CAT® Lift Trucks

Service Manual

S4S Diesel Engine

1001-up

For use with DP20/20K, DP25/25K,DP30/30K and DP35/35K
Chassis Service Manual.

99729-96100

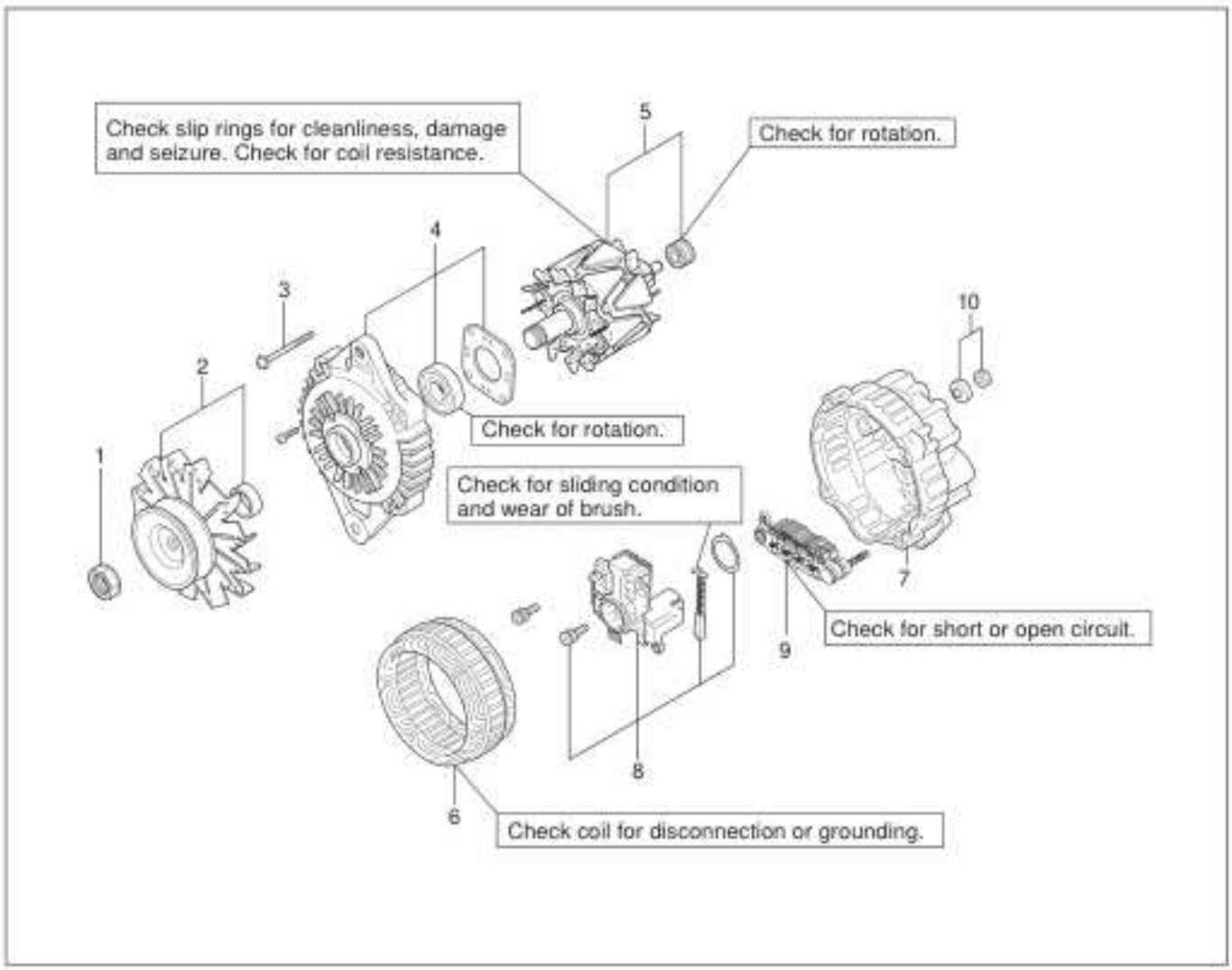
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2. Specifications

