1. Specifications and Performance

1-1 2TNE68

* **Output conditions:** Intake back pressure ≤ 250 mmAq, Exhaust back pressure ≤ 550 mmAq, other conditions complying with JIS D 1005–1986. After minimum 30 hour's run-in.

Item	Model / Unit	2TNE68		
Application	—	VM	CH	VH
Type	—	Vertical, 4-cycle water-cooled diesel engine		
Combustion system	—	Special swirl pre-combustion chamber		
No. of cylinders – Bore × Stroke	mm	2 – 68 × 72		
Displacement	ℓ	0.523		
Firing order	—	1 – 2		

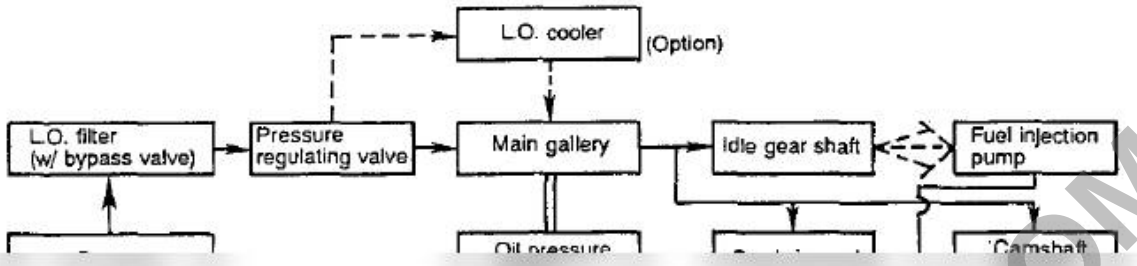
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2. Lubrication system diagram

(1) Indirect injection system



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4. Troubleshooting

4-1. Trouble causes and remedies

The following table summarizes the symptoms and causes of general troubles. If any symptom of trouble is found, a corrective action shall be taken before the said symptom develops into a serious accident.

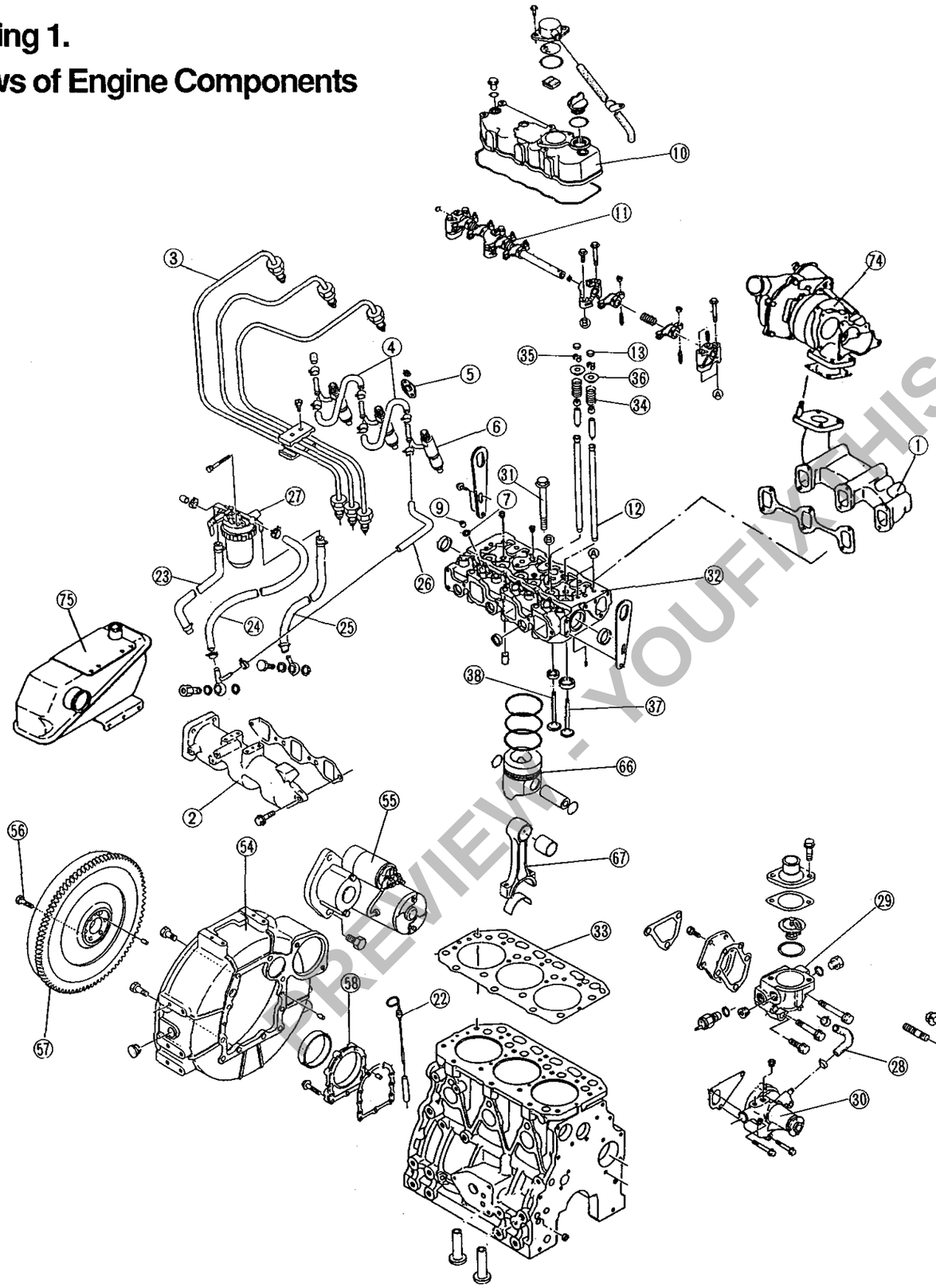
Carefully read Chapter 6, Measurement, Inspection and Adjustments, and Chapter 7, Measuring Procedures, Service Data and Countermeasures. Familiarize yourself with Chapter 6 and Chapter 7, which practice is extremely important for extending the service life of the engine.

