CAT® Lift Trucks

Service Manual

K21, K25 Gasoline Engine

K21 000001-up
K25 04868X-up

For use with GP15N-GP35N Chassis Service Manual.

99789-65110

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Specifications

INSPECTION AND ADJUSTMENT

- Oil capacity H line (L)
  3.5
- Oil capacity L line (L)
  2.5
- (Oil filter capacity) (L)
  0.3
- Fan belt deflection (When pressed by a force of approximately 10 kgf) (mm)
  Standard 11 - 13
- Compression [MPa (kgf/cm^2)/rpm]
  Standard 1.45 (14.8)/250 (K21; Gasoline/Combined)
  1.51 (15.4)/250 (K25; Gasoline/Combined)
  1.57 (16.0)/250 (K21/K25; LPG)
- Difference between each cylinder (kgf/cm^2/rpm)
  Repair limit 1.0/300
- Spark plug gap (mm)
  Standard 0.8 - 0.9
- Distributor (Full transistor type) air gap (mm)
  Standard 0.35 - 0.45
- Valve clearance (Hot) (mm)
  Standard Intake: 0.38±0.03
  Exhaust: 0.38±0.03
- Thermostat valve opening temperature (STD) (˚C)
  Standard 76.5
- Idle speed and ignition timing (BTDC˚/rpm)
  Standard 0/700±50 (K21)
  0/700±50 (K25)

CYLINDER HEAD

- Cylinder head (mm)
  Material Aluminum alloy
  Distortion limit 0.1

CYLINDER BLOCK

- Block upper surface (mm)
  Distortion limit 0.1
- Bore diameter dimension (mm)
  Standard 89.00 - 89.05
- Bore diameter wear (mm)
  Repair limit 0.2
- Bore diameter out-of-round (mm)
  Standard 0.02 or less
- Bore diameter taper (mm)
  Standard 0.02 or less
- Bore diameter out-of-round and taper (mm)
  Repair limit 0.1

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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 system	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.
	Air sucked from PCV hose (downstream of PCV)			♦	∇				♦	∇	♦	♦	♦	♦	♦	∇	∇		♦	♦		♦		∇	• Check the suction using a pressure gauge. • Generally applicable to air suction in air intake system
	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 start 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.

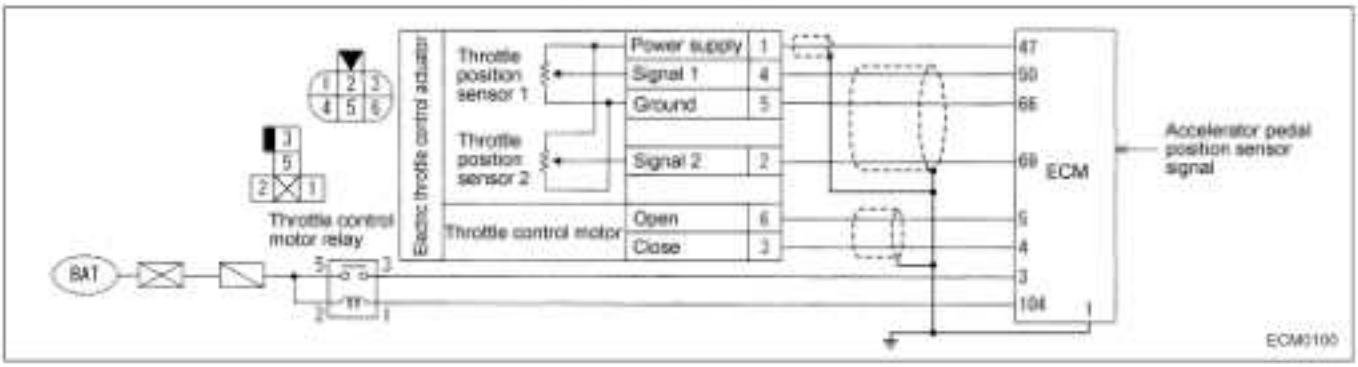
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ECM Input/Output Signal Specifications

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

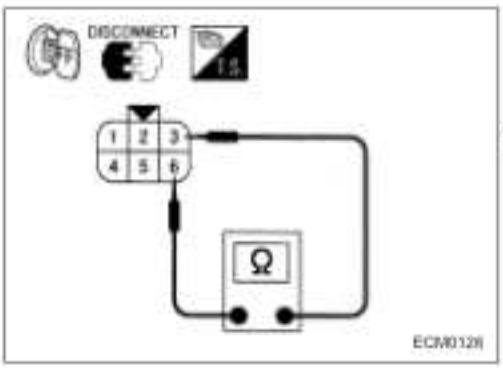
Terminal	Signal name	At idle after warming up	At approx. 2,000 rpm
5	Throttle control motor 1 (Open)	Approx. 0.1 - 0.15V	
4	Throttle control motor 2 (Close)	Approx. 2 - 2.5V	

Circuit Diagram



Component Parts Inspection

Electric throttle control motor (Electric throttle control actuator assembly)



Check resistance between electric throttle control motor (throttle position sensor connector) terminals 3 and 6.

Resistance: Approx. 1 -15 Ω (at 25˚C)

⚠ CAUTION:

- Make sure that there is no moisture around connector when removing and installing throttle position sensor connector. Completely wipe off water drops if there are any.
- Do not apply voltage to electric throttle control motor terminal.
- Perform "Throttle Valve Closed Position Learning" if disconnecting connector. Perform "Throttle Valve Closed Position Learning and Idle Air Volume Learning" if replacing electric throttle control actuator. (Refer to (EC-13), "Throttle Valve Closed Position Learning and Idle Air Volume Learning.")
- Do not disassemble electric throttle control actuator.

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