CAT Lift Trucks

Service Manual

GK21E, GK25E Engine
Electronic Control System
Gasoline & LPG & Dual Fuel

GK21E	GK25E
GP15N-GP25N	GP30N, GP35N
GPE15N-GPE25N	GPE20ZN, GPE25ZN
	GPE30N, GPE35N

99789-40100

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INSPECTION AND ADJUSTMENT

- Oil capacity H line: ℓ (Imp qt)
  3.8 (3-3/8)
- Oil capacity L line: ℓ (Imp qt)
  2.8 (2-1/2)
- (Oil filter capacity): ℓ (Imp pt)*
  0.3 (1/2)*
- Fan belt deflection [When pressed by a force of approximately 10 kg (22 lb)] : mm (in)
  Standard 11 - 13 (0.45 - 0.51)
- Compression: kPa (bar, kg/cm^2, psi)/rpm
  Standard 1,510 (15.1, 15.4, 219)/250 (K25)
- Difference between each cylinder: kPa (bar, kg/cm^2, psi)/rpm
  Repair limit 98 (0.98, 1.0, 14)/300
- Spark plug gap : mm (in)
  Standard 0.8 - 0.9 (0.31 - 0.35)
- Valve clearance (Hot) : mm (in)
  Standard Intake: 0.38 (0.0150)
  Exhaust: 0.38 (0.0150)
- Thermostat valve opening temperature (STD): °C (°F)
  Standard 76.5 (170)
- Idle speed and ignition timing (BTDC°/rpm)
  Standard 0±2/750±50

CYLINDER HEAD

- Cylinder head : mm (in)
  Material Aluminum alloy
  Distortion limit 0.1 (0.004)
- Valve guide : mm (in)
  Standard 7.000 - 7.018 (0.2756 - 0.2763)
  (for both intake and exhaust)
- Valve stem-to-valve guide clearance : mm (in)
  Repair limit 0.10 (0.0039)
  (for both intake and exhaust)

CYLINDER BLOCK

- Block upper surface : mm (in)
  Distortion limit 0.1 (0.004)
- Bore diameter dimension : mm (in)
  Standard 89.00 - 89.05 (3.5039 - 3.5059)
- Bore diameter wear : mm (in)
  Repair limit 0.2 (0.008)
- Bore diameter out-of-round : mm (in)
  Standard 0.015 (0.0006) or less
- Bore diameter taper : mm (in)
  Standard 0.01 (0.0004) or less
- Bore diameter out-of-round and taper : mm (in)
  Repair limit 0.1 (0.004)
- Distortion limit : mm (in)
  Intake manifold 0.1 (0.004)
  Exhaust manifold 0.3 (0.012)

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Diagnosis Chart by Symptom (Cont'd)

RELATIONSHIP BETWEEN MALFUNCTIONING SYMPTOM AND THE ENGINE MAIN BODY/AUXILIARY COMPONENT

The table below shows the possible symptoms caused by the malfunction of engine main body system. It will be helpful in malfunction trouble diagnosis. (The table lists general symptoms and some may not be applicable.)