	Symptom of trouble / Cause	Fails to start: Engine will not start.	Fails to start: Engine starts but stops soon: Exhaust smoke: Nil	Fails to start: Engine starts but stops soon: Exhaust smoke: Less	Fails to start: Engine starts but stops soon: Exhaust smoke: More	Insufficient engine output: Exhaust color: Regular	Insufficient engine output: Exhaust color: White	Insufficient engine output: Exhaust color: Black	Poor exhaust color: During work: White	Poor exhaust color: During work: Black	High knocking sound during combustion	Abnormal engine noise	Uneven combustion sound	Hunting: During idling	Hunting: During work	Large engine vibration	Poor return to low speed	Excessive fuel consumption	Lubricating oil: Excessive consumption	Lubricating oil: Diluted by fuel oil	Lubricating oil: Mixture with water	Lubricating oil: Low L.O. pressure	Much blow-by gas	Cooling water: Overheat	Cooling water: Low water temperature	Air intake: Pressure drop	Air intake: Pressure rise	Exhaust temperature rise				Corrective action
Engine System	Improper clearance of intake/exhaust valve	○	○			○						○													○		○					Adjust valve clearance (Refer to Chapter 6, 6-2.)
	Compression leakage from the valve seat					○		○		○		○					○					○			○		○					Rap valve seat (Refer to Chapter 7, 7-1-2.)
	Seized intake/exhaust valve	○			○	○		○		○		○			○	○			○			○			○							Correct or replace.
	Blowout of cylinder head gasket					○														○			○									Replace the gasket. (Refer to Chapter 8, 8-2-(10))
	Seized or broken piston ring	○			○		○		○			○		○		○		○	○			○	○				○					Replace the piston ring. (Refer to Chapter 7, 7-4-3, 4, (5))
	Worn piston ring, piston and cylinder	○			○		○		○									○	○			○										Make honing and use oversize parts. (Refer to Chapter 7, 7-2-3. & 7-4-(8))
	Seized crank pin metal and bearing	○	○									○		○	○	○						○										Repair or replace.
	Improper arrangement of piston ring joints		○				○											○				○										Correct the ring joint positions. (Refer to Chapter 7, 7-4-(5))
	Reverse assembly of the piston ring						○		○									○				○										Properly reassemble. (Refer to Chapter 7, 7-4-(5))
	Worn crank pin and journal metal					○						○		○	○	○					○											Measure and replace . Refer to Chapter 7, 7-5-3. and 7-7-(5))
	Loosened connecting rod bolt											○				○					○											Tighten bolt to the specified torque. (Refer to Chapter 10, 10-1.)
	Foreign matter trapped in combustion chamber	○										○						○				○										Disassemble and repair the combustion chamber. Eliminate foreign matter.
	Excessive gear backlash											○																				Adjust meshing of gears. (Refer to Chapter 7, 7-8-(2))
	Worn valve guide of intake/exhaust valves						○											○				○										Measure and replace. (Refer to Chapter 7, 7-1-(3))
	Poor governor		○											○	○	○	○															Repair and adjust. (Refer to Chapter 13.)
	Improper open/close timing of intake/exhaust valves	○					○	○	○	○		○																				Adjust valve clearance (refer to Chapter 6, 6-2) and check intake/exhaust valve timing (Refer to Chapter 9, 9-1)
Turbocharger	Dirty blower						○		○																○							Clean the blower.
	Waste gate malfunction						○		○																○							Disassemble and inspect the waste gate.
	Worn journal bearing					○		○																								Disassemble and inspect the journal bearing.
Cooling Water System	Cooling effect of radiator, excessive							○									○						○									Malfunction of thermostat (kept closed). (Refer to Chapter 6, 6-9)
	Cooling effect of radiator, insufficient						○																○				○					Malfunction of thermostat (kept opened). (Refer to Chapter 6, 6-9) Slipping fan belt (Refer to Chapter 6, 6-3)
	Insufficient cooling water level						○																○				○					Check water leakage from Cooling water system (Refer to Chapter 6, 6-7) and clean cooling water system (Refer to chapter 3, 3-1)
	Cracked water jacket																			○	○		○									Repair and replace.
	Slackened fan belt tension						○																○				○					Adjust fan belt tension. (Refer to Chapter 6, 6-3)
	Poor thermostat						○																○	○								Check or replace. (Refer to Chapter 6, 6-9)

