters. The company reserves the final right of interpretation for the content of this manual. If there are updates to the engine design and technical parameters, no further notice will be given, please understand.
Chapter 1 Safety Precautions
1.1 Operational Safety

- Personal protective equipment (safety helmet, protective gloves, non-slip shoes, safety goggles, etc.) must be worn before operating the engine. Loose clothing and jewelry are strictly prohibited to avoid being caught by moving parts.
- When the engine is running, it is strictly forbidden to open the engine compartment cover or touch high-temperature components (exhaust pipe, cylinder block, turbocharger, etc.) to prevent scalding; it is strictly forbidden to touch rotating components (crankshaft, fan, belt, etc.) to prevent entanglement injuries.
- Maintenance and servicing operations are strictly prohibited while the engine is running. If such operations are necessary, the engine must be shut down, the power supply cut off, and the engine allowed to cool completely before proceeding.
- Before starting the engine, check the surrounding environment, remove flammable and explosive materials (gasoline, diesel, sundries, etc.), and keep open flames away to prevent fire and explosion accidents.
- Overloading and overspeeding of the engine are strictly prohibited. Avoid prolonged operation of the engine under extreme working conditions to prevent damage to components.

1.2 Fuel and Lubrication Safety

- Use fuel and lubricating oil that meet the engine specifications (above CH4 grade). Inferior and non-compliant fuel and lubricating oil are strictly prohibited to avoid damage to internal engine components.
- The engine must be shut down when refueling. Open flames and smoking are strictly prohibited to prevent fire caused by fuel leakage; if fuel leakage occurs during refueling, stop refueling immediately and continue only after cleaning up the leaked fuel.
- The amount of lubricating oil added must be appropriate, neither excessive nor insufficient. Excessive oil will increase the engine load, while insufficient oil will lead to inadequate lubrication, both of which will damage the engine.
- Store fuel and lubricating oil in sealed containers, away from fire and heat sources, and place in a ventilated and dry area to prevent deterioration and leakage.

1.3 Emergency Safety

- If an abnormality occurs during engine operation (abnormal noise, smoke, overheating, oil leakage, water leakage, etc.), shut down the engine immediately, cut off the power supply, troubleshoot the fault, and do not restart the engine until the fault is eliminated.
- In case of fire, shut down the engine immediately, cut off the fuel supply, and use a dry powder fire extinguisher to put out the fire. Direct water pouring on the high-temperature engine or fuel leakage area is strictly prohibited.
- If the engine fails to start due to a fault, forced starting is strictly prohibited to avoid aggravating the fault. Contact after-sales service personnel for maintenance in a timely manner.

Chapter 2 Basic Parameters and Structure of the Engine

2.1 Basic Parameters

Parameter Name	**Specifications**
Engine Model	QSB6.7-M400
Number of Cylinders/Arrangement	6-cylinder in-line
Displacement	6.7L
Rated Power	294kW/3000rpm
Maximum Torque	1100N·m/1900-2500rpm
Fuel Type	Diesel

Parameter Name	Specifications
Lubrication Method	Forced circulation lubrication
Cooling Method	Water cooling
Starting Method	Electric starting
Exhaust Cooling Method	Water-cooled exhaust manifold, water-cooled turbocharger

2.2 Basic Structure

The engine is mainly composed of the following core components. Understanding the function of each component is helpful for correct operation and maintenance:

- Cylinder block: The basic component of the engine, supporting all moving parts and accommodating cylinders and cooling fluid.
- Cylinder head: Seals the top of the cylinder, installs valves, spark plugs (for gasoline engines), fuel injectors (for diesel engines) and other components to ensure the airtightness of the cylinder.
- Crankshaft: Converts the reciprocating motion of the piston into rotational motion and transmits engine power.
- Piston and connecting rod: The piston makes reciprocating motion in the cylinder and drives the crankshaft to rotate through the connecting rod.
- Valve train: Composed of valves, camshaft, timing gears, etc., it controls the opening and closing of valves to ensure smooth intake and exhaust of the engine.
- Fuel supply system: Provides fuel meeting the requirements for the engine, including fuel tank, fuel pump, fuel injector and other components.
- Lubrication system: Provides lubrication for all moving parts of the engine to reduce wear, including oil pump, oil filter, oil sump and other components.
- Cooling system: Controls the engine operating temperature to prevent overheating, including water pump, radiator, thermostat and other components.
- Starting system: Starts the engine, including starter motor, battery, start switch and other components.
- Exhaust system: Discharges exhaust gas after engine combustion, including exhaust pipe, muffler and other components.

