Products affected

Truck			Bus			Power Solutions		
4	PGRT	LPGRS	4	FKN	CK	P93	P96	E2011
–	–	X	–	–	–	–	–	–

Miscellaneous:

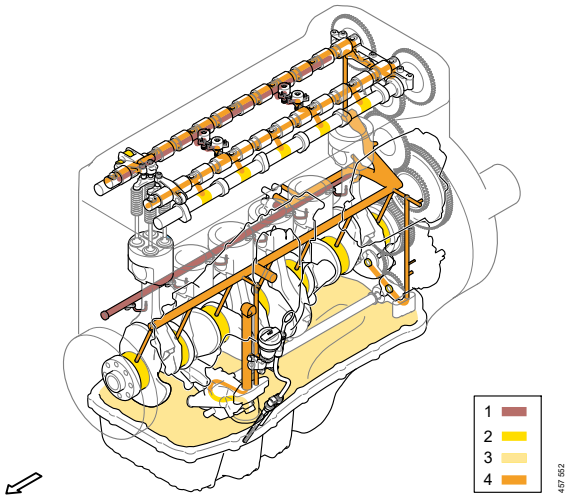
Particles inside DC13 generation 3 engines

Background

There have been instances of different particles being found inside DC13 gen 3 engines, which could mean that there is a fault inside the engine.

It may be possible to repair the engine with minor actions for further operation, while in other cases complete dismantling, cleaning and refitting is required.

In rarer cases, the engine must be replaced after a major breakdown where it is considered beyond restorative repair.



Cause:

Possible causes of chips inside the engine are:

- timing gear: gear (loosened) and bearing (seized).
- connecting rod: parting plane (particles loosened), bearing (seized)
- connecting rod bearings and main bearings: bearing (seized).
- oil pump: breakdown.

Solution:

A minimal amount of particles within the oil system and on components is to be considered normal and not a direct deviation. The purpose of the oil filter is to capture dirt and particles. If these are detected in the system after cleaning, there are grounds for investigating the cause. There may be a fault in the engine, so it is important to determine the cause.

Follow the following steps in order to find out how far the chips have spread.

Check the spread of chips in accordance with the following and the proposed actions:

A. Oil filter housing:

1. Oil filter: have chips passed through paper or been caught?

2. Bypass valve centre tube: dirt on top indicates that dirt has not continued further on.

A completely clean top indicates that it has opened and chips may have continued further on (only between -10 and -20°).

3. Oil filter housing: is there any dirt at the bottom?

4. Solenoid valve oil pump, T218: is there any dirt on strainers?

- If there are only a few odd chips on the filter and nothing else is observed in the filter housing: renew filter and change oil.

- If the filter has caught a large amount of chips or the filter has holes/damage, dirt on strainers T218 and the valve has indications of dirt and chips at the bottom of the filter housing: continue to **B.**

B. Inside the oil sump:

1. Oil sump: are there any chips on the bottom surface?

2. Oil suction strainer: has any dirt been caught?

3. Oil pump drive: is the gear rotating slowly?

4. Oil pump: normal rotation or seized rotation?

5. Oil pump cold start valve: is there any dirt or is it seizing?

6. Inside the oil pump: is there dirt/major scratches or damage?

- If the oil sump has the occasional particle but other components are OK: clean the oil sump, renew the seal and oil filter and change the oil.

- If there is a large amount of chips, which may also be more burnt into the plastic, and the spread can be attributed to the pump and its drive: continue to **C.**

- If there is a large amount of chips in the oil sump, the oil pump may be defective after having pumped around oil that has not passed through the oil filter: eliminate the source of the chips (e.g. compressor gear), clean the oil sump and oil's route from the source, renew the oil pump and filter.

C. Under rocker cover:

1. Within camshaft frame/on valve mechanism: is there any visible dirt?

2. CRB valve strainers: is dirt stuck on them?

3. Camshaft cap, rear oil duct: is there dirt underneath it?

- If there are occasional particles within the camshaft frame/ on the valve mechanism: remove them all, renew the seal and oil filter and change the oil.

- If there are chips within any of these parts: continue to **D.**

D. Inside the engine timing gear casing:

1. Timing gear casing, inner shelf/reinforcement: chips/dirt ends up in this area after compressor/HPP breakdown.

- If there are chips on these components, this confirms that chips have circulated through the oil system: continue to **E.**

E. Timing gear – main oil gallery:

1. Large upper intermediate gear bearing: is there any dirt?

- If this is a final confirmation that the main oil gallery has chips inside before the engine is lifted off for complete dismantling and checking: continue to **F.**

F. Crank mechanism – engine block:

1. Connecting rod bearing: broken? Rotated?

2. Connecting rod oil duct: blocked?

3. Main bearing: broken? Rotated?

4. Crankshaft: damaged bearing surfaces? oil holes blocked?

5. Cylinder block: chips in oil ducts?

- If the connecting rod/bearing has seized and damaged the crankshaft:

- Check the oil pump, block, all main bearing seat diameters + main bearing raceway cylindricity, discolouration where applicable.
- Discard: crankshaft, engine bearings, connecting rod, oil cooler. Also oil pump where applicable.

