P3816

Fault code description

SCR catalyst - Reduction efficiency not reached

Fault code information

Possible cause

1. Degraded, diluted or incorrect DEF (more likely if P1711 is also active).
2. Exhaust system leaks.
3. Polluted or blocked DEF filter (more likely if P1711 is also active).
4. Malfunctioning SCR system.
5. Diesel exhaust fluid deposits in decomposition pipe.
6. Malfunctioning SCR catalyst.
7. Engine related fault.
8. Engine out NOx emission too high.
9. Engine EGR measurement incorrect, restricted EGR cooler.
10. Blocked EGR cooler (more likely if P1711 is also active).

Additional information

The EAS-3 ECU monitors the NOx concentration in the engine's exhaust gases using an NOx before catalyst sensor and an NOx after catalyst sensor. By comparing these two values, the EAS-3 ECU is able to determine the conversion efficiency of the SCR catalyst and dosing system.

Engine torque will be reduced if the engine is operated for an extended period of time when this fault is active.

When an engine related fault is also active, always start the diagnostic session with the engine related fault.

Set condition of fault code

This diagnostic has to meet specific engine and aftertreatment conditions to run and complete. NOx sensor data is gathered over varying engine speeds and loads. When enough data has been gathered, the diagnostic will run, make a pass/fail decision and begin to gather data again.

The EAS-3 ECU detects that the NOx conversion across the SCR catalyst is lower than 68%.

Reset condition of fault code

After completing a stationary regeneration and if no additional fault codes change to active, the repair has been validated. Note that this fault code will still be active.

It is necessary to use the 'Reset All Faults' command in DAVIE to clear this fault.

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P3816, Diagnostic information

Technical data

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Location of component(s)

"Location information, EAS-3"

Electrical diagram(s)

Refer to the OEM service manual for more information.

Description of component(s)

"SCR unit"

Block diagram

"Block diagram EAS-3"

Step by step troubleshooting

Please perform the troubleshooting steps below using the breakout harness if necessary to check electrical components such as sensors, electrical control units or harnesses. Back probing is not recommended as it could damage the harness. The ignition should always be in the OFF position when connecting or disconnecting electrical components to reduce the likelihood of damage to electrical components.

- Disconnecting the EAS connectors during the troubleshooting process will result in multiple errors.
- For specific electrical component information and pin out locations, always refer to the technical data.
- It is necessary to exit the fault code menu in DAVIE and run the diagnostic test again to identify a

change in errors.

- Remember that the truck's operational or mechanical issues may be the root cause of both active and inactive fault codes. Refer to the 'possible causes' section.

- Before diagnosing P3816, ensure that the DEF quality is in accordance with the specifications.
- Ensure that the DEF filters are not clogged. There is a filter in the pump module, in the tank and in the inlet and return fittings on the pump.

Step by step 1: Check fault codes

Step 1A: Check for fault codes

Troubleshooting steps

1. Turn the key switch ON.
2. Use DAVIE to check for fault codes.

Is fault code P3816 or P3817 active?

- Yes – If the mileage is less than 2500, perform a stationary regeneration to degreen the system. If the mileage is more than 2500, proceed to step 1B.
- No – Proceed to step 1B.

Step 1B: Check for NOx sensor related fault codes

Troubleshooting steps

1. Turn the key switch ON.
2. Use DAVIE to check for fault codes.

Are fault codes related to NOx active (for example P3971, P3972, P3804, P3805 or P3813)?

- Yes – Proceed with the appropriate fault

code.

- No – Proceed to step 1C.

Step 1C: Check for active DEF dosing system related fault codes

Troubleshooting steps

1. Turn the key switch ON.
2. Use DAVIE to check for fault codes.

Are fault codes related to the DEF dosing system active (for example P3931)?

- Yes – Proceed with the appropriate fault code.
- No – Proceed to step 1D.

Step 1D: Check for engine emissions related fault codes

Troubleshooting steps

1. Turn the key switch ON.
2. Use DAVIE to check for fault codes.

Are fault codes related to the EGR system or NOx sensor plausibility active (for example P1711 or P1713)?

- Yes – Proceed with the appropriate fault code.
- No – Proceed to step 1E.

Step 1E: Check the freeze frame for P3816

Troubleshooting steps

1. Turn the key switch ON.
2. Use DAVIE to compare the readings of the NOx concentration before catalyst sensor and the SAM NOx model output.

Is the NOx concentration before catalyst sensor reading more than three times the SAM NOx model output?

- Yes – Proceed with fault code P1711 (even though it is not present).
- No – Proceed to step 2A.

Step by step 2: Check the DEF dosing valve circuit

Step 2A: Inspect the DEF dosing system for external leaks

Troubleshooting steps

1. Turn the key switch OFF.
2. Inspect all components of the DEF dosing system for signs of leaks, including:
   - DEF tank connections,
   - DEF pump module and pump module connections,
   - DEF lines and
   - DEF dosing valve.

DEF will form white deposits around leaking connections.

Are there external leaks detected in the system?

- Yes – Repair the leak. Proceed to step 2B.
- No – Proceed to step 2B.

Step 2B: Inspect the DEF quality

Troubleshooting steps

1. Turn the key switch OFF.
2. Check the DEF quality:
   - Visually check the DEF in the tank for signs of debris or contamination.
   - Use a DEF refractometer to measure the urea concentration.
   - Use the oil test paper to test for diesel fuel or oil contamination in the DEF tank.

Is the DEF free of contamination and within the specifications?

- Yes – Proceed to step 2C.
- No – The fluid in the tank is not pure DEF. Drain the tank, clean the system and fill the

tank with DEF. Proceed to step 2C.