Chapter 3 Engine Operation Procedures

3.1 Pre-start Inspection

A comprehensive inspection must be carried out before starting the engine to confirm no abnormalities, so as to avoid faults after starting.

- Visual inspection: Check whether the engine compartment cover is closed tightly, all components are connected firmly without loosening or falling off; check whether there are traces of oil, water and air leakage on the engine surface.
- Fuel inspection: Check the fuel level in the fuel tank to ensure sufficient fuel; check whether the fuel pipeline is damaged or leaking, and whether the joints are fastened.
- Lubricating oil inspection: Pull out the dipstick to check whether the oil level is between the "MAX" (highest) and "MIN" (lowest) scales, and whether the oil color is normal (no blackening or emulsification); check whether the oil pipeline is leaking.
- Cooling fluid inspection: Check whether the cooling fluid level is above the water tank sight glass, whether the cooling fluid color is normal without turbidity or leakage; check whether the cooling pipeline and joints are fastened.
- Electrical inspection: Check whether the battery terminals are firm without loosening or oxidation; check whether the start switch and instruments are normal, and whether the circuits are damaged.
- Other inspections: Check the tightness of the fan belt and drive belt to avoid excessive looseness or tightness; check whether the air filter is clean and unobstructed.

3.2 Starting Operation

1. Turn the engine start switch to the "ON" position, wait for the instrument self-inspection to complete, and confirm that all instruments display normally (no fault warning lights on).
2. For diesel engines, the system will automatically turn on the preheating switch for preheating (the preheating time is adjusted according to the ambient temperature, generally 3-5 seconds, and can be appropriately extended in low-temperature environments), with the preheating time not exceeding 25 seconds.
3. Turn the start switch to the "START" position to start the engine, and the starting time should not exceed 5 seconds; if the start fails once, wait 10-15 seconds before restarting to avoid overheating damage to the starter motor.
4. After the engine starts, release the start switch and observe the engine operation: listen to whether the engine runs smoothly without abnormal

noise; check whether the instruments display normally (oil pressure, cooling fluid temperature, speed, etc.); inspect for oil, water and air leakage.

5. After the engine starts, idle preheating is required. The preheating time is determined according to the ambient temperature: 3-5 minutes for normal temperature (about 20℃), 5-10 minutes for low temperature (below 0℃), to ensure full lubrication of all engine components and the temperature rises to the normal range.

3.3 Operation in Running State

- After the engine is preheated (water temperature above 40℃), the speed can be increased slowly and the load applied gradually. Avoid sudden heavy load to prevent impact on engine components.
- During operation, pay close attention to the instrument display, keep the engine speed and load within the rated range, and strictly prohibit overspeeding and overloading.
- Pay attention to the engine operating status. If abnormalities such as abnormal noise, smoke, overheating, low oil pressure, and high cooling fluid temperature occur, reduce the load immediately, shut down the engine and troubleshoot the fault.
- It is strictly forbidden to open the engine compartment cover at will while the engine is running. If inspection is necessary, reduce the speed first, shut down the engine and wait for it to cool before proceeding.
- After long-term operation (more than 2 hours), regularly check the oil level and cooling fluid level to ensure they are normal; if the level is insufficient, replenish in a timely manner.

3.4 Shutdown Operation

1. Before shutdown, reduce the engine load first, lower the speed to idle (1000-1500rpm), and run at idle speed for 3-5 minutes to allow all engine components to cool down gradually and avoid damage to components caused by sudden shutdown.
2. Observe the instrument display, confirm no abnormalities, then turn the start switch to the "OFF" position to shut down the engine.
3. After the engine is shut down, check for oil, water and air leakage on the engine surface; check whether all components are connected firmly.
4. If the engine is not used for a long time (more than 7 days), close the fuel valve and disconnect the battery power supply to prevent fuel

leakage and battery power loss; conduct a comprehensive inspection and maintenance of the engine before storage.

