



YANMAR

SERVICE MANUAL

INDUSTRIAL DIESEL ENGINE

MODEL **4TNE94·98·106(T)**
(Direct Injection System)



YANMAR DIESEL ENGINE CO., LTD.

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FOREWORD

This manual describes the service procedures for the 4TNE94-98-106(T) engines (direct injection) for industrial use.

Please use this manual for accurate, quick and safe servicing of the said engine. Since the explanation in this manual assumes the standard type engine, the specifications and components may partially be different from the engine installed on individual work equipment (power generator, pump, compressor, etc.). Please also refer to the service manual for each work equipment for details.

The specifications and components may be subject to change for improvement of the engine quality. If any modification of the contents described herein becomes necessary, it will be notified in the form of a correction information each time.



This product has been developed, designed and manufactured in a plant certified by the JMI, BSI and EQNET to conform to the quality assurance system standard provided as ISO 9001 (International Standard for Quality Assurance).

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4.1 Introduction

Make preparation as follows before starting engine inspection and service:

- (1) Fix the engine on a horizontal base.

▲ CAUTION

Be sure to fix the engine securely to prevent injury or damage to parts due to falling during the work.

- (2) Remove the cooling water hose, fuel oil pipe, wire harness, control wires etc. connecting the driven machine and engine, and drain cooling water, lubricating oil and fuel.
- (3) Clean soil, oil, dust, etc. from the engine by washing with solvent, air, steam, etc. Carefully operate so as not to let any foreign matter enter the engine.

▲ CAUTION

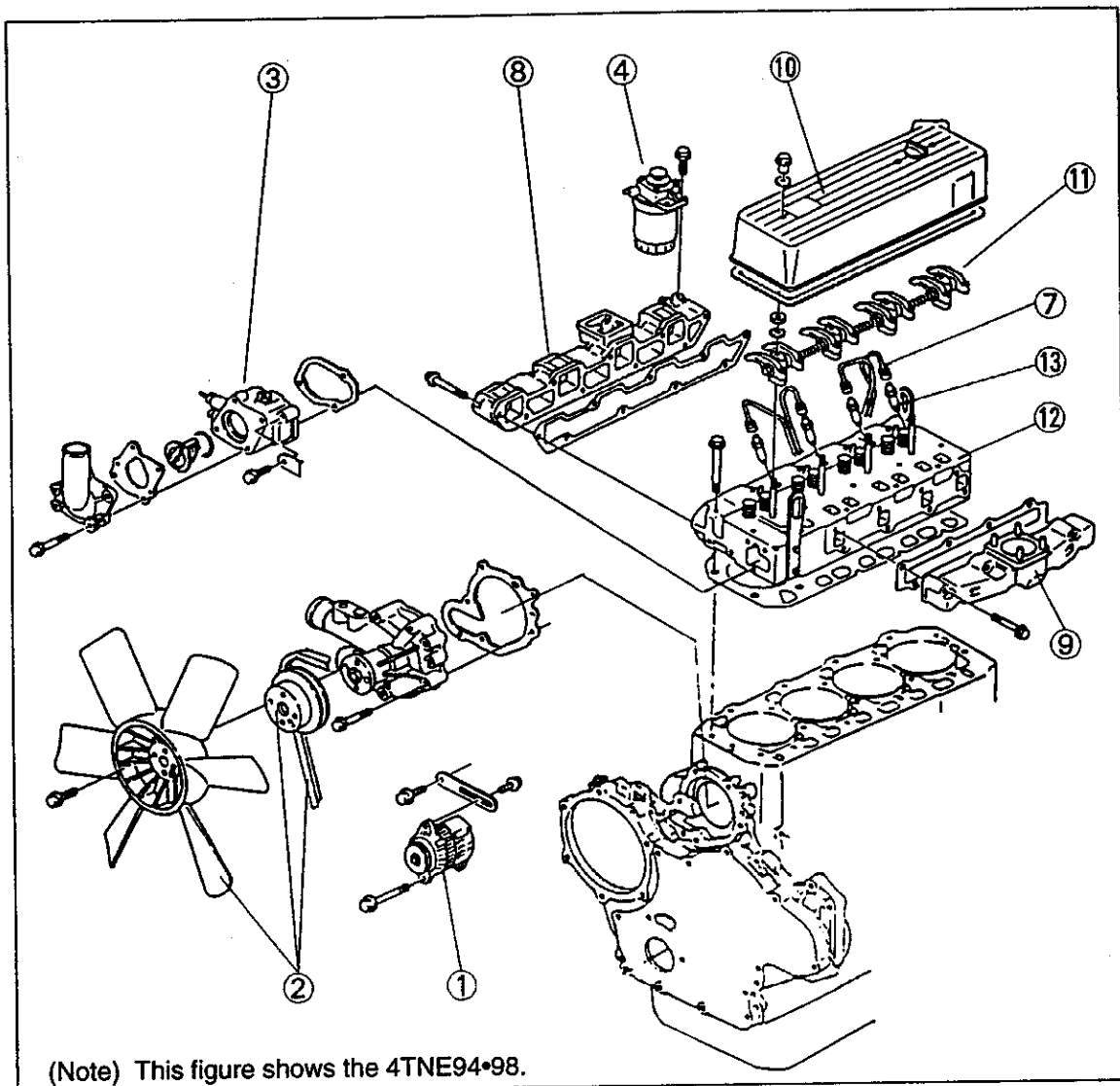
Always wear glasses or other protectors when using compressed air or steam to prevent any foreign matter from getting in the eyes.

