



# Operation & Maintenance Manual

**DIESEL ENGINE FOR INDUSTRIAL**

**DE12**

**DE12T**

**DE12T1A**

**DE12T1S**
















## FOREWORD

This manual is designed to serve as a reference for DOOSAN Heavy Industries & Machinery Ltd's (here after DOOSAN's) customers and distributors who wish to gain basic product knowledge on DOOSAN's **DE12T, DE12TI, DE12TIA and DE12TIS** diesel engines.

These economical and high-performance diesel engines (6 cylinders, 4 strokes, in-line type) have been so designed and manufactured to be used for the industrial application. They meet all the requirements such as low noise, fuel economy, high engine speed and durability.

To maintain the engine in optimum condition and retain maximum performance for a long time, **CORRECT OPERATION** and **PROPER MAINTENANCE** are essential.

In this manual, the following symbols are used to indicate the type of service operations to be performed.

	Removal		Adjustment
	Installation		Cleaning
	Disassembly		Pay close attention-Important
	Reassembly		Tighten to specified torque
	Align the marks		Use special tools of manufacturer's
	Directional Indication		Lubricate with oil
	Inspection		Lubricate with grease
	Measurement		

During engine maintenance, please observe following instructions to prevent environmental damage;

- Take old oil to an old oil disposal point only.
- Ensure without fail that oil will not get into the sea or rivers and canals or the ground.
- Treat undiluted anti-corrosion agents, antifreeze agents, filter element and cartridges as special waste.
- The regulations of the relevant local authorities are to be observed for the disposal of spent coolants and special waste.

If you have any question or recommendation in connection with this manual, please do not hesitate to contact our head office, dealers or authorized service shops near by your location for any services.

For the last, the content of this maintenance instruction may be changed without notice for some quality improvement. Thank you.

DOOSAN Infracore Co., Ltd.

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# CONTENTS

<b>1. SAFETY REGULATIONS &amp; ENGINE SPECIFICATIONS .....</b>	<b>1</b>
1.1. General Notes	
1.2. Regulations Designed to Prevent Accidents	
1.3. Regulations Designed to prevent Damage to Engine and Premature Wear	
1.4. Regulations Designed to Prevent Pollution	
1.5. Notes on Safety in Handling Used Engine Oil	
1.6. General Repair instructions	
1.7. Engine Specification	
1.8. Engine Assembly	
<b>2. TECHNICAL INFORMATION .....</b>	<b>16</b>
2.1. Engine Model and Serial Number	
2.2. Engine Type	
2.3. Engine Timing	
2.4. Valves	
2.5. Lubrication System	
2.6. Fuel System	
2.7. Cooling System	
2.8. Fan Belt	
2.9. Air Cleaner	
2.10. Intercooler	
2.11. Valve Clearance Adjust Procedure	
2.12. Cylinder Compression Pressure	
2.13. Injection Nozzle	
2.14. Fuel Injection Nozzle	
2.15. Battery	
2.16. Air Removal of Fuel System	
2.17. Fuel Supply Pump	
2.18. Turbocharger	
2.19. Starting Motor	
2.20. Electrical Equipment	
2.21. Diagnosis and Remedy	
2.22. Engine Inspection	
<b>3. DISASSEMBLY AND REASSEMBLY OF MAJOR COMPONENTS .....</b>	<b>48</b>
3.1. Disassembly	
3.2. Inspection and Measurement	
3.3. Reassembly	
<b>4. COMMISSIONING AND OPERATION .....</b>	<b>99</b>
4.1. Preparation	
4.2. Breaking-In	
4.3. Inspections After Starting	
4.4. Operation in Winter Time	
4.5. Tuning the Engine	
<b>5. MAINTENANCE AND CARE .....</b>	<b>103</b>
5.1. Periodical Inspection and Maintenance	
5.2. Lubrication System	
5.3. Adjustment of Valve Clearance	
5.4. Replacement of Fuel Filter	
5.5. Fuel System Checks	
5.6. Injection Nozzle Maintenance	

**6. MAINTENANCE OF MAJOR COMPONENTS ..... 111**

6.1. Fuel Injection Pump

6.4. Turbocharger

6.2. Cooling System

6.5. Air Intake System

6.3. Lubricating System

6.6. V-belts

**7. SPECIAL TOOL LIST ..... 174**

- **Appendix**
- **Part & After service center**
- **Worldwide Network**

# 1. SAFETY REGULATIONS & ENGINE SPECIFICATIONS

## 1.1. General Notes

Day-to-day use of power engines and the service products necessary for running them presents no problems if the persons occupied with their operation, maintenance and care are given suitable training and think as they work

This summary is a compilation of the most important regulations. These are broken down into main sections which contain the information necessary for preventing injury to persons, damage to property and pollution. In addition to these regulations those dictated by the type of engine and its site are to be observed also.



