

FITTING INSTRUCTIONS

Fitting instructions

Table of Contents

1	Introduction	3
2	General recommendations	3
	Warning	3
	Cleaning	3
	Sealing caps	3
	Bolts and nuts	3
	Conventional and stretch bolts	3
	Flywheel and bolts	4
	Pulley/vibration damper	4
3	Cooling	4
	Coolant	4
	Thermostat	4
	Water pump	4
4	Fuel supply	5
	Air filter	5
	Intake manifold	5
	Intake manifold gasket	5
	Fuel filters	5
	Diesel high pressure pump	6
	Adjustment of the petrol injection system	6
	Injection pipes system	6
	Injectors	6
	Driving on LPG	6
5	Ignition system	7
6	Crank case ventilating system	7
7	Exhaust system	7
8	Automatic gearbox	7
9	Oil system	8
	Oil filter	8
	Oil type	8
10	Running-in advice	8
	Pre-start instructions	8
	Running in	8
	Diesel engines	9

1. Introduction

We are very pleased that you have decided to install a ApprovedGreen product. The quality of our product, together with the quality of the installation, determines the satisfaction obtained by the customer. Please take a few moments to read through these notes, they could save you a lot of time and unnecessary work.

2. General recommendations

Warning

To prevent repetition of engine damage, the failure of the old engine should be diagnosed and action taken as necessary. If not, the life of the new product is likely to be reduced. For example, in the event of damage to the piston, check the settings of the ignition, injection, and air intake manifold. Check the pressure (output) on the oil pumps that are not supplied by ApprovedGreen. If your vehicle is fitted with an oil cooler system, then it is essential that the unit is removed and cleaned out thoroughly. If there has been an engine damage where metal parts were in the oil, the oil cooler always have to be replaced, if not residue from previous engine failure will contaminate the lubrication system.

Cleaning

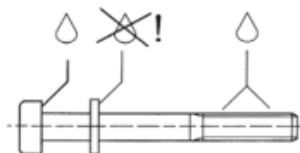
It is recommended to clean the engine compartment after the engine and/or gearbox has been removed. Your customer will appreciate it and the installation of the new engine can be completed more quickly and professionally.

Sealing caps

Most openings in the engine are provided with caps upon delivery. Do not remove these caps until the fittings are installed on the engine. This will reduce the risk of foreign objects falling into your engine.

Bolts and nuts

Always tighten nuts and bolts to the specified torque. Some nuts and bolts can only be used once. It is advisable to lightly lubricate the cylinder-head bolts on the screw thread and in between the washer and cylinder head before fitting.



Conventional and stretch bolts

- conventional bolts are only tightened to a torque setting.
- Torque to Yield, more commonly known as stretch bolts, are tightened to a provisional torque setting, always followed by an angle tightening.
- Always replace stretch bolts with new ones.
- Never use torque setting instructions of conventional bolts to fit stretch bolts, as the performance of stretch bolts is based on an entirely different principle, and this might cause leaking of the head gasket (cylinder-head bolts) or even cause the cylinder block to crack.
- Never use a torque as the "check setting" for a stretch bolt.
- Observe the instructions for the order of tightening.
- Use the most recently applicable tightening instructions from the producer of the vehicle.
- Always ensure that the cylinder block threads that accept the head retaining bolts are thoroughly cleaned out. Foreign objects and oil residue have to be removed.



Fly wheel and bolts

If the holes for the bolts are drilled through the crankshaft, the mating threads should be smeared with sealing compound to avoid oil leakage. Fit the bolts at the correct torque and check the starter ring and the clutch surface for wear or damage.



Pulley / vibration damper

Carefully fit the pulley, ensuring that the drive key is correctly located. Clean all components thoroughly. Fit the central pulley bolt with the correct torque setting and, if necessary, use a locking fluid. Before installation: check the crankshaft contact surface for the pulley thoroughly in order to ensure correct installation. Check the rubber damping element of the vibration damper



3. Cooling

The radiator must be checked, preferably by a specialist. Optimum cooling is of vital importance for the engine, in particular during the running-in period.

Check the performance of the fan, sensors, and

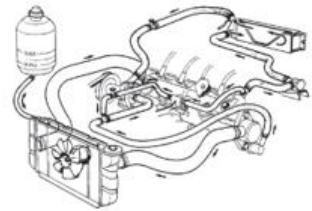
radiator/expansion tank cap.