Model designation				S4S
General	Type			Water-cooled, 4-stroke cycle
	No. of cylinders–arrangement			4–in line
	Combustion chamber type			Swirl chamber
	Valve mechanism			Overhead
	Cylinder bore × stroke mm (in.)			94 × 120 (3.70 × 4.72)
	Piston displacement liter (cu in.)			3.331 (203)
	Compression ratio			22 : 1
	Firing order			1 – 3 – 4 – 2
	Fuel			Diesel fuel (JIS K2204 or equivalent)
	Direction of rotation			Counterclockwise as viewed from flywheel side
	Dimension (with fan)	Overall length mm (in.)		647 (25.5)
		Overall width mm (in.)		578 (22.8)
		Overall height mm (in.)		710 (28.0)
	Weight (dry) kg (lb)			245 (540)
Engine main parts	Type of cylinder sleeve			Dry (Integral with cylinder block)
	No. of piston ring	Compression ring		2
		Oil ring		1 (w/spring expander)
	Valve timing	Inlet valve	Open	BTDC 30°
			Close	ABDC 50°
		Exhaust valve	Open	BBDC 74°
			Close	ATDC 30°
	Starting system			Electric–starter
	Starting aid			Glow plugs
Fuel system	Fuel injection pump	Type		Distributor type (Delphi Diesel System, VE) In-line type (DENSO)
		Diameter of plunger mm (in.)		7.0 (0.276) for distributor type 6.5 (0.256) for in-line type
	Fuel feed pump	Type		Delphi Diesel System, vane type DENSO, piston type
		Cam lift mm (in.)		8.0 (0.315), DENSO, piston type
	Governor	Mechanism		Centrifugal
		Type		Delphi Diesel System, all speed type DENSO, RSV
	Fuel injection nozzle	Type of nozzle		DENSO, throttle type
		No. of spray orifice		1
		Diameter of spray orifice mm (in.)		1.0 (0.039)
		Spray angle		15°
		Valve opening pressure MPa (kgf/cm²) [psi]		14.22 (145) [2062]
	Fuel filter	Type		Cartridge of paper element

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A2TA7877 (12V-25A)



Disassembly sequence

1 Nut
2 Pulley, Spacer
3 Screw
4 Front bracket assembly
5 Rotor assembly
6 Stator
7 Rear bracket
8 Regulator assembly
9 Rectifier assembly
10 Nut set

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Causes of Engine Problems and Remedies

	Problems/Symptoms / Possible causes	Hard starting: Engine turns: No exhaust smoke	Hard starting: Engine turns: Small amount of exhaust smoke	Hard starting: Engine turns: Large amount of exhaust smoke	Hard starting: Cranking speed low	Hard starting: Engine does not turn: Engine can be cranked manually	Hard starting: Engine does not turn: Engine cannot be cranked manually	Glow plugs do not produce red heat	Glow plugs produce red heat too fast	Not enough power: Small amount of exhaust smoke	Not enough power: Large amount of white exhaust smoke	Not enough power: Large amount of black exhaust smoke	Exhaust smoke abnormal: At idling	Exhaust smoke abnormal: In operation: White	Exhaust smoke abnormal: In operation: Black	Engine produces loud knocking sound	Engine produces abnormal noise	Engine produces irregular combustion sound	Engine hunts: At idling	Engine hunts: In operation
Fuel System	No fuel to injection pump	○	○	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—
	Greater variance of fuel injection quantity	—	—	○	—	—	—	—	—	—	—	○	○	—	○	○	—	○	○	○
	Injection pump oil seals defective	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Insufficient fuel injection volume	○	○	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—
	Excessive fuel injection volume	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—
	Injection nozzle defective	—	—	○	—	—	—	—	—	—	—	○	○	○	○	○	—	○	○	○
	Excessive fuel return from injection nozzles	—	○	—	—	—	—	—	—	○	—	—	—	—	—	—	—	○	○	—
	Injection timing is too advanced	—	—	○	—	—	—	—	—	—	○	—	—	○	○	○	—	—	—	—
	Injection timing is too retarded	—	—	○	—	—	—	—	—	—	—	○	○	—	—	—	—	○	○	—
	Engine speed is too low	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—
	Failure to stop	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Improper fuel	—	—	○	—	—	—	—	—	—	○	○	○	○	○	○	—	—	—	—
	Fuel viscosity is too high	○	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lubrication System	Improper oil quality	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil viscosity is too high	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil viscosity is too low	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—
	Oil pressure does not rise	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil leaks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Excessive pumping up of oil	—	—	—	—	—	—	—	—	—	—	—	—	○	○	○	—	—	—	—
	Clogged oil filter	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil pressure switch or lamp defective	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Air Intake System	Insufficient intake air	—	—	○	—	—	—	—	—	—	—	○	—	—	○	—	—	—	—	—
	Insufficient compression pressure	—	—	○	—	—	—	—	—	—	○	○	○	○	○	○	—	○	○	○
	Ambient temperature is too high, or ambient pressure is too low (high altitude)	—	—	—	—	—	—	—	—	—	—	○	—	—	○	—	—	—	—	—

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