**Important :**

***If, despite all precautions, an accident occurs, in particular through contact with caustic acids, fuel penetrating the skin, scalding from oil, antifreeze being splashed in the eyes etc., consult a doctor immediately.***

## 1.2. Regulations Designed to Prevent Accidents

### 1.2.1. During commissioning, starting and operation

Before putting the engine into operation for the first time, read the operating instructions carefully and familiarize yourself with the “critical” points, If you are unsure, ask your DAEWOO representative.

- For reasons of safety we recommend you attach a notice to the door of the engine room prohibiting the access of unauthorized persons and that you draw the attention of the operating personal to the fact that they are responsible for the safety of persons who enter the engine room.
- The engine must be started and operated only by authorized personnel. Ensure that the engine cannot be started by unauthorized persons.
- When the engine is running, do not get too close to the rotating parts. Wear close-fitting clothing.
- Do not touch the engine with bare hands when it is warm from operation risk of burns.
- Exhaust gases are toxic. Comply with the installation instructions for the installation of DAEWOO diesel engines which are to be operated in enclosed spaces. Ensure that there is adequate ventilation and air extraction.
- Keep vicinity of engine, ladders and stairways free of oil and grease.  
Accidents caused by slipping can have serious consequences.

### 1.2.2. During maintenance and care

- Always carry out maintenance work when the engine is switched off. If the engine has to be maintained while it is running, e.g. changing the elements of change-over filters, remember that there is a risk of scalding. Do not get too close to rotating parts.
- Change the oil when the engine is warm from operation.



**Caution :**

***There is a risk of burns and scalding. Do not touch oil drain valve or oil filters with bare hands.***

- Take into account the amount of oil in the sump. Use a vessel of sufficient size to ensure that the oil will not overflow.
- Open the coolant circuit only when the engine has cooled down. If opening while the engine is still warm is unavoidable, comply with the instructions in the chapter entitled "Cooling".
- Neither tighten up nor open pipes and hoses (lube oil circuit, coolant circuit and any additional hydraulic oil circuit) during the operation. The fluid which flows out can cause injury.
- Fuel is inflammable. Do not smoke or use naked lights in its vicinity. The tank must be filled only when the engine is switched off.
- Keep service products (anti-freeze) only in containers which can not be confused with drinks containers.
- Comply with the manufacturer's instructions when handling batteries.



**Caution :**

***Accumulator acid is toxic and caustic. Battery gases are explosive.***

### 1.2.3. When carrying out checking, setting and repair work

- Checking, setting and repair work must be carried out by authorized personnel only.
- Use only tools which are in satisfactory condition. Slip caused by the worn open-end wrench could lead to injury.
- When the engine is hanging on a crane, no-one must be allowed to stand or pass under it. Keep lifting gear in good condition.
- When checking injectors, do not put your hands under the jet of fuel. Do not inhale atomized fuel.
- When working on the electrical system disconnect the battery earth cable first. Connect it up again last to prevent short circuits.

### **1.3. Regulations Designed to Prevent Damage to Engine and Premature Wear**

- (1) Never demand more of the engine than it was designed to yield for its intended purpose. Detailed information on this can be found in the sales literature. The injection pump must not be adjusted without prior written permission of DAEWOO.
- (2) If faults occur, find the cause immediately and have it eliminated in order to prevent more serious damage.
- (3) Use only genuine DAEWOO spare parts. DAEWOO will accept no responsibility for damage resulting from the installation of other parts which are supposedly "just as good".
- (4) In addition to the above, note the following points.
  - Never let the engine run when dry, i.e. without lube oil or coolant. Use only DAEWOO approved service products (engine oil, anti-freeze and anticorrosion agent).
  - Pay attention to cleanliness, The Diesel fuel must be free of water. See "Maintenance and care".
  - Have the engine maintained at the specified intervals.
  - Do not switch off the engine immediately when it is warm, but let it run without load for about 5 minutes so that temperature equalization can take place.
  - Never put cold coolant into an overheated engine. See "Maintenance and care".
  - Do not add so much engine oil that the oil level rises above the max. marking on the dipstick. Do not exceed the maximum permissible tilt of the engine. Serious damage to the engine may result if these instructions are not adhered to.
  - Always ensure that the testing and monitoring equipment (for battery charge, oil pressure, and coolant temperature) function satisfactorily.
  - Comply with instructions for operation of the alternator. See "Commissioning and operation".
  - Do not let the water pump run dry. If there is a risk of frost, drain the water when the engine is switched off.

### **1.4. Regulations Designed to Prevent Pollution**

#### **1.4.1. Engine oil, filter cartridge, fuel filter**

- Take old oil only to an oil collection point. Take strict precautions to ensure that oil does not get into the drains or into the ground.
- The drinking water supply may be contaminated.
- Oil and fuel filter elements are classed as dangerous waste and must be treated as such.

#### **1.4.2. Coolant**

- Treat undiluted anti-corrosion agent and / or antifreeze as dangerous waste.
- When disposing of spent coolant comply with the regulations of the relevant local authorities.