Check the water hoses; replace if they are punctured or damaged. This will

prevent problems for your

customer. Always fit a new thermostat and use

new hose clips when water hoses are replaced, which will ensure a proper sealing. Don't forget to check the EGR cooler



Coolant

Always use new coolant, this will protect the cooling system from corrosion and erosion. Carefully extract air from the cooling system in accordance with the manufacturer's instructions to prevent damage to the engine. Check the cooling system, preferably by pressure testing it.

Thermostat

Heat up the thermostat in hot water to check the opening temperature.



Water pump

If the water pump is not supplied, the pump to be used must be checked for corrosion, leakage and wear of the bearings. Replace the pump if necessary.



4. Fuel supply

A fuel supply system that is not performing to an optimum will be to the detriment of the engine. A too rich mixture costs fuel, and will also cause damage and excessive wear of the cylinders and piston rings. A too lean mixture will cause a too high temperature, creating overheating.



Air filter

Replace the air filter with a new one of the correct type. A blocked air filter will increase the fuel consumption, and may even cause damage to the engine. An incorrect, punctured or incorrectly fitted air filter may pass through dirt and dust, which will cause increased wear of the piston rings and bearings.



Intake manifold

Before fitting the intake manifold, check for foreign objects, which may be inside the manifold following a previous engine failure. The best method is to knock it lightly and then blow it out with compressed air.



Intake manifold gasket

It is essential to provide complete sealing between the manifold and the cylinder head. The gasket surfaces should be clean, undamaged and free of grease. Ensure that the securing bolts and/or nuts are tightened in the correct order, and to the correct torque. A leaking gasket of a petrol engine may cause a weak mixture, creating thermal overload and causing damage to valves and pistons.

Fuel filters

It is important to renew the fuel filters. The smallest particle of dirt will damage the injection pump or the injectors. Make sure the surrounding area of the filter housing is clean before the filter is replaced. A blocked filter will lower the fuel pressure (petrol injection systems), resulting in a weak mixture, which may cause piston damage due to overheating.



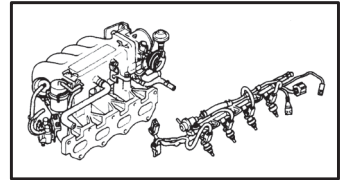


Diesel high pressure pump

Always test the high pressure pump before refitting. Make sure that the correct fuel relief valve (return port) is fitted to obtain the required engine performance. A too rich setting or incorrect timing may cause a great deal of smoke emission. Always protect the system from dirt so it can't damage or seize the plungers in the pump or the injection needles of the injectors.

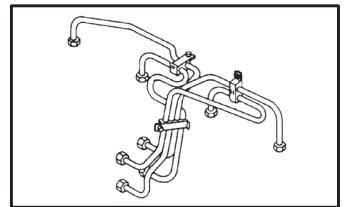
Adjustment of the petrol

injection system The petrol injection system must be checked and adjusted by a specialist. Insufficient power could be the result of insufficient fuel, and the fuel distributor or the fuel feed pump may be the reason for this problem.



Injection pipes system

Always avoid entry of dust and moisture into the pipes, as this may cause damage to the injectors. After installation, and before starting the engine, the pump, pipes and injectors should be bled. Use the correct tools to fit the unions and tighten to the correct torque. The pipes should be fitted in a tension-free condition to avoid breakage from stress cracking. Pipes must only be blown through with filtered air.



Injectors

Check the injectors for dirt and deposits and make sure that the injection needle is not stuck. A poor sealing will cause a rich mixture. If the injector needle cannot come clear of the seat, the mixture will become too weak. Check the spray pattern and make sure the injector does not leak. Check the opening pressure of the injectors.

Driving on LPG

During de-aeration of the cooling system, the evaporator should also be de-aerated. To prevent incorrect air mixture, it is essential that the gas mixture part of the evaporator should not have any leaks. The engine must be run-in on petrol only. Only after 3000 km (1800 miles), can it be switched to gas.

5. Ignition / sensors



Check before installation always if the correct Crankshaft position sensor ring is fitted! Always fit new spark plugs according to the factory instructions. The performance of the module and sensors of an electronic motor management system must be checked with specialized equipment. Replace defective parts if necessary.

