DTC P013A:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5]

id0102h4310200

Note
- To determine the malfunctioning part, proceed with the diagnostics from "Function Inspection Using M-MDS".

Details On DTCs

DESCRIPTION	HO2S: Slow response (during transition from rich to lean)	
DETECTION CONDITION	Determination conditions	• The response speed of the HO2S input signal when the air/fuel ratio is fluctuated from rich to lean is slow.
	Preconditions	• Fuel injection control: during fuel cut*1 • Catalytic converter estimated temperature: specified value or more • HO2S estimated temperature: specified value or more • HO2S output voltage during fuel cut: Specified value or more • The following DTCs are not detected: — HO2S heater: P0037:00, P0038:00 — MAF sensor: P0102:00, P0103:00 — ECT sensor: P0117:00, P0118:00 — HO2S: P0137:00, P0138:00, P0140:00 *1: Condition can be verified by displaying PIDs using M-MDS
	Drive cycle	• 2
	Self test type	• CMDTC self test
	Sensor used	• HO2S
FAIL-SAFE FUNCTION	• Not applicable	
VEHICLE STATUS WHEN DTCs ARE OUTPUT	• Illuminates check engine light.	
POSSIBLE CAUSE	• HO2S malfunction — HO2S connector or terminals malfunction — HO2S loose — Exhaust system leakage — TWC damaged or malfunction • HO2S deterioration • HO2S heater malfunction • Improper operation of purge control system — Purge solenoid valve malfunction — Improper connection of evaporative hose (purge solenoid valve side) • Fuel leakage in fuel line • Engine malfunction — Insufficient engine compression • PCM malfunction	

System Wiring Diagram
- Not applicable

Function Explanation (DTC Detection Outline)
- If the rate at which the HO2S output voltage is lowered is slow during fuel cut, a DTC is stored.

Repeatability Verification Procedure
1. Warm up the engine to allow the engine coolant temperature to reach **80 °C {176 °F} or more**.
2. Verify that OBD information (such as FREEZE FRAME DATA (Mode 2)) has been obtained and recorded.
3. Clear the DTC from the PCM memory using the M-MDS. (See AFTER REPAIR PROCEDURE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Switch the ignition off.
5. Drive the vehicle for **15 min** at a speed of **40 km/h {25 mph} or more**.
6. Shift to 3rd gear and rapidly accelerate the vehicle to **60 km/h {37 mph}**.
7. Release the accelerator pedal and decelerate the vehicle to **40 km/h {25 mph}**.
8. Repeat Step 5 to 7 operations **above 5 times**.
9. Try to reproduce the malfunction by driving the vehicle for **5 min** based on the values in the FREEZE FRAME DATA (Mode 2)/snapshot data.

Note
- Match the engine coolant temperature in the recorded FREEZE FRAME DATA (Mode 2)/snapshot data, the vehicle speed, and engine speed values to the best extent possible while driving the vehicle.

PID Item/Simulation Item Used In Diagnosis

PID/DATA monitor item table

Item	Definition	Unit/ Condition	Condition/Specification (Reference)
O2S12	HO2S	V	• Idle (after warm up): 0—1.0 V • Deceleration fuel cut (accelerator pedal released from engine speed of 4,000 rpm or more): Approx. 0 V

Function Inspection Using M-MDS

STEP	INSPECTION	RESULTS	ACTION
1	**PURPOSE: VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**PURPOSE: RECORD VEHICLE STATUS AT TIME OF DTC DETECTION TO UTILIZE WITH REPEATABILITY VERIFICATION** • Has the FREEZE FRAME DATA (Mode 2)/ snapshot data been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA (Mode 2)/snapshot data on the repair order, then go to the next step. **Note** • Recording can be facilitated using the screen capture function of the PC.
3	**PURPOSE: VERIFY IF DIAGNOSTIC RESULT IS AFFECTED BY DTC RELATED TO A/F SENSOR RESPONSIVENESS** • Switch the ignition off, then ON (engine off). • Perform the Pending Trouble Code Access Procedure and DTC Reading Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is the PENDING CODE/DTC P0133:00 also present?	Yes	Go to the next step.
		No	Go to Step 6.
4	**PURPOSE: VERIFY IF DIAGNOSTIC RESULT IS AFFECTED BY DTC RELATED TO PURGE SOLENOID VALVE** • Perform the Pending Trouble Code Access Procedure and DTC Reading Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is the PENDING CODE/DTC P0443:00 also present?	Yes	Go to the applicable PENDING CODE or DTC inspection. (See DTC P0443:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
5	**PURPOSE: VERIFY IF DIAGNOSTIC RESULT IS AFFECTED BY DTC OCCURRING FROM FUEL SYSTEM RELATED PART** • Perform the Pending Trouble Code Access Procedure and DTC Reading Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is a DTC related to a fuel system part stored?	Yes	Go to the applicable PENDING CODE or DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	A factor other than the HO2S can be considered the cause of the malfunction. • Go to the troubleshooting procedure to perform the procedure from Step 1.

STEP	INSPECTION	RESULTS	ACTION
6	**PURPOSE: VERIFY FLUCTUATION OF HO2S INPUT SIGNAL AT START OF FUEL CUT** • Start the engine and warm it up completely. • Access the O2S12 PID using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Drive the vehicle under the following conditions. **Warning** **• When the M-MDS is used to observe monitor system status while driving, be sure to have another technician with you, or record the data in the M-MDS using the PID/DATA MONITOR AND RECORD capturing function and inspect later.** **• While performing this step, always operate the vehicle in a safe and lawful manner.** — After increasing the engine speed to **4,000 rpm**, decelerate using engine braking. • Can a fluctuation in the displayed PID value be verified?	Yes	Go to the troubleshooting procedure to perform the procedure from Step 10. • If a malfunction occurs, perform diagnosis from Step 1 of the malfunction diagnostic procedure.
		No	HO2S signal can be considered the cause. • Go to the troubleshooting procedure to perform the procedure from Step 4.