[NOTICE]

- *Any part which is found defective as a result of inspection or any part whose measured value does not satisfy the standard or limit shall be replaced.*
- *Any part predicted to dissatisfy the standard or limit before the next service as estimated from the state of use should be replaced even when the measured value then satisfies the standard or limit.*

4.2 Cylinder Head

(1) Components



(2) Disassembly procedure:

Disassemble in the order of the numbers shown in the illustration.

- ① Remove the alternator assy. **(Point 1)**
- ② Remove the fan, pulley and V belt.
- ③ Remove the thermostat case. **(Point 2)**
- ④ Remove the fuel filter and fuel oil piping. **(Point 3)**
- ⑤ Remove the oil level gage assy.
- ⑥ Remove the oil filter. **(Point 4)**
- ⑦ Remove the fuel injection pipes. **(Point 5)**
- ⑧ Remove the intake manifold assy.
- ⑨ Remove the exhaust manifold assy.
- ⑩ Remove the bonnet Assy.
- ⑪ Remove the rocker shaft assy, push rods and valve caps. **(Point 6)**
- ⑫ Remove the cylinder head assy and head gasket. **(Point 7)**
- ⑬ Remove the fuel injection valves and fuel return pipe. **(Point 8)**
- ⑭ Remove the intake/exhaust valves, stem seals and valve springs. **(Point 9)**
- ⑮ Remove the rocker arms from the rocker shaft.

- (3) **Reassembly procedure:**
Reverse order of the disassembly procedure.

(4) **Servicing points**

Point 1

Disassemble:

- Loosen the mounting bolt while supporting the alternator.



CAUTION

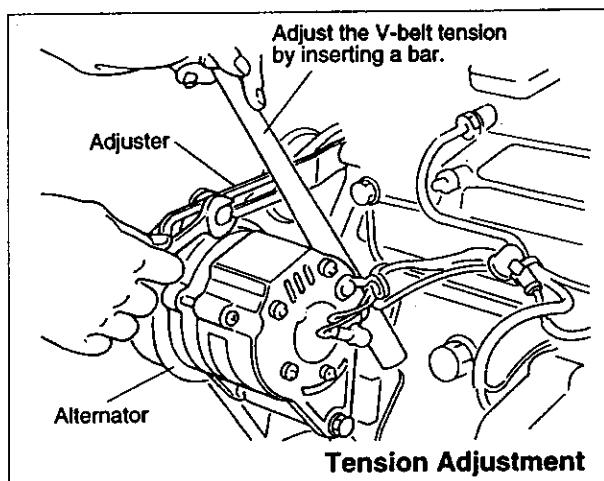
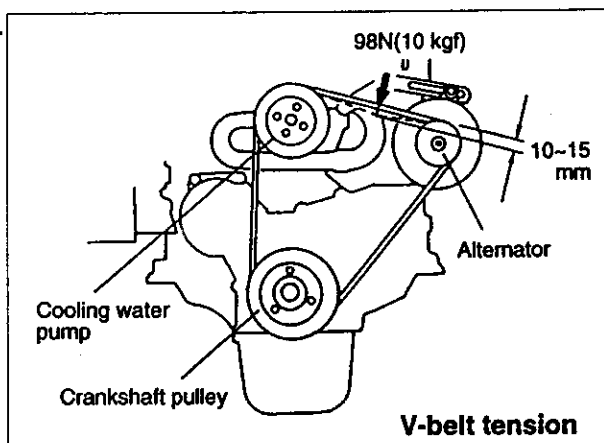
Do not tilt the alternator toward the cylinder block in a haste since it may damage the alternator or pinch a finger.