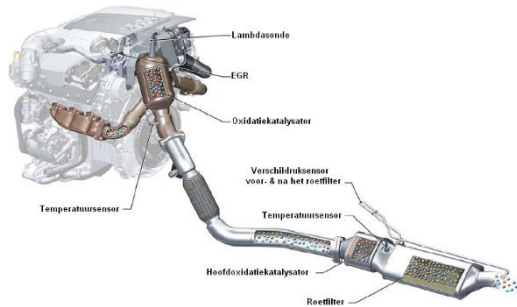
6. Crankcase ventilating system

Check before installation the crankcase ventilation system, the proper operation of the crankcase ventilation valve is very important for the right functionality of the engine. An incorrect valve can lead to high oil consumption and turbocharger damage.



7. Exhaust system

Exhaust systems should be checked for restrictions and debris that could have happened as a result of the previous engine failure. It is a common occurrence for catalytic converters to melt down and block exhaust systems, which eventually leads to engine damage. Therefore it is very important to check or replace the lambda sensor and catalytic converter to prevent repetition



8. Automatic gearbox

When the engine is used with an automatic gearbox it is easy to make a serious mistake. The torque converter is connected to the oil pump of the gearbox by a hollow shaft. When the old engine is removed, the hollow shaft can easily slip out of the oil pump. Before installation of the new engine, the hollow shaft must be re-located, rotating it into the oil pump. The actuating cams at the end of the hollow shaft are to be inserted into the recess of the oil pump.



9. Oil system

Oil filter

Always replace the filter by the correct filter type.

Oil type

Fill the engine with the oil type according to the manufacturer's instructions. Do not add any loose additives, which may be detrimental to the additives that are in the oil as a standard.



10. Running-in advice

Pre-start instructions

Before starting it is important to make sure that all parts are tight, that there is sufficient oil in the crankcase, that there is sufficient coolant in the cooling system and that the belt tension is correct. Many modern cars no longer have an oil pressure warning light when starting, so it is very important to observe the following procedure:

- Connect a mechanical oil pressure gauge to the oil supply system.
- With a petrol engine, disconnect the connectors from the injectors. If there is no room for this, disconnect the ignition system plugs. With a diesel, the fuel supply to the cylinders must be prevented.
- Crank the engine without starting until it has sufficient oil pressure. You can check this by reading the oil pressure gauge. If this does not work, you must bleed the lubrication system by filling the oil filter housing and the oil channels with oil.
- If there is sufficient oil pressure, you can connect the injectors or ignition coils or open the fuel supply to the cylinders on a diesel.
- Start the engine and let it run at an increased idle speed.
- Closely monitor engine oil pressure and temperature.
- If the oil pressure is correct, the oil pressure gauge can be disassembled.
- Add enough coolant when bleeding.
- Check whether oil and/or water leaks occur.

Running in

The purpose of running in a reconditioned engine, is to gradually enlarge the bearing surface of two contact-sliding surfaces. Even though these surfaces can be treated with modern means of production, it is advisable to be cautious in the beginning when loading the engine. The engine must first reach operating temperature before it can be loaded. The correct method of running in is to drive with different speeds, while the load can be increased now and then for a short period. Avoid unnecessary idling and constant revolutions, never more than 5 minutes consecutively. Change down gear in time. The engine must not run at low r.p.m. and high load. Also avoid too high revolutions, especially in high gears. At high revolutions do not brake using the engine.

Check the oil level daily to prevent damage caused by shortage of lubrication oil. The oil consumption can be higher than usual during the running in period. After a while it should settle at the specified level. After 1000 km the car should be returned to the engine installer for a first inspection and an oil (and filter) change. Further maintenance should be carried out according to the original manufacturer's specifications.

Diesel engines

When an engine is treated too gentle (low revs and loads), a layer will develop on the cylinder wall consisting of metal particles, carbon and other chemical products, which are not removed due to the slight contact pressure of the piston springs. This "enamel layer" fills and covers the bore glaze grooves causing the oil-containing capacity in the cylinder wall to be considerably reduced. Once this layer has formed, proper running in is no longer possible. Diesel engines especially, are sensitive to this. A reasonable load will press the upper piston ring well onto the wall, which will remove the enamel layer. Take note that if running idle for a longer period, it is not recommended to idle for more than 5 minutes during the run-ning-in period. For the initial 750 to 1000 km, it is advisable to use loads of 60 - 80 % of the engine capacity