Troubleshooting Diagnostic Procedure
Intention of troubleshooting procedure

- Step 1—2
  — Perform an emission system parts inspection.
- Step 3
  — Perform an engine inspection.
- Step 4—9
  — Perform an inspection of the HO2S signal related parts.
- Step 10—11
  — Verify that the primary malfunction is resolved and there are no other malfunctions.

STEP	INSPECTION	RESULTS	ACTION
1	**PURPOSE: DETERMINE INTEGRITY OF PURGE SOLENOID VALVE** • Inspect the purge solenoid valve. (See PURGE SOLENOID VALVE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction?	Yes	Replace the purge solenoid valve, then go to Step 10. (See PURGE SOLENOID VALVE REMOVAL/ INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
2	**PURPOSE: VERIFY IF DIAGNOSTIC RESULT IS AFFECTED BY MALFUNCTION RELATED TO POOR EVAPORATIVE HOSE CONNECTION** • Verify the connection condition of the evaporative hose (purge solenoid valve side). (See PURGE SOLENOID VALVE REMOVAL/ INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is the evaporative hose (purge solenoid valve side) connection normal?	Yes	Go to the next step.
		No	Connect evaporative hose correctly, then go to Step 10. (See PURGE SOLENOID VALVE REMOVAL/ INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

STEP	INSPECTION	RESULTS	ACTION
3	**PURPOSE: VERIFY IF MALFUNCTION RELATED TO ENGINE COMPRESSION AFFECTS DIAGNOSTIC RESULTS** • Inspect the engine compression. (See COMPRESSION INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Are compression pressures within specification? **Specification:** • Compression [SKYACTIV-G 2.0, European (L.H.D. U.K.) specs.] — Standard: **978 kPa {9.97 kgf/cm^2, 142 psi} (300 rpm)** — Minimum: **783 kPa {7.98 kgf/cm^2, 114 psi} (300 rpm)** — Maximum difference between cylinders: **166 kPa {1.69 kgf/cm^2, 24.1 psi}** (**300 rpm**) • Compression [SKYACTIV-G 2.0, Except European (L.H.D. U.K.) specs.] — Standard: **885 kPa {9.02 kgf/cm^2, 128 psi} (300 rpm)** — Minimum: **708 kPa {7.22 kgf/cm^2, 103 psi} (300 rpm)** — Maximum difference between cylinders: **150 kPa {1.53 kgf/cm^2, 21.8 psi}** (**300 rpm**) • Compression [SKYACTIV-G 2.5] — Standard: **954 kPa {9.73 kgf/cm^2, 138 psi} (300 rpm)** — Minimum: **763 kPa {7.78 kgf/cm^2, 111 psi} (300 rpm)** — Maximum difference between cylinders: **161 kPa {1.64 kgf/cm^2, 23.4 psi}** (**300 rpm**) **Note** • Because the SKYACTIV-G 2.0 and SKYACTIV-G 2.5 retards the intake valve closing timing, compression pressure is low.	Yes	Go to the next step.
		No	Replace or overhaul the engine, then go to Step 10.
4	**PURPOSE: INSPECT HO2S CONNECTOR CONDITION** • Switch the ignition off. • Disconnect the HO2S connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the connector and/or terminals, then go to Step 10.
		No	Go to the next step.
5	**PURPOSE: INSPECT INSTALLATION OF HO2S** • Inspect installation of HO2S. • Is the HO2S installed securely?	Yes	Go to the next step.
		No	Retighten the HO2S, then go to Step 10. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/ INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
6	**PURPOSE: DETERMINE INTEGRITY OF HO2S** • Reconnect all disconnected connectors. • Inspect the HO2S. (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction?	Yes	Replace the HO2S, then go to Step 10. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/ INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
7	**PURPOSE: DETERMINE INTEGRITY OF HO2S HEATER** • Reconnect all disconnected connectors. • Inspect the HO2S heater. (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction?	Yes	Replace the HO2S, then go to Step 10. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
8	**PURPOSE: INSPECT EXHAUST SYSTEM FOR LEAKAGE** • Visually inspect for exhaust gas leakage from the exhaust system. • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 10.
		No	Go to the next step.
9	**PURPOSE: VERIFY IF CATALYTIC CONVERTER DAMAGE AFFECTS HO2S SIGNAL** • Verify if the catalytic converter is damaged. • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to the next step.
		No	Replace the HO2S, then go to the next step. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
10	**PURPOSE: VERIFICATION OF VEHICLE REPAIR COMPLETION** • Always reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the M-MDS. (See AFTER REPAIR PROCEDURE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Implement the repeatability verification procedure. (See Repeatability Verification Procedure.) • Perform the Pending Trouble Code Access Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is the PENDING CODE for this DTC present?	Yes	Repeat the inspection from Step 1 of the troubleshooting diagnostic procedure. • If the malfunction recurs, replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Go to the next step.
		No	Go to the next step.
11	**PURPOSE: VERIFY IF THERE IS ANY OTHER MALFUNCTION** • Is any other DTC or pending code stored?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	DTC troubleshooting completed.