SEN06599-00

Shop Manual

ENGINE

88E -7 SERIES

MidWestTech | Komatsu 88E-7 Series Engine Service Manual | Publication SEN06599-00

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Tappet

Inspection item	Standard	Limit	Reference page
Tappet bore (block) inside diameter	0.4724 - 0.4734 in. (12.000 - 12.025 mm)	0.4742 in. (12.045 mm)	*See Inspection of tappets on page 6-42.*
Tappet stem outside diameter	0.4715 - 0.4720 in. (11.975 - 11.990 mm)	0.4707 in. (11.955 mm)	
Oil clearance	0.0004 - 0.0020 in. (0.010 - 0.050 mm)	0.0035 in. (0.090 mm)	

CYLINDER BLOCK SPECIFICATIONS

Cylinder Block

Inspection item		Standard	Limit	Reference page
Cylinder inside diameter		3.4646 - 3.4657 in. (88.000 - 88.030 mm)	3.4724 in. (88.200 mm)	*See Inspection of cylinder block on page 6-40.*
Cylinder bore	Roundness	0.0004 in. (0.01 mm) or less	0.0012 in. (0.03 mm)	
	Taper			

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Failure code (DTC)	Failure phenomenon (Display of screen)	Error Item		ECU generation code	Referenced page number	
		Area	Status		Overview	Failure diagnosis
#B1232	Start Assist Relay Abnormality A	Start Assist Relay	Error A	P1232/4	P.14-72	P.15-44
#B1233	Start Assist Relay Abnormality B		Error B	P1233/3	P.14-74	
#B1234	Start Assist Relay Intermittent Failure		Intermittent failure	P1234/2	P.14-76	
#B1242	CSD solenoid valve Abnormality A	CSD solenoid valve	Error A	P1242/4	P.14-78	P.15-48
#B1243	CSD solenoid valve Abnormality B		Error B	P1243/3	P.14-80	
#B1244	CSD solenoid valve Intermittent Failure		Intermittent failure	P1244/2	P.14-82	
#B1402	EGR Valve (Step Motor A-phase) Abnormality A	EGR valve	Error A (Step Motor A-Phase)	P1402/4	P.14-84	P.15-52
#B1403	EGR Valve (Step Motor A-phase) Abnormality B		Error B (Step Motor A-Phase)	P1403/3	P.14-86	
#B1412	EGR Valve (Step Motor B-phase) Abnormality A		Error A (Step Motor B-Phase)	P1412/4	P.14-88	
#B1413	EGR Valve (Step Motor B-phase) Abnormality B		Error B (Step Motor B-Phase)	P1413/3	P.14-90	
#B1422	EGR Valve (Step Motor C-phase) Abnormality A		Error A (Step Motor C-Phase)	P1422/4	P.14-92	
#B1423	EGR Valve (Step Motor C-phase) Abnormality B		Error B (Step Motor C-Phase)	P1423/3	P.14-94	
#B1432	EGR Valve (Step Motor D-phase) Abnormality A		Error A (Step Motor D-Phase)	P1432/4	P.14-96	
#B1433	EGR Valve (Step Motor D-phase) Abnormality B		Error B (Step Motor D-Phase)	P1433/3	P.14-98	
#B1192	Oil Pressure Switch Open Circuit	Oil pressure switch	Error	P1192/4	P.14-100	P.15-57
#B1198	Oil Pressure Low Error Alarm	Oil Pressure Descend Error		P1198/1	P.14-102	
#B1562	Charge Switch Open Circuit	Charge switch	Error	P1562/4	P.14-104	
#B1568	Charge Alarm	Charge Alarm		P1568/1	P.14-106	
#B1217	—	Abnormal Water Temperature		P1217/0	P.14-108	
#B1101	—	Air cleaner Clogging Alarm		P1101/0	P.14-110	
#B1151	—	Oil-water separator Alarm		P1151/0	P.14-112	
#B1212	Rack Actuator Abnormality (Low Current)	Rack actuator	Error (low current)	P1212/4	P.14-114	P.15-63
#B1213	Rack Actuator Abnormality (High Current)		Error (high current)	P1213/3	P.14-116	
#B1211	Rack Actuator Mechanical Failure		Mechanical failure	P1211/7	P.14-118	
#B1214	Engine Trouble	Engine	Error	P1214/2	P.14-120	
#B0605	FlashROM Error (Checksum A)	ECU Internal / Flash ROM	Error (Checksum A)	P0605/12	P.14-122	P.15-67
#B1605	FlashROM Error (Checksum B,C)		Error (Checksum B, C))	P1605/2 P1605/3		
#B1620	Map Format Error	Map format	Error	P1620/12		
#B1601	EEPROM Error (Checksum)	EEPROM	Error (Checksum)	P1601/2		
#B0601	EEPROM Memory Deletion Error		Error (read/write error)	P0601/12	P.14-123	
#B1610	Sub-CPU Abnormality (A,B,C)	Sub CPU	Error A	P1610/12		
#B1611	—		Error B	P1611/12		
#B1612	—		Error C	P1612/12		
#B0686	Main Relay Error	Main relay	Error	P0686/4	P.14-124	P.15-69
#BG001	CAN Communication Error	CAN Communication	Error	U0001/12	P.14-126	P.15-73
#BG167	Immobilizer CAN Communication Error	Immobilizer	Error (CAN communication)	U0167/12	P.14-128	P.15-75
#BH167	—		Error (pulse communication)	U1167/8	P.14-130	
#BG426	Immobilizer System Error		Error (System)	U0426/2	P.14-132	