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Attached Drawing 1.
Exploded Views of Engine Components



No.	Engine Component	No.	Engine Component
1	Exhaust manifold	27	Fuel filter
2	Intake manifold	28	Cooling water pipe
3	High-pressure fuel pipe	29	Thermostat assembly
4	Fuel return pipe	30	Cooling water pump
5	Fuel injection nozzle retainer	31	Cylinder head tightening bolt
6	Fuel injection nozzle	32	Cylinder head assembly
7	Nozzle seat	33	Cylinder head gasket
9	Nozzle protector	34	Valve spring
10	Bonnet assembly	35	Valve cotter
11	Valve rocker arm shaft assembly	36	Valve retainer
12	Push rod	37	Intake valve
13	Valve cap	38	Exhaust valve
14	Fan mounting bolt	54	Flywheel housing
15	Fan	55	Starting motor
16	Adjusting bolt	56	Flywheel mounting bolt
17	V-belt	57	Flywheel
18	Alternator	58	Oil seal case
19	Spacer	66	Piston
20	V-pulley	67	Connecting rod
22	Dipstick	74	Turbocharger (3TNE84T, 4TNE84T)
23 ~ 26	Fuel return pipe	75	Surge tank (3TNE84T)

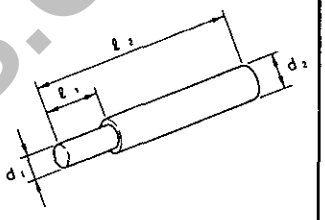
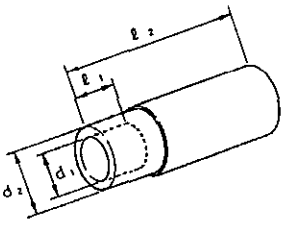
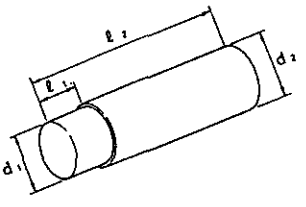
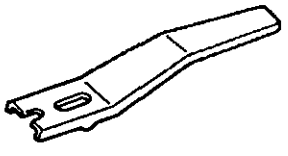
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5. Special Service Tools and Measuring Instruments

Although main engine parts can be disassembled and reassembled only with standard service tools, it is recommended to provide the following special service tools and measuring instruments for more efficient and accurate work, correct measurement, diagnosis, and troubleshooting.