Chapter 4 Daily Maintenance and Servicing

4.1 Maintenance Principles

Daily maintenance and servicing are the key to extending the engine service life and ensuring operational safety, and the principles of "regular inspection, timely replacement and standardized operation" must be followed; maintenance and servicing shall be carried out when the engine is shut down and cooled, in strict accordance with the cycles and methods required in this manual.

4.2 Daily Maintenance (Daily/Before Each Start)

- Check the fuel level, oil level and cooling fluid level to ensure they are within the specified ranges.
- Check for traces of oil, water and air leakage on the engine surface and whether all components are connected firmly.
- Check the tightness of the fan belt and drive belt for cracks and wear.
- Check the surface of the air filter for cleanliness and blockage.
- Check whether the battery terminals are firm and free of oxidation.

4.3 Regular Maintenance (Performed by Operating Time or Mileage)

Maintenance Cycle	**Maintenance Items**	**Maintenance Methods**
First 50 operating hours/500 km	1. Replace oil filter; 2. Check oil level and replenish oil; 3. Clean air filter; 4. Check cooling fluid level and replenish cooling fluid; 5. Check fuel filter and clean filter element.	1. Remove the oil filter, replace with a new filter element and tighten to the specified torque; 2. Pull out the dipstick to check the oil level, replenish oil that meets the specifications if insufficient; 3. Remove the air filter housing, clean the filter element, and replace it in a timely manner if it is damaged or blocked; 4. Check the water tank cooling fluid, replenish the same type of cooling fluid if insufficient; 5. Remove the fuel filter and replace with a new filter element.
First 200	1. Replace oil and oil filter;	1. After preheating the engine,

Maintenance Cycle	Maintenance Items	Maintenance Methods
operating hours/2000 km	2. Replace fuel filter; 3. Check valve clearance; 4. Check fan belt and drive belt, replace if necessary; 5. Check cooling system.	drain the old oil, replace the oil filter and add new oil to the specified level; 2. Replace with a new fuel filter and tighten to the specified torque; 3. Adjust the valve clearance to meet the technical requirements; 4. Check the belt tightness, replace with a new belt if there are severe cracks and wear; 5. Check the intercooler anti-corrosion device and replace it in a timely manner if severe corrosion occurs.
Every 500 operating hours/5000 km	1. Replace air filter, fuel filter, oil filter and oil; 2. Check crankcase ventilation system; 3. Conduct a comprehensive inspection of the connection of all engine components; 4. Check cooling system.	1. Replace air filter, fuel filter, oil filter and oil; 2. Check the crankcase ventilation pipe, clean the ventilation valve to ensure smooth ventilation; 3. Check whether all engine bolts and joints are firm without loosening or falling off; 4. Check the intercooler anti-corrosion device and replace it in a timely manner if severe corrosion occurs.
Every 1000 operating hours/10000 km	1. Replace air filter, fuel filter, oil filter and oil; 2. Check crankcase ventilation system; 3. Conduct a comprehensive inspection of the connection of all engine components; 4. Check cooling system.	1. Replace air filter, fuel filter, oil filter and oil; 2. Check the crankcase ventilation pipe, clean the ventilation valve to ensure smooth ventilation; 3. Check whether all engine bolts and joints are firm without loosening or falling off; 4. Check the intercooler anti-corrosion device and replace it in a timely manner if severe corrosion occurs.

4.4 Maintenance Notes

- During maintenance and servicing, use components, oil, cooling fluid, fuel, etc. that meet the engine specifications. Inferior and non-compliant products are strictly prohibited.
- When replacing components, ensure they are installed correctly and fastened in accordance with technical requirements to avoid faults caused by improper installation.
- Use special tools to clean filter elements, radiators and other components to avoid damage; ensure proper installation after cleaning.
- Keep records during maintenance, including maintenance time, maintenance items, replaced components, etc., for subsequent inquiry and traceability.
- If the engine is not used for a long time, start it regularly (1-2 times a month, running for 10-15 minutes each time) to prevent rusting of components and deterioration of oil.

Chapter 5 Common Fault Troubleshooting and Handling

If an abnormality occurs during engine operation, preliminary troubleshooting and handling can be carried out according to the following common fault phenomena; if the fault cannot be eliminated, contact after-sales service personnel in a timely manner. Do not forcibly start or operate the engine to avoid aggravating the fault.

