SEN06575-00

Shop Manual

ENGINE

86E-7 - 98E-7 SERIES

KOMATSU®

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PRINCIPAL ENGINE SPECIFICATIONS

3D88E-7

Engine model	3D88E-7
Version	VM
Type	Vertical in-line diesel engine (Common rail system)
Combustion system	Direct injection
Aspiration	Naturally aspiration
No. of cylinders	3
Bore × stroke	88 × 90 mm
Displacement	1.642 ℓ
Max. rated output (Gross)	3000 min^{-1}
	27.5 kW
	37.4 PS
High idling	3150 ± 25 min^{-1}
Engine weight (Dry)	188 kg
PTO position	Flywheel end
Direction of rotation	Counterclockwise viewed from flywheel end
Cooling system	Liquid-cooled with radiator
Lubricating system	Forced lubrication with trochoid pump
Normal oil pressure at rated engine speed	0.34 - 0.54 MPa
Normal oil pressure at low idle speed	0.06 MPa
Starting system	Electric starting (Starter motor: DC 12 V - 1.7 kW)
	Alternator (12 V - 55 A)
	Recommended battery capacity: 12 V 413CCA
Dimensions (L × W × H)	Depend on KDPF layout
Engine oil pan capacity	6.7/3.9 ℓ (Dipstick upper limit/lower limit)
Engine coolant capacity	2.0 ℓ (Engine only)
Standard cooling fan	ø335 pusher
Crank V-pulley dia./ fan V-pulley dia.	ø110/ø110 mm
Top clearance	0.73 ± 0.06 mm

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#B1425: —

Failure code (DTC)	#B1425	Failure phenomenon (Display of screen)	—

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The post injection is inhibited by prohibition SW of KDPF regeneration when the operation transmitted to the reset regeneration mode.	Regeneration prohibition switch (including CAN control)

● Actions when a malfunction occurs

Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: Error determination conditions are not met.
Remarks	

● Presumed cause of the malfunction or the abnormal condition

The mode is reset regeneration, but the regeneration is prohibited by the regeneration prohibition switch (including CAN control) and the regeneration cannot be performed.

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● Work description

1. Check of the motor resistance value (motor unit):
   1- Remove the motor from the wire harness.
   2- Use the circuit tester to measure the resistance value (total resistance value) between the motor terminals A and B.

Reference: Total resistance of the motor

Terminal	Specification
Between terminal A and B	0.3 - 100 Ω (20°C)

Not OK	Replace the motor.
OK	Refer to "Check of the motor resistance value (motor + wire harness):"

2. Check of the motor resistance value (motor + wire harness):
   1- Connect the motor and the wire harness. Remove the E-ECU from the harness.
   2- Use the circuit tester to measure the resistance value (total resistance value) between the E-ECU side wire harness connectors A19 and A20.
   Note: Refer to the above-mentioned reference "Total resistance of the motor".

No	• A coupler failure between the motor and the wire harness may be caused. Replace the motor. • Replace the wire harness.
Applied	Refer to "Check the wire harness conduction:"

3. Check the wire harness conduction:
   1- Remove the wire harness from the motor and the E-ECU. Here, keep the junction coupler connected.
   2- Perform the wire harness conduction check between the terminal 1 and the terminal 2 in the below table while referring to P16-4 "E-ECU pin layout diagram".

Detection error	Check method
No-load of throttle valve drive H bridge circuit	Perform the check pattern 1
Power short circuit of throttle valve drive H bridge output 1	Perform the check pattern 2
Power short circuit of throttle valve drive H bridge output 2	Perform the check pattern 3
GND short circuit of throttle valve drive H bridge output 1	Perform the check pattern 4
GND short circuit of throttle valve drive H bridge output 2	Perform the check pattern 5

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7. Removal of high-pressure pipe (Supply pump - common rail)
   1- Clean around the cap nuts on both the pump and rail sides, using a brush or aspirator.
   2- While pressing and holding the pipes of the rail and pump sides respectively against the bearing surface by hand, loosen the cap nut using a tool.
   3- After that, while pressing the pipes of the rail and pump sides respectively against the bearing surface by hand, loosen and remove the cap nut by hand.
   4- Remove the high-pressure pipe.
   5- Clean the removed seat portions of the rail inlet with an aspirator or the like and cover them with a vinyl bag.
8. Remove the supply pump cover (drive gear) of the gear case.
9. Remove the supply pump drive gear nut (M18).