Reassemble:

- The belt deflection shall be 10–15 mm (7 ~ 9 mm for a new belt).

Reassemble:

- Replace the belt with a new one if cracked, worn or damaged.
- Carefully prevent the belt from being smeared with oil or grease.



Point 2

Reassemble:

- Check the thermostat function. (See 3.9 in Chapter 3 for the check procedure.)

Point 3

Reassemble:

- Replace the fuel filter element with a new one.

Disassemble:

- Cover the fuel pipe opening with tape to prevent intrusion of foreign matters.

Point 4

Reassemble:

- Replace the oil filter with a new one.
- After fully tightening the filter manually, retighten it with a filter wrench (see 11.1-6 in Chapter 11) by 3/4 turn.

Point 5

Disassemble:

- Cover the fuel injection pipe and pump inlets and outlets with tape or the like to prevent intrusion of foreign matters.

4. Engine Body

Point 6

Disassemble:

- Keep the removed push rods by attaching tags showing corresponding cylinder Nos.

Reassemble:

- Always apply oil to the contact portions of the push rods and valve clearance adjusting screws.

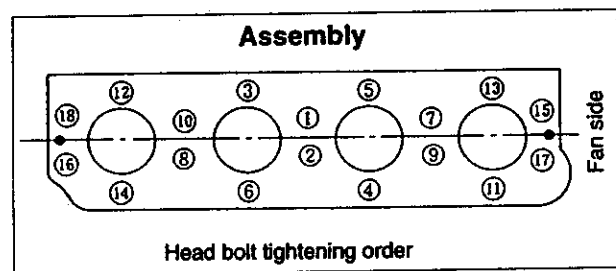
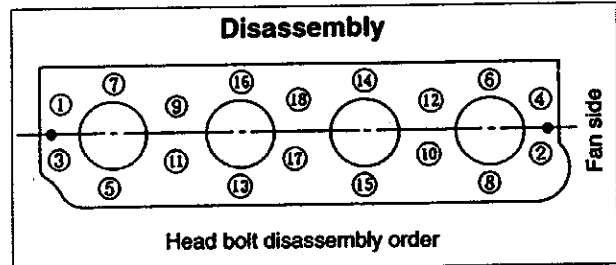
Point 7

Disassemble:

- Loosen the cylinder head bolts in two steps in the illustrated order.
- Place the cylinder head assy on a paper board to prevent the combustion face from any damage.

Reassemble:

- Remove the head gasket with a new one.
- Uniformly install the head bolts manually after applying oil on the threaded and seat portions.
- They shall be tightened in two steps in the reverse of the order for disassembly.
- Tightening torque



Nm(kgf·m)

	4TNE94*98	4TNE106 (T)
First step:	49~58.8 (5~6)	88.3~98.1 (9~10)
Second step:	102.9~112.7 (10.5~11.5)	181.4~191.2 (18.5~19.5)

Point 8

Disassemble:

- Carefully remove the fuel injection valve so as not to leave the tip end protector from being left inside the cylinder.

Reassemble:

- Replace the fuel injection valve protector with a new one.

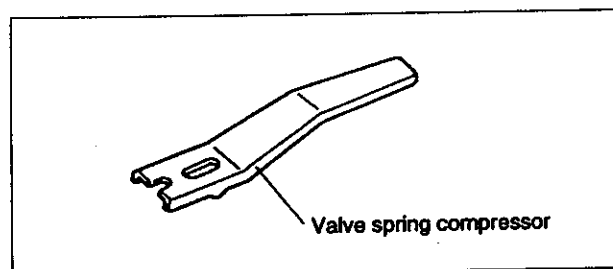
Point 9

Disassemble:

- When removing each intake/exhaust valve from the cylinder head, use a valve spring compressor (see 11.1-4 in Chapter 11) and compress the valve spring and remove the valve cotter.
- Keep each removed intake/ exhaust valve after attaching a tag showing the corresponding cylinder No.
- If cotter burr is seen at the shaft of each intake/exhaust valve stem, remove it with an oil-stone and extract the valve from the cylinder head.

Reassemble:

- Replace the stem seal with a new one when an intake/exhaust valve is disassembled.
- Carefully install each valve after oil application so as not to damage the stem seal.