⊕: Highly possible
•: Possible
∇: Not very possible

	Symptoms	Impossible to start		Poor starting		Poor idle					Poor driving							Engine stall				Other		Description/notable characteristics of the symptom
		No initial combustion	Initial combustion	When engine is cold	When engine is warming up	Fast idle is not effective	High idle rpm	Low idle rpm	Inconsistent idle when engine is cold.	Inconsistent idle when warming up	Poor power output	Poor acceleration	Engine rpm does not increase smoothly.	During surge and acceleration	During surge and constant speed driving	Knocking	Backfire	After-burn	At idle	Driving	During deceleration	During a heavy load	Engine over temperature (Overheat)	Poor fuel consumption efficiency	
Fuel mixture	Air sucked from oil level gauge								•	∇		•	•						∇			∇		∇	• Air-fuel ratio becomes LEAN. • High air-fuel correction factor.
	Air sucked from oil filler cap								•	∇		•	•						∇			∇		∇	• Low suction power (vacuum pressure) of intake manifold. * Check the suction using a pressure gauge. * Generally applicable to air suction in air intake system
	Air sucked from PCV hose (downstream of PCV)			•	∇				•	∇	•	•	•	•	•	∇	∇		•	•		•		∇	
	Air sucked from intake manifold and gasket			•	∇				•	∇	•	•	•	•	•	∇	∇		•	•		•		∇	
	PCV kept open						•		•	∇		•	•	•	•									•	• Noise (high hissing tone)
	Clogged fuel strainer			•	∇				•	∇	•	•	•	•	•	•	•		∇	•		•			• Symptom depends on clogging status. This tends to happen during high-speed or high load operation.
	Clogged air cleaner element										•	•	•	•	•									•	
	Malfunctioning gasoline pressure regulator	∇	•	•	•				•	•	•	•	•	•	•				•	•	•	•			• Symptom varies depending on combustion pressure.
	Poor quality gasoline	∇	•	•	•				•	•	•	•	•	•	•	∇			•	•	•	•		∇	• Symptom varies depending on oil quality.
	Improper LPG fuel (cold area and propane ratio)	•	•	•	•				•	•	•	•	•	•	•	∇			•	•	•	•		∇	• Starting ability in cold area is changed depending on propane ratio. • Use LPG with proper propane ratio.
	Malfunctioning LPG vaporizer pressure adjusting valve	∇	•	•	•				•	•	•	•	•	•	•				•	•	•	•			• If the pressure is low, it is caused by poor output during high-speed or high load operation. • If the pressure is excessively high, relief valve operates and engine stalls at rich.
	Clogged LPG vaporizer hot water circuit			•	•				•	•	•	•	•	•	•				•	•	•	•			• Symptom depends on fuel temperature. This tends to happen during engine stall and is impossible to restart during engine warming up.
	Clogged LPG interception valve filter			•	∇				•	∇	•	•	•	•	•				∇	•		∇			• Symptom depends on clogging status. This tends to happen during high-speed or high load operation.
	Valve deposit			•	•				•	∇	•	•	•	•	•	•	•		•	•	•	•		∇	• Air-fuel ratio becomes LEAN. High air-fuel correction factor.
Sparking	Improper connection of wire connector			∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇			∇	∇	∇	∇	∇		∇	• Check that wiring route is proper.
	Poor connection of wire connector	∇	•	•	•			•	•	•	•	•	•	•				•	•	•	•	•		•	• Check that connector is slightly raised. Poor starting if slightly raised connectors are in all cylinders.
	Improper ignition timing adjustment			•	•				•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	—
	Malfunctioning spark plug			•	•				•	•	•	•	•	•	•				∇		∇	∇			• Check that the gap is proper. Check spark plug for electric wear, soil (fuel injection, smoking), and damaged insulator.
	Leakage from high-pressure parts	∇	•	•	•				•	•	•	•	•	•	•			•	•	•		•		•	• Symptom varies depending on the level of leakage.

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LPG Cut Sol Valve

SST DATA MONITOR DISPLAY

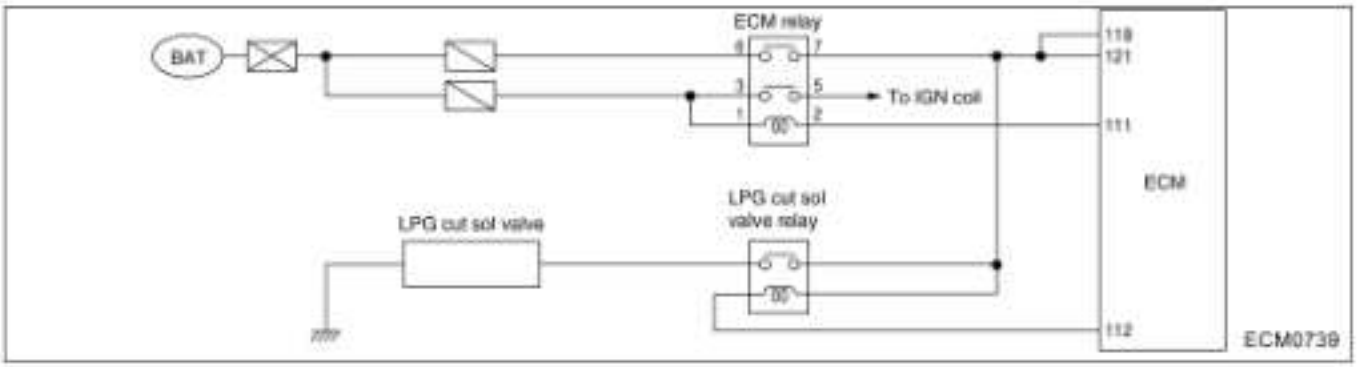
Monitor item	At engine stop	At engine running
MAIN CUT RELAY	OFF	ON

ECM INPUT/OUTPUT SIGNAL SPECIFICATIONS

Check voltage between terminals shown below and ground using a circuit tester.

Terminal	Signal name	At engine stop	At engine running
112	Main cut relay	Approx. 0V	Battery voltage

CIRCUIT DIAGRAM



PTC Heater (Integrated with Vaporizer)

Check the resistance between PTC heater terminal and ground.

Resistance:
1.5-27Ω (Engine coolant temperature (25°C (77°F)).

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