# **ENGINE MECHANICAL**

MA

GI

EM

LC

EC

FE

MT

SECTION

### **MODIFICATION NOTICE:**

#### **TB** series engine

• TB45S engine has been added. Refer to Supplement-III (SM9E-Y61CG0) for details of TB45S.

#### TD series engine

 $\bullet\,$  TD42T engine has been added. For specifications other than those described here, refer to the TD42 engine.

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TD42T

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	ST
	-
	RS
	BT
	ΠΠΔ
	HA.

EL

SE

IDX

#### TD42T





### OUTER COMPONENT PARTS

TD42T



IDX





Removal	and Installation	G]
1. Drain er 2. Remove	igine coolant. the following.	MA
<ul> <li>Air duct</li> <li>Heat shi</li> <li>Exhaust</li> </ul>	and intercooler components eld plates front tube	EM
<ul> <li>Oil tubes</li> <li>Water tu</li> <li>3. Remove</li> <li>4. Remove</li> </ul>	s bes turbocharger from exhaust manifold. turbocharger bracket bolts	LC
Inspectio	n	EC
Condition 1: Lov	v engine power	FE
Probable cause	Corrective action	CL
Air leak at the connection of compressor housing and suc- tion hose/inlet tube, or inlet and intake manifold.	Correct the connection.	MT
Exhaust gas leak at the connection of turbine housing and exhaust manifold, connecting tube or exhaust outlet.	Correct the connection or replace gasket.	AT
By-pass valve is stuck in open position.		TF
Stuck or worn journal or bearing.	→	PD
Broken shaft.	Replace turbocharger assembly.	FA
Sludge on back of turbine wheel.	→	RA
Broken turbine wheel.	→	BR
		ST
Condition 2: Excessive	ely high engine power	RS
Probable cause	Corrective action	RT
Disconnected or cracked rubber hose of by-pass valve controller.	Correct or replace rubber hose.	HA
By-pass valve is stuck in closed position.	Replace turbocharger assembly.	EL
Controller diaphragm is broken.	→	SE

### TURBOCHARGER

### Inspection (Cont'd)

 Condition 3: Excessively high oil consumption, or exhaust shows pale blue smoke

 Probable cause
 Corrective action

 Oil leak at the connection of lubricating oil passage.
 Correct the connection.

 Oil leak at oil seal of turbine.
 Image: Compressor.

 Oil leak at oil seal of compressor.
 Image: Compressor.

 Worn journal or bearing.
 Image: Compressor.

#### Perform the following checks. If NG, replace turbocharger unit.





#### **OIL AND WATER TUBES**

Check tubes for clogging.

	TURBOCHARGER	TD42T
	Inspection (Cont'd)	
- Hook	ROTOR SHAFT	G
		MA
		EN
		LC
	2. Check rotor shaft for carbon deposits.	EG
Rotor shaft		FE
		GL
		MT
	3. Measure rotor shaft runout.	AT
Rotor	Runout (Total indicator reading): Standard 0.12 - 0.17 mm (0.0047 - 0.0067 in)	1 T
		PD
		FA
DEM120		RA
	4. Measure rotor shaft end play. End play: Standard	BR
	<ul> <li>Do not allow wheels to turn when axial play is be sured.</li> </ul>	eing mea- <sub>ST</sub>
		RS
DEM138		BT
	TURBINE WHEEL Check turbine wheel for the following.	HA
	<ul> <li>Oil</li> <li>Carbon deposits</li> <li>Deformed fine</li> </ul>	FI
	<ul> <li>Contact with turbine housing</li> </ul>	ح <u>ا</u> حا
		SE
DEM122		IDX

### EM-7

### TURBOCHARGER



GI

#### SEC. 111•130•185•220



IDX



Paint mark

### Inspection COMBUSTION CHAMBER Identification of combustion chambers

Identification mark	Outer diameter
(on combustion chamber)	"D" mm (in)
1 place	37 (1.46)

### Assembly

### Identification of valves

Identification mark (on intake and exhaust valve)		
Intake valve	Exhaust valve	
3	L	

## Installation

### Cylinder head identification mark

Identificati (on cylind	on number der head)
Rear mark	Punch mark
T2	J

### Cylinder head bolt tightening procedure

Apply oil to the thread portion and seat surface of bolts and tighten cylinder head bolts using Tool.

1st: Tighten bolts to 39 - 44 N⋅m (4.0 - 4.5 kg-m, 29 - 33 ft-lb). 2nd: Tighten bolts to 59 - 64 N⋅m (6.0 - 6.5 kg-m, 43 - 47 ft-lb).

3rd:

- (1) Mark exhaust side of cylinder head and cylinder head bolts with paint as shown.
- (2) Turn all bolts 110±10 degrees clockwise.
- (3) Check that the paint mark of each bolt is facing the front of the vehicle.
- Always check the bolt tightening angle with an angle wrench or protractor. Do not check visually.

EM-10

DEM038-A

Front

Front	Removal	GI
	<ol> <li>Remove engine undercover, under guard and hood.</li> <li>Follow the same procedure as for TD42.</li> </ol>	MA
		EM
Under guard Under guard DEM143		LC
DLWING		EC
		FE
		GL
		MT
		AT
		TF
		PD
		FA
		RA
		BR
		ST
		RS
		BT
		HA
		EL
		SE
		IDX

#### SEC. 110•120•130•135•150



DEM101-A



### **ENGINE OVERHAUL**



### Inspection and Replacement (Cont'd) CONNECTING ROD BEND AND TORSION

Bend and torsion: mm (in) Limit

0.05 (0.0020) per 100 (3.94) length



#### **GEAR TRAIN**

- 1. Set No. 1 piston at TDC on its compression stroke.
- 2. Align each gear mark and install gears.

		Unit: mm (in)
	Standard	Limit
Side clearance		
Тор	0.06 - 0.10 (0.0024 - 0.0039)	0.50 (0.0197)
2nd	0.04 - 0.08 (0.0016 - 0.0031)	0.30 (0.0118)
Oil	0.02 - 0.06 (0.0008 - 0.0024)	0.15 (0.0059)
Ring gap		
With cylinder liner for factory		
Тор	0.30 - 0.45 (0.0118 - 0.0177)	
2nd	0.50 - 0.65 (0.0197 - 0.0256)	
Oil (rail ring)	0.25 - 0.45 (0.0098 - 0.0177)	
With cylinder liner for service		1.5 (0.059)
Тор	0.40 - 0.60 (0.0157 - 0.0236)	
2nd	0.60 - 0.80 (0.0236 - 0.0315)	
Oil ring	0.40 - 0.65 (0.0157 - 0.0256)	

### CONNECTING ROD

	Unit: mm (in)	MA
Center distance	156.975 - 157.025 (6.1801 - 6.1821)	EM
Bend, torsion [per 100 (3.94)]		
Limit	0.05 (0.0020)	LC
Piston pin bore dia.	30.025 - 30.038 (1.1821 - 1.1826)	
Side clearance		EC
Standard	0.10 - 0.22 (0.0039 - 0.0087)	
Limit	0.22 (0.0087)	FE

### AVAILABLE MAIN BEARING

### Bearing clearance

	Unit: mm (in)	0/152
Main bearing clearance		UMU U
Standard	0.035 - 0.083 (0.0014 - 0.0033)	
Limit	0.15 (0.0059)	AT
Connecting rod bearing clearance		
Standard	0.035 - 0.077 (0.0014 - 0.0030)	TF
Limit	0.15 (0.0059)	
		PD

GI

CL

FA

RA

BR

ST

RS

BT

HA

EL

SE