5-1. Special service tools

<table>
<tr><th>No.</th><th>Tool name</th><th>Applicable model and tool dimension</th><th>Illustration</th></tr>
<tr><td>1</td><td>Valve guide extraction tool</td><td>(mm)
<table><tr><th>Dimension / Model</th><th>ℓ_1</th><th>ℓ_2</th><th>d_1</th><th>d_2</th></tr><tr><td>2/3TNE68</td><td>20</td><td>55</td><td>5</td><td>8</td></tr><tr><td>3TNE74</td><td>20</td><td>75</td><td>6.5</td><td>10</td></tr><tr><td>3TNE78A/82A</td><td>20</td><td>75</td><td>6.5</td><td>10</td></tr><tr><td>3/4TNE82
3/4TNE84(T)
3/4TNE88</td><td>20</td><td>75</td><td>7.5</td><td>11</td></tr></table>* Locally manufactured</td><td></td></tr>
<tr><td>2</td><td>Valve guide insertion tool</td><td>(mm)
<table><tr><th>Dimension / Model</th><th>ℓ_1</th><th>ℓ_2</th><th>d_1</th><th>d_2</th></tr><tr><td>2/3TNE68</td><td>7</td><td>60</td><td>11</td><td>17</td></tr><tr><td>3TNE74</td><td>9</td><td>60</td><td>13</td><td>19</td></tr><tr><td>3TNE78A/82A</td><td>12</td><td>60</td><td>13</td><td>19</td></tr><tr><td>3/4TNE82
3/4TNE84(T)
3/4TNE88</td><td>15</td><td>65</td><td>14</td><td>20</td></tr></table>* Locally manufactured</td><td></td></tr>
<tr><td>3</td><td>Connecting rod bushing replacer</td><td>(mm)
<table><tr><th>Dimension / Model</th><th>ℓ_1</th><th>ℓ_2</th><th>d_1</th><th>d_2</th></tr><tr><td>2/3TNE68</td><td>22</td><td>62</td><td>$20^{-0.3}_{-0.6}$</td><td>$22^{-0.3}_{-0.6}$</td></tr><tr><td>3TNE74</td><td>20</td><td>80</td><td>$21^{-0.3}_{-0.6}$</td><td>$23^{-0.3}_{-0.6}$</td></tr><tr><td>3TNE78A/82A</td><td>25</td><td>85</td><td>$23^{-0.3}_{-0.6}$</td><td>$26^{-0.3}_{-0.6}$</td></tr><tr><td>3/4TNE82
3/4TNE84(T)
3/4TNE88</td><td>20</td><td>100</td><td>$26^{-0.3}_{-0.6}$</td><td>$29^{-0.3}_{-0.6}$</td></tr></table>* Locally manufactured</td><td></td></tr>
<tr><td>4</td><td>Valve spring compressor (Replacement of valve spring)</td><td><table><tr><th>Model</th><th>Yanmar Code No.</th></tr><tr><td>All model</td><td>129100–92630</td></tr></table></td><td></td></tr>
</table>

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10. Tightening Torque

10-1 Main bolt/nut

(Unit: kgf-m)

No.	Item	Model / Torque	2/3TNE68	3TNE74	3TNE78A 3TNE82A	3/4TNE82, 3/4TNE84(T), 3/4TNE88
1	Cylinder head bolt	Lubricating oil applied (Thread dia. × pitch)	3.8~4.2 (M8 × 1.25)	6.0~6.5 (M9 × 1.25)	6.8~7.2 (M9 × 1.25)	8.7~9.3 (M10 × 1.25)
2	Connecting rod bolt	Lubricating oil applied (Thread dia. × pitch)	2.3~2.8 (M7 × 1.0)	2.3~2.8 (M7 × 1.0)	3.8~4.2 (M8 × 1.0)	4.5~5.5 (M9 × 1.0)
3	Flywheel clamping bolt	Lubricating oil applied (Thread dia. × pitch)	8.2~8.8 (M10 × 1.25)	8.0~9.0 (M10 × 1.25)	8.5~9.0 (M10 × 1.25)	8.5~9.0 (M10 × 1.25)

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6. Measurement, Inspection and Adjustment

6-1. Measuring the compression pressure

1. Measuring Procedure

(1) Warm up the engine. Remove the fuel injection pipe and fuel injection valve from the cylinder to be measured.

(2) Crank the engine before attaching the compression gauge adapter.

∗ : *Never fail to attach the gasket to the tip of the adapter.*



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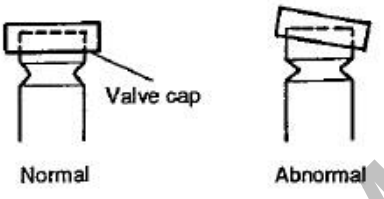
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6-2. Adjusting the valve head clearance

(1) Inspect and adjust a valve head clearance while the engine is in cold state.

(2) Raise the piston in the cylinder to be measured to the top dead center (TDC) of compression.



(3) Loosen the lock nut and adjusting screw.

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6-11. Checking the Piston Cooling Nozzle

The piston cooling nozzle is installed as a standard component on turbocharged engines in the TNE series.

(1) Piston cooling nozzle function
A nozzle made of a steel pipe is installed below the main gallery in the cylinder body. The lubricating oil from the main gallery is constricted at the nozzle hole

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