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3. Check of harness continuity:
   - Remove the cooling water temperature sensor and E-ECU from the harness.
   - Check the harness continuity using a circuit tester.

Terminal	Continuity	Status
Sensor signal wire E16 (E25) [E-ECU ñ between sensor connector]	Available	OK: normal
	Unavailable	NG: harness disconnection
Sensor GND wire E28 [Between E-ECU and sensor connector]	Available	OK: normal
	Unavailable	NG: harness disconnection
Between E16 and other terminal/GND (between E25 and other terminal/GND)	Unavailable	OK: normal
	Available	NG: harness short-circuited with GND
E28 ñ GND/E45/E47	Available	OK: normal
	Unavailable	NG: harness disconnection
Between E28 and other terminals	Unavailable	OK: normal
	Available	NG: harness short-circuited with another wiring

NG	• Check if the harness is damaged, or if the wiring is correct. • Replace the harness.
OK	Check the output voltage of the cooling water temperature sensor. → Go to [4. Output voltage check of the cooling water temperature sensor:]

4. Output voltage check of the cooling water temperature sensor:
   - Connect the 2G eco-checker harness between E-ECU and machine's harness (for details, see[How to use the 2G eco-checker harness] (P15-5). And connect the all connectors (sensors, E-ECU).
   - Measure the voltage between sensor signal E16 and E28 (E35 and E28) using a circuit tester.

Voltage	Status	Action
E16(E25) ≤ 0.2[V]	NG	• Replace the harness. • Replace the cooling water temperature sensor.
0.2[V] < E16(E25) < 4.8V	OK (Normal range)	ReplaceE-ECU.
4.8V ≤ E16(E25)	NG	• Replace the harness. • Replace the cooling water temperature sensor.

NG	• Check if the harness is damaged, or if the wiring is correct. • Replace the harness.
OK	ReplaceE-ECU.

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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 volts (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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Disassembly of Crankshaft and Piston Components

■ Removal of pistons

NOTICE

Keep the piston pin parts, piston assemblies, and connecting rod assemblies together to be returned to the same position during the reassembly process. Label the parts using an appropriate method.

NOTICE

Engines with high operating hours may have a ridge near the top of the cylinders that will catch the piston rings and make it impossible to remove the pistons. Use a suitable ridge reamer to remove ridges and carbon prior to removing the pistons.

Note: Pistons can fall from cylinder block if the engine is inverted. Rotate the engine so the connecting rods are horizontal before removing the connecting rod caps.

1. Using a feeler gauge, measure the connecting rod side clearance as shown (**Figure 6-51**). *See Connecting Rod on page 6-8 for the standard limit.* If the measurement is out of specification, replace the crankshaft, connecting rod, or both.



Figure 6-51

2. Measure bearing oil clearance prior to removing the pistons and connecting rods to determine extent of wear. Record the measurements.

NOTICE

Mark the connecting rod caps and connecting rods so the caps and connecting rods stay together.

1- Remove the bearing cap. Do not remove the bearing inserts at this time.

2- Wipe oil from the bearing insert and crankshaft journal surfaces.

3- Place a piece of PLASTIGAGE® (1, **Figure 6-52**) along the full width of the bearing insert.



Figure 6-52

NOTICE

Do not rotate the crankshaft when using PLASTIGAGE. A false reading may result.

4- Reinstall bearing cap and tighten to specification. *See Special Torque Chart on page 6-10.*

5- Remove bearing cap.

6- Compare the width of the flattened PLASTIGAGE to the graduation marks on the package (1, **Figure 6-53**). The mark that most closely matches the width of the flattened PLASTIGAGE will indicate the bearing oil clearance.