## 1.5. Notes on Safety in Handling Used Engine Oil

Prolonged or repeated contact between the skin and any kind of engine oil decreases the skin. Drying, irritation or inflammation of the skin may therefore occur. Used engine oil also contains dangerous substances which have caused skin cancer in animal experiments. If the basic rules of hygiene and health and safety at work are observed, health risks are not to the expected as a result of handling used engine oil.



### Health precautions

- Avoid prolonged or repeated skin contact with used engine oil.
- Protect your skin by means of suitable agents (creams etc.) or wear protective gloves.
- Clean skin which has been in contact with engine oil.
  - Wash thoroughly with soap and water, A nailbrush is an effective aid.
  - Certain products make it easier to clean your hands.
  - Do not use petrol, Diesel fuel, gas oil, thinners or solvents as washing agents.
- After washing apply a fatty skin cream to the skin.
- Change oil-soaked clothing and shoes.
- Do not put oily rags into your pockets.



### Ensure that used engine oil is disposed of properly.

**- Engine oil can endanger the water supply -**

For this reason do not let engine oil get into the ground, waterways, the drains or the sewers. Violations are punishable. Collect and dispose of used engine oil carefully. For information on collection points please contact the seller, the supplier or the local authorities.



## 1.6. General Repair Instructions



1. Before performing service operation, disconnect the grounding cable from the battery for reducing the chance of cable damage and burning due to short-circuiting.
2. Use covers for preventing the components from damage or pollution.
3. Engine oil and anti-freeze solution must be handled with reasonable care as they cause paint damage.
4. The use of proper tools and special tools where specified is important to efficient and reliable service operation.
5. Use genuine DAEWOO parts necessarily.
6. Used cotter pins, gaskets, O-rings, oil seals, lock washer and self-lock nuts should be discarded and new ones should be prepared for installation as normal function of the parts can not be maintained if these parts are reused.
7. To facilitate proper and smooth reassemble operation, keep disassembled parts neatly in groups. Keeping fixing bolts and nut separate is very important as they vary in hardness and design depending on position of installation.
8. Clean the parts before inspection or reassembly. Also clean oil ports, etc. using compressed air to make certain they are free from restrictions.
9. Lubricate rotating and sliding faces of parts with oil or grease before installation.
10. When necessary, use a sealer on gaskets to prevent leakage.
11. Carefully observe all specifications for bolts and nuts torques.
12. When service operation is completed, make a final check to be sure service has been done property.

## 1.7. Engine Specification

### 1.7.1. Specification

Engine Model		DE12T	DE12TI/A	DE12TIS
Items				
Engine type		4 cycle in-line, Water-cooled type Turbo charged	4 cycle in-line, Water-cooled type Turbo charged & intercooled	
Combustion chamber type		Direct injection type		
Cylinder liner type		Replaceable dry liner		
Timing gear system		Gear driven type		
No. of piston ring		2 Compression ring , 1 oil ring		
No. of cylinder-bore x stroke (mm)		6 - 123 x 155		
Total piston displacement (cc)		11,051		
Compression ratio		17.1 : 1	16.5 : 1	19.5 : 1
Engine dimension (length x width x height) (mm)		1,317 x 847 x 1,064	1,379 x 1,017 x 1,310	
Engine weight (kg)		909	900	
Rotating direction (viewed from flywheel)		Counter clockwise		
Fuel injection order		1 - 5 - 3 - 6 - 2 - 4		
Injection pump type		Mechanical	Mechanical	Mechanical
Governor type		RSV	RSV / RFD	RSV
Injection nozzle type		Multi-hole (5- $\phi$ 0.31)	Multi-hole(5- $\phi$ 0.31)	Multi-hole(5- $\phi$ 0.29)
Fuel injection pressure (kg/cm <sup>2</sup> )		220	220	160 / 220
Compression pressure (kg/cm <sup>2</sup> )		28 (at 200rpm)		
Intake and exhaust valve clearance(at cold) (mm)		0.3		
Intake valve	Open at	18° (B.T.D.C)	18.2° (B.T.D.C)	
	Close at	34° (A.B.D.C)	32.2° (A.B.D.C)	
Exhaust valve	Open at	46° (B.B.D.C)	69.8° (B.B.D.C)	
	Close at	14° (A.T.D.C)	29.8° (A.T.D.C)	
Lubrication method		Full forced pressure feed type		
Oil pump type		Gear type driven by crankshaft		
Oil filter type		Cartridge type		
Lubricating oil capacity (max./min) (liter)		25/17		
Oil cooler type		Water cooled		
Water pump		Centrifugal type driven by gear		
Cooling method		Fresh water forced circulation		
Cooling water capacity (engine only) (liter)		21		
Thermostat type (opening temperature)		Wax pallet type (71 or 85 °C)		
Alternator voltage - capacity (V - A)		24V - 50A		
Starting motor voltage - output (V - kW)		24 - 6.6		