- Different stem seals are provided for the intake and exhaust valves. Do not confuse them since those for exhaust valves are marked with yellow paint.
- After assembling the intake/exhaust valve, stem seal, valve spring, seat, and cotter, tap the head of the valve stem lightly for settling.
- Do not forget to install the valve cap.

(5) Parts Inspection and measurement

(5.1) Cylinder head

Clean the cylinder head, mainly the combustion surface, valve seats and intake/exhaust ports, remove carbon deposit and bonding agent, and check the surface state.

(a) Appearance check

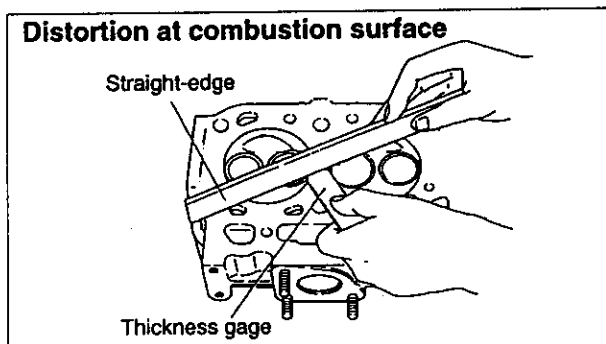
Check mainly discoloration and crack.
If crack is suspected, perform color check.

(b) Combustion surface distortion

Apply a straight-edge in two diagonal directions and on four sides of the cylinder head, and measure distortion with a thickness gage.

(mm)

-	Standard	Limit
Distortion	0.05 or less	0.15

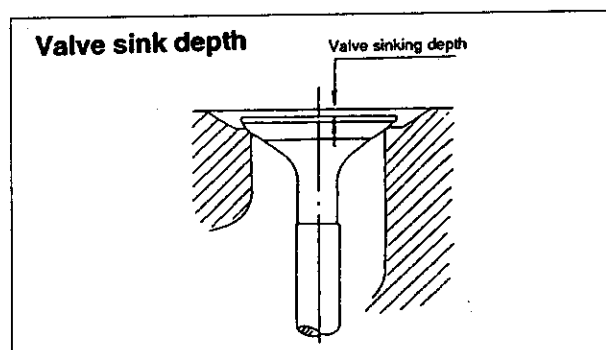
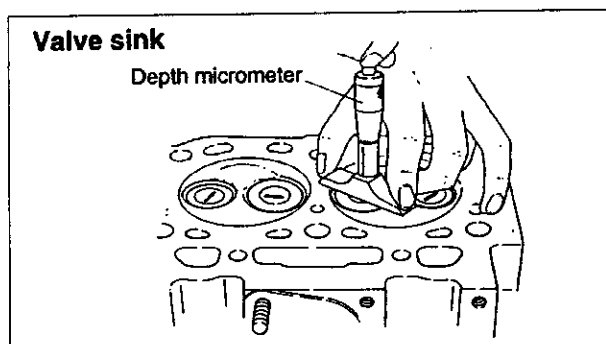


(c) Valve sink

Measure with the valve inserted to the cylinder head.

(mm)

-		Standard	Limit
4TNE94*98	Intake	0.5~0.7	1.0
	Exhaust	0.6~0.8	1.1
4TNE106 (T)	Intake	0.7~0.9	1.2
	Exhaust	0.9~1.1	1.4



4. Engine Body

(d) Seat contact

Apply a thin coat of minium on the valve seat. Insert the valve in the cylinder and push it against the seat to check seat contact.

Standard: Continuous contact all around

(5.2) Valve guide

Mainly check damage and wear on the inside wall. Apply supply part code when replacing the part.

-	Service part code
4TNE94*98	129150-11810
4TNE106 (T)	119000-11170

① Inside diameter (mm)

-		Standard	Limit
4TNE94*98			
Intake value	Guide I.D.	8.015~8.030	8.100
	Stem O.D.	7.965~7.980	7.915
	Clearance	0.035~0.065	0.185
Exhaust value	Guide I.D.	8.015~8.030	8.100
	Stem O.D.	7.955~7.970	7.905
	Clearance	0.045~0.075	0.195
4TNE106 (T)			
Intake value	Guide I.D.	9.000~9.015	9.085
	Stem O.D.	8.950~8.965	8.900
	Clearance	0.035~0.065	0.185
Exhaust	Guide I.D.	9.000~9.015	9.085
	Stem O.D.	8.940~8.955	8.890
	Clearance	0.045~0.075	0.195