- If chips have spread within the crankshaft and connecting rods:

- Check: oil pump, connecting rods, crankshaft.
- Discard: engine bearings, oil cooler. Oil pump where applicable.

- If main bearings have seized:

- Check: oil pump, cylinder block, all main bearing seat diameters + main bearing raceway, discolouration where applicable. (High probability the block will need to be discarded.) Crankshaft.
- Discard: engine bearings, oil cooler. Oil pump and cylinder block where applicable.

- If chips have spread through the cylinder block.

- Check: oil pump, crankshaft, connecting rods.
- Discard: engine bearings, oil cooler. Oil pump where applicable.

Cleaning engine parts:

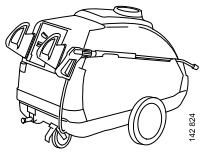
	Industrial washing	White spirit
Ladder frame	X	
Oil sump	X	
Oil pump (variable)		X
Oil pump shaft		X
Oil suction strainer		X
Oil filter housing*	X	
Oil cooler cover with oil thermostat	X	
Cylinder block*	X	
Main bearing cap	X	
Cylinder liner	X	
Crankshaft*	X	
Crankshaft gear		X
Connecting rod*	X	
Piston/piston bolt		X
Piston cooling nozzle*		X
Valve housing, variable oil pump		X
Intermediate gear		X
Compressor gear		X
HPP gear		X
Camshaft		X
Camshaft gear		X
Rocker arm shaft		X
Valve bridge		X
Rocker cover	X	
Camshaft frame*	X	
Camshaft cap*		X
Timing gear housing (upper small housing)	X	
Timing gear casing	X	

Flywheel housing	X	
Front cover	X	

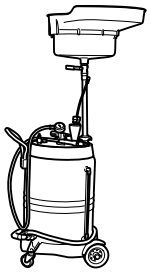
* Oil ducts are cleaned and checked with welding rod, compressed air, lamp and endoscope.

Tools/equipment:

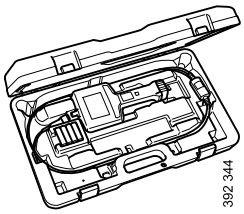
Hot water wash with washer nozzles for ducts, for external washing and extra flushing of ducts inside the block:

Number	Designation	Illustration	Tool board
587597	Hot water high-pressure cleaner		N/A

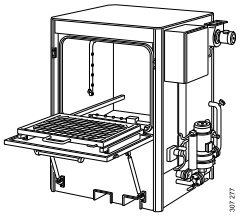
Mobile waste oil drainer with extra suction pipe, for removing chips found locally:

Number	Designation	Illustration	Tool board
588546	Waste oil trolley		N/A

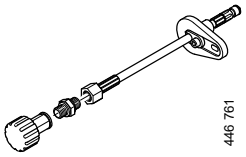
Endoscope, for checking ducts:

Number	Designation	Illustration	Tool board
2564584	Endoscope		N/A

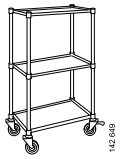
Industrial washing machine, for washing blocks and components:

Number	Designation	Illustration	Tool board
588901	Washing machine		N/A

Cleaning the main oil gallery:

Number	Designation	Illustration	Tool board
3048817	Cleaning tool		MB5

Storage trolley for transport and storage area for engine components:

Number	Designation	Illustration	Tool board
587625	Storage trolley		N/A

Assembly sequence:

The most important installation for basic engines with lead-free engine bearings in terms of cleanliness. Essentially, parts are assembled as follows to enclose the most sensitive parts: crankshaft, engine bearings and connecting rods.

All engine surfaces that are machined from the factory should be sprayed with agents that extract moisture, preserve the surfaces and provide corrosion protection.

Remember to always fit new: piston rings, engine bearings, seals/gaskets, filters and use new engine oil.

Fitted on **cylinder block:**

- rear cover plates
- cylinder liner/O-ring
- piston cooling nozzles
- main bearing/thrust bearing
- crankshaft
- main bearing cap
- connecting rod/piston/piston bolts
- crankshaft gear
- ladder frame/seal
- oil pump drive
- oil pump with suction strainer
- oil sump/seal
- oil pump control valve T218
- piston cooling valve
- front cover
- front crankshaft seal
- flywheel housing
- gear transmission
- timing gear housing
- rear crankshaft seal

Assembly space:

Dismantling work on engines containing dirt and chips is best performed in the designated space for machine repair within the workshop. This space must be cleaned thoroughly in order for reassembly of the engine to produce a successful result.