Step 2C: Inspect the DEF pump module

Troubleshooting steps

1. Turn the key switch OFF.
2. Disconnect all DEF lines and electrical connections.
3. Remove the DEF dosing valve.
4. Check the DEF filters, including:
   - the one on the DEF pump module,
   - the one in the inlet fitting on the DEF pump,
   - the one in the fitting on the back flow and
   - the one in the tank.
5. Place the DEF dosing valve in a measuring container and cover.
6. Perform the DEF pump module override test. For more information, go to 'Explanatory notes to DAVIE'.

Does the DEF pump module meet the specifications?

- Yes – Proceed to step 3A.
- No – Replace the DEF filters as required, then perform the test again. If the pump module does not meet the specifications, replace the pump module. Proceed to step 3A.

Step by step 3: Check the aftertreatment system

Step 3A: Check the exhaust system for leaks

Troubleshooting steps

1. Turn the key switch OFF.
2. Check the exhaust for leaks.
3. Inspect the exhaust system between the turbocharger and the SCR catalyst

outlet. Check for:

- loose connections,
- leaking connections and
- broken exhaust system components.

Is the exhaust system leaking?

- Yes – Repair the exhaust system leak. Proceed to step 3B.
- No – Proceed to step 3B.

Step 3B: Check for deposits in the decomposition pipe

Troubleshooting steps

1. Turn the key switch OFF.
2. Remove the decomposition elbow pipe.
3. Inspect the decomposition pipe for DEF deposits.

Does the decomposition pipe contain DEF deposits?

- Yes – Clean and re-install the decomposition pipe. Proceed to step 4A.
- No – Proceed to step 4A.

Step by step 4: Check the EGR venturi

If no other conditions that could explain the fault have been found, it may be caused by a fouled EGR venturi.

Step 4A: Aftertreatment system problems

Have problems with the aftertreatment system been found and corrected?

- Yes – Proceed to step 5A.
- No – Proceed to step 4B.

Step 4B: Check the EGR system

Troubleshooting steps

1. Turn the key switch OFF.
2. Remove and inspect the:
   - EGR pressure difference sensor,

- mounting block and
- pressure tubes.

3. Remove the inlet and the outlet of the EGR cooler.
4. If the EGR cooler seems to be clogged or plugged, blow shop air from the front to back through the cooling cells. Be aware that this may cause a soot cloud.
5. Remove and inspect the boost pressure sensor's orifice and the boost pressure sensor port on the engine for plugging. If no plugging, reinstall.

Are any of the components still blocked or restricted by soot buildup, or is coolant leaking?

- Yes – Perform the following actions as needed:
  - If the EGR cooler is still blocked or restricted by soot buildup, see campaign E051 for a cleaning kit.
  - If coolant is found, use the EGR Cooler Pressure Test Kit (part number 1903031). Before replacing an EGR cooler, contact the Engine Support Center with these test results.
  - If the boost pressure sensor's orifice seems to be plugged, replace the sensor. If the boost pressure sensor port on the engine is blocked, clean and ensure it is clear of any debris.
  - After performing the aforementioned actions, proceed to step 4C.
- No – Proceed to step 4C

Step 4C: Check the EGR venturi

Troubleshooting steps

1. Turn the key switch OFF.
2. Remove the EGR venturi.

3. Inspect the EGR venturi for coating or buildup.
4. Inspect the EGR venturi for corrosion greater than 0.5 mm (1/32").

Is there a coating or is there corrosion more than 0.5 mm thick on the inside of the venturi?

- Yes – If the venturi is coated, clean the inside. If the venturi has corroded by more than 0.5 mm, contact the Engine Support Center for further instructions. Proceed to step 5A.
- No – Proceed to step 5A.

Step by step 5: Check for active fault codes

Step 5A: Perform a stationary regeneration and check for active fault codes

Troubleshooting steps

1. Connect all components.
2. Start the engine.
3. Perform a stationary regeneration. For more information, go to 'Explanatory notes to DAVIE'.
4. Check for active faults upon completion of the stationary regeneration.

Is fault code P3971 or P3972 active?

- Yes – Proceed with the appropriate fault code.
- No – Proceed to step 5B.

Step 5B: Check for active fault codes

Troubleshooting steps

1. Start the engine.
2. Check for active faults upon completion of the stationary regeneration.

Is fault code P3977 active?

- Yes – Proceed with the appropriate fault

code.

- No – Proceed to step 5C.

Step 5C: Check for active fault codes

Troubleshooting steps

1. Start the engine.
2. Check for active faults upon completion of the stationary regeneration.

Is fault code P3978 active?

- Yes – Return to step 1A.

  If all the steps have been completed and checked again, contact the Engine Support Center for further instructions.
- No – Proceed to step 6A.

Step by step 6: Clear the fault code

Step 6A: Disable the fault code

Troubleshooting steps

1. Connect all components.
2. Operate the system within the 'reset condition of the fault code' found in the fault code information.
3. Use DAVIE to verify that the fault codes are inactive.

Is fault code P3816 inactive?

- Yes – Proceed to step 6B.
- No – Return to the troubleshooting steps. Proceed to step 1A.

  If all the steps have been completed and checked again, contact the Engine Support Center for further instructions.

Step 6B: Clear the inactive fault codes

Troubleshooting steps

1. Connect all components

2. Turn the key switch ON.
3. Use DAVIE to clear the inactive fault codes.

Have all the fault codes been cleared?

- Yes – Repair complete.
- No – Troubleshoot any remaining active fault codes.

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