NOTICE

Be sure to put an alignment mark between the supply pump drive gear and the idle gear. Do not rotate the crankshaft of the engine after putting the mark.

10. Extract the supply pump drive gear by using the gear extraction tool.

NOTICE

Be sure to use the gear extraction tool.

11. Remove the supply pump nut (M8 - 3 pieces), and remove the supply pump.

NOTICE

- Never disassemble the supply pump.
- If you change the supply pump to the new one must be changed with whole pump.

Reassembly of Supply Pump

1. Reassembly of supply pump body
   Align the position of the supply pump drive shaft key (pin) to the drive gear position, and reinstall the supply pump to the gear case.
   Reinstall the supply pump with the 3 pieces of M8 nuts.

NOTICE

Be sure to apply oil to the O-ring at the time of installation so that is does not roll up.

Tightening torque for M8 nuts	16.7 - 20.9 ft·lb 22.6 - 28.4 N·m (2.3 - 2.9 kgf·m)

2. With the special M18 nuts, reinstall the supply pump drive gear to the supply pump drive shaft.

Tightening torque for M18 nut	55.3 - 62.7 ft·lb 75 - 85 N·m (7.7 - 8.7 kgf·m)

NOTICE

Make sure that the alignment mark with the idle gear is not misaligned.

NOTICE

Make sure that painting does not get into the coupler while reinstalling the coupler.

3. Reinstall the supply pump cover

Tightening torque for M8 bolts	16.7 - 20.9 ft·lb 22.6 - 28.4 N·m (2.3 - 2.9 kgf·m)

4. Reassembly of high-pressure pipe (Supply pump - common rail)

⚠ CAUTION

For high-pressure pipe, use a new one. If you reuse it, the displacement of the working face may occur, causing the fuel leaks.

   1- Before reinstalling the high-pressure pipe, apply fuel to the cap nut thread portion.

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ELECTRIC WIRING PRECAUTIONS

Failure to follow these precautions may result in the failure of an electrical component and the loss of warranty coverage on that item as well as related items. Make sure that all users read and understand these precautions.

NOTICE

Do not reverse the positive (+) and negative (-) ends of the battery cable. The alternator diode and stator coil will be damaged.

NOTICE

When the battery indicator goes out, it should not come on again. The battery indicator only comes on during operation if the alternator fails. However, if an LED is used in the battery indicator, the LED will shine faintly during normal operation.

NOTICE

Make sure that the combined total resistance of the battery cable in both directions between the starter motor and the battery is within the value indicated in the *Battery Cable Resistance chart* in the *Electric Wiring Section* of this manual. The starter motor will malfunction and fail if the resistance is higher than the specified value.

NOTICE

Removing the battery cables or the battery while the engine is operating may cause damage to the current limiter depending on the electrical equipment being used. This situation could cause loss of control of output voltage. The continuous high voltage of 23 - 24 V (for 5000 min^{-1} (rpm) dynamo) will damage the current limiter and other electrical equipment.

NOTICE

Reversing the battery cable connections at the battery or on the engine will destroy the SCR diode in the current limiter. This will cause the charging system to malfunction and may cause damage to the electrical harnesses.

