



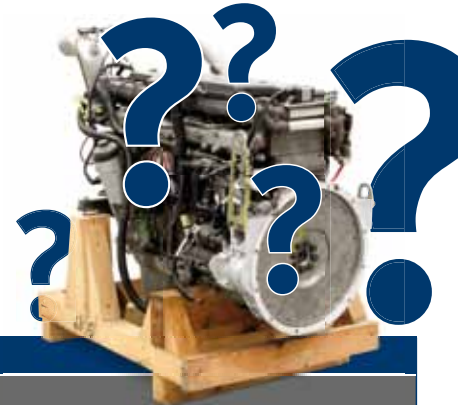
Engine installation and initial start-up

Checklist for avoiding consequential faults

Situation

Following engine repairs, severe damage often occurs soon after, because certain things were not heeded during replacement of the engine. Overlooked problems in the periphery of the engine, whether mechanical

or electrical, have often resulted in expensive consequential faults. With the checklist below, the majority of possible sources of trouble can be eliminated from the start during engine installation.



Engine mechanics		
Component	Activity	Background
intake system	check, clean	A damaged engine can cause fragments, metal particles and other foreign bodies to remain in the intake system, which when left in the engine result in immediate engine damage.
charge-air cooler	clean or replace	Following engine damage, there are often large quantities of engine oil in the charge-air cooler. If a new engine is connected to the charge-air cooler, this can lead to renewed engine damage.
turbocharger connecting lines	check, clean, replace	The inside of supply and return lines often gets clogged with carbon due to thermal influences, which damages the turbocharger. Mechanically clean the lines (with a metal brush), or replace them. Blowing out lines with compressed air is not recommended.
turbocharger	check, replace	The turbine and compressor impellers must be in impeccable condition, they must not be deformed or cracked, or have ground against the housing.
oil filter, oil cooler and oil lines	clean or replace	Metal particles resulting from engine damage can be flushed to the clean side of the oil filter. Thoroughly wash out and clean the oil cooler and filter housing. Blowing out with compressed air is not recommended. It is advisable to completely replace the oil cooler and connecting lines.
oil system	fill	After you have connected it to all components supplied with pressure oil (oil cooler, turbocharger, hydraulic pumps, etc.), fill the engine with pressure oil to prevent dry running and damage to bearings. This process is described in detail in KS Service Information "KS SI 0012 Filling reconditioned engines with pressure oil".
exhaust system	check, clean, replace	When an engine is damaged, piston, valve and turbocharger fragments as well as fuel and oil get into the exhaust system, causing further damage to the catalyst or the particulate filter.
fuel filter and filter housing	check, clean	Injectors and high-pressure pumps in diesel engines are extremely sensitive to fuel contamination.
fuel/tank contents	check, replace if necessary	Filling the tank with the incorrect fuel frequently leads to engine damage. If there is any uncertainty regarding the composition of the existing tank contents, empty the tank completely and fill with the specified fuel.



Engine mechanics (continued)		
Component	Activity	Background
cooling system	clean	Before installing the engine, rinse cooling system components remaining in the vehicle with clean water.
coolant	replace	Only use specified coolant in the correct dilution. Do not start up the engine, even briefly, without filling the cooling system. If the water pump runs dry, the scraper ring seal burns immediately and the pump starts to leak.

Before starting the new engine		
Component	Activity	Background
electric cables and hose connections	check	Check correct connections using a circuit diagram of all vacuum lines and electrical connections. This also applies to earth cables between the engine and the body/starter battery. This prevents damage to electrical components and cables due to overload.
engine	start	Let the engine build up oil pressure before starting up. If necessary, take suitable measures to ensure that the engine does not start up before oil pressure has built up.
engine	after start-up	After start-up, do not damage the engine through repeated acceleration. The oil system needs some time until it has bled completely and all components are supplied with fresh oil.

Electronic components		
Component	Activity	Background
engine control unit(s)	fault check	Read out the fault code memory, make a note of faults, delete fault codes
engine electronics with components	actuator test	The actuator test is used to check the function of the relevant components. This is helpful for flagging up interchanged connectors and faulty actuators, for example.
perform adaptation	adapt, teach in	Today, many components have to be adapted following replacement. These include, for example: Air mass sensors, step motors, throttle valves, regulating throttles and EGR valves. Also see PIERBURG Service Information SI 0090 and SI 0092.
common rail injectors	programme	After being swapped or replaced, common rail injectors must be programmed in the control unit separately for each cylinder. This is essential in order to compensate for manufacturing tolerances. To this aim, a code is printed on every injector, which must be programmed in the control unit using a diagnostic tester. The injectors from some manufacturers do not have a code, and programming is not necessary. These injectors programme themselves by means of a built-in invariable resistor. Such injectors can be recognised by their 4-way connector and by the lack of a printed code.

Test drive/finishing work/final inspection		
Component	Activity	Background
test drive	note OBD driving cycle	The test drive should incorporate a cold start, warm-up, urban traffic, driving on a highway and a motorway. In addition, please bear in mind that in passenger cars, for example, some components are no longer monitored by the OBD at speeds in excess of 75 mph.
fault code memory	check, delete	Always do this BEFORE and AFTER the test drive, even if the MIL (malfunction indicator lamp) does not light up during or after the test drive. With OBD systems, the MIL is often only activated after a fault has occurred twice. However, a fault code is stored in the memory the first time this fault occurs.