Fault Phenomenon	**Possible Causes**	**Troubleshooting and Handling Methods**
Engine fails to start	1. Insufficient fuel or blocked fuel pipeline; 2. Battery power loss or loose terminals; 3. Starter motor fault; 4. Fuel injector fault.	1. Check the fuel level and replenish fuel; inspect the fuel pipeline and clear blockages; 2. Check the battery terminals and fasten loose joints; charge the battery before starting if it is low on power; 3. Inspect the starter motor, replace or repair if faulty; 4. Check the fuel injector, clean or replace faulty components.
Unstable idle speed after engine start	1. Clogged air filter; 2. Clogged fuel filter; 3. Fuel injector fault; 4. Improperly adjusted valve clearance.	1. Clean or replace the air filter; 2. Clean or replace the fuel filter; 3. Overhaul or replace the fuel injector; 4. Adjust the valve clearance to the specified range.

Fault Phenomenon	Possible Causes	Troubleshooting and Handling Methods
Abnormal noise during engine operation	1. Insufficient or deteriorated oil; 2. Worn and loose bearings; 3. Valve noise; 4. Loose or worn fan belt and drive belt; 5. Turbocharger fault.	1. Check the oil level, replenish or replace the oil; 2. Inspect the bearings, replace if severely worn; 3. Adjust the valve clearance and overhaul valve components; 4. Adjust the belt tightness and replace worn belts; 5. Overhaul the turbocharger, replace if necessary.
Engine overheating	1. Insufficient or deteriorated cooling fluid; 2. Clogged heat exchanger; 3. Water pump fault; 4. Thermostat fault.	1. Replenish or replace the cooling fluid; 2. Clean the heat exchanger; 3. Overhaul or replace the water pump; 4. Check the thermostat, replace if faulty.
Engine oil and water leakage	1. Loose pipeline joints; 2. Aged and damaged seals; 3. Cracks in components; 4. Excessive oil/cooling fluid added.	1. Fasten loose joints; 2. Replace aged and damaged seals; 3. Inspect components, replace if cracked; 4. Drain excess oil/cooling fluid to the specified level.
Insufficient engine power	1. Clogged air filter, air leakage in intercooler pipeline; 2. Insufficient fuel supply; 3. Fuel injector fault; 4. Turbocharger fault; 5. Engine overloading.	1. Clean or replace the air filter, re-fasten the intercooler pipeline; 2. Check the fuel pipeline and fuel filter to ensure smooth fuel supply; 3. Overhaul or replace the fuel injector; 4. Overhaul the turbocharger; 5. Reduce the engine load and avoid overloading.

Chapter 6 After-sales Service and Contact Information

6.1 After-sales Service Commitment

The company provides you with a comprehensive after-sales service. From the date of engine purchase, you are entitled to free warranty service within the specified period (see the product warranty card for the specific warranty period); within the warranty period, if the engine has non-human faults, the company will provide free maintenance services and replace faulty components.

After the warranty period, the company will provide paid maintenance services, charging reasonable component costs and maintenance man-hour fees; at the same time, we will provide long-term component supply and technical support services.

6.2 Warranty Claim Conditions

- When a fault occurs in the engine, contact after-sales service personnel in a timely manner and explain the fault phenomenon, operating time, maintenance status and other information.
- To make a warranty claim within the warranty period, provide the product purchase certificate and warranty card, ensure the engine is within the warranty scope, and there is no man-made damage or irregular operation.
- Cooperate with after-sales service personnel for fault troubleshooting and provide necessary assistance when making a warranty claim.

6.3 Contact Information

After-sales Service Hotline: [Fill in the after-sales service hotline number]
After-sales Service Email: [Fill in the after-sales service email address]
Company Address: [Fill in the detailed company address]
Service Hours: [Fill in the service hours, e.g.: Monday to Sunday 8:00-18:00]

Chapter 7 Supplementary Provisions

1. This manual is a guiding document for engine use and maintenance. If there is any discrepancy with the actual engine conditions, the actual engine configuration and technical parameters shall prevail.
2. The company reserves the right to modify the content of this manual due to product upgrades and technical improvements without further notice.
3. If the engine is damaged due to failure to operate and maintain the engine in accordance with the requirements of this manual, the company shall not bear the warranty liability.
4. The copyright of this manual belongs to the company. Unauthorized reproduction and distribution are prohibited without permission.