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Cause	Symptoms and conditions of failures	Defective start: Starter not rotate: ECU indicator lamp not on just after key-on	Defective start: Starter not rotate: ECU indicator lamp on just after key-on (2 seconds)	Defective start: Starter rotates: Engine not start (not even initial combustion)	Defective start: Starter rotates: Engine not start (stall after serial combustion)	Defective start: Starter rotates: Engine starts later than ever	Engine stall after start: Exhaust fume: None	Engine stall after start: Exhaust fume: Little	Engine stall after start: Exhaust fume: Much	Defective rotation control: Speed change by accelerator not available (constant speed)	Defective rotation control: Without load: Specified speed setting not available	Defective rotation control: Without load: Poor acceleration	Defective rotation control: Without load: Return to low speed not smooth	Defective rotation control: Without load: Hunting	Defective rotation control: At work: Hunting	Insufficient engine output: Exhaust color: Normal	Insufficient engine output: Exhaust color: White	Insufficient engine output: Exhaust color: Black	Noise/vibration: Knocking noise at combustion too high	Noise/vibration: Combustion noise uneven	Noise/vibration: Noise other than combustion from engine	Noise/vibration: Engine vibration too big	Lubricant: Lubricant consumption too much	Lubricant: Lubricant diluted with fuel	Lubricant: Lubricant mixed with water	Lubricant: Oil pressure too low (oil pressure lamp on)	Cooling water: Overheated (water temperature lamp on)	Cooling water: Water temperature too low	Intake: Pressure down (air cleaner lamp on)	Intake: Pressure up	Exhaust: At work: White exhaust color	Exhaust: At work: Black exhaust color	Exhaust: Blow-by too much	Exhaust: Exhaust temperature up	Fuel: Fuel consumption too much	Fuel: Fuel mixed with water (oil-water separator lamp on)	Fuel: Fuel filter contaminated too early	Electrics/electronics: Battery charge defect (charge lamp on)	Electrics/electronics: ECU indicator lamp flashing	Electrics/electronics: ECU indicator lamp not on just after key-on (2 seconds)	Electrics/electronics: Prescribed ECU control function not operate	Electrics/electronics: Fuse meltdown, disconnection (repeated)	Action	Referenced page number
Cooling water system	Radiator super cooled																																										Thermostat replacement	*See Disassembly of Engine Coolant Pump on page 8-7.*
	Insufficient radiator cooling																	○									○							○									Thermostat replacement or check for fan belt loose	*See Disassembly of Engine Coolant Pump on page 8-7.*
	Insufficient cooling water quantity																	○									○							○									Water leak inspection of cooling water system	*See Engine Coolant System Check on page 8-8.*
	Water jacket cracks																							○	○	○	○																Repair or replacement	*See Disassembly of Engine Coolant Pump on page 8-7.*
	Fan belt elongation																	○									○							○									Adjustment of belt tension	
	Thermostat fault																	○									○	○			○												Inspection or replacement	*See Disassembly of Engine Coolant Pump on page 8-7.*
Lubricant system	Incorrect lubricant			○			○									○							○			○								○									Usage of correct lubricant	*See Engine Oil Specifications on page 4-22.*
	Lubricant system leakage																						○			○																	Repair	*See Disassembly of Oil Pump on page 9-7.*
	Insufficient discharge rate of trochoid pump																									○																	Inspection and repair	*See Disassembly of Oil Pump on page 9-7.*
	Lubricant filter clogged																									○						○											Cleaning or replacement	
	Regulator valve fault																									○																	Cleaning, adjustment or replacement	*See Disassembly of Oil Pump on page 9-7.*
	Insufficient lubricant quantity						○																			○																	Replenishment of correct lubricant	*See Adding Engine Oil on page 4-23.*
	Excess filling into crankcase																						○			○				○												Engine oil check	*See Adding Engine Oil on page 4-23.*
Fuel system	Incorrect fuel															○	○	○			○									○	○					○	○						Usage of correct fuel	*See Diesel Fuel Specifications on page 4-19.*
	Water entered into fuel system			○	○			○			○	○		○				○			○									○						○							Drainage of fuel filter	
	Fuel filter clogged			○		○	○				○					○																										Cleaning or replacement	
	Air entered into fuel system			○	○		○					○	○			○																										Bleeding	*See Priming the Fuel System on page 4-21.*
	Fuel pipe clogged, cracked			○			○									○																										Cleaning or replacement	
	Insufficient fuel feeding to fuel supply pump			○	○		○				○					○																										Check of fuel tank cock, fuel filter, fuel pipe, fuel feed pump	
	Priming not available			○																																						Valve in priming pump pinched dust (disassembled cleaning)	*See Fuel System Components on page 7-8.*
	Strainer at feed pump inlet clogged					○					○					○																										Cleaning of strainer	
	Sealing defect of fuel tank																																										Check of fuel tank and cap, as well as installation of genuine parts	
Intake	Air filter clogged							○			○							○			○										○			○	○								Cleaning of air filter	
	Engine operation at high temperature or high land																	□										○		○			○			□							Consideration of matching output reduction with load	
	Exhaust pipe clogged							○			○							□			○												○		○								Cleaning of exhaust pipe	

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