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Symptoms and conditions of failures / Cause		Defective start					Engine stall after start			Defective rotation control						Insufficient engine output			Noise/vibration				Lubricant				Cooling water		Intake		Exhaust			Fuel				Electrics/electronics					Action	Referenced page number
		Starter not rotate		Starter rotates			Exhaust fume			Speed change by accelerator not available (constant speed)	Without load				At work	Exhaust color			Knocking noise at combustion too high	Combustion noise uneven	Noise other than combustion from engine	Engine vibration too big	Lubricant consumption too much	Lubricant diluted with fuel	Lubricant mixed with water	Oil pressure too low (oil pressure lamp on)	Overheated (water temperature lamp on)	Water temperature too low	Pressure down (air cleaner lamp on)	Pressure up	At work		Blow-by too much	Exhaust temperature up	Fuel consumption too much	Fuel mixed with water (oil-water separator lamp on)	Fuel filter contaminated too early	Battery charge defect (charge lamp on)	ECU indicator lamp flashing	ECU indicator lamp not on just after key-on (2 seconds)	Prescribed ECU control function not operate	Fuse meltdown, disconnection (repeated)		
		ECU indicator lamp not on just after key-on	ECU indicator lamp on just after key-on (2 seconds)	Engine not start (not even initial combustion)	Engine not start (stall after serial combustion)	Engine starts later than ever	None	Little	Much		Specified speed setting not available	Poor acceleration	Return to low speed not smooth	Hunting	Hunting	Normal	White	Black													White exhaust color	Black exhaust color														
Electric system	Fuse meltdown, disconnection	○	○				○																																○		○	Inspection and replacement of fuse Repair or replacement of harness	For harness inspection method, *See Mechanical System Failure Diagnosis on page 16-1.*
	Starter fault		○	○																																		○				Repair or replacement of starter	*See Starter Motor on page 10-8.*
	Alternator fault			○																																		○				Repair or replacement of alternator	*See Removal of Alternator on page 11-9.*
	Wiring disconnection	○	○	○			○																															○	○	○	○		Repair or replacement of harness disconnection	
	Wiring short-circuit (insulator broken), electric power load of added device too big	○																																							○	Inspection, repair or replacement of harnesses Review of added devices	
	Battery voltage descent		○	○																																		-					Inspection and charging of battery	
	Key switch fault, disconnection	○					○																																	○			Repair or replacement of harness Key switch replacement	For harness inspection method, *See Mechanical System Failure Diagnosis on page 16-1.*
	Instantaneous interruption of key switch				○		○																																				Key switch replacement	
	Failure, disconnection, short-circuit of starter relay		○																																								Repair or replacement of harness Replacement of starter relay	For harness inspection method, *See Mechanical System Failure Diagnosis on page 16-1.*
	Main relay fault (Error other than contact sticking that ECU can't detect)	○																																						○			Repair or replacement of harness Replacement of main relay	For harness inspection method, *See Mechanical System Failure Diagnosis on page 16-1.*
	Actuator relay fault (Error of contact that ECU can't detect)		○	○			○																																				Replacement of actuator relay	
	The start assist relay may be faulty. (Error of contact that ECU can't detect)			○		○													○												○												Replacement of start assist relay	
	Accelerator sensor signal error (Error at which level ECU can't detect)									○			○	○						○																								Repair or replacement of accelerator sensor	Monitor the accelerator sensor by the machine monitor.
	Engine coolant temperature sensor signal error (Error at which level ECU can't detect)			○		○							○	○					○																								Replacement of engine coolant temperature sensor	Monitor the cooling water temperature by the machine monitor.
	Speed sensor signal error (Cause of noise etc. that ECU can't detect)				○	○	○							○	○						○																						Cleaning or replacement of speed sensor Repair or replacement of fuel injection pump	Monitor the engine rotational speed by the machine monitor.
	Rack position sensor signal error (Level that ECU can't detect)					○	○					○	○	○							○																						Repair or replacement of fuel injection pump	Monitor the rack position sensor signal by the machine monitor.
	Operation defect of rack actuator (Level that ECU can't detect)					○	○					○	○	○							○																						Repair or replacement of fuel injection pump	Check the movement of rack actuator by the machine monitor.
	ECU failure lamp disconnected																																							○			Replace the lamp. Repair or replace the harness.	For harness inspection method, *See Mechanical System Failure Diagnosis on page 16-1.*
	ECU faulty (ECU self diagnosis failure)	○	○							○																														○	○		Replace the ECU.	

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